เอกสารแนบที่ 126

ตัวอย่างแผนและผลบำรุงรักษาอุปกรณ์ป้องกัน และระงับอัคคีภัยของท่อขนส่งวัตถุดิบอุปกรณ์ตรวจจับการรั่วไหลบริเวณบรรจุวัตถุดิบ สารเคมี และผลิตภัณฑ์

ตัวอย่างแผนและผลบำรุงรักษาอุปกรณ์ป้องกัน และระงับอัคคีภัย :NBL PLANT PREVENTIVE MAINTENANCE PROGRAM 2022

Item No.	Tag. No.	Description	Jan	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	PM Type	Calibration Interval	Remark	Type
1	100-AT-101	P-10103 AREA LEL ANALYZER TRANSMITTER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
2	100-AT-011	TOXIC GAS DETECTOR AIR MONITORING ANALYZER SHELTER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
3	100-AT-104	BD DAY TANK AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
4	100-AT-105	MAA FEED AND CHARGE AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
5	100-AT-106	STYRENE FEED PUMP P-10106 AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
6	100-AT-301A	REACTOR R-10301A AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
7	100-AT-301B	REACTOR R-10301B AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
8	100-AT-301C	REACTOR R-10301C AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
9	100-AT-301D	REACTOR BOTTOM D AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
10	100-AT-306D	REACTOR D TOP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
11	100-AT-301E	REACTOR E BOTTOM AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
12	100-AT-306E	REACTOR E TOP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
13	100-AT-301F	REACTOR F BOTTOM AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
14	100-AT-306F	REACTOR F TOP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
15	100-AT-401A	BLOWDOWN AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
16	100-AT-401B	STRIPPER AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
17	100-AT-501	BD COMPRESSOR AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
18	100-AT-504	RECOVERED BD AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
19	100-AT-505	AN SCRUBBER AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
20	100-AT-551	P-10556A AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
21	100-AT-552	AN PRODUCT TRANSFER PUMP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
22	100-AT-553	MEHQ FEED PUMP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
23	100-AT-581	RECOVERED AN PUMP P-10559 AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
24	174-AT-7403	COOLING TOWER AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
25	174-AT-7404	COOLING TOWER AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
26	176-AT-7601	CHILLED WATER TANK LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
27	182-AT-8201	SUMP PITAREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
28	100-AT-001	NBL LAB LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
29	100-AT-002	NBL LAB LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
30	100-AT-003	NBL LAB LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
31	100-AT-004	NBL LAB LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
32	100-AT-306A	REACTOR R-10301A AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
33	100-AT-306B	REACTOR R-10301B AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
34	100-AT-306C	NEAR BOTTOM OF REACTOR R-10301C AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
35	100-AT-506	B-10501B AND B-10501C AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
36	100-AT-508	CAT-OX AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
37	100-AT-509	LEL Gas detector at CAT-OX unit			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
38	100-AT-510	LEL gas detector at CAT-OX unit			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
39	100-AT-507	CAT-OX LEL DETECTOR			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
40	100-AT-301G	REACTOR BOTTOM R-10301G AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
41	100-AT-306G	REACTOR BOTTOM R-10301G AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
42	100-AT-301H	REACTOR BOTTOM R-10301H AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
43	100-AT-306H	REACTOR TOP R-10301H AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
44	100-AT-402	BLOWDOWN V-10401D TOP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR

45	100-AT-403	BLOWDOWN V-10401D BOTTOM AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
46	100-AT-404	STRIPPER V-10402D TOP AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
47	100-AT-405	STRIPPER V-10402D BOTTOM AREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
48	183-AT-8311	GAS DETECTOR			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
49	100-AT-010	COMBUSTION GAS DETECTOR AIR MONITORING ANALYZER SHELTER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
50	100-AT-103	P-10108 ANAREA LEL ANALYZER			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
51	100-AT-701	Between V-10702 and V-10703			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
52	100-AT-702	Between R-10702 and R-10704			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
53	100-AT-708	LEL Transmitter for Continuous reactor			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
54	100-AT-704	Near Air Condition			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
55	100-AT-707	LEL Transmitter for Continuous reactor			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
56	100-AT-703	Near C-10701			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
57	100-AT-102	AN TANK V-10106 AREA AN DETECTOR			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
58	100-AT-554	AN DETECTOR T-10559 AREA			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
59	100-AT-005	AN DETECTOR ON CCR ROOF			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR
60	100-AT-107	AN CHARGE PUMP AN DETECTOR			IC1			IC1			IC1			IC1	TIME BASE MAINTENANCE	3 months calibration		GAS DETECTOR

DRAEGER SAFETY (THAILAND) LIMITED.

Dräger

Test Certificate

		Job Number	*SVR2301-121*
Customer	*Bangkok Synthetics Co.,Ltd.(NBL)*		
Location	*Map-Ta-Phut Ind.,Est., Mueang , Rayong*		
Measuring Head P/No	*4544403*	**Sensor P/NO**	*6810745*
Measuring Head S/No	*ERHD-1106*	**Sensor S/No**	*ARHH-1106*
Software Version	*1.5.0*	**Calibration Date**	*29-Mar-23*
Customer Ref	*100-AT-102*	**Next Calibration Date**	*30-Jun-23*

Service Report

1.) Service and Calibration done.

Inspection Summary

Instrument configuration checked	*OK*	Sensor	*OK*
Calibration verified	*OK*	Display	*OK*
Functional Inspection	*OK*	Housing	*OK*

Reference standard gas:	*CO 50 ppm Nitrogen Balanace*	Lot no.:	*1324419*
Test equipment :	-	S/N:	-

Test Result

Configuration Target Gas	Full Range	Zero calibration		Test Gas	Span calibration		Test Gas
		Before calibration	After Calibration		Before calibration	After Calibration	
Acetonitrile	*0-10.0 ppm*	*0.0 ppm*	*0.0 ppm*	*CO 50.0 ppm*	*49.0 ppm*	*50.0 ppm*	*Carbon monoxide*

This is to certify that this equipment has been checked, serviced and tested in accordance to Dräger Test Instructions Polytron 8100 Revision 4.0. Calibration Gases are tracable to NIST.

DRAEGER SAFETY (THAILAND) LIMITED WANNASIT S. SERVICE

Calibrated by **Stamp**

Draeger Safety (Thailand) Limited True Digital Park phase 2 Unicorn Tower 101 Soi Piyabutr 1, Sukhumvit Road, Bang Chak Subdistrict,, Phra Khanong District, Bangkok 10260, 9th Floor

Telephone +66 2 744 0110 Fax +66 2 744 0585

E MAIL sales.thailand@draeger.com

INTERNET www.draeger.com

NATURE C ENGINEERING & SERVICE CO., LTD

Nature C Engineering and Service Co., Ltd.
Address: 66 Soi Wattananivet 7 Samsennok Huaykwang Bangkok10310
Tel: +66 2 277 5966 Fax: +66 2 277 5991 Email: info@natureceng.com

Calibration Certificate

This is certified that

CUSTOMER : Bangkok Synthetics Co.,Ltd.
ADDRESS : 8 I-2 Road, Map Ta Phut Industrial Estate, Muang District, Rayong, Thailand 21150

GAS DETECTOR INFORMATION ;

Certificate No.
NCES-C-2303-005

MANUFACTURER:	HONEYWELL	**MODEL SENSOR NO:**	MPD-AMCB1
DESCRIPTION :	XNX WITH MPD	**SERIALSENSOR NO :**	01120052
MODEL TRANSMITTER NO :	XNX-AMVI-NNCB1	**TAG NO :**	100-AT-101
SERIAL TRANSMITTER NO :	01120185	**LOCATION :**	Plant 100

STANDARD INFORMATION :
The standard mixer gases traceable to gas manufacturer as mentioned in Cerificate of Standard gas.

Standard Calibration Gas :	Iso-Butane	**Certificate No :**	EAN-17A-0.9-6
Concentration :	0.9%Vol (50%LEL) Balance Air	**Expiry Date :**	14 August 2026
Accuracy :	±2% Relative		

TEST RESULTS :

Sensor Type :	1,3-Butadiene	
Standard Calibration Gas :	Iso-Butane 0.9%Vol (50%LEL) Balance Air	
Before Calibrate :	48.0 %LEL	
After Calibrate :	46.0 %LEL	
Output :	- mA	
Response Time :	6 Second	

CALIBRATION RESULTS :

X	Passed Without Remark
	Passed With Remark
	Clean lens Sensor and filter sensor
	Clean Guard and Body
	Clean line samping
	Clean line Drian

REMARKS :

Calibration Date :	15 March 2023
Calibrated Due Date :	13 June 2023

REPRESENTATIVE SIGNATURE :

Calibrated By	Approved By
MR. WUTTINUN RODNUAL	MR. NOPPHADOL KHUNPHINIJ
15 March 2023	15 March 2023

All test and calibration records are maintained at Nature C Engineering and Service Co., Ltd. This certificate shall not be reproduced except in full, without the written approval of Nature C Engineering and Service Co., Ltd.

NATURE C ENGINEERING & SERVICE CO., LTD

Nature C Engineering and Service Co., Ltd.
Address: 66 Soi Wattananivet 7 Samsennok Huaykwang Bangkok10310
Tel: +66 2 277 5966 Fax: +66 2 277 5991 Email: info@natureceng.com

Calibration Certificate

This is certified that

CUSTOMER : Bangkok Synthetics Co.,Ltd.
ADDRESS : 8 I-2 Road, Map Ta Phut Industrial Estate, Muang District, Rayong, Thailand 21150

GAS DETECTOR INFORMATION ;

Certificate No.
NCES-C-2303-007

MANUFACTURER:	HONEYWELL	MODEL SENSOR :	2108B 2003N
DESCRIPTION :	XNX WITH OPTIMA PLUS	SERIAL NO :	Z0177317310060
MODEL :	XNX-AMAI-NHNNN	TAG NO :	100-AT-104
SERIAL NO :	45161563	LOCATION :	Plant 100

STANDARD INFORMATION :
The standard mixer gases traceable to gas manufacturer as mentioned in Certificate of Standard gas.

Standard Calibration Gas :	Iso-Butane	Certificate No :	EAN-17A-0.9-6
Concentration :	0.9%Vol (50%LEL) Balance Air	Expiry Date :	14 August 2026
Accuracy :	±2% Relative		

TEST RESULTS :

Sensor Type :	1,3-Butadiene
Standard Calibration Gas :	0.9%Vol (50%LEL) Balance Air
Before Calibrate :	45.0 %LEL
After Calibrate :	45.0 %LEL
Output :	- mA
Response Time :	8 Second

CALIBRATION RESULTS :

X	Passed Without Remark
	Passed With Remark
	Clean lens Sensor and filter sensor
	Clean Guard and Body
	Clean line samping
	Clean line Drian

REMARKS :

Calibration Date :	15 March 2023
Calibrated Due Date :	13 June 2023

REPRESENTATIVE SIGNATURE :

Calibrated By	Approved By
MR. WUTTINUN RODNUAL	MR. NOPPHADOL KHUNPHINIJ
15 March 2023	15 March 2023

All test and calibration records are maintained at Nature C Engineering and Service Co., Ltd.
This certificate shall not be reproduced except in full, without the written approval of Nature C Engineering and Service Co., Ltd.

NATURE C ENGINEERING & SERVICE CO., LTD

Nature C Engineering and Service Co., Ltd.
Address: 66 Soi Wattananivet 7 Samsennok Huaykwang Bangkok10310
Tel: +66 2 277 5966 Fax: +66 2 277 5991 Email: info@natureceng.com

Calibration Certificate

This is certified that

CUSTOMER : Bangkok Synthetics Co.,Ltd.
ADDRESS : 8 I-2 Road, Map Ta Phut Industrial Estate, Muang District, Rayong, Thailand 21150

GAS DETECTOR INFORMATION ;

Certificate No.
NCES-C-2303-006

MANUFACTURER:	HONEYWELL	MODEL SENSOR NO:	MPD-AMCB1
DESCRIPTION :	XNX WITH MPD	SERIALSENSOR NO :	01120054
MODEL TRANSMITTER NO :	XNX-AMVI-NNCB1	TAG NO :	100-AT-103
SERIAL TRANSMITTER NO :	01120187	LOCATION :	Plant 100

STANDARD INFORMATION :
The standard mixer gases traceable to gas manufacturer as mentioned in Certificate of Standard gas.

Standard Calibration Gas :	Iso-Butane	Certificate No :	EAN-17A-0.9-6
Concentration :	0.9%Vol (50%LEL) Balance Air	Expiry Date :	14 August 2026
Accuracy :	±2% Relative		

TEST RESULTS :

Sensor Type :	1,3-Butadiene
Standard Calibration Gas :	Iso-Butane 0.9%Vol (50%LEL) Balance Air
Before Calibrate :	48.0 %LEL
After Calibrate :	46.0 %LEL
Output :	- mA
Response Time :	7 Second

CALIBRATION RESULTS :

X	Passed Without Remark
	Passed With Remark
	Clean lens Sensor and filter sensor
	Clean Guard and Body
	Clean line samping
	Clean line Drian

REMARKS :

Calibration Date :	15 March 2023
Calibrated Due Date :	13 June 2023

REPRESENTATIVE SIGNATURE :

Calibrated By	Approved By
MR. WUTTINUN RODNUAL	MR. NOPPHADOL KHUNPHINIJ
15 March 2023	15 March 2023

All test and calibration records are maintained at Nature C Engineering and Service Co., Ltd.
This certificate shall not be reproduced except in full, without the written approval of Nature C Engineering and Service Co., Ltd.

NATURE C ENGINEERING & SERVICE CO., LTD
Nature C Engineering and Service Co., Ltd.
Address: 66 Soi Wattananivet 7 Samsennok Huaykwang Bangkok10310
Tel: +66 2 277 5966 Fax: +66 2 277 5991 Email: info@natureceng.com

Calibration Certificate

This is certified that

CUSTOMER : Bangkok Synthetics Co.,Ltd.
ADDRESS : 8 I-2 Road, Map Ta Phut Industrial Estate, Muang District, Rayong, Thailand 21150

GAS DETECTOR INFORMATION ;

Certificate No.
NCES-C-2303-009

MANUFACTURER:	HONEYWELL	MODEL SENSOR NO:	MPD-AMCB1
DESCRIPTION :	XNX WITH MPD	SERIALSENSOR NO :	01120081
MODEL TRANSMITTER NO :	XNX-AMVI-NNCB1	TAG NO :	100-AT-106
SERIAL TRANSMITTER NO :	01120213	LOCATION :	Plant 100

STANDARD INFORMATION :
The standard mixer gases traceable to gas manufacturer as mentioned in Certificate of Standard gas.

Standard Calibration Gas :	Iso-Butane	Certificate No :	EAN-17A-0.9-6
Concentration :	0.9%Vol (50%LEL) Balance Air	Expiry Date :	14 August 2026
Accuracy :	±2% Relative		

TEST RESULTS :

Sensor Type :	1,3-Butadiene		X	Passed Without Remark
Standard Calibration Gas :	Iso-Butane 0.9%Vol (50%LEL) Balance Air			Passed With Remark
Before Calibrate :	47.0	%LEL		Clean lens Sensor and filter sensor
After Calibrate :	47.0	%LEL		Clean Guard and Body
Output :	-	mA		Clean line samping
Response Time :	6	Second		Clean line Drian

CALIBRATION RESULTS :

REMARKS :

Calibration Date :	15 March 2023
Calibrated Due Date :	13 June 2023

REPRESENTATIVE SIGNATURE :

Calibrated By	Approved By
MR. WUTTINUN RODNUAL	MR. NOPPHADOL KHUNPHINIJ
15 March 2023	15 March 2023

All test and calibration records are maintained at Nature C Engineering and Service Co., Ltd. This certificate shall not be reproduced except in full, without the written approval of Nature C Engineering and Service Co., Ltd.

NATURE C ENGINEERING & SERVICE CO., LTD
Nature C Engineering and Service Co., Ltd.
Address: 66 Soi Wattananivet 7 Samsennok Huaykwang Bangkok10310
Tel: +66 2 277 5966 Fax: +66 2 277 5991 Email: info@natureceng.com

Calibration Certificate

This is certified that

CUSTOMER : Bangkok Synthetics Co.,Ltd.
ADDRESS : 8 I-2 Road, Map Ta Phut Industrial Estate, Muang District, Rayong, Thailand 21150

GAS DETECTOR INFORMATION ;

Certificate No.
NCES-C-2303-008

MANUFACTURER:	HONEYWELL	MODEL SENSOR NO:	MPD-AMCB1
DESCRIPTION :	XNX WITH MPD	SERIALSENSOR NO :	01120051
MODEL TRANSMITTER NO :	XNX-AMVI-NNCB1	TAG NO :	100-AT-105
SERIAL TRANSMITTER NO :	01120184	LOCATION :	Plant 100

STANDARD INFORMATION :
The standard mixer gases traceable to gas manufacturer as mentioned in Certificate of Standard gas.

Standard Calibration Gas :	Iso-Butane	Certificate No :	EAN-17A-0.9-6
Concentration :	0.9%Vol (50%LEL) Balance Air	Expiry Date :	14 August 2026
Accuracy :	±2% Relative		

TEST RESULTS :

Sensor Type :	1,3-Butadiene		X	Passed Without Remark
Standard Calibration Gas :	Iso-Butane 0.9%Vol (50%LEL) Balance Air			Passed With Remark
Before Calibrate :	48.0	%LEL		Clean lens Sensor and filter sensor
After Calibrate :	47.0	%LEL		Clean Guard and Body
Output :	-	mA		Clean line samping
Response Time :	4	Second		Clean line Drian

CALIBRATION RESULTS :

REMARKS :

Calibration Date :	15 March 2023
Calibrated Due Date :	13 June 2023

REPRESENTATIVE SIGNATURE :

Calibrated By	Approved By
MR. WUTTINUN RODNUAL	MR. NOPPHADOL KHUNPHINIJ
15 March 2023	15 March 2023

All test and calibration records are maintained at Nature C Engineering and Service Co., Ltd. This certificate shall not be reproduced except in full, without the written approval of Nature C Engineering and Service Co., Ltd.

DRAEGER SAFETY (THAILAND) LIMITED.

Dräger

Test Certificate

		Job Number	*SVR2301-121*
Customer	*Bangkok Synthetics Co.,Ltd.(NBL)*		
Location	*Map-Ta-Phut Ind.,Est., Mueang , Rayong*		
Measuring Head P/No	*4544403*	**Sensor P/NO**	*6810745*
Measuring Head S/No	*ERHD-1100*	**Sensor S/No**	*ARKL-0045*
Software Version	*1.5.0*	**Calibration Date**	*29-Mar-23*
Customer Ref	*100-AT-107*	**Next Calibration Date**	*30-Jun-23*

Service Report

1.) Service and Calibration done.

Inspection Summary

Instrument configuration checked	*OK*	Sensor	*OK*
Calibration verified	*OK*	Display	*OK*
Functional Inspection	*OK*	Housing	*OK*
Reference standard gas:	*CO 50 ppm Nitrogen Balanace*	Lot no.:	*1324419*
Test equipment :	-	S/N:	-

Test Result

Configuration Target Gas	Full Range	Zero calibration		Test Gas	Span calibration		Test Gas
		Before calibration	After Calibration		Before calibration	After Calibration	
Acetonitrile	*0-10.0 ppm*	*0.0 ppm*	*0.0 ppm*	*CO 50.0 ppm*	*36.50 ppm*	*50.0 ppm*	*Carbon monoxide*

This is to certify that this equipment has been checked, serviced and tested in accordance to Dräger Test Instructions Polytron 8100 Revision 4.0. Calibration Gases are tracable to NIST.

DRAEGER SAFETY (THAILAND) LIMITED WANNASIT S. SERVICE

Calibrated by **Stamp**

Draeger Safety (Thailand) Limited True Digital Park phase 2 Unicorn Tower 101 Soi Piyabutr 1, Sukhumvit Road, Bang Chak Subdistrict,, Phra Khanong District, Bangkok 10260, 9th Floor

Telephone +66 2 744 0110 Fax +66 2 744 0585

E MAIL sales.thailand@draeger.com

INTERNET www.draeger.com

2B.แบบฟอร์มการทดสอบ Fire Water Spray Systems test (Every 6 month(time)

ชื่องาน/Job..... วันที่...6.../...01.../2023..... พื้นที่ Top Blowdown & Stripper

ลำดับ	เลขที่อุปกรณ์	Area	ตำแหน่งอุปกรณ์	Solenoid Valve สามารถทำงานได้ปกติ (Normal Open)	2.Pressure Gauge อยู่ในช่วงที่กำหนด 100 Bar	3.สามารถสั่งงานจากระบบ Manual ของตู้ Panel ของ(DCR)	4.Water Spray Nozzle ยังไม่มีสิ่งกีดขวางการพ่นน้ำ (ยกเว้น Dry Pipe)	5.Drainage valve อยู่ในตำแหน่งปิด (ยกเว้นระบบ Deluge)	ผลการทดสอบ	
									ทำงานใช้งานได้ (✓ / B / C)	ไม่ทำงาน (A)
1	DV-7201	IBD Tank and MAA Tank			□ = ผ่าน		□ = ผ่าน	□ = A		
2	DV-7202	Pump chemical truck unload			□ = ผ่าน		□ = ผ่าน	□ = A		
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน		□ = ผ่าน	□ = A		
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน		□ = ผ่าน	□ = A		
5	DV-7205	BD Recovery Area			□ = ผ่าน		□ = ผ่าน	□ = A		
6	DV-7206	AN Recovery Area			□ = ผ่าน		□ = ผ่าน	□ = A		
7	DV-7207	Blow Down & Stripper 2nd & 3rd Fl.			□ = ผ่าน		□ = ผ่าน	□ = A		
8	DV-7208	Top Blowdown & Stripper		/	☑ = ผ่าน	/	☑ = ผ่าน	□ = A	/	
9	DV-7209	Slop & BD compressor C			□ = ผ่าน		□ = ผ่าน	□ = A		
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน		□ = ผ่าน	□ = A		
11	DV-7211	V-10559 TDDN,AN Tank A rea			□ = ผ่าน		□ = ผ่าน	□ = A		
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน		□ = ผ่าน	□ = A		
13	DV-7212	Reactor GH			□ = ผ่าน		□ = ผ่าน	□ = A		
14	DV-7213	Reactor GH			□ = ผ่าน		□ = ผ่าน	□ = A		
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน		□ = ผ่าน	□ = A		

ข้อเสนอแนะ.....

ลงชื่อ.....ผู้ทำการทดสอบ
(ผู้ควบคุมงานระบบ/ตัวแทนเจ้าของโครงการ).....
วันที่...../...../.....

ลงชื่อ.....ผู้ทำการทดสอบ
(ตัวแทนเจ้าของโครงการ).....
วันที่...6.../...07.../2566.....

ลงชื่อ.....ผู้ทำการทดสอบ
(ผู้ควบคุมงานระบบ/ตัวแทนเจ้าของโครงการ).....
วันที่...../...../.....

S-9SAC-D-1202 (ver.4)_JJ_ Eff 31-08-22_3F_ID-3500/22

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน..... วันที่ 25, 2, 23 พื้นที่ truck unload

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ: 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถตั้งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve ปิดสนิทหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้งาน (A)	✓ - ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป)
											การแก้ไข/หมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload	—	/	☑ = ผ่าน □ = A	/	☑ = ผ่าน □ = A	/	/		Change Solinoid DV-7202 Re test ok.
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

ลงชื่อ ศุภลักษณ์ กำหนด ผู้ตรวจสอบ
เจ้าของพื้นที่
วันที่ 25, 2, 23

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

S-PSM-CO-F1202 (re.4)_1/1_Eff.15-08-22_3Y_ID-1050/22

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน.....-..... วันที่....27.../...03.../2023..... พื้นที่ V-10559,V-10106,V-10109

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ: 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถตั้งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve ปิดสนิทหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้งาน (A)	✓ - ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป)
											การแก้ไข/หมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201		/	☑ = ผ่าน □ = A	/	☑ = ผ่าน □ = A	/	/		
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

ลงชื่อ ไพฑูรย์ นิ่มเผือก ผู้ตรวจสอบ
เจ้าของพื้นที่
วันที่...27.../.....03.../...2566.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

S-PSM-CO-F1202 (re.4)_1/1_Eff.15-08-22_3Y_ID-1050/22

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

APR-23

จำนวน..... วันที่ 22/04/23 พื้นที่ 550

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถสั่งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (ฉีดพ่น Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve มีการหนีหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้ (%) (A)	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป) การแก้ไขหมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C		OK.	✓ = ผ่าน □ = A	OK.	✓ = ผ่าน □ = A	OK.	/		
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ ลงชื่อ PHN ผู้ตรวจสอบ ลงชื่อ..... ผู้ตรวจสอบ

ผู้ร่วมตรวจสอบ ส่วนงานบริษัท..... เจ้าของพื้นที่ ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....

วันที่ ... / ... / ... วันที่ 24, 4, 23 วันที่ ... / ... / ...

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

May-23

จำนวน..... วันที่ 2-5-23 พื้นที่ Unit 400

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถสั่งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (ฉีดพ่น Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve มีการหนีหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้ (%) (A)	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป) การแก้ไขหมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.		OK	✓ = ผ่าน □ = A	OK	✓ = ผ่าน □ = A	OK	✓		
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

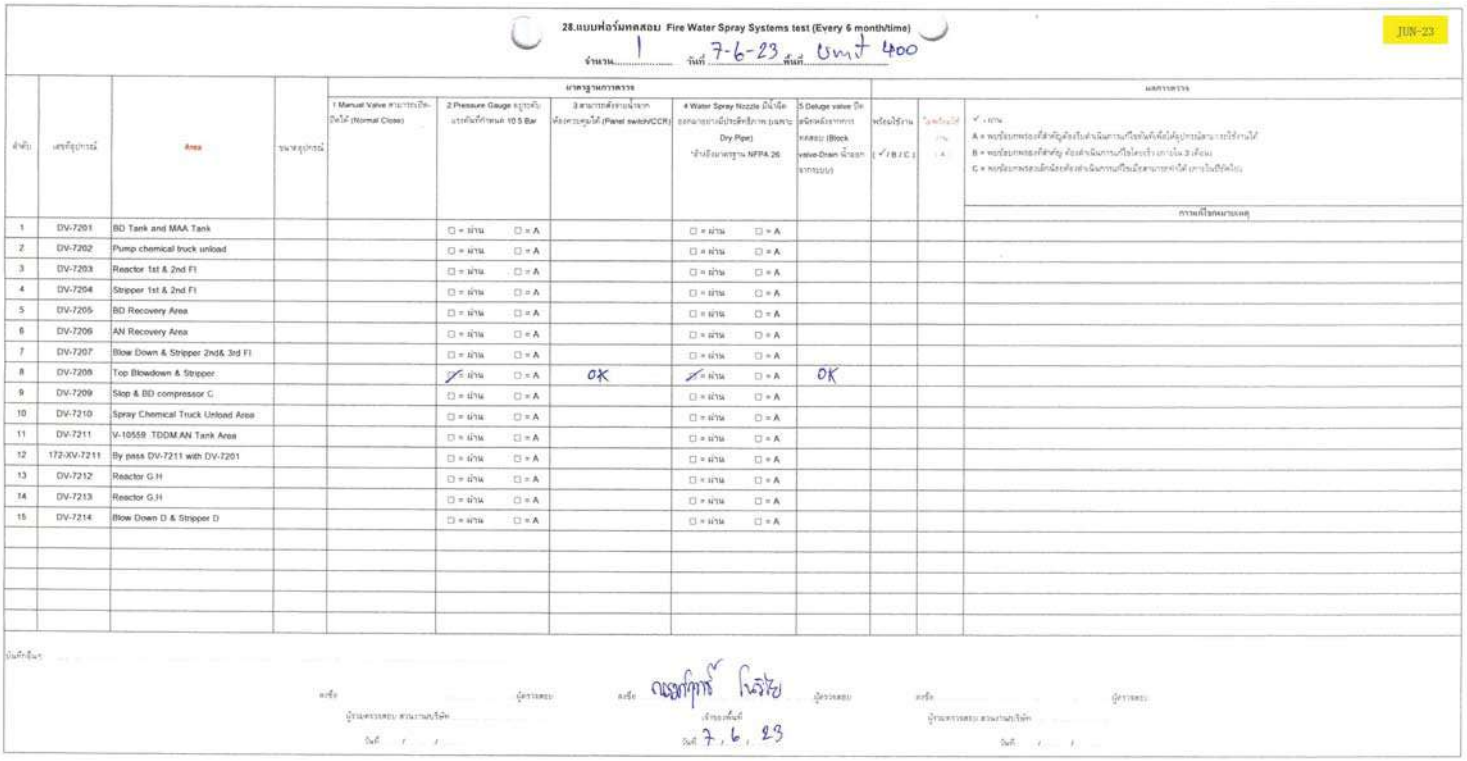
บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ ลงชื่อ ศุภลักษณ์ ศรีรัตนพงศ์ ผู้ตรวจสอบ ลงชื่อ..... ผู้ตรวจสอบ

ผู้ร่วมตรวจสอบ ส่วนงานบริษัท..... เจ้าของพื้นที่ ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....

วันที่ ... / ... / ... วันที่ 2, 5, 23 วันที่ ... / ... / ...

JUN-23



28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน 1 วันที่ 7-6-23 พื้นที่ Unit 400

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ: 1 Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2 Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3 สามารถตั้งจากน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4 Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5 Deluge valve ปิดตลิ่งหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓/B/C)	[illegible]	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรับดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีปัจจุบัน) การแก้ไขหมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			☑ = ผ่าน □ = A	OK	☑ = ผ่าน □ = A	OK			
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 TDDM.AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G.H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G.H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ

ลงชื่อ ..... ผู้ตรวจสอบ ลงชื่อ [illegible] ผู้ตรวจสอบ ลงชื่อ ..... ผู้ตรวจสอบ

ผู้รวมตรวจสอบ สวนงานบริษัท ..... เจ้าของพื้นที่ ผู้รวมตรวจสอบ สวนงานบริษัท .....

วันที่ / / วันที่ 7, 6, 23 วันที่ / /

S-PSM-CO-F1202 (re 4)_4/9_Eff 15-08-22_19_ID-1050/22

ตัวอย่างผลการตรวจสอบ

Water Deluge Valve

& Water Sprinkler

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน..... วันที่ 25, 2, 23 พื้นที่ truck unload

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ: 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถตั้งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve ปิดสนิทหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓/B/C)	ไม่พร้อมใช้งาน (A)	✓ - ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป)
											การแก้ไข/หมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload	—	/	☑ = ผ่าน □ = A	/	☑ = ผ่าน □ = A	/	/		Change Solinoid DV-7202 Re test ok.
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

ลงชื่อ ศุภลักษณ์ กำหนด ผู้ตรวจสอบ
เจ้าของพื้นที่
วันที่ 25, 2, 23

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

S-PSM-CO-F1202 (re.4)_1/1_Eff.15-08-22_3Y_ID-1050/22

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน.....-..... วันที่....27.../...03.../2023..... พื้นที่ V-10559,V-10106,V-10109

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ: 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถตั้งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve ปิดสนิทหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓/B/C)	ไม่พร้อมใช้งาน (A)	✓ - ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป)
											การแก้ไข/หมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201		/	☑ = ผ่าน □ = A	/	☑ = ผ่าน □ = A	/	/		
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

ลงชื่อ ไพฑูรย์ นิ่มเผือก ผู้ตรวจสอบ
เจ้าของพื้นที่
วันที่...27.../...03.../...2566.....

ลงชื่อ..... ผู้ตรวจสอบ
ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....
วันที่...../...../.....

S-PSM-CO-F1202 (re.4)_1/1_Eff.15-08-22_3Y_ID-1050/22

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

APR-23

จำนวน..... วันที่ 22/04/23 พื้นที่ 550

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถสั่งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (ฉีดพ่น Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve มีการหนีหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้ (%) (A)	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป) การแก้ไขหมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C		OK.	✓ = ผ่าน □ = A	OK.	✓ = ผ่าน □ = A	OK.	/		
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ ลงชื่อ PHN ผู้ตรวจสอบ ลงชื่อ..... ผู้ตรวจสอบ

ผู้ร่วมตรวจสอบ ส่วนงานบริษัท..... เจ้าของพื้นที่ ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....

วันที่ ... / ... / ... วันที่ 24, 4, 23 วันที่ ... / ... / ...

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

May-23

จำนวน..... วันที่ 2-5-23 พื้นที่ Unit 400

ลำดับ	เลขที่อุปกรณ์	Area	ขนาดอุปกรณ์	มาตรฐานการตรวจ 1.Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2.Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3.สามารถสั่งจ่ายน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4.Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (ฉีดพ่น Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5.Deluge valve มีการหนีหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ พร้อมใช้งาน (✓ / B / C)	ไม่พร้อมใช้ (%) (A)	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรีบดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีถัดไป) การแก้ไขหมายเหตุ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl.		OK	✓ = ผ่าน □ = A	OK	✓ = ผ่าน □ = A	OK	✓		
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl.			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 ,TDDM,AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G,H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกอื่นๆ.....

ลงชื่อ..... ผู้ตรวจสอบ ลงชื่อ ศุภลักษณ์ ศรีรัตนพงศ์ ผู้ตรวจสอบ ลงชื่อ..... ผู้ตรวจสอบ

ผู้ร่วมตรวจสอบ ส่วนงานบริษัท..... เจ้าของพื้นที่ ผู้ร่วมตรวจสอบ ส่วนงานบริษัท.....

วันที่ ... / ... / ... วันที่ 2, 5, 23 วันที่ ... / ... / ...

JUN-23

28.แบบฟอร์มทดสอบ Fire Water Spray Systems test (Every 6 month/time)

จำนวน 1 วันที่ 7-6-23 พื้นที่ Unit 400

ลำดับ	เลขที่อุปกรณ์	Area	จนาดอุปกรณ์	มาตรฐานการตรวจ: 1 Manual Valve สามารถเปิด-ปิดได้ (Normal Close)	2 Pressure Gauge อยู่ระดับแรงดันที่กำหนด 10.5 Bar	3 สามารถตั้งจากน้ำจากห้องควบคุมได้ (Panel switch/CCR)	4 Water Spray Nozzle มีน้ำฉีดออกมาอย่างมีประสิทธิภาพ (เฉพาะ Dry Pipe) *อ้างอิงมาตรฐาน NFPA 26	5 Deluge valve ปิดสนิทหลังจากการทดสอบ (Block valve-Drain น้ำออกจากระบบ)	ผลการตรวจ: พร้อมใช้งาน (✓/B/C)	[illegible]	✓ = ผ่าน A = พบข้อบกพร่องที่สำคัญต้องรับดำเนินการแก้ไขทันทีเพื่อให้อุปกรณ์สามารถใช้งานได้ B = พบข้อบกพร่องที่สำคัญ ต้องดำเนินการแก้ไขโดยเร็ว (ภายใน 3 เดือน) C = พบข้อบกพร่องเล็กน้อยต้องดำเนินการแก้ไขเมื่อสามารถทำได้ (ภายในปีปัจจุบัน) การแก้ไขตามระบบ
1	DV-7201	BD Tank and MAA Tank			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
2	DV-7202	Pump chemical truck unload			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
3	DV-7203	Reactor 1st & 2nd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
4	DV-7204	Stripper 1st & 2nd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
5	DV-7205	BD Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
6	DV-7206	AN Recovery Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
7	DV-7207	Blow Down & Stripper 2nd& 3rd Fl			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
8	DV-7208	Top Blowdown & Stripper			☑ = ผ่าน □ = A	OK	☑ = ผ่าน □ = A	OK			
9	DV-7209	Slop & BD compressor C			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
10	DV-7210	Spray Chemical Truck Unload Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
11	DV-7211	V-10559 TDDM.AN Tank Area			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
12	172-XV-7211	By pass DV-7211 with DV-7201			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
13	DV-7212	Reactor G.H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
14	DV-7213	Reactor G.H			□ = ผ่าน □ = A		□ = ผ่าน □ = A				
15	DV-7214	Blow Down D & Stripper D			□ = ผ่าน □ = A		□ = ผ่าน □ = A				

บันทึกเพิ่มเติม

ลงชื่อ ..... ผู้ตรวจสอบ ลงชื่อ [illegible] ผู้ตรวจสอบ ลงชื่อ ..... ผู้ตรวจสอบ

ผู้รวมตรวจสอบ สวนงานบริษัท ..... เจ้าของพื้นที่ ผู้รวมตรวจสอบ สวนงานบริษัท .....

วันที่ / / วันที่ 7, 6, 23 วันที่ / /

เอกสารแนบที่ 127

เอกสารรับรองการออกแบบท่อขนส่งตามมาตรฐาน ANSI/ASME

BST	Bangkok Synthetics Co., Ltd. Calculation Of Pipe Wall Thickness	Doc. No: NG Wall Thickness-01 Rev. : 0 Update on : 04 / 08 / 20 Sheet 1 of 1

Pipe Design Thickness for Piping Class 150 (FOR NATURAL GAS TO THERMAL OXIDIZER)

Materials A53 Gr. B

Design Code	:	ASME B 31.3	
Fluid Name	:	Natural gas	
Design Pressure	:	856.4 kPA	(7.7 Kg/cm2G)
Design Temperature	:	65 Deg. C	
Location Class	:	4	
Materials	:	A53 Gr.B	

$$t = \frac{P \times D}{2(SEW+PY)}$$

t	=	Req'd thickness including corrosion allowance	0.233	mm
P	=	Design Pressure	856.4	kPa
D	=	Nominal outside diameter of pipe	2	inch
S	=	Specified minimum yield strength	110,316	kPa
Y	=	Valuves Of Coefficient	0.4	
W	=	Weld joint strenght reduction factor	1	
E	=	Quality factor	1	

Calculation Thickness for Piping Class 150#

Item	Pipe size (Inch)	Pipe O.D. (mm)	Calculated Thk (mm)	Used		Remarks
				(mm)	SCH	
1	2"	60.33	0.233	3.912	40	

Conclusions :

The required wall thickness for material grade and design factor is noted below:

Pipe 2" Class 150 required thickness = 0.233 mm Selected thickness = 3.912 mm **PASS**

Plant	Client	Code	Doc ID Code	Project No.
NBL	BST	NBL Incremental Project (Phase 1.5)	PTH-PIP-00-EC-0002	01-6008

thyssenkrupp

Engineering Specification for Piping Material

BST

ENGINEERING SPECIFICATION

FOR PIPING MATERIAL

Rev.	Status	Description	Date	Prepared	Date	Checked	Date	Approved	AC
02	IFD	Re-Issued for Design	22.11.19	SP	22.11.19	PT	22.11.19	NP	
01	IFD	Issued for Design	21.10.19	SP	21.10.19	PT	21.10.19	NP	

01-6008-10431704

3

Category Code

PIPING SPECIFICATION

NBL Incremental Project

01-6008

Part 1

CLIENT :
SITE :
PROJECT :
PLANT :

TITLE OF DOCUMENT : PIPING SPECIFICATION
DATE OF FIRST ISSUE :

REV.	DATE	PREPARED DATE / SIGN	CHECKED DATE / SIGN	APPROVED DATE / SIGN	REMARKS

REVISION	DATE OF REVISION	PARTS	DESCRIPTION

thyssenkrupp Industrial Solutions

Piping Specification
General

UAN	:	01-6008-000
Part	:	1
Page	:	2
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	19.11.2019
Print Time	:	06:20

C O N T E N T - L I S T

PART 1 - GENERAL

PART 2 - LIST OF FLUIDS

PART 3.1 - WALL THICKNESS TABLES

PART 3.2 - BRANCH TABLES

PART 4.1 - PIPING CLASSES

PART 4.2 - SPECIAL PARTS PIPING CLASSES

G E N E R A L N O T E S :

1) This specification shall be applied to piping materials indicated on P&ID flow diagrams and Utility flow Diagrams.
However, the piping materials which are furnished as a regular part of proprietary or standardized equipment
(or package facility) shall be in accordance with the equipment manufacturer's standards for the design conditions.

This specification shall not be applied to specially designed mating flanges, gaskets, bolts and nuts
at the equipment nozzle.

2) Design, fabrication, testing, and inspection of piping materials shall be accomplished in accordance
with the applicable Codes and Standards of the latest edition as follow

ANSI B16.21	Non metallic Gaskets for Pipe flanges
ANSI B16.43	Wrought Copper and Copper Alloy Solder Joint Fittings for Solvent Drainage System
ANSI B18.2.1	Square and Hex Bolts and Screws (Inch Series)
ANSI B18.2.2	Square and Hex Nuts (Inch Series)
API 594	Wafer Type Check Valves
API 595	Cast - Iron Gate Valves, Flanged Ends
API 598	Valve Inspection and Test
API 599	Steel and Ductile Iron Plug Valves
API 600	Steel Gate Valves - Flanged and Butt-Welding Ends
API 601	Metallic Gaskets for Raised-Face Pipe Flanges and Flanged Connections (Double-Jacketed Corrugated and Spiral-Wound)
API 602	Compact Steel Gate Valves
API 604	Ductile Iron Gate Valves, Flanged Ends
API 605	Large-Diameter Carbon Steel Flanges
API 606	Compact Steel Gate Valves-Extended Body
API 609	Butterfly Valves, Lug-Type and Water-Type
API RP 947	Controlling Weld Hardness of Carbon Steel Refinery Equipment to Prevent Environmental Cracking
ASME B1.20.1	Pipe Threads
ASME B16.1	Cast Iron Pipe Flanges and Flanged Fittings
ASME B16.3	Malleable Iron Threaded Fittings, 150# and 300#
ASME B16.4	Cast Iron Threaded Fittings
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.9	Factory-Made Wrought Steel Butt welding Fittings
ASME B16.10	Face-to-Face and End-to-End Dimensions of Valves
ASME B16.11	Forged Steel Fittings, Socket-Welding the Threaded
ASME B16.20	Ring-Joint Gaskets and Grooves for Steel Pipe Flanges
ASME B16.25	Butt welding Ends
ASME B16.34	Valves-Flanged, Threaded and Welding End
ASME B16.36	Orifice flange
ASME B16.42	Ductile Iron Pipe Flanges and Flanged Fittings

thyssenkrupp Industrial Solutions

Piping Specification
General

ASME B16.47	Large Diameter Steel Flanges
ASME B16.48	Spectacle blind
ASME B31.3	Chemical Plant and Petroleum Refinery Piping
ASME B31.4	Liquid Petroleum Transportation Piping Systems.
ASME B31.8	Pipeline Gas Transmission and Distribution Piping
ASME B36.10	Welded and Seamless Wrought Steel Pipe
ASME B36.19	Stainless Steel Pipe
ASME IX	Welding and Brazing Qualifications
ASTM A269	Stainless steel seamless tube
BS 3799	Steel Pipe Fitting, Screwed and Socket-Welding for Petroleum industry
BS 5352	Steel Wedge Gate, Globe and Check Valves 50 mm. and Smaller for the Petroleum, Petrochemical and Allied Industries
ISO 4427	Plastics piping systems-Polyethylene(PE) pipes and fittings for water supply
MSS SP-6	Standard Finishes for Contact Faces of Pipe Flanges
MSS SP-25	Standard Marking System for Valves, Fittings, Flanges and Unions
MSS SP-43	Wrought Stainless Steel Butt welding Fittings
MSS SP-44	Steel Pipe Line Flanges
MSS SP-53	Magnetic Particle Examination Method
MSS SP-54	Radiographic Inspection Method
MSS SP-55	Visual Method
MSS SP-61	Hydrostatic Testing of Steel Valves
MSS SP-72	Ball Valves with Flanged or Butt-Welding ends for General Service
MSS SP-95	Swage Nipple
MSS SP-97	Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded, and Butt Welding Ends,
MSS SP-84	Steel Valves - Socket Welding and Threaded Ends
MSS SP-85	Cast - Iron Globe and Angle Valves Flanged and Threaded End
NACE	National Association of Corrosion Engineers
SSPC-SP-1	Steel Structures Painting Manual - Solvent Cleaning
SSPC-SP-2	Steel Structures Painting Manual - Hand Tool Cleaning
SSPC-SP-3	Steel Structures Painting Manual - Power Tool Cleaning

3) Scope

3.1 This specification shall be applied to piping materials indicated on the piping and instrument diagram (hereinafter referred to as P&ID).
However, piping systems furnished as a regular part of equipment or package shall be in accordance with design conditions of equipment
manufacturer s standards.

3.2 When the piping is connected to the equipment, this specification shall be applied to the extent as Indicated below:
A. Companion flanges, gaskets, bolts and nuts at equipment nozzle.
B. First block valve(*) with companion flanges , gaskets ,bolts and nuts in the instrument connecting line
C. Companion flanges, gaskets, bolts and nuts for relief valves.
D. Companion flanges gaskets, bolts and nuts at the matching point between the piping furnished as

part of equipment by its manufacturers and that provided by SECL. "First block valve" in the instrument connecting line as used herein shall mean the nearest valve to a line to which the instrument is connected.
(*) "First block valve" in the instrument connecting line as used herein shall mean the nearest valve to a line to which the

3.3 This specification shall not be applied to specially designed companion flanges, gaskets , bolts and nuts at the equipment nozzle

3.4 Codes and Standards

3.4.1 This specification is based on the American Society of Mechanical Engineers for Pressure Piping ASME B31.3 "Chemical Plant and Petroleum Refinery Piping"

3.4.2 Unless otherwise specified in listing codes , the latest edition of listing codes shall be used.

3.5 Abbreviations

Abbreviations used in this specification are defined in Appendix 1 "Abbreviations"

4) MATERIALS

4.1 Standard Materials
Materials shall be generally in accordance with ASTM and those not covered in ASTM shall conform to KS or JIS standards of country of origin. When Materials are not covered by official standards , those shall be in accordance with manufacturer's standards.

4.2 Cooper and cooper Alloys
Copper based alloy shall not be used in ammonia service. Alloys with a copper content greater than 50% shall not be used in services where acetylene in a wet environment is present

4.3 Material Classification

4.3.1 Piping material specifications is classified in accordance with the pressures and temperatures for each line, and the medium in the line.

4.3.2 Material classes are identified by a coding system which consists of one letter(L) and four number (N)

Three position system	:	N	L	N
Example	:	150	A	1
		Pressure Rating	Material Code Letter	Number

4.4 Carbon Content
Carbon steel containing carbon content of more than 0.35% shall not be used in we3lded construction,or to be shaped by oxygen cutting or thermal cutting process.

4.5 Environmental Evaluation
Environmental pollution, disruption and sanitation shall be considered in selecting piping materials.

thyssenkrupp Industrial Solutions

Piping Specification
General

5) REQUIREMENT

5.1 Pipes

5.1.1 Pipe dimensions shall be in accordance with ASME B36.10 for welded and seamless wrought steel pipe with ASME B36.19 for stainless steel pipe, unless otherwise specified.

5.1.2 Pipe made by acid Bessemer process shall not be acceptable. Hot dip galvanized process shall be done (Refer to ASTM A123, A153, A385).

5.1.3 Butt-welding ends preparation shall be in accordance with ASME B16.25.

5.1.4 The thickness of threaded nipples shall be calculated in accordance with ASME B31.3.

5.1.5 Pipe tolerances shall be in accordance with applicable material code.

5.1.6 Pipe thickness shall be calculated in accordance with ASME B31.3.

5.1.7 Polyethylene coated pipes shall be manufactured in accordance with KS D 3589 or class 2 of KS D 3607

5.2 Valves

5.2.1 Gate, Globe and check valves
A. Forged steel valves (socket welding or threaded ends) shall be in accordance with API 602 forclass 600 and lower, and ASME B16.34 for class 900 and higher, unless otherwise specified.
B. Cast steel valves (flanged or butt-welding ends) shall be in accordance with API 600, unless otherwise specified.
C. Pressure seal shall be in accordance with ASME B16.34, if required.

5.2.2 Ball valves shall conform to MSS SP-72, plug valves shall conform to API 599.

5.2.3 Butterfly valves shall conform to API 609, wafer type check valves shall conform to API 594

5.2.4 Corrosion resistant valves (normally austenitic stainless steel) shall be in accordance with API603,unless otherwise specified.

5.2.5 Bronze valves shall conform to MSS SP-80, "Gate, Globe, Angle and Check valves", MSS SP-72" Ball valve", API 609 "Butterfly valve".

5.2.6 Face to face and end to end dimensions of steel valves shall conform to ASME B16.10 to the extent covered. Valve supplier shall furnish certified dimension drawings for all valves.

5.2.7 Butt-welding end valves shall be furnished with ends to match pipe schedule. End preparation shall be in accordance with ASME B16.25.

5.2.8 End connection of threaded valves shall be in accordance with ASME B1.20.1. End connection of socket welding valves shall be in accordance with ASME B16.11.

5.2.9 Bonnet gasket materials shall be compatible with the gasket materials specified in the individual materialspecification data, unless

otherwise specified.

5.2.10 Features not covered by the valve descriptions shall be in accordance with manufacturer's standard suitable for the intended application.

5.2.11 Where carbon steel bonnet, cap or gland bolts are normally furnished with ASTM A193 grade B7, they shall be furnished in the liquid quenched and tempered condition.

5.2.12 Bonnet, cap or gland bolts are not normally furnished with ASTM A307, unless otherwise specified in the individual material class.

5.2.13 Unless otherwise specified in the individual material class, manual gear operators shall be supplied for the following size and larger, The operating force at half opening position of the handwheel or lever shall not exceed 35 kgf.

Class	Gate	Globe	Ball	Plug	Butterfly
150	14" and over	10" and over	8" and over	4" and over	8" and over
300	10" and over	8" and over	6" and over	4" and over	-
600	8" and over	6" and over	6" and over	4" and over	-
900	6" and over	6" and over	4" and over	4" and over	-
1500	4" and over	4" and over	3" and over	3" and over	-
2500	3" and over	3" and over	3" and over	3" and over	-

5.2.14 The gate valves with 2-piece or split wedge may not be used, unless specific approval is obtained. The 2-piece or split wedge type shall not used in steam service.

5.2.15 Swing check valves shall be provided with limit stops to prevent disc from remaining in the open position and also suitable for horizontal as well as vertical installation.

5.2.16 The operating levers or handles on ball valves and plug valves shall indicate by their position whether the valve is open or closed. The open position shall be indicated when the lever or handle points in a direction parallel to the flow through the valve. In addition, it shall be impossible to reverse the indicating position inadvertently during reassembly of the valve.

5.2.17 Lubricated plug valves shall not be used unless otherwise specified.

5.2.18 Fire-safe ball valves design shall be in accordance with API 607, where fire-safe design specified in the individual material specification

5.3 Flanges

5.3.1 Flanges shall be as follows:

A. ASME Class 125 cast iron (all sizes) : ASME B16.1
B. ASME Class 150 ~ 1500 (1/2B ~ 24B) : ASME B16.5
C. ASME Class 2500 (1/2B ~ 12B) : ASME B16.5
D. MSS Class 150~600 (26B ~ 60B) : MSS SP-44, ASME B16.47, series "A"
E. MSS Class 150~600 (26B ~ 60B) : MSS SP-44, ASME B16.47, series "A"

5.3.2 Unless otherwise specified, steel flange faces shall be in accordance with ASME B16.5. However, smooth finish of raised face (RFSF) flange shall be between 125micron inch and 200micron inch arithmetic average roughness height(AARH).

5.3.3 Flanges not conforming to ASME B16.5, ASME16.1, MSS SP-44, ASME B16.77 or API 605 shall be specified on drawings.

5.3.4 Sizes for reducing or blind flanges are indicated by nominal pipe sizes.

5.3.5 End preparation of welding neck flanges shall be in accordance with ASME B16.25. The nore of welding neck flanges shall correspond to the inside diameter of the connecting pipe or fitting, permitting a thickness difference up to 1.6mm. When the difference in wall thickness between the two components being joined exceeds 1.6mm taper boring shall be performed on the component having the heavier wall per ASME B16.25

5.3.6 Flat face flanges with full face gaskets shall be used against flat face cast iron equipment and valve flanges.

5.3.7 Ring type joint flanges shall have grooves conforming to ASME B16.20.

5.4 Fittings

5.4.1 All fittings shall be as follows :

A. Forged steel socket welding and threaded fittings : ASME B16.11
B. Butt-welding fittings and stub ends : ASME B16.9
C. Butt-welding short radius elbows and returns : ASME B16.28 .

5.4.2 End preparation of butt-welding fittings are specified with a wall thickness larger than that of the pipe and this results in misalignment greater than 1.6mm between the inside surfaces of the parts to be joined, the fitting shall be taper bored per ASME B16.25.

5.4.3 All lines which connect to another line or header, including instrument connections, vents and drains are considered as branch connections. The basis for design of branch connections is the applicable ASME code. Reinforcement requirements shall be determined by ASME B31.3. Branches having adequate strength shall be made with unreinforced or reinforced sub-ins with the following exceptions

A. Size-to-size connections shall be tees in all pressure ratings.
B. Branches 1-1/2B and smaller shall be made with integrally reinforced branch connection fittings ortees.

5.4.4 Special consideration shall be taken for branch connection in cyclic service such as temperature cycling.

5.4.5 Polyethylene coated fittings shall be manufactured in accordance with class 1 (PF4) of KS D 3607 or PIF of KS D 3589.

5.5 Gaskets

5.5.1 All gaskets shall be as follows :

A. Spiral wound gasket : API 601
B. Non-metallic gasket : ASME B16.21
C. Ring-joint gaskets : ASME B16.20
D. Gasket dimensions for flange 26B and larger : Applicable flange codes
E. Gaskets not conforming above codes shall be specified on drawings.

5.6 Bolts and Nuts for Flange

5.6.1 Bolts and nuts shall be as follows :

A. Bolts and nuts shall be heavy hexagon bolts and nuts, and shall conform to ASME B16.2.1 and B16.2.2 respectively.
B. Threads shall be to coarse thread series ASME B1.1. Number of threads shall be 8 per one inch for bolt size U1-1/8" and larger.
C. Accuracy of threads and fineness of finish Item Accuracy of thread Fineness of finish Bolt 2A Semi-finished or better Nut 2B

5.6.2 Stub bolts shall be threaded in their full length.

5.6.3 Stub bolt with two nuts shall be used rather than bolt with one nut.

5.6.4 Number of diameter and length of bolts for flange connection shall be in accordance with ASME B16.5

5.7 Thread

Threads for pipes, flanges, valves and fittings shall be specified in ASME B1.20.1 pipe threads, unless otherwise specified.

BST PROJECT

1. GENERAL NOTE FOR CLASS : 150A1

1.1 Ball Valve special suitable for AN & BD Service (MPTFE seat used for all valve with BD process service)
1.2 Gate Valve (SW) used for small bore inline connections and Drain.
1.3 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.
1.4 Gate Valve (NPTxSW) used for connection to Instrument.
1.5 Quick Coupling used for Fire hydrant connector.

2. GENERAL NOTE FOR CLASS : 150K1

2.1 Gate Valve (SW) used for small bore inline connections and Drain.

thyssenkrupp Industrial Solutions

Piping Specification
General

2.2 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.
2.3 Gate Valve (NPTxSW) used for connection to Instrument.

3. GENERAL NOTE FOR CLASS : 150P1

3.1 Gate Valve (SW) used for small bore inline connections and Drain.
3.2 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.
3.3 Gate Valve (NPTxSW) used for connection to Instrument.

4. GENERAL NOTE FOR CLASS : 150X1

4.1 Gate Valve (NPT) used for small bore inline connections,drain and instruments.
4.2 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.

5. GENERAL NOTE FOR CLASS : 300A1

5.1 Gate Valve (SW) used for small bore inline connections and Drain.
5.2 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.
5.3 Gate Valve (NPTxSW) used for connection to Instrument.

6. GENERAL NOTE FOR CLASS : 150P1(B)

6.1 Gate Valve (SW) used for small bore inline connections and Drain.
6.2 Gate Valve (Flanged) used for directly connection to flange piping/component/instrument/nozzle.
6.3 Gate Valve (NPTxSW) used for connection to Instrument.

7. GENERAL NOTE FOR CLASS : 150X2

7.1 Half coupling used for Spray nozzle.

8. GENERAL NOTE FOR CLASS : 300P1

8.1 Full Coupling (NPTxSW) used for connection to Instrument.

9. GENERAL NOTE FOR BRANCH TABLE

9.1 STUB-INS SHALL BE REINFORCED IN ACCORDANCE WITH ASME B31.3 Para 304.3 WHERE REINFORCING PAD TO BE REQUIRED.

Piping Class	Material	Corr. Allowance	Nominal Pressure	Facing
1500V5	A312 GR.TP316	0.0 MM	1500	RFSF
150A1	A106 GR.B/A53 GR.B SMLS	1.5 MM	150	RFSF
150F1	A106 GR.B Glass Lining	0.0 MM	150	RFSF
150K1	A312 GR.TP304 SMLS	0.0 MM	150	RFSF
150P1	A312 GR.TP316L SMLS	0.0 MM	150	RFSF
150X1	A53 GR.B SMLS GALV.	1.5 MM	150	FF
150X2	A53 GR.B SMLS GALV.	1.5 MM	150	FF
150Z3	HDPE PE100	0.0 MM	PN 16	FF
150Z5	HDPE PE100	0.0 MM	PN 12.5	FF
300A1	A106 GR.B/A53 GR.B SMLS	1.5 MM	300	RFSF
300P1	A312 GR.TP316L SMLS	0.0 MM	300	RFSF

PIPING SPECIFICATION

NBL Incremental Project

01-6008

Part 2

thyssenkrupp Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	1
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
AA	Acrylic Acid								40		12.5	65	11.3	40	150P1
AI	Instrument Air								40		9.1	65	8	40	150X1
AMM	Ammonia Aqueous								35		11.1	65	8.6	35	150P1
AMM_1	Ammonia Aqueous								35		11.1	65	8.6	35	300P1
AN	Acrylonitrile								35	K	14.7	65	12	35	150A1
ANF	Waste Water (w/ AN)								60		14.7	65	12	60	150A1
ANIP	Water (w/AN), AN (w/Water)								60		8	50	4.3	60	150A1
ANR	Recovered Acrylonitrile								40		14.7	65	12	40	150A1
ANR_1	Recovered Acrylonitrile								40		14.7	65	12	40	150P1
AN_1	Acrylonitrile								35		14.7	65	12	35	150P1
AOE	Anti-Oxidant								0.2		7.7	65	4.8	0.2	150P1
AP	Plant Air								40		10.4	65	8	40	150A1
AP_1	Plant Air								40		10.4	65	8	40	150P1
AP_2	Plant Air								40		10.4	65	8	40	150X1
AQS	Aqueous Solution								40		12.5	87	11.3	40	150P1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

thyssenkrupp Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	2
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
AV	Atmospheric vent								35		7.7	100	2	35	150A1
BGL	Bruggolite (Reducer)								40		10.5	65	8	40	150P1
BIO	Biocide								35		7.7	65	2.8	35	150P1
CA	Catalyst , Sodium Persulfate								35		12.5	65	11.3	35	150P1
CHGD	ChainGuard (Short Stopper)								40		15.5	65	13.9	40	300P1
CHGD_1	ChainGuard (Short Stopper)								40		15.5	65	13.9	40	150P1
CL	Low Pressure Condensate								170	W	11.2	200	7.5	170	150A1
DBA	Dodecyl Benzene Sulfonic Acid								40		7.7	68	4.2	40	150P1
DEF	Defoamner								40		11.1	65	8.6	40	150P1
DR	Drain								104		8	65	7	104	150A1
DR_1	Drain								104		8.5	65	7	104	150P1
DR_2	Drain								104		9.1	65	7	104	150X1
DR_3	Drain								104		7.7	65	7	104	150K1
DSP	Dispersant								35		8	65	4.7	35	150P1
EDTA	EDTA solution								40		7.7	65	6.7	40	150P1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

40-7849-10/IRP4.0-MT1/RS20/1997-08/00

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	3
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
FG	Fuel Gas								35		7.7	65	1.5	35	150A1
KL	Emergency Killing Agent								40		21.5	65	16.5	40	300A1
KL_1	Emergency Killing Agent								40		21.5	65	16.5	40	150A1
KM	Tert-Dodecyl Mercaptan (TDDM)								35		12.5	65	11.3	35	150P1
KO	Paramenthane Hydro peroxide								40		7.7	65	2.4	40	150P1
KOH	Potassium Hydroxide								35		11.09	65	8.6	35	150P1
LAX	Latex								40		7.7	84	5.3	40	150F1
LAX_1	Latex								40		7.7	84	5.3	40	150P1
MAA	Methacrylic Acid								27		12.5	57	11.3	27	150P1
MAN	Manifold								170	KW	7.7	65	11.3	170	150P1
MAN_1	Manifold								170		15.5	65	11.3	170	300P1
MAN_2	Manifold								170		14.7	65	11.3	170	300F1
MAN_3	Manifold								170		7.7	65	11.3	170	150A1
MAN_4	Manifold								170		7.7	65	11.3	170	150F1
MF	Styrene								35		12.5	65	11.3	35	150A1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	4
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
MF_1	Styrene								35		12.5	65	11.3	35	150P1
N	Nitrogen								40		10.4	65	9.5	40	150A1
NLO	Nitrogen Low O2								40		7.7	65	8	40	150A1
NLO_1	Nitrogen Low O2								40		9.1	65	8	40	150X1
NLO_2	Nitrogen Low O2								40		10.4	65	8	40	150P1
NMP	N-Methylpyrrolidone								40		7.7	65	0.4	40	150P1
NO	Caustic Soda								40		7.7	65	5.3	40	150A1
NO_1	Caustic Soda								40		7.7	65	5.3	40	150P1
N_1	Nitrogen								40		10.4	65	9.5	40	150P1
OS	O2 Scavenger								40		10	65	7.7	40	150P1
PB	Butadiene								35	K	13	65	10	35	150A1
PBB	Blended Butadiene								17	K	13	45	10	17	150A1
PBD	Purified Butadiene								35		15	65	11.3	35	150A1
PBD_1	Purified Butadiene								35	K	15	65	11.3	35	150P1
PBR	Recovered Butadiene								80		19	110	14.5	80	150A1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	5
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
PBR_2	Recovered Butadiene								80		19	110	14.5	80	1500V5
PD	Process Drain, Waste Water								40		7.7	90	2.3	40	150A1
SFR	Seal Fluid Return								80		10.4	110	8	80	1500V5
SFR_1	Seal Fluid Return								80		10.4	110	8	80	300P1
SFS	Seal Fluid Supply								50		10.4	70	8	50	1500V5
SFS_1	Seal Fluid Supply								50		10.4	70	8	50	300P1
SL	Low pressure steam								190	W	9.1	200	7.5	190	150A1
SLX	Seed Latex								40		15.7	134	12.1	40	150P1
SLX_2	Seed Latex								40		15.7	134	12.1	40	300P1
SL_1	Low pressure steam								190	W	9.1	200	7.5	190	150P1
SS	Short Stopper								35		15.5	65	13.9	35	300P1
SSL	Super Low pressure steam								156	W	7.7	186	3	156	150A1
SSL_1	Super Low pressure steam								156		7.7	186	3	156	150P1
SUR	Surfactant								40		11.7	65	9	40	150P1
SUR2	Surfactant 2								35		14	65	8	35	150P1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	6
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
SWF	Seal Water Flushing								40		23.3	65	16	40	1500V5
SWR	Seal Water Return								80		21.2	110	8	80	1500V5
SWS	Seal Water Supply								40		21.2	65	8	40	1500V5
TKPP	Tetrapotassium Pyrophosphate								40		7.7	65	3.9	40	150P1
VAC	Vacuum								35		7.7	65	-0.1	35	150A1
VAC_1	Vacuum								35		7.7	65	-0.1	35	150P1
VAC_2	Vacuum								35		7.7	65	-0.1	35	300A1
VAP	Vapor								35		7.7	65	0	35	1500V5
VENT	Vent / Waste Gas								80		7.7	65	16.5	80	150A1
VENT_1	Vent / Waste Gas								80		7.7	65	16.5	80	150P1
VENT_2	Vent / Waste Gas								80		21.5	65	16.5	80	300F1
VENT_3	Vent / Waste Gas								80		21.5	65	16.5	80	300A1
VENT_4	Vent / Waste Gas								80		7.7	65	16.5	80	150F1
VENT_5	Vent / Waste Gas								80		9.1	65	16.5	80	150X1
WA	Raw Water								40		7.7	65	4	40	150A1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

40-7849-10/IRP4.0-MT1/RS20/1997-08/00

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	7
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
WD	Demineralized Water								40		14.2	70	10	40	150K1
WD_1	Demineralized Water								40		14.2	70	10	40	150P1
WD_3	Demineralized Water								40		14.2	70	10	40	300P1
WD_4	Demineralized Water								40		14.2	70	10	40	1500V5
WF	Fire Water								40		15	65	13	40	150X2
WF_1	Fire Water U/G								40		15	65	13	40	150Z3
WF_2	Fire Water Wet System								40		15	65	13	40	150A1
WLR	Chilled Water Return								10	K	7.7	37	7	10	150A1
WLS	Chilled Water Supply								4	K	7.7	34	7	4	150A1
WP	Potable Water								40		7.7	65	4	40	150X1
WP_1	Potable Water								40		7.7	73	4	40	150Z5
WR	Cooling Water Return								43		7.7	73	6	43	150A1
WS	Cooling Water Supply								33		7.7	63	6	33	150A1
WT	Treated Water								40		10.4	65	7.5	40	150A1
WTP	Tempered Cooling water								120		7.7	134	6	120	150A1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

thyssenkrupp
Industrial Solutions

Piping Specification
List of Fluids

UAN	:	01-6008-000
Part	:	2
Page	:	8
Rev. Date	:	24.09.19
First Issue	:	24.09.19
Print Date	:	2019-11-21
Print Time	:	07:10

Fluid		Aggr.	DN	Techn.	WGK	SK	GK	Corros.	Insul.	Ins.	Design		Calc.		Piping
Symbol	Description	state	max.	Stand.	1)	2)	3)	allow. mm	temp. CEL	Type	press. BAR(G)	temp. CEL	press. BAR(G)	temp. CEL	class
WW	Waste Water								40		8	65	4	40	150A1
WWL_1	White Water								60		7.7	65	3.5	60	150P1

1) Water - Hazard - Class acc. to 'german water reserves law WHG'; Classification acc. to VWV WASSERGEFAEHRDENDE STOFFE.
2) Symbol-Ident-letter for product properties acc. to GEFAHRSTOFFVERORDNUNG:
Xn = noxious, O = incendiary, T = toxic, T+ = very toxic, F = light flammable, F+ = highly flammable, C = caustic, Xi = irritant, E = explosive, N = environment endangering
3) Hazard class acc. to PRESS.VESSEL CODE: 1 = toxic/combustible/caustic 2 = very toxic 3 = liquid gas

40-7849-10/IRP4.0-MT1/RS20/1997-08/00

PIPING SPECIFICATION NBL Incremental Project 01-6008 Part 3

DN	Outside Diameter	Wall Thickness in MM											
		PS											
1/2"	21,3	3,73											
3/4"	26,7	3,91											
1"	33,4	4,55											
1 1/2"	48,3	5,08											
2"	60,3	3,91											
2 1/2"	73,0	5,16											
3"	88,9	5,49											
4"	114,3	6,02											
6"	168,3	7,11											
8"	219,1	8,18											
10"	273,0	9,27											
12"	323,8	9,53											
14"	355,6	9,53											
16"	406,4	7,92											
18"	457,0	7,92											
20"	508,0	9,53											
24"	610,0	9,53											

PS = PIPES

PIPING SPECIFICATION NBL Incremental Project 01-6008 P a r t 3

Main Pipe DN \ Branch Pipe DN	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
1/2"	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
3/4"	TR	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1"	TR	TR	T	—	—	—	—	—	—	—	—	—	—	—	—	—	—
1 1/2"	TR	TR	TR	T	—	—	—	—	—	—	—	—	—	—	—	—	—
2"	S	S	TR	TR	T	—	—	—	—	—	—	—	—	—	—	—	—
2 1/2"	S	S	S	TR	TR	T	—	—	—	—	—	—	—	—	—	—	—
3"	S	S	S	TR	TR	TR	T	—	—	—	—	—	—	—	—	—	—
4"	S	S	S	S	TR	TR	TR	T	—	—	—	—	—	—	—	—	—
6"	S	S	S	S	*	*	TR	TR	T	—	—	—	—	—	—	—	—
8"	S	S	S	S	*	*	*	TR	TR	T	—	—	—	—	—	—	—
10"	S	S	S	S	*	*	*	*	TR	TR	T	—	—	—	—	—	—
12"	S	S	S	S	*	*	*	*	TR	TR	TR	T	—	—	—	—	—
14"	S	S	S	S	*	*	*	*	*	TR	TR	TR	T	—	—	—	—
16"	S	S	S	S	*	*	*	*	*	TR	TR	TR	TR	T	—	—	—
18"	S	S	S	S	*	*	*	*	*	*	TR	TR	TR	TR	T	—	—
20"	S	S	S	S	*	*	*	*	*	*	*	TR	TR	TR	TR	T	—
24"	S	S	S	S	*	*	*	*	*	*	*	*	TR	TR	TR	TR	T

* = STUB-IN (Note 9.1)
T = Equal Tee
S = Sockolet
TR = BW-Tee, reduced

thyssenkrupp Industrial Solutions

Piping Specification

Piping Class: 150A1

NBL Incremental Project

UAN : 01-6008-000
Part : 4
Page : 3

Print Date : 21.11.2019
Print Time : 02:52

Fluid code:

AN	ANF	ANIP	ANR	AP	AV	CL	DR	FG	KL_1	MAN_3	MF	N	NLO	NO	PB	PBB	PBD
PBR	PD	SL	SSL	VAC	VENT	WA	WLR	WLS	WR	WS	WT	WTP	WW				

Basic Material: A106 GR.B/A53 GR.B SMLS | Facing: RFSF | Corrosion allowance: 1.5 MM

Rating: Class 150														
	Temperature CEL:	371	343	260	204	149	38	-29						
	Pressure bar g:	7,7	8,7	11,9	14,0	16,1	20,0							

Piping Schedule

ASME B36.10M	DN	1/2"	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"
	OD	21,3	26,7	33,4	48,3	60,3	73,0	88,9	114,3	168,3	219,1	273,0	323,8	355,6	406,4
	Thk	3,73	3,91	4,55	5,08	3,91	5,16	5,49	6,02	7,11	8,18	9,27	9,53	9,53	7,92
CONTINUE	DN	18"	20"	24"											
	OD	457,0	508,0	610,0											
	Thk	7,92	9,53	9,53											

Pipe		Designation	Rating Class	DN from	DN to	Material	Standard	End Connection	Note
P	PSY-L07-PADA	PIPE Sch80 SMLS PE		1/2"	1 1/2"	A106,GR.B	ASME B36.10M	Plain ends	
P	PSZ-F01-PADA	PIPE STD SMLS BE		2"	14"	A106,GR.B	ASME B36.10M	BW-Ends acc.to ASME B16.25	
P	PSZ-D01-PADA	PIPE SCH20 SMLS BE		16"	24"	A106,GR.B	ASME B36.10M	BW-Ends acc.to ASME B16.25	

Fittings

E	LEXN-01-FAAA	ELBOW 90 DEG SW	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
E	EEZ-F01-EAAA	ELBOW 90 DEG LR STD BW		2"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
E	EEZ-D01-EABA	ELBOW 90 DEG LR Sch20 BW		16"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
EA	EGZ-D-1-KIAAB	ELBOW 90 DEG Sch20 SR BW		20"	20"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
EF	LFXN-01-FAAA	ELBOW 45 DEG SW	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
EF	EFZ-F01-EAAA	ELBOW 45 DEG LR STD BW		2"	14"	A234,GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
EF	EFZ-D01-EABA	ELBOW 45 DEG LR Sch20 BW		16"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
R	EOZ-F01-EAAA	REDUCER, CON STD BW		3"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
R	EOZ-D01-EABA	REDUCER, CON Sch20 BW		18"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
RA	EOZDF01-EABA	REDUCER, CON Sch20xSTD BW		16"	18"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
RAA	EOZ-F-0-KIBAB	REDUCER, CON STD BW		2"	2"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
RB	EOZ-D01-EABAH	REDUCER, CON Sch20 BW (HOLE)		16"	20"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	

Revision	Date	Name	Checked	Description	Revision	Date	Name	Checked	Description

thyssenkrupp Industrial Solutions

Piping Specification

Piping Class: 150A1

NBL Incremental Project

UAN : 01-6008-000
Part : 4
Page : 4

Print Date : 21.11.2019
Print Time : 02:52

Fittings

		Designation	Rating Class	DN from	DN to	Material	Standard	End Connection	Note
RE	EXZ-F01-EAAA	REDUCER, ECC STD BW		3"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
RE	EXZ-D01-EABA	REDUCER, ECC Sch20 BW		18"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
REA	EXZ-F-0-KIBAB	REDUCER, ECC STD BW		2"	2"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
REA	EXZDF01-EABA	REDUCER, ECC Sch20xSTD BW		16"	18"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
T	LTXN-05-FAAA	TEE, EQUAL SW	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
T	ETZ-F09-EAAA	TEE, EQUAL STD BW		2"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
T	ETZ-D01-EABA	TEE, EQUAL Sch20 BW		16"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
TL	ELG-D-2-DKAAB	LATERAL, EQUAL Sch20 BW		6"	20"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
TR	LTXN-06-FAAA	TEE, REDUCED SW	3000	3/4"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
TR	ETZ-F10-EAAA	TEE, REDUCED STD BW		3"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
TR	ETZ-D02-EABA	TEE, REDUCED Sch20 BW		18"	24"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
TRA	ETZFL01-EAAA	TEE, REDUCED SchSTDx80 BW		2"	3"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
TRA	ETZDF01-EABA	TEE, REDUCED Sch20xSTD BW		16"	18"	A234,GR.WPBW	ASME B16.9	BW-Ends acc.to ASME B16.25	
TS	LSXN-01-FAAA	SOCKOLET SW	3000	2"	24"	A105	MSS SP-97	SW-Ends acc.to ASME B16.11	
C	LKXN-01-FAAA	CAP SW	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
C	EKZ-F01-EAAA	CAP STD BW		2"	14"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
C	EKZ-D01-EAAA	CAP Sch20 BW		16"	24"	A234 GR.WPB	ASME B16.9	BW-Ends acc.to ASME B16.25	
CA	LKFN-05-FAAA	CAP FNPT	3000	1/2"	1 1/2"	A105	ASME B16.11	inside THR-Ends, ASME B16.11	
M	LMXN-01-FAAA	FULL COUPLING SW	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
MA	LMXNF01-FAAA	FULL COUPLING SWxNPT	3000	1/2"	1 1/2"	A105	ASME B16.11	SW-Ends acc.to ASME B16.11	
N	NBY-L01-PADA	PIPE NIPPLE Sch80 PBE 100mm		1/2"	1 1/2"	A106,GR.B	UHDE SPECIFIC.	Plain ends	
NA	NBY-L02-PADA	PIPE NIPPLE Sch80 POExTOE100mm		1/2"	1 1/2"	A106,GR.B	UHDE SPECIFIC.	Plain ends	
NB	NBY-L03-PADA	PIPE NIPPLE Sch80 POExTOE150mm		1/2"	1 1/2"	A106,GR.B	UHDE SPECIFIC.	Plain ends	
R	ENY-L01-FAAA	SWAGE CON Sch80 PBE		3/4"	1 1/2"	A105	MSS SP-95	Plain ends	
R	ENZYL01-FAAA	SWAGE CON SchSTDx80 BLExPSE		2"	2 1/2"	A105	MSS SP-95	BW-Ends acc.to ASME B16.25	
RA	ENYFL01-FAAA	SWAGE CON Sch80 PLExTSE		3/4"	1 1/2"	A105	MSS SP-95	Plain ends	
RE	ENY-L02-FAAA	SWAGE ECC Sch80 PBE		3/4"	1 1/2"	A105	MSS SP-95	Plain ends	
RE	ENZYL02-FAAA	SWAGE ECC SchSTDx80 BLExPSE		2"	2 1/2"	A105	MSS SP-95	BW-Ends acc.to ASME B16.25	
REA	ENYFL02-FAAA	SWAGE ECC Sch80 PLExTSE		3/4"	1 1/2"	A105	MSS SP-95	Plain ends	
CP	HSGN-01-FAAA	PLUG ROUND HEAD NPT	3000	1/2"	1 1/2"	A105	ASME B16.11	outside THR-Ends	

Flanges

Revision	Date	Name	Checked	Description	Revision	Date	Name	Checked	Description

Flanges		Designation	Rating Class	DN from	DN to	Material	Standard	End Connection	Note
F	FWBD-04-FAAA	SOCKET WELD FLANGE Sch80 RFSF	150	1/2"	1 1/2"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
F	FABDF08-FAAA	WELDING NECK FLANGE STD RFSF	150	2"	14"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
F	FABDD03-FAAA	WELDING NECK FLANGE Sch20 RFSF	150	16"	24"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FA	FABDF08-FAAAJ	WN FLANGE W/JACK BOLT STD RFSF	150	2"	14"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FA	FABDD03-FAAAJ	WN FLANGE W/JACK BOLT RFSF	150	16"	24"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FB	FBBD-03-FAAA	BLIND FLANGE RFSF	150	1/2"	24"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FBD	FBBF-03-FAAA	BLIND FLANGE RFSF	300	1/2"	24"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FBH	FRBD-03-FAAAH	BLIND FLANGE RFSF W/ NPT TAP	150	3/4"	2"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FD	FWBF-03-FAAA	SOCKET WELD FLANGE Sch80 RFSF	300	1/2"	1 1/2"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FD	FABFF08-FAAA	WELDING NECK FLANGE STD RFSF	300	2"	14"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FD	FABFD03-FAAA	WELDING NECK FLANGE Sch20 RFSF	300	16"	24"	A105	ASME B16.5	RFSF acc.to ASME B16.5	
FO	FOBFF04-FAAA	WN-ORIFICE FLANGE STD RFSF	300	2"	24"	A105	ASME B16.36	RFSF acc.to ASME B16.5	
Bolts									
B	BB--B1-ABAB	STUD BOLT / NUTS (HDG).	150	1/2"	24"	A193,GR.B7 (HDG) / A194,GR.2H (HDG)	B16.5/18.2.1&2	ASME B16.5/API 605	
BBD	BB--B3-ABAB	STUD BOLT / NUTS (HDG).	300	1/2"	24"	A193,GR.B7 (HDG) / A194,GR.2H (HDG)	B16.5/18.2.1&2	ASME B16.5/API 605	
Gaskets									
G	DSBD-04-GAZA	SPIRAL WOUND GASKET 4.5mm	150	1/2"	24"	SS304/GRAPHITE	ASME B16.20	RF acc.to ASME B16.5	
GD	DSBF-07-GACA	SPIRAL WOUND GASKET 4.5mm	300	1/2"	24"	SS304/GRAPHITE	ASME B16.20	RF acc.to ASME B16.5	
Others									
MC	QUCCSA	DOUBLE FEMALE HOSE CONNECTOR	150	2"	3"	A105	MFR-STD	RFSF acc.to ASME B16.5	5
VW	KBBD-01-SAAA	SPECTACLE BLIND RFSF	150	1/2"	8"	A285 GR.C	ASME B16.48	RFSF acc.to ASME B16.5	
VW	KABD-01-SAAA	PADDLE BLANK & SPACER RFSF	150	10"	24"	A285 GR.C	ASME B16.48	RFSF acc.to ASME B16.5	
MB	SP-UC-001	QUICK COUPLING FNPT	3000	3/4"	1"	A182, GR.F304	MFR-STD	outside THR-Ends	

Valves		Designation	Rating Class	DN from	DN to	Material Body	Material Body Seat	Material Packing	Standard	End Connection	Note
V	SAXI-C02FAAAS	GATE VALVE OS&Y BB SW VAS818F	800	1/2"	1 1/2"	A105	13CR HF	FLEXIBLE GRAPHITE	API 602	SW-Ends acc.to ASME B16.11	2
V	SABD-C02CBBAS	GATE OS&Y BB RFSF VAF221F	150	2"	12"	A216 GR.WCB	13CR	FLEXIBLE GRAPHITE	API 600	RFSF acc.to ASME B16.5	
V	SGBD-C02CBBAS	GATE OS&Y GOP BB RFSF VAF221F	150	14"	24"	A216 GR.WCB	13CR	FLEXIBLE GRAPHITE	API 600	RFSF acc.to ASME B16.5	

Revision	Date	Name	Checked	Description	Revision	Date	Name	Checked	Description

thyssenkrupp Industrial Solutions

Piping Specification
Piping Class: 150A1
NBL Incremental Project

UAN : 01-6008-000
Part : 4
Page : 6

Print Date : 21.11.2019
Print Time : 02:52

Valves		Designation	Rating Class	DN from	DN to	Material Body	Material Body Seat	Material Packing	Standard	End Connection	Note
VA	SABD-C02FAAAS	GATE OS&Y BB RFSF VAF218F	150	1/2"	1 1/2"	A105	13CR HF	FLEXIBLE GRAPHITE	API 600	RFSF acc.to ASME B16.5	3
VAA	SAXFIC02FAAAS	GATE OS&Y BB NPTxSW VAD818F	800	1/2"	1 1/2"	A105	13CR HF	FLEXIBLE GRAPHITE	API 602	SW-Ends acc.to ASME B16.11	4
VB	TKBD-C32CBBA	BALL VALVE LOP FB RFSF VFL22K	150	1/2"	6"	A216, GR.WCB	RTFE	PTFE	API 607,608	RFSF acc.to ASME B16.5	
VB	TLBD-C32CBBA	BALL VALVE GOP FB RFSF VFL22K	150	8"	24"	A216, GR.WCB	RTFE	PTFE	API 607,608	RFSF acc.to ASME B16.5	
VBA	TKBF-C32CBBA	BALL VALVE LOP FB RFSF VLF32K	300	4"	4"	A216, GR.WCB	RTFE	PTFE	API 607,608	RFSF acc.to ASME B16.5	
VBB	TLBF-C32CBBA	BALL VALVE GOP FB RFSF VLF32K	300	6"	10"	A216, GR.WCB	RTFE	PTFE	API 607,608	RFSF acc.to ASME B16.5	
VBC	TKBD-162CBBA	BALL VALVE FB RFSF VFL22K-1	150	1/2"	6"	A216, GR.WCB	MPTFE	MPTFE	API 607,608	RFSF acc.to ASME B16.5	21
VBC	TLBD-162CBBA	BALL VALVE GO FB RFSF VFL22K-1	150	8"	24"	A216, GR.WCB	MPTFE	MPTFE	API 607,608	RFSF acc.to ASME B16.5	21
VF	UEMD-C32CBBA	BUTTERFLY LO WAFER RFSF VUW22H	150	3"	6"	A216,GR.WCB	EPDM	EPDM	API STD 609	Sandwich, Wafer-Type	
VF	UKMD-C32CBBA	BUTTERFLY GO WAFER RFSF VUW22H	150	8"	24"	A216,GR.WCB	EPDM	EPDM	API STD 609	Sandwich, Wafer-Type	
VG	VKXI-C02FAAA	GLOBE VALVE OS&Y BB SW VBS818F	800	1/2"	1 1/2"	A105	13CR HF	FLEXIBLE GRAPHITE	API 602	SW-Ends acc.to ASME B16.11	
VG	VABD-C01CBBA	GLOBE OS&Y BB RFSF VBF221F	150	2"	8"	A216 GR.WCB	13CR	FLEXIBLE GRAPHITE	ANSI B16.10	RFSF acc.to ASME B16.5	
VG	VBBD-C01CBBA	GLOBE OS&Y BB GOP RFSF VBF221F	150	10"	10"	A216 GR.WCB	13CR	FLEXIBLE GRAPHITE	ANSI B16.10	RFSF acc.to ASME B16.5	
VL	TABD-139DJBGDB	PLUG VALVE LOP FB RFSF	150	1/2"	6"	A216 WCB	PTFE	PTFE	API 6D	RFSF acc.to ASME B16.5	
VC	RAXI-C02FAAA	LIFT CHECK VALVE SW VCS818	800	1/2"	1 1/2"	A105	13CR HF	FLEXIBLE GRAPHITE	API 602	SW-Ends acc.to ASME B16.11	
VC	RKBD-C01CBBA	SWING CHECK VALVE RFSF VCF221	150	2"	8"	A216 Gr.WCB	13CR	FLEXIBLE GRAPHITE	ASME B16.10	RFSF acc.to ASME B16.5	
VCB	RMBD-C34CBBA	DUAL CHECK WAFER RFSF VCW22G	150	2"	24"	A216 GR.WCB	13CR + INCONEL	FLEXIBLE GRAPHITE	API 594	Wafer-Type RFSF ASME B16.5	

Notes

21 - See General note Project 1.1
2 - See General note Project 1.2
3 - See General note Project 1.3
4 - See General note Project 1.4
5 - See General note Project 2.1

Revision	Date	Name	Checked	Description	Revision	Date	Name	Checked	Description

APPROVED BY	PTT		PTT GAS PIPELINES FOR BST ELASTOMER CO.,LTD.
CHECKED BY	PTT		
PREPARED BY	MXN		

PTT Public Company Limited

PIPE WALL THICKNESS CALCULATION

DOC. NO. ED-P-1802.39-0330-001 REV.B

REVIEW STAMP

APPROVAL

- ☐ E. Work may proceed.
- ☐ F. Work may proceed. Submit Final Drawing
- ☐ G. Revise and Resubmit. Work may proceed subject to incorparation of change indicated.
- ☐ H. Revies and Resubmit. Work not proceed.
- ☐ I. Review not required. Work may proceed.

Acceptance in any of these categories shall be in no way relieve the Contracor/Supplier of its responsibiity for the due and proper performance of the Work in accordance with the contract/Purchase Order.
Name :
Signed : Date :

MAXENs	PROJECT NO. 1802.12	MXN PROJECT NO./ CONTRACT NO.

DOCUMENT CHANGE RECORD

Rev	Date	Prepared/ Revised By	Reviewed By	Approved By	Description
A	28-May-19	MXN	PTT	PTT	Issued for Approval
B	10-Jun-19	MXN	PTT	PTT	Issued for Approval

TABLE OF CONTENTS

SECTION **PAGE**

1. Piping Material – Class 300# (D30) 4

Calculation Cover Sheet
Piping Wall Thickness per ASME B31.8

Project No:	1802.39	**Calc No:**	
Activity:	Pipe Wall Thickness Check	**File:**	
Client:	PTT Public Company Limited		
Project:	PTT GAS PIPELINES FOR BST ELASTOMER CO.,LTD.		
Subject:	Calculation for Piping wall thickness - D30		

Calculation Objective

To ascertain the required wall thicknesses for pressure containment per ASME B31.8 for Knauf Gypsum (Thailand) Limited Project- Location Class 4 (design factor = 0.4). Design Factor selected as per PTT DCM for Inplant Piping

Calculation Method

The calculation methodology is described within ASME B31.8 Clause 841.11.

Design pressure

API 5L GRB, MAOP = 4.964 MPa (720 psi),
Wall thicknesses are calculated for location classes as follows: Class 1 Div 1(F=0.80), Class 1 Div 2 (F=0.72), Class 2 (F=0.60), Class 3 (F=0.5) and Class 4 (F=0.4)

Assumptions

References

1) ASME B31.8-2003 "Gas Transmission and Distribution Piping Systems"
2) API 5L-2000: Specification for Line Pipe

Conclusions

The required wall thickness for the material grade and design factor is noted below:

3" D30	2.29 mm	Selected thickness SCH 40 = 5.49 mm	Passed

Piping Wall Thickness per ASME B31.8

Version 1.0

Project No:	1802.39	**Calc No:**	
Activity:	Pipe Wall Thickness Check	**File:**	
Client:	PTT Public Company Limited		
Project:	PTT GAS PIPELINES FOR BST ELASTOMER CO.,LTD.		
Subject:	Wall Thickness Calculation		

Input - Design Parameters

Design Pressure	P	4.964 MPa	(720 psi)
Pipe Manufacture		API 5L - Seamless	
Longitudinal Joint Factor	E	1.00	
Design Temperature		49 °C	(120°F)
Temp. Derating Factor	T	1.000	
Pipe Material Grade		API 5L B	
Pipe SMYS	S	241 MPa	

Ref: ASME B31.8-2003 Clause 841.1.1

$$t = \frac{P \cdot D}{2.S.F.E.T}$$

Results - Nominal Wall Thickness (t)

Diameter			Class 1, Div 1	Class 1, Div 2	Class 2	Class 3	Class 4
(DN)	(in)	(mm)	F = 0.80	F = 0.72	F = 0.60	F = 0.50	F = 0.40
DN8	0.25	13.7	0.18	0.20	0.24	0.28	0.35
DN15	0.5	21.3	0.27	0.30	0.37	0.44	0.55
DN20	0.75	26.7	0.34	0.38	0.46	0.55	0.69
DN25	1	33.4	0.43	0.48	0.57	0.69	0.86
DN40	1.5	48.3	0.62	0.69	0.83	0.99	1.24
DN50	2	60.3	0.78	0.86	1.04	1.24	1.55
DN80	3	88.9	1.14	1.27	1.53	1.83	2.29
DN100	4	114.3	1.47	1.63	1.96	2.35	2.94
DN150	6	48.3	0.62	0.69	0.83	0.99	1.24
DN200	8	219.1	2.82	3.13	3.76	4.51	5.64
DN250	10	273.1	3.52	3.906	4.69	5.63	7.03
DN300	12	323.9	4.17	4.63	5.56	6.67	8.34
DN350	14	355.6	4.58	5.09	6.10	7.32	9.16
DN400	16	406.4	5.23	5.81	6.98	8.37	10.46
DN450	18	457.2	5.89	6.54	7.85	9.42	11.77
DN500	20	508.0	6.54	7.27	8.72	10.46	13.08
DN550	22	558.8	7.19	7.99	9.59	11.51	14.39
DN600	24	609.6	7.85	8.72	10.46	12.56	15.70
DN650	26	660.4	8.50	9.45	11.34	13.60	17.00
DN700	28	711.2	9.16	10.17	12.21	14.65	18.31
DN750	30	762.0	9.81	10.90	13.08	15.70	19.62
DN800	32	812.8	10.46	11.63	13.95	16.74	20.93
DN850	34	863.6	11.12	12.35	14.82	17.79	22.24
DN900	36	914.4	11.77	13.08	15.70	18.83	23.54
DN950	38	965.2	12.43	13.81	16.57	19.88	24.85
DN1000	40	1016.0	13.08	14.53	17.44	20.93	26.16
DN1050	42	1066.8	13.73	15.26	18.31	21.97	27.47
DN1100	44	1117.6	14.39	15.99	19.18	23.02	28.77
DN1150	46	1168.4	15.04	16.71	20.06	24.07	30.08
DN1200	48	1219.2	15.70	17.44	20.93	25.11	31.39

เอกสารแนบที่ 128

เอกสารการตรวจสอบรอยเชื่อมท่อขนส่งก๊าซธรรมชาติ

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

Piping Line No.

184-6177-FG-1"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-013
Inspection date : May 19, 2023
Issue report date : June 22, 2023

Content

Item	*Description*	*Page*
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 54*
4	*Ultrasonic Thickness Measurement Report*	*55 - 83*
5	*Eddy Current Testing Report*	*84 - 112*
6	*2D & 3D ISO-Drawing*	*113 - 134*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : June 22, 2023	Date : June 25, 2023	Date : June 28, 2023

SUMMARY FINDING

Report No. :	IS/B-23-CUI-P-NBL-013		
Request No. :	-		
Date of Test :	19/05/2023		
Page :	1 of 112	Rev.00	

Code : | Rev.: | Effective date :

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 13 Line No.	184-6177-FG-1"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	8.0 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	90.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20. (See picture No. 11-13)	Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.
2	Instrument (Pressure gauge)	**Major**	Found water trap inside pressure gauge CMLs 42. (See picture No. 29-31)	Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
3	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of valve 1" CMLs 60. (See picture No. 44-46)	Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.
4	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of valve 1" CMLs 64. (See picture No. 49-51)	Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.
5	Pipe, Fitting, Branch Connection, Valve, Flange Connection	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, fitting, branch connection, valve and flange connection at CMLs 2-3, 5, 32, 38, 40, 46-47. (See picture No. 2-3, 5, 22, 25, 27, 34-35)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Found 4 Major case at CMLs 20, 42, 60, 64. See detail in "VISUAL TESTING REPORT".	**Result :**	Rejected
UTM :	No significant wall-loss than corrosion allowance with maximum corrosion rate = 0.041 mm. / year and remaining life = 36.384 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

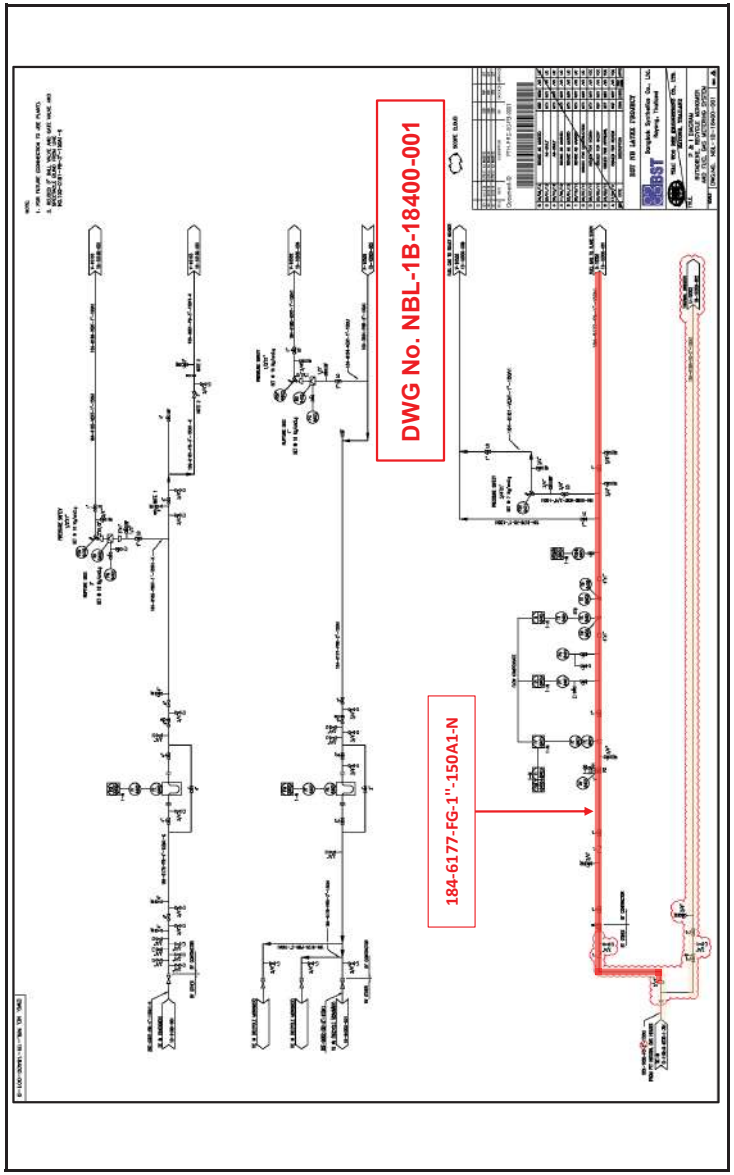
AFTER REPAIR INSPECTION RESULT

- Planned to replace within next S/D (2024) -

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	2 of 112	Rev.	00

Piping and Instrumentation Diagram (P&ID)

Code : Rev. : Effective date :



VISUAL TESTING REPORT

Code : Rev. : Effective date :

Report No. :	IS/B-23-CUI-P-NBL-013	
Request No. :	-	
Date of Test :	19/05/2023	
Page :	3 of 112	Rev.00

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6177-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			Slightly rust	-
2. Flange connection (Flange, Stud & Nut, Gasket)			✓		- Severe corrosion at gasket - Rust at stud & nut	11-13, 44-46, 49-51
3. Branch Connection (Vent, Drain, Nipples)	✓				Rust spot	-
4. Valve (Body, Bonnet, Stem, Packing, Handle)	✓					-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
9. Pressure gauge			✓		Water trap inside gauge	29-31
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)	✓					-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	June 22, 2023	Date :	June 25, 2023	Date :	June 28, 2023

Picture No. 1

Finding :

Pipe 1" include coupling CMLs 1 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Found painting damage & rust spot at check valve 1" CMLs 2.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

Found painting damage & rust spot at socket tee reducer 1" x 3/4" CMLs 3.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 4

Finding :

Drain branch 3/4" CMLs 4 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

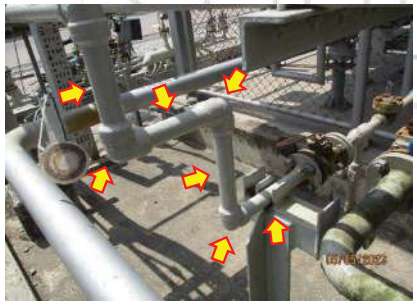
Picture No. 5

Finding :

Found slightly rust at valve 1" CMLs 5.

Recommendation :

Shall be monitor within next inspection.



Picture No. 6

Finding :

Pipe 1" CMLs 6, CMLs 8, CMLs 10, CMLs 12 and socket elbow 1" CMLs 7, CMLs 9, CMLs 11 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Pipe 1" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 8

Finding :

Pipe 1" CMLs 15 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Socket elbow 1" CMLs 16 and pipe 1" CMLs 17 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

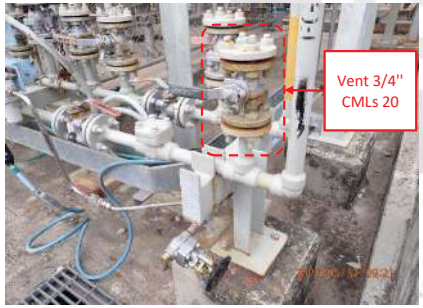
Picture No. 10

Finding :

Socket elbow 1" CMLs 18 and socket tee 1" x 1" CMLs 19 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 11

Finding :

Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20.

Recommendation :

Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.

Picture No. 12

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be immediately re-tighten packing of drain valve 3/4" CMLs 13.

Picture No. 13

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.

Picture No. 14

Finding :

Pipe 1" CMLs 21, CMLs 23 and check valve 1" CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 15

Finding :

Valve 1" CMLs 24 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Control valve 1" CMLs 25 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 17

Finding :

Pipe 1" and U-bolt support CMLs 26 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 18

Finding :

Socket tee reducer 1" x 3/4" CMLs 27 and valve 3/4" CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 19

Finding :

Instrument pipe 1" at support CMLs 29 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 20

Finding :

Instrument CMLs 30 was found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 21

Finding :

Instrument pipe 1" at support CMLs 31 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 22

Finding :

Found rust spot as all set of stud & nut at valve 1" CMLs 32.

Recommendation :

Shall be monitor within next inspection.

Picture No. 23

Finding :

Pipe 1" CMLs 33, CMLs 35 and socket elbow 1" CMLs 34, CMLs 36 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 24

Finding :

Socket tee reducer 1" x 3/4" CMLs 37 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Found rust spot as all set of stud & nut at valve 3/4" CMLs 38.

Recommendation :

Shall be monitor within next inspection.

Picture No. 26

Finding :

Socket tee reducer 1" x 3/4" CMLs 39 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 27

Finding :

Found rust spot as all set of stud & nut at valve 3/4" CMLs 40.

Recommendation :

Shall be monitor within next inspection.

Picture No. 28

Finding :

Pipe 3/4" include socket tee reducer 3/4" x 1/2" CMLs 41 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Found water trap inside pressure gauge CMLs 42.

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 30

Finding :

This photo shown water trap inside pressure gauge CMLs 42

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 31

Finding :

Close-up picture No. 30.

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 32

Finding :

Reducer 4" x 1" include coupling CMLs 44 were found in normal condtion.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Pipe 4" CMLs 45 include U-bolt and structure support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 34

Finding :

Found rust spot as all set of stud & nut at flange connection of branch 1" CMLs 46.

Recommendation :

Shall be monitor within next inspection.

Picture No. 35

Finding :

Found rust spot as all set of stud & nut at flange connection of branch 1" CMLs 47.

Recommendation :

Shall be monitor within next inspection.

Picture No. 36

Finding :

Reducer 4" x 1" include coupling CMLs 48 were found in normal condtion.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Socket tee 1" x 1" CMLs 49 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Small bore branch 1" CMLs 50 include valve were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 39

Finding :

Pipe 1" CMLs 51 include U-bolt and structure support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Socket tee 1" x 1" CMLs 52 and small bore branch 1" CMLs 53 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

Pipe 1" CMLs 54 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

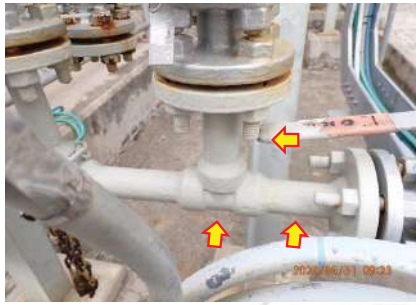
Picture No. 42

Finding :

Socket tee reducer 1" x 3/4" CMLs 55, small bore branch 3/4" CMLs 56 and pipe 1" CMLs 57 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



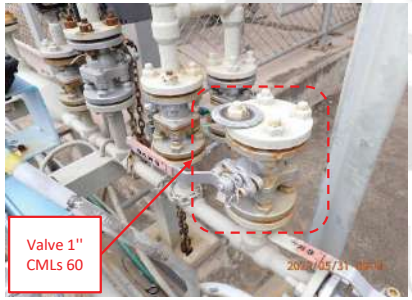
Picture No. 43

Finding :

Socket tee 1" x 1" CMLs 58, small bore branch 1" CMLs 59 and pipe 1" CMLs 61 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 44

Finding :

Found severe corrosion at gasket inside flange connection of valve 1" CMLs 60.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 45

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 46

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 47

Finding :

Valve 1" CMLs 62 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 48

Finding :

Socket tee 1" x 1" CMLs 63 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

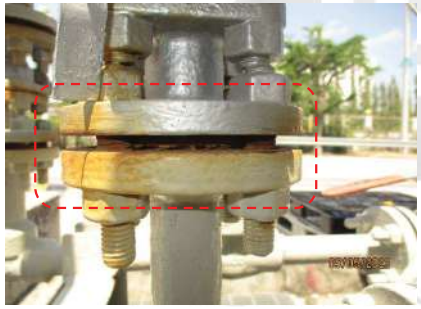
Picture No. 49

Finding :

Found severe corrosion at gasket inside flange connection of valve 1" CMLs 64.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.



Picture No. 50

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.

Picture No. 51

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.

Picture No. 52

Finding :

Pipe 1" CMLs 65, CMLs 67 and socket elbow 1" CMLs 66 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 53

Finding :

Socket elbow 1" CMLs 68 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 54

Finding :

Pipe 1", U-bolt and structure support CMLs 69 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 55

Finding :

Pipe 1", U-bolt and structure support CMLs 70 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 56

Finding :

Pipe 1", U-bolt and structure support CMLs 71, CMLs 72, CMLs 73 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 57

Finding :

Socket elbow 1" CMLs 74 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 58

Finding :

Pipe 1", U-bolt and structure support CMLs 75 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 59

Finding :

Pipe 1", U-bolt and structure support CMLs 76, CMLs 77 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

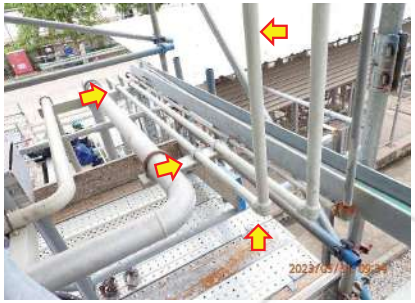
Picture No. 60

Finding :

Socket elbow 1" CMLs 78 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 61

Finding :

Pipe 1", U-bolt, structure support CMLs 79, CMLs 80, CMLs 82 and socket elbow 1" CMLs 81 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

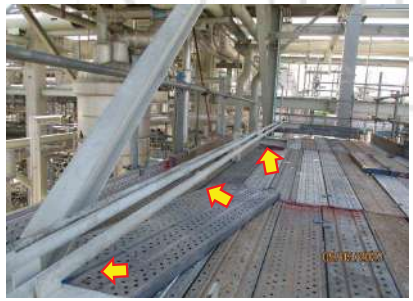
Picture No. 62

Finding :

Socket elbow 1" CMLs 83 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 63

Finding :

Pipe 1", coupling and structure support CMLs 84, CMLs 85, CMLs 86 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 64

Finding :

Socket elbow 1" CMLs 88, CMLs 90, CMLs 92 and pipe 1" CMLs 89, CMLs 91 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 65

Finding :

Pipe 1" CMLs 93 and socket elbow 1" CMLs 94 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 66

Finding :

Pipe 1" CMLs 95 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 67

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 68

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 69

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 70

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 71

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 72

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 73

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 74

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 75

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 76

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 77

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 78

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 79

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 80

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 81

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 82

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 83

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 84

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	32 of 112 Rev.00

Code : | Rev.: | Effective date :

Picture No. 85

Finding :

Pipe 1" CMLs 96, CMLs 98, socket tee 1" x 1" CMLs 97 and socket elbow 1" CMLs 99 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 86

Finding :

This photo shown pipe 1" and socket tee 1" were in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 87

Finding :

This photo shown pipe 1" and socket elbow 1" were in normal condition.

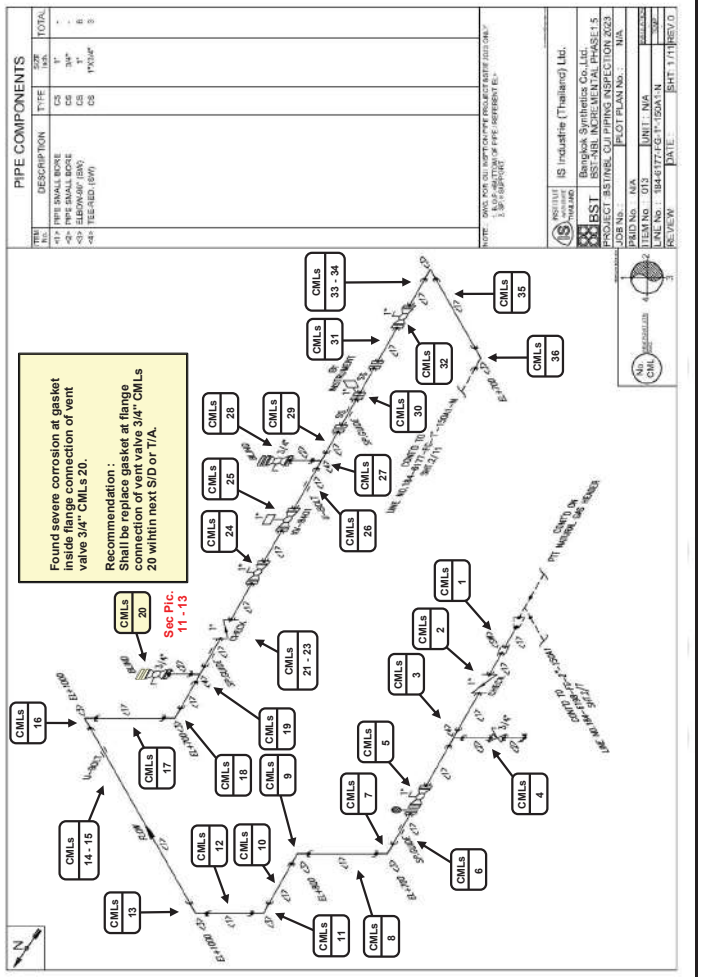
Recommendation :

Should be monitor within next inspection.

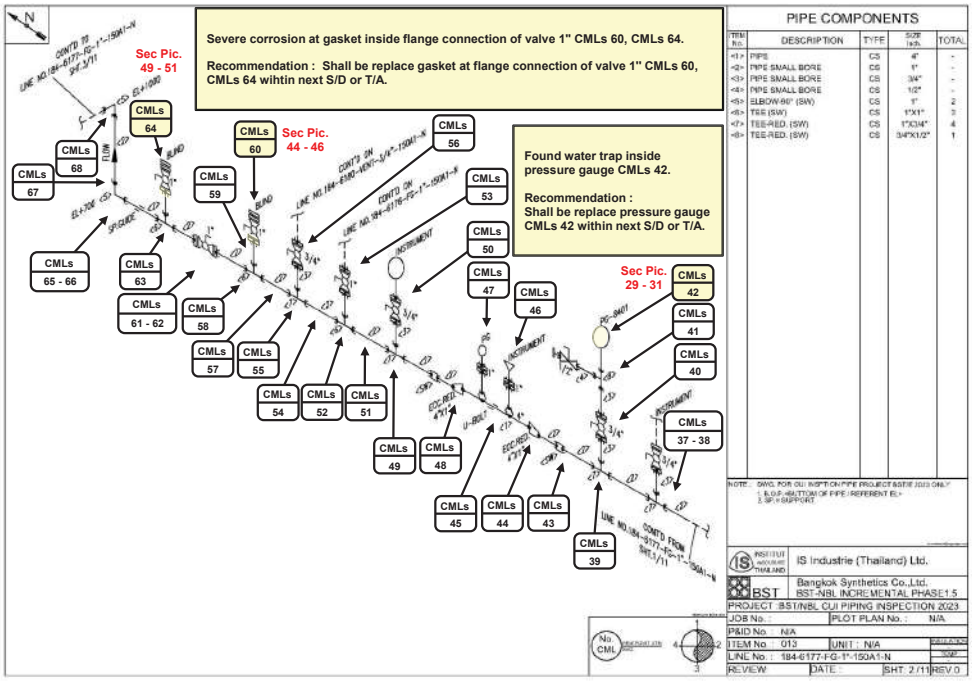
2D ISO-DRAWING WITH MARK UP

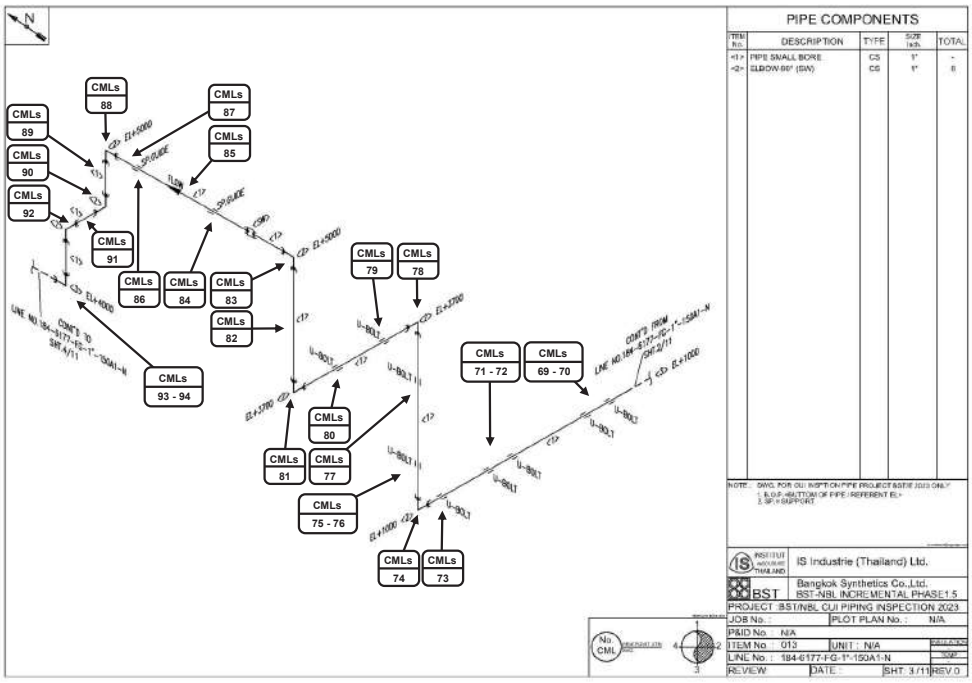
Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	33 of 112 Rev.00

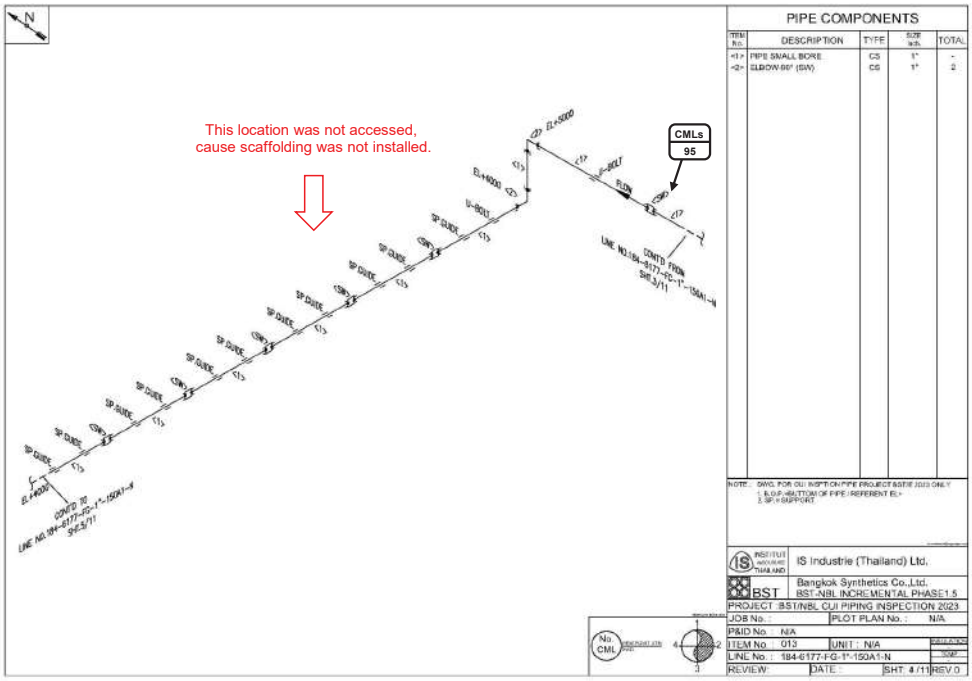
Code : | Rev.: | Effective date :



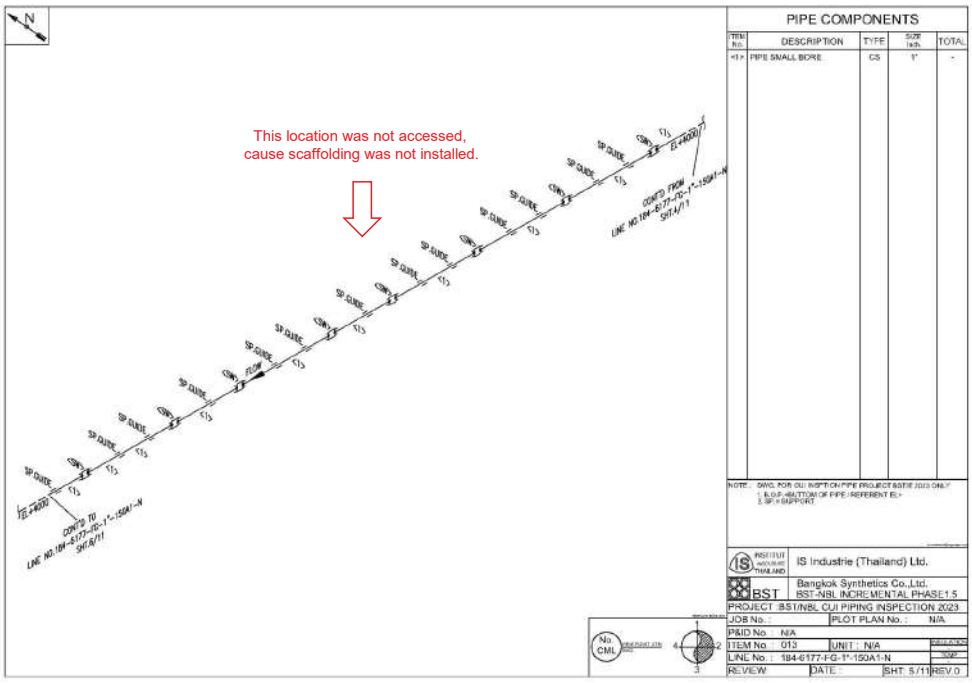
IS SOUDURE THAILAND


Severe corrosion at gasket inside flange connection of valve 1" CMLs 60, CMLs 64.
Recommendation : Shall be replace gasket at flange connection of valve 1" CMLs 60, CMLs 64 wihtin next S/D or T/A.
Found water trap inside pressure gauge CMLs 42.
Recommendation : Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
Sec Pic. 49 - 51
Sec Pic. 44 - 46
Sec Pic. 29 - 31
PIPE COMPONENTS
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023

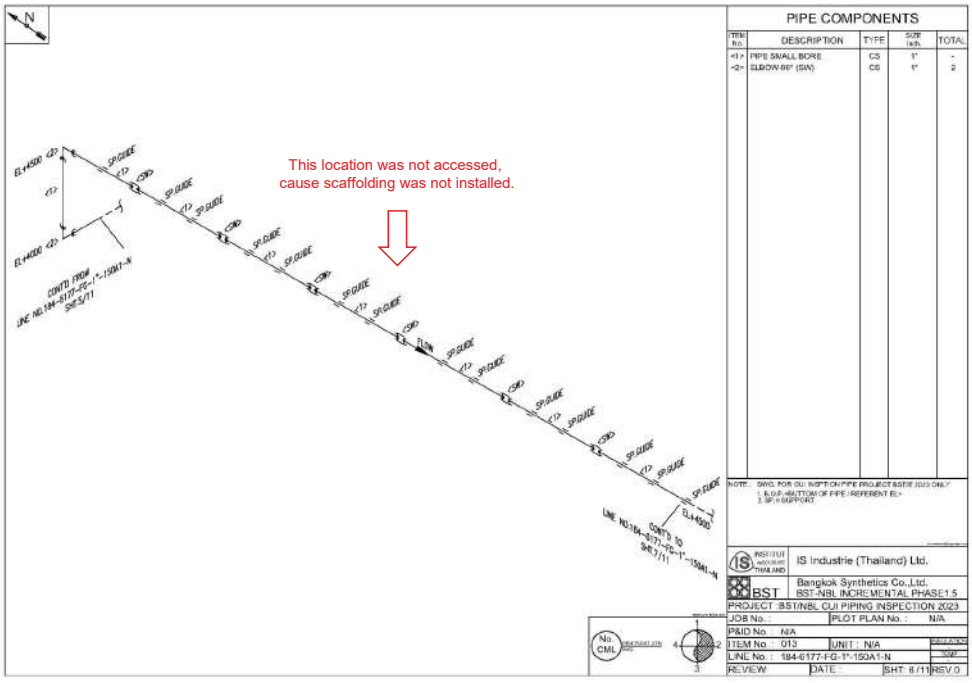

PIPE COMPONENTS
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023



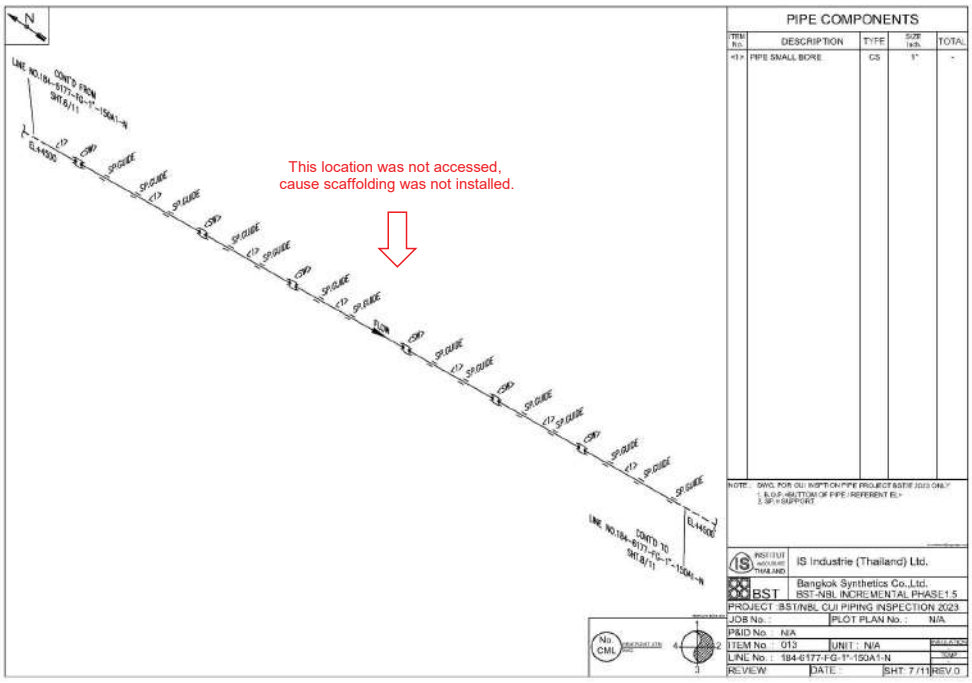
THAILAND



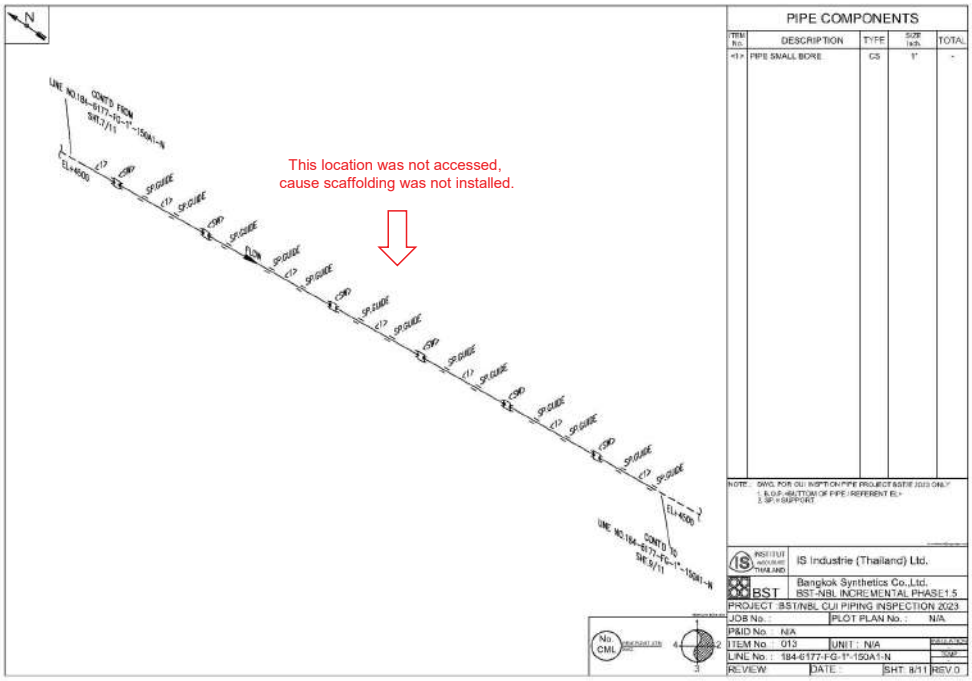
THAILAND



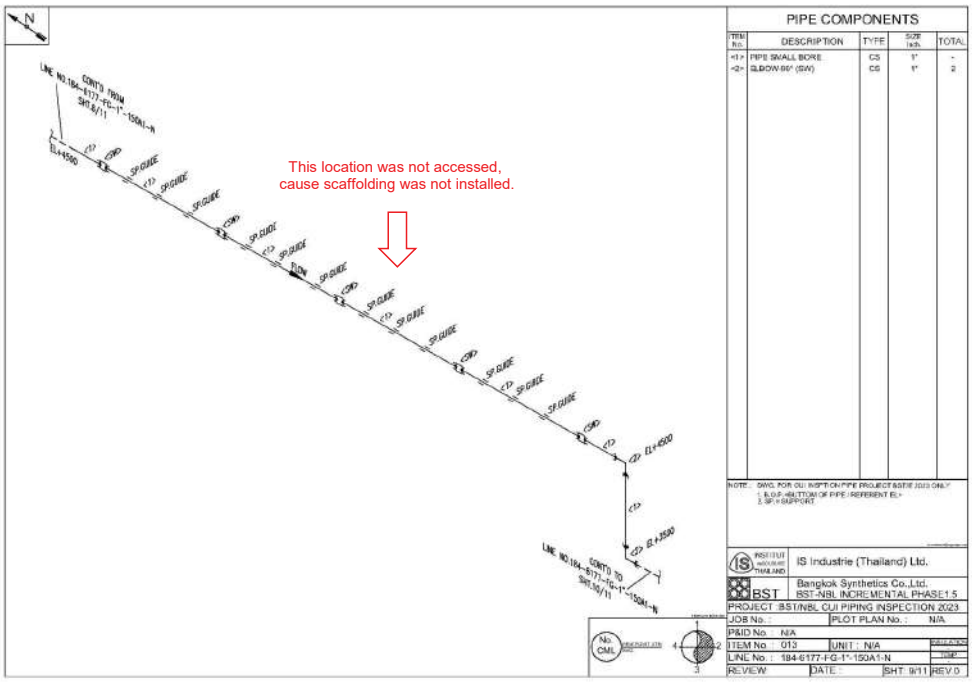
THAILAND



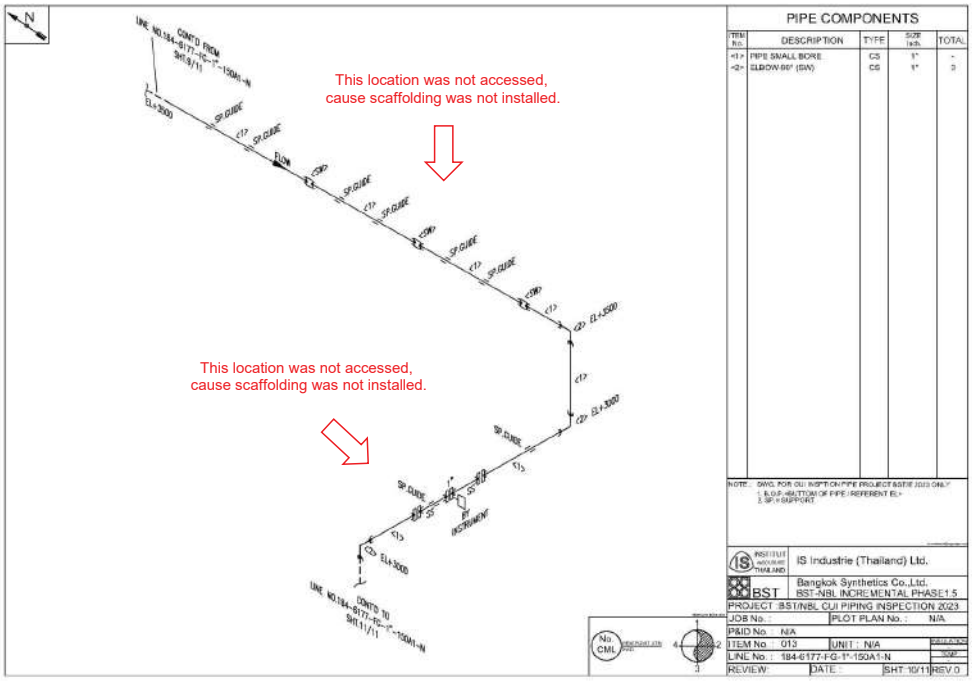
THAILAND



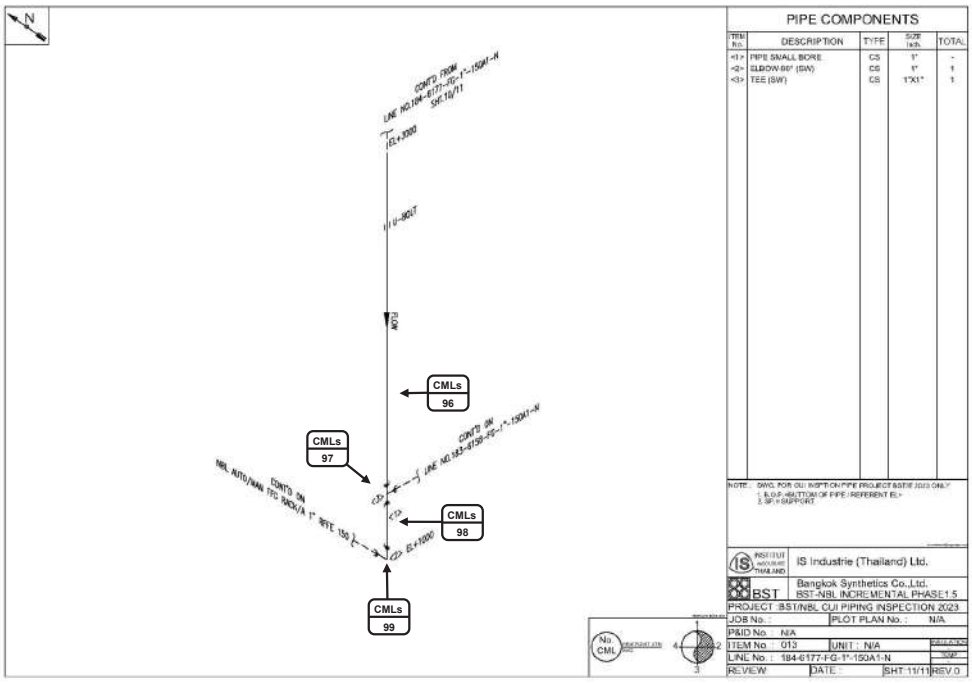
THAILAND



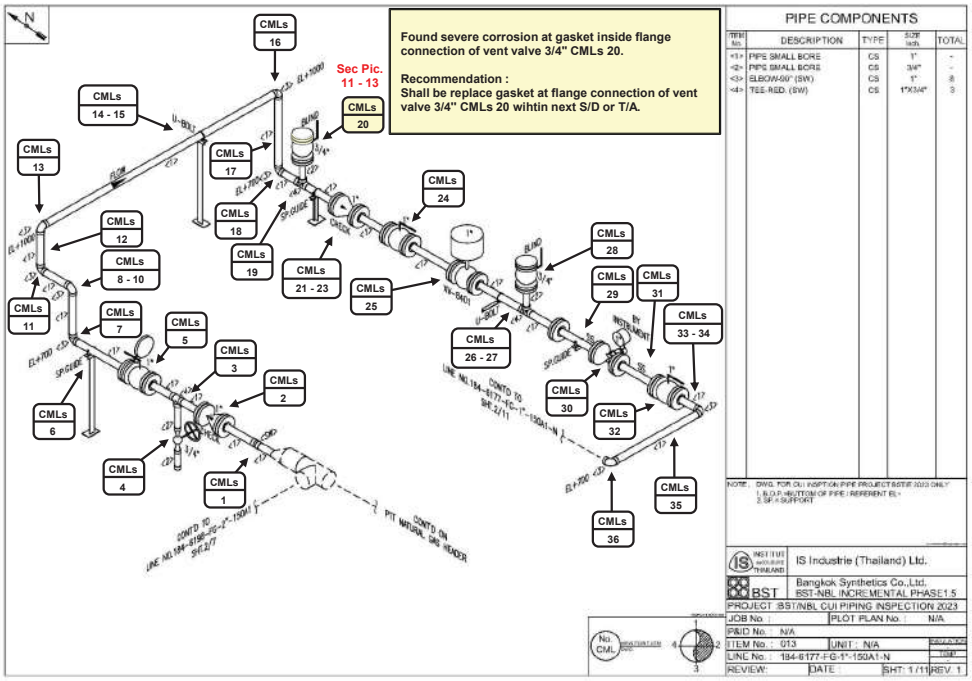
THAILAND

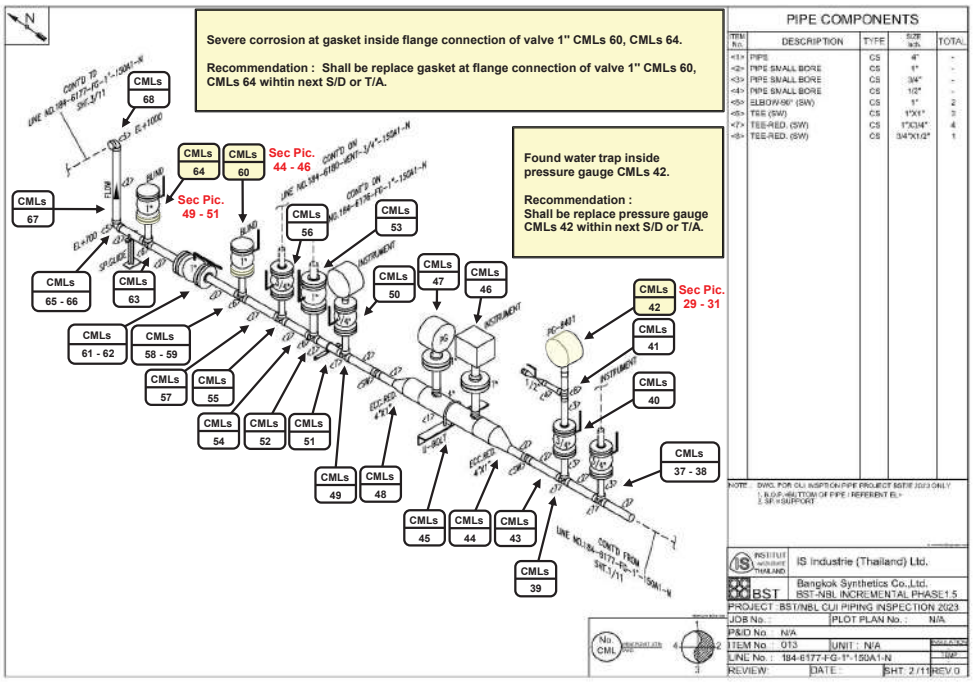


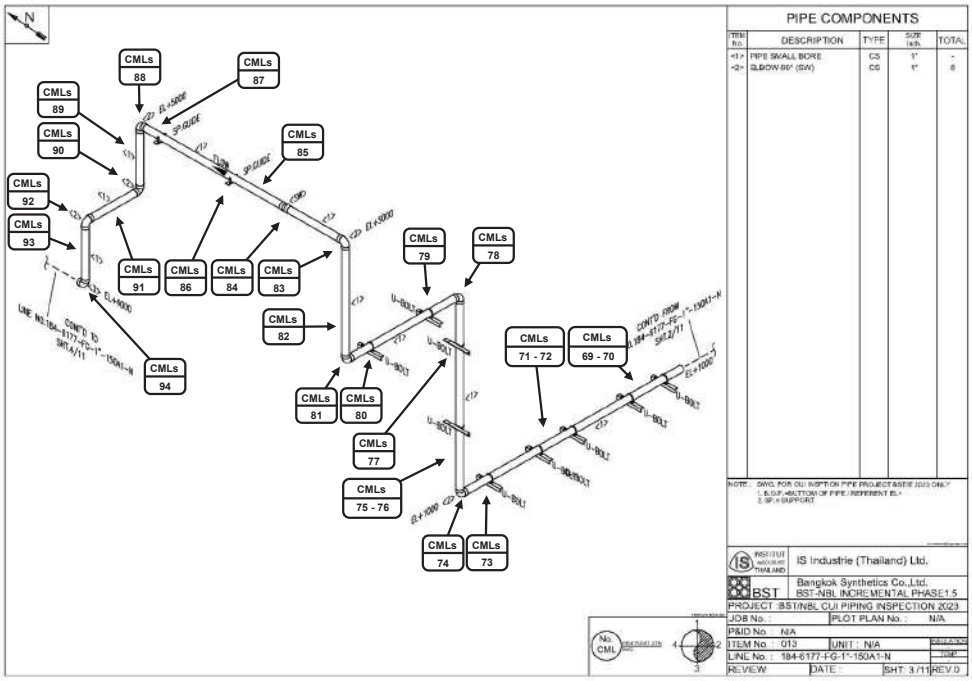
THAILAND



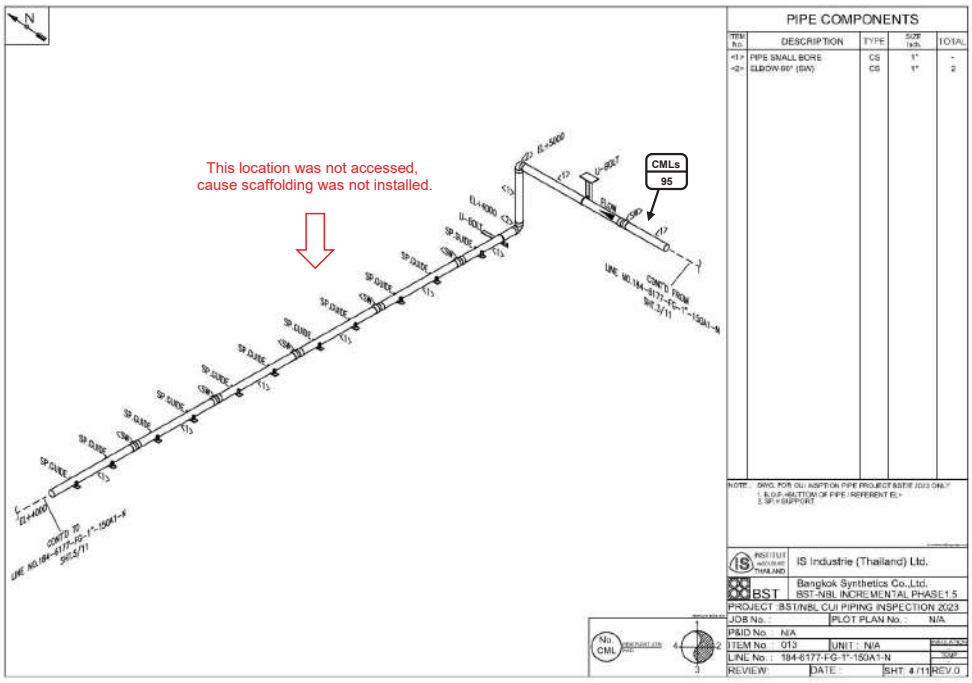
THAILAND


Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20.
Recommendation :
Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.
Sec Pic. 11 - 13
CMLs 16
CMLs 14 - 15
CMLs 20
CMLs 13
CMLs 17
CMLs 24
CMLs 18
CMLs 12
CMLs 19
CMLs 21 - 23
CMLs 8 - 10
CMLs 25
CMLs 28
CMLs 29
CMLs 31
CMLs 11
CMLs 7
CMLs 33 - 34
CMLs 5
CMLs 26 - 27
CMLs 3
CMLs 2
CMLs 30
CMLs 6
CMLs 32
CMLs 4
CMLs 1
CMLs 35
CMLs 36
CONT'D TO LINE NO.184-6156-FG-2"-150A1 SHT.2/7
CONT'D ON PIT NATURAL GAS HEADER
CONT'D TO LINE NO.184-6177-FG-1"-150A1-N SHT.2/11
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° (SW) CS 1" 8
<4> TEE-RED. (SW) CS 1"X3/4" 3
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTIF 2023 ONLY
1. B.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 1 /11 REV. 1

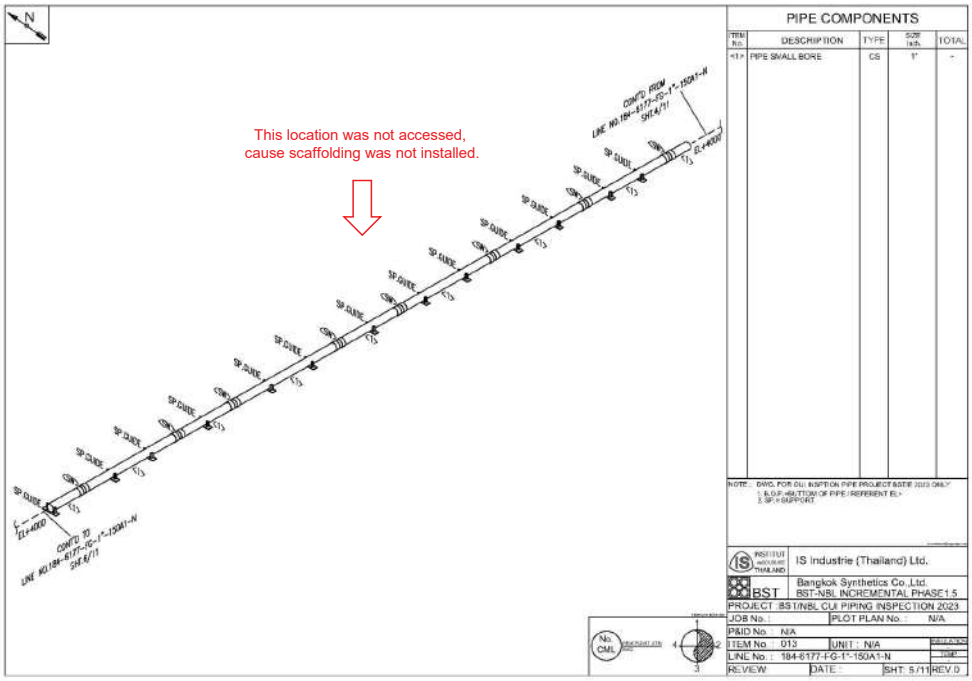

Severe corrosion at gasket inside flange connection of valve 1" CMLs 60, CMLs 64.
Recommendation : Shall be replace gasket at flange connection of valve 1" CMLs 60, CMLs 64 wihtin next S/D or T/A.
Found water trap inside pressure gauge CMLs 42.
Recommendation :
Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
CMLs 68
CMLs 64
CMLs 60
Sec Pic. 44 - 46
Sec Pic. 49 - 51
CMLs 67
CMLs 56
CMLs 53
CMLs 50
CMLs 47
CMLs 46
CMLs 42
Sec Pic. 29 - 31
CMLs 65 - 66
CMLs 63
CMLs 41
CMLs 61 - 62
CMLs 58 - 59
CMLs 40
CMLs 57
CMLs 55
CMLs 37 - 38
CMLs 54
CMLs 52
CMLs 51
CMLs 49
CMLs 48
CMLs 45
CMLs 44
CMLs 43
CMLs 39
CONT'D TO LINE NO.184-6177-FG-1"-150A1-N SHT.2/11
CONT'D ON LINE NO.184-6180-JGNT-3/4"-150A1-N
CONT'D ON LINE NO.184-6176-FG-1"-150A1-N
CONT'D FROM LINE NO.184-6177-FG-1"-150A1-N SHT.1/11
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 4" -
<2> PIPE SMALL BORE CS 1" -
<3> PIPE SMALL BORE CS 3/4" -
<4> PIPE SMALL BORE CS 1/2" -
<5> ELBOW-90° (SW) CS 1" 2
<6> TEE (SW) CS 1"X1" 3
<7> TEE-RED. (SW) CS 1"X3/4" 4
<8> TEE-RED. (SW) CS 3/4"X1/2" 1
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTIF 2023 ONLY
1. B.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 /11 REV. 0



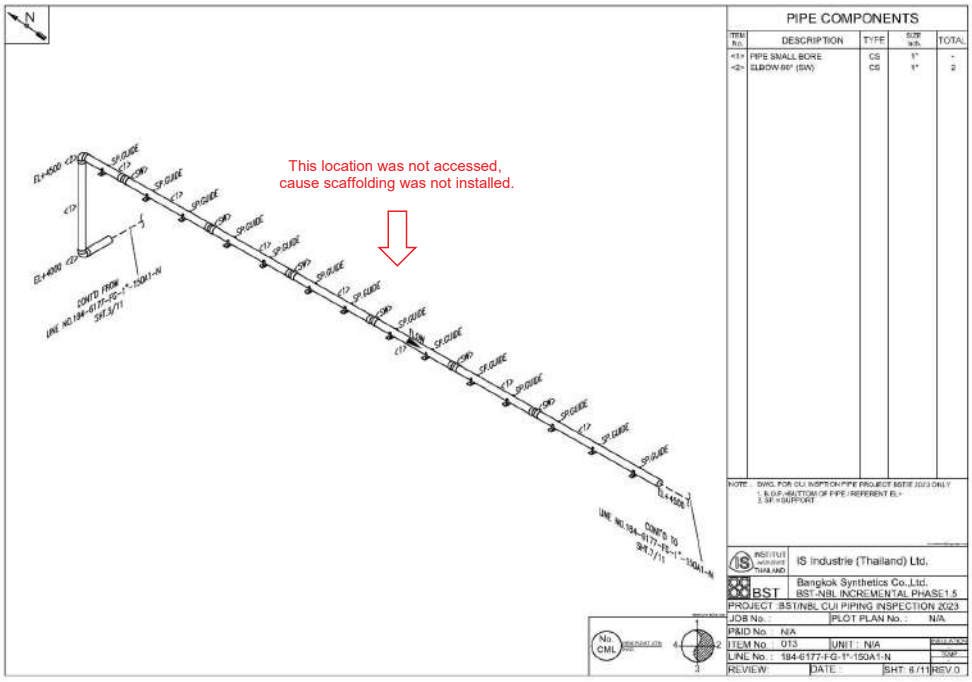
THAILAND



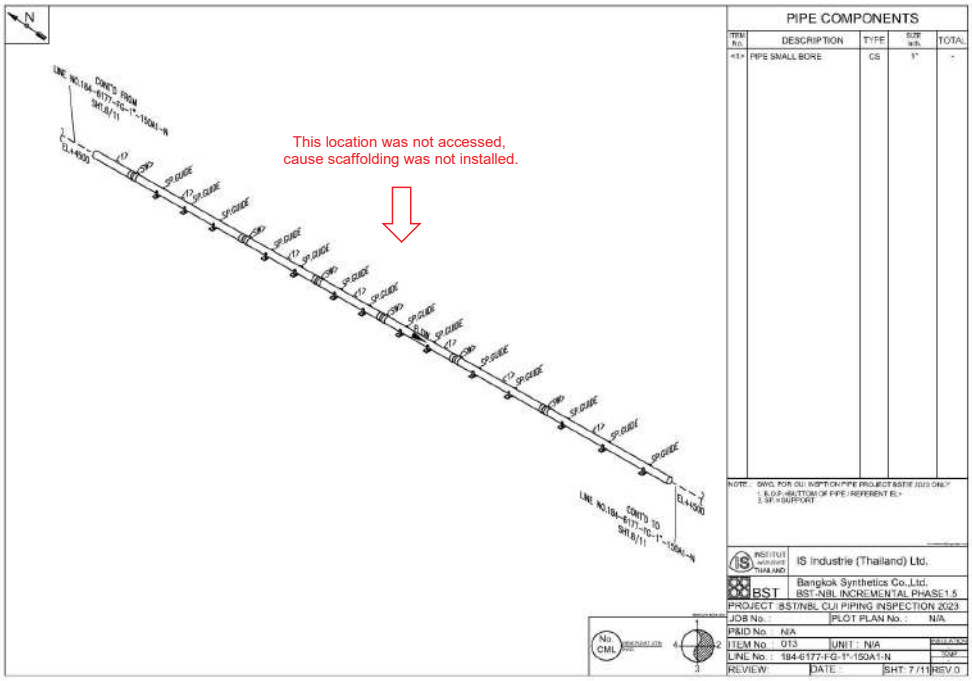
THAILAND



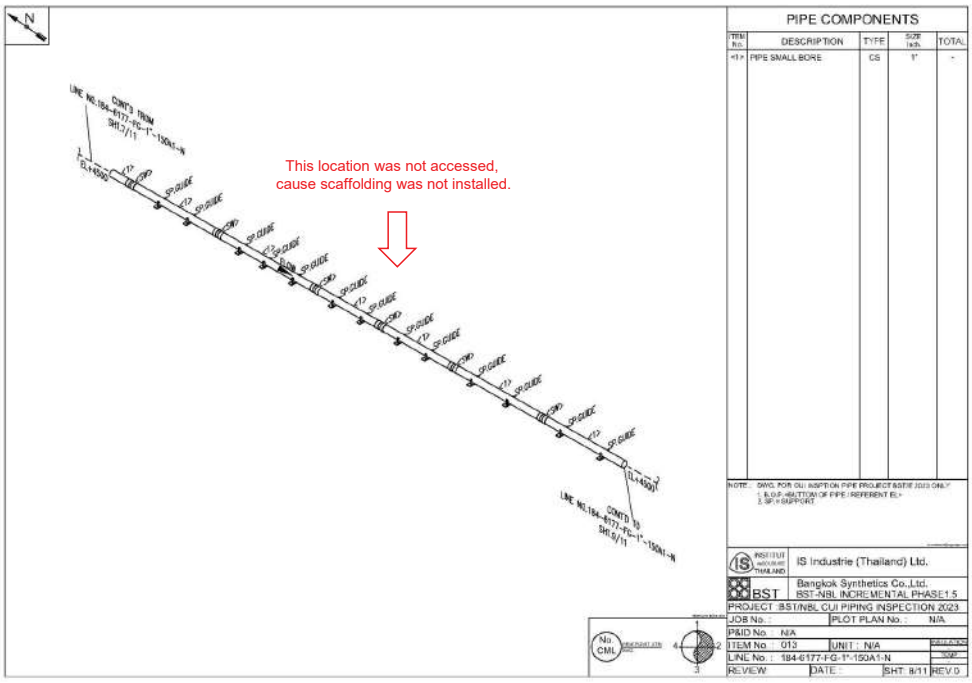
THAILAND



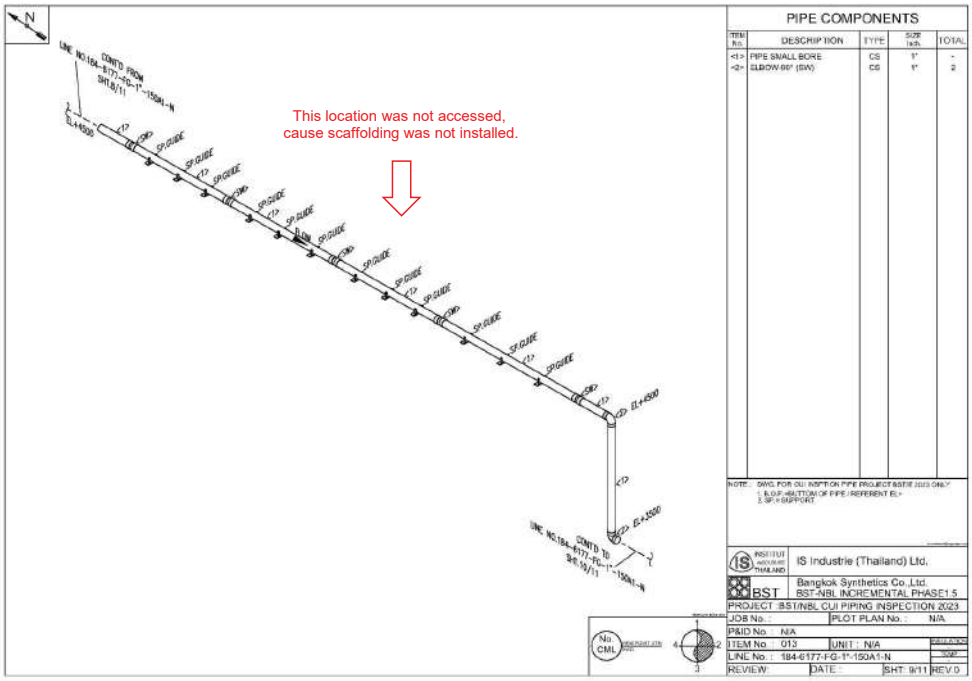
THAILAND



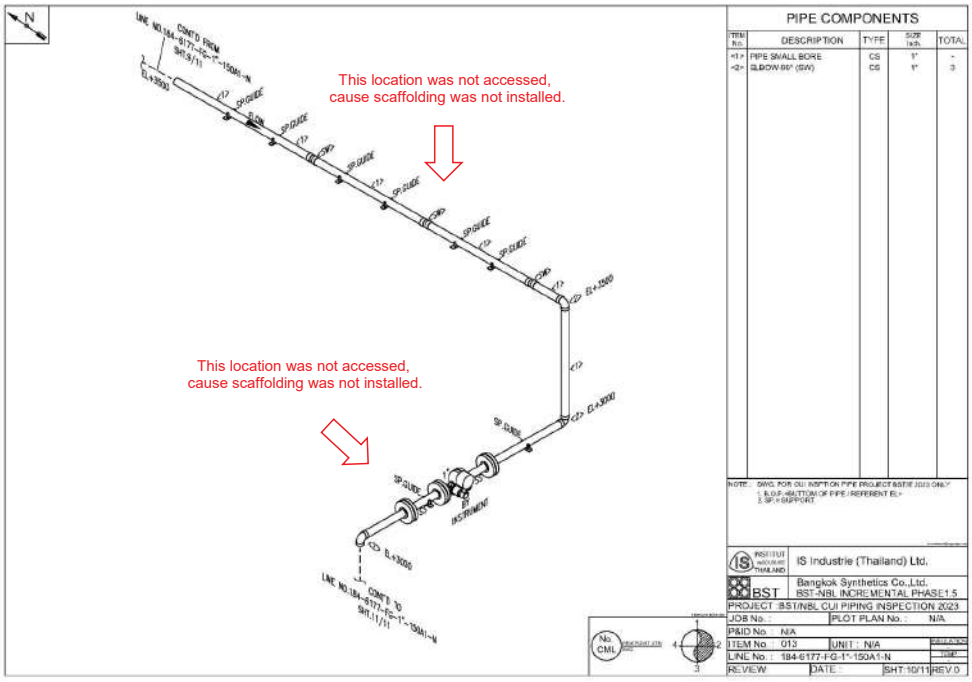
THAILAND



THAILAND



THAILAND

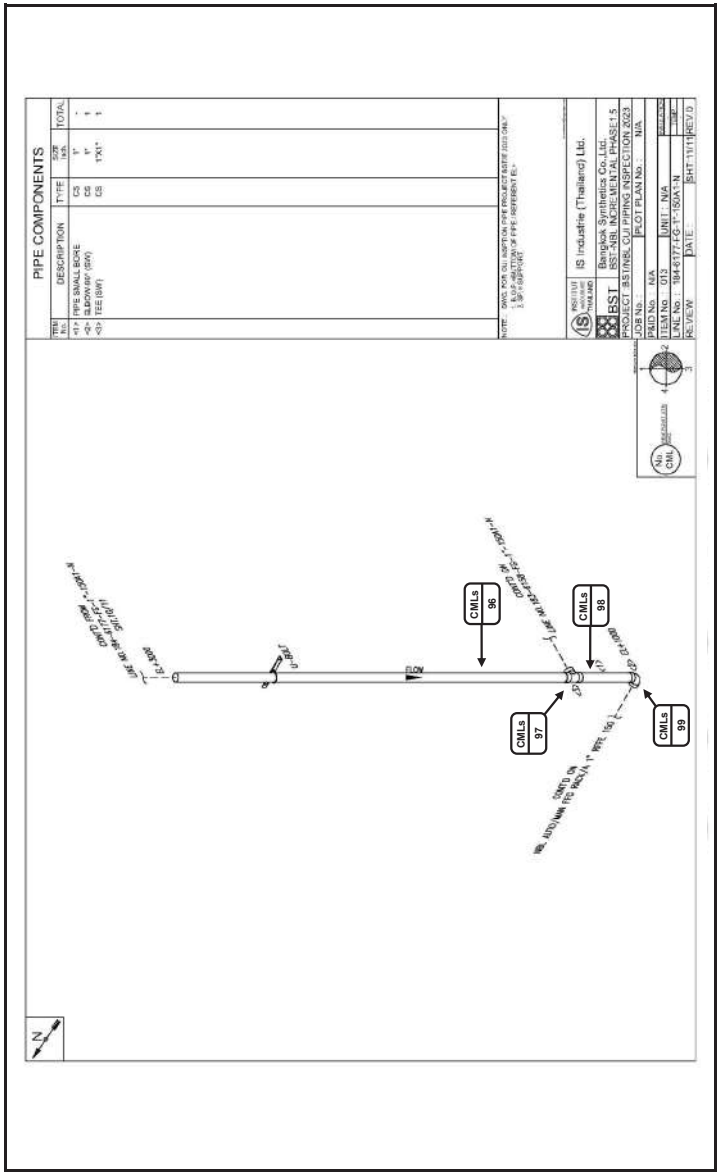


THAILAND

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	54 of 112 Rev.00

3D ISO-DRAWING WITH MARK UP

Code : Rev.: Effective date :



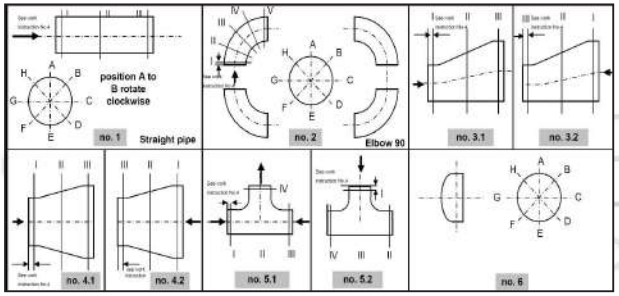
THAILAND

	ULTRASONIC THICKNESS MEASUREMENT REPORT	Report No. :	IS/B-23-CUI-P-NBL-013
		Request No. :	-
		Date of Test :	19/05/2023
	Code : Rev.: Effective date :	Page :	55 of 112 Rev.00

PIPING DATA					
Location :	BST SITE # 2 (NBL PLANT)		**Unit :**	FUEL GAS (EIA)	
Line No. :	184-6177-FG-1"-150A1-N		**Process Fluid :**	Fuel Gas	
Procedure :	SPR-NDT-UTM-001_REV.04		**Insulation Type :**	Non-Insulated	
Design Pressure :	8.0	Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570	
Design Temperature :	90.0	°C	**Service Date :**	January 1, 2013	

MEASUREMENT TOOL DATA					
Equipment Manufacturer	Olympus		**Calibration block**	Step bar 5 step	
Equipment Model	38 DL Plus		**Calibration Range**	2.50 - 7.50	mm.
Serial No.	151114106		**Serial No.**	144816	
Probe Manufacturer	Olympus		**Sound Velocity**	5904	mm./µs
Probe Model	D790-SM		**Couplant**	GE ZG-F / SONO 600	
Probe Dia.	10	mm.	**Scan Type**	A-SCAN	
Serial No.	1039668		**Technique**	Echo to Echo (Thru painting)	
Frequency	5	MHz			

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	No significant of wall-loss. (Maximum corrosion rate = 0.041 mm. / year and remaining life = 36.384 years)
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		**SIGNATURE :**		**SIGNATURE :**	
NAME :	MR. NITIPAT C.	**NAME :**	MR. KRISCHANUT S.	**NAME :**	MR. NATTA K.
Position :	UT Level II	**Position :**	API 570	**Position :**	Inspection Engineer
Date :	May 19, 2023	**Date :**	June 25, 2023	**Date :**	June 28, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	56 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
1	1.1	A	Pipe	1"	80	4.55	1.80	4.24			2.44	-	0.030	82.094	
	1.1	B	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	1.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	1.1	D	Pipe	1"	80	4.55	1.80	4.48			2.68	-	0.007	399.320	
2	2.1	A	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	2.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	2.1	C	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	2.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
3	3.1	A	Pipe	3/4"	80	3.91	1.80	3.91			2.11	-	0.000	#DIV/0!	Note 1
	3.1	B	Pipe	3/4"	80	3.91	1.80	3.98			2.18	-	-0.007	-324.820	Note 1
	3.1	C	Pipe	3/4"	80	3.91	1.80	3.99			2.19	-	-0.008	-285.521	Note 1
	3.1	D	Pipe	3/4"	80	3.91	1.80	4.05			2.25	-	-0.013	-167.625	Note 1
4	4.1	A	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	4.1	B	Pipe	1"	80	4.55	1.80	4.74			2.94	-	-0.018	-161.391	Note 1
	4.1	C	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	4.1	D	Pipe	1"	80	4.55	1.80	4.07			2.27	-	0.046	49.325	
5	5.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	5.1	B	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
	5.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	5.1	D	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
6	6.1	A	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
	6.1	B	Pipe	1"	80	4.55	1.80	4.08			2.28	-	0.045	50.597	
	6.1	C	Pipe	1"	80	4.55	1.80	4.41			2.61	-	0.013	194.445	
	6.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
7	7.1	A	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	7.1	B	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	7.1	C	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	7.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
8	8.1	A	Pipe	1"	80	4.55	1.80	4.68			2.88	-	-0.012	-231.065	Note 1
	8.1	B	Pipe	1"	80	4.55	1.80	4.52			2.72	-	0.003	945.653	
	8.1	C	Pipe	1"	80	4.55	1.80	4.61			2.81	-	-0.006	-488.472	Note 1
	8.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
9	9.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	9.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	9.1	C	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	9.1	D	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
10	10.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	10.1	B	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
	10.1	C	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	10.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	57 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
11	11.1	A	Pipe	3/4"	80	3.91	1.80	3.91			2.11	-	0.000	#DIV/0!	Note 1
	11.1	B	Pipe	3/4"	80	3.91	1.80	3.82			2.02	-	0.009	234.096	
	11.1	C	Pipe	3/4"	80	3.91	1.80	3.84			2.04	-	0.007	303.960	
	11.1	D	Pipe	3/4"	80	3.91	1.80	3.84			2.04	-	0.007	303.960	
12	12.1	A	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	12.1	B	Pipe	1"	80	4.55	1.80	4.12			2.32	-	0.041	56.273	
	12.1	C	Pipe	1"	80	4.55	1.80	4.64			2.84	-	-0.009	-329.124	Note 1
	12.1	D	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
13	13.1	A	Pipe	1"	80	4.55	1.80	4.21			2.41	-	0.033	73.930	
	13.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	13.1	C	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	13.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
14	14.1	A	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	14.1	B	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	14.1	C	Pipe	1"	80	4.55	1.80	4.71			2.91	-	-0.015	-189.696	Note 1
	14.1	D	Pipe	1"	80	4.55	1.80	4.62			2.82	-	-0.007	-420.180	Note 1
15	15.1	A	Pipe	1"	80	4.55	1.80	4.71			2.91	-	-0.015	-189.696	Note 1
	15.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	15.1	C	Pipe	1"	80	4.55	1.80	4.52			2.72	-	0.003	945.653	
	15.1	D	Pipe	1"	80	4.55	1.80	4.59			2.79	-	-0.004	-727.492	Note 1
16	16.1	A	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	16.1	B	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	16.1	C	Pipe	3/4"	80	3.91	1.80	3.87			2.07	-	0.004	539.753	
	16.1	D	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
17	17.1	A	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	17.1	B	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	17.1	C	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	17.1	D	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
18	18.1	A	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	18.1	B	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	18.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	18.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
19	19.1	A	Pipe	1"	80	4.55	1.80	4.41			2.61	-	0.013	194.445	
	19.1	B	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
	19.1	C	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	19.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
20	20.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	20.1	B	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	
	20.1	C	Pipe	1"	80	4.55	1.80	4.58			2.78	-	-0.003	-966.513	Note 1
	20.1	D	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	58 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
21	21.1	A	Pipe	3/4"	80	3.91	1.80	4.07			2.27	-	-0.015	-147.976	Note 1
	21.1	B	Pipe	3/4"	80	3.91	1.80	4.02			2.22	-	-0.011	-210.496	Note 1
	21.1	C	Pipe	3/4"	80	3.91	1.80	3.96			2.16	-	-0.005	-450.576	Note 1
	21.1	D	Pipe	3/4"	80	3.91	1.80	4.09			2.29	-	-0.017	-132.693	Note 1
22	22.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	22.1	B	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	22.1	C	Pipe	1"	80	4.55	1.80	4.21			2.41	-	0.033	73.930	
	22.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
23	23.1	A	Pipe	3/4"	80	3.91	1.80	4.11			2.31	-	-0.019	-120.467	Note 1
	23.1	B	Pipe	3/4"	80	3.91	1.80	4.00			2.20	-	-0.009	-254.956	Note 1
	23.1	C	Pipe	3/4"	80	3.91	1.80	4.04			2.24	-	-0.012	-179.717	Note 1
	23.1	D	Pipe	3/4"	80	3.91	1.80	4.04			2.24	-	-0.012	-179.717	Note 1
24	24.1	A	Pipe	3/4"	80	3.91	1.80	3.77			1.97	-	0.013	146.765	
	24.1	B	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	24.1	C	Pipe	3/4"	80	3.91	1.80	3.66			1.86	-	0.024	77.599	
	24.1	D	Pipe	3/4"	80	3.91	1.80	3.46			1.66	-	0.043	38.475	
25	25.1	A	Pipe	1/2"	80	3.73	1.80	3.69			1.89	-	0.004	492.817	
	25.1	B	Pipe	1/2"	80	3.73	1.80	3.60			1.80	-	0.012	144.415	
	25.1	C	Pipe	1/2"	80	3.73	1.80	3.50			1.70	-	0.022	77.091	
	25.1	D	Pipe	1/2"	80	3.73	1.80	3.52			1.72	-	0.020	85.427	
26	26.1	A	Pipe	1/2"	80	3.73	1.80	3.30			1.50	-	0.041	36.384	
	26.1	B	Pipe	1/2"	80	3.73	1.80	3.74			1.94	-	-0.001	-2023.420	Note 1
	26.1	C	Pipe	1/2"	80	3.73	1.80	3.66			1.86	-	0.007	277.140	
	26.1	D	Pipe	1/2"	80	3.73	1.80	3.36			1.56	-	0.035	43.975	
27	27.1	A	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
	27.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	27.1	C	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	27.1	D	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
28	28.1	A	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.10			3.80	-	-0.008	-495.425	Note 1
	28.1	B	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.09			3.79	-	-0.007	-564.710	Note 1
	28.1	C	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.11			3.81	-	-0.009	-441.537	Note 1
	28.1	D	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.18			3.88	-	-0.015	-252.928	Note 1
29	29.1	A	Pipe	4"	STD	6.02	2.30	5.94			3.64	-	0.008	474.565	
	29.1	B	Pipe	4"	STD	6.02	2.30	6.23			3.93	-	-0.020	-195.190	Note 1
	29.1	C	Pipe	4"	STD	6.02	2.30	6.40			4.10	-	-0.036	-112.534	Note 1
	29.1	D	Pipe	4"	STD	6.02	2.30	5.92			3.62	-	0.010	377.566	
30	30.1	A	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	30.1	B	Pipe	1"	80	4.55	1.80	4.60			2.80	-	-0.005	-584.080	Note 1
	30.1	C	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	30.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	59 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
31	31.1	A	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	31.1	B	Pipe	1"	80	4.55	1.80	4.60			2.80	-	-0.005	-584.080	Note 1
	31.1	C	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	31.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
32	32.1	A	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.21			3.91	-	-0.018	-214.638	Note 1
	32.1	B	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.20			3.90	-	-0.017	-225.983	Note 1
	32.1	C	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.28			3.98	-	-0.025	-159.659	Note 1
	32.1	D	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.27			3.97	-	-0.024	-165.628	Note 1
33	33.1	A	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	33.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	33.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	33.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
34	34.1	A	Pipe	3/4"	80	3.91	1.80	3.88			2.08	-	0.003	723.147	
	34.1	B	Pipe	3/4"	80	3.91	1.80	3.95			2.15	-	-0.004	-560.612	Note 1
	34.1	C	Pipe	3/4"	80	3.91	1.80	4.01			2.21	-	-0.010	-230.503	Note 1
	34.1	D	Pipe	3/4"	80	3.91	1.80	4.08			2.28	-	-0.016	-139.885	Note 1
35	35.1	A	Pipe	1"	80	4.55	1.80	4.62			2.82	-	-0.007	-420.180	Note 1
	35.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	35.1	C	Pipe	1"	80	4.55	1.80	-			-	-	-	-	Note 3
	35.1	D	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
36	36.1	A	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	36.1	B	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	36.1	C	Pipe	1"	80	4.55	1.80	4.26			2.46	-	0.028	88.475	
	36.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
37	37.1	A	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	37.1	B	Pipe	1"	80	4.55	1.80	4.35			2.55	-	0.019	132.983	
	37.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	37.1	D	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
38	38.1	A	Pipe	3/4"	80	3.91	1.80	3.82			2.02	-	0.009	234.096	
	38.1	B	Pipe	3/4"	80	3.91	1.80	3.80			2.00	-	0.011	189.636	
	38.1	C	Pipe	3/4"	80	3.91	1.80	3.80			2.00	-	0.011	189.636	
	38.1	D	Pipe	3/4"	80	3.91	1.80	3.85			2.05	-	0.006	356.358	
39	39.1	A	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	39.1	B	Pipe	1"	80	4.55	1.80	4.58			2.78	-	-0.003	-966.513	Note 1
	39.1	C	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	39.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
40	40.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	40.1	B	Pipe	1"	80	4.55	1.80	4.43			2.63	-	0.012	228.591	
	40.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	40.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	60 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
41	41.1	A	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	41.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	41.1	C	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	41.1	D	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
42	42.1	A	Pipe	1"	80	4.55	1.80	4.43			2.63	-	0.012	228.591	
	42.1	B	Pipe	1"	80	4.55	1.80	4.48			2.68	-	0.007	399.320	
	42.1	C	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	42.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
43	43.1	A	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	43.1	B	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
	43.1	C	Pipe	1"	80	4.55	1.80	4.22			2.42	-	0.032	76.487	
	43.1	D	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
44	44.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	44.1	B	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	44.1	C	Pipe	1"	80	4.55	1.80	-			-	-	-	-	Note 3
	44.1	D	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
45	45.1	A	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	45.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	45.1	C	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	45.1	D	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
46	46.1	A	Pipe	1"	80	4.55	1.80	4.22			2.42	-	0.032	76.487	
	46.1	B	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	46.1	C	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	46.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
47	47.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	47.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	47.1	C	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	47.1	D	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
48	48.1	A	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
	48.1	B	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	48.1	C	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	48.1	D	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
49	49.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	49.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	49.1	C	Pipe	1"	80	4.55	1.80	4.61			2.81	-	-0.006	-488.472	Note 1
	49.1	D	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
50	50.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	50.1	B	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	50.1	C	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	50.1	D	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

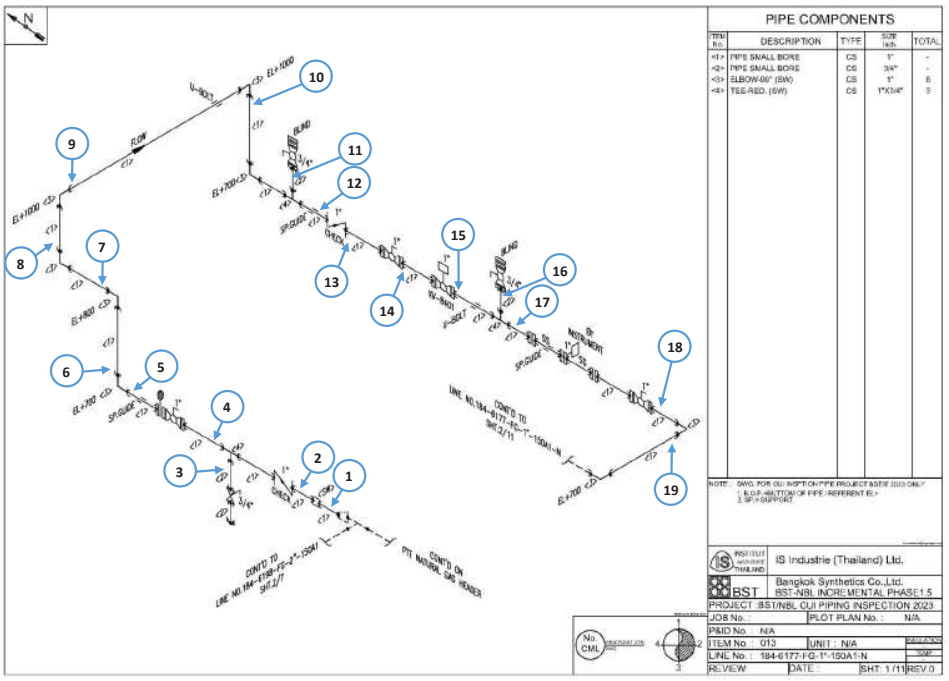
Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	61 of 112	Rev.00

Code : | Rev.: | Effective date :

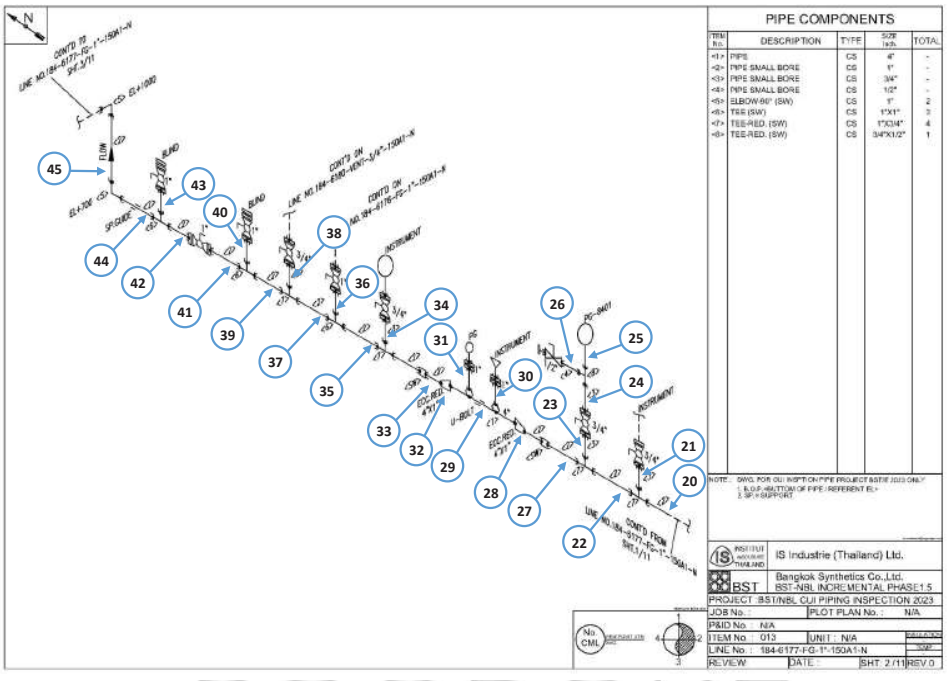
THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
51	51.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	51.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	51.1	C	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	51.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	
52	52.1	A	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
	52.1	B	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	52.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	52.1	D	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	
53	53.1	A	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	53.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	53.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	53.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
54	54.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	54.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	54.1	C	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	54.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
55	55.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	55.1	B	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	55.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	55.1	D	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	

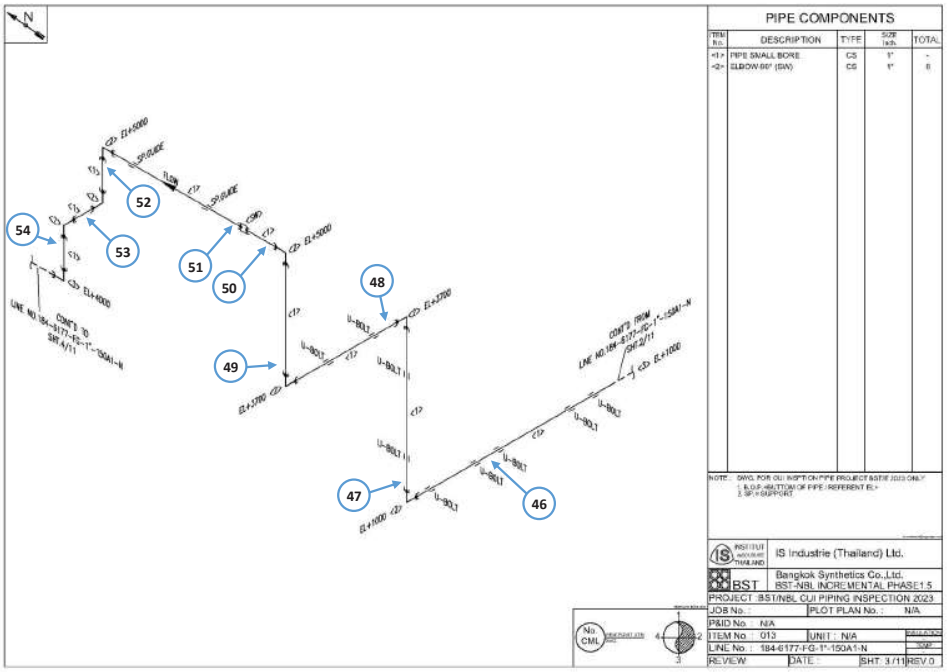
Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.



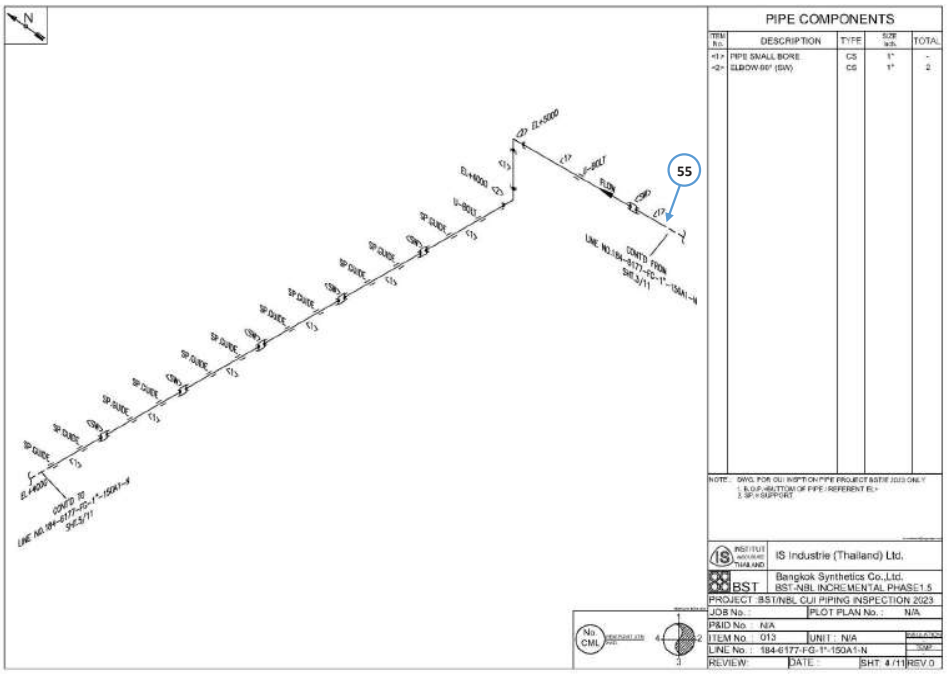
THAILAND



THAILAND

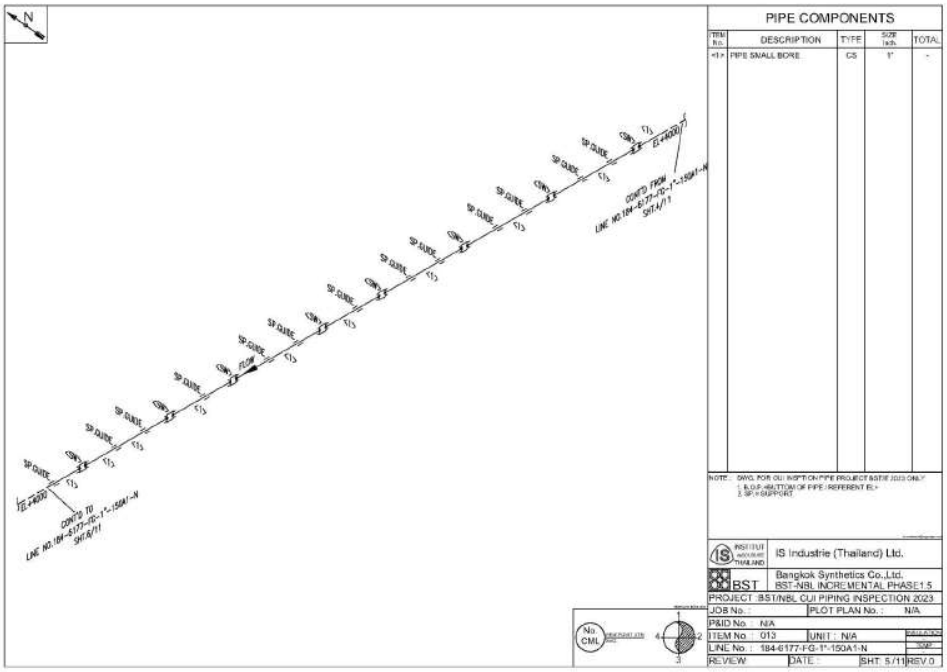


THAILAND



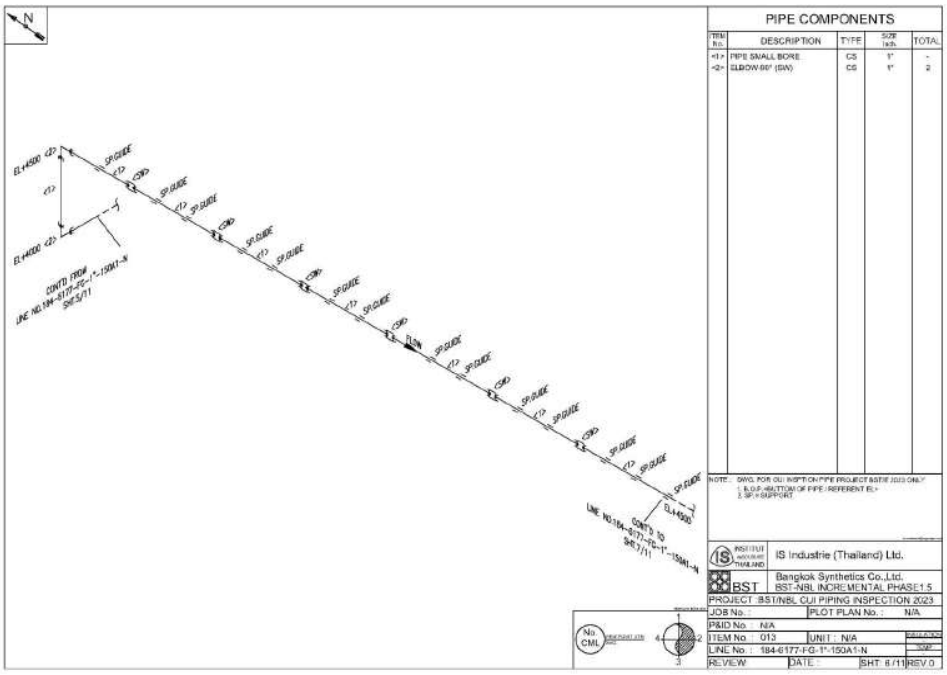
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	66 of 112 Rev.00

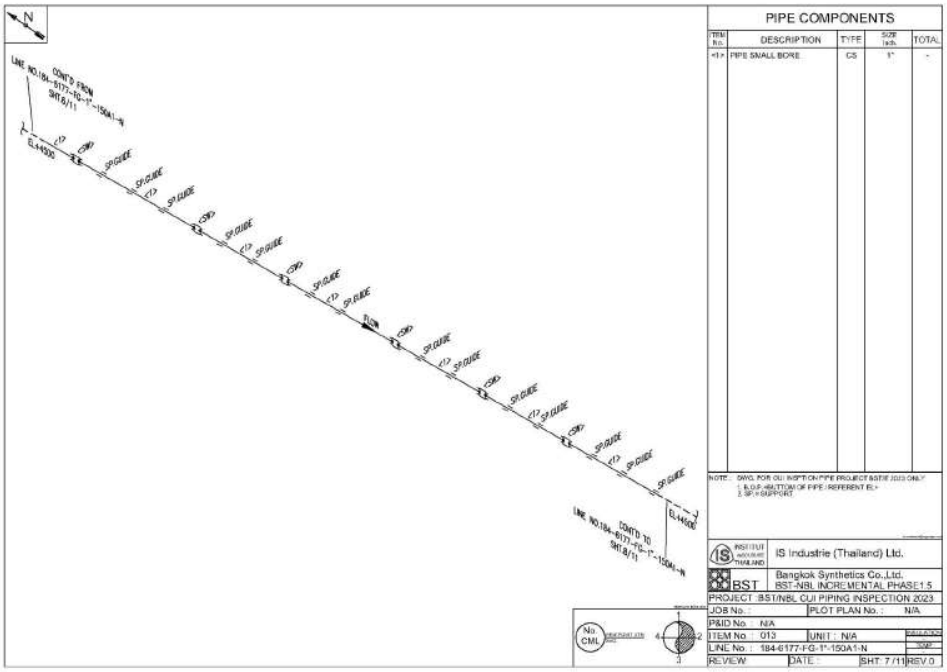


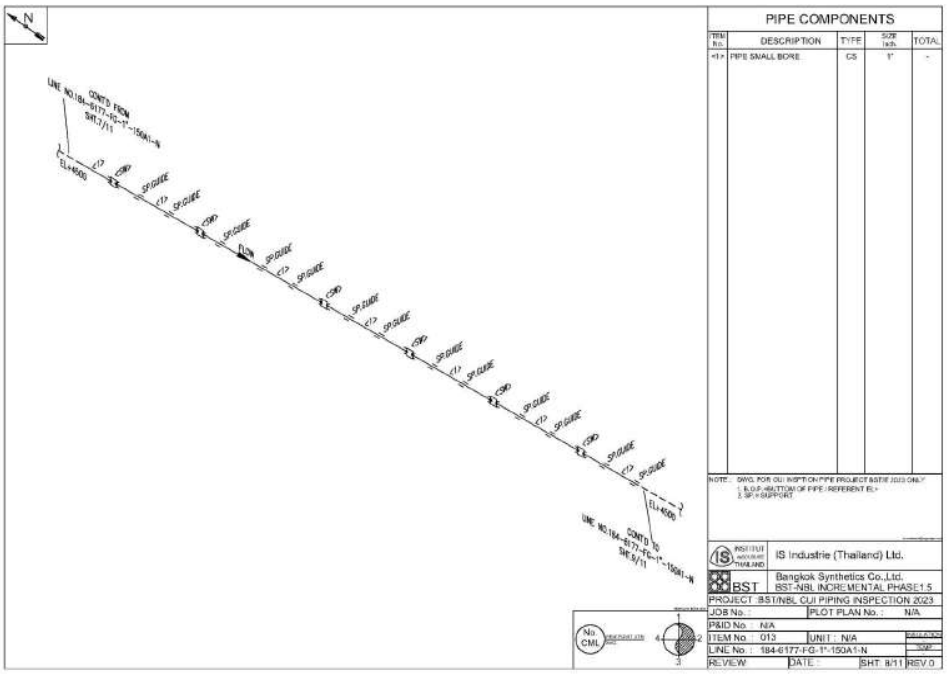
THAILAND

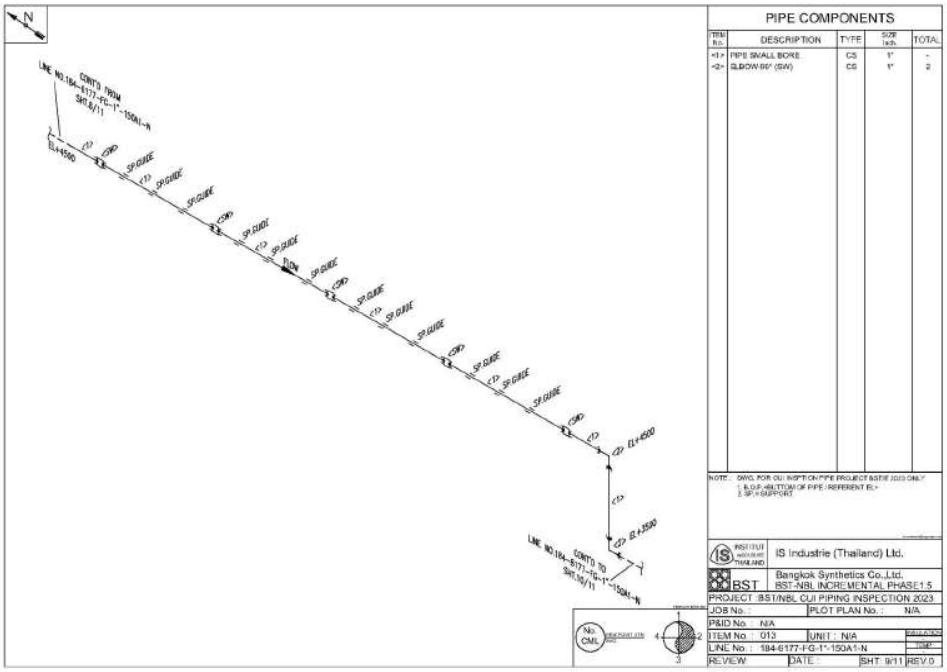
INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	67 of 112 Rev.00

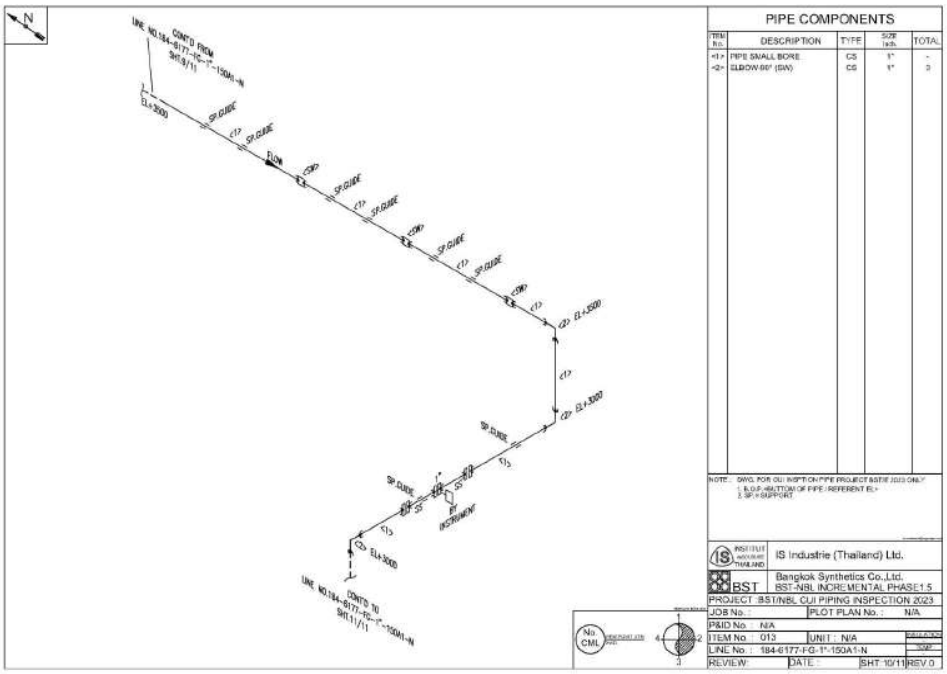


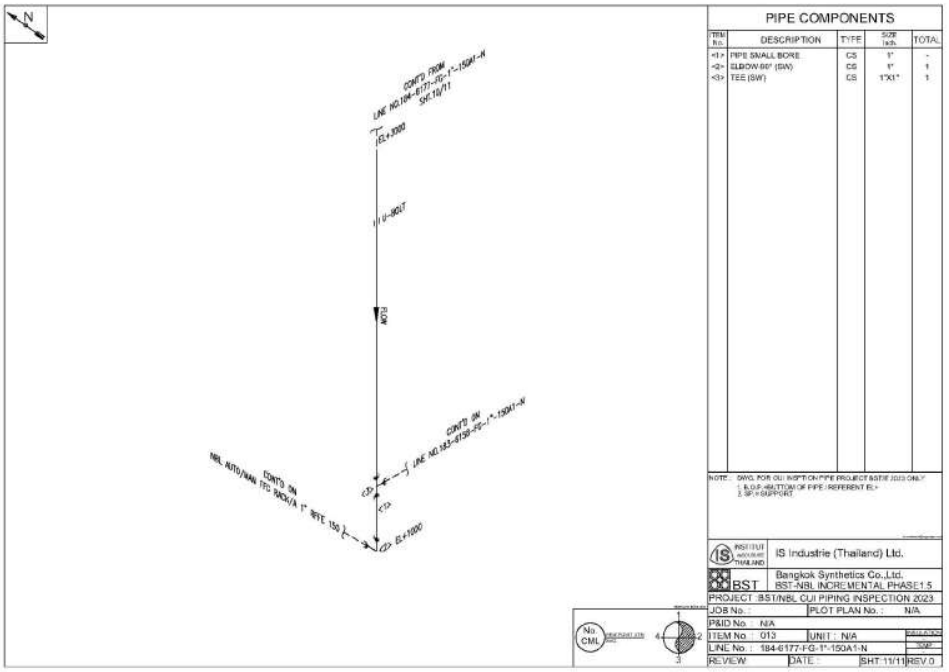
THAILAND


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT. 7 /11 RSV.0
LINE NO.184-6177-FG-1"-150A1-N CONT'D FROM SHT.6/11
LINE NO.184-6177-FG-1"-150A1-N CONT'D TO SHT.8/11
EL.+4000
SP.GUIDE
FLOW

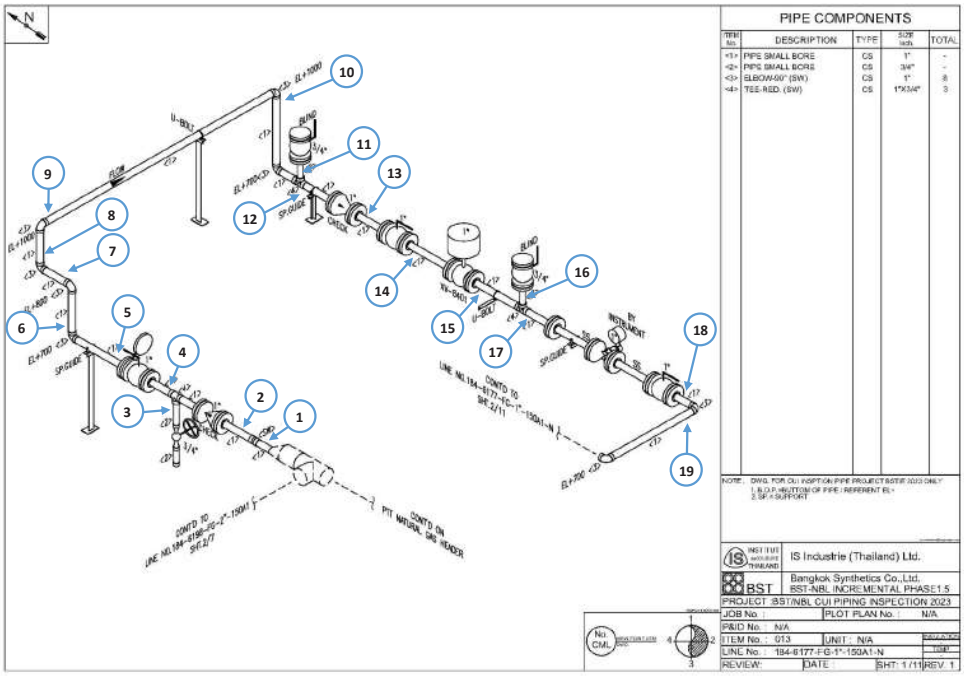

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT. 8/11 RSV.0
LINE NO.184-6177-FG-1"-150A1-N CONT'D FROM SHT.7/11
LINE NO.184-6177-FG-1"-150A1-N CONT'D TO SHT.9/11
EL.+4000
SP.GUIDE
FLOW


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT: 9/11 REV.0
EL.+4500
EL.+3500
SP.GUIDE
ELBOW
FLOW
CONT'D FROM
CONT'D TO

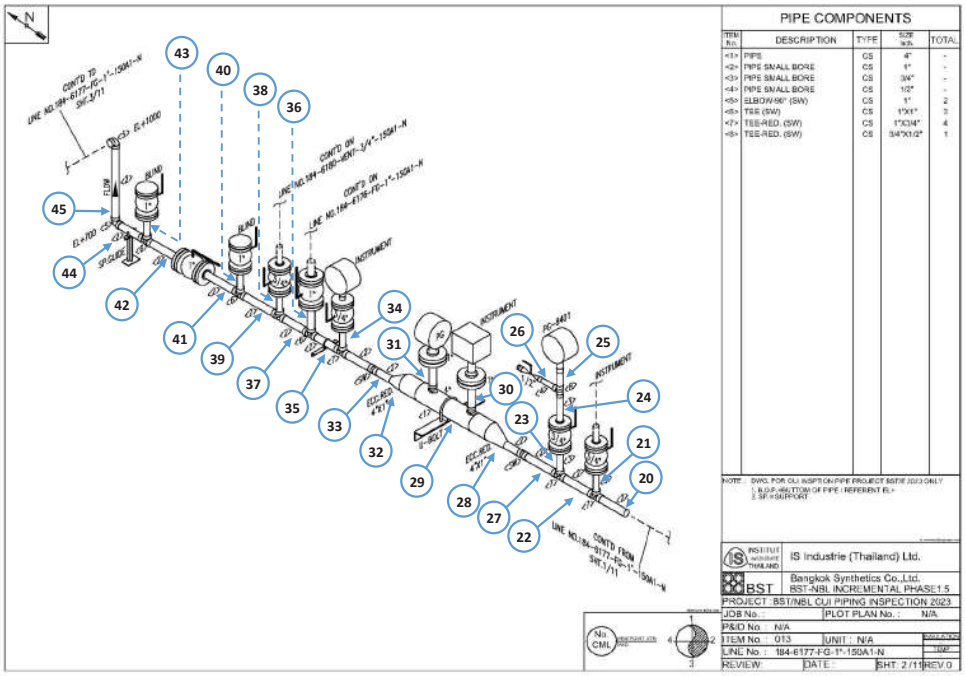

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT: 10/11 REV.0
EL.+3500
EL.+3000
SP.GUIDE
ELBOW
FLOW
INSTRUMENT
CONT'D FROM
CONT'D TO



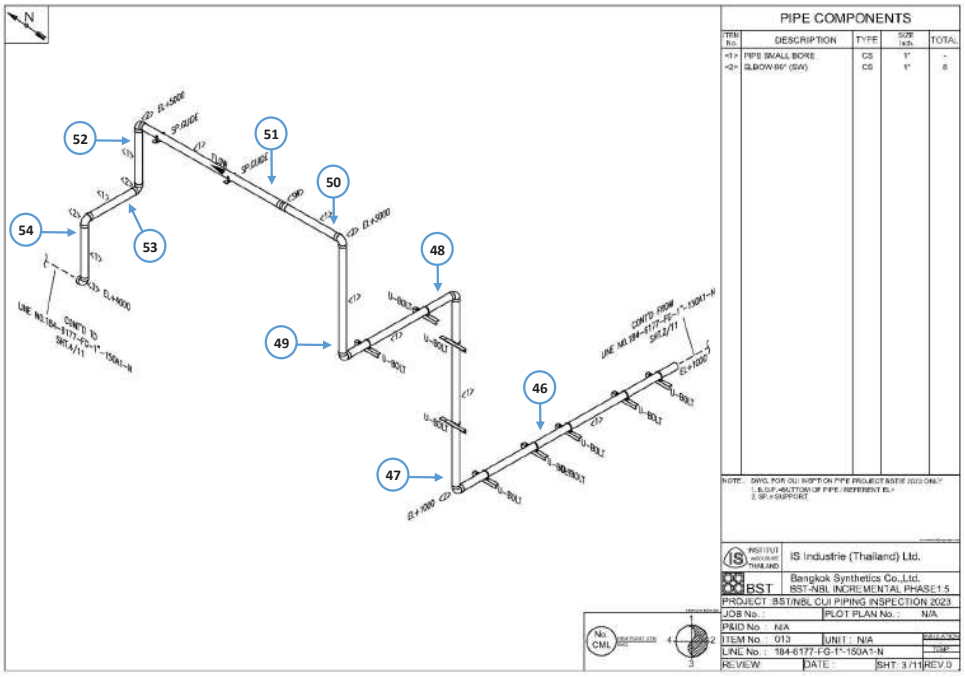
THAILAND



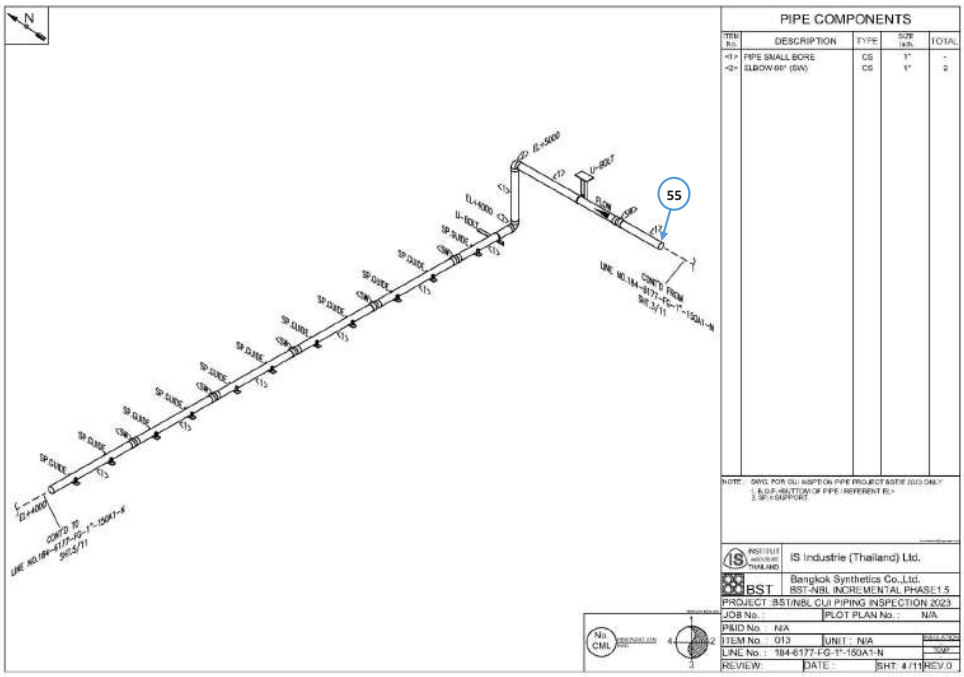
THAILAND

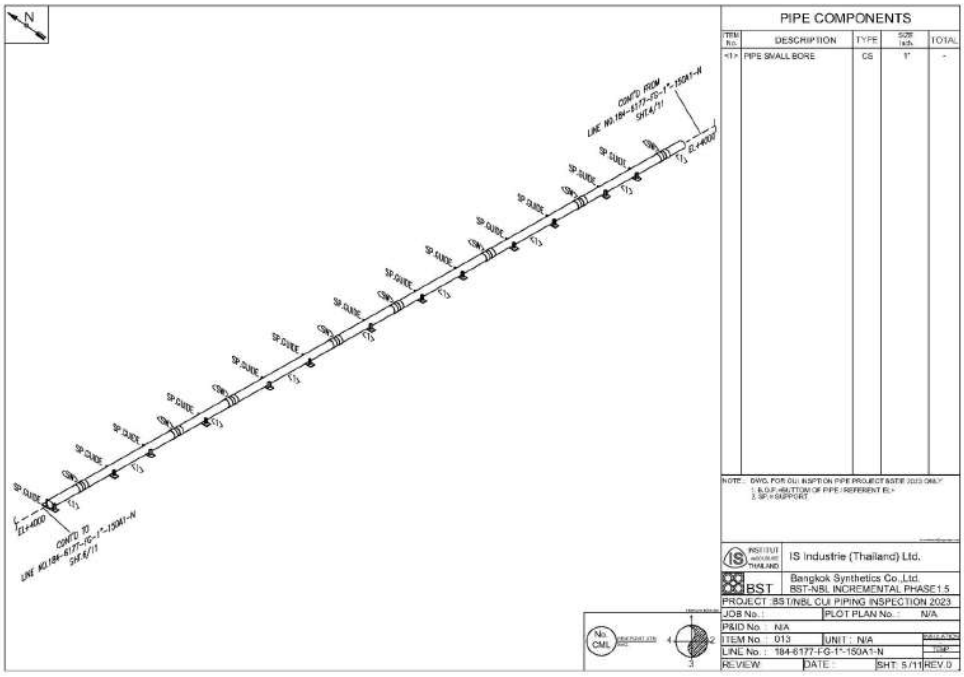


THAILAND

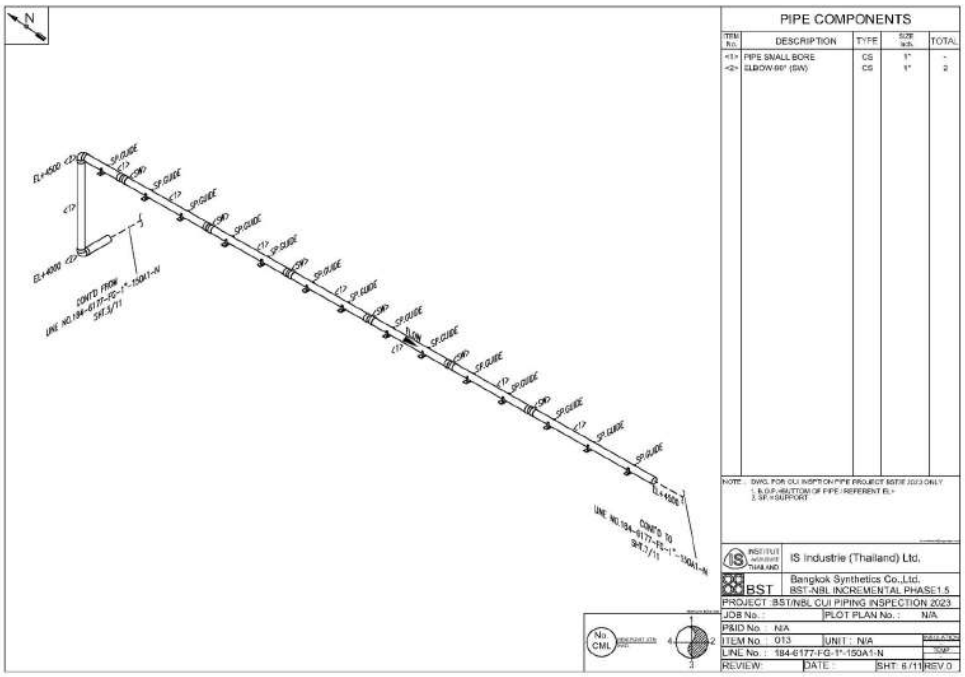


THAILAND


N
55
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE (NPS) | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 2
NOTE: DWG. FOR CUI INSPECTION PIPE PROJECT &STIE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL.=
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 4 /11 REV.0

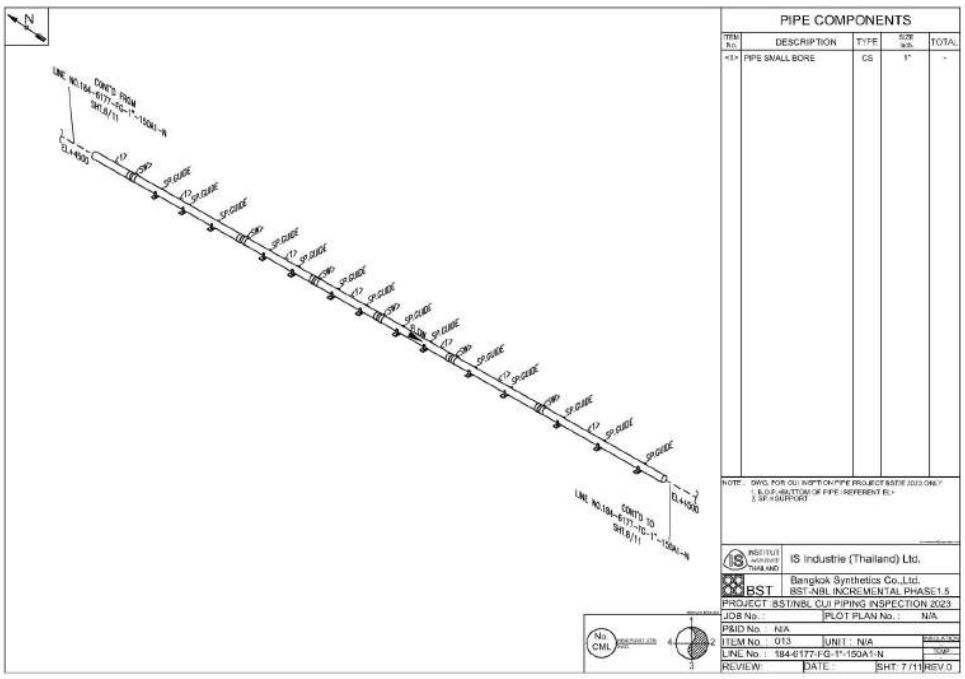

N
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE (NPS) | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
NOTE: DWG. FOR CUI INSPECTION PIPE PROJECT &STIE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL.=
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 5 /11 REV.0

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	78 of 112 Rev.00

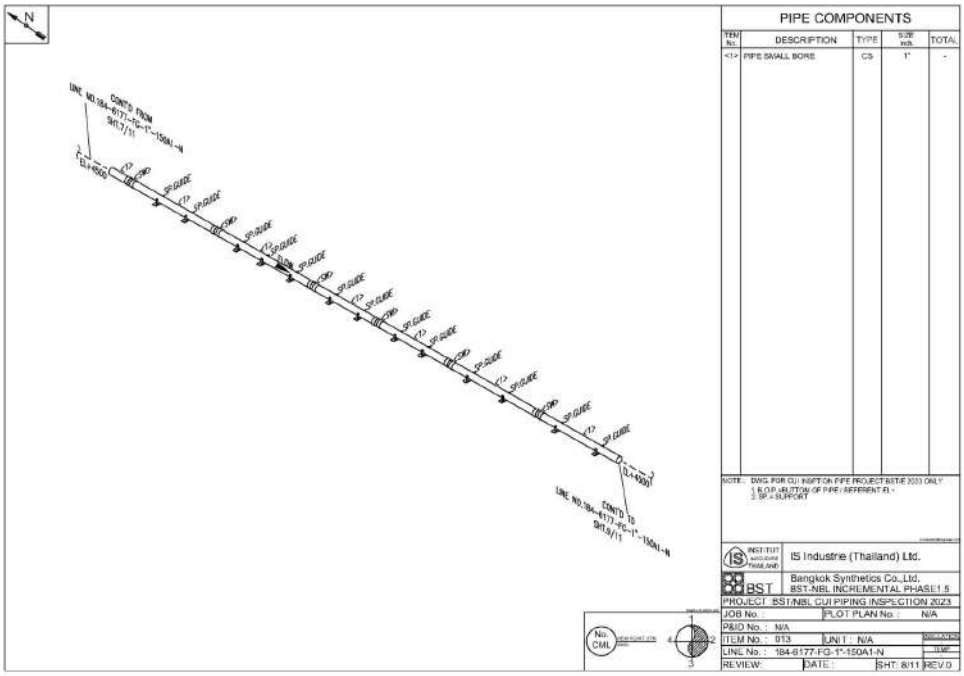


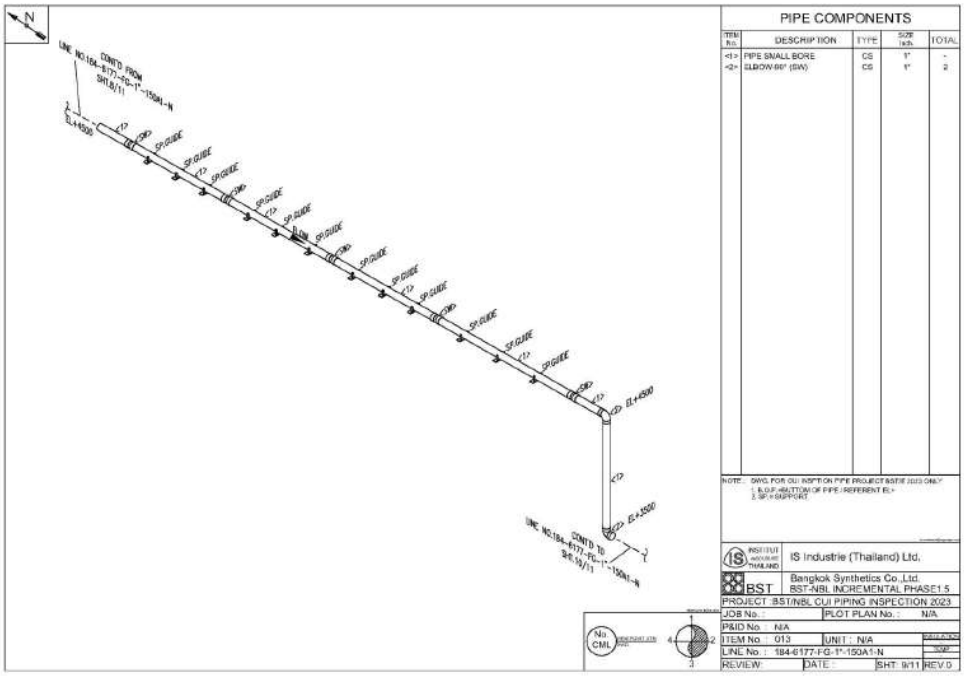
THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	79 of 112 Rev.00

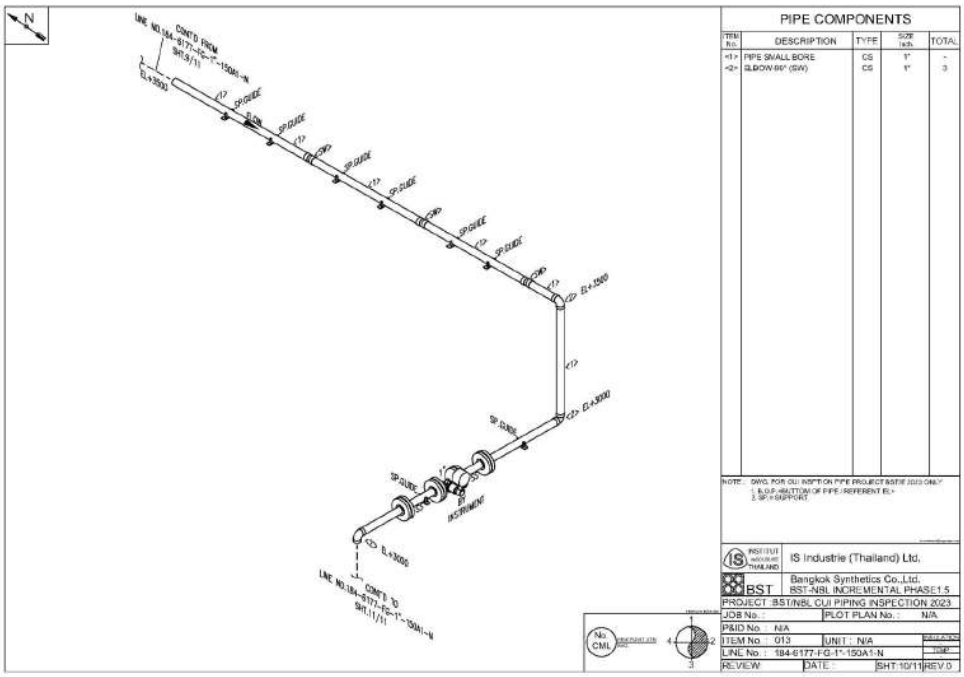


THAILAND


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE... DWG FOR CUI INSPECTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P.=BUTTON OF PIPE / REFERENT EL =
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST-NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 8/11
REV.0
No. CML

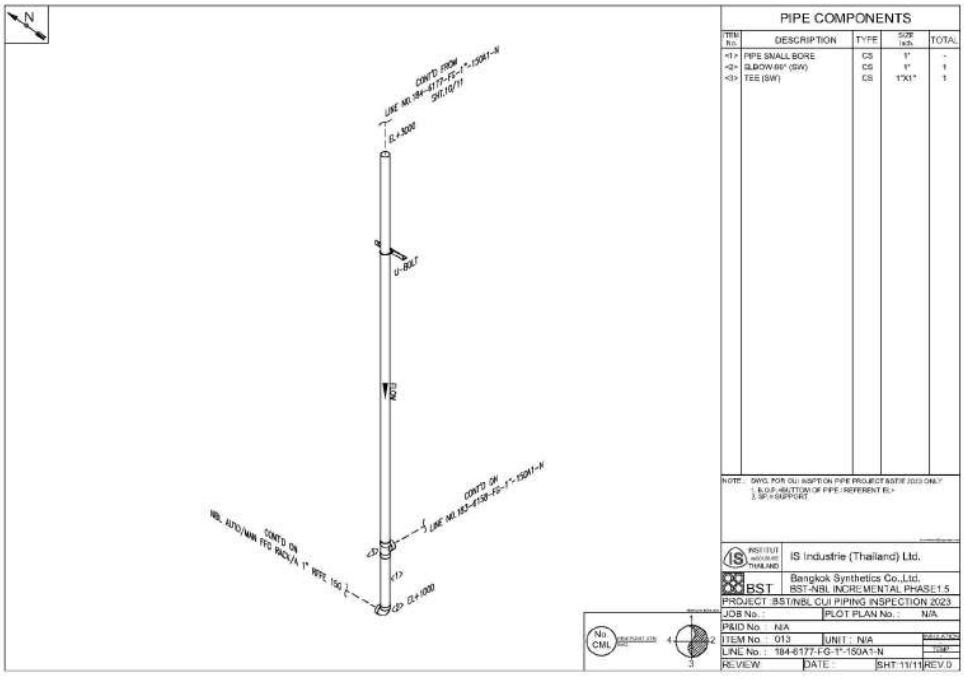

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE... DWG FOR CUI INSPECTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P.=BUTTON OF PIPE / REFERENT EL =
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST-NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 9/11
REV.0
No. CML

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	82 of 112 Rev.00



THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	83 of 112 Rev.00



THAILAND

EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	84 of 112	Rev.00	

Code : | Rev.: | Effective date :

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE

TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS

STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other :	HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :	
LIGHTING TYPE :	☑ Natural light	☐ Artificial light			

PART IDENTIFICATION & INFORMATION

EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	184-6177-FG-1"-150A1-N

SCOPE OF INSPECTION

To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

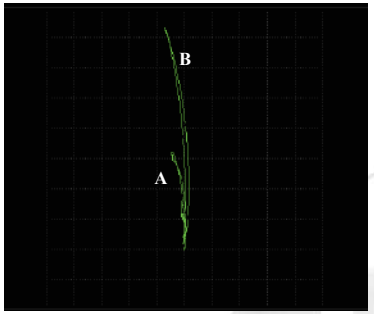
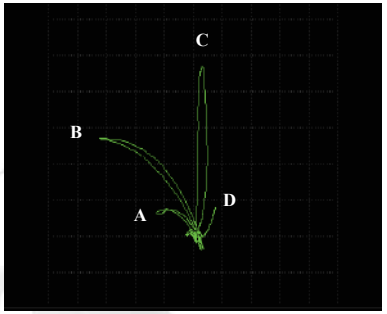
REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	ECT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	85 of 112	Rev.00	

Code : | Rev.: | Effective date :

SETUP CALIBRATION

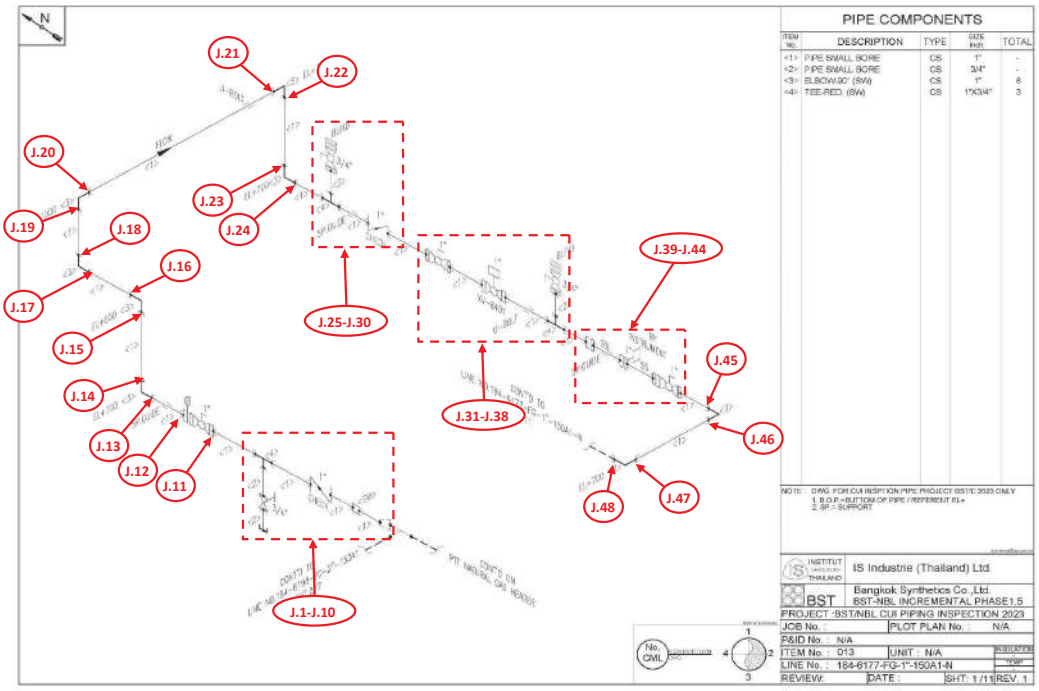
Absolute channel : Surface Signal		Absolute channel : Sub-Surface Signal	
			
Frequency :	500 KHz	Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.	Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.	Absolute Channel Signal B :	Surface Depth 1.0 mm.
		Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
		Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

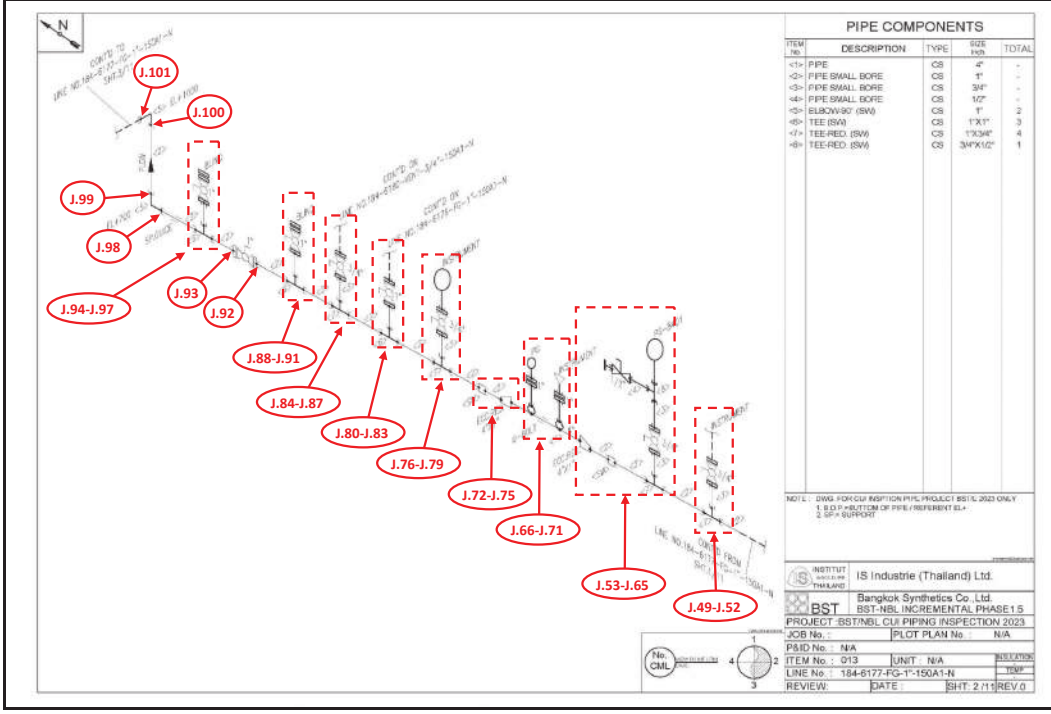
- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

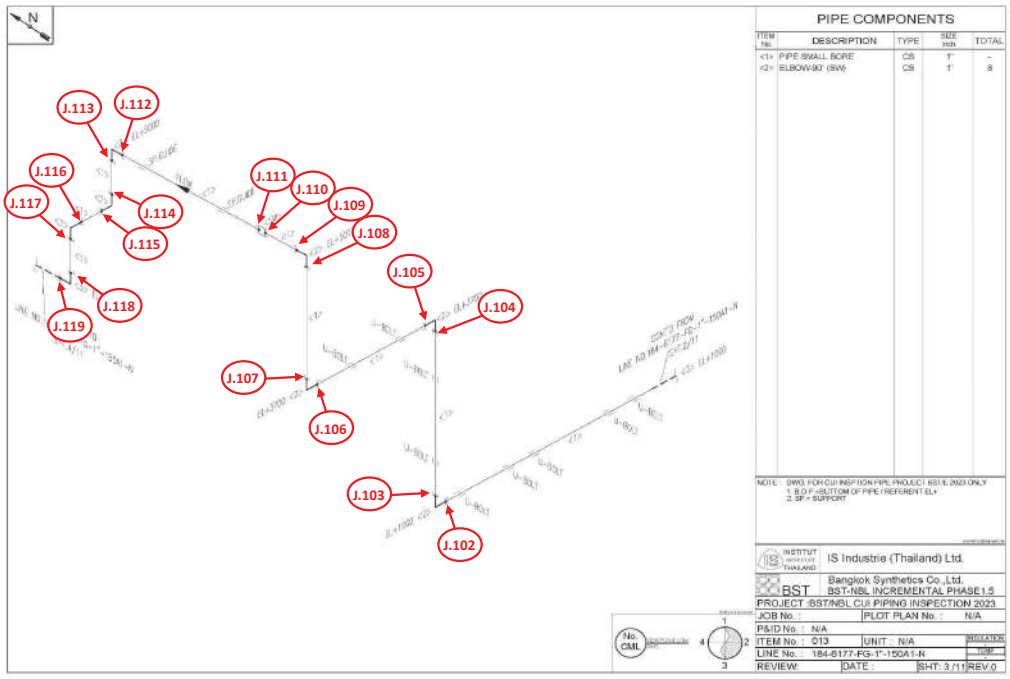
Note : FSH = Full Screen High



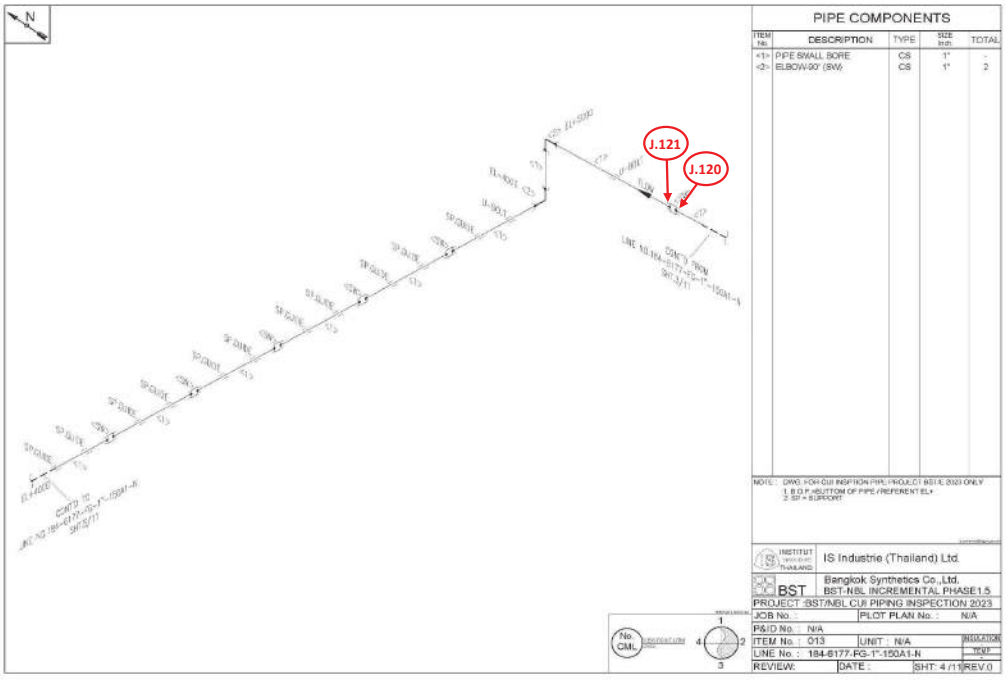
THAILAND



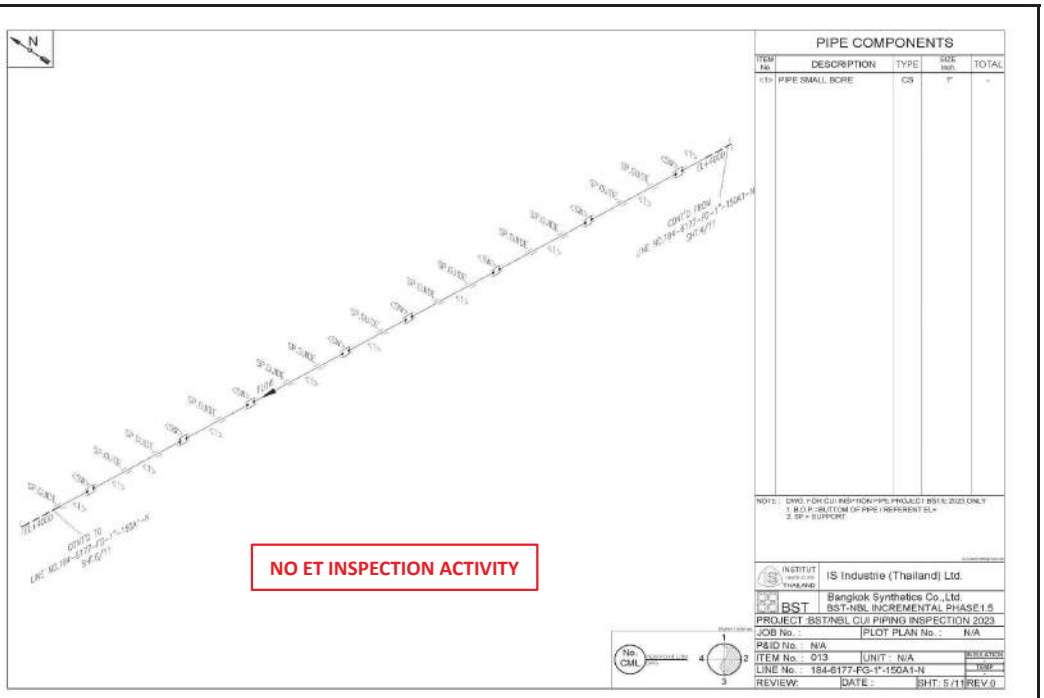
THAILAND

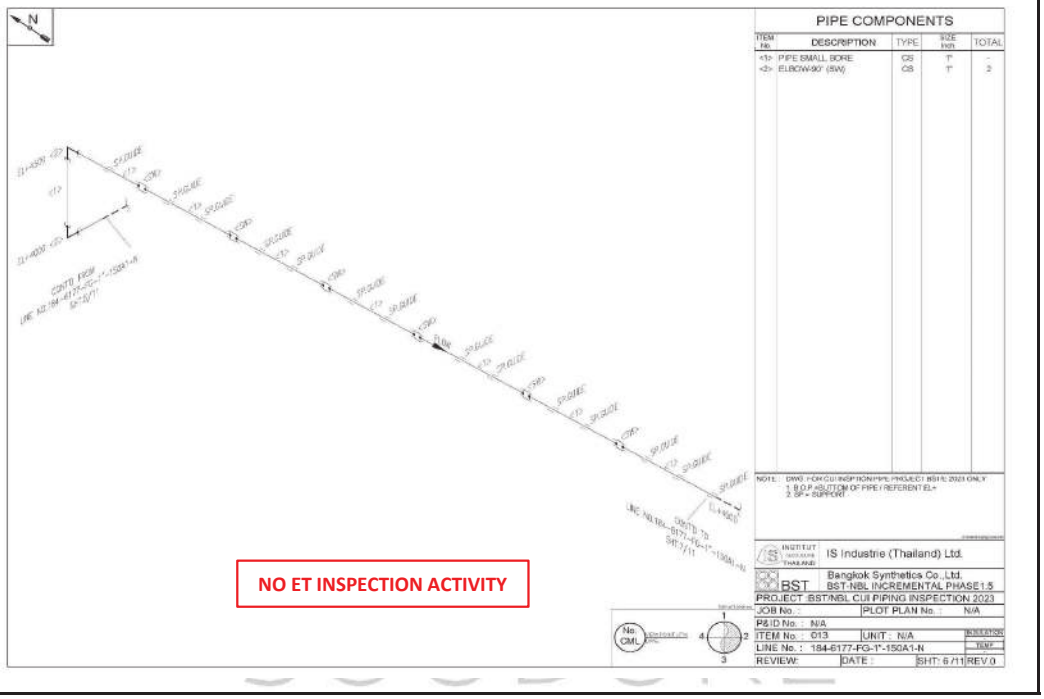


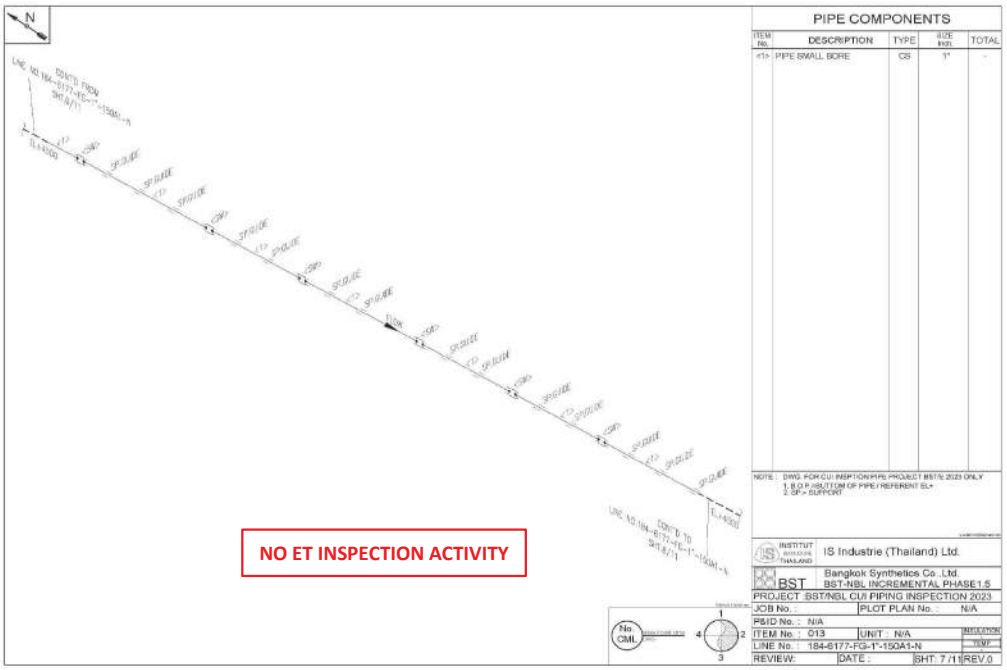
THAILAND



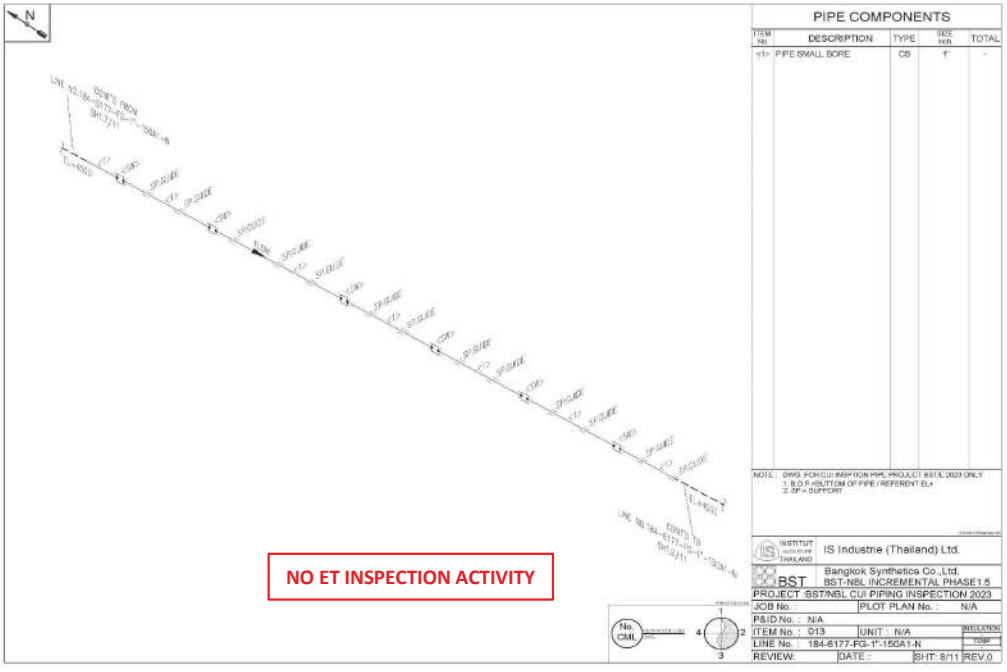
THAILAND


N
PIPE COMPONENTS
ITEM No
DESCRIPTION
TYPE
SIZE Inch
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : DWG FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. B.O.P. =BUTTOM OF PIPE / REFERENT EL=
2. SP = SUPPORT
NO ET INSPECTION ACTIVITY
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 5 /11
REV.0

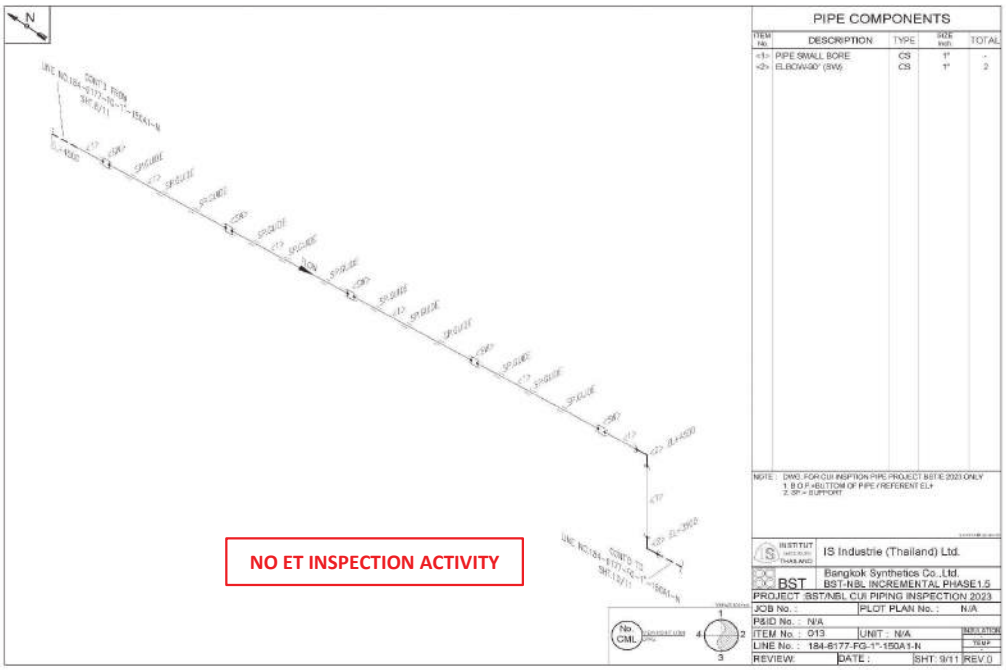

N
PIPE COMPONENTS
ITEM No
DESCRIPTION
TYPE
SIZE Inch
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : DWG FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. B.O.P. =BUTTOM OF PIPE / REFERENT EL=
2. SP = SUPPORT
NO ET INSPECTION ACTIVITY
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 6 /11
REV.0

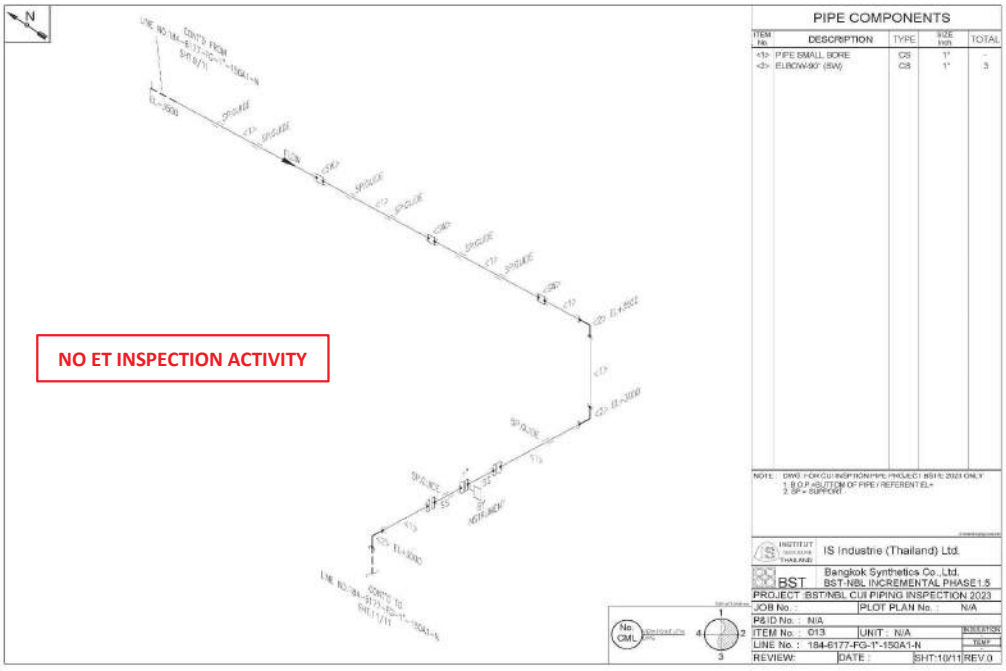


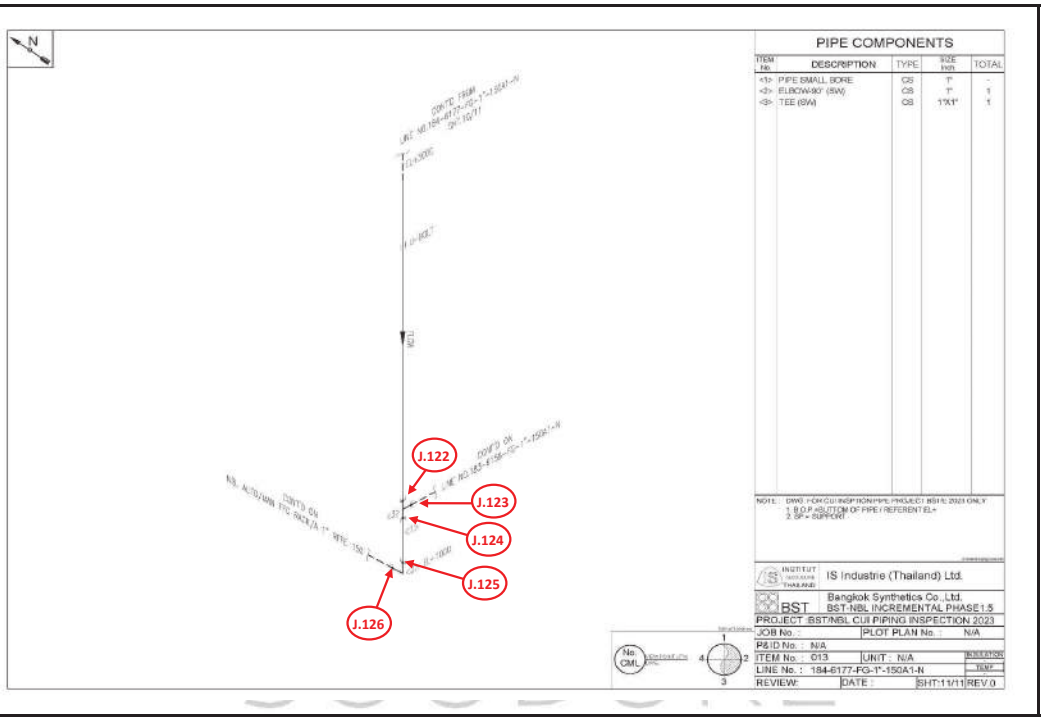
THAILAND

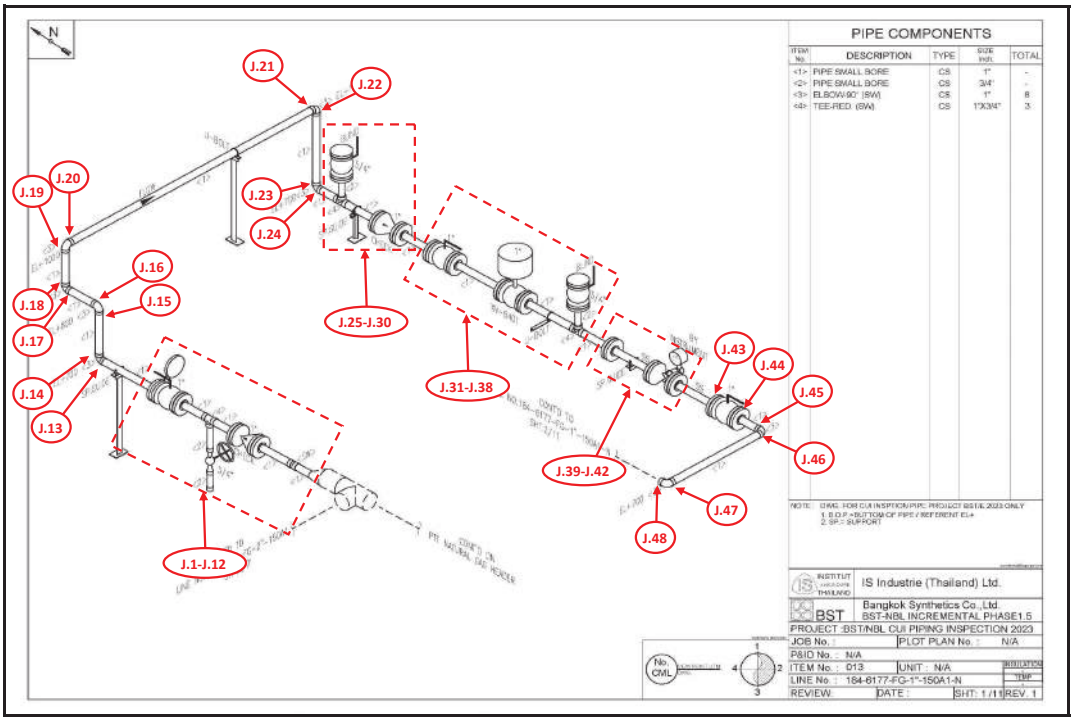


THAILAND

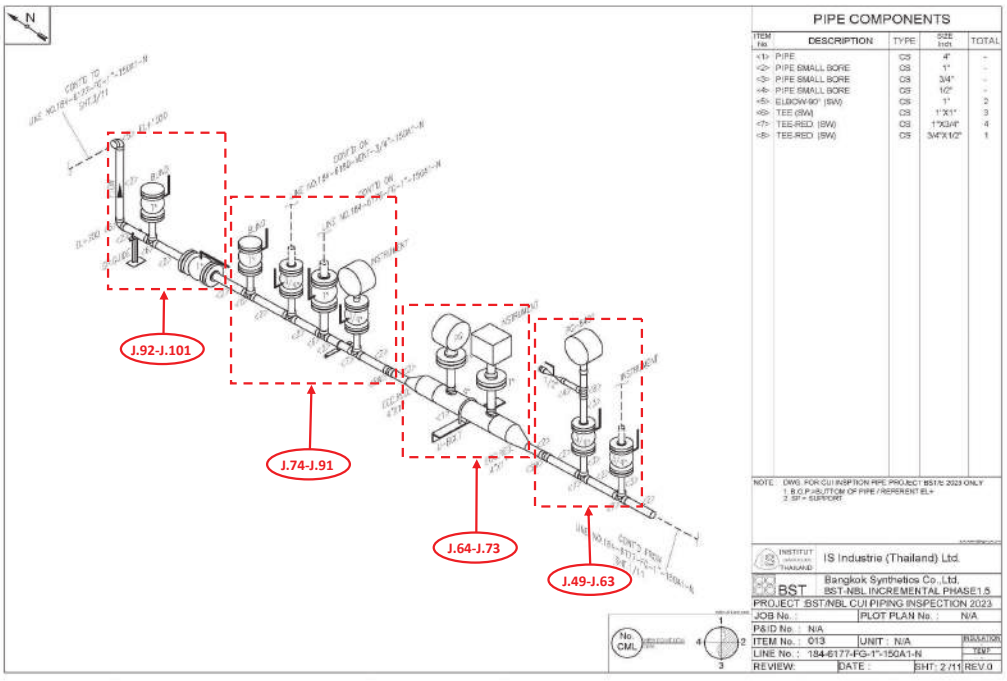

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 2
NOTE : DWG FOR CUI INSPTION PIPE PROJECT BST IS 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 9/11 | REV.0
NO ET INSPECTION ACTIVITY


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 3
NOTE : DWG FOR CUI INSPTION PIPE PROJECT BST IS 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 10/11 | REV.0
NO ET INSPECTION ACTIVITY


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" |
<2> ELBOW-90° (SW) | CS | 1" | 1
<3> TEE (SW) | CS | 1"X1" | 1
J.122
J.123
J.124
J.125
J.126
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT:11/11 | REV.0

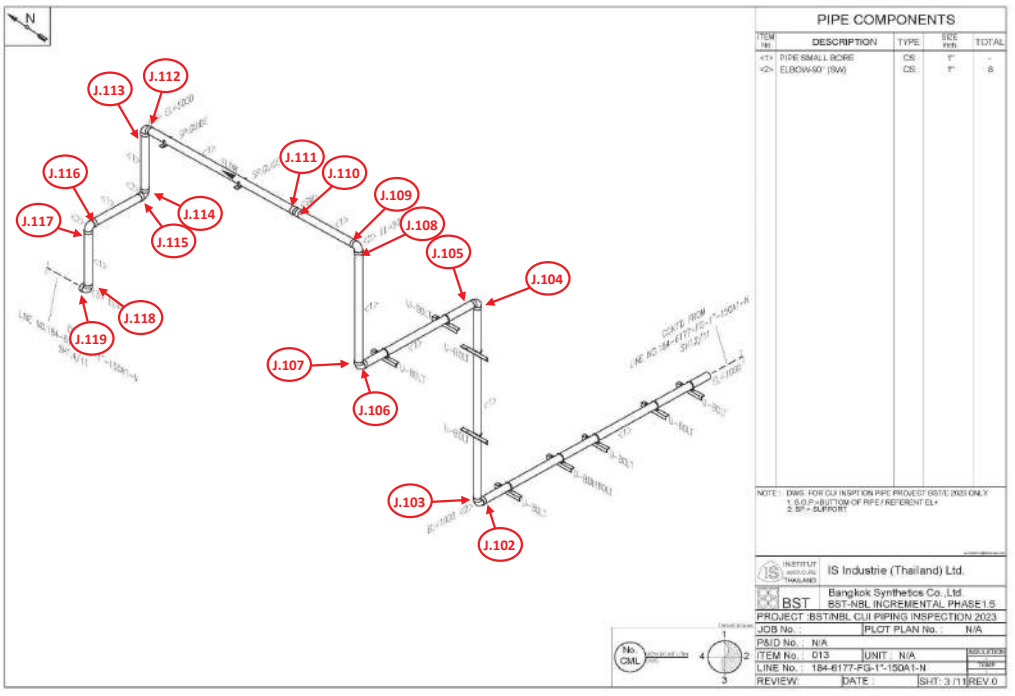

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° (SW) | CS | 1" | 8
<4> TEE-RED (SW) | CS | 1"X3/4" | 3
J.1-J.12
J.13
J.14
J.15
J.16
J.17
J.18
J.19
J.20
J.21
J.22
J.23
J.24
J.25-J.30
J.31-J.38
J.39-J.42
J.43
J.44
J.45
J.46
J.47
J.48
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 1 /11 | REV. 1

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 98 of 112	Rev.00



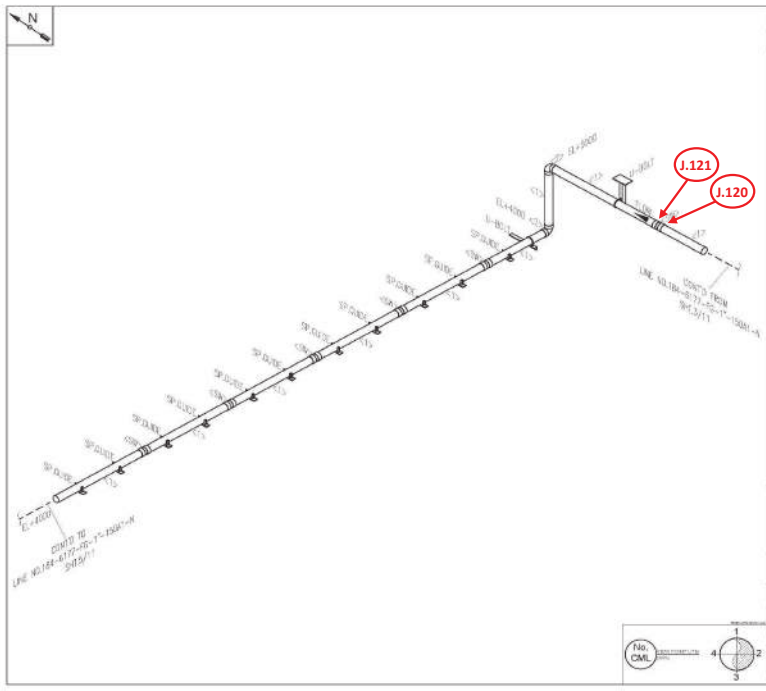
THAILAND

	2D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 99 of 112	Rev.00



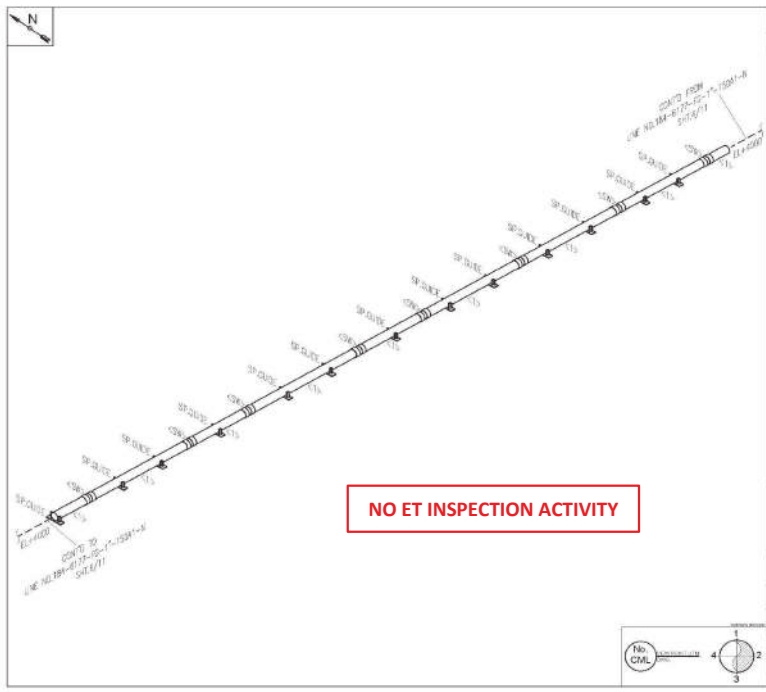
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	100 of 112	Rev.00

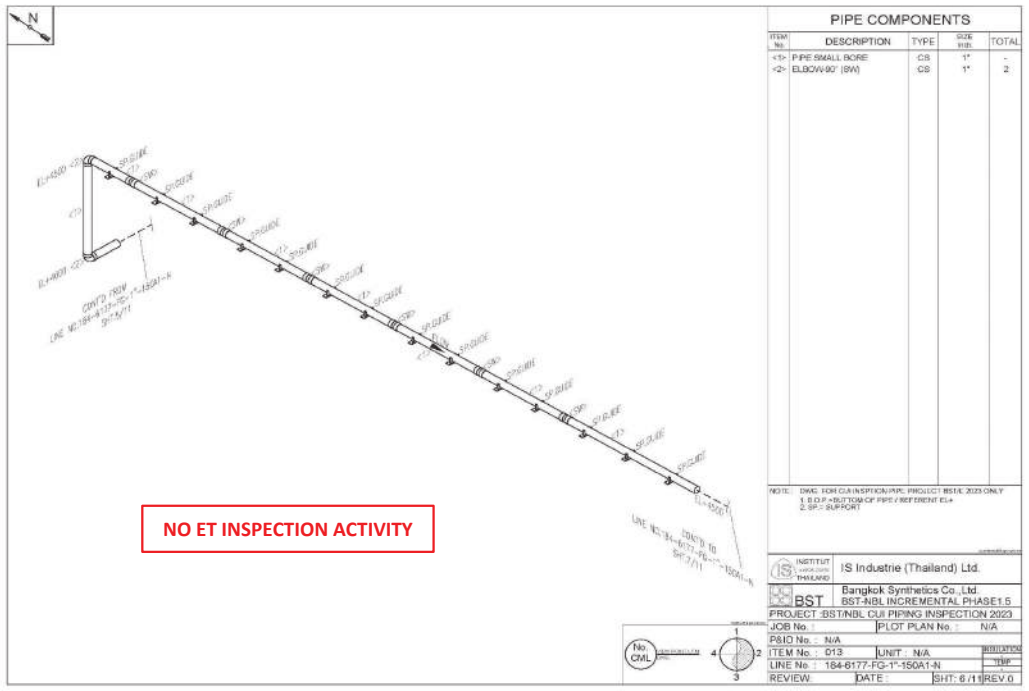


THAILAND

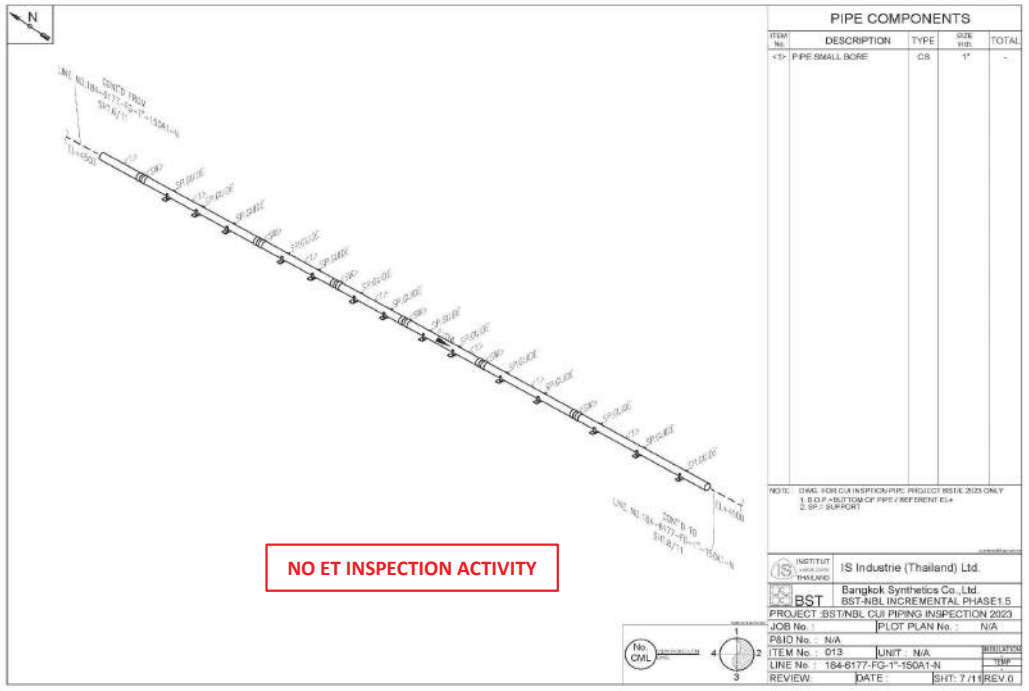
	3D ISO-DRAWING WITH WELD JOINT MARK UP			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	101 of 112	Rev.00



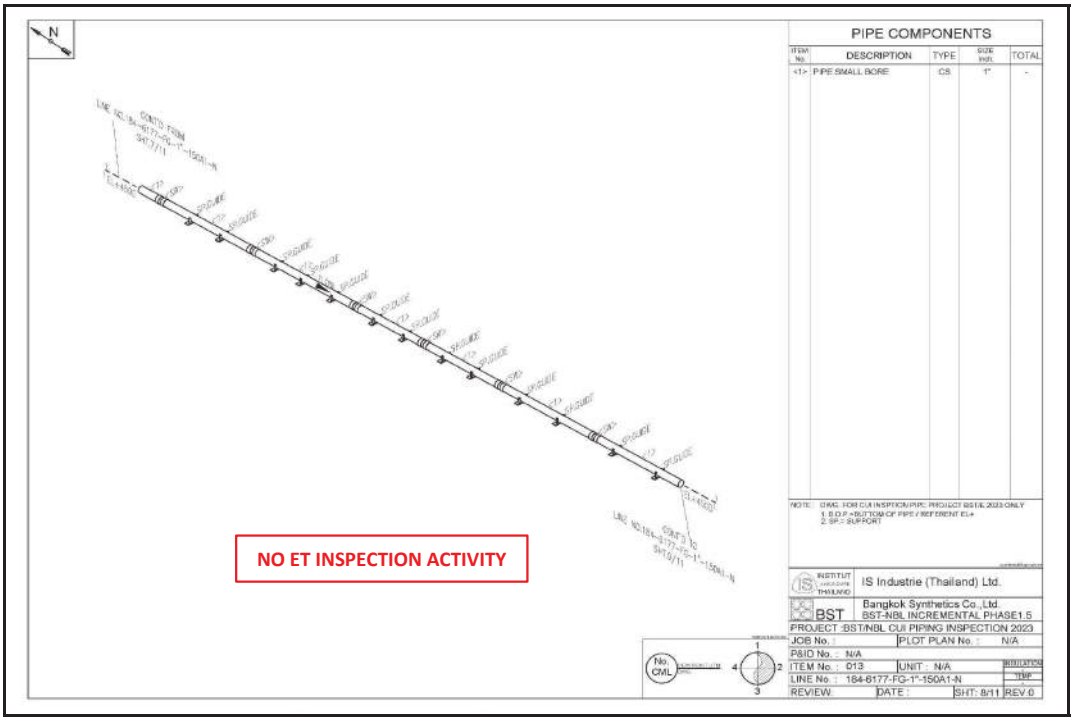
THAILAND



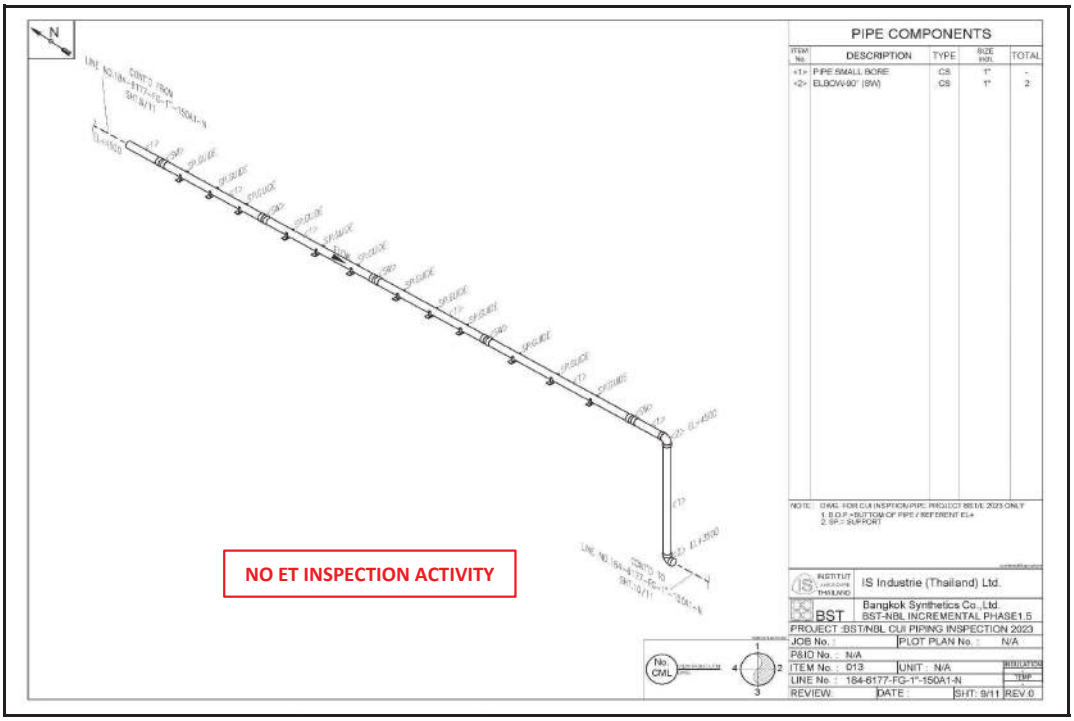
THAILAND



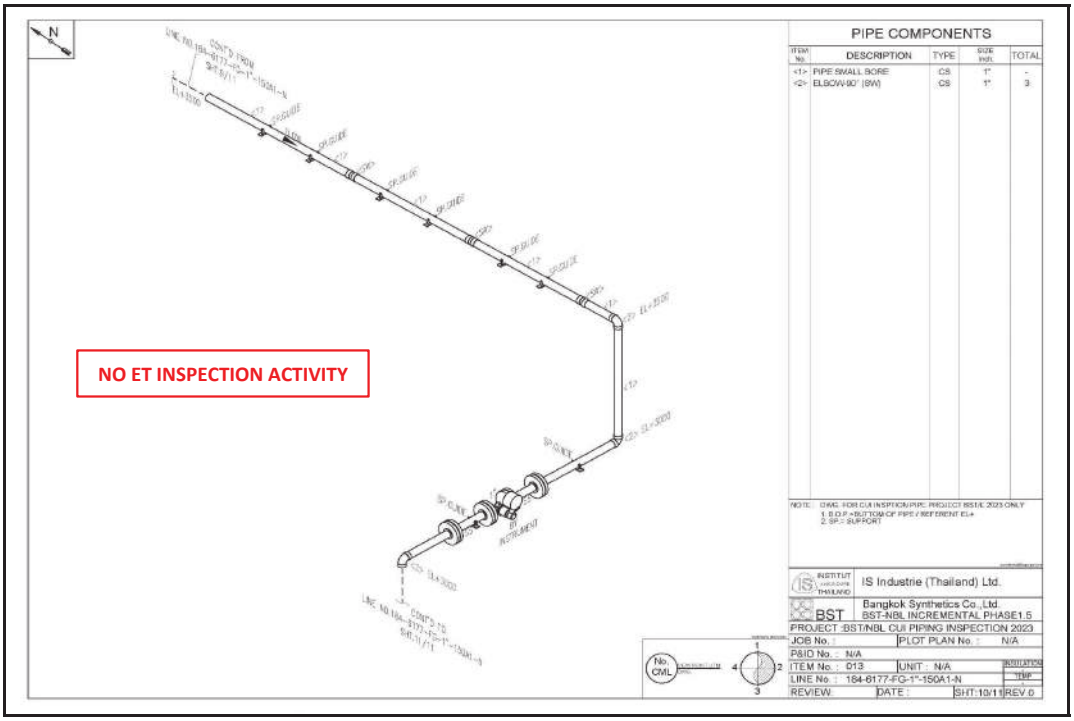
THAILAND



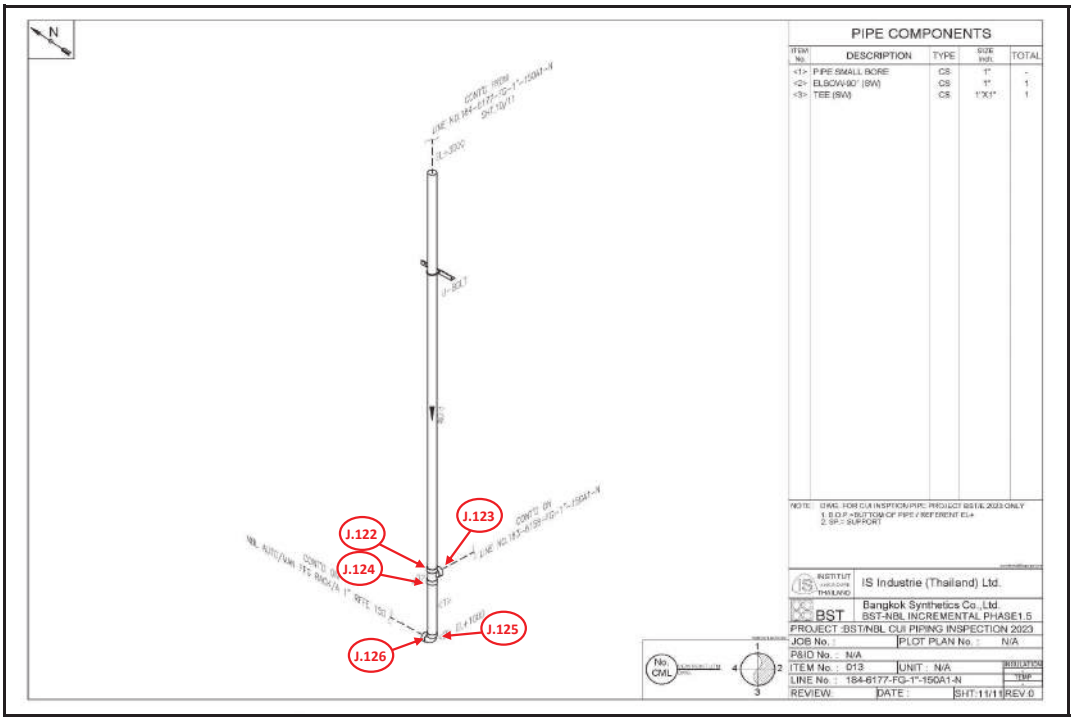
THAILAND



THAILAND



THAILAND



THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-013
				Line No. :	184-6177-FG-1"-150A1-N
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 108 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	FW
2	Joint No.2	Weld and HAZ	No indication was found	FW
3	Joint No.3	Weld and HAZ	No indication was found	FW
4	Joint No.4	Weld and HAZ	No indication was found	FW
5	Joint No.5	Weld and HAZ	No indication was found	FW
6	Joint No.6	Weld and HAZ	No indication was found	FW
7	Joint No.7	Weld and HAZ	No indication was found	FW
8	Joint No.8	Weld and HAZ	No indication was found	FW
9	Joint No.9	Weld and HAZ	No indication was found	FW
10	Joint No.10	Weld and HAZ	No indication was found	FW
11	Joint No.11	Weld and HAZ	No indication was found	FW
12	Joint No.12	Weld and HAZ	No indication was found	FW
13	Joint No.13	Weld and HAZ	No indication was found	FW
14	Joint No.14	Weld and HAZ	No indication was found	FW
15	Joint No.15	Weld and HAZ	No indication was found	FW
16	Joint No.16	Weld and HAZ	No indication was found	FW
17	Joint No.17	Weld and HAZ	No indication was found	FW
18	Joint No.18	Weld and HAZ	No indication was found	FW
19	Joint No.19	Weld and HAZ	No indication was found	FW
20	Joint No.20	Weld and HAZ	No indication was found	FW
21	Joint No.21	Weld and HAZ	No indication was found	FW
22	Joint No.22	Weld and HAZ	No indication was found	FW
23	Joint No.23	Weld and HAZ	No indication was found	FW
24	Joint No.24	Weld and HAZ	No indication was found	FW
25	Joint No.25	Weld and HAZ	No indication was found	FW
26	Joint No.26	Weld and HAZ	No indication was found	FW
27	Joint No.27	Weld and HAZ	No indication was found	FW
28	Joint No.28	Weld and HAZ	No indication was found	FW
29	Joint No.29	Weld and HAZ	No indication was found	FW
30	Joint No.30	Weld and HAZ	No indication was found	FW
31	Joint No.31	Weld and HAZ	No indication was found	FW
32	Joint No.32	Weld and HAZ	No indication was found	FW
33	Joint No.33	Weld and HAZ	No indication was found	FW
34	Joint No.34	Weld and HAZ	No indication was found	FW
35	Joint No.35	Weld and HAZ	No indication was found	FW
36	Joint No.36	Weld and HAZ	No indication was found	FW
37	Joint No.37	Weld and HAZ	No indication was found	FW
38	Joint No.38	Weld and HAZ	No indication was found	FW
39	Joint No.39	Weld and HAZ	No indication was found	FW
40	Joint No.40	Weld and HAZ	No indication was found	FW
41	Joint No.41	Weld and HAZ	No indication was found	FW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW
45	Joint No.45	Weld and HAZ	No indication was found	FW

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-013
				Line No. :	184-6177-FG-1"-150A1-N
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 109 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
46	Joint No.46	Weld and HAZ	No indication was found	FW
47	Joint No.47	Weld and HAZ	No indication was found	FW
48	Joint No.48	Weld and HAZ	No indication was found	FW
49	Joint No.49	Weld and HAZ	No indication was found	FW
50	Joint No.50	Weld and HAZ	No indication was found	FW
51	Joint No.51	Weld and HAZ	No indication was found	FW
52	Joint No.52	Weld and HAZ	No indication was found	FW
53	Joint No.53	Weld and HAZ	No indication was found	FW
54	Joint No.54	Weld and HAZ	No indication was found	FW
55	Joint No.55	Weld and HAZ	No indication was found	FW
56	Joint No.56	Weld and HAZ	No indication was found	FW
57	Joint No.57	Weld and HAZ	No indication was found	FW
58	Joint No.58	Weld and HAZ	No indication was found	FW
59	Joint No.59	Weld and HAZ	No indication was found	FW
60	Joint No.60	Weld and HAZ	No indication was found	FW
61	Joint No.61	Weld and HAZ	No indication was found	FW
62	Joint No.62	Weld and HAZ	No indication was found	FW
63	Joint No.63	Weld and HAZ	No indication was found	FW
64	Joint No.64	Weld and HAZ	No indication was found	BW
65	Joint No.65	Weld and HAZ	No indication was found	FW
66	Joint No.66	Weld and HAZ	No indication was found	FW
67	Joint No.67	Weld and HAZ	No indication was found	FW
68	Joint No.68	Weld and HAZ	No indication was found	FW
69	Joint No.69	Weld and HAZ	No indication was found	FW
70	Joint No.70	Weld and HAZ	No indication was found	FW
71	Joint No.71	Weld and HAZ	No indication was found	FW
72	Joint No.72	Weld and HAZ	No indication was found	FW
73	Joint No.73	Weld and HAZ	No indication was found	BW
74	Joint No.74	Weld and HAZ	No indication was found	FW
75	Joint No.75	Weld and HAZ	No indication was found	FW
76	Joint No.76	Weld and HAZ	No indication was found	FW
77	Joint No.77	Weld and HAZ	No indication was found	FW
78	Joint No.78	Weld and HAZ	No indication was found	FW
79	Joint No.79	Weld and HAZ	No indication was found	FW
80	Joint No.80	Weld and HAZ	No indication was found	FW
81	Joint No.81	Weld and HAZ	No indication was found	FW
82	Joint No.82	Weld and HAZ	No indication was found	FW
83	Joint No.83	Weld and HAZ	No indication was found	FW
84	Joint No.84	Weld and HAZ	No indication was found	FW
85	Joint No.85	Weld and HAZ	No indication was found	FW
86	Joint No.86	Weld and HAZ	No indication was found	FW
87	Joint No.87	Weld and HAZ	No indication was found	FW
88	Joint No.88	Weld and HAZ	No indication was found	FW
89	Joint No.89	Weld and HAZ	No indication was found	FW
90	Joint No.90	Weld and HAZ	No indication was found	FW

	EDDY CURRENT TESTING SURFACE REPORT	Report No. :	IS/B-23-CUI-P-NBL-013	
		Line No. :	184-6177-FG-1"-150A1-N	
		Date of Test :	19/05/2023	
	Code : Rev.: Effective date :	Page :	110 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
91	Joint No.91	Weld and HAZ	No indication was found	FW
92	Joint No.92	Weld and HAZ	No indication was found	FW
93	Joint No.93	Weld and HAZ	No indication was found	FW
94	Joint No.94	Weld and HAZ	No indication was found	FW
95	Joint No.95	Weld and HAZ	No indication was found	FW
96	Joint No.96	Weld and HAZ	No indication was found	FW
97	Joint No.97	Weld and HAZ	No indication was found	FW
98	Joint No.98	Weld and HAZ	No indication was found	FW
99	Joint No.99	Weld and HAZ	No indication was found	FW
100	Joint No.100	Weld and HAZ	No indication was found	FW
101	Joint No.101	Weld and HAZ	No indication was found	FW
102	Joint No.102	Weld and HAZ	No indication was found	FW
103	Joint No.103	Weld and HAZ	No indication was found	FW
104	Joint No.104	Weld and HAZ	No indication was found	FW
105	Joint No.105	Weld and HAZ	No indication was found	FW
106	Joint No.106	Weld and HAZ	No indication was found	FW
107	Joint No.107	Weld and HAZ	No indication was found	FW
108	Joint No.108	Weld and HAZ	No indication was found	FW
109	Joint No.109	Weld and HAZ	No indication was found	FW
110	Joint No.110	Weld and HAZ	No indication was found	FW
111	Joint No.111	Weld and HAZ	No indication was found	FW
112	Joint No.112	Weld and HAZ	No indication was found	FW
113	Joint No.113	Weld and HAZ	No indication was found	FW
114	Joint No.114	Weld and HAZ	No indication was found	FW
115	Joint No.115	Weld and HAZ	No indication was found	FW
116	Joint No.116	Weld and HAZ	No indication was found	FW
117	Joint No.117	Weld and HAZ	No indication was found	FW
118	Joint No.118	Weld and HAZ	No indication was found	FW
119	Joint No.119	Weld and HAZ	No indication was found	FW
120	Joint No.120	Weld and HAZ	No indication was found	FW
121	Joint No.121	Weld and HAZ	No indication was found	FW
122	Joint No.122	Weld and HAZ	No indication was found	FW
123	Joint No.123	Weld and HAZ	No indication was found	FW
124	Joint No.124	Weld and HAZ	No indication was found	FW
125	Joint No.125	Weld and HAZ	No indication was found	FW
126	Joint No.126	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG	Report No. :	IS/B-23-CUI-P-NBL-013	
		Line No. :	184-6177-FG-1"-150A1-N	
		Date of Test :	19/05/2023	
	Code : Rev.: Effective date :	Page :	111 of 112	Rev.00

Picture No. 1 : ET result found not indication.

Picture No. 2 : ET result found not indication.

Picture No. 3 : ET result found not indication.

Picture No. 4 : ET result found not indication.

Picture No. 5 : ET result found not indication.

Picture No. 6 : ET result found not indication.

ECT PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	112 of 112 Rev.00

Code : Rev.: Effective date :

Picture No. 7 : ET result found not indication.

Picture No. 8 : ET result found not indication.

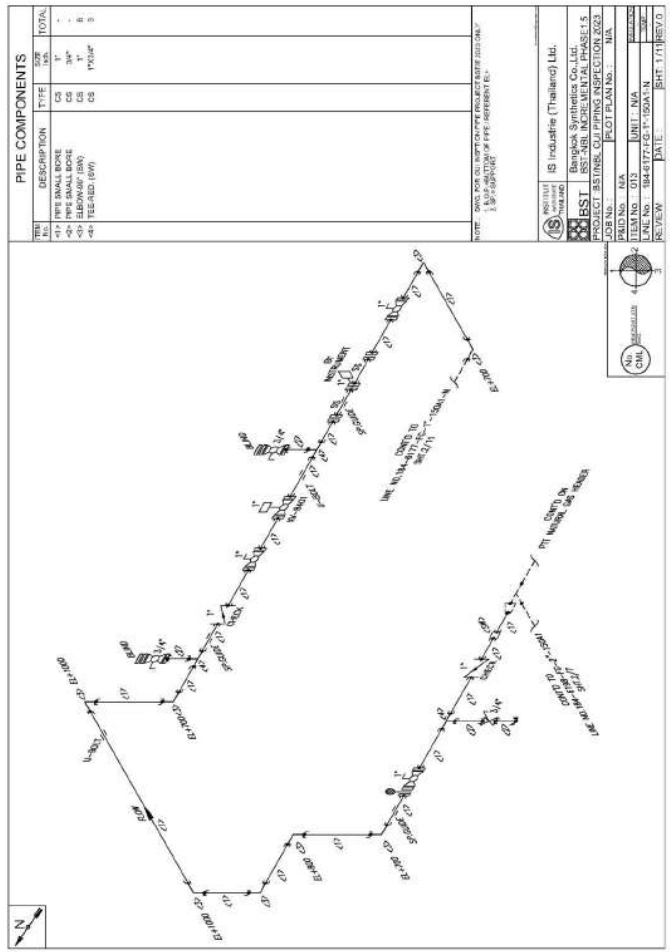
Picture No. 9 : ET result found not indication.

Picture No. 10 : ET result found not indication.

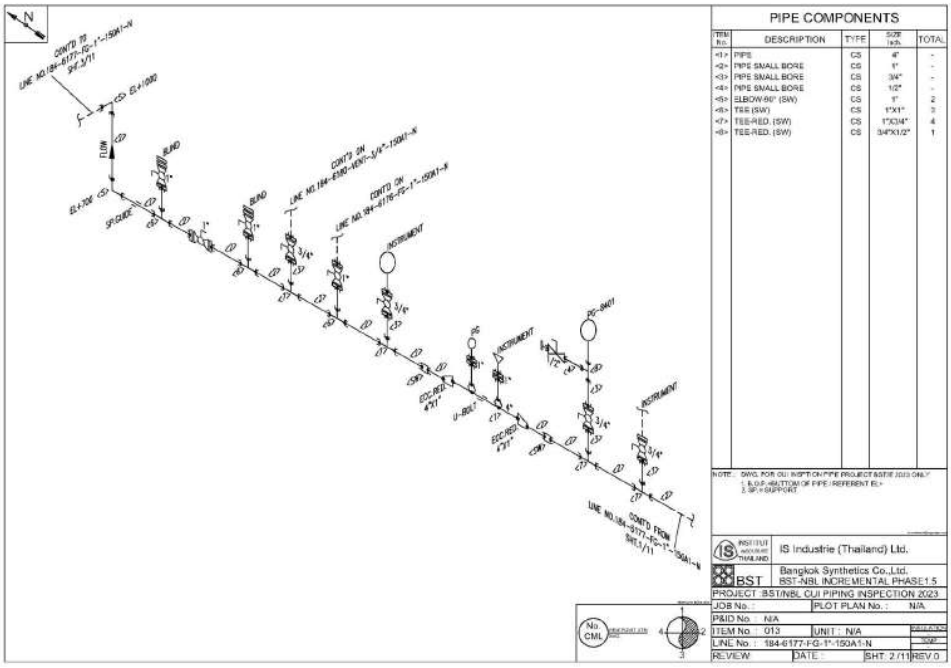
2D ISO-DRAWING

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	113 of 112 Rev.00

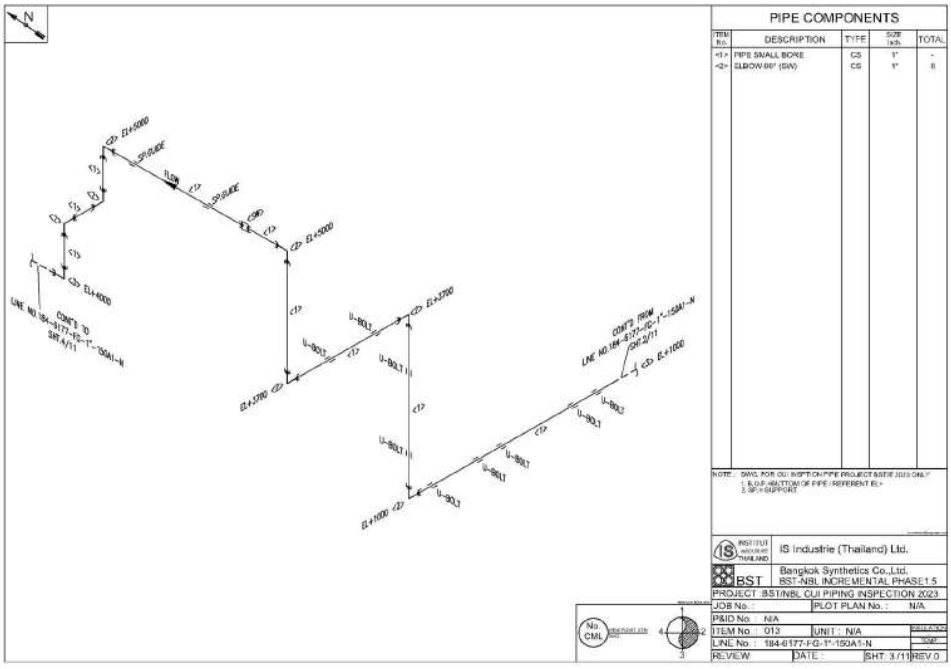
Code : Rev.: Effective date :



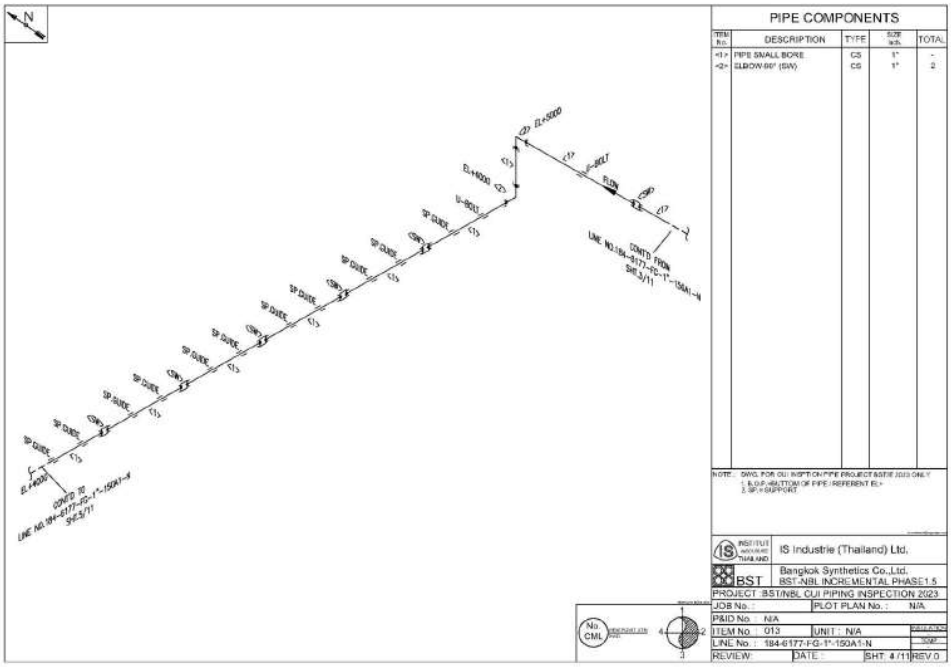
INSTITUT de SOUDURE THAILAND



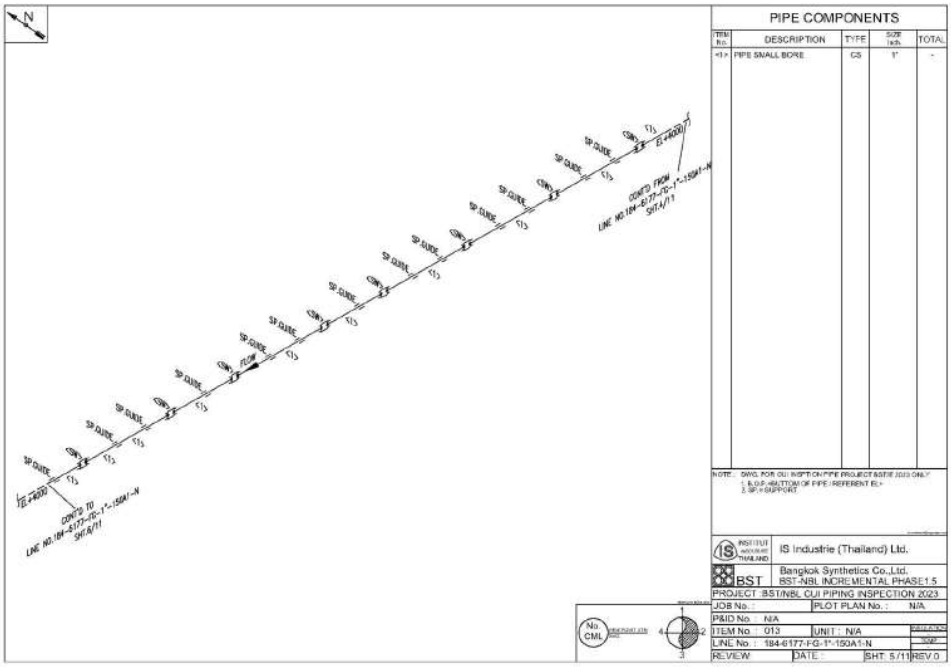
THAILAND



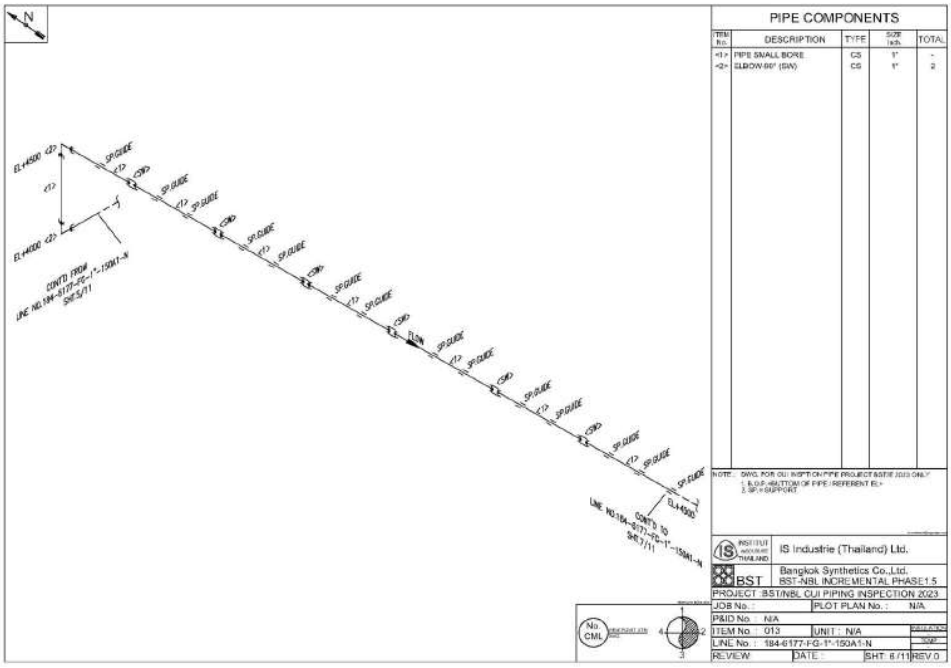
THAILAND



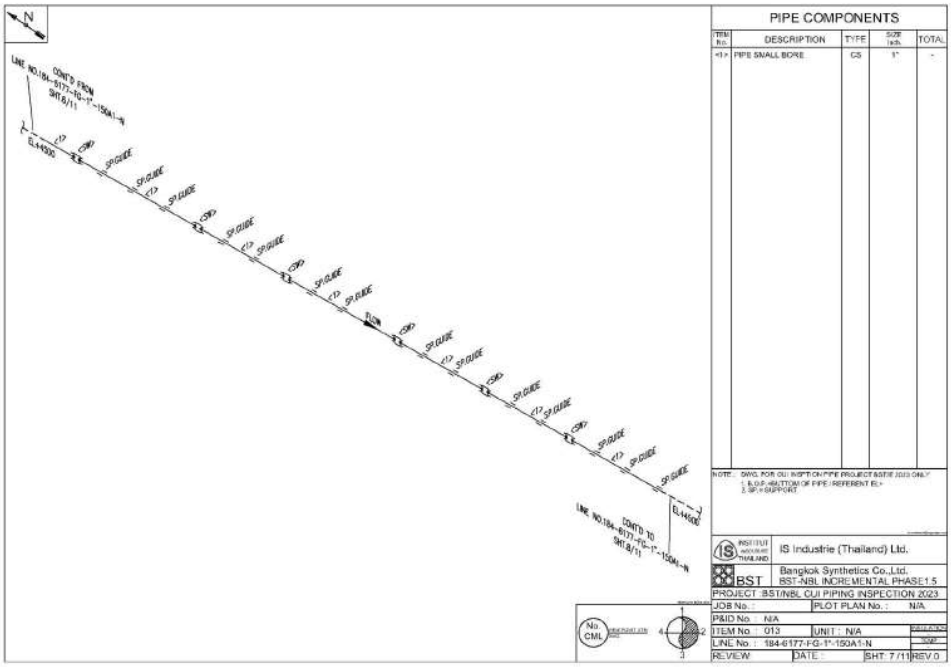
THAILAND



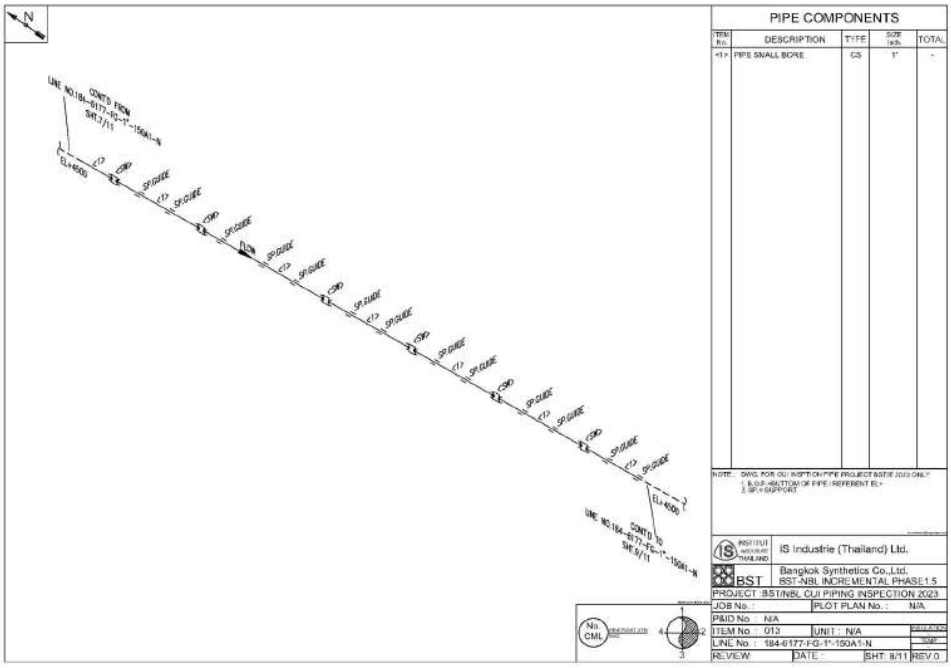
THAILAND



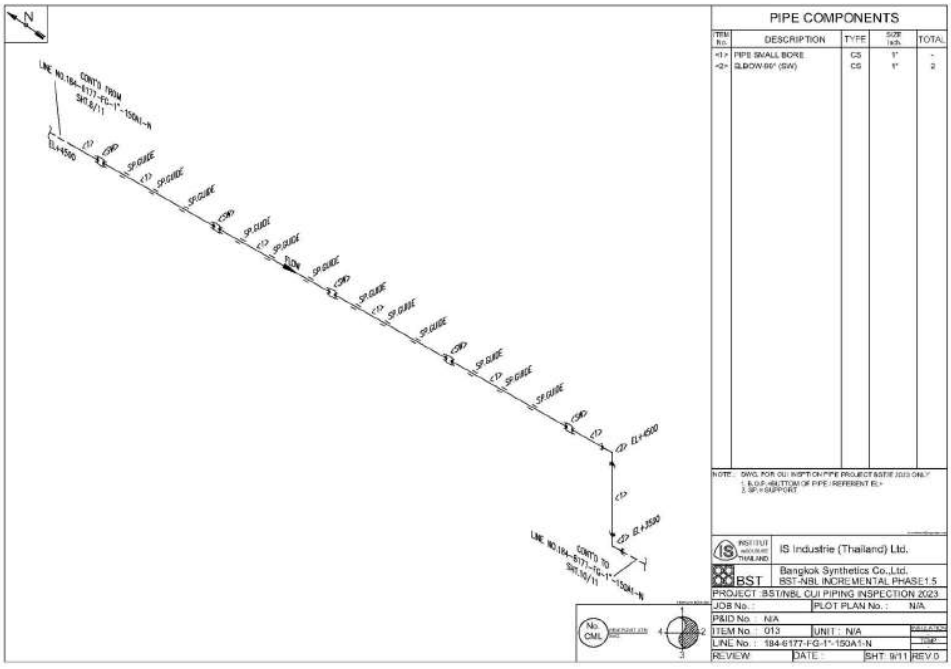
THAILAND



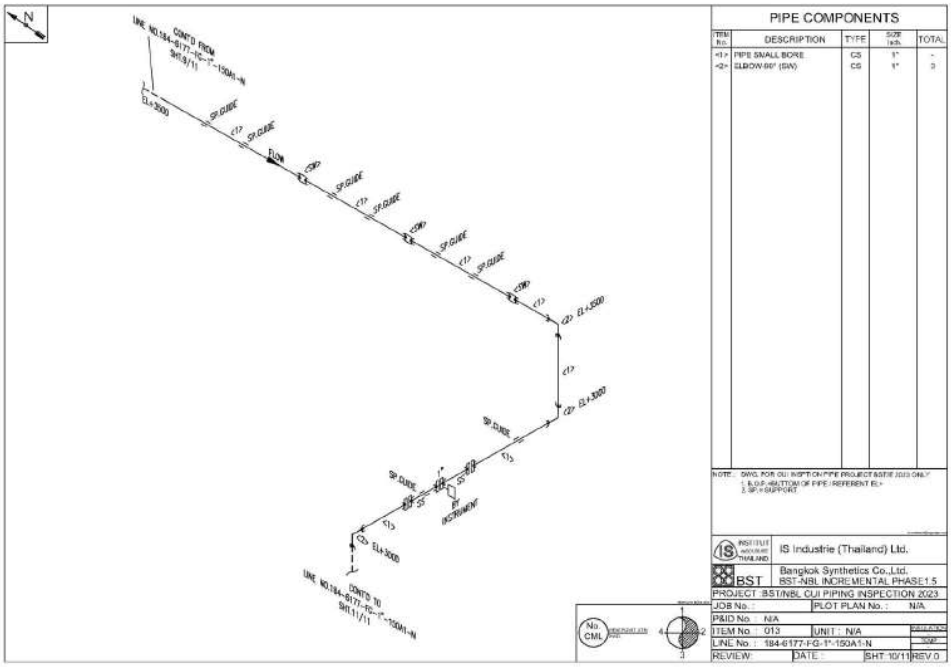
THAILAND



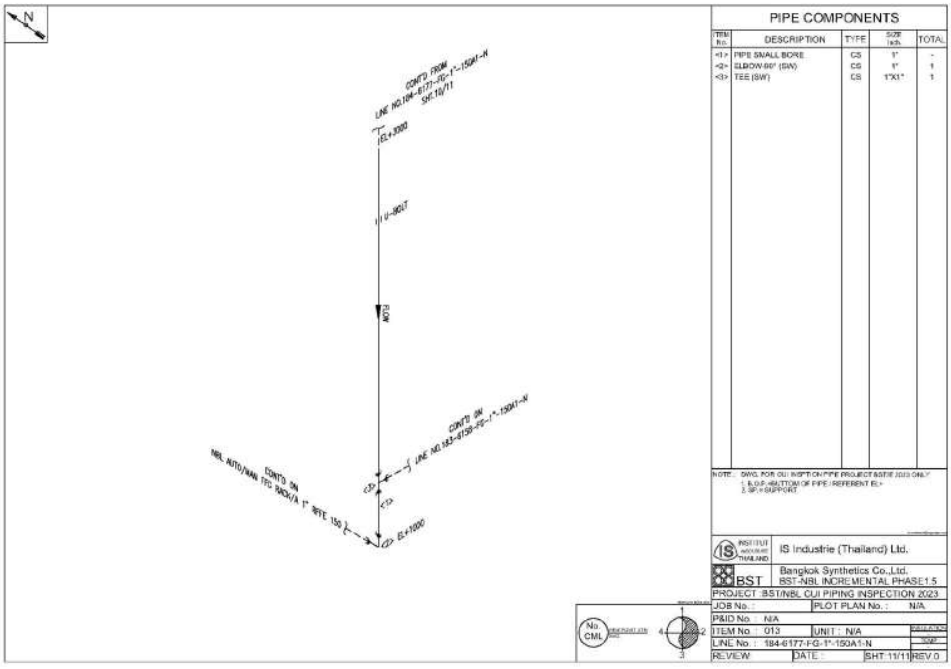
THAILAND



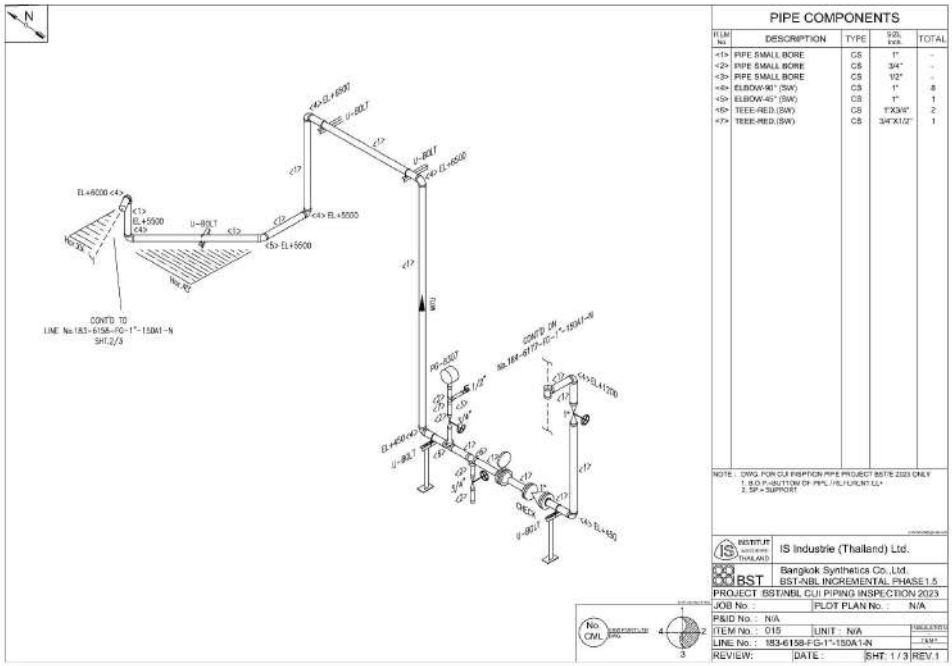
THAILAND



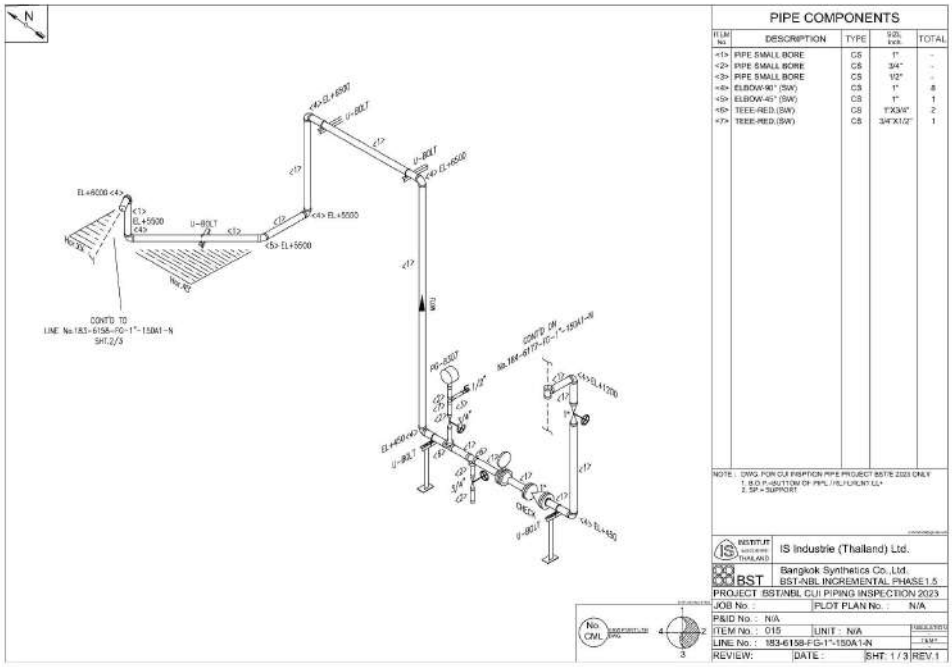
THAILAND



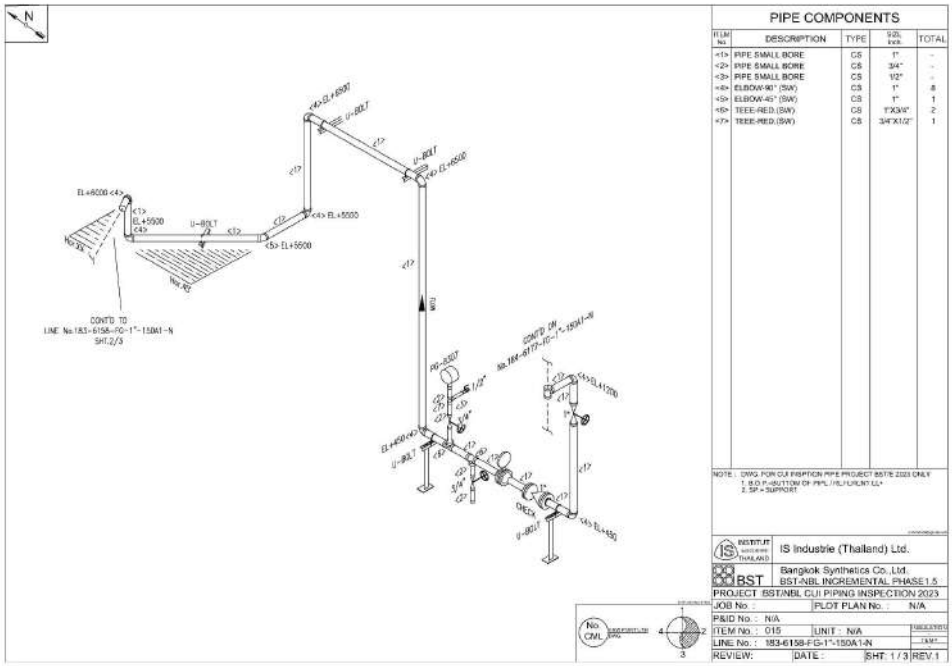
THAILAND



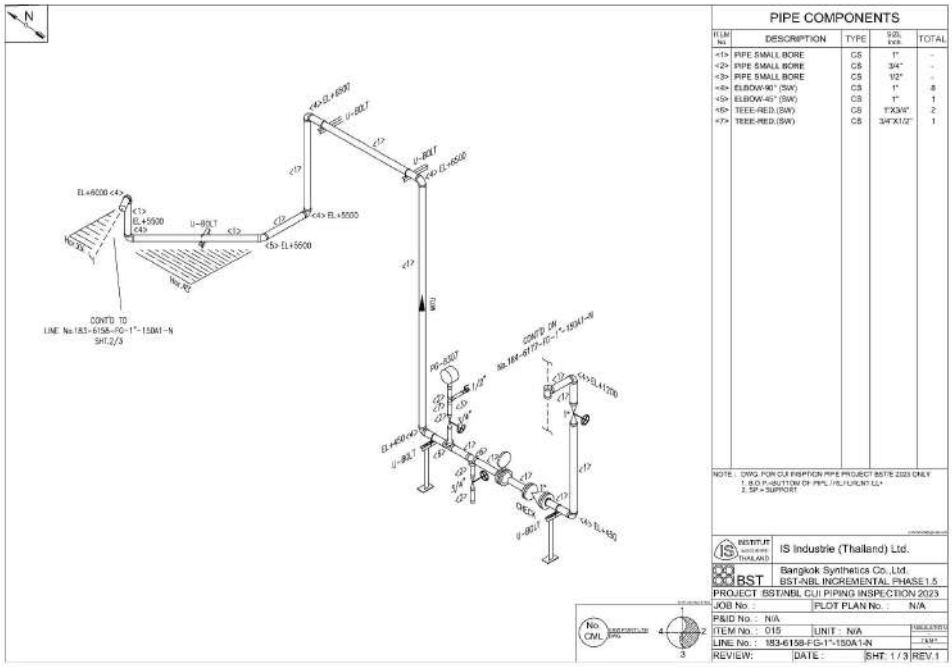
THAILAND



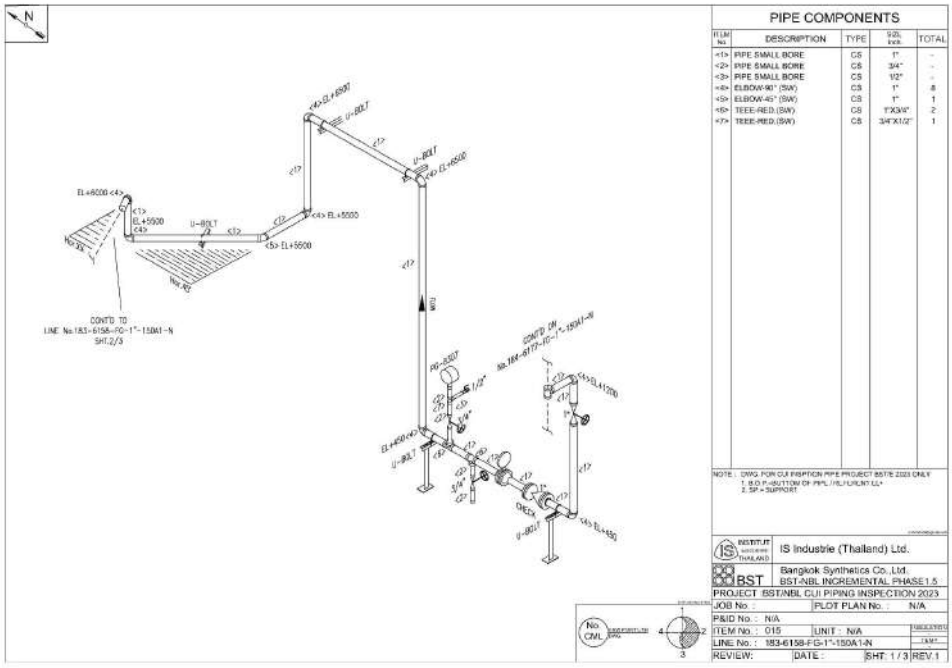
THAILAND



THAILAND

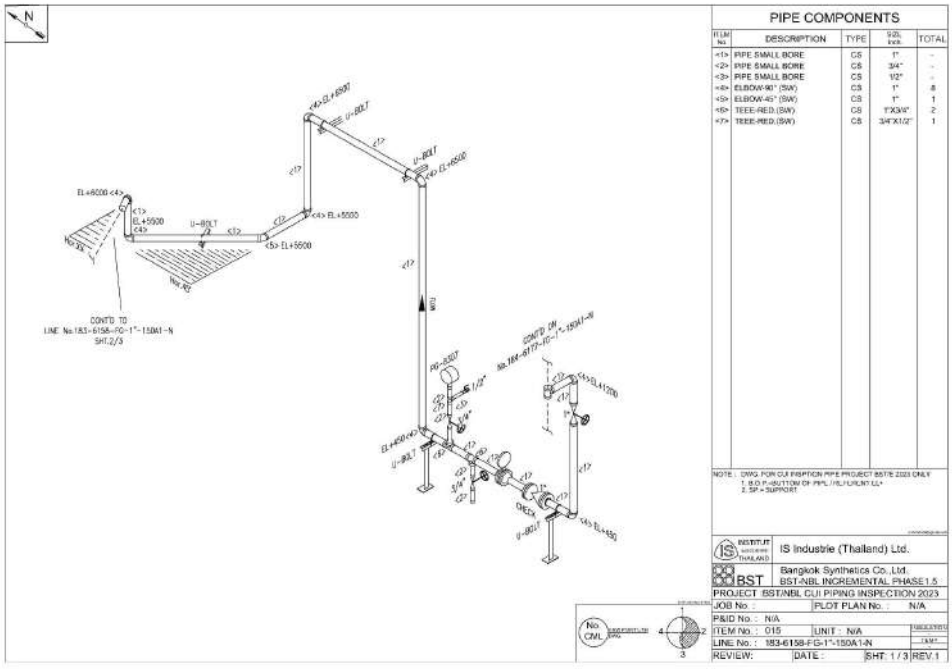


THAILAND

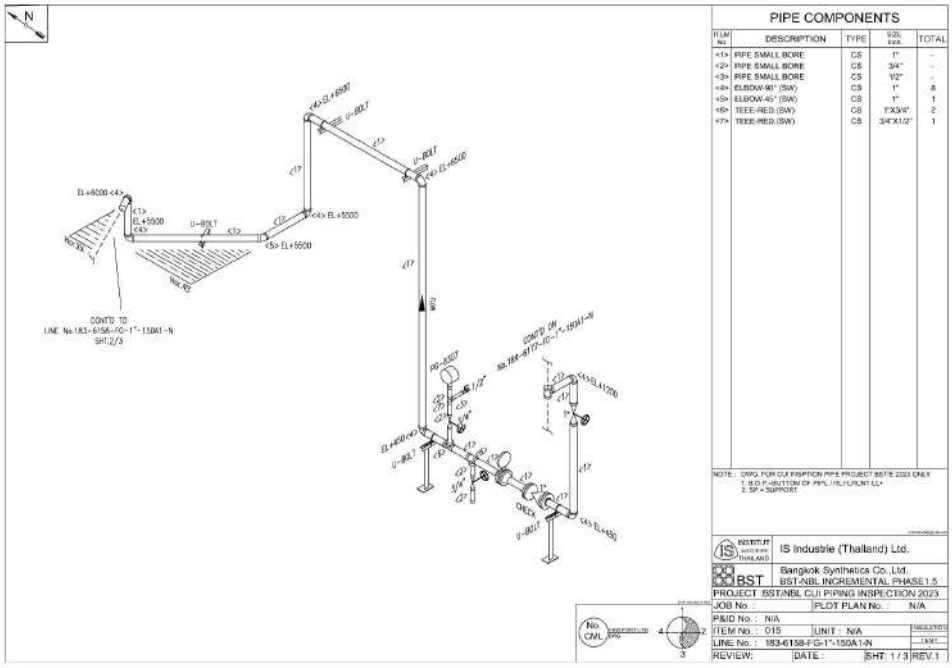


THAILAND

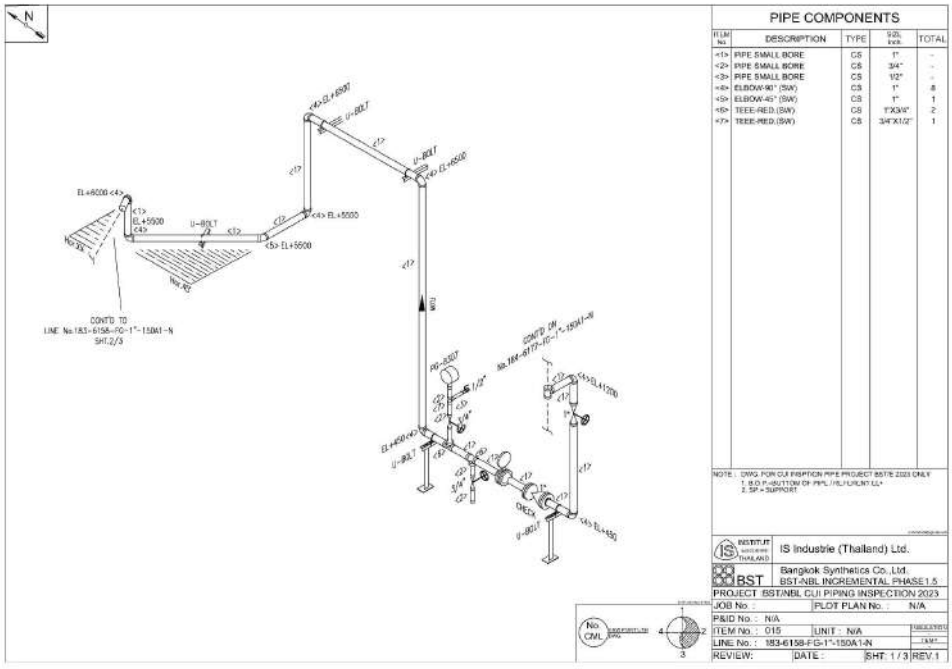
	3D ISO-DRAWING			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
Code :	Rev.:	Effective date :		Page :	129 of 112	Rev.00



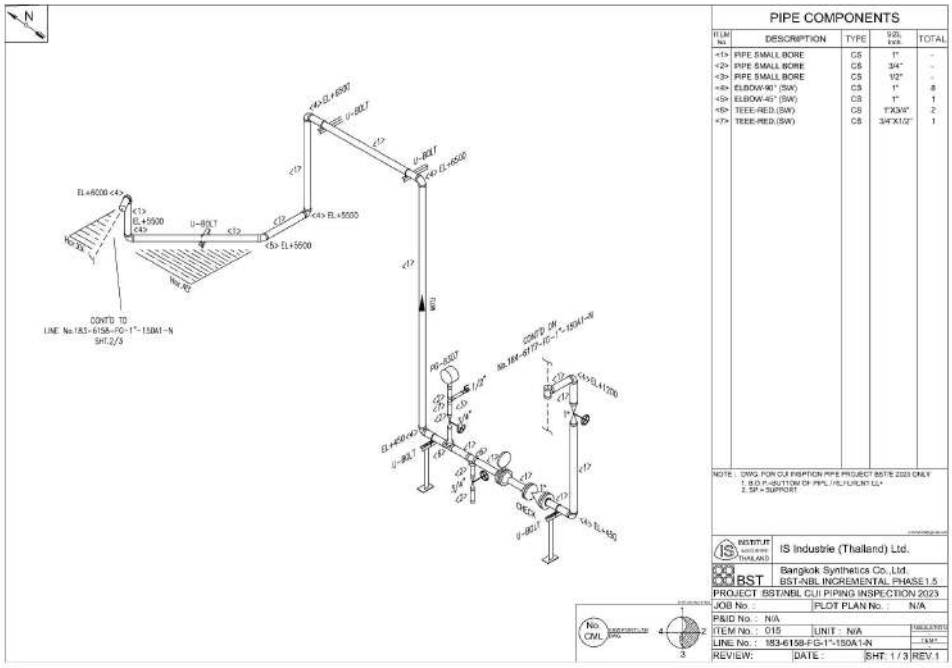
THAILAND



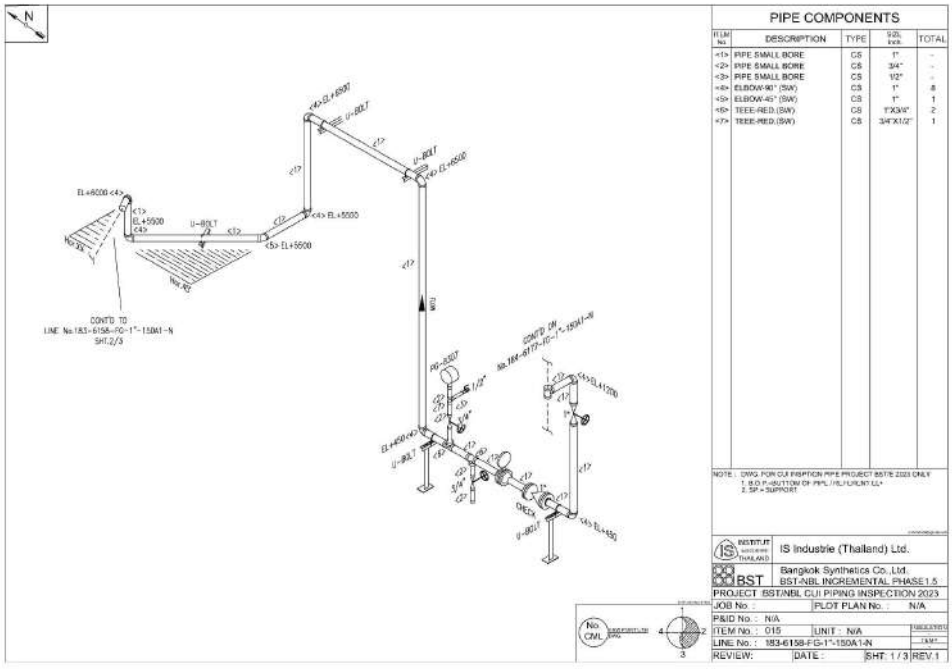
THAILAND



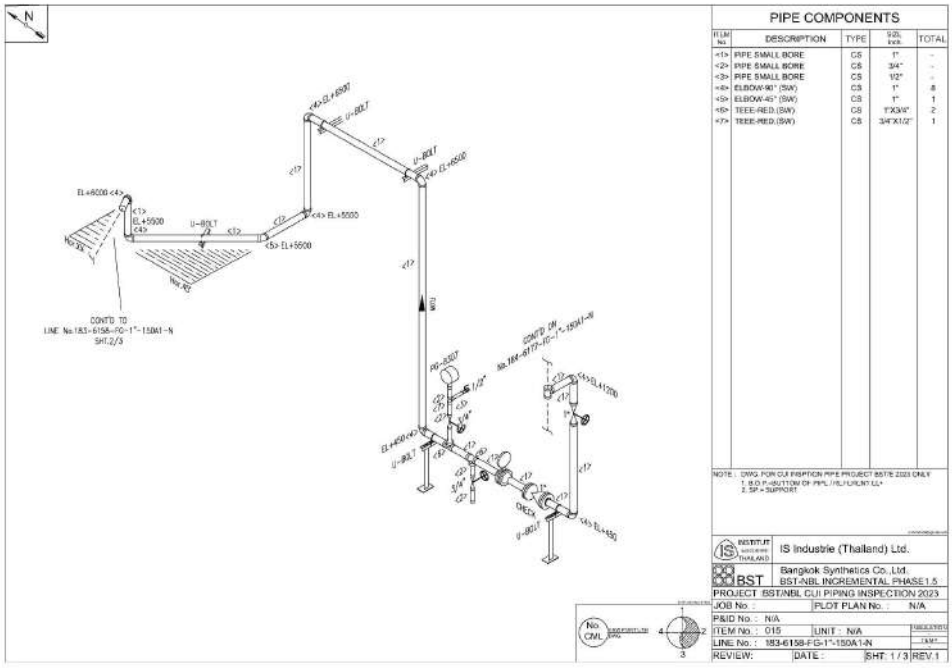
THAILAND



THAILAND



THAILAND



INSTITUT de SOUDURE THAILAND

Appendix 1
Inspector Certification

API INDIVIDUAL CERTIFICATION PROGRAMS

ANAB
ANSI National Accreditation Board
ACCREDITED
ISO/IEC 17024
PERSONNEL CERTIFICATION BODY

verifies that

krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69176

ORIGINAL CERTIFICATION DATE	November 30, 2016
CURRENT CERTIFICATION DATE	November 30, 2022
EXPIRATION DATE	November 30, 2025

Director, Individual Certification Programs

API | ICP

THIS IS A COPY

Copyright 2020 - American Petroleum Institute. All rights reserved. API, ICP, the API logo and the ICP mark are trademarks or registered trademarks of API in the United States and/or other countries. This certificate is the property of the American Petroleum Institute. It must be returned on request. Authentic and official ICP certificates are printed on a three-sectored paper stock with blue screened patterns and incorporate gold foil seal elements. This certificate should be verified by google http://engineerwatch.api.org and following the instructions to obtain authenticity. Certification must be renewed every three years. American Petroleum Institute, 200 Massachusetts Avenue, NW Suite 1100, Washington, DC 20001-5571, U.S.A. 2020-100 (06/20).

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)
Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

IS INDUSTRIE (THAILAND) LTD

Mr. Satish Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jodelyn Robin STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

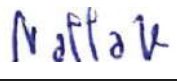
Piping Line No.

184-6198-FG-2"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-014
Inspection date : May 19, 2023
Issue report date : June 22, 2023

Content

Item	Description	Page
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 41*
4	*Ultrasonic Thickness Measurement Report*	*42 - 65*
5	*Eddy Current Testing Report*	*66 - 84*
6	*2D & 3D ISO-Drawing*	*85 - 98*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
		
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : June 22, 2023	Date : June 25, 2023	Date : June 28, 2023

	SUMMARY FINDING			Report No. :	IS/B-23-CUI-P-NBL-014
				Request No. :	-
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 1 of 98	Rev.00

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 14 Line No.	184-6198-FG-2"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Fitting	**Accepted (Alert)**	Found 1 position of internal corrosion (Erosion) at elbow 2" TMLs No. 41 (CMLs 51) with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years.	Shall be monitor elbow 2" TMLs 41 (CMLs 51) within next inspection.
2	Pipe, Fitting, Branch Connection, Valve	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, fitting, branch connection and valve at CMLs 3, 5-6, 15, 34, 40, 44, 55-56, 58-59. (See picture No. 2, 4-5, 13-14, 30-31, 33-34, 38, 60-63, 65-66)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Satisfactory condition observed. See detail in "VISUAL TESTING REPORT".	**Result :**	Accepted
UTM :	Found 1 position of internal corrosion (Erosion) at elbow 2" TMLs No. 41 with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

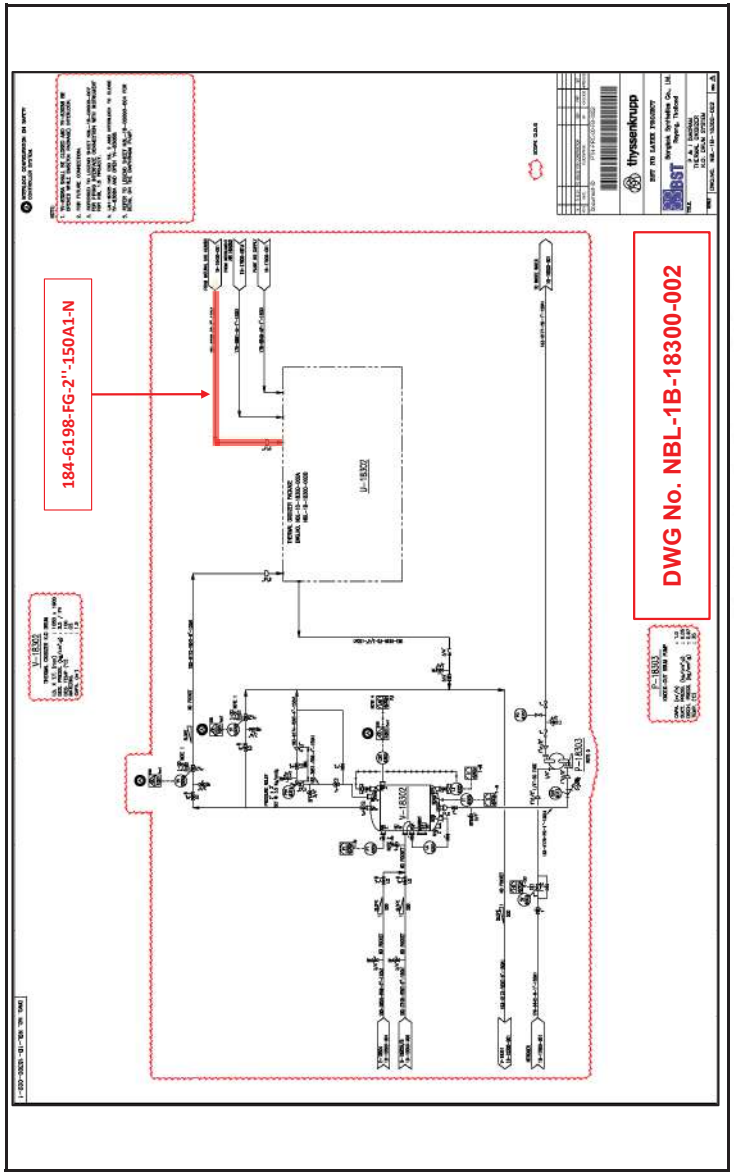
AFTER REPAIR INSPECTION RESULT

- None -

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	2 of 98 Rev.00

Piping and Instrumentation Diagram (P&ID)

Code : Rev.: Effective date :



VISUAL TESTING REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Request No. :	-
Date of Test :	19/05/2023
Page :	3 of 98 Rev.00

Code : Rev.: Effective date :

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6198-FG-2"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			spot area of slight corrosion	-
2. Flange connection (Flange, Stud & Nut, Gasket)	✓					-
3. Branch Connection (Vent, Drain, Nipples)		✓			Rust spot	-
4. Valve (Body, Bonnet, Stem, Packing, Handle)		✓			Slight corrosion	-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
Other …				✓		-
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)	✓					-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	June 22, 2023	Date :	June 25, 2023	Date :	June 28, 2023

Picture No. 1

Finding :

Short piece pipe 2" CMLs 1 and tee 2" x 2" CMLs 2 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Found painting damage & rust spot around valve handle of valve 2" CMLs 3.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

After remove any dirt found pipe 2" CMLs 4 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 4

Finding :

Found rust spot as drain pipe 3/4" and drain valve 3/4" at drain branch 3/4" CMLs 5.

Recommendation :

Should be monitor within next inspection.

Picture No. 5

Finding :

Found slight corrosion as packing, painting damage & rust spot as flange and body of valve 2" CMLs 6.

Recommendation :

Shall be monitor within next inspection.

Picture No. 6

Finding :

After remove any dirt found pipe 2" CMLs 7 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Elbow 2" CMLs 8 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 8

Finding :

After remove any dirt found pipe 2" CMLs 9 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Small bore branch pipe 3/4" CMLs 10 include valve 3/4" were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 10

Finding :

Pipe 2", U-bolt and structure support CMLs 11 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 11

Finding :

After remove any dirt found elbow 2" CMLs 12 and CMLs 13 were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 12

Finding :

Pipe 2" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 13

Finding :

Found coating damage & slight corrosion at elbow 2" CMLs 15.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 14

Finding :

This photo shown close-up view of slight corrosion at elbow 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 15

Finding :

After remove any dirt found pipe 2" CMLs 16 and elbow 2" CMLs 17 were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Pipe 2", U-bolt and structure support CMLs 18 and CMLs 19 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 17

Finding :

This photo shown U-bolt and structure support were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 18

Finding :

Elbow 2" CMLs 20 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 19

Finding :

Pipe 1" CMLs 21 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 20

Finding :

Pipe 2", U-bolt and structure support CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

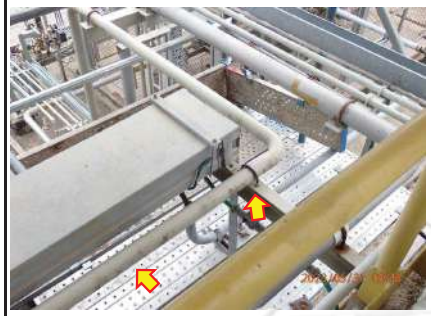
Picture No. 21

Finding :

Elbow 2" CMLs 23 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 22

Finding :

Pipe 2", U-bolt and structure support CMLs 24, CMLs 25 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 23

Finding :

Pipe 2" CMLs 26 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 24

Finding :

Pipe 2", U-bolt and structure support CMLs 27, CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Pipe 2", U-bolt and structure support CMLs 29 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 26

Finding :

Elbow 2" CMLs 30 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 27

Finding :

Pipe 2" CMLs 31 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 28

Finding :

Elbow 2" include dummy support CMLs 32 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Pipe 2" CMLs 33 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 30

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 34.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 31

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 32

Finding :

Elbow 2" CMLs 35, CMLs 37, CMLs 39 and pipe 2" CMLs 36, CMLs 38 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 40.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 34

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 35

Finding :

Elbow 2" CMLs 41 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 36

Finding :

Pipe 2" CMLs 42 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Pipe 2", U-bolt and structure support CMLs 43 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Found spot area of coating damage & rust spot at elbow 2" CMLs 44.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 39

Finding :

Pipe 2" CMLs 45 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Elbow 2" CMLs 46 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 42

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 43

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 44

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 45

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 46

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 47

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 48

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 49

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 50

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 51

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 52

Finding :

Pipe 1" CMLs 65, CMLs 67 and socket elbow 1" CMLs 66 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 53

Finding :

Pipe 2" CMLs 47 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 54

Finding :

Pipe 2", U-bolt and structure support CMLs 48 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 55

Finding :

Elbow 2" CMLs 49 and pipe 2" CMLs 50 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

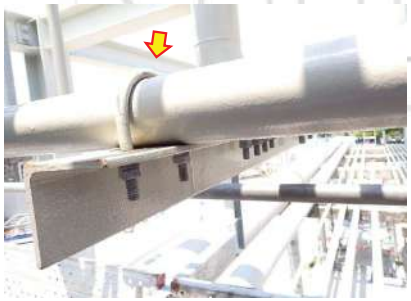
Picture No. 56

Finding :

Elbow 2" CMLs 51 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 57

Finding :

Pipe 2", U-bolt and structure support CMLs 52 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 58

Finding :

Pipe 2" CMLs 53 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 59

Finding :

Pipe 2", U-bolt and structure support CMLs 54 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 60

Finding :

Found coating damage & rust spot at weldment of elbow 2" CMLs 56.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 61

Finding :

This photo shown coating damage & rust spot at weldment of elbow 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 62

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 56.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 63

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 64

Finding :

Elbow 2" CMLs 57 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 65

Finding :

Found spot area of painting damage at pipe 2" CMLs 58.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 66

Finding :

Found slightly rust as pipe 2" surface CMLs 59 (Beginning period of CUS).

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 67

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 68

Finding :

Elbow 2" CMLs 60 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 69

Finding :

Pipe 2" CMLs 61 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 70

Finding :

Socket elbow 1" CMLs 62 and pipe 1" CMLs 63 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 71

Finding :

Socket elbow 1" CMLs 62 and shore piece pipe 1" CMLs 64 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

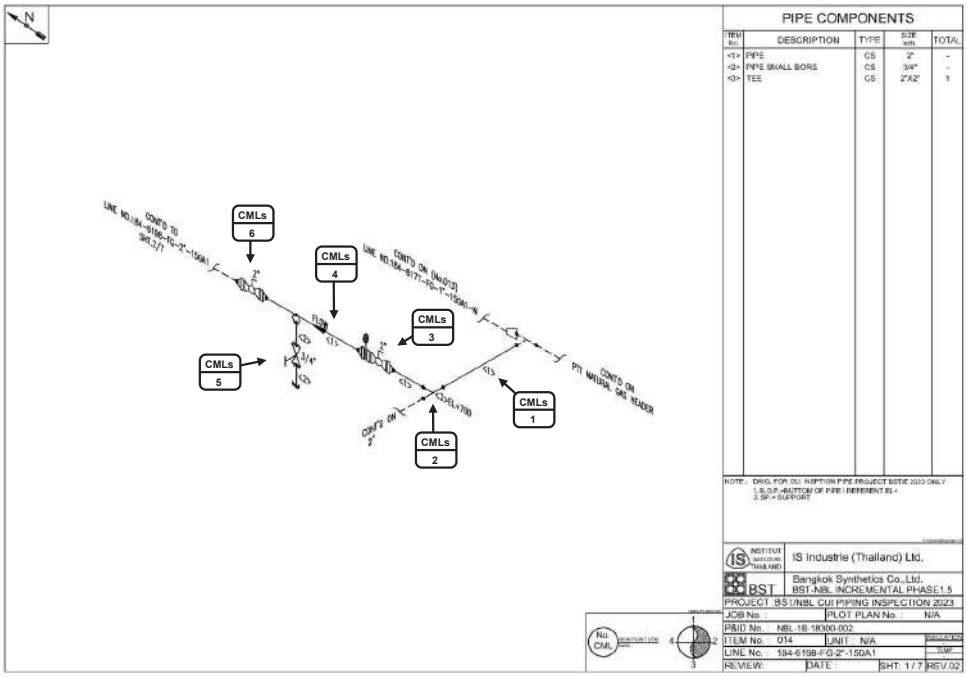
Picture No. 72

Finding :

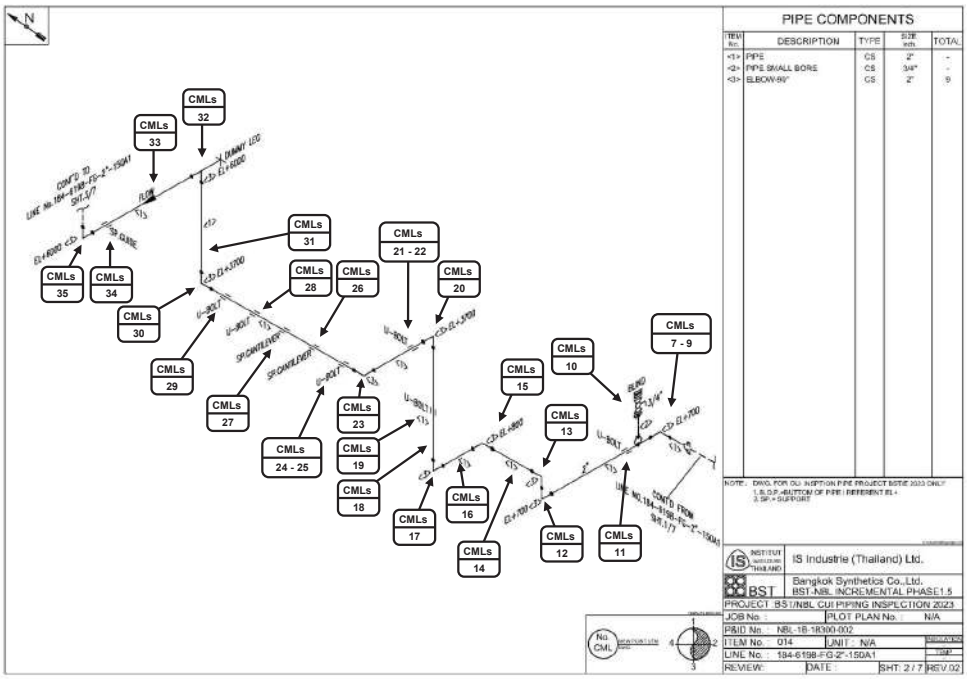
Flange connection (Ending location) CMLs 65 include all set of stud & nut were found in normal condition.

Recommendation :

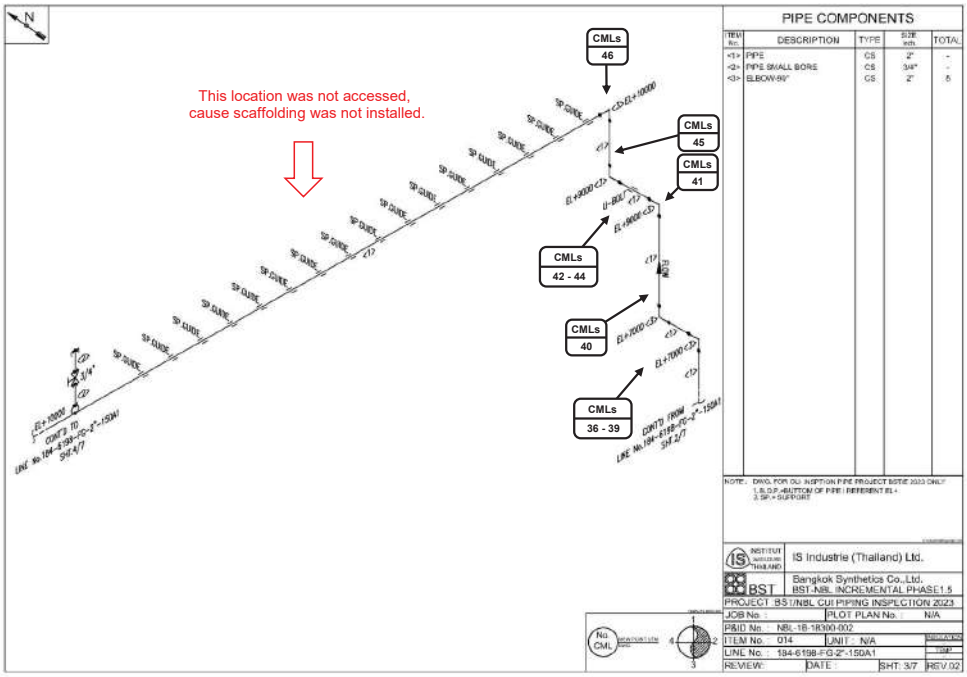
Should be monitor within next inspection.



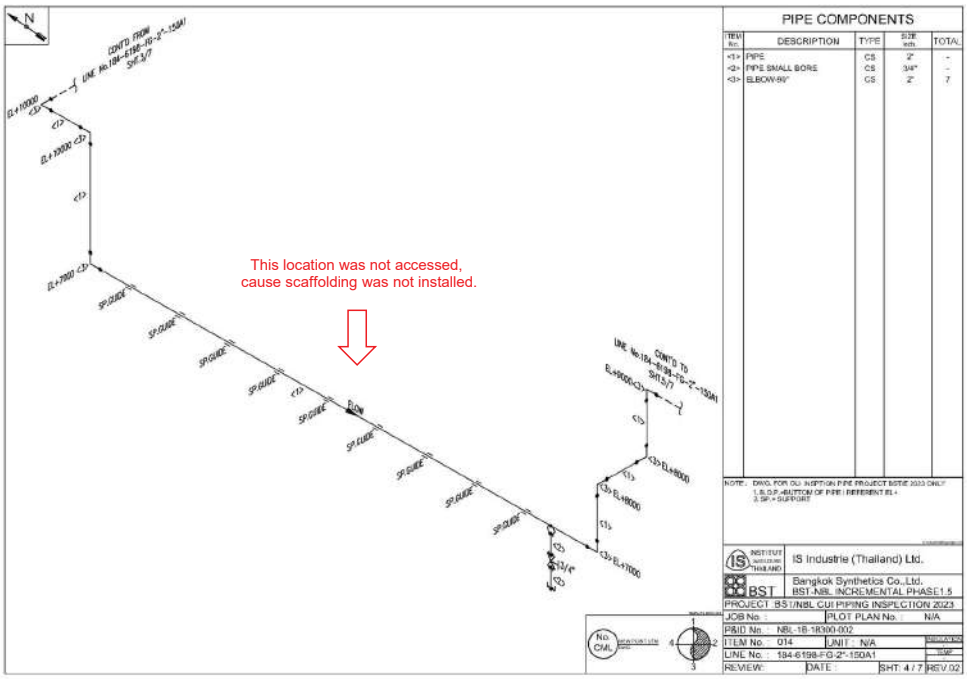
THAILAND



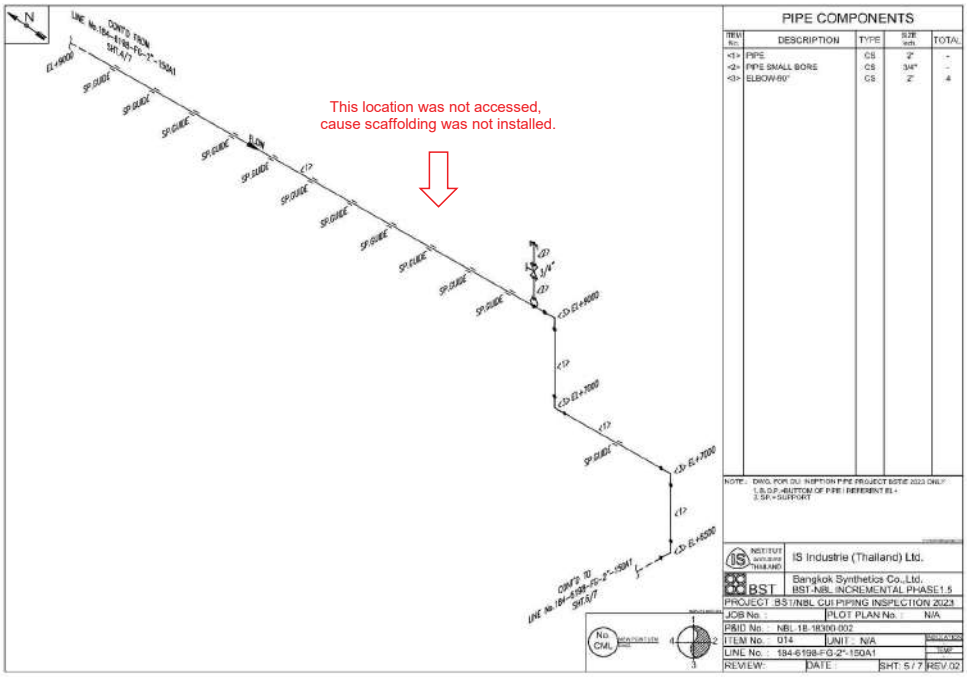
THAILAND

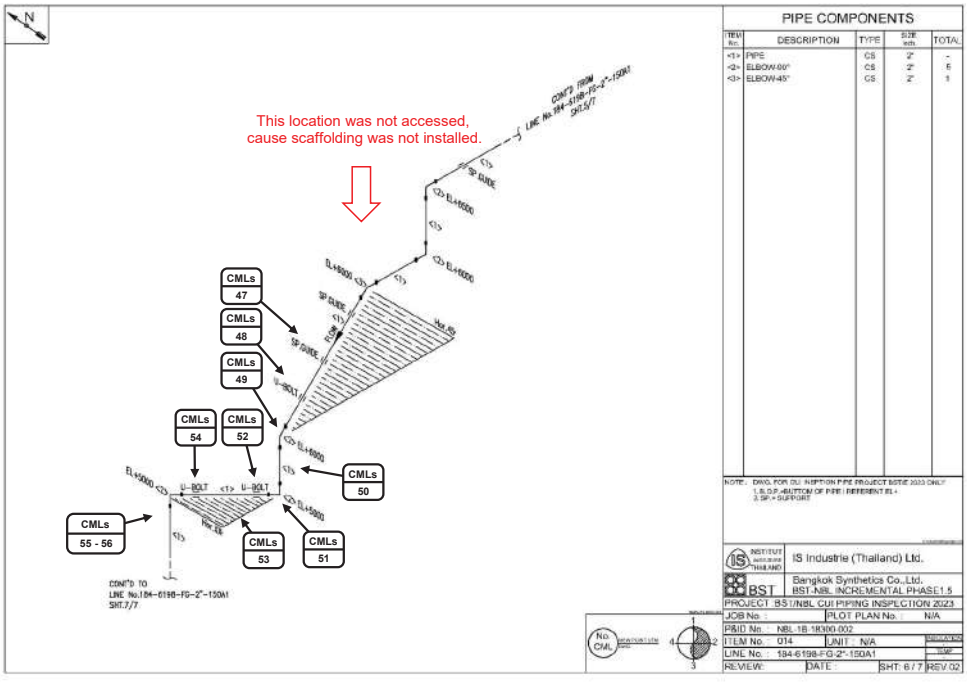


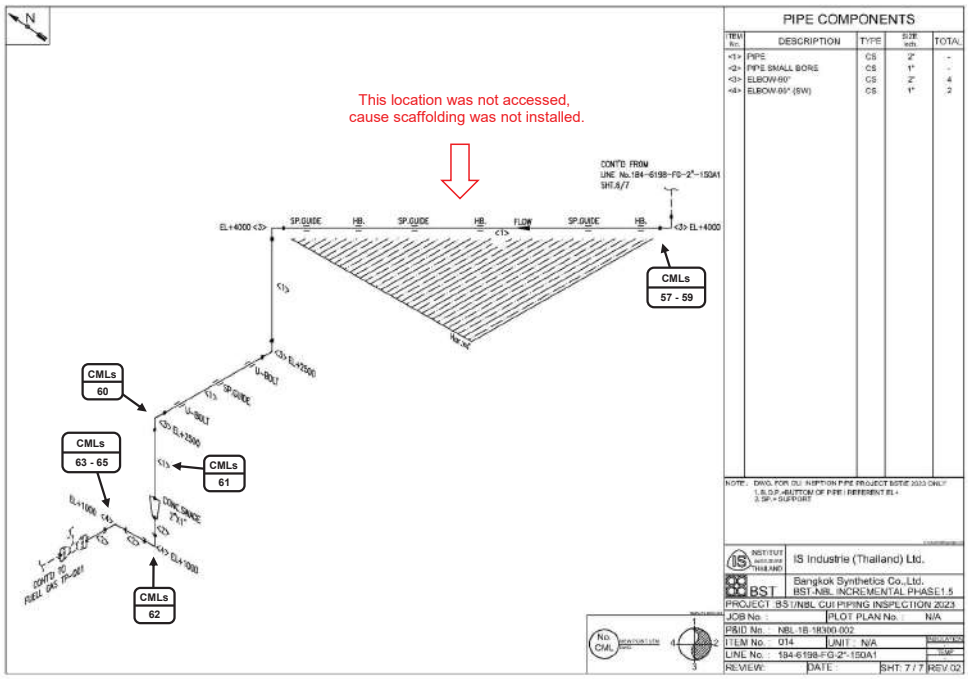
THAILAND



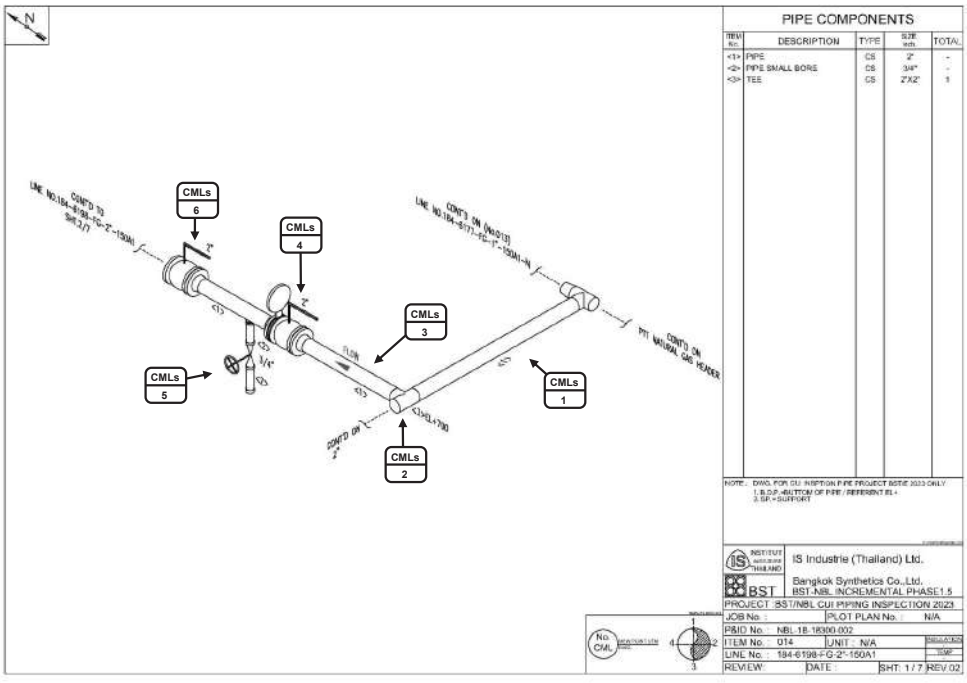
THAILAND


This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. NBL-1B-18300-002
ITEM No. 014 UNIT N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 5 / 7 REV.02

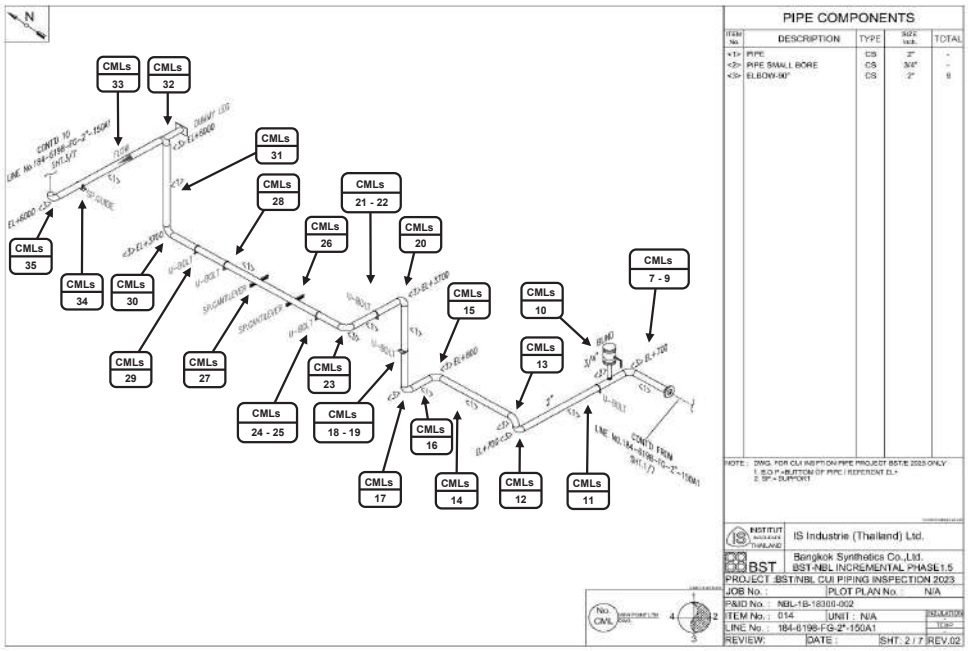

This location was not accessed,
cause scaffolding was not installed.
CMLs 47
CMLs 48
CMLs 49
CMLs 54
CMLs 52
CMLs 50
CMLs 55 - 56
CMLs 53
CMLs 51
U-BOLT
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 6
<3> ELBOW-45° | CS | 2" | 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. NBL-1B-18300-002
ITEM No. 014 UNIT N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 6 / 7 REV.02

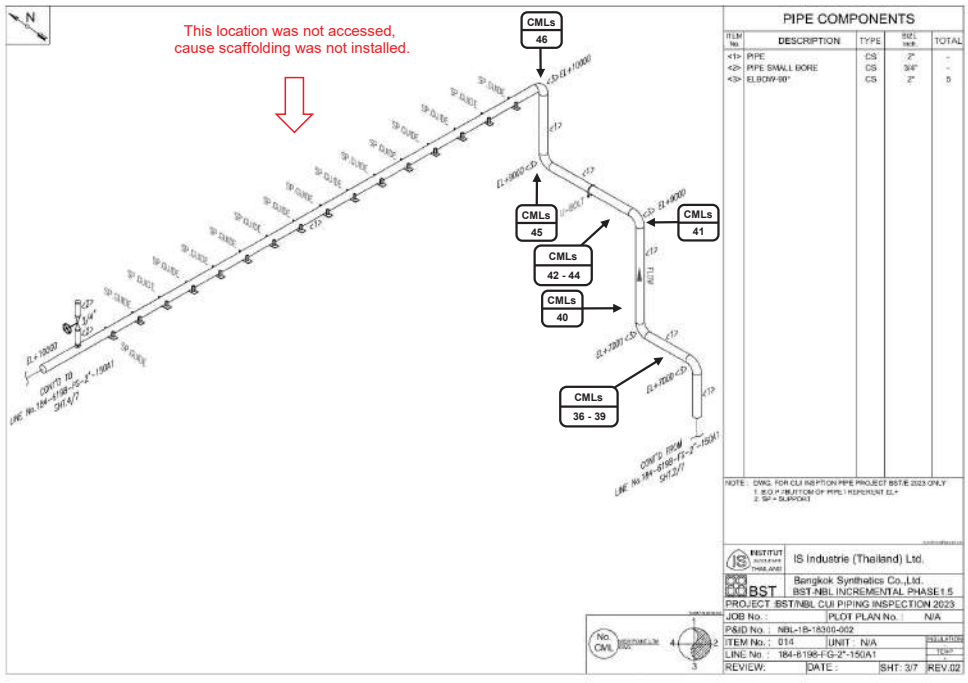


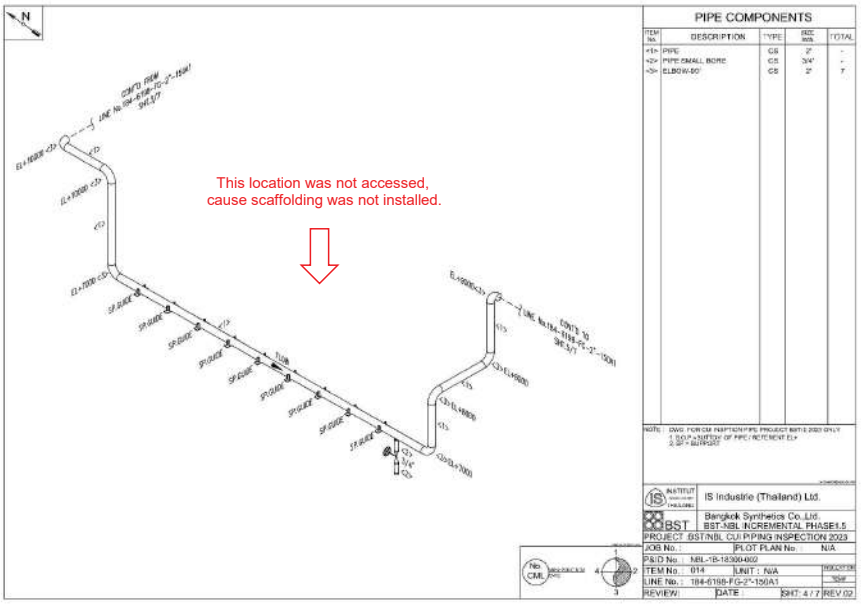
THAILAND

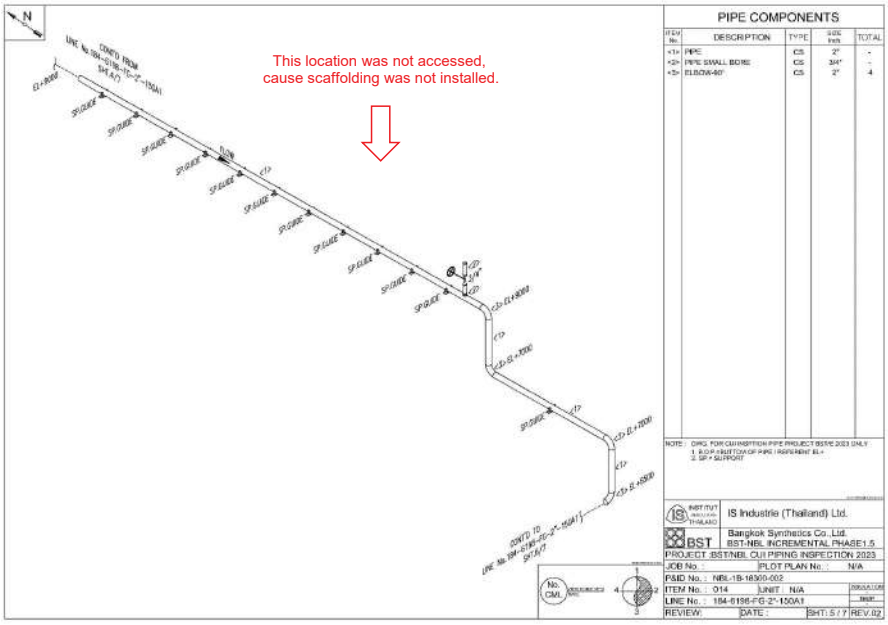


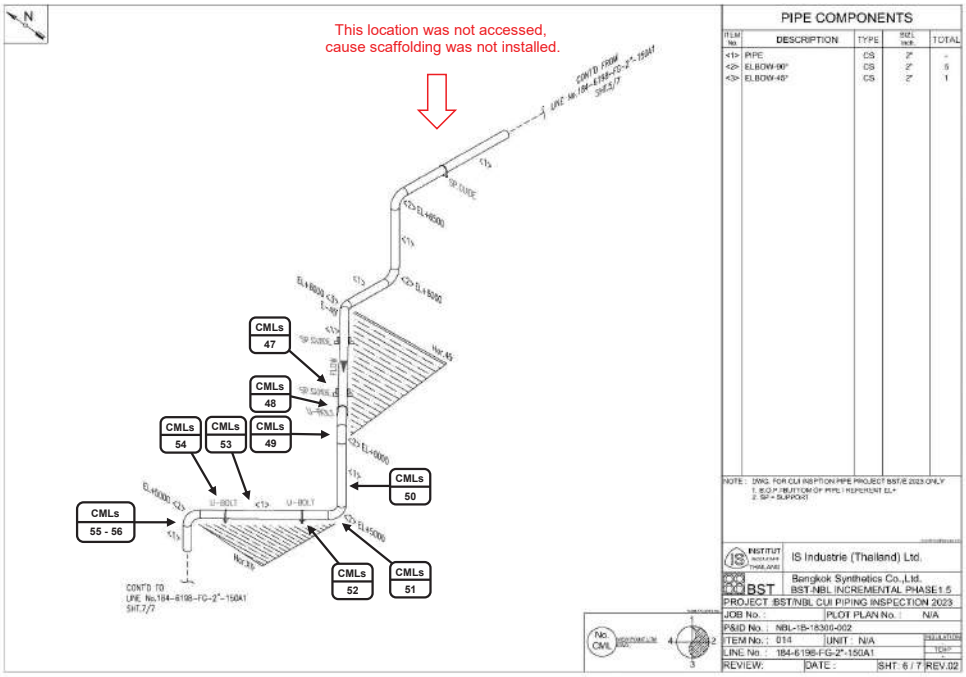
THAILAND

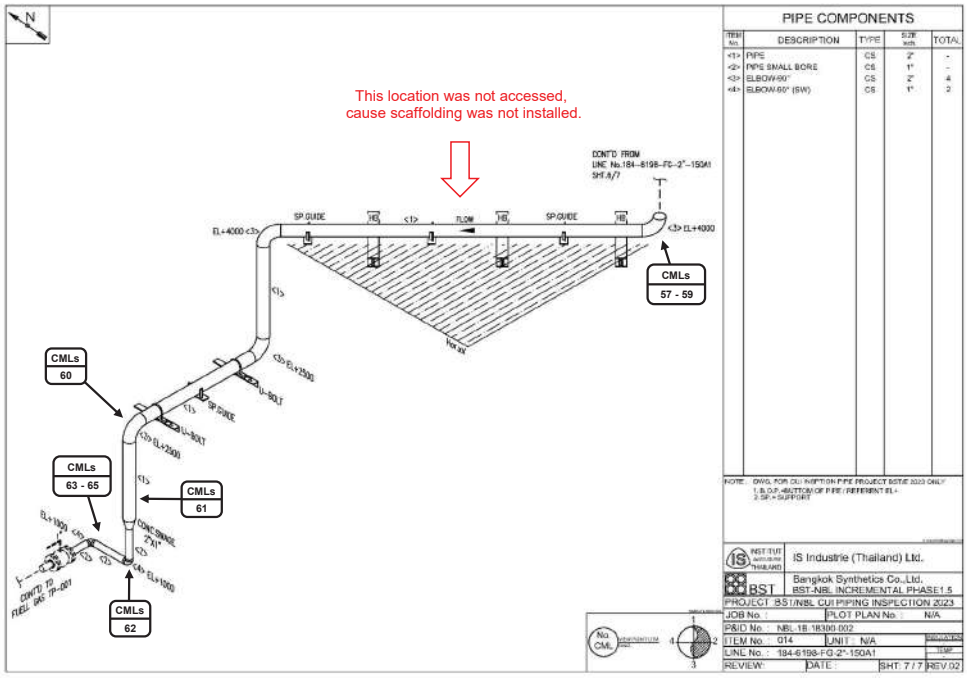

N
CMLs 33
CMLs 32
CMLs 31
CMLs 28
CMLs 21 - 22
CMLs 26
CMLs 20
CMLs 35
CMLs 34
CMLs 30
CMLs 15
CMLs 10
CMLs 7 - 9
CMLs 29
CMLs 27
CMLs 13
CMLs 23
CMLs 24 - 25
CMLs 18 - 19
CMLs 16
CMLs 17
CMLs 14
CMLs 12
CMLs 11
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P = BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02


N
This location was not accessed,
cause scaffolding was not installed.
CMLs 46
CMLs 45
CMLs 41
CMLs 42 - 44
CMLs 40
CMLs 36 - 39
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 5
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P = BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 3/7 REV.02


N
This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 7
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW | DATE : | SHT: 4 / 7 | REV.02


N
This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW | DATE : | SHT: 5 / 7 | REV.02


This location was not accessed,
cause scaffolding was not installed.
CONT'D FROM LINE No.184-6198-FG-2"-150A1 SHT.5/7
CONT'D TO LINE No.184-6198-FG-2"-150A1 SHT.7/7
SP.GUIDE
U-BOLT
CMLs 47
CMLs 48
CMLs 54
CMLs 53
CMLs 49
CMLs 50
CMLs 55 - 56
CMLs 52
CMLs 51
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch
TOTAL
<1> PIPE CS 2" -
<2> ELBOW-90° CS 2" 5
<3> ELBOW-45° CS 2" 1
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT. 6 / 7 REV.02


This location was not accessed,
cause scaffolding was not installed.
CONT'D FROM LINE No.184-6198-FG-2"-150A1 SHT.6/7
CONT'D TO FIELD LINE TP-001
SP.GUIDE
U-BOLT
CMLs 57 - 59
CMLs 60
CMLs 63 - 65
CMLs 61
CMLs 62
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 1" -
<3> ELBOW-90° CS 2" 4
<4> ELBOW-90° (SW) CS 1" 2
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT. 7 / 7 REV.02

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Request No. :	-		
Date of Test :	19/05/2023		
Page :	42 of 98	Rev.00	

Code : | Rev.: | Effective date :

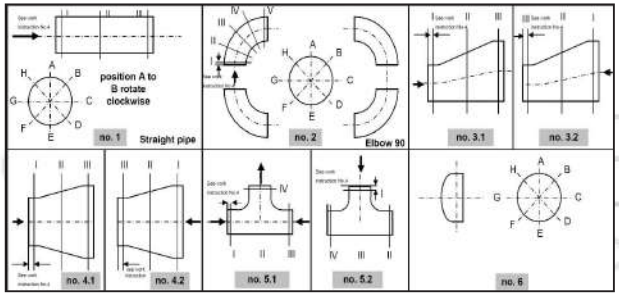
PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6198-FG-2"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-NDT-UTM-001_REV.04	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

MEASUREMENT TOOL DATA

Equipment Manufacturer	Olympus	**Calibration block**	Step bar 5 step
Equipment Model	38 DL Plus	**Calibration Range**	2.50 - 7.50 mm.
Serial No.	151114106	**Serial No.**	144816
Probe Manufacturer	Olympus	**Sound Velocity**	5904 mm./µs
Probe Model	D790-SM	**Couplant**	GE ZG-F / SONO 600
Probe Dia.	10 mm.	**Scan Type**	A-SCAN
Serial No.	1039668	**Technique**	Echo to Echo (Thru painting)
Frequency	5 MHz		

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	Found 1 position of internal corrosion (Erosion) at elbow TMLs No. 41 with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years.
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	UT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	43 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
1	1.1	A	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
	1.1	B	Pipe	2"	STD	3.91	1.80	-	3.78		1.98	-	0.012	158.857	
	1.1	C	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
	1.1	D	Pipe	2"	STD	3.91	1.80	-	3.72		1.92	-	0.018	105.398	
2	2.1	A	Elbow	2"	STD	3.91	1.80	4.07	4.01		2.21	0.090	-0.010	-230.503	Note 1, 3
	2.1	B	Elbow	2"	STD	3.91	1.80	4.20	4.23		2.43	-0.045	-0.031	-79.203	Note 1
	2.1	C	Elbow	2"	STD	3.91	1.80	3.94	3.85		2.05	0.135	0.006	356.358	Note 3
	2.1	D	Elbow	2"	STD	3.91	1.80	4.06	4.34		2.54	-0.421	-0.041	-61.610	Note 1
	2.2	A	Elbow	2"	STD	3.91	1.80	3.99	4.02		2.22	-0.045	-0.011	-210.496	Note 1
	2.2	B	Elbow	2"	STD	3.91	1.80	4.24	4.20		2.40	0.060	-0.028	-86.317	Note 1, 3
	2.2	C	Elbow	2"	STD	3.91	1.80	3.77	3.79		1.99	-0.030	0.012	172.964	
	2.2	D	Elbow	2"	STD	3.91	1.80	4.08	4.30		2.50	-0.330	-0.037	-66.859	Note 1
	2.3	A	Elbow	2"	STD	3.91	1.80	4.02	4.01		2.21	0.015	-0.010	147.132	
	2.3	B	Elbow	2"	STD	3.91	1.80	4.18	4.28		2.48	-0.150	-0.035	-69.909	Note 1
	2.3	C	Elbow	2"	STD	3.91	1.80	3.70	3.88		2.08	-0.270	0.003	723.147	
	2.3	D	Elbow	2"	STD	3.91	1.80	4.20	4.19		2.39	0.015	-0.027	159.115	
3	3.1	A	Pipe	3/4"	80	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	3.1	B	Pipe	3/4"	80	3.91	1.80	3.73	3.87		2.07	-0.210	0.004	539.753	
	3.1	C	Pipe	3/4"	80	3.91	1.80	3.88	3.76		1.96	0.180	0.014	136.285	Note 3
	3.1	D	Pipe	3/4"	80	3.91	1.80	3.82	3.75		1.95	0.105	0.015	127.116	Note 3
4	4.1	A	Pipe	2"	STD	3.91	1.80	3.70	3.83		2.03	-0.195	0.008	264.661	
	4.1	B	Pipe	2"	STD	3.91	1.80	3.65	3.81		2.01	-0.240	0.010	209.643	
	4.1	C	Pipe	2"	STD	3.91	1.80	3.73	3.71		1.91	0.030	0.019	63.579	
	4.1	D	Pipe	2"	STD	3.91	1.80	3.97	3.74		1.94	0.345	0.016	119.025	Note 3
5	5.1	A	Elbow	2"	STD	3.91	1.80	4.19	4.18		2.38	0.015	-0.026	158.449	
	5.1	B	Elbow	2"	STD	3.91	1.80	4.10	4.14		2.34	-0.060	-0.022	-106.114	Note 1
	5.1	C	Elbow	2"	STD	3.91	1.80	3.72	3.75		1.95	-0.045	0.015	127.116	
	5.1	D	Elbow	2"	STD	3.91	1.80	4.50	3.82		2.02	1.021	0.009	234.096	Note 3
	5.2	A	Elbow	2"	STD	3.91	1.80	4.08	4.19		2.39	-0.165	-0.027	-89.027	Note 1
	5.2	B	Elbow	2"	STD	3.91	1.80	4.22	4.06		2.26	0.240	-0.014	-157.145	Note 3
	5.2	C	Elbow	2"	STD	3.91	1.80	3.75	3.71		1.91	0.060	0.019	31.790	
	5.2	D	Elbow	2"	STD	3.91	1.80	4.22	4.26		2.46	-0.060	-0.034	-73.308	Note 1
	5.3	A	Elbow	2"	STD	3.91	1.80	4.05	4.17		2.37	-0.180	-0.025	-95.073	Note 1
	5.3	B	Elbow	2"	STD	3.91	1.80	4.46	4.36		2.56	0.150	-0.043	-59.335	Note 1, 3
	5.3	C	Elbow	2"	STD	3.91	1.80	3.97	3.86		2.06	0.165	0.005	429.716	Note 3
	5.3	D	Elbow	2"	STD	3.91	1.80	4.17	4.16		2.36	0.015	-0.024	157.118	
6	6.1	A	Elbow	2"	STD	3.91	1.80	-	3.97		2.17	-	-0.006	-377.218	Note 1
	6.1	B	Elbow	2"	STD	3.91	1.80	-	4.31		2.51	-	-0.038	-65.448	Note 1
	6.1	C	Elbow	2"	STD	3.91	1.80	-	3.99		2.19	-	-0.008	-285.521	Note 1
	6.1	D	Elbow	2"	STD	3.91	1.80	-	4.37		2.57	-	-0.044	-58.272	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	44 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
6	6.2	A	Elbow	2"	STD	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	
	6.2	B	Elbow	2"	STD	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	6.2	C	Elbow	2"	STD	3.91	1.80	-	3.93		2.13	-	-0.002	-1110.795	Note 1
	6.2	D	Elbow	2"	STD	3.91	1.80	-	4.07		2.27	-	-0.015	-147.976	Note 1
	6.3	A	Elbow	2"	STD	3.91	1.80	-	3.92		2.12	-	-0.001	-2211.160	Note 1
	6.3	B	Elbow	2"	STD	3.91	1.80	-	4.18		2.38	-	-0.026	-91.939	Note 1
	6.3	C	Elbow	2"	STD	3.91	1.80	-	3.75		1.95	-	0.015	127.116	
	6.3	D	Elbow	2"	STD	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
7	7.1	A	Pipe	2"	STD	3.91	1.80	-	3.81		2.01	-	0.010	209.643	
	7.1	B	Pipe	2"	STD	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	7.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	7.1	D	Pipe	2"	STD	3.91	1.80	-	3.85		2.05	-	0.006	356.358	
8	8.1	A	Elbow	2"	STD	3.91	1.80	3.80	3.79		1.99	0.015	0.012	132.485	
	8.1	B	Elbow	2"	STD	3.91	1.80	3.88	3.84		2.04	0.060	0.007	303.960	Note 1, 3
	8.1	C	Elbow	2"	STD	3.91	1.80	3.93	3.83		2.03	0.150	0.008	264.661	Note 3
	8.1	D	Elbow	2"	STD	3.91	1.80	3.73	3.77		1.97	-0.060	0.013	146.765	
	8.2	A	Elbow	2"	STD	3.91	1.80	3.98	4.00		2.20	-0.030	-0.009	-254.956	Note 1
	8.2	B	Elbow	2"	STD	3.91	1.80	4.00	4.01		2.21	-0.015	-0.010	-230.503	Note 1
	8.2	C	Elbow	2"	STD	3.91	1.80	3.83	3.81		2.01	0.030	0.010	66.908	
	8.2	D	Elbow	2"	STD	3.91	1.80	3.62	3.71		1.91	-0.135	0.019	99.606	
	8.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.99		2.19	-0.015	-0.008	-285.521	Note 1
	8.3	B	Elbow	2"	STD	3.91	1.80	3.84	3.83		2.03	0.015	0.008	135.148	
	8.3	C	Elbow	2"	STD	3.91	1.80	3.78	3.71		1.91	0.105	0.019	99.606	Note 3
	8.3	D	Elbow	2"	STD	3.91	1.80	3.87	3.82		2.02	0.075	0.009	234.096	Note 3
9	9.1	A	Pipe	2"	STD	3.91	1.80	3.72	3.67		1.87	0.075	0.023	81.267	Note 3
	9.1	B	Pipe	2"	STD	3.91	1.80	3.64	3.63		1.83	0.015	0.027	68.167	
	9.1	C	Pipe	2"	STD	3.91	1.80	3.75	3.68		1.88	0.105	0.022	85.254	Note 3
	9.1	D	Pipe	2"	STD	3.91	1.80	3.61	3.56		1.76	0.075	0.034	52.448	Note 3
10	10.1	A	Elbow	2"	STD	3.91	1.80	4.08	4.01		2.21	0.105	-0.010	-230.503	Note 1, 3
	10.1	B	Elbow	2"	STD	3.91	1.80	4.29	3.96		2.16	0.496	-0.005	-450.576	Note 1, 3
	10.1	C	Elbow	2"	STD	3.91	1.80	3.73	3.76		1.96	-0.045	0.014	136.285	
	10.1	D	Elbow	2"	STD	3.91	1.80	3.91	4.27		2.47	-0.541	-0.035	-71.561	Note 1
	10.2	A	Elbow	2"	STD	3.91	1.80	3.92	3.92		2.12	0.000	-0.001	#DIV/0!	Note 1
	10.2	B	Elbow	2"	STD	3.91	1.80	4.26	3.93		2.13	0.496	-0.002	-1110.795	Note 1, 3
	10.2	C	Elbow	2"	STD	3.91	1.80	3.90	3.77		1.97	0.195	0.013	146.765	Note 3
	10.2	D	Elbow	2"	STD	3.91	1.80	3.88	4.37		2.57	-0.736	-0.044	-58.272	Note 1
	10.3	A	Elbow	2"	STD	3.91	1.80	4.07	4.01		2.21	0.090	-0.010	-230.503	Note 1, 3
	10.3	B	Elbow	2"	STD	3.91	1.80	4.33	4.17		2.37	0.240	-0.025	-95.073	Note 1, 3
	10.3	C	Elbow	2"	STD	3.91	1.80	3.76	3.78		1.98	-0.030	0.012	158.857	
	10.3	D	Elbow	2"	STD	3.91	1.80	3.98	4.40		2.60	-0.631	-0.047	-55.343	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	45 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
11	11.1	A	Pipe	2"	STD	3.91	1.80	3.69	3.56		1.76	0.195	0.034	52.448	Note 3
	11.1	B	Pipe	2"	STD	3.91	1.80	3.82	3.75		1.95	0.105	0.015	127.116	Note 3
	11.1	C	Pipe	2"	STD	3.91	1.80	3.66	3.74		1.94	-0.120	0.016	119.025	
	11.1	D	Pipe	2"	STD	3.91	1.80	3.63	3.76		1.96	-0.195	0.014	136.285	
12	12.1	A	Elbow	2"	STD	3.91	1.80	3.95	3.94		2.14	0.015	-0.003	142.471	
	12.1	B	Elbow	2"	STD	3.91	1.80	3.91	3.89		2.09	0.030	0.002	69.571	
	12.1	C	Elbow	2"	STD	3.91	1.80	3.58	3.58		1.78	0.000	0.032	56.259	
	12.1	D	Elbow	2"	STD	3.91	1.80	3.99	4.08		2.28	-0.135	-0.016	-139.885	Note 1
	12.2	A	Elbow	2"	STD	3.91	1.80	4.08	3.96		2.16	0.180	-0.005	-450.576	Note 1, 3
	12.2	B	Elbow	2"	STD	3.91	1.80	3.83	3.76		1.96	0.105	0.014	136.285	Note 1, 3
	12.2	C	Elbow	2"	STD	3.91	1.80	3.63	3.70		1.90	-0.105	0.020	94.367	
	12.2	D	Elbow	2"	STD	3.91	1.80	4.20	4.14		2.34	0.090	-0.022	-106.114	Note 1, 3
	12.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.94		2.14	0.060	-0.003	-744.007	Note 1, 3
	12.3	B	Elbow	2"	STD	3.91	1.80	3.77	3.77		1.97	0.000	0.013	146.765	
	12.3	C	Elbow	2"	STD	3.91	1.80	3.56	3.69		1.89	-0.195	0.021	89.603	
	12.3	D	Elbow	2"	STD	3.91	1.80	4.16	4.16		2.36	0.000	-0.024	#DIV/0!	Note 1
13	13.1	A	Pipe	2"	STD	3.91	1.80	3.79	3.54		1.74	0.376	0.035	49.049	Note 1, 3
	13.1	B	Pipe	2"	STD	3.91	1.80	3.71	3.58		1.78	0.195	0.032	56.259	Note 1, 3
	13.1	C	Pipe	2"	STD	3.91	1.80	3.56	3.73		1.93	-0.255	0.017	111.833	
	13.1	D	Pipe	2"	STD	3.91	1.80	3.54	3.65		1.85	-0.165	0.025	74.213	
14	14.1	A	Elbow	2"	STD	3.91	1.80	3.96	3.90		2.10	0.090	0.001	2190.300	Note 1, 3
	14.1	B	Elbow	2"	STD	3.91	1.80	3.98	4.04		2.24	-0.090	-0.012	-179.717	Note 1
	14.1	C	Elbow	2"	STD	3.91	1.80	3.92	4.01		2.21	-0.135	-0.010	-230.503	Note 1
	14.1	D	Elbow	2"	STD	3.91	1.80	4.57	4.16		2.36	0.616	-0.024	-98.459	Note 1, 3
	14.2	A	Elbow	2"	STD	3.91	1.80	3.81	3.81		2.01	0.000	0.010	209.643	
	14.2	B	Elbow	2"	STD	3.91	1.80	4.06	4.04		2.24	0.030	-0.012	-179.717	Note 1, 3
	14.2	C	Elbow	2"	STD	3.91	1.80	4.12	4.09		2.29	0.045	-0.017	-132.693	Note 1, 3
	14.2	D	Elbow	2"	STD	3.91	1.80	4.17	4.11		2.31	0.090	-0.019	-120.467	Note 1, 3
	14.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.83		2.03	0.045	0.008	264.661	Note 3
	14.3	B	Elbow	2"	STD	3.91	1.80	4.18	4.14		2.34	0.060	-0.022	-106.114	Note 1, 3
	14.3	C	Elbow	2"	STD	3.91	1.80	4.18	4.17		2.37	0.015	-0.025	157.784	
	14.3	D	Elbow	2"	STD	3.91	1.80	4.12	4.13		2.33	-0.015	-0.021	-155.121	Note 1
15	15.1	A	Pipe	2"	STD	3.91	1.80	3.54	3.64		1.84	-0.150	0.026	71.079	
	15.1	B	Pipe	2"	STD	3.91	1.80	3.57	3.63		1.83	-0.090	0.027	68.167	
	15.1	C	Pipe	2"	STD	3.91	1.80	3.83	3.74		1.94	0.135	0.016	119.025	Note 3
	15.1	D	Pipe	2"	STD	3.91	1.80	3.51	3.63		1.83	-0.180	0.027	68.167	
16	16.1	A	Pipe	2"	STD	3.91	1.80	-	3.75		1.95	-	0.015	127.116	
	16.1	B	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	16.1	C	Pipe	2"	STD	3.91	1.80	-	3.80		2.00	-	0.011	189.636	
	16.1	D	Pipe	2"	STD	3.91	1.80	-	3.67		1.87	-	0.023	81.267	

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	46 of 98
Code :	Rev.: 00
Effective date :	

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
17	17.1	A	Pipe	2"	STD	3.91	1.80	-	3.72		1.92	-	0.018	105.398	
	17.1	B	Pipe	2"	STD	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
	17.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	17.1	D	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
18	18.1	A	Pipe	2"	STD	3.91	1.80	-	3.69		1.89	-	0.021	89.603	
	18.1	B	Pipe	2"	STD	3.91	1.80	-	3.86		2.06	-	0.005	429.716	
	18.1	C	Pipe	2"	STD	3.91	1.80	-	3.81		2.01	-	0.010	209.643	
	18.1	D	Pipe	2"	STD	3.91	1.80	-	3.74		1.94	-	0.016	119.025	
19	19.1	A	Elbow	2"	STD	3.91	1.80	3.88	3.86		2.06	0.030	0.005	68.573	
	19.1	B	Elbow	2"	STD	3.91	1.80	3.82	4.15		2.35	-0.496	-0.023	-102.127	Note 1
	19.1	C	Elbow	2"	STD	3.91	1.80	3.84	3.83		2.03	0.015	0.008	135.148	
	19.1	D	Elbow	2"	STD	3.91	1.80	4.08	3.76		1.96	0.481	0.014	136.285	Note 3
	19.2	A	Elbow	2"	STD	3.91	1.80	3.79	3.76		1.96	0.045	0.014	136.285	Note 3
	19.2	B	Elbow	2"	STD	3.91	1.80	3.80	3.95		2.15	-0.225	-0.004	-560.612	Note 1
	19.2	C	Elbow	2"	STD	3.91	1.80	3.76	3.83		2.03	-0.105	0.008	264.661	
	19.2	D	Elbow	2"	STD	3.91	1.80	4.10	3.81		2.01	0.436	0.010	209.643	Note 3
	19.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.90		2.10	-0.060	0.001	2190.300	
	19.3	B	Elbow	2"	STD	3.91	1.80	3.93	4.09		2.29	-0.240	-0.017	-132.693	Note 1
	19.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.78		1.98	-0.060	0.012	158.857	
	19.3	D	Elbow	2"	STD	3.91	1.80	3.98	3.84		2.04	0.210	0.007	303.960	Note 3
20	20.1	A	Pipe	2"	STD	3.91	1.80	3.86	3.81		2.01	0.075	0.010	209.643	Note 3
	20.1	B	Pipe	2"	STD	3.91	1.80	3.93	3.77		1.97	0.240	0.013	146.765	Note 3
	20.1	C	Pipe	2"	STD	3.91	1.80	3.74	3.84		2.04	-0.150	0.007	303.960	
	20.1	D	Pipe	2"	STD	3.91	1.80	3.98	3.65		1.85	0.496	0.025	74.213	Note 3
21	21.1	A	Elbow	2"	STD	3.91	1.80	4.07	3.91		2.11	0.240	0.000	#DIV/0!	Note 1, 3
	21.1	B	Elbow	2"	STD	3.91	1.80	4.17	4.18		2.38	-0.015	-0.026	-158.449	Note 1
	21.1	C	Elbow	2"	STD	3.91	1.80	3.78	3.88		2.08	-0.150	0.003	723.147	
	21.1	D	Elbow	2"	STD	3.91	1.80	4.45	4.18		2.38	0.406	-0.026	-91.939	Note 1, 3
	21.2	A	Elbow	2"	STD	3.91	1.80	3.98	4.15		2.35	-0.255	-0.023	-102.127	Note 1
	21.2	B	Elbow	2"	STD	3.91	1.80	4.23	4.24		2.44	-0.015	-0.032	-162.444	Note 1
	21.2	C	Elbow	2"	STD	3.91	1.80	3.98	3.81		2.01	0.255	0.010	209.643	Note 3
	21.2	D	Elbow	2"	STD	3.91	1.80	4.31	4.15		2.35	0.240	-0.023	-102.127	Note 1, 3
	21.3	A	Elbow	2"	STD	3.91	1.80	3.91	3.97		2.17	-0.090	-0.006	-377.218	Note 1
	21.3	B	Elbow	2"	STD	3.91	1.80	4.09	4.01		2.21	0.120	-0.010	-230.503	Note 1, 3
	21.3	C	Elbow	2"	STD	3.91	1.80	3.79	3.80		2.00	-0.015	0.011	189.636	
	21.3	D	Elbow	2"	STD	3.91	1.80	4.39	4.20		2.40	0.285	-0.028	-86.317	Note 1, 3
22	22.1	A	Pipe	2"	STD	3.91	1.80	3.95	3.83		2.03	0.180	0.008	264.661	Note 3
	22.1	B	Pipe	2"	STD	3.91	1.80	3.84	3.89		2.09	-0.075	0.002	1089.935	
	22.1	C	Pipe	2"	STD	3.91	1.80	3.62	3.75		1.95	-0.195	0.015	127.116	
	22.1	D	Pipe	2"	STD	3.91	1.80	3.90	3.85		2.05	0.075	0.006	356.358	Note 3

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	47 of 98
Code :	Rev.: 00
Effective date :	

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
23	23.1	A	Pipe	2"	STD	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	
	23.1	B	Pipe	2"	STD	3.91	1.80	-	3.74		1.94	-	0.016	119.025	
	23.1	C	Pipe	2"	STD	3.91	1.80	-	3.84		2.04	-	0.007	303.960	
	23.1	D	Pipe	2"	STD	3.91	1.80	-	4.09		2.29	-	-0.017	-132.693	Note 1
24	24.1	A	Elbow	2"	STD	3.91	1.80	4.10	4.00		2.20	0.150	-0.009	-254.956	Note 1, 3
	24.1	B	Elbow	2"	STD	3.91	1.80	4.15	4.10		2.30	0.075	-0.018	-126.258	Note 1, 3
	24.1	C	Elbow	2"	STD	3.91	1.80	3.69	3.72		1.92	-0.045	0.018	105.398	
	24.1	D	Elbow	2"	STD	3.91	1.80	4.39	4.41		2.61	-0.030	-0.048	-86.881	Note 1
	24.2	A	Elbow	2"	STD	3.91	1.80	4.11	3.93		2.13	0.270	-0.002	-1110.795	Note 1, 3
	24.2	B	Elbow	2"	STD	3.91	1.80	4.15	4.07		2.27	0.120	-0.015	-147.976	Note 1, 3
	24.2	C	Elbow	2"	STD	3.91	1.80	3.87	3.90		2.10	-0.045	0.001	2190.300	
	24.2	D	Elbow	2"	STD	3.91	1.80	4.47	4.44		2.64	0.045	-0.051	-51.953	Note 1, 3
	24.3	A	Elbow	2"	STD	3.91	1.80	4.15	4.17		2.37	-0.030	-0.025	-95.073	Note 1
	24.3	B	Elbow	2"	STD	3.91	1.80	4.34	4.14		2.34	0.300	-0.022	-106.114	Note 1, 3
	24.3	C	Elbow	2"	STD	3.91	1.80	3.90	4.02		2.22	-0.180	-0.011	-210.496	Note 1
	24.3	D	Elbow	2"	STD	3.91	1.80	4.39	4.42		2.62	-0.045	-0.049	-58.142	Note 1
25	25.1	A	Pipe	2"	STD	3.91	1.80	3.92	3.95		2.15	-0.045	-0.004	-560.612	Note 1
	25.1	B	Pipe	2"	STD	3.91	1.80	3.61	3.60		1.80	0.015	0.030	60.561	
	25.1	C	Pipe	2"	STD	3.91	1.80	3.72	3.77		1.97	-0.075	0.013	146.765	
	25.1	D	Pipe	2"	STD	3.91	1.80	3.66	3.72		1.92	-0.090	0.018	105.398	
26	26.1	A	Elbow	2"	STD	3.91	1.80	3.97	4.01		2.21	-0.060	-0.010	-230.503	Note 1
	26.1	B	Elbow	2"	STD	3.91	1.80	4.31	4.28		2.48	0.045	-0.035	-69.909	Note 1, 3
	26.1	C	Elbow	2"	STD	3.91	1.80	3.93	4.05		2.25	-0.180	-0.013	-167.625	Note 1
	26.1	D	Elbow	2"	STD	3.91	1.80	4.34	4.26		2.46	0.120	-0.034	-73.308	Note 1, 3
	26.2	A	Elbow	2"	STD	3.91	1.80	3.96	4.06		2.26	-0.150	-0.014	-157.145	Note 1
	26.2	B	Elbow	2"	STD	3.91	1.80	4.19	4.23		2.43	-0.060	-0.031	-79.203	Note 1
	26.2	C	Elbow	2"	STD	3.91	1.80	3.88	3.92		2.12	-0.060	-0.001	-2211.160	Note 1
	26.2	D	Elbow	2"	STD	3.91	1.80	4.31	4.28		2.48	0.045	-0.035	-69.909	Note 1, 3
	26.3	A	Elbow	2"	STD	3.91	1.80	4.14	4.02		2.22	0.180	-0.011	-210.496	Note 1, 3
	26.3	B	Elbow	2"	STD	3.91	1.80	4.23	4.23		2.43	0.000	-0.031	#DIV/0!	Note 1
	26.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.83		2.03	-0.135	0.008	264.661	
	26.3	D	Elbow	2"	STD	3.91	1.80	4.35	4.19		2.39	0.240	-0.027	-89.027	Note 1, 3
27	27.1	A	Pipe	2"	STD	3.91	1.80	3.74	3.82		2.02	-0.120	0.009	234.096	
	27.1	B	Pipe	2"	STD	3.91	1.80	3.70	3.68		1.88	0.030	0.022	62.581	
	27.1	C	Pipe	2"	STD	3.91	1.80	3.68	3.81		2.01	-0.195	0.010	209.643	
	27.1	D	Pipe	2"	STD	3.91	1.80	3.89	3.73		1.93	0.240	0.017	111.833	Note 3
28	28.1	A	Elbow	2"	STD	3.91	1.80	3.75	3.71		1.91	0.060	0.019	99.606	Note 3
	28.1	B	Elbow	2"	STD	3.91	1.80	3.97	3.82		2.02	0.225	0.009	234.096	Note 3
	28.1	C	Elbow	2"	STD	3.91	1.80	3.99	3.93		2.13	0.090	-0.002	-1110.795	Note 1, 3
	28.1	D	Elbow	2"	STD	3.91	1.80	4.08	4.10		2.30	-0.030	-0.018	-126.258	Note 1

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	48 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
28	28.2	A	Elbow	2"	STD	3.91	1.80	3.79	3.80		2.00	-0.015	0.011	189.636	
	28.2	B	Elbow	2"	STD	3.91	1.80	3.84	3.96		2.16	-0.180	-0.005	-450.576	Note 1
	28.2	C	Elbow	2"	STD	3.91	1.80	3.85	3.84		2.04	0.015	0.007	135.814	
	28.2	D	Elbow	2"	STD	3.91	1.80	4.09	4.04		2.24	0.075	-0.012	-179.717	Note 1, 3
	28.3	A	Elbow	2"	STD	3.91	1.80	3.66	3.66		1.86	0.000	0.024	77.599	
	28.3	B	Elbow	2"	STD	3.91	1.80	4.02	3.96		2.16	0.090	-0.005	-450.576	Note 1, 3
	28.3	C	Elbow	2"	STD	3.91	1.80	3.96	3.92		2.12	0.060	-0.001	-2211.160	Note 1, 3
	28.3	D	Elbow	2"	STD	3.91	1.80	4.05	3.90		2.10	0.225	0.001	2190.300	Note 3
29	29.1	A	Pipe	2"	STD	3.91	1.80	3.61	3.90		2.10	-0.436	0.001	2190.300	
	29.1	B	Pipe	2"	STD	3.91	1.80	3.58	3.54		1.74	0.060	0.035	49.049	Note 3
	29.1	C	Pipe	2"	STD	3.91	1.80	3.64	3.70		1.90	-0.090	0.020	94.367	
	29.1	D	Pipe	2"	STD	3.91	1.80	3.88	3.78		1.98	0.150	0.012	158.857	Note 3
30	30.1	A	Elbow	2"	STD	3.91	1.80	3.98	3.95		2.15	0.045	-0.004	-560.612	Note 1, 3
	30.1	B	Elbow	2"	STD	3.91	1.80	3.90	3.77		1.97	0.195	0.013	146.765	Note 3
	30.1	C	Elbow	2"	STD	3.91	1.80	3.84	3.74		1.94	0.150	0.016	119.025	Note 3
	30.1	D	Elbow	2"	STD	3.91	1.80	3.86	3.78		1.98	0.120	0.012	158.857	Note 3
	30.2	A	Elbow	2"	STD	3.91	1.80	3.84	3.85		2.05	-0.015	0.006	356.358	
	30.2	B	Elbow	2"	STD	3.91	1.80	3.82	3.78		1.98	0.060	0.012	158.857	Note 3
	30.2	C	Elbow	2"	STD	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	30.2	D	Elbow	2"	STD	3.91	1.80	4.00	3.89		2.09	0.165	0.002	1089.935	Note 3
	30.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.95		2.15	0.045	-0.004	-560.612	Note 1, 3
	30.3	B	Elbow	2"	STD	3.91	1.80	3.66	3.91		2.11	-0.376	0.000	#DIV/0!	Note 1
	30.3	C	Elbow	2"	STD	3.91	1.80	3.66	3.65		1.85	0.015	0.025	74.213	
	30.3	D	Elbow	2"	STD	3.91	1.80	4.05	3.64		1.84	0.616	0.026	71.079	Note 3
31	31.1	A	Pipe	2"	STD	3.91	1.80	3.50	3.61		1.81	-0.165	0.029	62.928	
	31.1	B	Pipe	2"	STD	3.91	1.80	3.49	3.50		1.70	-0.015	0.039	43.246	
	31.1	C	Pipe	2"	STD	3.91	1.80	3.64	3.64		1.84	0.000	0.026	71.079	
	31.1	D	Pipe	2"	STD	3.91	1.80	3.88	3.75		1.95	0.195	0.015	127.116	Note 3
32	32.1	A	Elbow	2"	STD	3.91	1.80	3.89	3.84		2.04	0.075	0.007	303.960	Note 3
	32.1	B	Elbow	2"	STD	3.91	1.80	3.92	3.92		2.12	0.000	-0.001	#DIV/0!	Note 1
	32.1	C	Elbow	2"	STD	3.91	1.80	3.85	3.91		2.11	-0.090	0.000	#DIV/0!	Note 1
	32.1	D	Elbow	2"	STD	3.91	1.80	4.05	4.21		2.41	-0.240	-0.029	-83.788	Note 1
	32.2	A	Elbow	2"	STD	3.91	1.80	3.99	4.07		2.27	-0.120	-0.015	-147.976	Note 1
	32.2	B	Elbow	2"	STD	3.91	1.80	4.05	3.90		2.10	0.225	0.001	2190.300	Note 3
	32.2	C	Elbow	2"	STD	3.91	1.80	4.01	4.06		2.26	-0.075	-0.014	-157.145	Note 1
	32.2	D	Elbow	2"	STD	3.91	1.80	4.20	4.07		2.27	0.195	-0.015	-147.976	Note 1, 3
	32.3	A	Elbow	2"	STD	3.91	1.80	3.89	3.89		2.09	0.000	0.002	1089.935	
	32.3	B	Elbow	2"	STD	3.91	1.80	4.15	3.99		2.19	0.240	-0.008	-285.521	Note 1, 3
	32.3	C	Elbow	2"	STD	3.91	1.80	3.95	3.92		2.12	0.045	-0.001	-2211.160	Note 1, 3
	32.3	D	Elbow	2"	STD	3.91	1.80	4.12	4.27		2.47	-0.225	-0.035	-71.561	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	49 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
33	33.1	A	Pipe	2"	STD	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	33.1	B	Pipe	2"	STD	3.91	1.80	3.89	3.73		1.93	0.240	0.017	111.833	Note 3
	33.1	C	Pipe	2"	STD	3.91	1.80	3.84	3.85		2.05	-0.015	0.006	356.358	
	33.1	D	Pipe	2"	STD	3.91	1.80	3.71	3.82		2.02	-0.165	0.009	234.096	
34	34.1	A	Pipe	2"	STD	3.91	1.80	-	3.78		1.98	-	0.012	158.857	
	34.1	B	Pipe	2"	STD	3.91	1.80	-	3.87		2.07	-	0.004	539.753	
	34.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	34.1	D	Pipe	2"	STD	3.91	1.80	-	3.84		2.04	-	0.007	303.960	
35	35.1	A	Elbow	2"	STD	3.91	1.80	4.01	4.09		2.29	-0.120	-0.017	-132.693	
	35.1	B	Elbow	2"	STD	3.91	1.80	4.07	4.07		2.27	0.000	-0.015	#DIV/0!	Note 1
	35.1	C	Elbow	2"	STD	3.91	1.80	3.59	3.57		1.77	0.030	0.033	54.297	
	35.1	D	Elbow	2"	STD	3.91	1.80	4.02	4.00		2.20	0.030	-0.009	-254.956	Note 1, 3
	35.2	A	Elbow	2"	STD	3.91	1.80	3.77	3.75		1.95	0.030	0.015	64.911	
	35.2	B	Elbow	2"	STD	3.91	1.80	3.79	4.09		2.29	-0.451	-0.017	-132.693	Note 1
	35.2	C	Elbow	2"	STD	3.91	1.80	3.67	3.81		2.01	-0.210	0.010	209.643	
	35.2	D	Elbow	2"	STD	3.91	1.80	4.06	3.95		2.15	0.165	-0.004	-560.612	Note 1, 3
	35.3	A	Elbow	2"	STD	3.91	1.80	3.94	3.94		2.14	0.000	-0.003	#DIV/0!	Note 1
	35.3	B	Elbow	2"	STD	3.91	1.80	4.22	3.86		2.06	0.541	0.005	429.716	Note 3
	35.3	C	Elbow	2"	STD	3.91	1.80	3.75	3.86		2.06	-0.165	0.005	429.716	
	35.3	D	Elbow	2"	STD	3.91	1.80	3.71	4.18		2.38	-0.706	-0.026	-91.939	Note 1
36	36.1	A	Pipe	2"	STD	3.91	1.80	3.64	3.63		1.83	0.015	0.027	68.167	
	36.1	B	Pipe	2"	STD	3.91	1.80	3.78	3.86		2.06	-0.120	0.005	429.716	
	36.1	C	Pipe	2"	STD	3.91	1.80	3.73	3.72		1.92	0.015	0.018	105.398	
	36.1	D	Pipe	2"	STD	3.91	1.80	3.83	3.85		2.05	-0.030	0.006	356.358	
37	37.1	A	Elbow	2"	STD	3.91	1.80	4.23	4.12		2.32	0.165	-0.020	-115.227	Note 1, 3
	37.1	B	Elbow	2"	STD	3.91	1.80	4.15	4.12		2.32	0.045	-0.020	-115.227	Note 1, 3
	37.1	C	Elbow	2"	STD	3.91	1.80	3.77	3.73		1.93	0.060	0.017	111.833	Note 3
	37.1	D	Elbow	2"	STD	3.91	1.80	4.48	4.44		2.64	0.060	-0.051	-51.953	Note 1, 3
	37.2	A	Elbow	2"	STD	3.91	1.80	4.14	4.05		2.25	0.135	-0.013	-167.625	Note 1, 3
	37.2	B	Elbow	2"	STD	3.91	1.80	4.15	4.42		2.62	-0.406	-0.049	-53.582	Note 1
	37.2	C	Elbow	2"	STD	3.91	1.80	3.76	3.74		1.94	0.030	0.016	64.578	
	37.2	D	Elbow	2"	STD	3.91	1.80	4.44	4.19		2.39	0.376	-0.027	-89.027	Note 1, 3
	37.3	A	Elbow	2"	STD	3.91	1.80	3.94	3.97		2.17	-0.045	-0.006	-377.218	Note 1
	37.3	B	Elbow	2"	STD	3.91	1.80	4.15	4.40		2.60	-0.376	-0.047	-55.343	Note 1
	37.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.71		1.91	0.045	0.019	99.606	Note 3
	37.3	D	Elbow	2"	STD	3.91	1.80	4.44	4.18		2.38	0.391	-0.026	-91.939	Note 1, 3
38	38.1	A	Pipe	2"	STD	3.91	1.80	3.75	3.75		1.95	0.000	0.015	127.116	
	38.1	B	Pipe	2"	STD	3.91	1.80	3.68	3.67		1.87	0.015	0.023	81.267	
	38.1	C	Pipe	2"	STD	3.91	1.80	3.74	3.70		1.90	0.060	0.020	94.367	Note 3
	38.1	D	Pipe	2"	STD	3.91	1.80	4.44	3.74		1.94	1.051	0.016	119.025	Note 3

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	50 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
39	39.1	A	Elbow	2"	STD	3.91	1.80	3.75	3.70		1.90	0.075	0.020	94.367	Note 3
	39.1	B	Elbow	2"	STD	3.91	1.80	4.15	3.93		2.13	0.330	-0.002	-1110.795	Note 1, 3
	39.1	C	Elbow	2"	STD	3.91	1.80	4.12	4.08		2.28	0.060	-0.016	-139.885	Note 3
	39.1	D	Elbow	2"	STD	3.91	1.80	4.16	3.97		2.17	0.285	-0.006	-377.218	Note 3
	39.2	A	Elbow	2"	STD	3.91	1.80	3.82	3.71		1.91	0.165	0.019	99.606	Note 3
	39.2	B	Elbow	2"	STD	3.91	1.80	4.18	4.14		2.34	0.060	-0.022	-106.114	Note 3
	39.2	C	Elbow	2"	STD	3.91	1.80	3.96	3.95		2.15	0.015	-0.004	143.137	
	39.2	D	Elbow	2"	STD	3.91	1.80	3.84	3.82		2.02	0.030	0.009	234.096	Note 3
	39.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.87		2.07	-0.015	0.004	539.753	
	39.3	B	Elbow	2"	STD	3.91	1.80	4.00	4.02		2.22	-0.030	-0.011	-210.496	Note 1
	39.3	C	Elbow	2"	STD	3.91	1.80	3.92	3.94		2.14	-0.030	-0.003	-744.007	Note 1
	39.3	D	Elbow	2"	STD	3.91	1.80	4.11	4.04		2.24	0.105	-0.012	-179.717	Note 3
40	40.1	A	Pipe	2"	STD	3.91	1.80	3.74	3.88		2.08	-0.210	0.003	723.147	
	40.1	B	Pipe	2"	STD	3.91	1.80	3.74	3.87		2.07	-0.195	0.004	539.753	
	40.1	C	Pipe	2"	STD	3.91	1.80	3.76	3.82		2.02	-0.090	0.009	234.096	
	40.1	D	Pipe	2"	STD	3.91	1.80	3.90	3.76		1.96	0.210	0.014	136.285	Note 3
41	41.1	A	Elbow	2"	STD	3.91	1.80	3.42	3.38		1.58	0.060	0.051	26.297	Erosion
	41.1	B	Elbow	2"	STD	3.91	1.80	3.58	3.66		1.86	-0.120	0.024	77.599	
	41.1	C	Elbow	2"	STD	3.91	1.80	3.44	3.33		1.53	0.165	0.056	27.514	Erosion
	41.1	D	Elbow	2"	STD	3.91	1.80	3.57	3.66		1.86	-0.135	0.024	77.599	
	41.2	A	Elbow	2"	STD	3.91	1.80	3.37	3.45		1.65	-0.120	0.044	37.412	Erosion
	41.2	B	Elbow	2"	STD	3.91	1.80	3.59	3.71		1.91	-0.180	0.019	99.606	
	41.2	C	Elbow	2"	STD	3.91	1.80	3.44	3.64		1.84	-0.300	0.026	71.079	
	41.2	D	Elbow	2"	STD	3.91	1.80	3.64	3.59		1.79	0.075	0.031	58.343	Note 3
	41.3	A	Elbow	2"	STD	3.91	1.80	3.45	3.47		1.67	-0.030	0.042	39.587	Erosion
	41.3	B	Elbow	2"	STD	3.91	1.80	3.61	3.64		1.84	-0.045	0.026	71.079	
	41.3	C	Elbow	2"	STD	3.91	1.80	3.58	3.60		1.80	-0.030	0.030	60.561	
	41.3	D	Elbow	2"	STD	3.91	1.80	3.67	3.62		1.82	0.075	0.028	**24.233**	Erosion
42	42.1	A	Pipe	2"	STD	3.91	1.80	3.95	3.98		2.18	-0.045	-0.007	-324.820	Note 1
	42.1	B	Pipe	2"	STD	3.91	1.80	3.82	3.94		2.14	-0.180	-0.003	-744.007	Note 1
	42.1	C	Pipe	2"	STD	3.91	1.80	3.50	3.94		2.14	-0.661	-0.003	-744.007	Note 1
	42.1	D	Pipe	2"	STD	3.91	1.80	3.93	3.83		2.03	0.150	0.008	264.661	Note 3
43	43.1	A	Pipe	2"	STD	3.91	1.80	3.77	3.74		1.94	0.045	0.016	119.025	Note 3
	43.1	B	Pipe	2"	STD	3.91	1.80	3.96	3.90		2.10	0.090	0.001	2190.300	Note 3
	43.1	C	Pipe	2"	STD	3.91	1.80	3.92	3.82		2.02	0.150	0.009	234.096	Note 3
	43.1	D	Pipe	2"	STD	3.91	1.80	3.78	3.74		1.94	0.060	0.016	119.025	Note 3
44	44.1	A	Pipe	1"	80	4.55	1.80	4.35	4.41		2.61	-	0.013	194.445	
	44.1	B	Pipe	1"	80	4.55	1.80	4.41	4.41		2.61	-	0.013	194.445	
	44.1	C	Pipe	1"	80	4.55	1.80	4.41	4.42		2.62	-	0.012	210.205	
	44.1	D	Pipe	1"	80	4.55	1.80	4.56	4.28		2.48	-	0.026	95.801	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

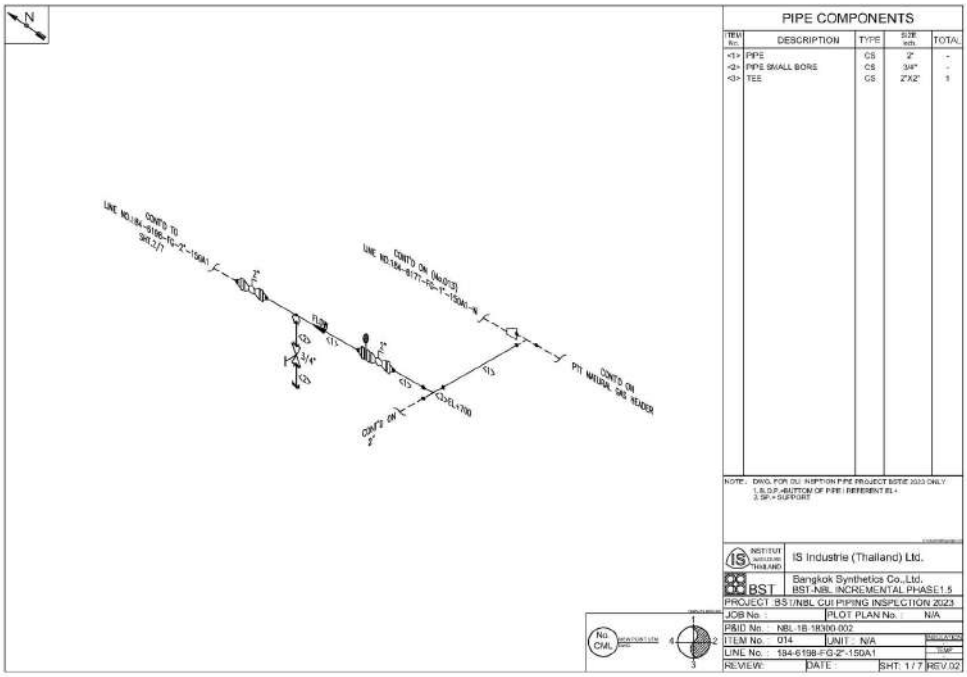
Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	51 of 98	Rev.00

Code : | Rev.: | Effective date :

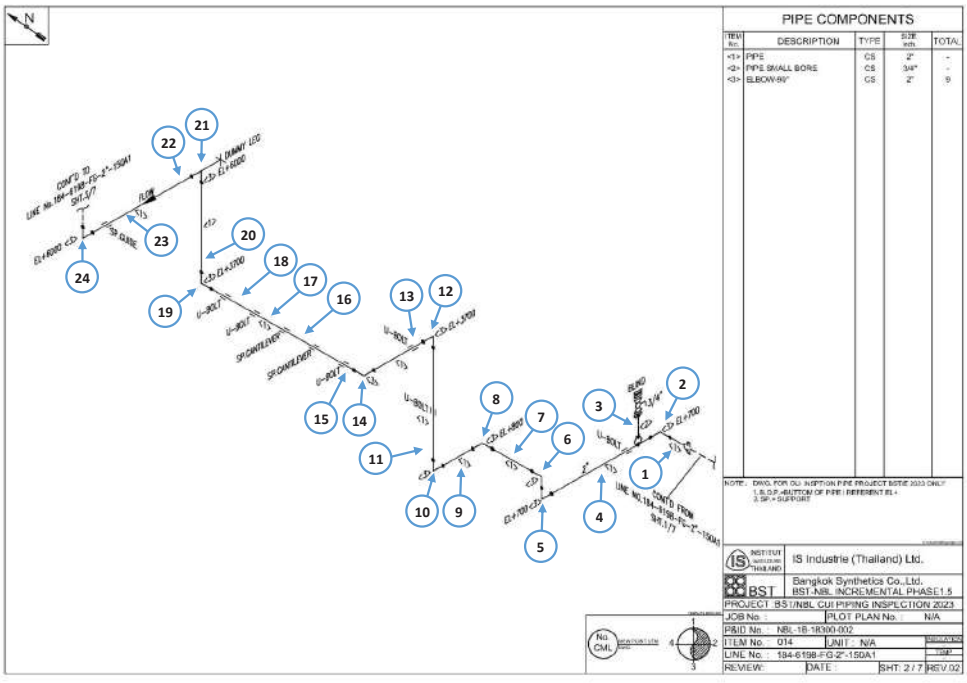
THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
45	45.1	A	Pipe	1"	80	4.55	1.80	4.30	4.46		2.66	-0.240	0.009	308.264	
	45.1	B	Pipe	1"	80	4.55	1.80	4.38	4.59		2.79	-0.315	-0.004	-727.492	Note 1
	45.1	C	Pipe	1"	80	4.55	1.80	4.33	4.49		2.69	-0.240	0.006	467.612	
	45.1	D	Pipe	1"	80	4.55	1.80	4.39	4.43		2.63	-0.060	0.012	228.591	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

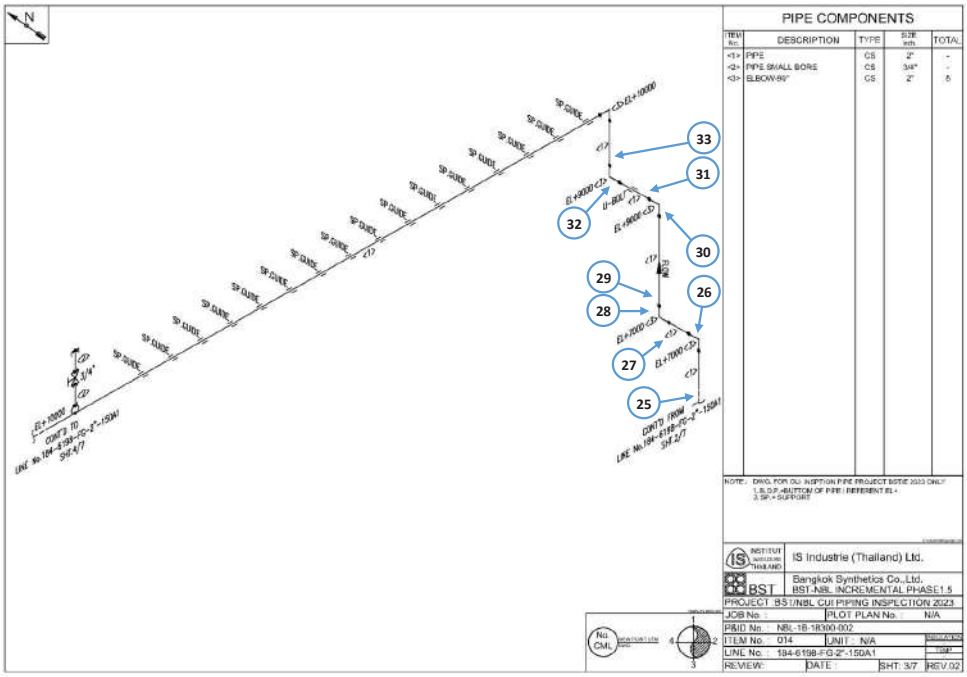


THAILAND



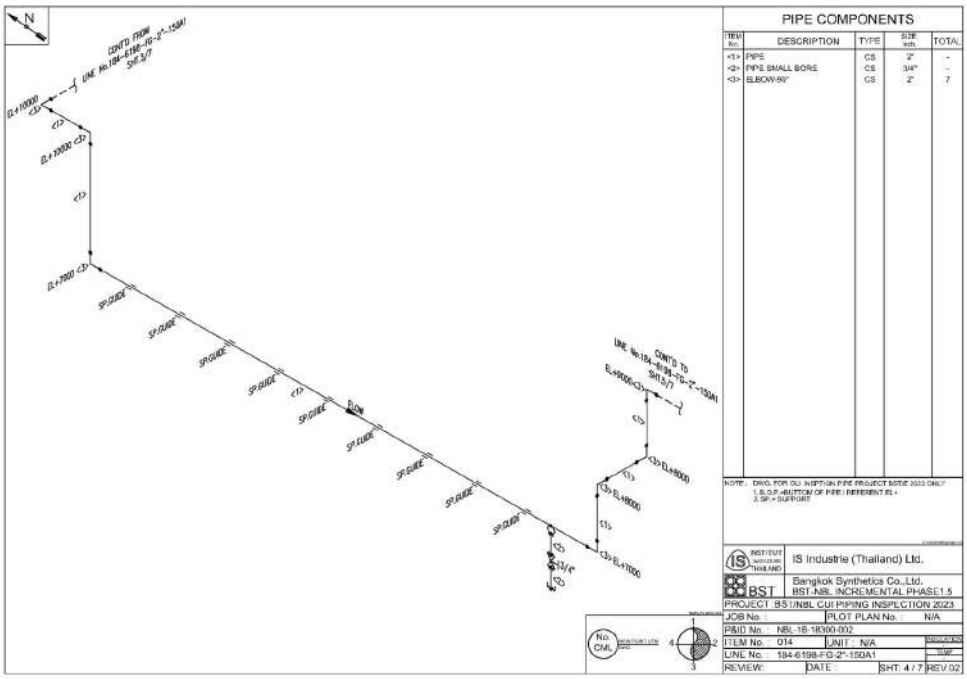
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
Code :	Rev.:	Effective date :	Page : 54 of 98 Rev.00

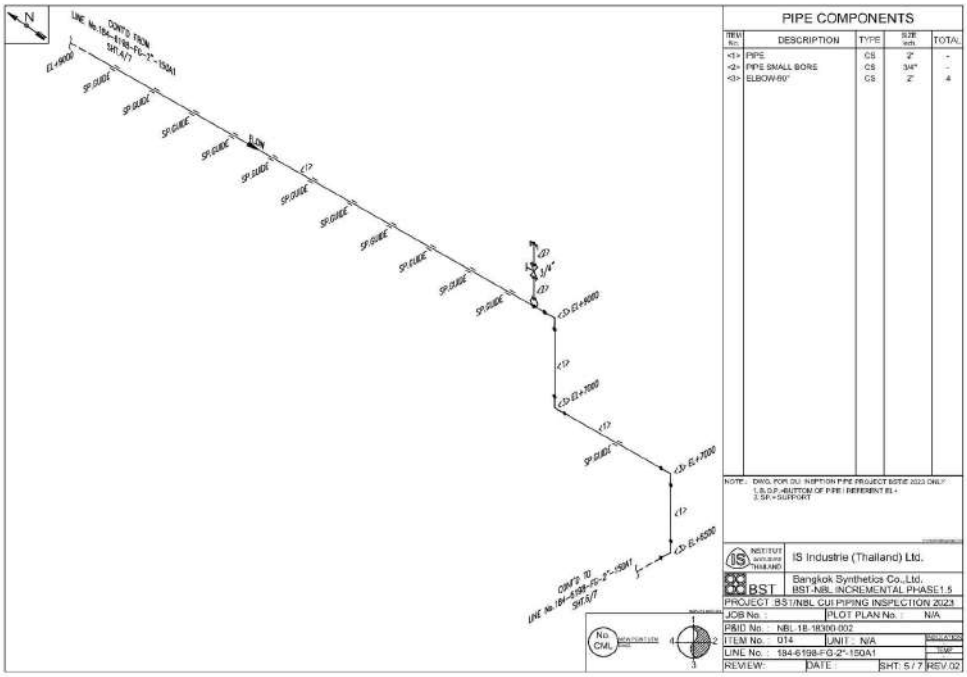


THAILAND

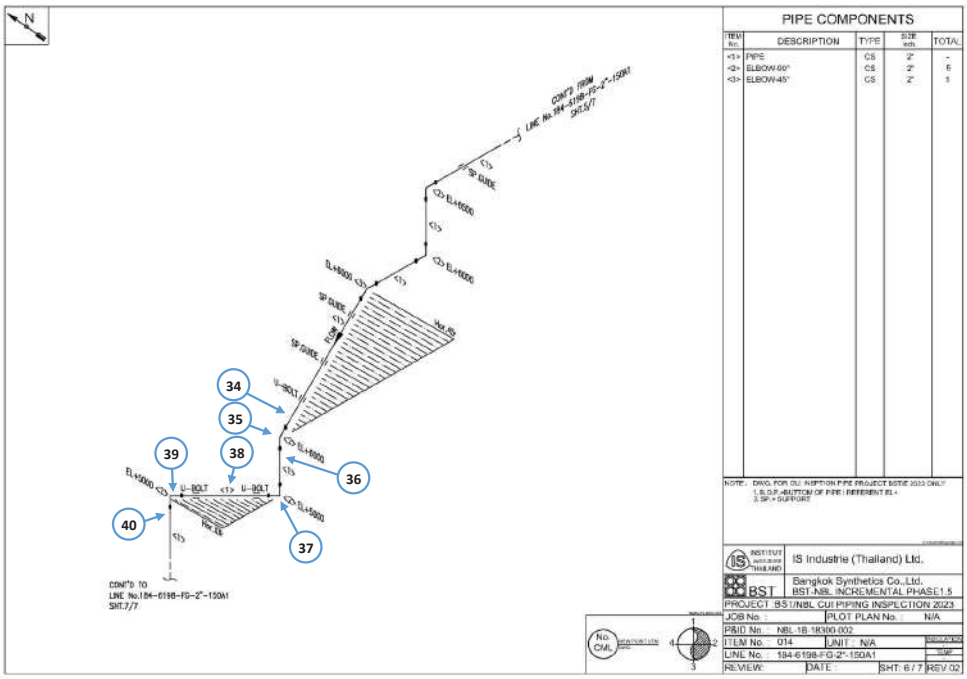
INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
Code :	Rev.:	Effective date :	Page : 55 of 98 Rev.00



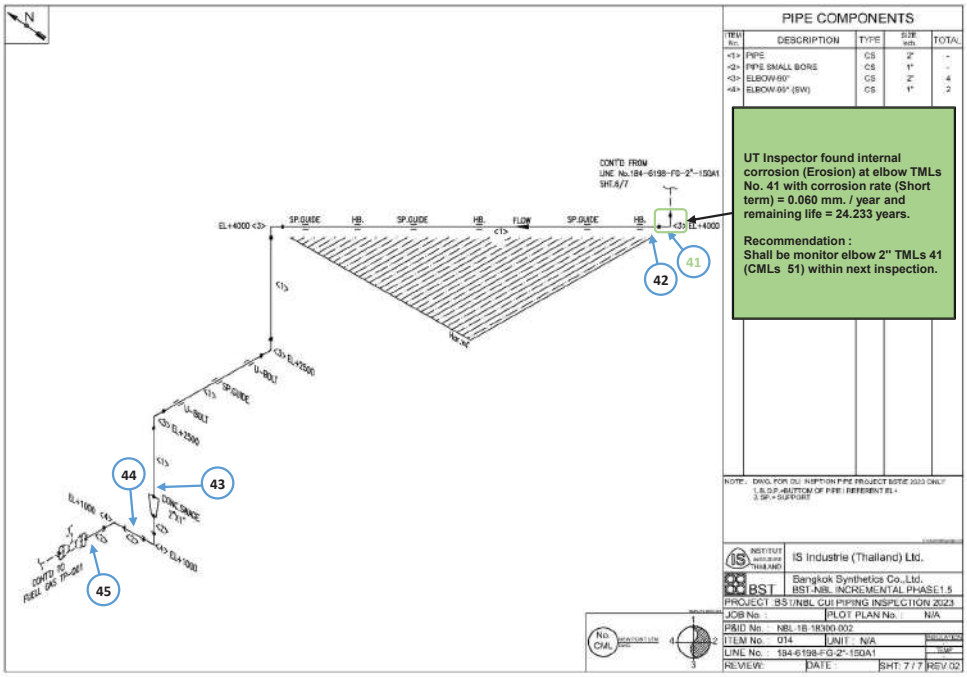
THAILAND



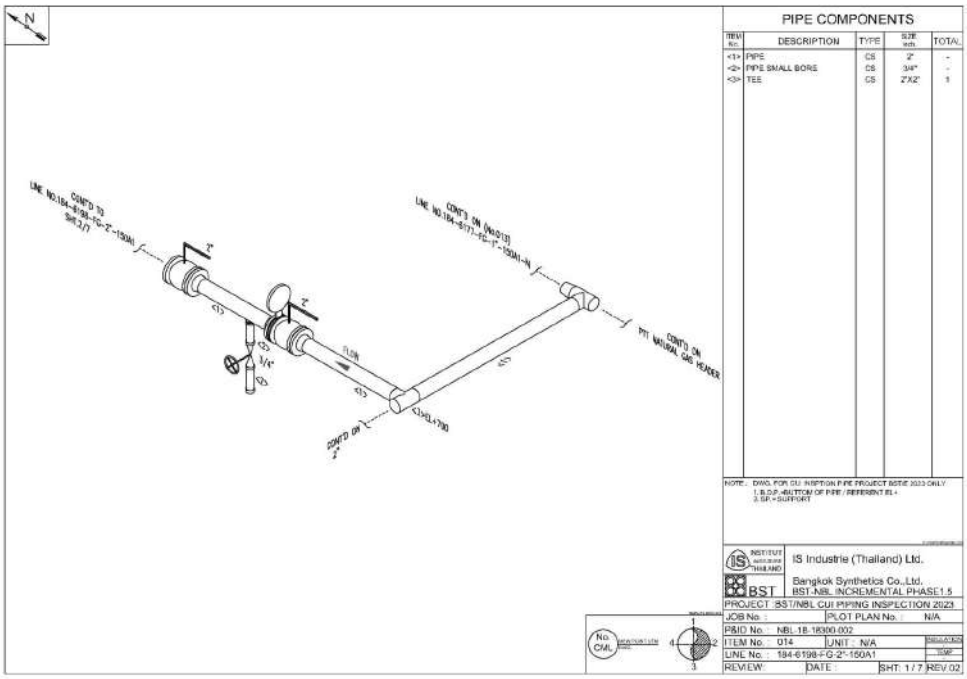
THAILAND



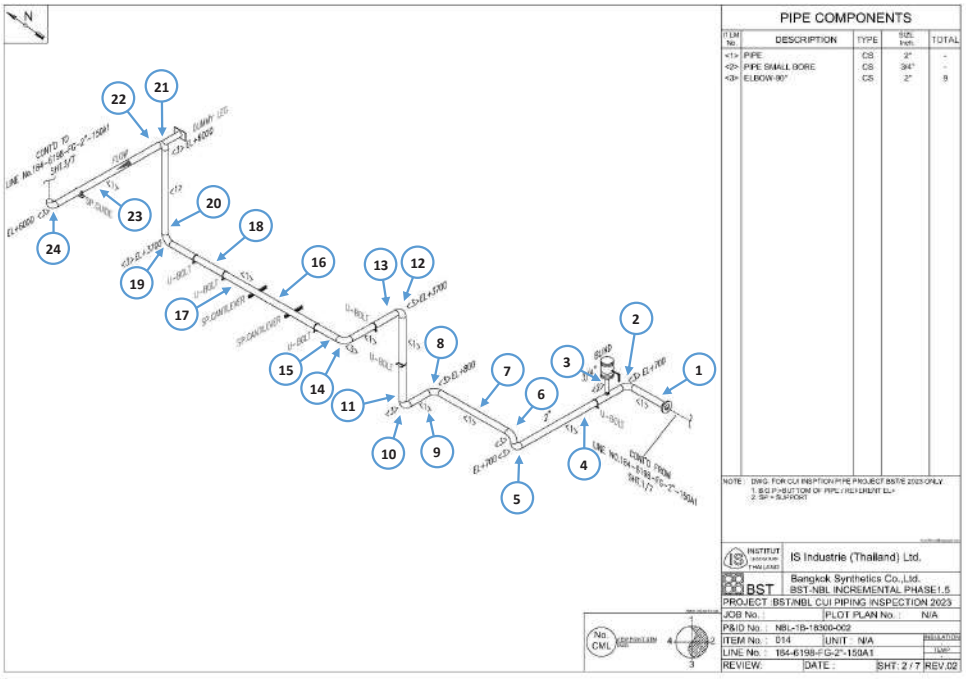
THAILAND

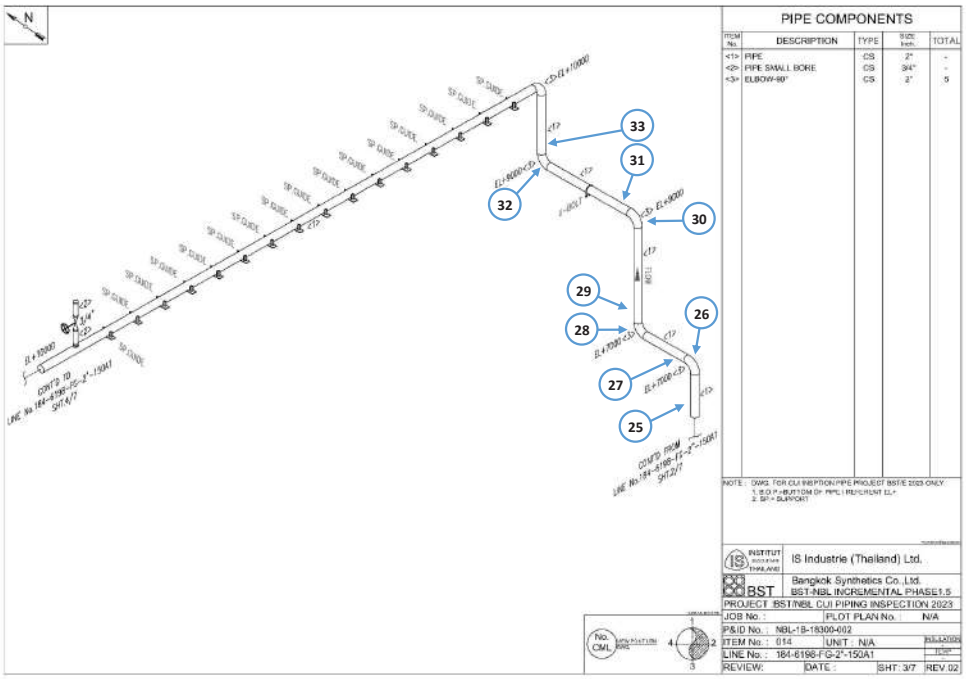


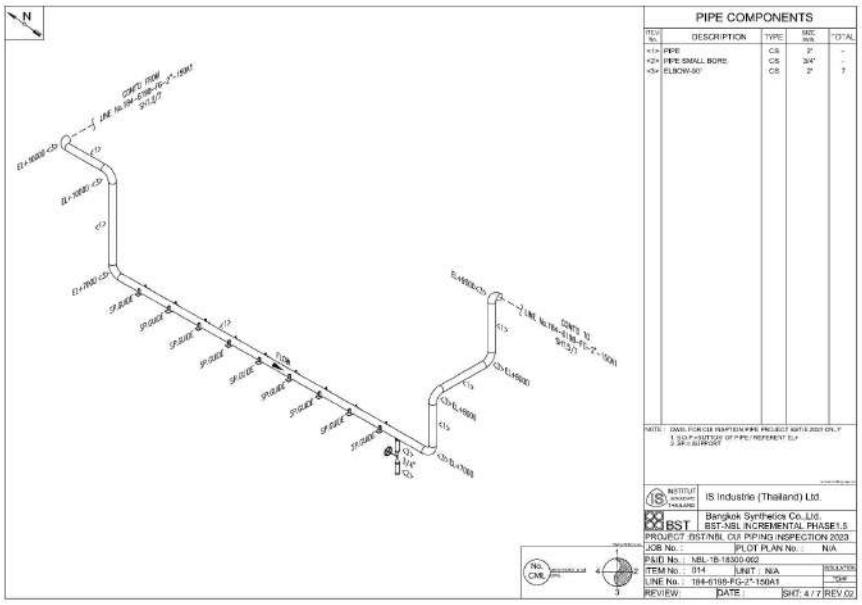
THAILAND

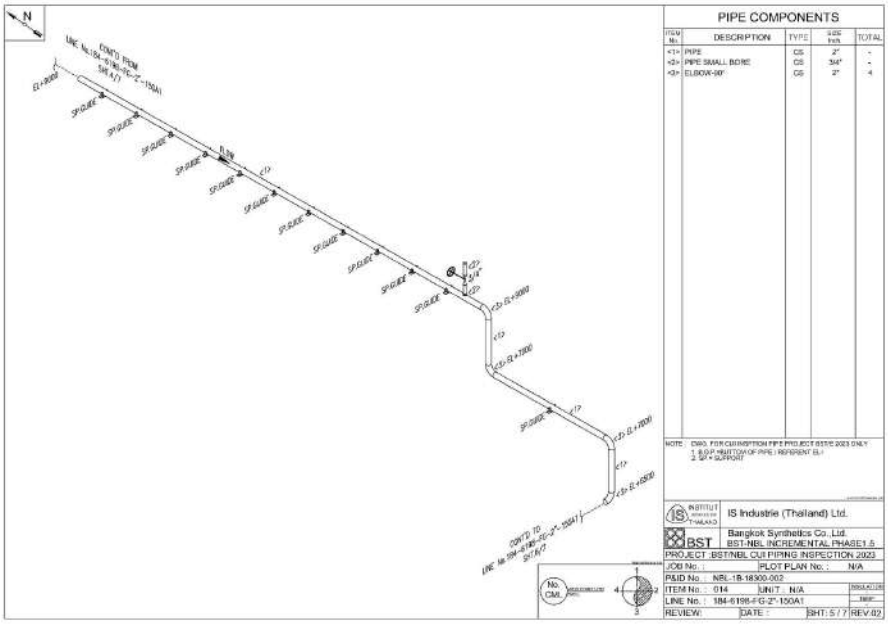


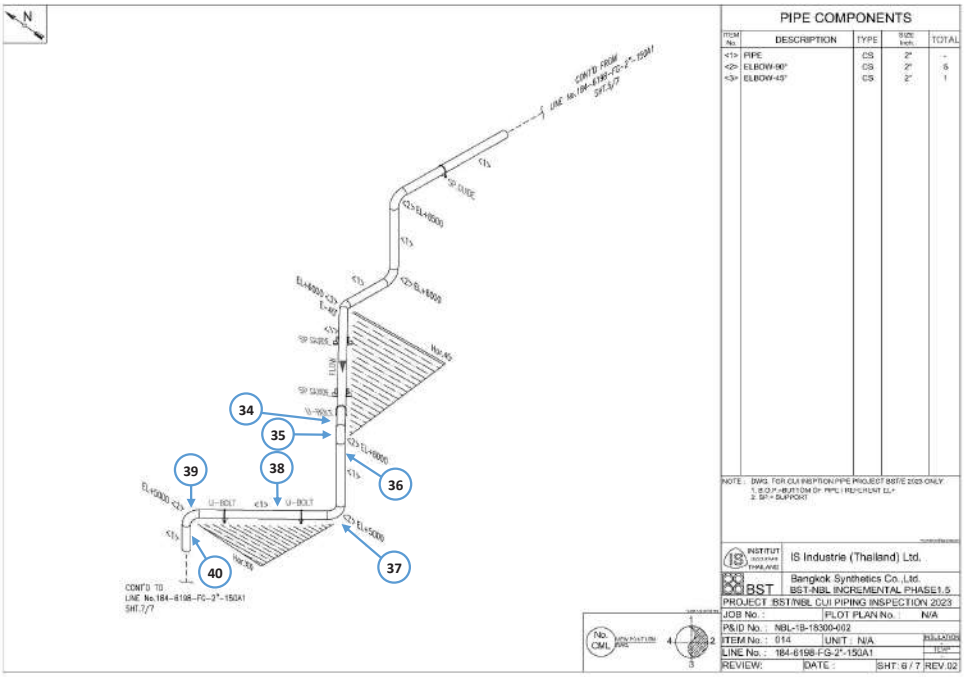
THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BST/E 2023 ONLY.
1. S.E.P = SUCTION OF PIPE / RESIDENT EL=
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02
22
21
23
24
20
18
19
17
16
13
12
15
14
11
8
7
3
2
1
6
10
9
4
5

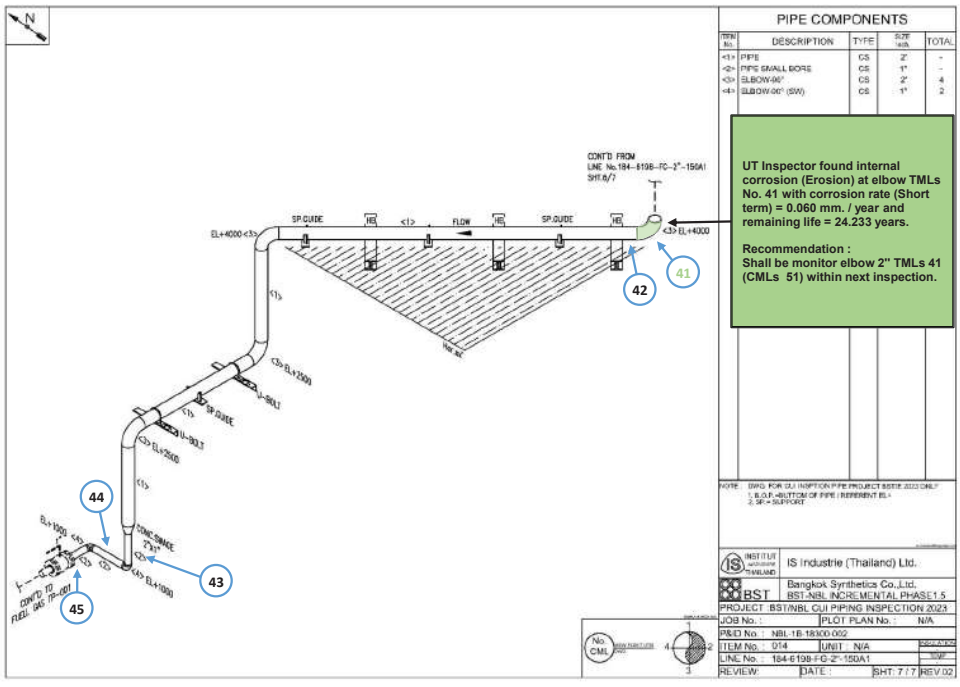

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BST/E 2023 ONLY.
1. S.E.P = SUCTION OF PIPE / RESIDENT EL=
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 3/7 REV.02
33
31
32
30
29
28
26
27
25


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE INCH | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 7
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: | DATE : | SHT: 4 / 7 | REV.02


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE INCH | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: | DATE : | SHT: 5 / 7 | REV.02



THAILAND



THAILAND

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE

TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS

STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other :	HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :	
LIGHTING TYPE :	☑ Natural light	☐ Artificial light			

PART IDENTIFICATION & INFORMATION

EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	184-6198-FG-2"-150A1-N

SCOPE OF INSPECTION

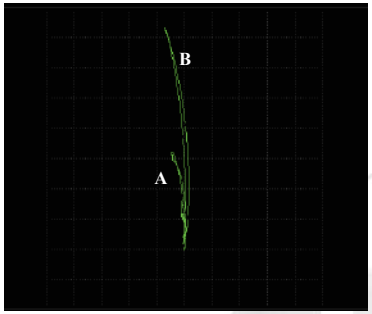
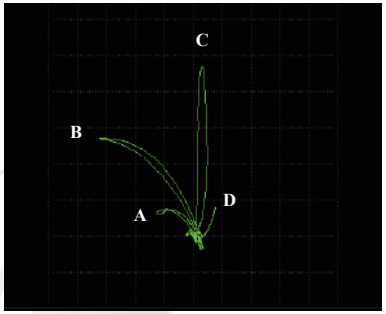
To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	ECT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

SETUP CALIBRATION

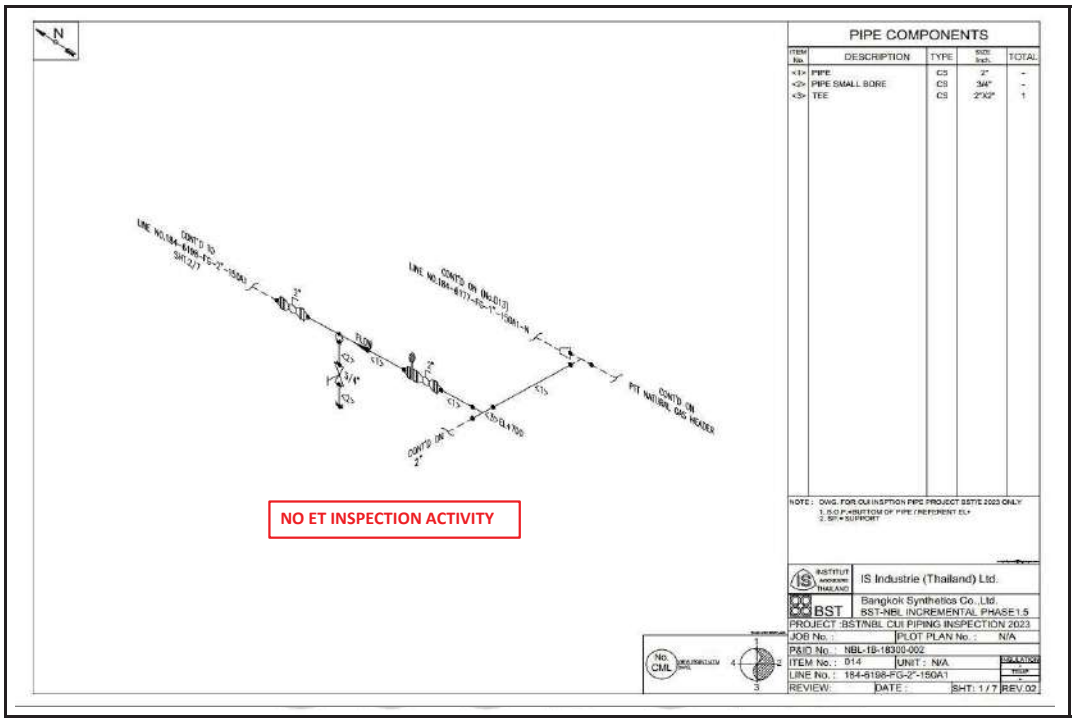
Absolute channel : Surface Signal		Absolute channel : Sub-Surface Signal	
			
Frequency :	500 KHz	Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.	Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.	Absolute Channel Signal B :	Surface Depth 1.0 mm.
		Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
		Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

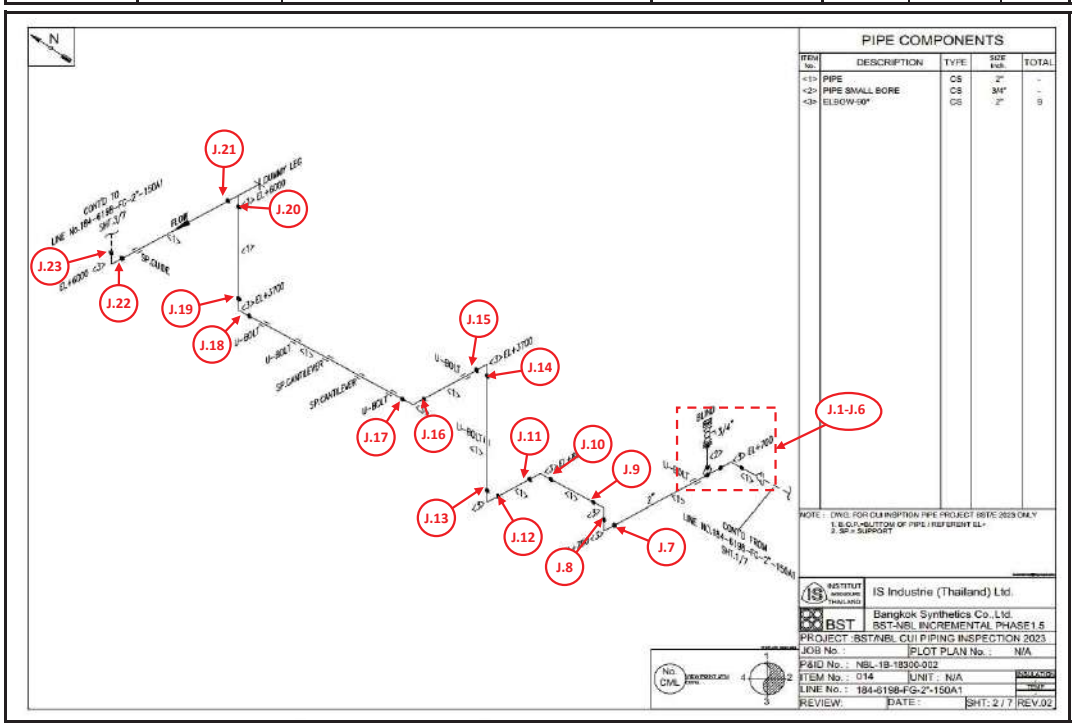
- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

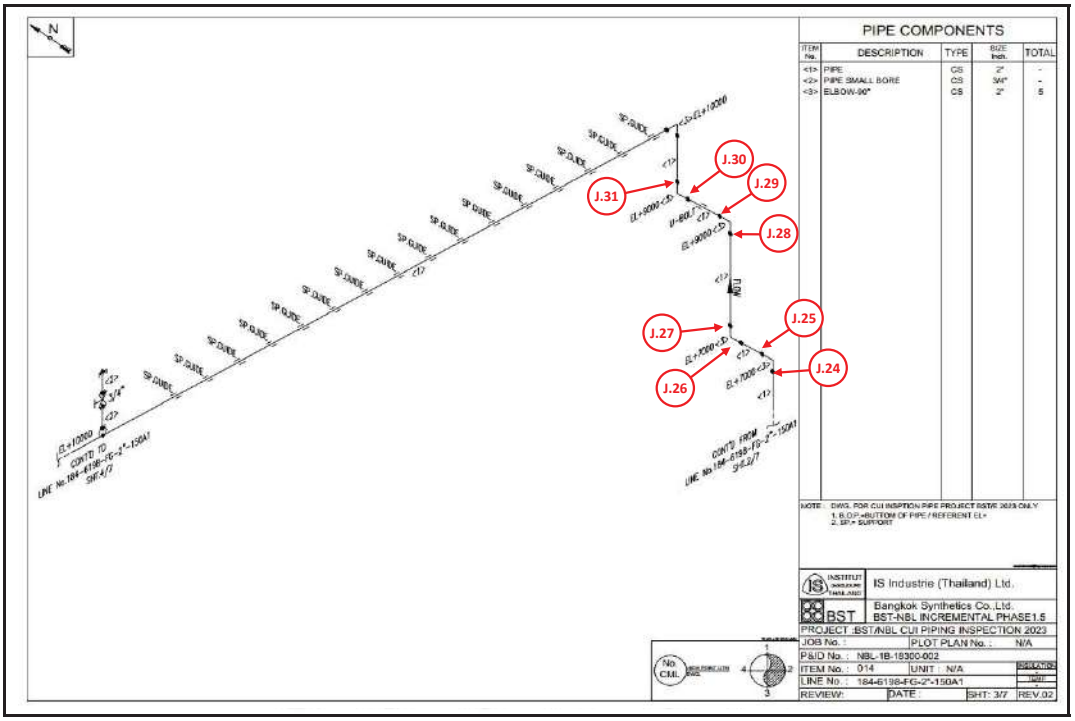
Note : FSH = Full Screen High



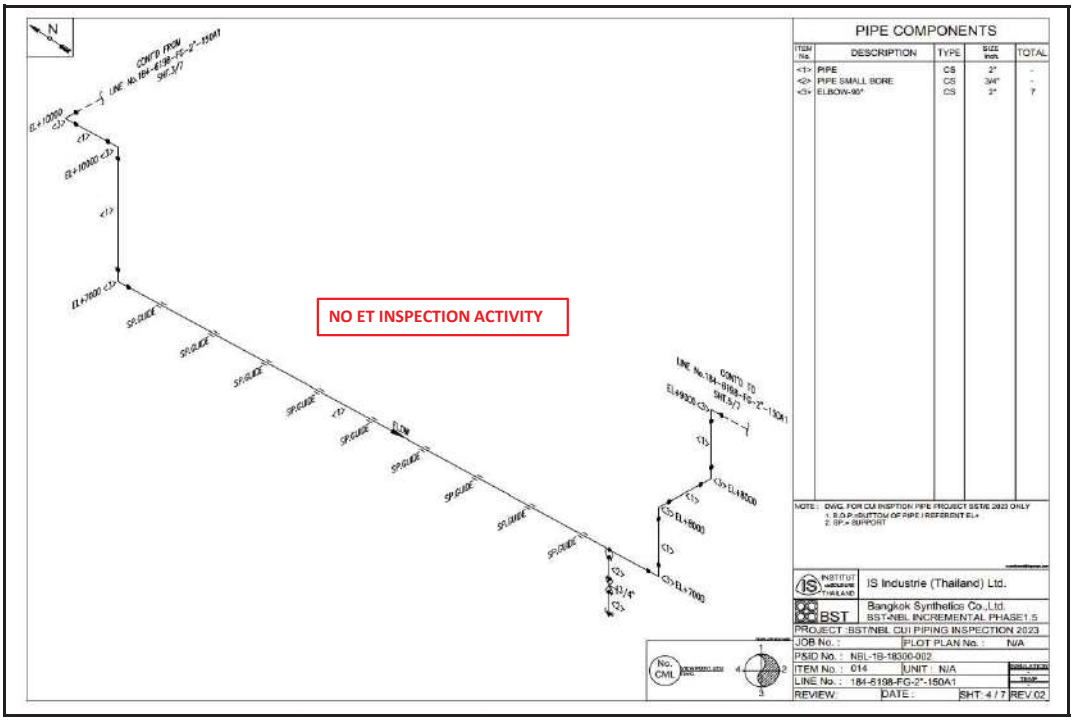
THAILAND



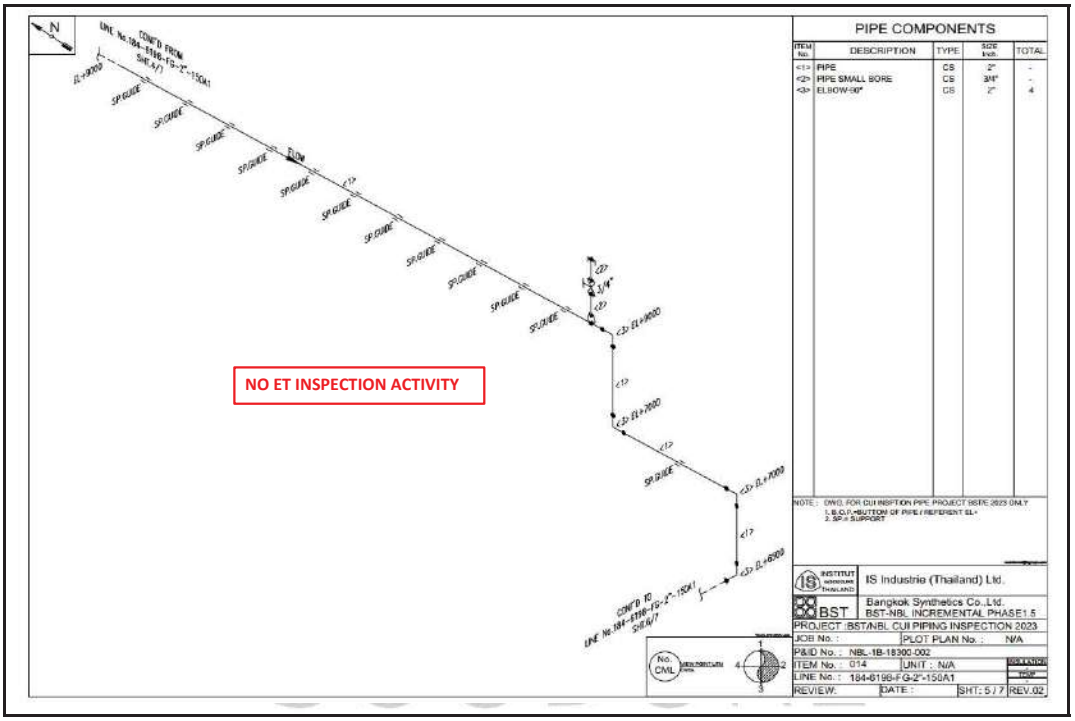
THAILAND

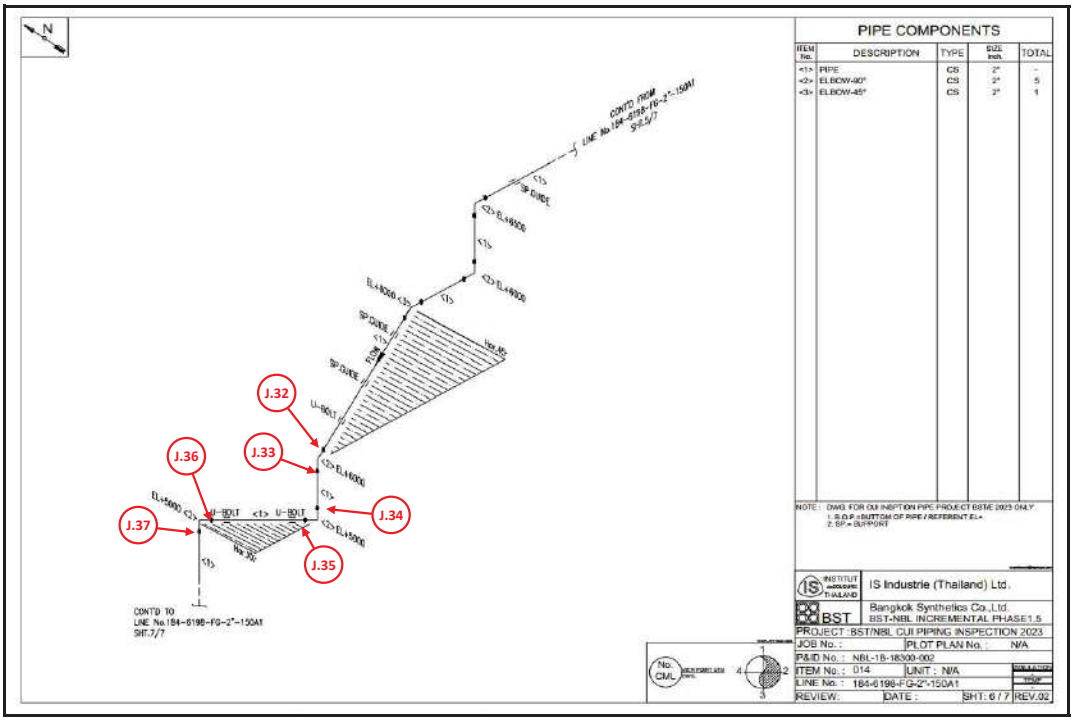


THAILAND

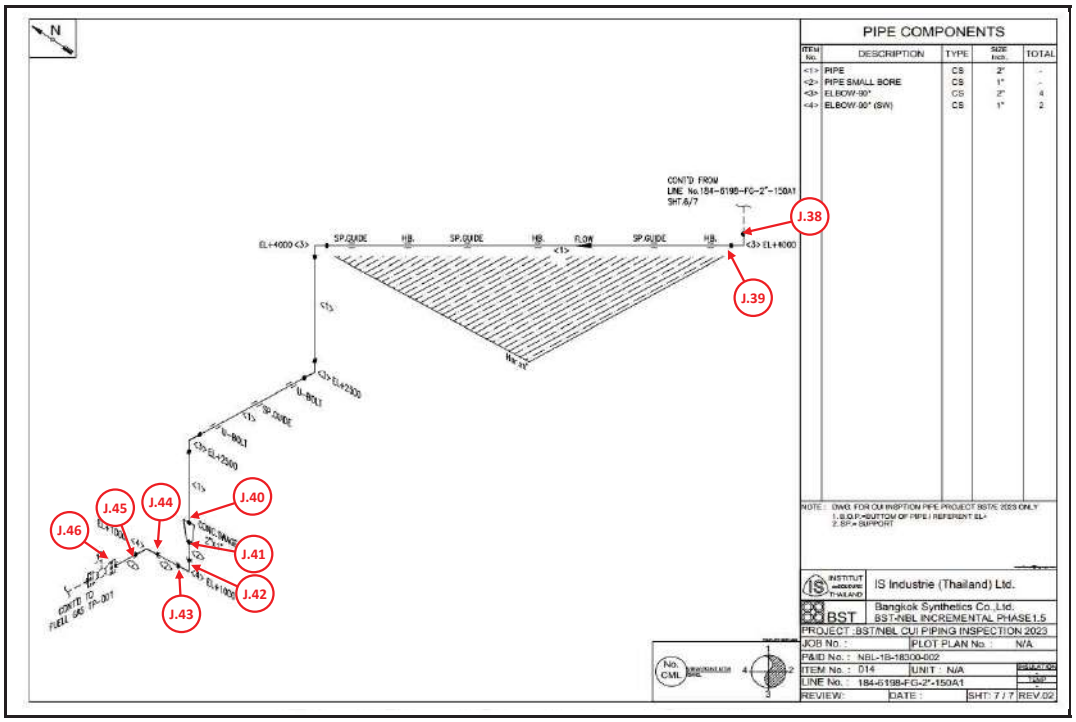


THAILAND


N
NO ET INSPECTION ACTIVITY
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch. | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTPE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 5 / 7 REV.02

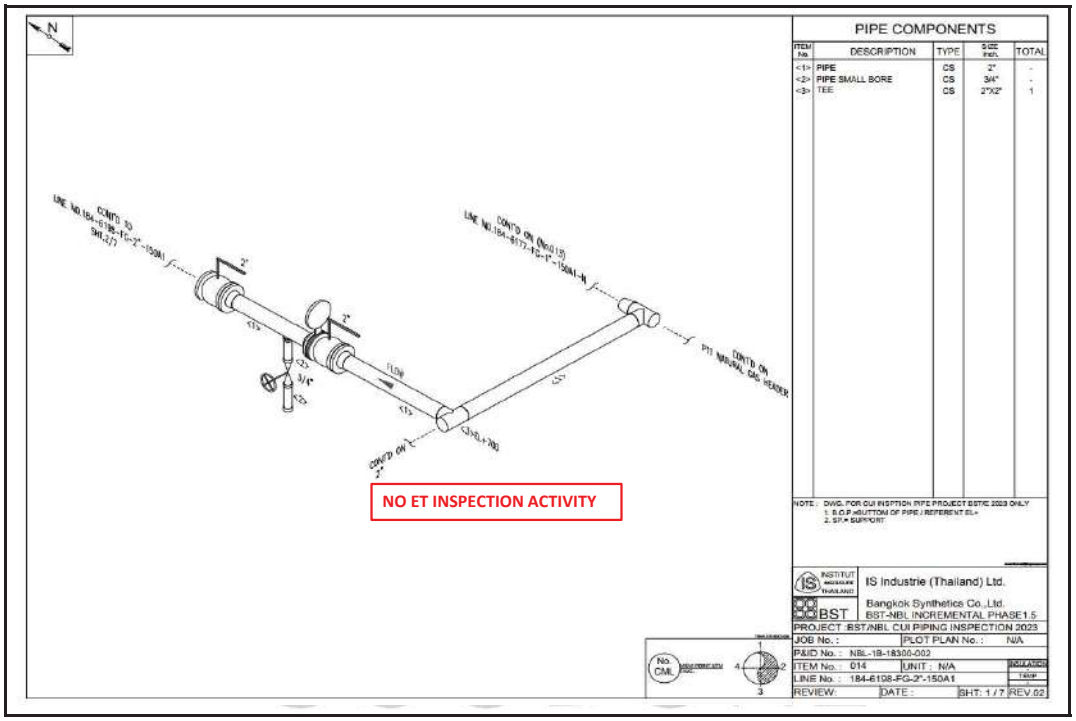

N
J.32
J.33
J.34
J.35
J.36
J.37
U-BOLT
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch. | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 5
<3> ELBOW-45° | CS | 2" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTPE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 6 / 7 REV.02

	2D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 74 of 98	Rev.00



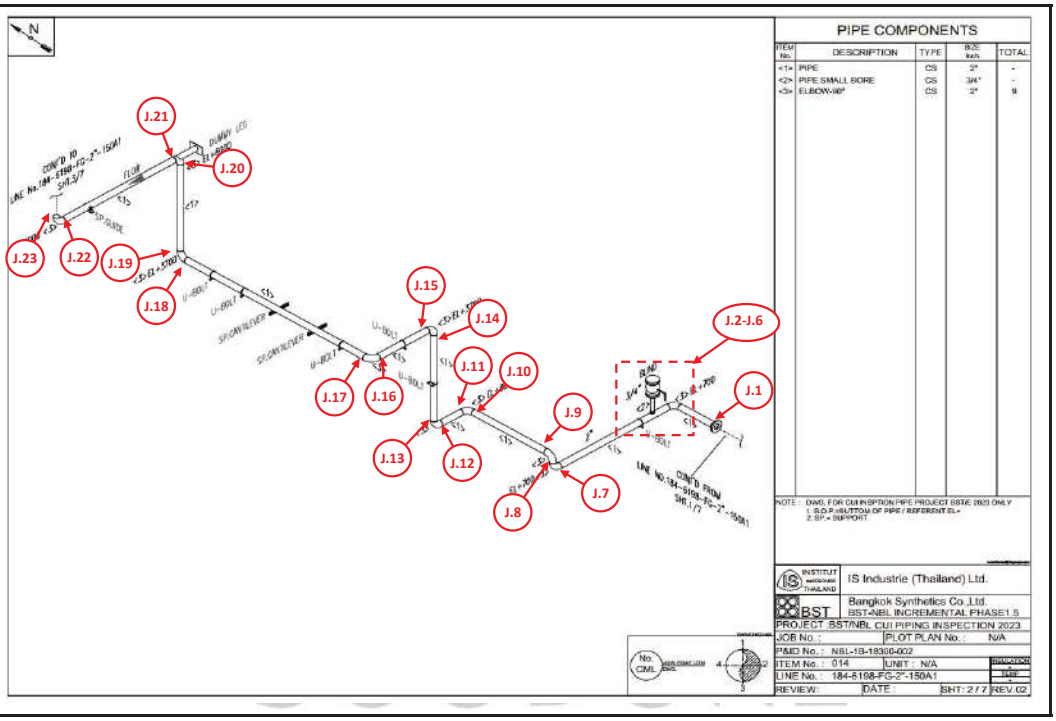
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 75 of 98	Rev.00



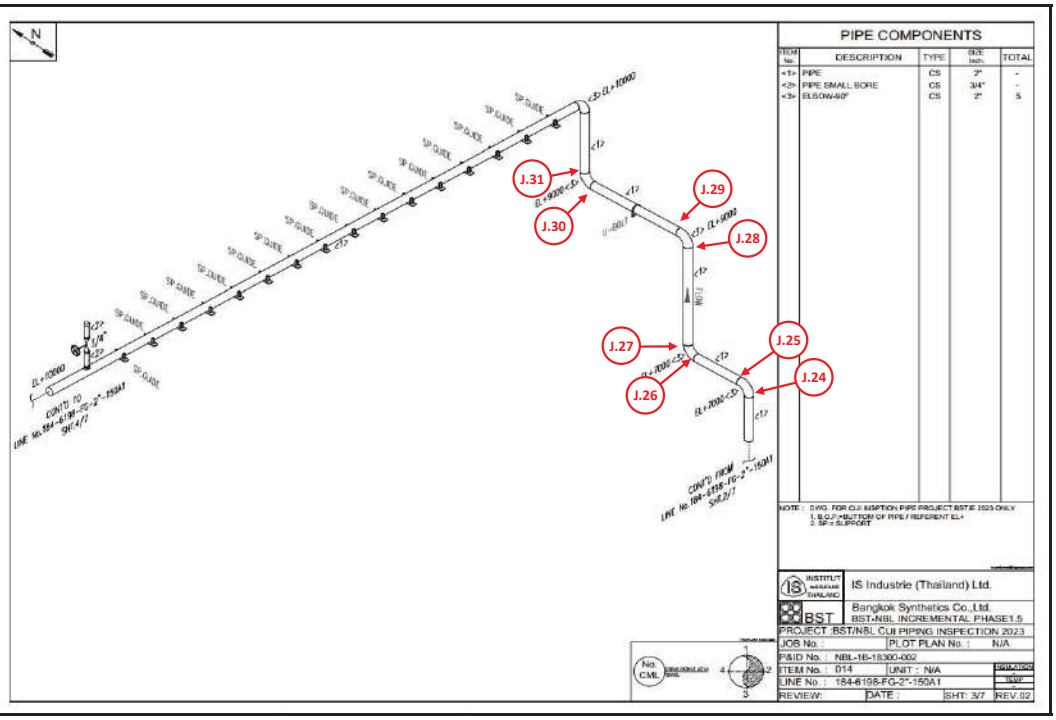
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 76 of 98	Rev.00

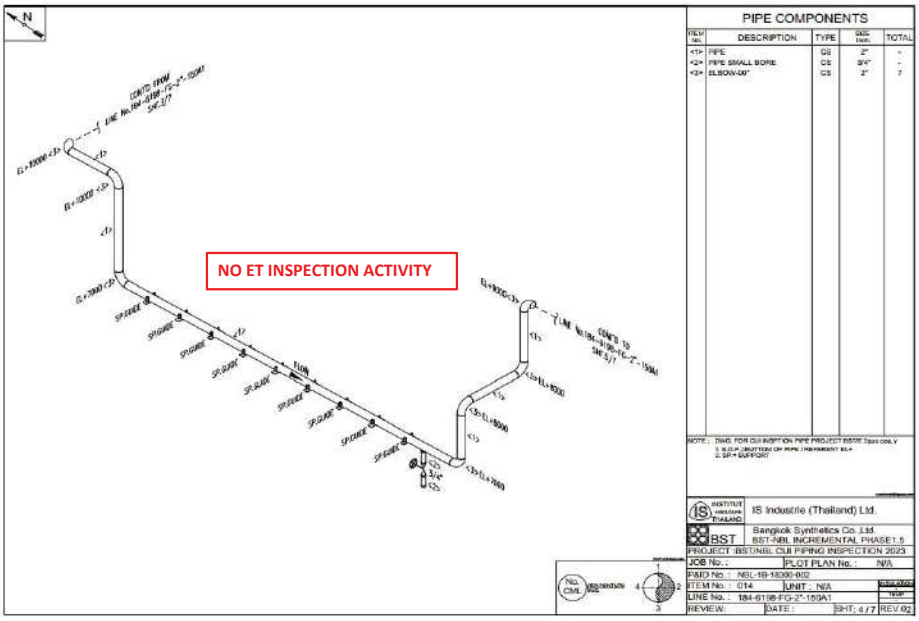


THAILAND

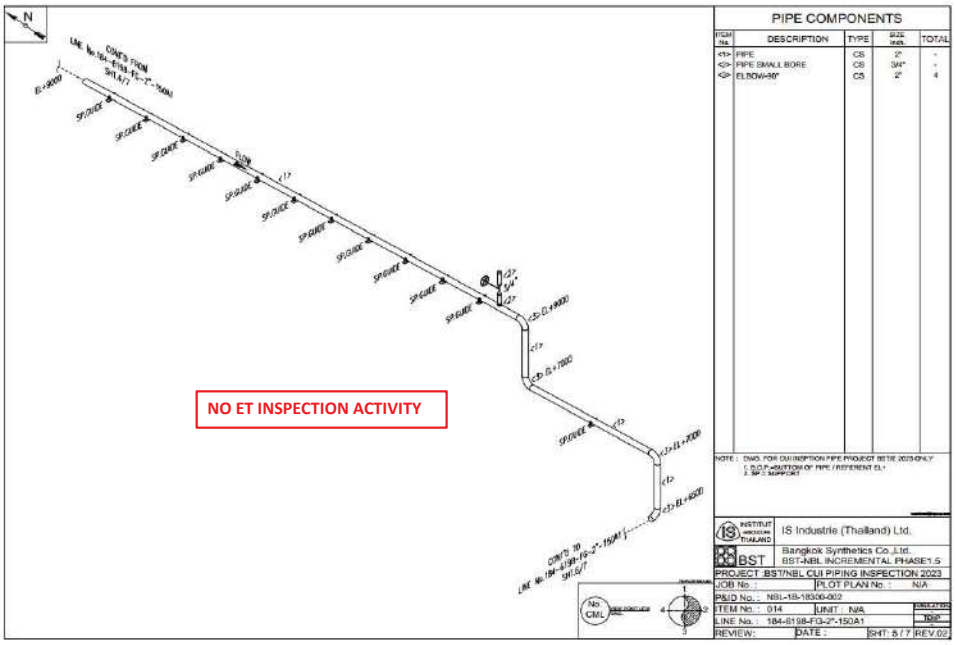
	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 77 of 98	Rev.00



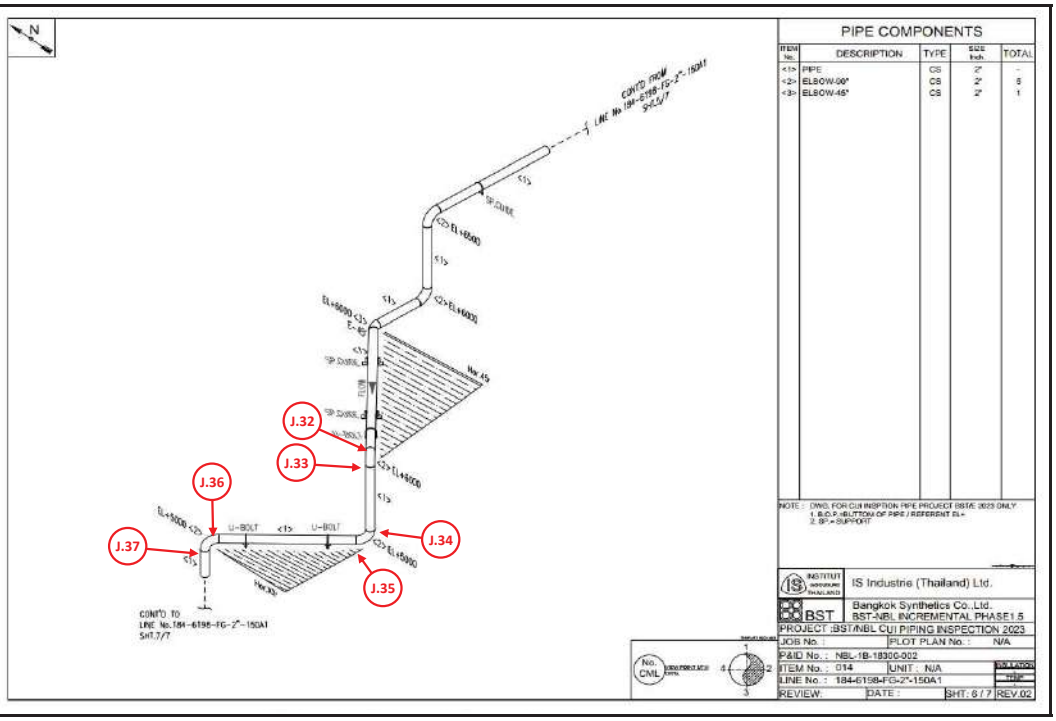
THAILAND



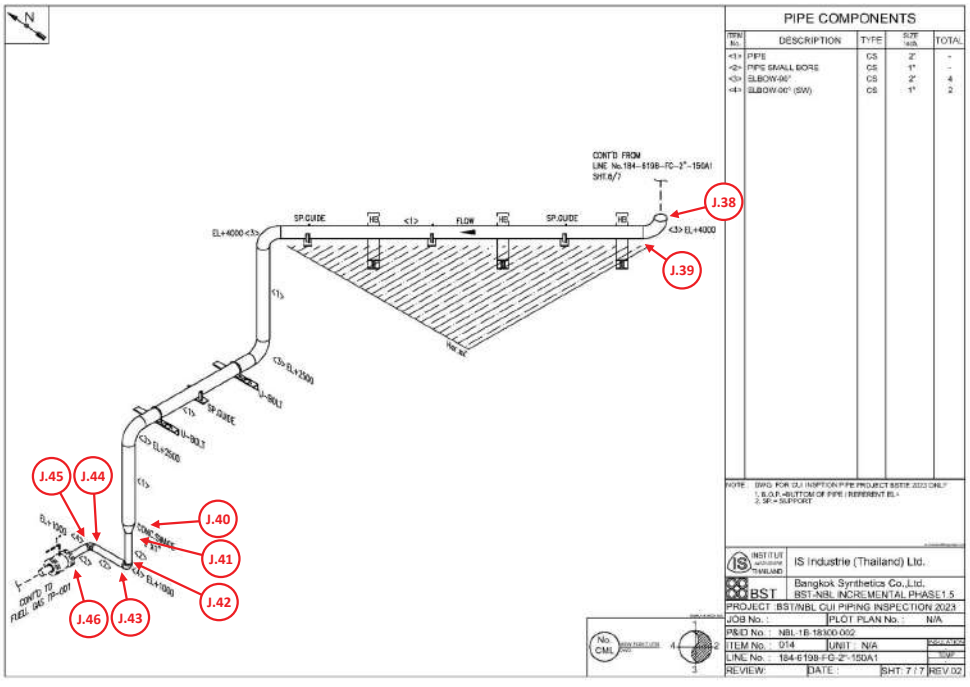
THAILAND



THAILAND



THAILAND



THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-014	
				Line No. :	184-6198-FG-2"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	82 of 99	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	BW
2	Joint No.2	Weld and HAZ	No indication was found	BW
3	Joint No.3	Weld and HAZ	No indication was found	BW
4	Joint No.4	Weld and HAZ	No indication was found	Weldolet
5	Joint No.5	Weld and HAZ	No indication was found	Weldolet
6	Joint No.6	Weld and HAZ	No indication was found	BW
7	Joint No.7	Weld and HAZ	No indication was found	BW
8	Joint No.8	Weld and HAZ	No indication was found	BW
9	Joint No.9	Weld and HAZ	No indication was found	BW
10	Joint No.10	Weld and HAZ	No indication was found	BW
11	Joint No.11	Weld and HAZ	No indication was found	BW
12	Joint No.12	Weld and HAZ	No indication was found	BW
13	Joint No.13	Weld and HAZ	No indication was found	BW
14	Joint No.14	Weld and HAZ	No indication was found	BW
15	Joint No.15	Weld and HAZ	No indication was found	BW
16	Joint No.16	Weld and HAZ	No indication was found	BW
17	Joint No.17	Weld and HAZ	No indication was found	BW
18	Joint No.18	Weld and HAZ	No indication was found	BW
19	Joint No.19	Weld and HAZ	No indication was found	BW
20	Joint No.20	Weld and HAZ	No indication was found	BW
21	Joint No.21	Weld and HAZ	No indication was found	BW
22	Joint No.22	Weld and HAZ	No indication was found	BW
23	Joint No.23	Weld and HAZ	No indication was found	BW
24	Joint No.24	Weld and HAZ	No indication was found	BW
25	Joint No.25	Weld and HAZ	No indication was found	BW
26	Joint No.26	Weld and HAZ	No indication was found	BW
27	Joint No.27	Weld and HAZ	No indication was found	BW
28	Joint No.28	Weld and HAZ	No indication was found	BW
29	Joint No.29	Weld and HAZ	No indication was found	BW
30	Joint No.30	Weld and HAZ	No indication was found	BW
31	Joint No.31	Weld and HAZ	No indication was found	BW
32	Joint No.32	Weld and HAZ	No indication was found	BW
33	Joint No.33	Weld and HAZ	No indication was found	BW
34	Joint No.34	Weld and HAZ	No indication was found	BW
35	Joint No.35	Weld and HAZ	No indication was found	BW
36	Joint No.36	Weld and HAZ	No indication was found	BW
37	Joint No.37	Weld and HAZ	No indication was found	BW
38	Joint No.38	Weld and HAZ	No indication was found	BW
39	Joint No.39	Weld and HAZ	No indication was found	BW
40	Joint No.40	Weld and HAZ	No indication was found	BW
41	Joint No.41	Weld and HAZ	No indication was found	BW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW
45	Joint No.45	Weld and HAZ	No indication was found	FW
46	Joint No.46	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-014	
				Line No. :	184-6198-FG-2"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	83 of 99	Rev.00

Picture No. 1 : ET reault found no indication.

Picture No. 2 : ET reault found no indication.

Picture No. 3 : ET reault found no indication.

Picture No. 4 : ET reault found no indication.

Picture No. 5 : ET reault found no indication.

Picture No. 6 : ET reault found no indication.

ECT PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	84 of 99 Rev.00

Code : Rev.: Effective date :

Picture No. 1 : ET reault found no indication.

Picture No. 2 : ET reault found no indication.

Picture No. 3 : ET reault found no indication.

Picture No. 4 : ET reault found no indication.

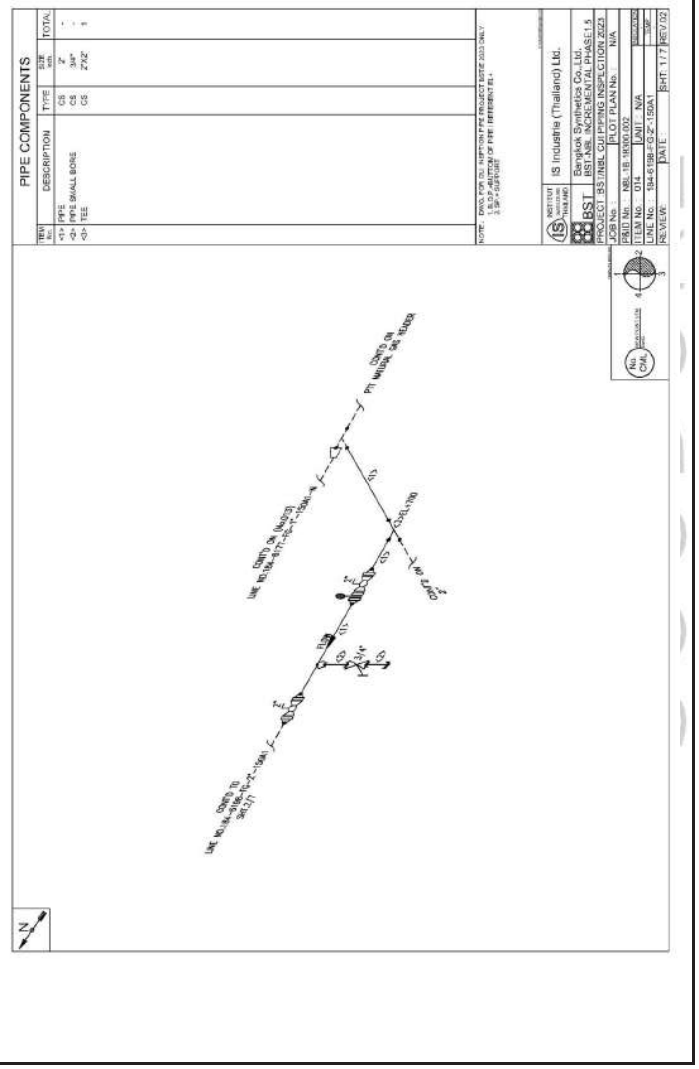
Picture No. 5 : ET reault found no indication.

Picture No. 6 : ET reault found no indication.

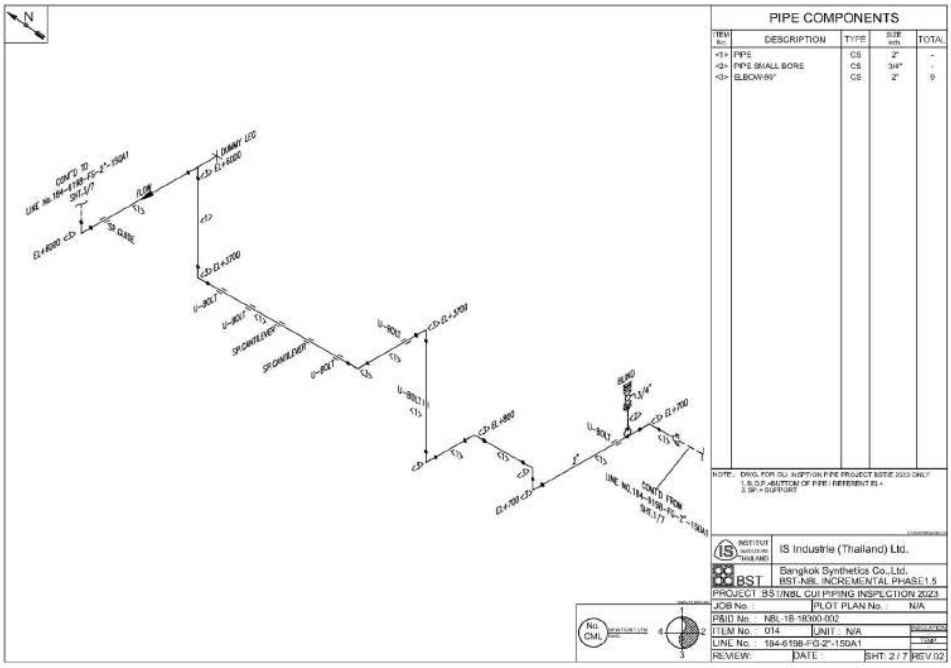
2D ISO-DRAWING

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	85 of 99 Rev.00

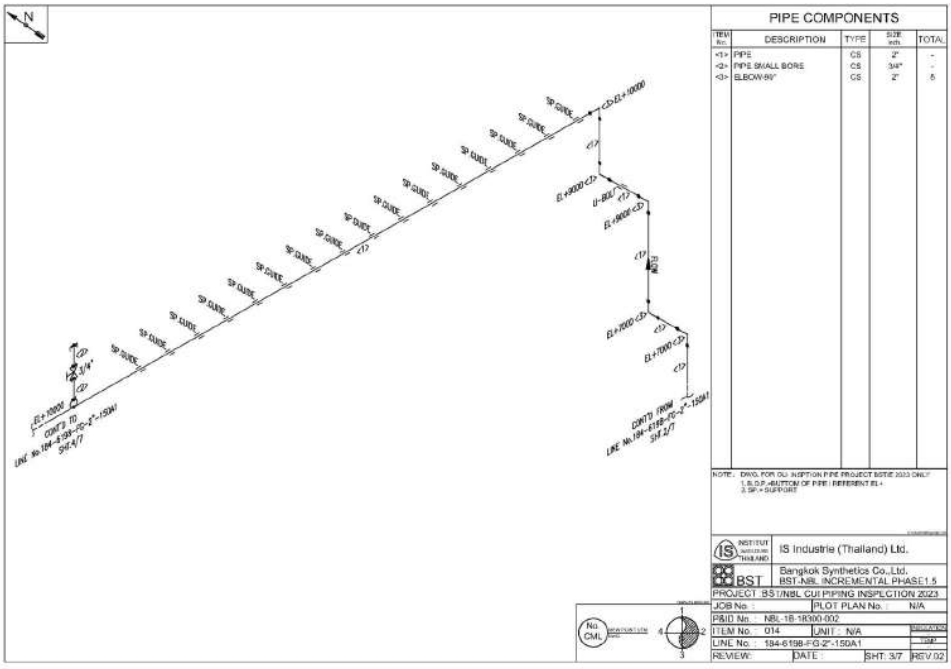
Code : Rev.: Effective date :



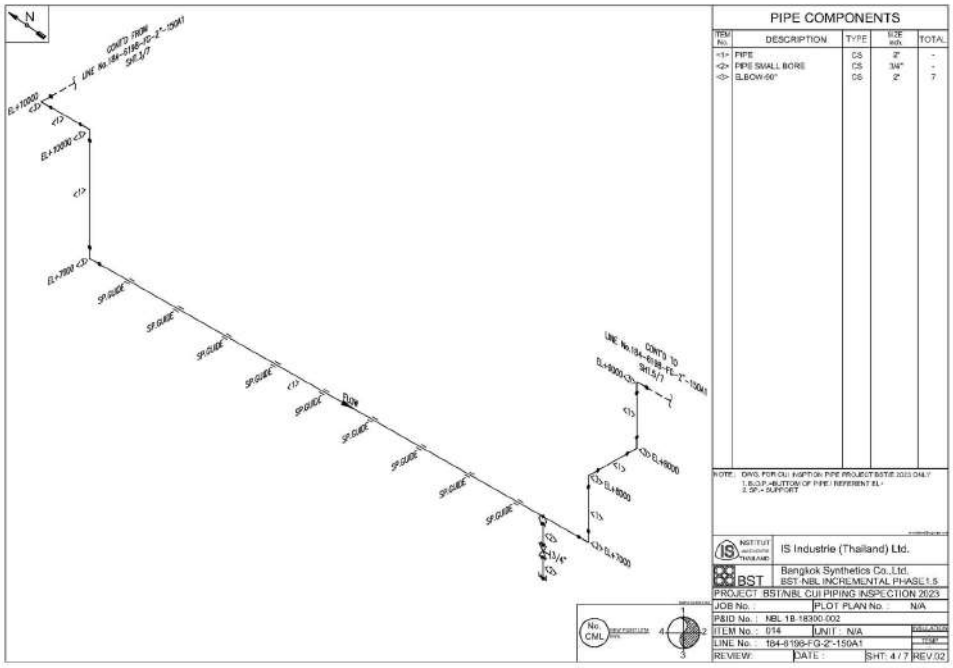
INSTITUT SOUDURE THAILAND



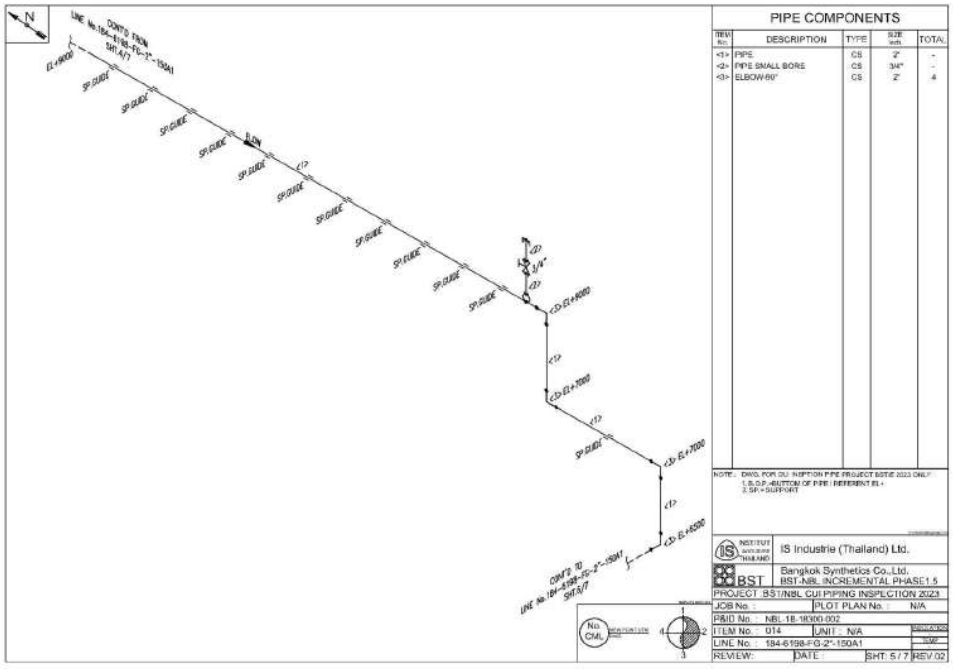
THAILAND



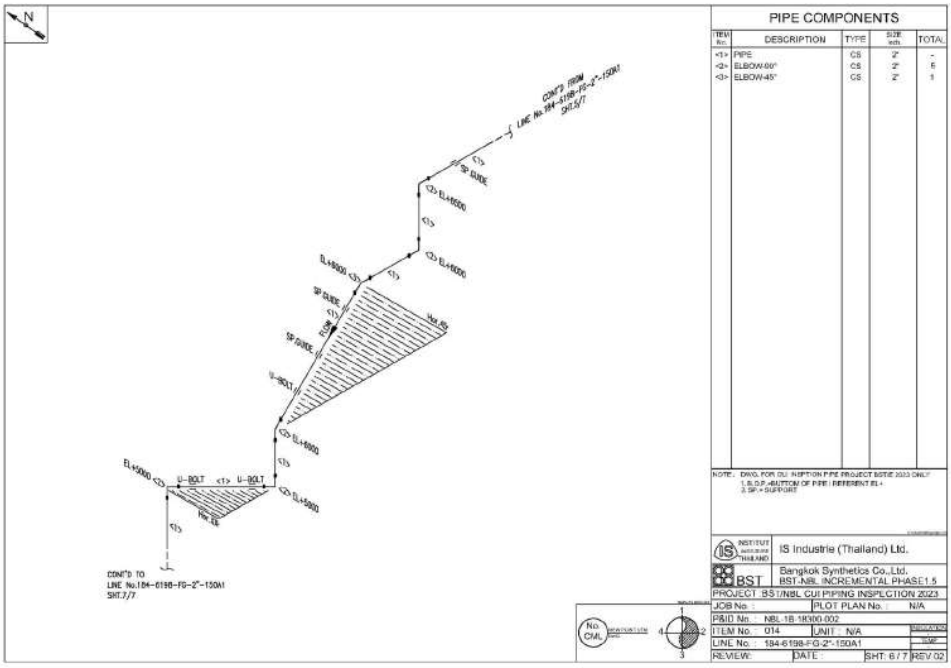
THAILAND



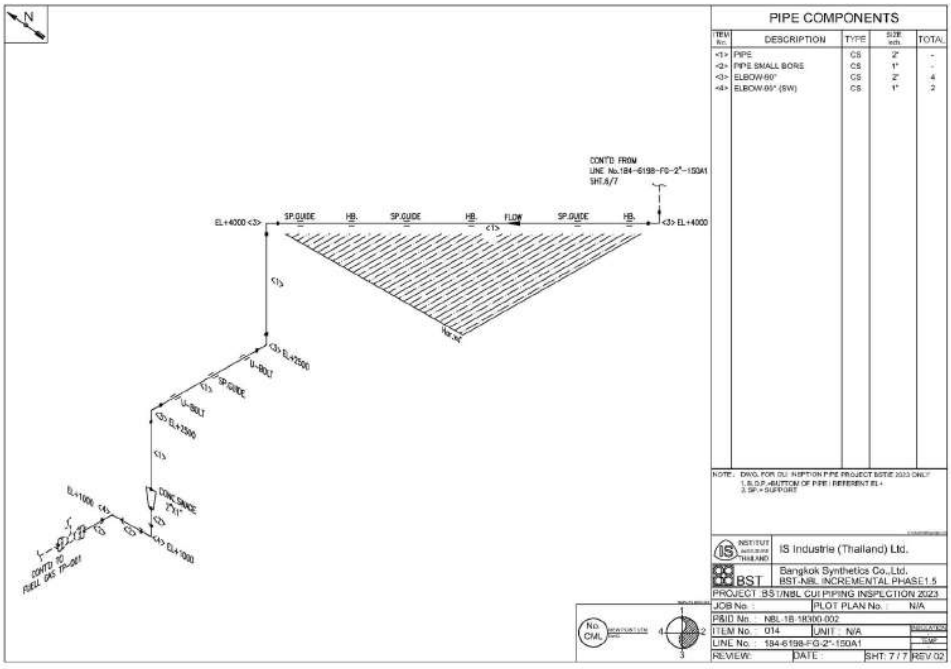
THAILAND



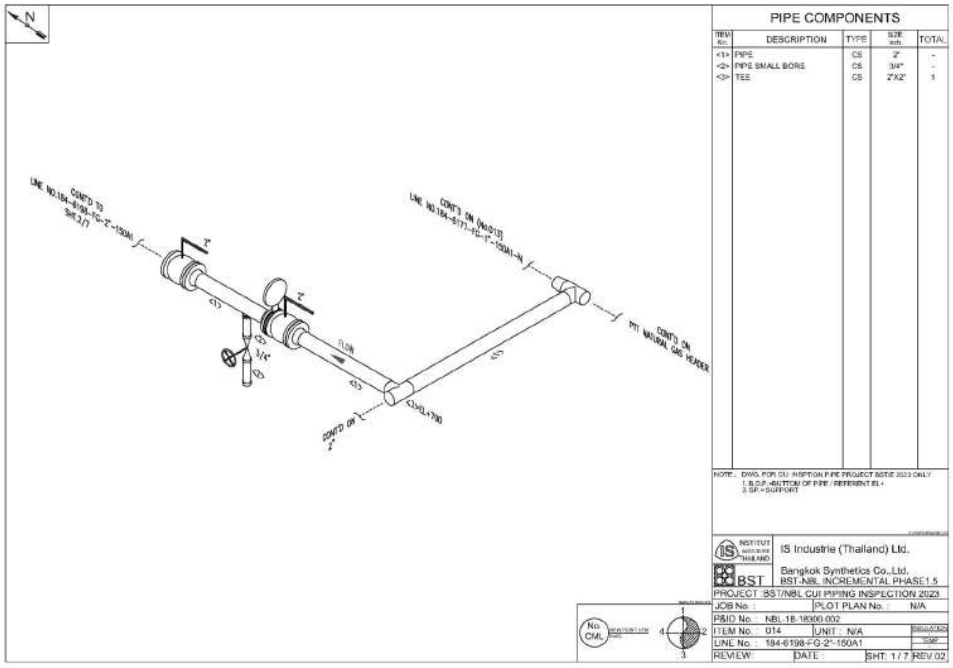
THAILAND

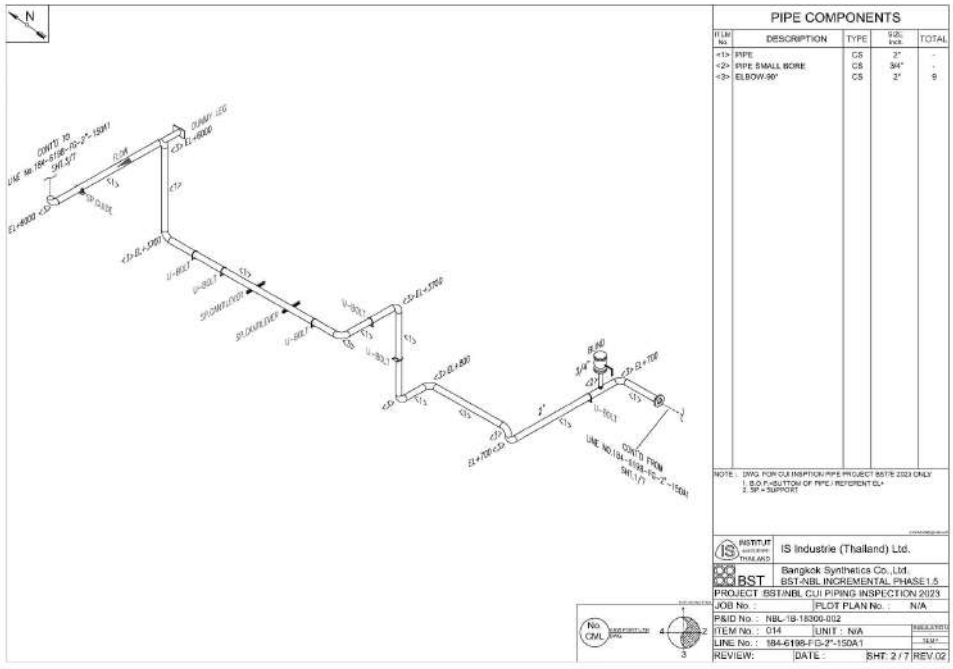


THAILAND

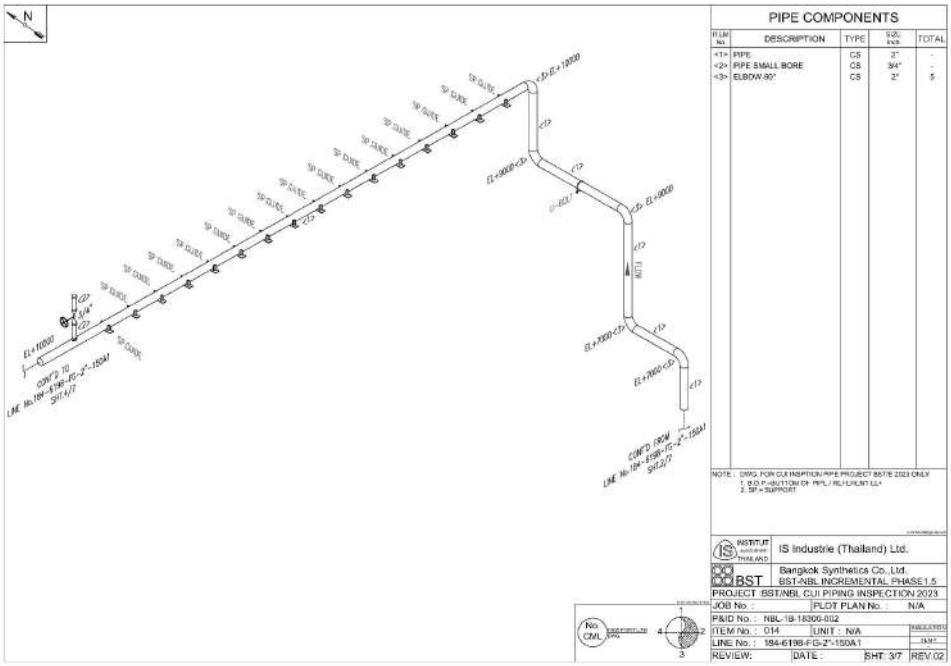


THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> TEE CS 2"X2" 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P =BUTTON OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 1 / 7 REV.02

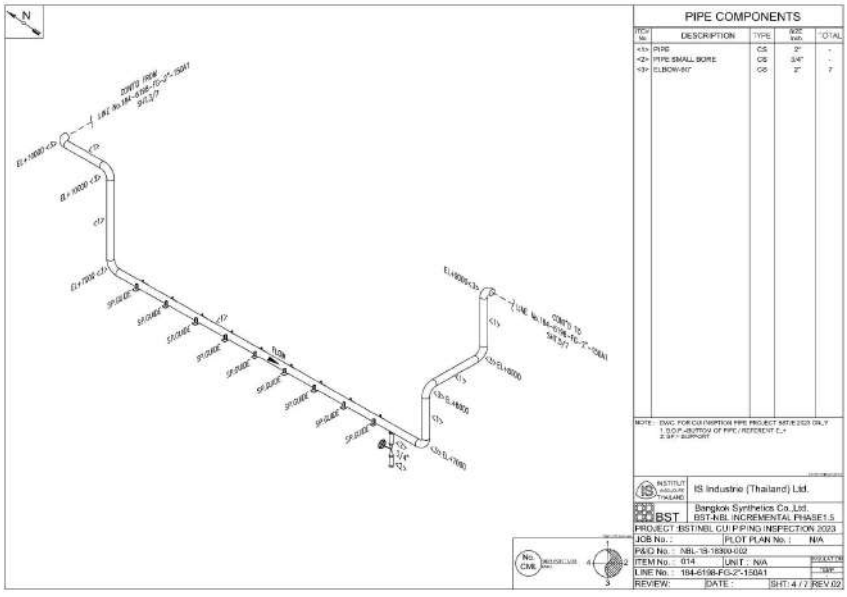

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P =BUTTON OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 94 of 99 Rev.00

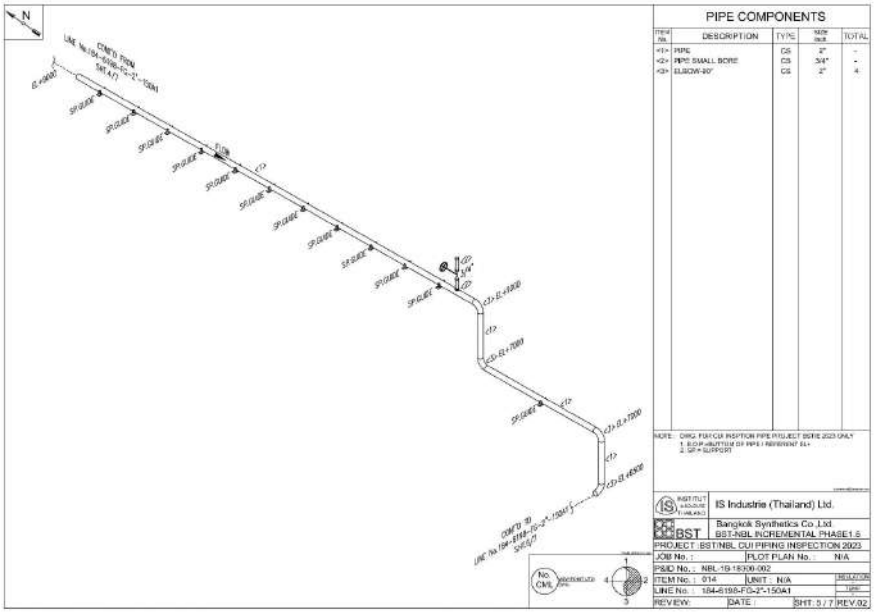


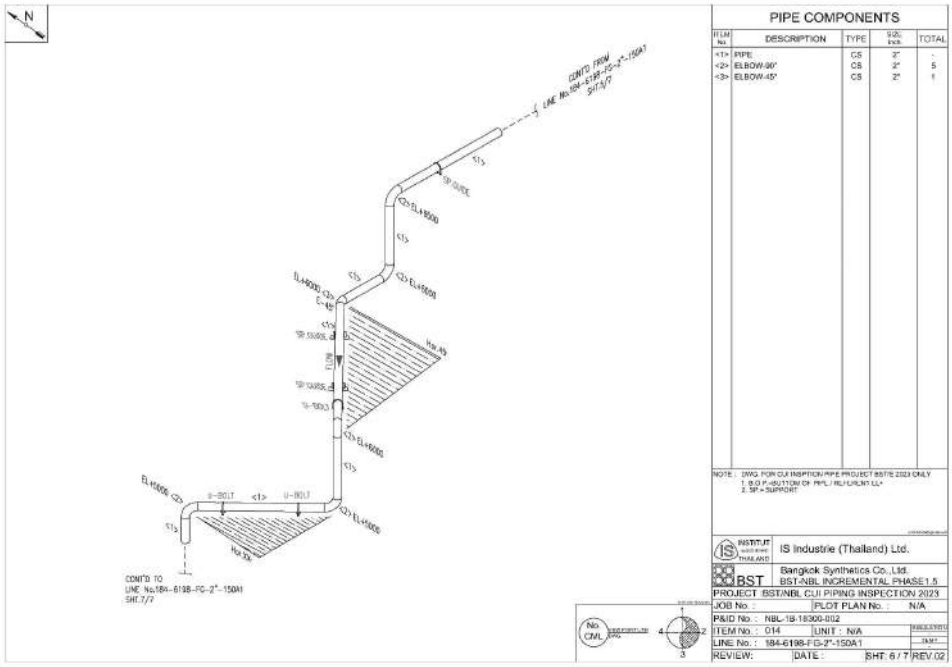
THAILAND

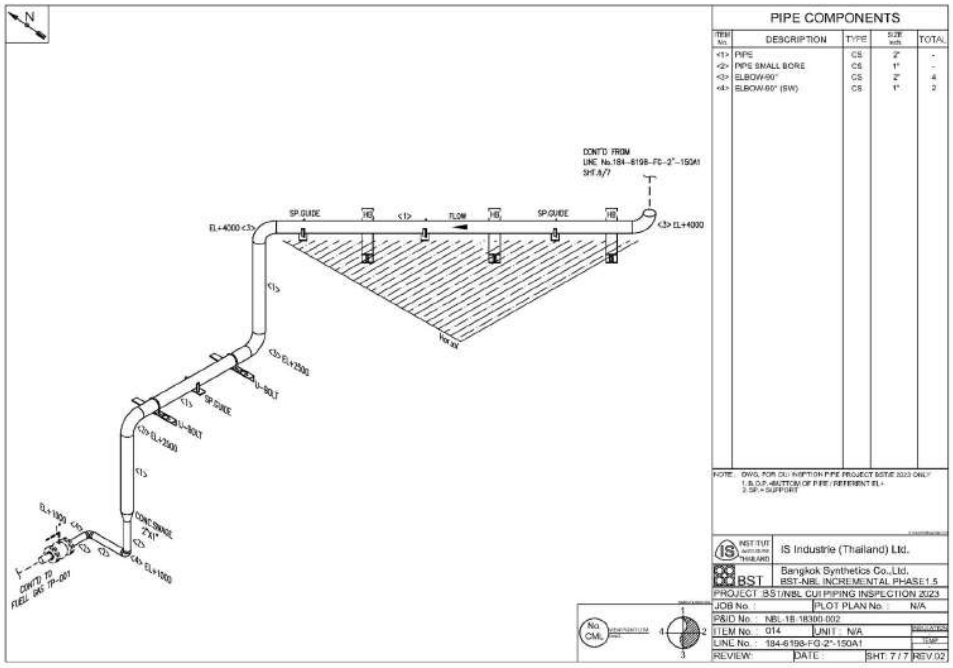
INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 95 of 99 Rev.00



THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTE 2023 ONLY
1. E.O.P = BOTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014
UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW:
DATE :
SHT. 5 / 7
REV.02


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 5
<3> ELBOW-45° | CS | 2" | 1
U-BOLT
U-BOLT
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTE 2023 ONLY
1. E.O.P = BOTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014
UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW:
DATE :
SHT. 6 / 7
REV.02



INSTITUT de SOUDURE THAILAND

Appendix 1
Inspector Certification

API INDIVIDUAL CERTIFICATION PROGRAMS

ANAB
ACCREDITED
PERSONNEL CERTIFICATION BODY

verifies that

krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69176

ORIGINAL CERTIFICATION DATE	November 30, 2016
CURRENT CERTIFICATION DATE	November 30, 2022
EXPIRATION DATE	November 30, 2026

Director, Individual Certification Programs

API | ICP

Copyright 2020 - American Petroleum Institute. All rights reserved. API, ICP, the API logo and the ICP mark are trademarks or registered trademarks of API in the United States and/or other countries. This certificate is the property of the Accredited Certification Institute. It may be reserved at any time. Authentic and official ICP certificates are printed on a linen watermark paper stock with the reserved purpose and incorporate gold hot seal elements. This certificate should be verified by a copy of the Accredited Certification Institute. Any other copy is not a legal document and may not be reproduced or used in any form without the written permission of the Accredited Certification Institute. ICP Accredited Certification Institute, 200 Massachusetts Avenue, NW Suite 1100, Washington, DC 20001-5571, U.S.A. 202-682-1000 (10/2020).

COPY

IS INDUSTRIE (THAILAND) LTD.

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)
Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

IS INDUSTRIE (THAILAND) LTD.

Mr. Satish Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jocelyn Robin STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

Piping Line No.

183-6158-FG-1"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-015
Inspection date : May 10, 2023
Issue report date : May 15, 2023

Content

Item	Description	Page
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 24*
4	*Ultrasonic Thickness Measurement Report*	*25 - 34*
5	*Eddy Current Testing Report*	*35 - 46*
6	*2D & 3D ISO-Drawing*	*47 - 52*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : May 15, 2023	Date : May 18, 2023	Date : May 21, 2023

SUMMARY FINDING

Report No. :	IS/B-23-CUI-P-NBL-015		
Request No. :	-		
Date of Test :	10/05/2023		
Page :	1 of 52	Rev.00	

Code : | Rev.: | Effective date :

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 15 Line No.	183-6158-FG-1"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Pipe, U-bolt, Flange connection	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, U-bolt, Flange connection at CMLs 8, 16-18, 25, 56. (See picture No. 7, 16-21, 26, 45)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Satisfactory condition observed. See detail in "VISUAL TESTING REPORT".	**Result :**	Accepted
UTM :	No significant wall-loss than corrosion allowance with maximum corrosion rate = 0.045 mm. / year and remaining life = 55.479 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

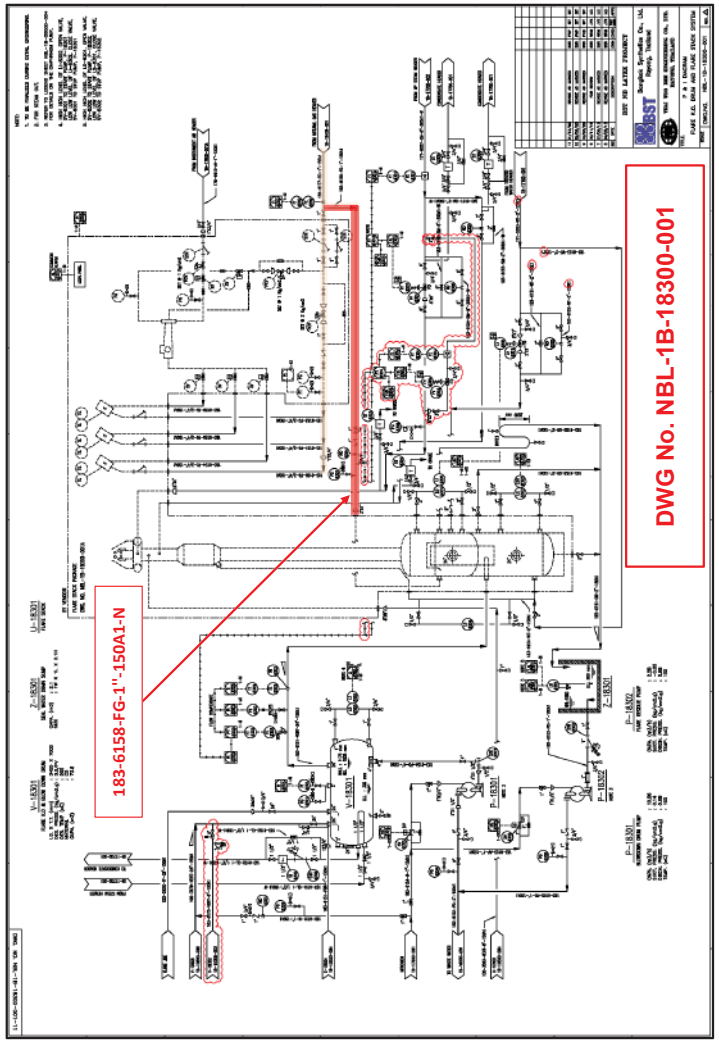
AFTER REPAIR INSPECTION RESULT

- None -

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	2 of 52 Rev.00

Piping and Instrumentation Diagram (P&ID)

Code : Rev.: Effective date :



VISUAL TESTING REPORT		Report No. :	IS/B-23-CUI-P-NBL-015
		Request No. :	-
		Date of Test :	10/05/2023
Code :	Rev.: Effective date :	Page :	3 of 52 Rev.00

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	183-6158-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			Rust spot	-
2. Flange connection (Flange, Stud & Nut, Gasket)		✓			Rust spot at stud & nut	-
3. Branch Connection (Vent, Drain, Nipples)	✓					-
4. Valve (Body, Bonnet, Stem, Packing, Handle)	✓					-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
Other …				✓		-
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)		✓			Rust at U-bolt thread & nuts	-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	May 15, 2023	Date :	May 18, 2023	Date :	May 21, 2023

Picture No. 1

Finding :

This photo shown overview of beginning location of line No. 183-6158-FG-1"-150A1-N.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Pipe 1" CMLs 1 and socket elbow 1" CMLs 2 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

Valve 1" CMLs 3 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

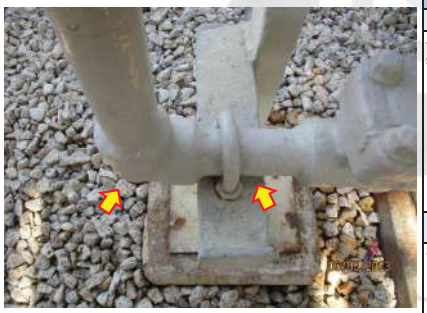
Picture No. 4

Finding :

Found spot area of painting damage & rust spot at pipe 1" CMLs 4.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.



Picture No. 5

Finding :

Socket elbow 1" CMLs 5 and pipe 1", U-bolt include support CMLs 6 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 6

Finding :

Check valve 1" CMLs 7 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Found slightly rust as all set of stud & nut at flange connection CMLs 8.

Recommendation :

Shall be monitor within next inspection.

Picture No. 8

Finding :

Socket tee reducer 1" x 3/4" CMLs 9 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Small bore branch drain pipe 3/4" CMLs 10 include drain valve 3/4" were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 10

Finding :

Socket tee reducer 1" x 3/4" CMLs 11 include small bore branch pipe 3/4" and pressure gauge were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 11

Finding :

Pipe 1", U-bolt and structure support CMLs 12 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 12

Finding :

Socket elbow 1" CMLs 13 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 13

Finding :

Pipe 1" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 14

Finding :

Socket elbow 1" CMLs 15 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 15

Finding :

This photo shown socket elbow 1" was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Found rust as U-bolt thread include nuts at support CMLs 16.

Recommendation :

Shall be monitor within next inspection.

Picture No. 17

Finding :

This photo shown close-up view of rust at U-bolt thread & nuts.

Recommendation :

Shall be monitor within next inspection.

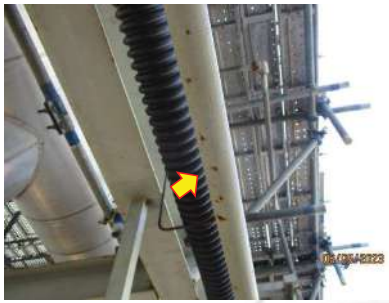
Picture No. 18

Finding :

Found rust spot at pipe 1" CMLs 17.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.



Picture No. 19

Finding :

This photo shown rust spot at pipe 1".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 20

Finding :

Found rust as U-bolt thread include nuts at support CMLs 18.

Recommendation :

Shall be monitor within next inspection.

Picture No. 21

Finding :

This photo shown close-up view of rust at U-bolt thread & nuts.

Recommendation :

Shall be monitor within next inspection.

Picture No. 22

Finding :

Socket elbow 1" CMLs 19 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

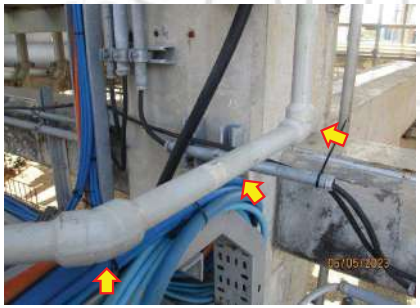
Picture No. 23

Finding :

Pipe 1" CMLs 20 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 24

Finding :

Socket elbow 1" CMLs 21, CMLs 23 and pipe 1" CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Pipe 1" CMLs 24 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 26

Finding :

Found rust spot at pipe 1" CMLs 25, but U-bolt and structure support were found in normal condition.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 27

Finding :

Socket elbow 1" CMLs 26 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 28

Finding :

Pipe 1" CMLs 27 and socket elbow 1" CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Pipe 1" CMLs 29 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 30

Finding :

Pipe 1" CMLs 30 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 31

Finding :

Pipe 1" CMLs 31, CMLs 32 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 32

Finding :

Pipe 1" CMLs 33, CMLs 34 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Pipe 1" CMLs 35, CMLs 36, CMLs 37, CMLs 38 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 34

Finding :

Pipe 1" CMLs 39 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

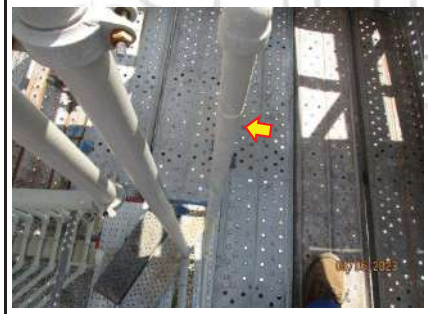
Picture No. 35

Finding :

Socket elbow 1" CMLs 40 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 36

Finding :

Pipe 1" CMLs 41 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Socket elbow 1" CMLs 42, CMLs 45 and pipe 1" CMLs 43, CMLs 44 include guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Pipe 1" CMLs 46 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 39

Finding :

Pipe 1" CMLs 47 include guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Socket elbow 1" CMLs 48 and pipe 1" CMLs 49 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

Socket elbow 1" CMLs 50 and pipe 1" CMLs 51 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 42

Finding :

Pipe 1", U-bolt and structure support CMLs 52 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	18 of 52 Rev.00

Code : | Rev.: | Effective date :

Picture No. 43

Finding :

Pipe 1" CMLs 53 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 44

Finding :

Reducer 2" x 1" CMLs 54 and elbow 2" CMLs 55 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 45

Finding :

Found rust spot as all set of stud & nut at flange connection (Ending location) CMLs 56.

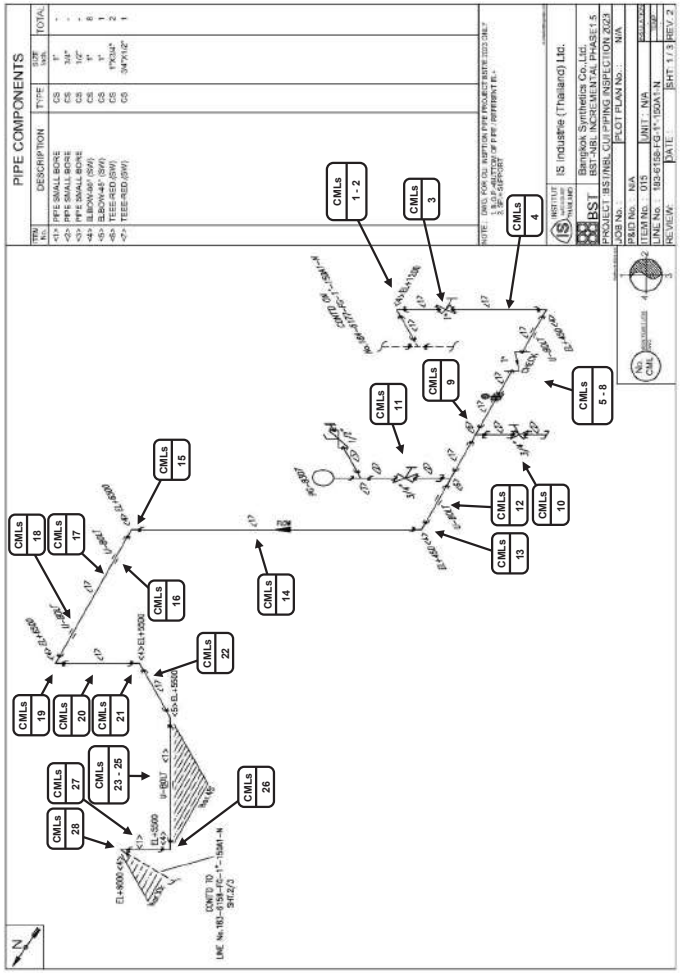
Recommendation :

Shall be monitor within next inspection.

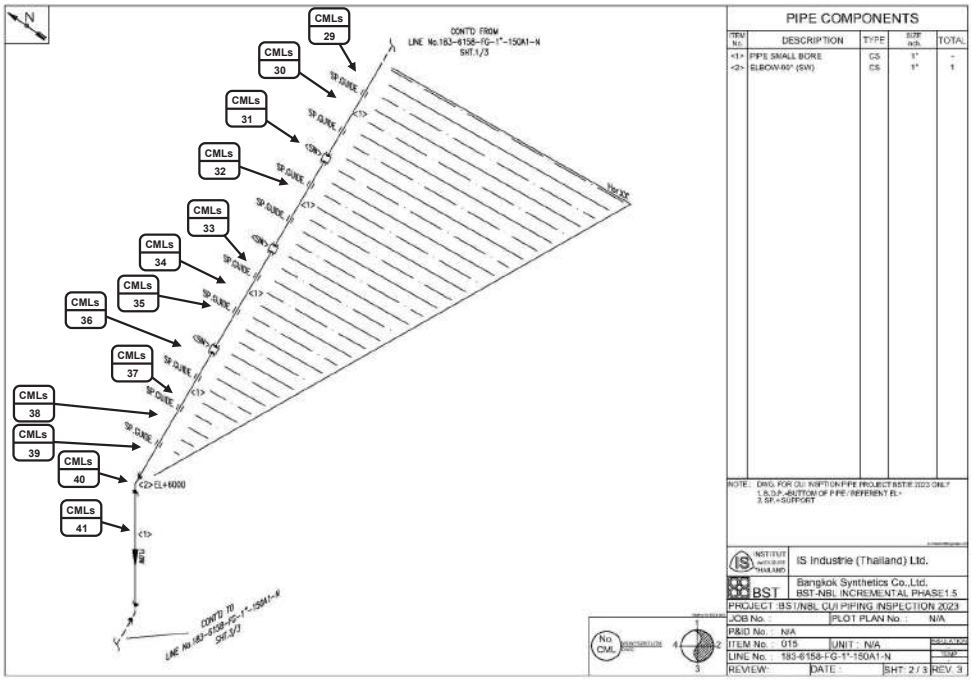
2D ISO-DRAWING WITH MARK UP

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	19 of 52 Rev.00

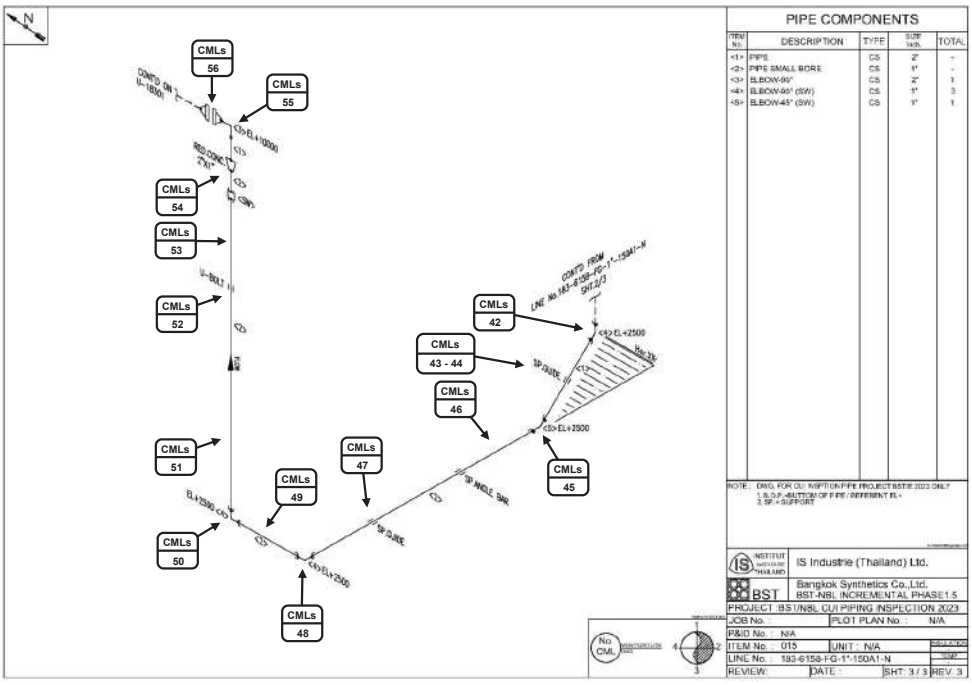
Code : | Rev.: | Effective date :



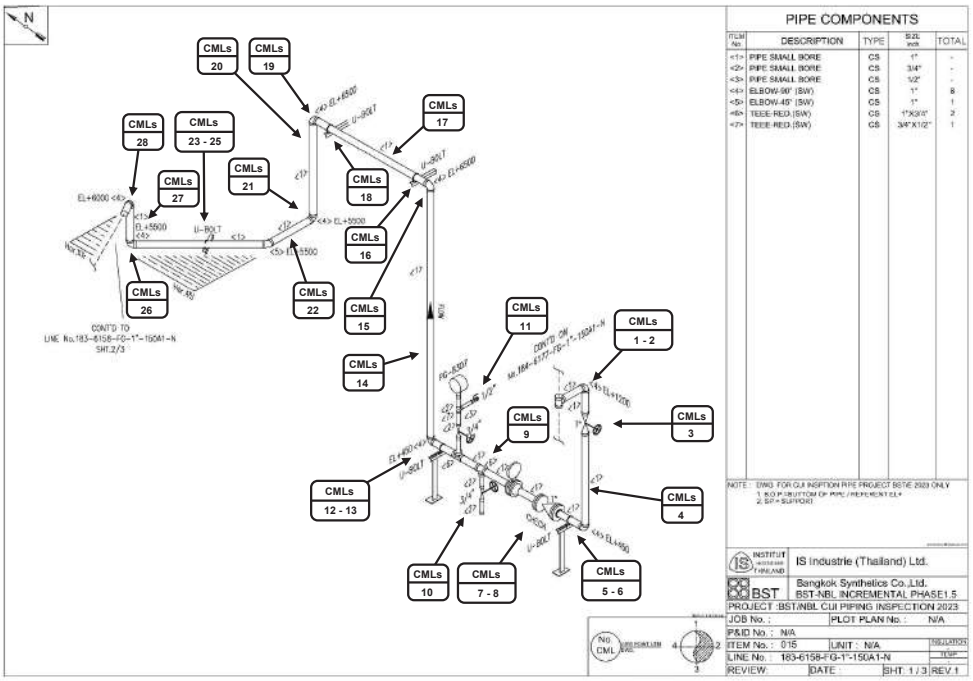
THAILAND



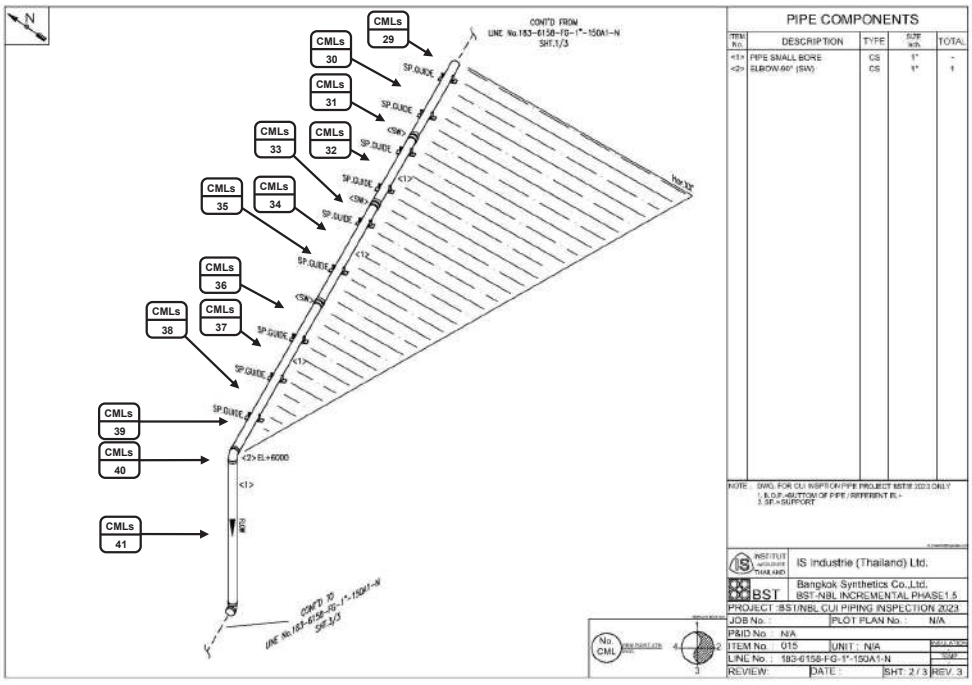
THAILAND



THAILAND



THAILAND

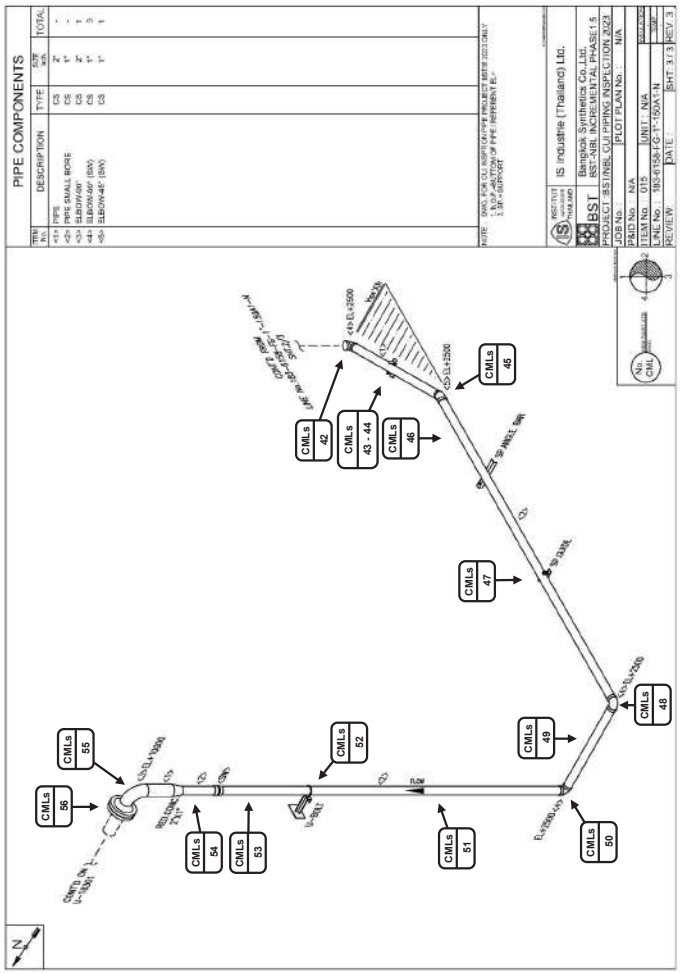


THAILAND

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	24 of 52 Rev.00

3D ISO-DRAWING WITH MARK UP

Code : Rev.: Effective date :



ULTRASONIC THICKNESS MEASUREMENT REPORT		Report No. :	IS/B-23-CUI-P-NBL-015
		Request No. :	-
		Date of Test :	10/05/2023
Code :	Rev.: Effective date :	Page :	25 of 52 Rev.00

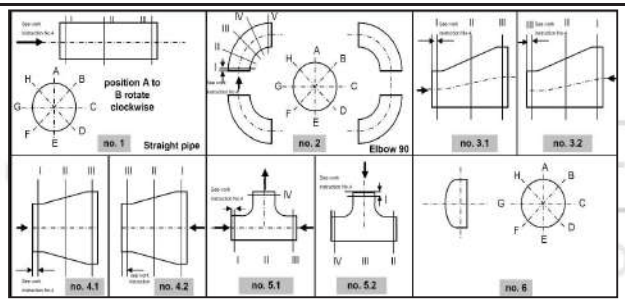
PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	183-6158-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-NDT-UTM-001_REV.04	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

MEASUREMENT TOOL DATA

Equipment Manufacturer	Olympus	**Calibration block**	Step bar 5 step
Equipment Model	38 DL Plus	**Calibration Range**	2.50 - 7.50 mm.
Serial No.	151114106	**Serial No.**	144816
Probe Manufacturer	Olympus	**Sound Velocity**	5904 mm./µs
Probe Model	D790-SM	**Couplant**	GE ZG-F / SONO 600
Probe Dia.	10 mm.	**Scan Type**	A-SCAN
Serial No.	1039668	**Technique**	Echo to Echo (Thru painting)
Frequency	5 MHz		

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	No significant of wall-loss. (Maximum corrosion rate = 0.045 mm. / year and remaining life = 55.479 years)
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	UT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 10, 2023	Date :	May 18, 2023	Date :	May 21, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015	
Line No. :	183-6158-FG-1"-150A1-N	
Date of Test :	10/05/2023	
Page :	26 of 52	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
1	1.1	A	Pipe	1"	80	4.55	1.80	4.41	4.44		2.64	-0.045	0.011	250.320	
	1.1	B	Pipe	1"	80	4.55	1.80	4.46	4.63		2.83	-0.255	-0.008	-368.961	Note 1
	1.1	C	Pipe	1"	80	4.55	1.80	4.53	4.59		2.79	-0.090	-0.004	-727.492	Note 1
	1.1	D	Pipe	1"	80	4.55	1.80	4.55	4.51		2.71	0.060	0.004	45.105	
2	2.1	A	Pipe	1"	80	4.55	1.80	4.55	4.65		2.85	-0.150	-0.010	-297.255	Note 1
	2.1	B	Pipe	1"	80	4.55	1.80	4.48	4.51		2.71	-0.045	0.004	706.632	
	2.1	C	Pipe	1"	80	4.55	1.80	4.70	4.53		2.73	0.255	0.002	1423.695	Note 3
	2.1	D	Pipe	1"	80	4.55	1.80	4.78	4.68		2.88	0.150	-0.012	-231.065	Note 3
3	3.1	A	Pipe	1"	80	4.55	1.80	4.28	4.36		2.56	-0.120	0.018	140.531	
	3.1	B	Pipe	1"	80	4.55	1.80	4.47	4.49		2.69	-0.030	0.006	467.612	
	3.1	C	Pipe	1"	80	4.55	1.80	4.26	4.28		2.48	-0.030	0.026	95.801	
	3.1	D	Pipe	1"	80	4.55	1.80	4.43	4.25		2.45	0.270	0.029	85.178	Note 3
4	4.1	A	Pipe	1"	80	4.55	1.80	4.57	4.75		2.95	-0.270	-0.019	-153.843	Note 1
	4.1	B	Pipe	1"	80	4.55	1.80	4.51	4.57		2.77	-0.090	-0.002	-1444.555	Note 1
	4.1	C	Pipe	1"	80	4.55	1.80	4.36	4.53		2.73	-0.255	0.002	1423.695	
	4.1	D	Pipe	1"	80	4.55	1.80	4.68	4.52		2.72	0.240	0.003	945.653	Note 3
5	5.1	A	Pipe	1"	80	4.55	1.80	-	4.52		2.72	-	0.003	945.653	
	5.1	B	Pipe	1"	80	4.55	1.80	-	4.58		2.78	-	-0.003	-966.513	Note 1
	5.1	C	Pipe	1"	80	4.55	1.80	-	4.67		2.87	-	-0.012	-249.451	Note 1
	5.1	D	Pipe	1"	80	4.55	1.80	-	4.42		2.62	-	0.012	210.205	
6	6.1	A	Pipe	1"	80	4.55	1.80	-	4.59		2.79	-	-0.004	-727.492	Note 1
	6.1	B	Pipe	1"	80	4.55	1.80	-	4.47		2.67	-	0.008	348.101	
	6.1	C	Pipe	1"	80	4.55	1.80	-	4.56		2.76	-	-0.001	-2878.680	Note 1
	6.1	D	Pipe	1"	80	4.55	1.80	-	4.52		2.72	-	0.003	945.653	
7	7.1	A	Pipe	3/4"	80	3.91	1.80	3.93	4.11		2.31	-0.270	-0.019	-120.467	Note 1
	7.1	B	Pipe	3/4"	80	3.91	1.80	3.98	3.99		2.19	-0.015	-0.008	-285.521	Note 1
	7.1	C	Pipe	3/4"	80	3.91	1.80	3.99	4.05		2.25	-0.090	-0.013	-167.625	Note 1
	7.1	D	Pipe	3/4"	80	3.91	1.80	3.94	3.78		1.98	0.240	0.012	158.857	Note 3
8	8.1	A	Pipe	1"	80	4.55	1.80	-	4.51		2.71	-	0.004	706.632	
	8.1	B	Pipe	1"	80	4.55	1.80	-	4.57		2.77	-	-0.002	-1444.555	Note 1
	8.1	C	Pipe	1"	80	4.55	1.80	-	4.50		2.70	-	0.005	563.220	
	8.1	D	Pipe	1"	80	4.55	1.80	-	4.63		2.83	-	-0.008	-368.961	Note 1
9	9.1	A	Pipe	3/4"	80	3.91	1.80	-	4.22		2.42	-	-0.030	-81.421	Note 1
	9.1	B	Pipe	3/4"	80	3.91	1.80	-	4.12		2.32	-	-0.020	-115.227	Note 1
	9.1	C	Pipe	3/4"	80	3.91	1.80	-	3.92		2.12	-	-0.001	-2211.160	Note 1
	9.1	D	Pipe	3/4"	80	3.91	1.80	-	4.05		2.25	-	-0.013	-167.625	Note 1
10	10.1	A	Pipe	3/4"	80	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
	10.1	B	Pipe	3/4"	80	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	10.1	C	Pipe	3/4"	80	3.91	1.80	-	4.07		2.27	-	-0.015	-147.976	Note 1
	10.1	D	Pipe	3/4"	80	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015	
Line No. :	183-6158-FG-1"-150A1-N	
Date of Test :	10/05/2023	
Page :	27 of 52	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
11	11.1	A	Pipe	1/2"	80	3.73	1.80	-	3.64		1.84	-	0.009	213.236	
	11.1	B	Pipe	1/2"	80	3.73	1.80	-	3.54		1.74	-	0.018	95.517	
	11.1	C	Pipe	1/2"	80	3.73	1.80	-	3.44		1.64	-	0.028	58.983	
	11.1	D	Pipe	1/2"	80	3.73	1.80	-	3.65		1.85	-	0.008	241.194	
12	12.1	A	Pipe	1/2"	80	3.73	1.80	-	3.52		1.72	-	0.020	85.427	
	12.1	B	Pipe	1/2"	80	3.73	1.80	-	3.46		1.66	-	0.026	64.125	
	12.1	C	Pipe	1/2"	80	3.73	1.80	-	3.67		1.87	-	0.006	325.068	
	12.1	D	Pipe	1/2"	80	3.73	1.80	-	3.69		1.89	-	0.004	492.817	
13	13.1	A	Pipe	1"	80	4.55	1.80	4.26	4.60		2.80	-0.511	-0.005	-584.080	Note 1
	13.1	B	Pipe	1"	80	4.55	1.80	4.42	4.56		2.76	-0.210	-0.001	-2878.680	Note 1
	13.1	C	Pipe	1"	80	4.55	1.80	4.52	4.45		2.65	0.105	0.010	276.395	
	13.1	D	Pipe	1"	80	4.55	1.80	4.23	4.38		2.58	-0.225	0.016	158.291	
14	14.1	A	Pipe	1"	80	4.55	1.80	4.21	4.43		2.63	-0.330	0.012	228.591	
	14.1	B	Pipe	1"	80	4.55	1.80	4.42	4.33		2.53	0.135	0.021	119.945	Note 3
	14.1	C	Pipe	1"	80	4.55	1.80	4.25	4.35		2.55	-0.150	0.019	132.983	
	14.1	D	Pipe	1"	80	4.55	1.80	4.25	4.48		2.68	-0.345	0.007	399.320	
15	15.1	A	Pipe	1"	80	4.55	1.80	4.41	4.24		2.44	0.255	0.030	82.094	Note 3
	15.1	B	Pipe	1"	80	4.55	1.80	4.52	4.39		2.59	0.195	0.015	168.836	Note 3
	15.1	C	Pipe	1"	80	4.55	1.80	4.47	4.47		2.67	0.000	0.008	348.101	
	15.1	D	Pipe	1"	80	4.55	1.80	4.58	4.47		2.67	0.165	0.008	348.101	Note 3
16	16.1	A	Pipe	1"	80	4.55	1.80	4.48	4.49		2.69	-0.015	0.006	467.612	
	16.1	B	Pipe	1"	80	4.55	1.80	4.51	4.59		2.79	-0.120	-0.004	-727.492	Note 1
	16.1	C	Pipe	1"	80	4.55	1.80	4.52	4.44		2.64	0.120	0.011	250.320	Note 3
	16.1	D	Pipe	1"	80	4.55	1.80	4.53	4.34		2.54	0.285	0.020	126.153	Note 3
17	17.1	A	Pipe	1"	80	4.55	1.80	4.48	4.50		2.70	-0.030	0.005	563.220	
	17.1	B	Pipe	1"	80	4.55	1.80	4.41	4.59		2.79	-0.270	-0.004	-727.492	Note 1
	17.1	C	Pipe	1"	80	4.55	1.80	4.31	4.50		2.70	-0.285	0.005	563.220	
	17.1	D	Pipe	1"	80	4.55	1.80	4.55	4.55		2.75	0.000	0.000	#DIV/0!	Note 1
18	18.1	A	Pipe	1"	80	4.55	1.80	4.41	4.70		2.90	-0.436	-0.014	-201.647	
	18.1	B	Pipe	1"	80	4.55	1.80	4.45	4.55		2.75	-0.150	0.000	#DIV/0!	Note 1
	18.1	C	Pipe	1"	80	4.55	1.80	4.45	4.53		2.73	-0.120	0.002	1423.695	
	18.1	D	Pipe	1"	80	4.55	1.80	4.40	4.50		2.70	-0.150	0.005	563.220	
19	19.1	A	Pipe	1"	80	4.55	1.80	4.74	4.35		2.55	0.586	0.019	132.983	Note 3
	19.1	B	Pipe	1"	80	4.55	1.80	4.46	4.43		2.63	0.045	0.012	228.591	Note 3
	19.1	C	Pipe	1"	80	4.55	1.80	4.40	4.39		2.59	0.015	0.015	168.836	
	19.1	D	Pipe	1"	80	4.55	1.80	4.43	4.55		2.75	-0.180	0.000	#DIV/0!	Note 1
20	20.1	A	Pipe	1"	80	4.55	1.80	4.43	4.41		2.61	0.030	0.013	86.881	
	20.1	B	Pipe	1"	80	4.55	1.80	4.39	4.31		2.51	0.120	0.023	109.080	Note 3
	20.1	C	Pipe	1"	80	4.55	1.80	4.33	4.30		2.50	0.045	0.024	55.479	
	20.1	D	Pipe	1"	80	4.55	1.80	4.45	4.39		2.59	0.090	0.015	168.836	Note 3

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015		
Line No. :	183-6158-FG-1"-150A1-N		
Date of Test :	10/05/2023		
Page :	28 of 52	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

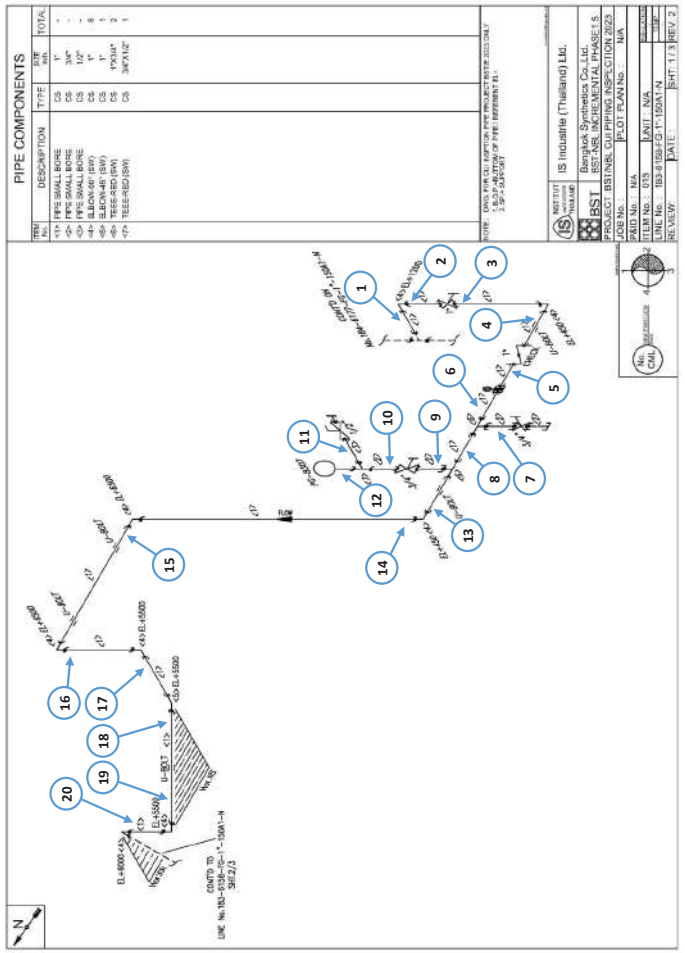
UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
21	21.1	A	Pipe	1"	80	4.55	1.80	4.42	4.27		2.47	0.225	0.027	92.007	Note 3
	21.1	B	Pipe	1"	80	4.55	1.80	4.41	4.24		2.44	0.255	0.030	82.094	Note 3
	21.1	C	Pipe	1"	80	4.55	1.80	4.49	4.49		2.69	0.000	0.006	467.612	
	21.1	D	Pipe	1"	80	4.55	1.80	4.34	4.34		2.54	0.000	0.020	126.153	
22	22.1	A	Pipe	1"	80	4.55	1.80	-	4.40		2.60	-	0.014	180.787	
	22.1	B	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
	22.1	C	Pipe	1"	80	4.55	1.80	-	4.63		2.83	-	-0.008	-368.961	Note 1
	22.1	D	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
23	23.1	A	Pipe	1"	80	4.55	1.80	-	4.36		2.56	-	0.018	140.531	
	23.1	B	Pipe	1"	80	4.55	1.80	-	4.25		2.45	-	0.029	85.178	
	23.1	C	Pipe	1"	80	4.55	1.80	-	4.29		2.49	-	0.025	99.887	
	23.1	D	Pipe	1"	80	4.55	1.80	-	4.30		2.50	-	0.024	104.300	
24	24.1	A	Pipe	1"	80	4.55	1.80	4.54	4.62		2.82	-0.120	-0.007	-420.180	Note 1
	24.1	B	Pipe	1"	80	4.55	1.80	4.40	4.52		2.72	-0.180	0.003	945.653	
	24.1	C	Pipe	1"	80	4.55	1.80	4.23	4.39		2.59	-0.240	0.015	168.836	
	24.1	D	Pipe	1"	80	4.55	1.80	4.50	4.50		2.70	0.000	0.005	563.220	
25	25.1	A	Pipe	1"	80	4.55	1.80	4.58	4.62		2.82	-0.060	-0.007	-420.180	Note 1
	25.1	B	Pipe	1"	80	4.55	1.80	4.41	4.52		2.72	-0.165	0.003	945.653	
	25.1	C	Pipe	1"	80	4.55	1.80	4.56	4.39		2.59	0.255	0.015	168.836	Note 3
	25.1	D	Pipe	1"	80	4.55	1.80	4.51	4.50		2.70	0.015	0.005	179.753	
26	26.1	A	Pipe	1"	80	4.55	1.80	4.43	4.41		2.61	0.030	0.013	86.881	
	26.1	B	Pipe	1"	80	4.55	1.80	4.63	4.26		2.46	0.556	0.028	88.475	Note 3
	26.1	C	Pipe	1"	80	4.55	1.80	4.55	4.47		2.67	0.120	0.008	348.101	Note 3
	26.1	D	Pipe	1"	80	4.55	1.80	4.41	4.48		2.68	-0.105	0.007	399.320	
27	27.1	A	Pipe	1"	80	4.55	1.80	4.36	4.29		2.49	0.105	0.025	99.887	Note 3
	27.1	B	Pipe	1"	80	4.55	1.80	4.30	4.41		2.61	-0.165	0.013	194.445	
	27.1	C	Pipe	1"	80	4.55	1.80	4.40	4.33		2.53	0.105	0.021	119.945	Note 3
	27.1	D	Pipe	1"	80	4.55	1.80	4.43	4.23		2.43	0.300	0.031	79.203	Note 3
28	28.1	A	Pipe	1"	80	4.55	1.80	4.36	4.32		2.52	0.060	0.022	114.277	Note 3
	28.1	B	Pipe	1"	80	4.55	1.80	4.27	4.35		2.55	-0.120	0.019	132.983	
	28.1	C	Pipe	1"	80	4.55	1.80	4.32	4.30		2.50	0.030	0.024	83.219	
	28.1	D	Pipe	1"	80	4.55	1.80	4.33	4.37		2.57	-0.060	0.017	148.917	
29	29.1	A	Pipe	1"	80	4.55	1.80	-	4.61		2.81	-	-0.006	-488.472	Note 1
	29.1	B	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
	29.1	C	Pipe	1"	80	4.55	1.80	-	4.40		2.60	-	0.014	180.787	
	29.1	D	Pipe	1"	80	4.55	1.80	-	4.51		2.71	-	0.004	706.632	
30	30.1	A	Pipe	1"	80	4.55	1.80	4.70	4.89		3.09	-0.285	-0.033	-94.790	Note 1
	30.1	B	Pipe	1"	80	4.55	1.80	4.79	4.53		2.73	0.391	0.002	1423.695	Note 3
	30.1	C	Pipe	1"	80	4.55	1.80	4.75	4.64		2.84	0.165	-0.009	-329.124	Note 1, 3
	30.1	D	Pipe	1"	80	4.55	1.80	4.56	4.65		2.85	-0.135	-0.010	-297.255	Note 1

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

Report No. :	IS/B-23-CUI-P-NBL-015		
Line No. :	183-6158-FG-1"-150A1-N		
Date of Test :	10/05/2023		
Page :	29 of 52	Rev.00	

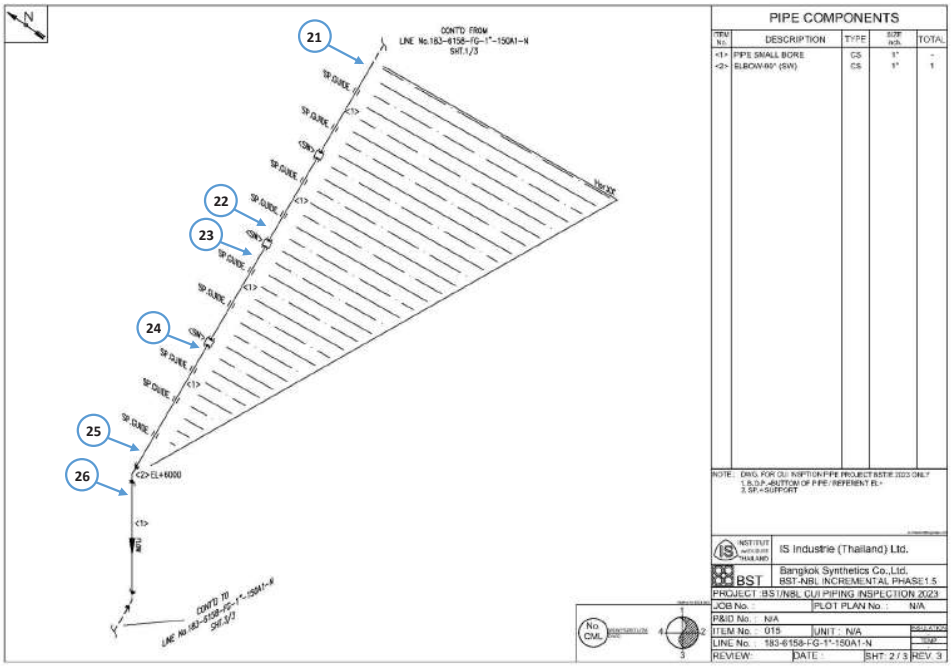
Code : | Rev.: | Effective date :

2D ISO-DRAWING WITH TMLs MARK UP



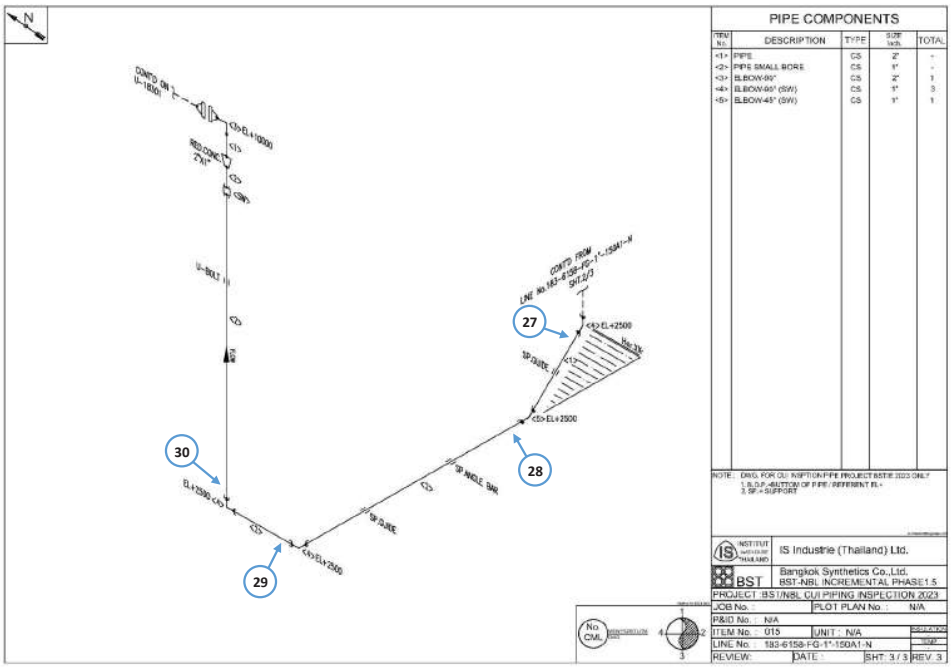
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	30 of 52 Rev.00

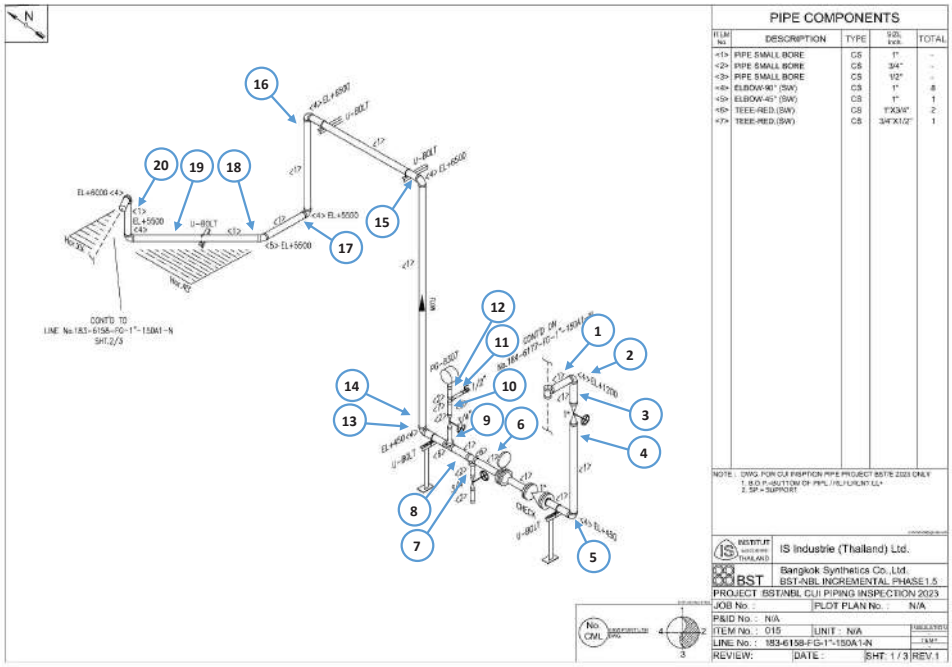


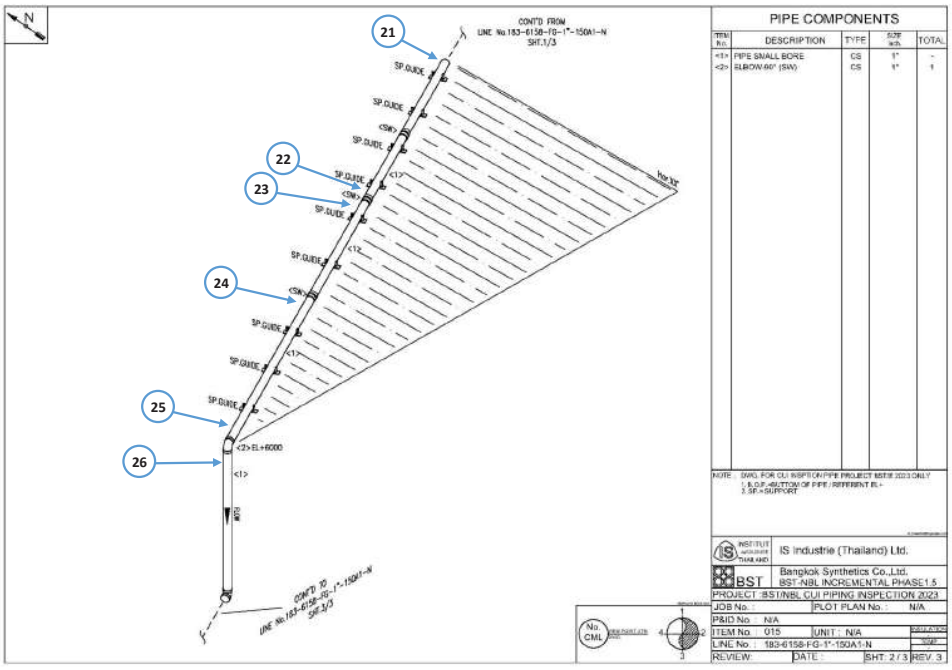
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	31 of 52 Rev.00



THAILAND

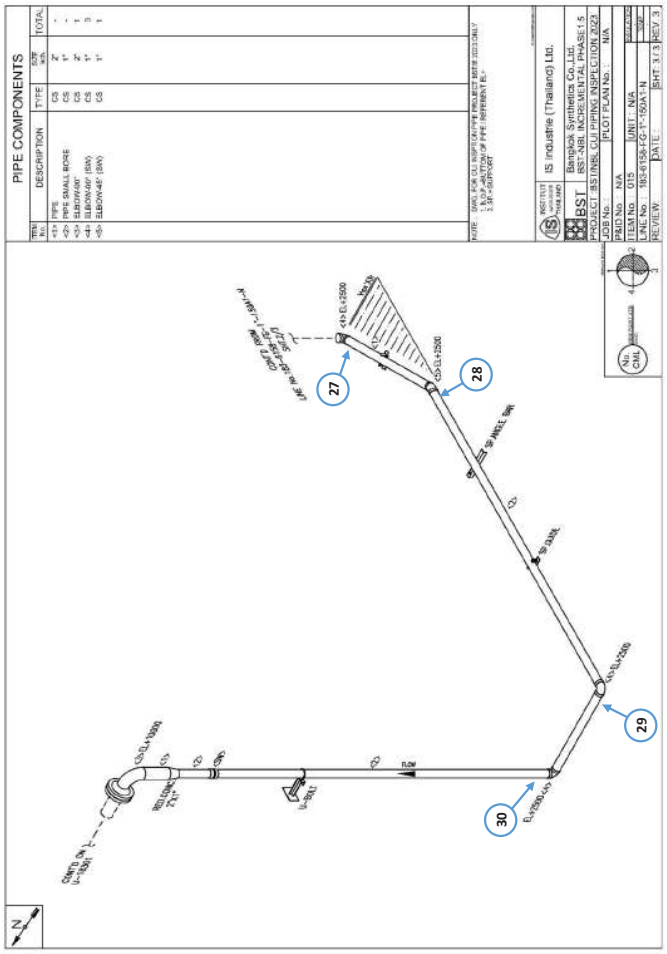

PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> PIPE SMALL BORE CS 3/4" -
<3> PIPE SMALL BORE CS 1/2" -
<6> ELBOW-90° (SW) CS 1" 8
<5> ELBOW-45° (SW) CS 1" 1
<5> TEEE-RED.(SW) CS 1"X3/4" 2
<7> TEEE-RED.(SW) CS 3/4"X1/2" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT. 1 / 3 REV.1


PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-60° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT. 2 / 3 REV. 3

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	34 of 52 Rev.00

3D ISO-DRAWING WITH TMLs MARK UP

Code : Rev.: Effective date :



Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	35 of 52 Rev.00

EDDY CURRENT TESTING SURFACE REPORT

Code : Rev.: Effective date :

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE			
TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS							
STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other : HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :
LIGHTING TYPE :	☑ Natural light	☐ Artificial light		

PART IDENTIFICATION & INFORMATION			
EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	183-6158-FG-1"-150A1-N

SCOPE OF INSPECTION

To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

REPORT PREPARED		**REVIEWED**		**CLIENT REPRESENTATIVE**	
SIGNATURE :		**SIGNATURE :**		**SIGNATURE :**	
NAME :	**MR. NITIPAT C.**	**NAME :**	**MR. KRISCHANUT S.**	**NAME :**	**MR. NATTA K.**
Position :	**ECT Level II**	**Position :**	**API 570**	**Position :**	**Inspection Engineer**
Date :	**May 10, 2023**	**Date :**	**May 18, 2023**	**Date :**	**May 21, 2023**

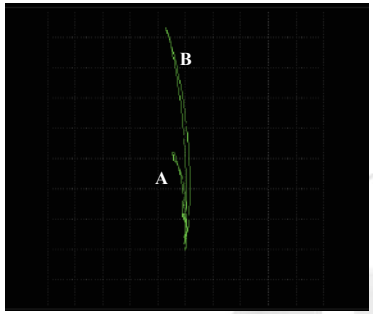
EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	36 of 52

Code : | Rev.: | Effective date : | Rev.00

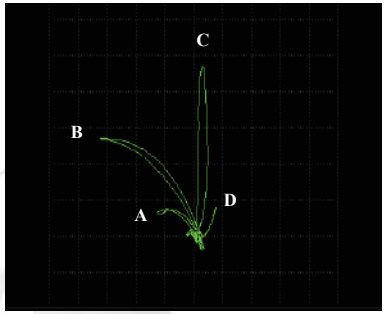
SETUP CALIBRATION

Absolute channel : Surface Signal



Frequency :	500 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.

Absolute channel : Sub-Surface Signal



Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.
Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

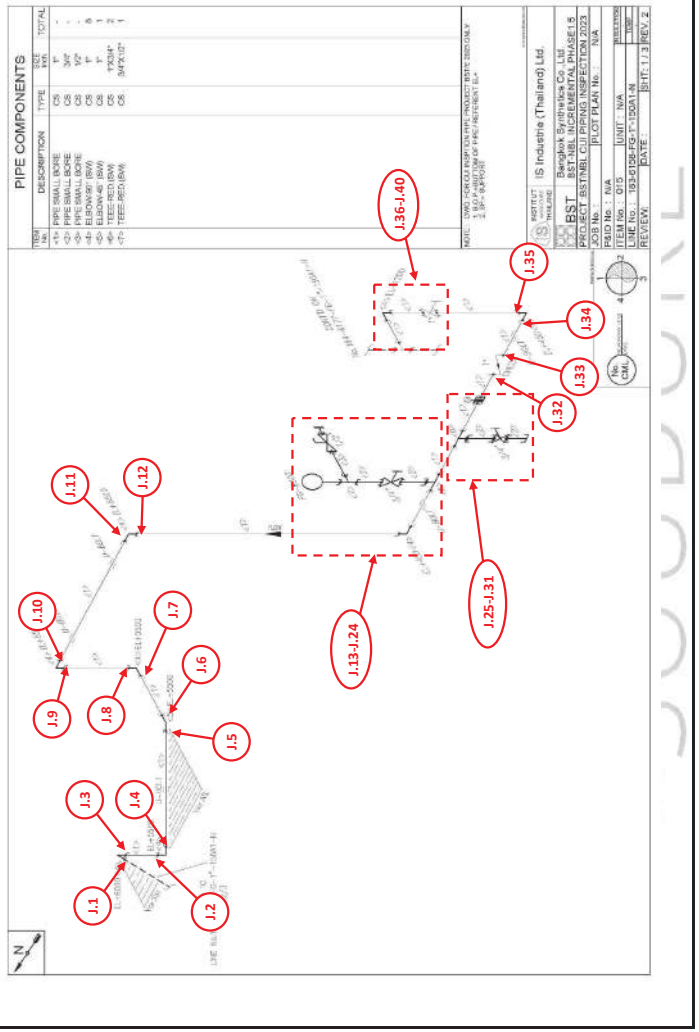
Note : FSH = Full Screen High

INSTITUT de SOUDURE THAILAND

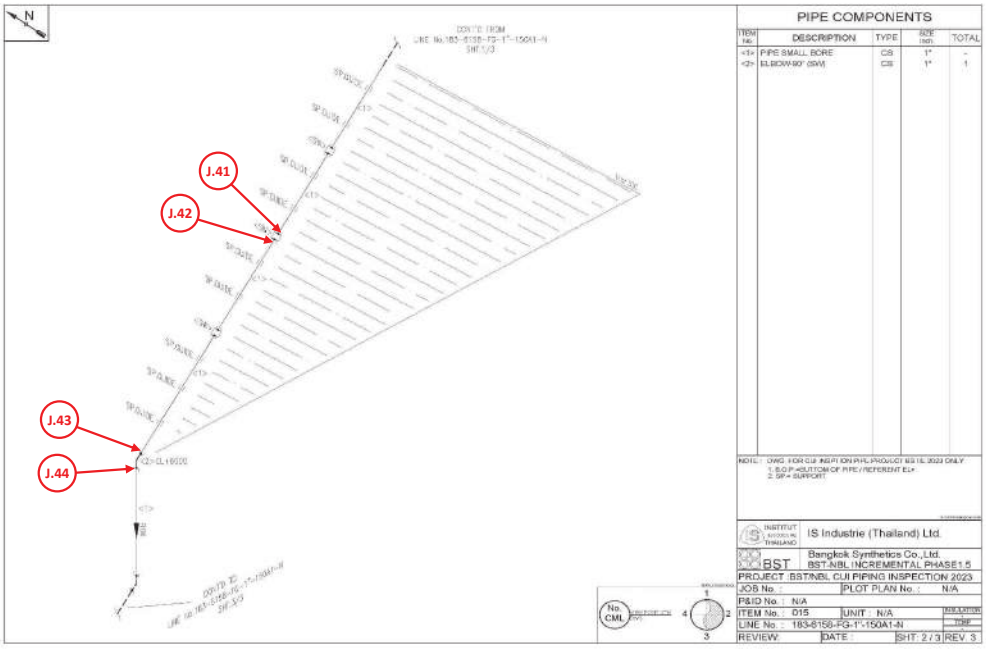
2D ISO-DRAWING WITH WELD JOINT MARK UP

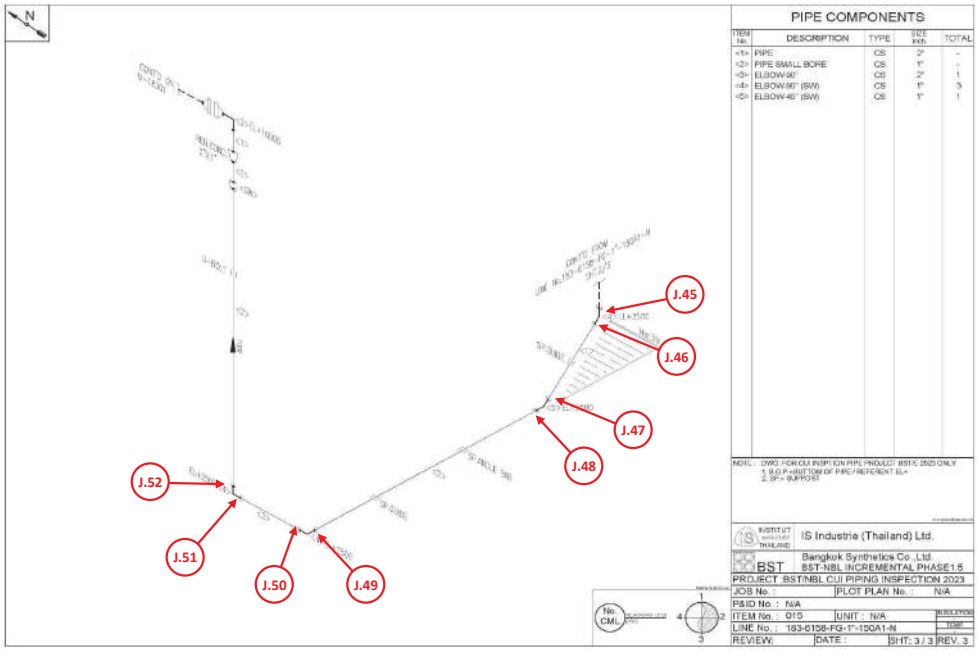
Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	37 of 52

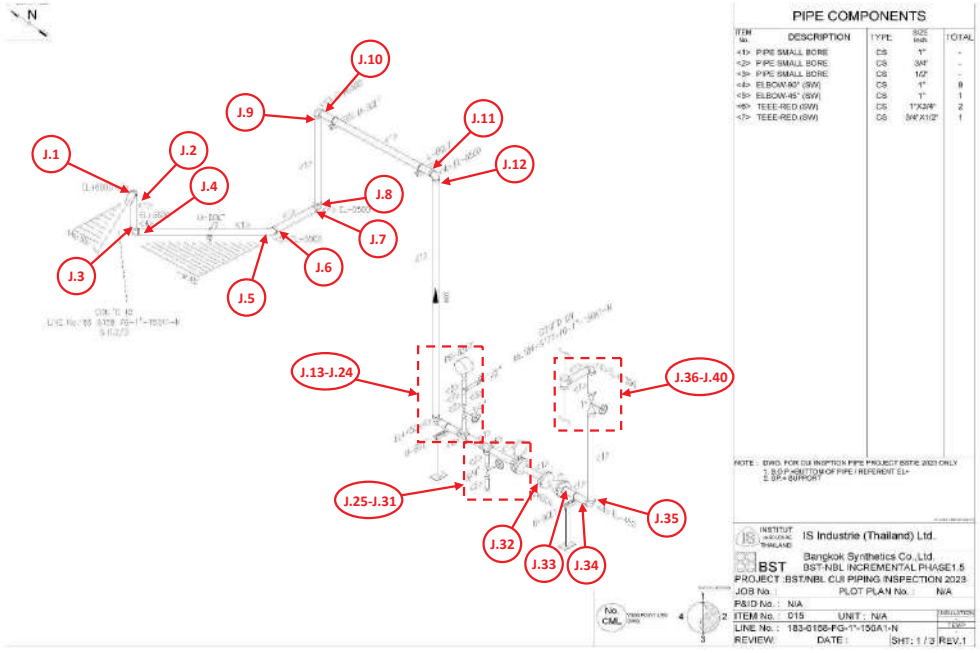
Code : | Rev.: | Effective date : | Rev.00

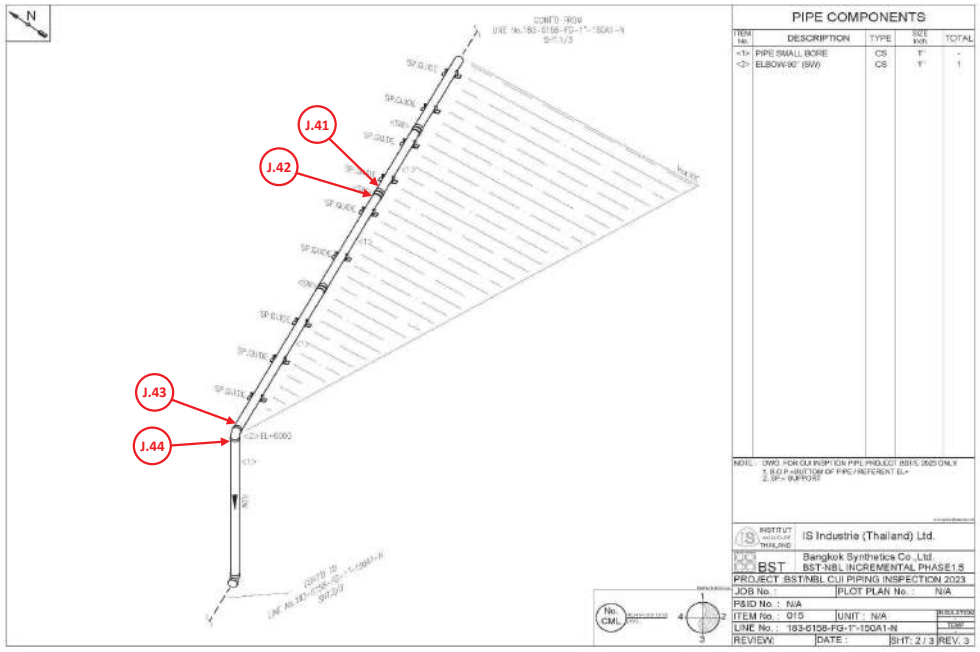


INSTITUT de SOUDURE THAILAND


N
J.41
J.42
J.43
J.44
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE (INCH)
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 / 3 REV. 3


N
J.45
J.46
J.47
J.48
J.49
J.50
J.51
J.52
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE (INCH)
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 1" -
<3> ELBOW-90° CS 2" 1
<4> ELBOW-90° (SW) CS 1" 3
<5> ELBOW-45° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 3 / 3 REV. 3


N
J.1
J.2
J.3
J.4
J.5
J.6
J.7
J.8
J.9
J.10
J.11
J.12
J.13-J.24
J.25-J.31
J.32
J.33
J.34
J.35
J.36-J.40
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> PIPE SMALL BORE | CS | 1/2" | -
<4> ELBOW-90° (SW) | CS | 1" | 8
<5> ELBOW-45° (SW) | CS | 1" | 1
<6> TEE-RED (SW) | CS | 1"X3/4" | 2
<7> TEE-RED (SW) | CS | 3/4"X1/2" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIL 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL=
2. SP= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 1 / 3 REV.1


N
J.41
J.42
J.43
J.44
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIL 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL=
2. SP= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 / 3 REV. 3

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	42 of 52 Rev.00

Code : Rev.: Effective date :

3D ISO-DRAWING WITH WELD JOINT MARK UP

INSTITUT SOUDURE THAILAND

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	43 of 52 Rev.00

Code : Rev.: Effective date :

EDDY CURRENT TESTING SURFACE REPORT

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	FW
2	Joint No.2	Weld and HAZ	No indication was found	FW
3	Joint No.3	Weld and HAZ	No indication was found	FW
4	Joint No.4	Weld and HAZ	No indication was found	FW
5	Joint No.5	Weld and HAZ	No indication was found	FW
6	Joint No.6	Weld and HAZ	No indication was found	FW
7	Joint No.7	Weld and HAZ	No indication was found	FW
8	Joint No.8	Weld and HAZ	No indication was found	FW
9	Joint No.9	Weld and HAZ	No indication was found	FW
10	Joint No.10	Weld and HAZ	No indication was found	FW
11	Joint No.11	Weld and HAZ	No indication was found	FW
12	Joint No.12	Weld and HAZ	No indication was found	FW
13	Joint No.13	Weld and HAZ	No indication was found	FW
14	Joint No.14	Weld and HAZ	No indication was found	FW
15	Joint No.15	Weld and HAZ	No indication was found	FW
16	Joint No.16	Weld and HAZ	No indication was found	FW
17	Joint No.17	Weld and HAZ	No indication was found	FW
18	Joint No.18	Weld and HAZ	No indication was found	FW
19	Joint No.19	Weld and HAZ	No indication was found	FW
20	Joint No.20	Weld and HAZ	No indication was found	FW
21	Joint No.21	Weld and HAZ	No indication was found	FW
22	Joint No.22	Weld and HAZ	No indication was found	FW
23	Joint No.23	Weld and HAZ	No indication was found	FW
24	Joint No.24	Weld and HAZ	No indication was found	FW
25	Joint No.25	Weld and HAZ	No indication was found	FW
26	Joint No.26	Weld and HAZ	No indication was found	FW
27	Joint No.27	Weld and HAZ	No indication was found	FW
28	Joint No.28	Weld and HAZ	No indication was found	FW
29	Joint No.29	Weld and HAZ	No indication was found	FW
30	Joint No.30	Weld and HAZ	No indication was found	FW
31	Joint No.31	Weld and HAZ	No indication was found	FW
32	Joint No.32	Weld and HAZ	No indication was found	FW
33	Joint No.33	Weld and HAZ	No indication was found	FW
34	Joint No.34	Weld and HAZ	No indication was found	FW
35	Joint No.35	Weld and HAZ	No indication was found	FW
36	Joint No.36	Weld and HAZ	No indication was found	FW
37	Joint No.37	Weld and HAZ	No indication was found	FW
38	Joint No.38	Weld and HAZ	No indication was found	FW
39	Joint No.39	Weld and HAZ	No indication was found	FW
40	Joint No.40	Weld and HAZ	No indication was found	FW
41	Joint No.41	Weld and HAZ	No indication was found	FW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW

INSTITUT SOUDURE THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-015
				Line No. :	183-6158-FG-1"-150A1-N
				Date of Test :	10/05/2023
	Code :	Rev.:	Effective date :	Page : 44 of 52	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
45	Joint No.45	Weld and HAZ	No indication was found	FW
46	Joint No.46	Weld and HAZ	No indication was found	FW
47	Joint No.47	Weld and HAZ	No indication was found	FW
48	Joint No.48	Weld and HAZ	No indication was found	FW
49	Joint No.49	Weld and HAZ	No indication was found	FW
50	Joint No.50	Weld and HAZ	No indication was found	FW
51	Joint No.51	Weld and HAZ	No indication was found	FW
52	Joint No.52	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-015
				Line No. :	183-6158-FG-1"-150A1-N
				Date of Test :	10/05/2023
	Code :	Rev.:	Effective date :	Page : 45 of 52	Rev.00

Picture No. 1 : ET result found no indication.

Picture No. 2 : ET result found no indication.

Picture No. 3 : ET result found no indication.

Picture No. 4 : ET result found no indication.

Picture No. 5 : ET result found no indication.

Picture No. 6 : ET result found no indication.

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-015	
				Line No. :	183-6158-FG-1"-150A1-N	
				Date of Test :	10/05/2023	
	Code :	Rev.:	Effective date :	Page :	46 of 52	Rev.00

Picture No. 7 : ET result found no indication.

Picture No. 8 : ET result found no indication.

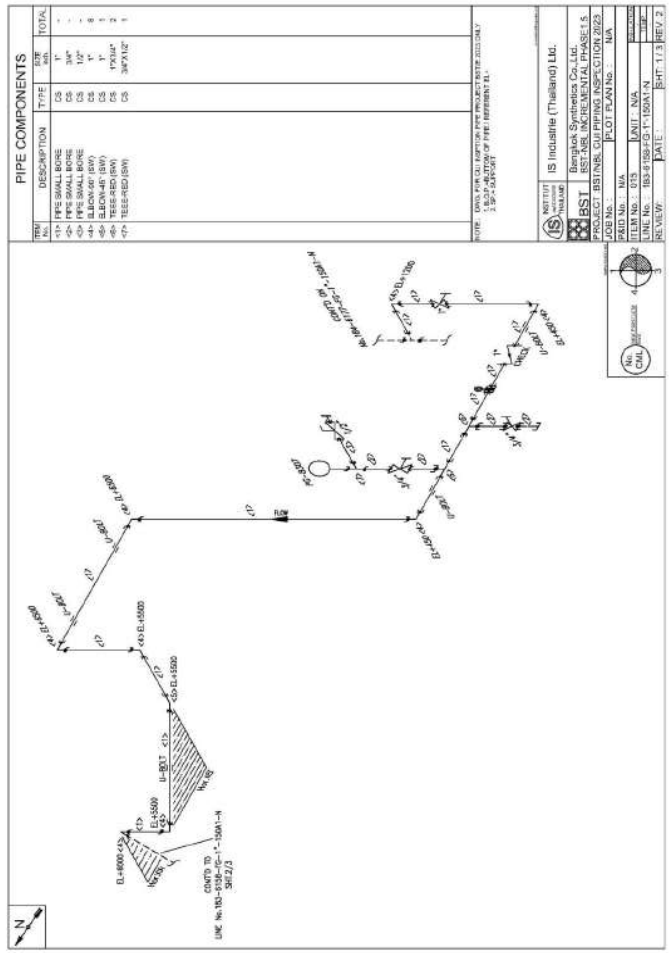
Picture No. 9 : ET result found no indication.

Picture No. 10 : ET result found no indication.

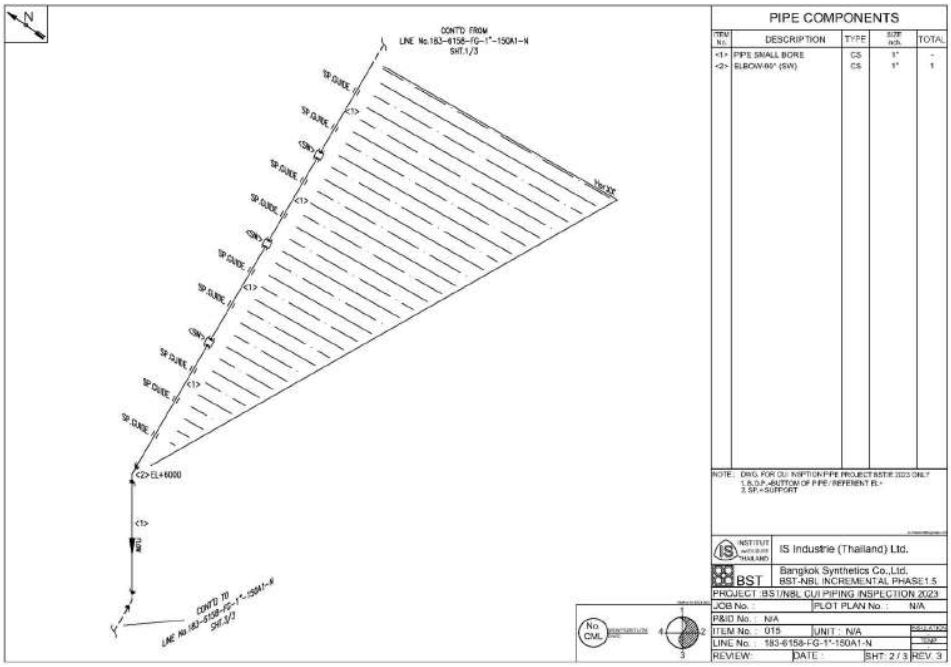
Picture No. 11 : ET result found no indication.

Picture No. 12 : ET result found no indication.

	2D ISO-DRAWING			Report No. :	IS/B-23-CUI-P-NBL-015	
				Line No. :	183-6158-FG-1"-150A1-N	
				Date of Test :	10/05/2023	
	Code :	Rev.:	Effective date :	Page :	47 of 52	Rev.00

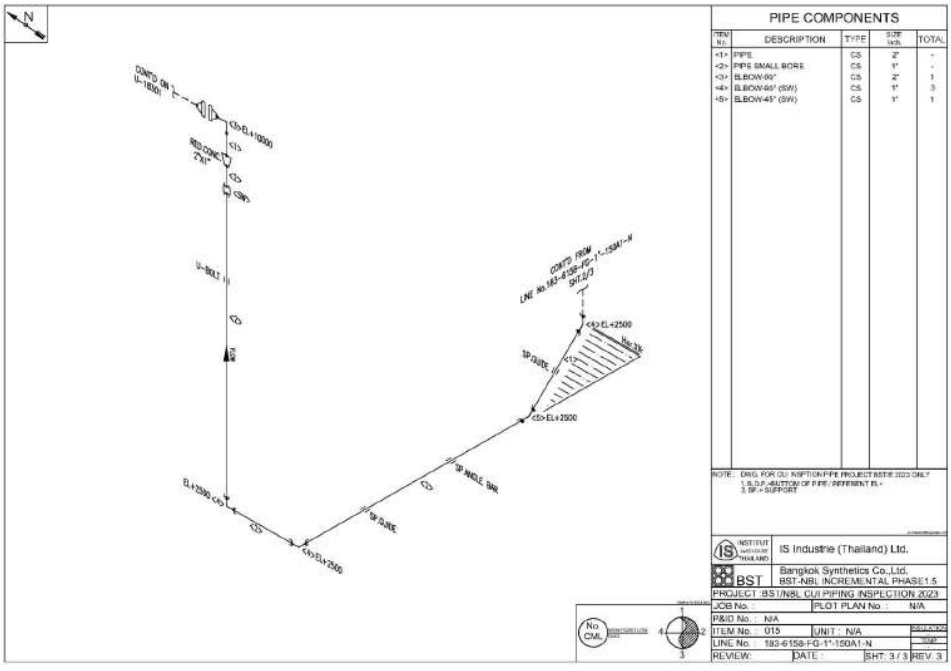


INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	48 of 52 Rev.00



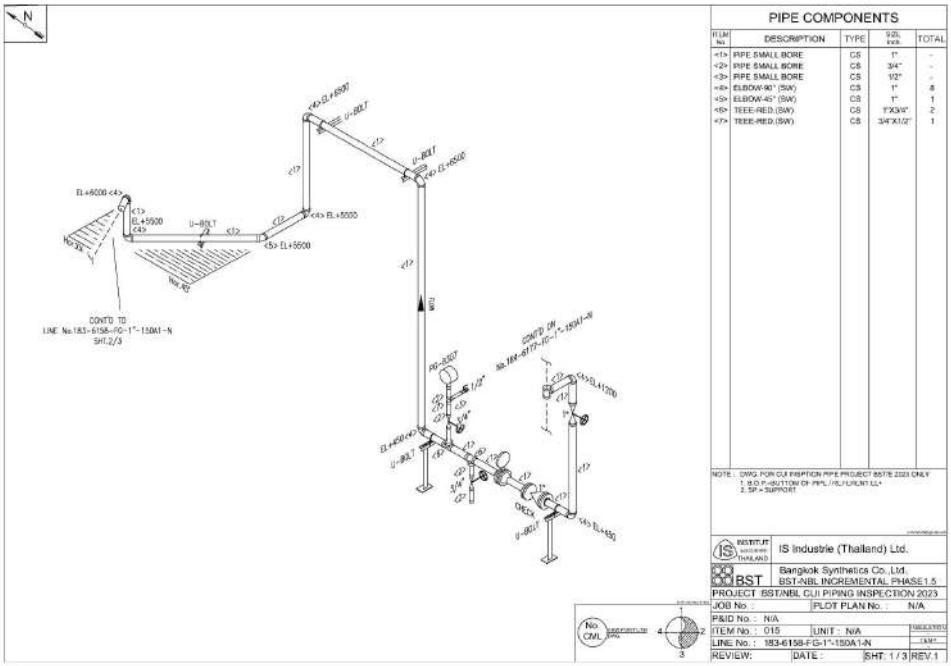
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	49 of 52 Rev.00



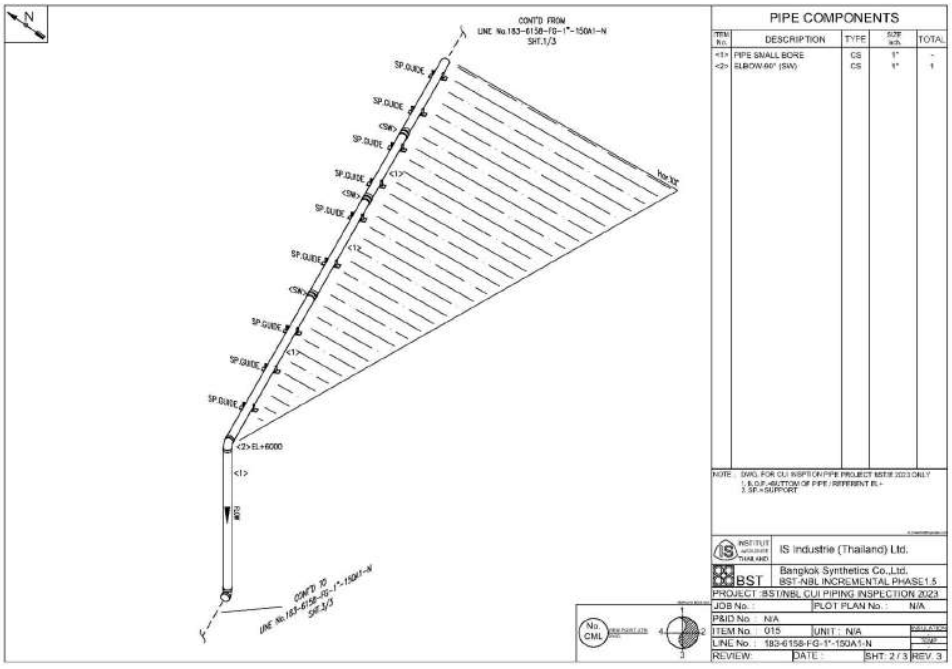
THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 50 of 52 Rev.00

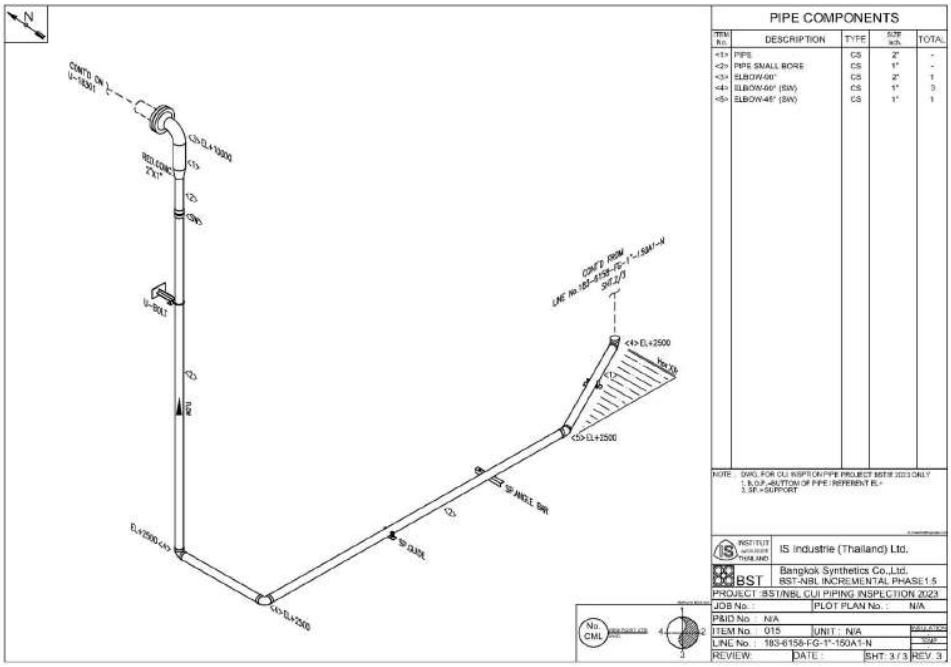


THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 51 of 52 Rev.00



THAILAND



Appendix 1
Inspector Certification

API INDIVIDUAL CERTIFICATION PROGRAMS

ANAB
ACCREDITED
PERSONNEL CERTIFICATION BODY

verifies that

krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69176

ORIGINAL CERTIFICATION DATE	November 30, 2016
CURRENT CERTIFICATION DATE	November 30, 2022
EXPIRATION DATE	November 30, 2025

Director, Individual Certification Programs

API | ICP

Copyright 2020 - American Petroleum Institute. All rights reserved. API, ICP, the API logo and the ICP mark are trademarks or registered trademarks of API, in the United States and/or other countries. This certificate is the property of Institute of Petroleum Technology. It is not to be reproduced, copied, or distributed without the express permission of the Institute of Petroleum Technology. Any use of this certificate is subject to the terms and conditions of the Institute of Petroleum Technology. Its authenticity and validity must be reviewed every three years. American Petroleum Institute, 200 Massachusetts Avenue, NW Suite 1100, Washington, DC 20001-5571 U.S.A. 202-682-8000 (00000).

COPY

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)
Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

IS INDUSTRIE (THAILAND) LTD.

Mr. Satish Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jocelyn Robin STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

เอกสารแนบที่ 129

แผนและผลการบำรุงรักษาท่อขนส่งก๊าซธรรมชาติ

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

Piping Line No.

184-6177-FG-1"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-013
Inspection date : May 19, 2023
Issue report date : June 22, 2023

Content

Item	*Description*	*Page*
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 54*
4	*Ultrasonic Thickness Measurement Report*	*55 - 83*
5	*Eddy Current Testing Report*	*84 - 112*
6	*2D & 3D ISO-Drawing*	*113 - 134*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : June 22, 2023	Date : June 25, 2023	Date : June 28, 2023

SUMMARY FINDING

Report No. :	IS/B-23-CUI-P-NBL-013		
Request No. :	-		
Date of Test :	19/05/2023		
Page :	1 of 112	Rev.00	

Code : | Rev.: | Effective date :

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 13 Line No.	184-6177-FG-1"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	8.0 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	90.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20. (See picture No. 11-13)	Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.
2	Instrument (Pressure gauge)	**Major**	Found water trap inside pressure gauge CMLs 42. (See picture No. 29-31)	Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
3	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of valve 1" CMLs 60. (See picture No. 44-46)	Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.
4	Other (Gasket)	**Major**	Found severe corrosion at gasket inside flange connection of valve 1" CMLs 64. (See picture No. 49-51)	Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.
5	Pipe, Fitting, Branch Connection, Valve, Flange Connection	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, fitting, branch connection, valve and flange connection at CMLs 2-3, 5, 32, 38, 40, 46-47. (See picture No. 2-3, 5, 22, 25, 27, 34-35)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Found 4 Major case at CMLs 20, 42, 60, 64. See detail in "VISUAL TESTING REPORT".	**Result :**	Rejected
UTM :	No significant wall-loss than corrosion allowance with maximum corrosion rate = 0.041 mm. / year and remaining life = 36.384 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

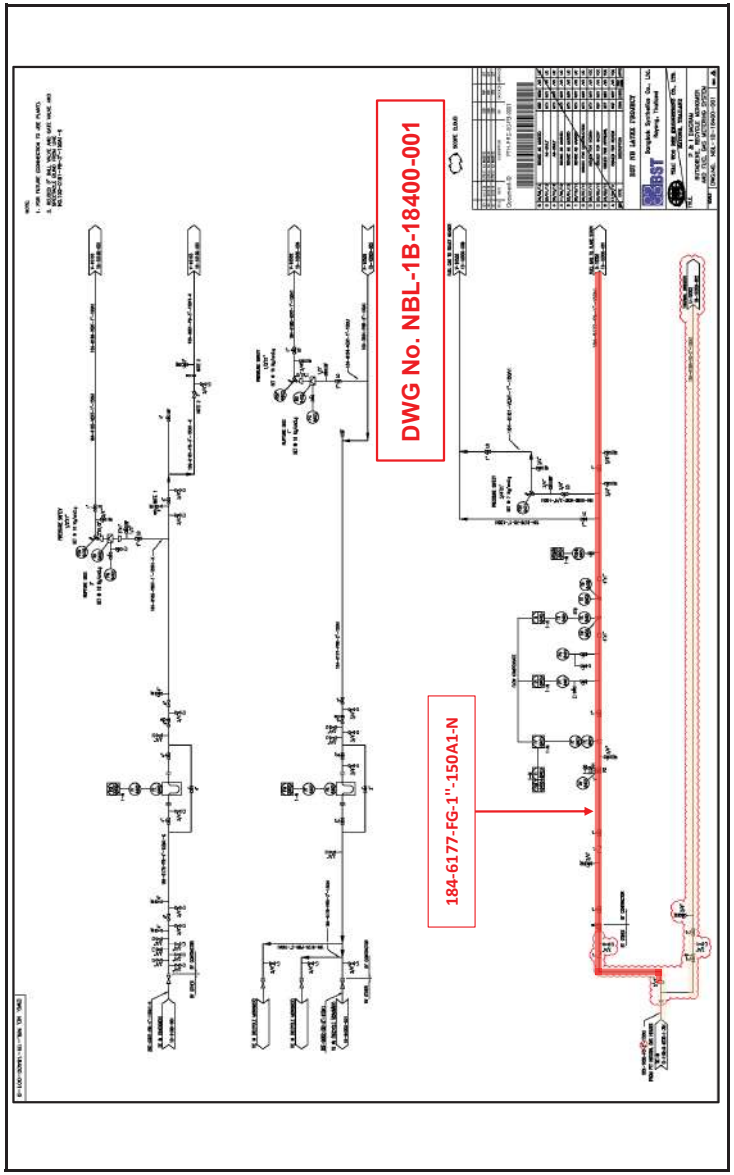
AFTER REPAIR INSPECTION RESULT

- Planned to replace within next S/D (2024) -

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	2 of 112	Rev.	00

Piping and Instrumentation Diagram (P&ID)

Code : Rev. : Effective date :



VISUAL TESTING REPORT

Code : Rev. : Effective date :

Report No. :	IS/B-23-CUI-P-NBL-013	
Request No. :	-	
Date of Test :	19/05/2023	
Page :	3 of 112	Rev.00

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6177-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			Slightly rust	-
2. Flange connection (Flange, Stud & Nut, Gasket)			✓		- Severe corrosion at gasket - Rust at stud & nut	11-13, 44-46, 49-51
3. Branch Connection (Vent, Drain, Nipples)	✓				Rust spot	-
4. Valve (Body, Bonnet, Stem, Packing, Handle)	✓					-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
9. Pressure gauge			✓		Water trap inside gauge	29-31
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)	✓					-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	June 22, 2023	Date :	June 25, 2023	Date :	June 28, 2023

Picture No. 1

Finding :

Pipe 1" include coupling CMLs 1 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Found painting damage & rust spot at check valve 1" CMLs 2.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

Found painting damage & rust spot at socket tee reducer 1" x 3/4" CMLs 3.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 4

Finding :

Drain branch 3/4" CMLs 4 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

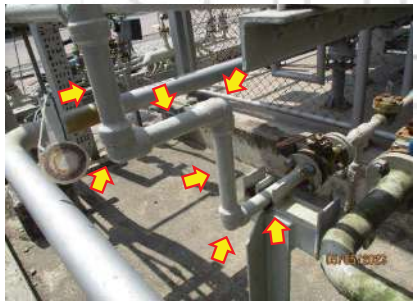
Picture No. 5

Finding :

Found slightly rust at valve 1" CMLs 5.

Recommendation :

Shall be monitor within next inspection.



Picture No. 6

Finding :

Pipe 1" CMLs 6, CMLs 8, CMLs 10, CMLs 12 and socket elbow 1" CMLs 7, CMLs 9, CMLs 11 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Pipe 1" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 8

Finding :

Pipe 1" CMLs 15 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Socket elbow 1" CMLs 16 and pipe 1" CMLs 17 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

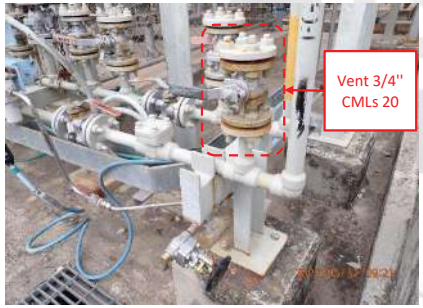
Picture No. 10

Finding :

Socket elbow 1" CMLs 18 and socket tee 1" x 1" CMLs 19 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 11

Finding :

Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20.

Recommendation :

Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.

Picture No. 12

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be immediately re-tighten packing of drain valve 3/4" CMLs 13.

Picture No. 13

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.

Picture No. 14

Finding :

Pipe 1" CMLs 21, CMLs 23 and check valve 1" CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 15

Finding :

Valve 1" CMLs 24 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Control valve 1" CMLs 25 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 17

Finding :

Pipe 1" and U-bolt support CMLs 26 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 18

Finding :

Socket tee reducer 1" x 3/4" CMLs 27 and valve 3/4" CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 19

Finding :

Instrument pipe 1" at support CMLs 29 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 20

Finding :

Instrument CMLs 30 was found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 21

Finding :

Instrument pipe 1" at support CMLs 31 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 22

Finding :

Found rust spot as all set of stud & nut at valve 1" CMLs 32.

Recommendation :

Shall be monitor within next inspection.

Picture No. 23

Finding :

Pipe 1" CMLs 33, CMLs 35 and socket elbow 1" CMLs 34, CMLs 36 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 24

Finding :

Socket tee reducer 1" x 3/4" CMLs 37 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Found rust spot as all set of stud & nut at valve 3/4" CMLs 38.

Recommendation :

Shall be monitor within next inspection.

Picture No. 26

Finding :

Socket tee reducer 1" x 3/4" CMLs 39 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 27

Finding :

Found rust spot as all set of stud & nut at valve 3/4" CMLs 40.

Recommendation :

Shall be monitor within next inspection.

Picture No. 28

Finding :

Pipe 3/4" include socket tee reducer 3/4" x 1/2" CMLs 41 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Found water trap inside pressure gauge CMLs 42.

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 30

Finding :

This photo shown water trap inside pressure gauge CMLs 42

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 31

Finding :

Close-up picture No. 30.

Recommendation :

Shall be replace pressure gauge CMLs 42 within next S/D or T/A.

Picture No. 32

Finding :

Reducer 4" x 1" include coupling CMLs 44 were found in normal condtion.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Pipe 4" CMLs 45 include U-bolt and structure support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 34

Finding :

Found rust spot as all set of stud & nut at flange connection of branch 1" CMLs 46.

Recommendation :

Shall be monitor within next inspection.

Picture No. 35

Finding :

Found rust spot as all set of stud & nut at flange connection of branch 1" CMLs 47.

Recommendation :

Shall be monitor within next inspection.

Picture No. 36

Finding :

Reducer 4" x 1" include coupling CMLs 48 were found in normal condtion.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Socket tee 1" x 1" CMLs 49 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Small bore branch 1" CMLs 50 include valve were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 39

Finding :

Pipe 1" CMLs 51 include U-bolt and structure support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Socket tee 1" x 1" CMLs 52 and small bore branch 1" CMLs 53 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

Pipe 1" CMLs 54 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

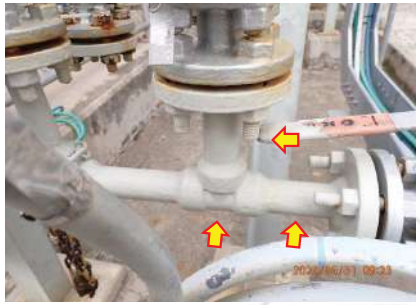
Picture No. 42

Finding :

Socket tee reducer 1" x 3/4" CMLs 55, small bore branch 3/4" CMLs 56 and pipe 1" CMLs 57 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



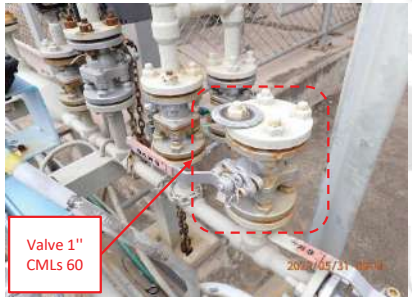
Picture No. 43

Finding :

Socket tee 1" x 1" CMLs 58, small bore branch 1" CMLs 59 and pipe 1" CMLs 61 were found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 44

Finding :

Found severe corrosion at gasket inside flange connection of valve 1" CMLs 60.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 45

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 46

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 60 wihtin next S/D or T/A.

Picture No. 47

Finding :

Valve 1" CMLs 62 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 48

Finding :

Socket tee 1" x 1" CMLs 63 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

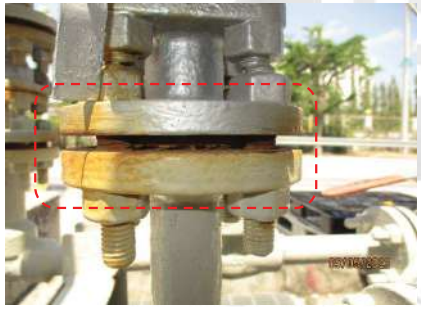
Picture No. 49

Finding :

Found severe corrosion at gasket inside flange connection of valve 1" CMLs 64.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.



Picture No. 50

Finding :

This photo shown flange connection which found damaged gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.

Picture No. 51

Finding :

This photo shown close-up view of severe corrosion at gasket.

Recommendation :

Shall be replace gasket at flange connection of valve 1" CMLs 64 wihtin next S/D or T/A.

Picture No. 52

Finding :

Pipe 1" CMLs 65, CMLs 67 and socket elbow 1" CMLs 66 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 53

Finding :

Socket elbow 1" CMLs 68 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 54

Finding :

Pipe 1", U-bolt and structure support CMLs 69 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 55

Finding :

Pipe 1", U-bolt and structure support CMLs 70 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 56

Finding :

Pipe 1", U-bolt and structure support CMLs 71, CMLs 72, CMLs 73 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 57

Finding :

Socket elbow 1" CMLs 74 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 58

Finding :

Pipe 1", U-bolt and structure support CMLs 75 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 59

Finding :

Pipe 1", U-bolt and structure support CMLs 76, CMLs 77 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

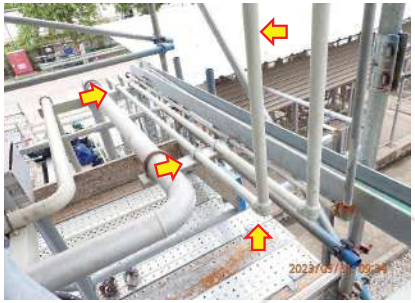
Picture No. 60

Finding :

Socket elbow 1" CMLs 78 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 61

Finding :

Pipe 1", U-bolt, structure support CMLs 79, CMLs 80, CMLs 82 and socket elbow 1" CMLs 81 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

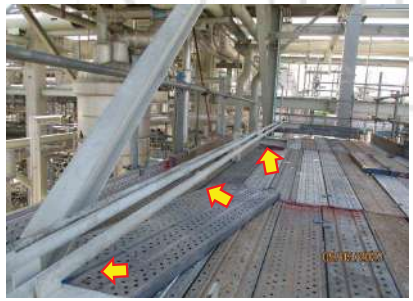
Picture No. 62

Finding :

Socket elbow 1" CMLs 83 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 63

Finding :

Pipe 1", coupling and structure support CMLs 84, CMLs 85, CMLs 86 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 64

Finding :

Socket elbow 1" CMLs 88, CMLs 90, CMLs 92 and pipe 1" CMLs 89, CMLs 91 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 65

Finding :

Pipe 1" CMLs 93 and socket elbow 1" CMLs 94 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 66

Finding :

Pipe 1" CMLs 95 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 67

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 68

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 69

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 70

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 71

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 72

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 73

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 74

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 75

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 76

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 77

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 78

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 79

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 80

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 81

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 82

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 83

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 84

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	32 of 112 Rev.00

Code : | Rev.: | Effective date :

Picture No. 85

Finding :

Pipe 1" CMLs 96, CMLs 98, socket tee 1" x 1" CMLs 97 and socket elbow 1" CMLs 99 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 86

Finding :

This photo shown pipe 1" and socket tee 1" were in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 87

Finding :

This photo shown pipe 1" and socket elbow 1" were in normal condition.

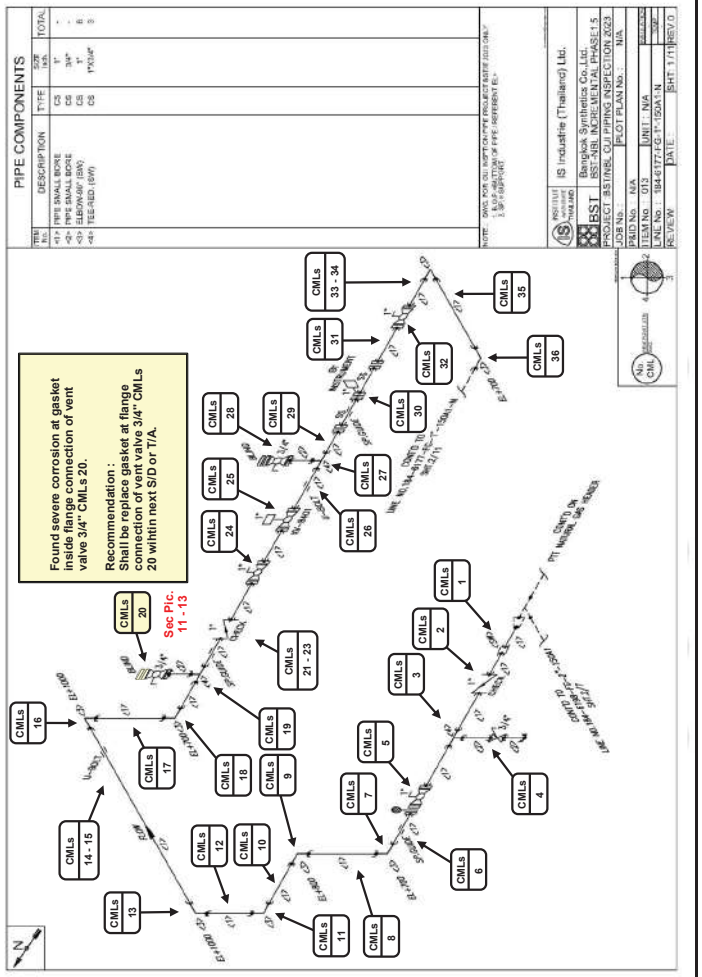
Recommendation :

Should be monitor within next inspection.

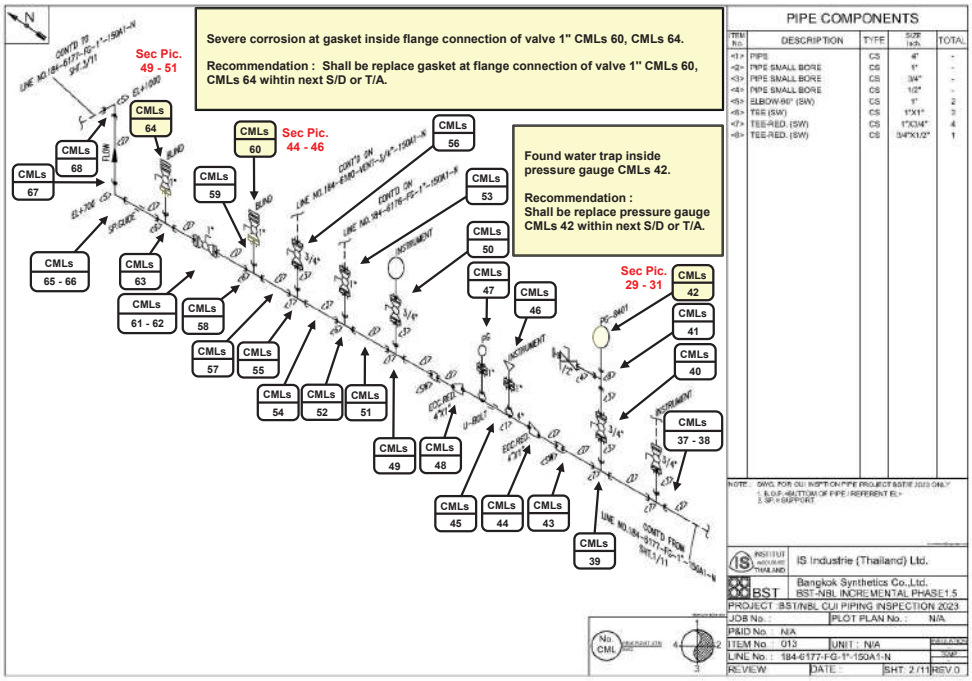
2D ISO-DRAWING WITH MARK UP

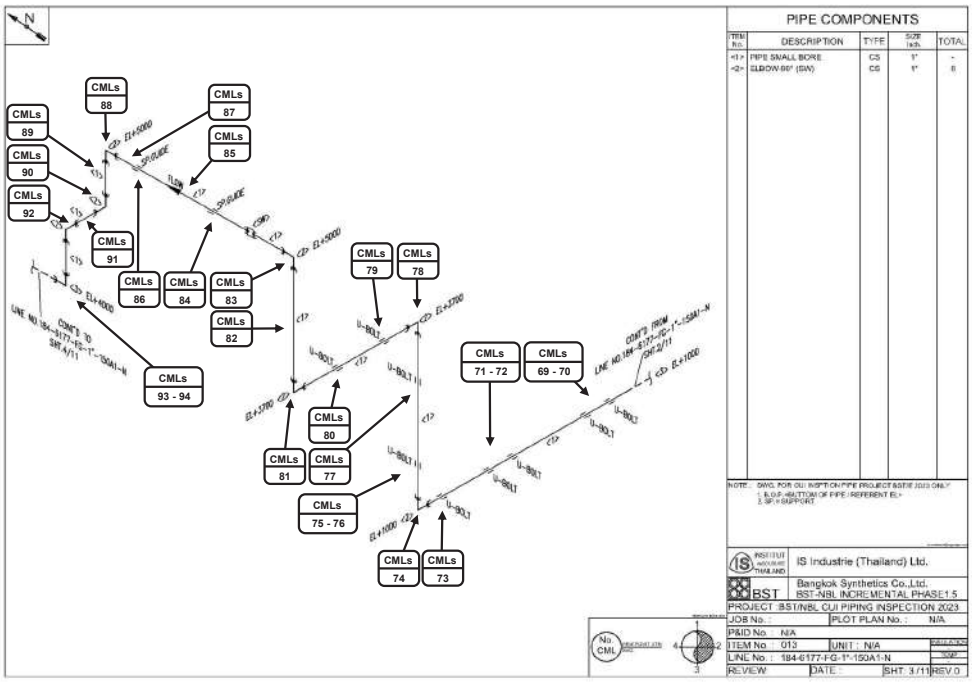
Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	33 of 112 Rev.00

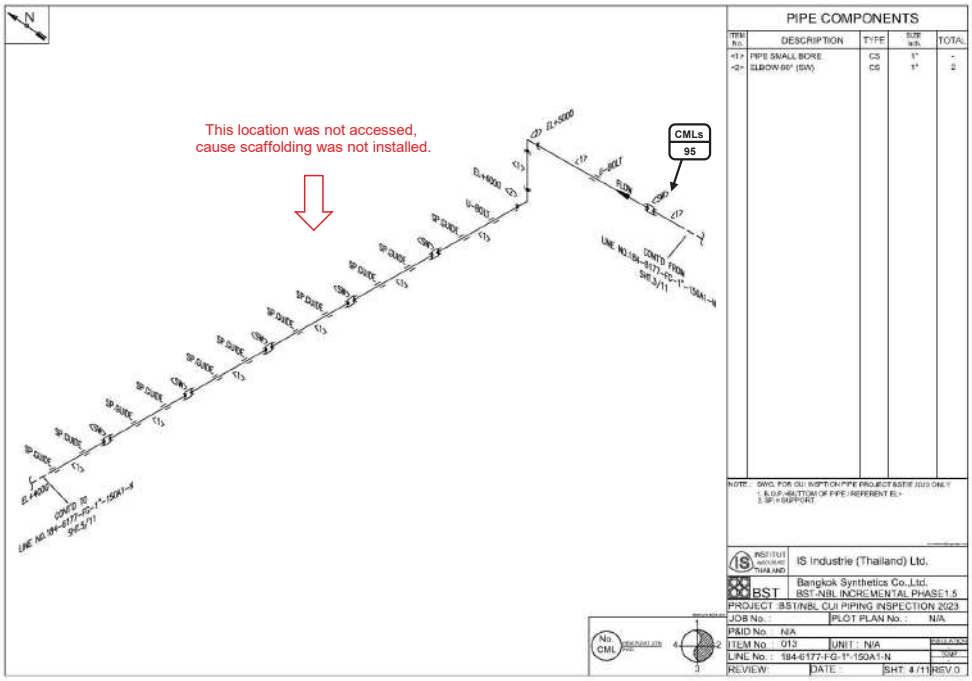
Code : | Rev.: | Effective date :



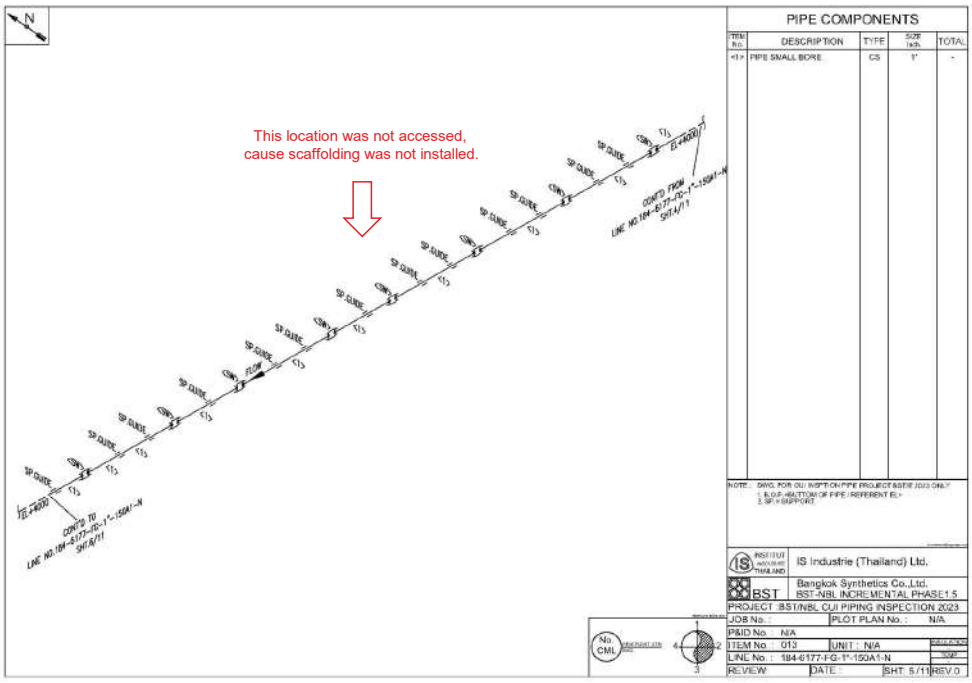
IS SOUDURE THAILAND


Severe corrosion at gasket inside flange connection of valve 1" CMLs 60, CMLs 64.
Recommendation : Shall be replace gasket at flange connection of valve 1" CMLs 60, CMLs 64 wihtin next S/D or T/A.
Found water trap inside pressure gauge CMLs 42.
Recommendation : Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
Sec Pic. 49 - 51
Sec Pic. 44 - 46
Sec Pic. 29 - 31
PIPE COMPONENTS
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023

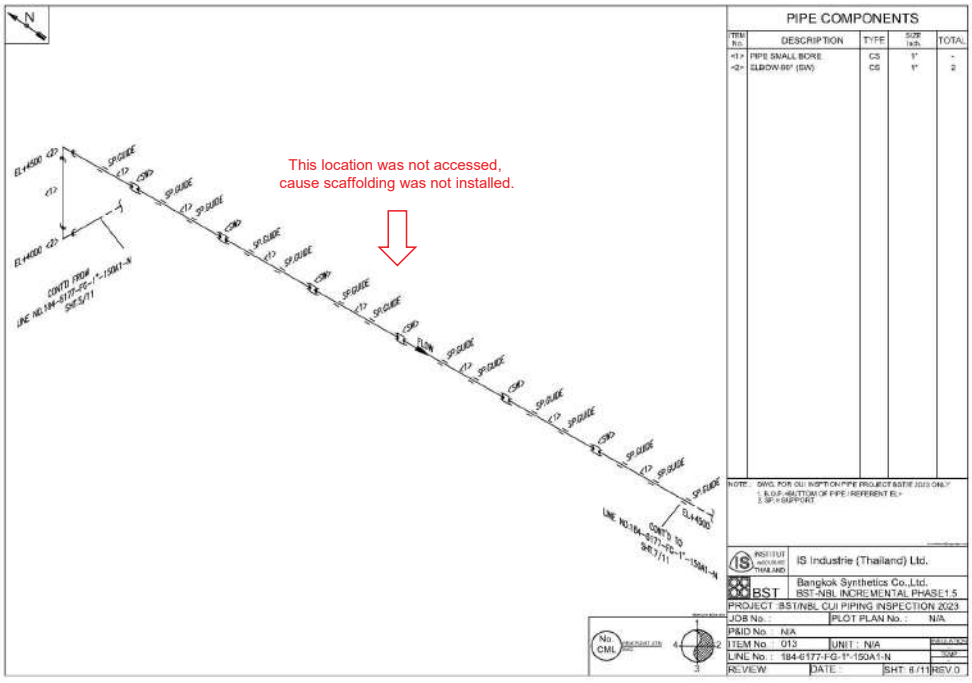

PIPE COMPONENTS
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023



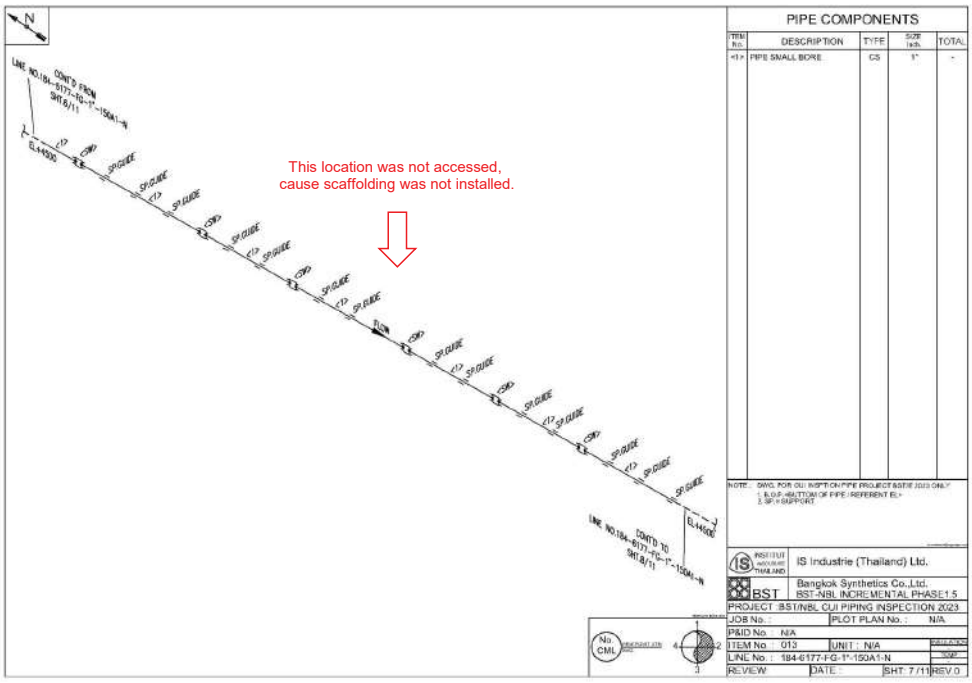
THAILAND



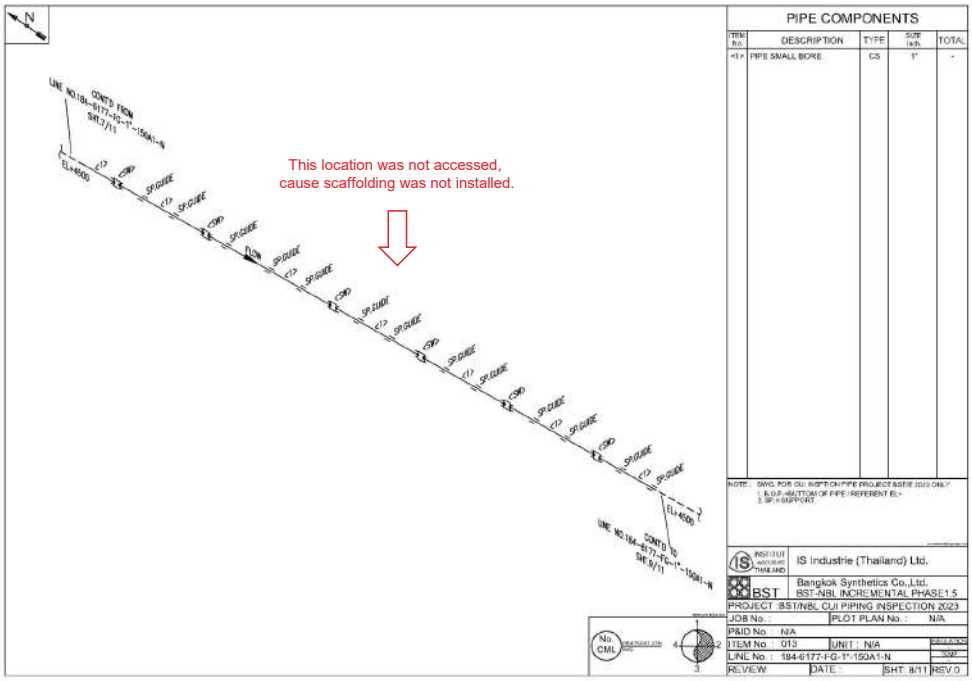
THAILAND



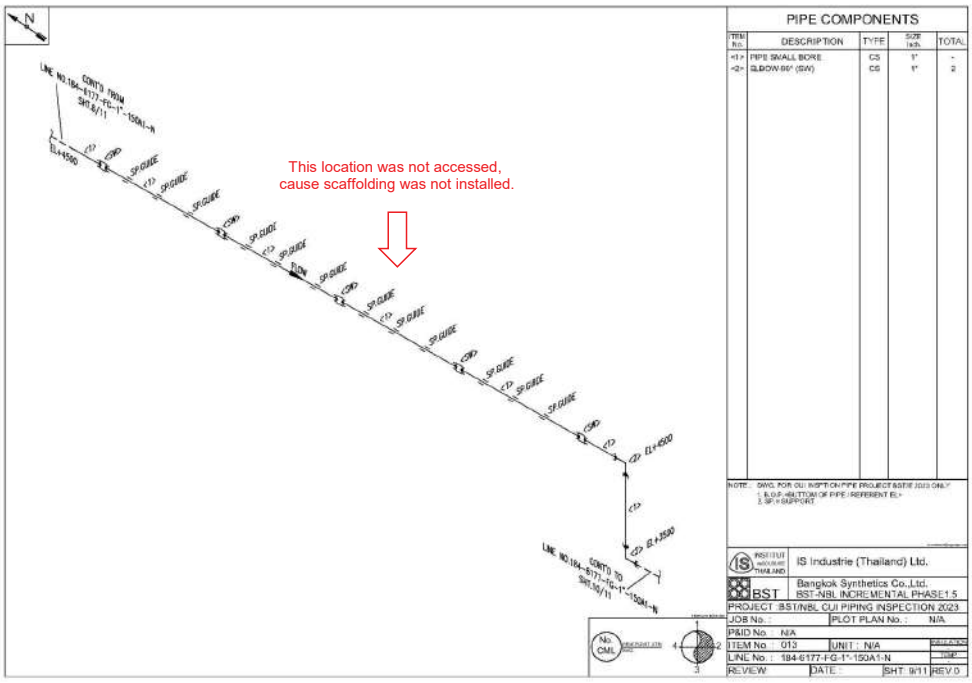
THAILAND



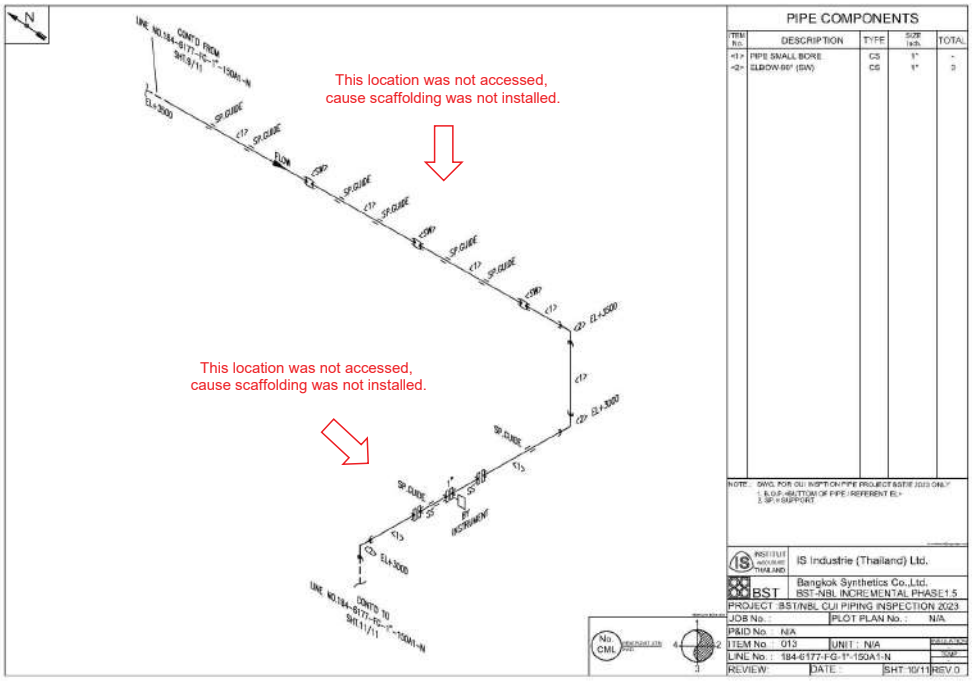
THAILAND



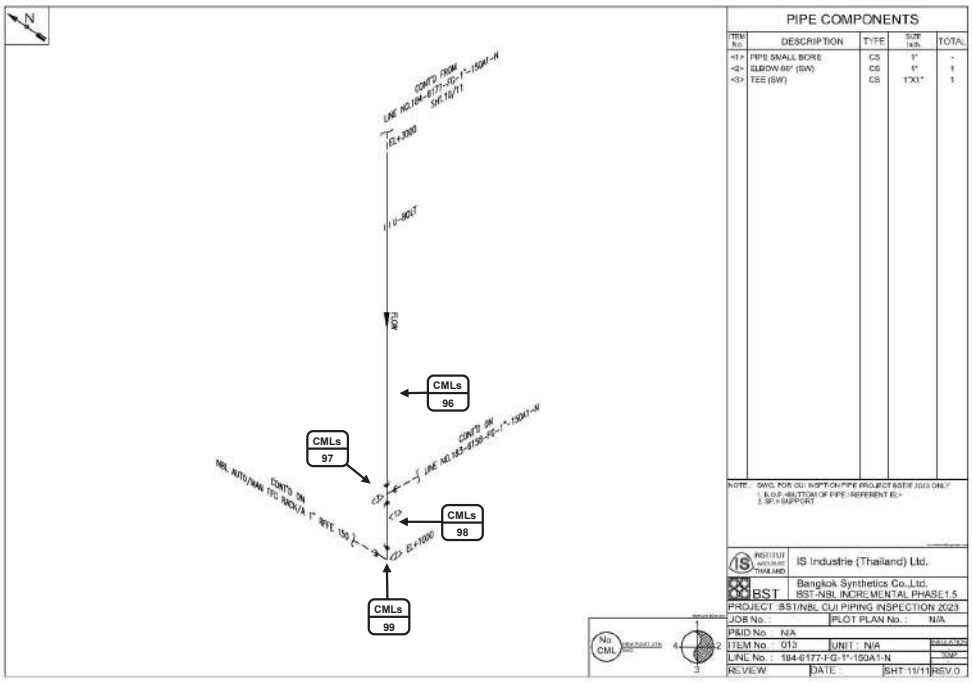
THAILAND



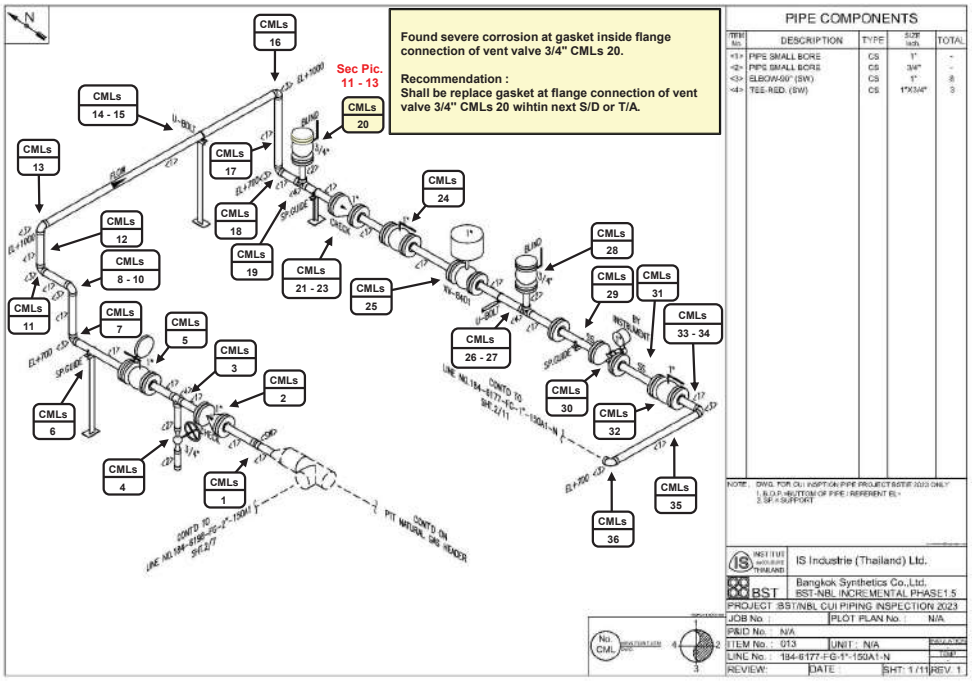
THAILAND

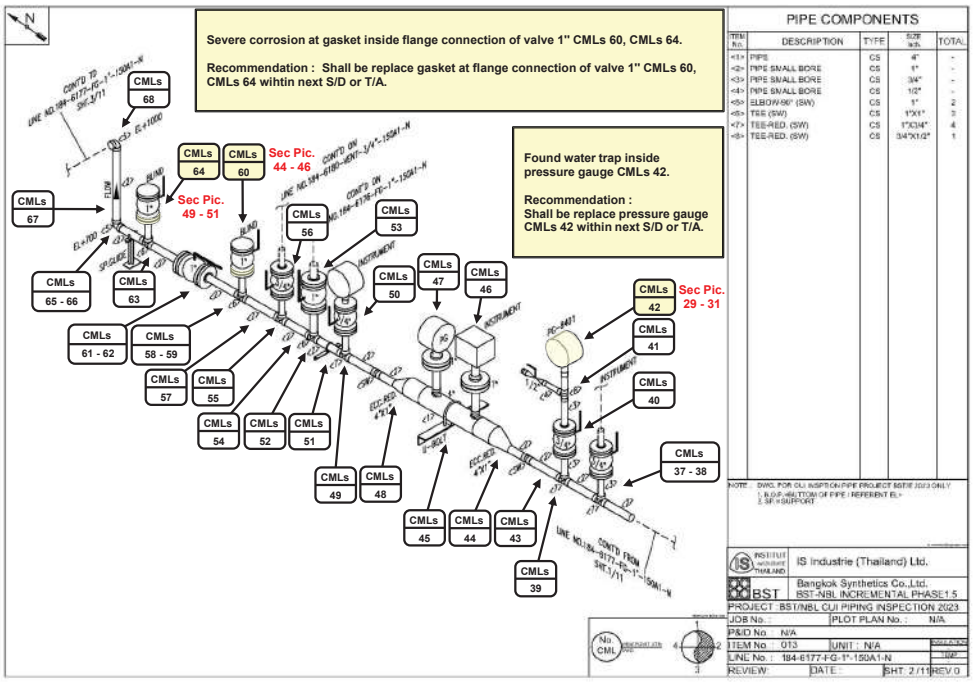


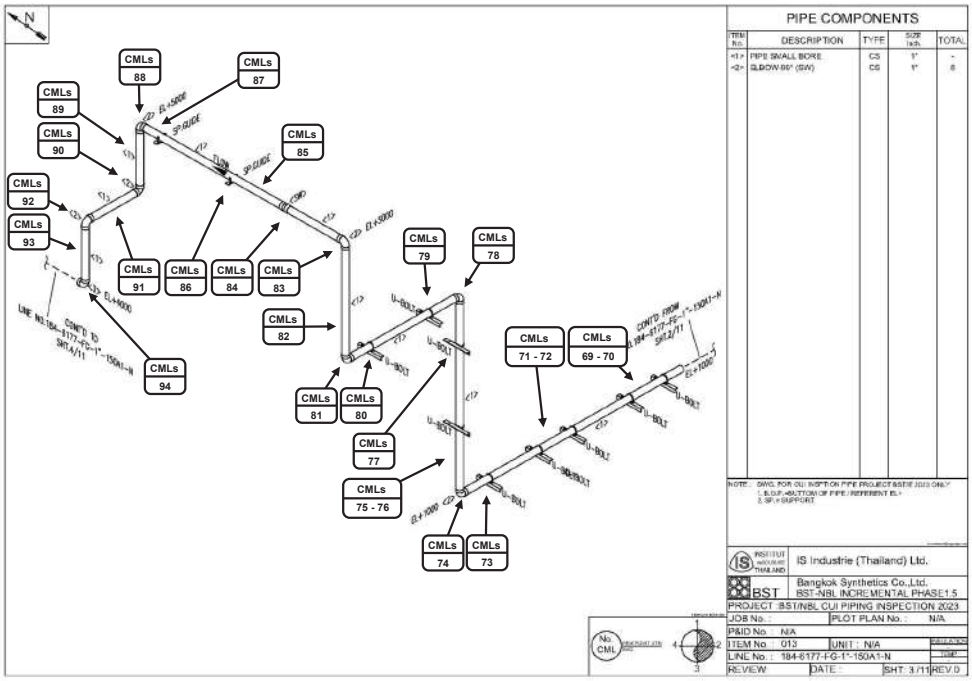
THAILAND



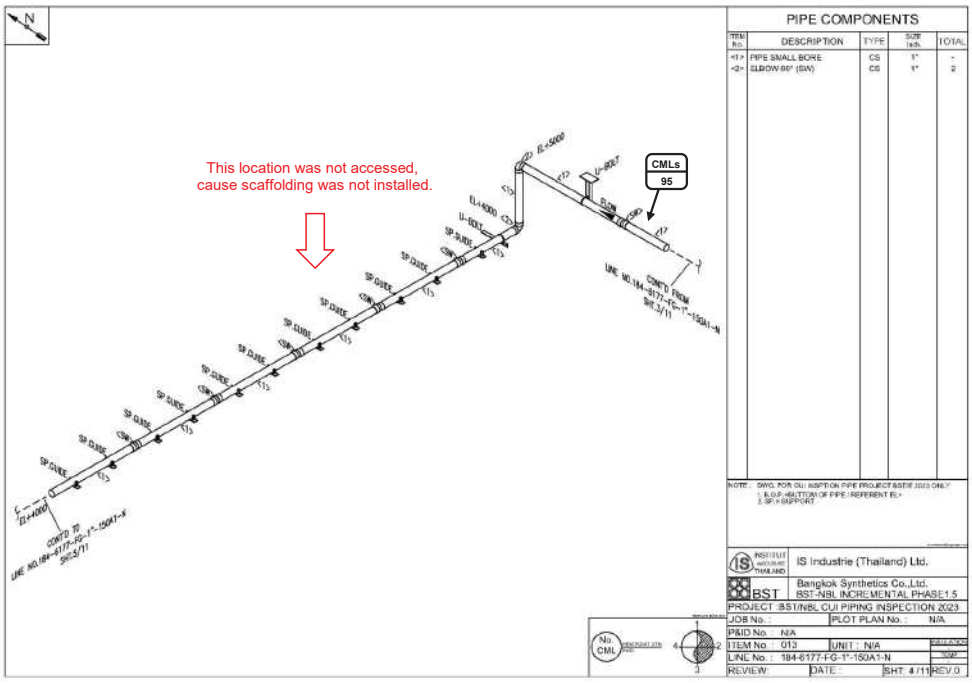
THAILAND


Found severe corrosion at gasket inside flange connection of vent valve 3/4" CMLs 20.
Recommendation :
Shall be replace gasket at flange connection of vent valve 3/4" CMLs 20 wihtin next S/D or T/A.
Sec Pic. 11 - 13
CMLs 16
CMLs 14 - 15
CMLs 20
CMLs 13
CMLs 17
CMLs 24
CMLs 18
CMLs 12
CMLs 19
CMLs 21 - 23
CMLs 8 - 10
CMLs 25
CMLs 28
CMLs 29
CMLs 31
CMLs 11
CMLs 7
CMLs 33 - 34
CMLs 5
CMLs 26 - 27
CMLs 3
CMLs 2
CMLs 30
CMLs 6
CMLs 32
CMLs 4
CMLs 1
CMLs 35
CMLs 36
CONT'D TO LINE NO.184-6156-FG-2"-150A1 SHT.2/7
CONT'D ON PIT NATURAL GAS HEADER
CONT'D TO LINE NO.184-6177-FG-1"-150A1-N SHT.2/11
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° (SW) CS 1" 8
<4> TEE-RED. (SW) CS 1"X3/4" 3
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTIF 2023 ONLY
1. B.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 1 /11 REV. 1

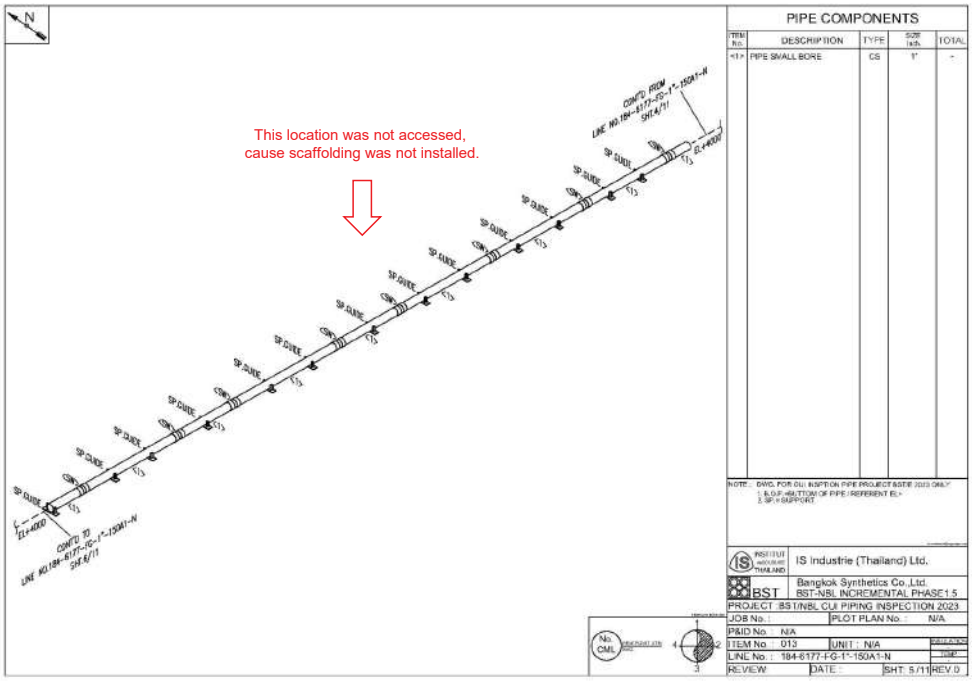

Severe corrosion at gasket inside flange connection of valve 1" CMLs 60, CMLs 64.
Recommendation : Shall be replace gasket at flange connection of valve 1" CMLs 60, CMLs 64 wihtin next S/D or T/A.
Found water trap inside pressure gauge CMLs 42.
Recommendation :
Shall be replace pressure gauge CMLs 42 within next S/D or T/A.
CMLs 68
CMLs 64
CMLs 60
Sec Pic. 44 - 46
Sec Pic. 49 - 51
CMLs 67
CMLs 56
CMLs 53
CMLs 50
CMLs 47
CMLs 46
CMLs 42
Sec Pic. 29 - 31
CMLs 65 - 66
CMLs 63
CMLs 41
CMLs 61 - 62
CMLs 58 - 59
CMLs 40
CMLs 57
CMLs 55
CMLs 37 - 38
CMLs 54
CMLs 52
CMLs 51
CMLs 49
CMLs 48
CMLs 45
CMLs 44
CMLs 43
CMLs 39
CONT'D TO LINE NO.184-6177-FG-1"-150A1-N SHT.2/11
CONT'D ON LINE NO.184-6180-JGNT-3/4"-150A1-N
CONT'D ON LINE NO.184-6176-FG-1"-150A1-N
CONT'D FROM LINE NO.184-6177-FG-1"-150A1-N SHT.1/11
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 4" -
<2> PIPE SMALL BORE CS 1" -
<3> PIPE SMALL BORE CS 3/4" -
<4> PIPE SMALL BORE CS 1/2" -
<5> ELBOW-90° (SW) CS 1" 2
<6> TEE (SW) CS 1"X1" 3
<7> TEE-RED. (SW) CS 1"X3/4" 4
<8> TEE-RED. (SW) CS 3/4"X1/2" 1
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTIF 2023 ONLY
1. B.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 /11 REV. 0



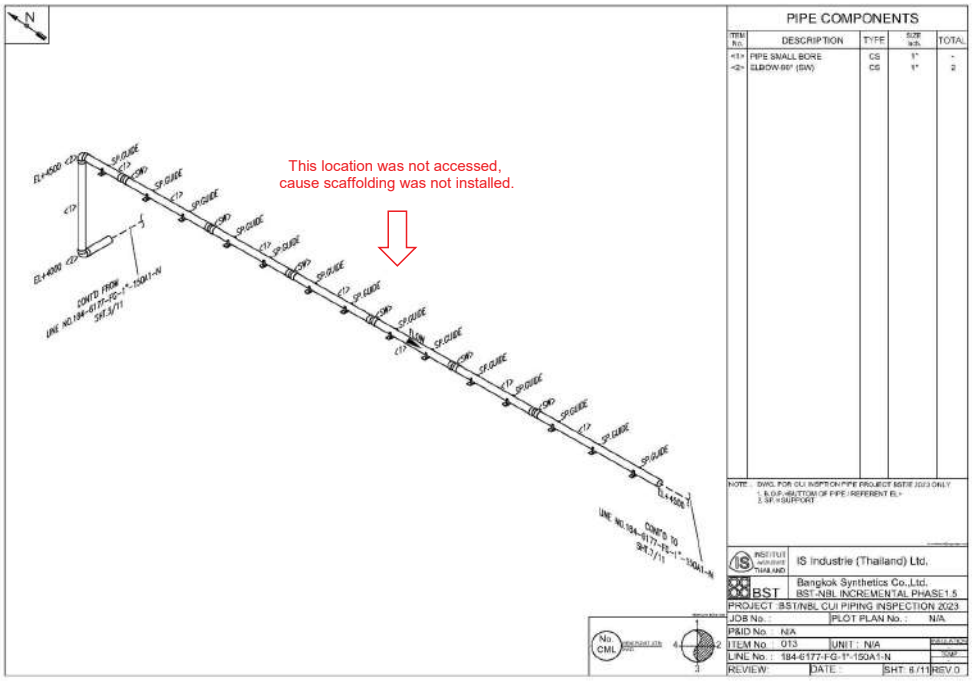
THAILAND



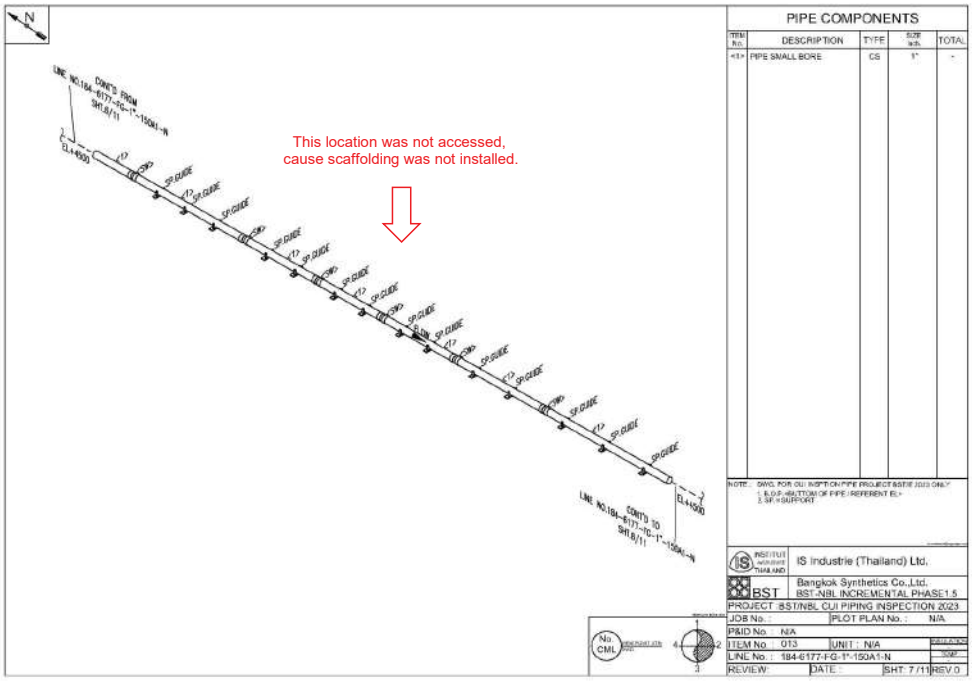
THAILAND



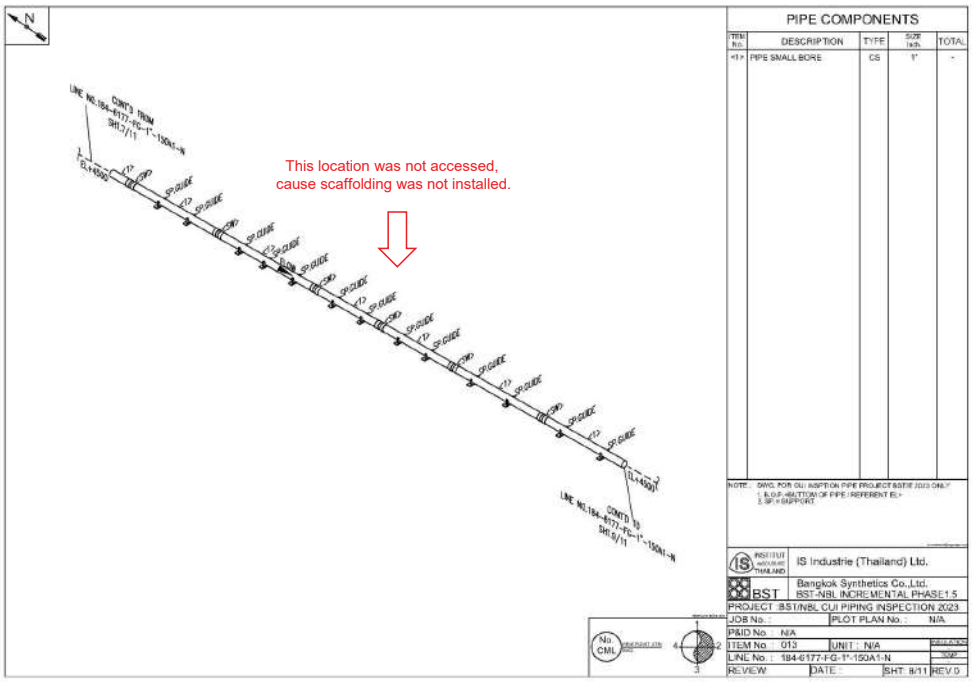
THAILAND



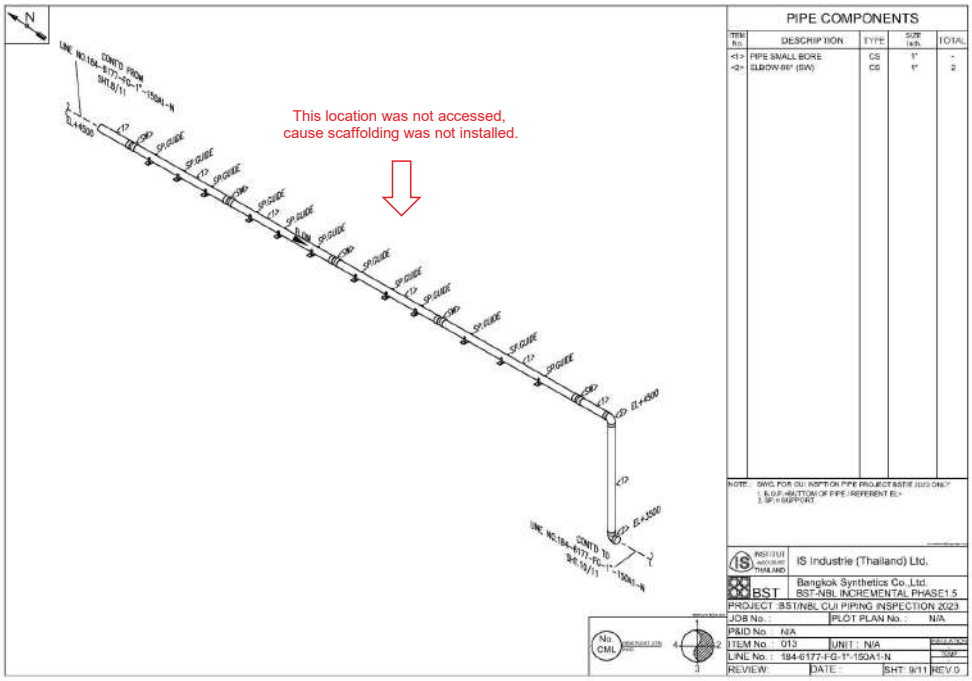
THAILAND



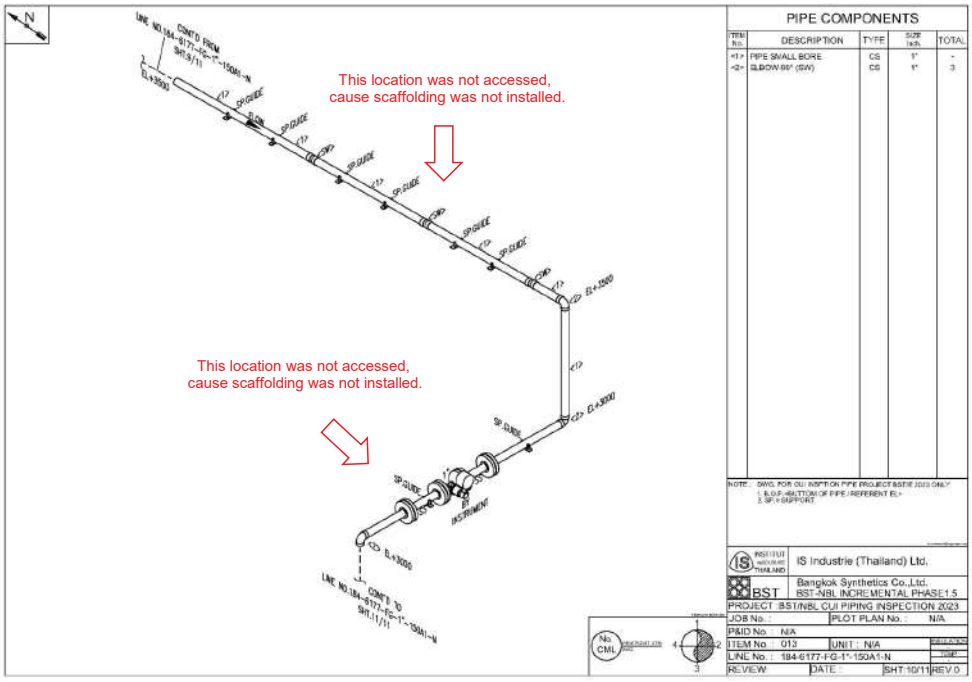
THAILAND



THAILAND



THAILAND

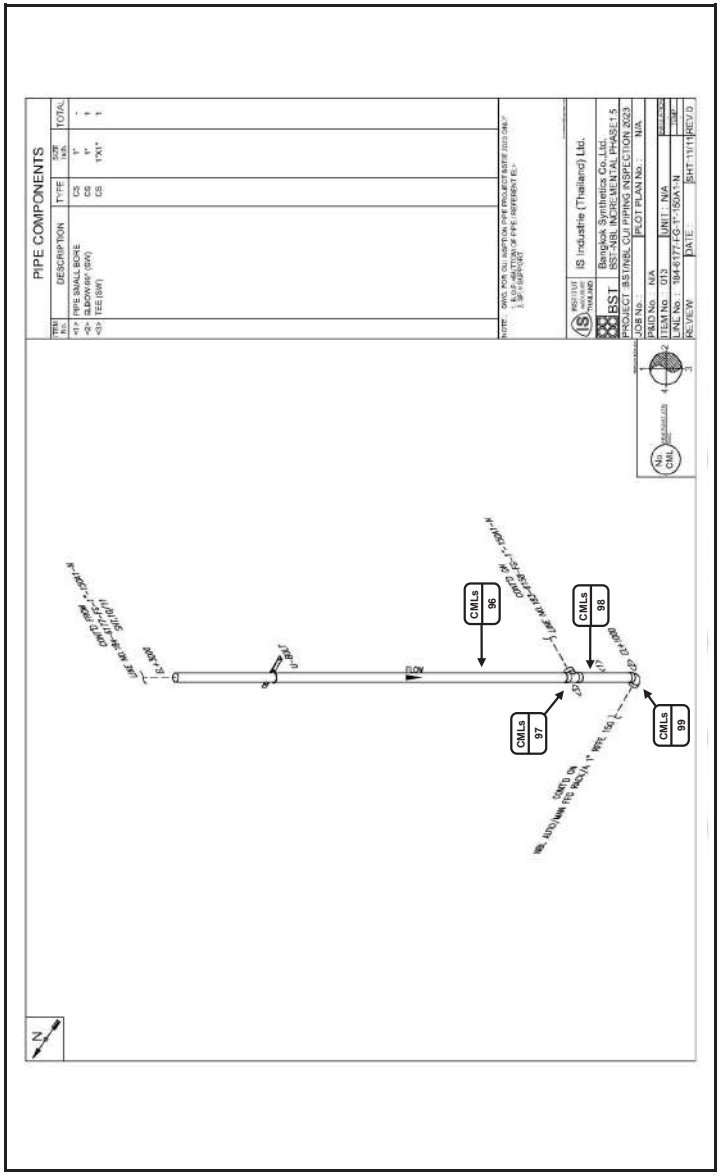


THAILAND

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	54 of 112 Rev.00

3D ISO-DRAWING WITH MARK UP

Code : Rev.: Effective date :



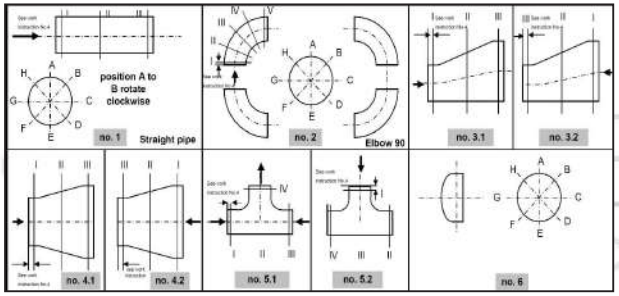
THAILAND

	ULTRASONIC THICKNESS MEASUREMENT REPORT	Report No. :	IS/B-23-CUI-P-NBL-013
		Request No. :	-
		Date of Test :	19/05/2023
	Code : Rev.: Effective date :	Page :	55 of 112 Rev.00

PIPING DATA					
Location :	BST SITE # 2 (NBL PLANT)		**Unit :**	FUEL GAS (EIA)	
Line No. :	184-6177-FG-1"-150A1-N		**Process Fluid :**	Fuel Gas	
Procedure :	SPR-NDT-UTM-001_REV.04		**Insulation Type :**	Non-Insulated	
Design Pressure :	8.0	Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570	
Design Temperature :	90.0	°C	**Service Date :**	January 1, 2013	

MEASUREMENT TOOL DATA					
Equipment Manufacturer	Olympus		**Calibration block**	Step bar 5 step	
Equipment Model	38 DL Plus		**Calibration Range**	2.50 - 7.50	mm.
Serial No.	151114106		**Serial No.**	144816	
Probe Manufacturer	Olympus		**Sound Velocity**	5904	mm./µs
Probe Model	D790-SM		**Couplant**	GE ZG-F / SONO 600	
Probe Dia.	10	mm.	**Scan Type**	A-SCAN	
Serial No.	1039668		**Technique**	Echo to Echo (Thru painting)	
Frequency	5	MHz			

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	No significant of wall-loss. (Maximum corrosion rate = 0.041 mm. / year and remaining life = 36.384 years)
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		**SIGNATURE :**		**SIGNATURE :**	
NAME :	MR. NITIPAT C.	**NAME :**	MR. KRISCHANUT S.	**NAME :**	MR. NATTA K.
Position :	UT Level II	**Position :**	API 570	**Position :**	Inspection Engineer
Date :	May 19, 2023	**Date :**	June 25, 2023	**Date :**	June 28, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	56 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
1	1.1	A	Pipe	1"	80	4.55	1.80	4.24			2.44	-	0.030	82.094	
	1.1	B	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	1.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	1.1	D	Pipe	1"	80	4.55	1.80	4.48			2.68	-	0.007	399.320	
2	2.1	A	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	2.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	2.1	C	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	2.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
3	3.1	A	Pipe	3/4"	80	3.91	1.80	3.91			2.11	-	0.000	#DIV/0!	Note 1
	3.1	B	Pipe	3/4"	80	3.91	1.80	3.98			2.18	-	-0.007	-324.820	Note 1
	3.1	C	Pipe	3/4"	80	3.91	1.80	3.99			2.19	-	-0.008	-285.521	Note 1
	3.1	D	Pipe	3/4"	80	3.91	1.80	4.05			2.25	-	-0.013	-167.625	Note 1
4	4.1	A	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	4.1	B	Pipe	1"	80	4.55	1.80	4.74			2.94	-	-0.018	-161.391	Note 1
	4.1	C	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	4.1	D	Pipe	1"	80	4.55	1.80	4.07			2.27	-	0.046	49.325	
5	5.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	5.1	B	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
	5.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	5.1	D	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
6	6.1	A	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
	6.1	B	Pipe	1"	80	4.55	1.80	4.08			2.28	-	0.045	50.597	
	6.1	C	Pipe	1"	80	4.55	1.80	4.41			2.61	-	0.013	194.445	
	6.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
7	7.1	A	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	7.1	B	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	7.1	C	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	7.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
8	8.1	A	Pipe	1"	80	4.55	1.80	4.68			2.88	-	-0.012	-231.065	Note 1
	8.1	B	Pipe	1"	80	4.55	1.80	4.52			2.72	-	0.003	945.653	
	8.1	C	Pipe	1"	80	4.55	1.80	4.61			2.81	-	-0.006	-488.472	Note 1
	8.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
9	9.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	9.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	9.1	C	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	9.1	D	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
10	10.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	10.1	B	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
	10.1	C	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	10.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	57 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
11	11.1	A	Pipe	3/4"	80	3.91	1.80	3.91			2.11	-	0.000	#DIV/0!	Note 1
	11.1	B	Pipe	3/4"	80	3.91	1.80	3.82			2.02	-	0.009	234.096	
	11.1	C	Pipe	3/4"	80	3.91	1.80	3.84			2.04	-	0.007	303.960	
	11.1	D	Pipe	3/4"	80	3.91	1.80	3.84			2.04	-	0.007	303.960	
12	12.1	A	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	12.1	B	Pipe	1"	80	4.55	1.80	4.12			2.32	-	0.041	56.273	
	12.1	C	Pipe	1"	80	4.55	1.80	4.64			2.84	-	-0.009	-329.124	Note 1
	12.1	D	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
13	13.1	A	Pipe	1"	80	4.55	1.80	4.21			2.41	-	0.033	73.930	
	13.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	13.1	C	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	13.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
14	14.1	A	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	14.1	B	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	14.1	C	Pipe	1"	80	4.55	1.80	4.71			2.91	-	-0.015	-189.696	Note 1
	14.1	D	Pipe	1"	80	4.55	1.80	4.62			2.82	-	-0.007	-420.180	Note 1
15	15.1	A	Pipe	1"	80	4.55	1.80	4.71			2.91	-	-0.015	-189.696	Note 1
	15.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	15.1	C	Pipe	1"	80	4.55	1.80	4.52			2.72	-	0.003	945.653	
	15.1	D	Pipe	1"	80	4.55	1.80	4.59			2.79	-	-0.004	-727.492	Note 1
16	16.1	A	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	16.1	B	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	16.1	C	Pipe	3/4"	80	3.91	1.80	3.87			2.07	-	0.004	539.753	
	16.1	D	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
17	17.1	A	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	17.1	B	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	17.1	C	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	17.1	D	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
18	18.1	A	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	18.1	B	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	18.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	18.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
19	19.1	A	Pipe	1"	80	4.55	1.80	4.41			2.61	-	0.013	194.445	
	19.1	B	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
	19.1	C	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	19.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
20	20.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	20.1	B	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	
	20.1	C	Pipe	1"	80	4.55	1.80	4.58			2.78	-	-0.003	-966.513	Note 1
	20.1	D	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	58 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
21	21.1	A	Pipe	3/4"	80	3.91	1.80	4.07			2.27	-	-0.015	-147.976	Note 1
	21.1	B	Pipe	3/4"	80	3.91	1.80	4.02			2.22	-	-0.011	-210.496	Note 1
	21.1	C	Pipe	3/4"	80	3.91	1.80	3.96			2.16	-	-0.005	-450.576	Note 1
	21.1	D	Pipe	3/4"	80	3.91	1.80	4.09			2.29	-	-0.017	-132.693	Note 1
22	22.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	22.1	B	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	22.1	C	Pipe	1"	80	4.55	1.80	4.21			2.41	-	0.033	73.930	
	22.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
23	23.1	A	Pipe	3/4"	80	3.91	1.80	4.11			2.31	-	-0.019	-120.467	Note 1
	23.1	B	Pipe	3/4"	80	3.91	1.80	4.00			2.20	-	-0.009	-254.956	Note 1
	23.1	C	Pipe	3/4"	80	3.91	1.80	4.04			2.24	-	-0.012	-179.717	Note 1
	23.1	D	Pipe	3/4"	80	3.91	1.80	4.04			2.24	-	-0.012	-179.717	Note 1
24	24.1	A	Pipe	3/4"	80	3.91	1.80	3.77			1.97	-	0.013	146.765	
	24.1	B	Pipe	3/4"	80	3.91	1.80	3.78			1.98	-	0.012	158.857	
	24.1	C	Pipe	3/4"	80	3.91	1.80	3.66			1.86	-	0.024	77.599	
	24.1	D	Pipe	3/4"	80	3.91	1.80	3.46			1.66	-	0.043	38.475	
25	25.1	A	Pipe	1/2"	80	3.73	1.80	3.69			1.89	-	0.004	492.817	
	25.1	B	Pipe	1/2"	80	3.73	1.80	3.60			1.80	-	0.012	144.415	
	25.1	C	Pipe	1/2"	80	3.73	1.80	3.50			1.70	-	0.022	77.091	
	25.1	D	Pipe	1/2"	80	3.73	1.80	3.52			1.72	-	0.020	85.427	
26	26.1	A	Pipe	1/2"	80	3.73	1.80	3.30			1.50	-	0.041	36.384	
	26.1	B	Pipe	1/2"	80	3.73	1.80	3.74			1.94	-	-0.001	-2023.420	Note 1
	26.1	C	Pipe	1/2"	80	3.73	1.80	3.66			1.86	-	0.007	277.140	
	26.1	D	Pipe	1/2"	80	3.73	1.80	3.36			1.56	-	0.035	43.975	
27	27.1	A	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
	27.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	27.1	C	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	27.1	D	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
28	28.1	A	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.10			3.80	-	-0.008	-495.425	Note 1
	28.1	B	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.09			3.79	-	-0.007	-564.710	Note 1
	28.1	C	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.11			3.81	-	-0.009	-441.537	Note 1
	28.1	D	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.18			3.88	-	-0.015	-252.928	Note 1
29	29.1	A	Pipe	4"	STD	6.02	2.30	5.94			3.64	-	0.008	474.565	
	29.1	B	Pipe	4"	STD	6.02	2.30	6.23			3.93	-	-0.020	-195.190	Note 1
	29.1	C	Pipe	4"	STD	6.02	2.30	6.40			4.10	-	-0.036	-112.534	Note 1
	29.1	D	Pipe	4"	STD	6.02	2.30	5.92			3.62	-	0.010	377.566	
30	30.1	A	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	30.1	B	Pipe	1"	80	4.55	1.80	4.60			2.80	-	-0.005	-584.080	Note 1
	30.1	C	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	30.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	59 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
31	31.1	A	Pipe	1"	80	4.55	1.80	4.25			2.45	-	0.029	85.178	
	31.1	B	Pipe	1"	80	4.55	1.80	4.60			2.80	-	-0.005	-584.080	Note 1
	31.1	C	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	31.1	D	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
32	32.1	A	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.21			3.91	-	-0.018	-214.638	Note 1
	32.1	B	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.20			3.90	-	-0.017	-225.983	Note 1
	32.1	C	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.28			3.98	-	-0.025	-159.659	Note 1
	32.1	D	Ecc. Reducer	4" x 1"	STD/80	6.02	2.30	6.27			3.97	-	-0.024	-165.628	Note 1
33	33.1	A	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	33.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	33.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	33.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
34	34.1	A	Pipe	3/4"	80	3.91	1.80	3.88			2.08	-	0.003	723.147	
	34.1	B	Pipe	3/4"	80	3.91	1.80	3.95			2.15	-	-0.004	-560.612	Note 1
	34.1	C	Pipe	3/4"	80	3.91	1.80	4.01			2.21	-	-0.010	-230.503	Note 1
	34.1	D	Pipe	3/4"	80	3.91	1.80	4.08			2.28	-	-0.016	-139.885	Note 1
35	35.1	A	Pipe	1"	80	4.55	1.80	4.62			2.82	-	-0.007	-420.180	Note 1
	35.1	B	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	35.1	C	Pipe	1"	80	4.55	1.80	-			-	-	-	-	Note 3
	35.1	D	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
36	36.1	A	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	36.1	B	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	36.1	C	Pipe	1"	80	4.55	1.80	4.26			2.46	-	0.028	88.475	
	36.1	D	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
37	37.1	A	Pipe	1"	80	4.55	1.80	4.27			2.47	-	0.027	92.007	
	37.1	B	Pipe	1"	80	4.55	1.80	4.35			2.55	-	0.019	132.983	
	37.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	37.1	D	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
38	38.1	A	Pipe	3/4"	80	3.91	1.80	3.82			2.02	-	0.009	234.096	
	38.1	B	Pipe	3/4"	80	3.91	1.80	3.80			2.00	-	0.011	189.636	
	38.1	C	Pipe	3/4"	80	3.91	1.80	3.80			2.00	-	0.011	189.636	
	38.1	D	Pipe	3/4"	80	3.91	1.80	3.85			2.05	-	0.006	356.358	
39	39.1	A	Pipe	1"	80	4.55	1.80	4.42			2.62	-	0.012	210.205	
	39.1	B	Pipe	1"	80	4.55	1.80	4.58			2.78	-	-0.003	-966.513	Note 1
	39.1	C	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	39.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
40	40.1	A	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	40.1	B	Pipe	1"	80	4.55	1.80	4.43			2.63	-	0.012	228.591	
	40.1	C	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	40.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	60 of 112	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
41	41.1	A	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	41.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	41.1	C	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	41.1	D	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
42	42.1	A	Pipe	1"	80	4.55	1.80	4.43			2.63	-	0.012	228.591	
	42.1	B	Pipe	1"	80	4.55	1.80	4.48			2.68	-	0.007	399.320	
	42.1	C	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
	42.1	D	Pipe	1"	80	4.55	1.80	4.44			2.64	-	0.011	250.320	
43	43.1	A	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	43.1	B	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
	43.1	C	Pipe	1"	80	4.55	1.80	4.22			2.42	-	0.032	76.487	
	43.1	D	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
44	44.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	44.1	B	Pipe	1"	80	4.55	1.80	4.51			2.71	-	0.004	706.632	
	44.1	C	Pipe	1"	80	4.55	1.80	-			-	-	-	-	Note 3
	44.1	D	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
45	45.1	A	Pipe	1"	80	4.55	1.80	4.45			2.65	-	0.010	276.395	
	45.1	B	Pipe	1"	80	4.55	1.80	4.49			2.69	-	0.006	467.612	
	45.1	C	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	45.1	D	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
46	46.1	A	Pipe	1"	80	4.55	1.80	4.22			2.42	-	0.032	76.487	
	46.1	B	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
	46.1	C	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	46.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	Note 1
47	47.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	47.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	47.1	C	Pipe	1"	80	4.55	1.80	4.39			2.59	-	0.015	168.836	
	47.1	D	Pipe	1"	80	4.55	1.80	4.47			2.67	-	0.008	348.101	
48	48.1	A	Pipe	1"	80	4.55	1.80	4.28			2.48	-	0.026	95.801	
	48.1	B	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
	48.1	C	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	
	48.1	D	Pipe	1"	80	4.55	1.80	4.23			2.43	-	0.031	79.203	
49	49.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	49.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	49.1	C	Pipe	1"	80	4.55	1.80	4.61			2.81	-	-0.006	-488.472	Note 1
	49.1	D	Pipe	1"	80	4.55	1.80	4.63			2.83	-	-0.008	-368.961	Note 1
50	50.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	50.1	B	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	50.1	C	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
	50.1	D	Pipe	1"	80	4.55	1.80	4.29			2.49	-	0.025	99.887	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.

ULTRASONIC THICKNESS MEASUREMENT REPORT

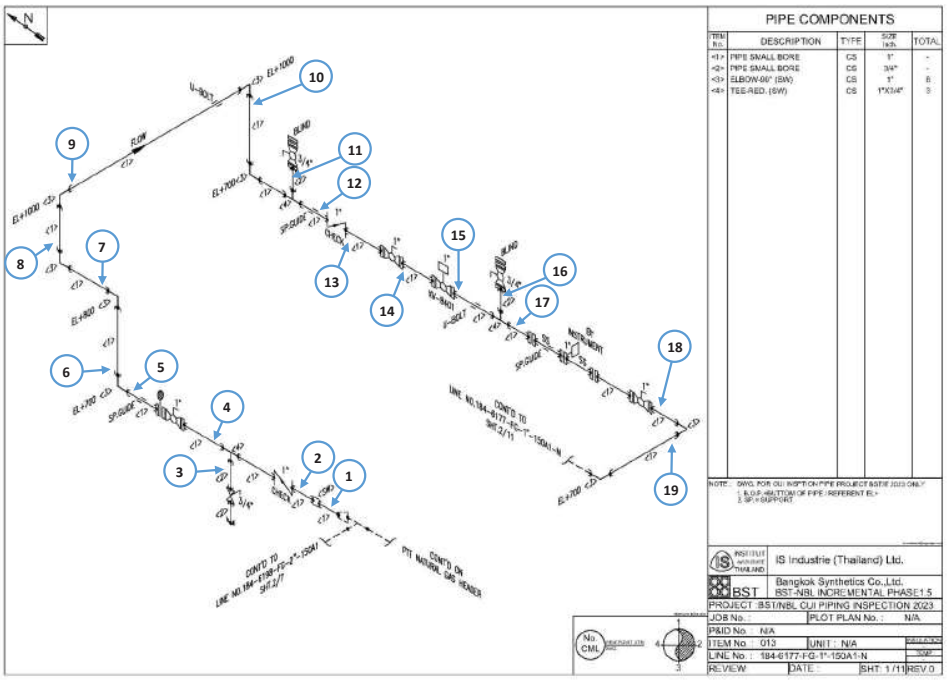
Report No. :	IS/B-23-CUI-P-NBL-013	
Line No. :	184-6177-FG-1"-150A1-N	
Date of Test :	19/05/2023	
Page :	61 of 112	Rev.00

Code : | Rev.: | Effective date :

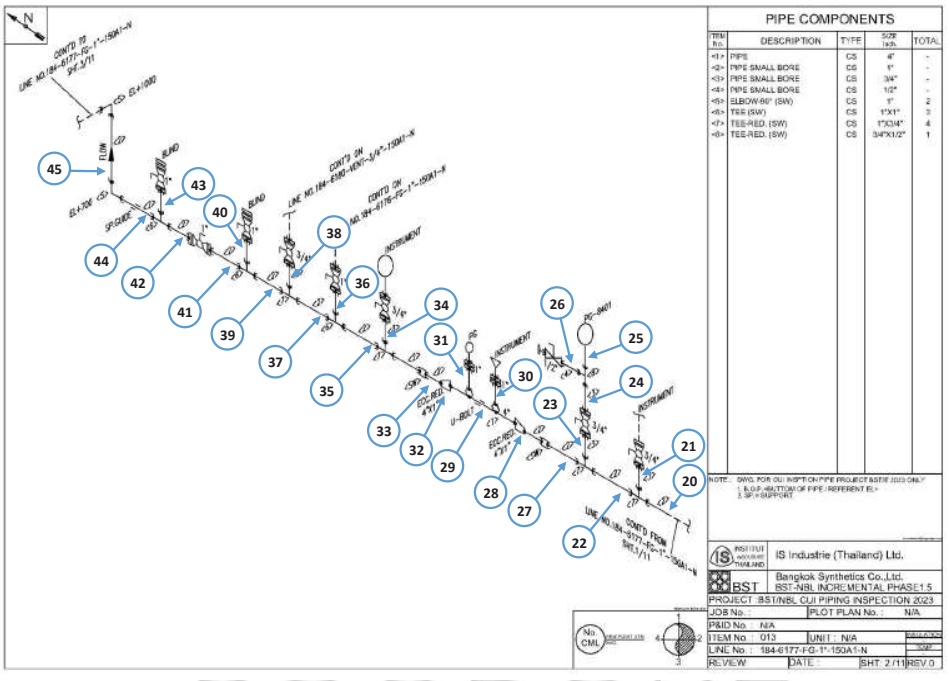
THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/06/2023							
51	51.1	A	Pipe	1"	80	4.55	1.80	4.56			2.76	-	-0.001	-2878.680	Note 1
	51.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	51.1	C	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	51.1	D	Pipe	1"	80	4.55	1.80	4.57			2.77	-	-0.002	-1444.555	
52	52.1	A	Pipe	1"	80	4.55	1.80	4.31			2.51	-	0.023	109.080	
	52.1	B	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	52.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	52.1	D	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	
53	53.1	A	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	53.1	B	Pipe	1"	80	4.55	1.80	4.36			2.56	-	0.018	140.531	
	53.1	C	Pipe	1"	80	4.55	1.80	4.37			2.57	-	0.017	148.917	
	53.1	D	Pipe	1"	80	4.55	1.80	4.30			2.50	-	0.024	104.300	
54	54.1	A	Pipe	1"	80	4.55	1.80	4.33			2.53	-	0.021	119.945	
	54.1	B	Pipe	1"	80	4.55	1.80	4.38			2.58	-	0.016	158.291	
	54.1	C	Pipe	1"	80	4.55	1.80	4.34			2.54	-	0.020	126.153	
	54.1	D	Pipe	1"	80	4.55	1.80	4.50			2.70	-	0.005	563.220	
55	55.1	A	Pipe	1"	80	4.55	1.80	4.40			2.60	-	0.014	180.787	
	55.1	B	Pipe	1"	80	4.55	1.80	4.55			2.75	-	0.000	#DIV/0!	Note 1
	55.1	C	Pipe	1"	80	4.55	1.80	4.46			2.66	-	0.009	308.264	
	55.1	D	Pipe	1"	80	4.55	1.80	4.32			2.52	-	0.022	114.277	

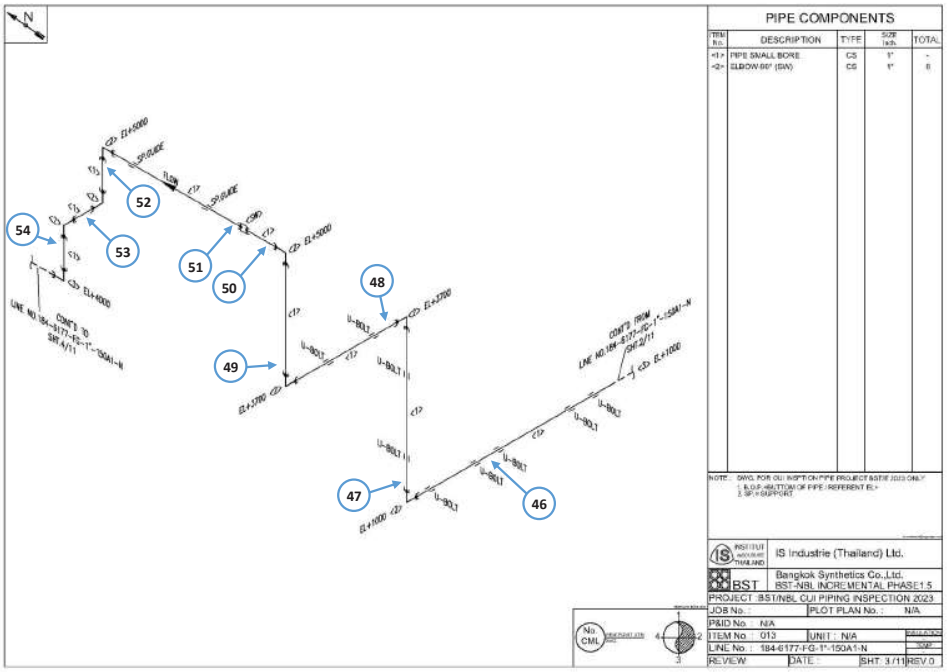
Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Can not apply UTM as selected TMLs, cuase of obstruction or surface isn't smooth.



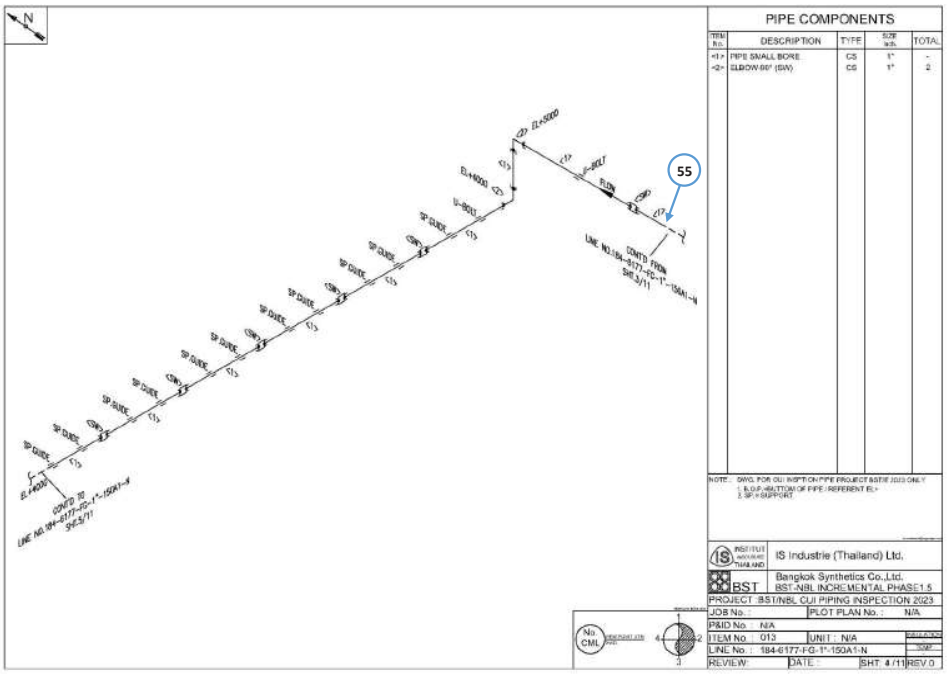
THAILAND



THAILAND

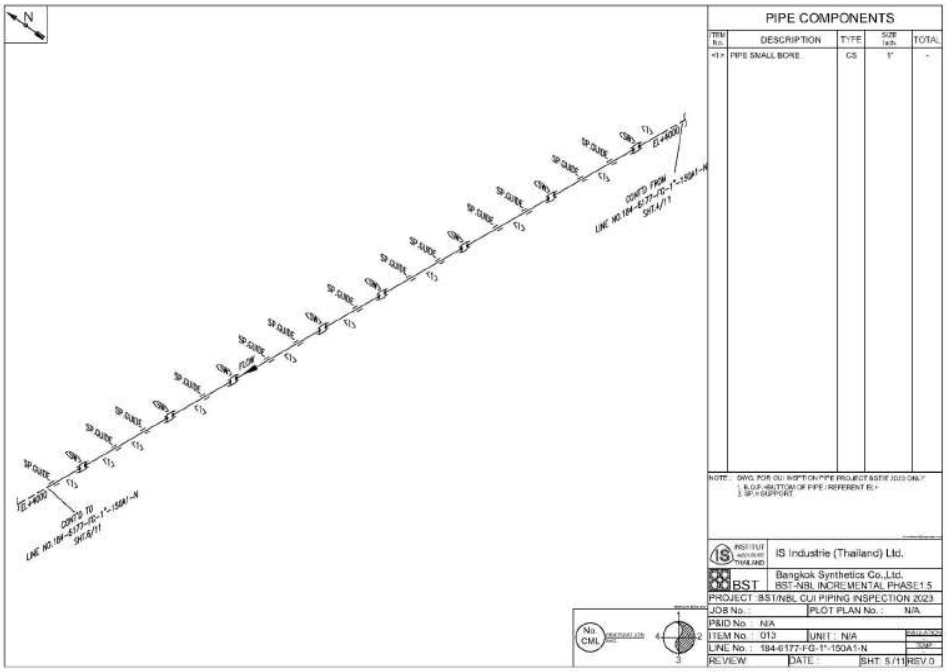


THAILAND



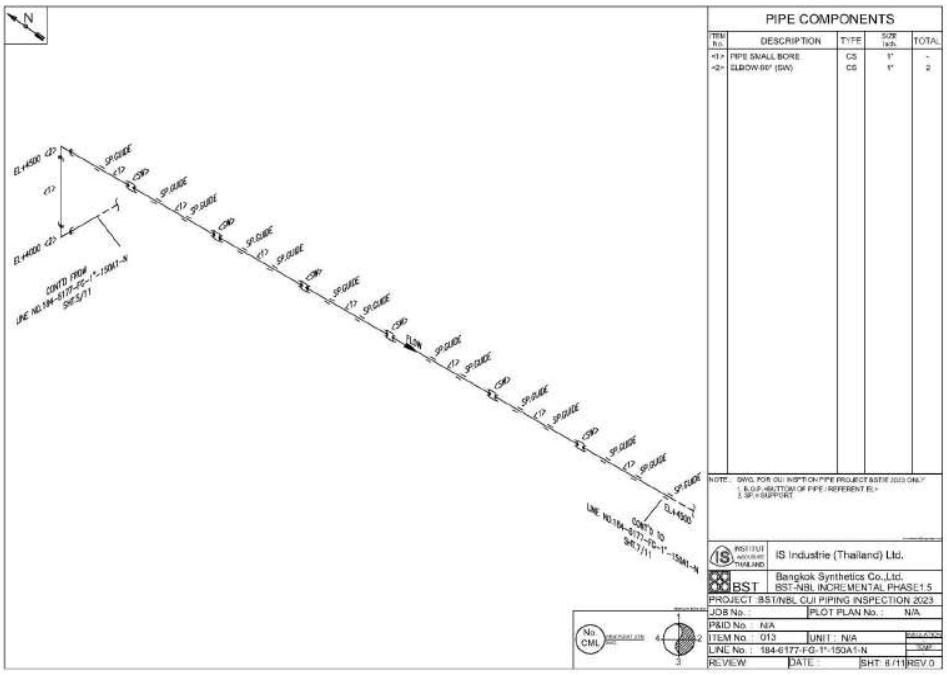
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	66 of 112 Rev.00

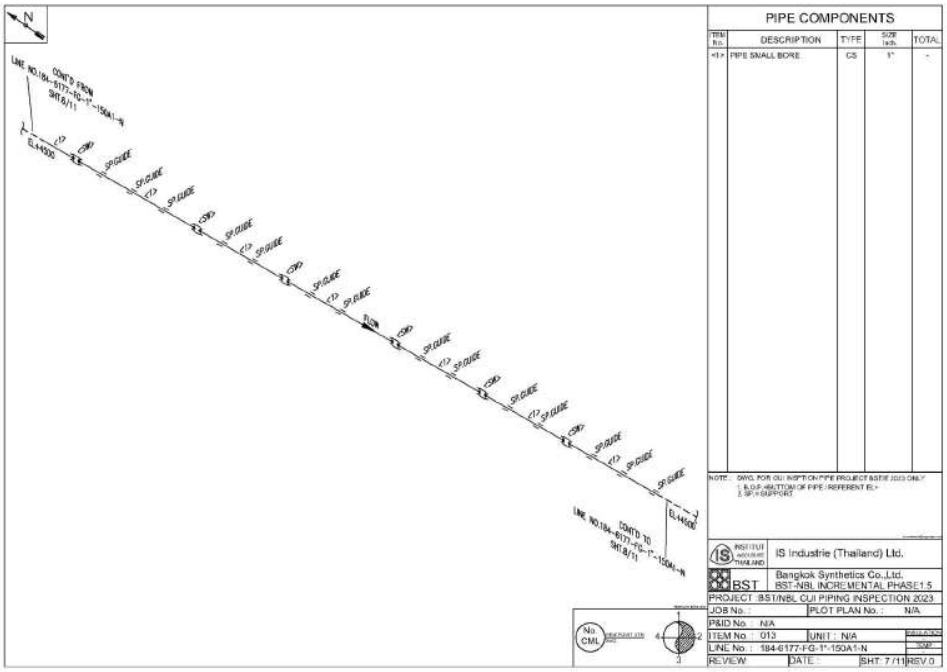


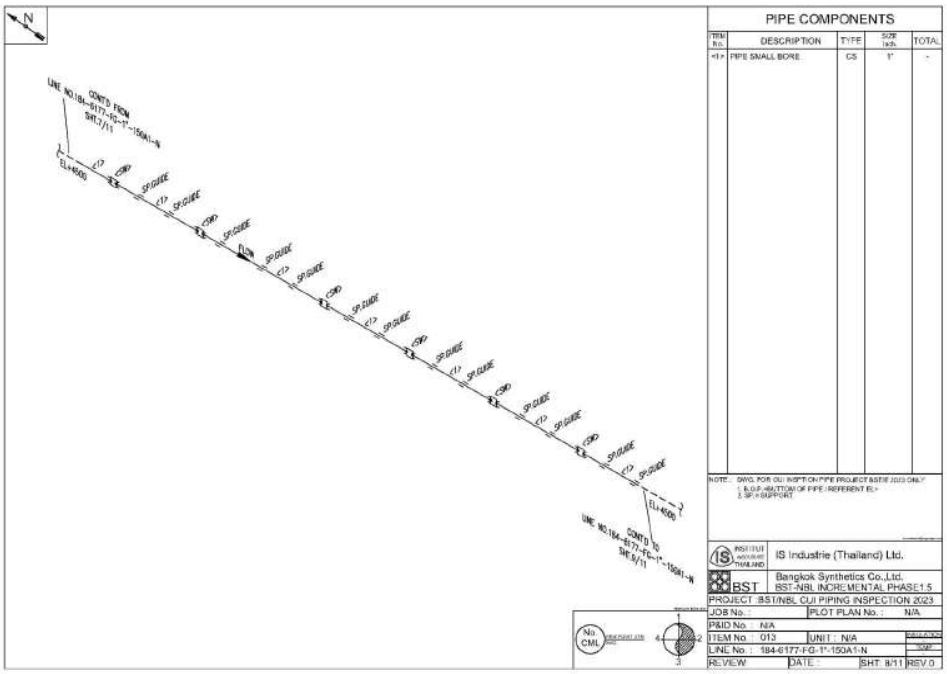
THAILAND

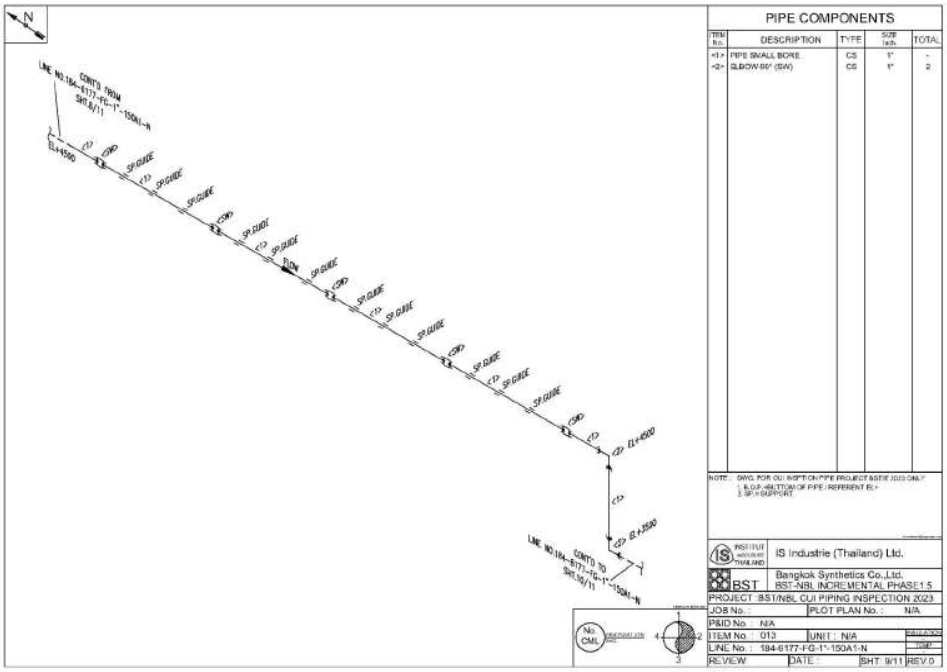
INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	67 of 112 Rev.00

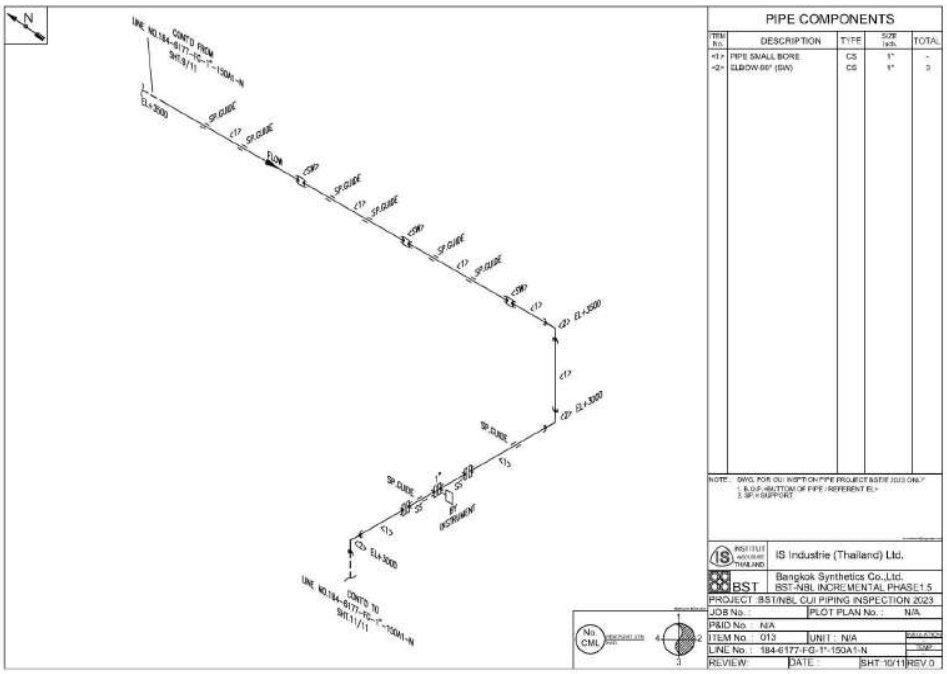


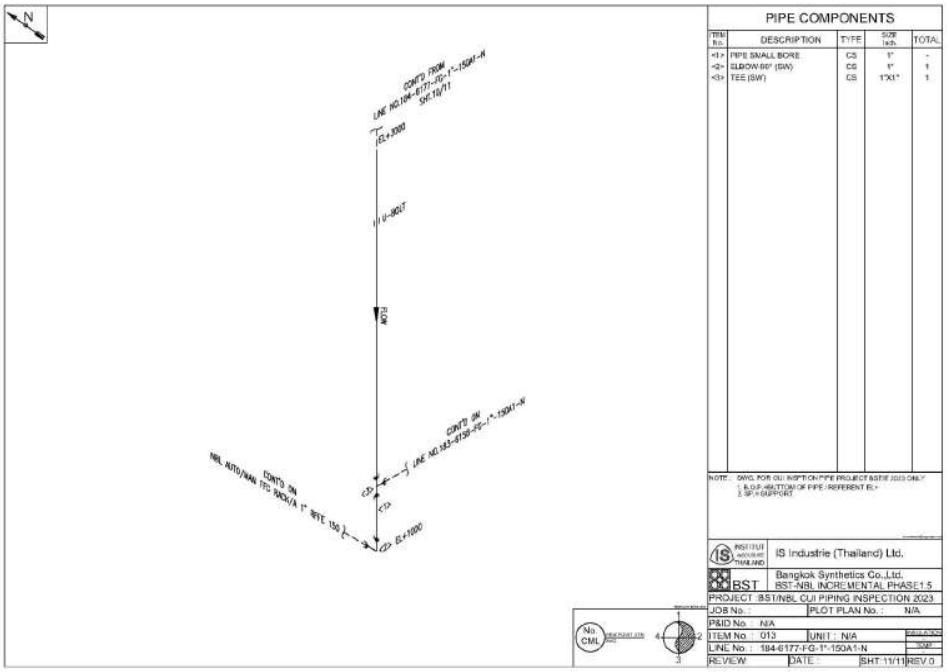
THAILAND


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT. 7 /11 RSV.0
LINE NO.184-6177-FG-1"-150A1-N CONT'D FROM SHT.6/11
LINE NO.184-6177-FG-1"-150A1-N CONT'D TO SHT.8/11
EL.+4000
SP.GUIDE
FLOW

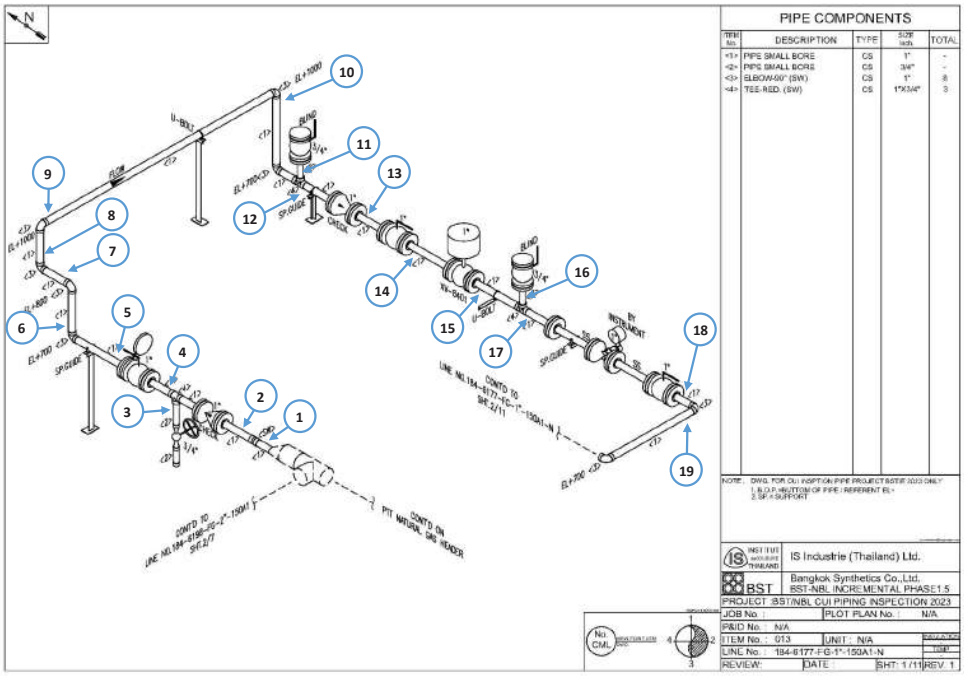

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT. 8/11 RSV.0
LINE NO.184-6177-FG-1"-150A1-N CONT'D FROM SHT.7/11
LINE NO.184-6177-FG-1"-150A1-N CONT'D TO SHT.9/11
EL.+4000
SP.GUIDE
FLOW


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT: 9/11 REV.0
EL.+4500
EL.+3500
SP.GUIDE
ELBOW
FLOW
CONT'D FROM
CONT'D TO

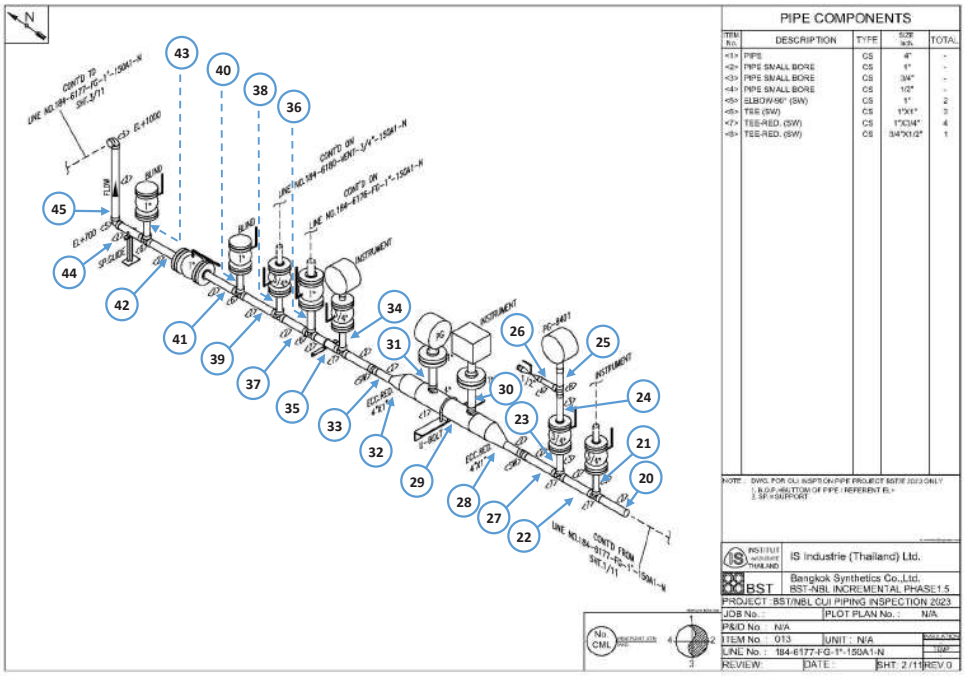

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE Inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : SWG. FOR CUI INSPECTION PIPE PROJECT BST/IE 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW DATE : SHT: 10/11 REV.0
EL.+3500
EL.+3000
SP.GUIDE
ELBOW
FLOW
INSTRUMENT
CONT'D FROM
CONT'D TO



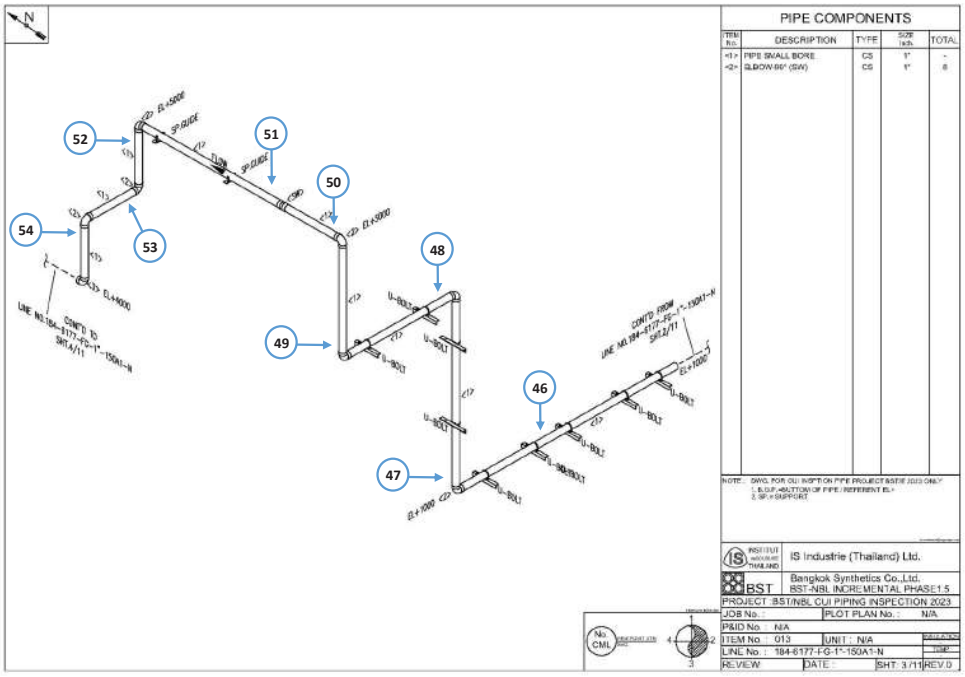
THAILAND



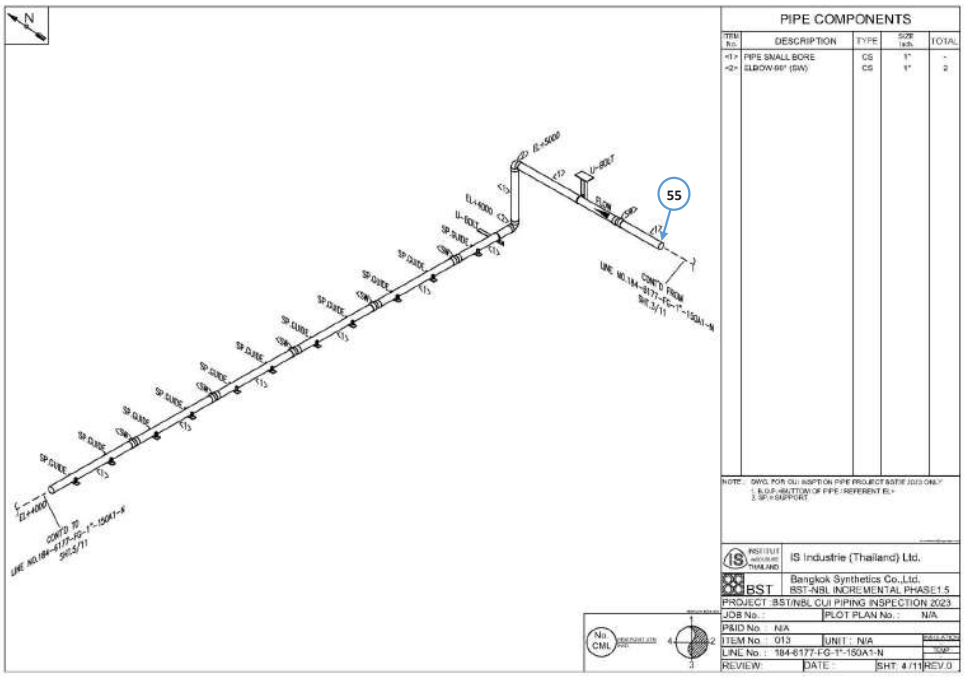
THAILAND

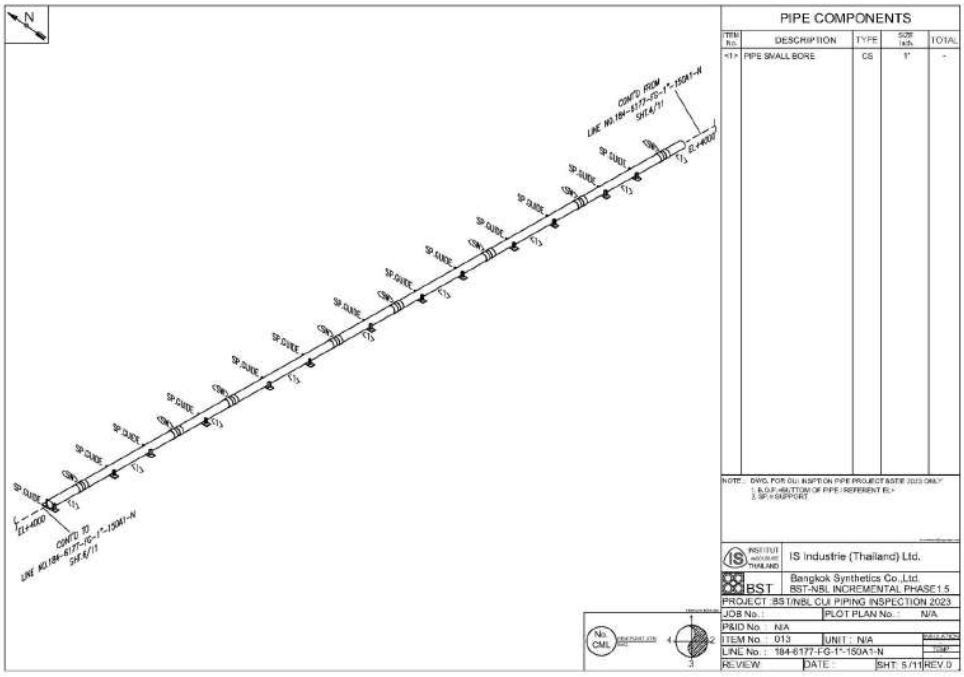


THAILAND

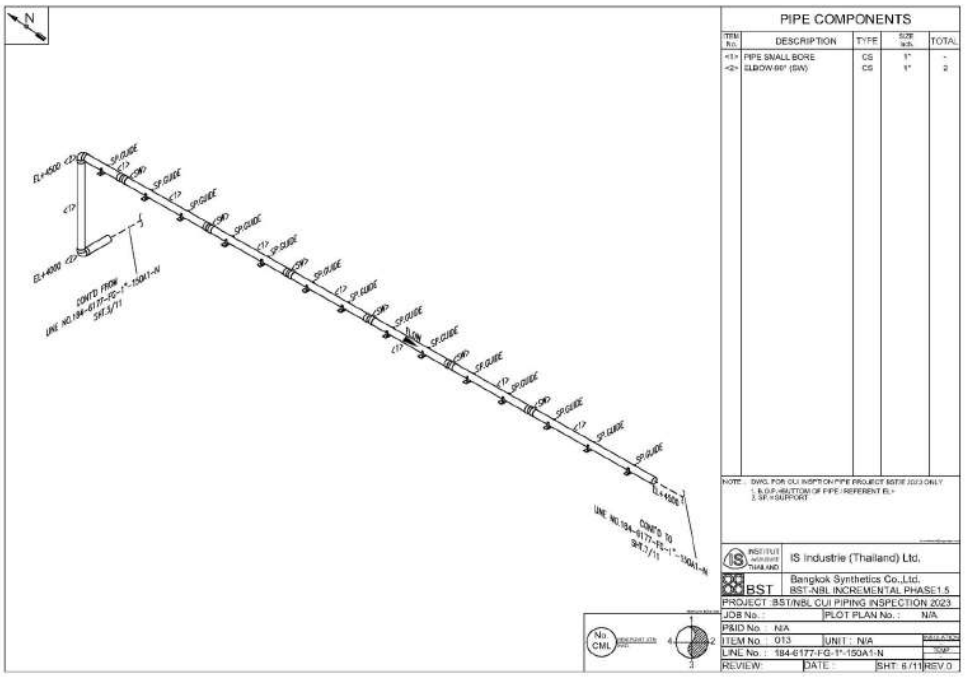


THAILAND


N
55
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE (NPS) | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 2
NOTE: DWG. FOR CUI INSPECTION PIPE PROJECT &STIE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL.=
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 4 /11 REV.0

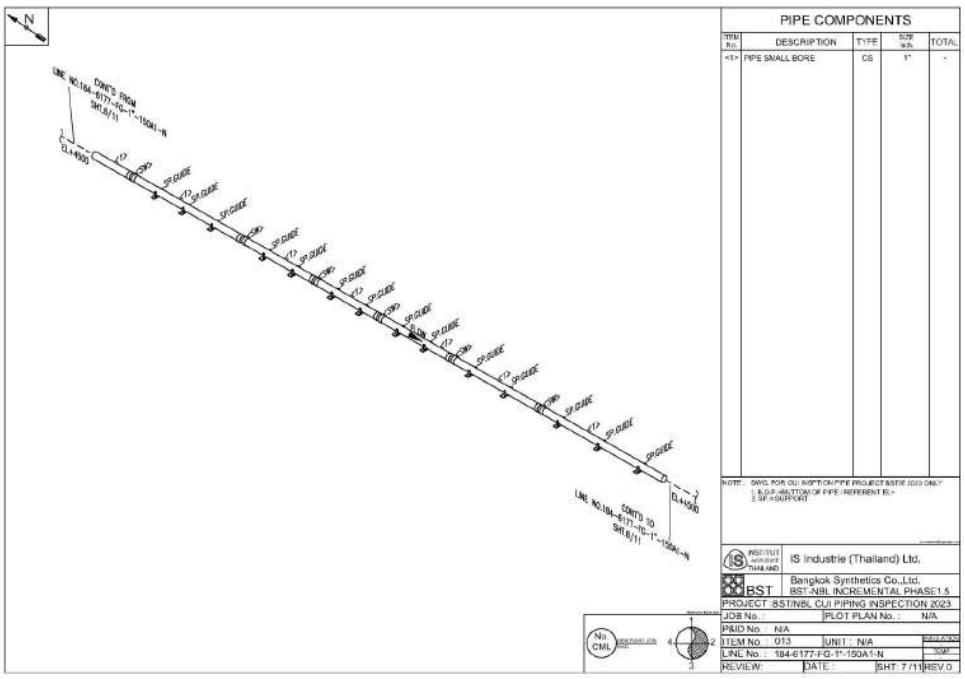

N
PIPE COMPONENTS
ITEM NO. | DESCRIPTION | TYPE | SIZE (NPS) | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
NOTE: DWG. FOR CUI INSPECTION PIPE PROJECT &STIE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL.=
2. SP.=SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: DATE : SHT: 5 /11 REV.0

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	78 of 112 Rev.00

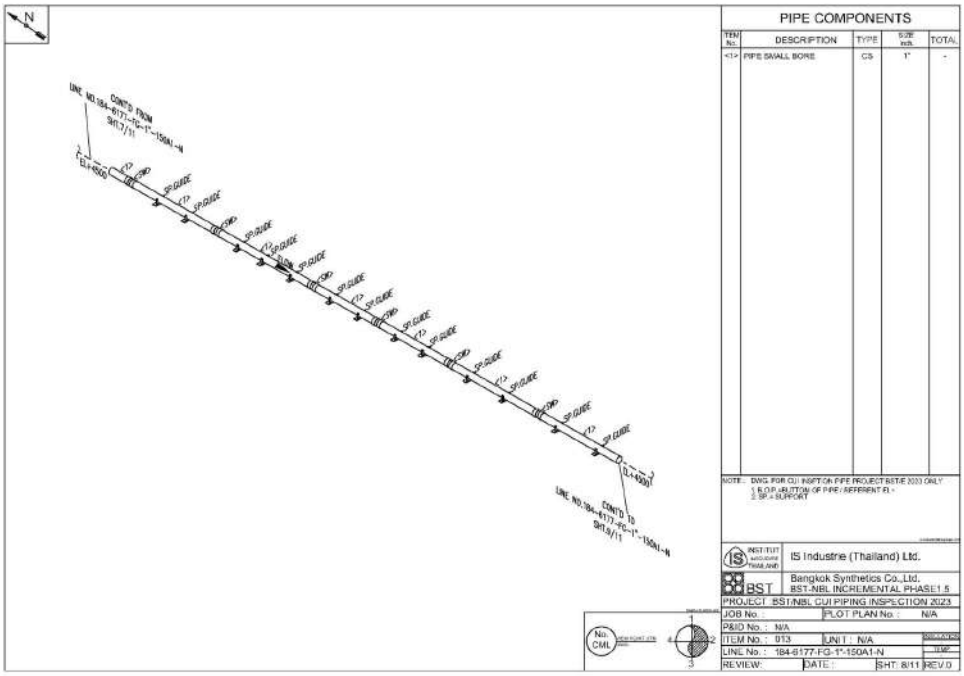


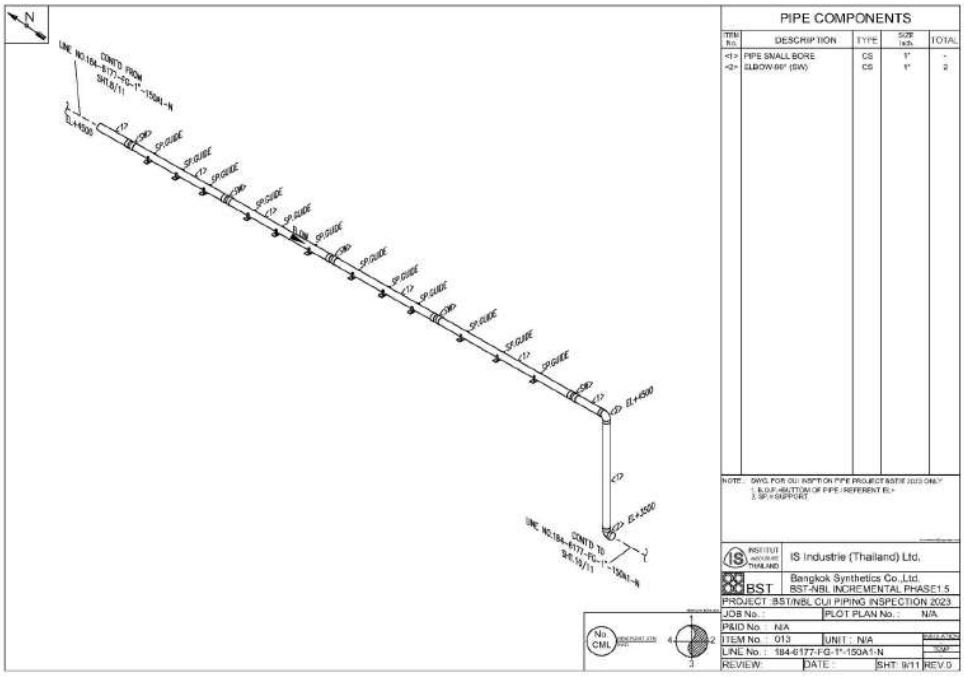
THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	79 of 112 Rev.00

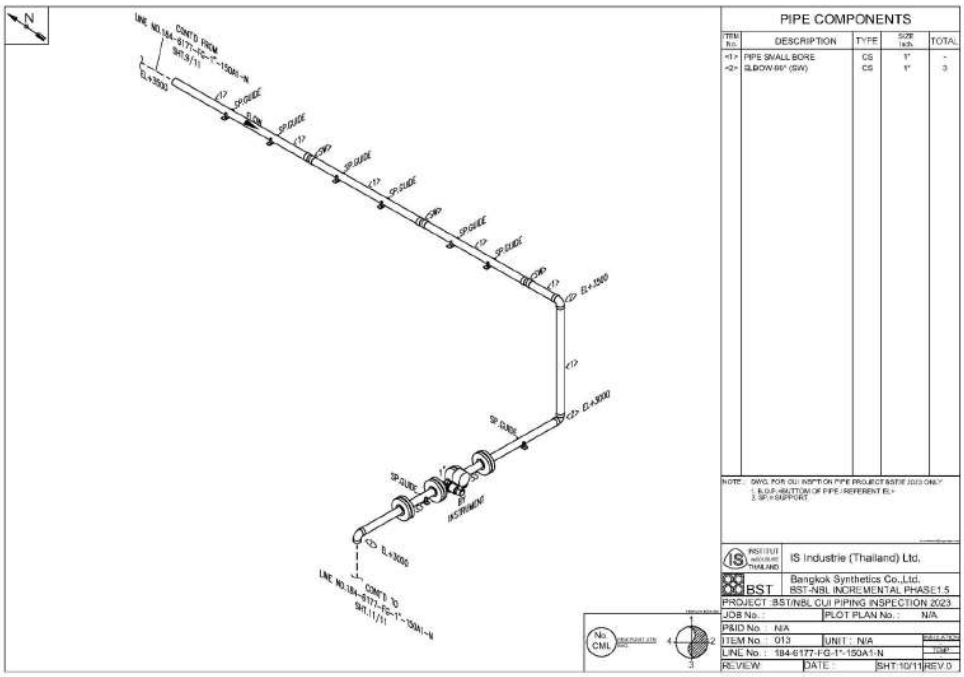


THAILAND


N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE... DWG FOR CUI INSPECTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P.=BUTTON OF PIPE / REFERENT EL =
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST-NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 8/11
REV.0
No. CML

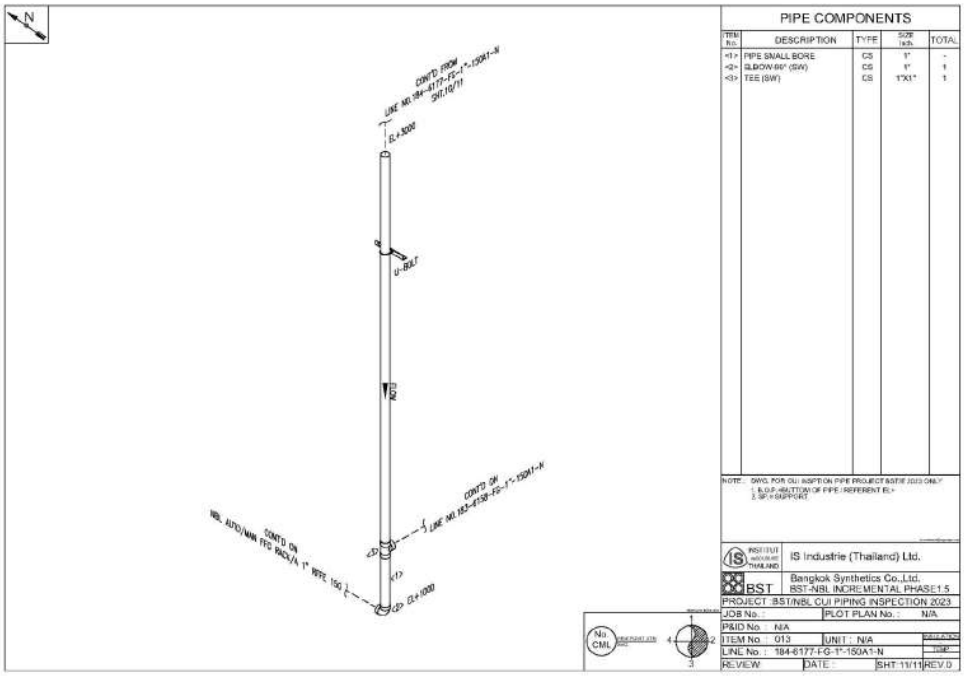

N
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch.
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE... DWG FOR CUI INSPECTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P.=BUTTON OF PIPE / REFERENT EL =
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST-NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 9/11
REV.0
No. CML

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	82 of 112 Rev.00



THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	83 of 112 Rev.00



THAILAND

EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	84 of 112	Rev.00	

Code : | Rev.: | Effective date :

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE

TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS

STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other :	HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :	
LIGHTING TYPE :	☑ Natural light	☐ Artificial light			

PART IDENTIFICATION & INFORMATION

EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	184-6177-FG-1"-150A1-N

SCOPE OF INSPECTION

To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

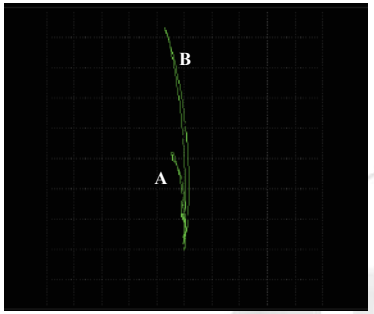
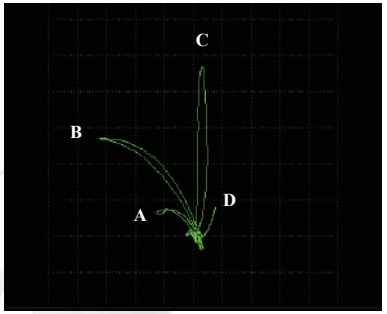
REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	ECT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-013		
Line No. :	184-6177-FG-1"-150A1-N		
Date of Test :	19/05/2023		
Page :	85 of 112	Rev.00	

Code : | Rev.: | Effective date :

SETUP CALIBRATION

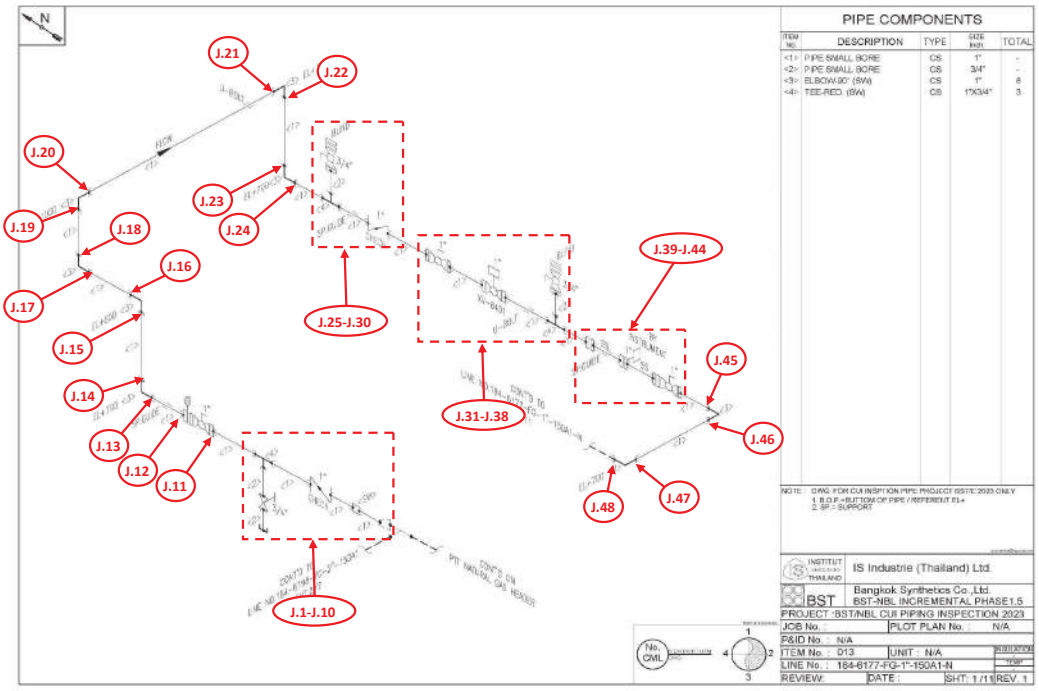
Absolute channel : Surface Signal		Absolute channel : Sub-Surface Signal	
			
Frequency :	500 KHz	Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.	Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.	Absolute Channel Signal B :	Surface Depth 1.0 mm.
		Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
		Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

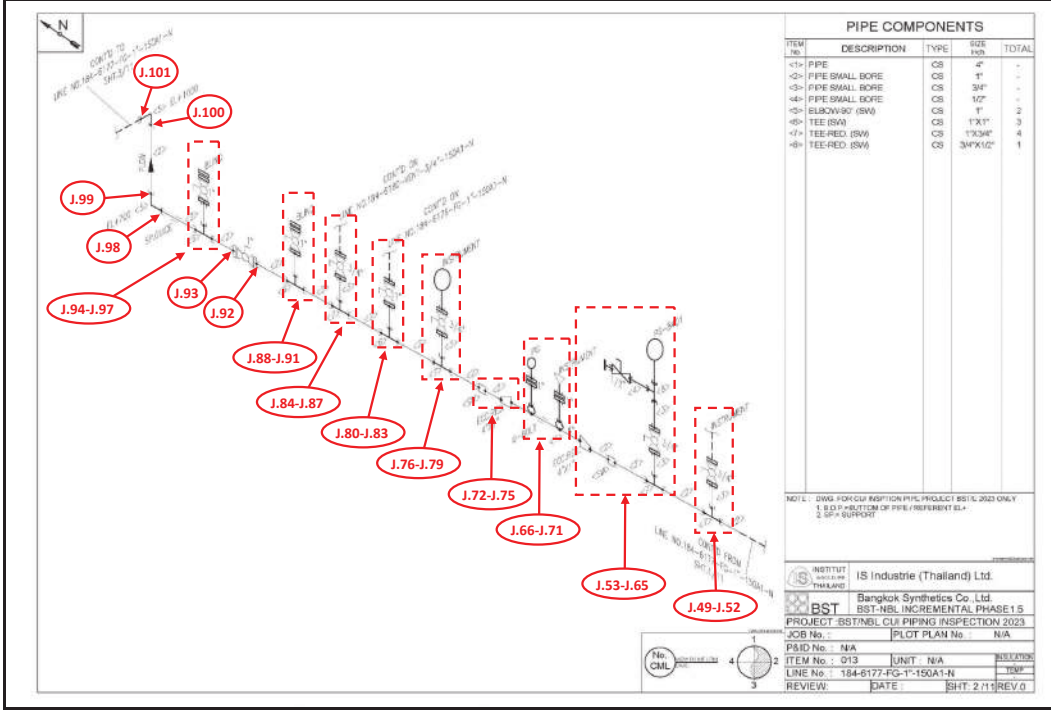
- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

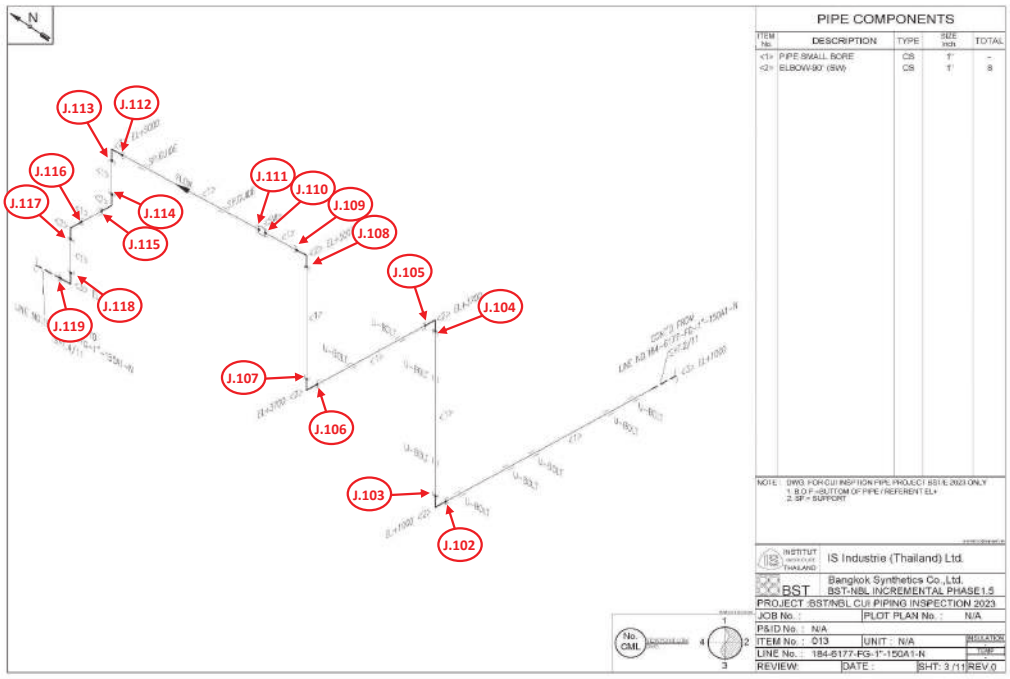
Note : FSH = Full Screen High



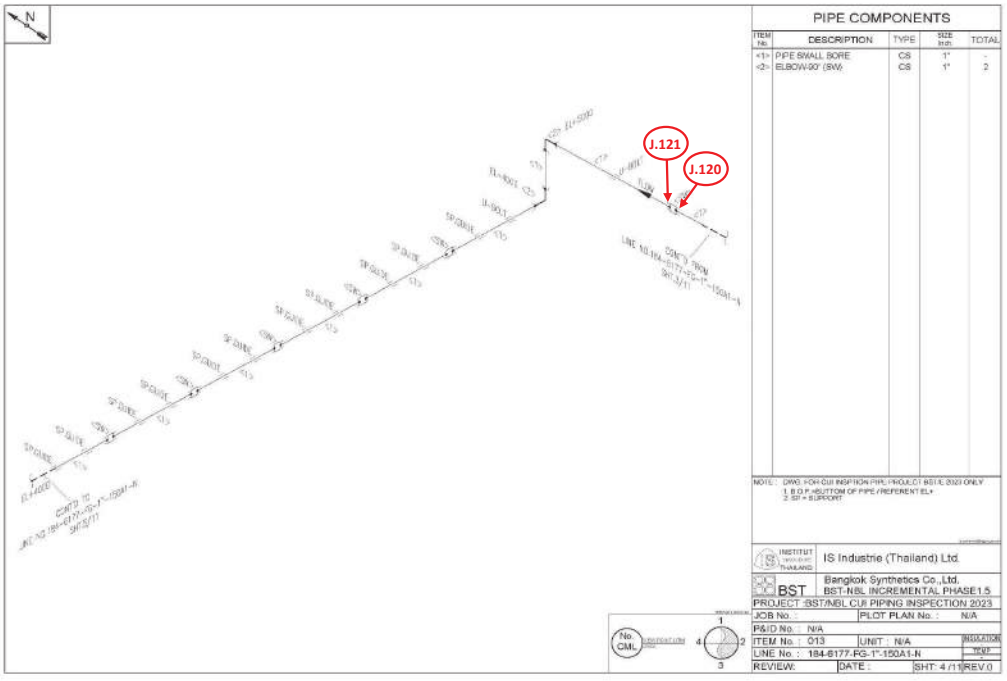
THAILAND



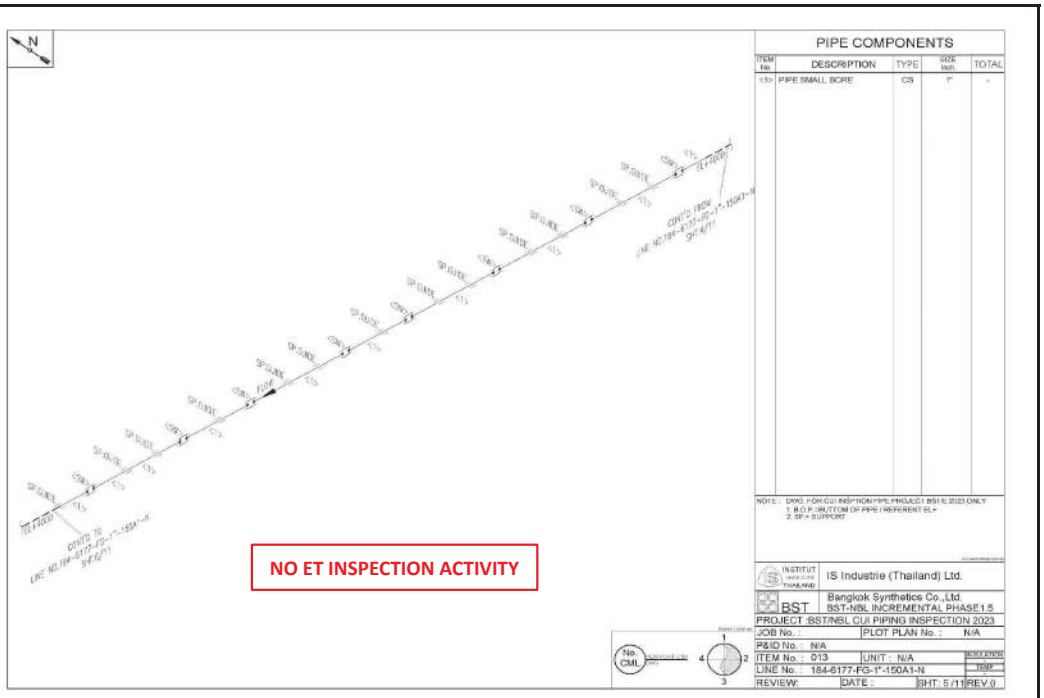
THAILAND

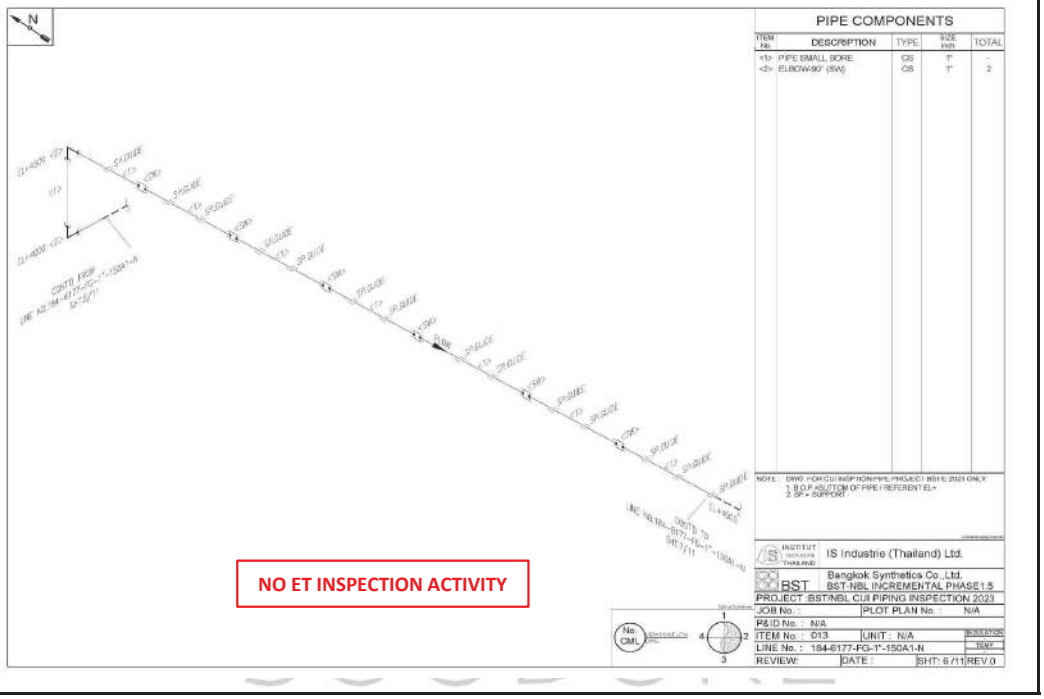


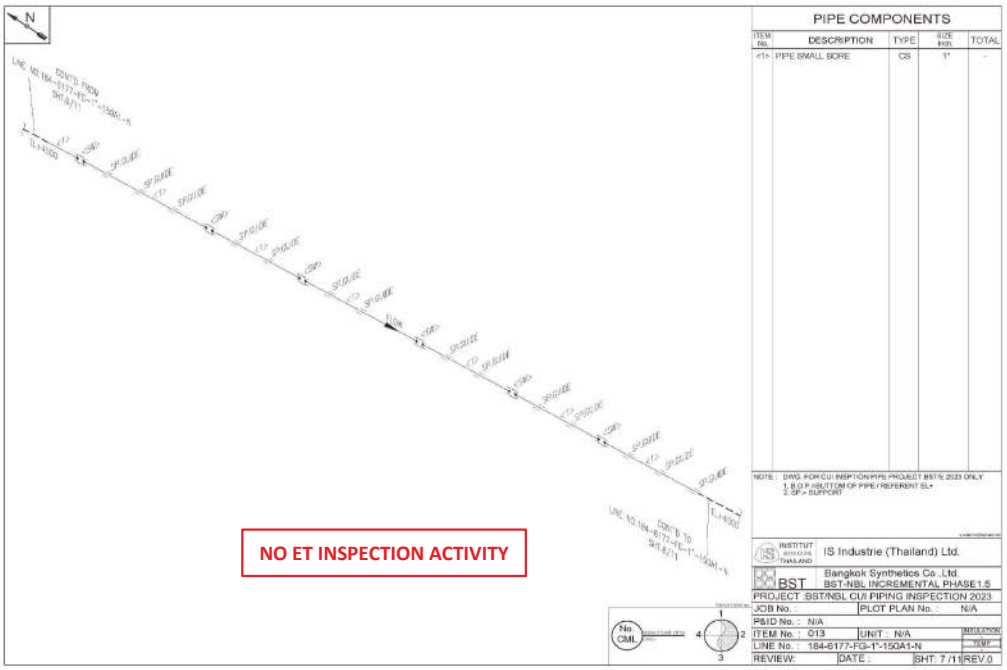
THAILAND



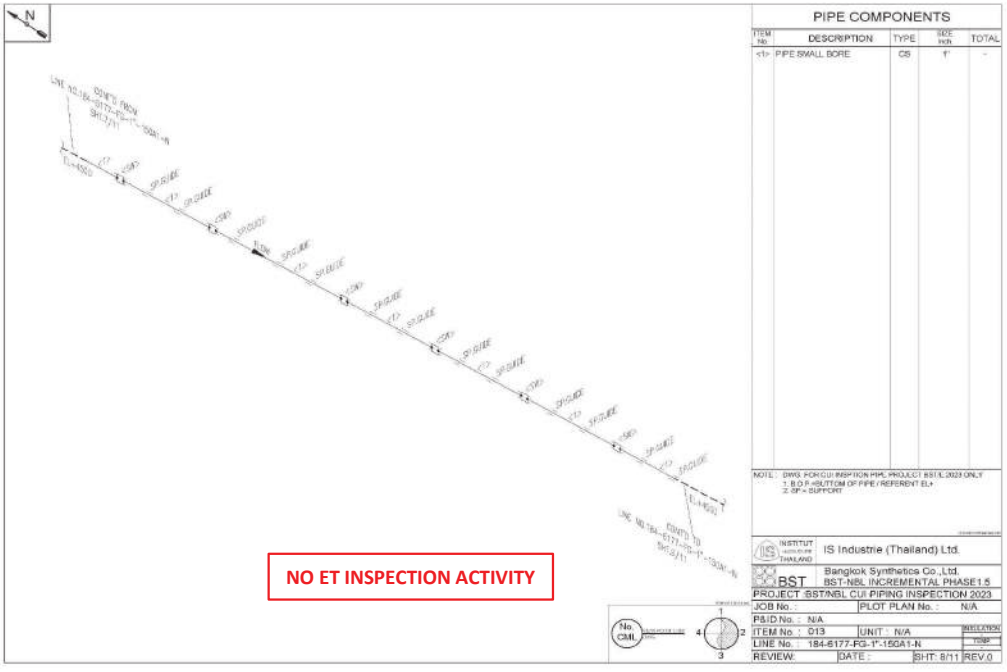
THAILAND


N
PIPE COMPONENTS
ITEM No
DESCRIPTION
TYPE
SIZE Inch
TOTAL
<1> PIPE SMALL BORE CS 1" -
NOTE : DWG FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. B.O.P. =BUTTOM OF PIPE / REFERENT EL=
2. SP = SUPPORT
NO ET INSPECTION ACTIVITY
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 5 /11
REV.0

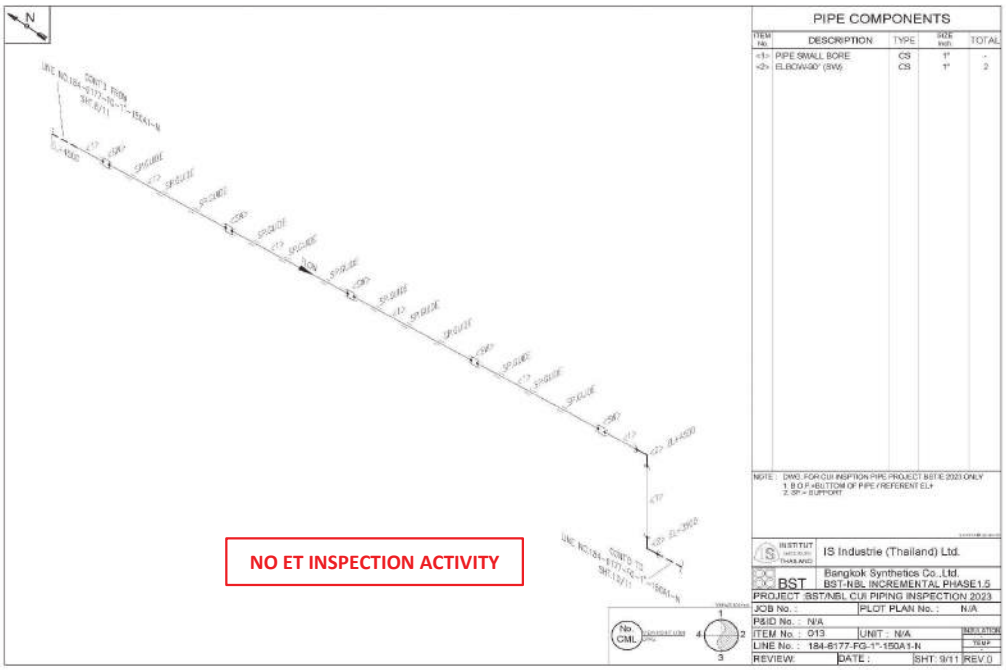

N
PIPE COMPONENTS
ITEM No
DESCRIPTION
TYPE
SIZE Inch
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 2
NOTE : DWG FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. B.O.P. =BUTTOM OF PIPE / REFERENT EL=
2. SP = SUPPORT
NO ET INSPECTION ACTIVITY
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013
UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW:
DATE :
SHT: 6 /11
REV.0

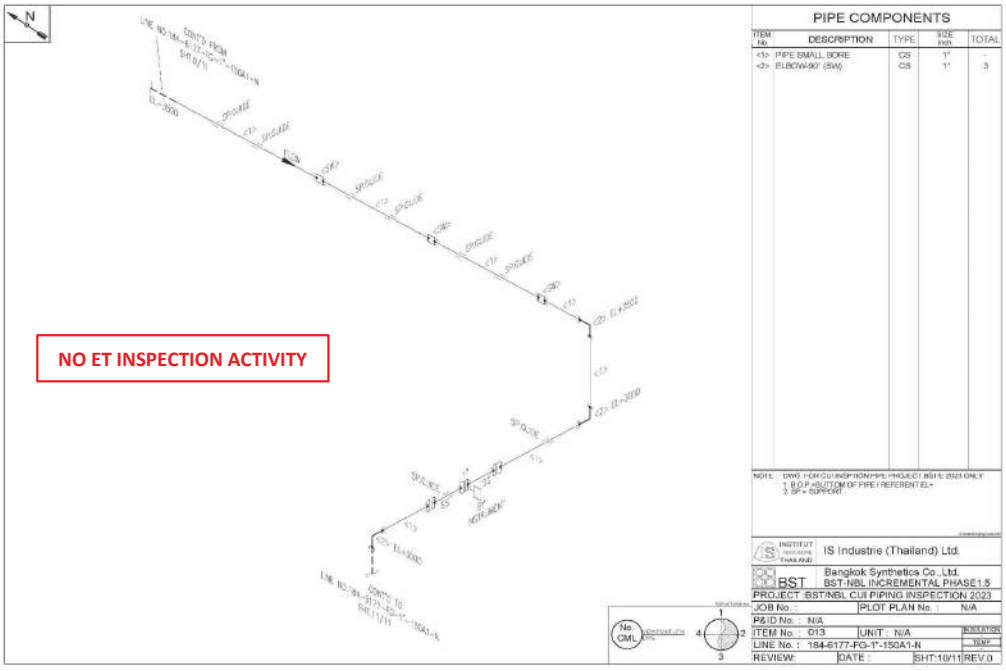


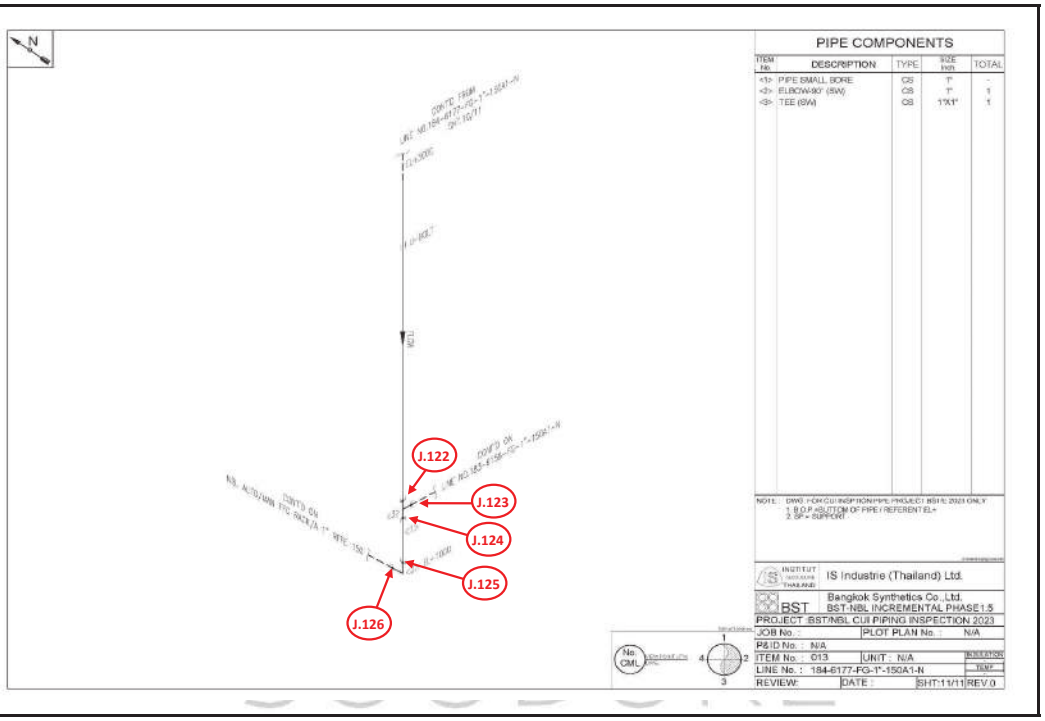
THAILAND

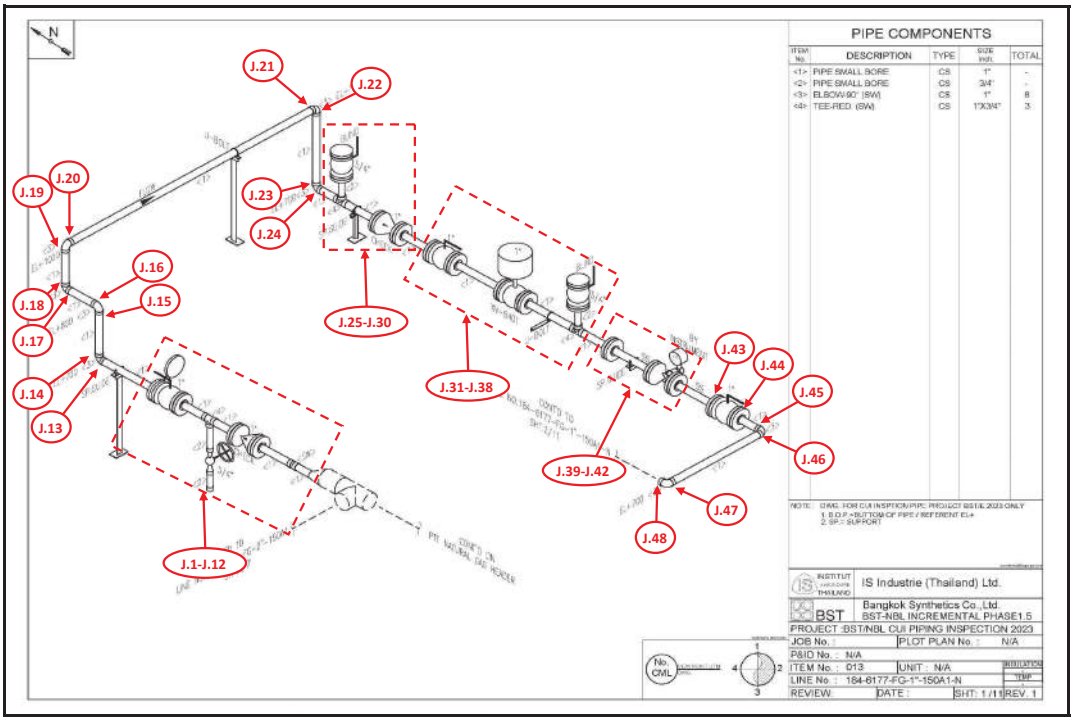


THAILAND

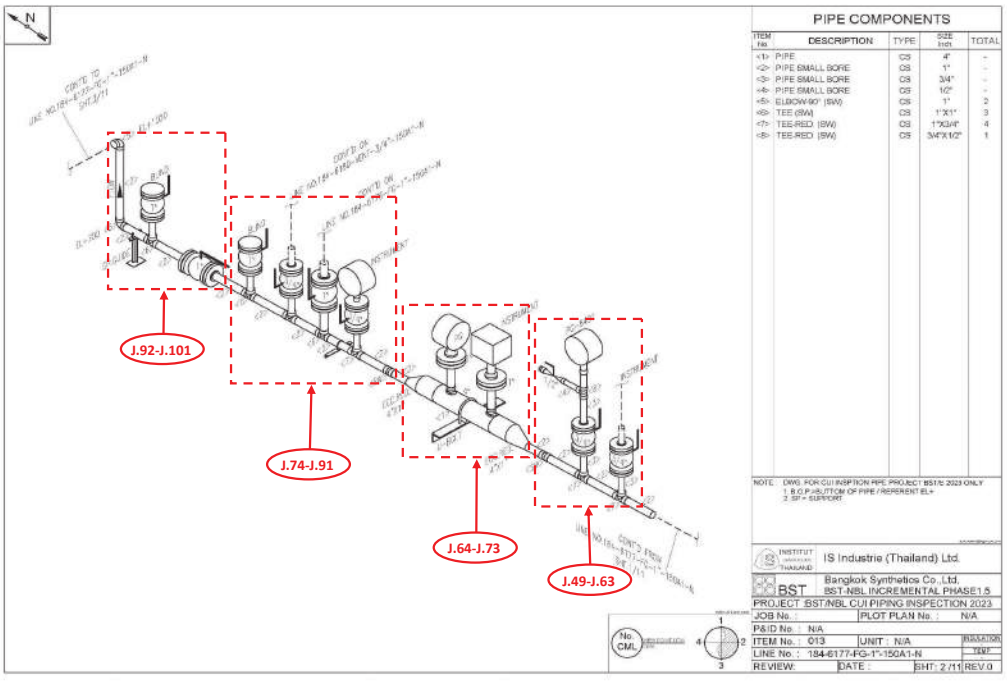

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 2
NOTE : DWG FOR CUI INSPTION PIPE PROJECT BST IS 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 9/11 | REV.0
NO ET INSPECTION ACTIVITY


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 3
NOTE : DWG FOR CUI INSPTION PIPE PROJECT BST IS 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 10/11 | REV.0
NO ET INSPECTION ACTIVITY


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" |
<2> ELBOW-90° (SW) | CS | 1" | 1
<3> TEE (SW) | CS | 1"X1" | 1
J.122
J.123
J.124
J.125
J.126
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT:11/11 | REV.0

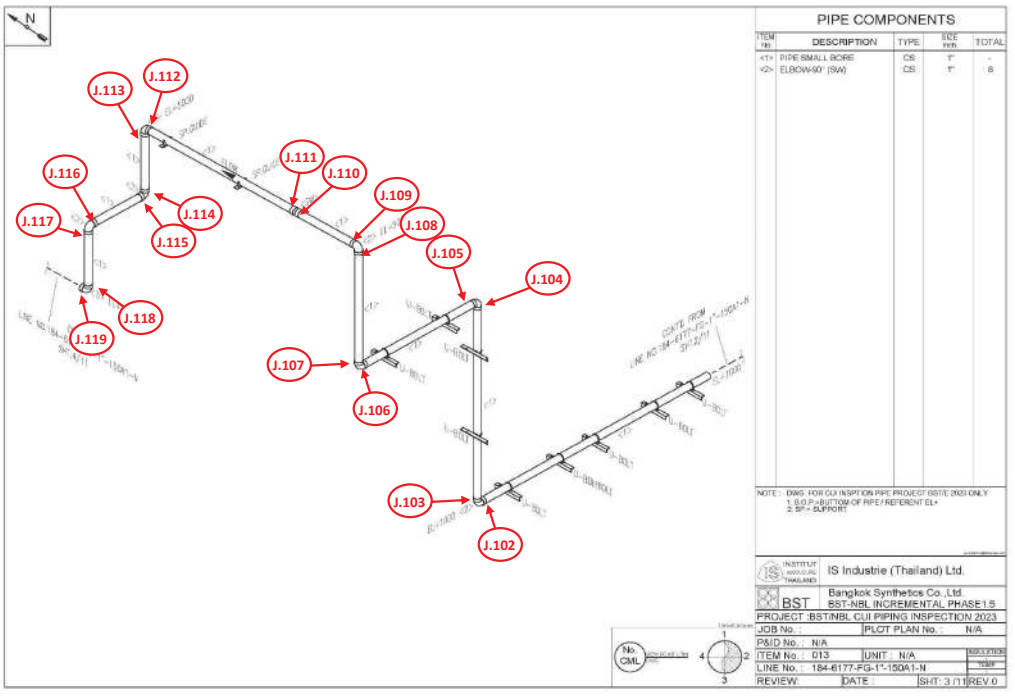

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° (SW) | CS | 1" | 8
<4> TEE-RED (SW) | CS | 1"X3/4" | 3
J.1-J.12
J.13
J.14
J.15
J.16
J.17
J.18
J.19
J.20
J.21
J.22
J.23
J.24
J.25-J.30
J.31-J.38
J.39-J.42
J.43
J.44
J.45
J.46
J.47
J.48
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 013 | UNIT : N/A
LINE No. : 184-6177-FG-1"-150A1-N
REVIEW: | DATE : | SHT: 1 /11 | REV. 1

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 98 of 112	Rev.00



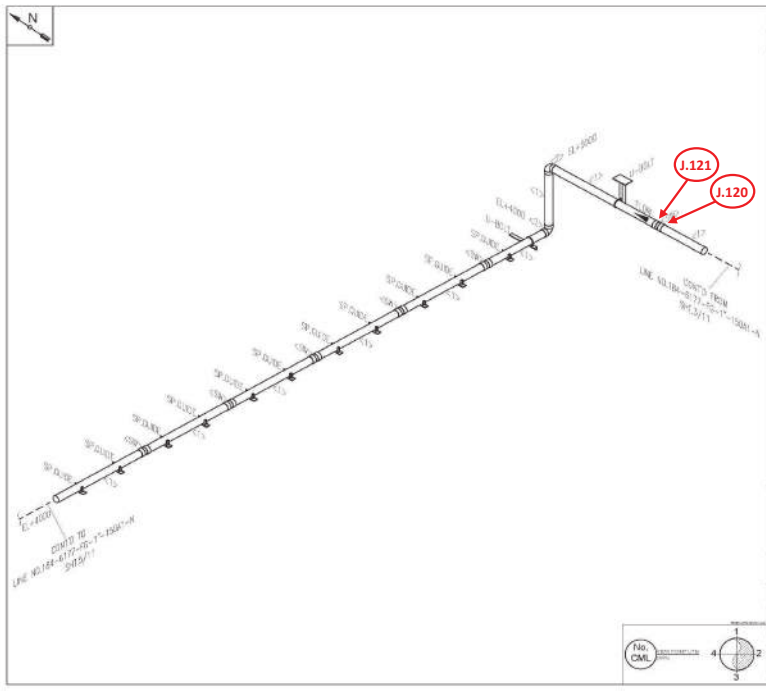
THAILAND

	2D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-013
		Line No. :	184-6177-FG-1"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 99 of 112	Rev.00



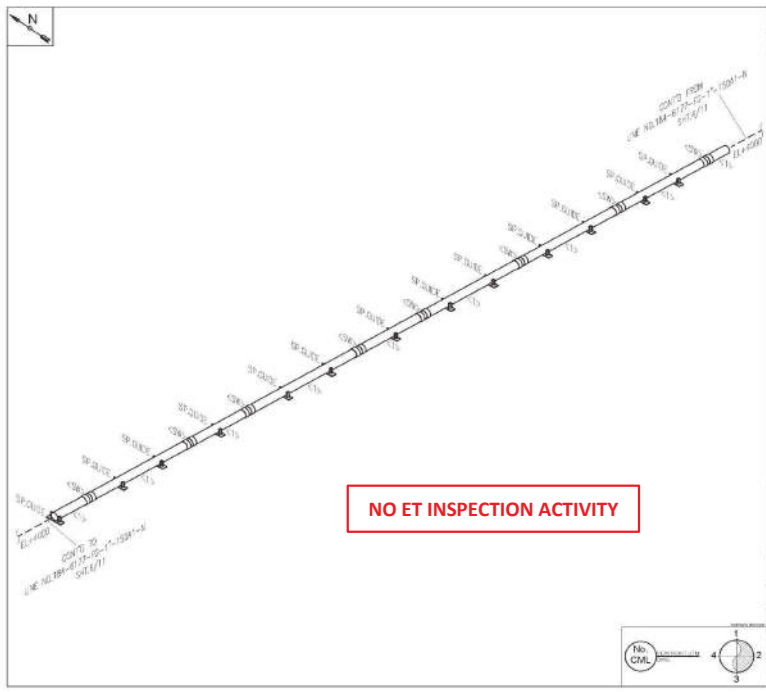
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	100 of 112	Rev.00

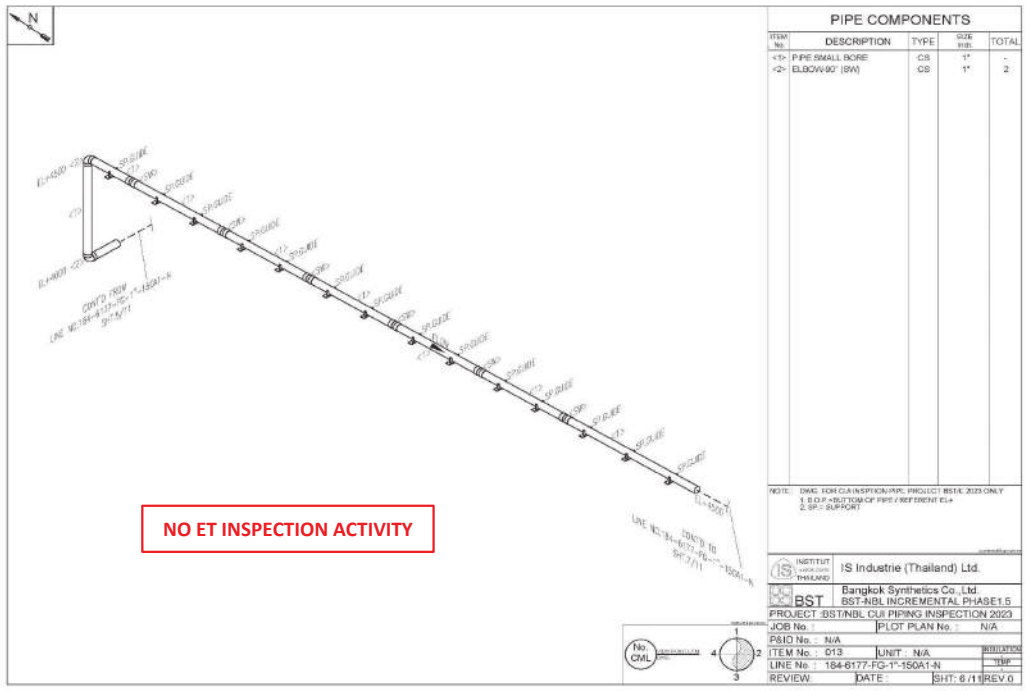


THAILAND

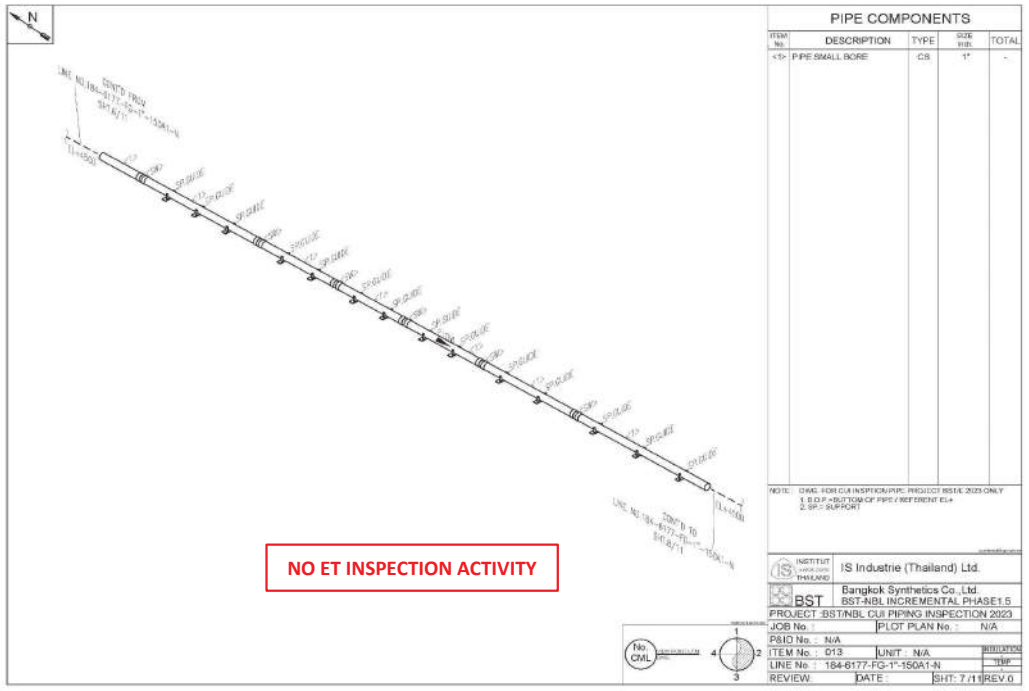
	3D ISO-DRAWING WITH WELD JOINT MARK UP			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	101 of 112	Rev.00



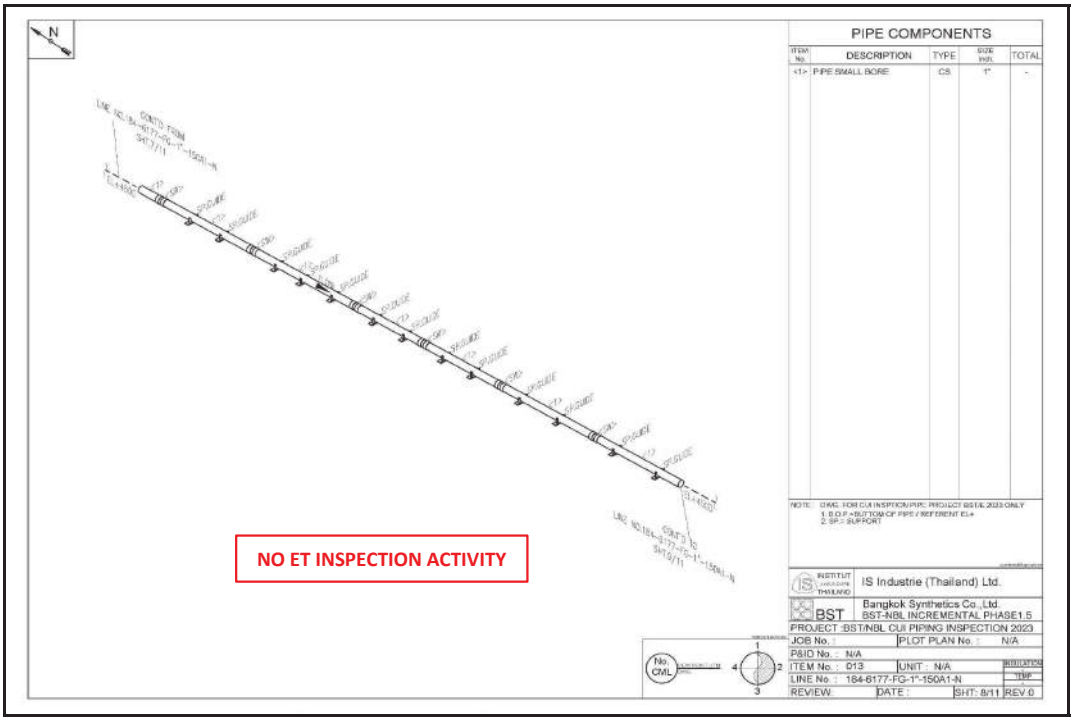
THAILAND



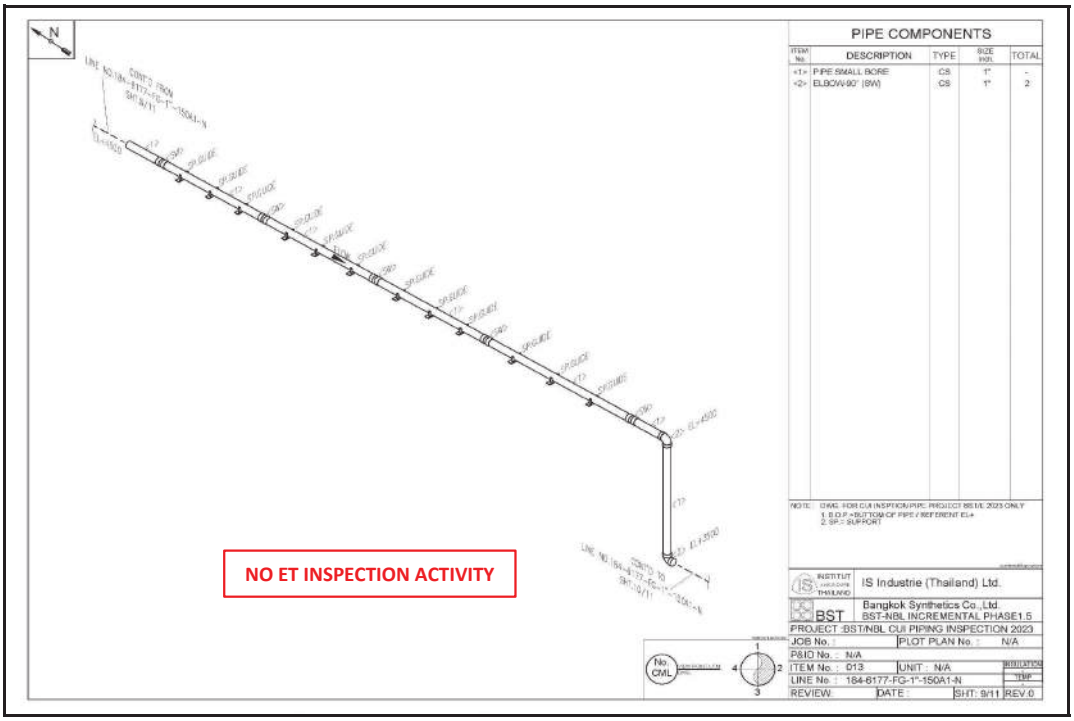
THAILAND



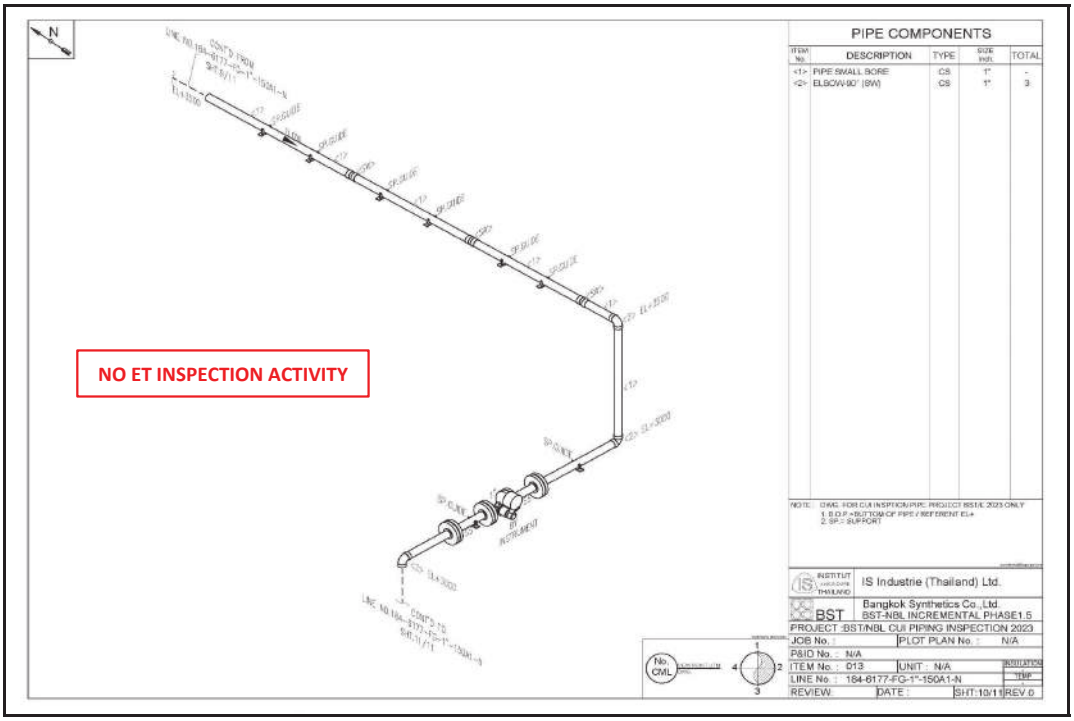
THAILAND



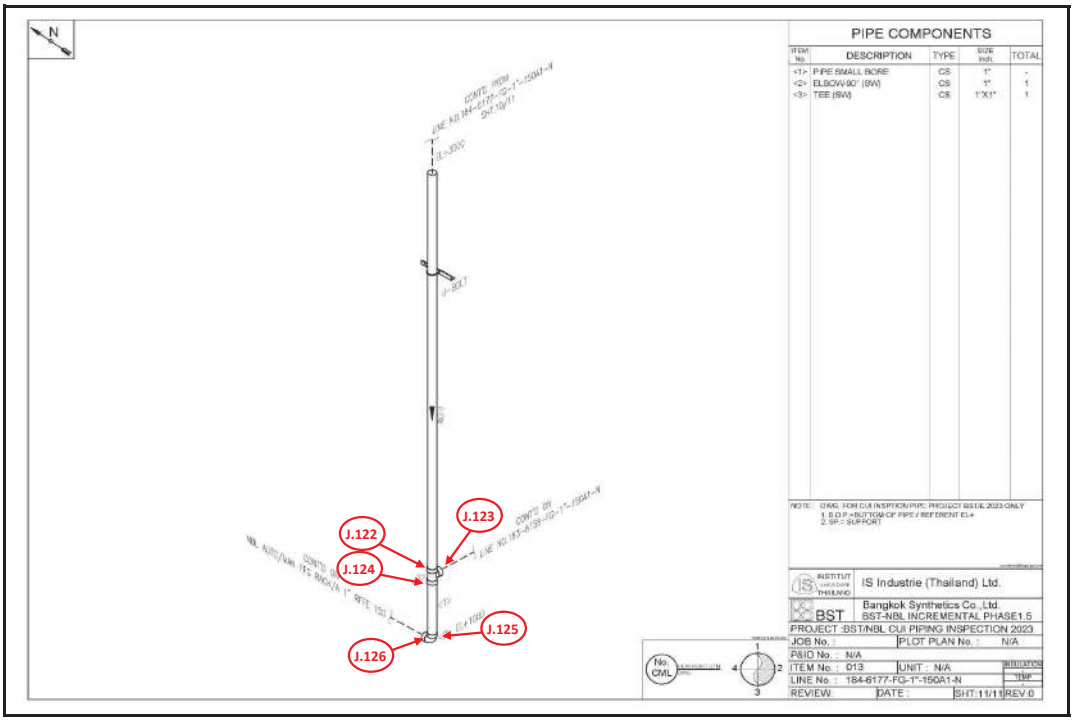
THAILAND



THAILAND



THAILAND



THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-013
				Line No. :	184-6177-FG-1"-150A1-N
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 108 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	FW
2	Joint No.2	Weld and HAZ	No indication was found	FW
3	Joint No.3	Weld and HAZ	No indication was found	FW
4	Joint No.4	Weld and HAZ	No indication was found	FW
5	Joint No.5	Weld and HAZ	No indication was found	FW
6	Joint No.6	Weld and HAZ	No indication was found	FW
7	Joint No.7	Weld and HAZ	No indication was found	FW
8	Joint No.8	Weld and HAZ	No indication was found	FW
9	Joint No.9	Weld and HAZ	No indication was found	FW
10	Joint No.10	Weld and HAZ	No indication was found	FW
11	Joint No.11	Weld and HAZ	No indication was found	FW
12	Joint No.12	Weld and HAZ	No indication was found	FW
13	Joint No.13	Weld and HAZ	No indication was found	FW
14	Joint No.14	Weld and HAZ	No indication was found	FW
15	Joint No.15	Weld and HAZ	No indication was found	FW
16	Joint No.16	Weld and HAZ	No indication was found	FW
17	Joint No.17	Weld and HAZ	No indication was found	FW
18	Joint No.18	Weld and HAZ	No indication was found	FW
19	Joint No.19	Weld and HAZ	No indication was found	FW
20	Joint No.20	Weld and HAZ	No indication was found	FW
21	Joint No.21	Weld and HAZ	No indication was found	FW
22	Joint No.22	Weld and HAZ	No indication was found	FW
23	Joint No.23	Weld and HAZ	No indication was found	FW
24	Joint No.24	Weld and HAZ	No indication was found	FW
25	Joint No.25	Weld and HAZ	No indication was found	FW
26	Joint No.26	Weld and HAZ	No indication was found	FW
27	Joint No.27	Weld and HAZ	No indication was found	FW
28	Joint No.28	Weld and HAZ	No indication was found	FW
29	Joint No.29	Weld and HAZ	No indication was found	FW
30	Joint No.30	Weld and HAZ	No indication was found	FW
31	Joint No.31	Weld and HAZ	No indication was found	FW
32	Joint No.32	Weld and HAZ	No indication was found	FW
33	Joint No.33	Weld and HAZ	No indication was found	FW
34	Joint No.34	Weld and HAZ	No indication was found	FW
35	Joint No.35	Weld and HAZ	No indication was found	FW
36	Joint No.36	Weld and HAZ	No indication was found	FW
37	Joint No.37	Weld and HAZ	No indication was found	FW
38	Joint No.38	Weld and HAZ	No indication was found	FW
39	Joint No.39	Weld and HAZ	No indication was found	FW
40	Joint No.40	Weld and HAZ	No indication was found	FW
41	Joint No.41	Weld and HAZ	No indication was found	FW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW
45	Joint No.45	Weld and HAZ	No indication was found	FW

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-013
				Line No. :	184-6177-FG-1"-150A1-N
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 109 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
46	Joint No.46	Weld and HAZ	No indication was found	FW
47	Joint No.47	Weld and HAZ	No indication was found	FW
48	Joint No.48	Weld and HAZ	No indication was found	FW
49	Joint No.49	Weld and HAZ	No indication was found	FW
50	Joint No.50	Weld and HAZ	No indication was found	FW
51	Joint No.51	Weld and HAZ	No indication was found	FW
52	Joint No.52	Weld and HAZ	No indication was found	FW
53	Joint No.53	Weld and HAZ	No indication was found	FW
54	Joint No.54	Weld and HAZ	No indication was found	FW
55	Joint No.55	Weld and HAZ	No indication was found	FW
56	Joint No.56	Weld and HAZ	No indication was found	FW
57	Joint No.57	Weld and HAZ	No indication was found	FW
58	Joint No.58	Weld and HAZ	No indication was found	FW
59	Joint No.59	Weld and HAZ	No indication was found	FW
60	Joint No.60	Weld and HAZ	No indication was found	FW
61	Joint No.61	Weld and HAZ	No indication was found	FW
62	Joint No.62	Weld and HAZ	No indication was found	FW
63	Joint No.63	Weld and HAZ	No indication was found	FW
64	Joint No.64	Weld and HAZ	No indication was found	BW
65	Joint No.65	Weld and HAZ	No indication was found	FW
66	Joint No.66	Weld and HAZ	No indication was found	FW
67	Joint No.67	Weld and HAZ	No indication was found	FW
68	Joint No.68	Weld and HAZ	No indication was found	FW
69	Joint No.69	Weld and HAZ	No indication was found	FW
70	Joint No.70	Weld and HAZ	No indication was found	FW
71	Joint No.71	Weld and HAZ	No indication was found	FW
72	Joint No.72	Weld and HAZ	No indication was found	FW
73	Joint No.73	Weld and HAZ	No indication was found	BW
74	Joint No.74	Weld and HAZ	No indication was found	FW
75	Joint No.75	Weld and HAZ	No indication was found	FW
76	Joint No.76	Weld and HAZ	No indication was found	FW
77	Joint No.77	Weld and HAZ	No indication was found	FW
78	Joint No.78	Weld and HAZ	No indication was found	FW
79	Joint No.79	Weld and HAZ	No indication was found	FW
80	Joint No.80	Weld and HAZ	No indication was found	FW
81	Joint No.81	Weld and HAZ	No indication was found	FW
82	Joint No.82	Weld and HAZ	No indication was found	FW
83	Joint No.83	Weld and HAZ	No indication was found	FW
84	Joint No.84	Weld and HAZ	No indication was found	FW
85	Joint No.85	Weld and HAZ	No indication was found	FW
86	Joint No.86	Weld and HAZ	No indication was found	FW
87	Joint No.87	Weld and HAZ	No indication was found	FW
88	Joint No.88	Weld and HAZ	No indication was found	FW
89	Joint No.89	Weld and HAZ	No indication was found	FW
90	Joint No.90	Weld and HAZ	No indication was found	FW

	EDDY CURRENT TESTING SURFACE REPORT	Report No. :	IS/B-23-CUI-P-NBL-013	
		Line No. :	184-6177-FG-1"-150A1-N	
		Date of Test :	19/05/2023	
	Code : Rev.: Effective date :	Page :	110 of 112	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
91	Joint No.91	Weld and HAZ	No indication was found	FW
92	Joint No.92	Weld and HAZ	No indication was found	FW
93	Joint No.93	Weld and HAZ	No indication was found	FW
94	Joint No.94	Weld and HAZ	No indication was found	FW
95	Joint No.95	Weld and HAZ	No indication was found	FW
96	Joint No.96	Weld and HAZ	No indication was found	FW
97	Joint No.97	Weld and HAZ	No indication was found	FW
98	Joint No.98	Weld and HAZ	No indication was found	FW
99	Joint No.99	Weld and HAZ	No indication was found	FW
100	Joint No.100	Weld and HAZ	No indication was found	FW
101	Joint No.101	Weld and HAZ	No indication was found	FW
102	Joint No.102	Weld and HAZ	No indication was found	FW
103	Joint No.103	Weld and HAZ	No indication was found	FW
104	Joint No.104	Weld and HAZ	No indication was found	FW
105	Joint No.105	Weld and HAZ	No indication was found	FW
106	Joint No.106	Weld and HAZ	No indication was found	FW
107	Joint No.107	Weld and HAZ	No indication was found	FW
108	Joint No.108	Weld and HAZ	No indication was found	FW
109	Joint No.109	Weld and HAZ	No indication was found	FW
110	Joint No.110	Weld and HAZ	No indication was found	FW
111	Joint No.111	Weld and HAZ	No indication was found	FW
112	Joint No.112	Weld and HAZ	No indication was found	FW
113	Joint No.113	Weld and HAZ	No indication was found	FW
114	Joint No.114	Weld and HAZ	No indication was found	FW
115	Joint No.115	Weld and HAZ	No indication was found	FW
116	Joint No.116	Weld and HAZ	No indication was found	FW
117	Joint No.117	Weld and HAZ	No indication was found	FW
118	Joint No.118	Weld and HAZ	No indication was found	FW
119	Joint No.119	Weld and HAZ	No indication was found	FW
120	Joint No.120	Weld and HAZ	No indication was found	FW
121	Joint No.121	Weld and HAZ	No indication was found	FW
122	Joint No.122	Weld and HAZ	No indication was found	FW
123	Joint No.123	Weld and HAZ	No indication was found	FW
124	Joint No.124	Weld and HAZ	No indication was found	FW
125	Joint No.125	Weld and HAZ	No indication was found	FW
126	Joint No.126	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG	Report No. :	IS/B-23-CUI-P-NBL-013	
		Line No. :	184-6177-FG-1"-150A1-N	
		Date of Test :	19/05/2023	
	Code : Rev.: Effective date :	Page :	111 of 112	Rev.00

Picture No. 1 : ET result found not indication.

Picture No. 2 : ET result found not indication.

Picture No. 3 : ET result found not indication.

Picture No. 4 : ET result found not indication.

Picture No. 5 : ET result found not indication.

Picture No. 6 : ET result found not indication.

ECT PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	112 of 112 Rev.00

Code : Rev.: Effective date :

Picture No. 7 : ET result found not indication.

Picture No. 8 : ET result found not indication.

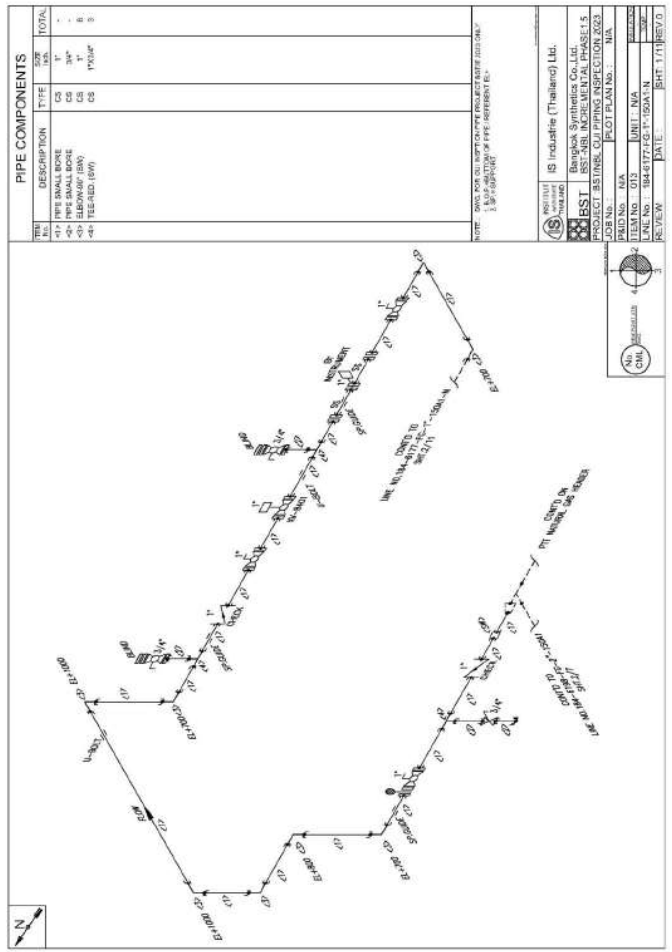
Picture No. 9 : ET result found not indication.

Picture No. 10 : ET result found not indication.

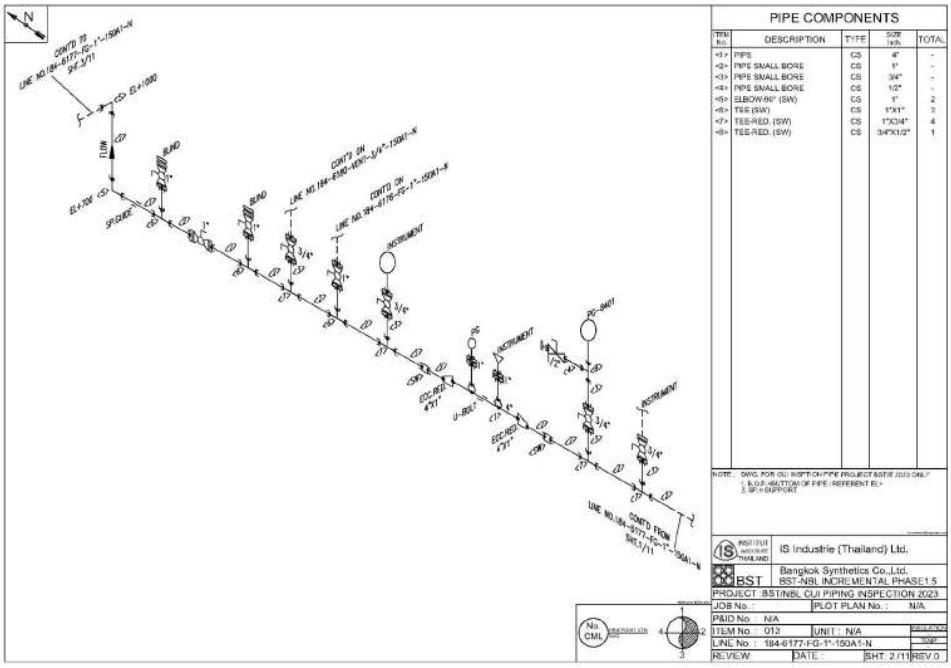
2D ISO-DRAWING

Report No. :	IS/B-23-CUI-P-NBL-013
Line No. :	184-6177-FG-1"-150A1-N
Date of Test :	19/05/2023
Page :	113 of 112 Rev.00

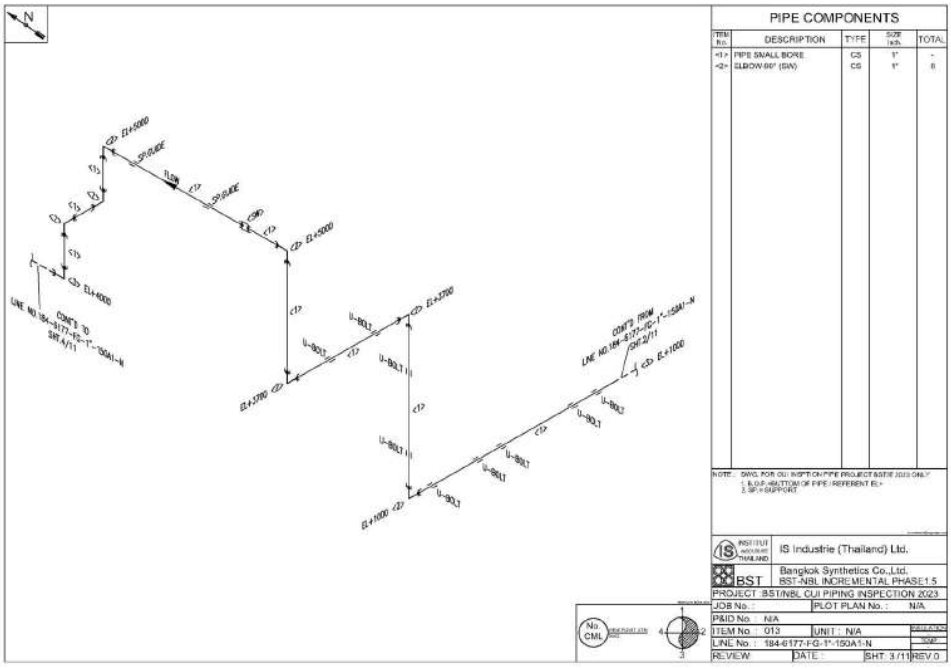
Code : Rev.: Effective date :



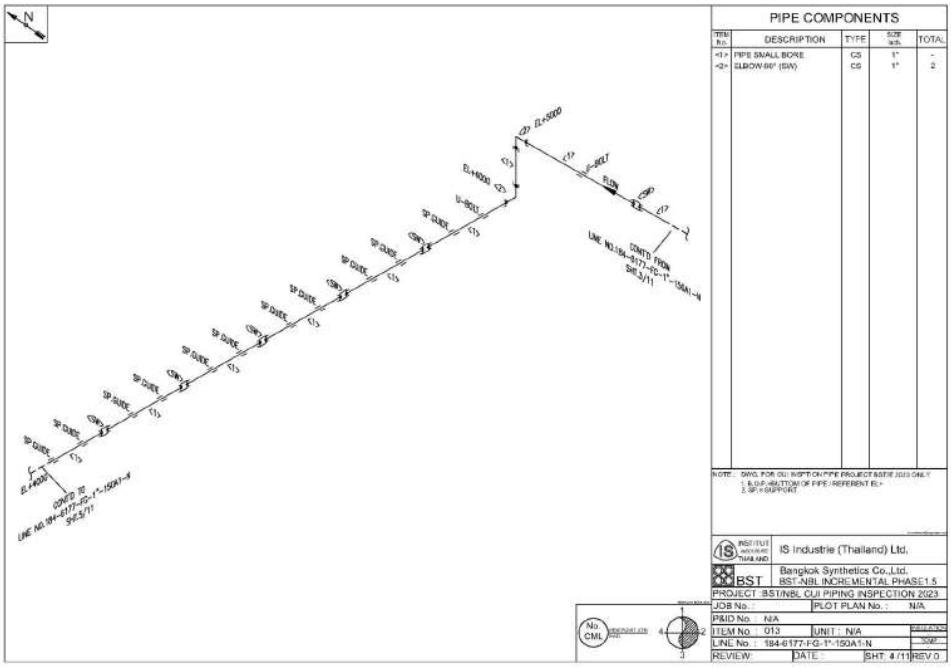
INSTITUT de SOUDURE THAILAND



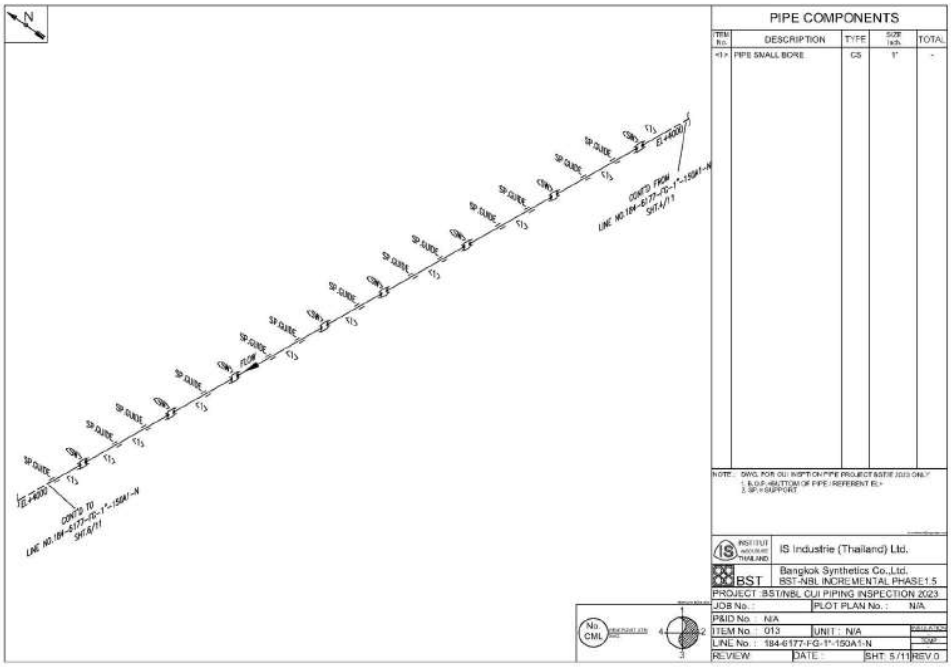
THAILAND



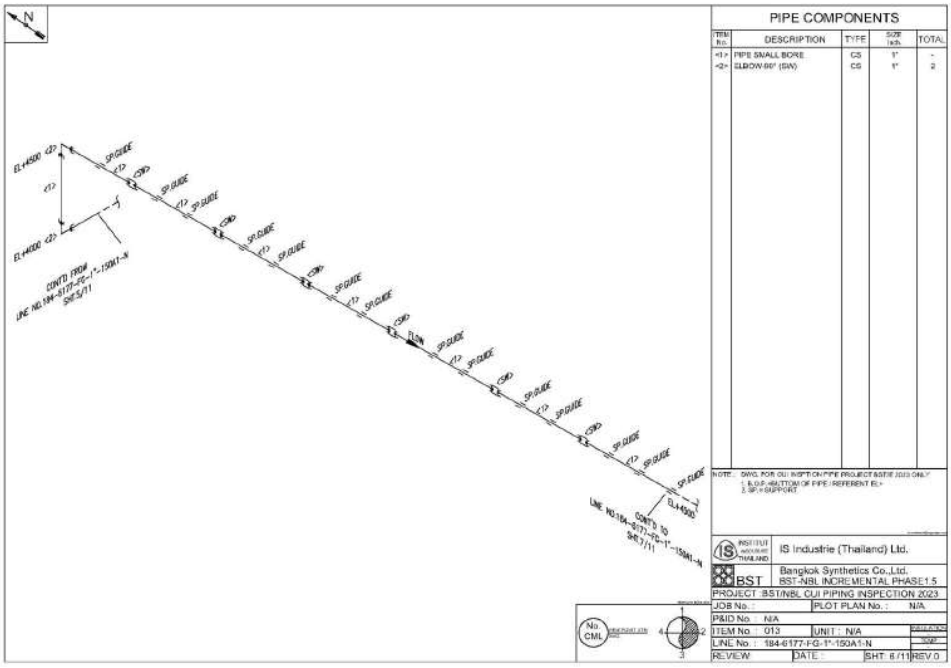
THAILAND



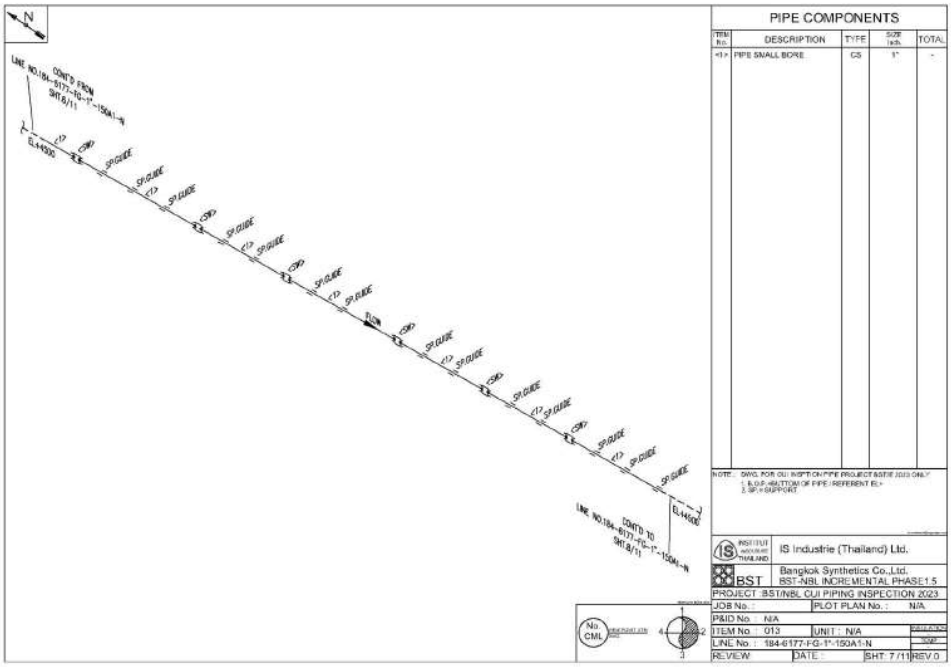
THAILAND



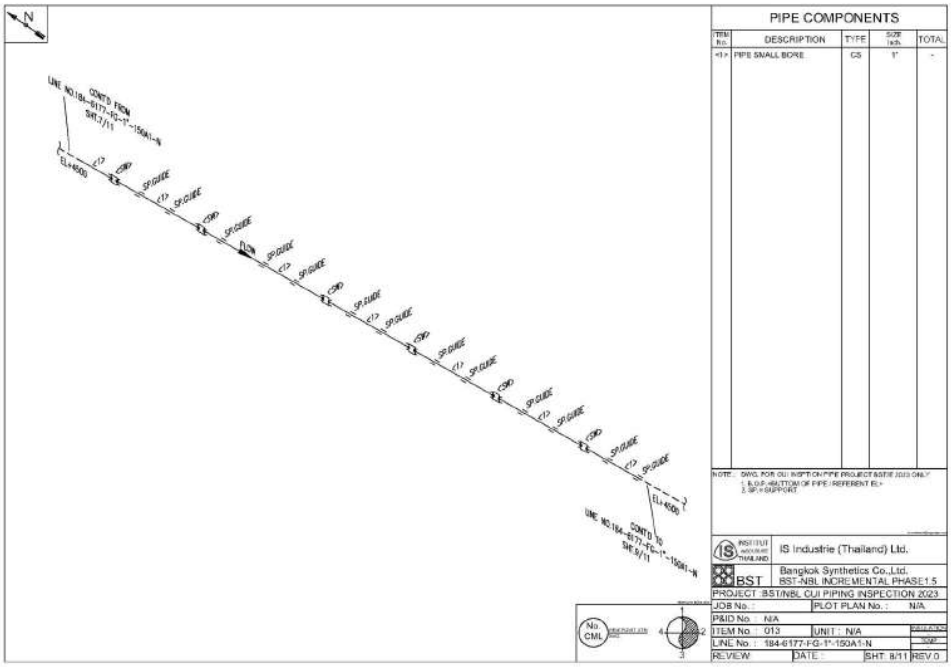
THAILAND



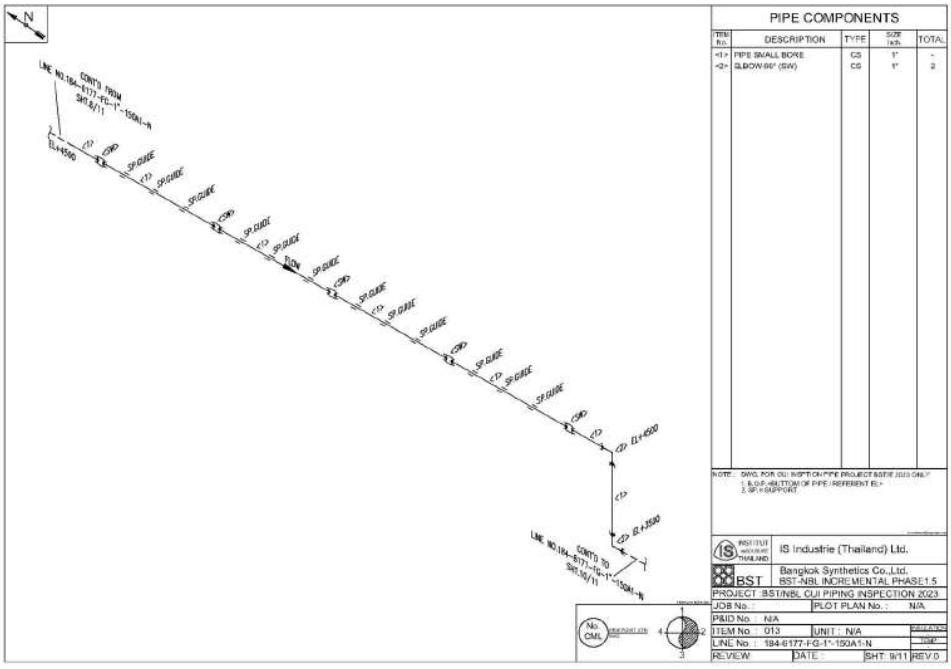
THAILAND



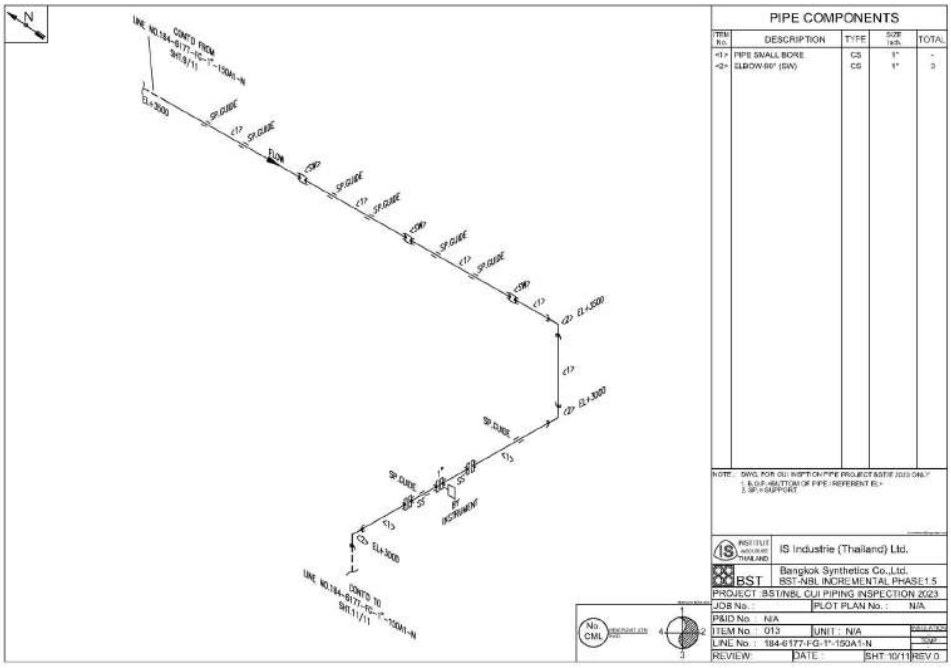
THAILAND



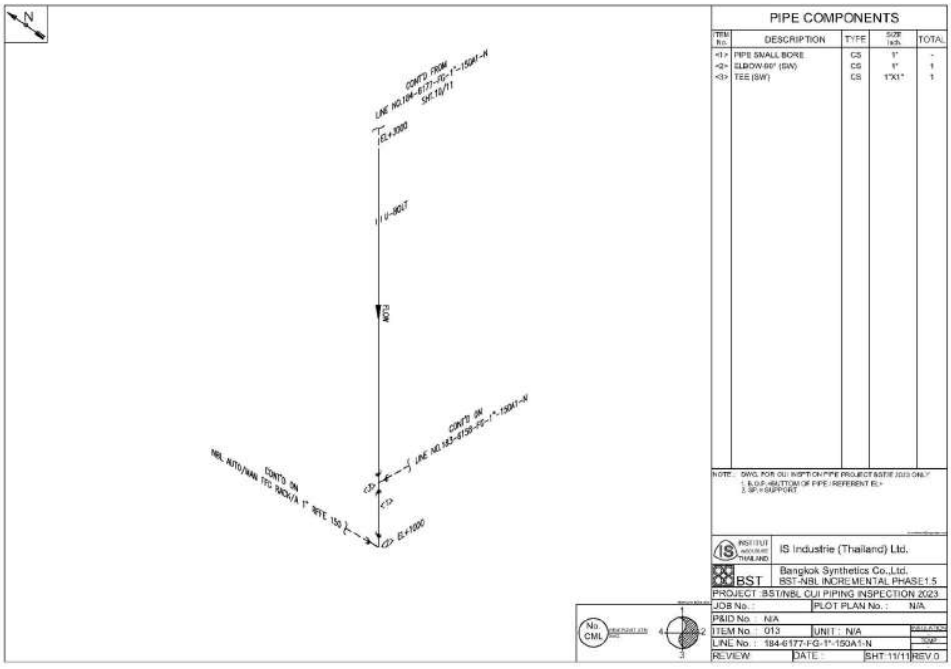
THAILAND



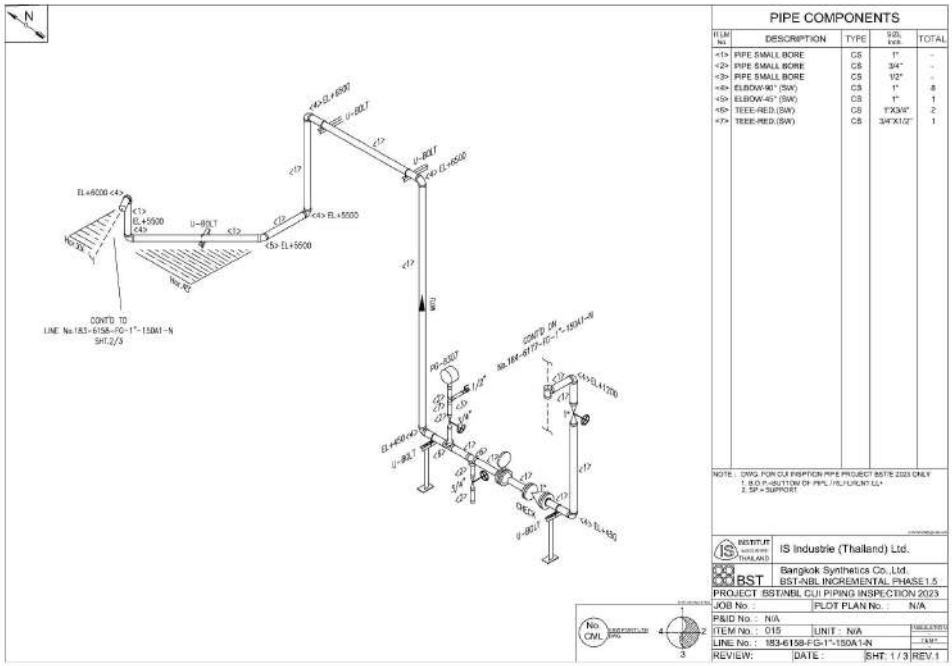
THAILAND



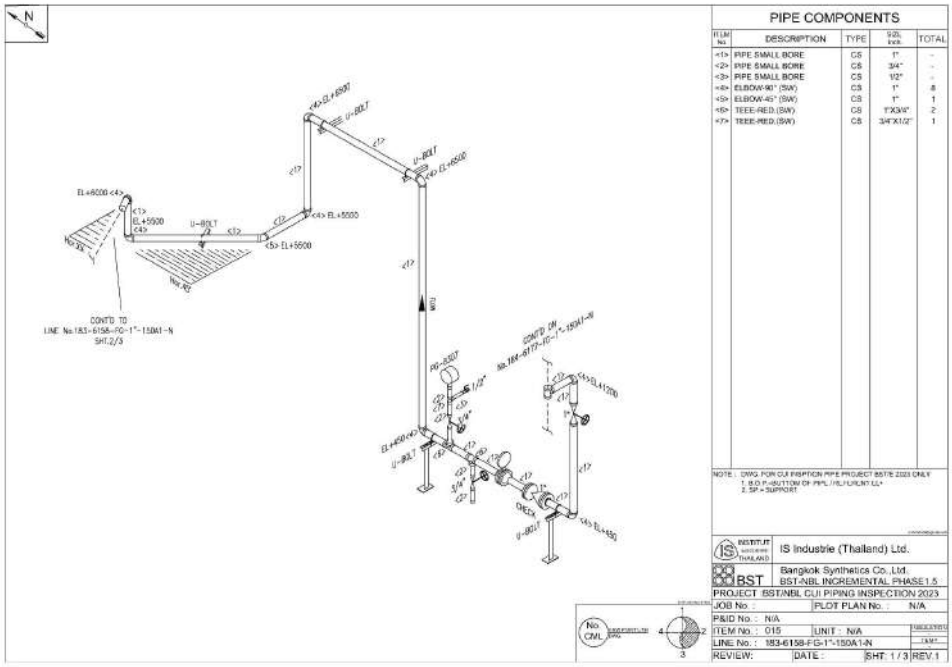
THAILAND



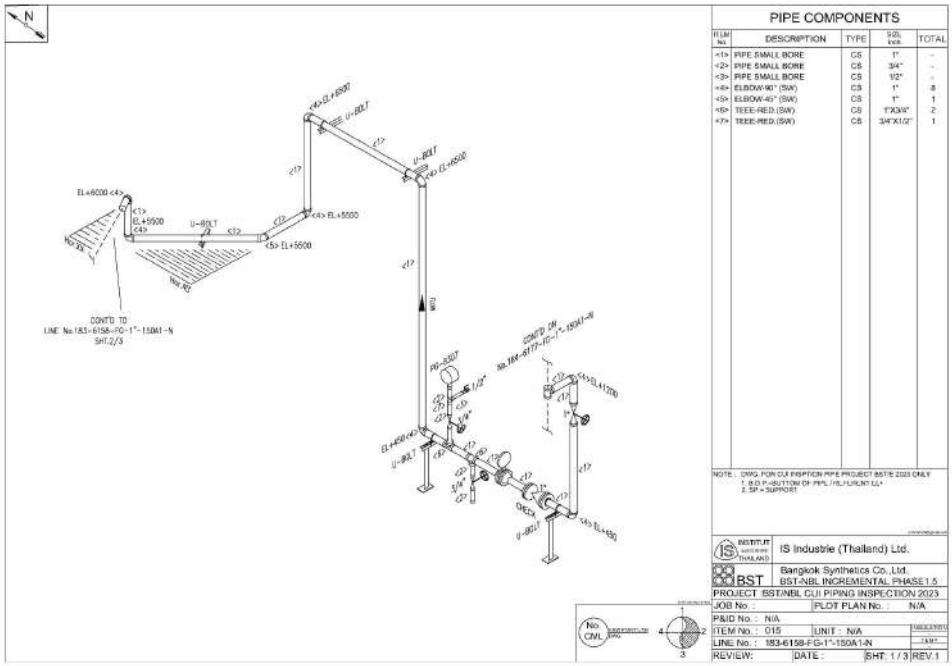
THAILAND



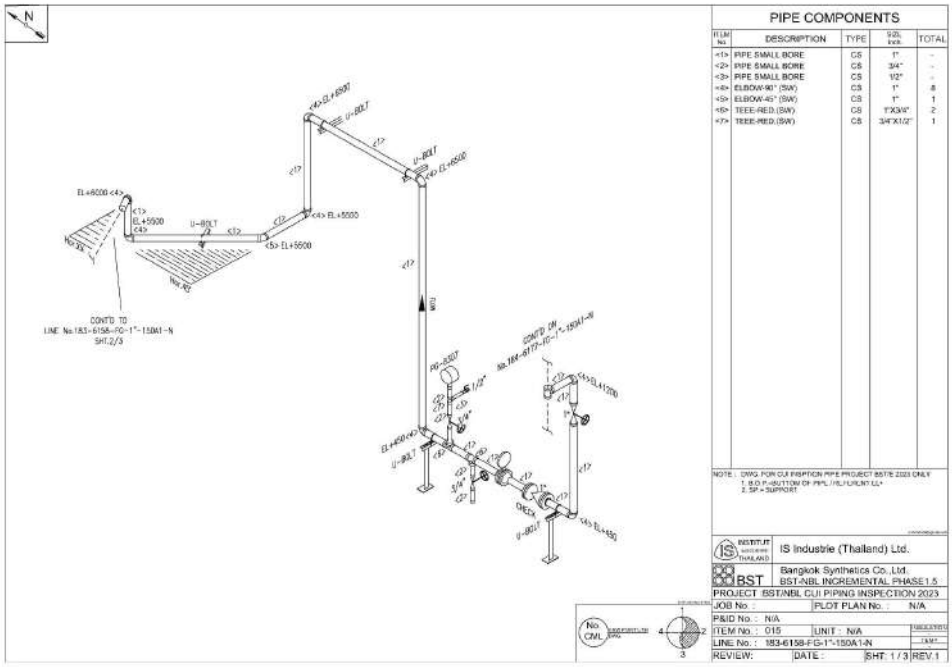
THAILAND



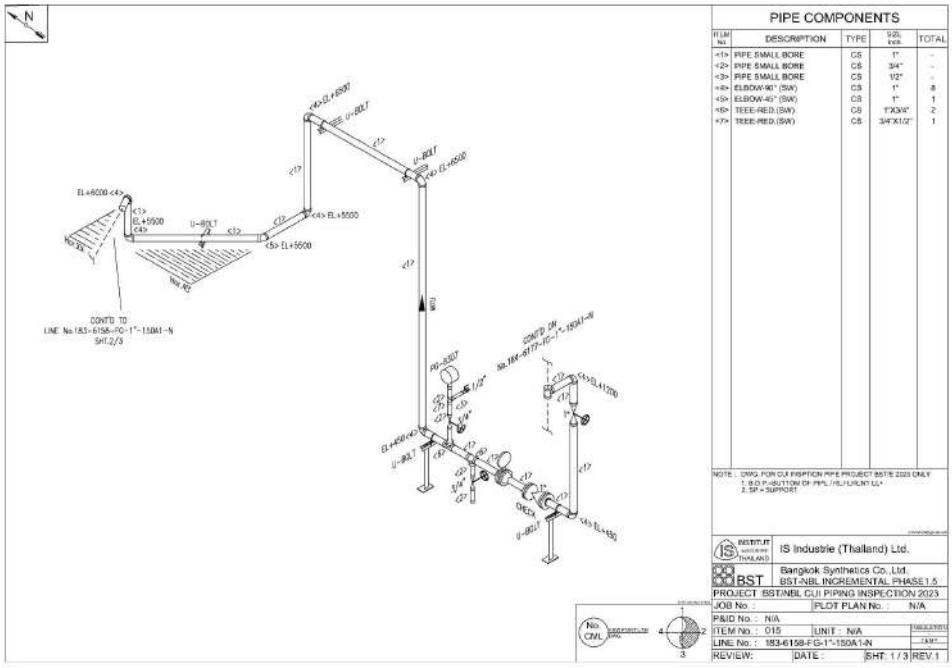
THAILAND



THAILAND

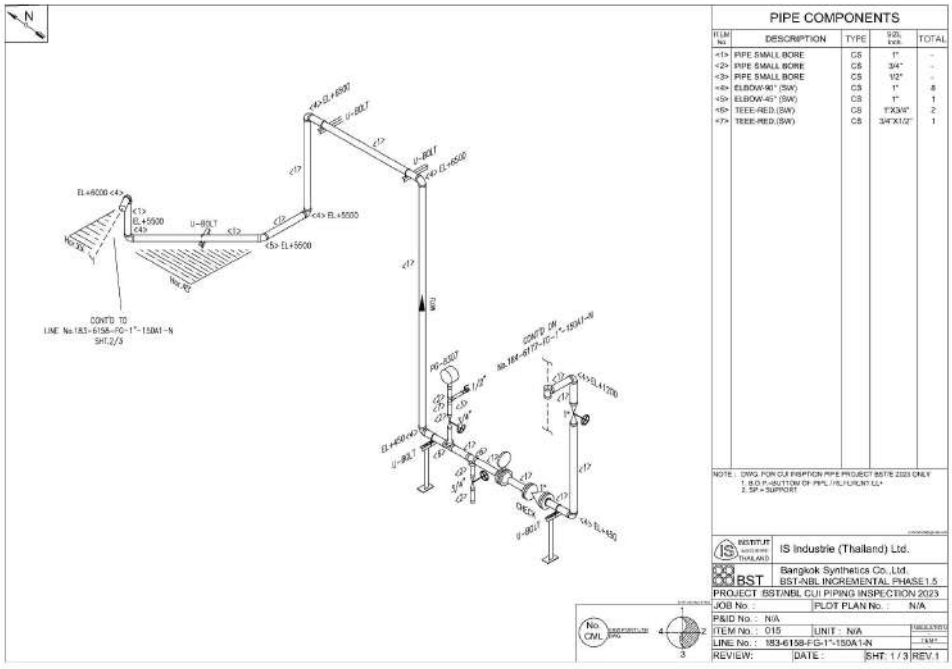


THAILAND

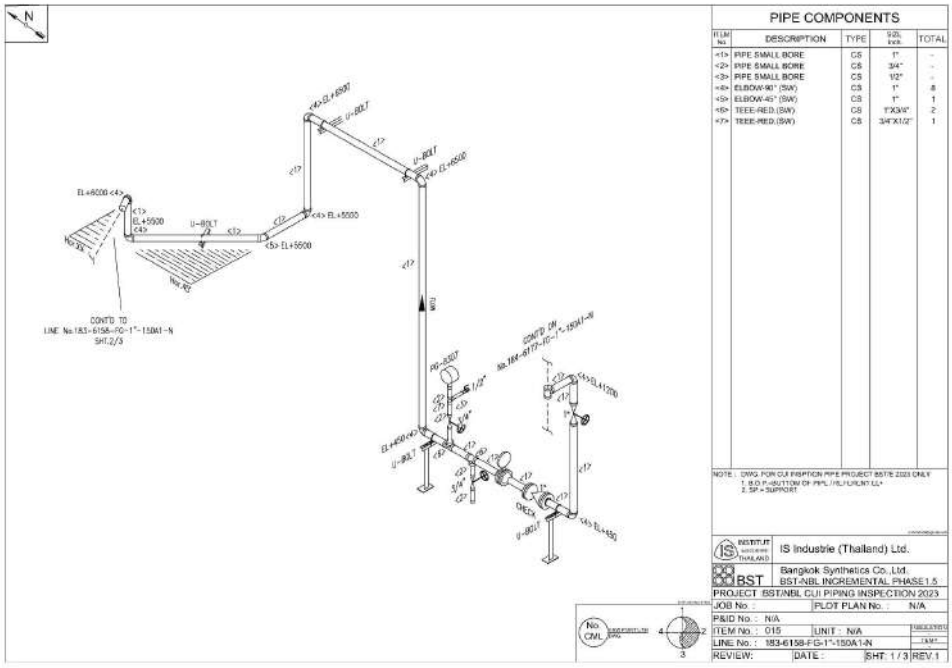


THAILAND

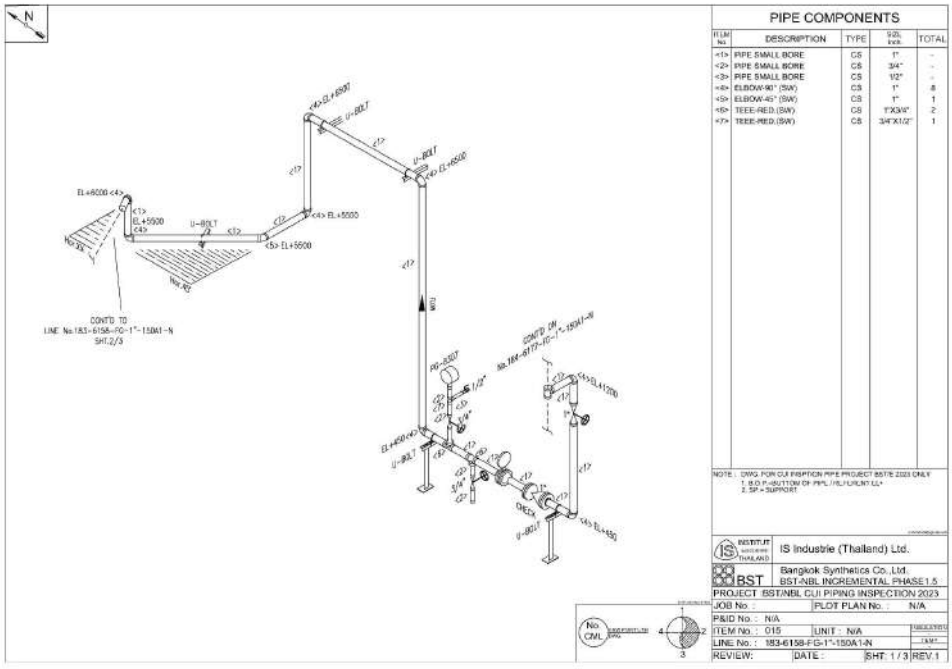
	3D ISO-DRAWING			Report No. :	IS/B-23-CUI-P-NBL-013	
				Line No. :	184-6177-FG-1"-150A1-N	
				Date of Test :	19/05/2023	
Code :	Rev.:	Effective date :		Page :	129 of 112	Rev.00



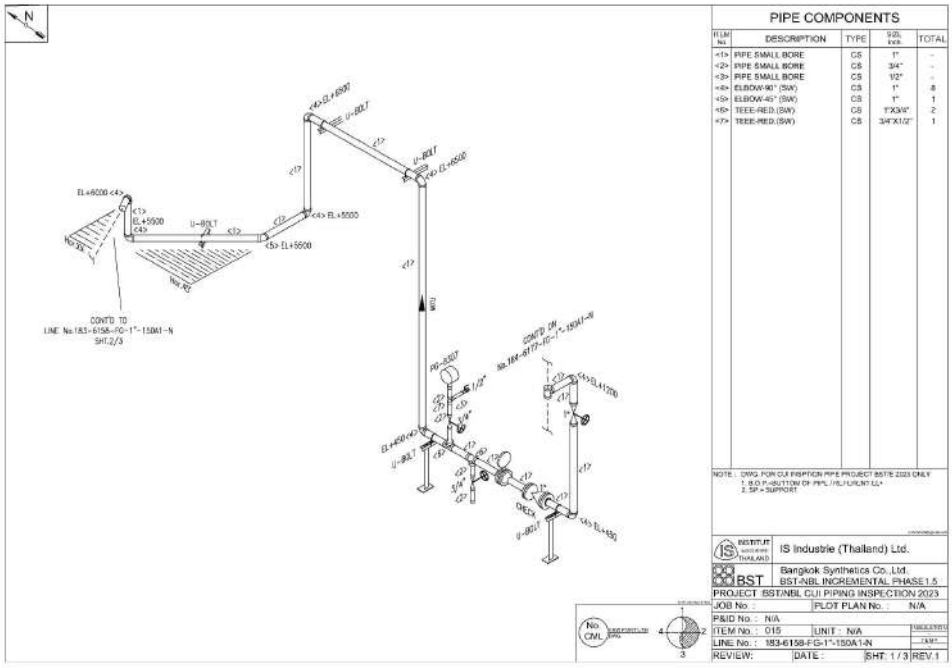
THAILAND



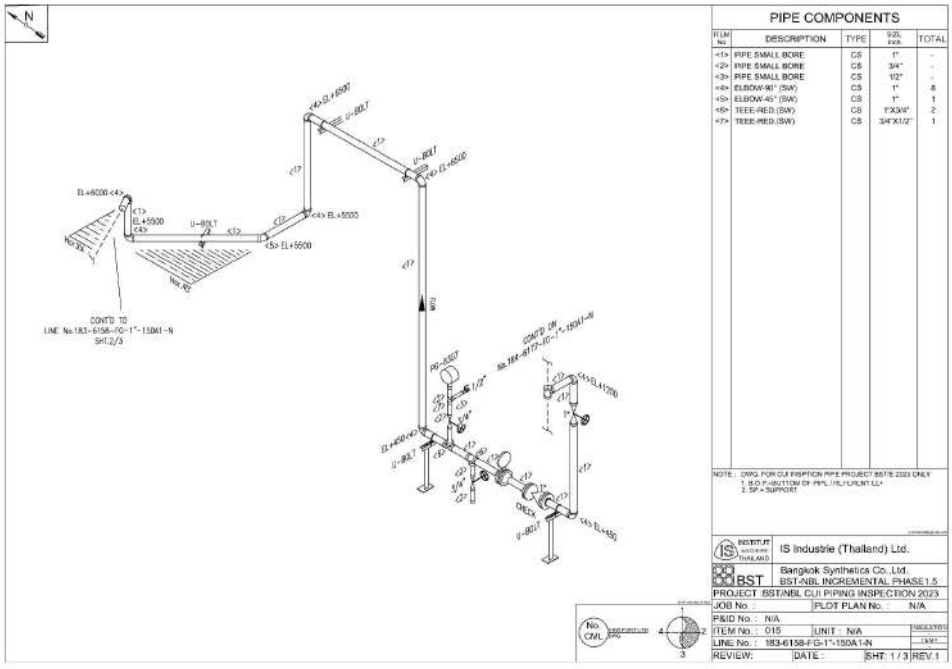
THAILAND



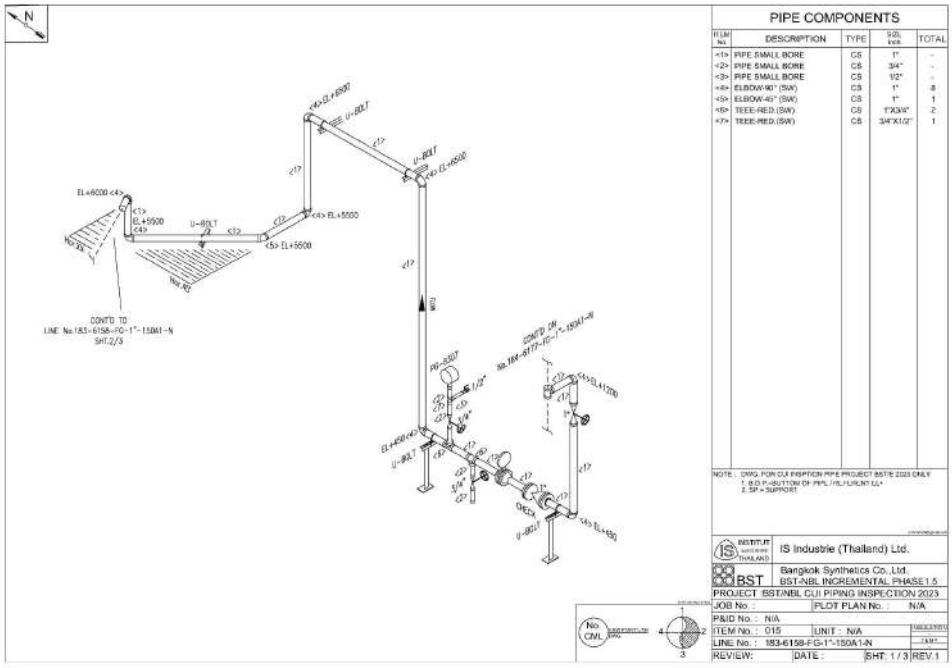
THAILAND



THAILAND



THAILAND



INSTITUT de SOUDURE THAILAND

Appendix 1
Inspector Certification

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)
Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

Mr. Satish Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jocelyn Robin STRAUB
MANAGING DIRECTOR

IS INDUSTRIE (THAILAND) LTD.

API INDIVIDUAL CERTIFICATION PROGRAMS

verifies that

Krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69174

ORIGINAL CERTIFICATION DATE November 30, 2016
CURRENT CERTIFICATION DATE November 30, 2022
EXPIRATION DATE November 30, 2025

Executive Vice President, Certification Programs

API ICP

ANAB
ACCREDITED
ISO/IEC 17024
PERSONNEL CERTIFICATION BODY

THIS IS A COPY

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

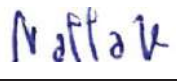
Piping Line No.

184-6198-FG-2"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-014
Inspection date : May 19, 2023
Issue report date : June 22, 2023

Content

Item	Description	Page
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 41*
4	*Ultrasonic Thickness Measurement Report*	*42 - 65*
5	*Eddy Current Testing Report*	*66 - 84*
6	*2D & 3D ISO-Drawing*	*85 - 98*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
		
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : June 22, 2023	Date : June 25, 2023	Date : June 28, 2023

	SUMMARY FINDING			Report No. :	IS/B-23-CUI-P-NBL-014
				Request No. :	-
				Date of Test :	19/05/2023
	Code :	Rev.:	Effective date :	Page : 1 of 98	Rev.00

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 14 Line No.	184-6198-FG-2"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Fitting	**Accepted (Alert)**	Found 1 position of internal corrosion (Erosion) at elbow 2" TMLs No. 41 (CMLs 51) with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years.	Shall be monitor elbow 2" TMLs 41 (CMLs 51) within next inspection.
2	Pipe, Fitting, Branch Connection, Valve	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, fitting, branch connection and valve at CMLs 3, 5-6, 15, 34, 40, 44, 55-56, 58-59. (See picture No. 2, 4-5, 13-14, 30-31, 33-34, 38, 60-63, 65-66)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Satisfactory condition observed. See detail in "VISUAL TESTING REPORT".	**Result :**	Accepted
UTM :	Found 1 position of internal corrosion (Erosion) at elbow 2" TMLs No. 41 with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

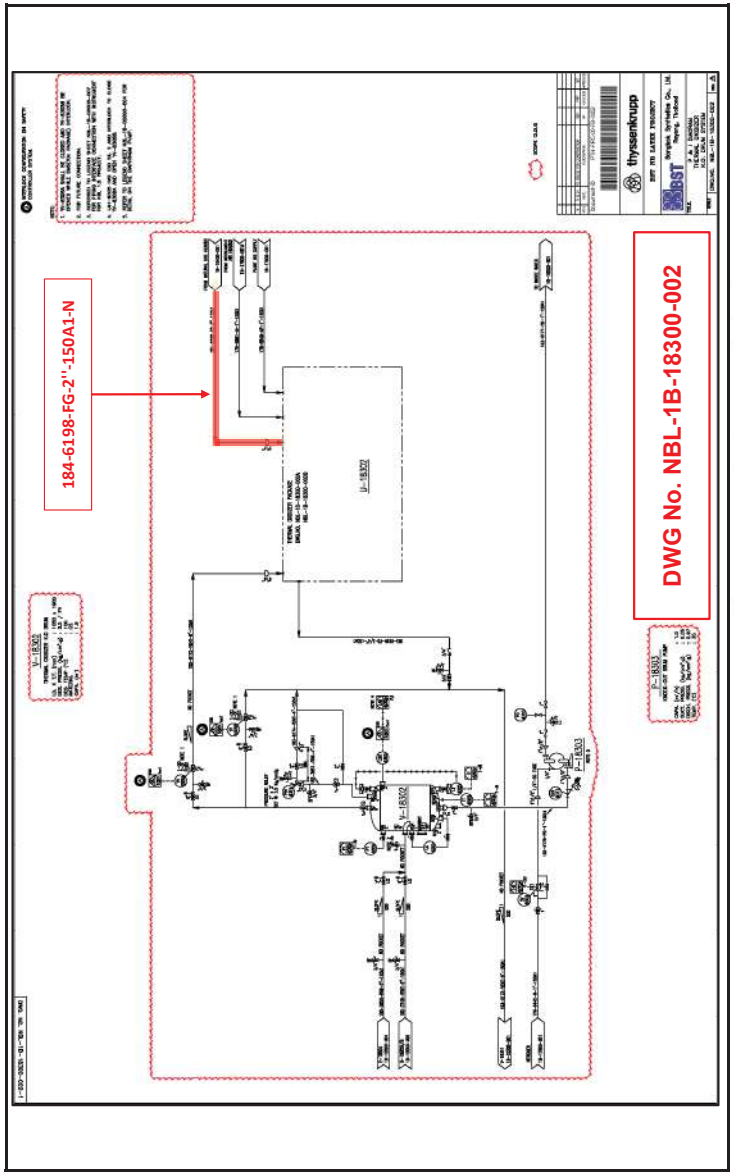
AFTER REPAIR INSPECTION RESULT

- None -

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	2 of 98 Rev.00

Piping and Instrumentation Diagram (P&ID)

Code : Rev.: Effective date :



VISUAL TESTING REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Request No. :	-
Date of Test :	19/05/2023
Page :	3 of 98 Rev.00

Code : Rev.: Effective date :

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6198-FG-2"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			spot area of slight corrosion	-
2. Flange connection (Flange, Stud & Nut, Gasket)	✓					-
3. Branch Connection (Vent, Drain, Nipples)		✓			Rust spot	-
4. Valve (Body, Bonnet, Stem, Packing, Handle)		✓			Slight corrosion	-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
Other …				✓		-
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)	✓					-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	June 22, 2023	Date :	June 25, 2023	Date :	June 28, 2023

Picture No. 1

Finding :

Short piece pipe 2" CMLs 1 and tee 2" x 2" CMLs 2 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Found painting damage & rust spot around valve handle of valve 2" CMLs 3.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

After remove any dirt found pipe 2" CMLs 4 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 4

Finding :

Found rust spot as drain pipe 3/4" and drain valve 3/4" at drain branch 3/4" CMLs 5.

Recommendation :

Should be monitor within next inspection.

Picture No. 5

Finding :

Found slight corrosion as packing, painting damage & rust spot as flange and body of valve 2" CMLs 6.

Recommendation :

Shall be monitor within next inspection.

Picture No. 6

Finding :

After remove any dirt found pipe 2" CMLs 7 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Elbow 2" CMLs 8 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 8

Finding :

After remove any dirt found pipe 2" CMLs 9 was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Small bore branch pipe 3/4" CMLs 10 include valve 3/4" were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 10

Finding :

Pipe 2", U-bolt and structure support CMLs 11 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 11

Finding :

After remove any dirt found elbow 2" CMLs 12 and CMLs 13 were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 12

Finding :

Pipe 2" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 13

Finding :

Found coating damage & slight corrosion at elbow 2" CMLs 15.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 14

Finding :

This photo shown close-up view of slight corrosion at elbow 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 15

Finding :

After remove any dirt found pipe 2" CMLs 16 and elbow 2" CMLs 17 were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Pipe 2", U-bolt and structure support CMLs 18 and CMLs 19 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 17

Finding :

This photo shown U-bolt and structure support were normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 18

Finding :

Elbow 2" CMLs 20 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 19

Finding :

Pipe 1" CMLs 21 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 20

Finding :

Pipe 2", U-bolt and structure support CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

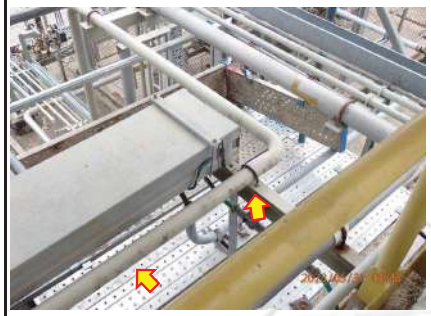
Picture No. 21

Finding :

Elbow 2" CMLs 23 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 22

Finding :

Pipe 2", U-bolt and structure support CMLs 24, CMLs 25 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 23

Finding :

Pipe 2" CMLs 26 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 24

Finding :

Pipe 2", U-bolt and structure support CMLs 27, CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Pipe 2", U-bolt and structure support CMLs 29 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 26

Finding :

Elbow 2" CMLs 30 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 27

Finding :

Pipe 2" CMLs 31 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 28

Finding :

Elbow 2" include dummy support CMLs 32 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Pipe 2" CMLs 33 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 30

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 34.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 31

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 32

Finding :

Elbow 2" CMLs 35, CMLs 37, CMLs 39 and pipe 2" CMLs 36, CMLs 38 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 40.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 34

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 35

Finding :

Elbow 2" CMLs 41 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 36

Finding :

Pipe 2" CMLs 42 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Pipe 2", U-bolt and structure support CMLs 43 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Found spot area of coating damage & rust spot at elbow 2" CMLs 44.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 39

Finding :

Pipe 2" CMLs 45 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Elbow 2" CMLs 46 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 42

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 43

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 44

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 45

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 46

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 47

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 48

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 49

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 50

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 51

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 52

Finding :

Pipe 1" CMLs 65, CMLs 67 and socket elbow 1" CMLs 66 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 53

Finding :

Pipe 2" CMLs 47 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 54

Finding :

Pipe 2", U-bolt and structure support CMLs 48 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 55

Finding :

Elbow 2" CMLs 49 and pipe 2" CMLs 50 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

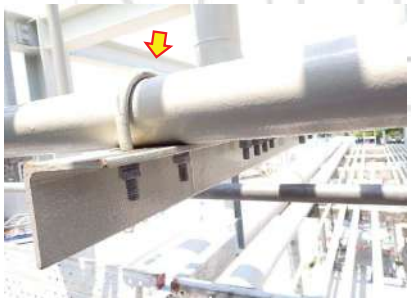
Picture No. 56

Finding :

Elbow 2" CMLs 51 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 57

Finding :

Pipe 2", U-bolt and structure support CMLs 52 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 58

Finding :

Pipe 2" CMLs 53 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 59

Finding :

Pipe 2", U-bolt and structure support CMLs 54 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 60

Finding :

Found coating damage & rust spot at weldment of elbow 2" CMLs 56.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 61

Finding :

This photo shown coating damage & rust spot at weldment of elbow 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 62

Finding :

Found spot area of coating damage & rust spot at pipe 2" CMLs 56.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 63

Finding :

This photo shown spot area of coating damage & rust spot at pipe 2".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 64

Finding :

Elbow 2" CMLs 57 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 65

Finding :

Found spot area of painting damage at pipe 2" CMLs 58.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 66

Finding :

Found slightly rust as pipe 2" surface CMLs 59 (Beginning period of CUS).

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 67

Finding :

This location was not accessed, cause scaffolding was not installed. But this section seems like still in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 68

Finding :

Elbow 2" CMLs 60 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 69

Finding :

Pipe 2" CMLs 61 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 70

Finding :

Socket elbow 1" CMLs 62 and pipe 1" CMLs 63 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 71

Finding :

Socket elbow 1" CMLs 62 and shore piece pipe 1" CMLs 64 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

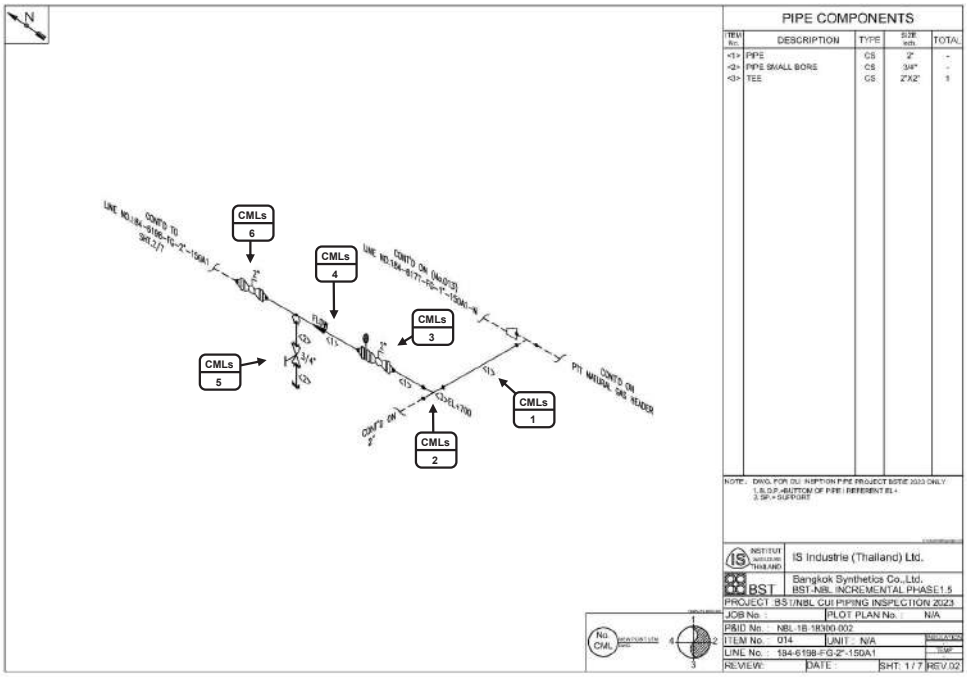
Picture No. 72

Finding :

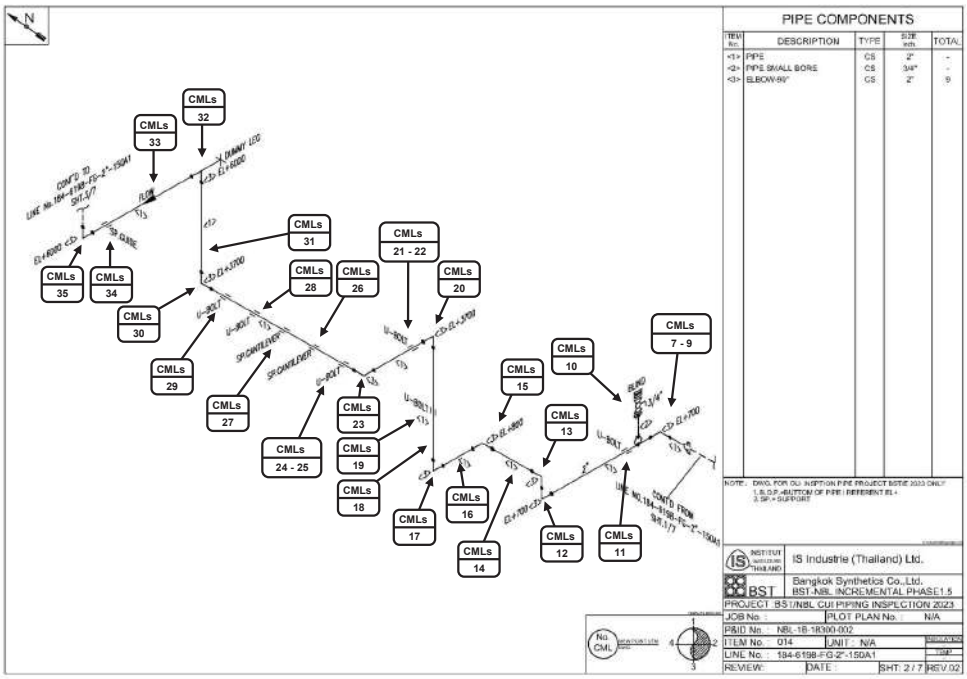
Flange connection (Ending location) CMLs 65 include all set of stud & nut were found in normal condition.

Recommendation :

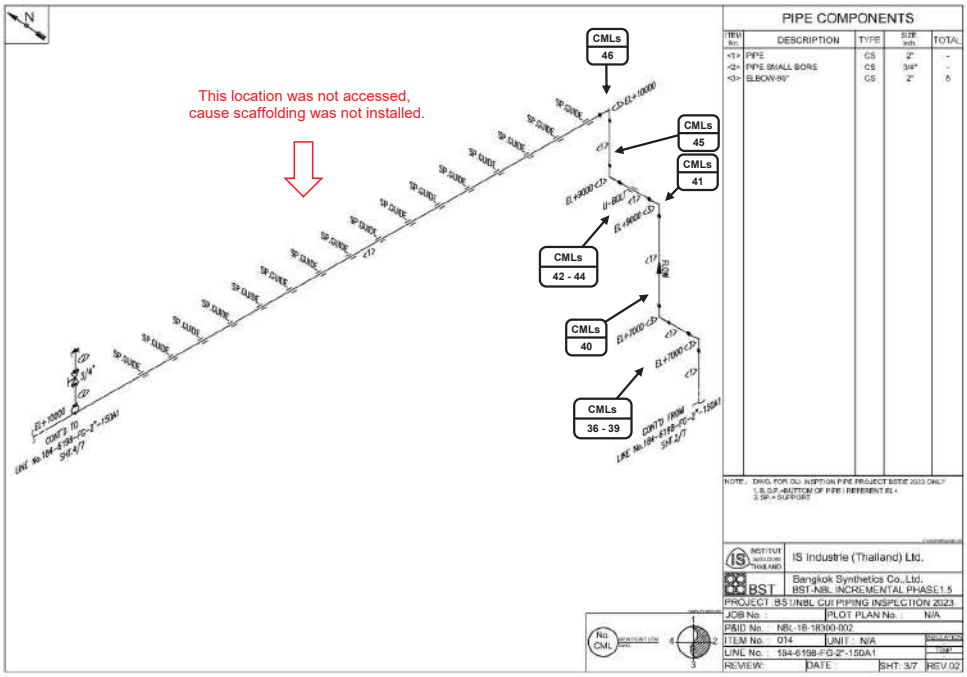
Should be monitor within next inspection.



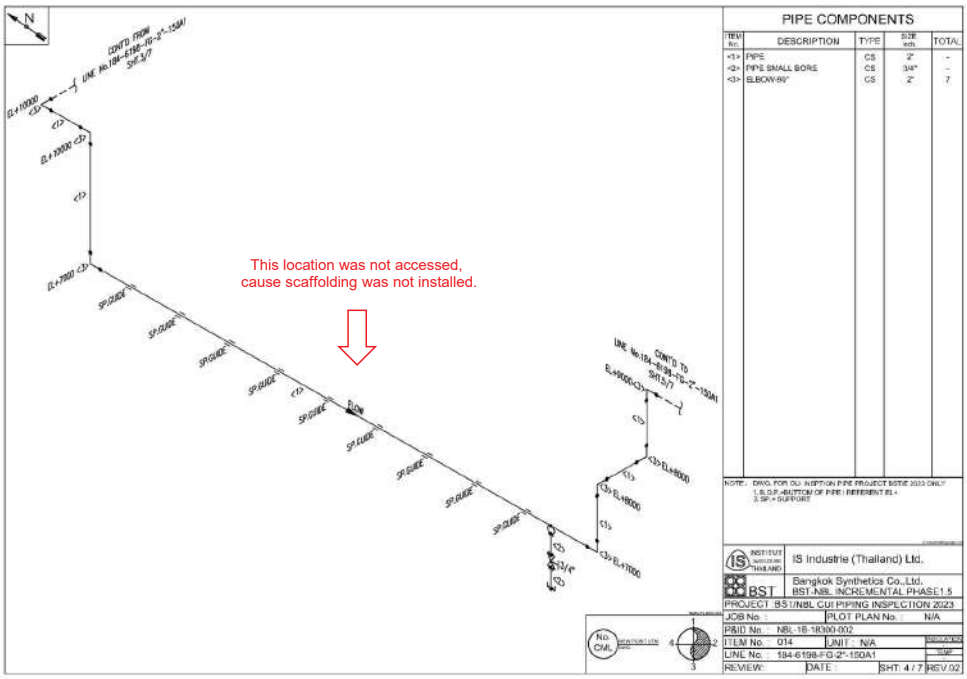
THAILAND



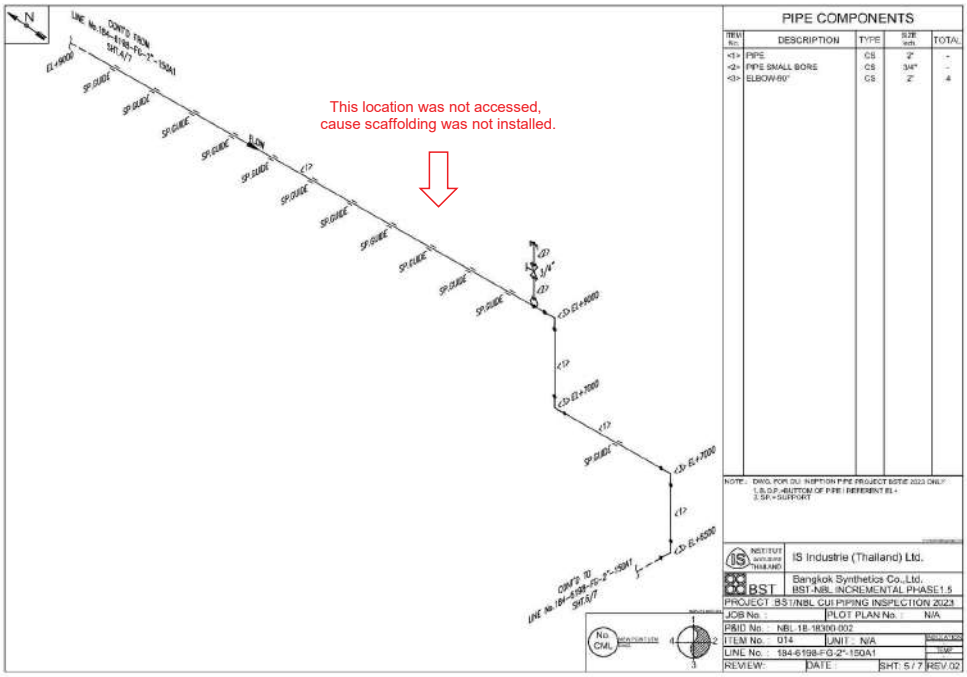
THAILAND

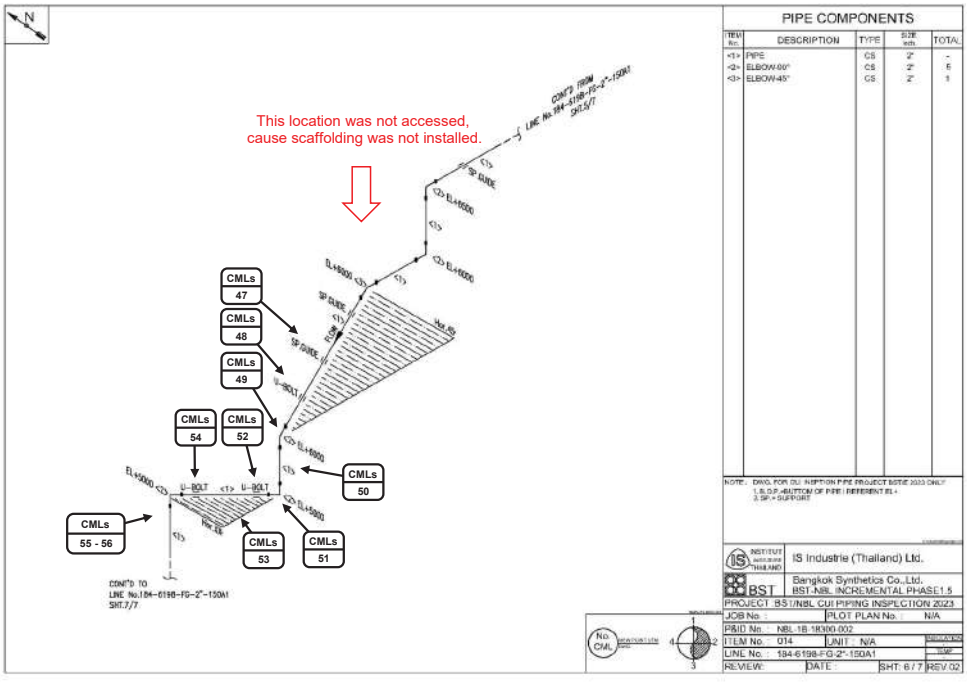


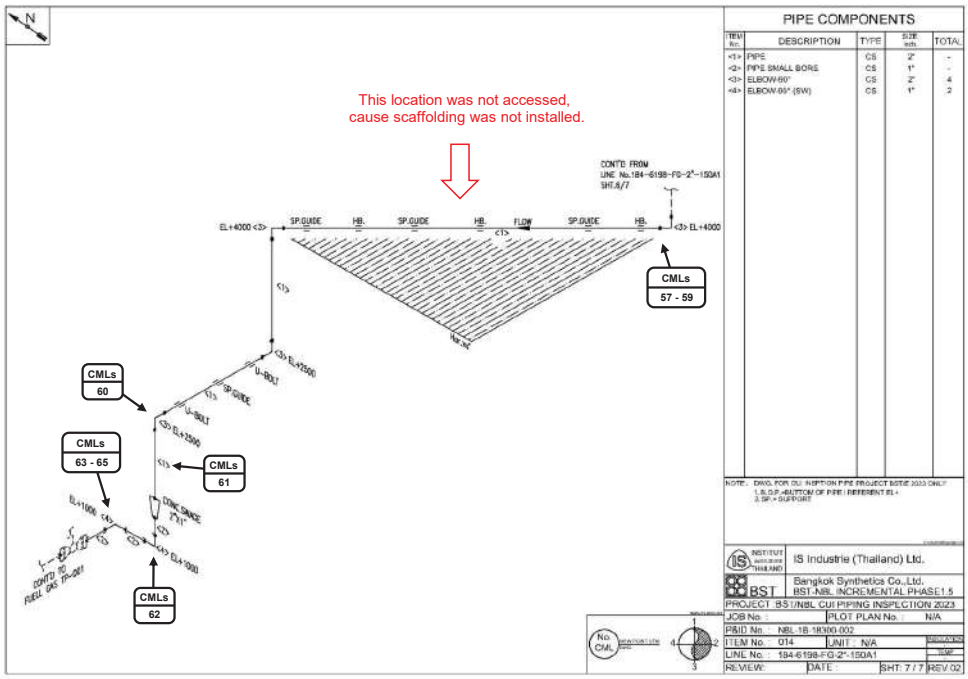
THAILAND



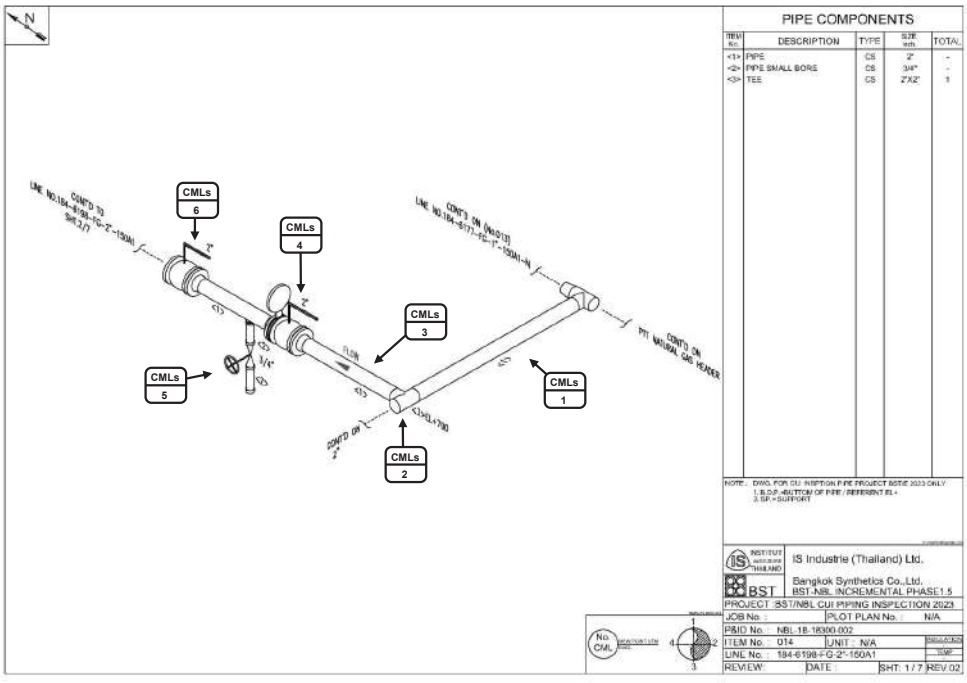
THAILAND


This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. NBL-1B-18300-002
ITEM No. 014 UNIT N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 5 / 7 REV.02

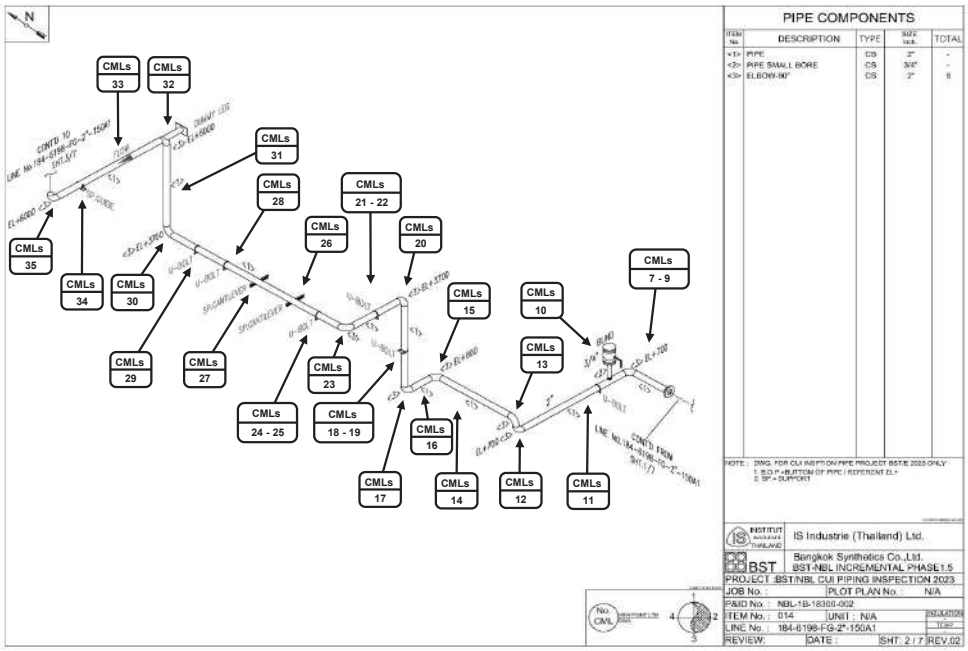

This location was not accessed,
cause scaffolding was not installed.
CMLs 47
CMLs 48
CMLs 49
CMLs 54
CMLs 52
CMLs 50
CMLs 55 - 56
CMLs 53
CMLs 51
U-BOLT
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 6
<3> ELBOW-45° | CS | 2" | 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. NBL-1B-18300-002
ITEM No. 014 UNIT N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 6 / 7 REV.02

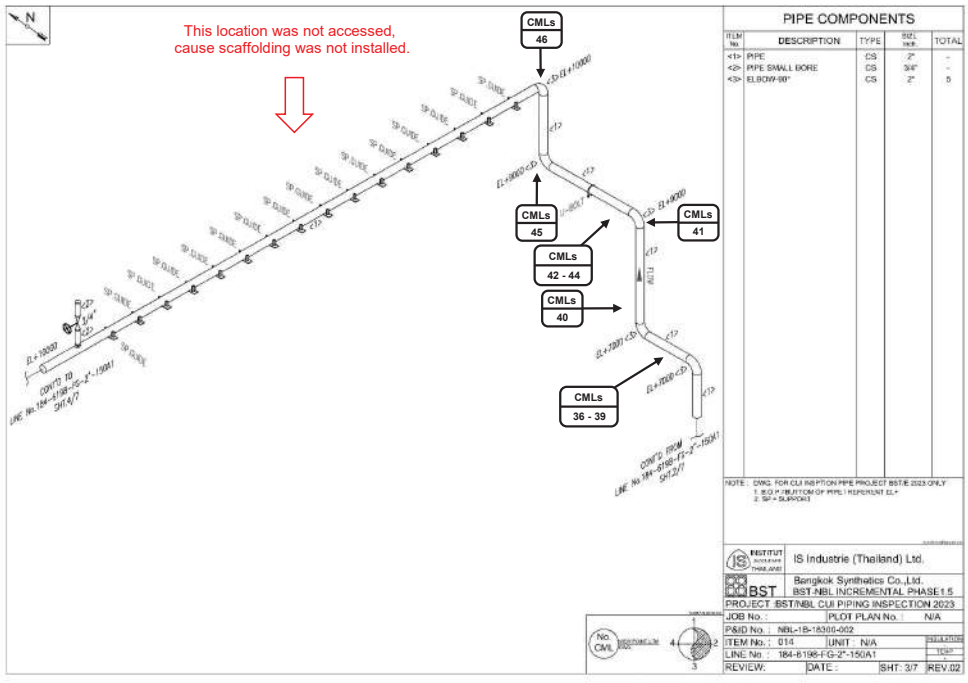


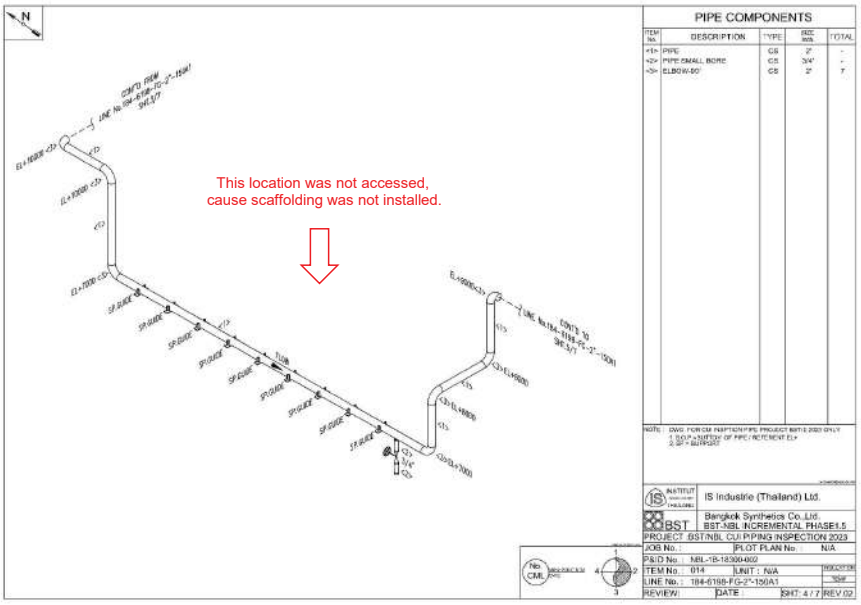
THAILAND

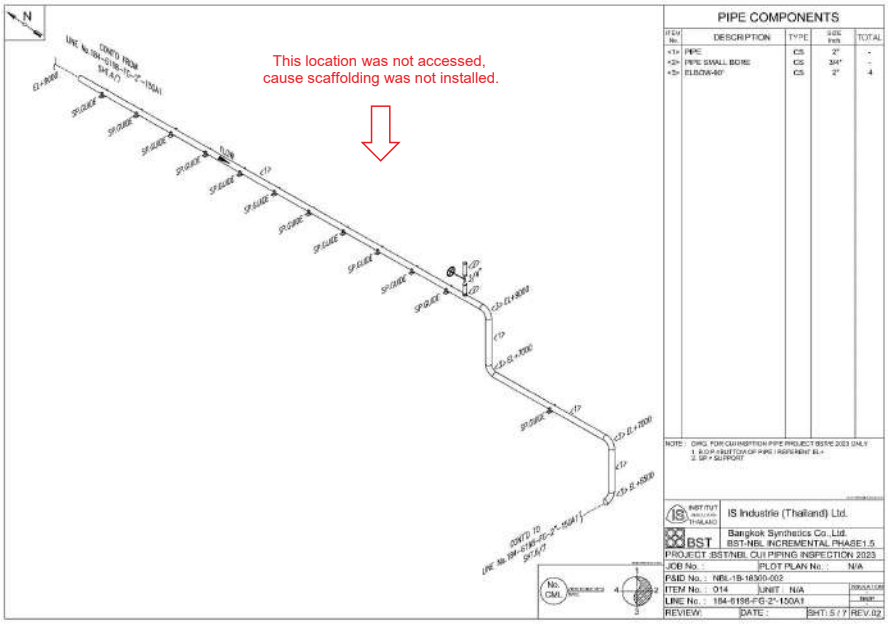


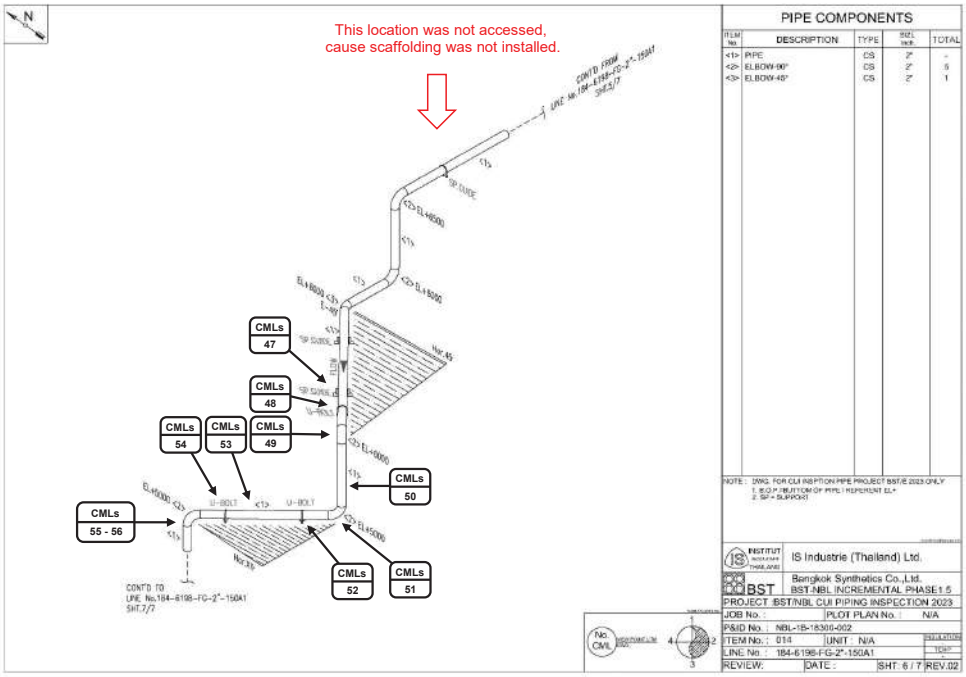
THAILAND

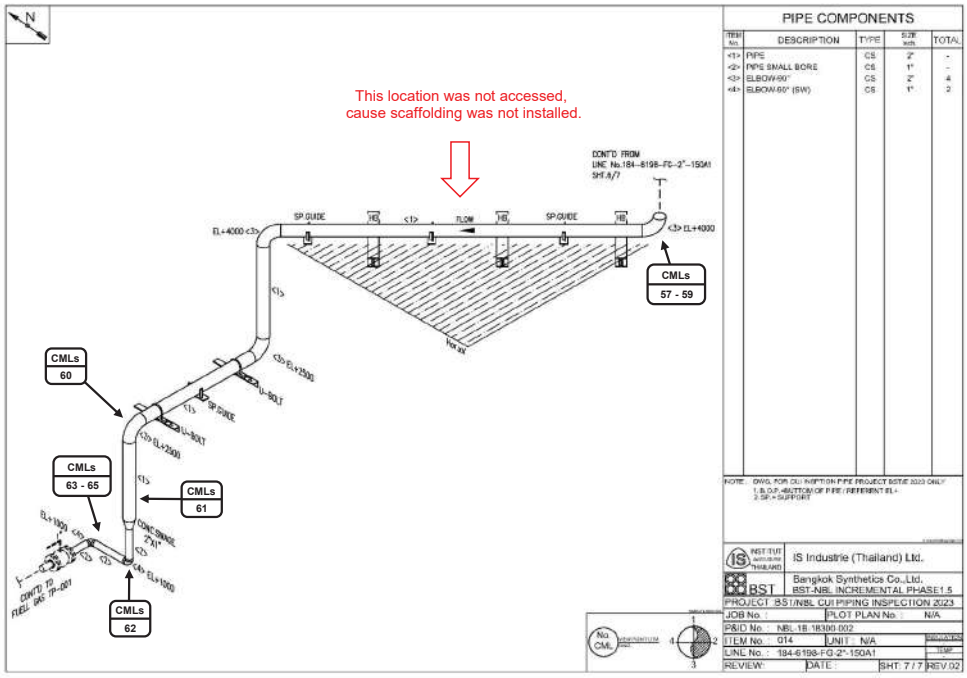

N
CMLs 33
CMLs 32
CMLs 31
CMLs 28
CMLs 21 - 22
CMLs 26
CMLs 20
CMLs 35
CMLs 34
CMLs 30
CMLs 15
CMLs 10
CMLs 7 - 9
CMLs 29
CMLs 27
CMLs 13
CMLs 23
CMLs 24 - 25
CMLs 18 - 19
CMLs 16
CMLs 17
CMLs 14
CMLs 12
CMLs 11
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P = BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02


N
This location was not accessed,
cause scaffolding was not installed.
CMLs 46
CMLs 45
CMLs 41
CMLs 42 - 44
CMLs 40
CMLs 36 - 39
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 5
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P = BUTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 3/7 REV.02


N
This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 7
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW | DATE : | SHT: 4 / 7 | REV.02


N
This location was not accessed,
cause scaffolding was not installed.
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW | DATE : | SHT: 5 / 7 | REV.02


This location was not accessed,
cause scaffolding was not installed.
CONT'D FROM LINE No.184-6198-FG-2"-150A1 SHT.5/7
CONT'D TO LINE No.184-6198-FG-2"-150A1 SHT.7/7
SP.GUIDE
U-BOLT
CMLs 47
CMLs 48
CMLs 54
CMLs 53
CMLs 49
CMLs 50
CMLs 55 - 56
CMLs 52
CMLs 51
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch
TOTAL
<1> PIPE CS 2" -
<2> ELBOW-90° CS 2" 5
<3> ELBOW-45° CS 2" 1
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT. 6 / 7 REV.02


This location was not accessed,
cause scaffolding was not installed.
CONT'D FROM LINE No.184-6198-FG-2"-150A1 SHT.6/7
CONT'D TO FIELD LINE TP-001
SP.GUIDE
U-BOLT
CMLs 57 - 59
CMLs 60
CMLs 63 - 65
CMLs 61
CMLs 62
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE inch
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 1" -
<3> ELBOW-90° CS 2" 4
<4> ELBOW-90° (SW) CS 1" 2
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BST/E 2023 ONLY
1. E.O.P.=BOTTOM OF PIPE / REFERENT EL.
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT. 7 / 7 REV.02

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Request No. :	-		
Date of Test :	19/05/2023		
Page :	42 of 98	Rev.00	

Code : | Rev.: | Effective date :

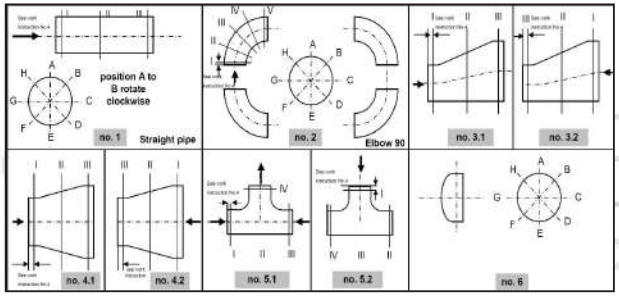
PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	184-6198-FG-2"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-NDT-UTM-001_REV.04	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

MEASUREMENT TOOL DATA

Equipment Manufacturer	Olympus	**Calibration block**	Step bar 5 step
Equipment Model	38 DL Plus	**Calibration Range**	2.50 - 7.50 mm.
Serial No.	151114106	**Serial No.**	144816
Probe Manufacturer	Olympus	**Sound Velocity**	5904 mm./µs
Probe Model	D790-SM	**Couplant**	GE ZG-F / SONO 600
Probe Dia.	10 mm.	**Scan Type**	A-SCAN
Serial No.	1039668	**Technique**	Echo to Echo (Thru painting)
Frequency	5 MHz		

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	Found 1 position of internal corrosion (Erosion) at elbow TMLs No. 41 with corrosion rate (Short term) = 0.060 mm. / year and remaining life = 24.233 years.
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	UT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	43 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
1	1.1	A	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
	1.1	B	Pipe	2"	STD	3.91	1.80	-	3.78		1.98	-	0.012	158.857	
	1.1	C	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
	1.1	D	Pipe	2"	STD	3.91	1.80	-	3.72		1.92	-	0.018	105.398	
2	2.1	A	Elbow	2"	STD	3.91	1.80	4.07	4.01		2.21	0.090	-0.010	-230.503	Note 1, 3
	2.1	B	Elbow	2"	STD	3.91	1.80	4.20	4.23		2.43	-0.045	-0.031	-79.203	Note 1
	2.1	C	Elbow	2"	STD	3.91	1.80	3.94	3.85		2.05	0.135	0.006	356.358	Note 3
	2.1	D	Elbow	2"	STD	3.91	1.80	4.06	4.34		2.54	-0.421	-0.041	-61.610	Note 1
	2.2	A	Elbow	2"	STD	3.91	1.80	3.99	4.02		2.22	-0.045	-0.011	-210.496	Note 1
	2.2	B	Elbow	2"	STD	3.91	1.80	4.24	4.20		2.40	0.060	-0.028	-86.317	Note 1, 3
	2.2	C	Elbow	2"	STD	3.91	1.80	3.77	3.79		1.99	-0.030	0.012	172.964	
	2.2	D	Elbow	2"	STD	3.91	1.80	4.08	4.30		2.50	-0.330	-0.037	-66.859	Note 1
	2.3	A	Elbow	2"	STD	3.91	1.80	4.02	4.01		2.21	0.015	-0.010	147.132	
	2.3	B	Elbow	2"	STD	3.91	1.80	4.18	4.28		2.48	-0.150	-0.035	-69.909	Note 1
	2.3	C	Elbow	2"	STD	3.91	1.80	3.70	3.88		2.08	-0.270	0.003	723.147	
	2.3	D	Elbow	2"	STD	3.91	1.80	4.20	4.19		2.39	0.015	-0.027	159.115	
3	3.1	A	Pipe	3/4"	80	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	3.1	B	Pipe	3/4"	80	3.91	1.80	3.73	3.87		2.07	-0.210	0.004	539.753	
	3.1	C	Pipe	3/4"	80	3.91	1.80	3.88	3.76		1.96	0.180	0.014	136.285	Note 3
	3.1	D	Pipe	3/4"	80	3.91	1.80	3.82	3.75		1.95	0.105	0.015	127.116	Note 3
4	4.1	A	Pipe	2"	STD	3.91	1.80	3.70	3.83		2.03	-0.195	0.008	264.661	
	4.1	B	Pipe	2"	STD	3.91	1.80	3.65	3.81		2.01	-0.240	0.010	209.643	
	4.1	C	Pipe	2"	STD	3.91	1.80	3.73	3.71		1.91	0.030	0.019	63.579	
	4.1	D	Pipe	2"	STD	3.91	1.80	3.97	3.74		1.94	0.345	0.016	119.025	Note 3
5	5.1	A	Elbow	2"	STD	3.91	1.80	4.19	4.18		2.38	0.015	-0.026	158.449	
	5.1	B	Elbow	2"	STD	3.91	1.80	4.10	4.14		2.34	-0.060	-0.022	-106.114	Note 1
	5.1	C	Elbow	2"	STD	3.91	1.80	3.72	3.75		1.95	-0.045	0.015	127.116	
	5.1	D	Elbow	2"	STD	3.91	1.80	4.50	3.82		2.02	1.021	0.009	234.096	Note 3
	5.2	A	Elbow	2"	STD	3.91	1.80	4.08	4.19		2.39	-0.165	-0.027	-89.027	Note 1
	5.2	B	Elbow	2"	STD	3.91	1.80	4.22	4.06		2.26	0.240	-0.014	-157.145	Note 3
	5.2	C	Elbow	2"	STD	3.91	1.80	3.75	3.71		1.91	0.060	0.019	31.790	
	5.2	D	Elbow	2"	STD	3.91	1.80	4.22	4.26		2.46	-0.060	-0.034	-73.308	Note 1
	5.3	A	Elbow	2"	STD	3.91	1.80	4.05	4.17		2.37	-0.180	-0.025	-95.073	Note 1
	5.3	B	Elbow	2"	STD	3.91	1.80	4.46	4.36		2.56	0.150	-0.043	-59.335	Note 1, 3
	5.3	C	Elbow	2"	STD	3.91	1.80	3.97	3.86		2.06	0.165	0.005	429.716	Note 3
	5.3	D	Elbow	2"	STD	3.91	1.80	4.17	4.16		2.36	0.015	-0.024	157.118	
6	6.1	A	Elbow	2"	STD	3.91	1.80	-	3.97		2.17	-	-0.006	-377.218	Note 1
	6.1	B	Elbow	2"	STD	3.91	1.80	-	4.31		2.51	-	-0.038	-65.448	Note 1
	6.1	C	Elbow	2"	STD	3.91	1.80	-	3.99		2.19	-	-0.008	-285.521	Note 1
	6.1	D	Elbow	2"	STD	3.91	1.80	-	4.37		2.57	-	-0.044	-58.272	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	44 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
6	6.2	A	Elbow	2"	STD	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	
	6.2	B	Elbow	2"	STD	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	6.2	C	Elbow	2"	STD	3.91	1.80	-	3.93		2.13	-	-0.002	-1110.795	Note 1
	6.2	D	Elbow	2"	STD	3.91	1.80	-	4.07		2.27	-	-0.015	-147.976	Note 1
	6.3	A	Elbow	2"	STD	3.91	1.80	-	3.92		2.12	-	-0.001	-2211.160	Note 1
	6.3	B	Elbow	2"	STD	3.91	1.80	-	4.18		2.38	-	-0.026	-91.939	Note 1
	6.3	C	Elbow	2"	STD	3.91	1.80	-	3.75		1.95	-	0.015	127.116	
	6.3	D	Elbow	2"	STD	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
7	7.1	A	Pipe	2"	STD	3.91	1.80	-	3.81		2.01	-	0.010	209.643	
	7.1	B	Pipe	2"	STD	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	7.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	7.1	D	Pipe	2"	STD	3.91	1.80	-	3.85		2.05	-	0.006	356.358	
8	8.1	A	Elbow	2"	STD	3.91	1.80	3.80	3.79		1.99	0.015	0.012	132.485	
	8.1	B	Elbow	2"	STD	3.91	1.80	3.88	3.84		2.04	0.060	0.007	303.960	Note 1, 3
	8.1	C	Elbow	2"	STD	3.91	1.80	3.93	3.83		2.03	0.150	0.008	264.661	Note 3
	8.1	D	Elbow	2"	STD	3.91	1.80	3.73	3.77		1.97	-0.060	0.013	146.765	
	8.2	A	Elbow	2"	STD	3.91	1.80	3.98	4.00		2.20	-0.030	-0.009	-254.956	Note 1
	8.2	B	Elbow	2"	STD	3.91	1.80	4.00	4.01		2.21	-0.015	-0.010	-230.503	Note 1
	8.2	C	Elbow	2"	STD	3.91	1.80	3.83	3.81		2.01	0.030	0.010	66.908	
	8.2	D	Elbow	2"	STD	3.91	1.80	3.62	3.71		1.91	-0.135	0.019	99.606	
	8.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.99		2.19	-0.015	-0.008	-285.521	Note 1
	8.3	B	Elbow	2"	STD	3.91	1.80	3.84	3.83		2.03	0.015	0.008	135.148	
	8.3	C	Elbow	2"	STD	3.91	1.80	3.78	3.71		1.91	0.105	0.019	99.606	Note 3
	8.3	D	Elbow	2"	STD	3.91	1.80	3.87	3.82		2.02	0.075	0.009	234.096	Note 3
9	9.1	A	Pipe	2"	STD	3.91	1.80	3.72	3.67		1.87	0.075	0.023	81.267	Note 3
	9.1	B	Pipe	2"	STD	3.91	1.80	3.64	3.63		1.83	0.015	0.027	68.167	
	9.1	C	Pipe	2"	STD	3.91	1.80	3.75	3.68		1.88	0.105	0.022	85.254	Note 3
	9.1	D	Pipe	2"	STD	3.91	1.80	3.61	3.56		1.76	0.075	0.034	52.448	Note 3
10	10.1	A	Elbow	2"	STD	3.91	1.80	4.08	4.01		2.21	0.105	-0.010	-230.503	Note 1, 3
	10.1	B	Elbow	2"	STD	3.91	1.80	4.29	3.96		2.16	0.496	-0.005	-450.576	Note 1, 3
	10.1	C	Elbow	2"	STD	3.91	1.80	3.73	3.76		1.96	-0.045	0.014	136.285	
	10.1	D	Elbow	2"	STD	3.91	1.80	3.91	4.27		2.47	-0.541	-0.035	-71.561	Note 1
	10.2	A	Elbow	2"	STD	3.91	1.80	3.92	3.92		2.12	0.000	-0.001	#DIV/0!	Note 1
	10.2	B	Elbow	2"	STD	3.91	1.80	4.26	3.93		2.13	0.496	-0.002	-1110.795	Note 1, 3
	10.2	C	Elbow	2"	STD	3.91	1.80	3.90	3.77		1.97	0.195	0.013	146.765	Note 3
	10.2	D	Elbow	2"	STD	3.91	1.80	3.88	4.37		2.57	-0.736	-0.044	-58.272	Note 1
	10.3	A	Elbow	2"	STD	3.91	1.80	4.07	4.01		2.21	0.090	-0.010	-230.503	Note 1, 3
	10.3	B	Elbow	2"	STD	3.91	1.80	4.33	4.17		2.37	0.240	-0.025	-95.073	Note 1, 3
	10.3	C	Elbow	2"	STD	3.91	1.80	3.76	3.78		1.98	-0.030	0.012	158.857	
	10.3	D	Elbow	2"	STD	3.91	1.80	3.98	4.40		2.60	-0.631	-0.047	-55.343	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	45 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
11	11.1	A	Pipe	2"	STD	3.91	1.80	3.69	3.56		1.76	0.195	0.034	52.448	Note 3
	11.1	B	Pipe	2"	STD	3.91	1.80	3.82	3.75		1.95	0.105	0.015	127.116	Note 3
	11.1	C	Pipe	2"	STD	3.91	1.80	3.66	3.74		1.94	-0.120	0.016	119.025	
	11.1	D	Pipe	2"	STD	3.91	1.80	3.63	3.76		1.96	-0.195	0.014	136.285	
12	12.1	A	Elbow	2"	STD	3.91	1.80	3.95	3.94		2.14	0.015	-0.003	142.471	
	12.1	B	Elbow	2"	STD	3.91	1.80	3.91	3.89		2.09	0.030	0.002	69.571	
	12.1	C	Elbow	2"	STD	3.91	1.80	3.58	3.58		1.78	0.000	0.032	56.259	
	12.1	D	Elbow	2"	STD	3.91	1.80	3.99	4.08		2.28	-0.135	-0.016	-139.885	Note 1
	12.2	A	Elbow	2"	STD	3.91	1.80	4.08	3.96		2.16	0.180	-0.005	-450.576	Note 1, 3
	12.2	B	Elbow	2"	STD	3.91	1.80	3.83	3.76		1.96	0.105	0.014	136.285	Note 1, 3
	12.2	C	Elbow	2"	STD	3.91	1.80	3.63	3.70		1.90	-0.105	0.020	94.367	
	12.2	D	Elbow	2"	STD	3.91	1.80	4.20	4.14		2.34	0.090	-0.022	-106.114	Note 1, 3
	12.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.94		2.14	0.060	-0.003	-744.007	Note 1, 3
	12.3	B	Elbow	2"	STD	3.91	1.80	3.77	3.77		1.97	0.000	0.013	146.765	
	12.3	C	Elbow	2"	STD	3.91	1.80	3.56	3.69		1.89	-0.195	0.021	89.603	
	12.3	D	Elbow	2"	STD	3.91	1.80	4.16	4.16		2.36	0.000	-0.024	#DIV/0!	Note 1
13	13.1	A	Pipe	2"	STD	3.91	1.80	3.79	3.54		1.74	0.376	0.035	49.049	Note 1, 3
	13.1	B	Pipe	2"	STD	3.91	1.80	3.71	3.58		1.78	0.195	0.032	56.259	Note 1, 3
	13.1	C	Pipe	2"	STD	3.91	1.80	3.56	3.73		1.93	-0.255	0.017	111.833	
	13.1	D	Pipe	2"	STD	3.91	1.80	3.54	3.65		1.85	-0.165	0.025	74.213	
14	14.1	A	Elbow	2"	STD	3.91	1.80	3.96	3.90		2.10	0.090	0.001	2190.300	Note 1, 3
	14.1	B	Elbow	2"	STD	3.91	1.80	3.98	4.04		2.24	-0.090	-0.012	-179.717	Note 1
	14.1	C	Elbow	2"	STD	3.91	1.80	3.92	4.01		2.21	-0.135	-0.010	-230.503	Note 1
	14.1	D	Elbow	2"	STD	3.91	1.80	4.57	4.16		2.36	0.616	-0.024	-98.459	Note 1, 3
	14.2	A	Elbow	2"	STD	3.91	1.80	3.81	3.81		2.01	0.000	0.010	209.643	
	14.2	B	Elbow	2"	STD	3.91	1.80	4.06	4.04		2.24	0.030	-0.012	-179.717	Note 1, 3
	14.2	C	Elbow	2"	STD	3.91	1.80	4.12	4.09		2.29	0.045	-0.017	-132.693	Note 1, 3
	14.2	D	Elbow	2"	STD	3.91	1.80	4.17	4.11		2.31	0.090	-0.019	-120.467	Note 1, 3
	14.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.83		2.03	0.045	0.008	264.661	Note 3
	14.3	B	Elbow	2"	STD	3.91	1.80	4.18	4.14		2.34	0.060	-0.022	-106.114	Note 1, 3
	14.3	C	Elbow	2"	STD	3.91	1.80	4.18	4.17		2.37	0.015	-0.025	157.784	
	14.3	D	Elbow	2"	STD	3.91	1.80	4.12	4.13		2.33	-0.015	-0.021	-155.121	Note 1
15	15.1	A	Pipe	2"	STD	3.91	1.80	3.54	3.64		1.84	-0.150	0.026	71.079	
	15.1	B	Pipe	2"	STD	3.91	1.80	3.57	3.63		1.83	-0.090	0.027	68.167	
	15.1	C	Pipe	2"	STD	3.91	1.80	3.83	3.74		1.94	0.135	0.016	119.025	Note 3
	15.1	D	Pipe	2"	STD	3.91	1.80	3.51	3.63		1.83	-0.180	0.027	68.167	
16	16.1	A	Pipe	2"	STD	3.91	1.80	-	3.75		1.95	-	0.015	127.116	
	16.1	B	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	16.1	C	Pipe	2"	STD	3.91	1.80	-	3.80		2.00	-	0.011	189.636	
	16.1	D	Pipe	2"	STD	3.91	1.80	-	3.67		1.87	-	0.023	81.267	

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	46 of 98
Code :	Rev.: 00
Effective date :	

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
17	17.1	A	Pipe	2"	STD	3.91	1.80	-	3.72		1.92	-	0.018	105.398	
	17.1	B	Pipe	2"	STD	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
	17.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	17.1	D	Pipe	2"	STD	3.91	1.80	-	3.73		1.93	-	0.017	111.833	
18	18.1	A	Pipe	2"	STD	3.91	1.80	-	3.69		1.89	-	0.021	89.603	
	18.1	B	Pipe	2"	STD	3.91	1.80	-	3.86		2.06	-	0.005	429.716	
	18.1	C	Pipe	2"	STD	3.91	1.80	-	3.81		2.01	-	0.010	209.643	
	18.1	D	Pipe	2"	STD	3.91	1.80	-	3.74		1.94	-	0.016	119.025	
19	19.1	A	Elbow	2"	STD	3.91	1.80	3.88	3.86		2.06	0.030	0.005	68.573	
	19.1	B	Elbow	2"	STD	3.91	1.80	3.82	4.15		2.35	-0.496	-0.023	-102.127	Note 1
	19.1	C	Elbow	2"	STD	3.91	1.80	3.84	3.83		2.03	0.015	0.008	135.148	
	19.1	D	Elbow	2"	STD	3.91	1.80	4.08	3.76		1.96	0.481	0.014	136.285	Note 3
	19.2	A	Elbow	2"	STD	3.91	1.80	3.79	3.76		1.96	0.045	0.014	136.285	Note 3
	19.2	B	Elbow	2"	STD	3.91	1.80	3.80	3.95		2.15	-0.225	-0.004	-560.612	Note 1
	19.2	C	Elbow	2"	STD	3.91	1.80	3.76	3.83		2.03	-0.105	0.008	264.661	
	19.2	D	Elbow	2"	STD	3.91	1.80	4.10	3.81		2.01	0.436	0.010	209.643	Note 3
	19.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.90		2.10	-0.060	0.001	2190.300	
	19.3	B	Elbow	2"	STD	3.91	1.80	3.93	4.09		2.29	-0.240	-0.017	-132.693	Note 1
	19.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.78		1.98	-0.060	0.012	158.857	
	19.3	D	Elbow	2"	STD	3.91	1.80	3.98	3.84		2.04	0.210	0.007	303.960	Note 3
20	20.1	A	Pipe	2"	STD	3.91	1.80	3.86	3.81		2.01	0.075	0.010	209.643	Note 3
	20.1	B	Pipe	2"	STD	3.91	1.80	3.93	3.77		1.97	0.240	0.013	146.765	Note 3
	20.1	C	Pipe	2"	STD	3.91	1.80	3.74	3.84		2.04	-0.150	0.007	303.960	
	20.1	D	Pipe	2"	STD	3.91	1.80	3.98	3.65		1.85	0.496	0.025	74.213	Note 3
21	21.1	A	Elbow	2"	STD	3.91	1.80	4.07	3.91		2.11	0.240	0.000	#DIV/0!	Note 1, 3
	21.1	B	Elbow	2"	STD	3.91	1.80	4.17	4.18		2.38	-0.015	-0.026	-158.449	Note 1
	21.1	C	Elbow	2"	STD	3.91	1.80	3.78	3.88		2.08	-0.150	0.003	723.147	
	21.1	D	Elbow	2"	STD	3.91	1.80	4.45	4.18		2.38	0.406	-0.026	-91.939	Note 1, 3
	21.2	A	Elbow	2"	STD	3.91	1.80	3.98	4.15		2.35	-0.255	-0.023	-102.127	Note 1
	21.2	B	Elbow	2"	STD	3.91	1.80	4.23	4.24		2.44	-0.015	-0.032	-162.444	Note 1
	21.2	C	Elbow	2"	STD	3.91	1.80	3.98	3.81		2.01	0.255	0.010	209.643	Note 3
	21.2	D	Elbow	2"	STD	3.91	1.80	4.31	4.15		2.35	0.240	-0.023	-102.127	Note 1, 3
	21.3	A	Elbow	2"	STD	3.91	1.80	3.91	3.97		2.17	-0.090	-0.006	-377.218	Note 1
	21.3	B	Elbow	2"	STD	3.91	1.80	4.09	4.01		2.21	0.120	-0.010	-230.503	Note 1, 3
	21.3	C	Elbow	2"	STD	3.91	1.80	3.79	3.80		2.00	-0.015	0.011	189.636	
	21.3	D	Elbow	2"	STD	3.91	1.80	4.39	4.20		2.40	0.285	-0.028	-86.317	Note 1, 3
22	22.1	A	Pipe	2"	STD	3.91	1.80	3.95	3.83		2.03	0.180	0.008	264.661	Note 3
	22.1	B	Pipe	2"	STD	3.91	1.80	3.84	3.89		2.09	-0.075	0.002	1089.935	
	22.1	C	Pipe	2"	STD	3.91	1.80	3.62	3.75		1.95	-0.195	0.015	127.116	
	22.1	D	Pipe	2"	STD	3.91	1.80	3.90	3.85		2.05	0.075	0.006	356.358	Note 3

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	47 of 98
Code :	Rev.: 00
Effective date :	

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
23	23.1	A	Pipe	2"	STD	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	
	23.1	B	Pipe	2"	STD	3.91	1.80	-	3.74		1.94	-	0.016	119.025	
	23.1	C	Pipe	2"	STD	3.91	1.80	-	3.84		2.04	-	0.007	303.960	
	23.1	D	Pipe	2"	STD	3.91	1.80	-	4.09		2.29	-	-0.017	-132.693	Note 1
24	24.1	A	Elbow	2"	STD	3.91	1.80	4.10	4.00		2.20	0.150	-0.009	-254.956	Note 1, 3
	24.1	B	Elbow	2"	STD	3.91	1.80	4.15	4.10		2.30	0.075	-0.018	-126.258	Note 1, 3
	24.1	C	Elbow	2"	STD	3.91	1.80	3.69	3.72		1.92	-0.045	0.018	105.398	
	24.1	D	Elbow	2"	STD	3.91	1.80	4.39	4.41		2.61	-0.030	-0.048	-86.881	Note 1
	24.2	A	Elbow	2"	STD	3.91	1.80	4.11	3.93		2.13	0.270	-0.002	-1110.795	Note 1, 3
	24.2	B	Elbow	2"	STD	3.91	1.80	4.15	4.07		2.27	0.120	-0.015	-147.976	Note 1, 3
	24.2	C	Elbow	2"	STD	3.91	1.80	3.87	3.90		2.10	-0.045	0.001	2190.300	
	24.2	D	Elbow	2"	STD	3.91	1.80	4.47	4.44		2.64	0.045	-0.051	-51.953	Note 1, 3
	24.3	A	Elbow	2"	STD	3.91	1.80	4.15	4.17		2.37	-0.030	-0.025	-95.073	Note 1
	24.3	B	Elbow	2"	STD	3.91	1.80	4.34	4.14		2.34	0.300	-0.022	-106.114	Note 1, 3
	24.3	C	Elbow	2"	STD	3.91	1.80	3.90	4.02		2.22	-0.180	-0.011	-210.496	Note 1
	24.3	D	Elbow	2"	STD	3.91	1.80	4.39	4.42		2.62	-0.045	-0.049	-58.142	Note 1
25	25.1	A	Pipe	2"	STD	3.91	1.80	3.92	3.95		2.15	-0.045	-0.004	-560.612	Note 1
	25.1	B	Pipe	2"	STD	3.91	1.80	3.61	3.60		1.80	0.015	0.030	60.561	
	25.1	C	Pipe	2"	STD	3.91	1.80	3.72	3.77		1.97	-0.075	0.013	146.765	
	25.1	D	Pipe	2"	STD	3.91	1.80	3.66	3.72		1.92	-0.090	0.018	105.398	
26	26.1	A	Elbow	2"	STD	3.91	1.80	3.97	4.01		2.21	-0.060	-0.010	-230.503	Note 1
	26.1	B	Elbow	2"	STD	3.91	1.80	4.31	4.28		2.48	0.045	-0.035	-69.909	Note 1, 3
	26.1	C	Elbow	2"	STD	3.91	1.80	3.93	4.05		2.25	-0.180	-0.013	-167.625	Note 1
	26.1	D	Elbow	2"	STD	3.91	1.80	4.34	4.26		2.46	0.120	-0.034	-73.308	Note 1, 3
	26.2	A	Elbow	2"	STD	3.91	1.80	3.96	4.06		2.26	-0.150	-0.014	-157.145	Note 1
	26.2	B	Elbow	2"	STD	3.91	1.80	4.19	4.23		2.43	-0.060	-0.031	-79.203	Note 1
	26.2	C	Elbow	2"	STD	3.91	1.80	3.88	3.92		2.12	-0.060	-0.001	-2211.160	Note 1
	26.2	D	Elbow	2"	STD	3.91	1.80	4.31	4.28		2.48	0.045	-0.035	-69.909	Note 1, 3
	26.3	A	Elbow	2"	STD	3.91	1.80	4.14	4.02		2.22	0.180	-0.011	-210.496	Note 1, 3
	26.3	B	Elbow	2"	STD	3.91	1.80	4.23	4.23		2.43	0.000	-0.031	#DIV/0!	Note 1
	26.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.83		2.03	-0.135	0.008	264.661	
	26.3	D	Elbow	2"	STD	3.91	1.80	4.35	4.19		2.39	0.240	-0.027	-89.027	Note 1, 3
27	27.1	A	Pipe	2"	STD	3.91	1.80	3.74	3.82		2.02	-0.120	0.009	234.096	
	27.1	B	Pipe	2"	STD	3.91	1.80	3.70	3.68		1.88	0.030	0.022	62.581	
	27.1	C	Pipe	2"	STD	3.91	1.80	3.68	3.81		2.01	-0.195	0.010	209.643	
	27.1	D	Pipe	2"	STD	3.91	1.80	3.89	3.73		1.93	0.240	0.017	111.833	Note 3
28	28.1	A	Elbow	2"	STD	3.91	1.80	3.75	3.71		1.91	0.060	0.019	99.606	Note 3
	28.1	B	Elbow	2"	STD	3.91	1.80	3.97	3.82		2.02	0.225	0.009	234.096	Note 3
	28.1	C	Elbow	2"	STD	3.91	1.80	3.99	3.93		2.13	0.090	-0.002	-1110.795	Note 1, 3
	28.1	D	Elbow	2"	STD	3.91	1.80	4.08	4.10		2.30	-0.030	-0.018	-126.258	Note 1

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	48 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
28	28.2	A	Elbow	2"	STD	3.91	1.80	3.79	3.80		2.00	-0.015	0.011	189.636	
	28.2	B	Elbow	2"	STD	3.91	1.80	3.84	3.96		2.16	-0.180	-0.005	-450.576	Note 1
	28.2	C	Elbow	2"	STD	3.91	1.80	3.85	3.84		2.04	0.015	0.007	135.814	
	28.2	D	Elbow	2"	STD	3.91	1.80	4.09	4.04		2.24	0.075	-0.012	-179.717	Note 1, 3
	28.3	A	Elbow	2"	STD	3.91	1.80	3.66	3.66		1.86	0.000	0.024	77.599	
	28.3	B	Elbow	2"	STD	3.91	1.80	4.02	3.96		2.16	0.090	-0.005	-450.576	Note 1, 3
	28.3	C	Elbow	2"	STD	3.91	1.80	3.96	3.92		2.12	0.060	-0.001	-2211.160	Note 1, 3
	28.3	D	Elbow	2"	STD	3.91	1.80	4.05	3.90		2.10	0.225	0.001	2190.300	Note 3
29	29.1	A	Pipe	2"	STD	3.91	1.80	3.61	3.90		2.10	-0.436	0.001	2190.300	
	29.1	B	Pipe	2"	STD	3.91	1.80	3.58	3.54		1.74	0.060	0.035	49.049	Note 3
	29.1	C	Pipe	2"	STD	3.91	1.80	3.64	3.70		1.90	-0.090	0.020	94.367	
	29.1	D	Pipe	2"	STD	3.91	1.80	3.88	3.78		1.98	0.150	0.012	158.857	Note 3
30	30.1	A	Elbow	2"	STD	3.91	1.80	3.98	3.95		2.15	0.045	-0.004	-560.612	Note 1, 3
	30.1	B	Elbow	2"	STD	3.91	1.80	3.90	3.77		1.97	0.195	0.013	146.765	Note 3
	30.1	C	Elbow	2"	STD	3.91	1.80	3.84	3.74		1.94	0.150	0.016	119.025	Note 3
	30.1	D	Elbow	2"	STD	3.91	1.80	3.86	3.78		1.98	0.120	0.012	158.857	Note 3
	30.2	A	Elbow	2"	STD	3.91	1.80	3.84	3.85		2.05	-0.015	0.006	356.358	
	30.2	B	Elbow	2"	STD	3.91	1.80	3.82	3.78		1.98	0.060	0.012	158.857	Note 3
	30.2	C	Elbow	2"	STD	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	30.2	D	Elbow	2"	STD	3.91	1.80	4.00	3.89		2.09	0.165	0.002	1089.935	Note 3
	30.3	A	Elbow	2"	STD	3.91	1.80	3.98	3.95		2.15	0.045	-0.004	-560.612	Note 1, 3
	30.3	B	Elbow	2"	STD	3.91	1.80	3.66	3.91		2.11	-0.376	0.000	#DIV/0!	Note 1
	30.3	C	Elbow	2"	STD	3.91	1.80	3.66	3.65		1.85	0.015	0.025	74.213	
	30.3	D	Elbow	2"	STD	3.91	1.80	4.05	3.64		1.84	0.616	0.026	71.079	Note 3
31	31.1	A	Pipe	2"	STD	3.91	1.80	3.50	3.61		1.81	-0.165	0.029	62.928	
	31.1	B	Pipe	2"	STD	3.91	1.80	3.49	3.50		1.70	-0.015	0.039	43.246	
	31.1	C	Pipe	2"	STD	3.91	1.80	3.64	3.64		1.84	0.000	0.026	71.079	
	31.1	D	Pipe	2"	STD	3.91	1.80	3.88	3.75		1.95	0.195	0.015	127.116	Note 3
32	32.1	A	Elbow	2"	STD	3.91	1.80	3.89	3.84		2.04	0.075	0.007	303.960	Note 3
	32.1	B	Elbow	2"	STD	3.91	1.80	3.92	3.92		2.12	0.000	-0.001	#DIV/0!	Note 1
	32.1	C	Elbow	2"	STD	3.91	1.80	3.85	3.91		2.11	-0.090	0.000	#DIV/0!	Note 1
	32.1	D	Elbow	2"	STD	3.91	1.80	4.05	4.21		2.41	-0.240	-0.029	-83.788	Note 1
	32.2	A	Elbow	2"	STD	3.91	1.80	3.99	4.07		2.27	-0.120	-0.015	-147.976	Note 1
	32.2	B	Elbow	2"	STD	3.91	1.80	4.05	3.90		2.10	0.225	0.001	2190.300	Note 3
	32.2	C	Elbow	2"	STD	3.91	1.80	4.01	4.06		2.26	-0.075	-0.014	-157.145	Note 1
	32.2	D	Elbow	2"	STD	3.91	1.80	4.20	4.07		2.27	0.195	-0.015	-147.976	Note 1, 3
	32.3	A	Elbow	2"	STD	3.91	1.80	3.89	3.89		2.09	0.000	0.002	1089.935	
	32.3	B	Elbow	2"	STD	3.91	1.80	4.15	3.99		2.19	0.240	-0.008	-285.521	Note 1, 3
	32.3	C	Elbow	2"	STD	3.91	1.80	3.95	3.92		2.12	0.045	-0.001	-2211.160	Note 1, 3
	32.3	D	Elbow	2"	STD	3.91	1.80	4.12	4.27		2.47	-0.225	-0.035	-71.561	Note 1

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014		
Line No. :	184-6198-FG-2"-150A1-N		
Date of Test :	19/05/2023		
Page :	49 of 98	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
33	33.1	A	Pipe	2"	STD	3.91	1.80	3.77	3.82		2.02	-0.075	0.009	234.096	
	33.1	B	Pipe	2"	STD	3.91	1.80	3.89	3.73		1.93	0.240	0.017	111.833	Note 3
	33.1	C	Pipe	2"	STD	3.91	1.80	3.84	3.85		2.05	-0.015	0.006	356.358	
	33.1	D	Pipe	2"	STD	3.91	1.80	3.71	3.82		2.02	-0.165	0.009	234.096	
34	34.1	A	Pipe	2"	STD	3.91	1.80	-	3.78		1.98	-	0.012	158.857	
	34.1	B	Pipe	2"	STD	3.91	1.80	-	3.87		2.07	-	0.004	539.753	
	34.1	C	Pipe	2"	STD	3.91	1.80	-	3.83		2.03	-	0.008	264.661	
	34.1	D	Pipe	2"	STD	3.91	1.80	-	3.84		2.04	-	0.007	303.960	
35	35.1	A	Elbow	2"	STD	3.91	1.80	4.01	4.09		2.29	-0.120	-0.017	-132.693	
	35.1	B	Elbow	2"	STD	3.91	1.80	4.07	4.07		2.27	0.000	-0.015	#DIV/0!	Note 1
	35.1	C	Elbow	2"	STD	3.91	1.80	3.59	3.57		1.77	0.030	0.033	54.297	
	35.1	D	Elbow	2"	STD	3.91	1.80	4.02	4.00		2.20	0.030	-0.009	-254.956	Note 1, 3
	35.2	A	Elbow	2"	STD	3.91	1.80	3.77	3.75		1.95	0.030	0.015	64.911	
	35.2	B	Elbow	2"	STD	3.91	1.80	3.79	4.09		2.29	-0.451	-0.017	-132.693	Note 1
	35.2	C	Elbow	2"	STD	3.91	1.80	3.67	3.81		2.01	-0.210	0.010	209.643	
	35.2	D	Elbow	2"	STD	3.91	1.80	4.06	3.95		2.15	0.165	-0.004	-560.612	Note 1, 3
	35.3	A	Elbow	2"	STD	3.91	1.80	3.94	3.94		2.14	0.000	-0.003	#DIV/0!	Note 1
	35.3	B	Elbow	2"	STD	3.91	1.80	4.22	3.86		2.06	0.541	0.005	429.716	Note 3
	35.3	C	Elbow	2"	STD	3.91	1.80	3.75	3.86		2.06	-0.165	0.005	429.716	
	35.3	D	Elbow	2"	STD	3.91	1.80	3.71	4.18		2.38	-0.706	-0.026	-91.939	Note 1
36	36.1	A	Pipe	2"	STD	3.91	1.80	3.64	3.63		1.83	0.015	0.027	68.167	
	36.1	B	Pipe	2"	STD	3.91	1.80	3.78	3.86		2.06	-0.120	0.005	429.716	
	36.1	C	Pipe	2"	STD	3.91	1.80	3.73	3.72		1.92	0.015	0.018	105.398	
	36.1	D	Pipe	2"	STD	3.91	1.80	3.83	3.85		2.05	-0.030	0.006	356.358	
37	37.1	A	Elbow	2"	STD	3.91	1.80	4.23	4.12		2.32	0.165	-0.020	-115.227	Note 1, 3
	37.1	B	Elbow	2"	STD	3.91	1.80	4.15	4.12		2.32	0.045	-0.020	-115.227	Note 1, 3
	37.1	C	Elbow	2"	STD	3.91	1.80	3.77	3.73		1.93	0.060	0.017	111.833	Note 3
	37.1	D	Elbow	2"	STD	3.91	1.80	4.48	4.44		2.64	0.060	-0.051	-51.953	Note 1, 3
	37.2	A	Elbow	2"	STD	3.91	1.80	4.14	4.05		2.25	0.135	-0.013	-167.625	Note 1, 3
	37.2	B	Elbow	2"	STD	3.91	1.80	4.15	4.42		2.62	-0.406	-0.049	-53.582	Note 1
	37.2	C	Elbow	2"	STD	3.91	1.80	3.76	3.74		1.94	0.030	0.016	64.578	
	37.2	D	Elbow	2"	STD	3.91	1.80	4.44	4.19		2.39	0.376	-0.027	-89.027	Note 1, 3
	37.3	A	Elbow	2"	STD	3.91	1.80	3.94	3.97		2.17	-0.045	-0.006	-377.218	Note 1
	37.3	B	Elbow	2"	STD	3.91	1.80	4.15	4.40		2.60	-0.376	-0.047	-55.343	Note 1
	37.3	C	Elbow	2"	STD	3.91	1.80	3.74	3.71		1.91	0.045	0.019	99.606	Note 3
	37.3	D	Elbow	2"	STD	3.91	1.80	4.44	4.18		2.38	0.391	-0.026	-91.939	Note 1, 3
38	38.1	A	Pipe	2"	STD	3.91	1.80	3.75	3.75		1.95	0.000	0.015	127.116	
	38.1	B	Pipe	2"	STD	3.91	1.80	3.68	3.67		1.87	0.015	0.023	81.267	
	38.1	C	Pipe	2"	STD	3.91	1.80	3.74	3.70		1.90	0.060	0.020	94.367	Note 3
	38.1	D	Pipe	2"	STD	3.91	1.80	4.44	3.74		1.94	1.051	0.016	119.025	Note 3

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	50 of 98	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
39	39.1	A	Elbow	2"	STD	3.91	1.80	3.75	3.70		1.90	0.075	0.020	94.367	Note 3
	39.1	B	Elbow	2"	STD	3.91	1.80	4.15	3.93		2.13	0.330	-0.002	-1110.795	Note 1, 3
	39.1	C	Elbow	2"	STD	3.91	1.80	4.12	4.08		2.28	0.060	-0.016	-139.885	Note 3
	39.1	D	Elbow	2"	STD	3.91	1.80	4.16	3.97		2.17	0.285	-0.006	-377.218	Note 3
	39.2	A	Elbow	2"	STD	3.91	1.80	3.82	3.71		1.91	0.165	0.019	99.606	Note 3
	39.2	B	Elbow	2"	STD	3.91	1.80	4.18	4.14		2.34	0.060	-0.022	-106.114	Note 3
	39.2	C	Elbow	2"	STD	3.91	1.80	3.96	3.95		2.15	0.015	-0.004	143.137	
	39.2	D	Elbow	2"	STD	3.91	1.80	3.84	3.82		2.02	0.030	0.009	234.096	Note 3
	39.3	A	Elbow	2"	STD	3.91	1.80	3.86	3.87		2.07	-0.015	0.004	539.753	
	39.3	B	Elbow	2"	STD	3.91	1.80	4.00	4.02		2.22	-0.030	-0.011	-210.496	Note 1
	39.3	C	Elbow	2"	STD	3.91	1.80	3.92	3.94		2.14	-0.030	-0.003	-744.007	Note 1
	39.3	D	Elbow	2"	STD	3.91	1.80	4.11	4.04		2.24	0.105	-0.012	-179.717	Note 3
40	40.1	A	Pipe	2"	STD	3.91	1.80	3.74	3.88		2.08	-0.210	0.003	723.147	
	40.1	B	Pipe	2"	STD	3.91	1.80	3.74	3.87		2.07	-0.195	0.004	539.753	
	40.1	C	Pipe	2"	STD	3.91	1.80	3.76	3.82		2.02	-0.090	0.009	234.096	
	40.1	D	Pipe	2"	STD	3.91	1.80	3.90	3.76		1.96	0.210	0.014	136.285	Note 3
41	41.1	A	Elbow	2"	STD	3.91	1.80	3.42	3.38		1.58	0.060	0.051	26.297	Erosion
	41.1	B	Elbow	2"	STD	3.91	1.80	3.58	3.66		1.86	-0.120	0.024	77.599	
	41.1	C	Elbow	2"	STD	3.91	1.80	3.44	3.33		1.53	0.165	0.056	27.514	Erosion
	41.1	D	Elbow	2"	STD	3.91	1.80	3.57	3.66		1.86	-0.135	0.024	77.599	
	41.2	A	Elbow	2"	STD	3.91	1.80	3.37	3.45		1.65	-0.120	0.044	37.412	Erosion
	41.2	B	Elbow	2"	STD	3.91	1.80	3.59	3.71		1.91	-0.180	0.019	99.606	
	41.2	C	Elbow	2"	STD	3.91	1.80	3.44	3.64		1.84	-0.300	0.026	71.079	
	41.2	D	Elbow	2"	STD	3.91	1.80	3.64	3.59		1.79	0.075	0.031	58.343	Note 3
	41.3	A	Elbow	2"	STD	3.91	1.80	3.45	3.47		1.67	-0.030	0.042	39.587	Erosion
	41.3	B	Elbow	2"	STD	3.91	1.80	3.61	3.64		1.84	-0.045	0.026	71.079	
	41.3	C	Elbow	2"	STD	3.91	1.80	3.58	3.60		1.80	-0.030	0.030	60.561	
	41.3	D	Elbow	2"	STD	3.91	1.80	3.67	3.62		1.82	0.075	0.028	**24.233**	Erosion
42	42.1	A	Pipe	2"	STD	3.91	1.80	3.95	3.98		2.18	-0.045	-0.007	-324.820	Note 1
	42.1	B	Pipe	2"	STD	3.91	1.80	3.82	3.94		2.14	-0.180	-0.003	-744.007	Note 1
	42.1	C	Pipe	2"	STD	3.91	1.80	3.50	3.94		2.14	-0.661	-0.003	-744.007	Note 1
	42.1	D	Pipe	2"	STD	3.91	1.80	3.93	3.83		2.03	0.150	0.008	264.661	Note 3
43	43.1	A	Pipe	2"	STD	3.91	1.80	3.77	3.74		1.94	0.045	0.016	119.025	Note 3
	43.1	B	Pipe	2"	STD	3.91	1.80	3.96	3.90		2.10	0.090	0.001	2190.300	Note 3
	43.1	C	Pipe	2"	STD	3.91	1.80	3.92	3.82		2.02	0.150	0.009	234.096	Note 3
	43.1	D	Pipe	2"	STD	3.91	1.80	3.78	3.74		1.94	0.060	0.016	119.025	Note 3
44	44.1	A	Pipe	1"	80	4.55	1.80	4.35	4.41		2.61	-	0.013	194.445	
	44.1	B	Pipe	1"	80	4.55	1.80	4.41	4.41		2.61	-	0.013	194.445	
	44.1	C	Pipe	1"	80	4.55	1.80	4.41	4.42		2.62	-	0.012	210.205	
	44.1	D	Pipe	1"	80	4.55	1.80	4.56	4.28		2.48	-	0.026	95.801	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

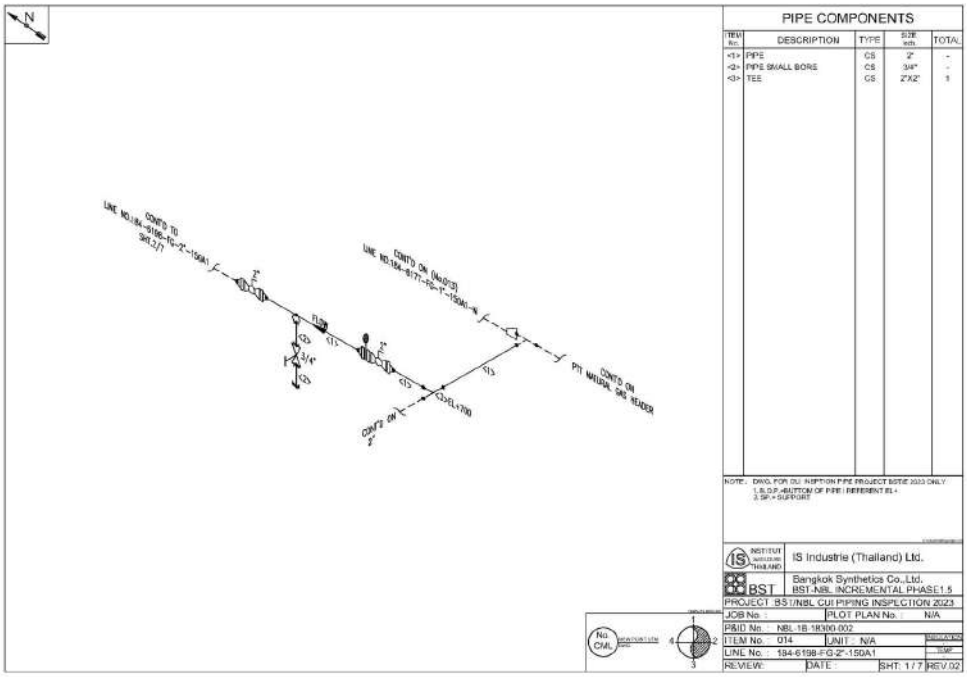
Report No. :	IS/B-23-CUI-P-NBL-014	
Line No. :	184-6198-FG-2"-150A1-N	
Date of Test :	19/05/2023	
Page :	51 of 98	Rev.00

Code : | Rev.: | Effective date :

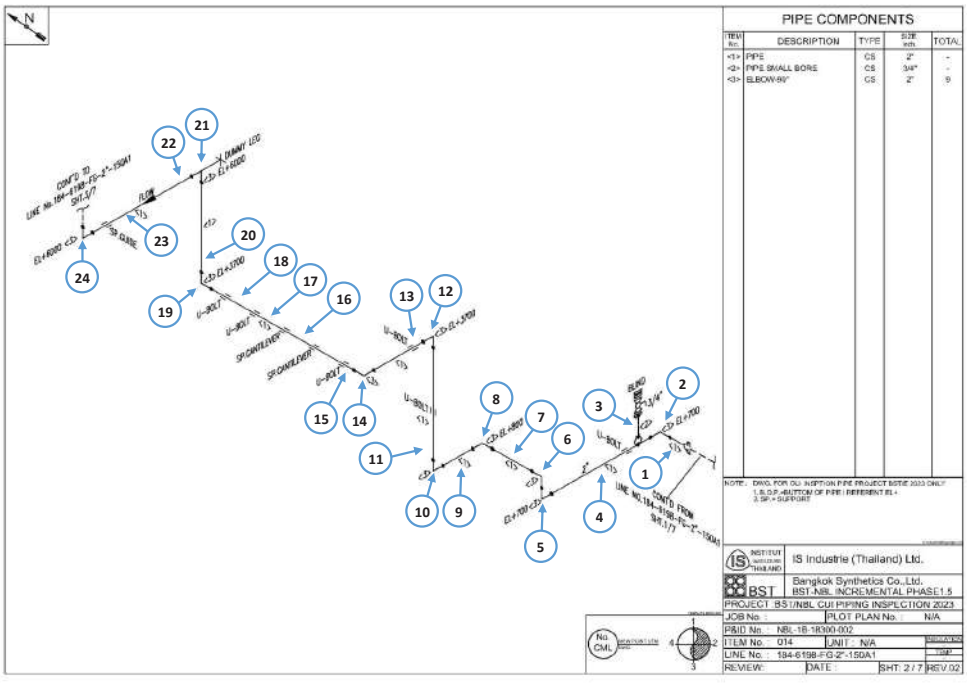
THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
45	45.1	A	Pipe	1"	80	4.55	1.80	4.30	4.46		2.66	-0.240	0.009	308.264	
	45.1	B	Pipe	1"	80	4.55	1.80	4.38	4.59		2.79	-0.315	-0.004	-727.492	Note 1
	45.1	C	Pipe	1"	80	4.55	1.80	4.33	4.49		2.69	-0.240	0.006	467.612	
	45.1	D	Pipe	1"	80	4.55	1.80	4.39	4.43		2.63	-0.060	0.012	228.591	

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

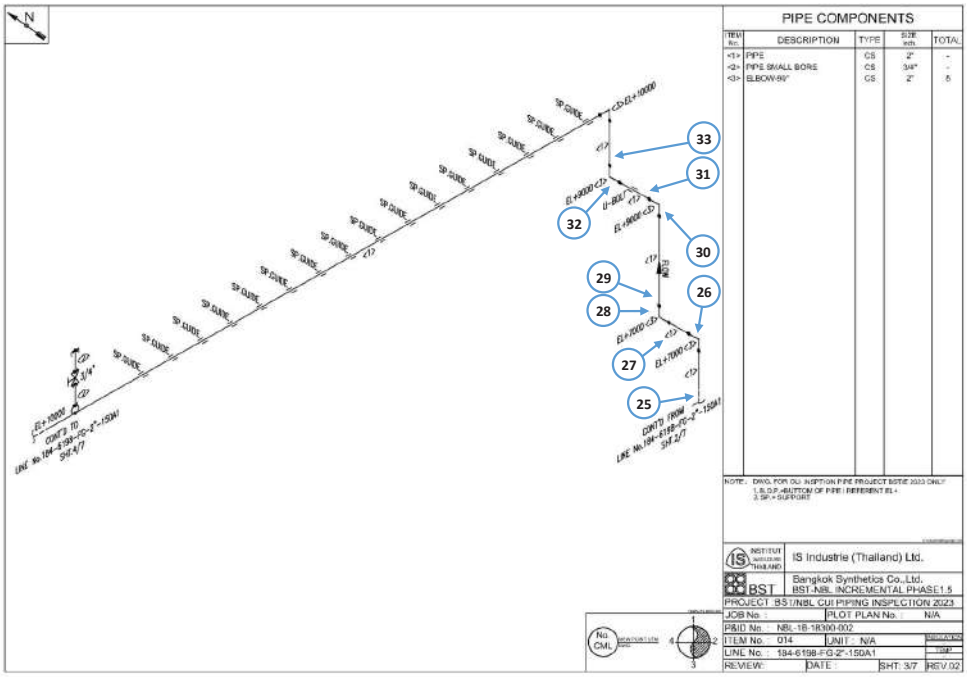


THAILAND



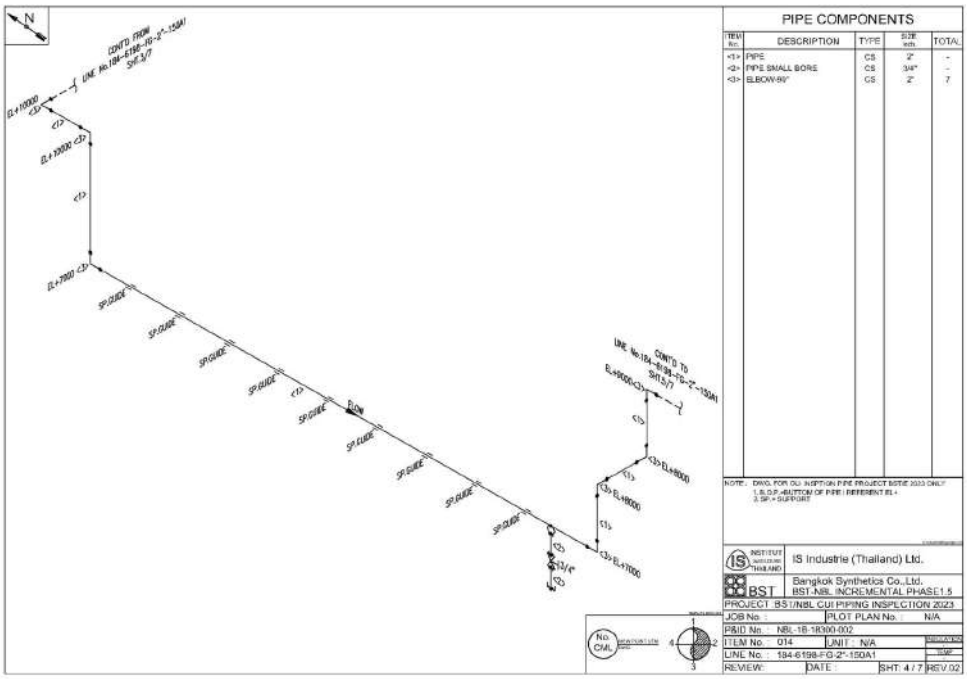
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	54 of 98 Rev.00

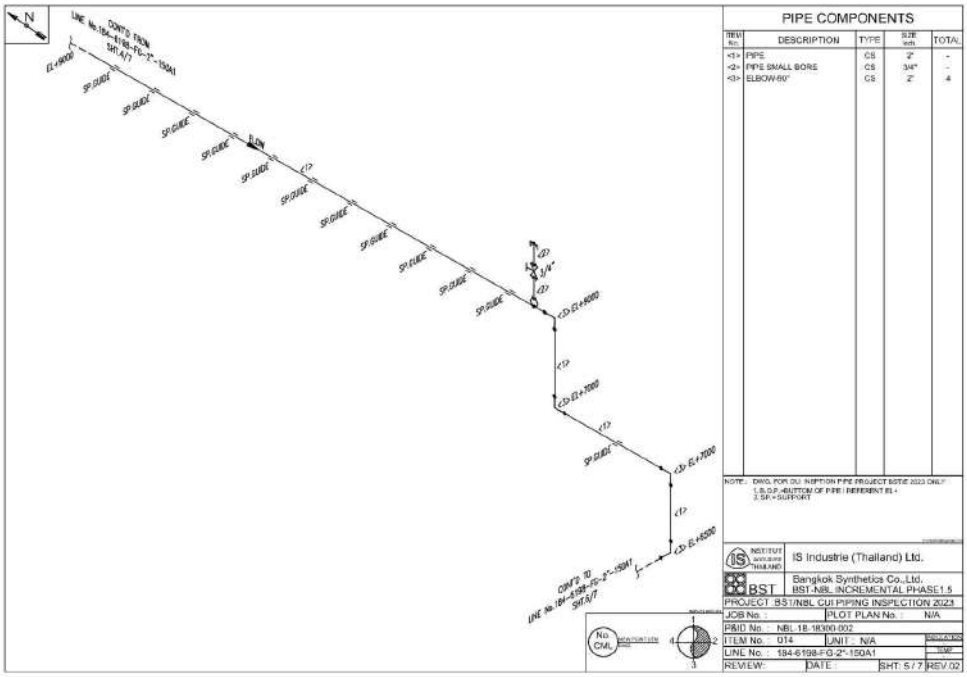


THAILAND

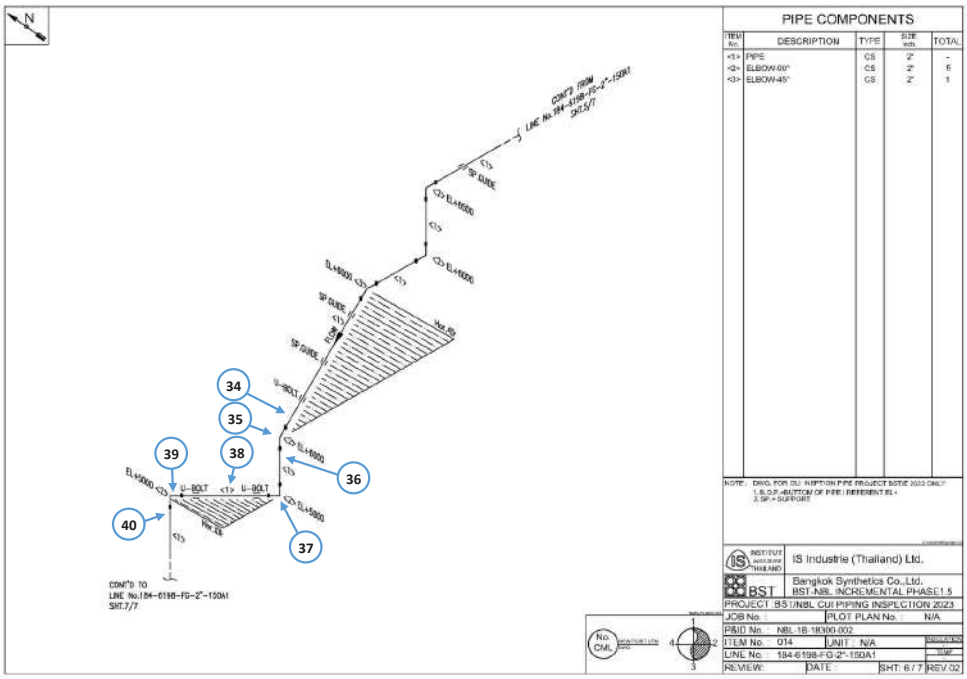
INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page :	55 of 98 Rev.00



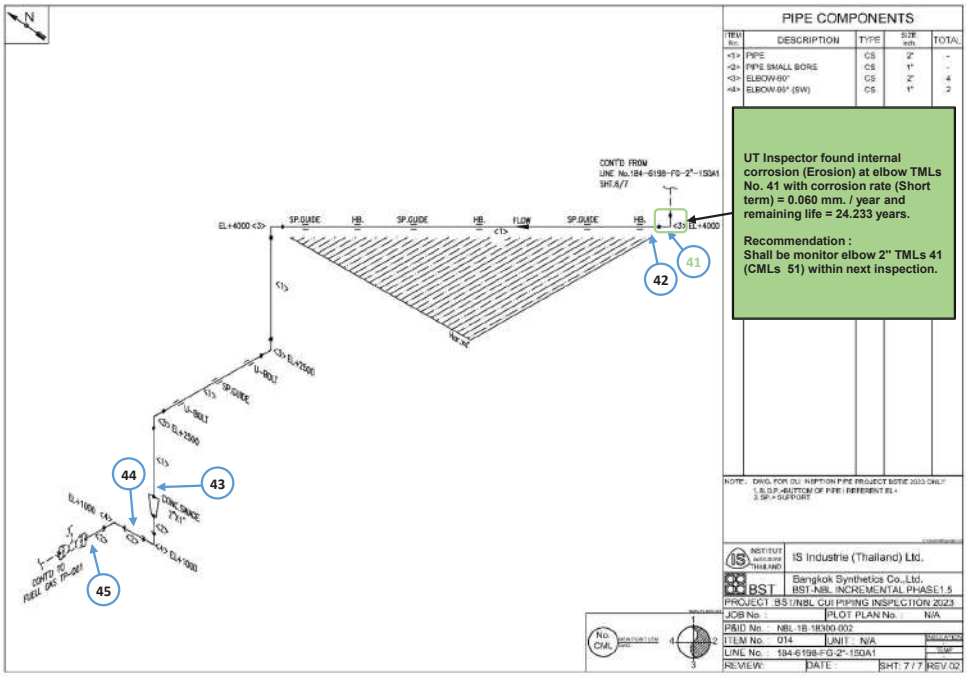
THAILAND



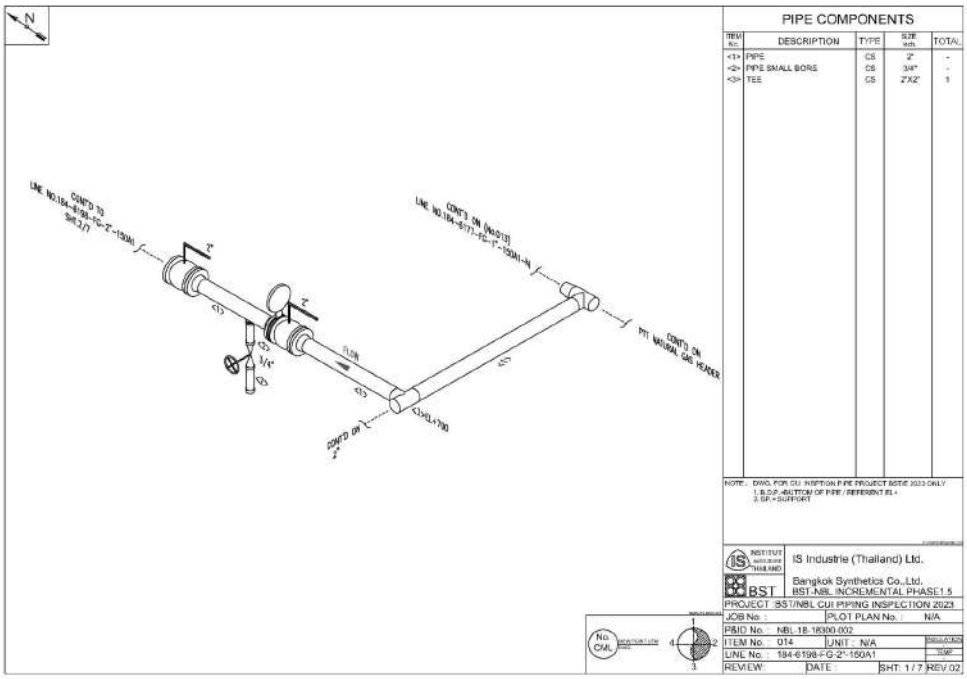
THAILAND



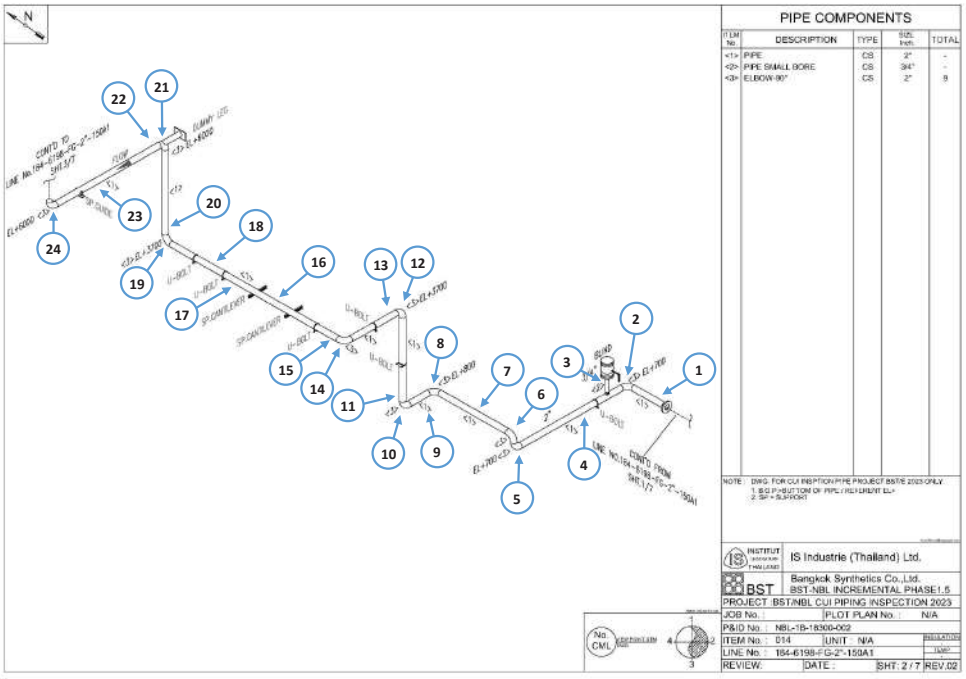
THAILAND

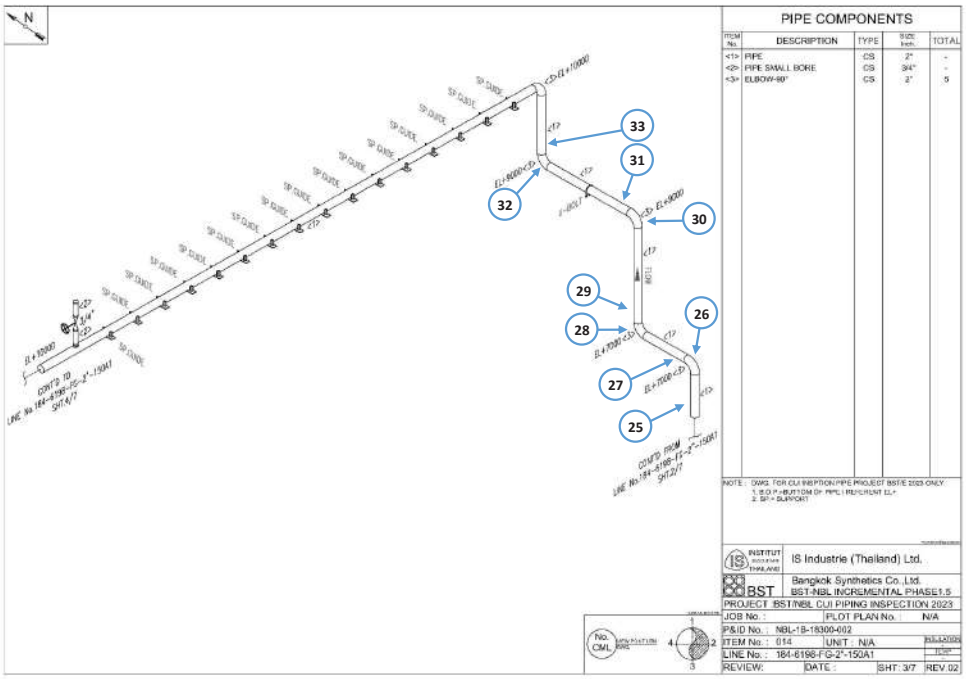


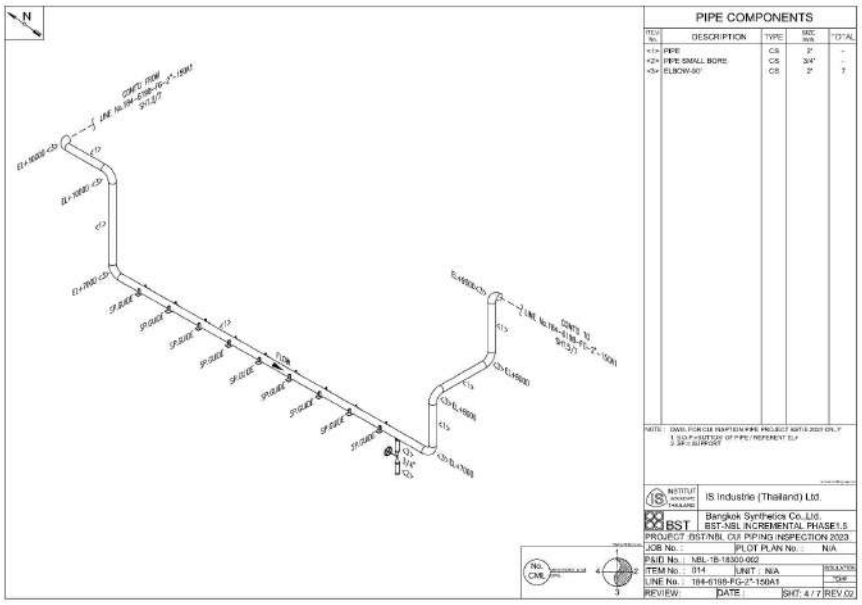
THAILAND

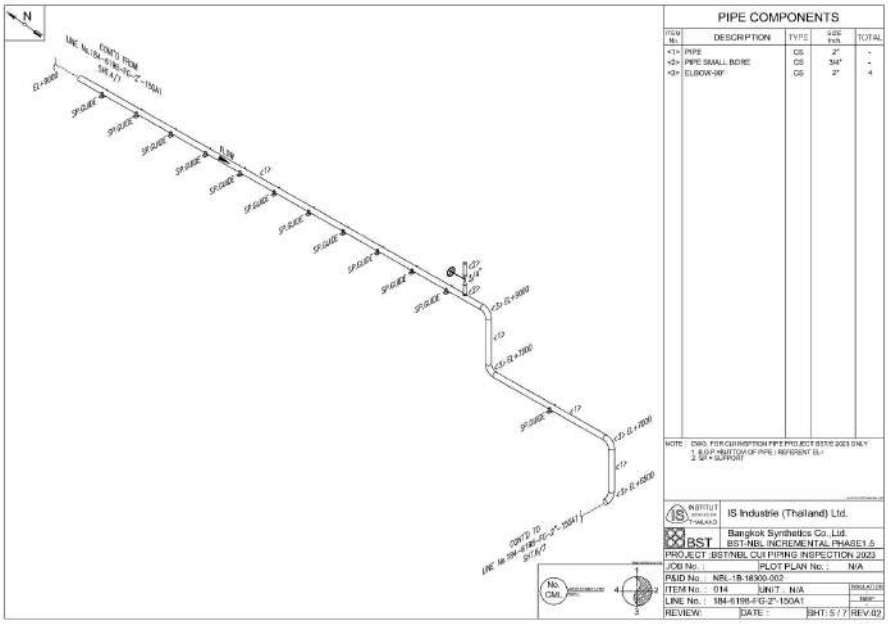


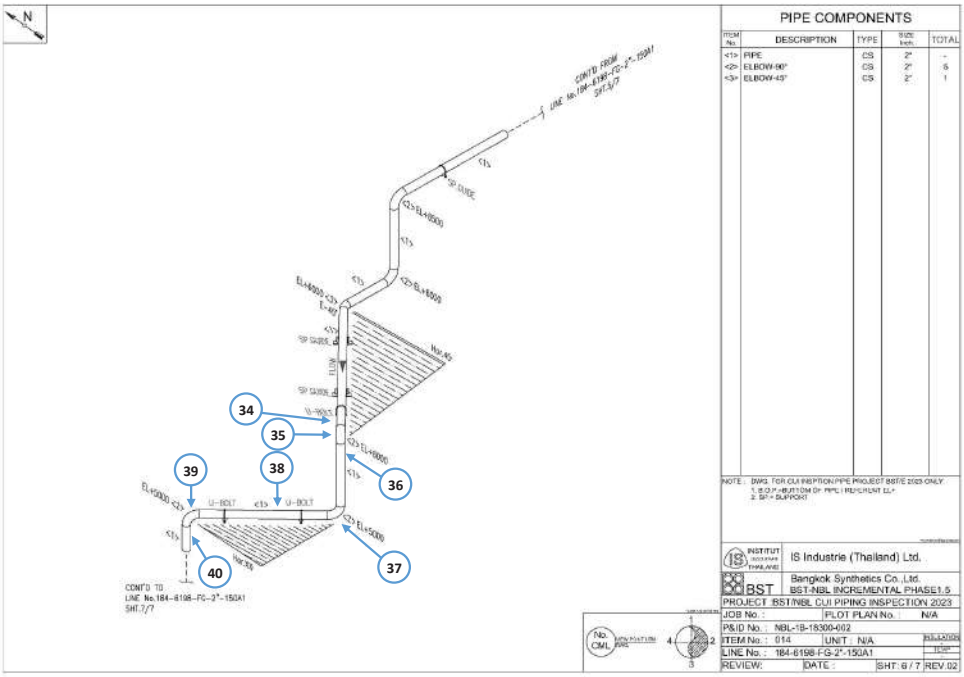
THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BST/E 2023 ONLY.
1. S.E.P = SUCTION OF PIPE / RESIDENT EL=
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02
22
21
23
24
20
18
19
17
16
13
12
15
14
11
8
7
3
2
1
6
10
9
4
5

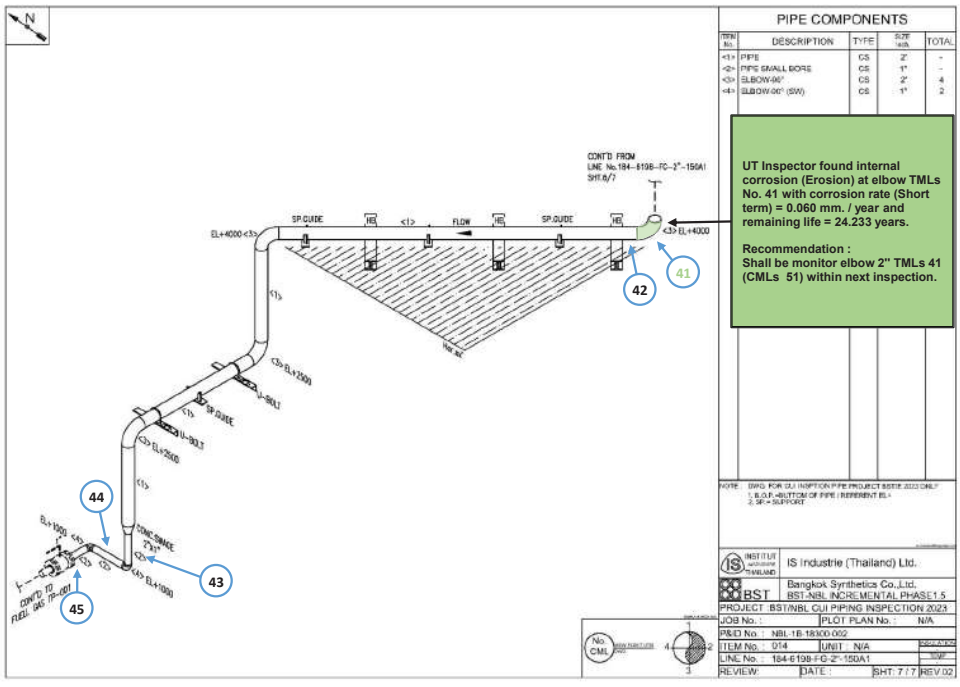

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BST/E 2023 ONLY.
1. S.E.P = SUCTION OF PIPE / RESIDENT EL=
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
BST Bangkok Synthetics Co., Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 3/7 REV.02
33
31
32
30
29
28
26
27
25


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE INCH | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 7
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: | DATE : | SHT: 4 / 7 | REV.02


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE INCH | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : | PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 | UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: | DATE : | SHT: 5 / 7 | REV.02



THAILAND



THAILAND

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE

TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS

STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other :	HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :	
LIGHTING TYPE :	☑ Natural light	☐ Artificial light			

PART IDENTIFICATION & INFORMATION

EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	184-6198-FG-2"-150A1-N

SCOPE OF INSPECTION

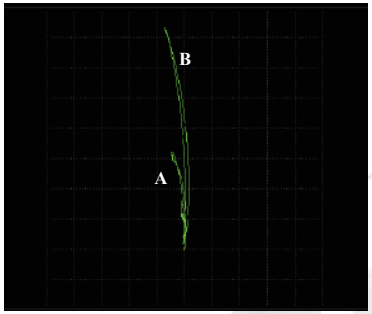
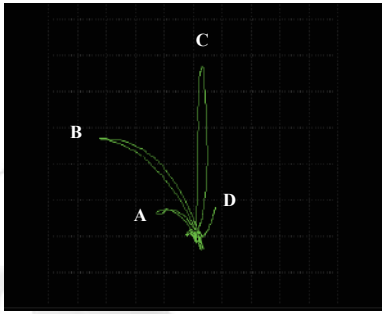
To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	ECT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 19, 2023	Date :	June 25, 2023	Date :	June 28, 2023

SETUP CALIBRATION

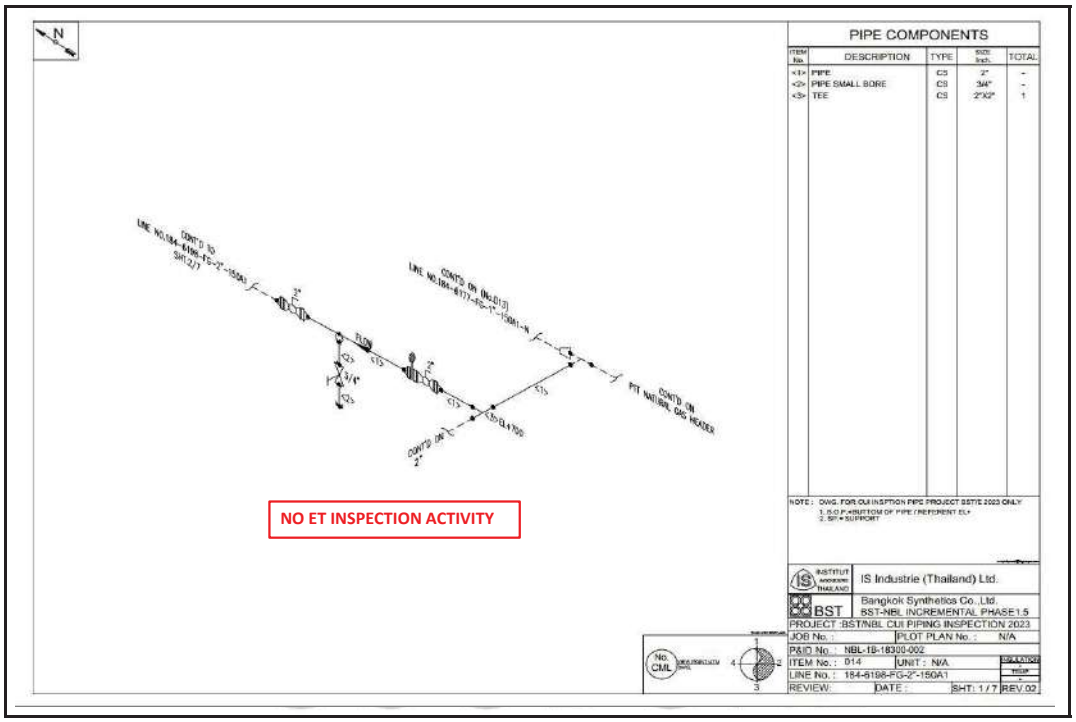
Absolute channel : Surface Signal		Absolute channel : Sub-Surface Signal	
			
Frequency :	500 KHz	Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.	Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.	Absolute Channel Signal B :	Surface Depth 1.0 mm.
		Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
		Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

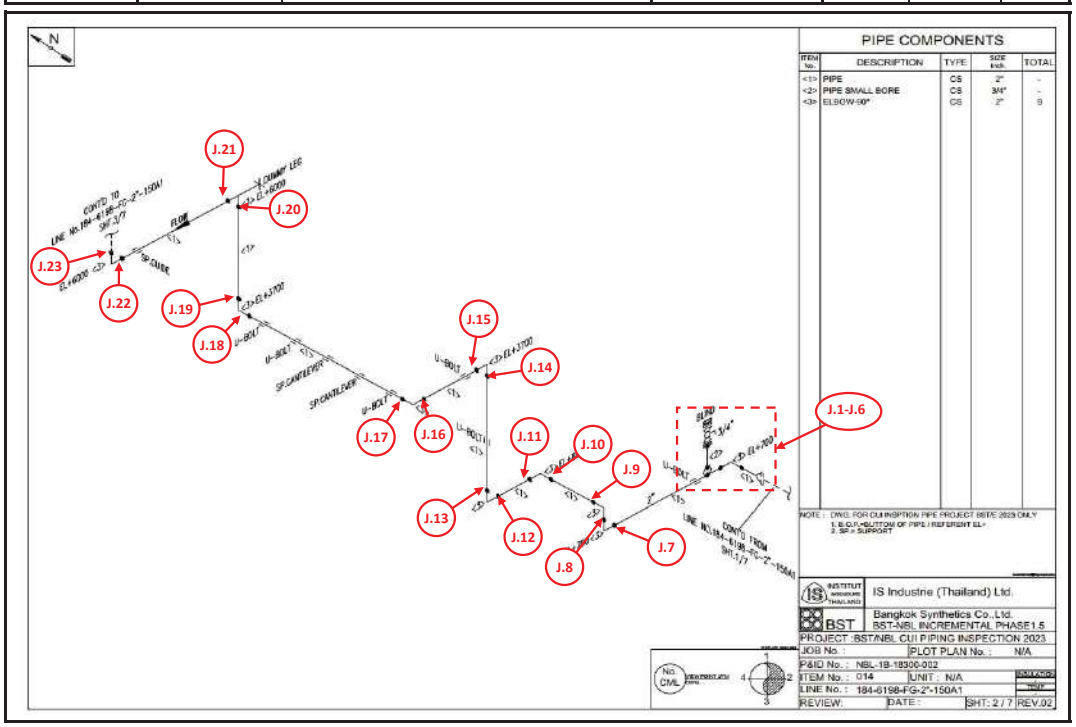
- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

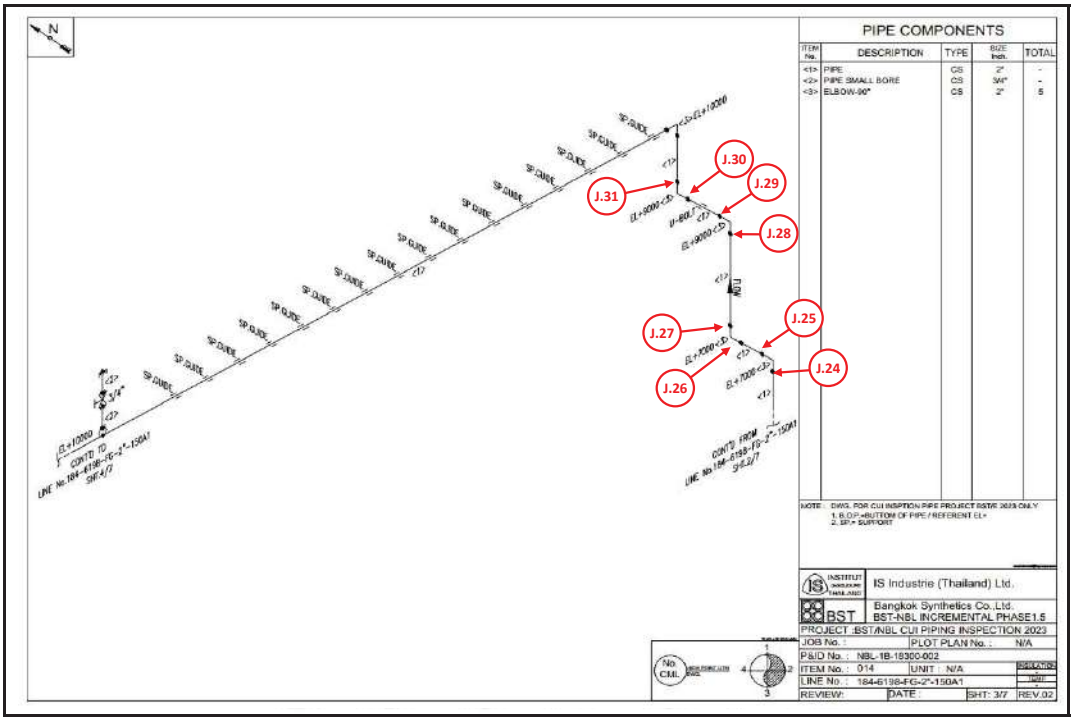
Note : FSH = Full Screen High



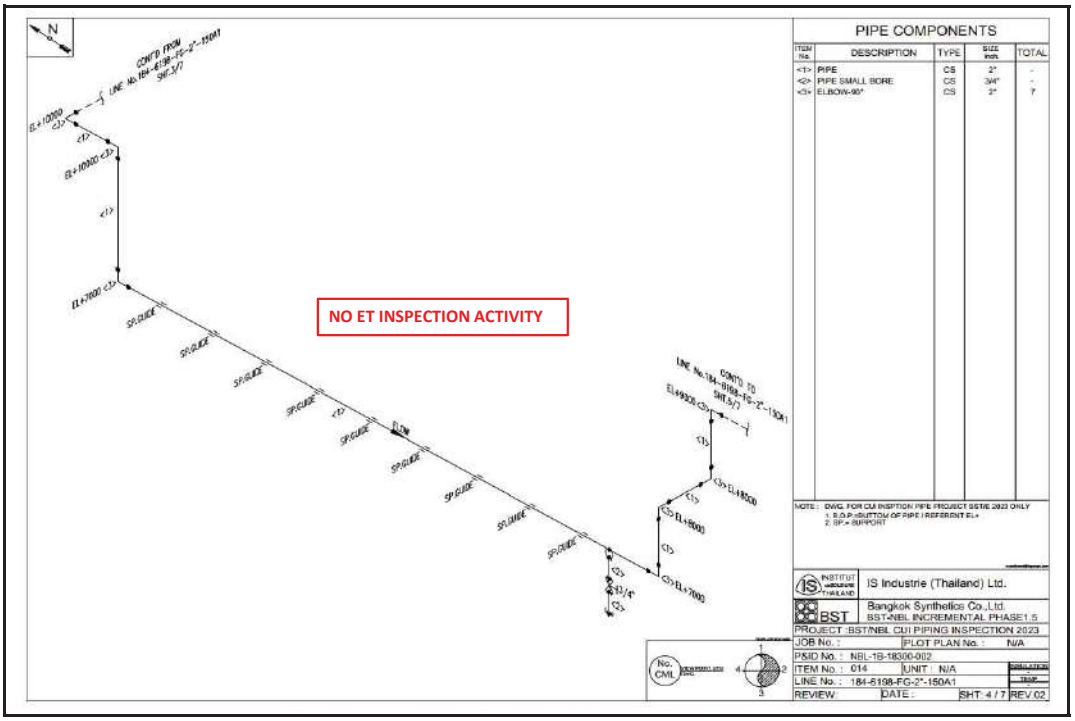
THAILAND



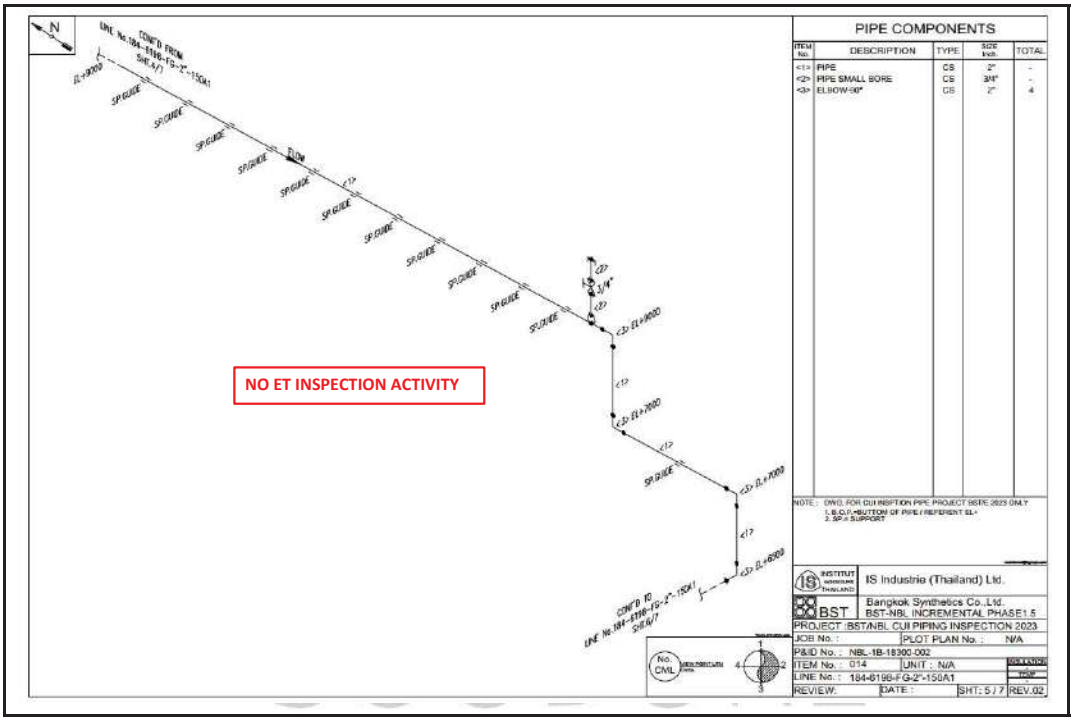
THAILAND

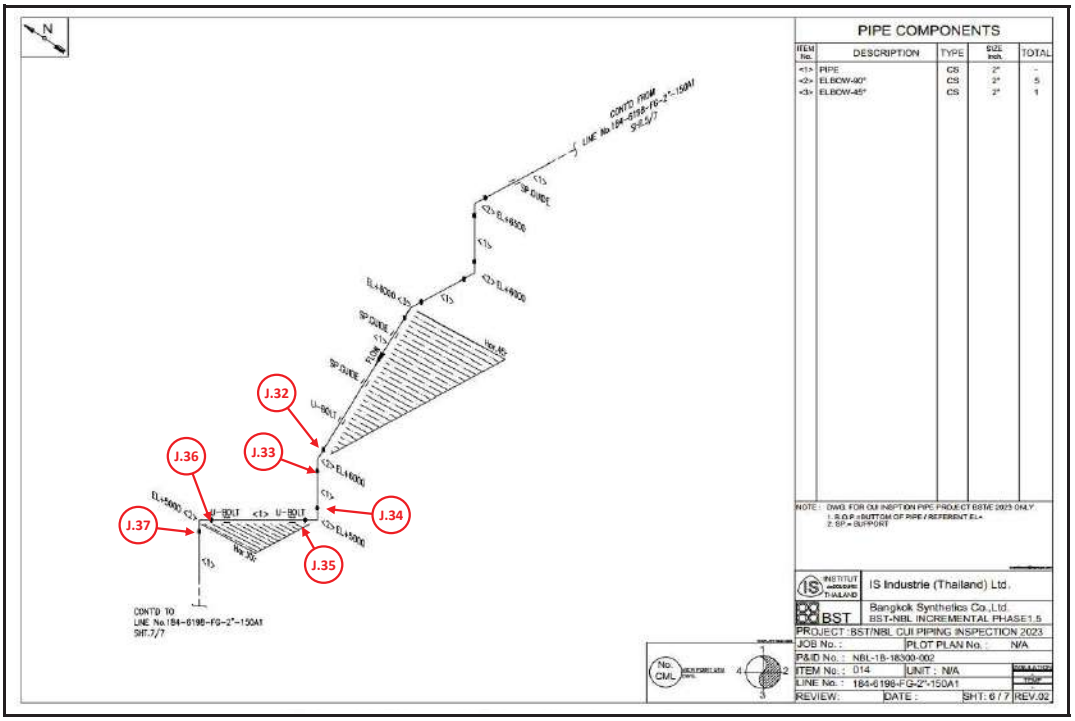


THAILAND

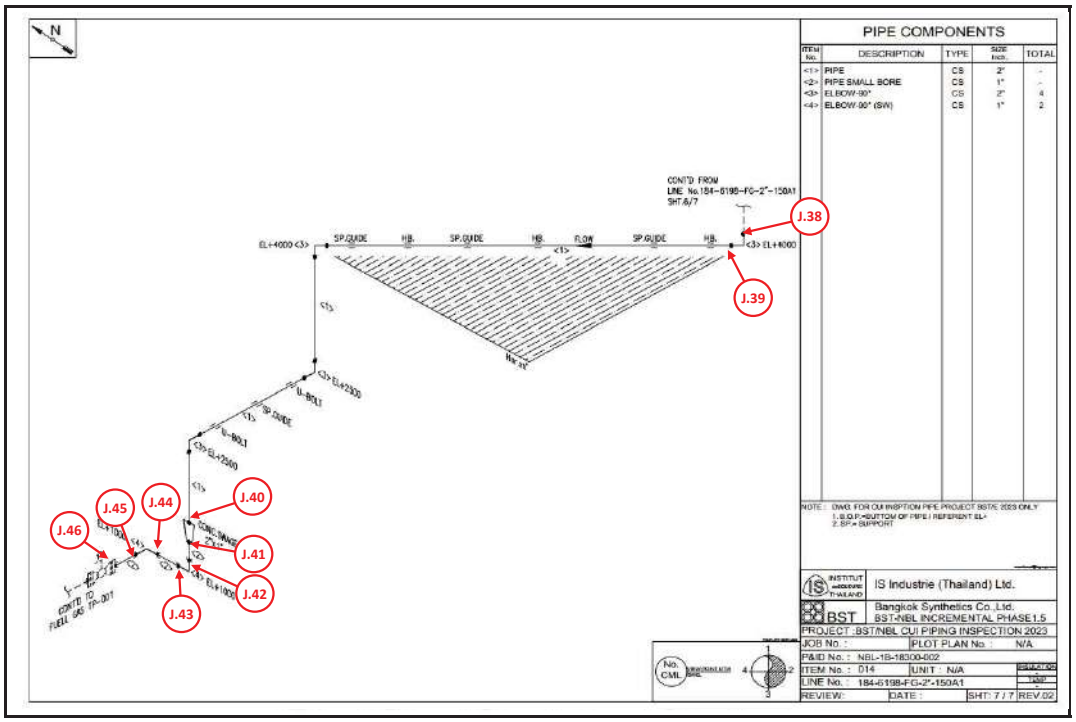


THAILAND


N
NO ET INSPECTION ACTIVITY
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch. | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTPE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 5 / 7 REV.02

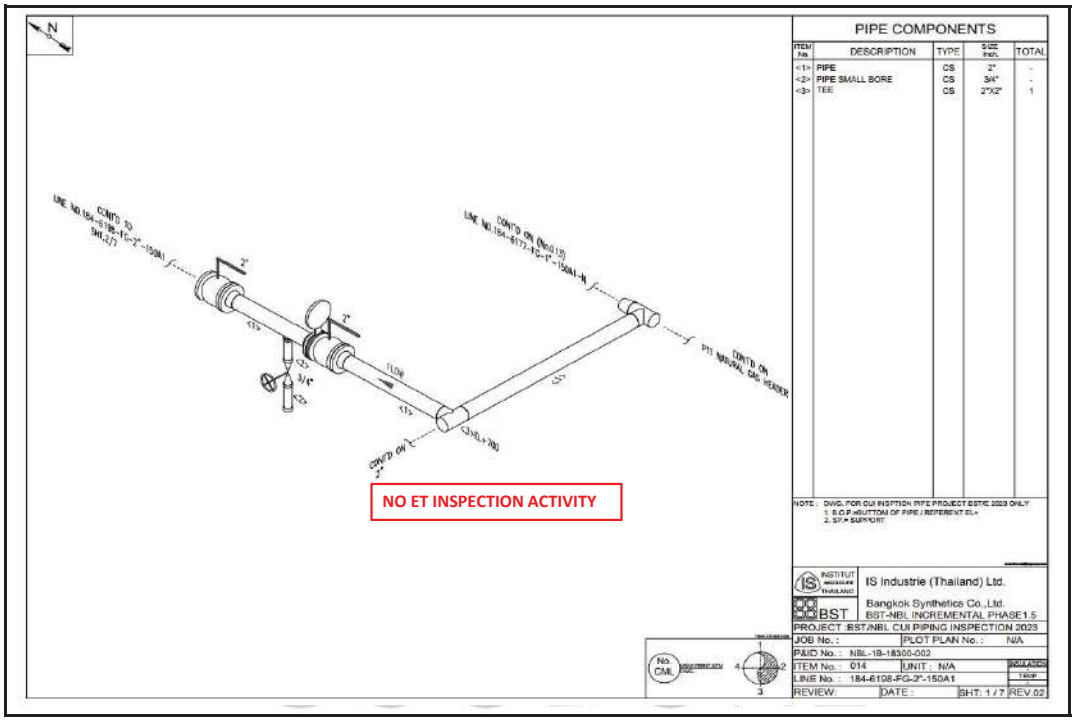

N
J.32
J.33
J.34
J.35
J.36
J.37
U-BOLT
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch. | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 5
<3> ELBOW-45° | CS | 2" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTPE 2023 ONLY
1. B.O.P.=BUTTOM OF PIPE / REFERENT EL+
2. SP.= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-1B-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 6 / 7 REV.02

	2D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 74 of 98	Rev.00



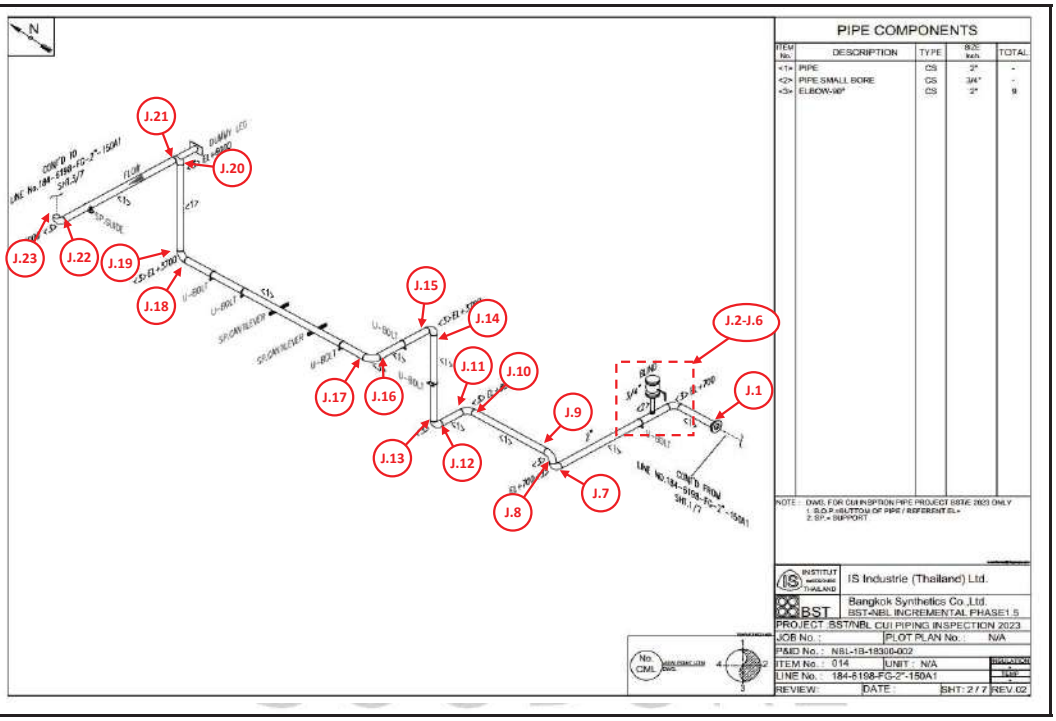
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 75 of 98	Rev.00



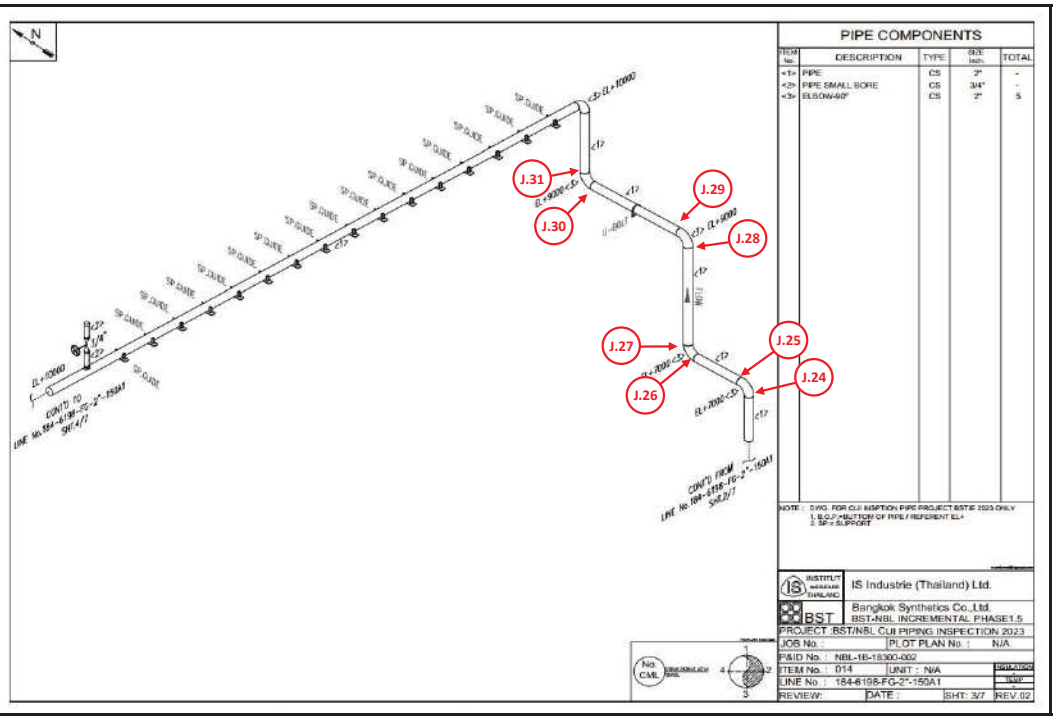
THAILAND

	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 76 of 98	Rev.00

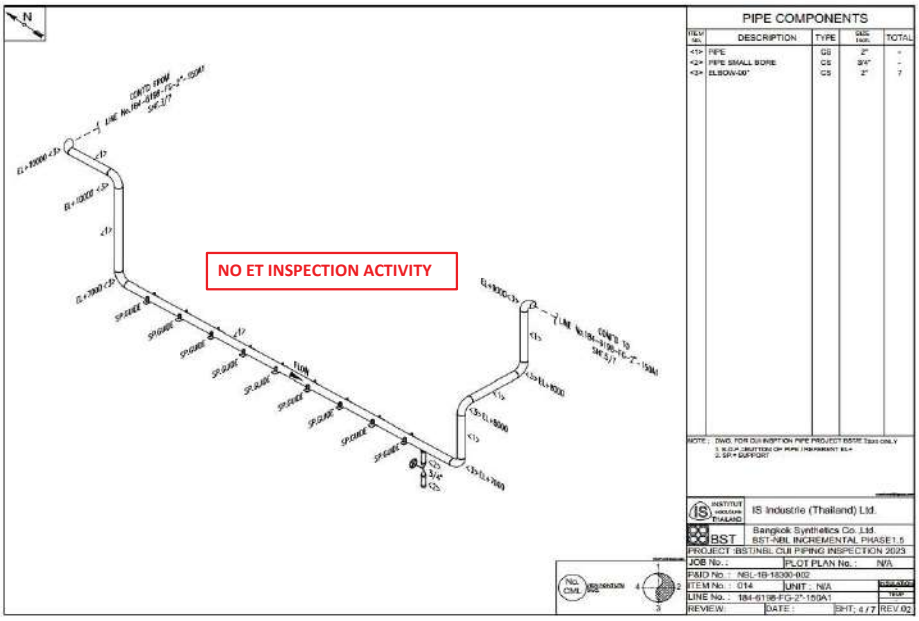


THAILAND

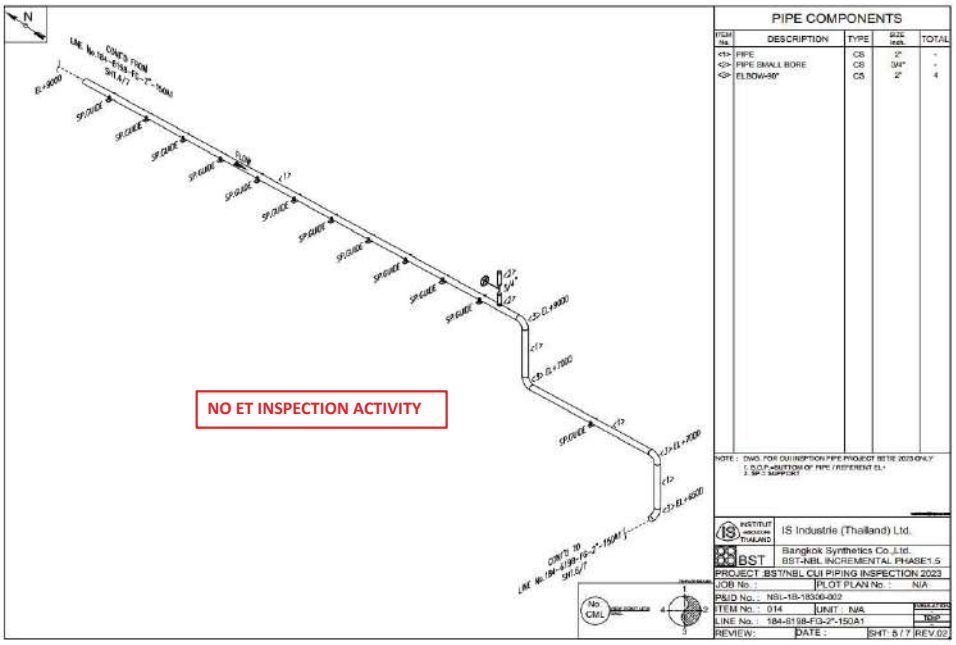
	3D ISO-DRAWING WITH WELD JOINT MARK UP	Report No. :	IS/B-23-CUI-P-NBL-014
		Line No. :	184-6198-FG-2"-150A1-N
		Date of Test :	19/05/2023
	Code : / Rev.: / Effective date :	Page : 77 of 98	Rev.00



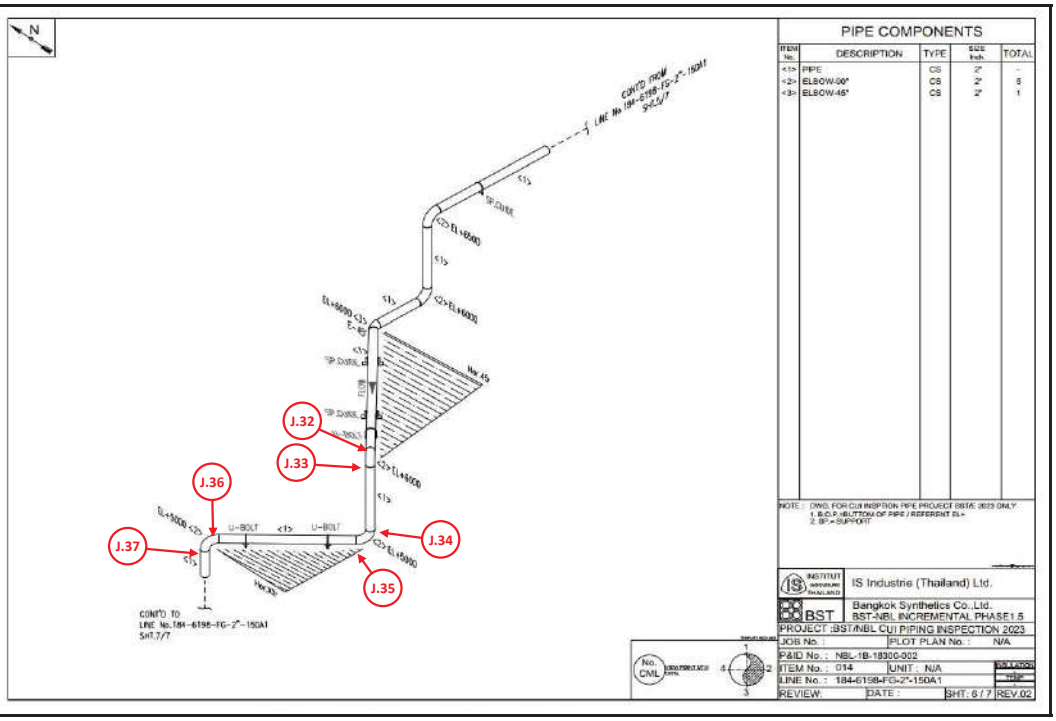
THAILAND



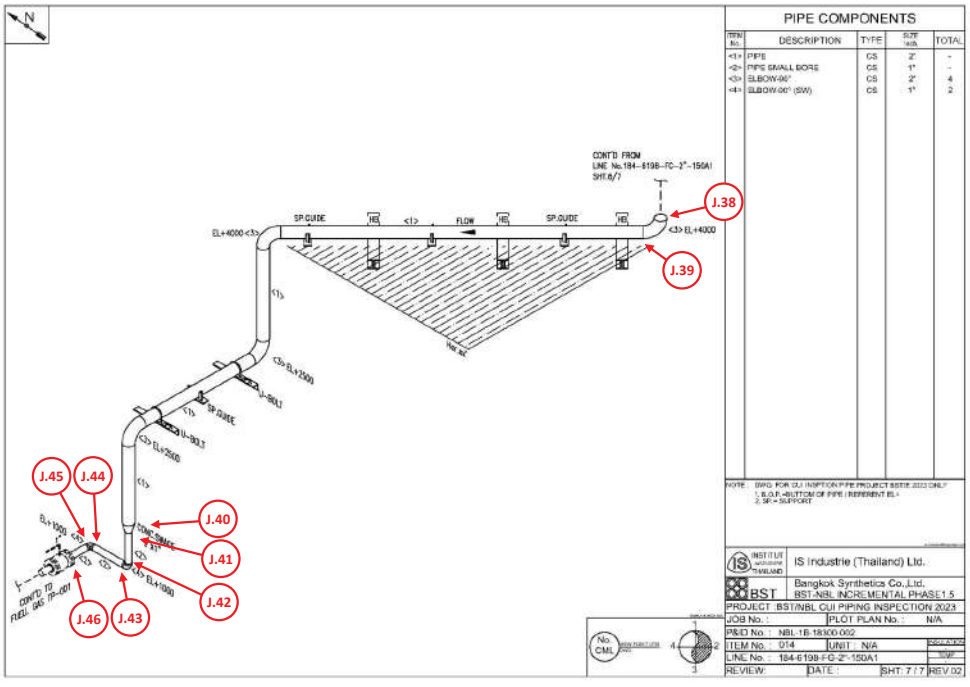
THAILAND



THAILAND



THAILAND



THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-014	
				Line No. :	184-6198-FG-2"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	82 of 99	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	BW
2	Joint No.2	Weld and HAZ	No indication was found	BW
3	Joint No.3	Weld and HAZ	No indication was found	BW
4	Joint No.4	Weld and HAZ	No indication was found	Weldolet
5	Joint No.5	Weld and HAZ	No indication was found	Weldolet
6	Joint No.6	Weld and HAZ	No indication was found	BW
7	Joint No.7	Weld and HAZ	No indication was found	BW
8	Joint No.8	Weld and HAZ	No indication was found	BW
9	Joint No.9	Weld and HAZ	No indication was found	BW
10	Joint No.10	Weld and HAZ	No indication was found	BW
11	Joint No.11	Weld and HAZ	No indication was found	BW
12	Joint No.12	Weld and HAZ	No indication was found	BW
13	Joint No.13	Weld and HAZ	No indication was found	BW
14	Joint No.14	Weld and HAZ	No indication was found	BW
15	Joint No.15	Weld and HAZ	No indication was found	BW
16	Joint No.16	Weld and HAZ	No indication was found	BW
17	Joint No.17	Weld and HAZ	No indication was found	BW
18	Joint No.18	Weld and HAZ	No indication was found	BW
19	Joint No.19	Weld and HAZ	No indication was found	BW
20	Joint No.20	Weld and HAZ	No indication was found	BW
21	Joint No.21	Weld and HAZ	No indication was found	BW
22	Joint No.22	Weld and HAZ	No indication was found	BW
23	Joint No.23	Weld and HAZ	No indication was found	BW
24	Joint No.24	Weld and HAZ	No indication was found	BW
25	Joint No.25	Weld and HAZ	No indication was found	BW
26	Joint No.26	Weld and HAZ	No indication was found	BW
27	Joint No.27	Weld and HAZ	No indication was found	BW
28	Joint No.28	Weld and HAZ	No indication was found	BW
29	Joint No.29	Weld and HAZ	No indication was found	BW
30	Joint No.30	Weld and HAZ	No indication was found	BW
31	Joint No.31	Weld and HAZ	No indication was found	BW
32	Joint No.32	Weld and HAZ	No indication was found	BW
33	Joint No.33	Weld and HAZ	No indication was found	BW
34	Joint No.34	Weld and HAZ	No indication was found	BW
35	Joint No.35	Weld and HAZ	No indication was found	BW
36	Joint No.36	Weld and HAZ	No indication was found	BW
37	Joint No.37	Weld and HAZ	No indication was found	BW
38	Joint No.38	Weld and HAZ	No indication was found	BW
39	Joint No.39	Weld and HAZ	No indication was found	BW
40	Joint No.40	Weld and HAZ	No indication was found	BW
41	Joint No.41	Weld and HAZ	No indication was found	BW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW
45	Joint No.45	Weld and HAZ	No indication was found	FW
46	Joint No.46	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-014	
				Line No. :	184-6198-FG-2"-150A1-N	
				Date of Test :	19/05/2023	
	Code :	Rev.:	Effective date :	Page :	83 of 99	Rev.00

Picture No. 1 : ET reault found no indication.

Picture No. 2 : ET reault found no indication.

Picture No. 3 : ET reault found no indication.

Picture No. 4 : ET reault found no indication.

Picture No. 5 : ET reault found no indication.

Picture No. 6 : ET reault found no indication.

ECT PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-014
Line No. :	184-6198-FG-2"-150A1-N
Date of Test :	19/05/2023
Page :	84 of 99 Rev.00

Code : Rev.: Effective date :

Picture No. 1 : ET reault found no indication.

Picture No. 2 : ET reault found no indication.

Picture No. 3 : ET reault found no indication.

Picture No. 4 : ET reault found no indication.

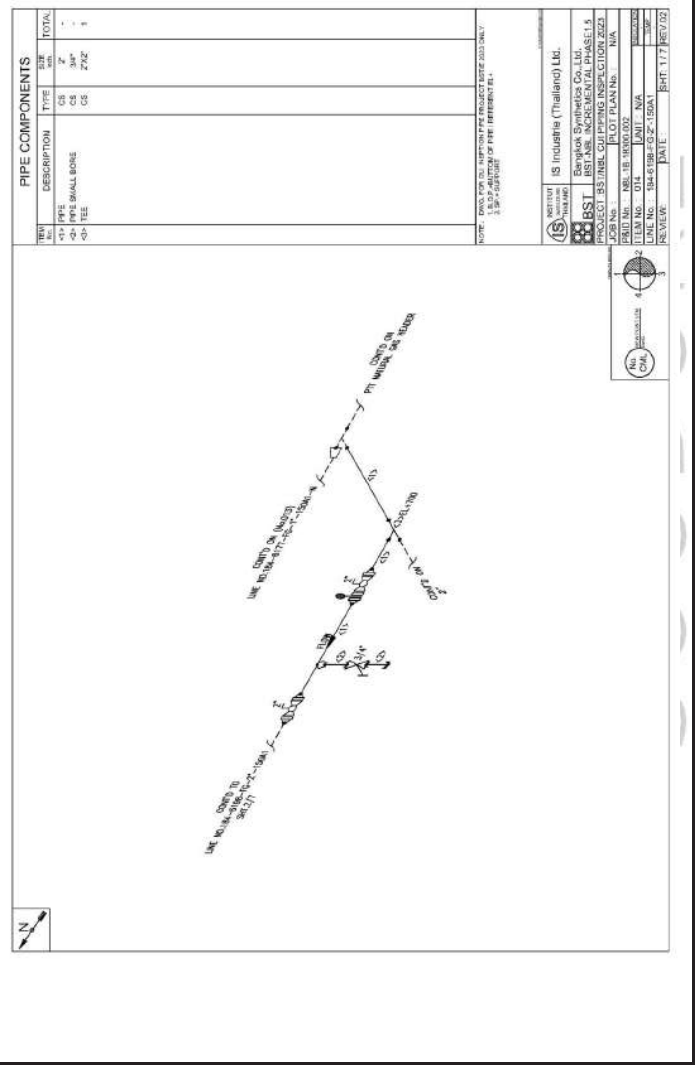
Picture No. 5 : ET reault found no indication.

Picture No. 6 : ET reault found no indication.

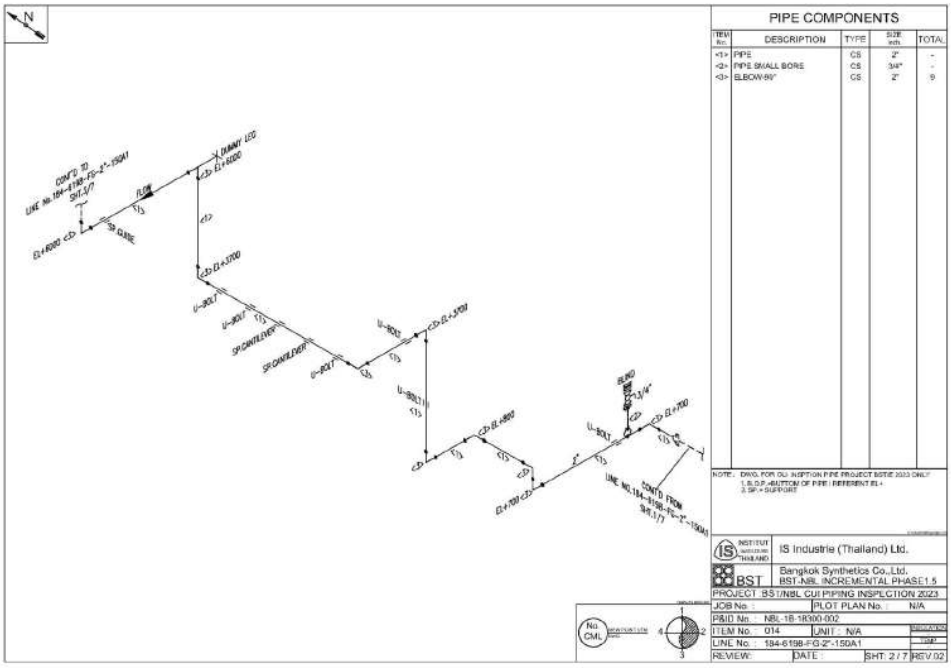
2D ISO-DRAWING

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	85 of 99 Rev.00

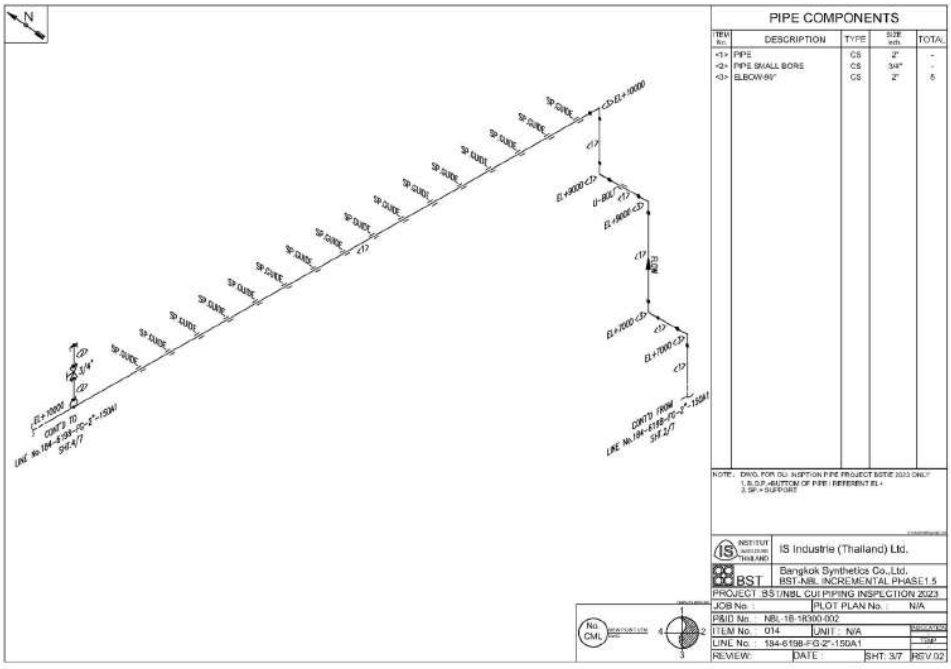
Code : Rev.: Effective date :



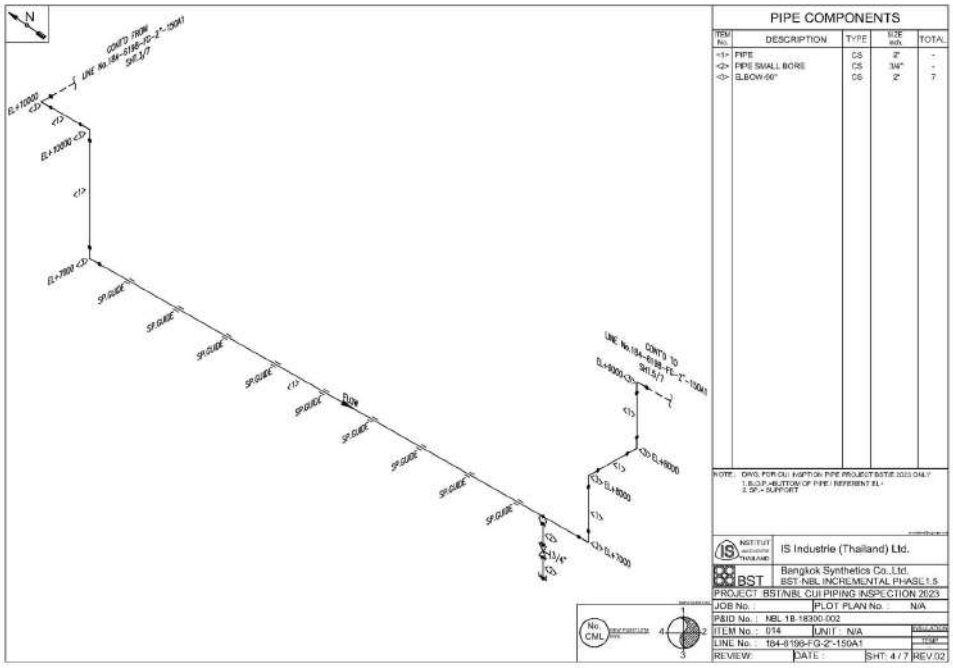
INSTITUT SOUDURE THAILAND



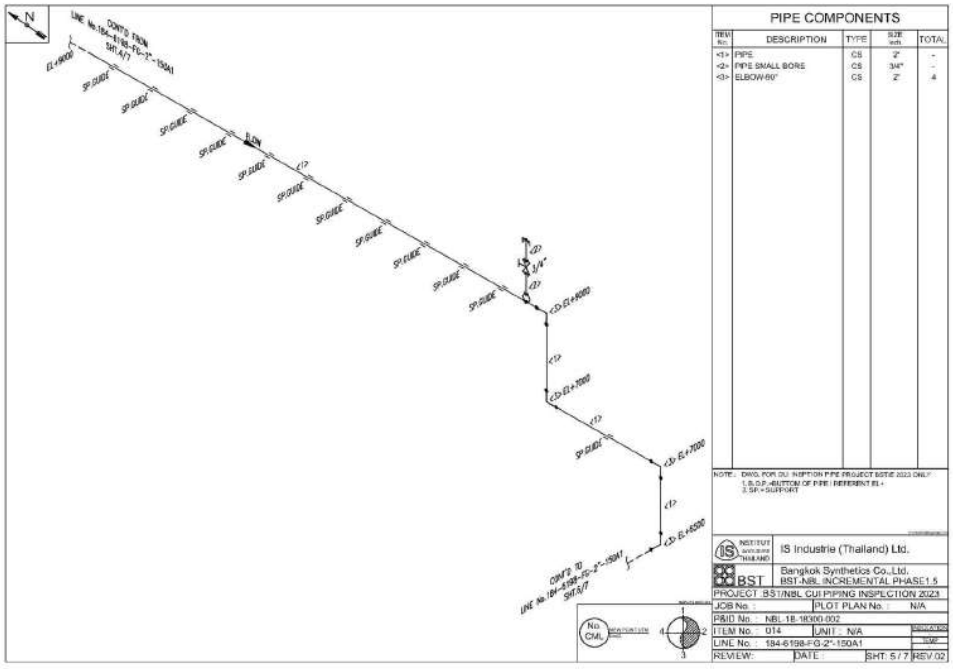
THAILAND



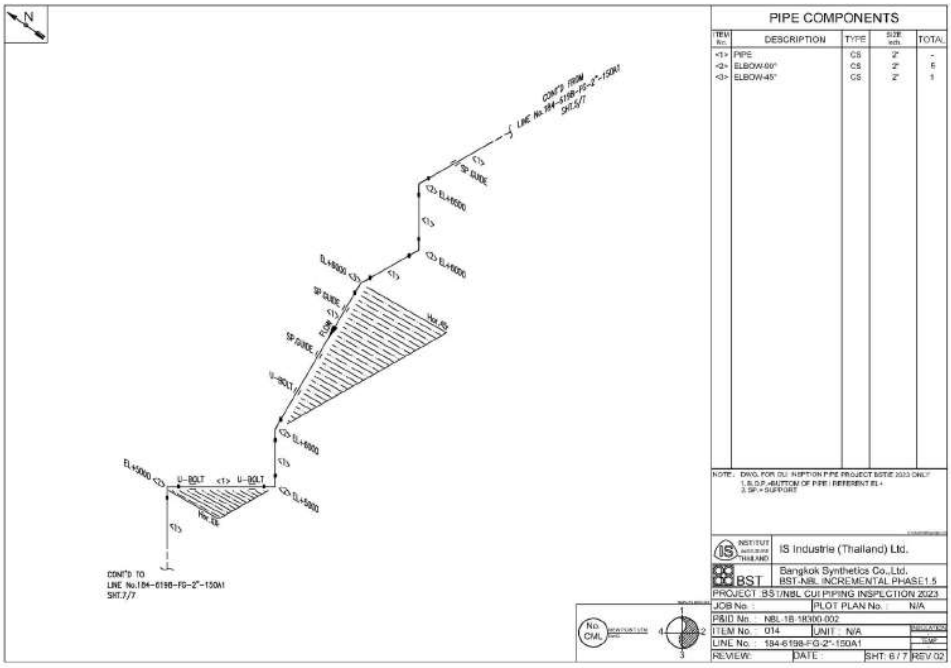
THAILAND



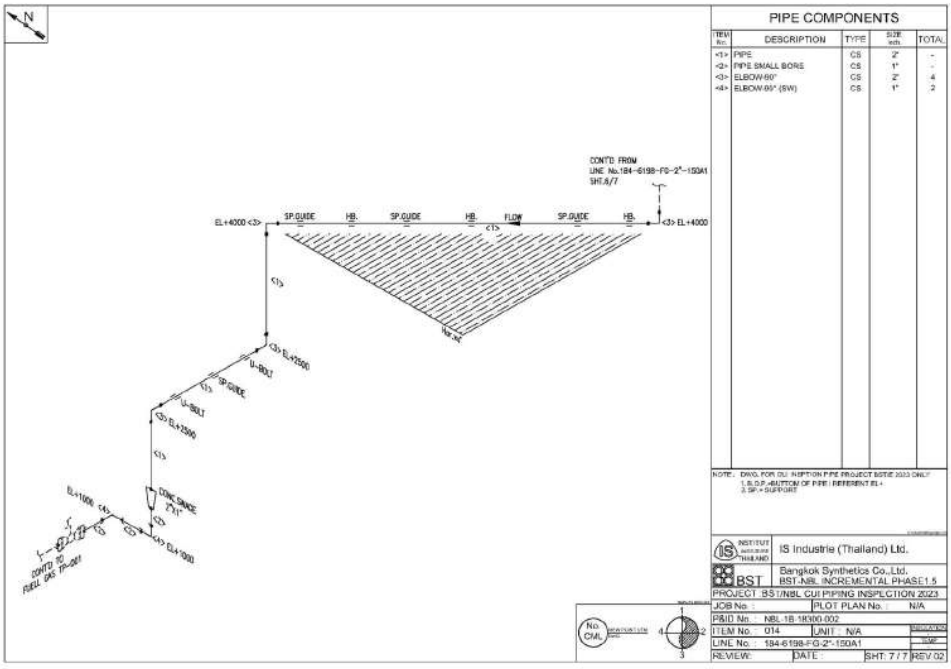
THAILAND



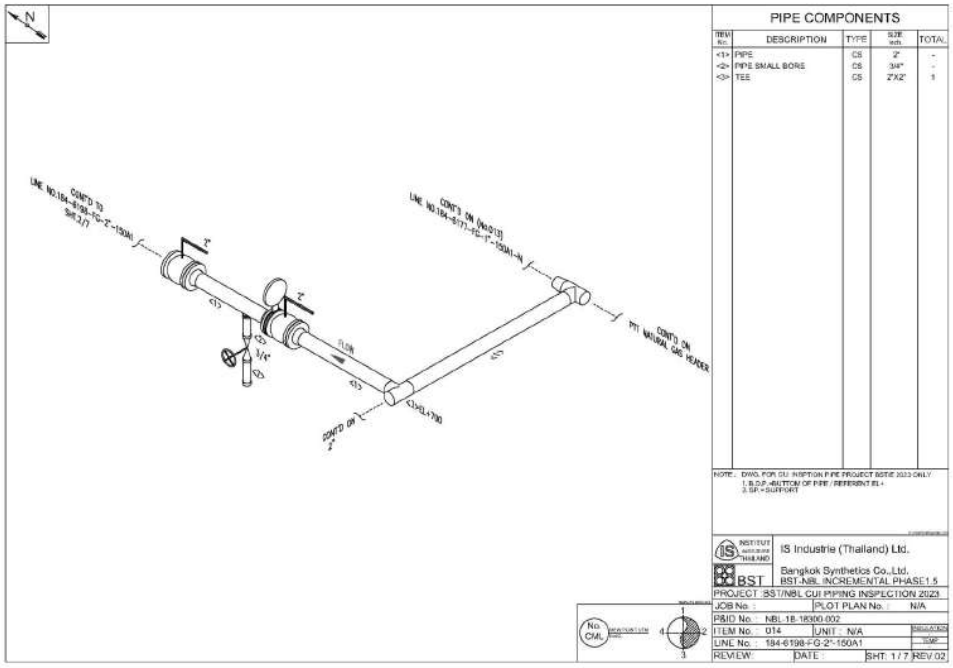
THAILAND

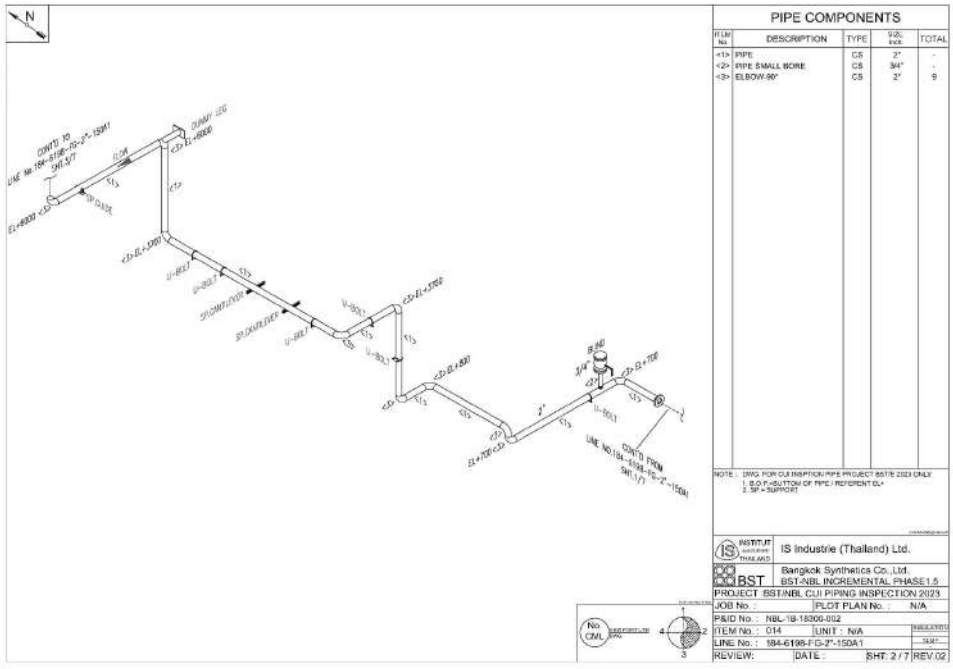


THAILAND

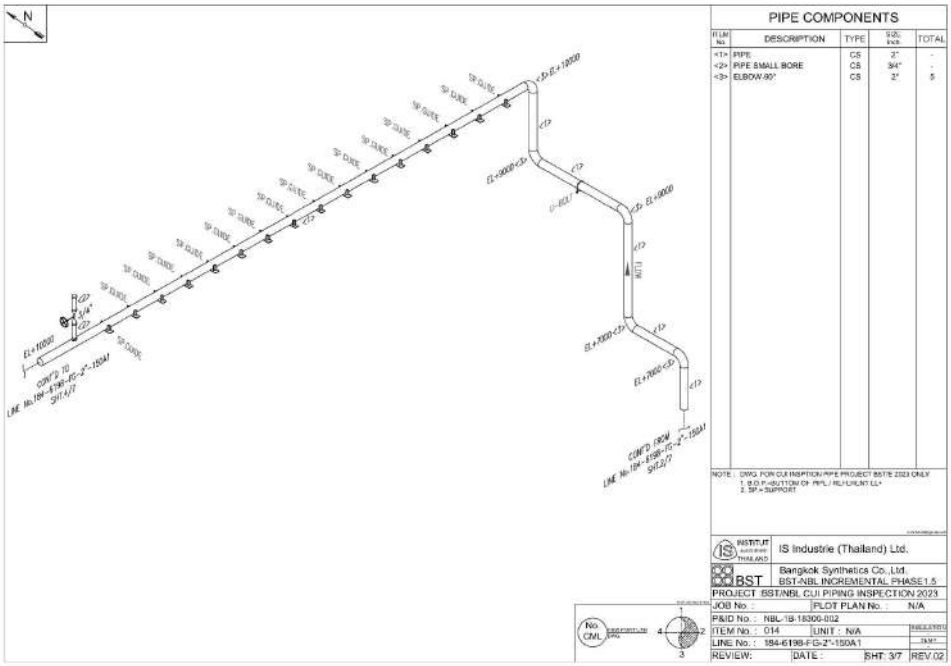


THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> TEE CS 2"X2" 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P =BUTTON OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 1 / 7 REV.02

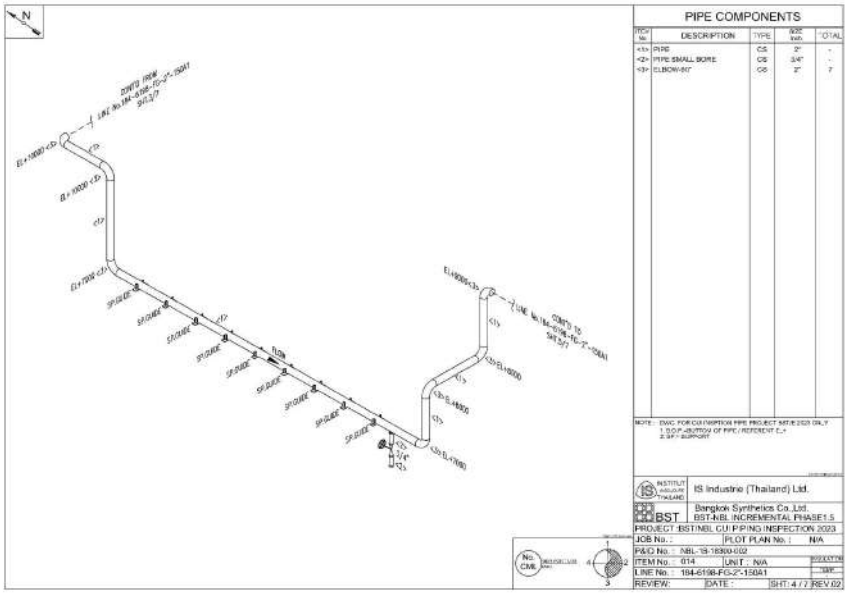

N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 3/4" -
<3> ELBOW-90° CS 2" 9
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIE 2023 ONLY
1. B.O.P =BUTTON OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014 UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW: DATE : SHT: 2 / 7 REV.02

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 94 of 99 Rev.00

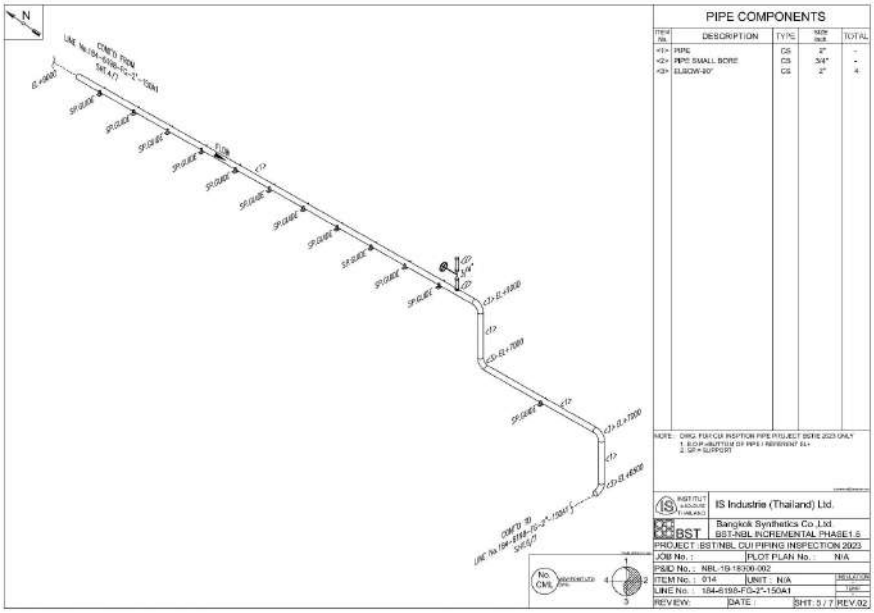


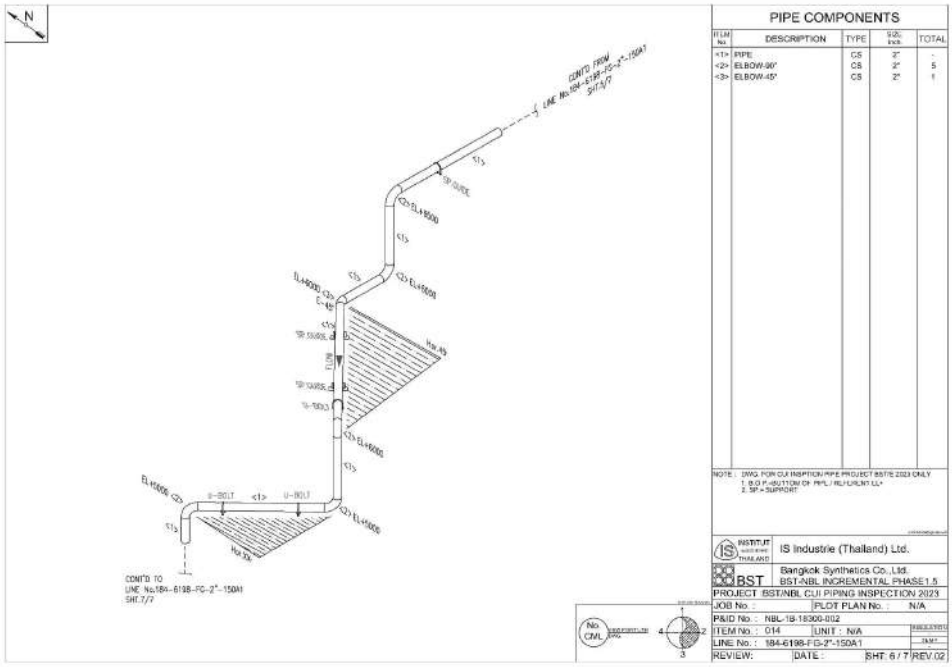
THAILAND

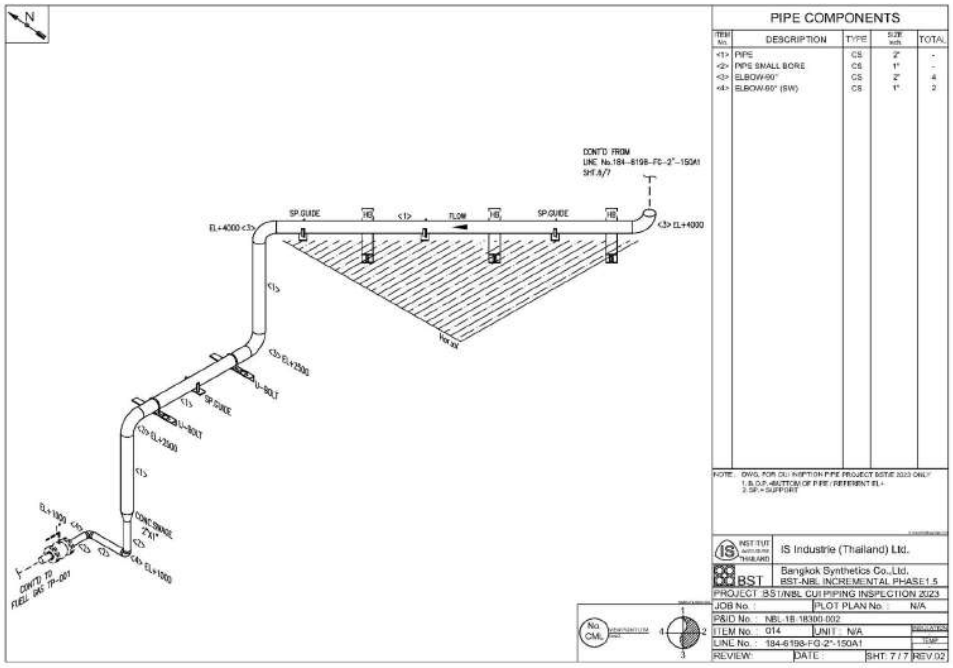
INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 95 of 99 Rev.00



THAILAND


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> ELBOW-90° | CS | 2" | 4
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTE 2023 ONLY
1. E.O.P = BOTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014
UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW:
DATE :
SHT. 5 / 7
REV.02


N
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE | CS | 2" | -
<2> ELBOW-90° | CS | 2" | 5
<3> ELBOW-45° | CS | 2" | 1
U-BOLT
U-BOLT
NOTE : DWG. FOR CUI INSPECTION PIPE PROJECT BSTE 2023 ONLY
1. E.O.P = BOTTOM OF PIPE / REFERENT EL+
2. SP = SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT : BST/NBL CUI PIPING INSPECTION 2023
JOB No. :
PLOT PLAN No. : N/A
P&ID No. : NBL-18-18300-002
ITEM No. : 014
UNIT : N/A
LINE No. : 184-6198-FG-2"-150A1
REVIEW:
DATE :
SHT. 6 / 7
REV.02



INSTITUT de SOUDURE THAILAND

Appendix 1
Inspector Certification

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

Mr. Saffsh Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jodelyn Robin STRAUB
MANAGING DIRECTOR

IS INDUSTRIE (THAILAND) CO.,LTD.

ANAB
ACCREDITED
ISO/IEC 17024
PERSONNEL CERTIFICATION BODY

API INDIVIDUAL CERTIFICATION PROGRAMS

verifies that

Krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69174

ORIGINAL CERTIFICATION DATE	November 30, 2016
CURRENT CERTIFICATION DATE	November 30, 2022
EXPIRATION DATE	November 30, 2025

Executive Vice President, Certification Programs

API | ICP

THIS IS A COPY

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

IS-industrie (Thailand) Ltd.

Head office
IS Industrie (Thailand)
777/32 Moo 9, Bang Pla Sub-distric
Bang Phli District, Samut Prakan
10540, Thailand
Tel: +66 (0) 2 136693336
Website: www.is-industrie.co.th

Rayong Branch
131/52, Moo 2 Plernjai 4 Village
T. Tubma, A. Muangrayong,
Rayong 21000, Thailand
Tel: +66 (0) 38 021 622-3
Fax: +66 (0) 38 021 621

CUI INSPECTION

Piping Line No.

183-6158-FG-1"-150A1-N

Inspection by : IS INDUSTRIE(THAILAND) LTD.
Client name : BANGKOK SYNTHETICS CO., LTD.
Location : BST SITE # 2 (NBL PLANT)
Unit : FUEL GAS (EIA)
Report No. : IS/B-23-CUI-P-NBL-015
Inspection date : May 10, 2023
Issue report date : May 15, 2023

Content

Item	Description	Page
1	*Summary Finding*	*1*
2	*Piping and Instrumentation Diagram (P&ID)*	*2*
3	*Visual testing Report*	*3 - 24*
4	*Ultrasonic Thickness Measurement Report*	*25 - 34*
5	*Eddy Current Testing Report*	*35 - 46*
6	*2D & 3D ISO-Drawing*	*47 - 52*
7	*Attachment Certification*	*Appendix 1*
8	*Other attachment*	-

REPORT PREPARED	REVIEWED	CLIENT REPRESENTATIVE
MR. DUSIT T.	MR. KRISCHANUT S.	MR. NATTA K.
Position : Inspector	Position : API 570	Position : Inspection Engineer
Date : May 15, 2023	Date : May 18, 2023	Date : May 21, 2023

SUMMARY FINDING

Report No. :	IS/B-23-CUI-P-NBL-015		
Request No. :	-		
Date of Test :	10/05/2023		
Page :	1 of 52	Rev.00	

Code : | Rev.: | Effective date :

PIPING INFORMATION

Location:	BST SITE # 2 (NBL PLANT)	**Process Fluid :**	Fuel Gas
Unit :	FUEL GAS (EIA)	**Material :**	A53 Gr. B
Item No. 15 Line No.	183-6158-FG-1"-150A1-N	**Corrosion Allowance :**	1.5 mm.
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Inspection scope :**	VT, UTM, ET

KEY FINDING / RECOMMENDATION

Item	Part Name	Level	Finding	Recommendation
1	Pipe, U-bolt, Flange connection	**Minor**	Found slight corrosion / slightly rust / rust spot / dirt stain / painting damage as pipe, U-bolt, Flange connection at CMLs 8, 16-18, 25, 56. (See picture No. 7, 16-21, 26, 45)	Shall be monitor & repair painting within next S/D or T/A.

SUMMARY INSPECTION SCOPE AND RESULT

VT:	Satisfactory condition observed. See detail in "VISUAL TESTING REPORT".	**Result :**	Accepted
UTM :	No significant wall-loss than corrosion allowance with maximum corrosion rate = 0.045 mm. / year and remaining life = 55.479 years. See detail in "ULTRASONIC THICKNESS MEASUREMENT REPORT".	**Result :**	Accepted
ET :	No indication found. See detail in "EDDY CURRENT TESTING SURFACE REPORT".	**Result :**	Accepted

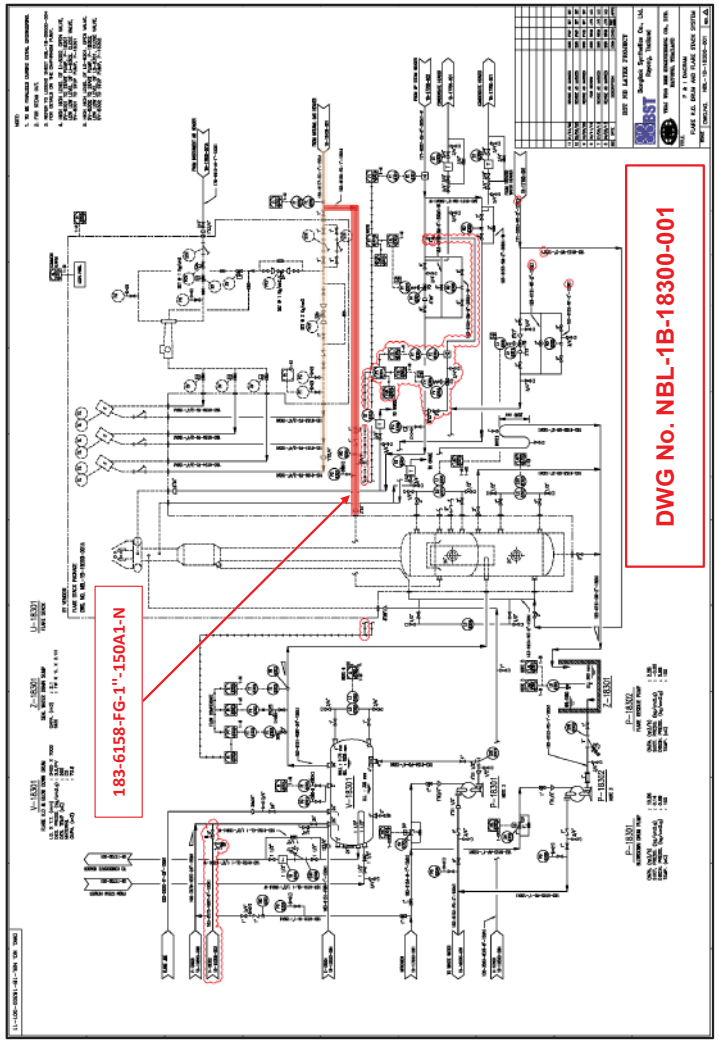
AFTER REPAIR INSPECTION RESULT

- None -

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	2 of 52 Rev.00

Piping and Instrumentation Diagram (P&ID)

Code : Rev.: Effective date :



VISUAL TESTING REPORT		Report No. :	IS/B-23-CUI-P-NBL-015
		Request No. :	-
		Date of Test :	10/05/2023
Code :	Rev.: Effective date :	Page :	3 of 52 Rev.00

PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	183-6158-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-INSC-003_REV.00	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

CHECK LIST

VISUAL INSPECTION CHECK LIST

Area of interest	Condition				Comment	Pic.No.
	Good	Fair	Poor	N/A		
A. Pressure Containment						
1. Pipe and fitting (Pipe, Elbow, Tee, Reducer)		✓			Rust spot	-
2. Flange connection (Flange, Stud & Nut, Gasket)		✓			Rust spot at stud & nut	-
3. Branch Connection (Vent, Drain, Nipples)	✓					-
4. Valve (Body, Bonnet, Stem, Packing, Handle)	✓					-
5. Steam Trap				✓		-
6. Heat Tracing				✓		-
7. Existing Repair (Clamping, Wraping)				✓		-
8. Expansion joint (Bellow)				✓		-
Other …				✓		-
B. Support						
1. Pipe support (Shoe, Clamp, U-Bolt, Guide, Leg)		✓			Rust at U-bolt thread & nuts	-
2. Structure support (Beam, Structure)	✓					-
3. Spring Support (Standing, Hanging)				✓		-
4. I-Rod				✓		-
5. Other…						-
C. Insulation & Painting						
1. Cladding				✓		-
2. Insulation				✓		-
3. Sealing (Plastic Plug, Screw, Silicone Sealant)				✓		-
4. Painting / Coating		✓			Painting damage < 10 % area	-
5. Other…						

Additional Recommendation

- None -

REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. DUSIT T.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	Inspector	Position :	API 570	Position :	Inspection Engineer
Date :	May 15, 2023	Date :	May 18, 2023	Date :	May 21, 2023

Picture No. 1

Finding :

This photo shown overview of beginning location of line No. 183-6158-FG-1"-150A1-N.

Recommendation :

Should be monitor within next inspection.

Picture No. 2

Finding :

Pipe 1" CMLs 1 and socket elbow 1" CMLs 2 were found in normal condition.

Recommendation :

Shall be monitor within next inspection.

Picture No. 3

Finding :

Valve 1" CMLs 3 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

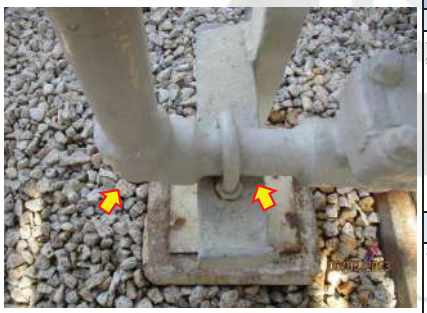
Picture No. 4

Finding :

Found spot area of painting damage & rust spot at pipe 1" CMLs 4.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.



Picture No. 5

Finding :

Socket elbow 1" CMLs 5 and pipe 1", U-bolt include support CMLs 6 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 6

Finding :

Check valve 1" CMLs 7 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 7

Finding :

Found slightly rust as all set of stud & nut at flange connection CMLs 8.

Recommendation :

Shall be monitor within next inspection.

Picture No. 8

Finding :

Socket tee reducer 1" x 3/4" CMLs 9 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 9

Finding :

Small bore branch drain pipe 3/4" CMLs 10 include drain valve 3/4" were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 10

Finding :

Socket tee reducer 1" x 3/4" CMLs 11 include small bore branch pipe 3/4" and pressure gauge were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 11

Finding :

Pipe 1", U-bolt and structure support CMLs 12 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 12

Finding :

Socket elbow 1" CMLs 13 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 13

Finding :

Pipe 1" CMLs 14 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 14

Finding :

Socket elbow 1" CMLs 15 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 15

Finding :

This photo shown socket elbow 1" was normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 16

Finding :

Found rust as U-bolt thread include nuts at support CMLs 16.

Recommendation :

Shall be monitor within next inspection.

Picture No. 17

Finding :

This photo shown close-up view of rust at U-bolt thread & nuts.

Recommendation :

Shall be monitor within next inspection.

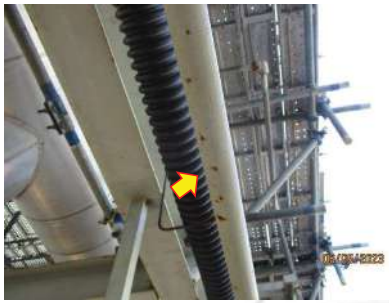
Picture No. 18

Finding :

Found rust spot at pipe 1" CMLs 17.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.



Picture No. 19

Finding :

This photo shown rust spot at pipe 1".

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 20

Finding :

Found rust as U-bolt thread include nuts at support CMLs 18.

Recommendation :

Shall be monitor within next inspection.

Picture No. 21

Finding :

This photo shown close-up view of rust at U-bolt thread & nuts.

Recommendation :

Shall be monitor within next inspection.

Picture No. 22

Finding :

Socket elbow 1" CMLs 19 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

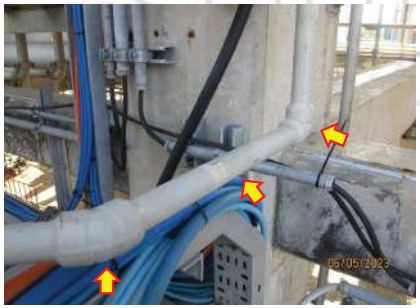
Picture No. 23

Finding :

Pipe 1" CMLs 20 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 24

Finding :

Socket elbow 1" CMLs 21, CMLs 23 and pipe 1" CMLs 22 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 25

Finding :

Pipe 1" CMLs 24 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 26

Finding :

Found rust spot at pipe 1" CMLs 25, but U-bolt and structure support were found in normal condition.

Recommendation :

Shall be monitor & repair painting within next S/D or T/A.

Picture No. 27

Finding :

Socket elbow 1" CMLs 26 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 28

Finding :

Pipe 1" CMLs 27 and socket elbow 1" CMLs 28 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 29

Finding :

Pipe 1" CMLs 29 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 30

Finding :

Pipe 1" CMLs 30 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 31

Finding :

Pipe 1" CMLs 31, CMLs 32 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 32

Finding :

Pipe 1" CMLs 33, CMLs 34 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 33

Finding :

Pipe 1" CMLs 35, CMLs 36, CMLs 37, CMLs 38 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 34

Finding :

Pipe 1" CMLs 39 and guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

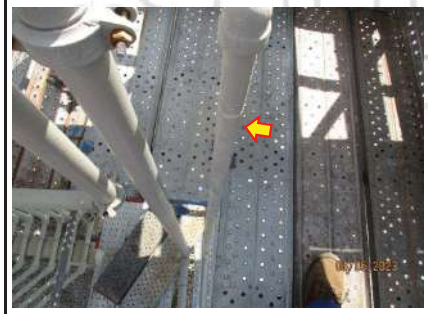
Picture No. 35

Finding :

Socket elbow 1" CMLs 40 was found in normal condition.

Recommendation :

Should be monitor within next inspection.



Picture No. 36

Finding :

Pipe 1" CMLs 41 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 37

Finding :

Socket elbow 1" CMLs 42, CMLs 45 and pipe 1" CMLs 43, CMLs 44 include guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 38

Finding :

Pipe 1" CMLs 46 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 39

Finding :

Pipe 1" CMLs 47 include guide support were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 40

Finding :

Socket elbow 1" CMLs 48 and pipe 1" CMLs 49 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 41

Finding :

Socket elbow 1" CMLs 50 and pipe 1" CMLs 51 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 42

Finding :

Pipe 1", U-bolt and structure support CMLs 52 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

PICTURE LOG

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	18 of 52 Rev.00

Code : | Rev.: | Effective date :

Picture No. 43

Finding :

Pipe 1" CMLs 53 was found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 44

Finding :

Reducer 2" x 1" CMLs 54 and elbow 2" CMLs 55 were found in normal condition.

Recommendation :

Should be monitor within next inspection.

Picture No. 45

Finding :

Found rust spot as all set of stud & nut at flange connection (Ending location) CMLs 56.

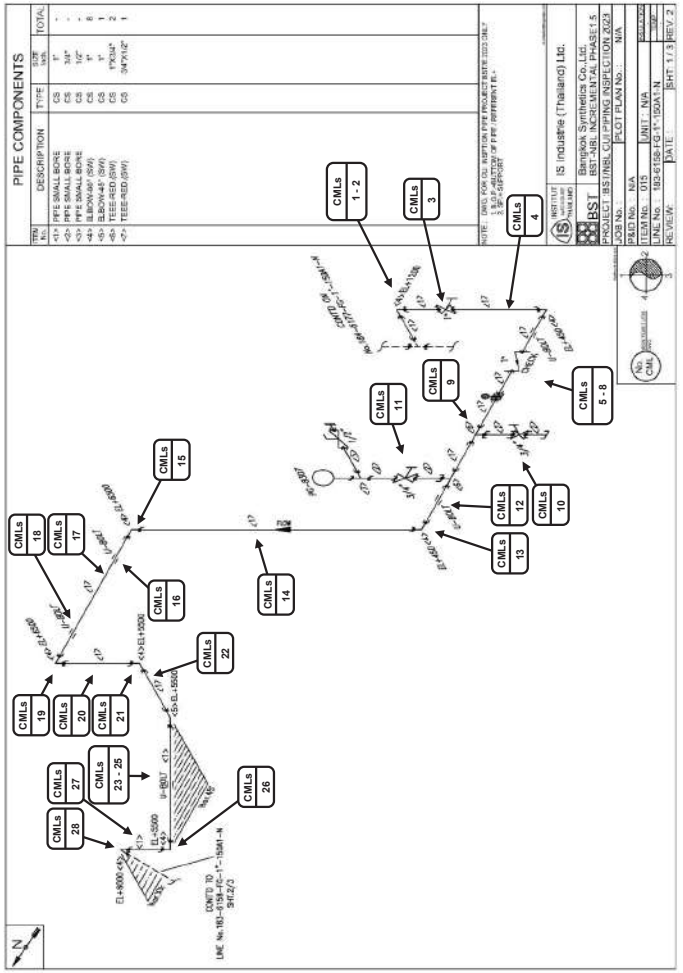
Recommendation :

Shall be monitor within next inspection.

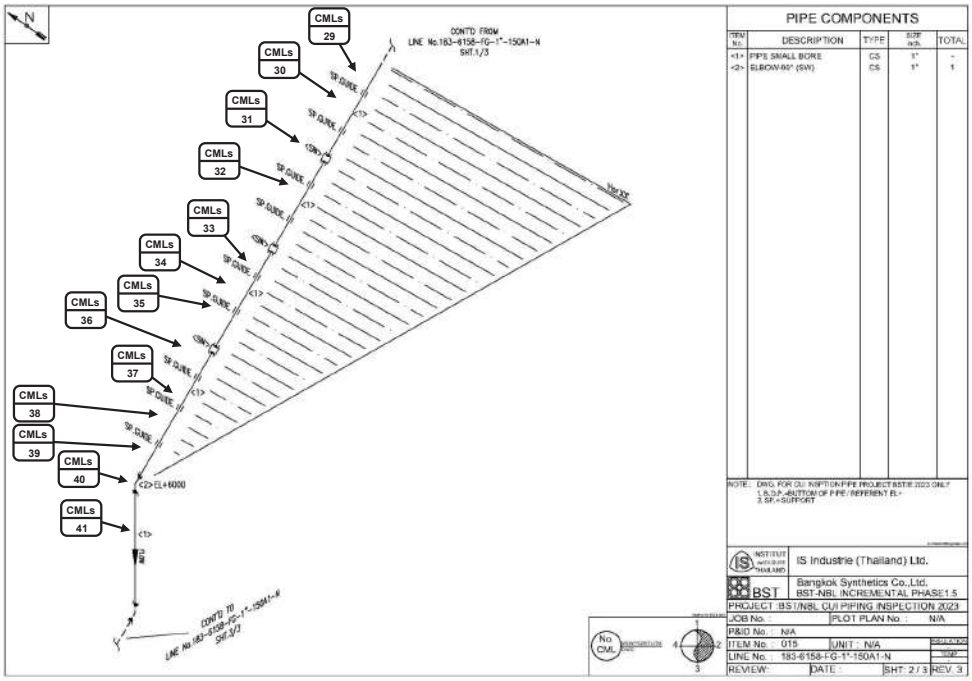
2D ISO-DRAWING WITH MARK UP

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	19 of 52 Rev.00

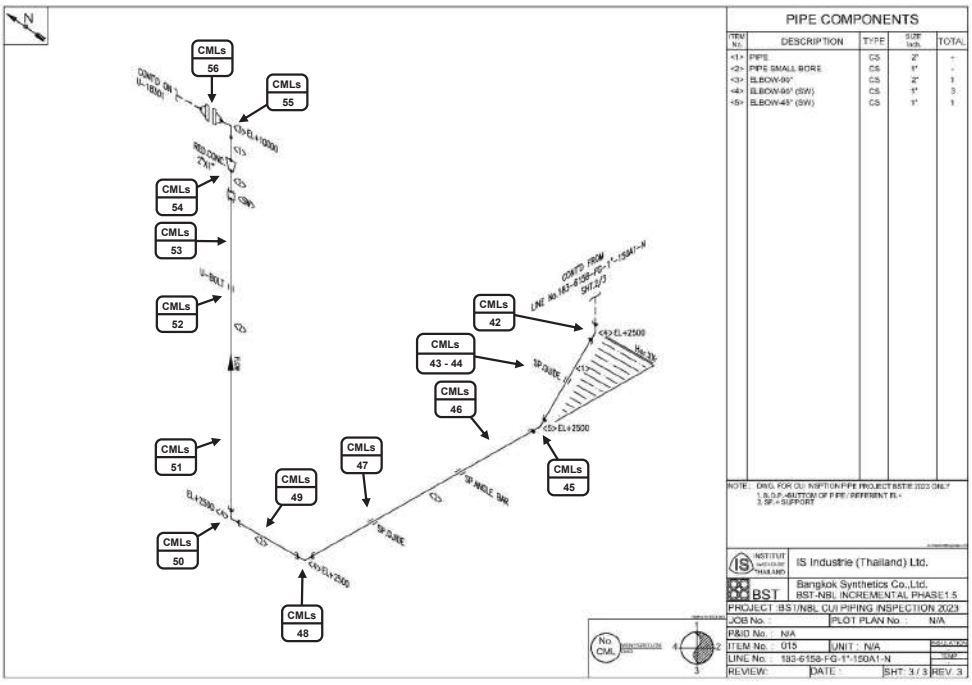
Code : | Rev.: | Effective date :



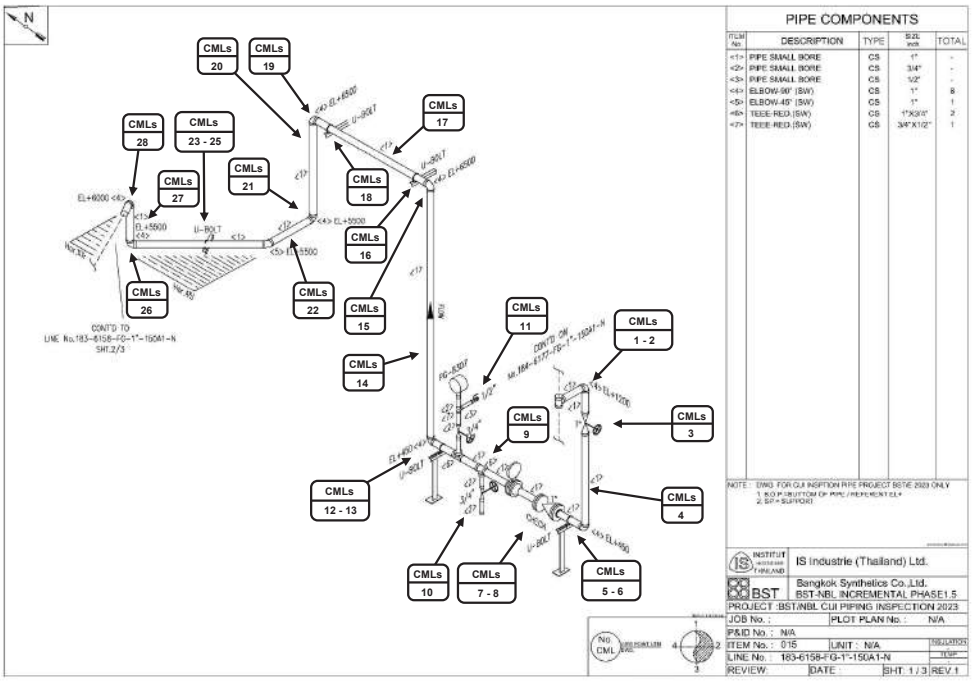
THAILAND



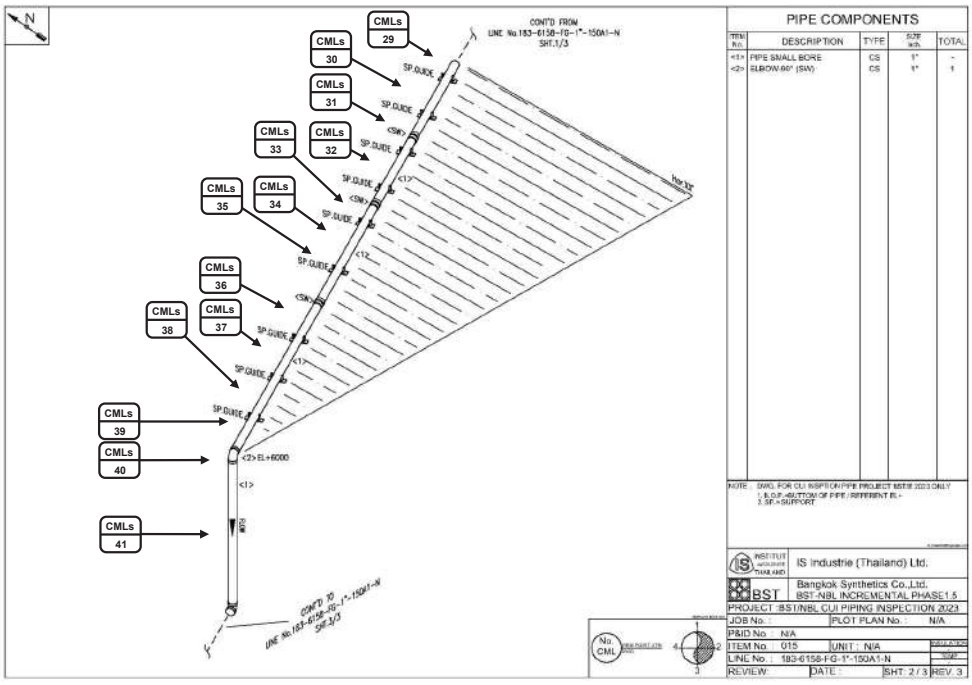
THAILAND



THAILAND



THAILAND

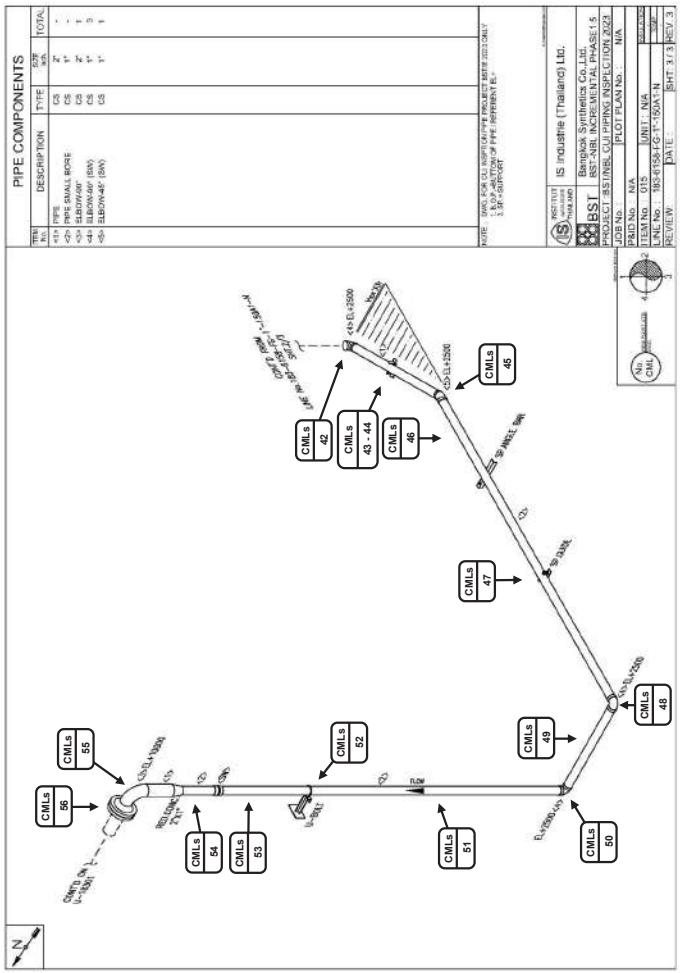


THAILAND

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	24 of 52 Rev.00

3D ISO-DRAWING WITH MARK UP

Code : Rev.: Effective date :



ULTRASONIC THICKNESS MEASUREMENT REPORT		Report No. :	IS/B-23-CUI-P-NBL-015
		Request No. :	-
		Date of Test :	10/05/2023
Code :	Rev.: Effective date :	Page :	25 of 52 Rev.00

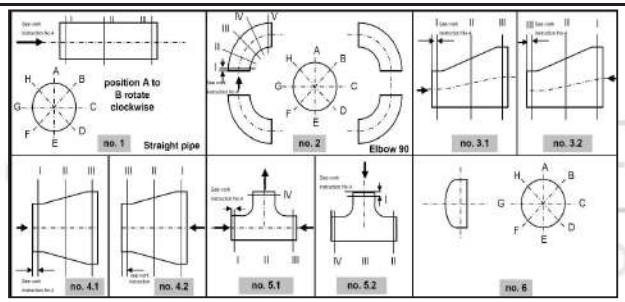
PIPING DATA

Location :	BST SITE # 2 (NBL PLANT)	**Unit :**	FUEL GAS (EIA)
Line No. :	183-6158-FG-1"-150A1-N	**Process Fluid :**	Fuel Gas
Procedure :	SPR-NDT-UTM-001_REV.04	**Insulation Type :**	Non-Insulated
Design Pressure :	7.7 Bar (g)	**Acceptance Standard :**	ASME B31.3, API 570
Design Temperature :	65.0 °C	**Service Date :**	January 1, 2013

MEASUREMENT TOOL DATA

Equipment Manufacturer	Olympus	**Calibration block**	Step bar 5 step
Equipment Model	38 DL Plus	**Calibration Range**	2.50 - 7.50 mm.
Serial No.	151114106	**Serial No.**	144816
Probe Manufacturer	Olympus	**Sound Velocity**	5904 mm./µs
Probe Model	D790-SM	**Couplant**	GE ZG-F / SONO 600
Probe Dia.	10 mm.	**Scan Type**	A-SCAN
Serial No.	1039668	**Technique**	Echo to Echo (Thru painting)
Frequency	5 MHz		

SCOPE :	Spot UTM as per ISO-drawing
FINDING :	No significant of wall-loss. (Maximum corrosion rate = 0.045 mm. / year and remaining life = 55.479 years)
CONCLUSION :	Keep monitoring within the next inspection interval (5 Years).



REPORT PREPARED		REVIEWED		CLIENT REPRESENTATIVE	
SIGNATURE :		SIGNATURE :		SIGNATURE :	
NAME :	MR. NITIPAT C.	NAME :	MR. KRISCHANUT S.	NAME :	MR. NATTA K.
Position :	UT Level II	Position :	API 570	Position :	Inspection Engineer
Date :	May 10, 2023	Date :	May 18, 2023	Date :	May 21, 2023

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015	
Line No. :	183-6158-FG-1"-150A1-N	
Date of Test :	10/05/2023	
Page :	26 of 52	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
1	1.1	A	Pipe	1"	80	4.55	1.80	4.41	4.44		2.64	-0.045	0.011	250.320	
	1.1	B	Pipe	1"	80	4.55	1.80	4.46	4.63		2.83	-0.255	-0.008	-368.961	Note 1
	1.1	C	Pipe	1"	80	4.55	1.80	4.53	4.59		2.79	-0.090	-0.004	-727.492	Note 1
	1.1	D	Pipe	1"	80	4.55	1.80	4.55	4.51		2.71	0.060	0.004	45.105	
2	2.1	A	Pipe	1"	80	4.55	1.80	4.55	4.65		2.85	-0.150	-0.010	-297.255	Note 1
	2.1	B	Pipe	1"	80	4.55	1.80	4.48	4.51		2.71	-0.045	0.004	706.632	
	2.1	C	Pipe	1"	80	4.55	1.80	4.70	4.53		2.73	0.255	0.002	1423.695	Note 3
	2.1	D	Pipe	1"	80	4.55	1.80	4.78	4.68		2.88	0.150	-0.012	-231.065	Note 3
3	3.1	A	Pipe	1"	80	4.55	1.80	4.28	4.36		2.56	-0.120	0.018	140.531	
	3.1	B	Pipe	1"	80	4.55	1.80	4.47	4.49		2.69	-0.030	0.006	467.612	
	3.1	C	Pipe	1"	80	4.55	1.80	4.26	4.28		2.48	-0.030	0.026	95.801	
	3.1	D	Pipe	1"	80	4.55	1.80	4.43	4.25		2.45	0.270	0.029	85.178	Note 3
4	4.1	A	Pipe	1"	80	4.55	1.80	4.57	4.75		2.95	-0.270	-0.019	-153.843	Note 1
	4.1	B	Pipe	1"	80	4.55	1.80	4.51	4.57		2.77	-0.090	-0.002	-1444.555	Note 1
	4.1	C	Pipe	1"	80	4.55	1.80	4.36	4.53		2.73	-0.255	0.002	1423.695	
	4.1	D	Pipe	1"	80	4.55	1.80	4.68	4.52		2.72	0.240	0.003	945.653	Note 3
5	5.1	A	Pipe	1"	80	4.55	1.80	-	4.52		2.72	-	0.003	945.653	
	5.1	B	Pipe	1"	80	4.55	1.80	-	4.58		2.78	-	-0.003	-966.513	Note 1
	5.1	C	Pipe	1"	80	4.55	1.80	-	4.67		2.87	-	-0.012	-249.451	Note 1
	5.1	D	Pipe	1"	80	4.55	1.80	-	4.42		2.62	-	0.012	210.205	
6	6.1	A	Pipe	1"	80	4.55	1.80	-	4.59		2.79	-	-0.004	-727.492	Note 1
	6.1	B	Pipe	1"	80	4.55	1.80	-	4.47		2.67	-	0.008	348.101	
	6.1	C	Pipe	1"	80	4.55	1.80	-	4.56		2.76	-	-0.001	-2878.680	Note 1
	6.1	D	Pipe	1"	80	4.55	1.80	-	4.52		2.72	-	0.003	945.653	
7	7.1	A	Pipe	3/4"	80	3.91	1.80	3.93	4.11		2.31	-0.270	-0.019	-120.467	Note 1
	7.1	B	Pipe	3/4"	80	3.91	1.80	3.98	3.99		2.19	-0.015	-0.008	-285.521	Note 1
	7.1	C	Pipe	3/4"	80	3.91	1.80	3.99	4.05		2.25	-0.090	-0.013	-167.625	Note 1
	7.1	D	Pipe	3/4"	80	3.91	1.80	3.94	3.78		1.98	0.240	0.012	158.857	Note 3
8	8.1	A	Pipe	1"	80	4.55	1.80	-	4.51		2.71	-	0.004	706.632	
	8.1	B	Pipe	1"	80	4.55	1.80	-	4.57		2.77	-	-0.002	-1444.555	Note 1
	8.1	C	Pipe	1"	80	4.55	1.80	-	4.50		2.70	-	0.005	563.220	
	8.1	D	Pipe	1"	80	4.55	1.80	-	4.63		2.83	-	-0.008	-368.961	Note 1
9	9.1	A	Pipe	3/4"	80	3.91	1.80	-	4.22		2.42	-	-0.030	-81.421	Note 1
	9.1	B	Pipe	3/4"	80	3.91	1.80	-	4.12		2.32	-	-0.020	-115.227	Note 1
	9.1	C	Pipe	3/4"	80	3.91	1.80	-	3.92		2.12	-	-0.001	-2211.160	Note 1
	9.1	D	Pipe	3/4"	80	3.91	1.80	-	4.05		2.25	-	-0.013	-167.625	Note 1
10	10.1	A	Pipe	3/4"	80	3.91	1.80	-	3.88		2.08	-	0.003	723.147	
	10.1	B	Pipe	3/4"	80	3.91	1.80	-	4.06		2.26	-	-0.014	-157.145	Note 1
	10.1	C	Pipe	3/4"	80	3.91	1.80	-	4.07		2.27	-	-0.015	-147.976	Note 1
	10.1	D	Pipe	3/4"	80	3.91	1.80	-	3.90		2.10	-	0.001	2190.300	

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015	
Line No. :	183-6158-FG-1"-150A1-N	
Date of Test :	10/05/2023	
Page :	27 of 52	Rev.00

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
11	11.1	A	Pipe	1/2"	80	3.73	1.80	-	3.64		1.84	-	0.009	213.236	
	11.1	B	Pipe	1/2"	80	3.73	1.80	-	3.54		1.74	-	0.018	95.517	
	11.1	C	Pipe	1/2"	80	3.73	1.80	-	3.44		1.64	-	0.028	58.983	
	11.1	D	Pipe	1/2"	80	3.73	1.80	-	3.65		1.85	-	0.008	241.194	
12	12.1	A	Pipe	1/2"	80	3.73	1.80	-	3.52		1.72	-	0.020	85.427	
	12.1	B	Pipe	1/2"	80	3.73	1.80	-	3.46		1.66	-	0.026	64.125	
	12.1	C	Pipe	1/2"	80	3.73	1.80	-	3.67		1.87	-	0.006	325.068	
	12.1	D	Pipe	1/2"	80	3.73	1.80	-	3.69		1.89	-	0.004	492.817	
13	13.1	A	Pipe	1"	80	4.55	1.80	4.26	4.60		2.80	-0.511	-0.005	-584.080	Note 1
	13.1	B	Pipe	1"	80	4.55	1.80	4.42	4.56		2.76	-0.210	-0.001	-2878.680	Note 1
	13.1	C	Pipe	1"	80	4.55	1.80	4.52	4.45		2.65	0.105	0.010	276.395	
	13.1	D	Pipe	1"	80	4.55	1.80	4.23	4.38		2.58	-0.225	0.016	158.291	
14	14.1	A	Pipe	1"	80	4.55	1.80	4.21	4.43		2.63	-0.330	0.012	228.591	
	14.1	B	Pipe	1"	80	4.55	1.80	4.42	4.33		2.53	0.135	0.021	119.945	Note 3
	14.1	C	Pipe	1"	80	4.55	1.80	4.25	4.35		2.55	-0.150	0.019	132.983	
	14.1	D	Pipe	1"	80	4.55	1.80	4.25	4.48		2.68	-0.345	0.007	399.320	
15	15.1	A	Pipe	1"	80	4.55	1.80	4.41	4.24		2.44	0.255	0.030	82.094	Note 3
	15.1	B	Pipe	1"	80	4.55	1.80	4.52	4.39		2.59	0.195	0.015	168.836	Note 3
	15.1	C	Pipe	1"	80	4.55	1.80	4.47	4.47		2.67	0.000	0.008	348.101	
	15.1	D	Pipe	1"	80	4.55	1.80	4.58	4.47		2.67	0.165	0.008	348.101	Note 3
16	16.1	A	Pipe	1"	80	4.55	1.80	4.48	4.49		2.69	-0.015	0.006	467.612	
	16.1	B	Pipe	1"	80	4.55	1.80	4.51	4.59		2.79	-0.120	-0.004	-727.492	Note 1
	16.1	C	Pipe	1"	80	4.55	1.80	4.52	4.44		2.64	0.120	0.011	250.320	Note 3
	16.1	D	Pipe	1"	80	4.55	1.80	4.53	4.34		2.54	0.285	0.020	126.153	Note 3
17	17.1	A	Pipe	1"	80	4.55	1.80	4.48	4.50		2.70	-0.030	0.005	563.220	
	17.1	B	Pipe	1"	80	4.55	1.80	4.41	4.59		2.79	-0.270	-0.004	-727.492	Note 1
	17.1	C	Pipe	1"	80	4.55	1.80	4.31	4.50		2.70	-0.285	0.005	563.220	
	17.1	D	Pipe	1"	80	4.55	1.80	4.55	4.55		2.75	0.000	0.000	#DIV/0!	Note 1
18	18.1	A	Pipe	1"	80	4.55	1.80	4.41	4.70		2.90	-0.436	-0.014	-201.647	
	18.1	B	Pipe	1"	80	4.55	1.80	4.45	4.55		2.75	-0.150	0.000	#DIV/0!	Note 1
	18.1	C	Pipe	1"	80	4.55	1.80	4.45	4.53		2.73	-0.120	0.002	1423.695	
	18.1	D	Pipe	1"	80	4.55	1.80	4.40	4.50		2.70	-0.150	0.005	563.220	
19	19.1	A	Pipe	1"	80	4.55	1.80	4.74	4.35		2.55	0.586	0.019	132.983	Note 3
	19.1	B	Pipe	1"	80	4.55	1.80	4.46	4.43		2.63	0.045	0.012	228.591	Note 3
	19.1	C	Pipe	1"	80	4.55	1.80	4.40	4.39		2.59	0.015	0.015	168.836	
	19.1	D	Pipe	1"	80	4.55	1.80	4.43	4.55		2.75	-0.180	0.000	#DIV/0!	Note 1
20	20.1	A	Pipe	1"	80	4.55	1.80	4.43	4.41		2.61	0.030	0.013	86.881	
	20.1	B	Pipe	1"	80	4.55	1.80	4.39	4.31		2.51	0.120	0.023	109.080	Note 3
	20.1	C	Pipe	1"	80	4.55	1.80	4.33	4.30		2.50	0.045	0.024	55.479	
	20.1	D	Pipe	1"	80	4.55	1.80	4.45	4.39		2.59	0.090	0.015	168.836	Note 3

Note : 1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

ULTRASONIC THICKNESS MEASUREMENT REPORT

Report No. :	IS/B-23-CUI-P-NBL-015		
Line No. :	183-6158-FG-1"-150A1-N		
Date of Test :	10/05/2023		
Page :	28 of 52	Rev.00	

Code : | Rev.: | Effective date :

THICKNESS MEASUREMENT VALUE AND CALCULATION

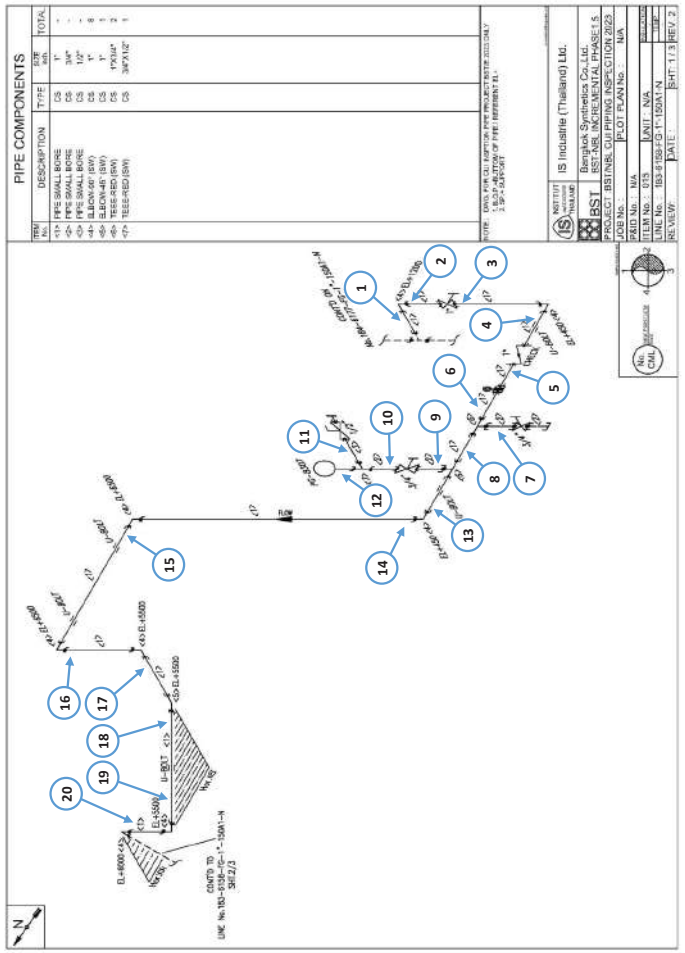
UTM No.	TMLs No.	Point	Part Name	Size (NPS)	SCH / Thk.	$T_{norm.}$ (mm.)	Min. Required Thk.	Thickness Measurement Value			Actual CA (mm.)	ST, CR (mm./ year)	LT, CR (mm./ year)	RL (Year)	Remark
								Date	Date	Date					
								05/10/2022	05/06/2023						
21	21.1	A	Pipe	1"	80	4.55	1.80	4.42	4.27		2.47	0.225	0.027	92.007	Note 3
	21.1	B	Pipe	1"	80	4.55	1.80	4.41	4.24		2.44	0.255	0.030	82.094	Note 3
	21.1	C	Pipe	1"	80	4.55	1.80	4.49	4.49		2.69	0.000	0.006	467.612	
	21.1	D	Pipe	1"	80	4.55	1.80	4.34	4.34		2.54	0.000	0.020	126.153	
22	22.1	A	Pipe	1"	80	4.55	1.80	-	4.40		2.60	-	0.014	180.787	
	22.1	B	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
	22.1	C	Pipe	1"	80	4.55	1.80	-	4.63		2.83	-	-0.008	-368.961	Note 1
	22.1	D	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
23	23.1	A	Pipe	1"	80	4.55	1.80	-	4.36		2.56	-	0.018	140.531	
	23.1	B	Pipe	1"	80	4.55	1.80	-	4.25		2.45	-	0.029	85.178	
	23.1	C	Pipe	1"	80	4.55	1.80	-	4.29		2.49	-	0.025	99.887	
	23.1	D	Pipe	1"	80	4.55	1.80	-	4.30		2.50	-	0.024	104.300	
24	24.1	A	Pipe	1"	80	4.55	1.80	4.54	4.62		2.82	-0.120	-0.007	-420.180	Note 1
	24.1	B	Pipe	1"	80	4.55	1.80	4.40	4.52		2.72	-0.180	0.003	945.653	
	24.1	C	Pipe	1"	80	4.55	1.80	4.23	4.39		2.59	-0.240	0.015	168.836	
	24.1	D	Pipe	1"	80	4.55	1.80	4.50	4.50		2.70	0.000	0.005	563.220	
25	25.1	A	Pipe	1"	80	4.55	1.80	4.58	4.62		2.82	-0.060	-0.007	-420.180	Note 1
	25.1	B	Pipe	1"	80	4.55	1.80	4.41	4.52		2.72	-0.165	0.003	945.653	
	25.1	C	Pipe	1"	80	4.55	1.80	4.56	4.39		2.59	0.255	0.015	168.836	Note 3
	25.1	D	Pipe	1"	80	4.55	1.80	4.51	4.50		2.70	0.015	0.005	179.753	
26	26.1	A	Pipe	1"	80	4.55	1.80	4.43	4.41		2.61	0.030	0.013	86.881	
	26.1	B	Pipe	1"	80	4.55	1.80	4.63	4.26		2.46	0.556	0.028	88.475	Note 3
	26.1	C	Pipe	1"	80	4.55	1.80	4.55	4.47		2.67	0.120	0.008	348.101	Note 3
	26.1	D	Pipe	1"	80	4.55	1.80	4.41	4.48		2.68	-0.105	0.007	399.320	
27	27.1	A	Pipe	1"	80	4.55	1.80	4.36	4.29		2.49	0.105	0.025	99.887	Note 3
	27.1	B	Pipe	1"	80	4.55	1.80	4.30	4.41		2.61	-0.165	0.013	194.445	
	27.1	C	Pipe	1"	80	4.55	1.80	4.40	4.33		2.53	0.105	0.021	119.945	Note 3
	27.1	D	Pipe	1"	80	4.55	1.80	4.43	4.23		2.43	0.300	0.031	79.203	Note 3
28	28.1	A	Pipe	1"	80	4.55	1.80	4.36	4.32		2.52	0.060	0.022	114.277	Note 3
	28.1	B	Pipe	1"	80	4.55	1.80	4.27	4.35		2.55	-0.120	0.019	132.983	
	28.1	C	Pipe	1"	80	4.55	1.80	4.32	4.30		2.50	0.030	0.024	83.219	
	28.1	D	Pipe	1"	80	4.55	1.80	4.33	4.37		2.57	-0.060	0.017	148.917	
29	29.1	A	Pipe	1"	80	4.55	1.80	-	4.61		2.81	-	-0.006	-488.472	Note 1
	29.1	B	Pipe	1"	80	4.55	1.80	-	4.46		2.66	-	0.009	308.264	
	29.1	C	Pipe	1"	80	4.55	1.80	-	4.40		2.60	-	0.014	180.787	
	29.1	D	Pipe	1"	80	4.55	1.80	-	4.51		2.71	-	0.004	706.632	
30	30.1	A	Pipe	1"	80	4.55	1.80	4.70	4.89		3.09	-0.285	-0.033	-94.790	Note 1
	30.1	B	Pipe	1"	80	4.55	1.80	4.79	4.53		2.73	0.391	0.002	1423.695	Note 3
	30.1	C	Pipe	1"	80	4.55	1.80	4.75	4.64		2.84	0.165	-0.009	-329.124	Note 1, 3
	30.1	D	Pipe	1"	80	4.55	1.80	4.56	4.65		2.85	-0.135	-0.010	-297.255	Note 1

Note :
1. Remaining life can't be calculated as measured thickness is equal or greater than the nominal thickness.
2. Remaining Thk. is so much higher than the Min. Required Thk., Remaining life is more than 20 years.
3. Short term corrosion rate is too high, cause shortly period of inspection interval (8 Months).

Report No. :	IS/B-23-CUI-P-NBL-015		
Line No. :	183-6158-FG-1"-150A1-N		
Date of Test :	10/05/2023		
Page :	29 of 52	Rev.00	

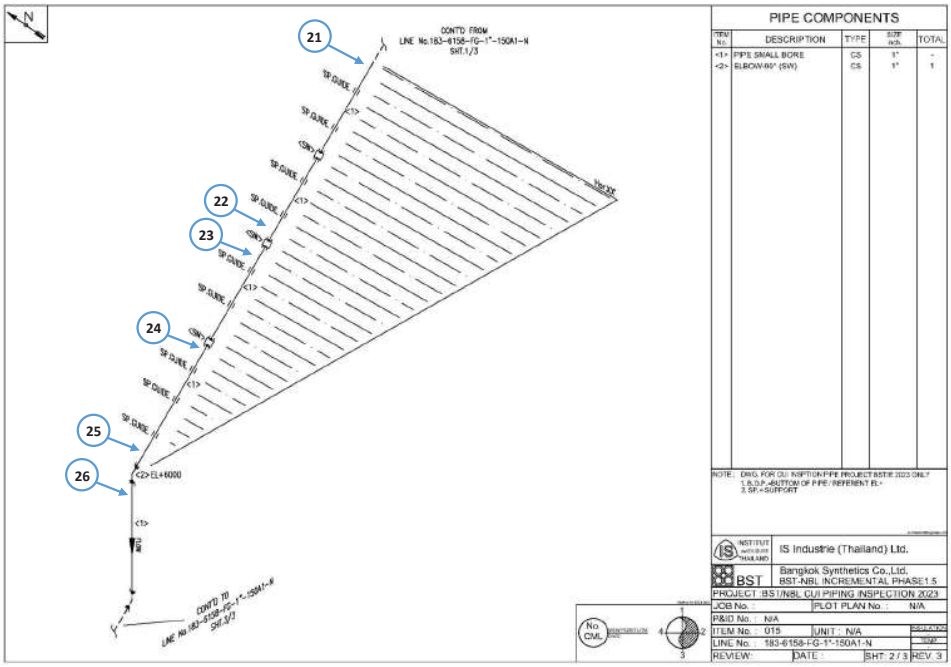
Code : | Rev.: | Effective date :

2D ISO-DRAWING WITH TMLs MARK UP



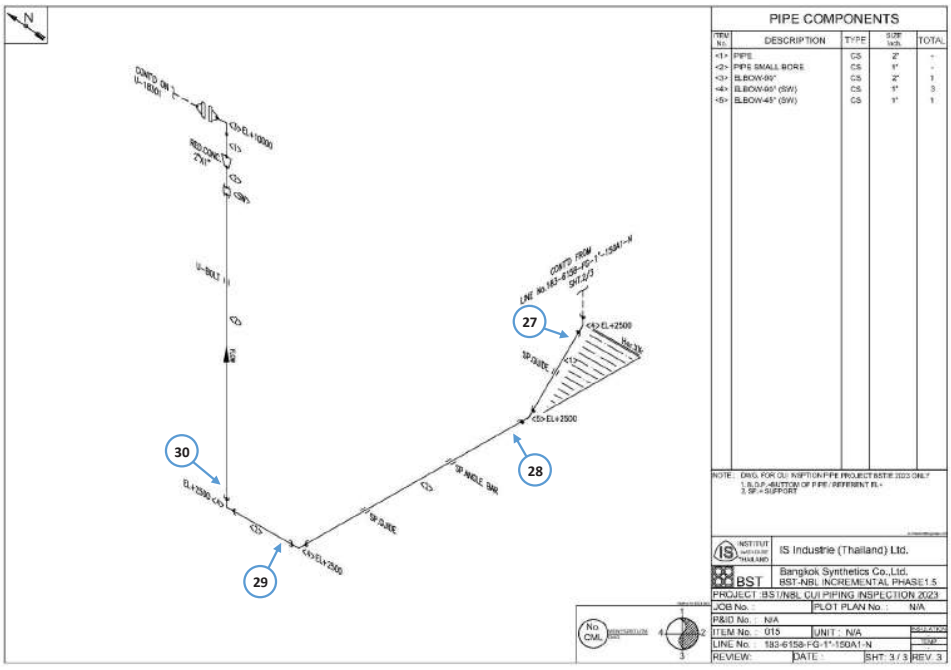
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	30 of 52 Rev.00

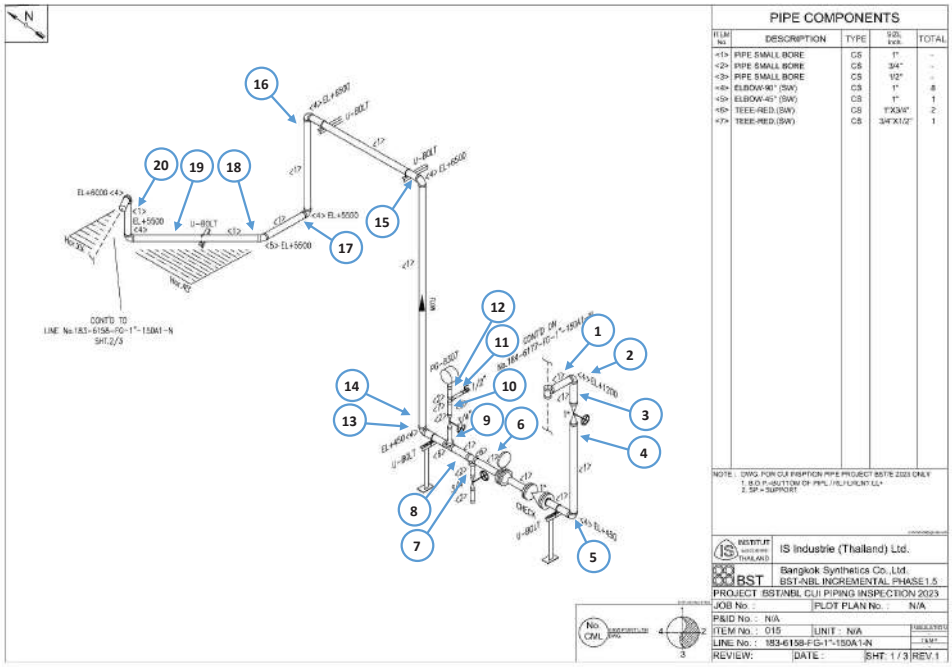


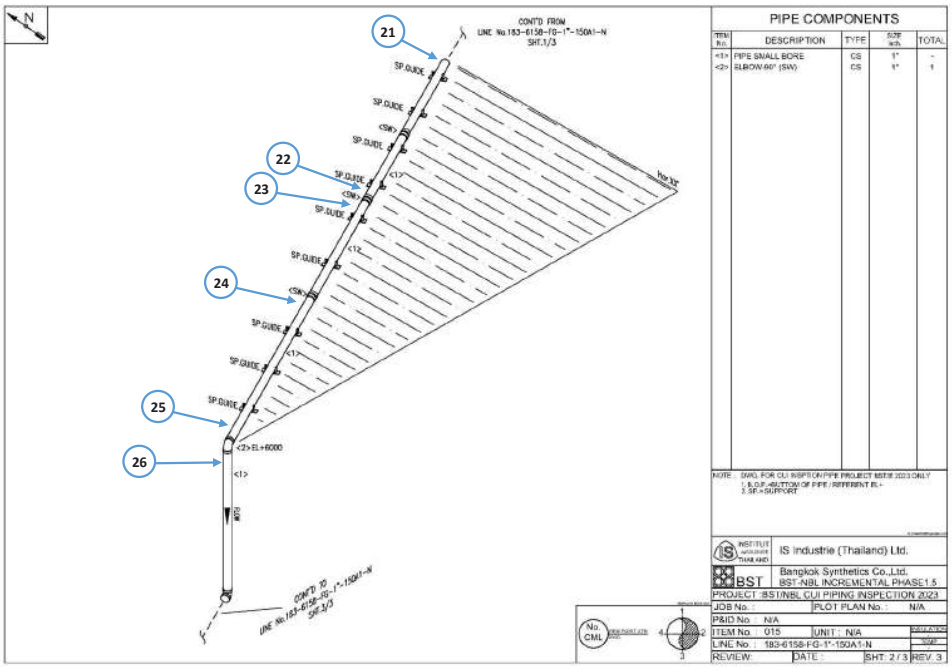
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING WITH TMLs MARK UP**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	31 of 52 Rev.00



THAILAND

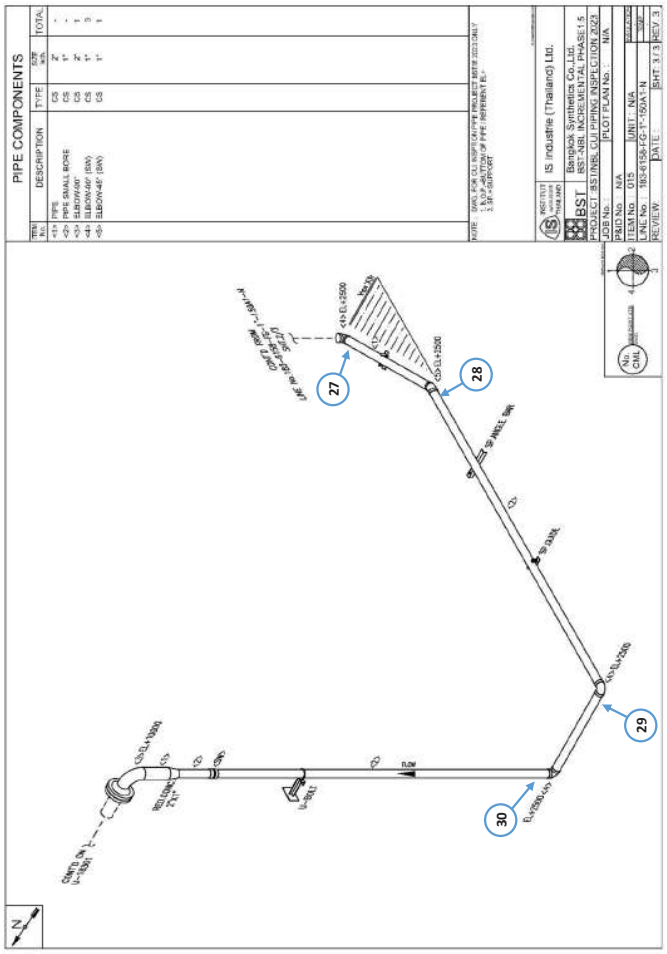

PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> PIPE SMALL BORE CS 3/4" -
<3> PIPE SMALL BORE CS 1/2" -
<6> ELBOW-90° (SW) CS 1" 8
<5> ELBOW-45° (SW) CS 1" 1
<5> TEEE-RED.(SW) CS 1"X3/4" 2
<7> TEEE-RED.(SW) CS 3/4"X1/2" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT. 1 / 3 REV.1


PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE inch | TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-60° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT. 2 / 3 REV. 3

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	34 of 52 Rev.00

3D ISO-DRAWING WITH TMLs MARK UP

Code : Rev.: Effective date :



Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	35 of 52 Rev.00

EDDY CURRENT TESTING SURFACE REPORT

Code : Rev.: Effective date :

CUSTOMER:	BANGKOK SYNTHETICS CO., LTD.
LOCATION / UNIT:	BST SITE # 2 (NBL PLANT)
PROJECT:	NBL CUI Piping Inspection 2023
ITEM DESCRIPTION:	Examination the heat-affected zone and weld.
ACCEPTANCE STANDARD:	ASME V Article 8 Appendix VI / ASME Section VIII Div.1 (2019)
PROCEDURE:	SPR-NDT-EMT-001_Rev.00 - Eddy Current Surface (EMT)

EQUIPMENT &TECHNIQUE			
TEST EQUIPMENT :	NORTECH 600	**PHASE :**	90°
TEST EQUIPMENT S/N :	140007603	**FREQUENCY :**	200 KHz
PROBE TYPE :	Weld Probe	**SENSITIVITY :**	Notch 1 mm = 6 FSH
PROBE S/N :	K14016	**SURFACE CONDITION :**	Weld and Heat Affect Zone
CALIBRATION BLOCK S/N :	IS-ET-03	**COATING THICKNESS :**	N/A
CAL.BLOCK MATERIAL:	Cabon Steel	**COATING EQUIPMENT S/N:**	N/A

OPERATION PARAMETERS							
STATE OF EXAMINATION :	☐ Prepared Edge	☑ As Weld	☐ As Part	☑ Other : HAZ
SURFACE PREPARATION :	☐ Grinding	☐ Machining	☐ Brushing	☐ Other :
LIGHTING TYPE :	☑ Natural light	☐ Artificial light		

PART IDENTIFICATION & INFORMATION			
EQUIPMENT NAME :	Pipeline weldment	**PART FORM :**	Weld and HAZ
DRAWING No. :	N/A	**LINE No.:**	183-6158-FG-1"-150A1-N

SCOPE OF INSPECTION

To the request of Bangkok Synthetics Co., Ltd. (BST CUI Piping inspection 2023 project), IS Industrie (Thailand) ltd performed non-destructive testing using eddy current surface testing method on pipeline. The aim of this inspection is to provide technical assistance in evaluating the condition and integrity of material.

OVERALL SUMMARY RESULT:

Eddy current testing surface not found indications.

REPORT PREPARED		**REVIEWED**		**CLIENT REPRESENTATIVE**	
SIGNATURE :		**SIGNATURE :**		**SIGNATURE :**	
NAME :	**MR. NITIPAT C.**	**NAME :**	**MR. KRISCHANUT S.**	**NAME :**	**MR. NATTA K.**
Position :	**ECT Level II**	**Position :**	**API 570**	**Position :**	**Inspection Engineer**
Date :	**May 10, 2023**	**Date :**	**May 18, 2023**	**Date :**	**May 21, 2023**

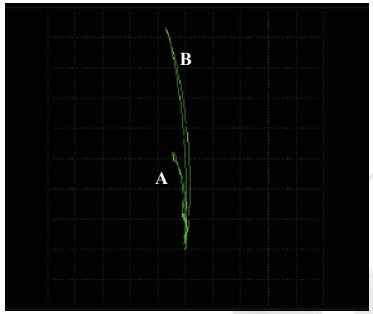
EDDY CURRENT TESTING SURFACE REPORT

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	36 of 52

Code : | Rev.: | Effective date : | Rev.00

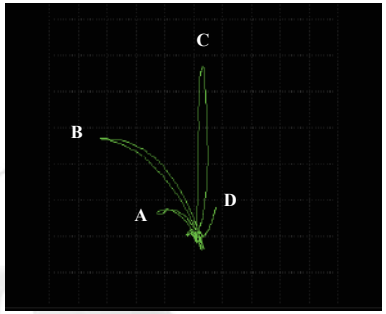
SETUP CALIBRATION

Absolute channel : Surface Signal



Frequency :	500 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.

Absolute channel : Sub-Surface Signal



Frequency :	250 KHz
Absolute Channel Signal A :	Surface Depth 0.5 mm.
Absolute Channel Signal B :	Surface Depth 1.0 mm.
Absolute Channel Signal C :	Sub-Surface Depth 0.1 mm.
Absolute Channel Signal D :	Sub-Surface Depth 0.37 mm.

SENSITIVITY

- Sensitivity surface crack peak 3 FSH of the surface crack signal. = Depth about 0.50 mm.
- Sensitivity surface crack peak 6 FSH of the surface crack signal. = Depth about 1.00 mm.
- Sensitivity surface crack peak over 6 FSH of the surface crack signal. = Depth about over 1.00 mm.

- Sensitivity sub surface crack peak 5 FSH of the surface crack signal. = The depth from the surface about 0.10 mm.
- Sensitivity sub surface crack peak 1 FSH of the surface crack signal. = The depth from the surface about 0.37 mm.

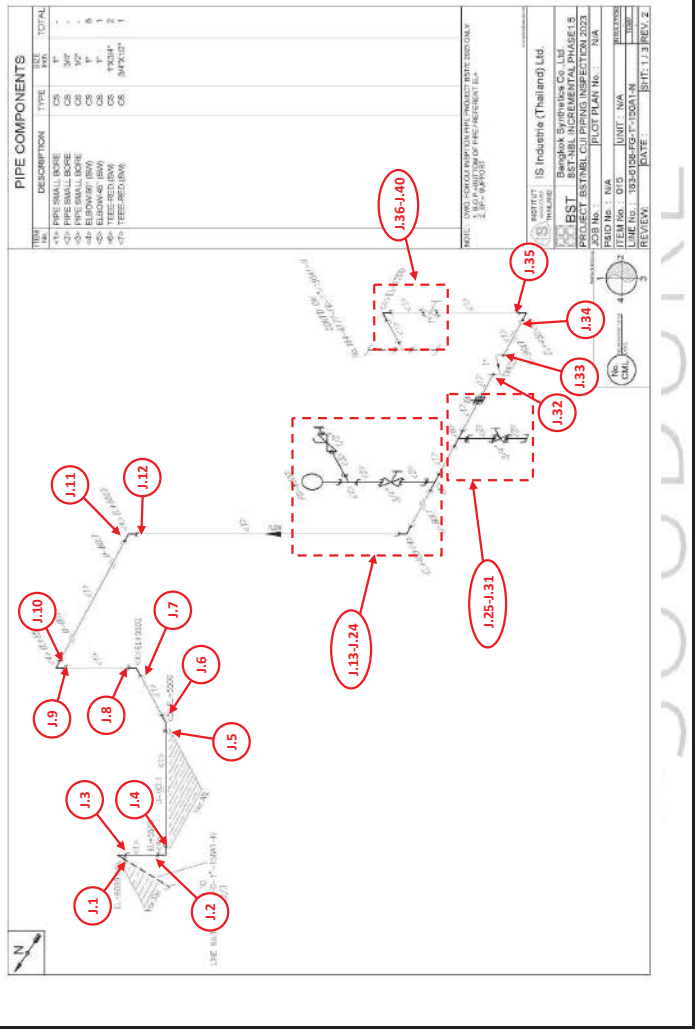
Note : FSH = Full Screen High

INSTITUT de SOUDURE THAILAND

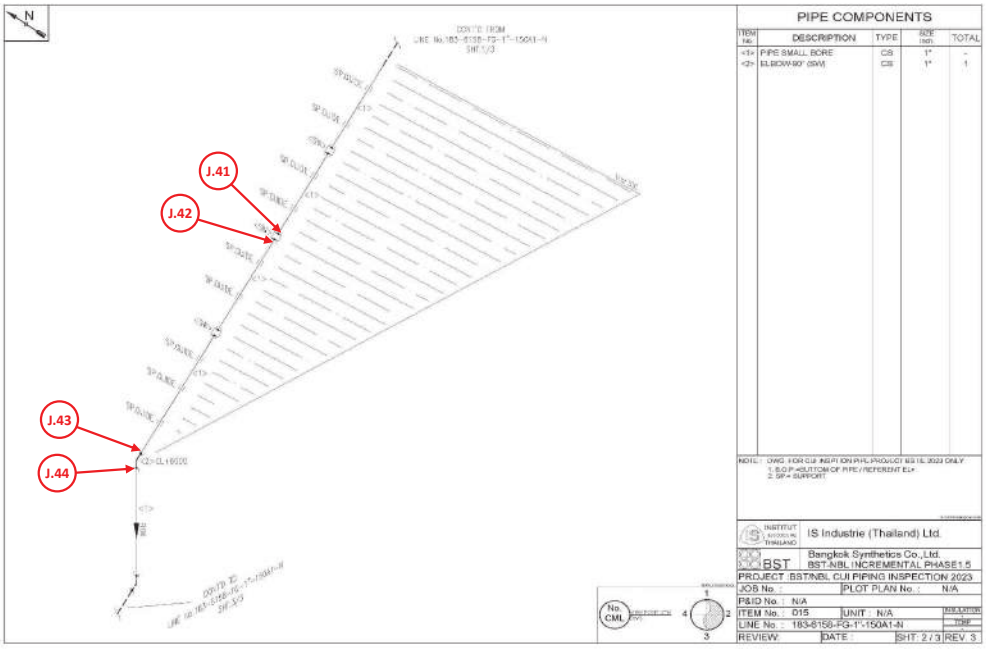
2D ISO-DRAWING WITH WELD JOINT MARK UP

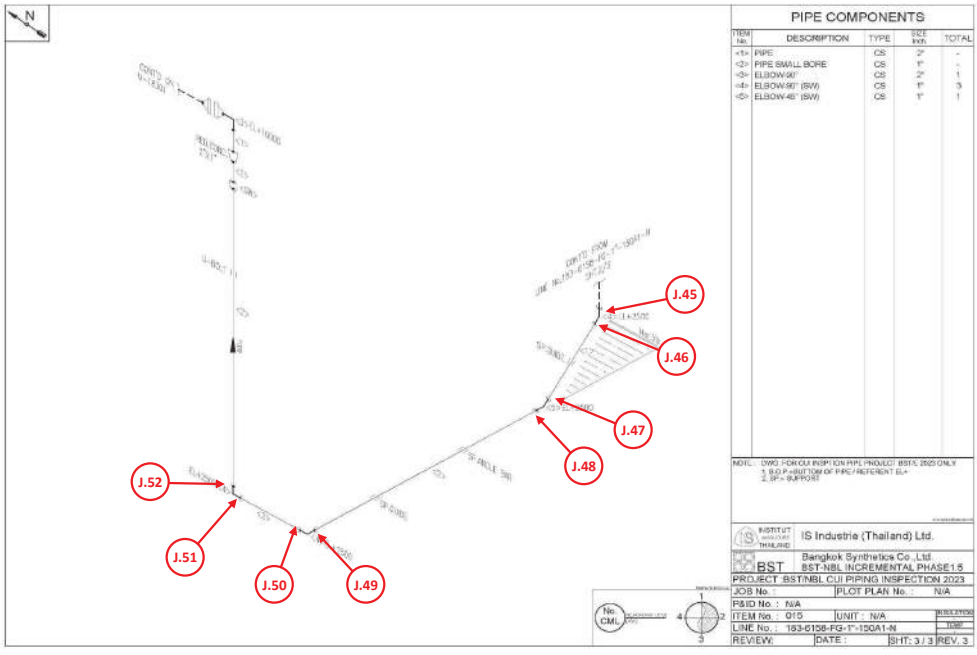
Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	37 of 52

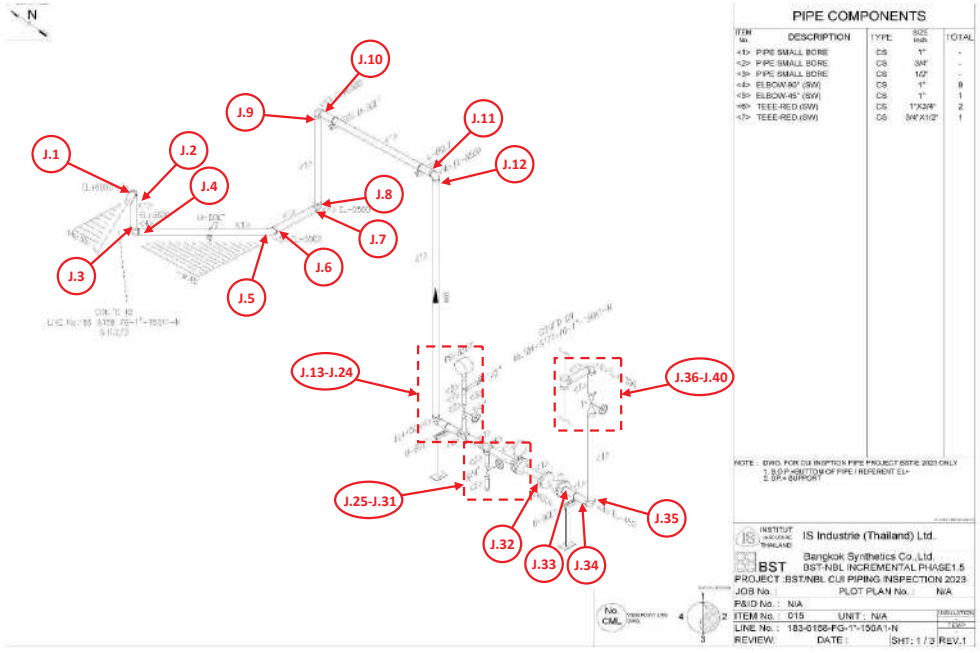
Code : | Rev.: | Effective date : | Rev.00

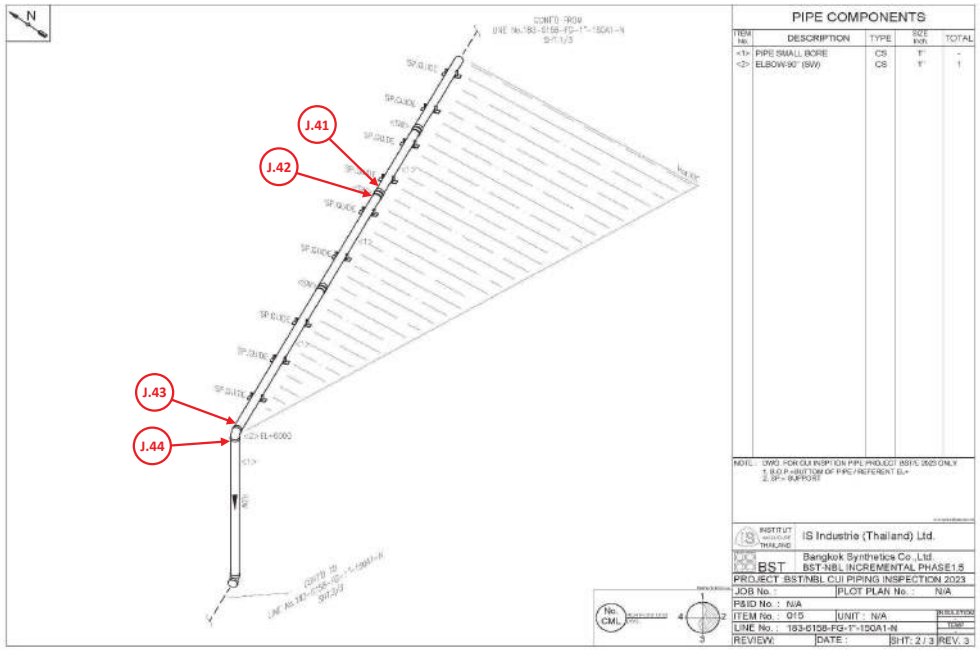


INSTITUT de SOUDURE THAILAND


N
J.41
J.42
J.43
J.44
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE (INCH)
TOTAL
<1> PIPE SMALL BORE CS 1" -
<2> ELBOW-90° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 / 3 REV. 3


N
J.45
J.46
J.47
J.48
J.49
J.50
J.51
J.52
PIPE COMPONENTS
ITEM No.
DESCRIPTION
TYPE
SIZE (INCH)
TOTAL
<1> PIPE CS 2" -
<2> PIPE SMALL BORE CS 1" -
<3> ELBOW-90° CS 2" 1
<4> ELBOW-90° (SW) CS 1" 3
<5> ELBOW-45° (SW) CS 1" 1
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 3 / 3 REV. 3


N
J.1
J.2
J.3
J.4
J.5
J.6
J.7
J.8
J.9
J.10
J.11
J.12
J.13-J.24
J.25-J.31
J.32
J.33
J.34
J.35
J.36-J.40
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> PIPE SMALL BORE | CS | 3/4" | -
<3> PIPE SMALL BORE | CS | 1/2" | -
<4> ELBOW-90° (SW) | CS | 1" | 8
<5> ELBOW-45° (SW) | CS | 1" | 1
<6> TEE-RED (SW) | CS | 1"X3/4" | 2
<7> TEE-RED (SW) | CS | 3/4"X1/2" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIL 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL=
2. SP= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 1 / 3 REV.1


N
J.41
J.42
J.43
J.44
PIPE COMPONENTS
ITEM No. | DESCRIPTION | TYPE | SIZE Inch | TOTAL
<1> PIPE SMALL BORE | CS | 1" | -
<2> ELBOW-90° (SW) | CS | 1" | 1
NOTE : DWG. FOR CUI INSPTION PIPE PROJECT BSTIL 2023 ONLY
1. B.O.P =BUTTOM OF PIPE / REFERENT EL=
2. SP= SUPPORT
IS Industrie (Thailand) Ltd.
Bangkok Synthetics Co.,Ltd.
BST BST-NBL INCREMENTAL PHASE1.5
PROJECT :BST/NBL CUI PIPING INSPECTION 2023
JOB No. : PLOT PLAN No. : N/A
P&ID No. : N/A
ITEM No. : 015 UNIT : N/A
LINE No. : 183-6158-FG-1"-150A1-N
REVIEW: DATE : SHT: 2 / 3 REV. 3

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	42 of 52 Rev.00

Code : Rev.: Effective date :

3D ISO-DRAWING WITH WELD JOINT MARK UP

INSTITUT SOUDURE THAILAND

Report No. :	IS/B-23-CUI-P-NBL-015
Line No. :	183-6158-FG-1"-150A1-N
Date of Test :	10/05/2023
Page :	43 of 52 Rev.00

Code : Rev.: Effective date :

EDDY CURRENT TESTING SURFACE REPORT

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
1	Joint No.1	Weld and HAZ	No indication was found	FW
2	Joint No.2	Weld and HAZ	No indication was found	FW
3	Joint No.3	Weld and HAZ	No indication was found	FW
4	Joint No.4	Weld and HAZ	No indication was found	FW
5	Joint No.5	Weld and HAZ	No indication was found	FW
6	Joint No.6	Weld and HAZ	No indication was found	FW
7	Joint No.7	Weld and HAZ	No indication was found	FW
8	Joint No.8	Weld and HAZ	No indication was found	FW
9	Joint No.9	Weld and HAZ	No indication was found	FW
10	Joint No.10	Weld and HAZ	No indication was found	FW
11	Joint No.11	Weld and HAZ	No indication was found	FW
12	Joint No.12	Weld and HAZ	No indication was found	FW
13	Joint No.13	Weld and HAZ	No indication was found	FW
14	Joint No.14	Weld and HAZ	No indication was found	FW
15	Joint No.15	Weld and HAZ	No indication was found	FW
16	Joint No.16	Weld and HAZ	No indication was found	FW
17	Joint No.17	Weld and HAZ	No indication was found	FW
18	Joint No.18	Weld and HAZ	No indication was found	FW
19	Joint No.19	Weld and HAZ	No indication was found	FW
20	Joint No.20	Weld and HAZ	No indication was found	FW
21	Joint No.21	Weld and HAZ	No indication was found	FW
22	Joint No.22	Weld and HAZ	No indication was found	FW
23	Joint No.23	Weld and HAZ	No indication was found	FW
24	Joint No.24	Weld and HAZ	No indication was found	FW
25	Joint No.25	Weld and HAZ	No indication was found	FW
26	Joint No.26	Weld and HAZ	No indication was found	FW
27	Joint No.27	Weld and HAZ	No indication was found	FW
28	Joint No.28	Weld and HAZ	No indication was found	FW
29	Joint No.29	Weld and HAZ	No indication was found	FW
30	Joint No.30	Weld and HAZ	No indication was found	FW
31	Joint No.31	Weld and HAZ	No indication was found	FW
32	Joint No.32	Weld and HAZ	No indication was found	FW
33	Joint No.33	Weld and HAZ	No indication was found	FW
34	Joint No.34	Weld and HAZ	No indication was found	FW
35	Joint No.35	Weld and HAZ	No indication was found	FW
36	Joint No.36	Weld and HAZ	No indication was found	FW
37	Joint No.37	Weld and HAZ	No indication was found	FW
38	Joint No.38	Weld and HAZ	No indication was found	FW
39	Joint No.39	Weld and HAZ	No indication was found	FW
40	Joint No.40	Weld and HAZ	No indication was found	FW
41	Joint No.41	Weld and HAZ	No indication was found	FW
42	Joint No.42	Weld and HAZ	No indication was found	FW
43	Joint No.43	Weld and HAZ	No indication was found	FW
44	Joint No.44	Weld and HAZ	No indication was found	FW

INSTITUT SOUDURE THAILAND

	EDDY CURRENT TESTING SURFACE REPORT			Report No. :	IS/B-23-CUI-P-NBL-015
				Line No. :	183-6158-FG-1"-150A1-N
				Date of Test :	10/05/2023
	Code :	Rev.:	Effective date :	Page : 44 of 52	Rev.00

INSPECTION POINT				
Items	Descriptions	Test Specified	Result	Remark
45	Joint No.45	Weld and HAZ	No indication was found	FW
46	Joint No.46	Weld and HAZ	No indication was found	FW
47	Joint No.47	Weld and HAZ	No indication was found	FW
48	Joint No.48	Weld and HAZ	No indication was found	FW
49	Joint No.49	Weld and HAZ	No indication was found	FW
50	Joint No.50	Weld and HAZ	No indication was found	FW
51	Joint No.51	Weld and HAZ	No indication was found	FW
52	Joint No.52	Weld and HAZ	No indication was found	FW

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-015
				Line No. :	183-6158-FG-1"-150A1-N
				Date of Test :	10/05/2023
	Code :	Rev.:	Effective date :	Page : 45 of 52	Rev.00

Picture No. 1 : ET result found no indication.

Picture No. 2 : ET result found no indication.

Picture No. 3 : ET result found no indication.

Picture No. 4 : ET result found no indication.

Picture No. 5 : ET result found no indication.

Picture No. 6 : ET result found no indication.

	ECT PICTURE LOG			Report No. :	IS/B-23-CUI-P-NBL-015	
				Line No. :	183-6158-FG-1"-150A1-N	
				Date of Test :	10/05/2023	
	Code :	Rev.:	Effective date :	Page :	46 of 52	Rev.00

Picture No. 7 : ET result found no indication.

Picture No. 8 : ET result found no indication.

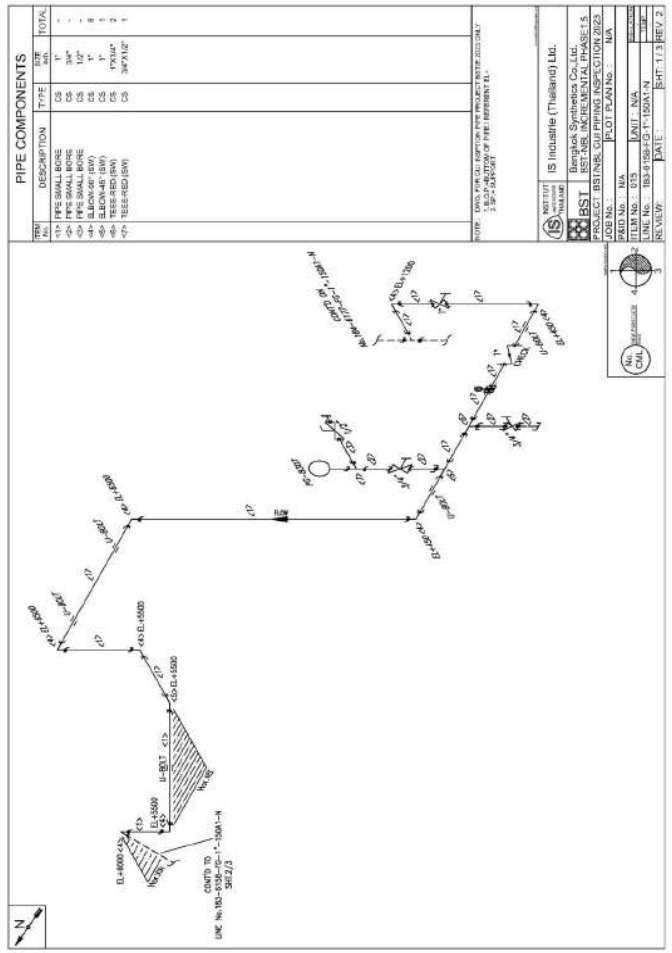
Picture No. 9 : ET result found no indication.

Picture No. 10 : ET result found no indication.

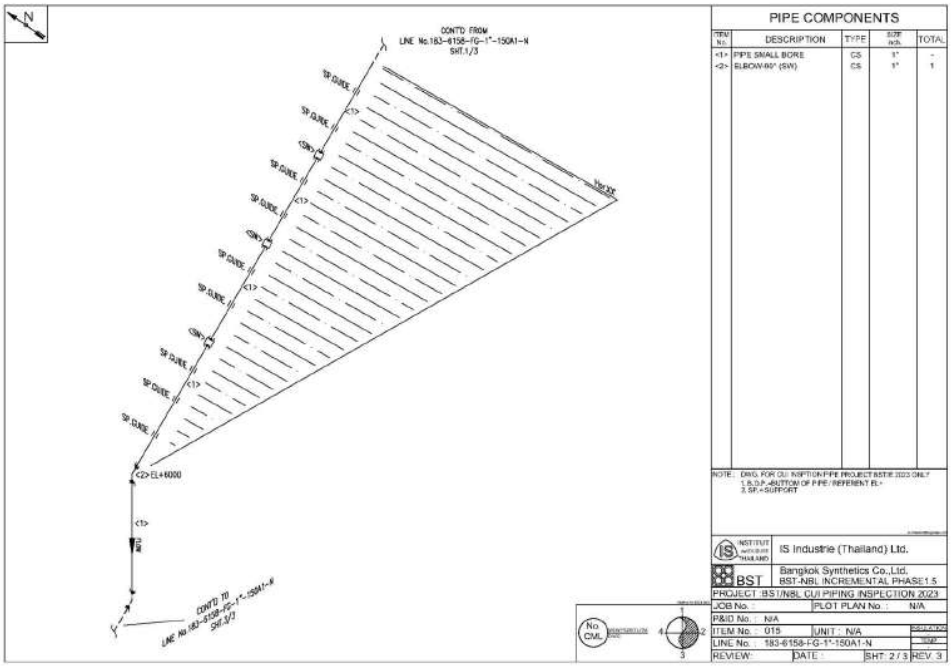
Picture No. 11 : ET result found no indication.

Picture No. 12 : ET result found no indication.

	2D ISO-DRAWING			Report No. :	IS/B-23-CUI-P-NBL-015	
				Line No. :	183-6158-FG-1"-150A1-N	
				Date of Test :	10/05/2023	
	Code :	Rev.:	Effective date :	Page :	47 of 52	Rev.00

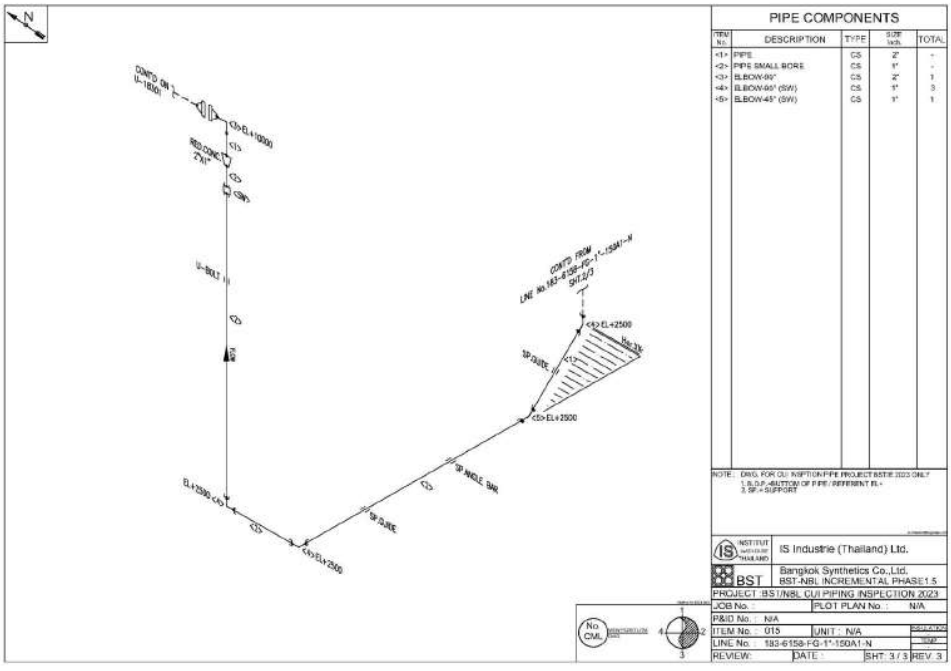


INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	48 of 52 Rev.00



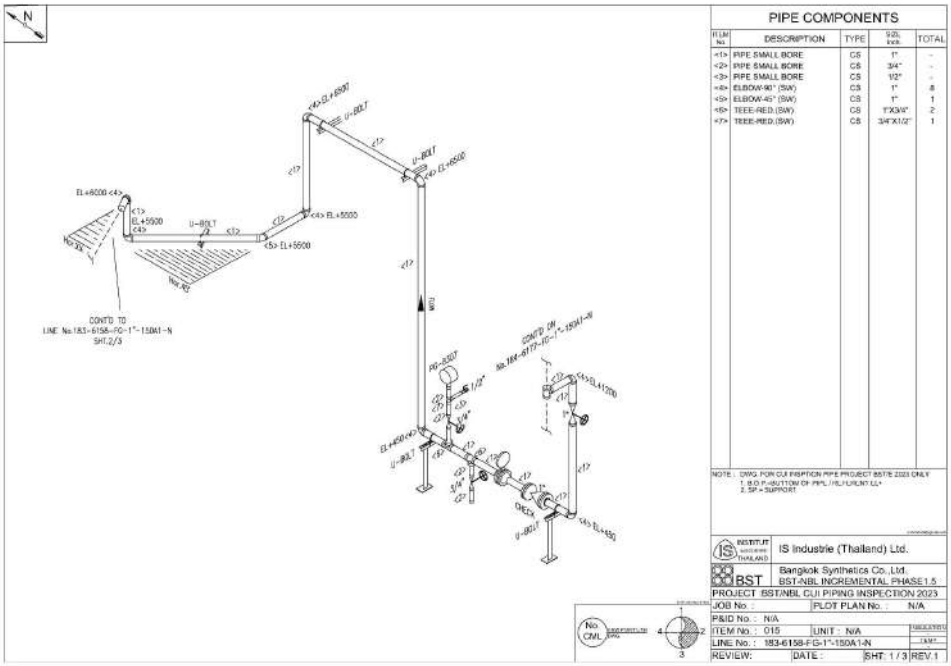
THAILAND

INSTITUT de SOUDURE THAILAND	**2D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
	Code : / Rev.: / Effective date :	Page :	49 of 52 Rev.00



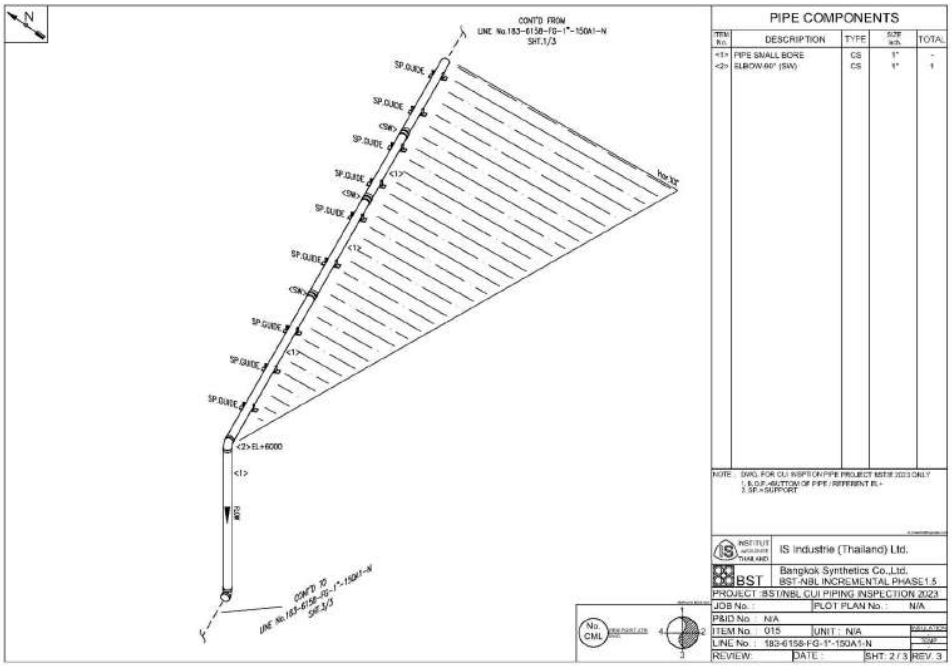
THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 50 of 52 Rev.00

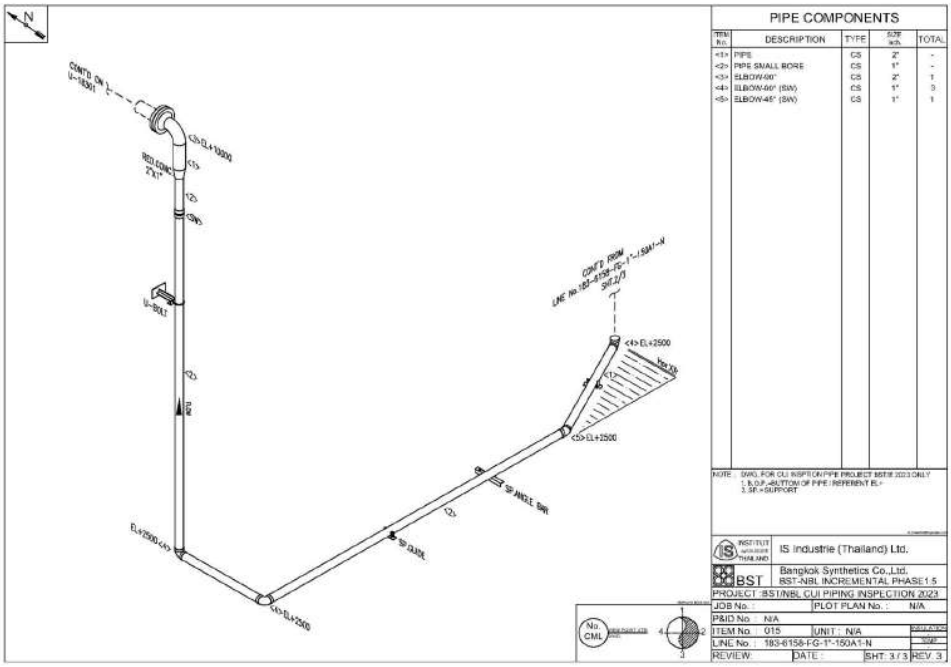


THAILAND

INSTITUT de SOUDURE THAILAND	**3D ISO-DRAWING**	Report No. :	IS/B-23-CUI-P-NBL-015
		Line No. :	183-6158-FG-1"-150A1-N
		Date of Test :	10/05/2023
Code :	Rev.:	Effective date :	Page : 51 of 52 Rev.00



THAILAND



Appendix 1
Inspector Certification

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Dusit TAPO

has successfully passed an examination in

VISUAL TESTING (VT)
Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2016. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	82.5%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	94.0%	70%	1/3
Grade Awarded:	83.8%	80%	

Cert. No. : IS-VT-005-21-004
Date of Issue : 12/03/2021
Date of Expiry : 11/03/2024

IS INDUSTRIE (THAILAND) CO.,LTD.

Mr. Sathish Kumar DONAL
NDT Level III
Cer. No: 245130

Mr. Jodelyn Robin STRAUB
MANAGING DIRECTOR

API INDIVIDUAL CERTIFICATION PROGRAMS

verifies that

krischanut songsawat

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 570 PIPING INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 570**

CERTIFICATION NUMBER 69174

ORIGINAL CERTIFICATION DATE November 30, 2016
CURRENT CERTIFICATION DATE November 30, 2022
EXPIRATION DATE November 30, 2025

Director, Individual Certification Programs

ANAB
ACCREDITED
ISO/IEC 17024
PERSONNEL CERTIFICATION BODY

THIS IS A COPY

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr.Nitipat CHAIWATTANA

has successfully passed an examination in

ULTRASONIC TESTING (UT) Level: II (two)

(A-Scan Thickness Measurement)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	90.0%	70%	1/3
b) Specific	100.0%	70%	1/3
c) Practical	92.0%	80%	1/3
Grade Awarded:	94.0%	80%	

Cert. No. : IS-UT-042-23-012
Date of Issue : 01/2023
Date of Expiry : 01/2028

IS INDUSTRIE (THAILAND) LTD

ASNT NDT Level III W'D ISO 9712

Ms. Darin WONGWATTANASET
NDT Level III
Certificate Number: 230363

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR

INSTITUT de SOUDURE GROUPE

Certificate

This is to certify that examinations have been administered for qualification on behalf of

IS INDUSTRIE (THAILAND) LTD.

Mr. Nitipat CHAIWATTANA

has successfully passed an examination in

EDDY CURRENT TESTING (ET)

Level: II (two)

In accordance with the minimum requirements of the Company's procedure based on the ASNT Recommended Practice No. SNT-TC-1A, 2020. Edition. Personnel Qualification and Certification in Nondestructive Testing.

Examination results are as follows:

	Actual	Pass Min.	Weighted Score.
a) General	85.0%	70%	1/3
b) Specific	75.0%	70%	1/3
c) Practical	93.0%	80%	1/3
Grade Awarded:	84.33%	80%	

Cert. No. : IS-ET-072-22-002
Date of Issue : 12/2022
Date of Expiry : 12/2027

IS INDUSTRIE (THAILAND) LTD

Krisada Kloengpong

Mr. Krisada KLOENGPONG
NDT Level III
Certificate Number: 115061

Mr. JOCELYN, ROBIN STRAUB
MANAGING DIRECTOR