

TOP PROJECT NO. :
CTCI PROJECT NO. :

HAZOP STUDY REPORT EPC MAIN WORK FOR CFP CRUDE OIL TANK PROJECT

FOR FINAL

						<div> Thai Oil Public Company Limited</div>	
						CERTIFIED	
0	Issue For Final					PROJ.	DATE
Z0	Issue For Design					MGR.	
A	Issue For Review						Rev. 0
REV.	DESCRIPTION	BY	CHK.	APPR.	DATE		

วัตถุประสงค์การศึกษาและขอบเขตงาน (Study Objective and Work Scope)

รายชื่อผู้เข้าร่วม (Attendee list)														
No.	Name	Company	Date of attendance											
			1 Mar 23	2 Mar 23	3 Mar 23	4 Mar 23	5 Mar 23	6 Mar 23	7 Mar 23	8 Mar 23	9 Mar 23	10 Mar 23	11 Mar 23	12 Mar 23

เอกสารอ้างอิง (Drawing & Reference)				
No.	Document Name	Drawing No	Document File	Comment
1	node1			
2	node2			

Node List (PID / PFD 11a: NODE Marked)							
No.	Node	Design Intent	Design Conditions	Operating Conditions	Node Boundary	Drawing No	Drawing Page (From-To)

RECCOMENDATION STATUS TRACKING TABLE					
REF.	NODE	RR	Recommendation	Status	Action By (Response & Signature)
1	node1	H	r1	Closed	Dungrat (TOP-XX)
2	node1		r2	Closed	Dungrat (TOP-XX)
3	node1			Closed	Dungrat (TOP-XX)
4	node1			Closed	Dungrat (TOP-XX)
5	node1			Closed	Dungrat (TOP-XX)
6	node1			Closed	Dungrat (TOP-XX)
7	node1			Closed	Dungrat (TOP-XX)
8	node2	M	r1	Open	TOP CMDP-Jaruwat P.
9	node2	L	r2	Open	TOP CMDP-Jaruwat P.
10	node2			Open	TOP CMDP-Jaruwat P.
11	node2			Open	TOP CMDP-Jaruwat P.
12	node2			Open	TOP CMDP-Jaruwat P.
13	node2			Open	TOP CMDP-Jaruwat P.
14	node2			Open	TOP CMDP-Jaruwat P.

Major Accident Event (MAE)			
No.	Node	Causes	Risk Asseessment Matrix (R)
1	node1	x1	H
2	node1	x1	H

Safety Critical Equipment (SCE)	
TBA	

HAZOP STUDY WORKSHEET



Project:	t2	NODE	node2
Design Intent :		System	
Design Conditions:		HAZOP Boundary	
Operating Conditions:			
PFD, PID No. :		Date	

Guide Word	Deviation	Causes	Consequences	CAT	Unmitigated Risk Assessment			Major Accident Event (Y/N)	Existing Safeguards	Mitigated Risk Assessment Matrix			Recommendations	Action No.	Action by
				(P/A/E/R/Q)	S	L	R			S	L	R			
Less/Low Flow	Less of	c1			4	3	H		5400	3	3	M	r1	MDP-Jaruwat P.	
MisdirectedFlow	Misdirected	c2			4	2	M		5400	3	2	L	r2	MDP-Jaruwat P.	
More/HighFlow	More of	c3												MDP-Jaruwat P.	
No Flow	None	c4												MDP-Jaruwat P.	
Reverse Flow	Reverse	c5												MDP-Jaruwat P.	
MLess/Low Pressure	Less of	c6												MDP-Jaruwat P.	
More/High Pressure	More of	c7												MDP-Jaruwat P.	

HAZOP STUDY WORKSHEET



Project:	t2	NODE	node1
Design Intent :		System	
Design Conditions:		HAZOP Boundary	
Operating Conditions:			
PFD, PID No. :		Date	

Guide Word	Deviation	Causes	Consequences	CAT	Unmitigated Risk Assessment			Major Accident Event (Y/N)	Existing Safeguards	Mitigated Risk Assessment Matrix			Recommendations	Action No.	Action by
				(P/A/E/R/Q)	S	L	R			S	L	R			
Less/Low Flow	Less of	x1			4	4	H	Y	ex1	4	3	H	r1	rat (TOP-XX)	
MisdirectedFlow	Misdirected	x2	c1						41				r2	rat (TOP-XX)	
More/HighFlow	More of	x3	c2											rat (TOP-XX)	
No Flow	None	x4	c3											rat (TOP-XX)	
Reverse Flow	Reverse	x5	c4											rat (TOP-XX)	
MLess/Low Pressure	Less of	x6												rat (TOP-XX)	
More/High Pressure	More of	x7												rat (TOP-XX)	

ภาคผนวก ก
ข้อมูลและตารางอ้างอิงสำหรับการประเมินความเสี่ยง
APPENDIX A
PHA -WORKSHEETS

ตารางการประเมินความเสี่ยง (Risk Assessment Matrix (RAM))

	โอกาสในการเกิดความเสี่ยง			
ระดับความรุนแรง	4	3	2	1
4	มากที่สุด 4	มากที่สุด 4	มาก 3	ปานกลาง 2
3	มากที่สุด 4	มาก 3	ปานกลาง 2	ปานกลาง 2
2	มาก 3	ปานกลาง 2	ปานกลาง 2	น้อย 1
1	ปานกลาง 2	ปานกลาง 2	น้อย 1	น้อย 1

Risk Assessment Matrix : 4X4

ကမ္ဘာလုံး - PIDs / PFDs

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	1		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x1		
Cause:			
Consequences:	ex1		
Safeguards:	r1		
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	1		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x2		
Cause:	c1		
Consequences:	41		
Safeguards:	r2		
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x3		
Cause:	c2		
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x4		
Cause:	c3		
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x5		
Cause:	c4		
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x6		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	Dungrat (TOP-XX)	Response By:	Dungrat (TOP-XX)
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	x7		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	1		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c1		
Cause:			
Consequences:	5400		
Safeguards:	r1		
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	1		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c2		
Cause:			
Consequences:	5400		
Safeguards:	r2		
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c3		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c4		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c5		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c6		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP RECOMMENDATION RESPONSE SHEET			
Project Title:t2			
Project No:HAZOP-2023-0000014			
Node:			
Action By:	TOP CMDP-Jaruwat P.	Response By:	TOP CMDP-Jaruwat P.
Action No.	0		
Drawing and Documents	d2 (Resume_Noppawit Yurayatra.pdf)		
Action Description			
Deviation:	c7		
Cause:			
Consequences:			
Safeguards:			
Recommendation:			
Action Response:			
Action Close-out Details	By whom	Signature	Date
Response			
Ownner Approval			

HAZOP Guide Words

Deviations	Guide Word	Process Deviation (Examples of Cause)	Area of Application
Flow			
Less of	Less/Low Flow	Line blockage– filter blockage – fouling in vessels – defective pumps – restrictor or orifice plates –etc.	System
Misdirected	MisdirectedFlow	Flow directed to stream other than intended due to misalignment of valves –etc.	System
More of	More/HighFlow	Increased pumping capacity – reduced delivery head increased suction pressure – static generation under high velocity – pump gland leaks –etc.	System
None	No Flow	Incorrect routing – blockage – burst pipe – large leak – equipment failure (C.V., isolation valve, pump, vessel, etc.) – incorrect pressure differential	System
Reverse	Reverse Flow	Incorrect pressure differential – two-way flow – emergency venting – incorrect operation – in-line spare equipment –etc.	System
Temperature			
Less of	Less/Low Temperature	Ambient conditions – reducing pressure – loss of heating – depressurisation of liquefied gas – Joule Thompson effect – line freezing –etc.	System
Less of	MLess/Low Pressure	Generation of vacuum condition – restricted pump/ compressor suction line – vessel drainage –etc.	System
More of	More/High Pressure	Surge problems (line and flange sizes) – relief philosophy (process / fire etc.) – connection to high pressure system – gas breakthrough (inadequate design)	System
More of	More/High Temperature	Ambient conditions – fire situation – high than normal temperature – fouled cooler tubes – cooling water temperature wrong –cooling water failure	System