

**T-901  
SOFT WATER SUPPLY TANK**

CAPACITY: 750BBL 119m<sup>3</sup>  
DIMENSIONS: 4648mm Dia. x 7315mm H  
DESIGN TEMPERATURE: 180  
DESIGN PRESSURE: ATM

**NOTES**

1. DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.
2. VENT TO BE TRACED & INSULATED
3. HUSKY TO PROVIDE & INSTALL TANK

**Association of Professional Engineers & Geoscientists  
of Saskatchewan**

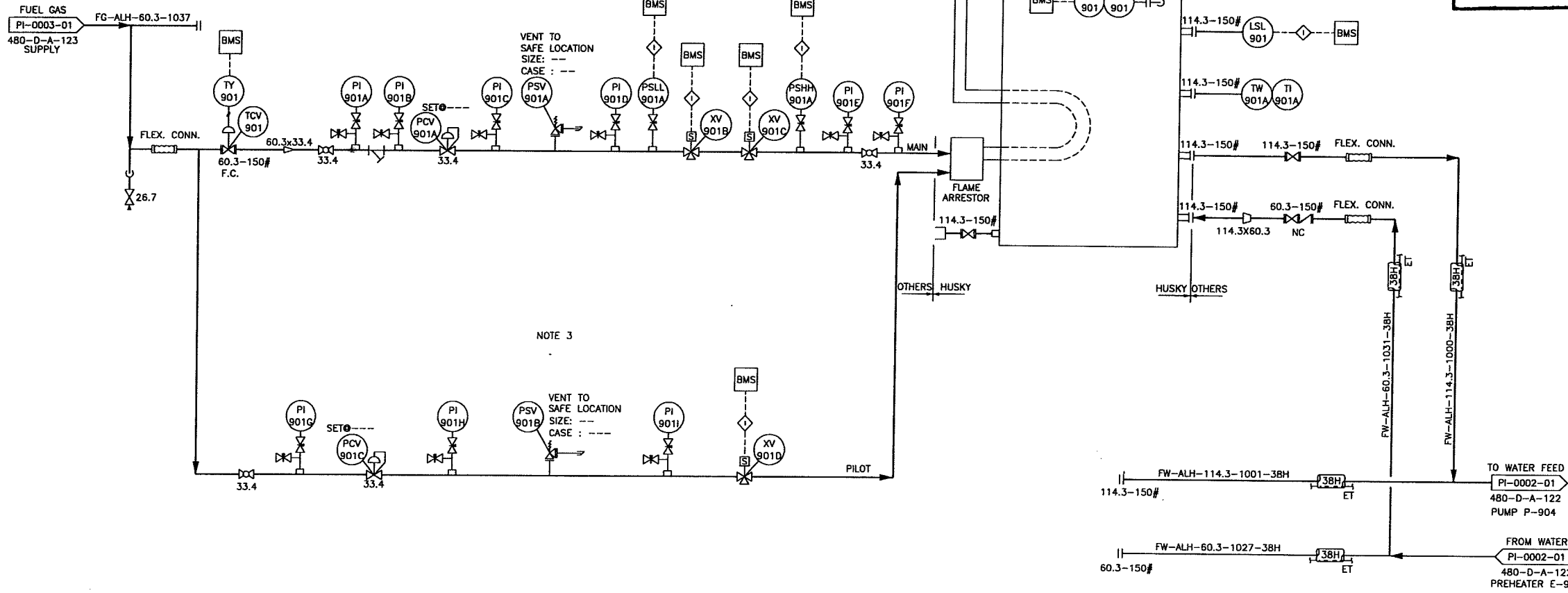
**CERTIFICATE OF AUTHORIZATION**  
**Triumph EPCM Ltd.**  
Number C20153


Permission to Consult held by:

Discipline <i>Mech</i>	Sk. Reg. No. <i>18849</i>	Signature <i>[Signature]</i>
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DETAILS TO BE FINALIZED  
AFTER EQUIPMENT SELECTION

BURNER MANAGEMENT SYSTEM	MUST BE 149.3-10 COMPLIANT
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ENGINEERING COMPANY PERMIT STAMP 	REGISTERED PROFESSIONAL ENGINEER STAMP
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REF	DRAWING NUMBER	DRAWING TITLE				
REFERENCE DRAWINGS						
1E	11-07-15	ISSUED FOR CONSTRUCTION				
1D	11-07-08	ISSUED FOR DESIGN				
1C	11-08-21	ISSUED FOR FINAL APPROVAL				
1B	11-05-04	ISSUED FOR REVIEW/HAZOP				
1A	11-03-30	ISSUED FOR REVIEW (INTERNAL)				
REV	DATE	DESCRIPTION	BY	CHK	ENG	APR

REVISION HISTORY						
1E	11-07-15	ISSUED FOR CONSTRUCTION				
1D	11-07-08	ISSUED FOR DESIGN	LZ	JZ	RD	RD
1C	11-08-21	ISSUED FOR FINAL APPROVAL	LZ	JZ	RD	RD
1B	11-05-04	ISSUED FOR REVIEW/HAZOP	AS	TDR	RD	RD
1A	11-03-30	ISSUED FOR REVIEW (INTERNAL)	AS	TDR	RD	RD

**Husky Oil Operations Limited**

DARSI ENGINEERING **Triumph** EPCM

111/10-04-050-24W3/00 SWB

TITLE  
HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
SOFT WATER SUPPLY TANK T-901  
PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION		10-04-050-24W3
ALTERNATE DWG NUMBER	480-D-A-121	REV NO
HUSKY DWG NUMBER	10-04-050-24W3-PI-0001-01	1E
VENDOR DWG NUMBER	N/A	SCALE
AMU/FLOC NUMBER	-	NTS
DCN NO	PROJECT NO	14898

**T-903  
SOFT WATER RETURN TANK**  
CAPACITY: 750BBL 119m<sup>3</sup>  
DIMENSIONS: 4648mm Dia. x 7315mm H  
DESIGN TEMPERATURE: TBD  
DESIGN PRESSURE: ATM

- NOTES**
1. DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.
  2. VENT TO BE TRACED & INSULATED
  3. HUSKY TO PROVIDE & INSTALL TANK

**Association of Professional Engineers & Geoscientists  
of Saskatchewan**

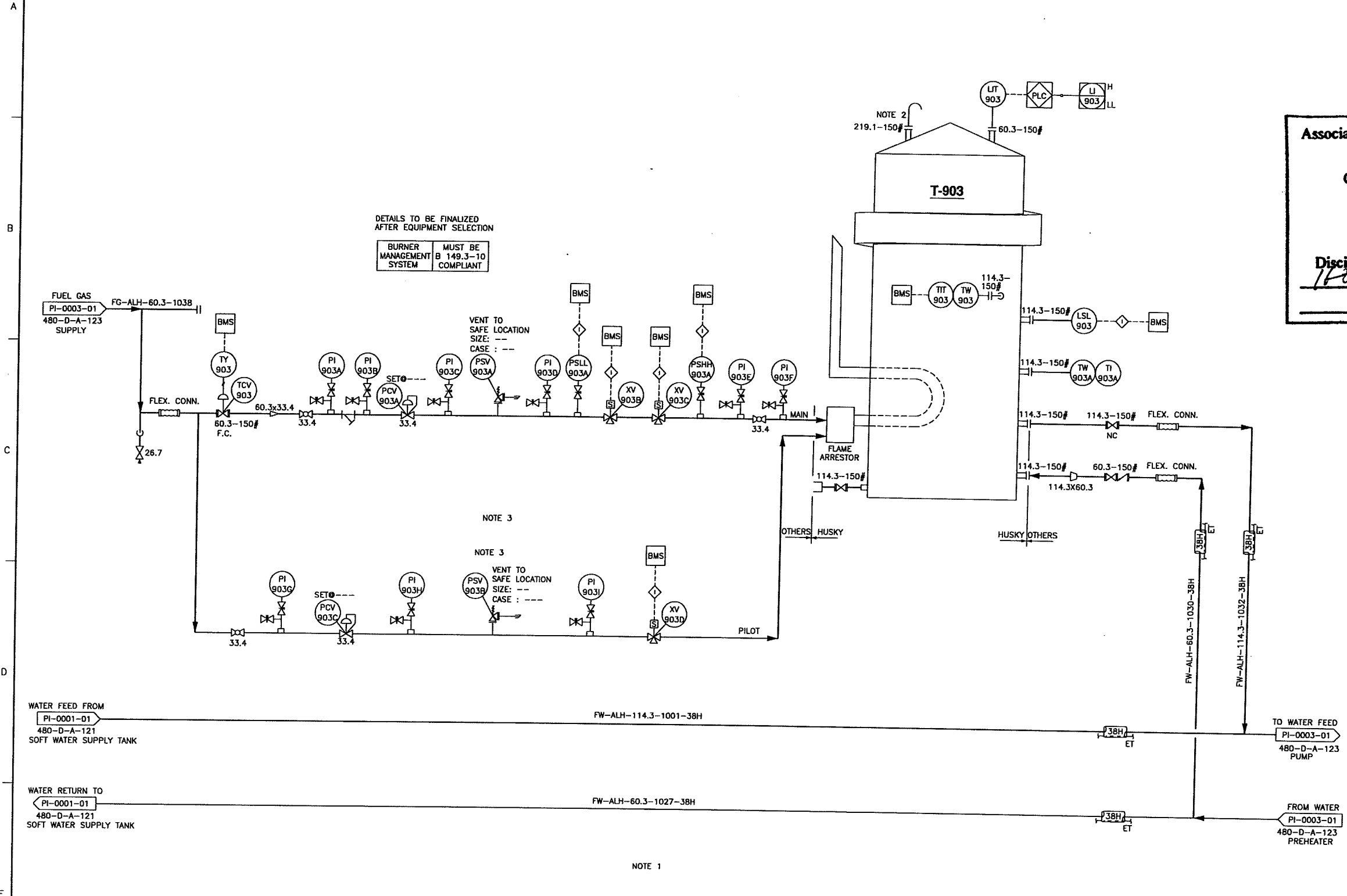
**CERTIFICATE OF AUTHORIZATION**  
**Triumph EPCM Ltd.**  
Number C20153

Permission to Consult held by:

Discipline: 16897Amk Sk. Reg. No. 16096 Signature: [Signature]

DETAILS TO BE FINALIZED  
AFTER EQUIPMENT SELECTION

BURNER MANAGEMENT SYSTEM	MUST BE B 149.3-10 COMPLIANT
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REV	DATE	DESCRIPTION	BY	CHK	ENG	APR

**Husky Oil Operations Limited**

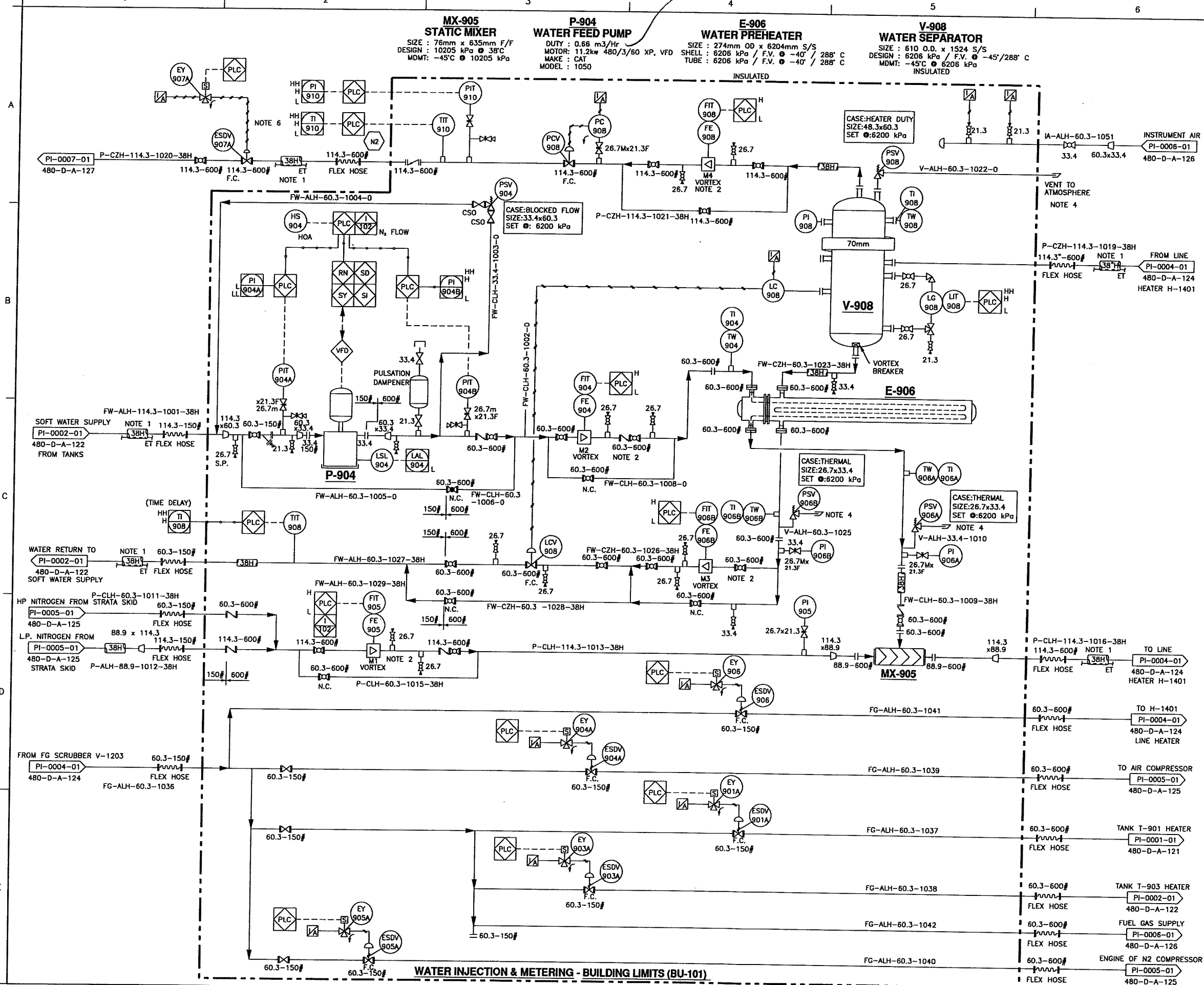
DARSI ENGINEERING Triumph EPCM

111/10-04-050-24W3/00 SWB

TITLE  
HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
SOFT WATER RETURN TANK T-903  
PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION	10-04-050-24W3	
ALTERNATE DWG NUMBER	480-D-A-122	REV NO
HUSKY DWG NUMBER	10-04-050-24W3-PI-0002-01	1E
VENDOR DWG NUMBER	N/A	SCALE
AMU/FLOC NUMBER	-	NTS
DCN NO	PROJECT NO	14898

2.9 USGPM



- NOTES**
- HEAT TRACE OUTSIDE ONLY
  - VORTEX METER REQUIRES 10 DIA. UPSTREAM 5 DIA. DOWNSTREAM.
  - DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.
  - PSV'S TO VENT/DRAIN TO SAFE LOCATION
  - NITROGEN TO FLOW FOR 10 MINUTES PRIOR TO P-904 STARTING
  - ESDV-907A TO BE PROVIDED WITH MANUAL LATCHES
  - FLEX HOSE CONNECTIONS TO BE INSULATED WITH THERMAL BLANKETS

**Association of Professional Engineers & Geoscientists  
of Saskatchewan**

**CERTIFICATE OF AUTHORIZATION**

**Triumph EPCM Ltd.**  
Number C20153

Permission to Consult held by:  
**Discipline** Civil **Sk. Reg. No.** 13786 **Signature** [Signature]

ENGINEERING COMPANY PERMIT STAMP		REGISTERED PROFESSIONAL ENGINEER STAMP	
REF	DRAWING NUMBER	DRAWING TITLE	
REFERENCE DRAWINGS			
1E	11-07-18	ISSUED FOR CONSTRUCTION	[Signature]
1D	11-07-08	ISSUED FOR DESIGN	[Signature]
1C	11-08-21	ISSUED FOR FINAL APPROVAL	[Signature]
1B	11-05-04	ISSUED FOR REVIEW/HAZOP	[Signature]
1A	11-03-30	ISSUED FOR REVIEW (INTERNAL)	[Signature]
REV	DATE	DESCRIPTION	BY

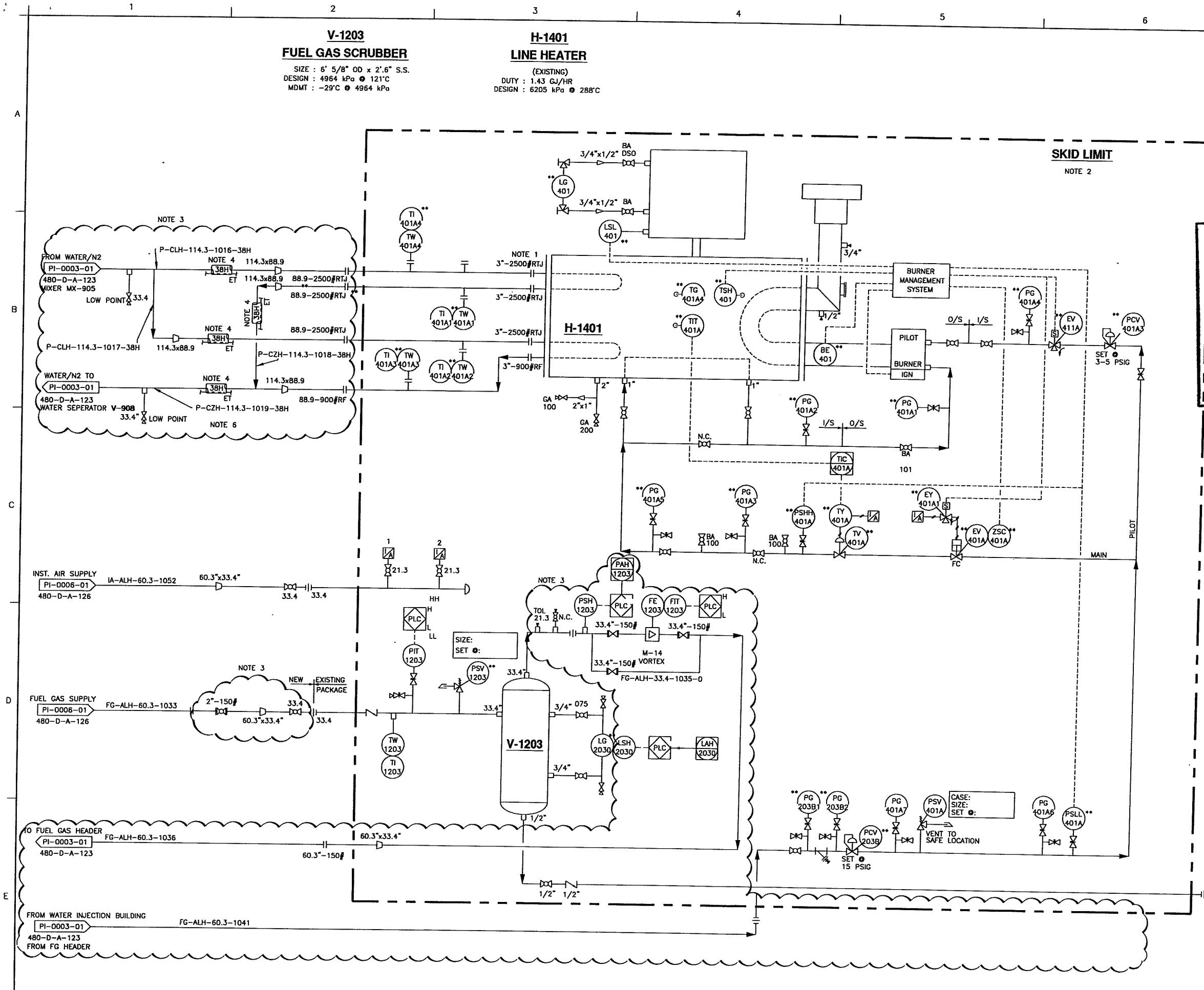
**Husky Oil Operations Limited**

**DARSI ENGINEERING Triumph EPCM**

111/10-04-050-24W3/00 SWB

TITLE  
HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
WATER INJECTION AND METERING PACKAGE  
PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION	10-04-050-24W3	REV NO	
ALTERNATE DWG NUMBER	480-D-A-123	HUSKY DWG NUMBER	10-04-050-24W3-PI-0003-01
VENDOR DWG NUMBER	N/A	HUSKY DWG NUMBER	480-D-A-126
AMU/FLOC NUMBER	-	VENDOR DWG NUMBER	N/A
DCN NO	PROJECT NO	SCALE	NTS
	14898		



- NOTES**
- MATING FLANGES TO MATCH HEATER FLANGES
  - NEW (SURPLUS) HUSKY LINE HEATER PACKAGE
  - TO BE FINALIZED AFTER LOCATION DETERMINED
  - ELECTRIC TRACE OUTSIDE
  - VORTEX METER REQUIRES 10 DIA. UPSTREAM, 5 DIA. DOWNSTREAM
  - \*\* - INCLUDED IN HEATER PACKAGE.
  - DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.

Association of Professional Engineers & Geoscientists  
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**CERTIFICATE OF AUTHORIZATION**  
**Triumph EPCM Ltd.**  
 Number C20153

Permission to Consult held by:

Discipline: *Control* Sk. Reg. No. *13786* Signature: *[Signature]*

ENGINEERING COMPANY PERMIT STAMP

REGISTERED PROFESSIONAL ENGINEER STAMP

**PROFESSIONAL ENGINEER**  
 B.P. SINGH  
 MEMBER 13786  
 11/7/19  
 S.A.S. SASKATCHEWAN

*[Signature]*

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REFERENCE DRAWINGS						
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REV	DATE	DESCRIPTION	BY	CHK	ENG	APR

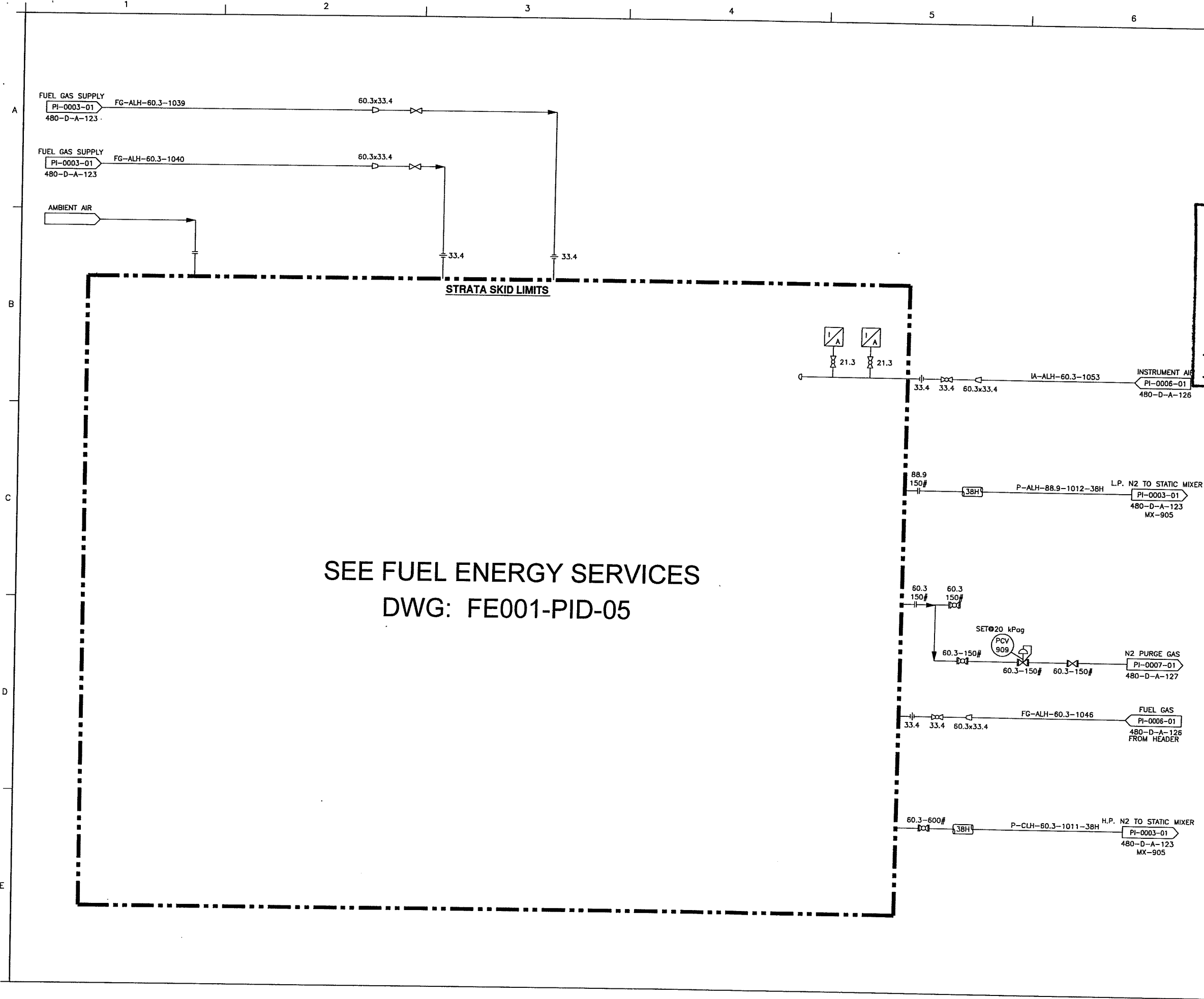
**Husky Oil Operations Limited**

DARSI ENGINEERING **Triumph** EPCM

111/10-04-050-24W3/00 SWB

TITLE  
 HOT WATER VAPOUR PROCESS (HWVP) PILOT PROJECT  
 LINE HEATER H-1401 AND FUEL GAS SCRUBBER V-1203  
 PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION	10-04-050-24W3	
ALTERNATE DWG NUMBER	480-D-A-124	REV NO
HUSKY DWG NUMBER	10-04-050-24W3-PI-0004-01	1E
VENDOR DWG NUMBER	N/A	SCALE
AMU/FLOC NUMBER	-	NTS
DCN NO	PROJECT NO	14898



SEE FUEL ENERGY SERVICES  
DWG: FE001-PID-05

- NOTES**
- SEE VENDOR DRAWING FOR DETAILS OF THE N2 PACKAGE
  - DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.


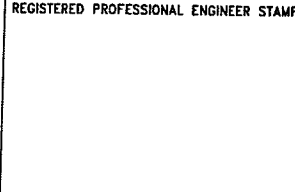
**Association of Professional Engineers & Geoscientists  
of Saskatchewan**

**CERTIFICATE OF AUTHORIZATION**

**Triumph EPCM Ltd.**  
Number C20153

Permission to Consult held by:

Discipline	Sk. Reg. No.	Signature
<i>MECH</i>	<i>16843</i>	<i>[Signature]</i>

ENGINEERING COMPANY PERMIT STAMP	REGISTERED PROFESSIONAL ENGINEER STAMP
	

REF	DRAWING NUMBER	DRAWING TITLE				
REFERENCE DRAWINGS						
1E	11-07-15	ISSUED FOR CONSTRUCTION				
1D	11-07-06	ISSUED FOR DESIGN				
1C	11-06-21	ISSUED FOR FINAL APPROVAL				
1B	11-05-04	ISSUED FOR REVIEW/HAZOP				
1A	11-03-30	ISSUED FOR REVIEW (INTERNAL)				
REV	DATE	DESCRIPTION	BY	CHK	ENG	APR

**Husky Oil Operations Limited**

DARSI ENGINEERING **Triumph** EPCM

111/10-04-050-24W3/00 SWB

TITLE  
HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
NITROGEN UNIT  
PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION 10-04-050-24W3

ALTERNATE DWG NUMBER	480-D-A-125	REV NO	
HUSKY DWG NUMBER	10-04-050-24W3-PI-0005-01	REV NO	1E
VENDOR DWG NUMBER	N/A	SCALE	
AMU/FLOC NUMBER	-	SCALE	NTS

DCN NO PROJECT NO 14898

**INSTRUMENT AIR COMPRESSOR**  
TBD

**GENSET**  
TBD

**UTILITY ROOM BUILDING HEATER**  
TBD

**ELECTRICAL ROOM BUILDING HEATER**  
TBD

**NOTES**

1. DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.
2. ESDV-900A TO BE PROVIDED WITH MANUAL LATCH
3. REGULATOR AND ESDV-900A TO BE TRACED AND INSULATED

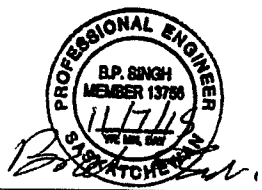
Association of Professional Engineers & Geoscientists  
of Saskatchewan

**CERTIFICATE OF AUTHORIZATION**  
**Triumph EPCM Ltd.**  
Number C20153

Permission to Consult held by:

Discipline *Instrumentation* Sk. Reg. No. *13756* Signature *Ravi Shankar*

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REV	DATE	DESCRIPTION	BY	CHK	ENG	APR

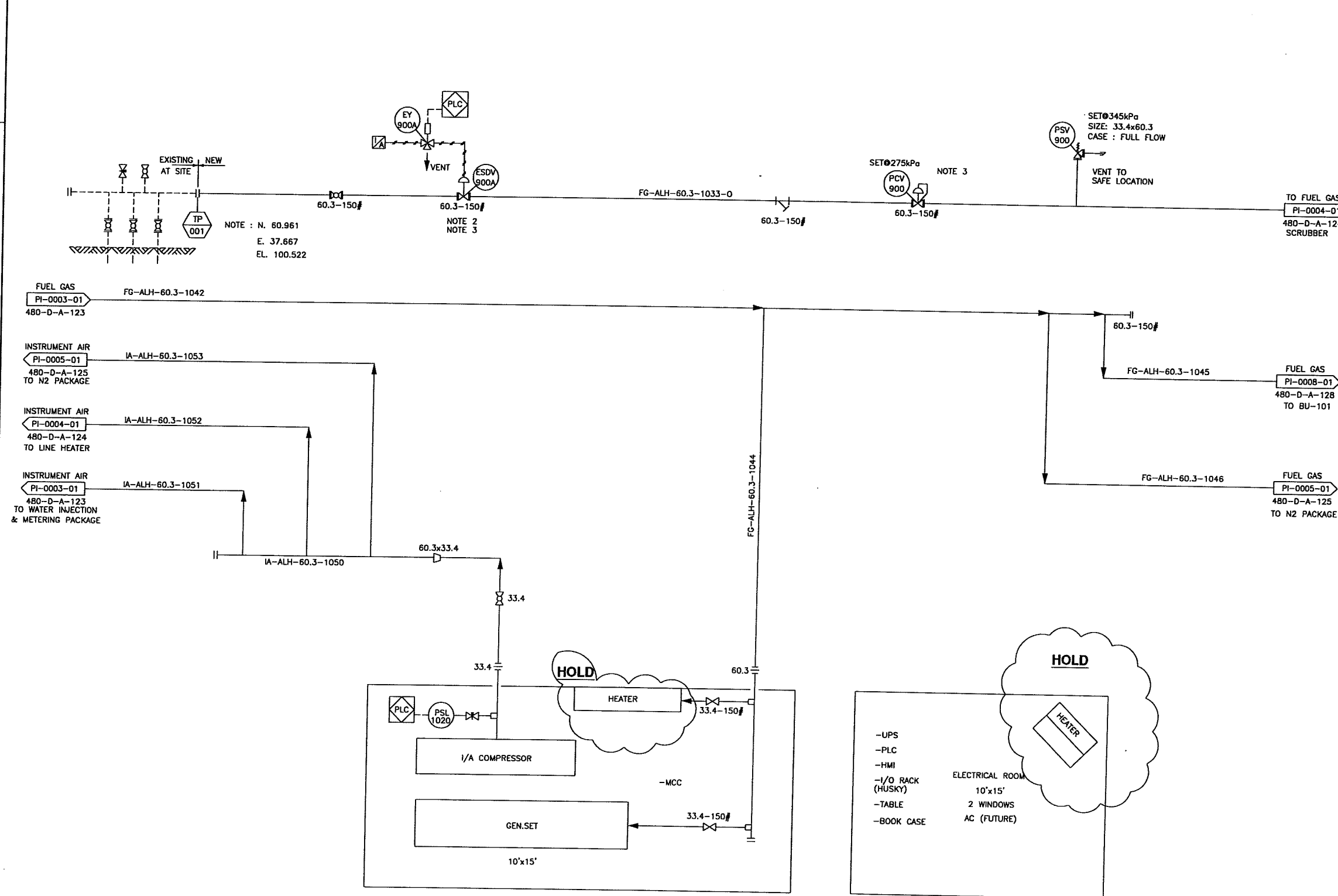
**Husky Oil Operations Limited**

DARSI ENGINEERING Triumph EPCM

111/10-04-050-24W3/00 SWB

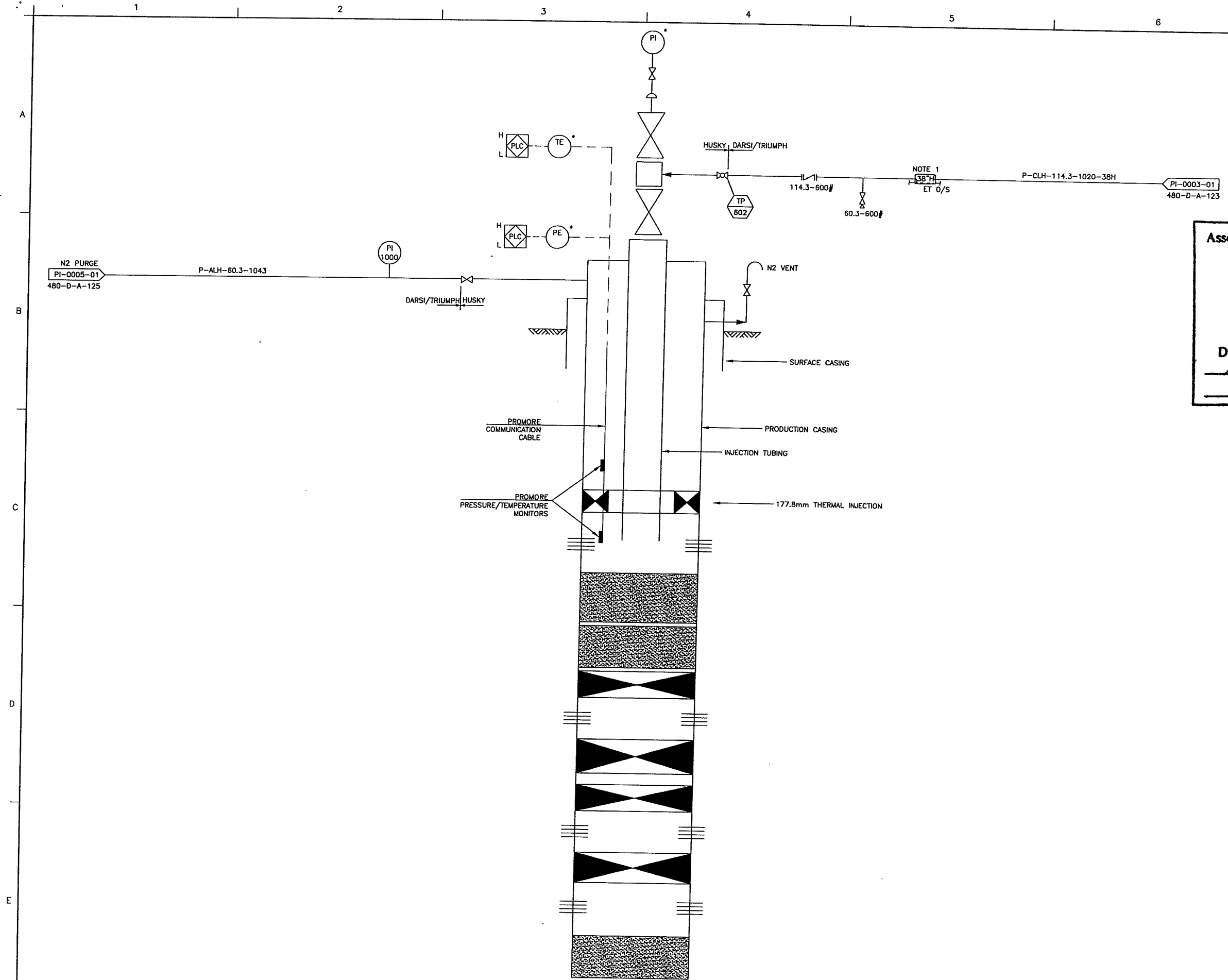
TITLE HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
FUEL GAS GEN.SET ELECTRICAL  
PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION	10-04-050-24W3	REV NO	1E
ALTERNATE DWG NUMBER	480-D-A-126	SCALE	NTS
HUSKY DWG NUMBER	10-04-050-24W3-PI-0006-01	DCN NO	PROJECT NO 14898
VENDOR DWG NUMBER	N/A		
AMU/FLOC NUMBER	-		



**HOLD**

**HOLD**



NOTES  
 1. HEAT TRACE OUTSIDE ONLY.  
 2. DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.  
 \* SUPPLIED BY HUSKY

Association of Professional Engineers & Geoscientists  
 of Saskatchewan  
**CERTIFICATE OF AUTHORIZATION**  
**Triumph EPCM Ltd.**  
 Number C20153  
 Permission to Consult held by:  
 Discipline Mech Sk. Reg. No. 16849 Signature [Signature]

ENGINEERING COMPANY PERMIT STAMP REGISTERED PROFESSIONAL ENGINEER STAMP

**PROFESSIONAL ENGINEER**  
 D.T. HEAVEN  
 MEMBER 16843  
 110715  
 SASKATCHEWAN

REF	DRAWING NUMBER	DRAWING TITLE				
REFERENCE DRAWINGS						
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**Husky Oil Operations Limited**

DARSI ENGINEERING Triumph EPCM

111/10-04-050-24W3/00 SWB

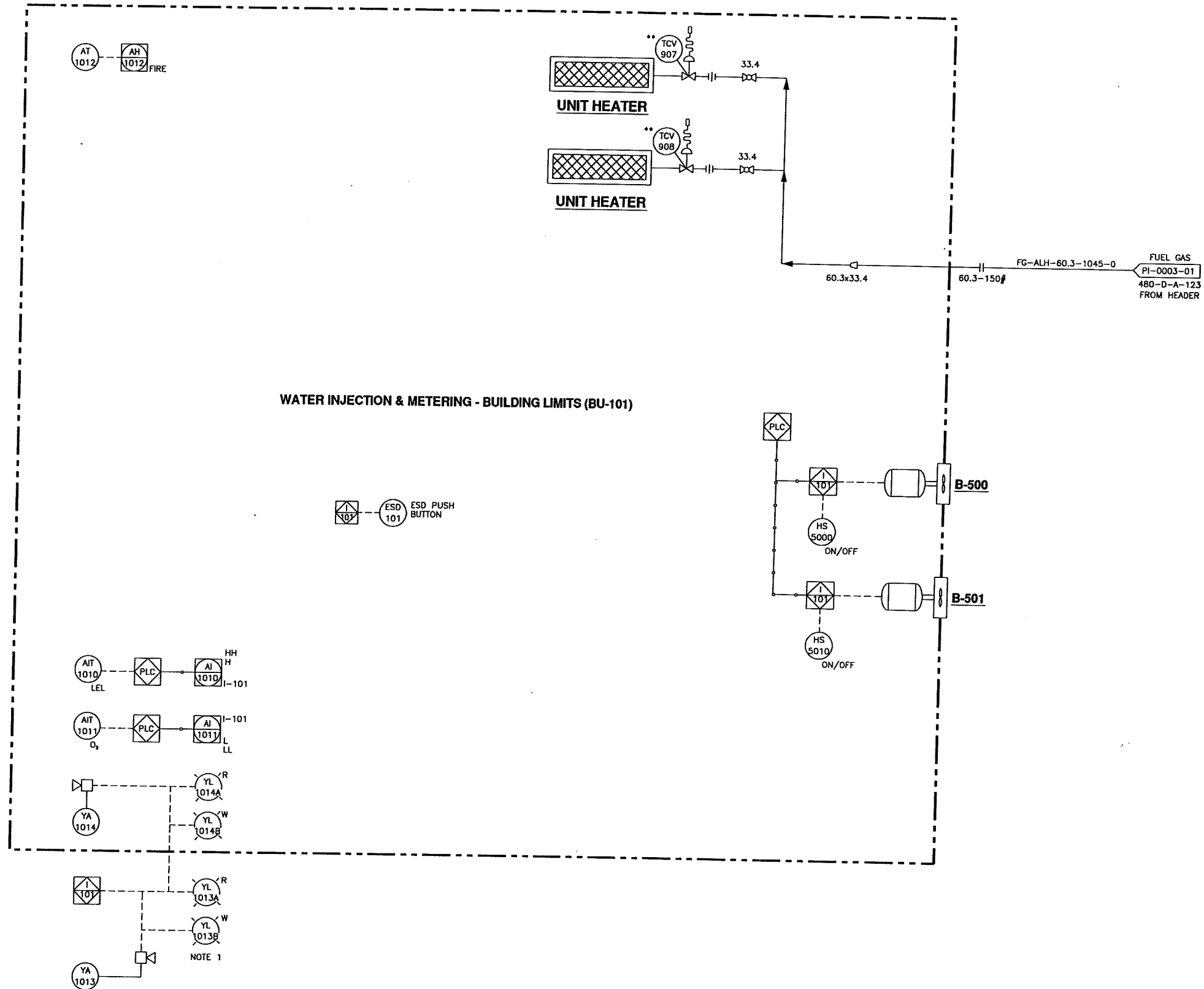
TITLE  
 HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
 WELLBORE  
 PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION 10-04-050-24W3

ALTERNATE DWG NUMBER	480-D-A-127	REV NO	1E
HUSKY DWG NUMBER	10-04-050-24W3-PI-0007-01	SCALE	NTS
VENDOR DWG NUMBER	N/A		
AMU/FLOC NUMBER	-		

DCN NO PROJECT NO 14898

**B-500/501**  
 SIZE: TBD  
 VOLTAGE: TBD



**NOTES**

1. BEACONS & ALARMS TO BE LOCATED OUTSIDE DOOR OF BU-101.
  2. ESD PUSH BUTTON TO BE MOUNTED ON THE OUTSIDE WALL OF THE BUILDING ON THE SAME SIDE AS THE DOOR KNOB.
  3. DRAINS AND VENTS TO BE FIELD LOCATED AT HIGH AND LOW POINTS.
- \*\* INCLUDED WITH UNIT HEATER.

**Association of Professional Engineers & Geoscientists  
 of Saskatchewan**

**CERTIFICATE OF AUTHORIZATION**

**Triumph EPCM Ltd.**  
 Number C20153

Permission to Consult held by:

Discipline <i>Civil</i>	Sk. Reg. No. <i>13786</i>	Signature <i>B. Singh</i>
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REVISION HISTORY

**Husky Oil Operations Limited**

DARSI ENGINEERING      Triumph EPCM

111/10-04-050-24W3/00 SWB

TITLE  
 HOT WATER VAPOUR PROCESS (HWVP) - PILOT PROJECT  
 FIRE, GAS AND ALARM SYSTEM  
 PIPING AND INSTRUMENTATION DIAGRAM

SURFACE LOCATION	10-04-050-24W3	REV NO	
ALTERNATE DWG NUMBER	480-D-A-128	HUSKY DWG NUMBER	1E
HUSKY DWG NUMBER	10-04-050-24W3-PI-0008-01	VENDOR DWG NUMBER	SCALE
VENDOR DWG NUMBER	N/A	AMU/FLOC NUMBER	NTS
DCN NO	PROJECT NO	14898	



ROW	LINE DESIGNATION															REFERENCE		OPERATING CONDITIONS		DESIGN CONDITIONS					FLOW				P&ID REV NUMBER			
	SERVICE	PIPING CLASS	SIZE OD mm	LINE NO	INSULATION		TRACING		SCHEDULE or WT WALL THICKNESS	EXTERNAL COATING INTERNAL LINING NOTE NO	X-RAY	STRESS RELIEF	HARDNESS TESTING	CLEANING NOTE NO	PIPE MATERIAL	DESIGN CODE	ORIGIN	TERMINATION	P&ID DRAWING NUMBER	GENERAL NOTES NO	PRESSURE kPa(g)	TEMPERATURE °C	CODE			TEST		FLOW RATE m³/d (standard if gas)		VELOCITY m/s	PRESSURE DROP kPa/100m	FLUID PHASE (GAS/LIQ)
					THICK mm	TYPE	TYPE	HOLD TEMP °C															PRESSURE kPa(g)	TEMPERATURE °C	MDMT °C	PRESSURE kPa(g)	MEDIUM					
1	FW	ALH	114.3	1000	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	T-901	FW-ALH-114.3-1001-38H	PI-0001-01 480-D-A-121	1			1960	38	-45	2940	WATER				LIQ	1B
2	FW	ALH	114.3	1001	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-114.3-1000-38H	P-904 SUCTION	PI-0001-01 480-D-A-121	1			1960	38	-45	2940	WATER				LIQ	1B
3	FW	CLH	60.3	1002	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	P-904 DISCHARGE	E-906	PI-0003-01 480-D-A123				10210	38	-45	15315	WATER				LIQ	1B
4	FW	CLH	33.4	1003	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-CLH-60.3-1002	PSV-904	PI-0003-01 480-D-A123				10210	38	-45	15315	WATER				LIQ	1B
5	FW	ALH	60.3	1004	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	PSV-904	FW-ALH-114.3-1001-38H	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				LIQ	1B
6	FW	ALH	60.3	1005	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-114.3-1001-38H	FW-CLH-60.3-1006	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				LIQ	1B
7	FW	CLH	60.3	1006	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-60.3-1005	FW-CLH-60.3-1002	PI-0003-01 480-D-A123				10210	38	-45	15315	WATER				LIQ	1B
8	FW	CLH	60.3	1008	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-CLH-60.3-1002	FW-CLH-60.3-1002	PI-0003-01 480-D-A123				10210	38	-45	15315	WATER				LIQ	1B
9	FW	CLH	60.3	1009	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	E-906 OUTLET	MX-905	PI-0003-01 480-D-A123				10210	38	-45	15315	WATER				LIQ	1B
10	V	ALH	33.4	1010	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	PSV-906A	ATMOSPHERE	PI-0003-01 480-D-A123				9838	63	-45	15315	WATER				LIQ	1B
11	P	CLH	60.3	1011	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	NITROGEN COMPRESSOR	P-CLH-114.3-1013-38H	PI-0005-01 480-D-A-125				9038	147	-45	15315	WATER				GAS	1B
12	P	ALH	88.9	1012	38	H	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	NITROGEN RECEIVER	P-CLH-114.3-1013-38H	PI-0005-01 480-D-A-125				1920	49	-45	2940	WATER				GAS	1B
13	P	CLH	114.3	1013	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	P-ALH-88.9-1012-38H	MX-905	PI-0003-01 480-D-A123				10131	43	-45	15135	WATER				GAS	1B
14	P	CLH	60.3	1015	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	P-CLH-114.3-1013-38H	P-CLH-114.3-1013-38H	PI-0003-01 480-D-A123				10131	43	-45	15135	WATER				GAS	1B
15	P	CLH	114.3	1016	38	H	ET	10	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	MX-905	H-1401	PI-0003-01 480-D-A123	1			9964	54	-45	15135	WATER				GAS&LIQ	1B
16	P	CLH	114.3	1017	38	H	ET	10	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	P-CLH-114.3-1016-38H	H-1401	PI-0004-01 480-D-A-124	1			9964	54	-45	15135	WATER				GAS&LIQ	1B
17	P	CZH	114.3	1018	38	H	ET	10	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	H-1401	P-CLH-114.3-1019-38H	PI-0004-01 480-D-A-124	1			8968	190	-29	15135	WATER				GAS&LIQ	1E
18	P	CZH	114.3	1019	38	H	ET	10	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	H-1401	V-908	PI-0004-01 480-D-A-124	1			8968	190	-29	15135	WATER				GAS&LIQ	1E
19	P	CZH	114.3	1020	38	H	ET	10	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	V-908	TP002	PI-0003-01 480-D-A123	1			8968	190	-29	15135	WATER				GAS	1E
20	P	CZH	114.3	1021	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	P-CLH-114.3-1020-38H	P-CLH-114.3-1020-38H	PI-0003-01 480-D-A123				8968	190	-29	15135	WATER				GAS	1E
21	V	ALH	60.3	1022	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	PSV908	ATMOSPHERE	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1B
22	FW	CZH	60.3	1023	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	V-908	E-906	PI-0003-01 480-D-A123				8968	190	-29	15135	WATER				LIQ	1E
23	V	ALH	33.4	1025	-	-	-	-	SCH 80	-	10%	-	HV,210	-	A333 GR 6	B31.3	PSV-906B	ATMOSPHERE	PI-0003-01 480-D-A123				1960	38	-45	15135	WATER				LIQ	1B
24	FW	CZH	60.3	1026	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	E-906 OUTLET	FW-ALH-60.3-1027-38H	PI-0003-01 480-D-A123				8968	38	-29	15135	WATER				LIQ	1E
25	FW	ALH	60.3	1027	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-60.3-1026-38H	HEADER	PI-0003-01 480-D-A123	1			1960	38	-45	2940	WATER				LIQ	1B
26	FW	CZH	60.3	1028	38	H	-	-	SCH 80	-	10%	-	HV,210	-	A106 GR 6	B31.3	FW-CLH-60.3-1026-38H	FW-ALH-60.3-1029-38H	PI-0003-01 480-D-A123				8968	38	-29	15135	WATER				LIQ	1E
27	FW	ALH	60.3	1029	38	H	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-CLH-60.3-1028-38H	FW-ALH-60.3-1027-38H	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				LIQ	1B
28	FW	ALH	60.3	1030	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-60.3-1027-38H	T-903	PI-0002-01 480-D-A-122	1			1960	38	-45	2940	WATER				LIQ	1B
29	FW	ALH	60.3	1031	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FW-ALH-60.3-1027-38H	T-901	PI-0001-01 480-D-A-121	1			1960	38	-45	2940	WATER				LIQ	1B
30	FW	ALH	114.3	1032	38	H	ET	10	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	T-903	FW-ALH-114.3-1001-38H	PI-0002-01 480-D-A-122	1			1960	38	-45	2940	WATER				LIQ	1B
31	FG	ALH	60.3	1033	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	TP001	V-1203	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1B
32	FG	ALH	60.3	1035	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	FG-ALH-60.3-1036	FG-ALH-60.3-1036	PI-0004-01 480-D-A-124				1960	38	-45	2940	WATER				GAS	1B
33	FG	ALH	60.3	1036	-	-	-	-	STD	-	10%	-	HV,210	-	A333 GR 6	B31.3	V-1203	HEADER	PI-0004-01 480-D-A-124				1960	38	-45	2940	WATER				GAS	1B

REV	REV DATE	BY	CHK	ENG	APR
1	July 19 / 2011	JFC	JZ	BS	[Signature]

NOTES:  
1. HEAT TRACE OUTSIDE ONLY

PROFESSIONAL ENGINEER  
B.P. SINGH  
MEMBER 13756

111/10-04-050-24W3/00 SWB  
BMS 00/3W3/050-24W3/00

**Husky Oil Operations Limited**

DARSI ENGINEERING  
Triumph EPCM

10-04-050-24W3-0001-01

MECHANICAL LINE LIST

Association of Professional Engineers & Geoscientists

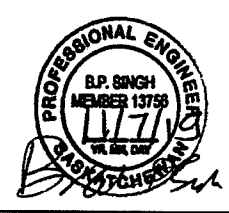
Triumph EPCM Ltd.  
BMS 00/3W3/050-24W3/00

10-04-050-24W3

ROW	LINE DESIGNATION																REFERENCE		OPERATING CONDITIONS		DESIGN CONDITIONS					FLOW RATE m <sup>3</sup> /d (standard if gas)	VELOCITY m/s	PRESSURE DROP kPa/100m	FLUID PHASE (GAS/LIQ)	1P&ID REV NUMBER						
	SERVICE	PIPING CLASS	SIZE OD mm	LINE NO	INSULATION		TRACING		SCHEDULE or WT WALL THICKNESS	EXTERNAL COATING INTERNAL LINING NOTE NO	X-RAY	STRESS RELIEF	HARDNESS TESTING	CLEANING NOTE NO	PIPE MATERIAL	DESIGN CODE	ORIGIN	TERMINATION	P&ID DRAWING NUMBER	GENERAL NOTES NO	PRESSURE kPa(g)	TEMPERATURE °C	CODE								TEST					
					THICK mm	TYPE	TYPE	HOLD TEMP °C															PRESSURE kPa(g)	TEMPERATURE °C	MDMT °C						PRESSURE kPa(g)	MEDIUM				
34	FG	ALH	60.3	1037	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	T-901	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
35	FG	ALH	60.3	1038	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	T-903	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
36	FG	ALH	60.3	1039	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	AIR COMPRESSOR	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
37	FG	ALH	60.3	1040	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	N2 COMPRESSOR	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
38	FG	ALH	60.3	1041	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	LINE HEATER	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
39	FG	ALH	60.3	1042	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	FG-ALH-60.3-1036	HEADER	PI-0003-01 480-D-A123				1960	38	-45	2940	WATER				GAS	1C				
40	FG	ALH	60.3	1043	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	NITROGEN PACKAGE	WELLBORE	PI-0005-01 480-D-A-125				1960	38	-45	2940	WATER				GAS	1C				
41	FG	ALH	60.3	1044	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	HEADER	UTILITIES BUILDING	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
42	FG	ALH	60.3	1045	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	HEADER	BU-101	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
43	FG	ALH	60.3	1046	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	HEADER	NITROGEN PACKAGE	PI-0005-01 480-D-A-125				1960	38	-45	2940	WATER				GAS	1C				
44																																				
45																																				
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47	IA	ALH	60.3	1050	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	INSTRUMENT AIR COMPRESSOR	HEADER	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
48	IA	ALH	60.3	1051	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	IA-ALH-60.3-1050	WATER INJECTION PACKAGE	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
49	IA	ALH	60.3	1052	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	IA-ALH-60.3-1050	LINE HEATER	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
50	IA	ALH	60.3	1053	-	-	-	-	STD	-	10%	-	HV <sub>2</sub> 210	-	A333 GR6	B31.3	IA-ALH-60.3-1050	NITROGEN PACKAGE	PI-0006-01 480-D-A-126				1960	38	-45	2940	WATER				GAS	1C				
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REV	REV DATE	BY	CHK	BS	APR
1	July 19 / 2011	JD	JR	BS	APR

NOTES:  
1. HEAT TRACE OUTSIDE ONLY



**Association of Professional Engineers and Geoscientists of Saskatchewan**

**Husky Oil Operations Limited**

**CERTIFICATE OF AUTHORIZATION**

**Triumph EPCM Ltd.** DARS ENGINEERING **Triumph EPCM**

Number C20153

Permission to Consult held by: **DARS ENGINEERING**

Discipline: **MECHANICAL** Sk. Reg. No. **13758**

Signature: *[Signature]*

DATE: **10-04-050-24W3-LL-0001-01**

SURFACE LSD: **10-04-050-24W3**