



**HERVE
BARON**

The execution of a Complex Project...

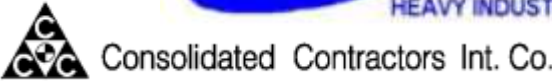
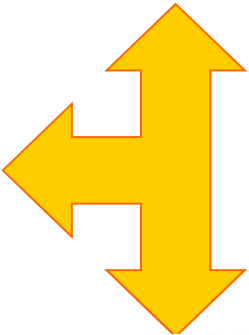
A guided tour

The actors

The suppliers

The
COMPANY
"Client"

The EPC
Contractor



The sub-contractors

The phases



Sanction

Sanction

Conceptual evaluation
+ Pre-Project
By COMPANY

Basic Engineering
By ENGINEERING

Project Execution
by EPC CONTRACTOR

Design



Procurement



Manufacturing



Shipping



Installation



Construction & erection



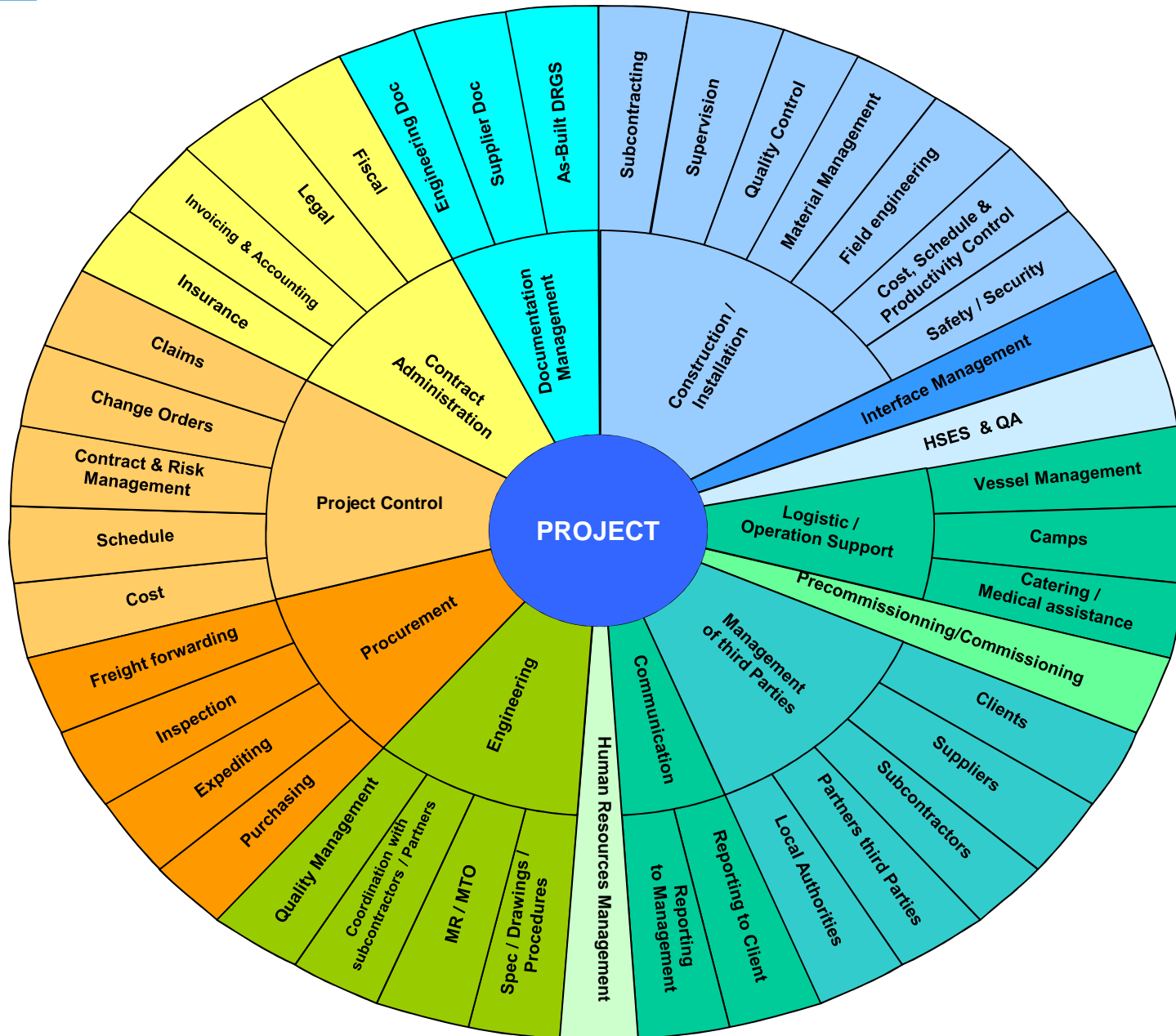
Inspection & tests



Hand-over

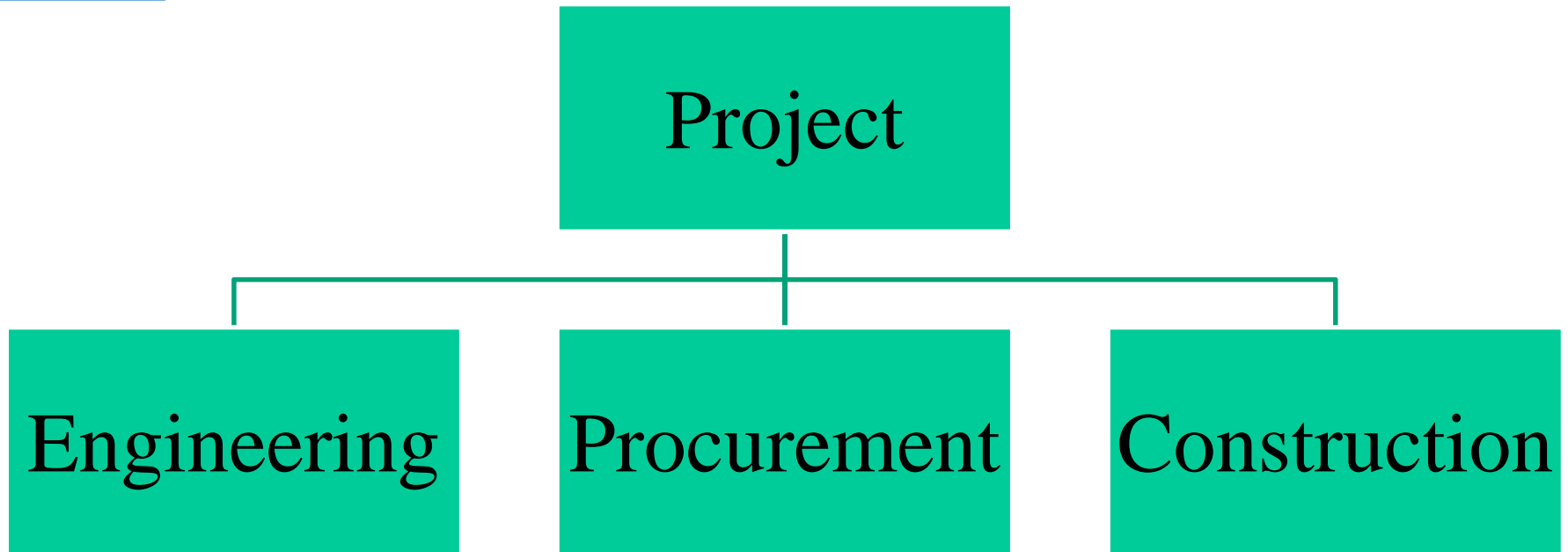


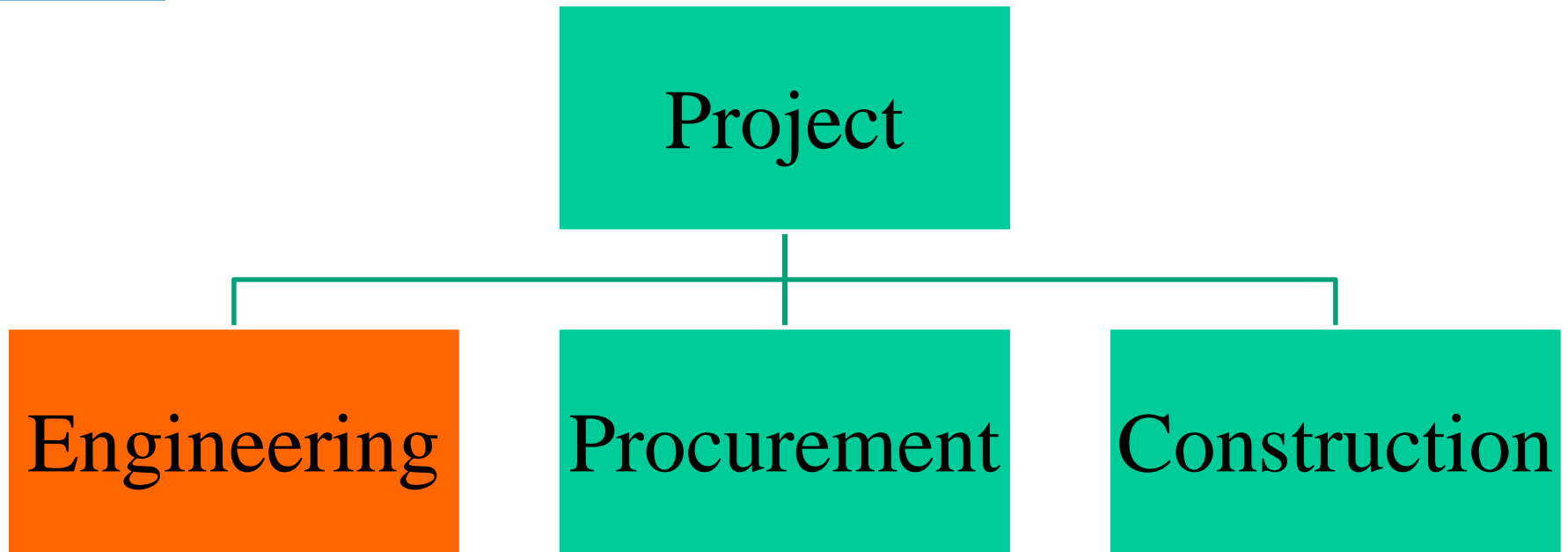
The multiple sides of a Project



The multiple sites of a Project







The facilities design basis

Process facilities:

Feedstock and products flow

Feedstock composition

Battery limit conditions

Equipment Spare

Performance:

Products specifications

Energy efficiency, emissions

Utilities:

Electric power supply

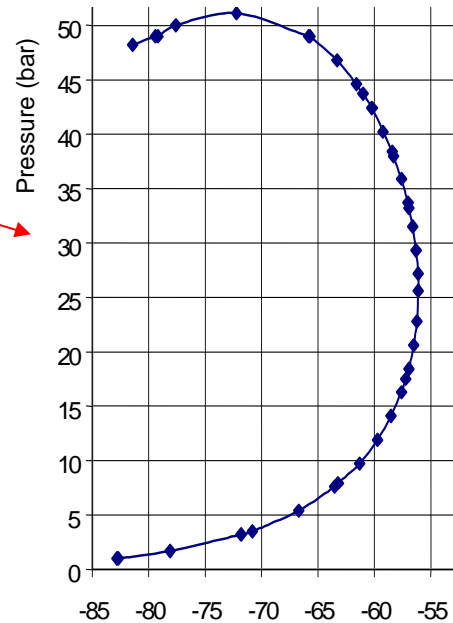
Other utilities

Systems:

Process control

Fire/gas alarm

Public address, LAN, PABX



Infrastructure:

Administrative and technical buildings

Control room

Access road

Site fencing, gates, check point

Design criteria:

% of over design

Environment data:

Min/max temperature

Rain/snow fall

Wind

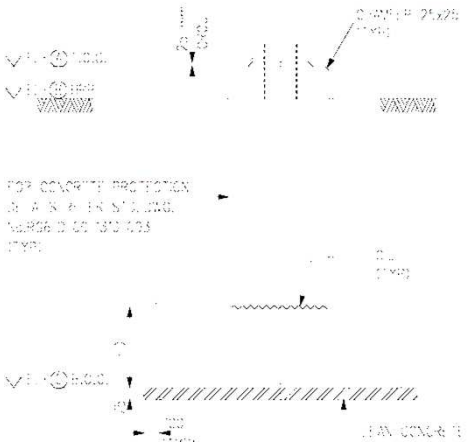
Geological conditions

Applicable codes and standards:

International standards

Local rules

Engineering in the Project



Design basis:

- Functional requirements
- Client specifications
- Design codes

Engineering

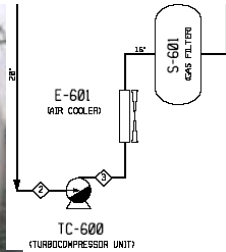
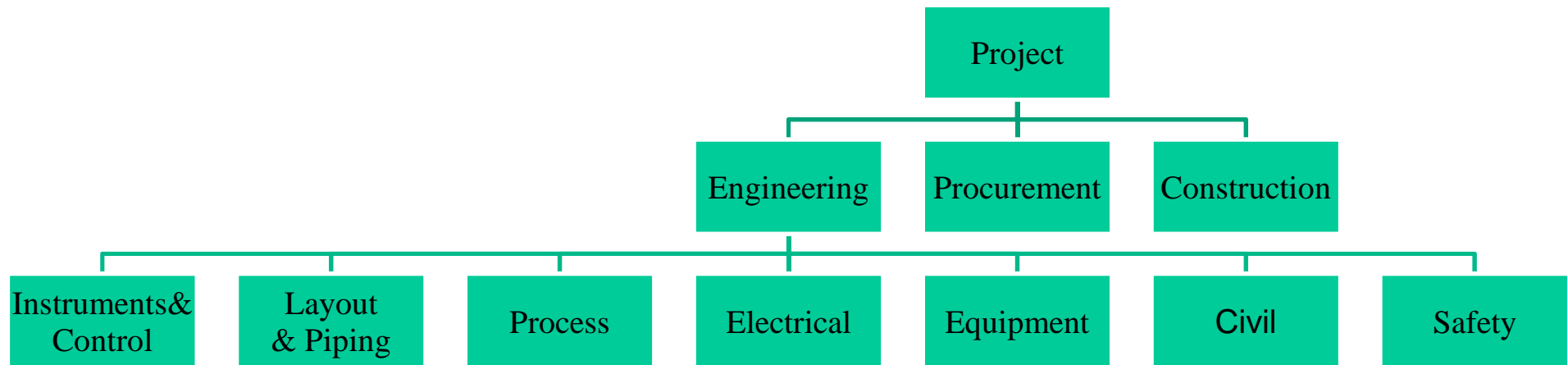
Documents for Construction:

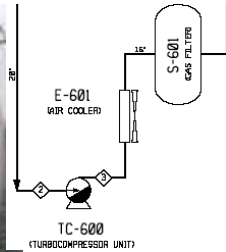
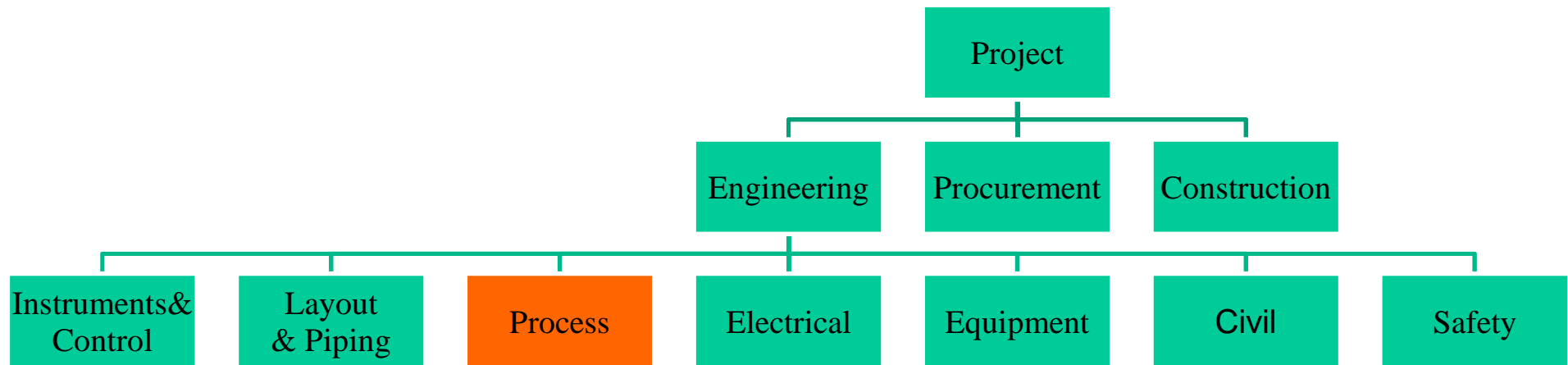
Construction drawings & specifications

Documents for Purchase:

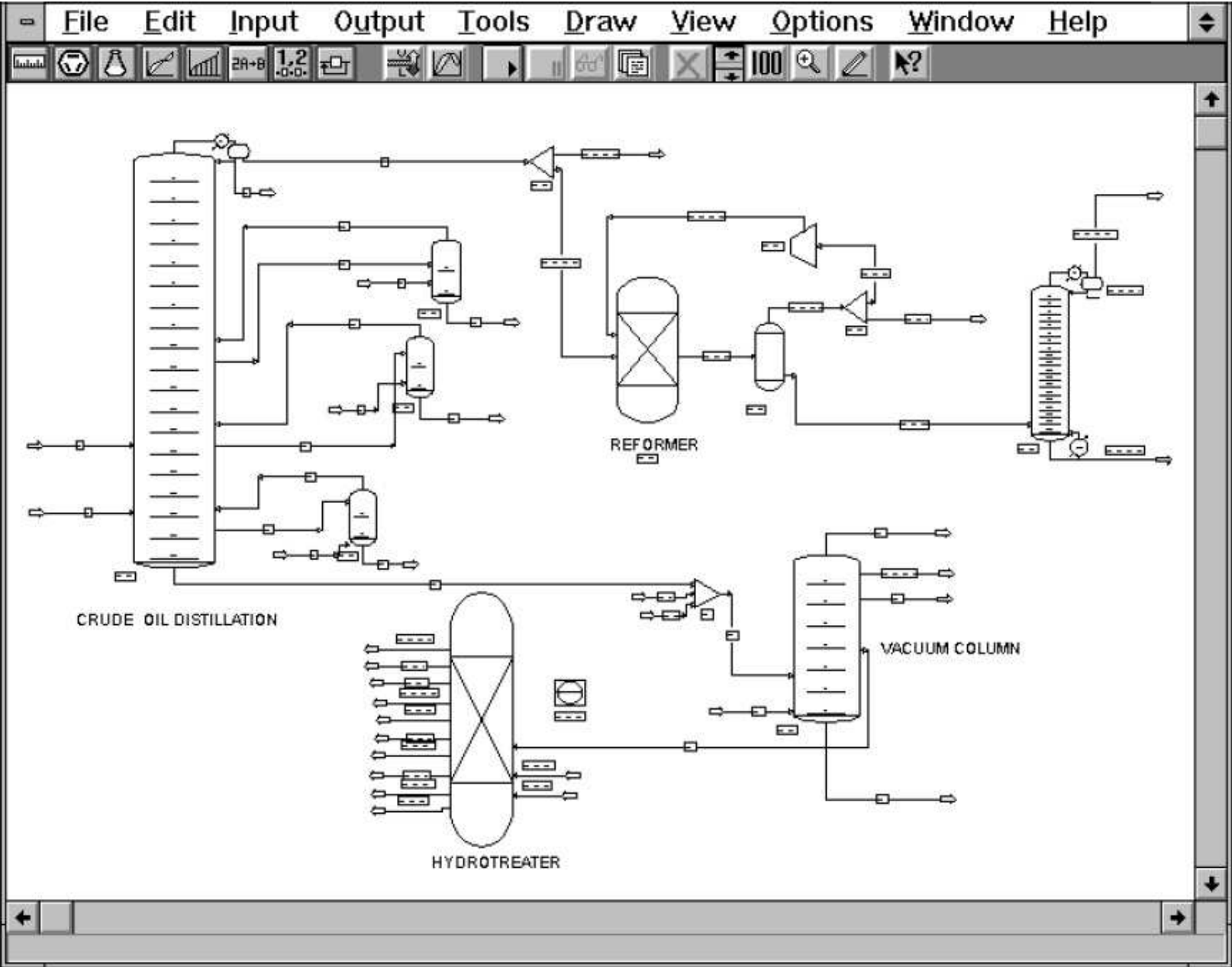
bill of quantity & specification

1. LIST OF MATERIALS			
ITEM	QUANTITY	TAG N°	DESIGNATION
1	6	TC100/TC200 TC300/TC400 TC500/TC800	TURBO COMPRESSORS
2	1		SET OF STAR-UP & COMMISSIONING SPARE PARTS FOR ITEM1
3	1		SET OF SPECIAL TOOLS FOR ITEM1
4	1		SET OF 2 YEARS SPARE PARTS



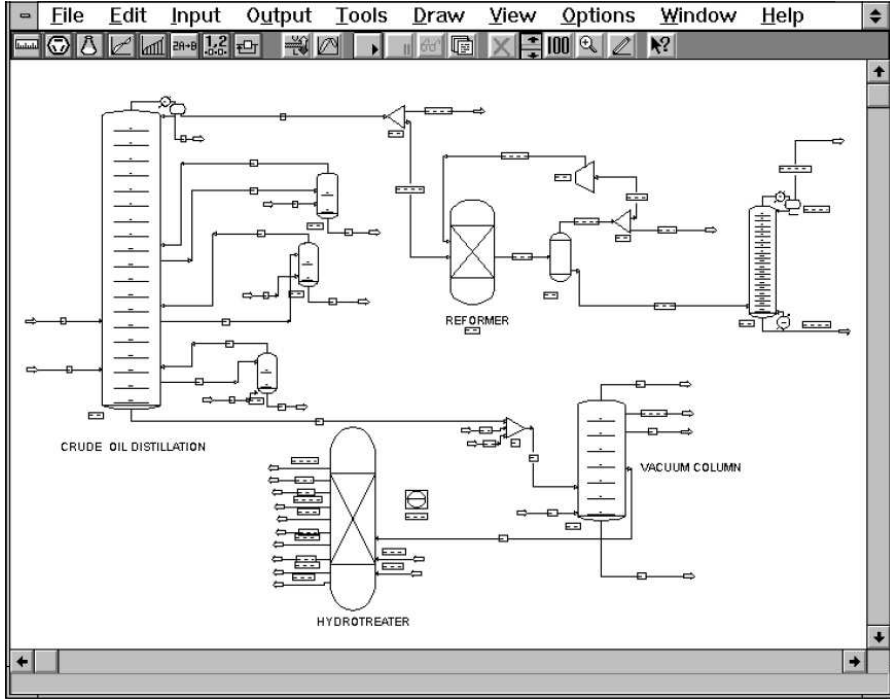


Process simulations



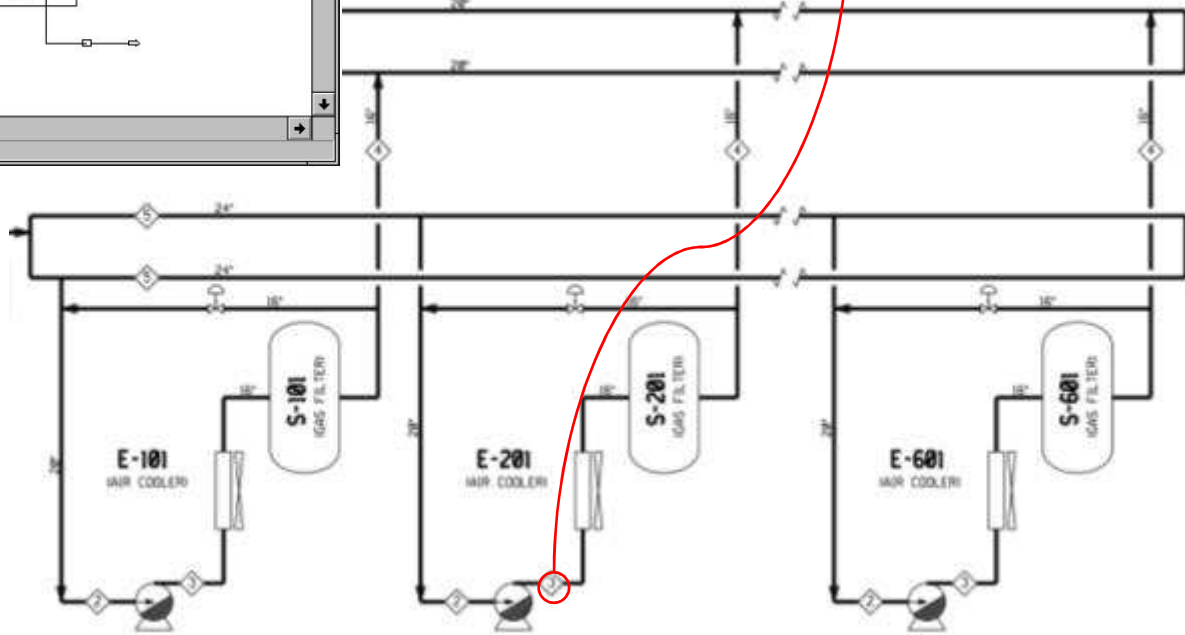
Thermodynamic
calculations

Heat & Material
balance



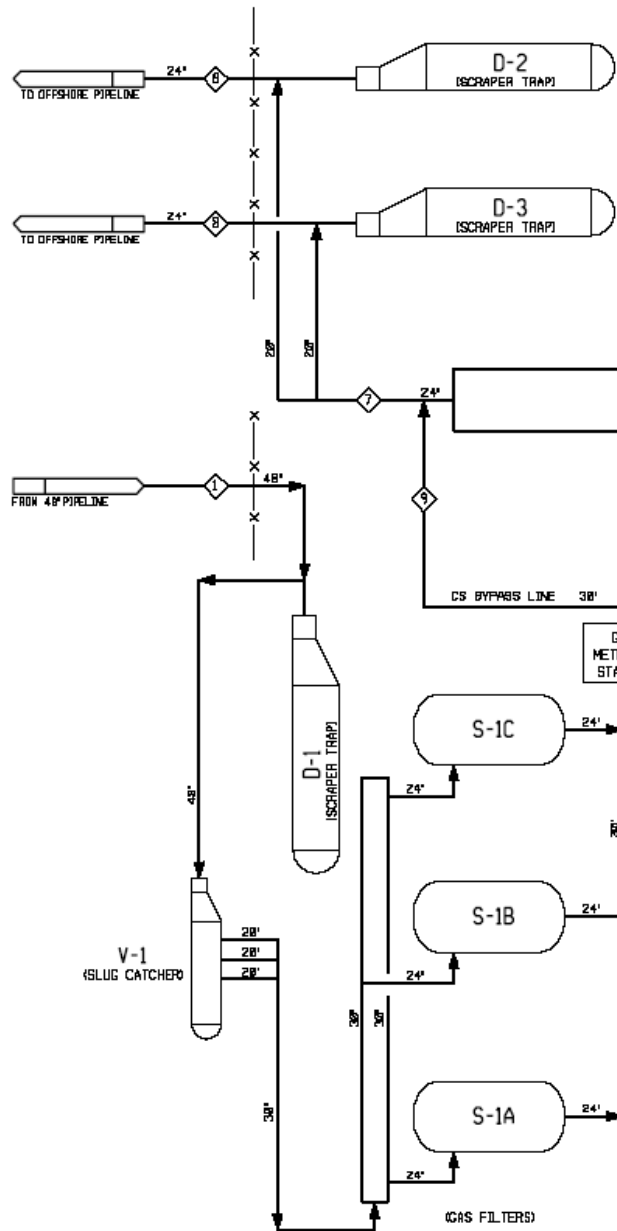
STREAM NUMBER	1	2	3	4	5	6	7	8
PHYSICAL PROPERTIES	0.78	0.52	2.1	20.86	3.52	20.06	24.10	24.90
TEMPERATURE (°C)	27.25	26.4	136	58.8	26.4	58.8	49.6	49.3
TOTAL FLOWRATE (Kg/h)	158816	345204	345204	345204	630488	630488	1388886	630488
PHASE	g	g	g	g	g	g	g	g
CUMULATIVE VOLUME (m³)	28467	3262	2816	3516	10626	1093	8200	4105
VELOCITY (m/s)	5.4	9.4	7.9	5.7	32.7	7.3	18.2	5.1
VELOCITY (km/h)	12.0	21.3	17.6	12.7	73.7	16.6	41.2	11.3
VELOCITY (ft/s)	12.0	21.3	17.6	12.7	73.7	16.6	41.2	11.3
VELOCITY (ft/min)	720	1278	1056	762	4422	996	2472	678
VELOCITY (ft/h)	43200	76680	63360	45720	265320	59760	148320	40680
VELOCITY (ft/d)	1036800	1840320	1520640	1097280	6363680	1434240	3559680	976320
VELOCITY (ft/y)	12441600	22083840	18247680	13167360	76364160	17210880	42716160	11715840
VELOCITY (ft/yr)	12441600	22083840	18247680	13167360	76364160	17210880	42716160	11715840
VELOCITY (ft/dec)	124416000	220838400	182476800	131673600	763641600	172108800	427161600	117158400
VELOCITY (ft/cent)	1244160000	2208384000	1824768000	1316736000	7636416000	1721088000	4271616000	1171584000
VELOCITY (ft/mill)	12441600000	22083840000	18247680000	13167360000	76364160000	17210880000	42716160000	11715840000
VELOCITY (ft/nan)	124416000000	220838400000	182476800000	131673600000	763641600000	172108800000	427161600000	117158400000
VELOCITY (ft/pic)	1244160000000	2208384000000	1824768000000	1316736000000	7636416000000	1721088000000	4271616000000	1171584000000
VELOCITY (ft/fem)	12441600000000	22083840000000	18247680000000	13167360000000	76364160000000	17210880000000	42716160000000	11715840000000
VELOCITY (ft/att)	124416000000000	220838400000000	182476800000000	131673600000000	763641600000000	172108800000000	427161600000000	117158400000000
VELOCITY (ft/zett)	1244160000000000	2208384000000000	1824768000000000	1316736000000000	7636416000000000	1721088000000000	4271616000000000	1171584000000000
VELOCITY (ft/yott)	12441600000000000	22083840000000000	18247680000000000	13167360000000000	76364160000000000	17210880000000000	42716160000000000	11715840000000000
VELOCITY (ft/rank)	124416000000000000	220838400000000000	182476800000000000	131673600000000000	763641600000000000	172108800000000000	427161600000000000	117158400000000000
VELOCITY (ft/decade)	1244160000000000000	2208384000000000000	1824768000000000000	1316736000000000000	7636416000000000000	1721088000000000000	4271616000000000000	1171584000000000000
VELOCITY (ft/century)	12441600000000000000	22083840000000000000	18247680000000000000	13167360000000000000	76364160000000000000	17210880000000000000	42716160000000000000	11715840000000000000
VELOCITY (ft/millennium)	124416000000000000000	220838400000000000000	182476800000000000000	131673600000000000000	763641600000000000000	1721088000000000000000	4271616000000000000000	11715840000000000000000
VELOCITY (ft/century)	124416000000000000000	220838400000000000000	182476800000000000000	131673600000000000000	763641600000000000000	1721088000000000000000	4271616000000000000000	11715840000000000000000
VELOCITY (ft/millennium)	1244160000000000000000	2208384000000000000000	1824768000000000000000	1316736000000000000000	7636416000000000000000	17210880000000000000000	42716160000000000000000	117158400000000000000000

Process Flow
Diagram (PFD)





Equipment list



- D-1
- V-1
- S-1A/B/C

INLET FACILITIES

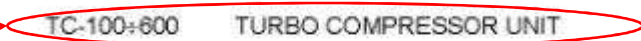
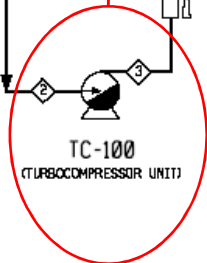
- RECEIVING SCRAPER TRAP
- SLUG CATCHER
- INLET GAS FILTER

GAS COMPRESSION SYSTEM

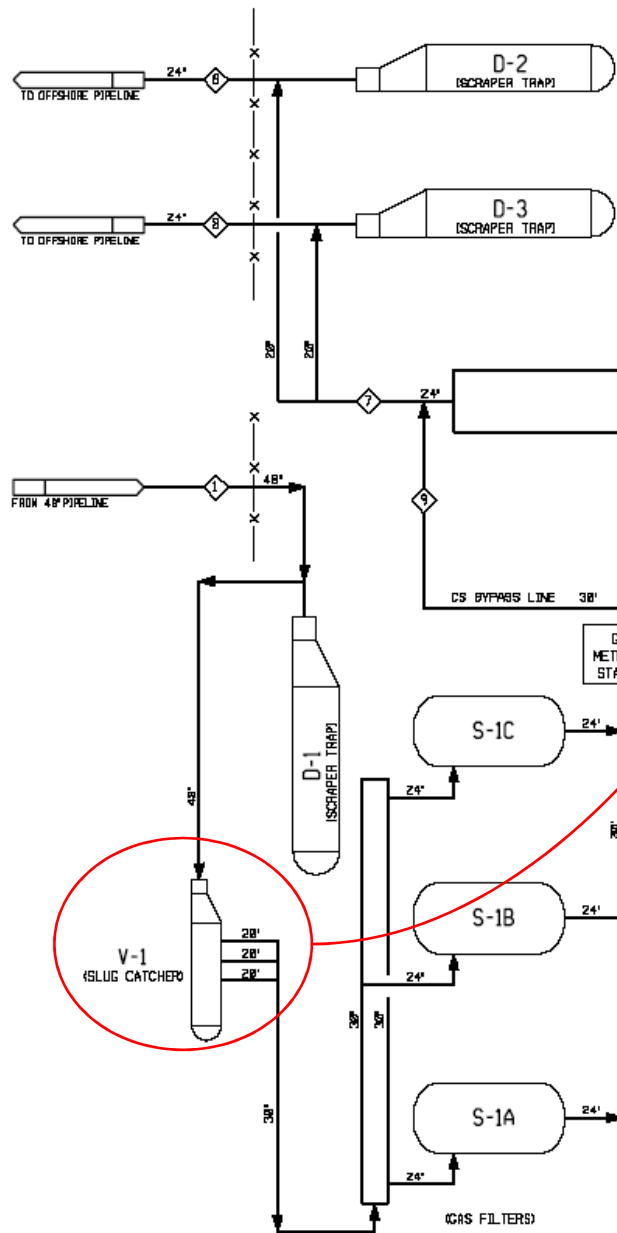
- TC-100+600
- E-101+601
- S-101+601

OUTLET FACILITIES

- D-2/3
- LAUNCHING SCRAPER TRAP

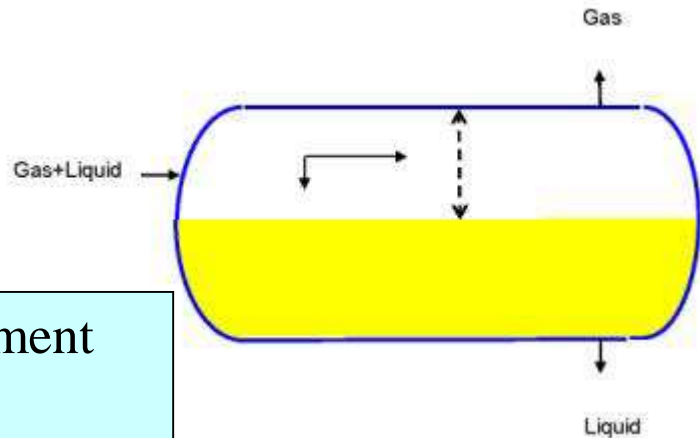


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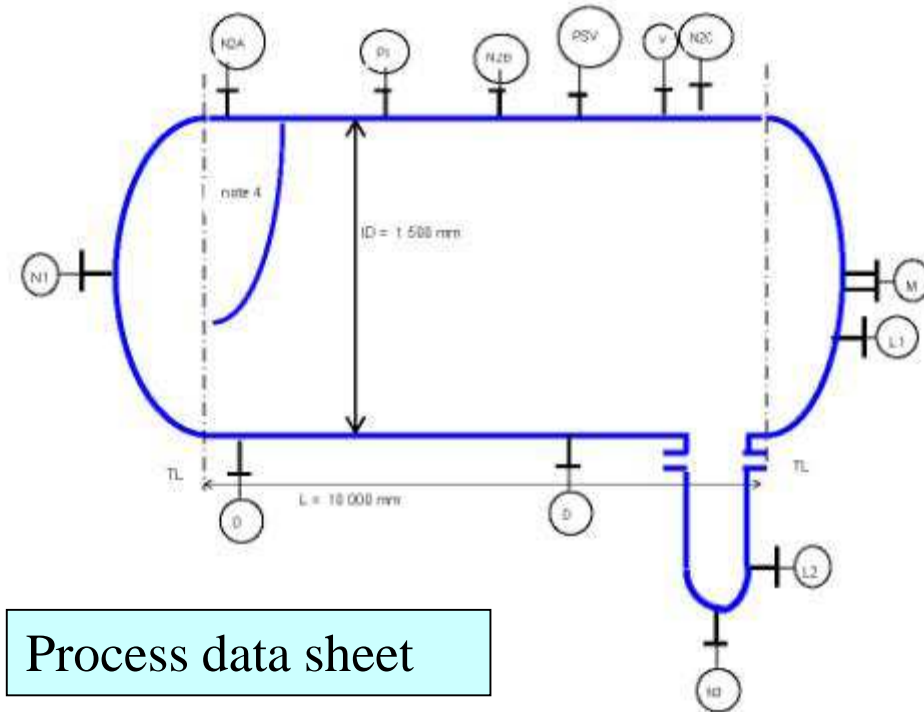


STREAM NUMBER	1
PROCES. OR. UNO. NO.	2724
TEMPERATURE (°C)	27.25
TOTAL LIQUOR (kg/hr)	1388216
PHASE	SLURRY
COMPONENTS (kg/hr)	
METHANE	2807280
ETHANE	28257
PROPANE	8.4
ISOBUTANE	11875
N-BUTANE	11.5
ISOPENTANE	16.52
TOTAL	2847406
METHANE	97.4337
ETHANE	1.000
PROPANE	0.000
ISOBUTANE	0.000
N-BUTANE	0.000
ISOPENTANE	0.000
TOTAL	100.000
METHANE	97.4337
ETHANE	1.000
PROPANE	0.000
ISOBUTANE	0.000
N-BUTANE	0.000
ISOPENTANE	0.000
TOTAL	100.000

Equipment duty



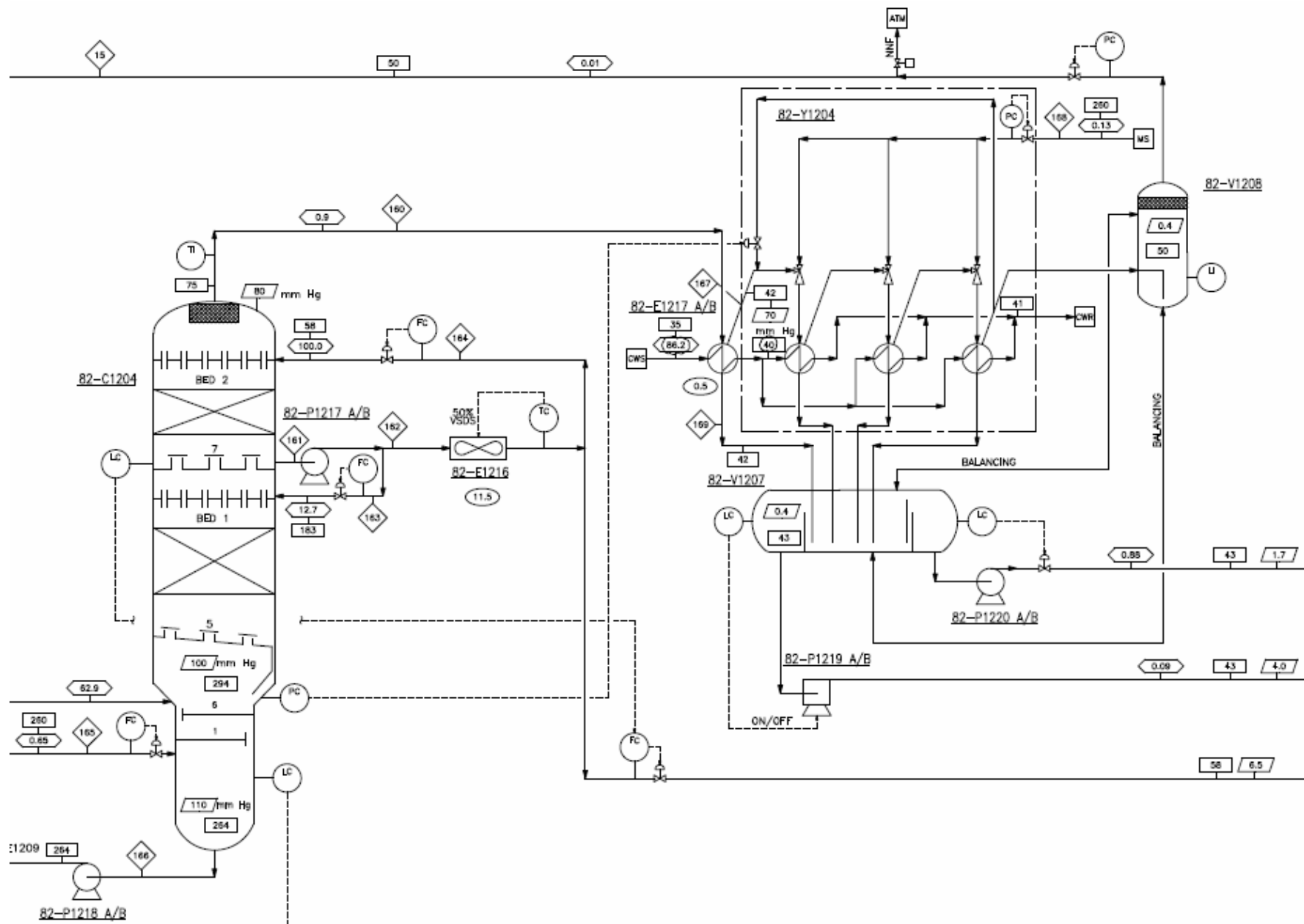
SERVICE	Slug Catcher		COLONNE / COLUMN
CONDITIONS OPERATOIRES / OPERATING CONDITIONS			
FLUIDE / FLUID	Natural Gas		
PRESION DE SERVICE / OPER. PRESSURE	9.7	MPa(a)	
TEMPERATURE DE SERVICE / OPER. TEMPERATURE	30	°C	
MASSE VOLUMIQUE LIQ. / LIQ. DENSITY	1000	kg/m ³	
ABRASION, CORROSION, CAUSE / EROSION, CORROSIVE DUE TO	note 3		
INFLAMMABLE - EXPLOSIF / FLAMMABLE - EXPLOSIVE	Flammable		
DONNEES DE CONSTRUCTION / CONSTRUCTION DATA			
PRESION DE CALCUL / DESIGN PRESSURE	10.11	MPa(e)	
VIDE - DEPRESSION DE CALCUL / DESIGN VACUUM PRESSURE		MPa(e)	
TEMPERATURE DE CALCUL / DESIGN TEMPERATURE	-20/50	°C	
CAPACITE / CAPACITY	10	m ³	
MATERIAU / MATERIAL	CS		
SUREPAISSEUR DE CORROSION / CORROSION ALLOWANCE	3	mm	
DETENSIONNEMENT / STRESS RELIEVE	OUI / YES <input type="checkbox"/>	NON / NO <input type="checkbox"/>	
RETEMENT INTERNE / LINING	note 6		
EPAISSEUR RETEMENT / LINING THICKNESS		mm	
CALORIFUGE / INSULATION	OUI / YES <input type="checkbox"/>	NON / NO <input checked="" type="checkbox"/>	
CONSERVATION CHALEUR / HEAT CONSERVATION	<input type="checkbox"/>		
PROTECTION PERSONNEL / PERSONNEL PROTECTION	<input type="checkbox"/>		
EQUIPEMENT INTERNE / INTERNALS			
CODE DE CONSTRUCTION / REFERENCE CODE	ASME VIII div1		
TUBULURES / NOZZLES			
REPERE / MARK	Nb	DN / SIZE	SERVICE
PSV	1	3"	Relief Valve
N1	1	48"	Inlet
N2A/B/C	3	24" (note 7)	Gas Outlets
N3	1	4"	Liquid Outlet
V	1	2"	Vent
D	2	2"	Drains
PI	1	2"	Pressure Gauge
L1 / L2	2	3"	Standpipe
M	1	24"	Manhole



Process data sheet

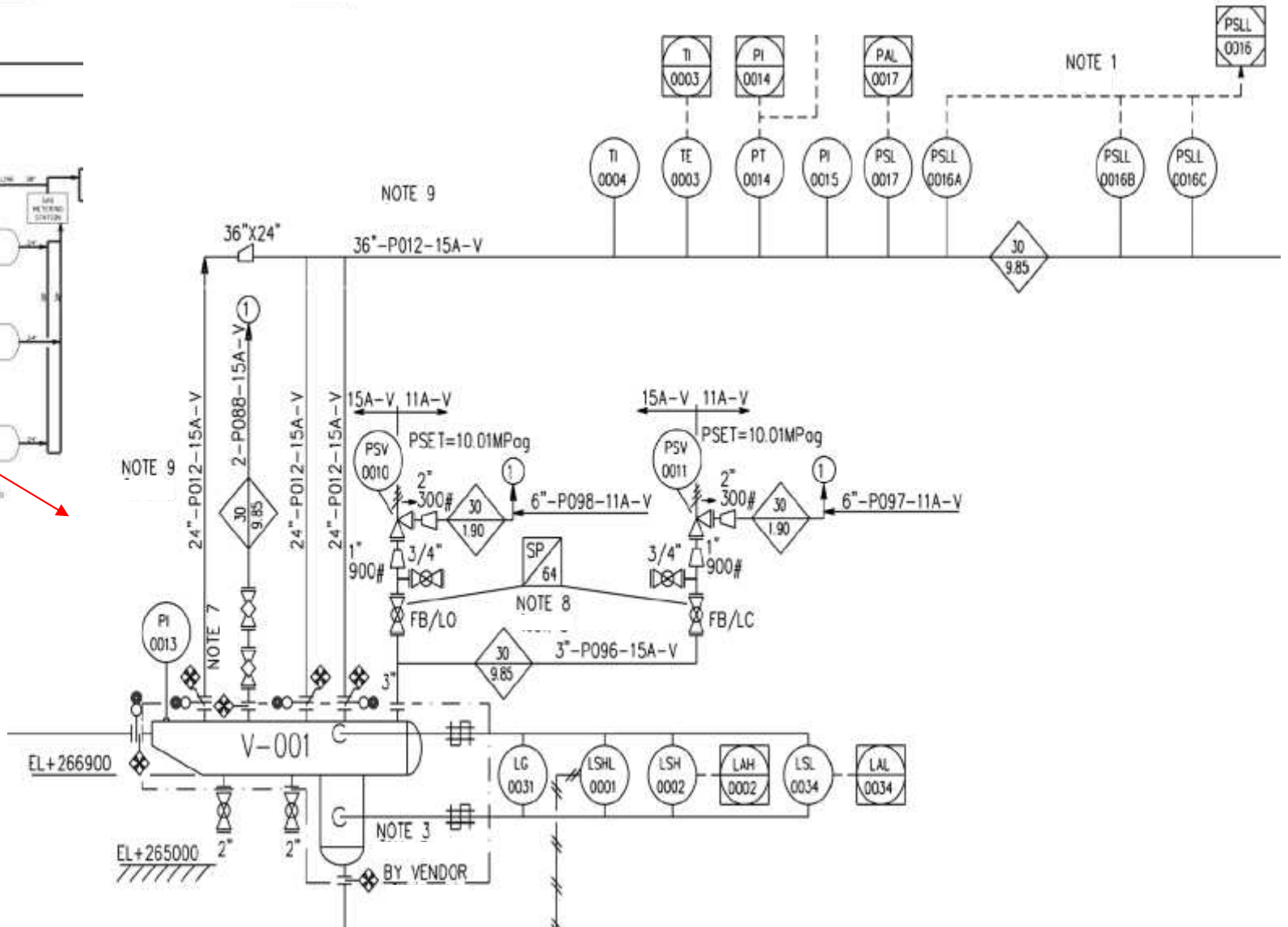
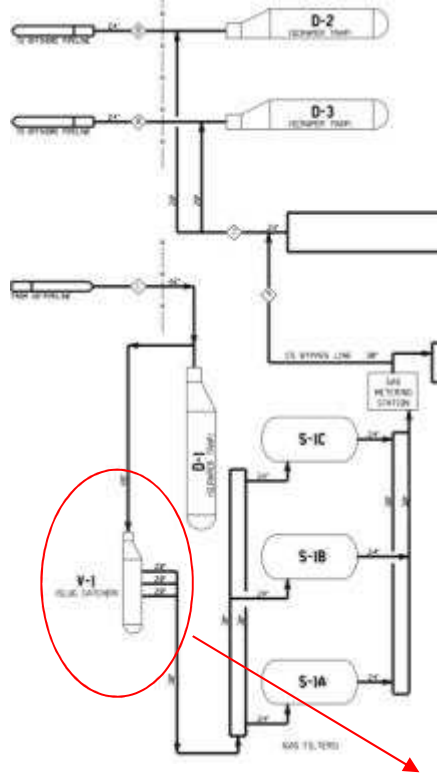


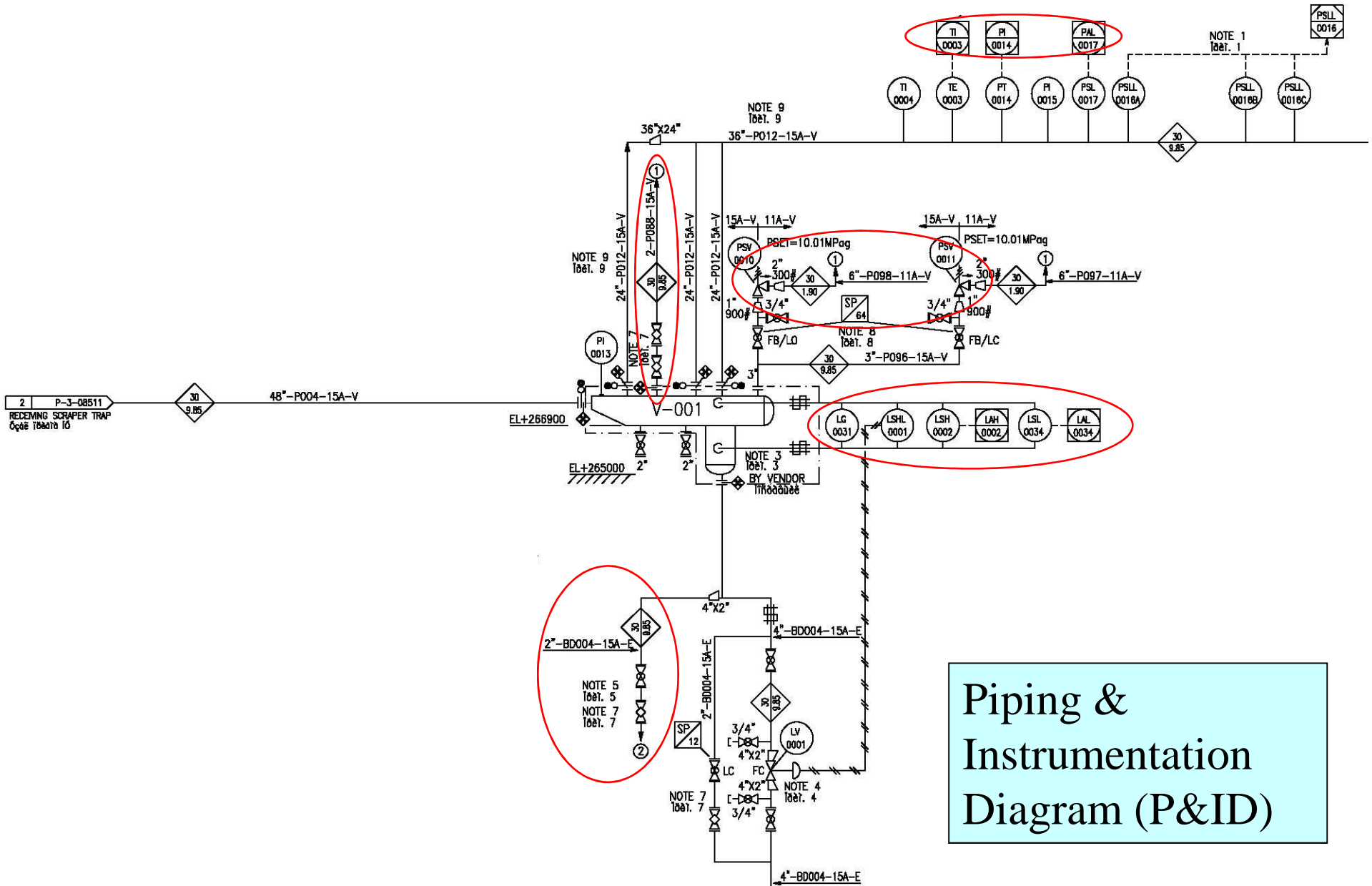
Process Flow Diagram (PFD)



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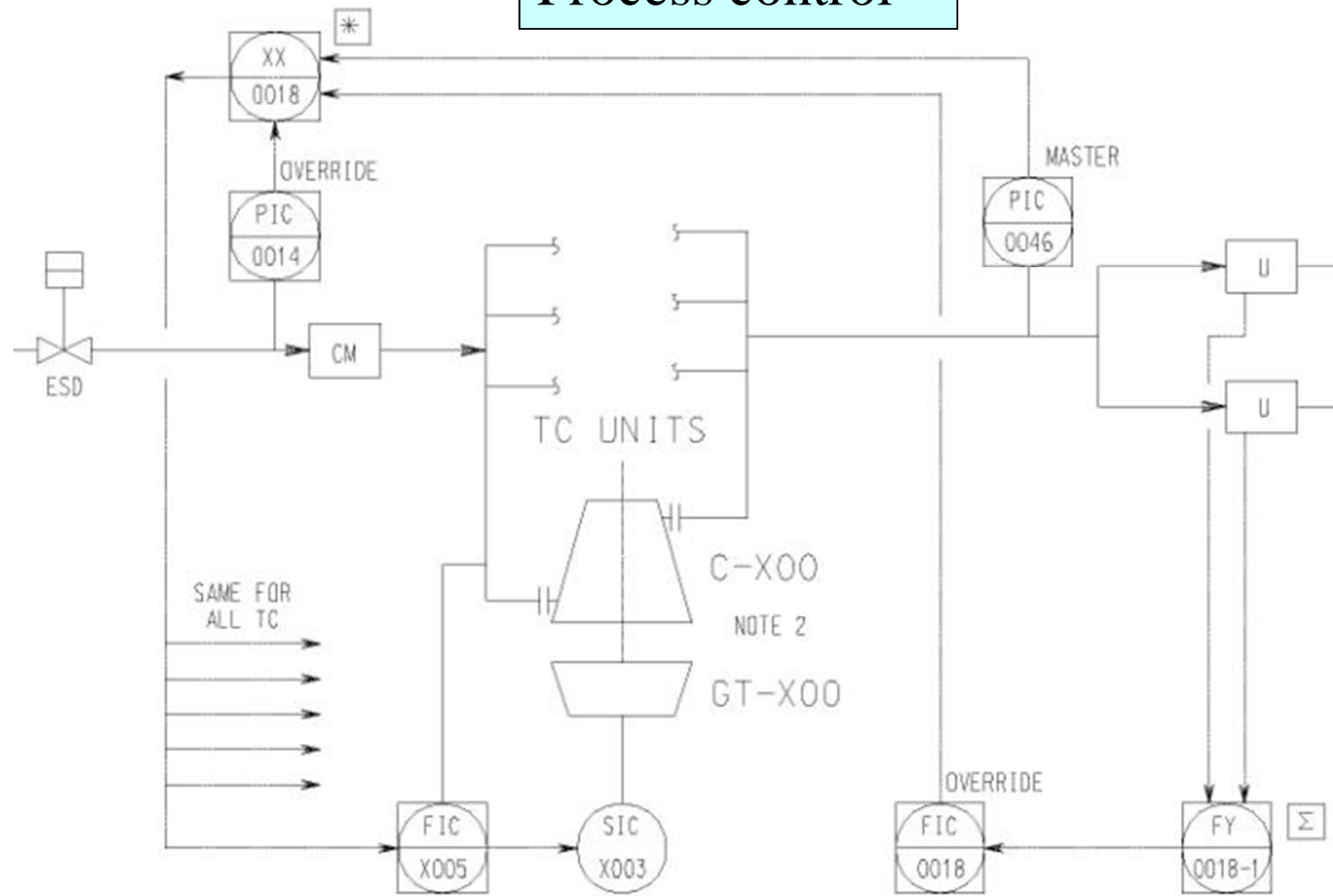
Piping & Instrumentation Diagram (P&ID)





Piping &
Instrumentation
Diagram (P&ID)

Process control

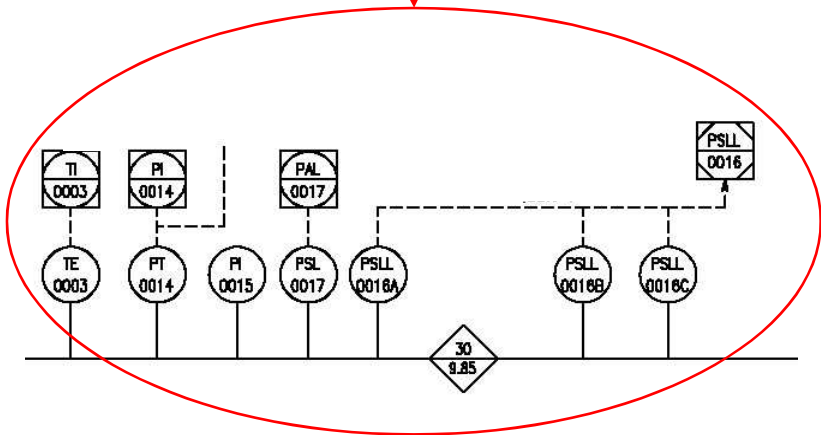
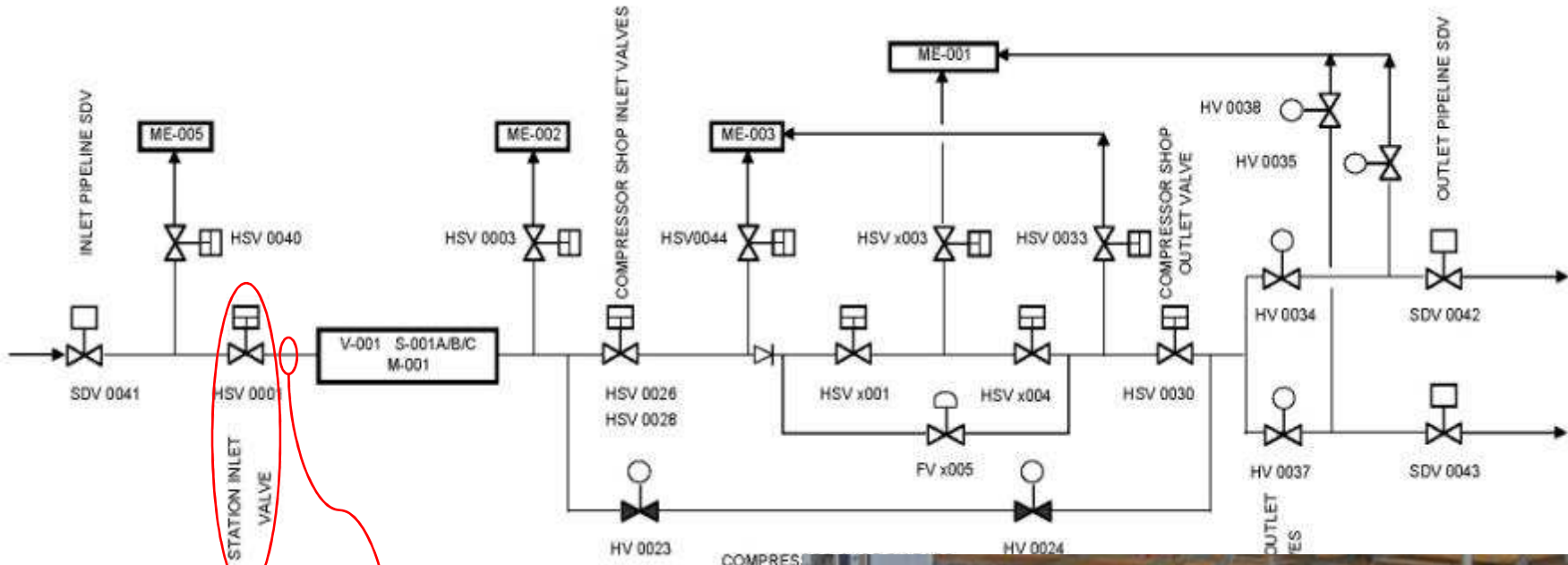


Station Control

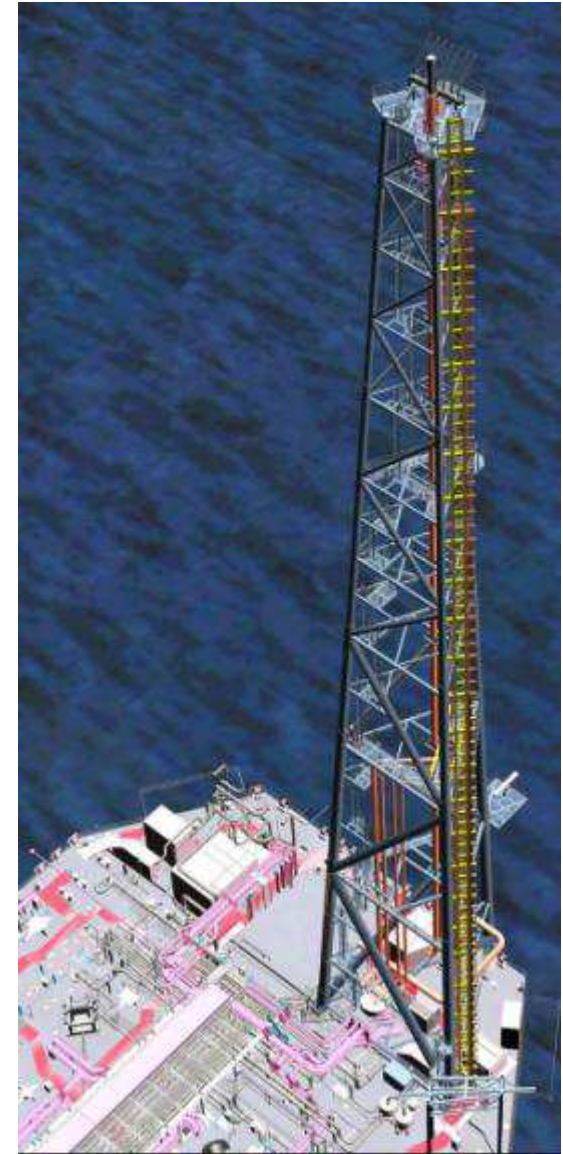
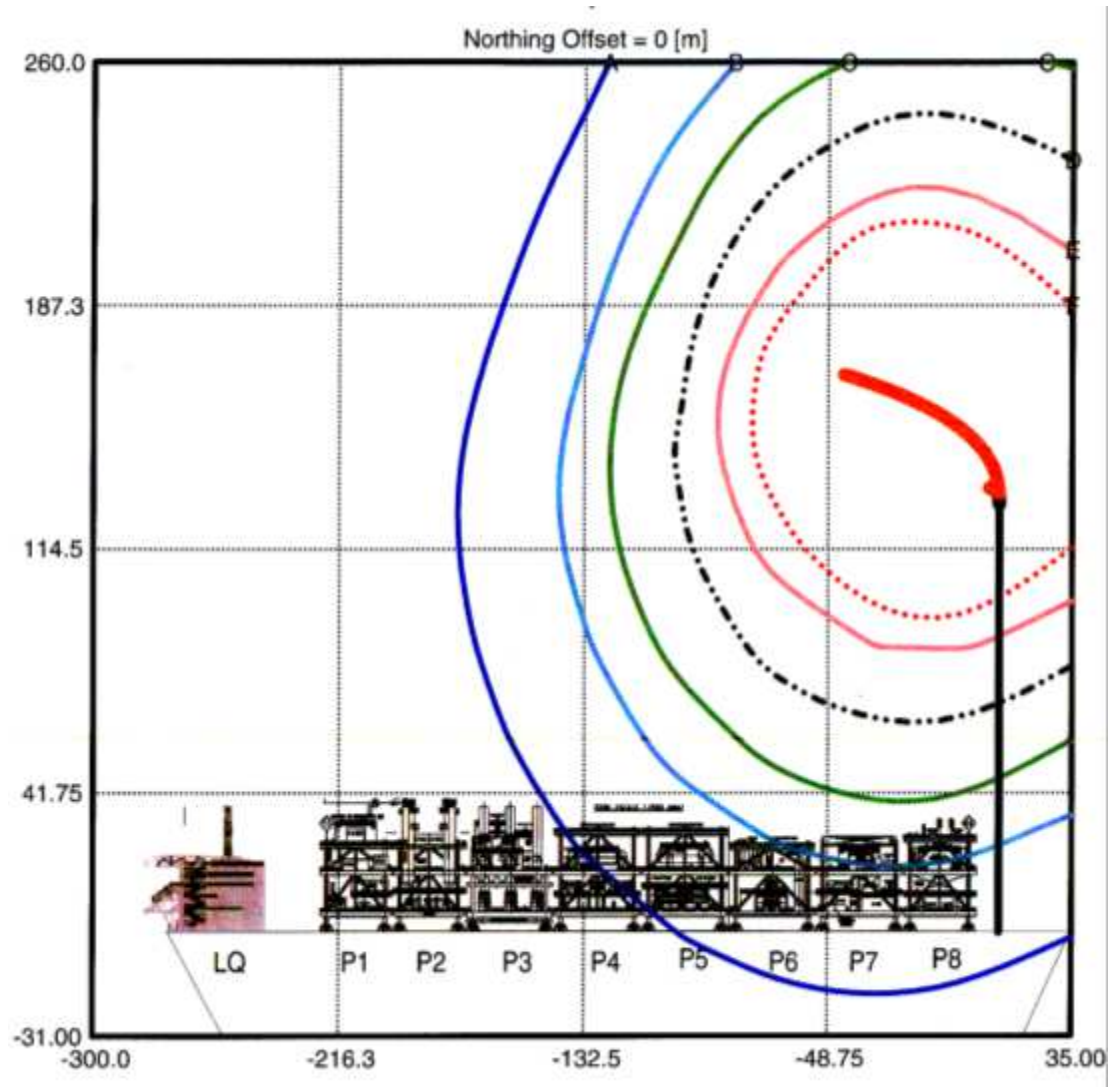
Control of the station shall be carried out, manually or automatically, by adjusting the revolutions of the units, controlling the most critical of the following parameters:

- suction gas pressure (override);
- discharge gas pressure (master);
- gas flow rate (override).

Emergency shut down



Emergency relief



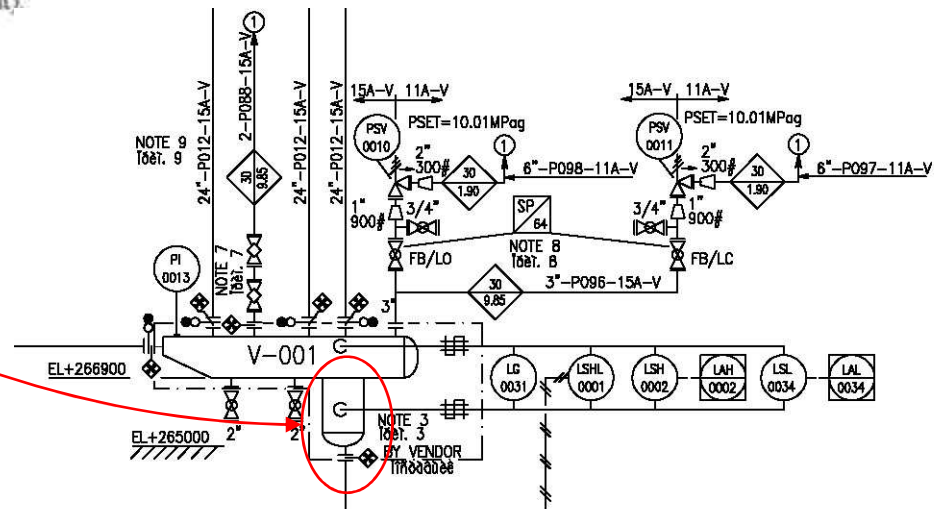
Initial start-up

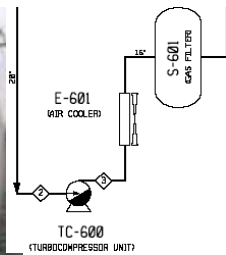
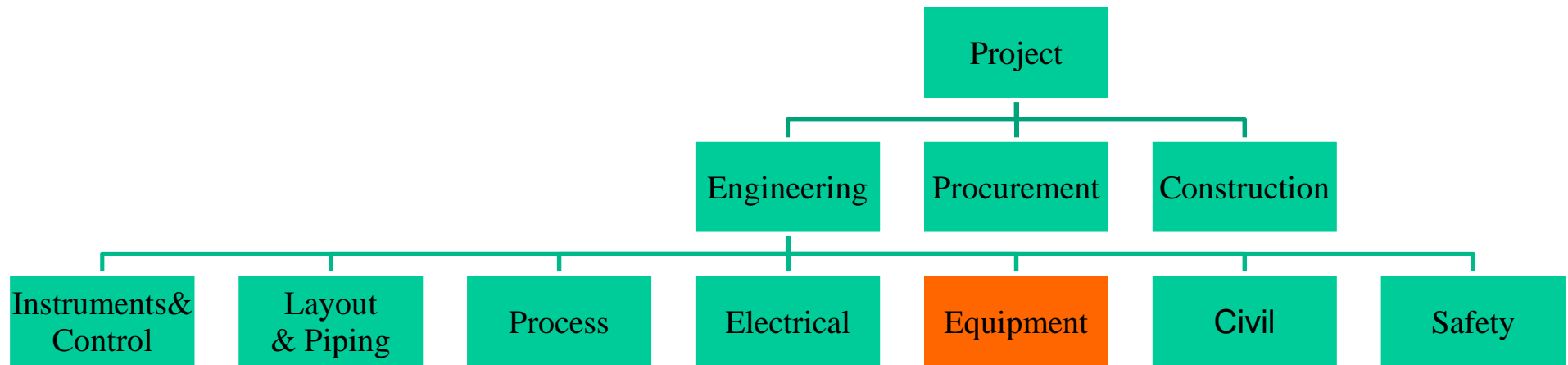
Slug catcher lining-up and liquid sealing

Refer to the following Piping & Instrument Diagram:

- P-3-08512 : Liquid disposal system

- Fill bottom of boot with diesel oil through connection of one of non installed instruments (LSH or LSL) at least up to LSL-0001 (Level Switch Low) in order to avoid gas blow-by through drain line as transported gas expected quality is dry. Blind the connection again. Check that LV is still closed.
- Ensure that all spectacle blinds (one at drum inlet, three at drum outlet) around slug catcher are in open position.
- Close the two 2" plug valves on vent line.
- Close the two 2" plug valves on each drain.
- Ensure that mechanical interlock between the PSV is in right position, i.e. the closure of one isolation valve causes the opening of the other one.
- Close the two 3/4" vent ball valves upstream PSVs.
- Close both 2" ball valve and plug valve on drain line (routed to local pit).
- Ensure that spectacle blind downstream FO-0003 is in open position.
- Open the two 4" ball valves around L.V-0001.
- Close both 2" ball valve and plug valve on by-pass of L.V.







Rotating machinery



Pressure vessels



Heat exchangers





Packages,
Fired Equipment





SERVICE : NATURAL GAS COMPRESSOR			
NOMBRE REQUIS / NUMBER REQUIRED		TOTAL / TOTAL :	6 RUNNING
OPERATION : CONTINUE / CONTINUOUS		<input checked="" type="checkbox"/>	
PROPRIETES DU FLUIDE / FLUID PROPERTIES			
CAS DE MARCHÉ / RUNNING CASE		mas.mol	DESIGN CASE
FLUIDE/FLUID	COMPOSANTS / COMPOUNDS	MW	
MOLAR PERCENT			
COMPONENT	DESIGN	ALTERNATIVE	
Methane CH4	97,528	97,721	
Ethane (C2H6)	0,680	0,095	
Propane (C3H8)	0,140	0,025	
I-Butane (C4H10)	0,015	0,005	
N-Butane (C4H10)	0,025	0,005	
I-Pentane (C5H12)	0,018	0,045	
N-Pentane (C5H12)	0,020	0,050	
Hexane (C6H14)	0,022	0,000	
Heptane + (C7H16)	0,013		
Nitrogen (N2)	0,930	1,746	
Carbon Dioxide (CO2)	0,410	0,280	
Oxygen (O2)	Nil	Nil	
COMPRESS. (Z)/COMPRESSIBILITY ASP/REF / SUCT/DISCH		0.876/1.013	
Cp/Cv ASP/REFOULEMENT / SUCTION/DISCHARGE		1.582/1.485	
TOXIQUE/TOXIC <input type="checkbox"/>		FLAMMABLE <input checked="" type="checkbox"/>	
CORROSIF / EROSIF, A CAUSE DE / CORROSIVE / EROSIVE, BECAUSE OF :			
DONNEES DE FONCTIONNEMENT / OPERATING CONDITIONS			
ASPIRATION / SUCTION	PRESSION ABS / ABS. PRESS	MPa(a)	8,52
	TEMPERATURE	°C	30
	MASSE VOLUMIQUE / DENSITY	kg/m ³	63,97
	DEBIT VOL. / FLOWRATE VOL		
	NORMAL	m ³ /s	-
	CALCUL / DESIGN	m ³ /s	5,99
	DEBIT MASSIQUE, NORMAL	kg/s	383,03
	MASS FLOW, NORMAL		
	TEMPERATURE MAXI SERVICE	°C	note 7
	MAX OPERATING TEMP.		
PRESSION ABSOLUE MAXI	MPa(a)		
ABSOLUTE PRESSURE MAXI			
REFOULT : PRESSION ABS / DISCH. ABS PRESS	MPa(a)	25,5	
REGULATION DE DEBIT / FLOW VARIATION	%		

Process data sheet

Mechanical data sheet

LOCATION: (2.1.8)			
<input checked="" type="checkbox"/>	INDOOR	<input checked="" type="checkbox"/> HEATED	<input type="checkbox"/> UNDER ROOF
<input type="checkbox"/>	OUTDOOR	<input type="checkbox"/> UNHEATED	<input type="checkbox"/> PARTIAL SIDES
<input checked="" type="checkbox"/>	GRADE	<input type="checkbox"/> MEZZANINE	<input type="checkbox"/>
<input checked="" type="checkbox"/>	ELEC. AREA CLASSIFICATION (2.1.14)		II A T3
	CL	GR	DIV
<input type="checkbox"/>	WINTERIZATION REQD.(2.1.8)		
<input type="checkbox"/>	TROPICALIZATION REQD.(3.4.6.6)		
SITE DATA:			
<input checked="" type="checkbox"/>	ELEVATION (m):	270 m	
<input type="checkbox"/>	BAROMETER (Bar abs):	-	
<input checked="" type="checkbox"/>	RANGE OF AMBIENT TEMPS (°C):	-19/42	
NOISE SPECIFICATIONS: (2.1.9)			
<input checked="" type="checkbox"/>	APPLICABLE TO MACHINE: 95dBA inside, 80dBA outside building		
ACOUSTIC HOUSING:		YES <input checked="" type="checkbox"/>	NO <input type="checkbox"/>
APPLICABLE SPECIFICATIONS:			
API 617, CENTRIFUGAL COMPR. FOR GEN. REFINERY SERV.			
CONSTRUCTION FEATURES			
TYPE FABRICATION		WELDED	
MATERIAL		ASTM A 182F22	
MAX. YIELD STRENGTH (N)		>310 N/mm ²	
BRINNEL HARDNESS: MAX./MIN.		207 /	
<input checked="" type="checkbox"/>	SHAFT:		
MATERIAL		40 NiCrMo7 (equivalent to AISI 4340)	
DIA. @ IMPELLER (mm)		163 / 182	
DIA. @ COUPLING (mm)		120	
SHAFT END:		<input checked="" type="checkbox"/> TAPERED	<input type="checkbox"/> CYLINDRICAL
MAX. YELD STRENGTH (BAR)		7350	
SHAFT HARDNESS (BNH) (Rc)		≤270 HB	
STRESS AT COUPLING (BAR)		-	
PAINTING:			
<input checked="" type="checkbox"/>	MANUFACTURER'S STD.		
<input type="checkbox"/>	OTHER: SUBJECT TO CLIENT APPROVAL		
SHAFT SEALS:			
<input checked="" type="checkbox"/>	SEAL TYPE (2.8.3)	DRY GAS SEALS	
<input checked="" type="checkbox"/>	SETTLING OUT PRESSURE (BARG)	153,7	
<input type="checkbox"/>	SPECIAL OPERATION (2.8.1)		
<input type="checkbox"/>	SUPPLEMENTAL DEVICE REQUIRED FOR CONTACT		
	SEALS (2.8.3.2) TYPE:	-	
<input checked="" type="checkbox"/>	BUFFER GAS SYSTEM REQUIRED (2.8.7)		
<input checked="" type="checkbox"/>	TYPE BUFFER GAS	COMPRESSED AIR	

Material Requisition

1. LIST OF MATERIALS			
ITEM	QUANTITY	TAG N°	DESIGNATION
1	6	TC100/TC200 TC300/TC400 TC500/TC600	TURBO COMPRESSORS
2	1		SET OF STAR-UP & COMMISSIONING SPARE PARTS FOR ITEM1
3	1		SET OF SPECIAL TOOLS FOR ITEM1
4	1		

2. APPLICABLE DOCUMENTS	DOCUMENTS	
	NUMBER*	REV
2.1. PROJECT GENERAL SPECIFICATIONS Technical Specification Centrifugal Compressor Data Sheets Centrifugal Compressor Data Sheets Gas Turbine General spec. for L.V. Switchboards for Packaged Unit Data Sheet for Turbocompressor MCC Turbocompressor Fuel Gas Functional Specification Procedure of Acceptance Turbo compressors	J-7-30001 (MA-E-30001) J-8-30101 (MA-E-30101) J-8-30102 (MA-E-30101) E-7-40011 (EA-E-40011) E-8-40044 (EA-E-40044) P-7-08071 (ZA-E-08071)	Rev. 2 Rev. 2 Rev. 1 Rev. A Rev. 3 Rev. 4

3. QA PROGRAM STANDARD AND INSPECTION REQUIREMENTS FOR VENDORS

ITEM DESCRIPTION : TURBO COMPRESSORS TC 100/TC 200/TC 300/TC 400/TC 500/TC 600

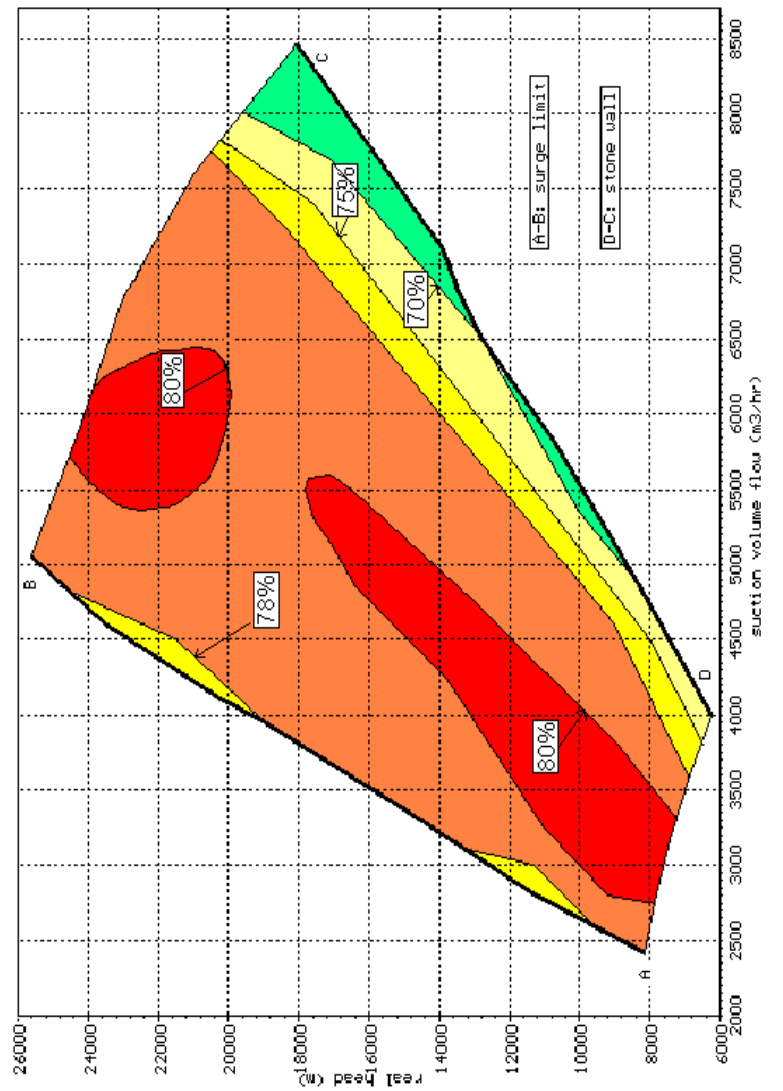
QA PROGRAM

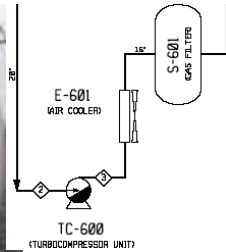
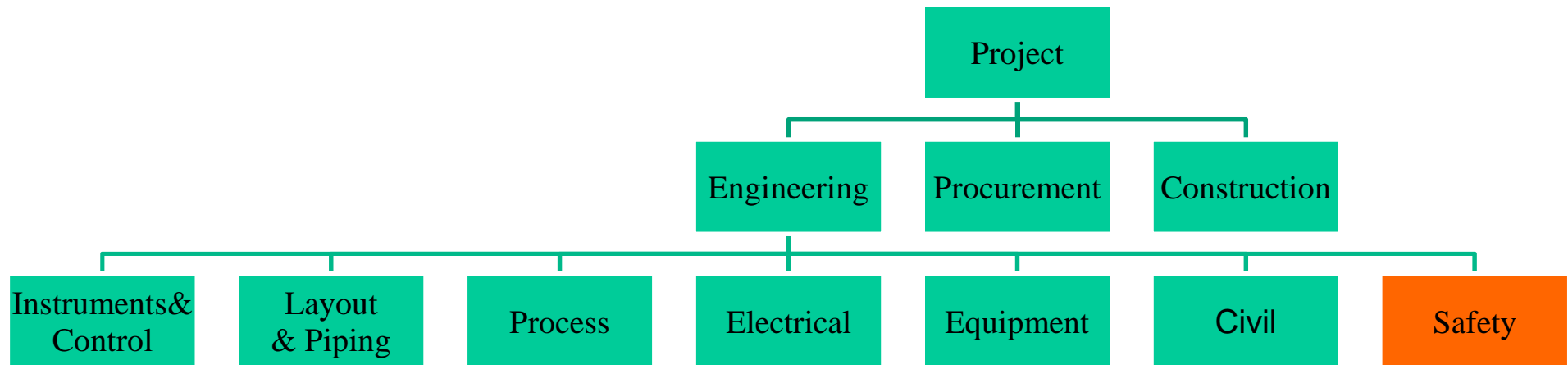
THE FOLLOWING QUALITY ASSURANCE PROGRAM (QA PROGRAM) SHALL BE IMPLEMENTED AND DOCUMENTED IF THE BIDDER IS AW

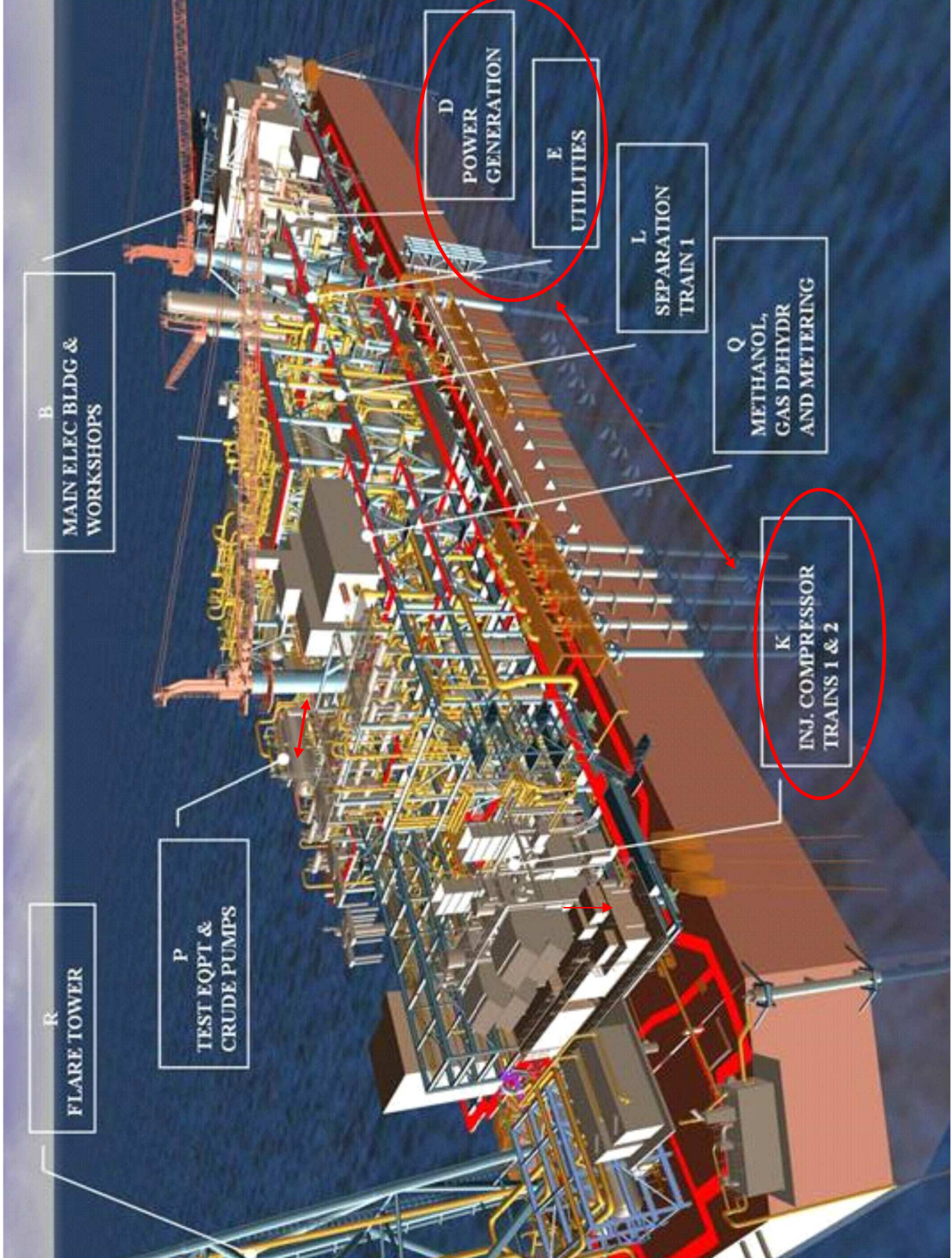
ISO	9001	{ X }
ISO	9002	{ }
ISO	9003	{ }
NONE		{ }

4. SUPPLIER'S DOCUMENTS – REQUIREMENT SCHEDULE

4.2. PROCESS AND PERFORMANCE DOCUMENTS							
TURBO COMPRESSOR		0	1	2	3	4	5
1	DIMENSIONAL OUTLINE DRAWINGS OF TURBOCOMPRESSOR SET*	A		B	C	D	E
2	GENERAL ARRANGEMENT DWG OF TURBOCOMPRESSOR BUILDING WITH INSIDE AND OUTSIDE INSTALLATIONS*	A		B	C	D	E
3	AIR INLET AND EXHAUST SYSTEMS ARRANGEMENT DRAWINGS*	A		B	C	D	E
4	LUBE OIL AIR COOLER ARRANGEMENT DRAWINGS*	A		B	C	D	E
5	TURBOCOMPRESSOR SET FOUNDATION PLAN WITH STATIC AND DYNAMIC LOADS*	A		B	C	D	E
6	FOUNDATION PLAN WITH STATIC AND DYNAMIC LOADS FOR TURBOCOMPRESSOR BUILDING AND OTHER AUX. EQUIPMENT	A		B	C	D	E
7	CUSTOMER MECHANICAL CONNECTIONS LIST AND PLAN WITH MAX. ALLOWABLE LOADS*			B	C	D	







R
FLARE TOWER

P
TEST EQPT &
CRUDE PUMPS

B
MAIN ELEC BLDG &
WORKSHOPS

D
POWER
GENERATION

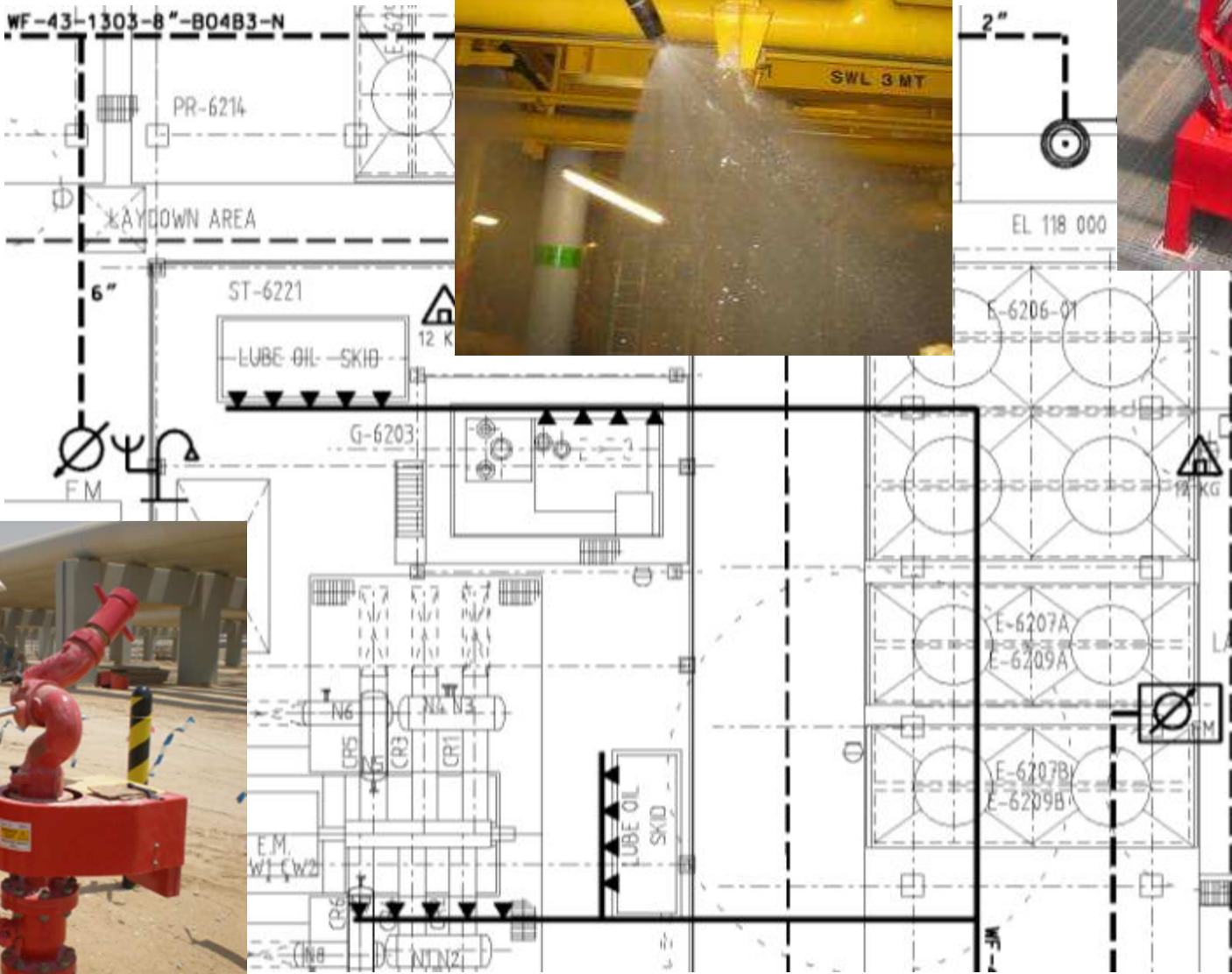
E
UTILITIES

L
SEPARATION
TRAIN 1

Q
METHANOL,
GAS DEHYDR
AND METERING

K
INJ. COMPRESSOR
TRAINS 1 & 2

Fire fighting

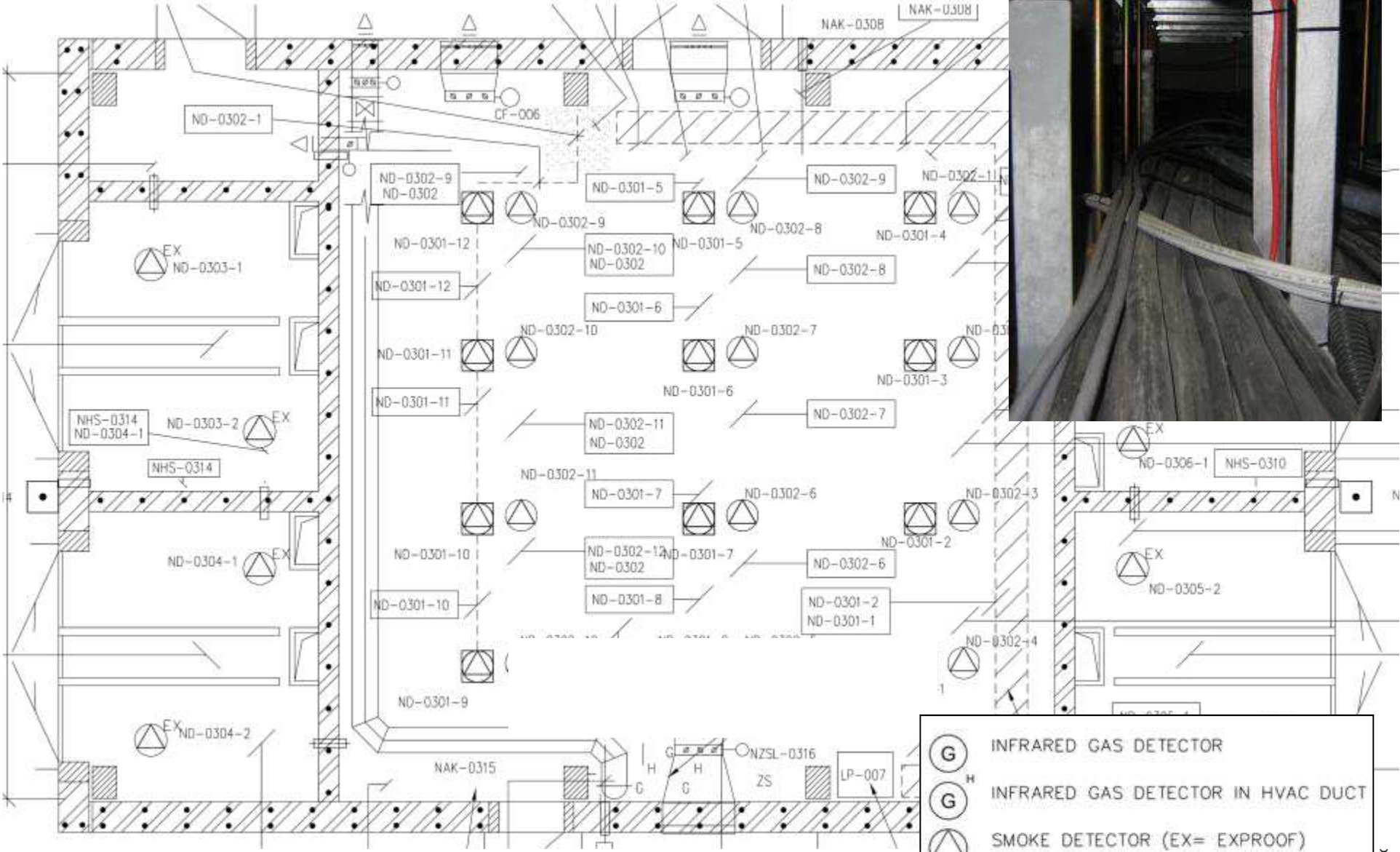






Passive fire protection



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Fire & Gas detection layout



-  INFRARED GAS DETECTOR
-  INFRARED GAS DETECTOR IN HVAC DUCT
-  SMOKE DETECTOR (EX= EXPROOF)
-  SMOKE DETECTOR IN FALSE FLOOR

Sources description

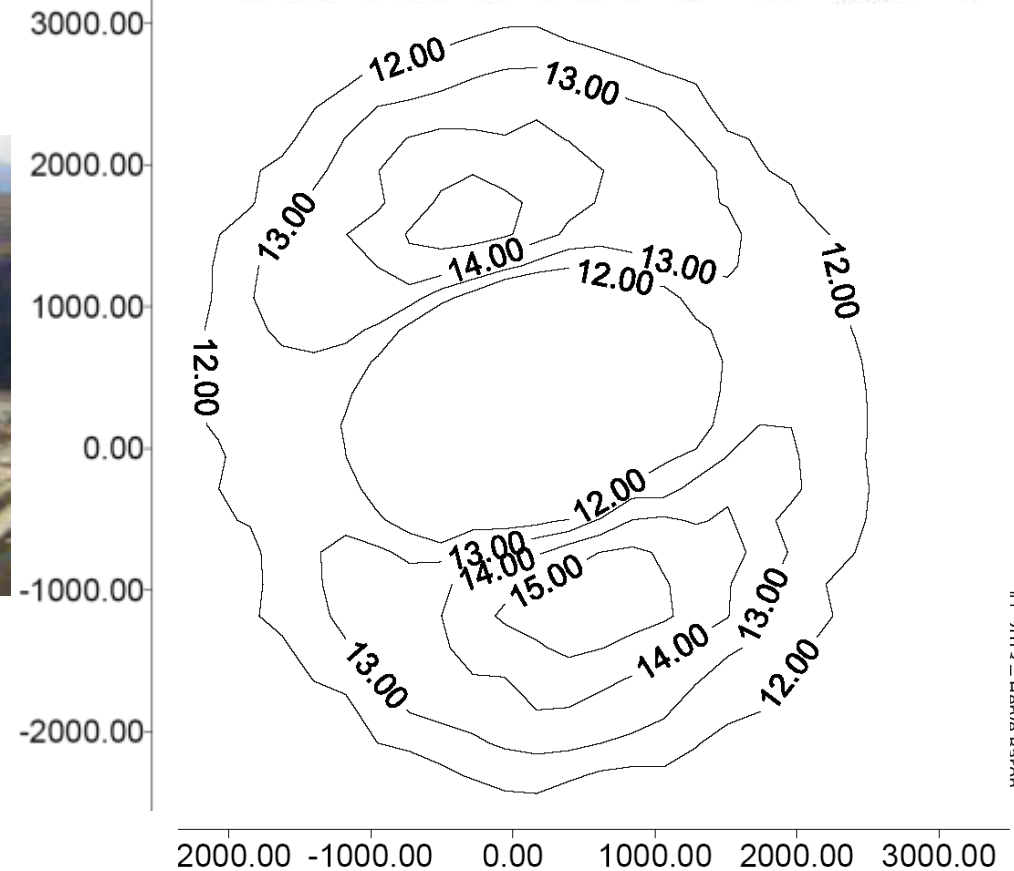
SOURCE NAME	Stack Height (m)	Stack diam. (m)	Flue gas temp. (°K)	Flue gas velocity (m/s)	Q _{WET} (Nm ³ /h)	NO _x (g/s)	CO (g/s)
Turbocompressor TC-100	15	2.9	775	28	206000	2.87	8.60
Turbocompressor TC-200	15	2.9	775	28	206000	2.87	8.60
Turbocompressor TC-300	15	2.9	775	28	206000	2.87	8.60
Turbocompressor TC-400	15	2.9	775	28	206000	2.87	8.60
Turbogenerator TG-001	15	1.38	806	28	45000	0.63	1.88
Turbogenerator TG-002	15	1.38	806	28	45000	0.63	1.88

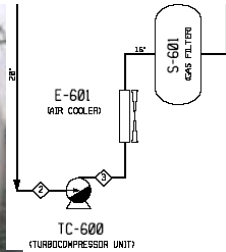
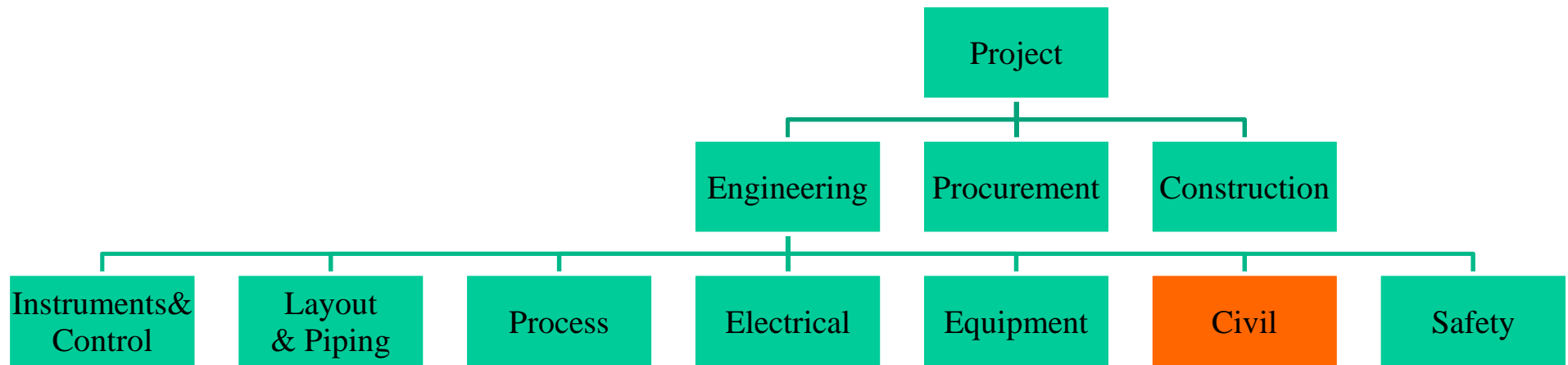
Coordinates of the sources

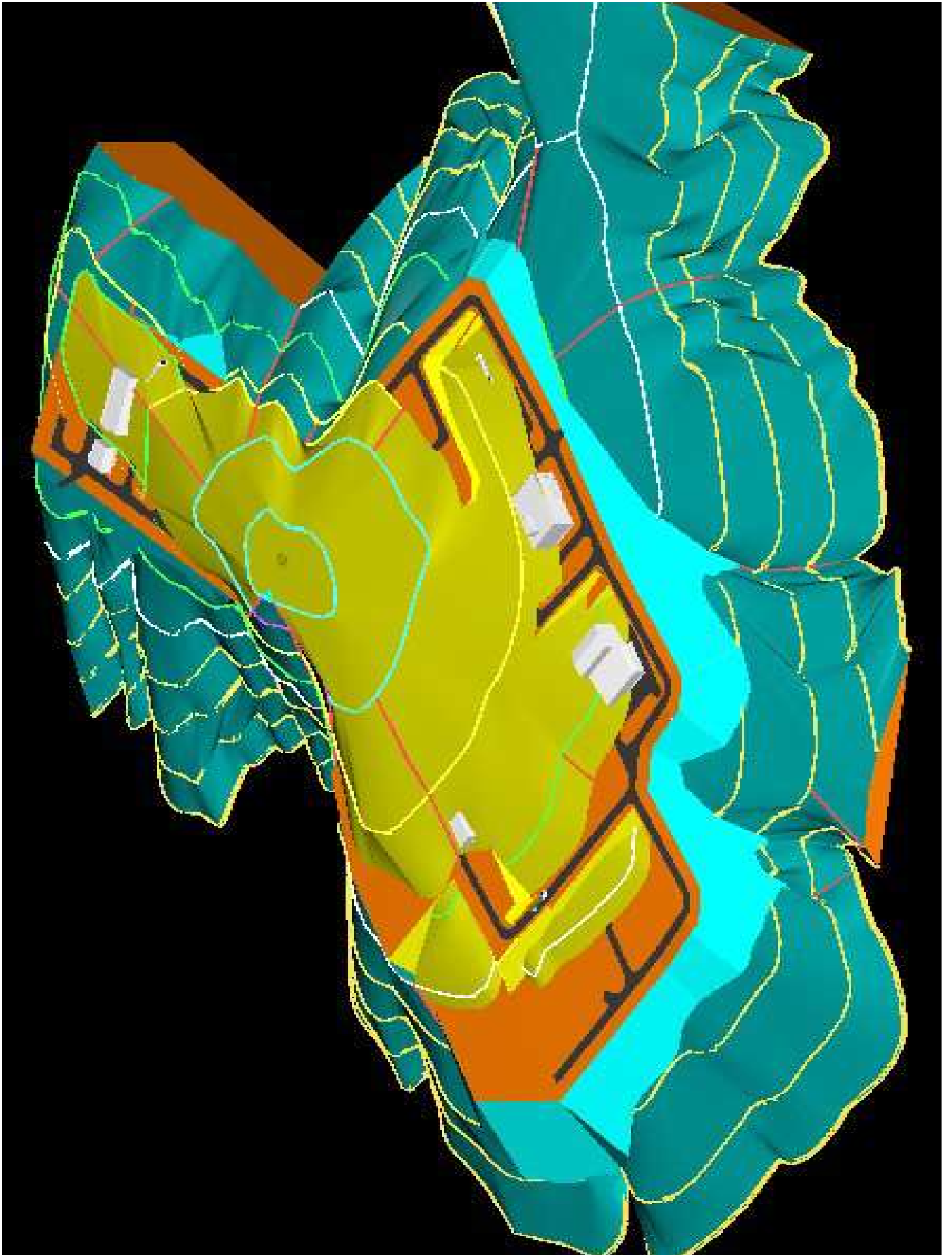
	X (m)	Y (m)
Turbocompressor TC-100	127	365
Turbocompressor TC-200	127	331
Turbocompressor TC-300	127	268
Turbocompressor TC-400	127	235
Turbogenerator TG-001	182	177
Turbogenerator TG-002	190	177

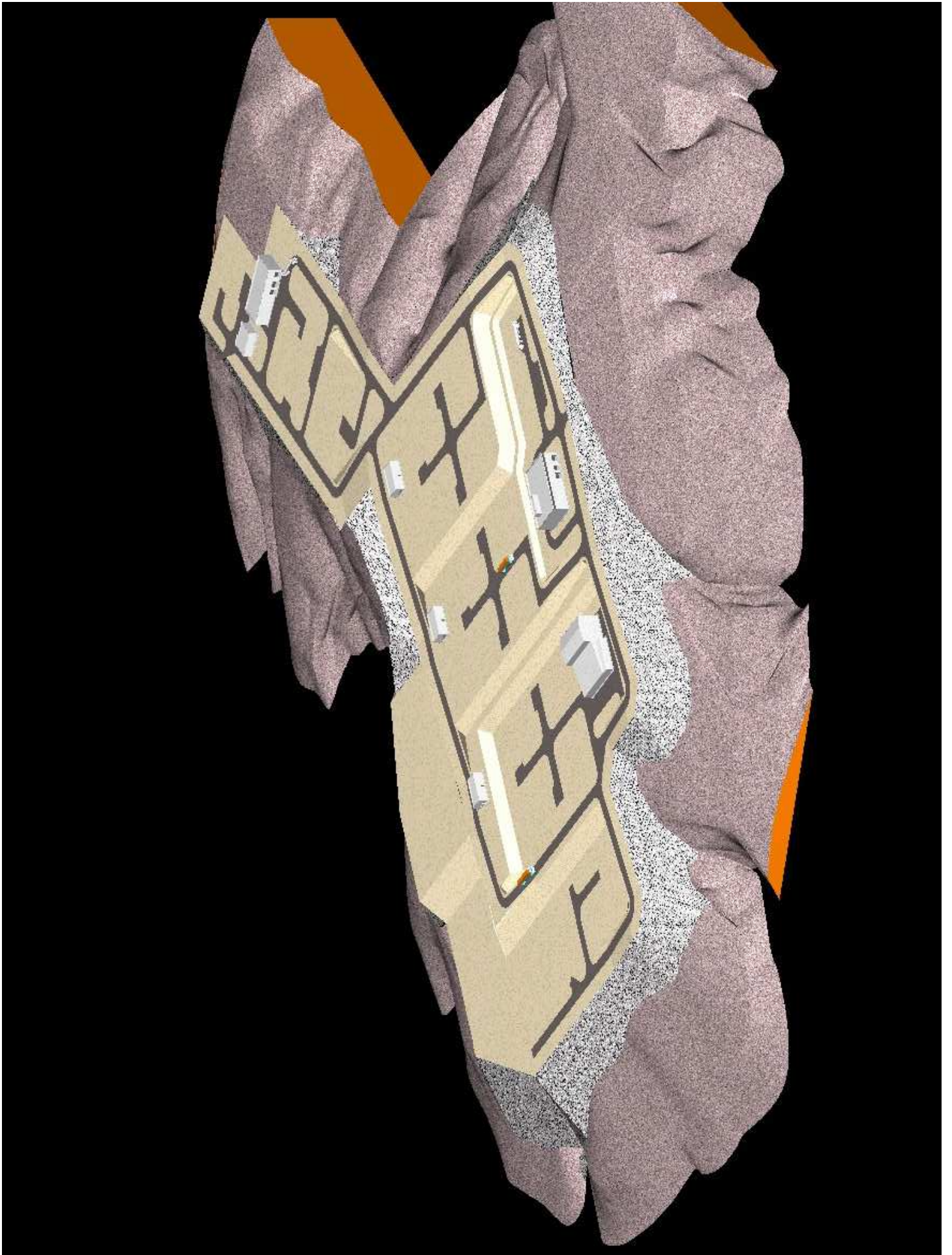


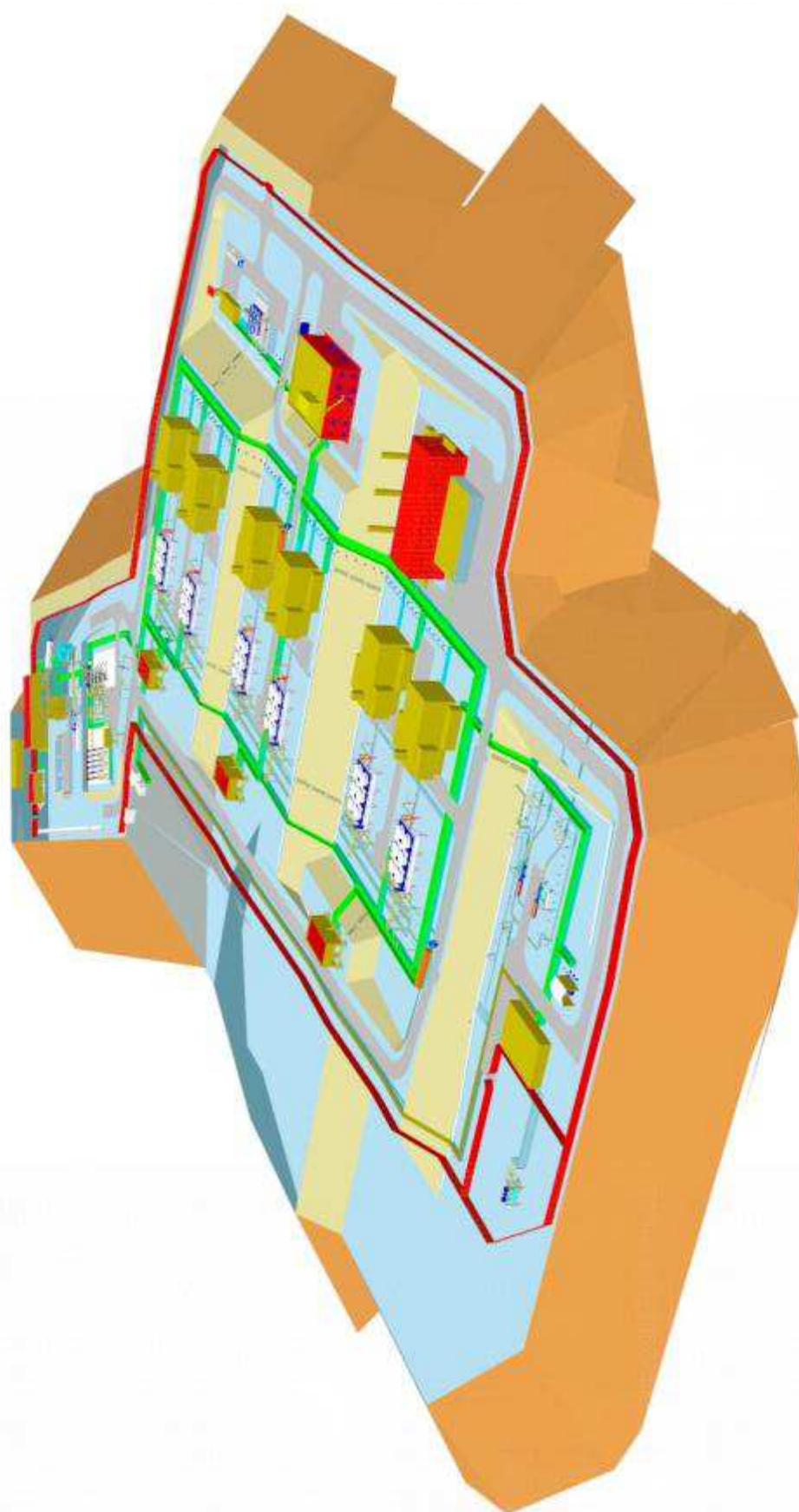
Ground Concentration of NO_x (µg/m³)











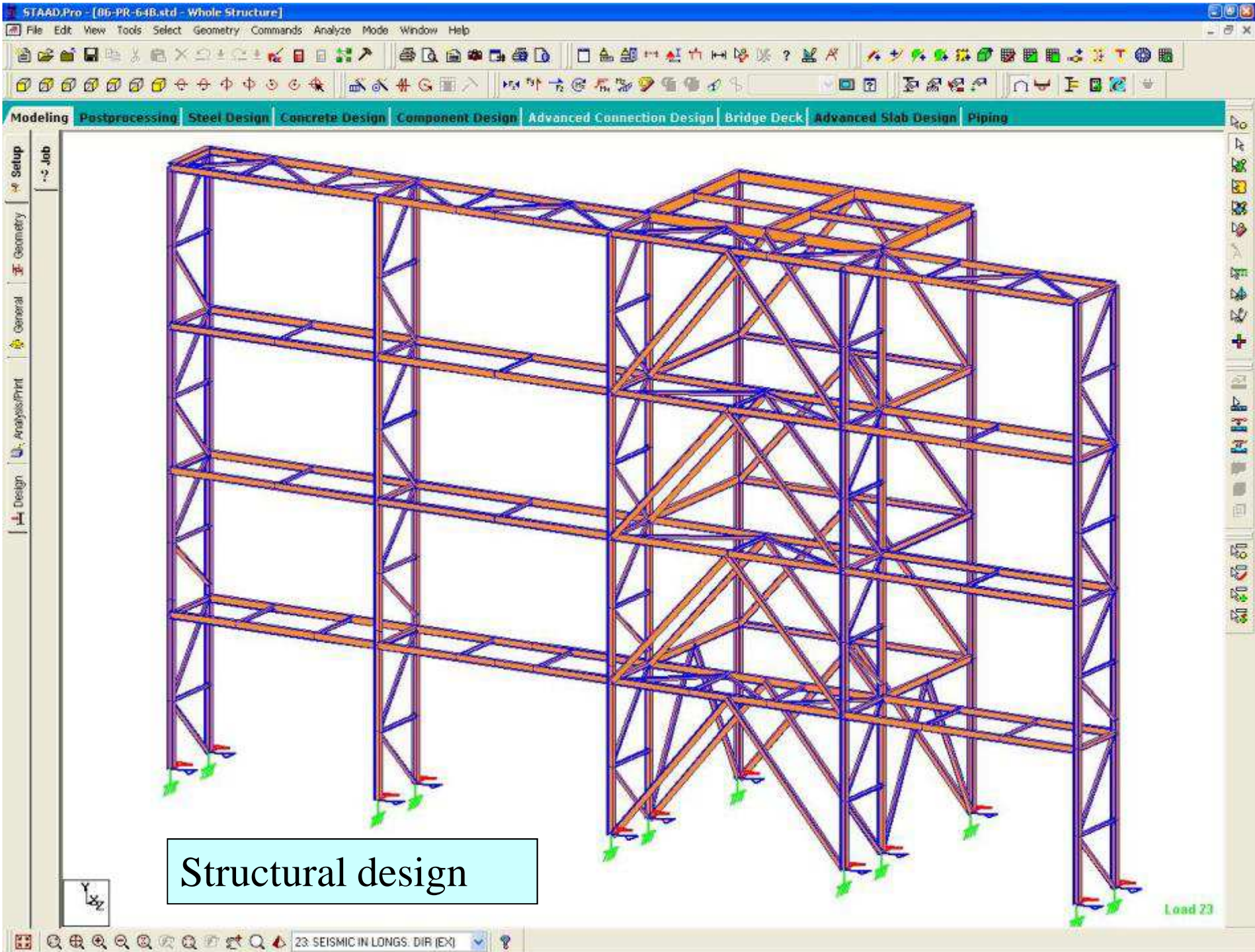


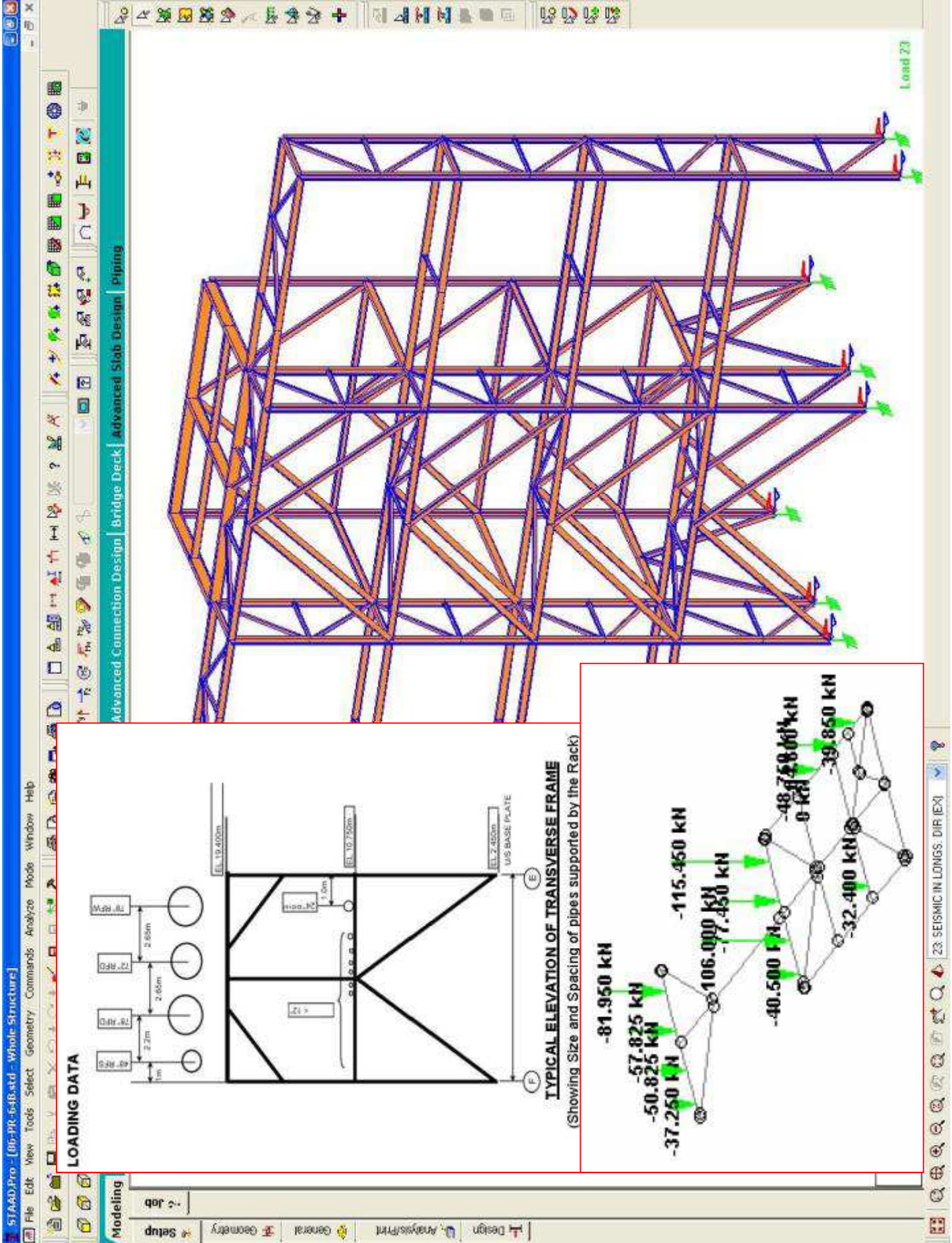


Equipment supporting structures

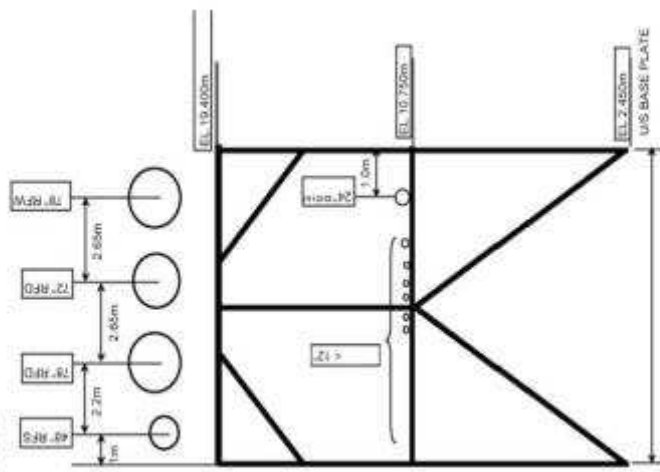


Piping supporting structures (pipe-racks)



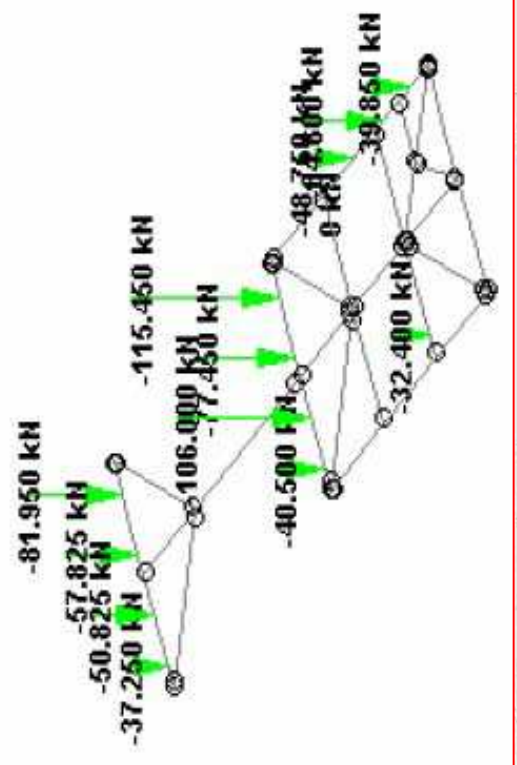


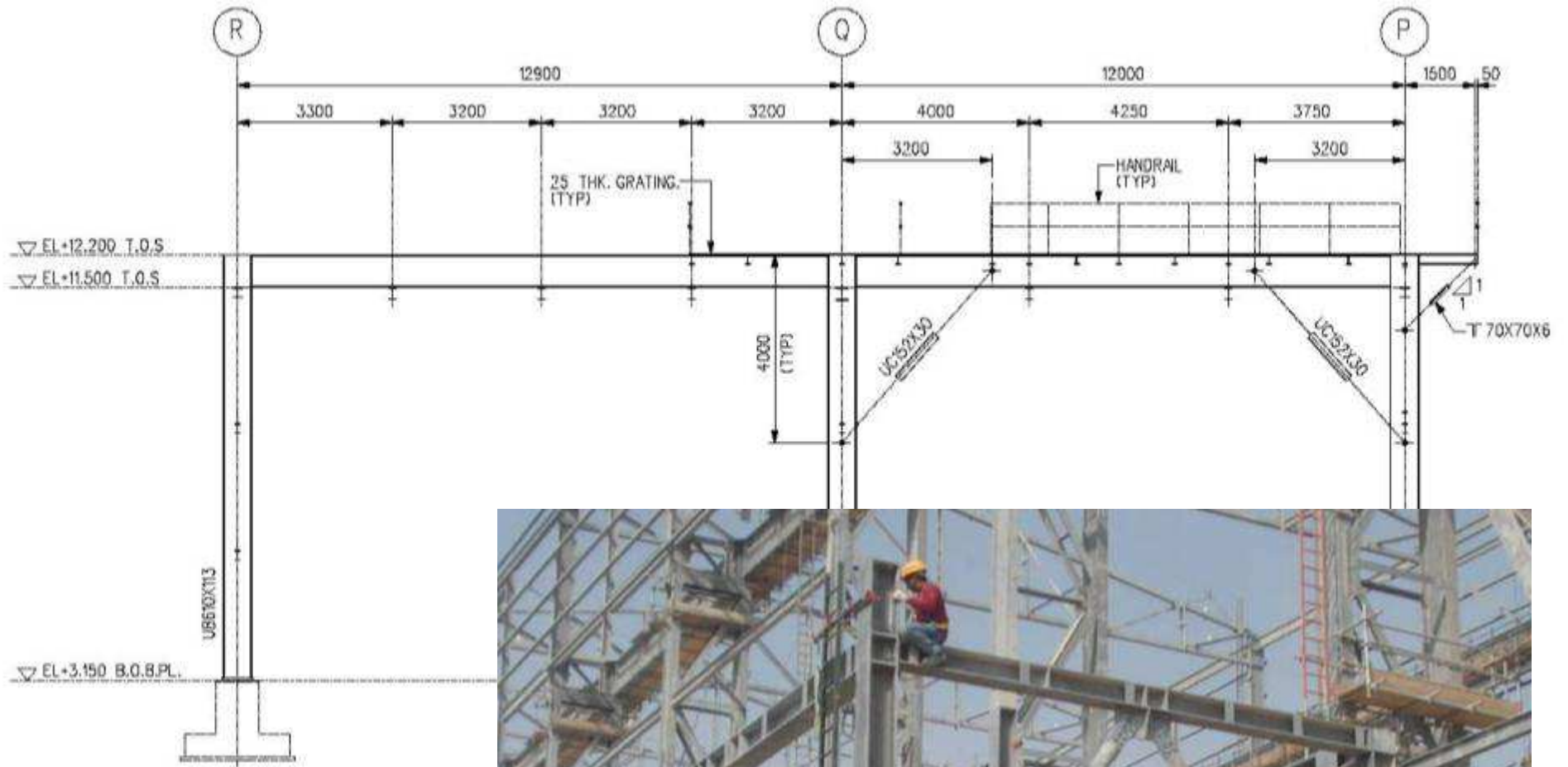
LOADING DATA



TYPICAL ELEVATION OF TRANSVERSE FRAME

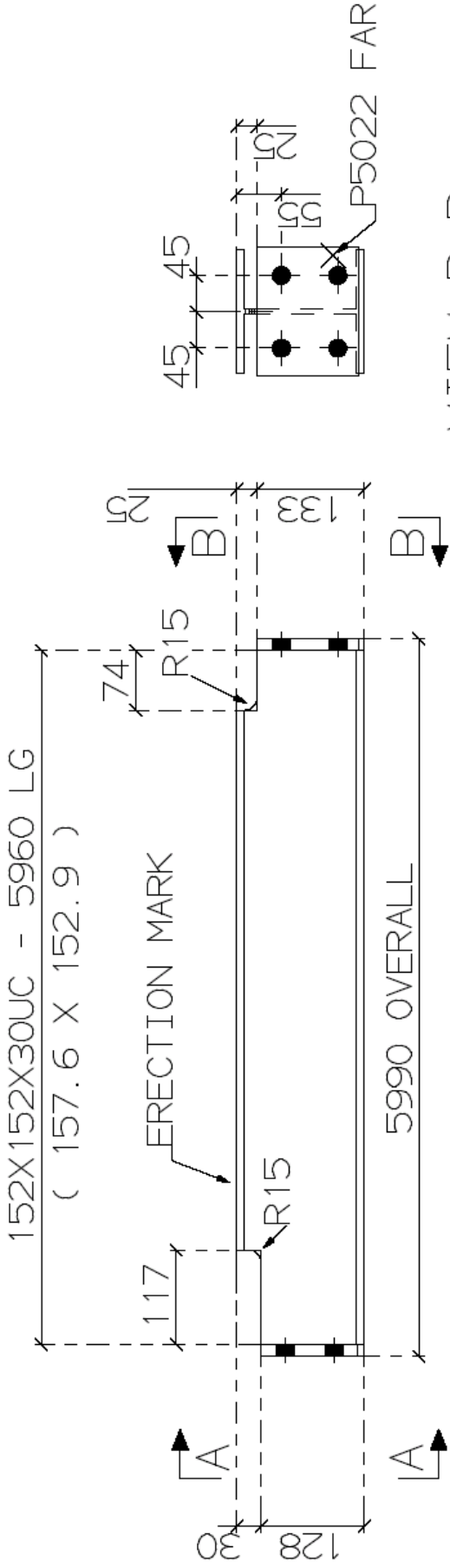
(Showing Size and Spacing of pipes supported by the Rack)

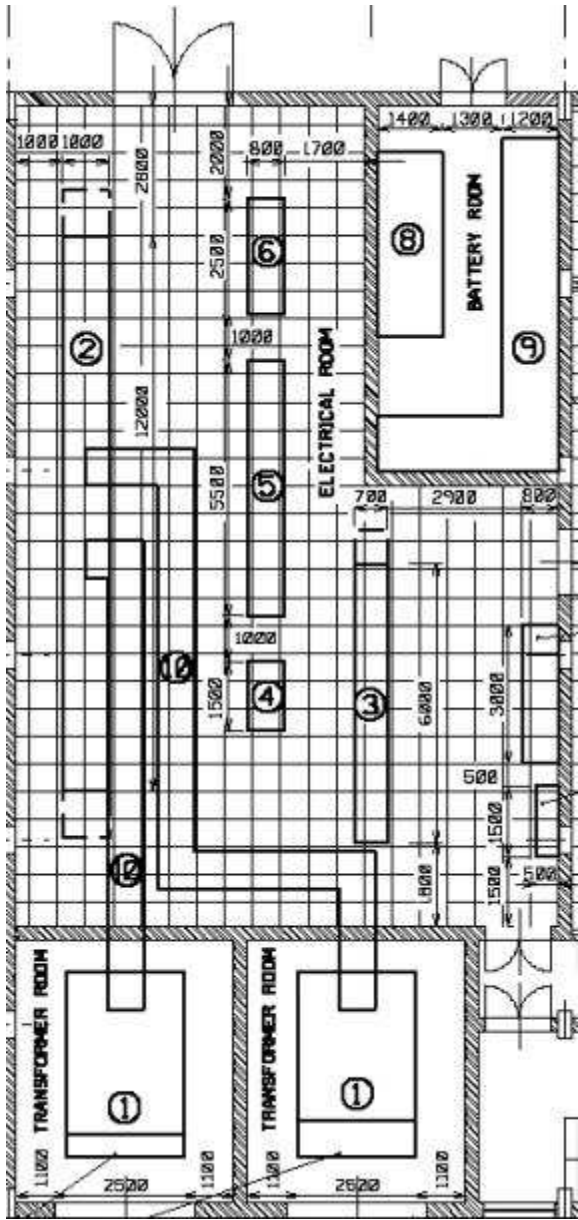




Structural drawings

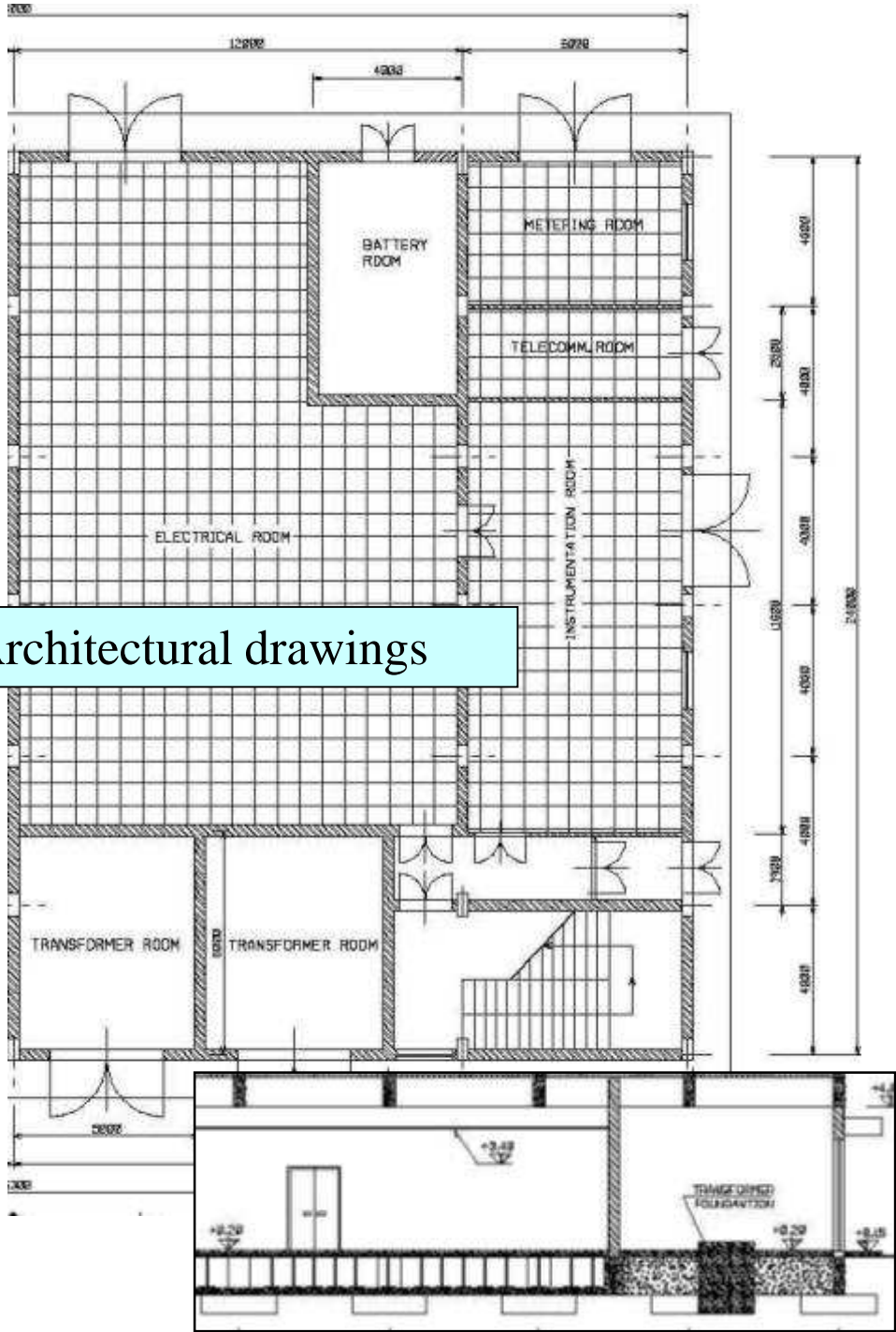




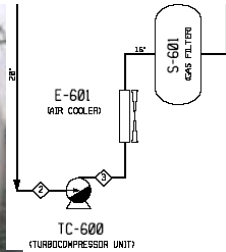
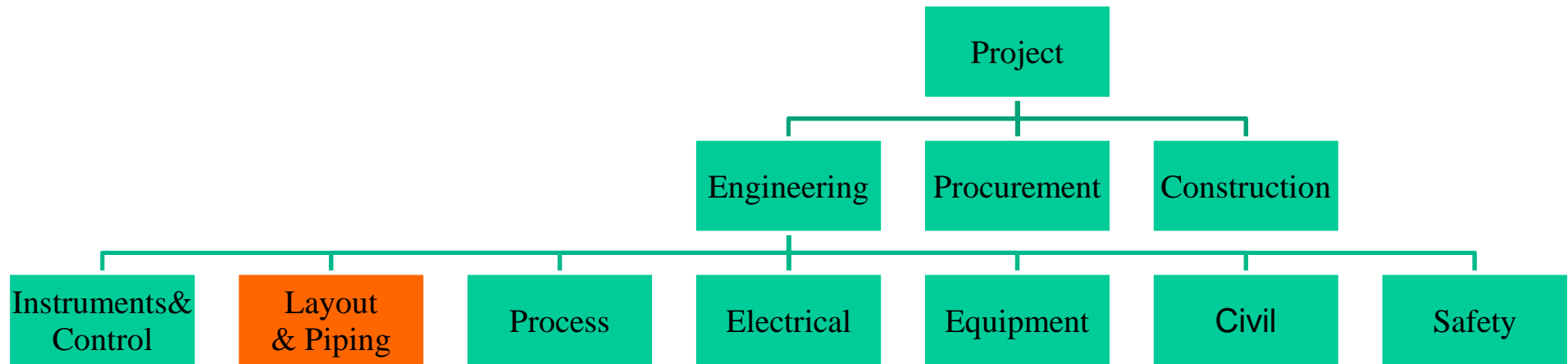


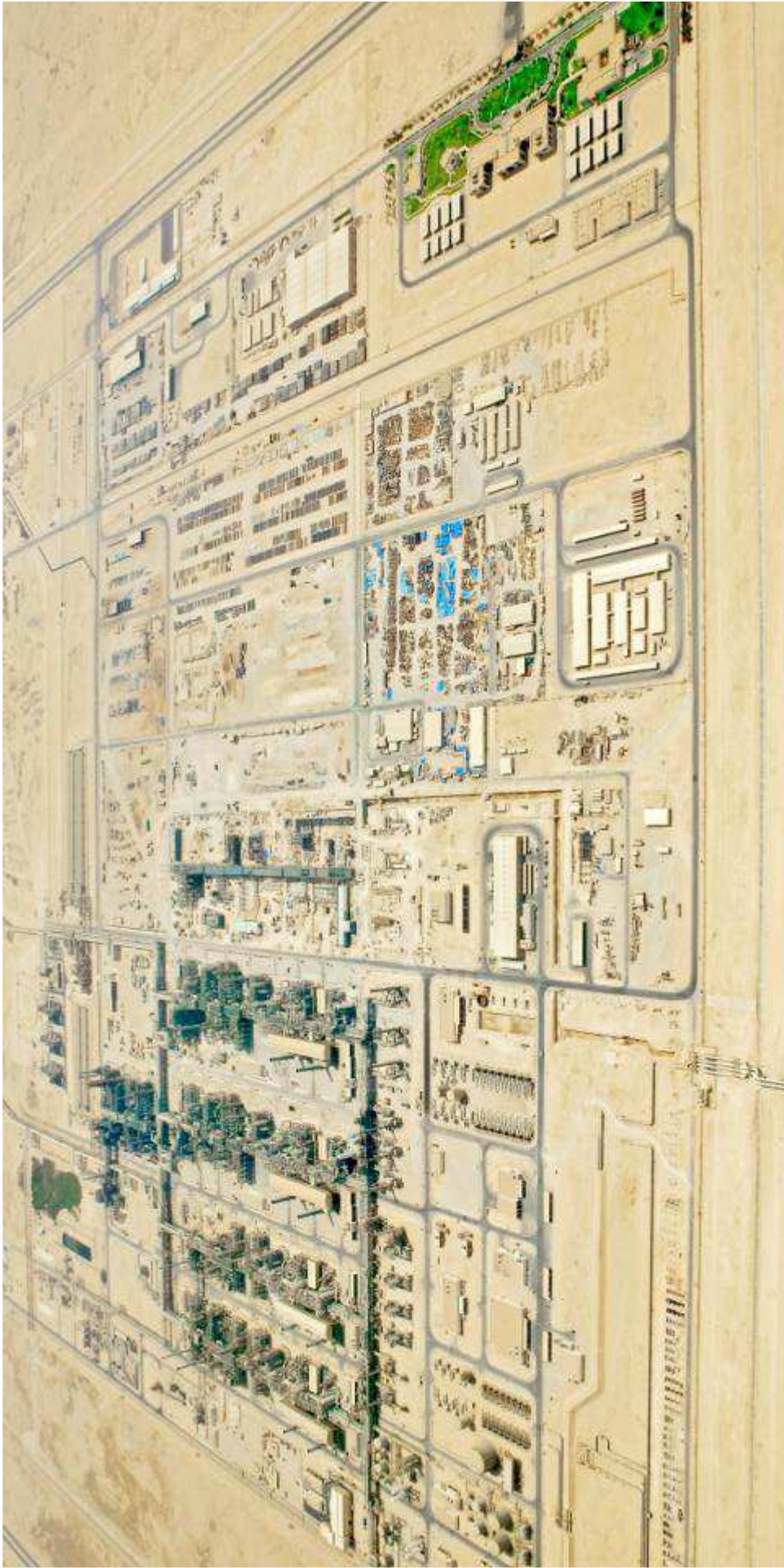
Equipment layout drawing

Architectural drawings

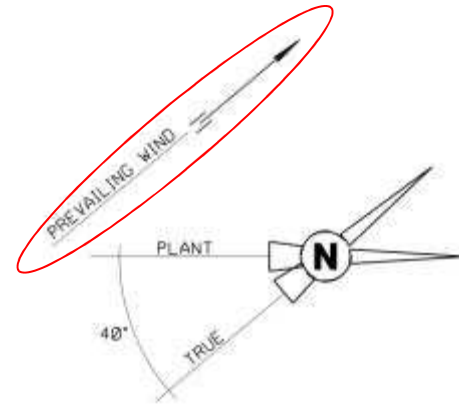
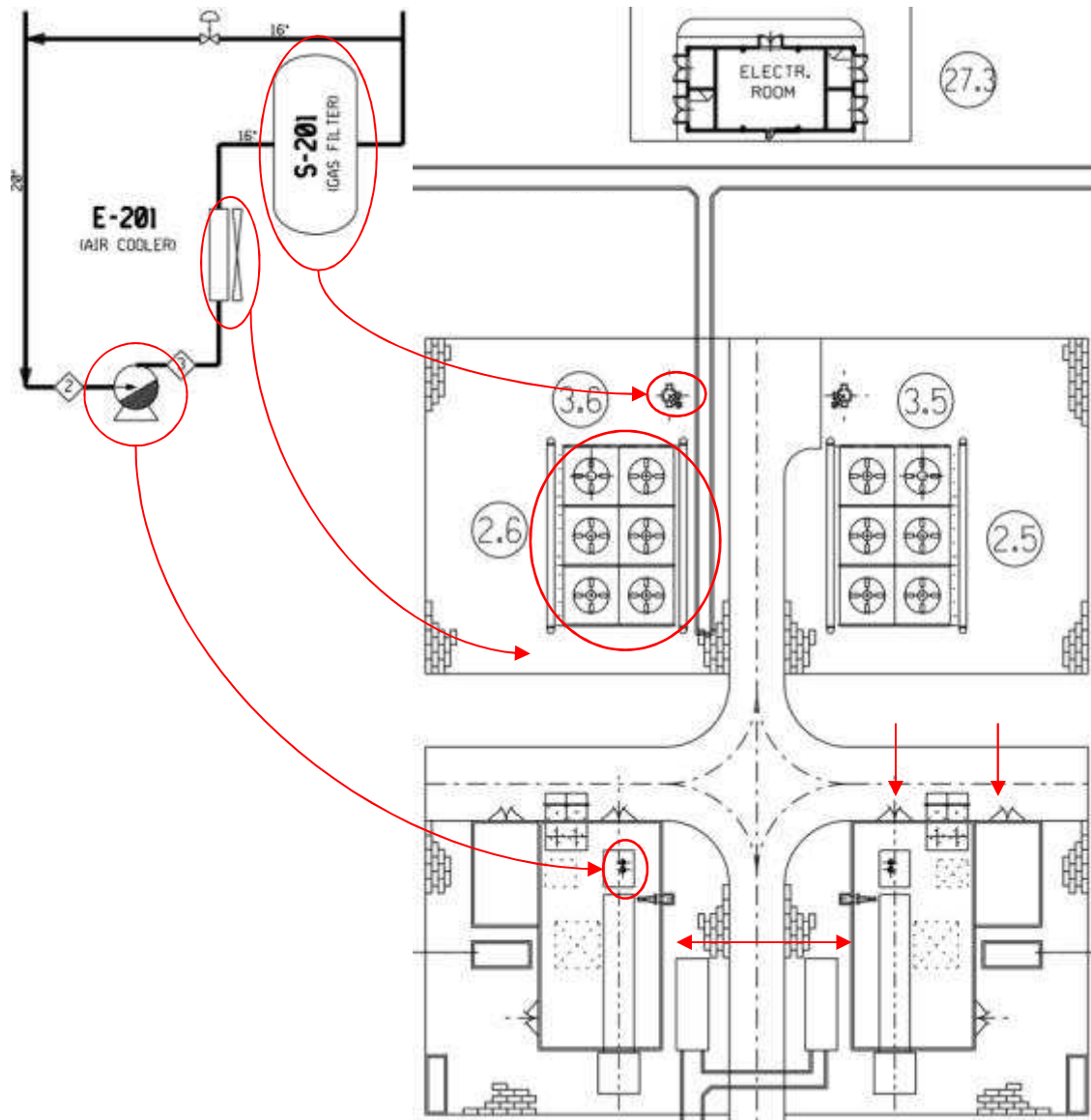








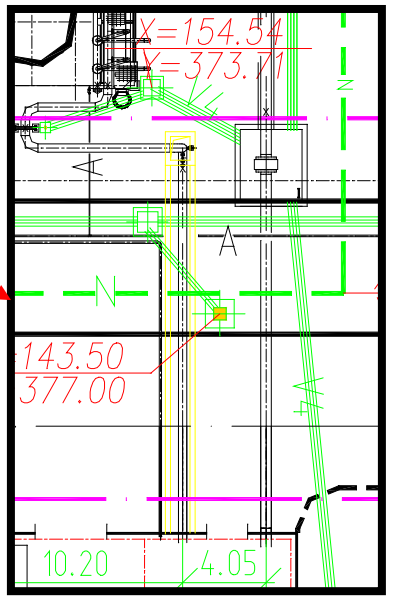
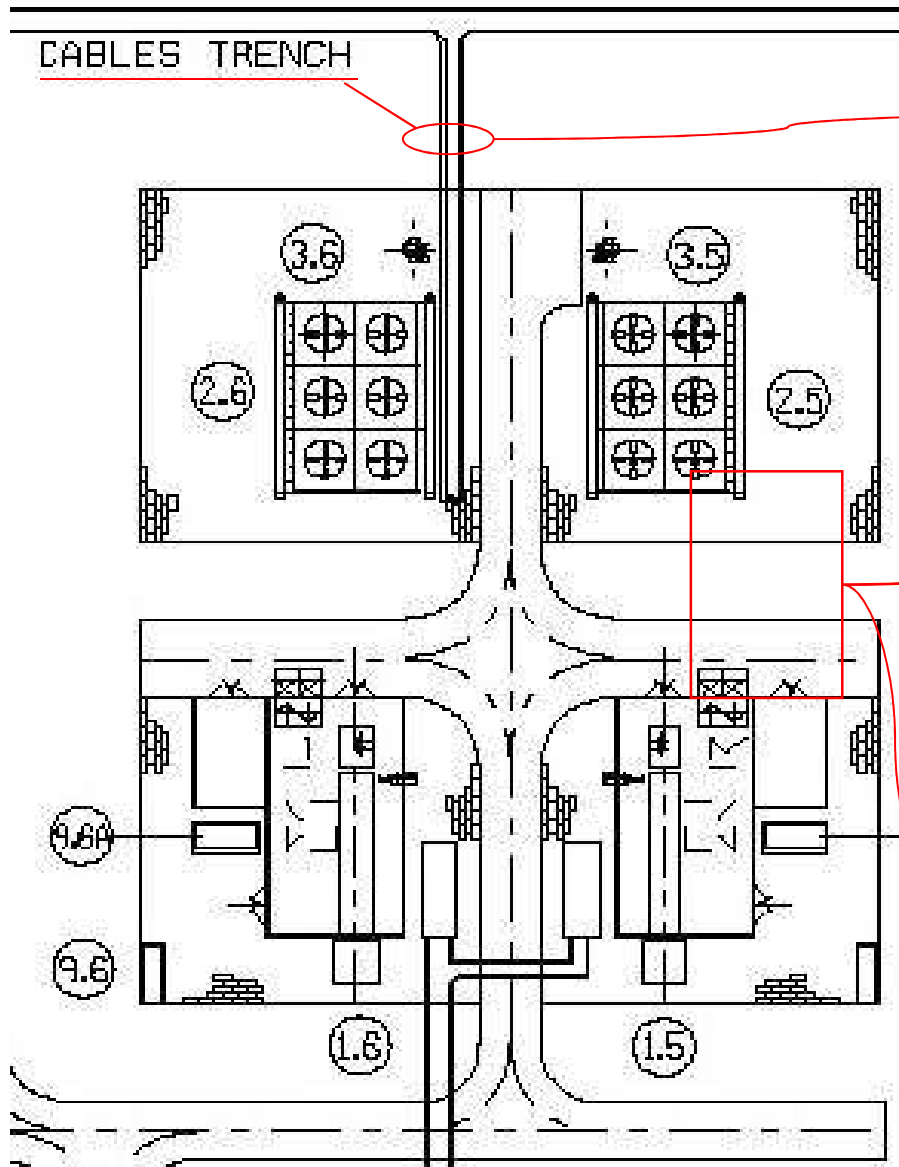
HERVE BARON



Layout/
principles

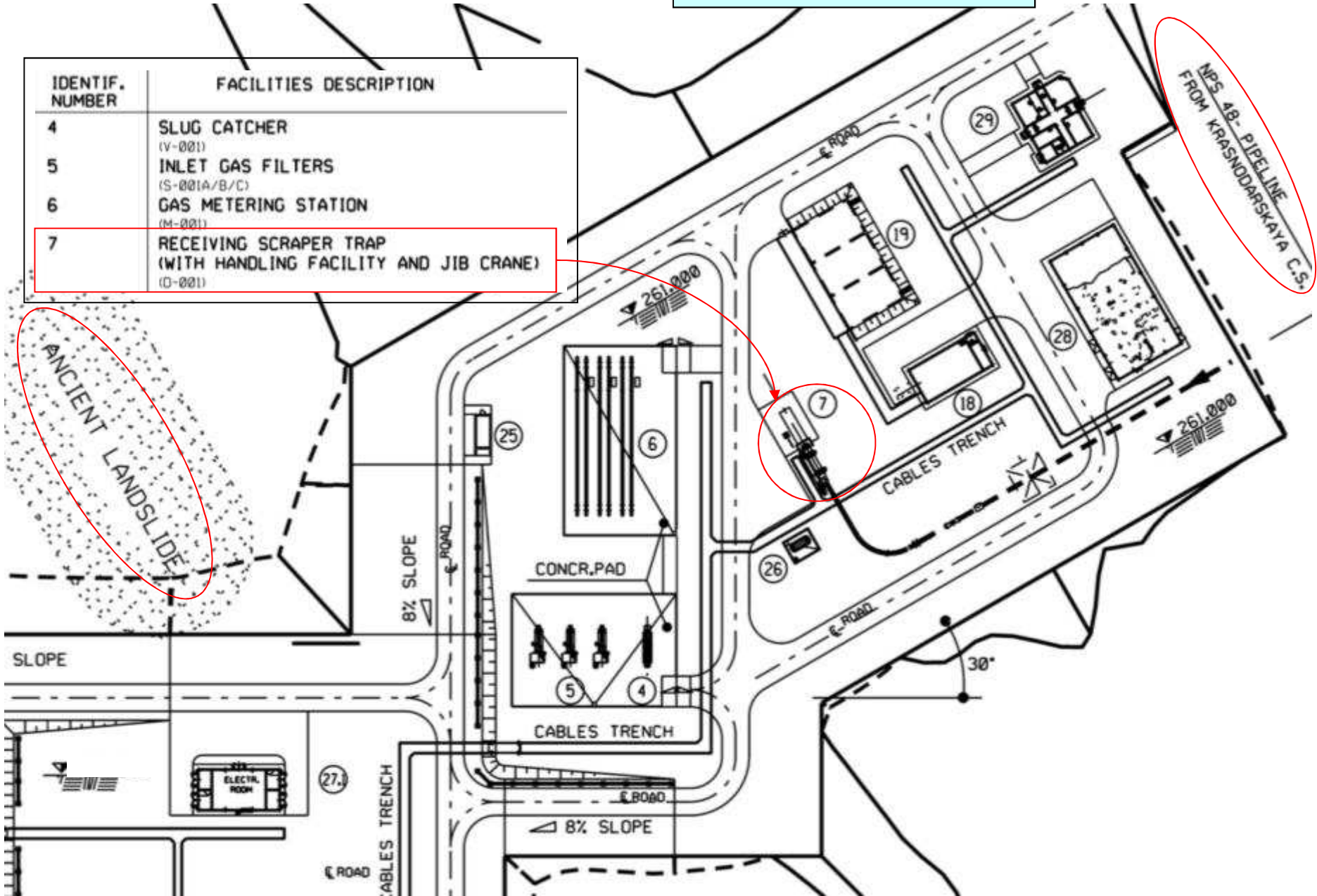


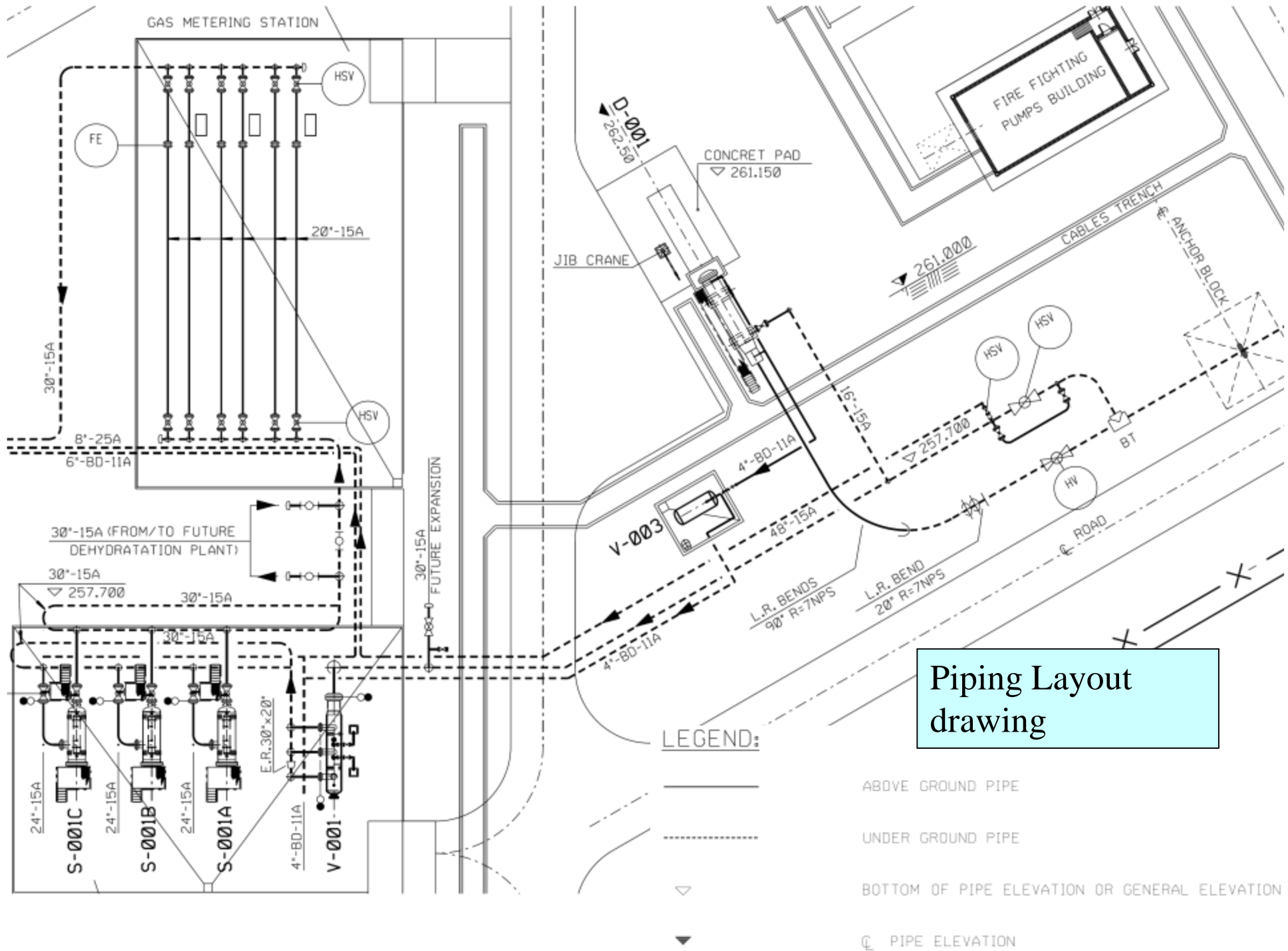
Layout/consideration for all networks



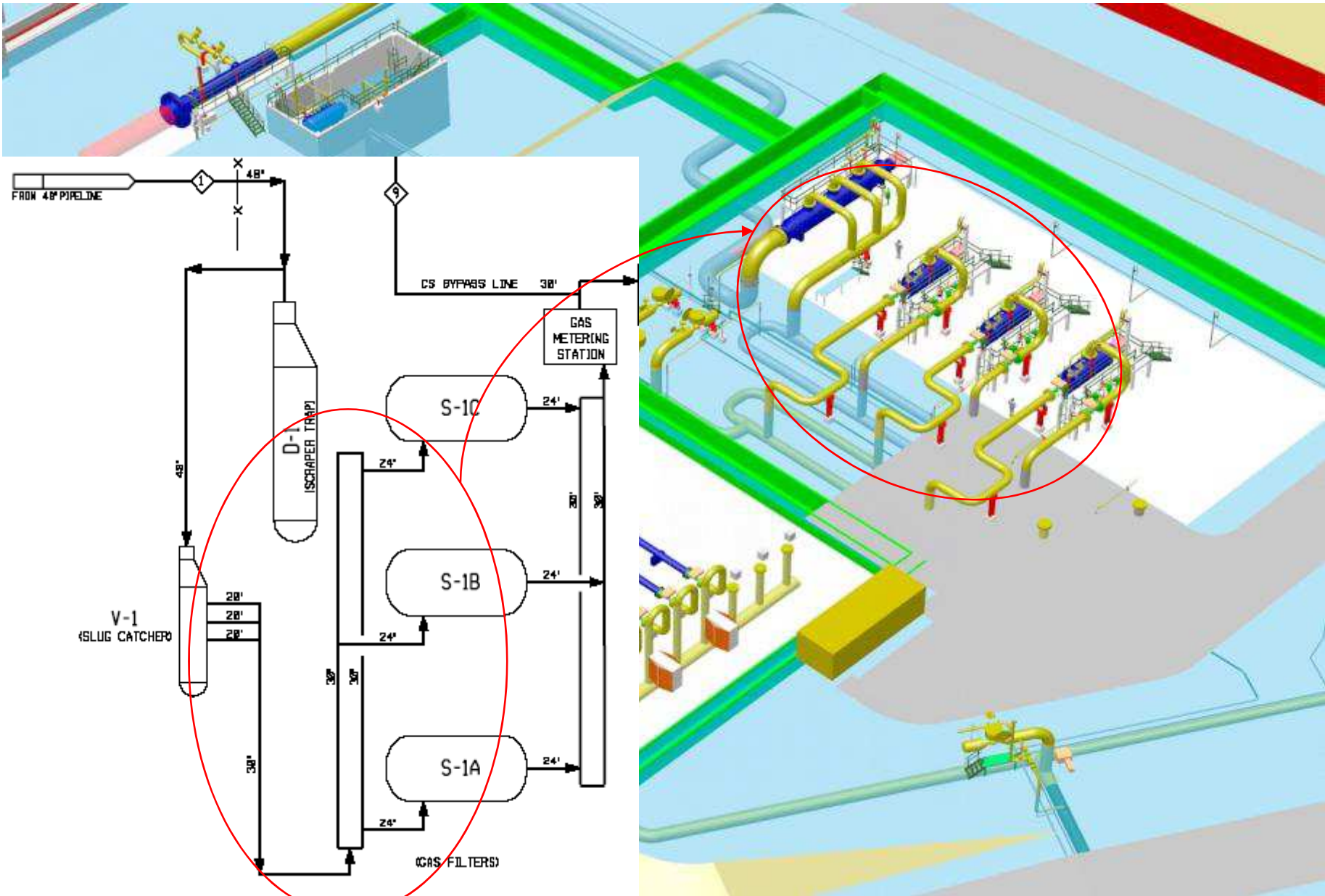
General Plot Plan

IDENTIF. NUMBER	FACILITIES DESCRIPTION
4	SLUG CATCHER (V-001)
5	INLET GAS FILTERS (S-001A/B/C)
6	GAS METERING STATION (M-001)
7	RECEIVING SCRAPER TRAP (WITH HANDLING FACILITY AND JIB CRANE) (D-001)

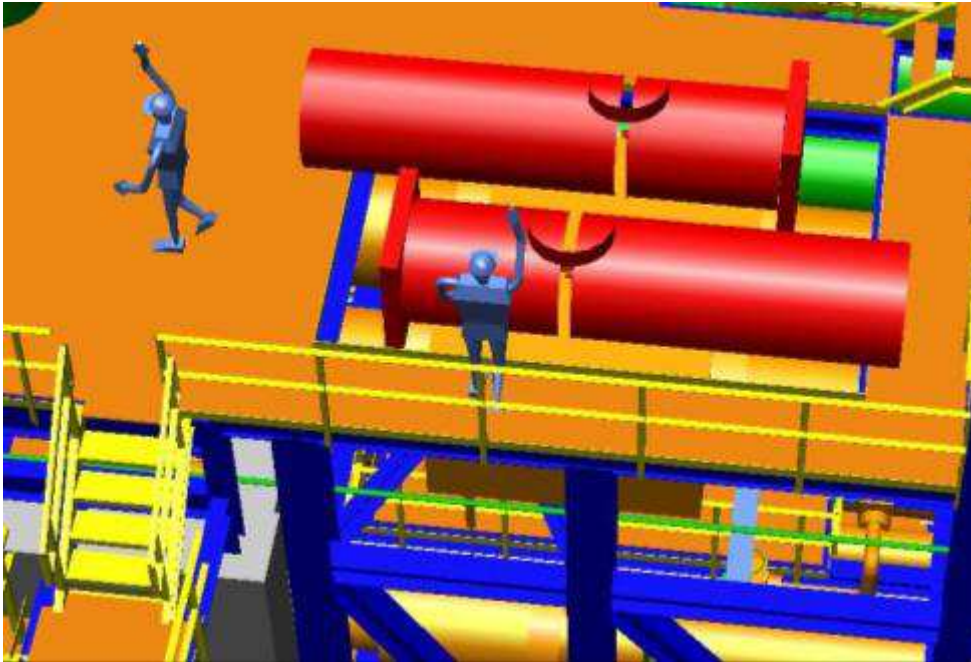




Piping Layout drawing

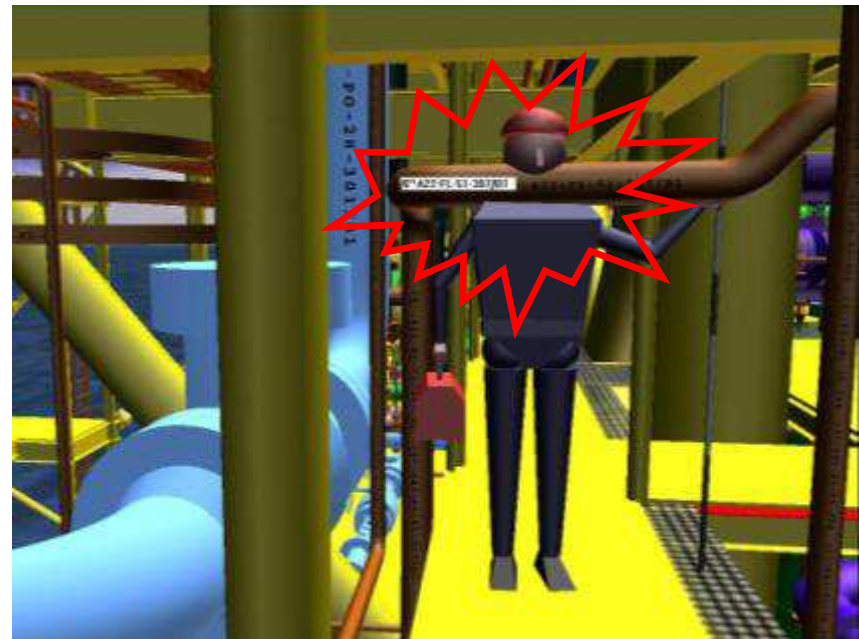


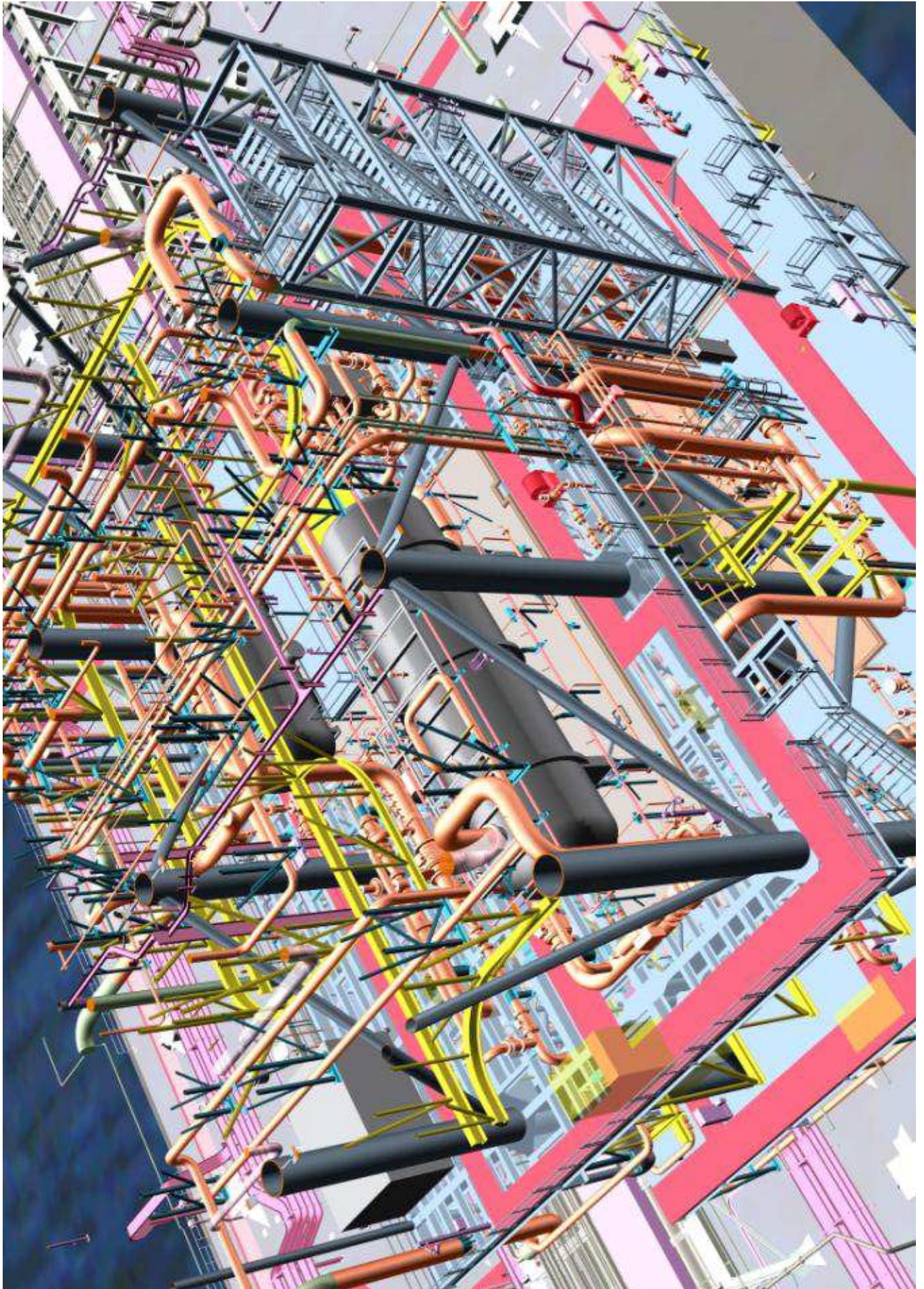
**HERVE
BARON**

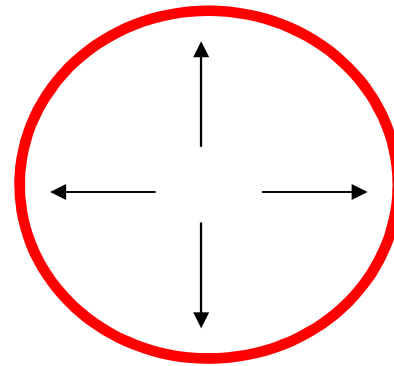


3D model review

3D model clash check







ANSI B31.8 (for gas pipelines and compressor stations)

841.1 Steel Piping Systems Design Requirements

841.11 Steel Pipe Design Formula

(a) The design pressure for steel gas piping systems or the nominal wall thickness for a given design pressure shall be determined by the following formula (for limitations, see para. 841.111):

$$P = \frac{2St}{D} FET$$

where

- D* = nominal outside diameter of pipe, in.
- E* = longitudinal joint factor obtained from Table 841.115A [see also para. 817.13(d)]
- F* = design factor obtained from Table 841.114A. In setting the values of the design factor, *F*, due consideration has been given and allowance has been made for the various underthickness tolerances provided for in the pipe specifications listed and approved for usage in this Code.
- P* = design pressure, psig (see also para. 841.111)
- S* = specified minimum yield strength, psi, stipulated in the specifications under which the pipe was purchased from the manufacturer or determined in accordance with paras. 817.13(h) and 841.112. The specified minimum yield strengths of some of the more commonly used piping steels whose specifications are incorporated by reference herein are tabulated for convenience in Appendix D.
- T* = temperature derating factor obtained from Table 841.116A
- t* = nominal wall thickness, in.

API 5L specification

Forty-first edition – APRIL 1995

CHEMICAL REQUIREMENTS FOR HEAT ANALYSES (Section 6)

Type of pipe	Grade	Carbon maxi % (1)	Manganese maxi % (1)	Phosphorus maxi %	Sulfur maxi %
seamless					
Non-expanded or cold expanded	A	0.22	0.90	0.030	0.030
	B(4)	0.27	1.15	0.030	0.030
Non-expanded	X42	0.29	1.25	0.030	0.030
	X46(4), X52(4)	0.31	1.35	0.030	0.030
Cold expanded	X42(4), X46(4), X52(4)	0.29(2)	1.25	0.030	0.030
	X56(3,4), X60(3,4)	0.26	1.35	0.030	0.030
Non-expanded or cold expanded	X65, X70, X80	(by agreement)			

TENSILE REQUIREMENTS (Section 6)

Grade	Yield strength minimum		Ultimate tensile strength minimum		Ultimate tensile strength maximum		Elongation minimum percent in 2 in. (50.8 mm)
	ksi	MPa	ksi	MPa	ksi	MPa	
A	30.0	207	48.0	331			See note (1)
B	35.0	241	60.0	413			
X42	42.0	289	60.0	413			
X46	46.0	317	63.0	434			
X52	52.0	358	66.0	455			
X56	56.0	386	71.0	489			
X60	60.0	413	75.0	517			

ANSI B31.8 (for gas pipelines and compressor stations)

841.1 Steel Piping Systems Design Requirements

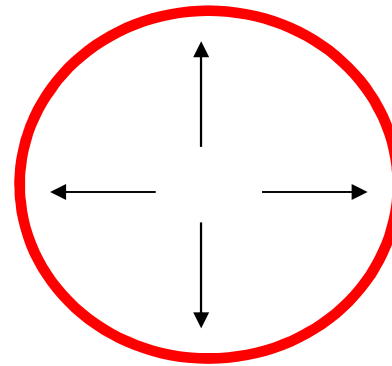
841.11 Steel Pipe Design Formula

(a) The design pressure for steel gas piping systems or the nominal wall thickness for a given design pressure shall be determined by the following formula (for limitations, see para. 841.111):

$$P = \frac{2St}{D} FET$$

where

- D* = nominal outside diameter of pipe, in.
- E* = longitudinal joint factor obtained from Table 841.115A [see also para. 817.13(d)]
- F* = design factor obtained from Table 841.114A. In setting the values of the design factor, *F*, due consideration has been given and allowance has been made for the various underthickness tolerances provided for in the pipe specifications listed and approved for usage in this Code.
- P* = design pressure, psig (see also para. 841.111)
- S* = specified minimum yield strength, psi, stipulated in the specifications under which the pipe was purchased from the manufacturer or determined in accordance with paras. 817.13(h) and 841.112. The specified minimum yield strengths of some of the more commonly used piping steels whose specifications are incorporated by reference herein are tabulated for convenience in Appendix D.
- T* = temperature derating factor obtained from Table 841.116A
- t* = nominal wall thickness, in.



API 5L specification

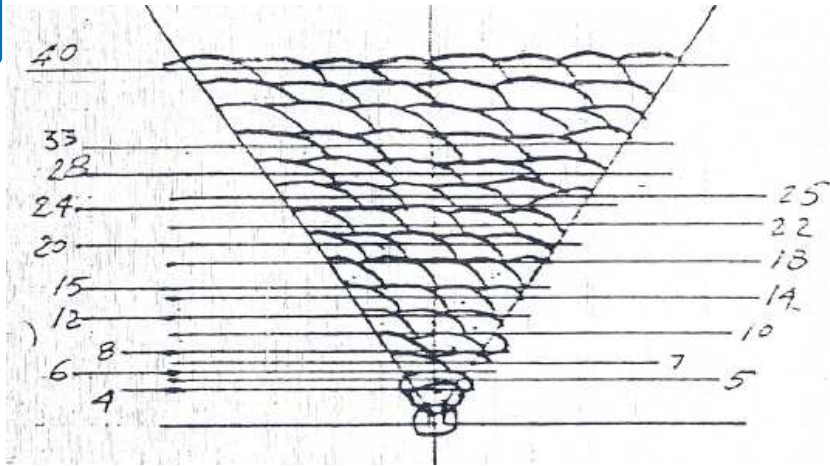
Forty-first edition – APRIL 1995

CHEMICAL REQUIREMENTS FOR HEAT ANALYSES (Section 6)

Type of pipe	Grade	Carbon maxi % (1)	Manganese maxi % (1)	Phosphorus maxi %	Sulfur maxi %
seamless					
Non-expanded or cold expanded	A	0.22	0.90	0.030	0.030
	B(4)	0.27	1.15	0.030	0.030
Non-expanded	X42	0.29	1.25	0.030	0.030
	X46(4), X52(4)	0.31	1.35	0.030	0.030
Cold expanded	X42(4), X46(4), X52(4)	0.29(2)	1.25	0.030	0.030
	X56(3,4), X60(3,4)	0.26	1.35	0.030	0.030
Non-expanded or cold expanded	X65, X70, X80	(by agreement)			

TENSILE REQUIREMENTS (Section 6)

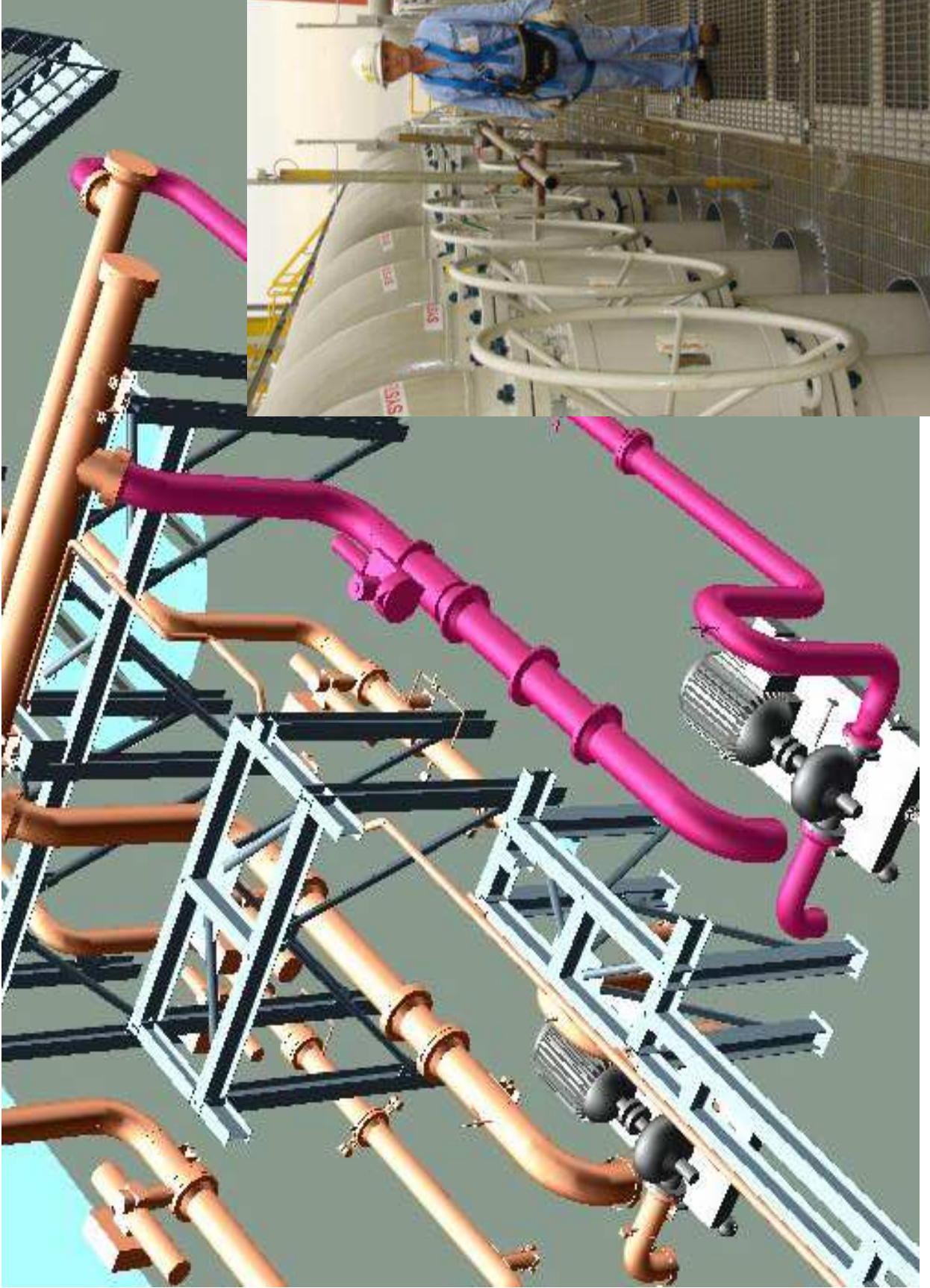
Grade	Yield strength minimum		Ultimate tensile strength minimum		Ultimate tensile strength maximum		Elongation minimum percent in 2 in. (50.8 mm)
	ksi	MPa	ksi	MPa	ksi	MPa	
A	30.0	207	48.0	331			See note (1)
B	35.0	241	60.0	413			
X42	42.0	289	60.0	413			
X46	46.0	317	63.0	434			
X52	52.0	358	66.0	455			
X56	56.0	386	71.0	489			
X60	60.0	413	75.0	517			



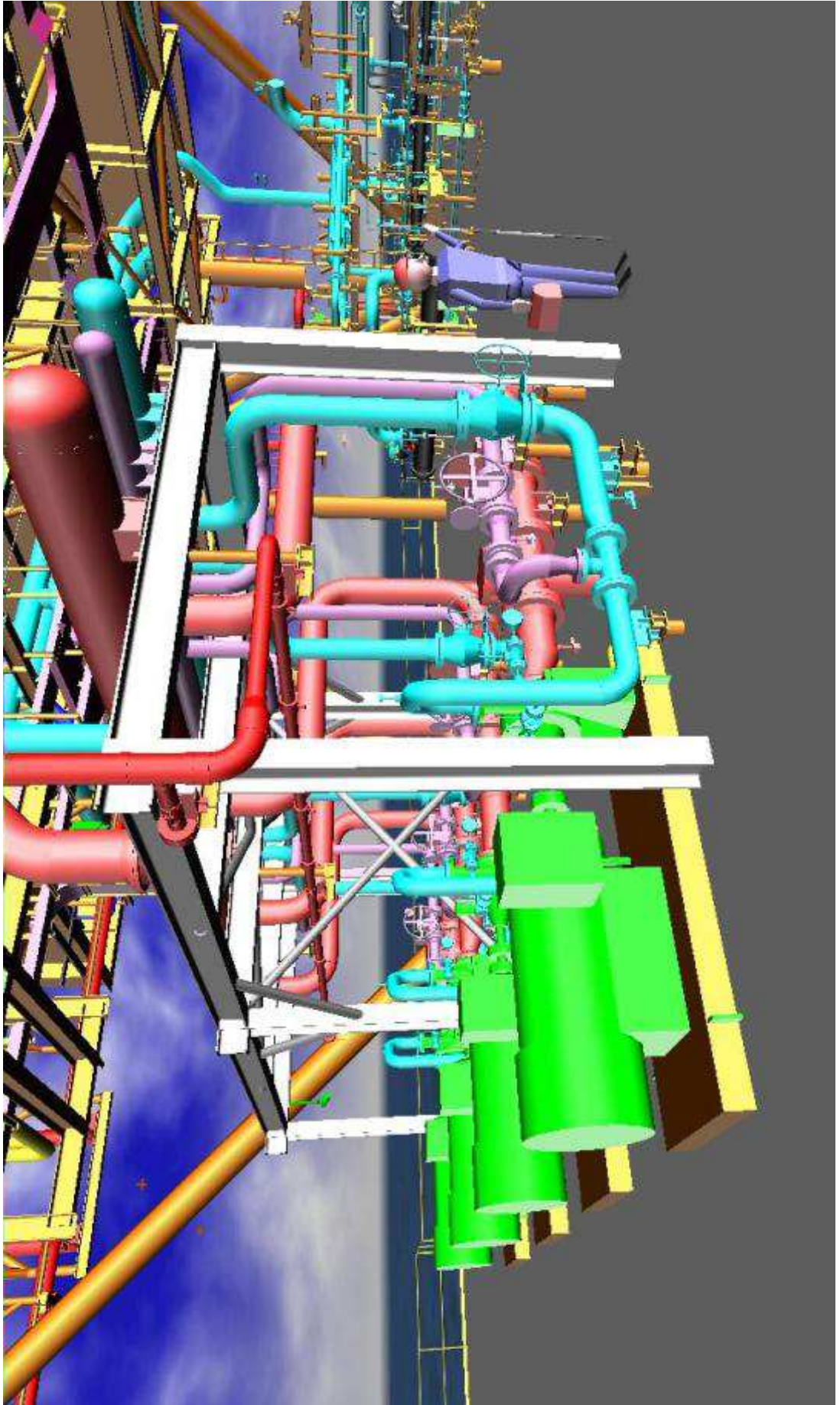
Thickness (mm) Number of passes

4	2	} +3 ROOT PASS
5	3	
6	4	
7	5	
8	7	
10	9	
12	11	
14	13	
15	14	
18	18	
20	22	
22	25	
24	30	
25	32	
28	38	
33	44	
40	60	

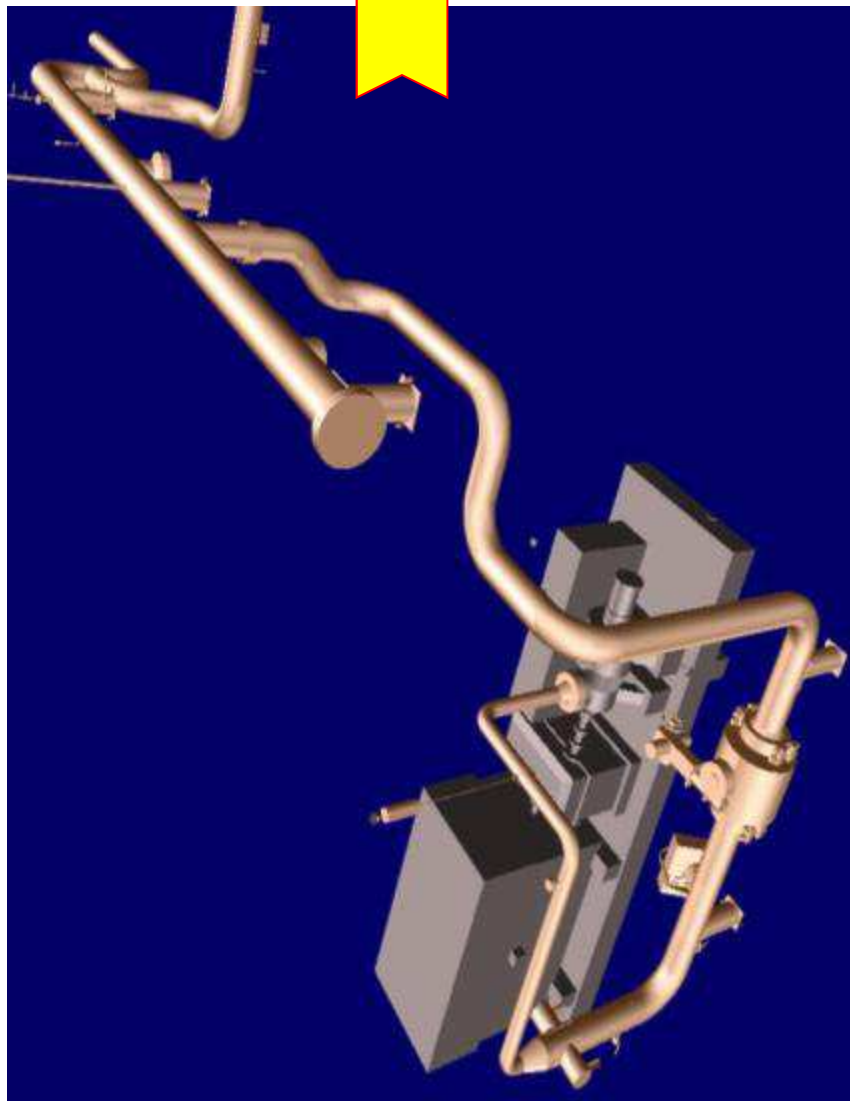
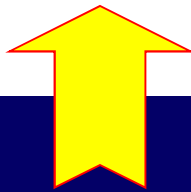
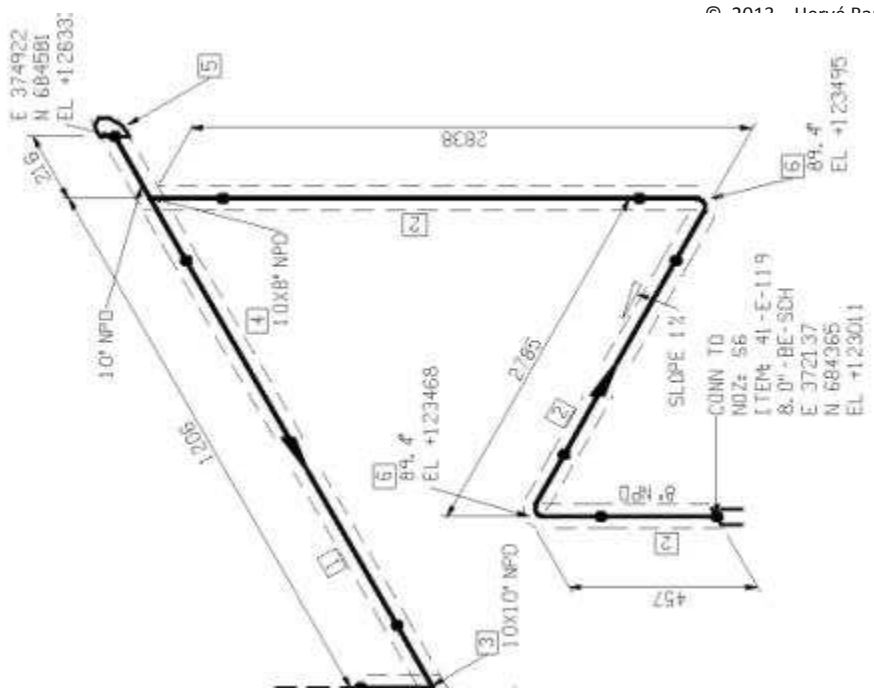




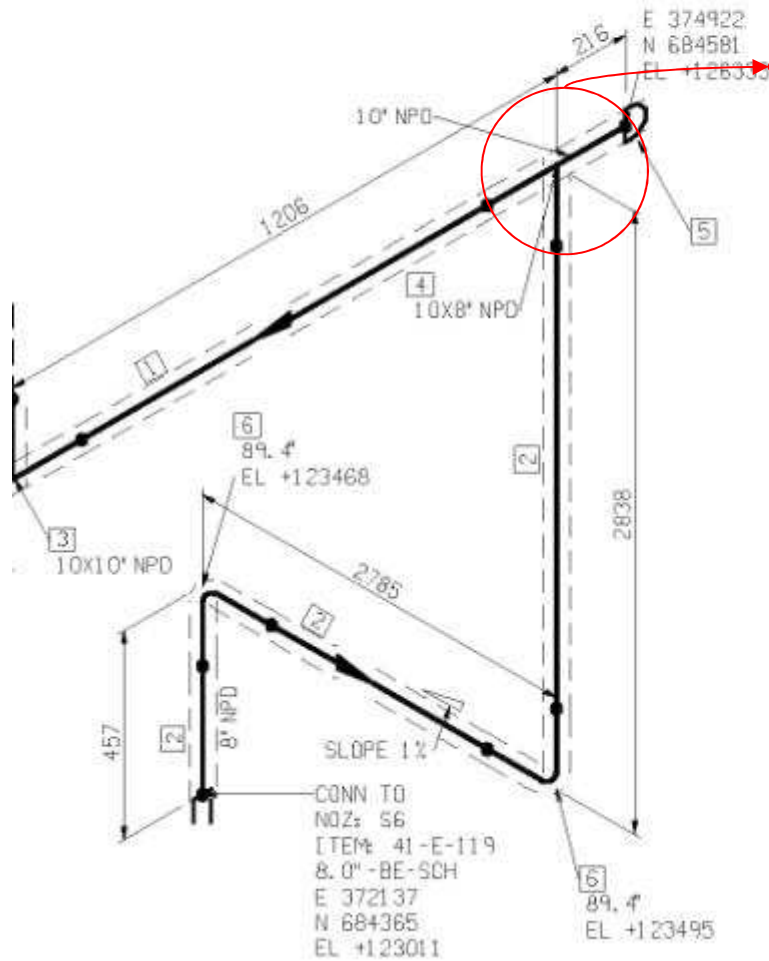
**HERVE
BARON**







Isometric drawing

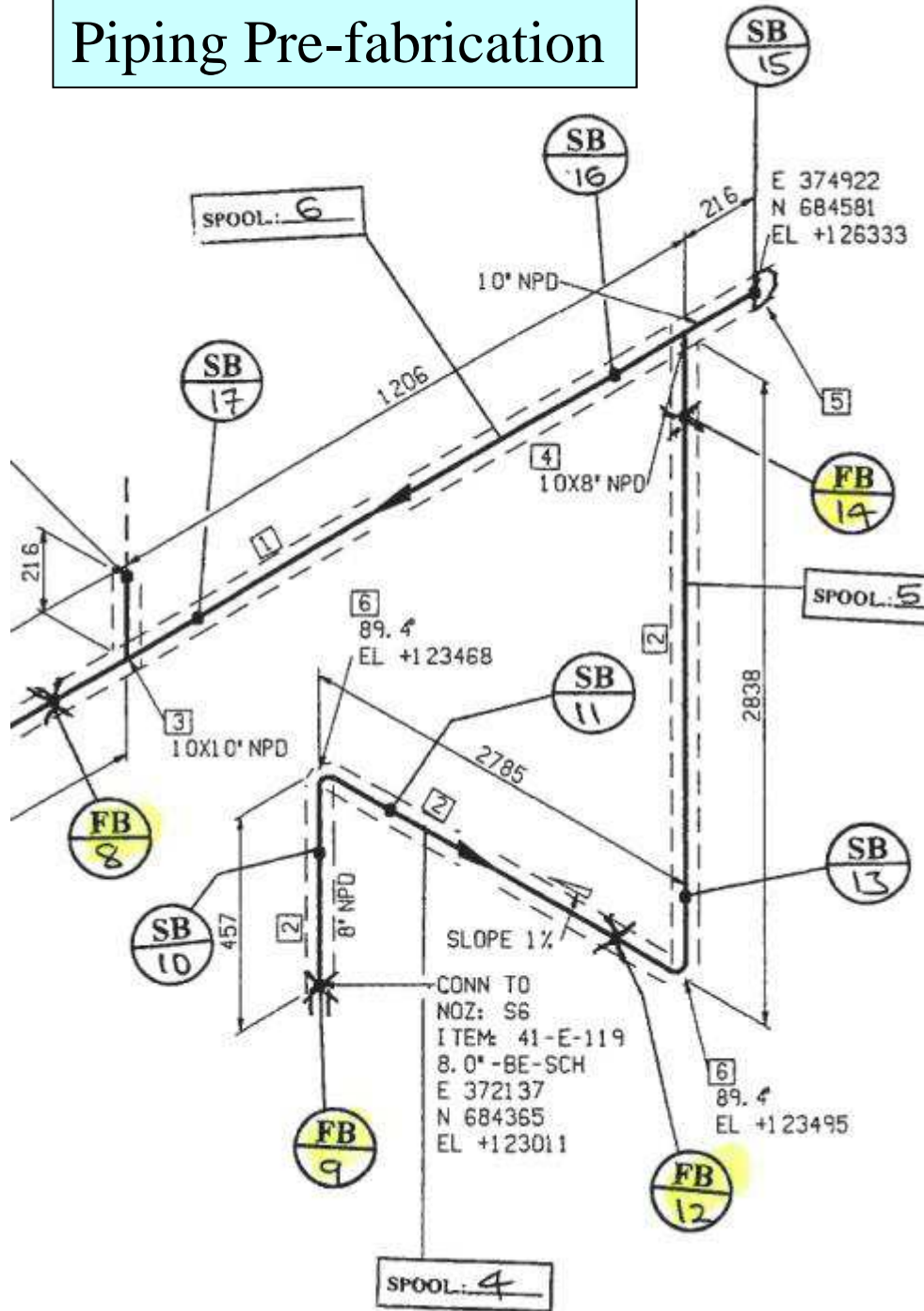


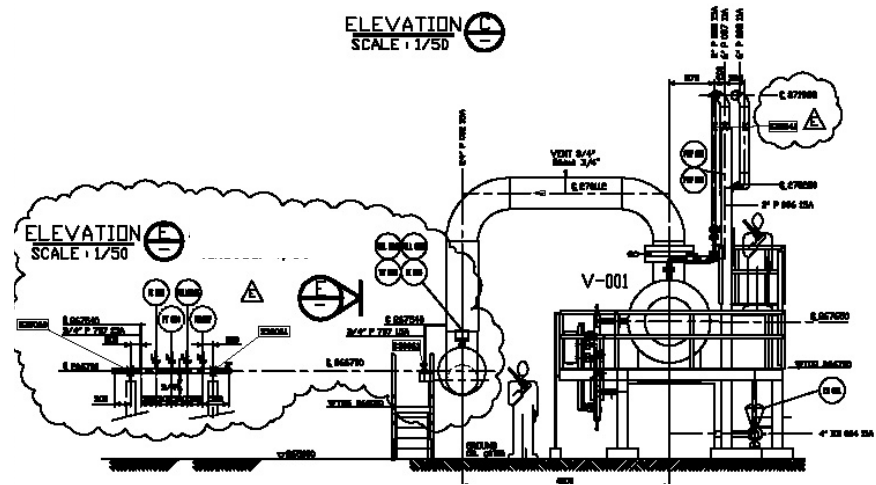
SHOP MATERIAL

PT NO	COMPONENT DESCRIPTION	DIAM (NS)	IDENT CODE	STOCK CODE	QTY
PIPE					
1	PIPE, ASME B36.10, ASME SA106 GR. B, BE, SEAMLESS, IN 10 X S-120	10	C1GABM	PP2C1 FHM P0000	1956 MM
2	PIPE, ASME B36.10, ASME SA106 GR. B, BE, SEAMLESS, IN 8 X S-120	8	C608E9	PP2C1 FHM P0000	9338 MM
FITTINGS					
3	EQUAL TEE, ASME B16.9, ASME SA234 GR. WPB, BW, SEAMLESS, IN 10 X S-120	10X10	C18M23H	DTE2CDRAM1 0000	1
4	REDUCING TEE, ASME B16.9, ASME SA234 GR. WPB, BW, SEAMLESS, IN 10 X S-120 / IN 8 X S-120	10X8	C18MPEB	DTR2CDRAM1 0000	2
5	END, ASME B16.9, ASME SA234 GR. WPB, BW, SEAMLESS, IN 10 X S-120	10	C18C03A	DLP2CDRAM1 0000	1
6	90 DEG ELBOW LR, ASME B16.9, ASME SA234 GR. WPB, BW, SEAMLESS, IN 8 X S-120	8	C88AW1	DE92CDRAM1 0000	4

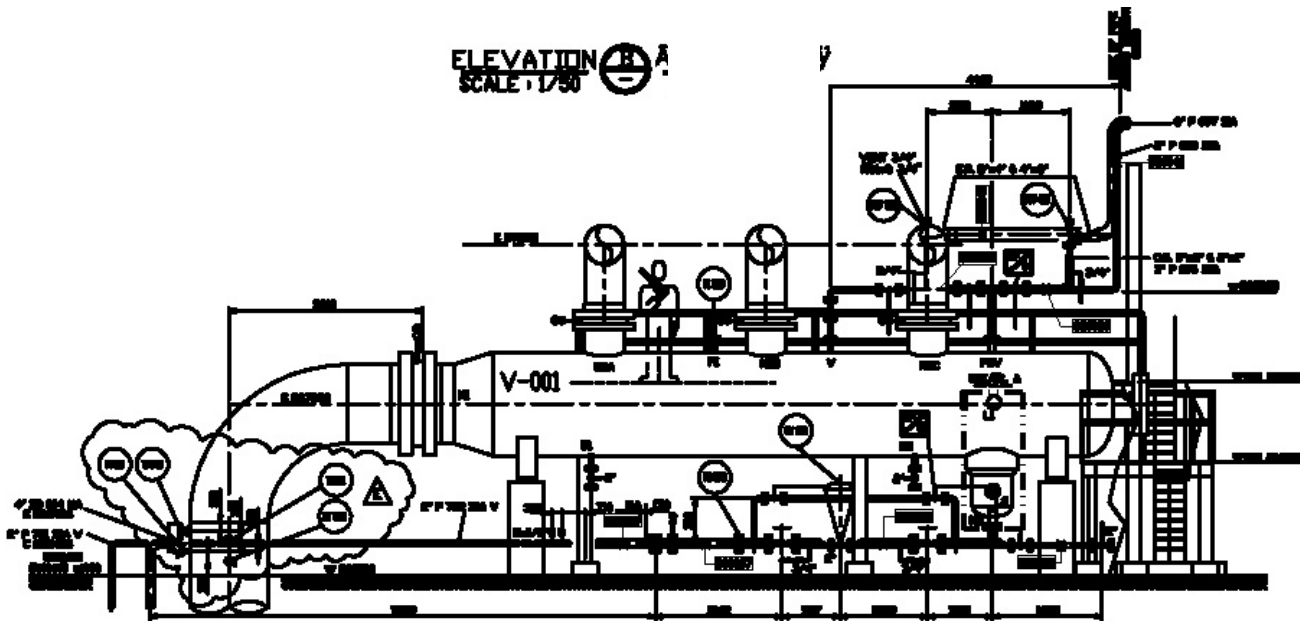


Piping Pre-fabrication





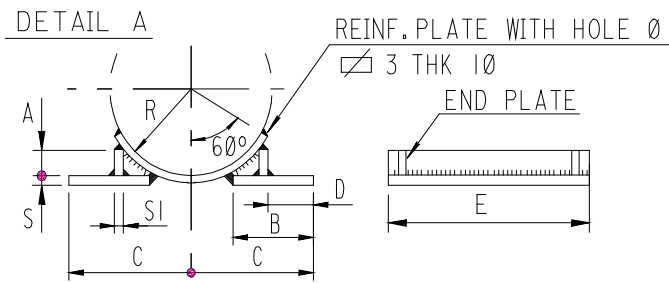
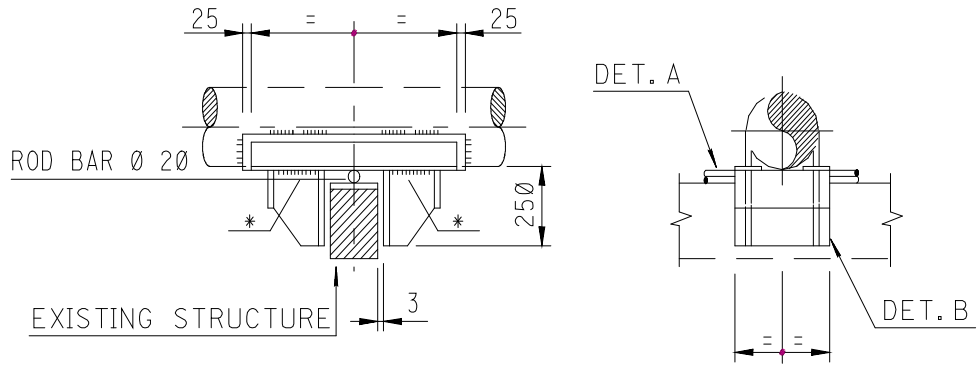
Piping General Arrangement drawing





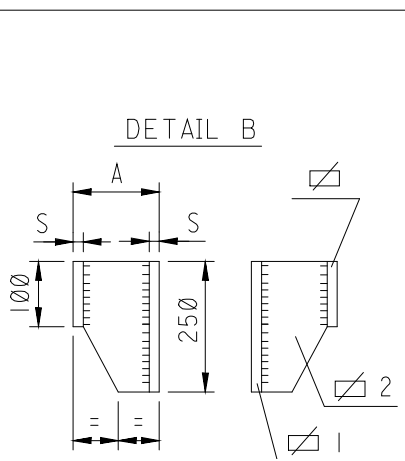
**Standard Pipe Support
drawings**

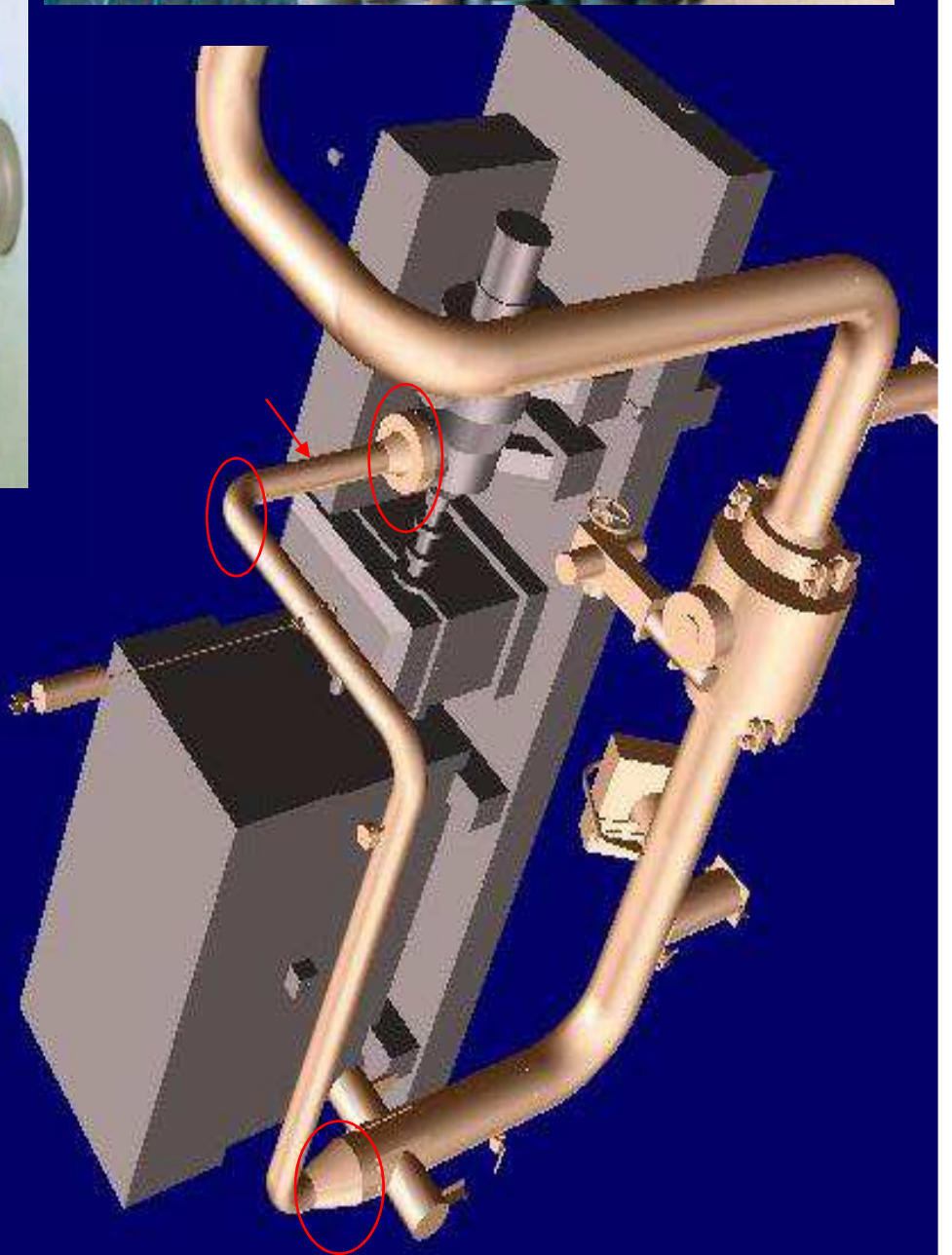
LINE STOP
DETAIL "3"



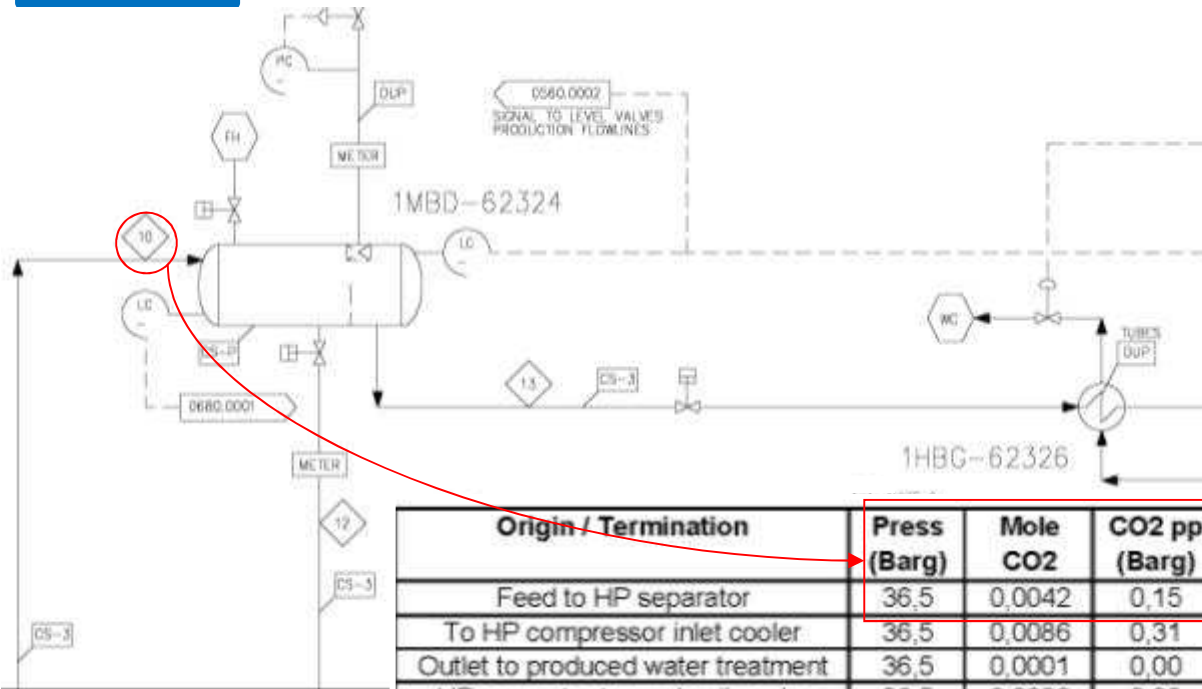
FROM 4" TO 24" DIA

DIA	R	A	B	C	D	E	S	SI	Ø 3
4"	57	22	55	80	24	1000	6	6	
6"	84	36	72	103	24				
8"	110	47	87	128	24				
10"	136	60	104	150	24	1100	8		
12"	162	71	119	175	26				
14"	178	79	131	200	27	1200			
16"	203	91	147	220	25				
18"	228	58	144	220	41	1300	10		
20"	254	64	155	235	37				
22"	279	72	168	252	37	1400			
24"	305	79	184	271	37				

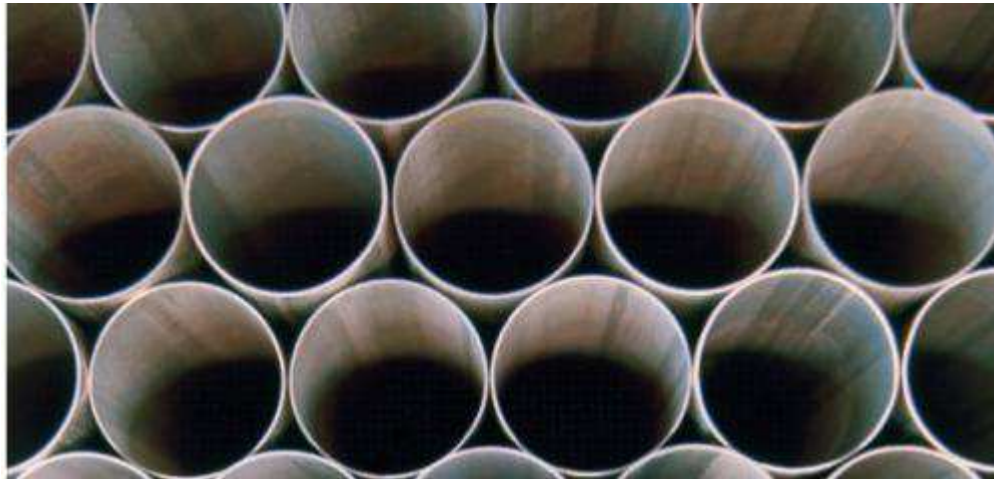




Material Selection



Origin / Termination	Press (Barg)	Mole CO2	CO2 pp (Barg)	Temp (C)	R (mm/y)	Corrected corrosion rate	Material + CA (mm)
Feed to HP separator	36,5	0,0042	0,15	96	3,25	0,06mm/yr	CS+3
To HP compressor inlet cooler	36,5	0,0086	0,31	96	5,93	3mm/yr	Duplex SS
Outlet to produced water treatment	36,5	0,0001	0,00	96	0,31	0,06mm/yr	CS+3
HP separator to crude oil cooler	36,5	0,0009	0,03	96	1,31	0,02mm/yr	CS+3
Feed to IP separator	3,5	0,0009	0,00	66	0,07	0,06mm/yr	CS+3



**HERVE
BARON**

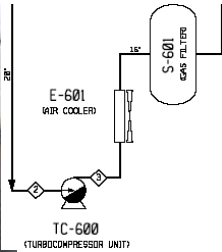
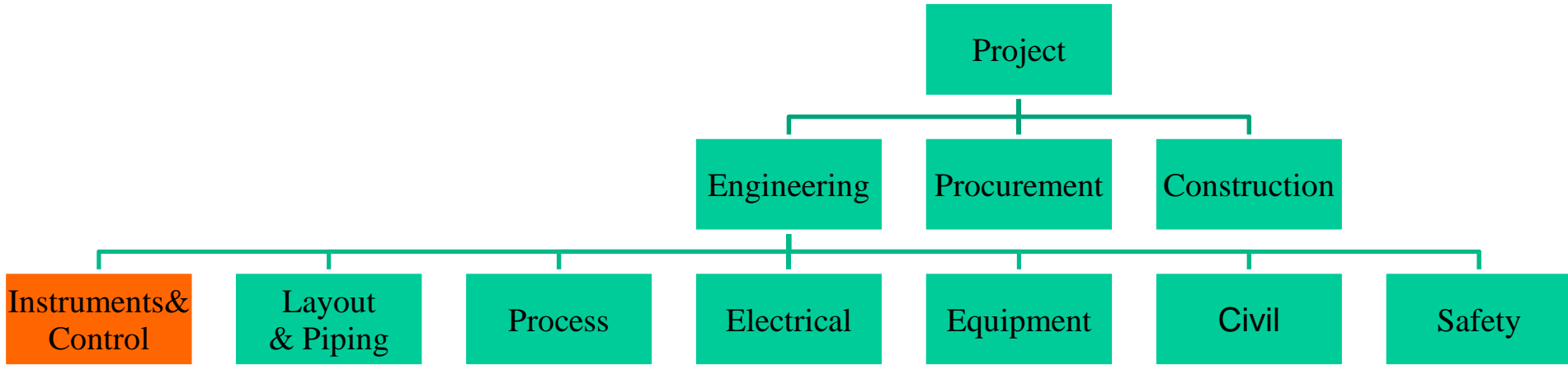
Material Specification

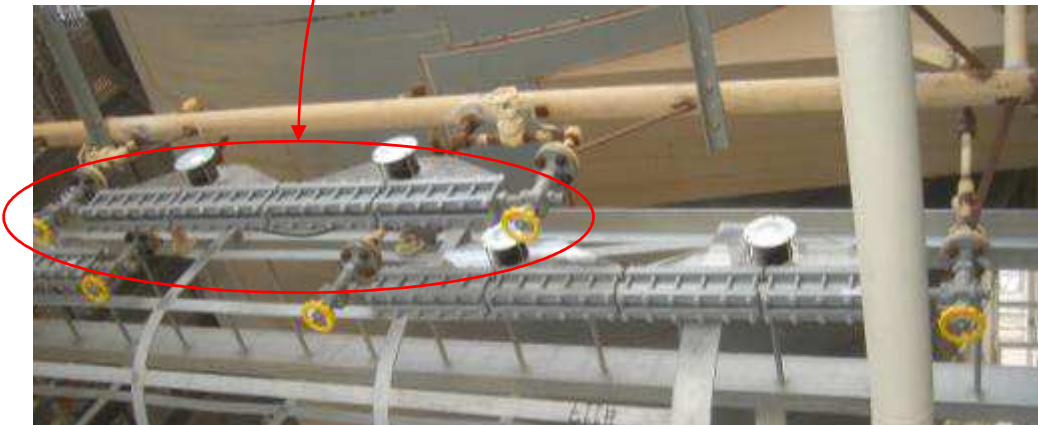
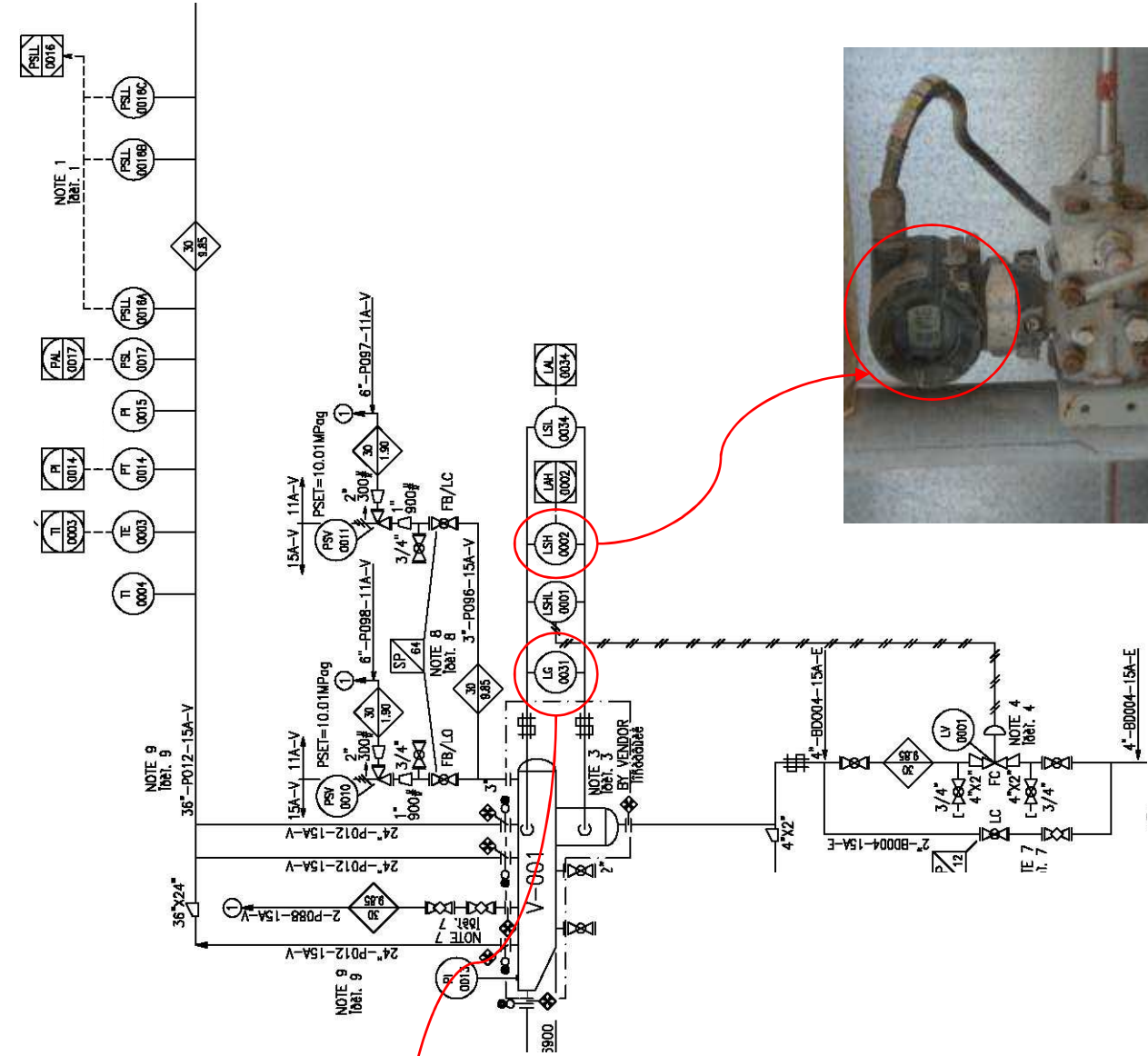


Material Specification



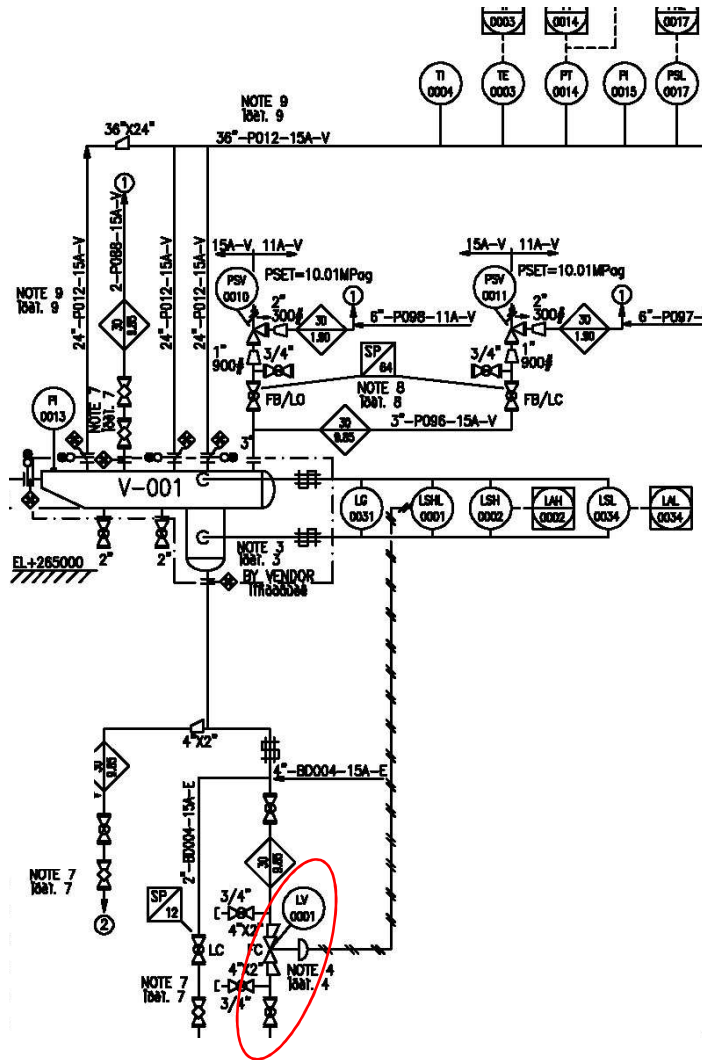
SERVICE: -DRAIN SYSTEM (BD) -HYDROCARBON GAS (P)					GENERAL MATERIAL : CARBON STEEL API 5L Gr. B		RATING : 150# RF	PIPING CLASS : 11A	Page : 2/3	
	DIA		Rating	End	DESIGNATION	Standard	Valve data sheet / Comments	NOTES	Corrosion Allowance = 0	
	from	to								
VALVES	2" - 20"		150#	RF	Bolted bonnet .OS & Y. Body: C.Steel Trim : 13% Cr.	API 600 ASME B16-34	VS 01-2-11A	1-3		
	1/2" - 1 1/2"		800#	SW	Straight Pattern .Bolted bonnet .OS & Y Body: C.Steel Trim : 13% Cr.	ASME B16-34	VD 01-1-11A	1		
	2" - 6"		150#	RF	Straight Pattern .Bolted bonnet .OS & Y Body: C.Steel Trim : 13% Cr.	ASME B16-34	VD 01-2-11A	1-3		
	1/2" - 1 1/2"		800#	SW	Ball or Piston-type Body: C.Steel Trim: F6	BS 5352 ASME B16-34	VDR-10-1-11A	1-3		
	2" - 20"		150#	RF	Dual plate-type Wafer Lug / Double flanged body Body : C.Steel Trim: 13% Cr.	API 594 ASME B16-34	VDR 10-2-11A	1-3		
1/2" - 1 1/2"		800#	SW	Full bore, Floating ball-type, with PE Nipples. Body: C.Steel Trim: 13% Cr. Seats/Seals: PTFE / Viton	BS 5351	VB 01-1-11A	1			
2" - 20"		150#	RF	Full bore, 2 or 3-piece body Bore dia. <=6": Floating ball Bore dia. >=8": Trunnion ball Material same as above except trim: 13%Cr or CS+ENP	API 6D ASME B16-34	VBF 01-2-11A	1-2 3			
2" - 20"		150#	RF	Reduced bore, 2 or 3-piece body Bore dia. <=6": Floating ball Bore dia. >=8": Trunnion ball Material same as above	API 6D ANSI B16-34	VB 01-2-11A	1-2 3			





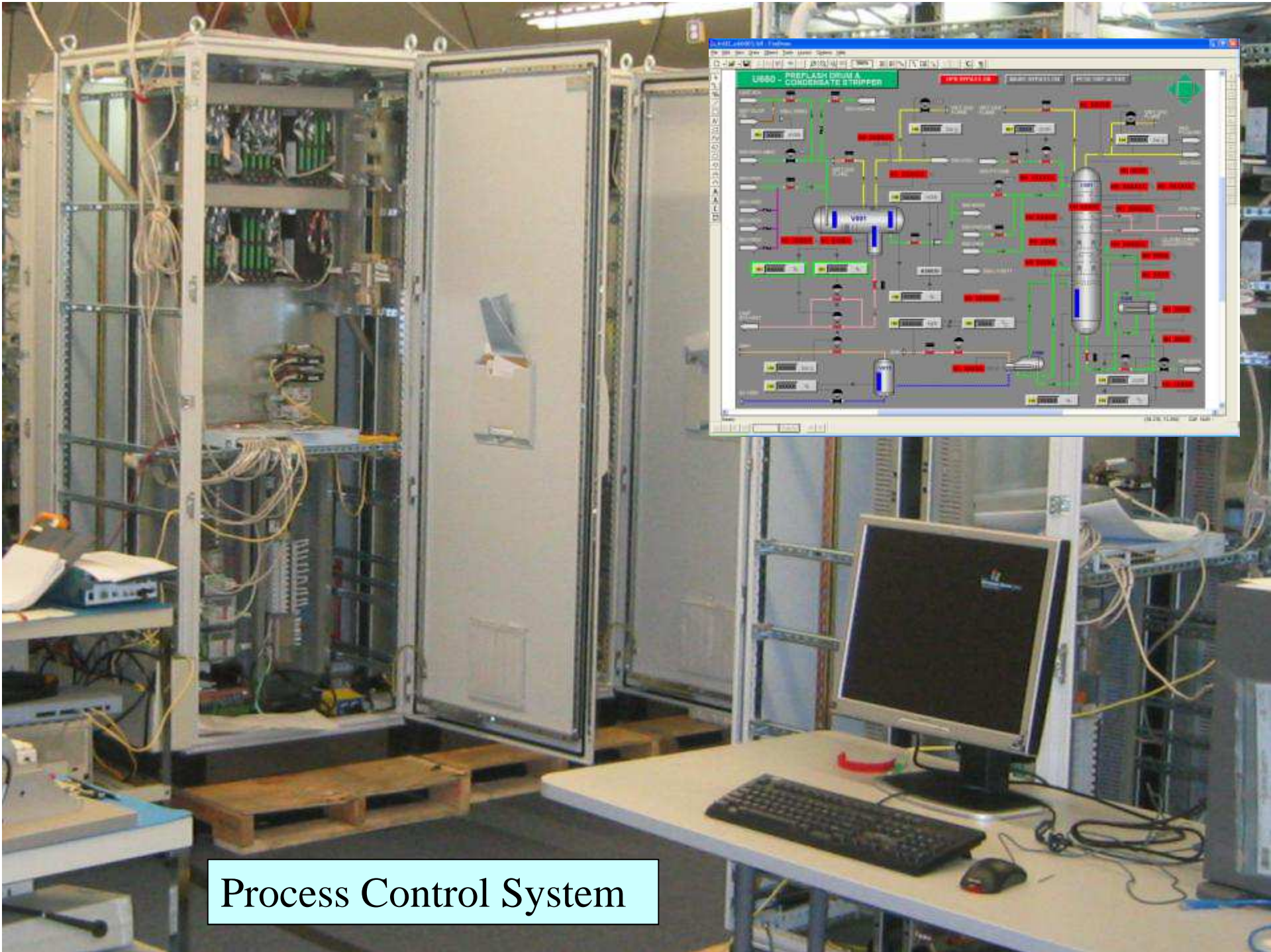


Instrument data sheet



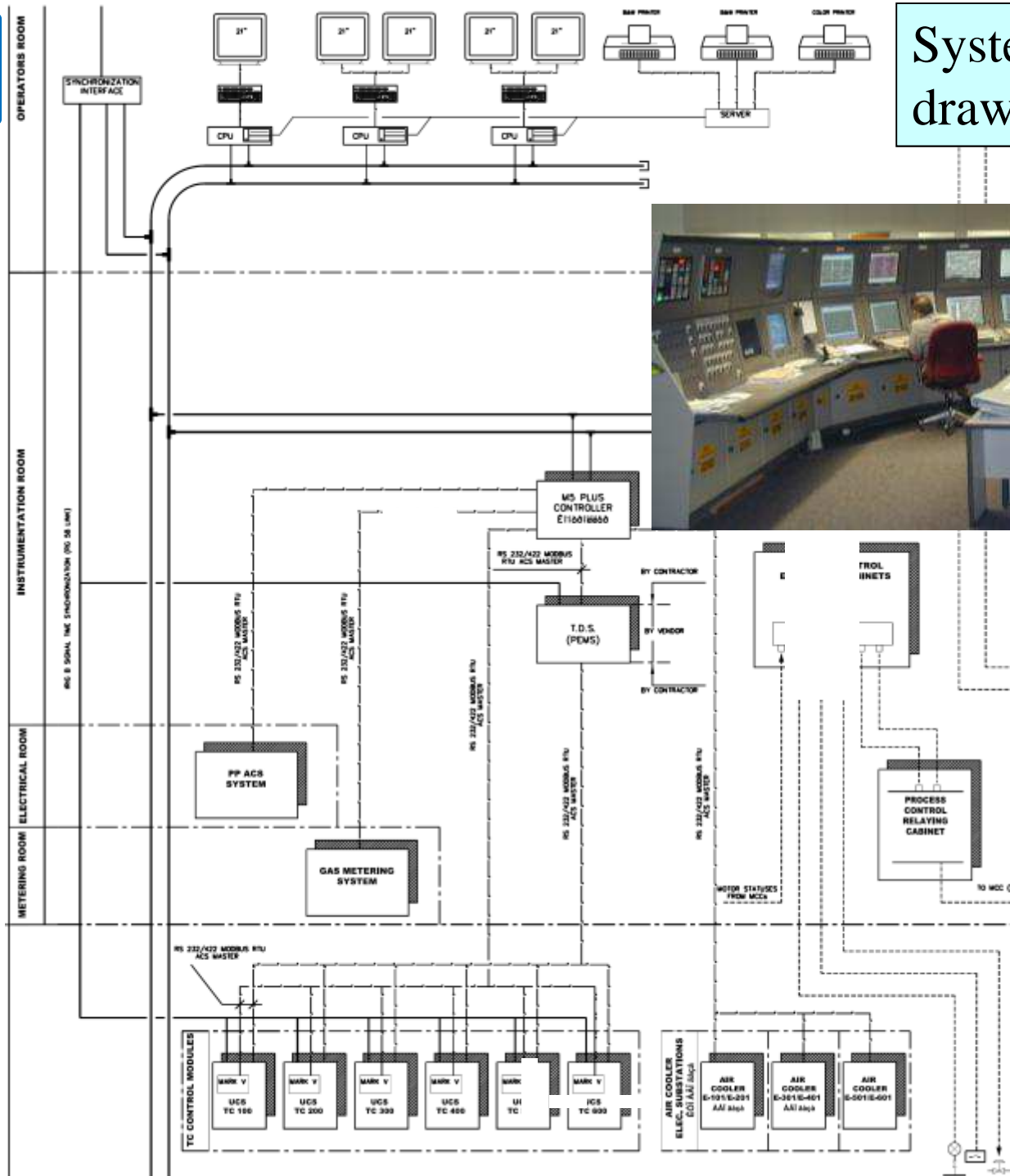
TAG	Tag No. : 84 FV -6703A	Instrument Type : Air Actuated CV (Globe) E/P positioner
	PID No. : RG6-D-84-1225-340	Valve Type : Control Globe
VALVE GEN.	Service : SM TO 84FL061	Valve Service :
		Quantity Tags : 1
GENERAL DESIGN DATA	Manufacturer Name : FISHER	53 Manufacturer : FISHER Model : 667-4
	Model No : ET Ser No. : 17982719	54 Type of Actuator : spring & diaphra Size : 70
ACTUATOR	Air Failure Action : FC	55 Material
	Max. Shut Off Pressure : 19 bar	56 Case : Yoke : Stem :
PAINT	Leakage Class : IV (standard)	57 Mechanical Design Pressure : 4.1 barg
	Material Corrosion Requirement :	58 Actuator Force Design Pressure :
VALVE ACC.	Line	59 Required Air Supply Pressure : 4.5 barg
	Line No. : 84SM-60020-8"-3S1-1	60 Stroke Speed : within 10 seconds
PREUMATIC	Line Size 8 in Schedule: 30	61 Travel Indicator : Yes
	Service Class: 3S1 Insulation Thickness :	62 Ori
BODY/BONNET	Design Pressure : 18 bar-g	63 Pai
	Design Temperature : 270 °C	64 Col
VALVE	Notes for Line :	65 B
	Instrument Air Supply	66 A
ACC.	Mechanical Design Pressure : 10.8	67 Lut
	Operating Pressure(Max/Min) : 12.6 / 11.6 bar-g	68 Lut
POSTNR.	Dew Point Temperature : -40 °C	69 Har
	Enclosure	70 Me
TRIM	Electrical Hazardous Protection	72 Air
	Class : Zone 2, IIB T3 Type : Ex n (SOV: Ex d)	73 Fitt
BODY/BONNET	Certificate : ATEX	74 Mir
	Weather Protection : IP65/NEMA 4X	75 Air
VALVE	Notes:	76 M
	Positioner Type : Electropneumatic Smart (HART)	77 F
BODY/BONNET	Manufacturer : Fisher Model :	78 Vol
	Input Signal Type : 4-20mA DC	79 T
VALVE	Gauges : Supply,Output	80 V
	Notes : Tag No: 84FVY-6703A	81 V
BODY/BONNET	Body Size : 6 in	82 B
	Rating : 300# Conn Type : RF Flange	83 M
VALVE	Flange Face Finish : 125-250 Ra	84 Not
	Face to Face Dimension : 472,9	86 Ele
VALVE	Body/Bonnet Material : A216-WCC	87 Ext
	Type of Bonnet : Plain	88 Sol
VALVE	Flow Direction : Up	89 T
	Corrosion Allowance : 1.2 mm	90 M
VALVE	Gasket Material : Single graphite Packing Mat.: laminated	91 P
	Notes : packing flange material: 316 SST	92 B
VALVE	Trim Type : Metal 301 Size : 5 3/8	93 C
	Trim Construction :	94 Typ
VALVE	Rated Cv : 129 Rated Travel : 3"	95 T
	Characteristic : Whisper3-C1/Linear	96 M
VALVE	Material	97 M
	Plug / Ball / Disc : 17-4PH SST	98 Not
VALVE	Seat : 410 SST	99
	Cage / Guide : 416 SST	100
VALVE	Stem : 316 SST	



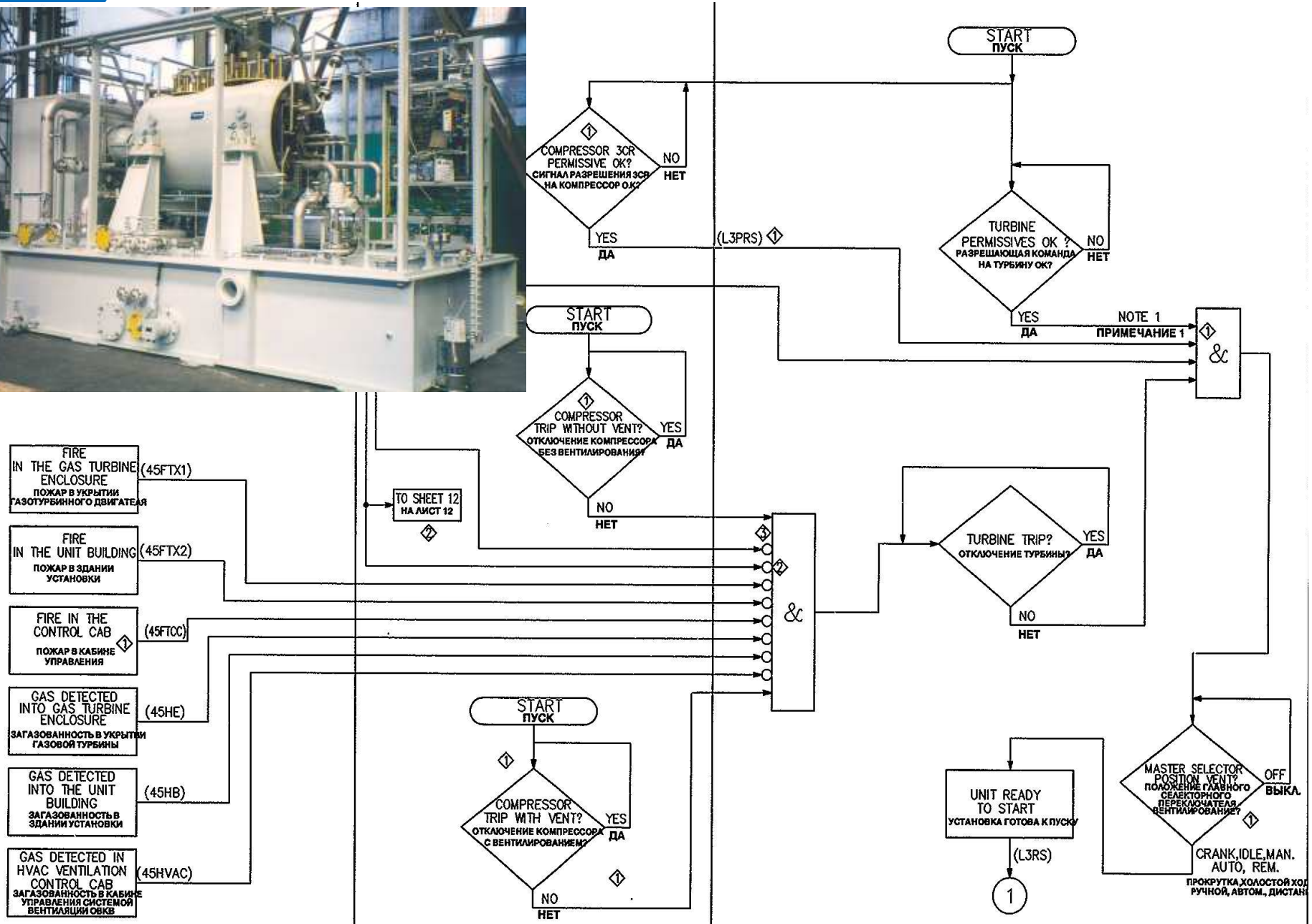


Process Control System

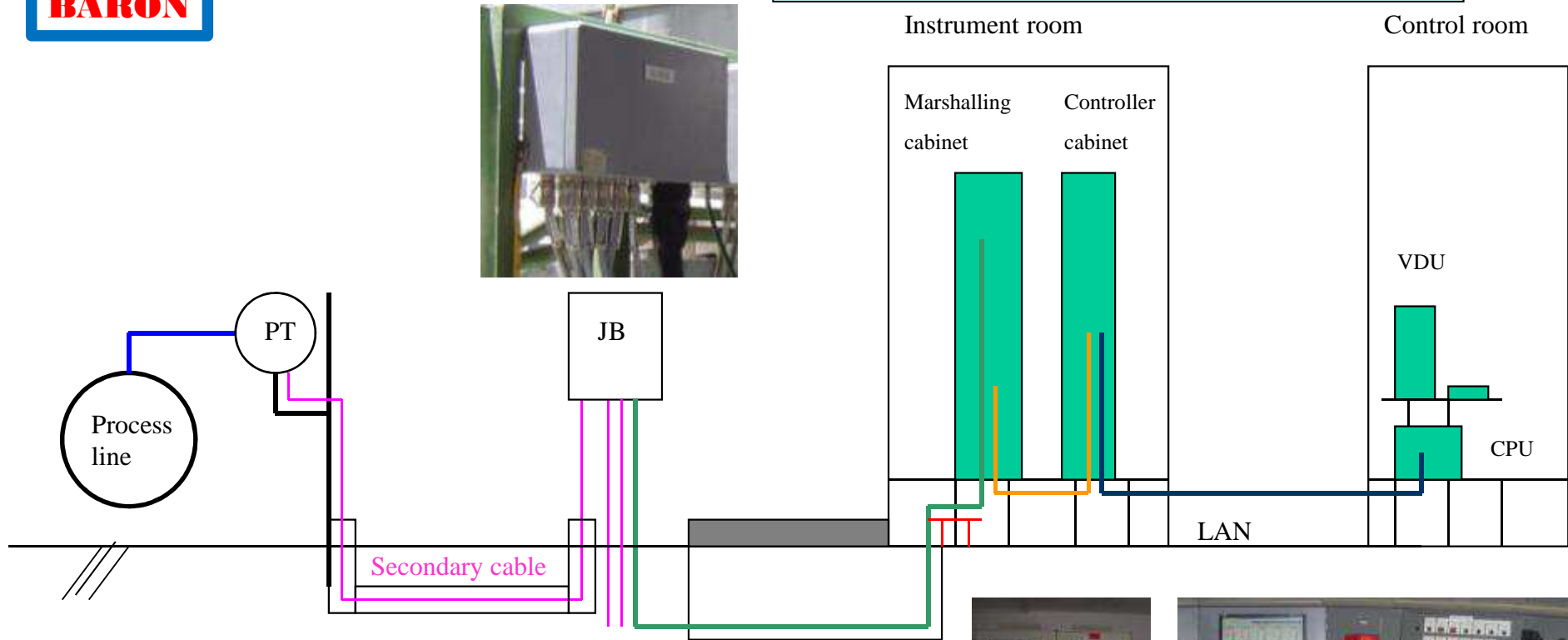
System architecture drawing

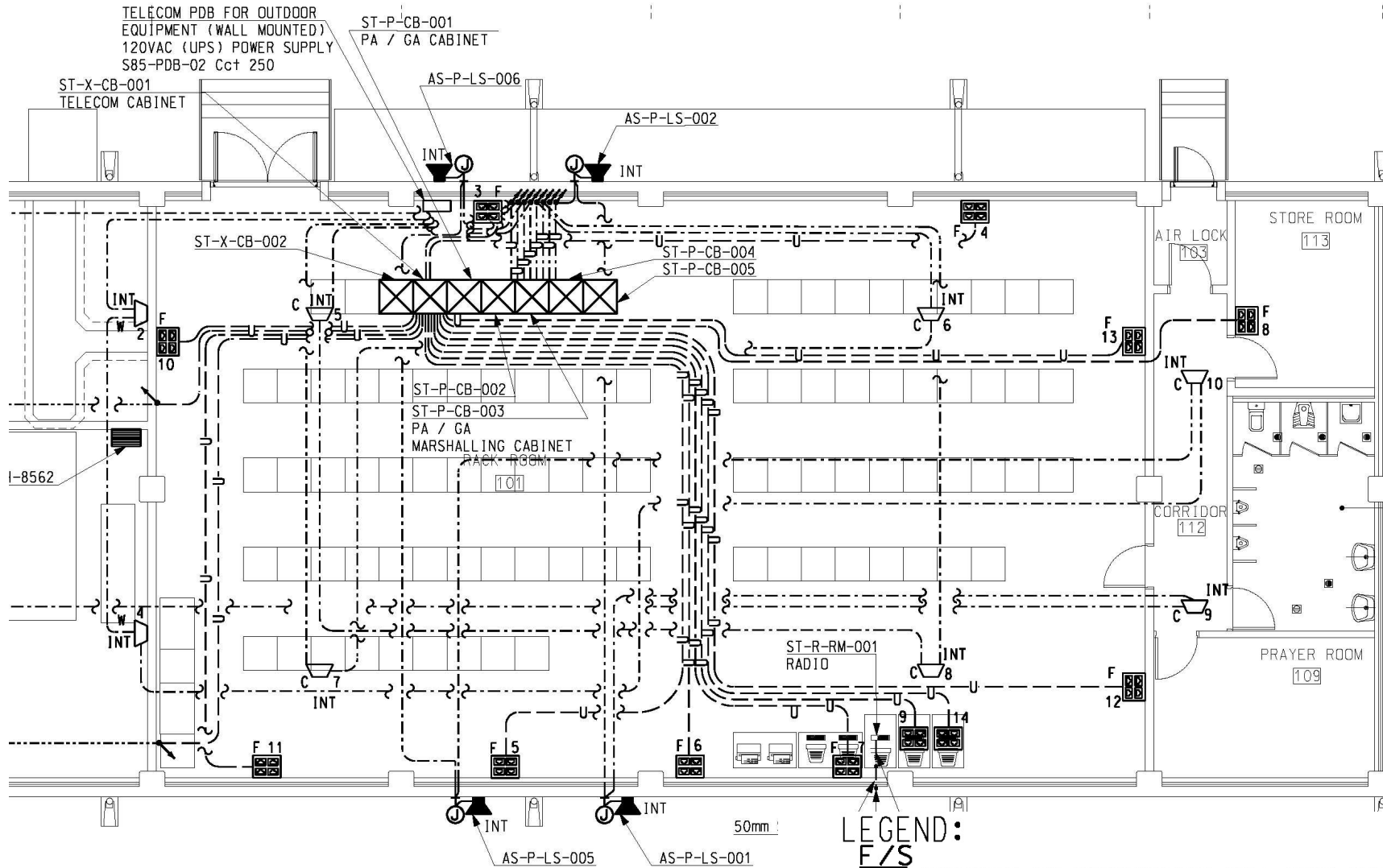


Mechanical Equipment Control








The instrumentation hardware

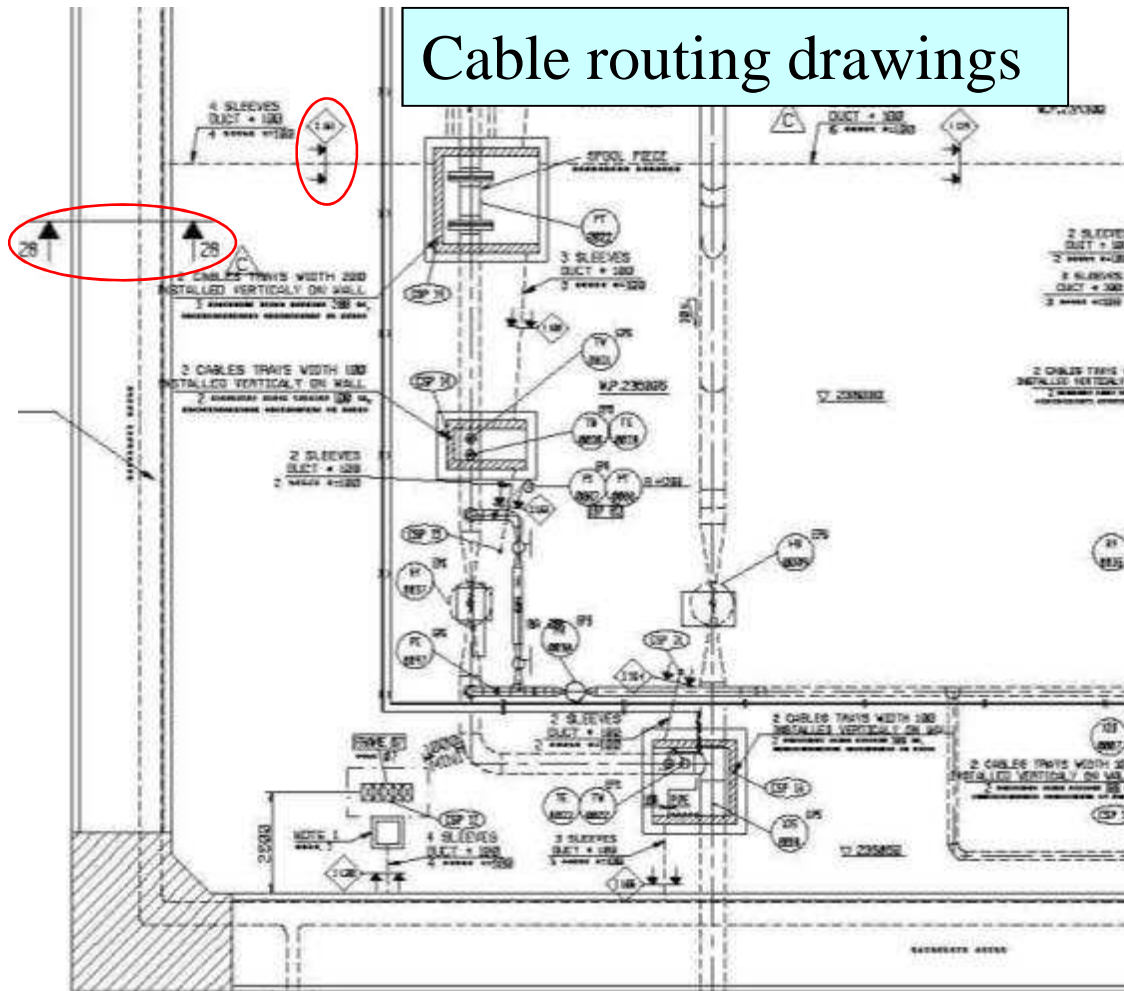




Building detail drawing/
Telecom and PAGA layout

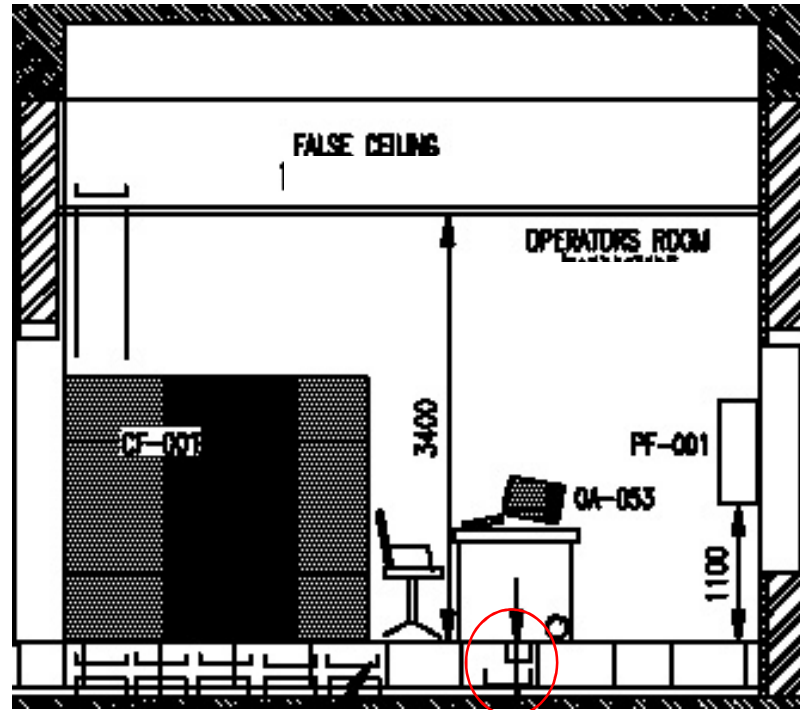
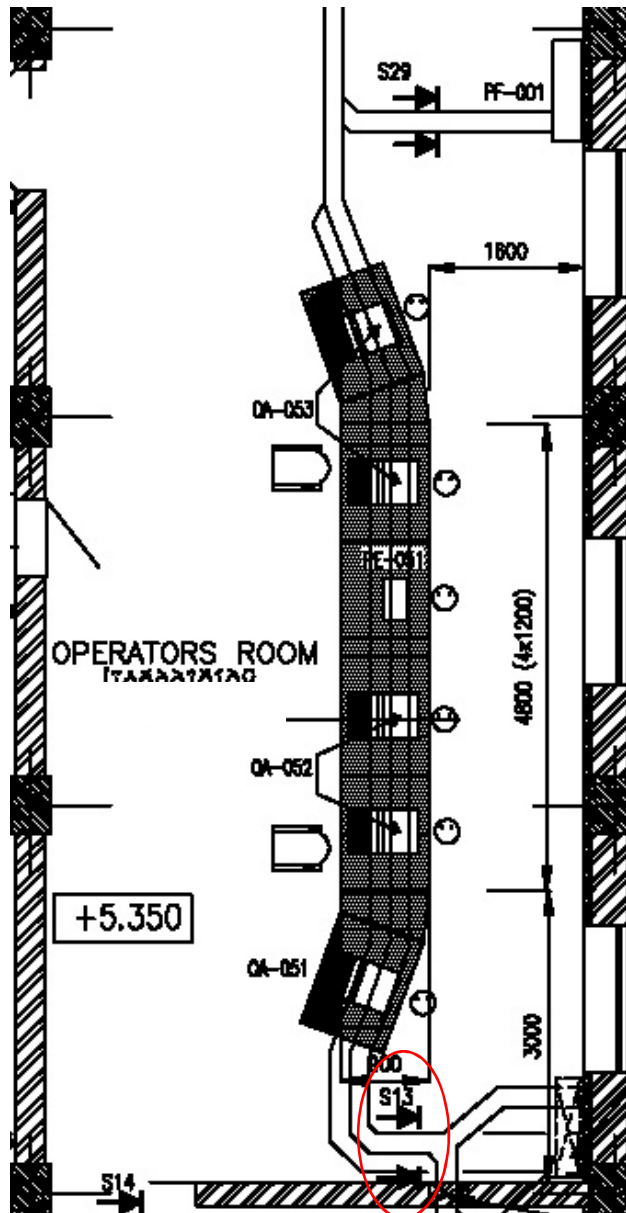
- LEGEND:**
-  COMBINED TELEPHONE/ICIMS WALL QUAD RJ45 OUTLET
 -  INDICATES INSTALLATION TYPE
 - F: FLUSH MOUNTED
 - S: SURFACE MOUNTED
 -  6W PA/GA SYSTEM INTELLIGENT, INDOOR, SAFE AREA, SPEAKER & JUNCTION BOX ASSEMBLY
 -  INDICATES INSTALLATION TYPE
 - C: CEILING MOUNTED
 - W: WALL MOUNTED
 -  INTELLIGENT OUTDOOR EXPLOSION PROOF TYPE SPEAKER & JUNCTION BOX ASSEMBLY

Cable routing drawings

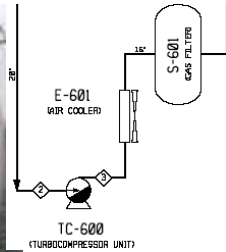
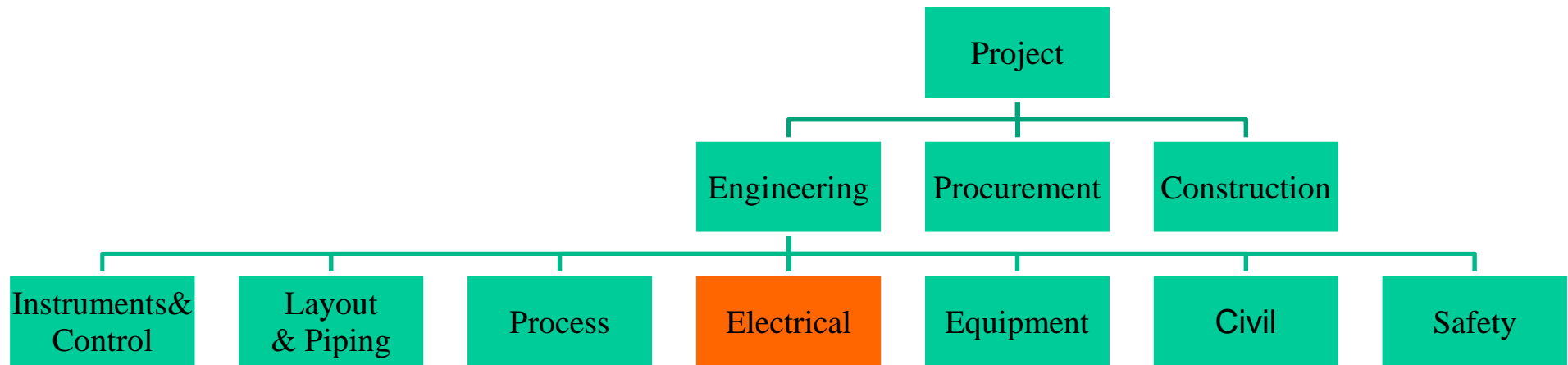


CABLES TAG	CABLES TYPE	SUPPLY BY (1)	FROM	LOCATION FRAME or OTHER	TO	LOCATION FRAME or OTHER	LENGTH m	ROUTING CROSS SECTIONS
CC-004	A-T-1-19-P-2-0	CONTRACTOR	JC-004	FIG D-002	CA-052	INSTRUM ROOM	370	1121-1119-1161-28-1B-11-9-44-4-2-1-96
CC-005	A-T-1-12-P-2-0	CONTRACTOR	JC-005	FILTER-SEPARATOR	CA-052	INSTRUM ROOM	440	1127-30B-36-36A-71-35-35B-65-34-3-1-96
CC-006	A-T-1-12-P-2-0	CONTRACTOR	JC-006	FILTER-SEPARATOR	CA-052	INSTRUM ROOM	440	1127-30B-36-36A-71-35-35B-65-34-3-1-96
CC-007	A-T-1-7-P-2-0	CONTRACTOR	JC-007	STATION INLET VALVES	CA-052	INSTRUM ROOM	370	1103-1190-36A-71-35-35B-65-34-3-1-96
CC-008	A-T-1-7-P-2-0	CONTRACTOR	JC-008	DIESEL GENERATOR	CA-052	INSTRUM ROOM	120	850-30-30B-20
CC-009	A-T-1-7-P-2-0	CONTRACTOR	JC-009	FIRE WATER	CF-004	FIRE BUILDING	100	
CC-101-1	A-T-1-19-P-2-0	CONTRACTOR	JC-101	AERO E-101	UA-101	SS ELECTRICAL 27-1	100	

Cable list



Cable routing inside technical room





LV Motor Control Center TG-MCC-002 (V=400/230V)							
Equipment No.	Description	Vital	Essential	Normal	Restarting	Duty Type	ABSORBED LOAD (A)
							kVA - kW
TG-002	Turbo Gen. (starting)						
88CR	Turb. Gen. Start. Motor					C	160
23QT-1	Lube Oil tank heater					C	7,50
23QT-2	Lube Oil tank heater					C	7,50
23FG-1	Fuel Gas Electric Heater						60
88BA-1	Turbine enclosure Ventilation duty fan					C	13,50
88BA-2	Turbine enclosure Ventilation duty fan						13,50
88FC-1	Oil Cooler Fan Motor						3,10
88FC-2	Oil Cooler Fan Motor						3,10
88FC-3	Oil Cooler Fan Motor						3,10
23WK-1	Heater OFF-LINE washing skid						4,00
88TW-1	Water wash pump motor OFF-LINE skid						2,20
88QA	Aux. Lube Oil Pump Moto					D	10,00
88QV	Lube Oil vapour separator motc					C	1,50
DCP-A	Direct current supply panel side F					C	25,00
DCP-B	Direct current supply panel side E					C	6,50

Electrical consumer list

Item	LV MCC MCC-002 (V=400/230V)		CONSUMED LOAD		
	Equipment No.	Description	Continuous (E)	Intermittent (F)	Spare (G)
			kW	kW	kW
1	LP003-1	Fire Fighting pump Bldg Light&Small Pwr	10,0		
2	LP003-2				
3	HSV-0011	Valve for gas metering station		1,3	
4	HSV-0012	Valve for gas metering station		1,3	
5	PM-032A	Fire Fighting Jockey Pump	5,2		
6	PM-032B	Fire Fighting Jockey Pump			5,2
Maximum of normal running plant load : kW = 16,7 (Est. $1 \cdot E + 0.6 \cdot F$)			15,2	2,6	5,2
Peak Load kW = 17,2 (Est. $1 \cdot E + 0.6 \cdot F + 0.1 \cdot G$)					

Electrical Load Summary

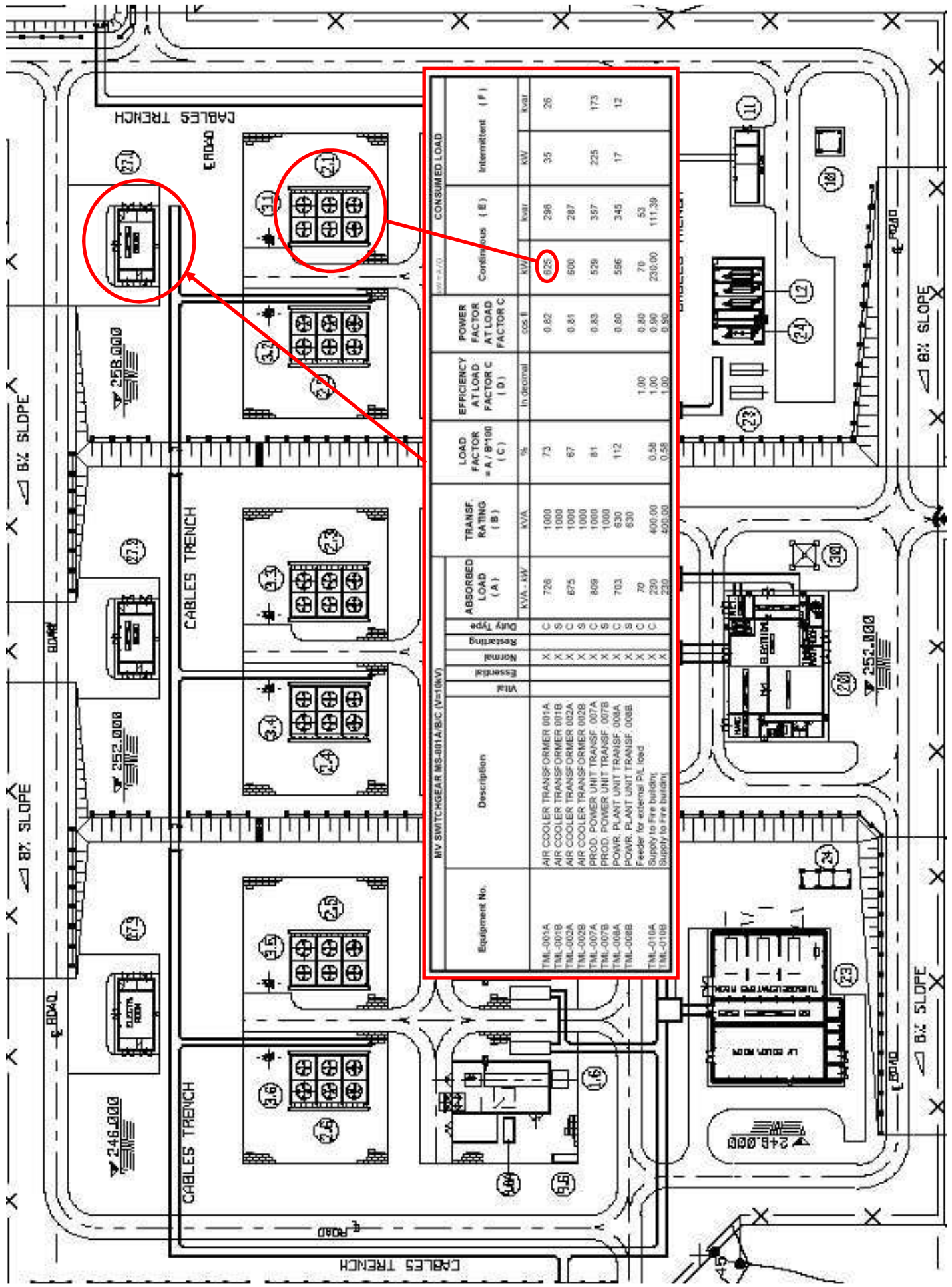
NOTES:

Consumed Loads:

E - "Continuous"; loads of machines or consumers which operate continuously when the plant is in operation, except for breakdowns.

F - "Intermittent "; machines or consumers with a start-stop cycle: pumping, storage, loading...

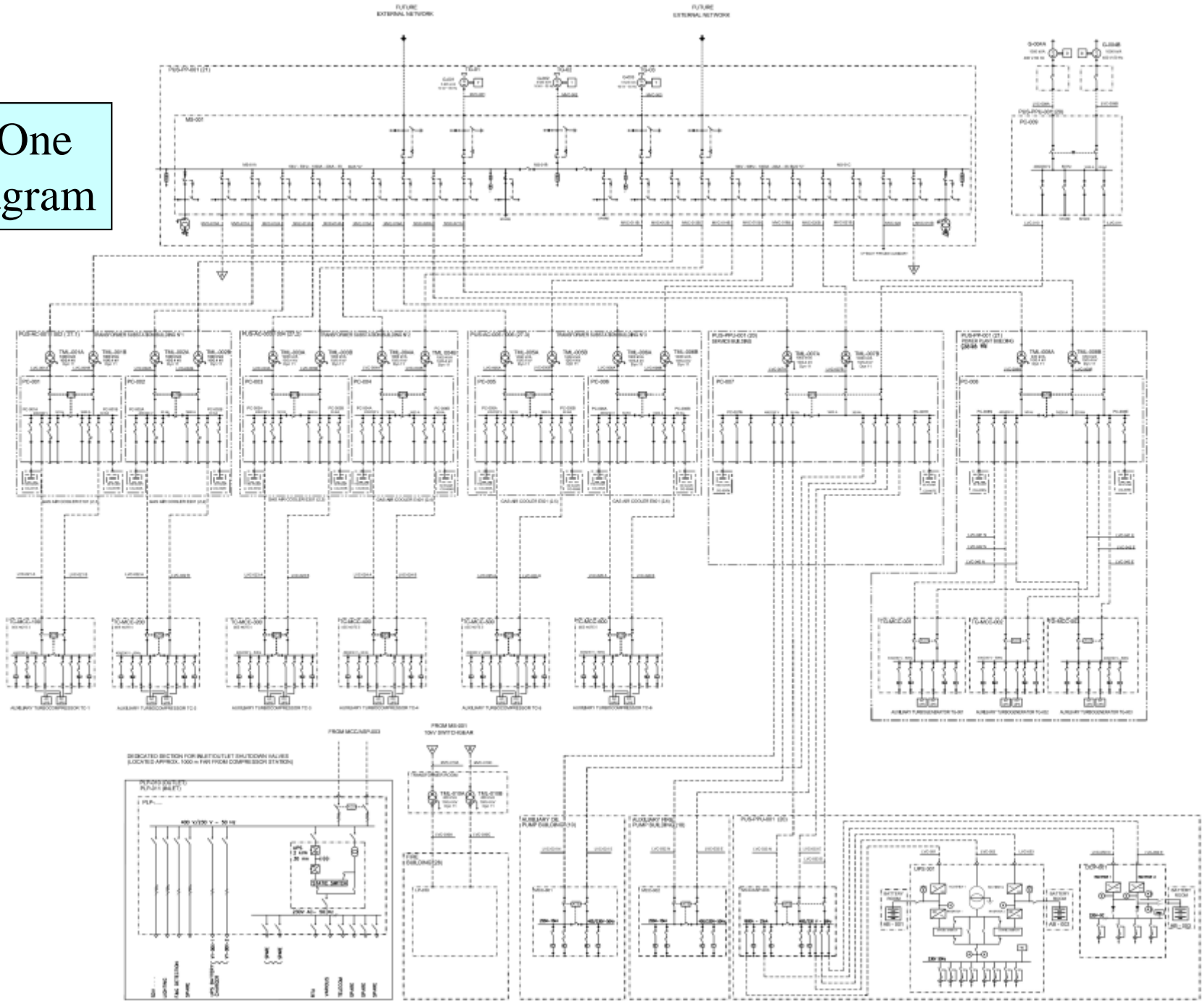
G - "Spare"; machines or consumers which act as a spare for other machines and which do not therefore normally operate when the plant is in operation.



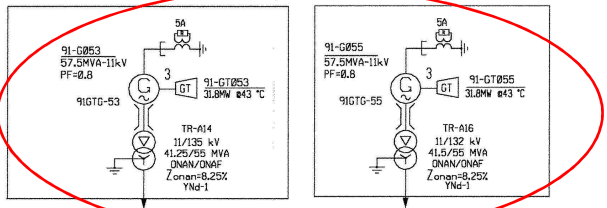
Equipment No.	Description	Virt	Essential	Normal	Duty Type	ABSORBED LOAD (A)		TRANSF. RATING (B)	LOAD FACTOR = A/B*100 (C)	EFFICIENCY AT LOAD FACTOR D	POWER FACTOR AT LOAD FACTOR C		CONSUMED LOAD		INTERMITTENT (F)	
						KVA	KW				cos φ	cos φ	kvar	kvar	kvar	kvar
TML-001A	AIR COOLER TRANSFORMER 001A	X	X	C	Restoring	726	1000	1000	73	In decimal	0.82	0.82	625	286	35	26
TML-001B	AIR COOLER TRANSFORMER 001B	X	X	S	C	1000	1000	1000	67		0.81	0.81	600	287		
TML-002A	AIR COOLER TRANSFORMER 002A	X	X	C	S	675	1000	1000	81		0.83	0.83	528	357	225	173
TML-002B	AIR COOLER TRANSFORMER 002B	X	X	C	S	808	1000	1000	81		0.83	0.83	528	357	225	173
TML-007A	PROD. POWER UNIT TRANSF. 007A	X	X	C	S	703	1000	1000	112		0.80	0.80	586	345	17	12
TML-007B	PROD. POWER UNIT TRANSF. 007B	X	X	C	S	630	1000	1000	112		0.80	0.80	586	345	17	12
TML-008A	POWR. PLANT UNIT TRANSF. 008A	X	X	C	S	630	830	830	0.58	1.00	0.90	0.90	70	53		
TML-008B	POWR. PLANT UNIT TRANSF. 008B	X	X	C	S	630	830	830	0.58	1.00	0.90	0.90	70	53		
TML-010A	Feeder for external P/L load	X	X	C	C	230	400.00	400.00	0.58	1.00	0.90	0.90	230.00	111.39		
TML-010B	Supply to Fire building	X	X	C	C	230	400.00	400.00	0.58	1.00	0.90	0.90	230.00	111.39		



General One Line Diagram

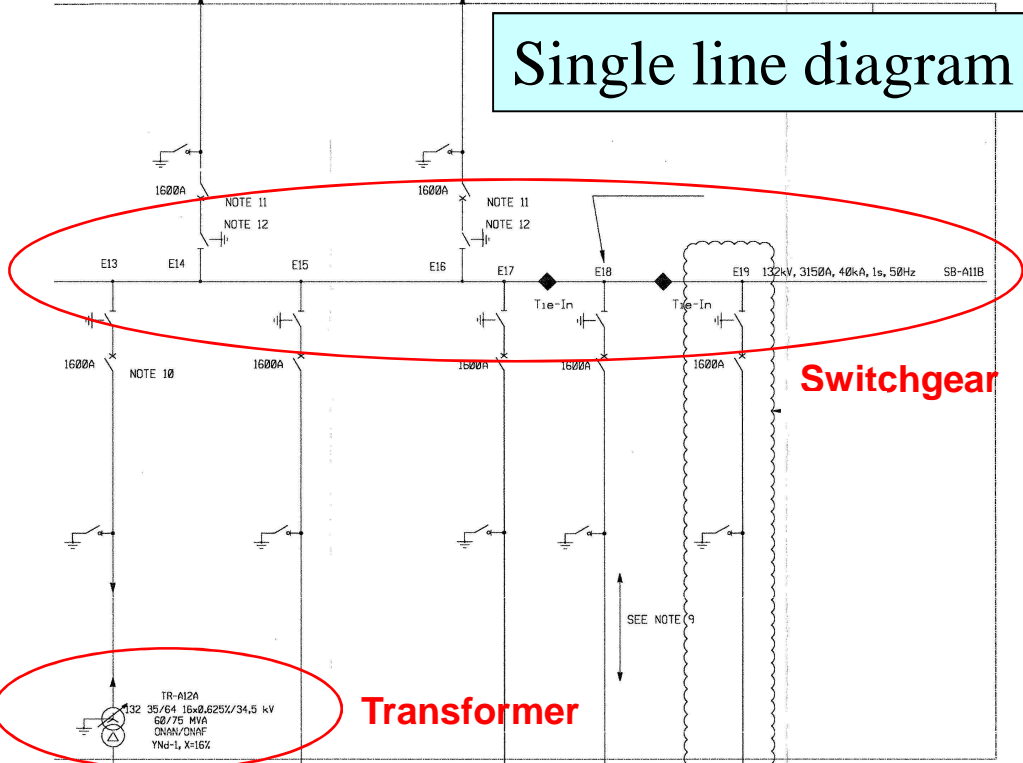


**HERVE
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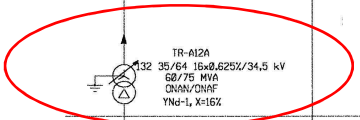


Generators

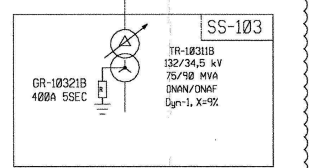
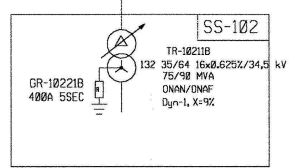
Single line diagram



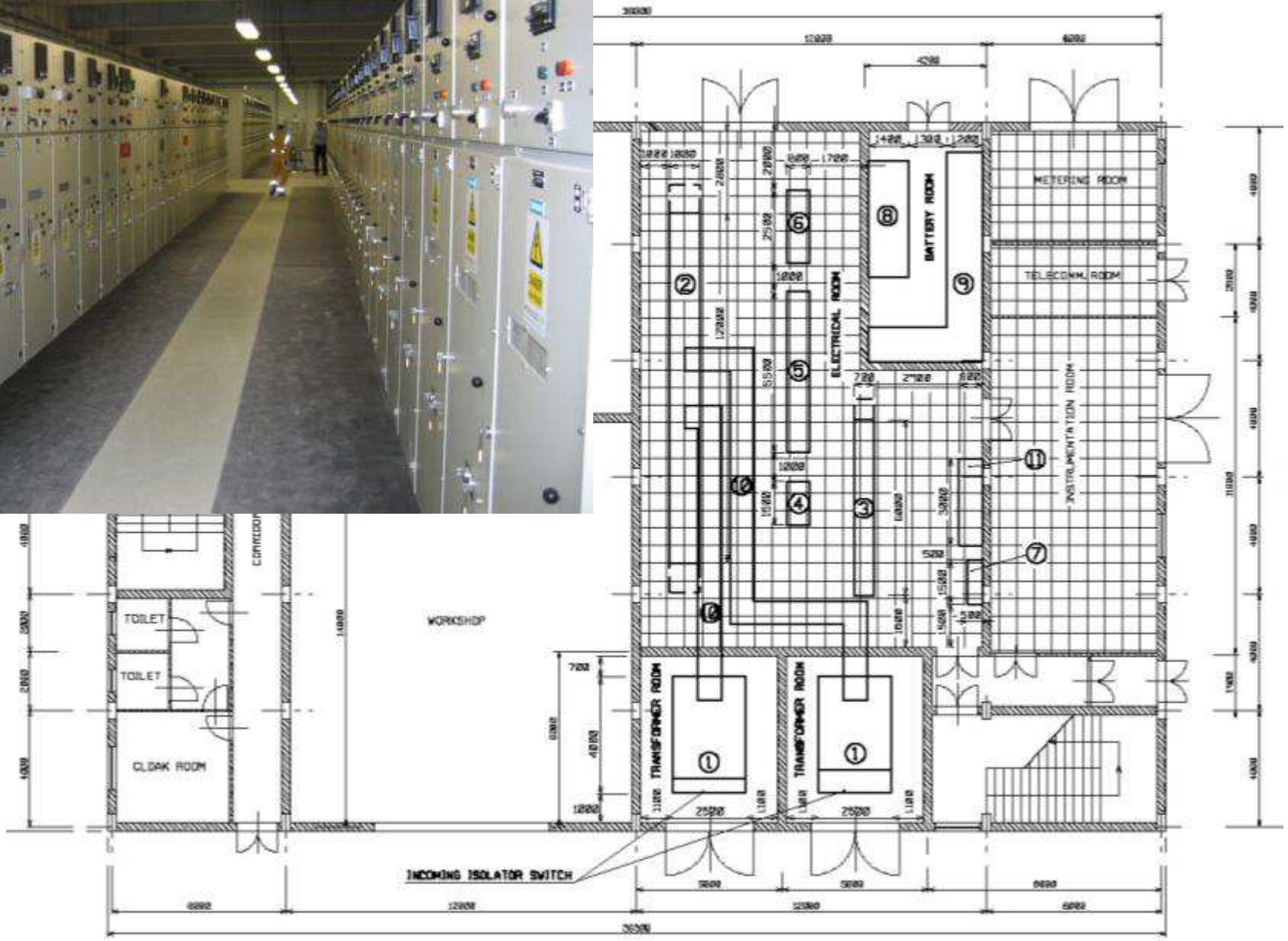
Switchgear



Transformer

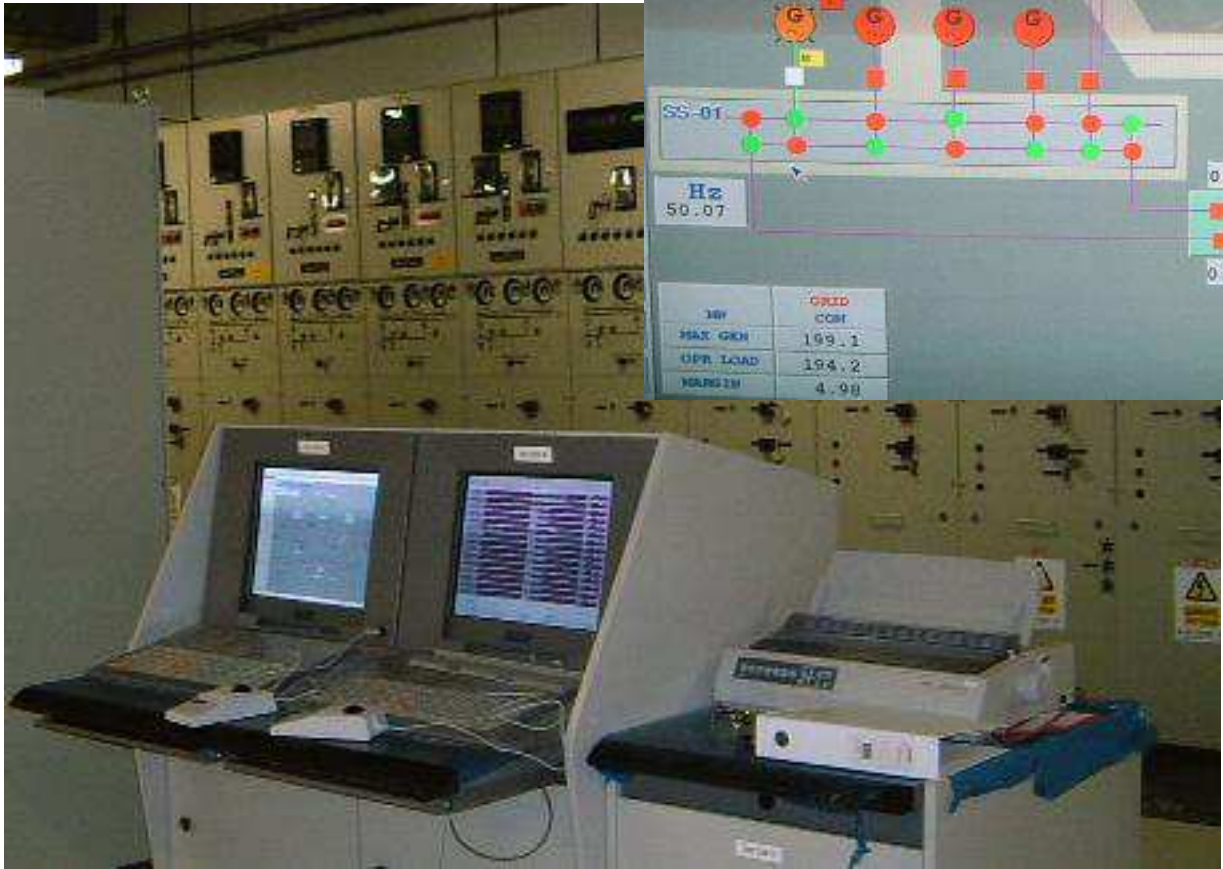
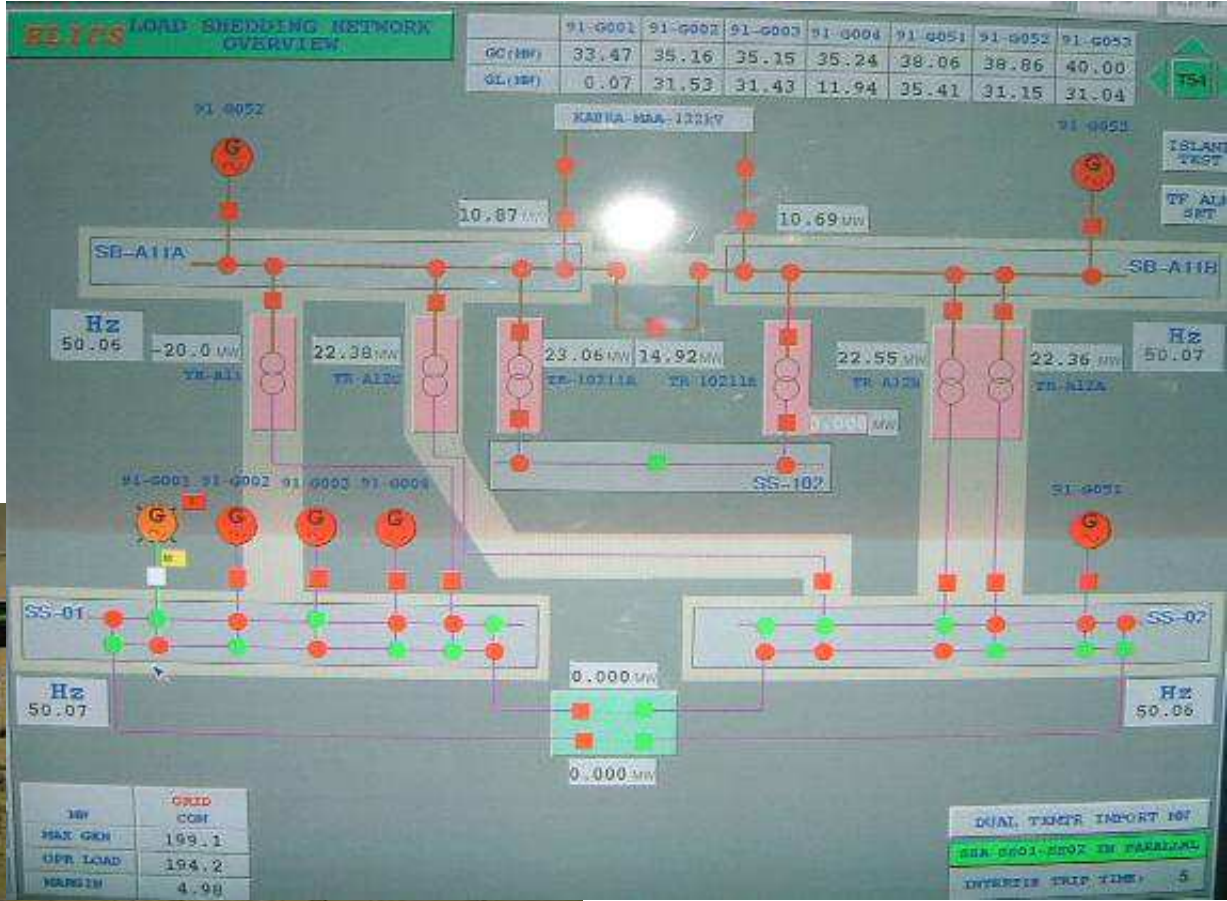


Electrical equipment layout



**HERVE
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Electrical Control System





PFDs
H&M balance

*Process
data sheet*

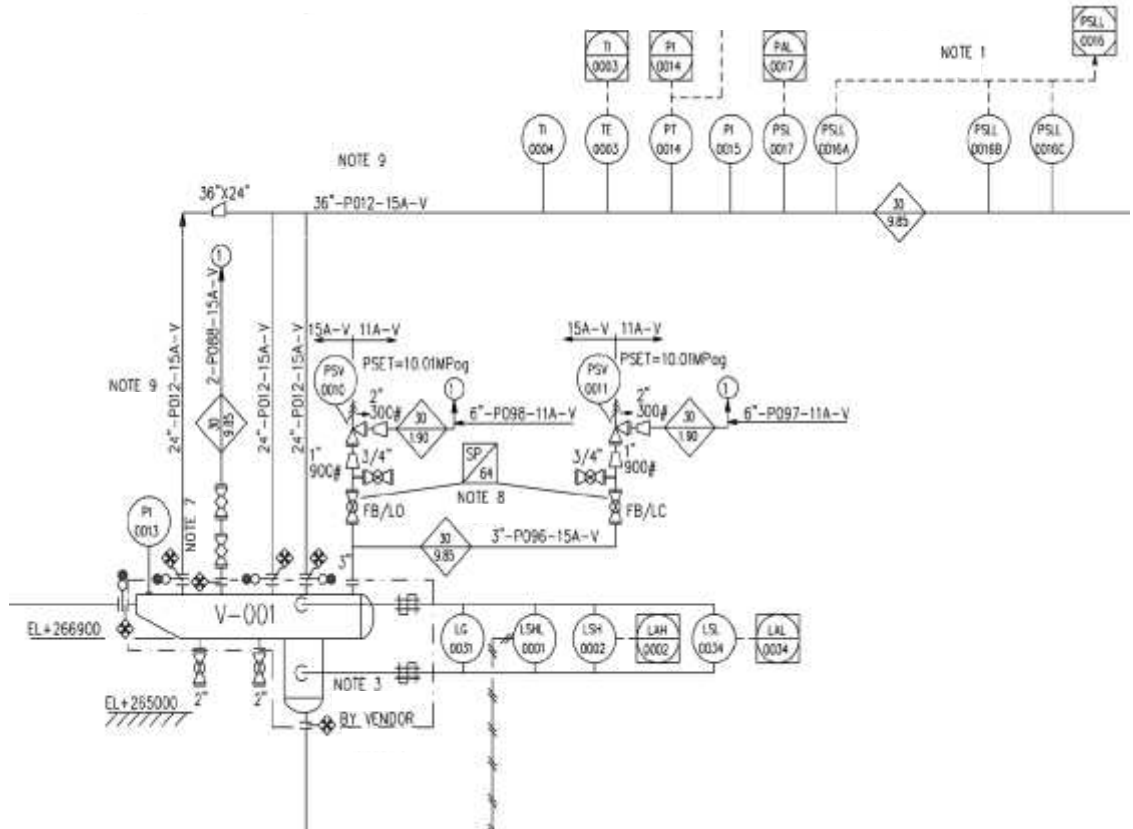
Equipment specification

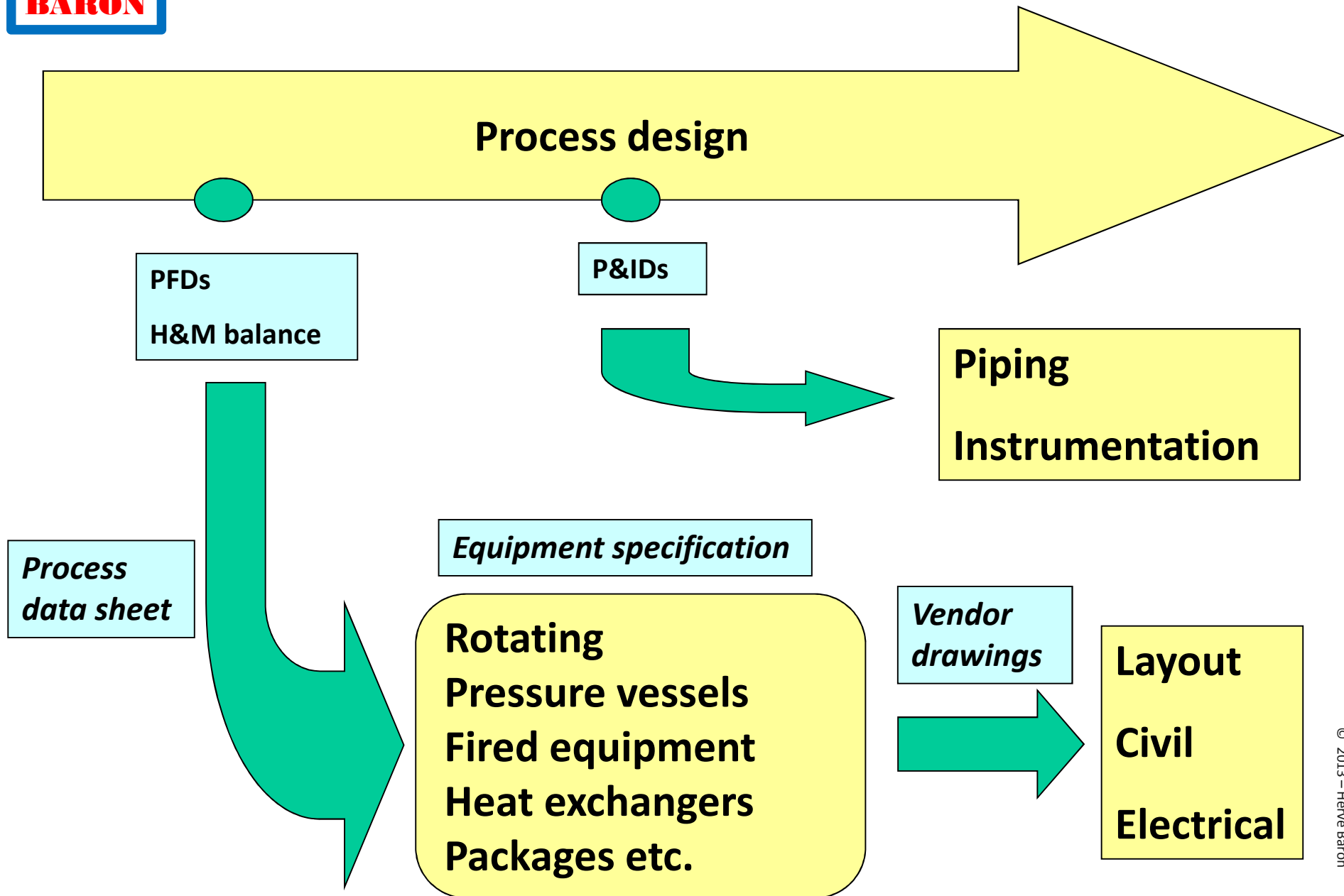
**Rotating
Pressure vessels
Fired equipment
Heat exchangers
Packages etc.**

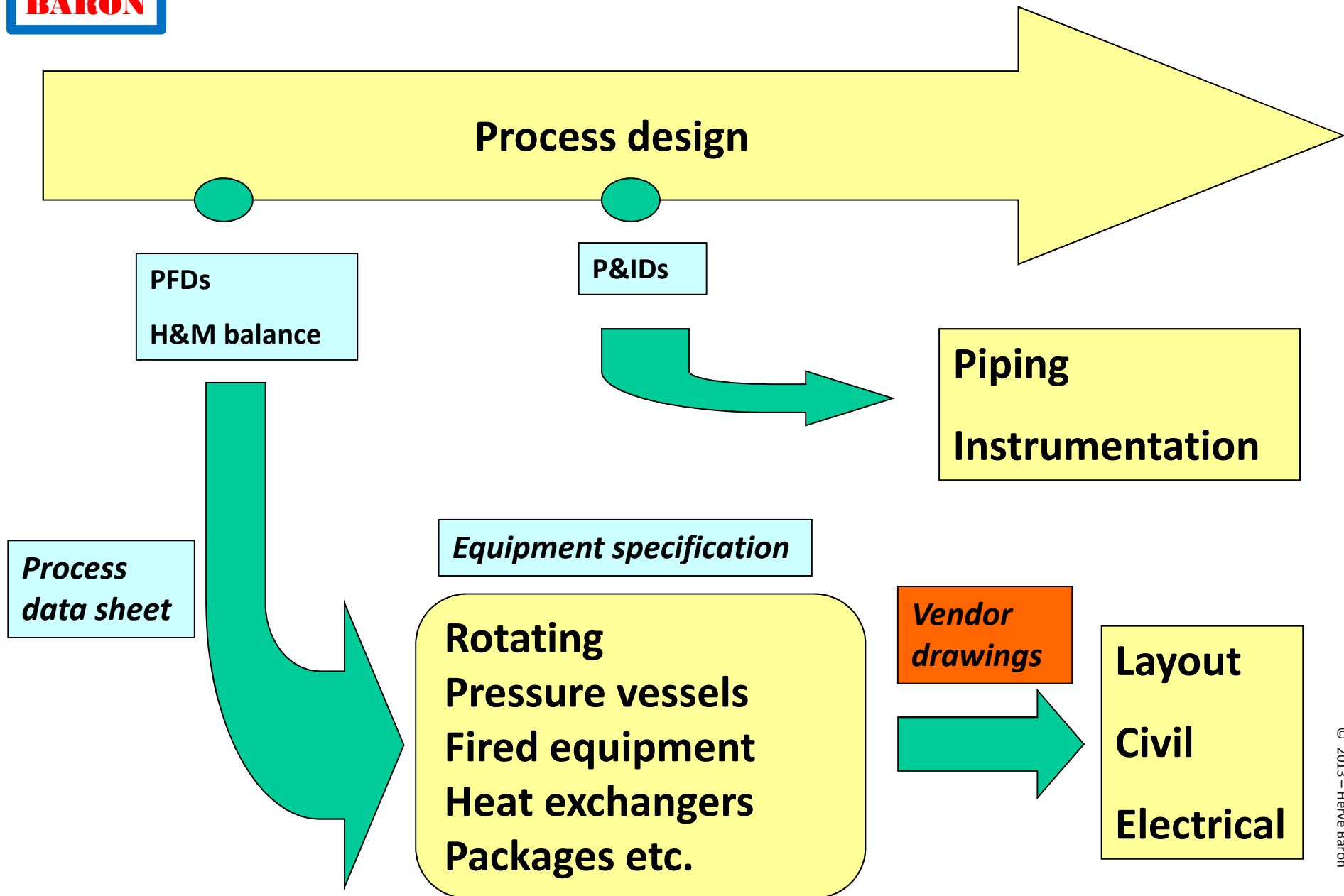
Process design

PFDs
H&M balance

P&IDs







Electrical

Layout

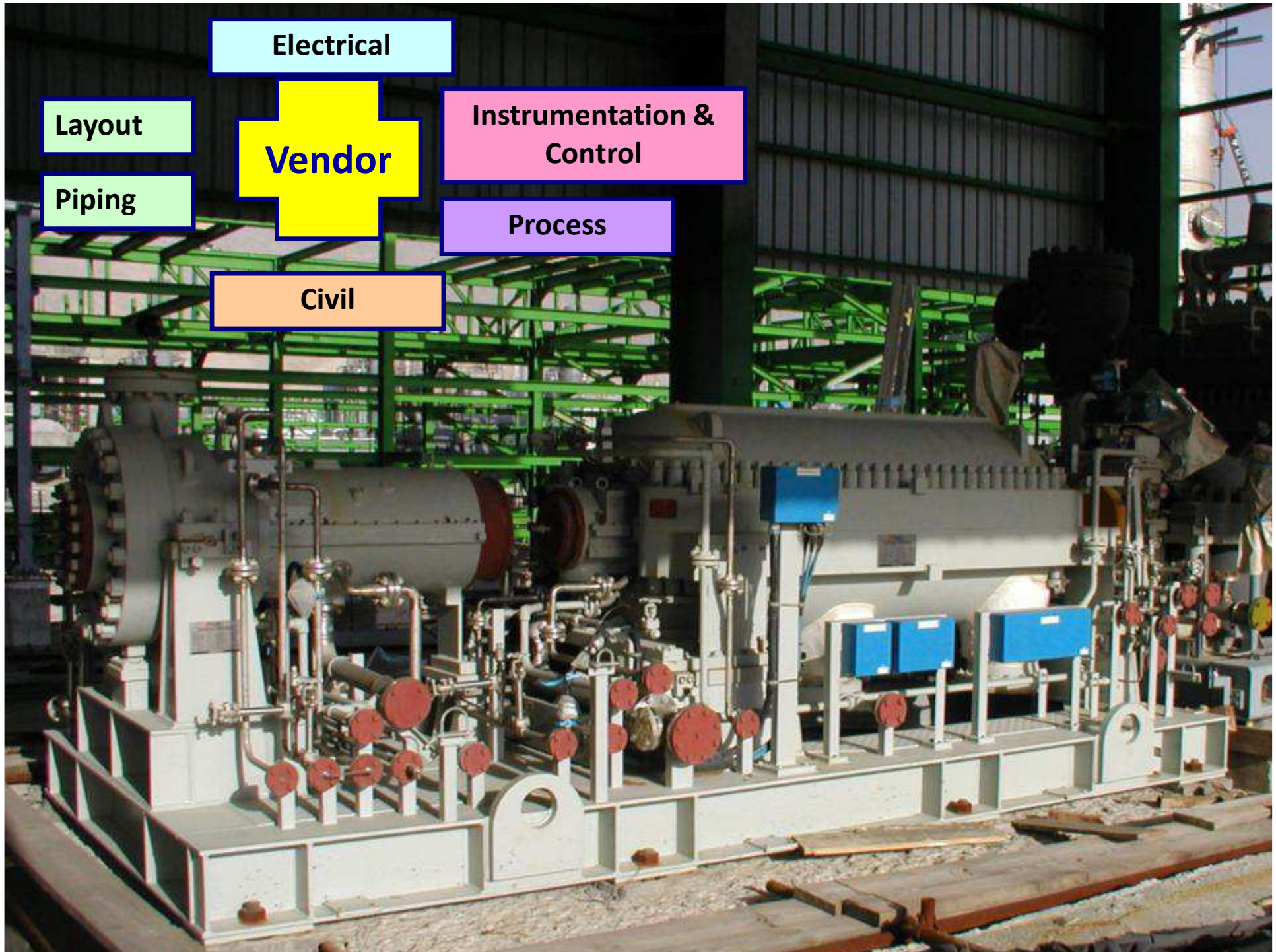
Vendor

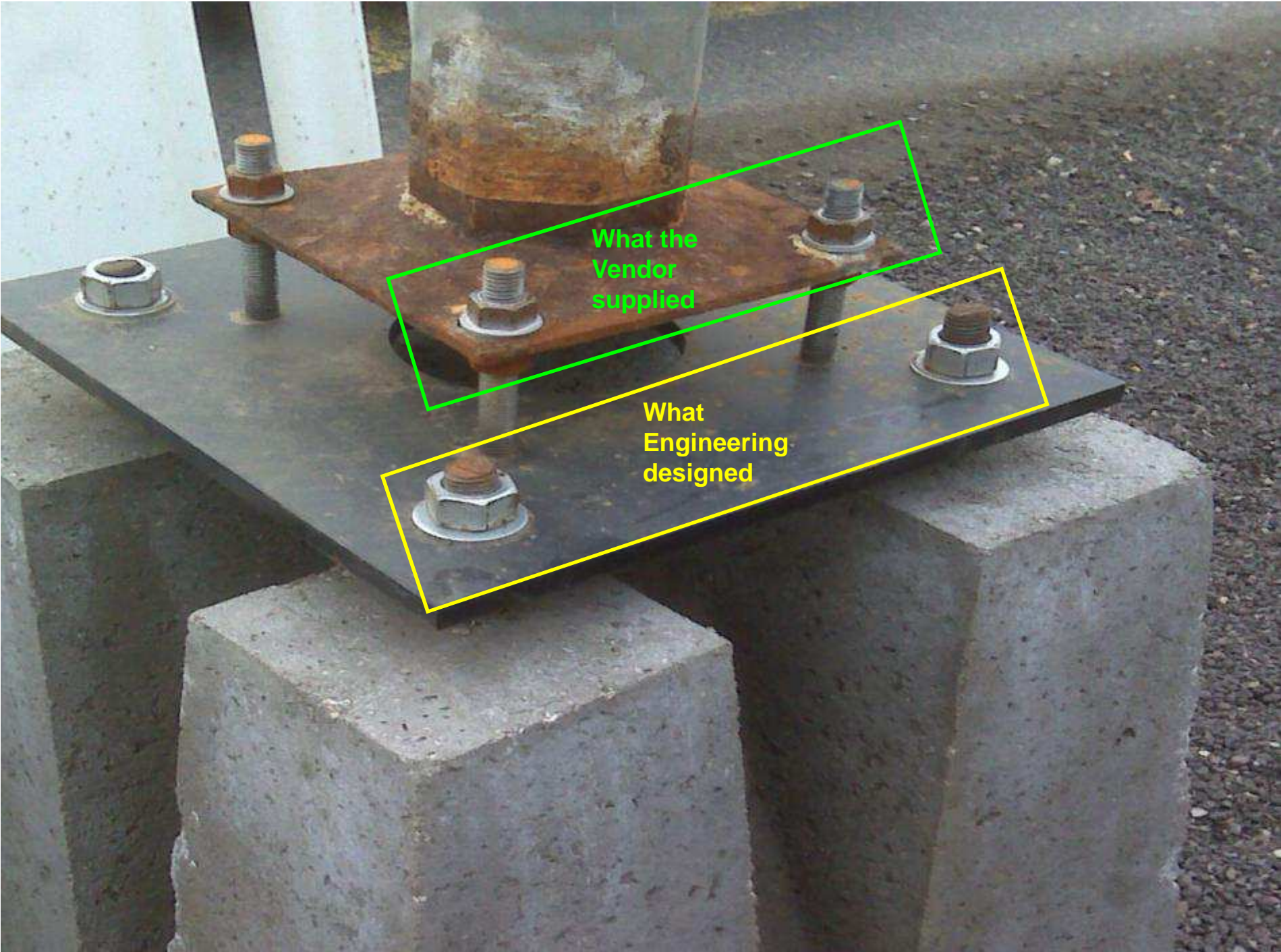
Instrumentation &
Control

Piping

Process

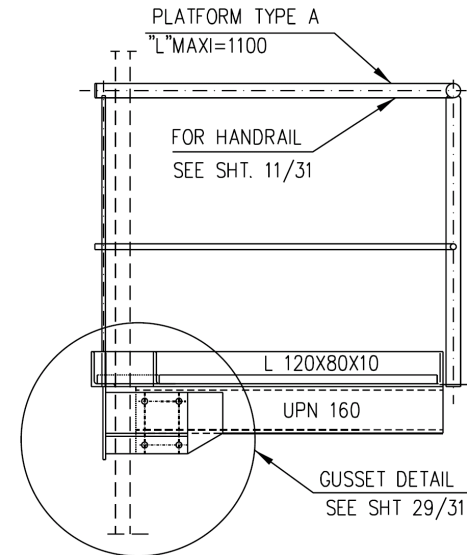
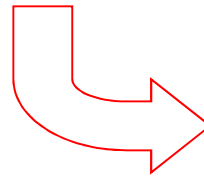
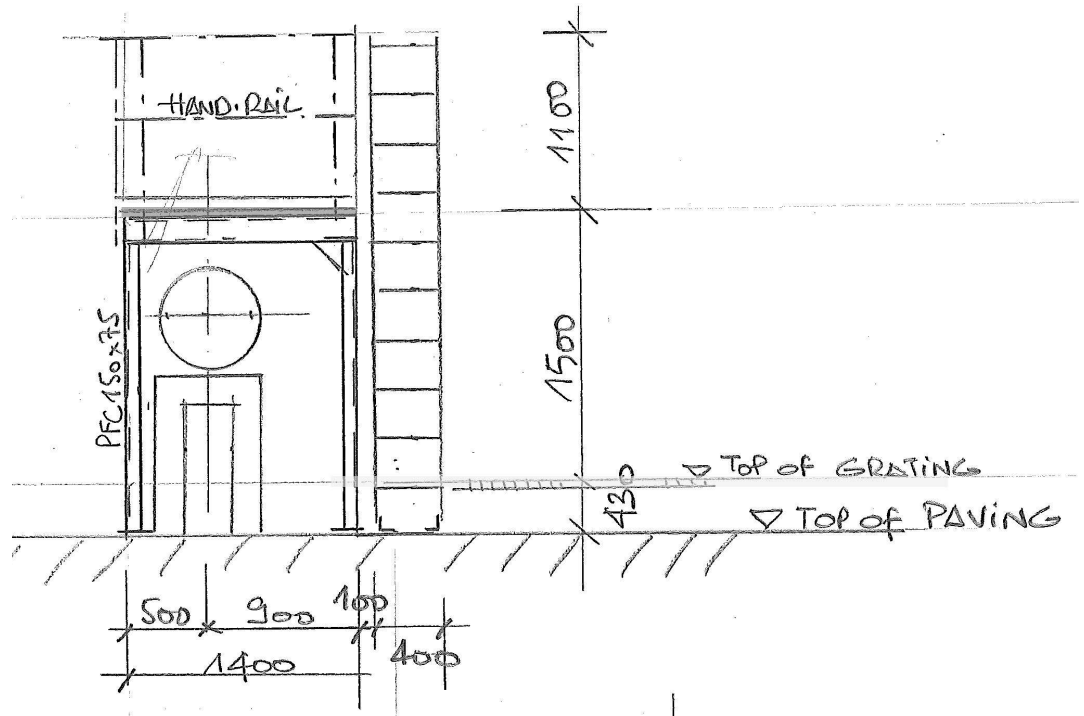
Civil





What the Vendor supplied

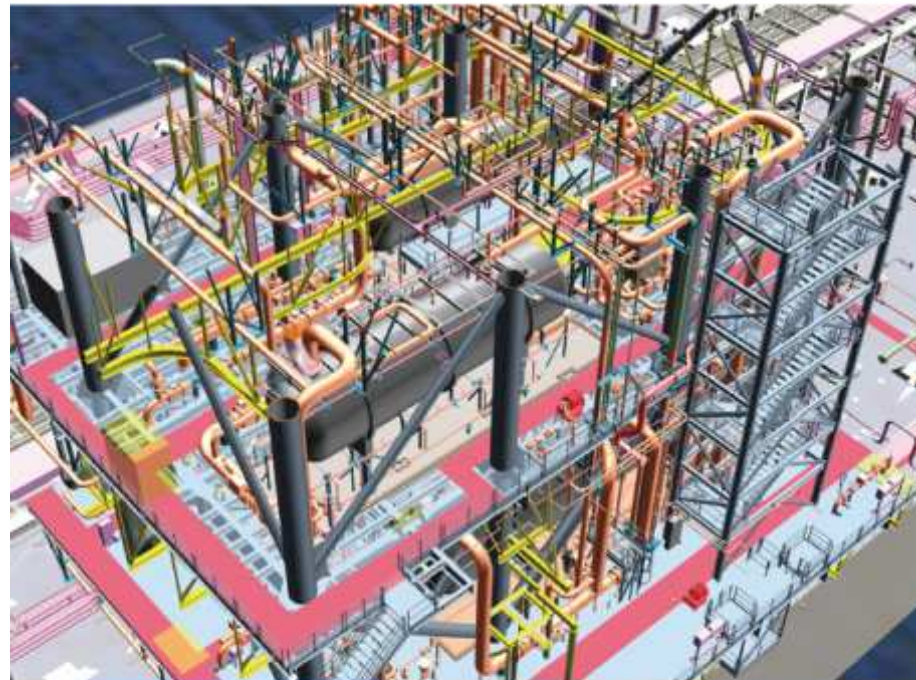
What Engineering designed



Interested and wanting to know more on Engineering?

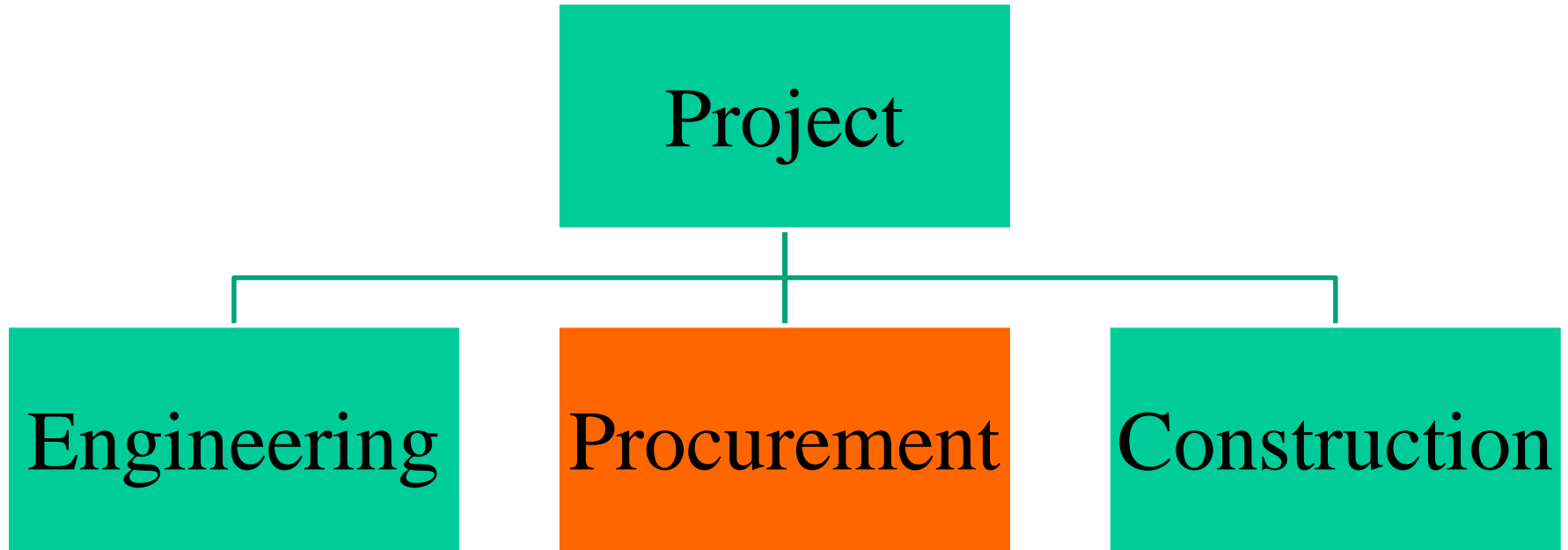
THE OIL & GAS ENGINEERING GUIDE

Hervé Baron



Editions TECHNIP

A unique synthesis for the busy Project professional
200 pages, 250 illustrations



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Procurement



Procurement / Steps

Inquiry (Call for Tender)

Short listing

Bid analysis

Clarifications

Negotiations

Purchase Order

Expediting

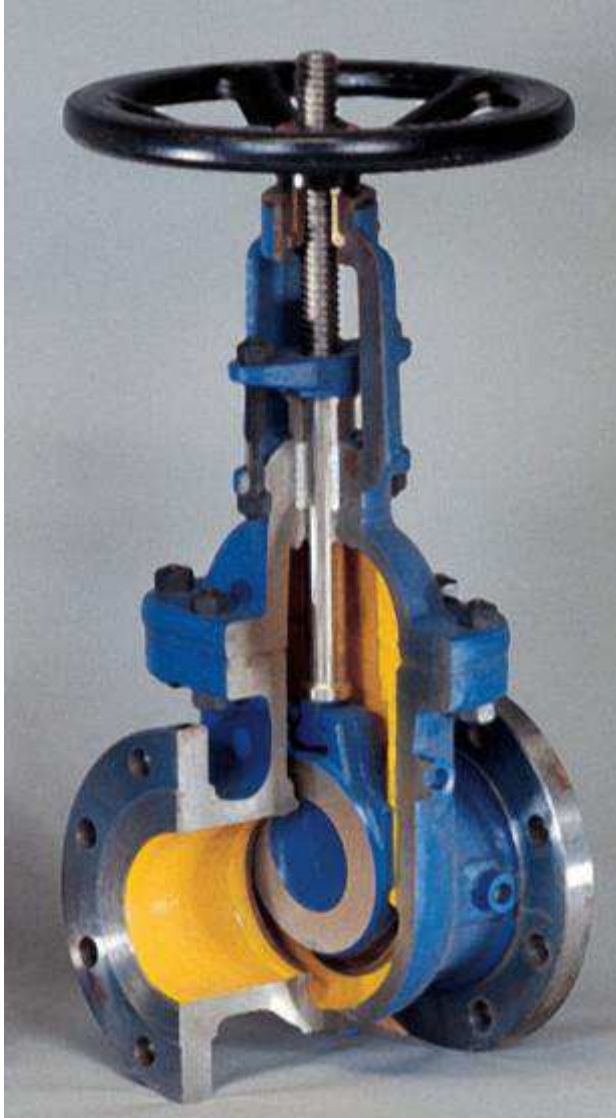
Inspection

Delivery

Warranty Period



Procurement / Supplier selection criteria



Technical Compliance

Price

Qualification of supplier

Schedule

Load of workshop

References

References with final Client

Financial situation

Annual turn-over

Internal feed-back

Procurement

Rated flow rate	27m3/h + miniflow requirements	27 + 11	27 + 15
Discharge pressure @ max	4.3barg	4.3	4.3
Material	CS	Impeller 316L SS / Body Cast Iron	Impeller 304 SS / Body Cast Iron
Control panel	IP 55	IP 55	IP 55
Equipment of control panel	pump selection, stop on low level, Auto /manu/O selector	yes	yes
Motor cable gland	required	Yes	?
Pressure gauge @pump discharge	Required	yes	yes
Pressure switch	Required	yes	yes
Pump motor	IP55	yes	Yes
Pump driver installed power	7.5kW	7.5	5.5
Power supply	415V / 3ph/ 50Hz	400V / 3ph / 50Hz	400V / 3ph / 50Hz
Control voltage of circuit control	240 Vac	?	?
Isolation valves	2 for each pump	Yes	Yes
Manifolds	2	Yes	Yes
Check valves	2 @ pump discharge	Yes	Yes

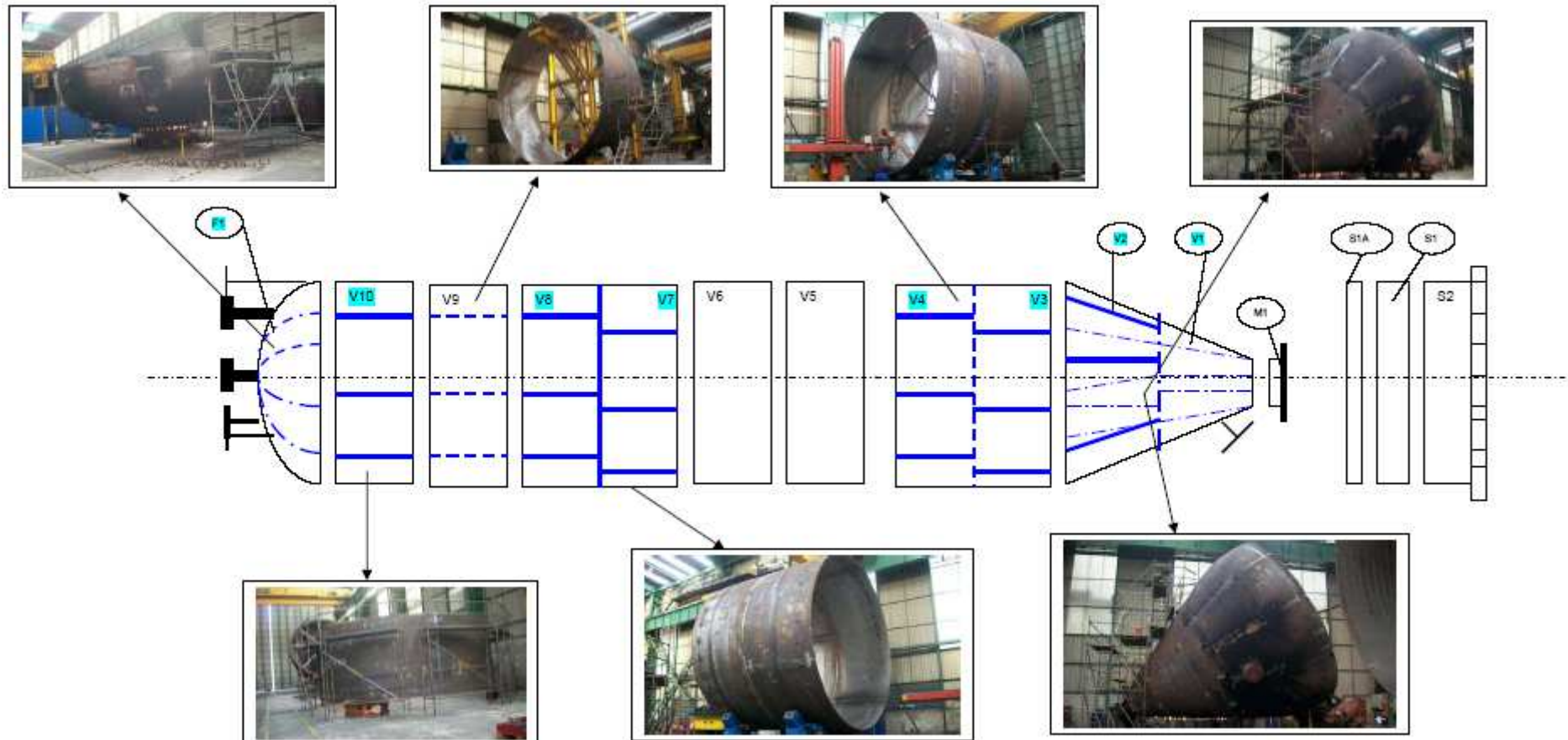
GENERAL TERMS AND CONDITIONS : GTC1_2_ANG_rev0 (for simple PO)	Agreed	Agreed
PRESERVATION, PACKING, MARKING & SHIPPING INSTRUCTIONS : PP 606	Agreed / standard packing	Agreed / standar packing
SITE SERVICE CONDITIONS FOR SUPPLIER'S SPECIALIST : PP 608	Agreed	Agreed
PURCHASE ORDER DRAFT	Agreed	Agreed
VENDORS QUALITY MANAGEMENT SYSTEM REQUIREMENTS : 9833N-0000-JSM-501	Agreed	Agreed
MECHANICAL GUARANTEE:	24 months from date of delivery	12 months from date of commissioning or 18 months from date of delivery
PAYMENT TERMS and CONDITIONS : Terms: 20 % AR 80 % Delivery according to agreed Incoterm + Certificate of origin + Final documentation Conditions : at 45 days after the end of the month of the date of issue of the corresponding invoice	- 20% AR - 75% Delivery of the supply - 5% Final documentation Agreed - except for 1st installment	- 20% AR - 60% Delivery DDP on site - 20% Erection of supply Agreed
LATE DELIVERY PENALTIES : EQUIPMENT : 1% the first 2 weeks, 2% the following, maxi 10% Aggregate maxi : 10%	0,5% per week Maxi 5%	Agreed - based on supply delivery on site (erection excluded) Agreed
SUB-SUPPLIER(S) LIST	Calpeca	ITT / LOWARA

Expediting



Job	Descr	Weight	Drawing Office	Planning	Fabricated	Sub Treatment	Treated	Loaded	% Fabricated	% Galvanized	% Delivered
60307	80-PR-13E	65.3864	0	0	0	0	0	65.3864	100.0%	100.0%	100.0%
60308	80-PR-12E	32.6998	0	0	0	0	0	32.6998	100.0%	100.0%	100.0%
60310	80-PR-19 (Pat -01)	56.1923	0	0	0	0	0	56.1923	100.0%	100.0%	100.0%
60311	80-PR-18	234.6891	0	0	0.6278	47.7529	0	178.7163	76.4%	76.2%	76.2%
60312	80-PR-27 (part - 02)	83.2827	0	0	0	0	0	83.2827	100.0%	100.0%	100.0%
60313	80-PR-19 (Pat -03)	126.7195	0	0	0	5.0505	0	121.669	96.0%	96.0%	96.0%
60314	80-PR-19 (Pat -02)	145.2883	0	0	10.2572	0.6449	0	129.3894	96.1%	89.1%	89.1%

Expediting





Inspection

Technip

INSPECTION RELEASE CERTIFICATE

N° IRC | N° Chrono IRC
PHO-0-013 -17

N° Chrono CD: 0-013 | Activé-contrôle: PO | CODE MAT: 8989N | N° ordre: 1300 | AVI: 602

FOURNISSEUR / Supplier - (NOM, ADRESSE / Name, Address)
Phoecenne
Vitrolles - 13742
France

CLIENT : WRG | SITE : Wilhelmshaven

REF. : PL 0013

LE MATERIEL CI-APRES DESIGNÉ VOIR DETAIL SUR LISTE JOINTE /
This hereafter designated material
 A ETE INSPECTE LE : NE SERA PAS INSPECTE PAR NOS SOINS
Has been inspected the : Inspection has been waived

REQUISITION N°	1300 0602 0			DESIGNATION DU MATERIEL /	Designation of Equipment
Révision N°	POSTE Part n°	ITEM N°	QUANTITE Quantity		
				Material described by MCS 17 (1 page)	

LA LIVRAISON DU MATERIEL EST PARTIELLE COMPLETE
The equipment delivery is Partially done Completed

OBSERVATIONS / Remarks :
Inspection release issued after review of material certificates at Technip office

Suppplier confirms that:

- All NCR's issued, have been solved and close-out reports issued
- No CR's remain outstanding
- All requirements of the PO/Requisition have been met
- All documentation (drawings, calculation notes, welding books...) has reached "No comment" status
- Manufacturer's data report is complete

CACHET DU FOURNISSEUR / NOM / SIGNATURE et DATE
SUPPLIER, stamp / Name / Signature and Date

EMETTEUR TECHNIP - Nom, Signature et Date
TECHNIP'S Representative Name, Signature and Date

TECHNIP INSP DEPT
SZCZEPANSKI Philippe N° 103
 WITNESS ACCEPTED
 REVIEW NOT ACCEPTED Aug. 21, 2009

21 AOUT 2009

A REMPLIR PAR LE FOURNISSEUR
To be filled in by the Supplier

CONTROL AND CONFORMITY CERTIFICATE

PAGE : 1 / 1

2009/08/20 WILHELMSHAVENER RAFFINERIEGESELL

V/Ref. : 8735V-0000-1300-
(V/Ref.)
N/Ref. : 33420/10
(O/Ref.)

We hereby certify that materials required of the above reference, have been manufactured and controlled according to the up to date specifications.

Date Date	Description Description	Quantité Quantity
08/20	SPRAL WOUND GASKET, ASME B16.20 304L GRAPHITE, RAISED FACE AS PER B16.5 150 LBS, INNER AISI 304L OUTER CARBON STEEL, LOW SEATING STRESS DESIGN, DIA. 6" CLASS 150 4600280	2,00

20 08 2009

TECHNIP INSP DEPT
SZCZEPANSKI Philippe N° 103
 WITNESS ACCEPTED
 REVIEW NOT ACCEPTED

Inspection

Item D-6130B (FCP n° 71.993B)

1.- Plate cutting

Monitoring plate cutting works on Plate n° 126417 for shell can V10, as follows:

- Pre-heat plates up to 220°C approx. using full gas burners. Temperature checked with tempilsticks (150°C) by Production and digital thermometer by QC people.
- Cutting plate on lateral sides. Checking pre-heat T° (165°C) as above.

2. – Shell section V3-V4 fit-up

Shell section V3-V4 have been assembled. The following inspections have been performed:

- a) Circ seam V3-V4: Inspection of "peel back" on bevel end edges. Clad plate has been removed 12 mm minimum and no visual defect is observed on bevel end edge. Total removal of clad plate was spot checked using a "copper sulphate pentahydrate" solution
- b) Circ seam V3-V4: Visual and dimensional of fitup. No damage was found and dimension was in accordance with dwg's 71-0993-001A rev. 2 / Weld detail 2 and 71-0993-011 rev. 1.

3.- Welding activities

3.1.- Welding parameters

Performed in process inspection of welding, as follows:

- Cone V2: Long seams L3, L8 (SMAW/outside)
- Nozzle N1B: Inside weld overlay (FCAW)
- Flange nozzle M1: Flange face o/v (ESW/1° layer)
- Shell can V7: Insulation supports to shell (SMAW)
- Head F1: Long seam L11 (SAW/inside)
- Confirmed that welders have the applicable WPS
- Confirmed that supplier was utilizing the correct weld consumable
- Confirmed the correct pre-heat and interpass maintenance, using full gas burners. T° checked with tempilstick (welder) and digital thermometer (QC people)
- Confirmed (by spot) the correct welding parameters (volts, amperes, travel speed) by spot checking.

3.2.- Back gouging surface

Cone V2: Long seams L5, L6, L9 & L10

100% visual inspection after arc air back gouging, confirming the compliance with applicable weld procedure and drawings.

3.3.- Welder qualifications (WQR)

Name	TAG n°	Welding process	Type of weld	Range qualified	Qualification date	NoBo approval	Comments
Ramón A. López	59	ESW	Weld overlay	Above 25mm thick	19/09/03	YES	(1)

(1) "Welder log" has been reviewed confirming continuity on welding process during last two years

Also see reports #13, 15

3.4.- Welding consumables control

Inspection performed on welding consumable warehouse for checking the storage, records and control of applicable welding consumables.

Welding electrodes are stored in a stationary oven. This oven is identified to be containing electrodes of this job only. Filler material (ESW, SAW, FCAW & GTAW) and flux bags are maintained in a clean and dry area.

4.- Nozzle dimensional control

Dimensional control of flange N2 (36"-WN-300# RTJ) after weld overlay and face machining. Face finishing (roughness and RTJ groove.); face & RTJ dimension (weld overlay thickness, OD and height); and ID weld overlay thickness were checked and found in compliance with ASME 16. 5 and drwg. 71.0993-005B rev. 2



Shipping

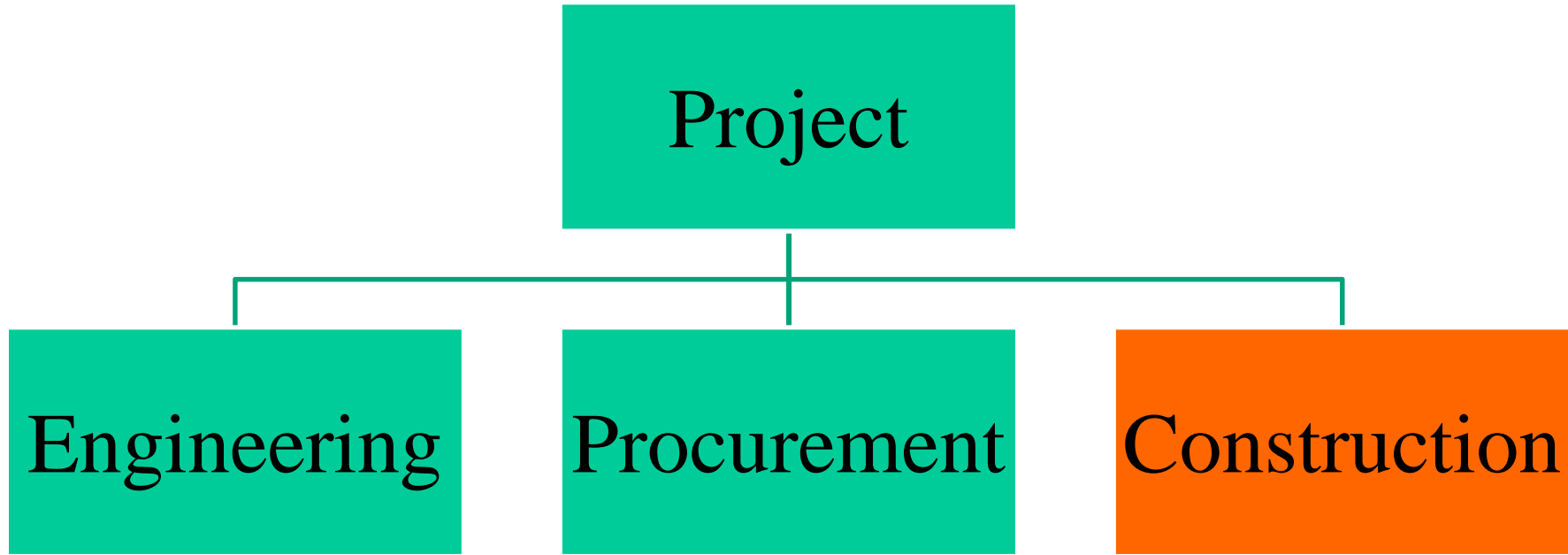


Shipping



Shipping





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Earthworks



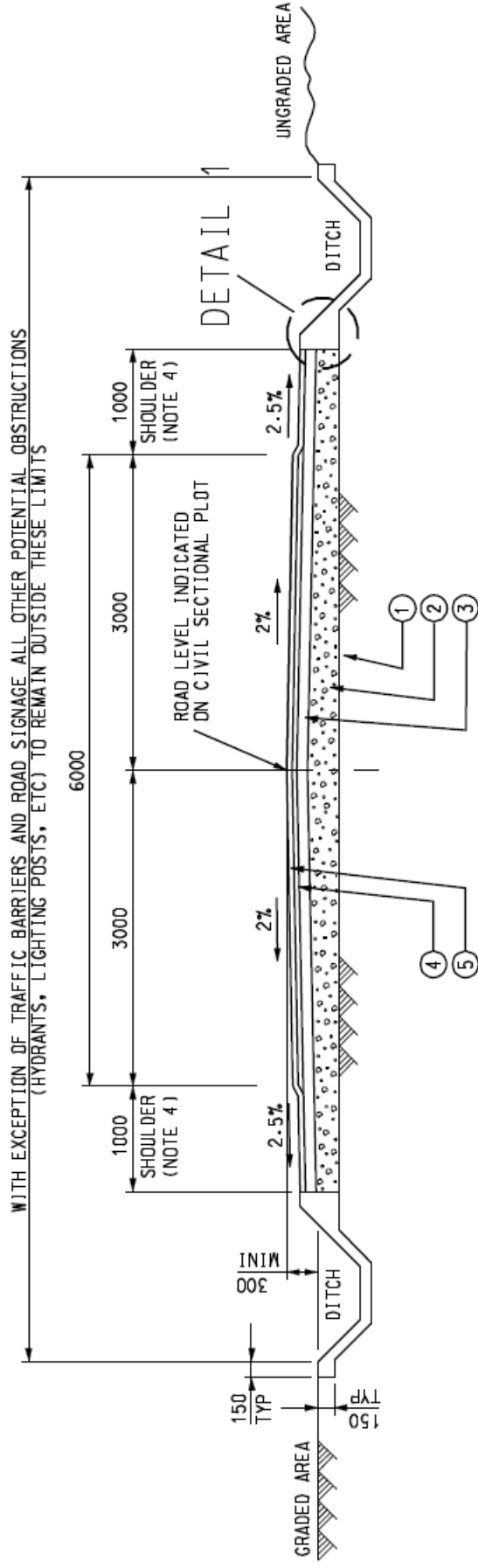
Pipeline



Pipeline



Roads

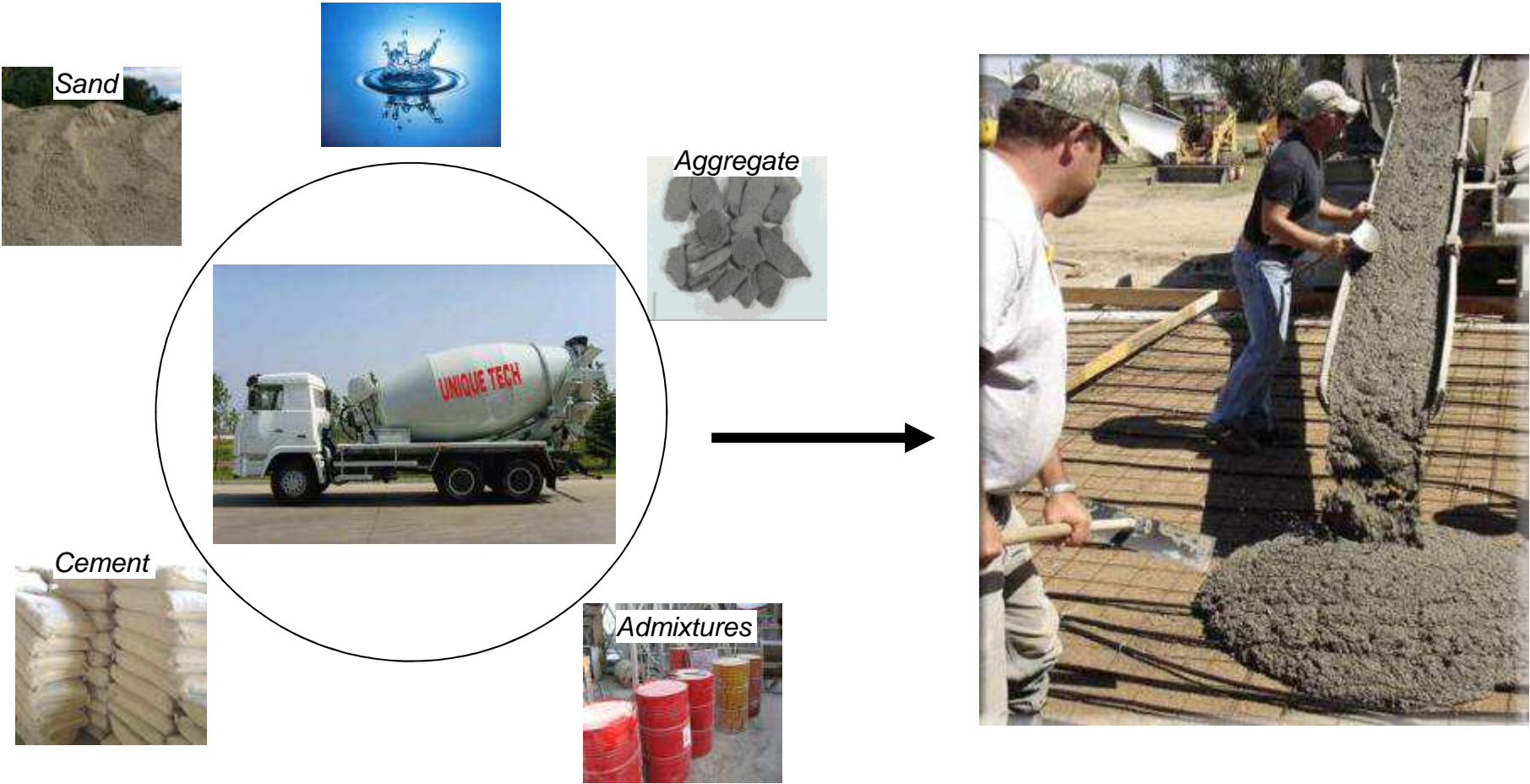


SECTION ROAD TYPE "A"

Buildings



Civil Works



Civil Works



Civil Works



Civil Works



Civil Works



Civil Works



Pre-fabrication



Erection



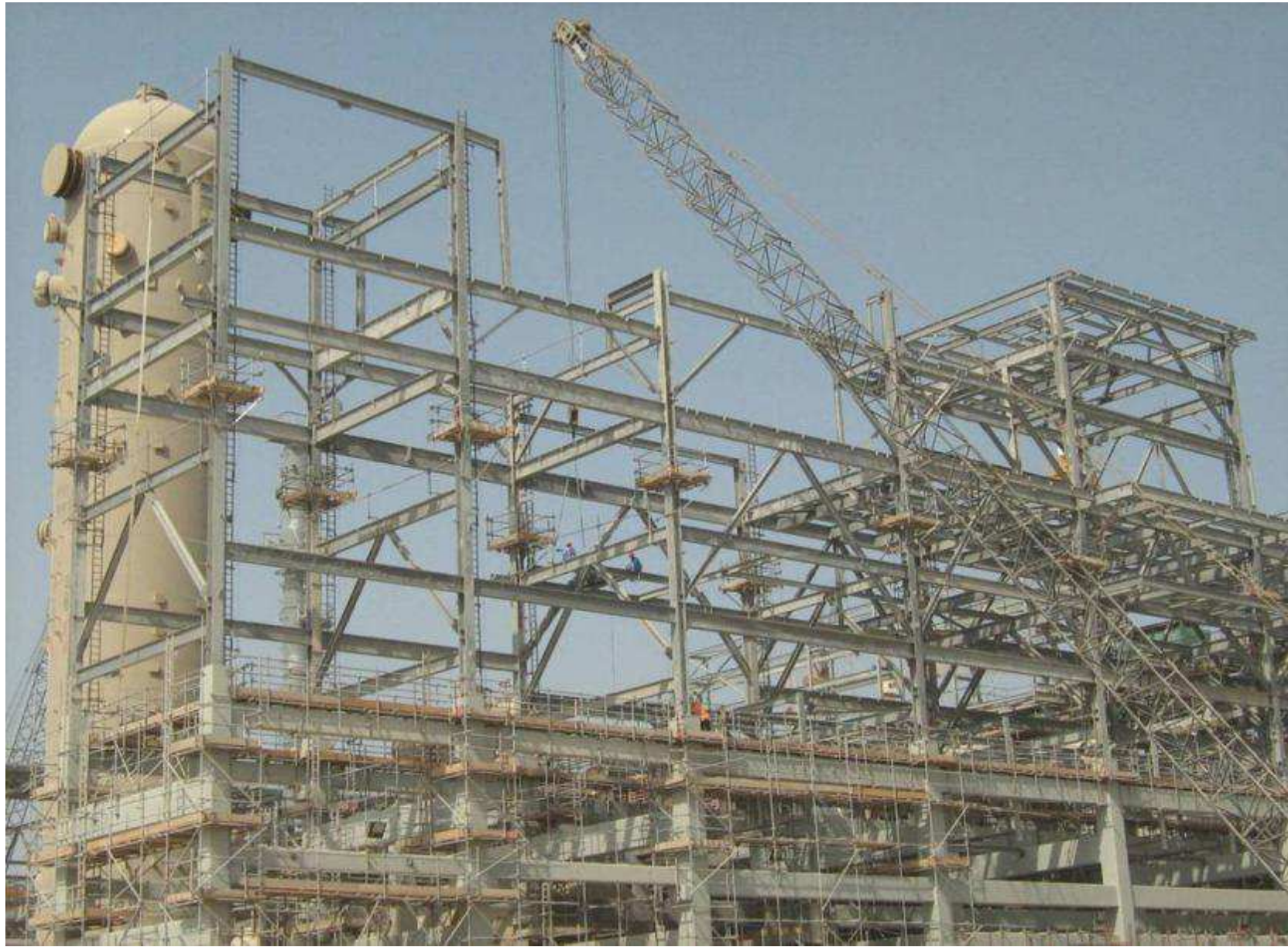
Underground networks



Plant erection



Steel structure erection



Equipment installation



Equipment installation



Piping Pre-fabrication



Piping erection



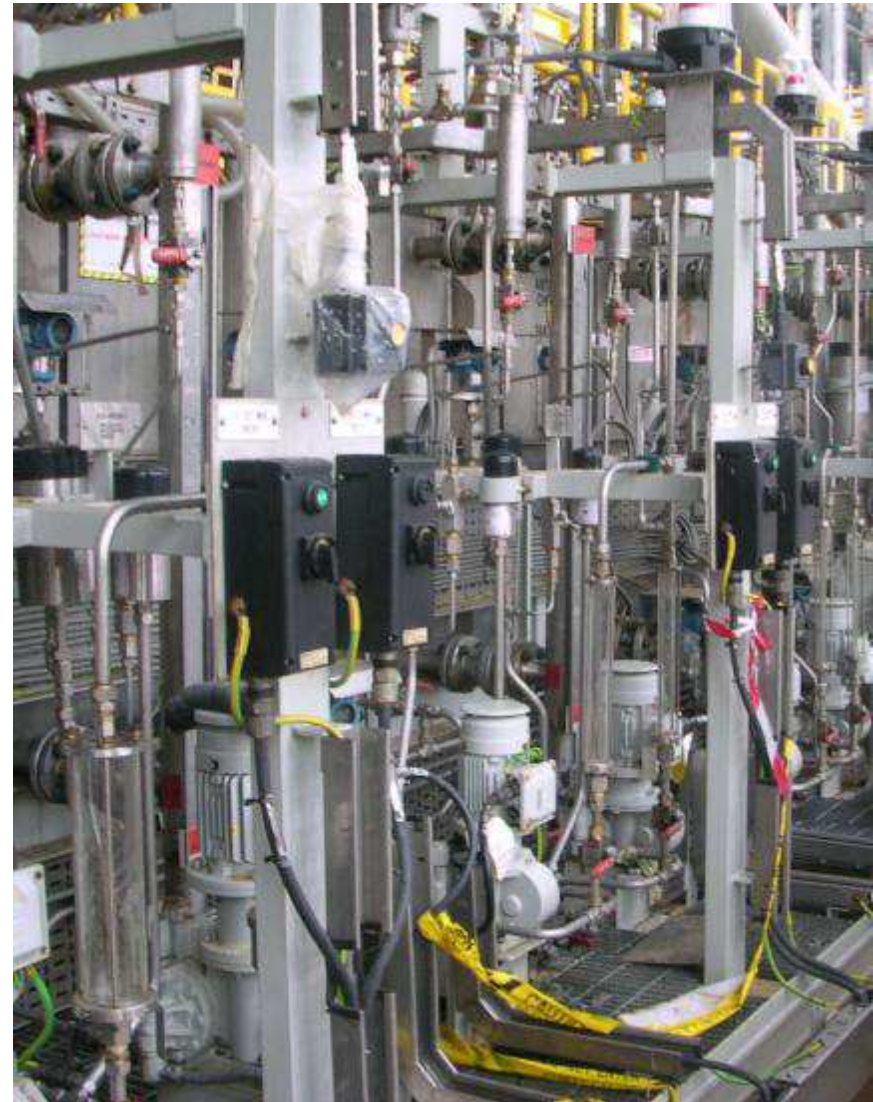
Piping erection



Field Instrumentation Installation



Electrical equipment connection



Cable pulling



Arrangement of Technical rooms



**HERVE
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Cable connections

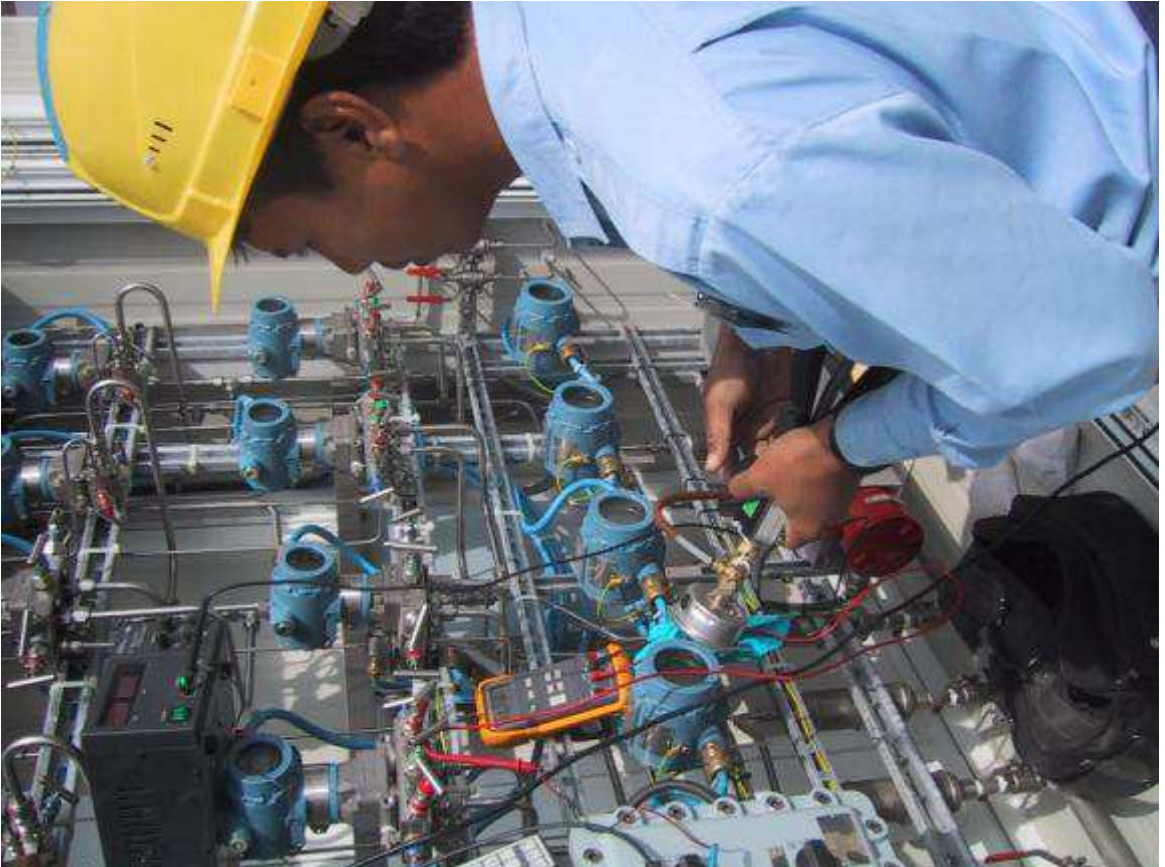
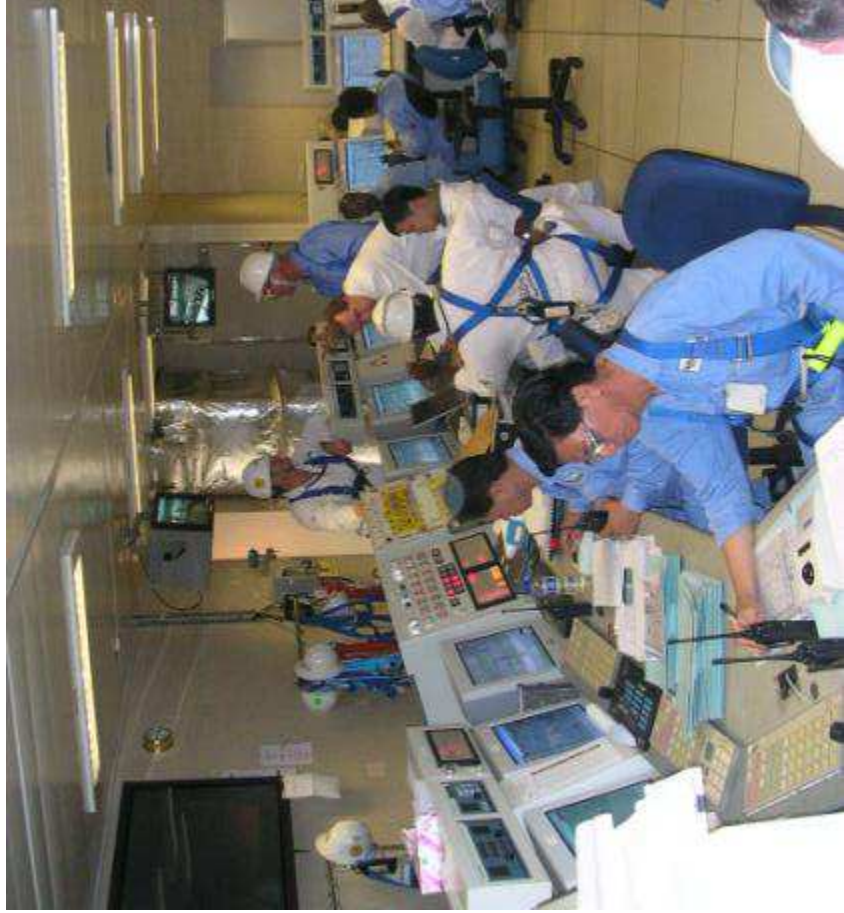


Other Systems Field Equipment Installation



Control room consoles installation





Testing

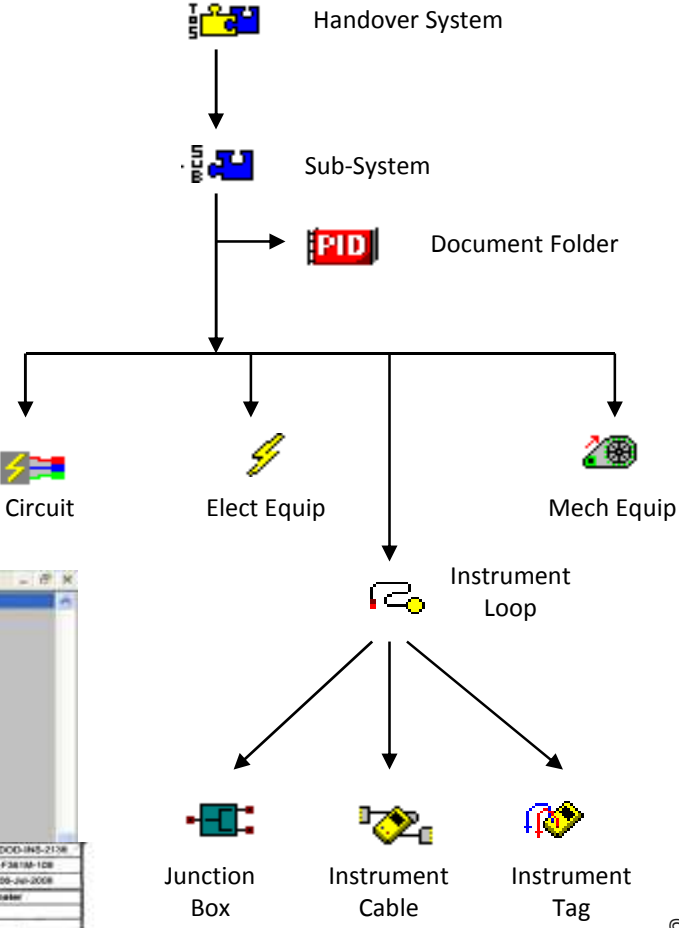


Commissioning

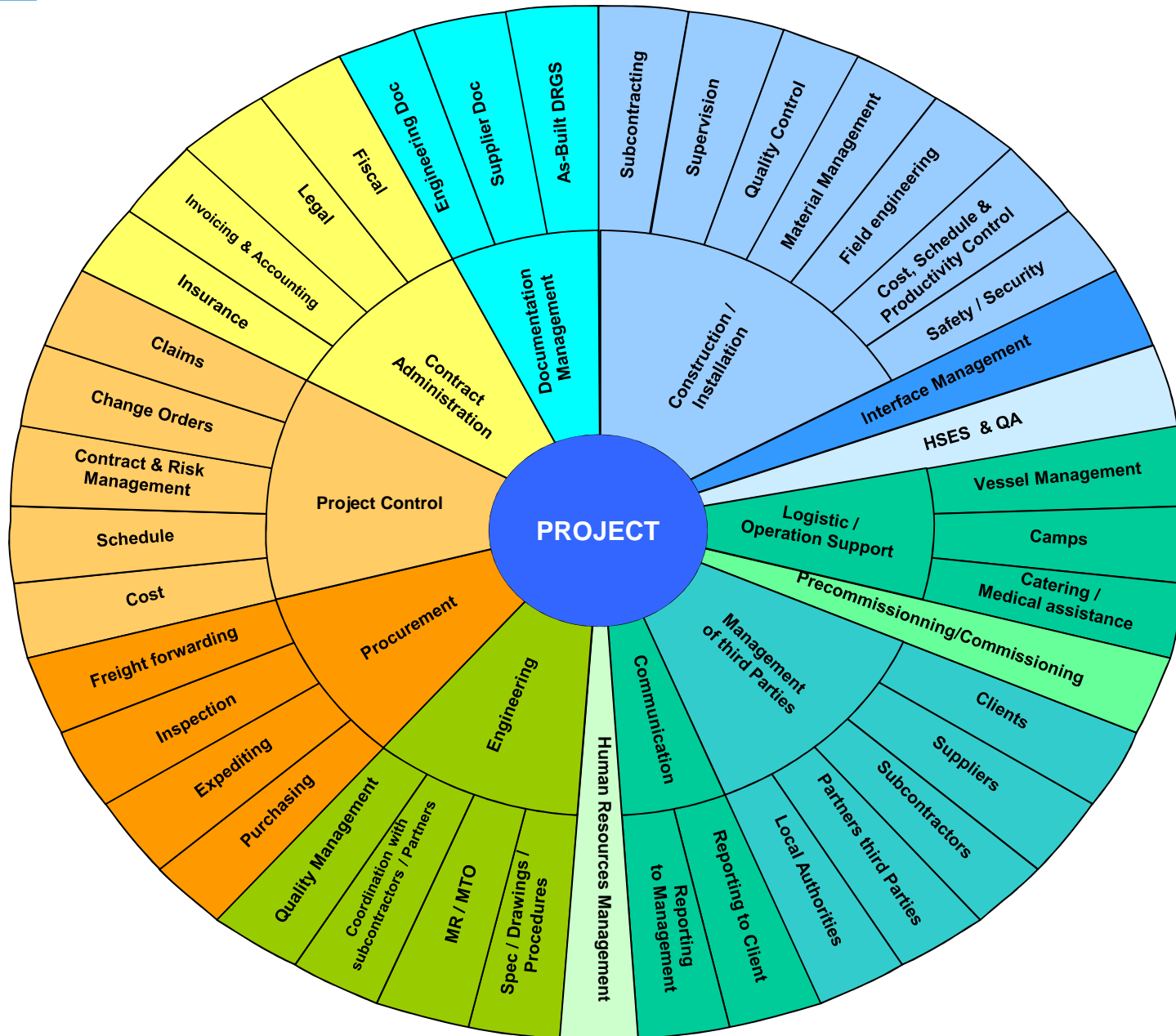
The screenshot shows the WinPCS software interface. The top part displays a project tree with various components like '92UC-1000A STEAM MASTER PRESSURE CONTROL' and '92F-6507 INSTRUMENT LOOP'. The bottom part shows a detailed test report for 'INSULATION RESISTANCE AND CONTINUITY TEST REPORT POST INSTALLATION OF MAIN INSTRUMENT CABLES'. The report includes a table with columns for Cable Tag No., Cable Type, From, To, Cable Continuity, and Cable Insulation Resistance (MΩ).

Sl. No.	Cable Tag No.	Cable Type	From	To	Cable Continuity	CABLE INSULATION RESISTANCE (MΩ)		
						Class A	Class B	Class C
1	92F-6507	XREWAW/2500 3mm ² OC20FR	RG6-92-JA-901	SS3-DCM-01	OK	>278	N/A	>278
2	92F-6508	XREWAW/2500 3mm ² OC20FR	RG6-92-JA-902	SS3-DCM-02	OK	>278	N/A	>278
3	92F-6509	XREWAW/2500 3mm ² OC20FR	RG6-92-JA-906	SS3-DCM-02	OK	>278	N/A	>278

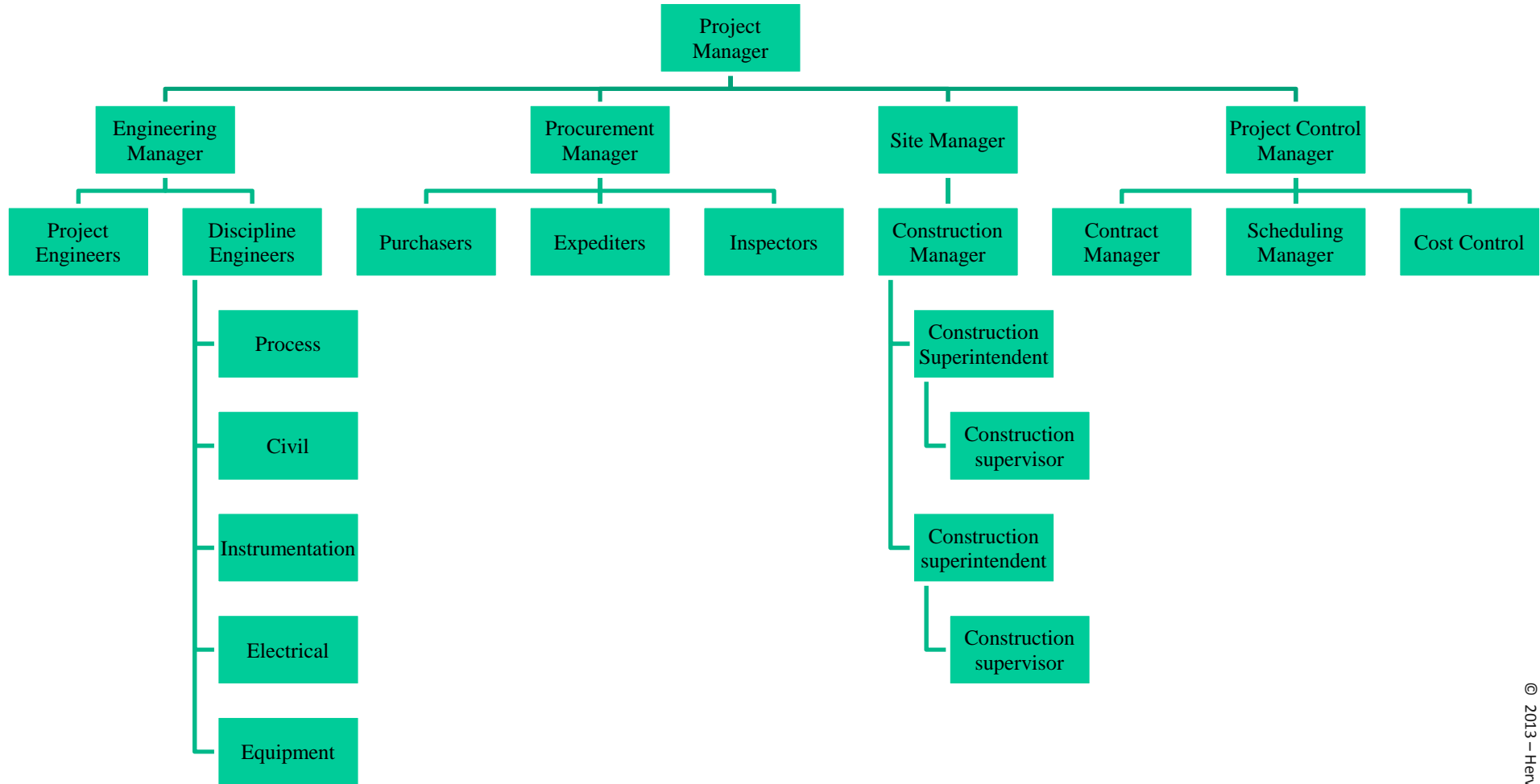
The report also includes a signature section with the name 'Kartick J. Karanth' and the date '6/Jul/2008'. There are several stamps and handwritten notes, including the number '018137' and a signature 'Ricardo Hernandez'.



The multiple sides of a Project



Project Organisation



Project procedures

List of Project Procedures
QA Assurance Manual
Communications procedure
Communications Procedure
Planning & Progress Control Procedure
Purchasing plan
Meetings Procedure
Reporting Procedure and examples
Engineering Procedure with examples of MDR & Dwg's & spec formats
Procurement Procedure
Subcontracting Procedure
Progress Control Procedure
Invoicing Procedure & Register
Precommissioning/commissioning procedure
QA/QC procedures
Safety Manual & HSE Program
Contract Close out procedure
Insurance Claims Procedure
CADD Procedure
Change Order procedure
Project Execution plan (including construction execution plan)
Warranty work
List of Project Procedures
Document Identification and Numbering Procedure
Calendar procedure
Vendor and Subcontractor Final Documentation
Interface Management Plan
Project Risk Management Procedure



Project temporary facilities



Project temporary facilities



Project temporary facilities



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Project temporary facilities

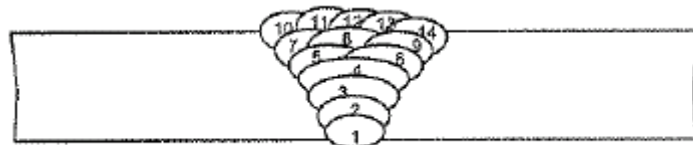
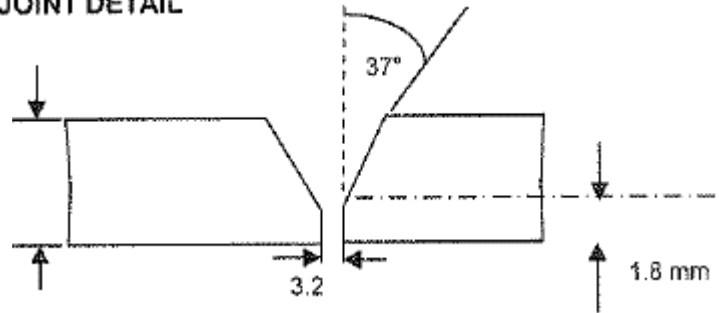


Project temporary facilities



Construction Procedures

JOINT DETAIL



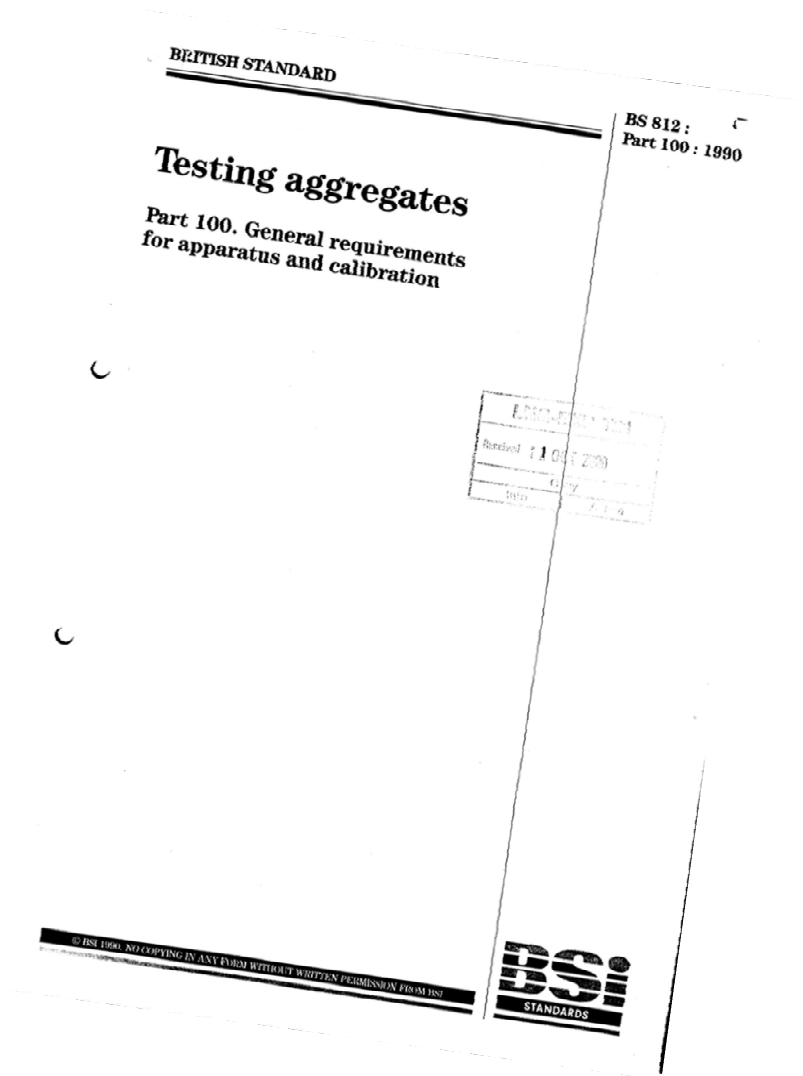
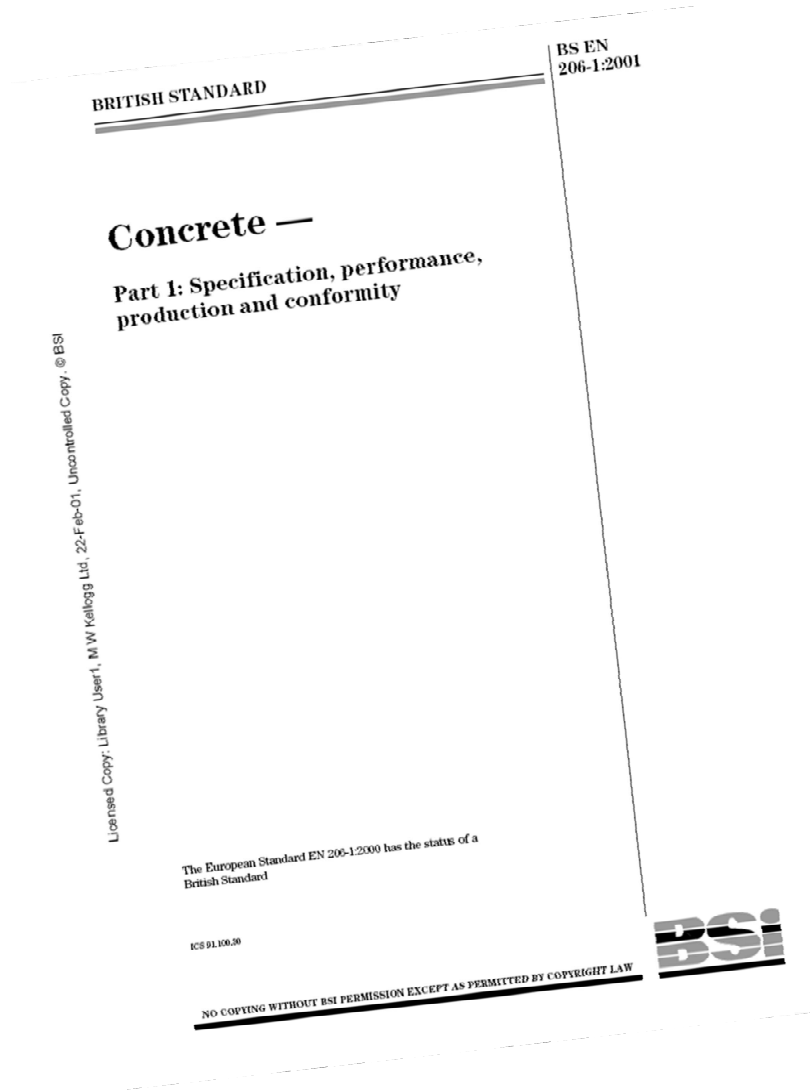
Pipe 20" x 38.1mm

WELDING PROCEDURE SPECIFICATION (IN ACCORDANCE WITH ASME IX & ASME B31.3/B31.8)									
POSITIONS [QW-405]					POST WELD HEAT TREATMENT [QW-407]				
Position(s) of Groove: <u>ALL</u>					Temperature Range: <u>610°C - 665°C</u>				
Welding Progression: <u>UP HILL</u>					Time Range: <u>ONE HOUR MINIMUM / INCH</u> <u>3.95 HOURS (MAXIMUM)</u>				
Position(s) of Fillet: <u>ALL</u>					GAS [QW-408]				
PREHEAT [QW-406]					Percent Composition				
Preheat Temperature: Min. <u>93°C</u>					Gas(es)			Flow Rate	
Interpass Temp. Max. <u>250°C</u>					Argon 99.9%			NA	
Preheat Maintenance: <u>NA</u>					Shielding:			6-16 Ltr/Min.	
(Continuous Special Heating where applicable to be recorded)					Purging:			NA	
					Trailing:			NA	
					Backing:			NA	
ELECTRICAL CHARACTERISTICS [QW-409]									
Current (A.C. or D.C.): <u>DC</u>					Polarity: <u>GTAW (-VE) & SMAW (+VE)</u>				
Amperes (Range): <u>SEE BELOW TABLE</u>					Volts (Range): <u>SEE BELOW TABLE</u>				
Tungsten Electrode (Size & Type): <u>2% THORIATED SIZE ø 2.00 / 2.40mm</u>									
Mode of Metal Transfer for GMAW: <u>NA</u>									
Electrode Wire Feed Speed Range: <u>NA</u>									
TECHNIQUE [QW-410]									
String or Weave Bead: <u>STRING & WEAVE</u>									
Orifice or Gas Cup Size: <u>8 - 13mm</u>									
Initial and Interpass Cleaning (Brushing, Grinding, etc.): <u>GRINDING / BRUSHING</u>									
Method of Back-gouging: <u>SEE "OTHER"</u>									
Oscillation: <u>NA</u>									
Contact Tube to Work Distance: <u>MULTIPLE</u>									
Multiple or Single Pass (Per Side): <u>SINGLE</u>									
Multiple or Single Electrodes: <u>SEE BELOW TABLE</u>									
Travel Speed (Range): <u>NOT ALLOWED</u>									
Peening: <u>NOT ALLOWED</u>									
Other:					1. When required, e.g. irregular root, root concavity, incomplete penetration etc. on the root and where access permits, the root may be back welded using the GTAW or SMAW parameters below. Preparation to ensure Fusion shall be by power grinder. (see Page No 4 for Back Weld Details) 2. Minimum 2 Passes for all pressure retaining welds including sockets & fillets.				
WELDING PARAMETER TABLE [QW-409]									
Weld Layers(s)	Process	Filler Metal		Current			Volt Range	Travel Speed Range mm/min	MAX Heat Input in KJ/mm
		Class	Dia (mm)	Type	Polar	Ampr. Range			
ROOT	GTAW	E70S-6	2.0 / 2.4	DC	-VE	80-120	10-15	50-80	0.83
HOT	SMAW	E7015-1	2.5/3.2	DC	+VE	60-100	20-30	80-130	1.42
FILL	SMAW	E7015-1	2.5/3.2/4.0	DC	+VE	70-175	20-30	80-130	2.70
CAP	SMAW	E7015-1	2.5/3.2/4.0	DC	+VE	65-145	20-30	80-160	2.70





Quality Control



Quality Control



Quality Control



Cost Control

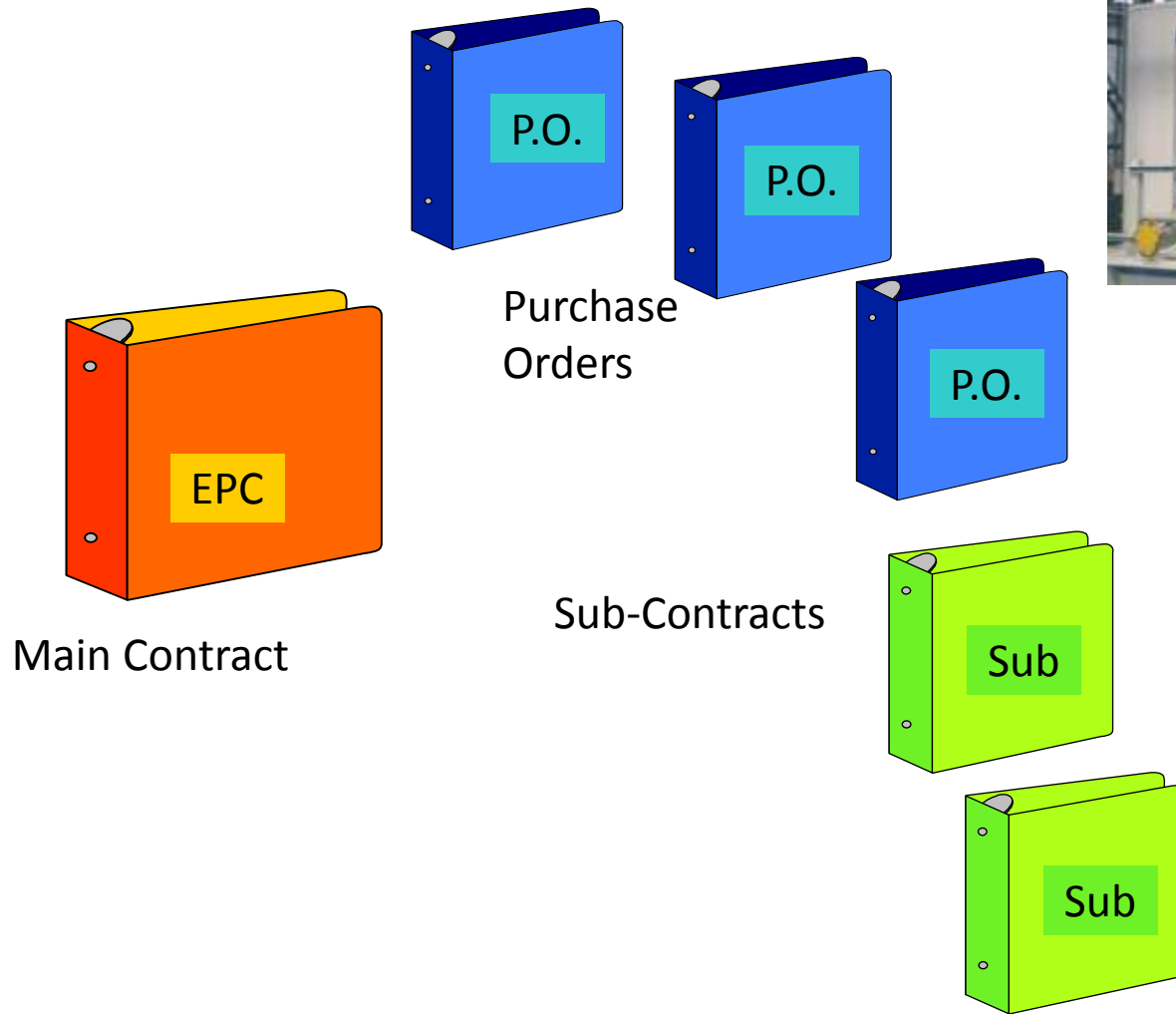
Item	budget	spent	to go	forecast
	A	B	A-B	C
engineering manhours				
main equipment				
bulk materials				
construction				
offices				
camps, temporary site facilities				
contingencies				
Risk				
TOTAL COST				



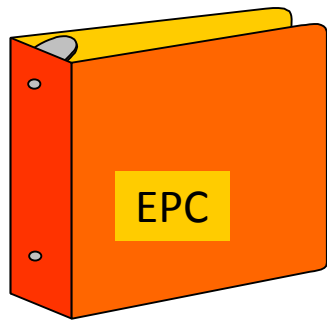
Insurance



Contracts



Contracts



Main Contract

Terms and
Conditions

Price

Schedule

Performance
guarantees

Technical
basis

Specifications,
codes & stds

Contracts

E



Contracts



E P



Contracts



E P C



Contracts



$$\Sigma + x\%$$

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Construction contracts



Civil



Construction contracts

Mechanical



Construction contracts



E&I



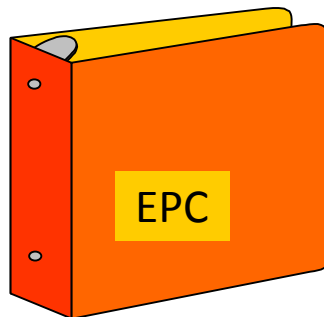
Construction contracts



General Contractor



Contracts Terms and Conditions



Main Contract

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- ARTICLE 1 - OBJECT OF CONTRACT
- ARTICLE 2 - DEFINITIONS AND SIGNIFICANCE OF EXPRESSIONS
- ARTICLE 3 - ENTIRE AGREEMENT
- ARTICLE 4 - NON-WAIVER - MODIFICATIONS TO CONTRACT
- ARTICLE 5 - LANGUAGE OF CONTRACT
- ARTICLE 6 - INTERPRETATION OF CONTRACT

CHAPTER II - GENERAL

- ARTICLE 7 - INDEPENDENCE OF CONTRACTOR
- ARTICLE 8 - COMPANY REPRESENTATIVE
- ARTICLE 9 - CONTRACTOR'S ORGANIZATION
- ARTICLE 10 - SUBCONTRACTORS
- ARTICLE 11 - ASSIGNMENT - OPTION FOR COMPANY ITEMS
- ARTICLE 12 - AWARENESS OF WORK CONDITIONS
- ARTICLE 13 - CORRECTNESS AND SUFFICIENCY OF CONTRACT DOCUMENTS

CHAPTER III - THE PERFORMANCE OF THE WORK

- ARTICLE 14 - CARRYING OUT THE WORK
- ARTICLE 15 - WORK TIME SCHEDULE AND PROGRESS CONTROL
- ARTICLE 16 - MAINTENANCE SERVICES
- ARTICLE 17 - QUALITY ASSURANCE - TECHNICAL AND SAFETY AUDITS - INSPECTIONS AND TESTS
- ARTICLE 18 - INTERIM AND PROVISIONAL ACCEPTANCE CERTIFICATES
- ARTICLE 19 - GUARANTEES AND WARRANTIES
- ARTICLE 20 - FINAL ACCEPTANCE
- ARTICLE 21 - CHANGE ORDERS

CHAPTER IV - CONDITIONS FOR THE PERFORMANCE OF THE WORK

- ARTICLE 22 - APPLICABLE LAWS - CUSTOMS REGULATIONS - AUTHORIZATIONS
- ARTICLE 23 - SAFETY, HEALTH AND ENVIRONMENT, ALCOHOL AND DRUG POLICY
- ARTICLE 24 - CONTRACTOR'S PERSONNEL
- ARTICLE 25 - CONSTRUCTION EQUIPMENT
- ARTICLE 26 - WORK LOCATIONS
- ARTICLE 27 - SITE REQUIREMENTS

CHAPTER II

GENERAL

ARTICLE 7 - INDEPENDENCE OF CONTRACTOR

CONTRACTOR declares and warrants that he is fully experienced and technically competent to perform the WORK and that he is properly financed, organized and equipped to perform such WORK.

CONTRACTOR shall manage, control and direct the WORK as an independent contractor and perform all obligations and duties under the CONTRACT at his own cost, risk and responsibility, in due compliance with the WORK TIME SCHEDULE and with the provisions of the CONTRACT.

COMPANY shall have the right to inspect CONTRACTOR as to the results which it wishes to obtain from the WORK and to inspect the WORK at all stages of execution in order to ascertain that these results are being obtained and that WORK is being carried out in accordance with CONTRACT requirements, but shall not have the right to direct the execution of the WORK, except as provided for under provisions of the CONTRACT covering defective performance by CONTRACTOR and/or Take-over by COMPANY.

CONTRACTOR's failure to perform any obligations shall always be at its sole cost and risk. Omissions or actions of COMPANY and/or inspecting authorities or agencies, including any comments or absence thereof, presence or absence of representatives at any time including during tests and inspections, issuance of certificates other than FINAL ACCEPTANCE CERTIFICATE (subject to surviving obligations and liabilities under the CONTRACT) or at least, payments, APPROVAL and the like, shall not release CONTRACTOR in any way from any of its obligations and liabilities under the CONTRACT or at least, nor imply acceptance of defective WORK.

CONTRACTOR shall remain solely responsible and liable for compliance with the CONTRACT by all SUBCONTRACTORS, and COMPANY's rights and interests shall not be affected in any way or their scope howsoever reduced due to any subcontracting.

CONTRACTOR shall not represent COMPANY or act for or on behalf of COMPANY or in its name without COMPANY's prior written consent and then only as and when mutually agreed by the PARTIES. Relations with third parties shall be subject to procedures previously agreed to by COMPANY. No employee, servant or agent of CONTRACTOR shall be deemed in any way to be an employee, servant or agent of COMPANY.



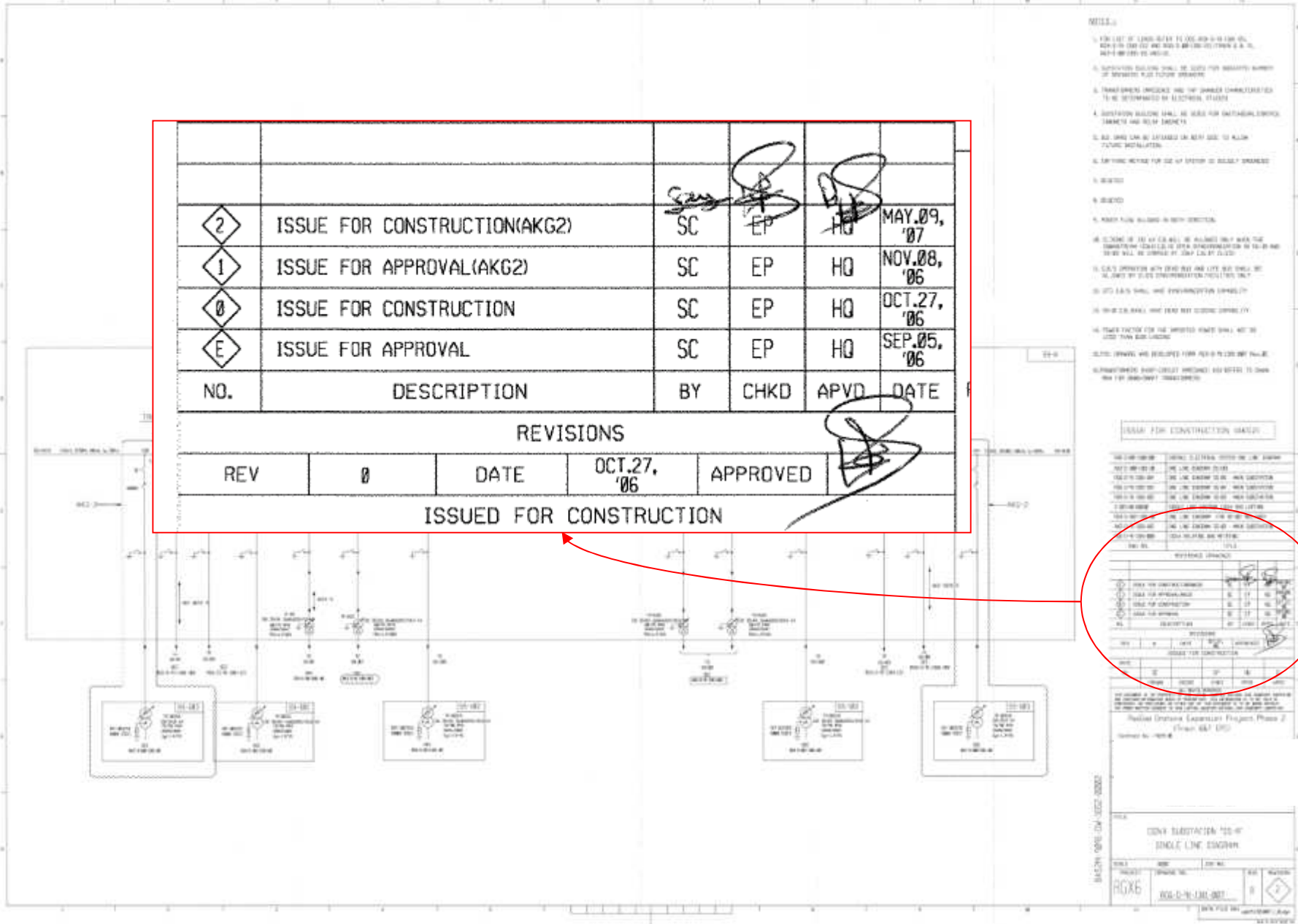
Obligations of the 2 parties

Limit of liability

Penalties in case of bad performance

Conflict resolution

Quality Assurance (QA)





Quality Assurance (QA)

Email

Subject : temporary irrigation system - Outcomes of the meeting with CPY

History: This message has been replied to and forwarded.

Good morning,

The meeting was held with CPY last Monday afternoon. You will find attached presentation

Temporary Irrigation System - Early Works.ppt

Below is CPY decision: GRP tank(s)

TECHNICAL QUERY SHEET																										
SUBCONTRACT N°	:	_____																								
SUBCONTRACTOR	:	_____																								
TQS N°	:	_____																								
DISCIPLINE	:	<table border="0"> <tr> <td>piling</td> <td>civil-works</td> <td>sewage</td> <td>road</td> <td>paving</td> <td>structural</td> </tr> <tr> <td>mechanical</td> <td>piling</td> <td>painting</td> <td>tracing</td> <td>Insulation</td> <td>electrical</td> </tr> <tr> <td>Instrumentation</td> <td>HVAC</td> <td>Architectural</td> <td></td> <td>Quality Control</td> <td>commissioning</td> </tr> <tr> <td>others</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	piling	civil-works	sewage	road	paving	structural	mechanical	piling	painting	tracing	Insulation	electrical	Instrumentation	HVAC	Architectural		Quality Control	commissioning	others					
piling	civil-works	sewage	road	paving	structural																					
mechanical	piling	painting	tracing	Insulation	electrical																					
Instrumentation	HVAC	Architectural		Quality Control	commissioning																					
others																										
Site area	:	_____																								
Equip / Item Tag	:	_____																								
Doc. Reference	:	_____																								
Attachements	:	_____																								
QUESTION <input type="checkbox"/> Deviation request <input type="checkbox"/> Clarification request																										
SUBCONTRACTOR	:	Date : _____ Visa : _____																								
ANSWER <input type="checkbox"/> Approved <input type="checkbox"/> Not Approved <input type="checkbox"/> Refer to text																										
<small>COMPANY's approval is required only for deviation request to COMPANY's documents/requirements.</small>																										
	CONTRACTOR	COMPANY (for deviation)																								
Name																										
Date																										
Company stamp																										
Signature																										

Email vs Technical Query...

Quality Assurance (QA)


Email

Subject : temporary irrigation system - Outcomes of the meeting with CPY

History: This message has been replied to and forwarded.

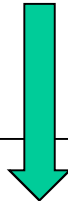
Good morning,

The meeting was held with CPY last Monday afternoon.



Temporary Irrigation System - Early Works.ppt

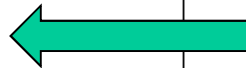
Below is CPY decision: GRP tank(s)



Unformal/Unrecoverable!

Email vs Technical Query...

Formal/Recoverable!



TECHNICAL QUERY SHEET																																										
SUBCONTRACT N°	:	_____																																								
SUBCONTRACTOR	:	_____																																								
TQS N°	:	_____																																								
DISCIPLINE	:	<table border="0"> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>piping</td> <td>civil-works</td> <td>sewage</td> <td>road</td> <td>paving</td> <td>structural</td> <td>electrical</td> <td></td> </tr> <tr> <td>mechanical</td> <td>piping</td> <td>painting</td> <td>tracing</td> <td>Insulation</td> <td>commissioning</td> <td></td> <td></td> </tr> <tr> <td>Instrumentation</td> <td>HVAC</td> <td>Architectural</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>others</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	_____	_____	_____	_____	_____	_____	_____	_____	piping	civil-works	sewage	road	paving	structural	electrical		mechanical	piping	painting	tracing	Insulation	commissioning			Instrumentation	HVAC	Architectural						others							
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piping	civil-works	sewage	road	paving	structural	electrical																																				
mechanical	piping	painting	tracing	Insulation	commissioning																																					
Instrumentation	HVAC	Architectural																																								
others																																										
Site area	:	_____																																								
Equip / Item Tag	:	_____																																								
Doc. Reference	:	_____																																								
Attachements	:	_____																																								
QUESTION <input type="checkbox"/> Deviation request <input type="checkbox"/> Clarification request																																										
SUBCONTRACTOR	:	Date : _____ Visa : _____																																								
ANSWER <input type="checkbox"/> Approved <input type="checkbox"/> Not Approved <input type="checkbox"/> Refer to text																																										
COMPANY's approval is required only for deviation request to COMPANY's documents/requirements.																																										
	CONTRACTOR	COMPANY (for deviation)																																								
Name																																										
Date																																										
Company stamp																																										
Signature																																										

Quality Assurance (QA)


Email

Subject : temporary irrigation system - Outcomes of the meeting with CPY

History: This message has been replied to and forwarded.

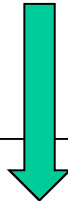
Good morning,

The meeting was held with CPY last Monday afternoon.



Temporary Irrigation System - Early Works.ppt

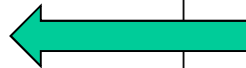
Below is CPY decision: GRP tank(s)



Unformal/Unrecoverable!

Email vs Technical Query...

Formal/Recoverable!



TECHNICAL QUERY SHEET																																										
SUBCONTRACT N°	:	_____																																								
SUBCONTRACTOR	:	_____																																								
TQS N°	:	_____																																								
DISCIPLINE	:	<table border="0"> <tr> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>piping</td> <td>civil-works</td> <td>sewage</td> <td>road</td> <td>paving</td> <td>structural</td> <td>electrical</td> <td></td> </tr> <tr> <td>mechanical</td> <td>piping</td> <td>painting</td> <td>tracing</td> <td>Insulation</td> <td>commissioning</td> <td></td> <td></td> </tr> <tr> <td>Instrumentation</td> <td>HVAC</td> <td>Architectural</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>others</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	_____	_____	_____	_____	_____	_____	_____	_____	piping	civil-works	sewage	road	paving	structural	electrical		mechanical	piping	painting	tracing	Insulation	commissioning			Instrumentation	HVAC	Architectural						others							
_____	_____	_____	_____	_____	_____	_____	_____																																			
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Think of somebody trying to find out what was CPY decision in 3 years time...

Document Control

Document number	Title Название	Revision Ревизия
A 1	48104 Service building instrument. rooms cables routing	B
A 2	48102 Trouble shooting diagrams	D
A 3	48134 F&G system architecture drawing	E
A 4	50100 Instrument index	B
A 7	50003 Spec for instrument installation works and service	C
A 8	50960 Instrument Data sheets for temperature switches	B
A 9	50110 Requisition for pressure relief valves	B
M 1	62059 General plot plan	B
M 2	62020 Piping details standard	C
M 2	62070 Piping general arrangement Area 1	D
M 5	62250 Piping isometrics booklet	C
M 6	60000 Pipes and fittings thickness calculation	A
M 6	62351 Calculation note CN1 - piping stress analysis	A
M 7	60001 General piping specification	C
M 8	60103 Data sheets for station piping material	B
M 9	60200 Requisition for pipes	F

Document code	
1	Installation drawings
2	Detail drawings
3	Diagrams
4	Lists – Bill of Quantities
5	Isometrics
6	Calculation notes
7	Specifications
8	Data sheets
9	Requisitions

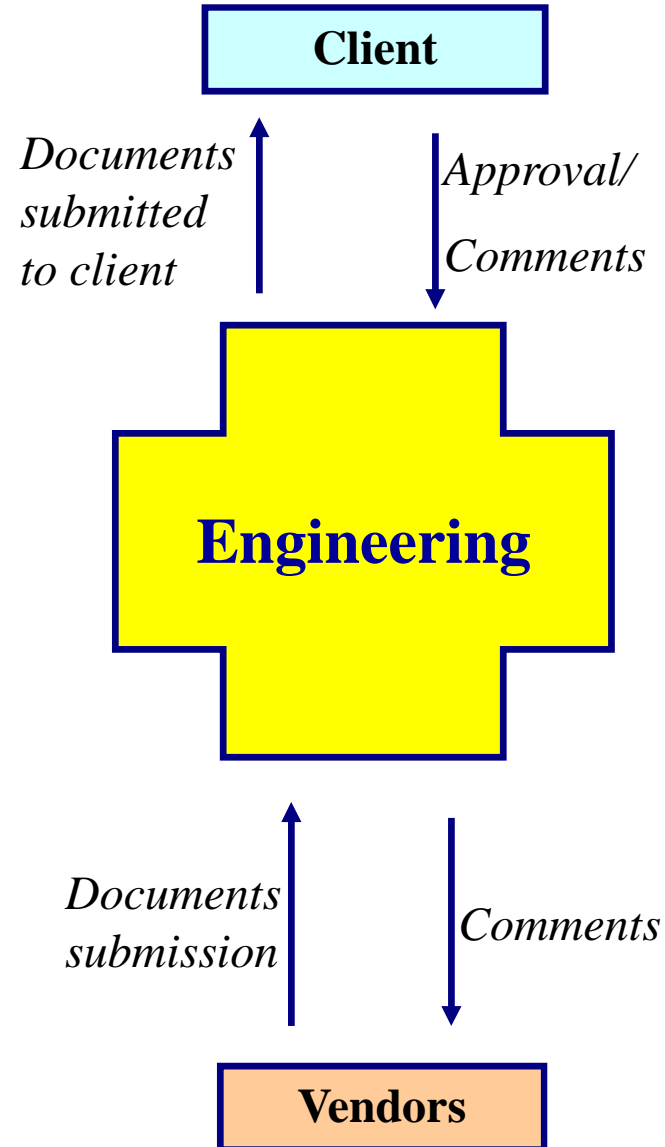
Discipline code	
A	Instrumentation & Control
C	Civil engineering
E	Electrical
G	Project general documents
J	Mechanical
K	Safety
M	Piping & Layout
P	Processes
S	Steel Structures
V	Vessels – Heat exchangers
W	Materials – Welding



Document Control

Document		Distributed to																							
		Project			Engineering disciplines														External						
Issuing discipline	Type of document	Project Director (E&P)	Construction site	Procurement Manager	Engineering File	Engineering Co-ordinator	Safety and Environment	Process	Piping/layout	Piping/material	Piping/stress	Drafting office	Civil	HVAC	Structure	Electrical	Instrumentation & telecom	Vessels & Heat exchangers	Pipelines	Mechanical	Materials	Cathodic protection	Engineering Sub-Contractor	Customer	Supplier
PROCESS	DIAGS	X	X		X	X	X	X	X	X	X	X				X	X	X		X	X		X	X	
	LIST	X	X	X	X	X	X	X	X	X	X		X		X	X	X	X		X			X	X	
	PHILOS	X	X		X	X	X	X	X		X		X		X	X	X	X		X				X	
	SPEC		X		X	X	X	X	X		X					X	X	X		X				X	
	DS		X		X	X	X	X	X		X					X	X	X		X	X			X	
	REQUIS		X	X		X			X																X
CIVIL	LAYOUT	X	X		X	X	X	X	X			X	X	X	X	X	X			X		X	X	X	X
	DWGS		X		X	X	X		X			X	X		X	X	X						X	X	X
	DWGS		X		X								X										X	X	
	MTO		X		X								X										X	X	
	CALC		X		X								X										X	X	
	SPEC		X		X								X										X	X	X
	DS		X		X									X									X	X	

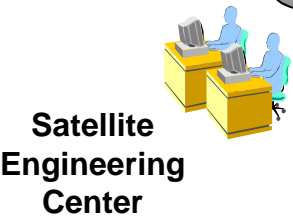
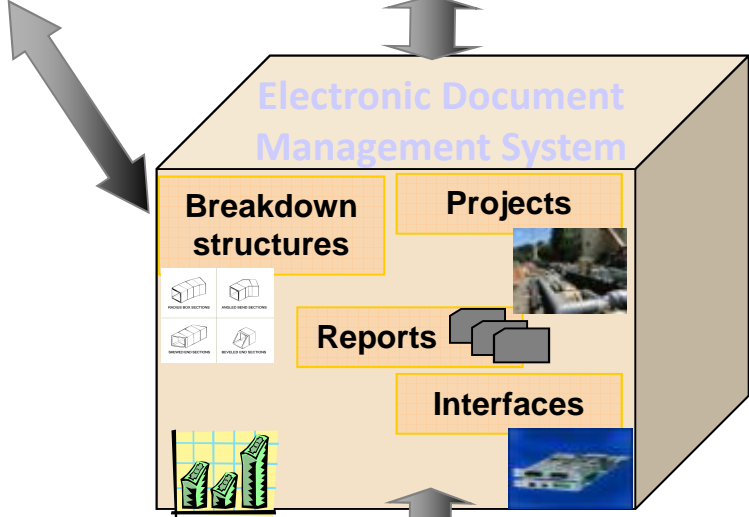
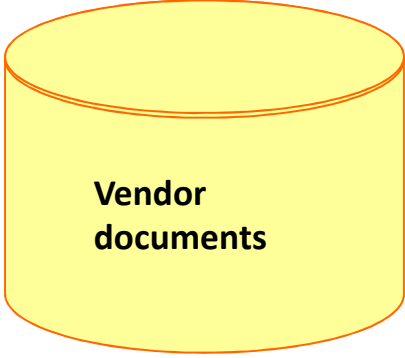
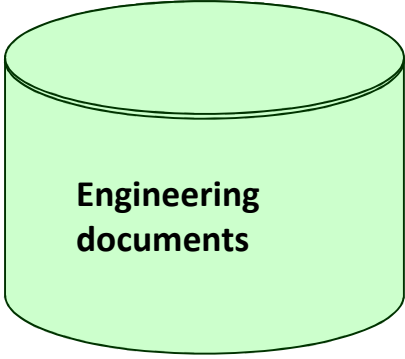
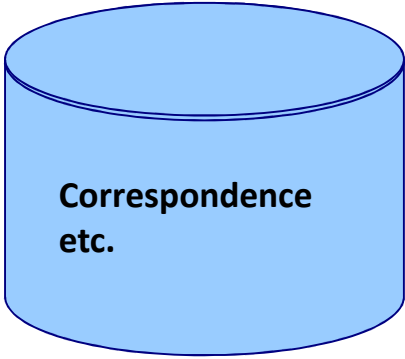
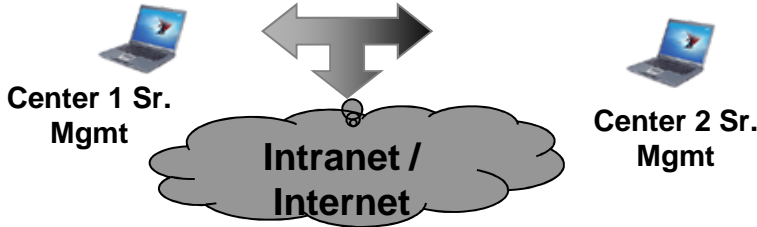
Document Control



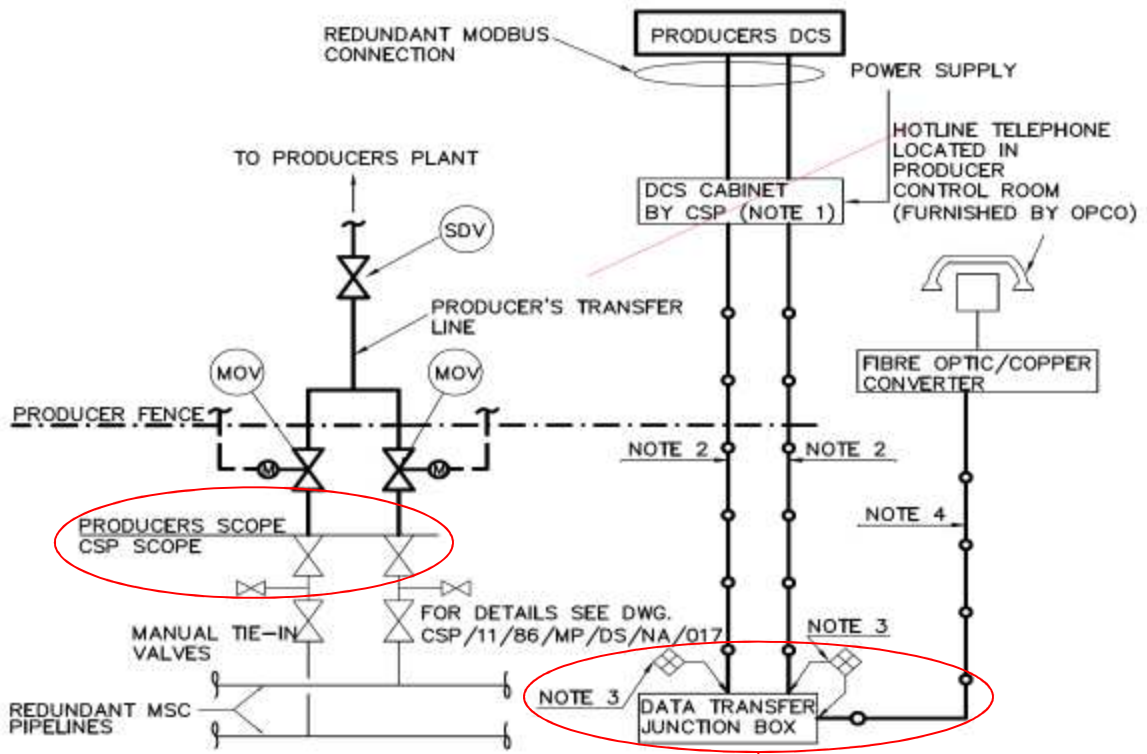


Electronic Document Management System

Leave Application	Leave Encumbered	Leave Requested	Leave Requested By	Leave Requested On	Leave Requested For	Leave Requested For	Leave Requested For	Leave Requested For	Leave Requested For
02/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
09/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
09/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
11/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
12/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
13/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
14/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
15/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
16/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
17/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
18/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						
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20/03/2008	08:57:00 AM	02:21:00 PM	Quick Knowledge						



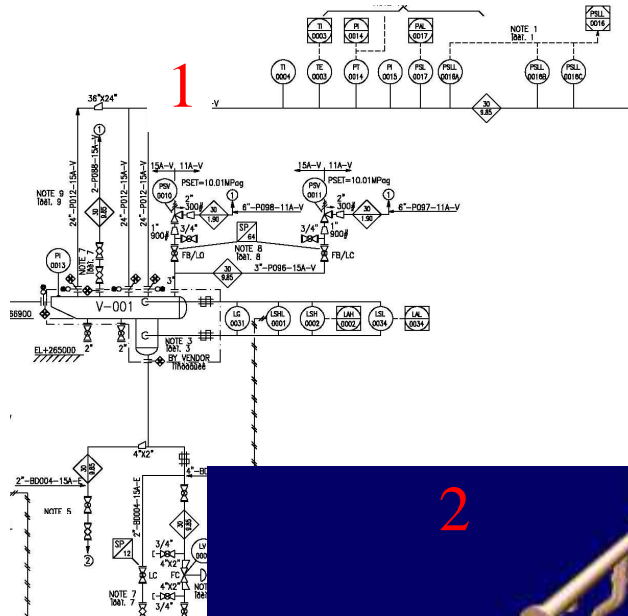
Interface Management



- NOTES:
1. DCS HARDWARE PROVIDED BY CSP. PRODUCER IS RESPONSIBLE FOR HOOKUP, TESTING, COMMISSIONING AND MAINTENANCE. CSP TO SUPPORT TESTING AND COMMISSIONING.
 2. REDUNDANT FIBRE OPTIC DATA HIGHWAY CABLES PROVIDED AND TERMINATED BY PRODUCER.
 3. PRODUCER PERFORMS FIBER OPTIC TIE-IN TO JUNCTION BOX PROVIDED BY CSP.

Scheduling

PROJECT SCHEDULE	MONTH																																					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	5	12	33	34	35	36								
PLANT START-UP																																					▼	
PIPING PRE-FABRICATION & INSTALLATION																																						
PIPING MATERIAL & DRAWINGS AT SITE																																						
PIPING MATERIAL MANUFACTURING & SHIPPING																																						
PURCHASE OF PIPING MATERIAL																																						
TECHNICAL & COMMERCIAL CLARIFICATIONS																																						
CALL FOR TENDER FOR PIPING MATERIAL																																						
PREPARE PIPING MATERIAL TAKE-OFF																																						
PIPING ROUTING STUDIES																																						
PIPING & INSTRUMENTATION DIAGRAMS (PIDs)																																						

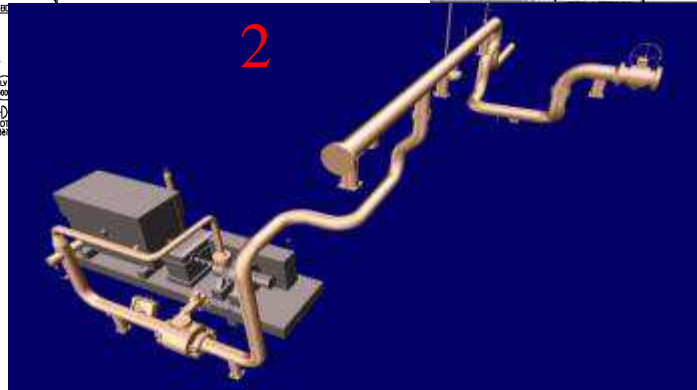


1

3

SIGMA CODE CLIENT CODE	large diam.	small diam. /length	QUANTITIES TO BE SUPPLIED		BALANCE TO BE SUP A - B
			New A	Old B	
TE04170	API5LGRB -ANSI B36-10 -BW -SCH40 -		212	34	
TE04900	API5LGRB -ANSI B36-10 -PLAIN END		6	6	

4



2

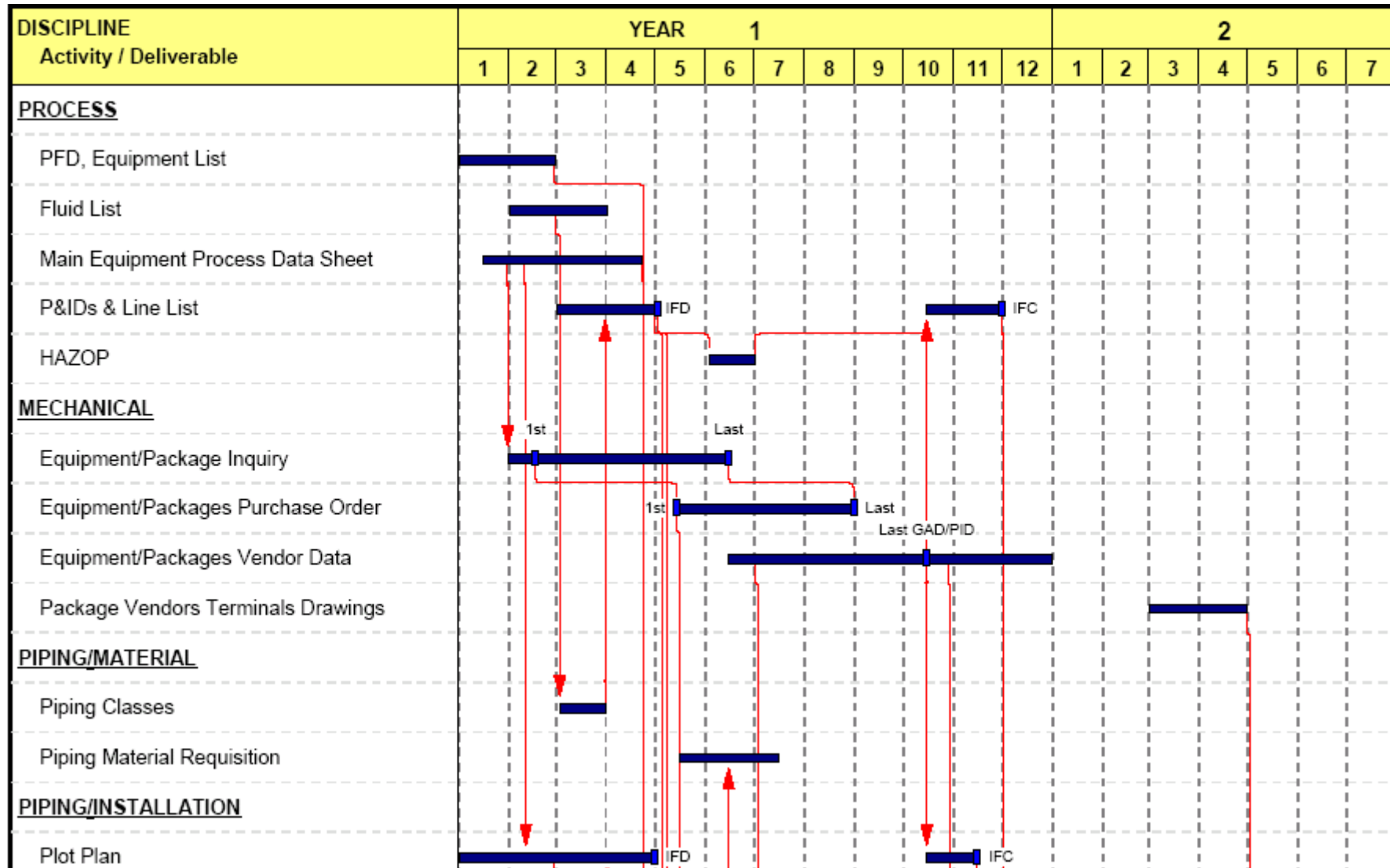


5

5



Scheduling



Progress Monitoring



How would you measure progress?





Progress Monitoring

ENGINEERING MILESTONES

ID (from P3)	DESCRIPTION	BASE LINE		CURRENT SCHEDULE As of 26/11/10				Variance Plan vs Forecast (Cal. Days)
		Planned Start	Planned Finish	Forecast Start	Forecast Finish	Actual Start	Actual Finish	
P099M01E00	Plot Plan AFD1 (Unit Plot Plans)		16-Aug-10		17-Aug-10		17-Aug-10	+1
P099M01E05	Last P&ID's issued for HAZOP		02-Jul-10		29-Jul-10		29-Jul-10	+27
P099M01E10	Issue Piping MTO & MR IFI (Based on Re-Feed)		18-May-10		18-May-10		18-May-10	+0
P099M01E15	Start HAZOP	05-Jul-10		05-Jul-10		05-Jul-10		+0
P099M01E20	LLI Equipment G.A.D.'s (Last)		07-Sep-10		13-Oct-10		13-Oct-10	+36
P099M01E22	Issue IARs Engineering only 2011 S/D		27-Jul-10		20-Nov-10			+116
P099M01E25	All engineering for 1st Tie-ins AFC		26-Nov-10		10-Dec-10			+14
P099M01E30	1st Model Review		20-Sep-10		29-Sep-10		29-Sep-10	+9
P099M01E40	Plot Plan AFC		25-Feb-11		28-Feb-11			+3
P099M01E45	Process P&ID's AFC issued		08-Mar-11		11-Mar-11			+3
P099M01E50	2nd Model Review		10-Dec-10		28-Jan-11			+49
P099M01E55	Model Review AFC		15-Mar-11		15-Mar-11			+0
P099M01E60	Piping Isometrics 50% Complete	08-Aug-11		08-Aug-11				+0

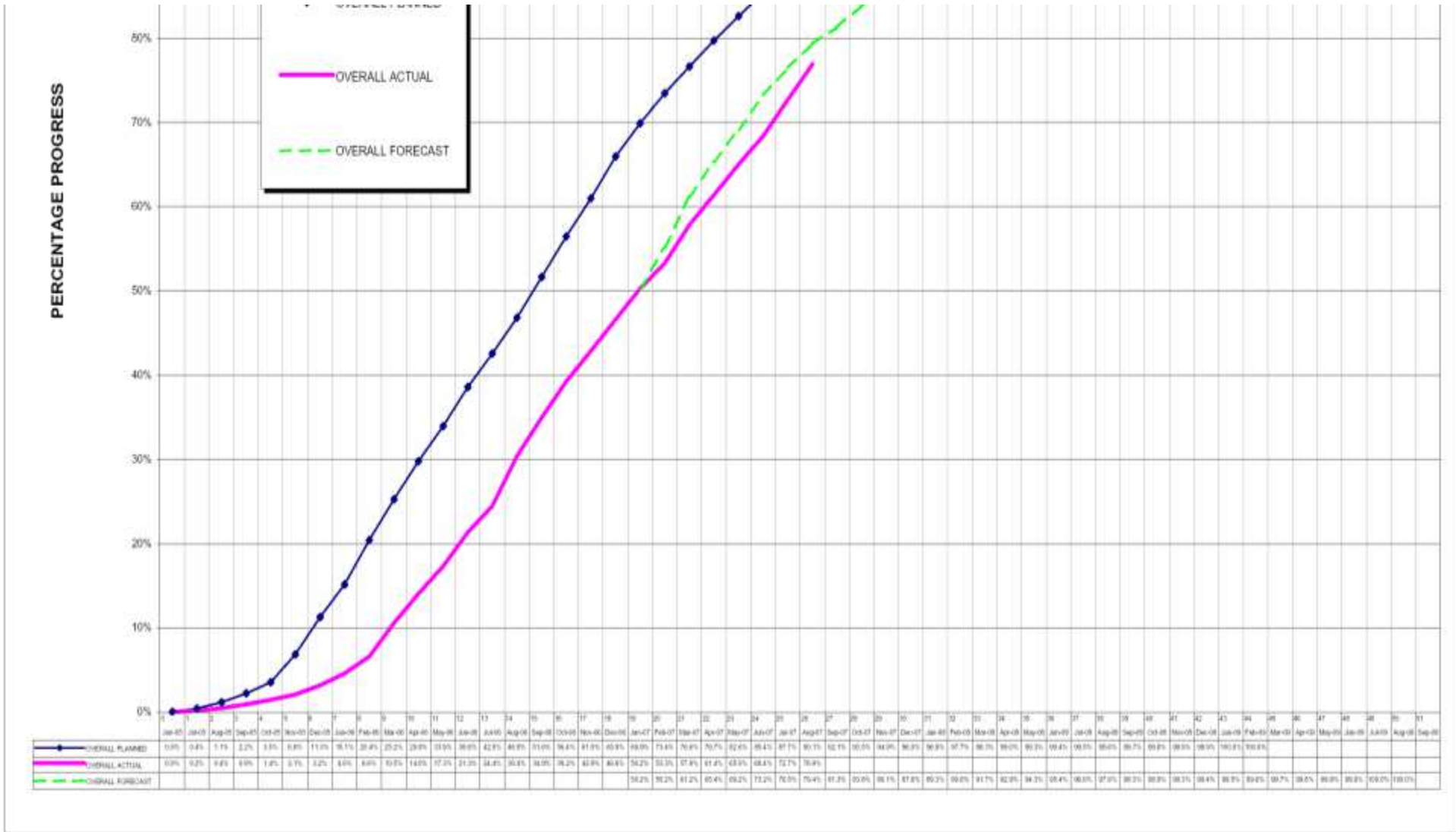
Description	Electrical	Instrument	Telecom	Grand total
Total cable quantity (nos.)	5 377	3 221	1 213	9 811
Quantity pulled (nos.)	4 438	2 442	167	7 047
Balance quantity to pull (nos.)	939	779	1 046	2 764
Total glands (nos.)	10 754	6 442	2 426	19 622
Total termination (nos.)	10 754	6 442	2 426	19 622
Completed gland (nos.)	5 280	2 991	108	8 379
Completed termination (nos.)	5 267	3 120	108	8 495
Balance to gland (nos.)	5 474	3 451	2 318	11 243
Balance to terminate (nos.)	5 487	3 322	2 318	11 127

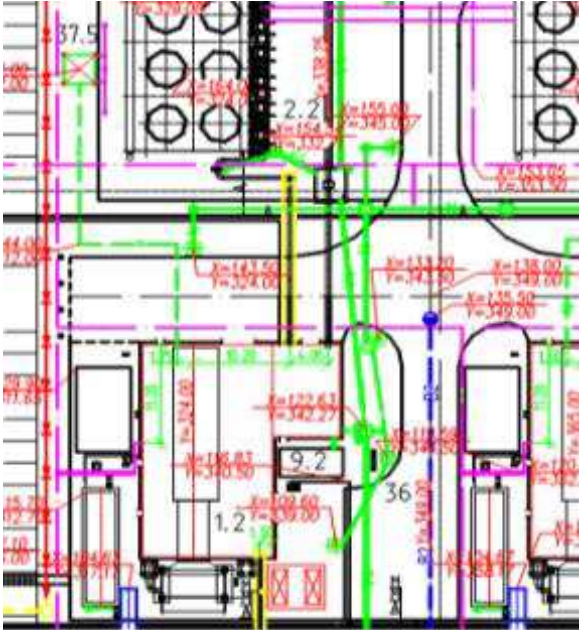
Progress Monitoring

Discipline	Weekly Progress						
	weight %	Plan		Actual		Delta	
		Week	Cumm.	Week	Cumm.	Week	Cumm.
Civil	24.44%	0.15%	99.21%	0.08%	96.56%	-0.06%	-2.65%
Steel Structure Erection	8.23%		100.00%	0.59%	93.08%	0.59%	-6.92%
Equipment installation	6.07%	0.18%	99.74%	0.61%	90.98%	0.43%	-8.76%
Piping	45.93%	1.48%	92.30%	1.64%	74.45%	0.16%	-17.85%
Painting	1.71%	0.85%	94.34%	0.80%	90.42%	-0.05%	-3.92%
Insulation	5.87%	2.75%	27.93%	0.33%	4.68%	-2.42%	-23.25%
Fire proofing	0.16%	4.35%	42.78%	0.71%	2.83%	-3.64%	-39.95%
Electrical	3.48%	1.70%	83.07%	0.77%	70.41%	-0.93%	-12.66%
Instrumentation	4.12%	2.95%	67.87%	1.01%	68.50%	-1.94%	0.63%
Overall Total	100%	1.09%	89.92%	0.96%	78.06%	-0.13%	-11.86%



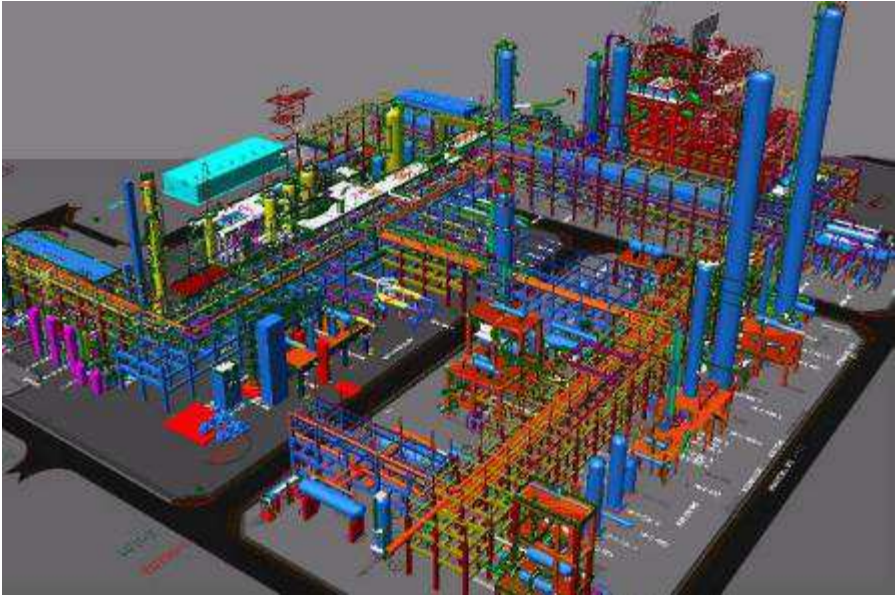
Progress Monitoring



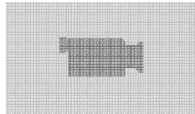


15 years ago: 2D

Today: 3D



**Tomorrow:
3D & data**



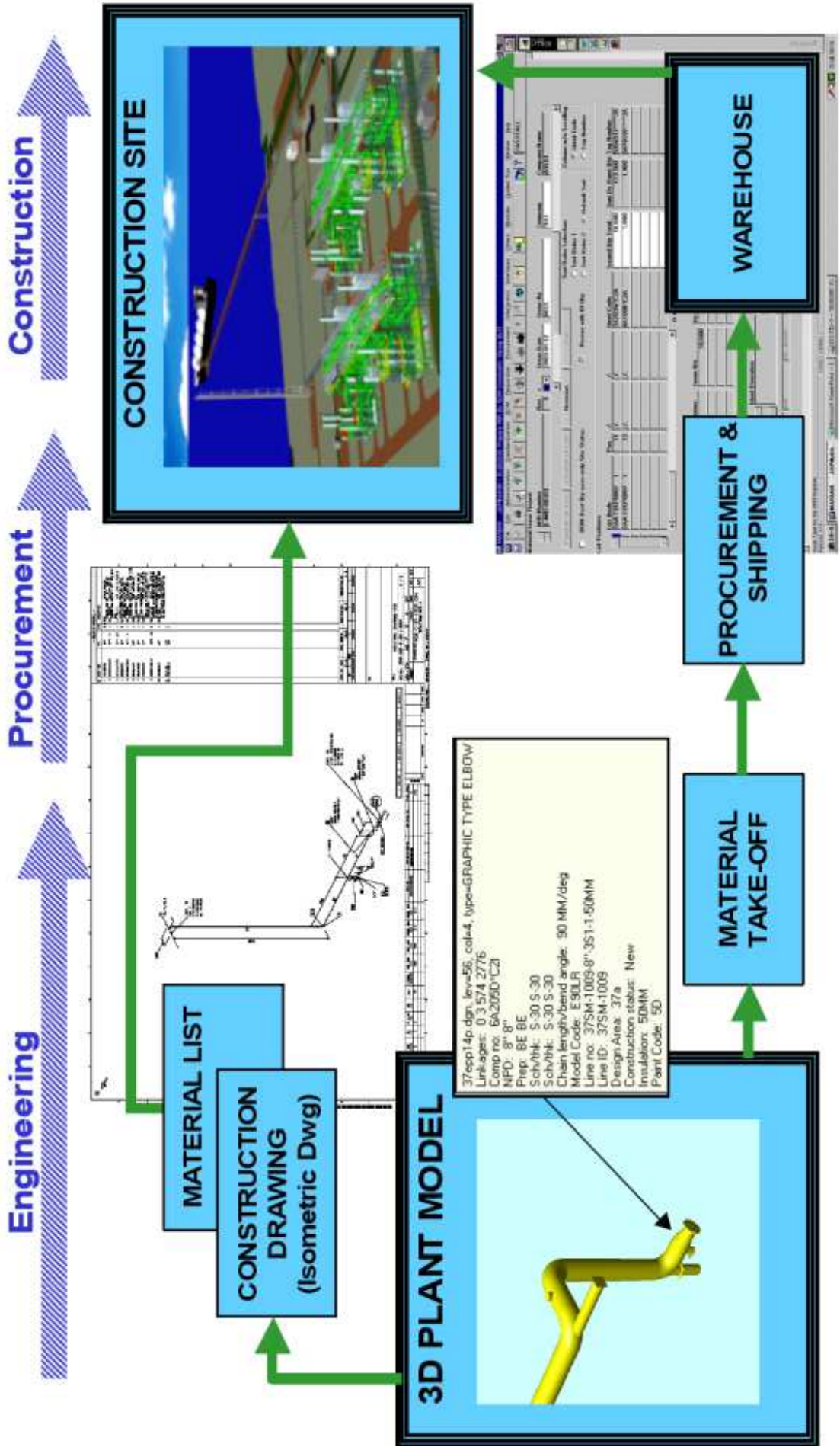
Property

Name: ABV-12827

Description:

Select column heading to compare

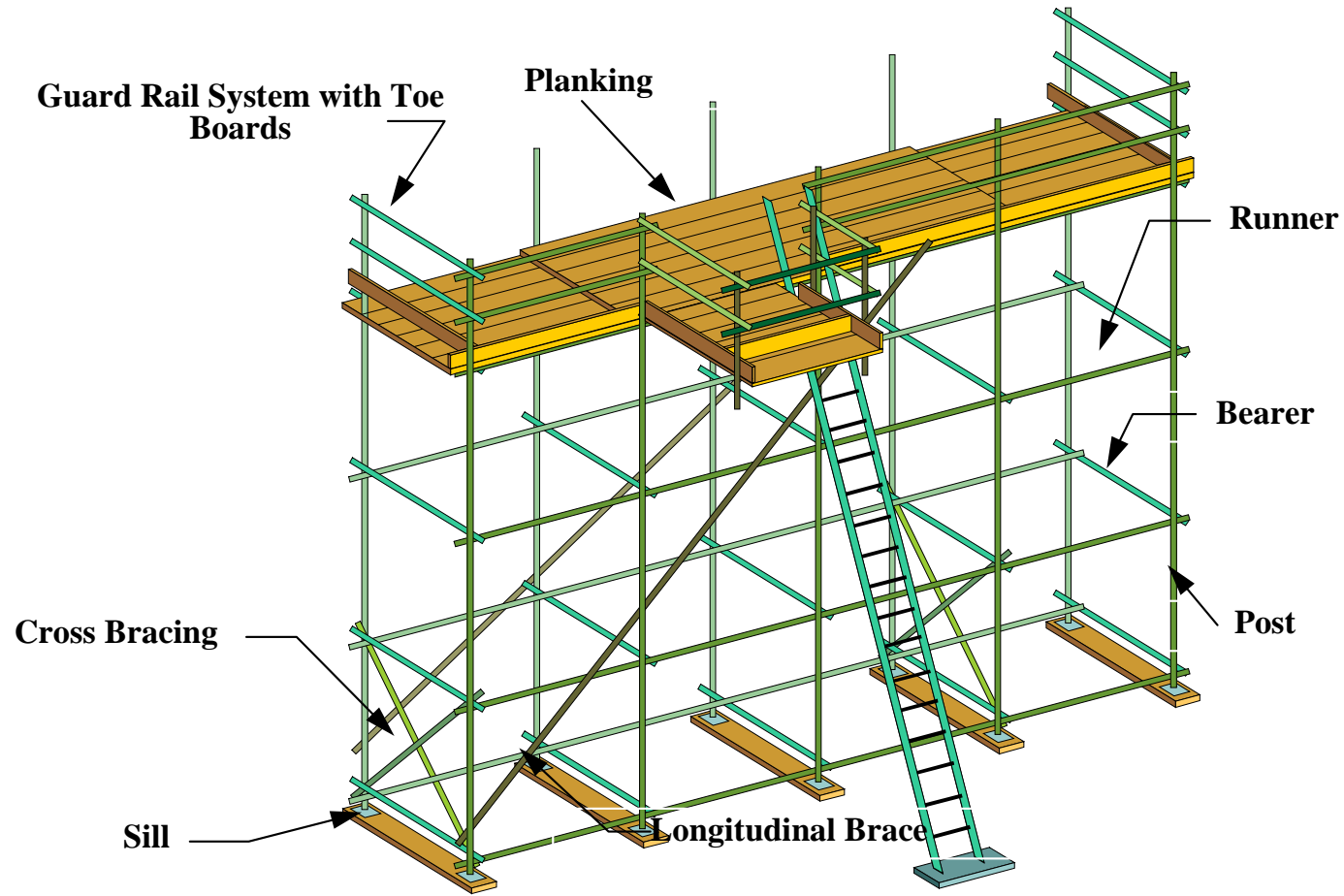
Property	Last In Value	DDS	PID
Cylinder height	3 in	3 in	
Face 1 to centerline dimension	4.5 in	4.5 in	
Face-to-face dimension	9 in	9 in	
Heat-tracing requirement			
Instrument dimensional group	Valve_Rack & Pini	Valve_Rack & Pini	
Instrument function modifier	BV	BV	BV
Instrument location	Field	Field	
Instrument loop suffix			
Instrument process function	Control Valve	Control Valve	Control Valve
Instrument subtype	Control valve	Control valve	Control valve
Instrument tag prefix			TigerUnit
Instrument tag sequence number	12827	12827	12827
Instrument tag suffix			
Instrument type	CV	CV	CV
Measured variable	A	A	A
Name	ABV-12827	ABV-12827	ABV-12827
Nominal diameter	4 in	3 in	4 in
Object Configuration			
Operation height	3 in	3 in	
The flow-direction of this item is relevant	False		False
Unique key			



Safety



Safety

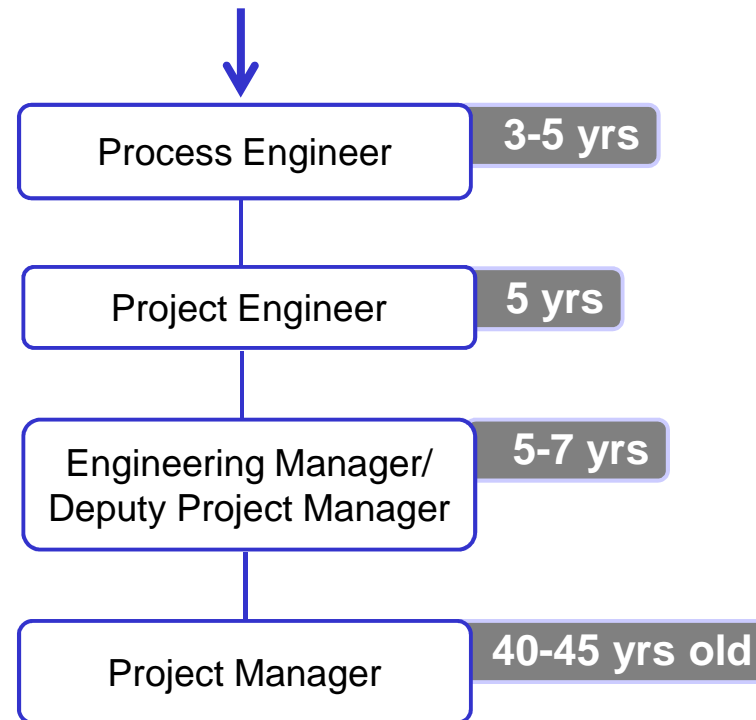




Safety

Human resources / career path

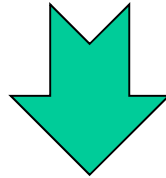
Graduate Engineer, 25 years old



Note: the career pattern shown here is a very fast track one to the PM position... One would enjoy oneself just as well taking more time!

Beyond this presentation...

- Share my **new developments**
- Find my other **on-line** and **classroom training**



<http://www.toblog.fr/en/baron.html>



Engineering resources website

Published Saturday 26/01/2013

Here is a place you MUST visit.

It is packed with useful Engineering resources:

- course manuals in various engineering disciplines,
- glossaries,
- newsletters with lots of technical goodies,
- and much more...

Have a look:

<http://adelltd.com/en/document.html>

Great Job, Jack. Keep it up!

[Comments\(0\)](#)

Engineering and Contract Management training

Published Sunday 02/12/2012

Share my 20 years of experience with EPC contractors including Technip and Saipem:

Attend my coming training sessions in Bali in March 2013:

"Hands-On Engineering Management Training" - 3 days

PREVIEW: <http://www.slideshare.net/hbaron/eng-management>

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TECHNIP



Baron Hervé

He began his professional career with an international oil company. Starting out with an interest in the Operation of Oil & Gas Facilities, his technical curiosity about their design saw him move to engineering contractors to become expert in this area.

THE OIL & GAS ENGINEERING GUIDE

Hervé Baron



Editions TECHNIP

See the summary of the book

