

		SOUTH PARS GAS FIELD DEVELOPMENT PHASE 11	 N.I.O.C. Pars Oil & Gas Company
		EPCI Contract for Topside, Ancillaries and Tripods (SP11A)	
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Specification for Equipment Design Conditions

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Appendices

Appendix A Seismic Accelerations for Design of Equipment

Appendix B Summarized Equipment Design Conditions

Appendix C Geodetic Systems Used for SP11A

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1. INTRODUCTION

1.1 General

The South Pars field is located in the Persian Gulf approximately 130 km South West of Assaluyeh and 175km West of Kish Island. The South Pars Phase 11 development facilities comprise 2 wellhead platforms named SP11A and SP11B and located around 70m water depth, two 32" sea lines associated with their 4" piggy-back returned lines, exporting the gas to the existing onshore plants. The Phase 11 development of the South Pars gas field (SP11A and SP11B) is designed for a production of 2000 MMSCFD of reservoir fluid (1000 MMSCFD for each SP11A and SP11B).

The development of SP11A is based on new 15 slots Wellhead platform and sea-line. The sea-line from SP11A Wellhead Platform (SPD11A) will send SP11A production to SP12 onshore facilities in TOMBAK via the 32" sea line. When the field starts to be depleted, a compression phase will be implemented (out of Project SOW).

In addition to the wellhead platform (SPD), a Relief platform (RP), equipped with a vertical Flare, will be connected by 2 bridges (BR1 & BR2) to the SP11A platform for personnel access. One Bridge Support Platform (BSP), supports the two bridges that allow access from SPD to RP. Typically, The SP11A Platform consists of:

1. The wellhead platform dedicated to drilling with a jack-up rig. [SPD]
2. The Relief platform, which is equipped with a vertical Flare. [RP]
3. The Bridge Support Platform [BSP]
4. The two Bridges, which connect SPD to RP through BSP [BR1, BR2]

Iran Shipbuilding & Offshore Industries Complex Co. known as ISOICO (CONTRACTOR) has been awarded to conduct and to perform the Engineering, Procurement, Supply, Fabrication, Construction, Load Out, Sea Fastening, Transportation and Installation of the SP11A Wellhead topside, ancillaries and Tripods and the commissioning of installed equipment on it, hereinafter referred to as "Project".

Scope of SLT International (ENGINEER) involvement in the Project is detail design engineering and procurement engineering services.

1.2 Purpose of the Document

This specification defines the environmental conditions and project design data to be used for the South Pars Field Development Phase 11 Offshore for equipment to be installed on SPD11A, BSP11A & RP11A and associated bridges.

1.3 Key Definitions

OWNER	National Iranian Oil Company (NIOC)
	Pars Oil and Gas Company (POGC)

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COMPANY	Petropars Ltd. (PPL)
CONTRACTOR	Iran Shipbuilding & Offshore Industries Complex Co. (ISOICO)
ENGINEER	SLT International;
GOODS	means all or part of the articles, materials, equipment, supplies, documents and other things or any of them described in the PURCHASE ORDER to be supplied by VENDOR.
PACKING COMPANY	means any PERSON selected by VENDOR to perform the packing and marking operations.
PROJECT	means South Pars Phase 11 HP mode development project
PURCHASER	means any PERSON designated as such in the PURCHASE ORDER.
VENDOR(S)	means any CONTRACTOR's and/or SUBCONTRACTORS' supplier(s) of CONTRACTOR item(s).

1.4 Abbreviations

NIOC	National Iranian Oil Company;
POGC	Pars Oil & Gas Company;
PPL	Petro Pars Ltd.;
ISOICO	Iran Shipbuilding & Offshore Industries Complex Co;
SLT	SLT International;
AFC	Approved For Construction;
CA	Certifying Authority;
CRS	Comment Response Sheet;
IDC	Inter Discipline Check;
IFA	Issued For Approval;
IFR	Issued For Review;
DC	Document Controller;
EM	Engineering Manager;
EDMS	Engineering Document Management System;
LE	Lead Engineer;
PM	Project Manager;
QA	Quality Assurance;
SOW	Scope Of Work;
TBA	To Be Advised;
TBC	To Be Confirmed;
WHP	Well Head Platform;

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CoG	Center of Gravity;
CPY	Company;
N/A	Not Applicable;
PO	PURCHASE ORDE;
RFP	Release For Packing;

1.5 References

The following listed documents are considered as references for preparation of this document.

1.5.1 Project References

This document shall be read in conjunction with the project documents listed below:

[1]	Structural Design Basis	Doc. No. SP11-10-D-23-5-001
[2]	Specification for Pressure Vessels	Doc. No. SP11-23-D-18-4-033
[3]	Onshore & Offshore Safety Concept	Doc. No. SP11-10-D-11-5-001
[4]	Data Sheet for Noise Level	Doc. No. SP11-10-D-11-7-071
[5]	Specification for Skid Structures	Doc. No. SP11-10-D-23-4-012

1.5.2 Basic Design References

[6]	Updated design criteria & operational conditions	Doc. No. EP/DSO/IP/TEC/GEO-PL17-047 Rev.0, Nov.2017
[7]	Metoccean Design Criteria, South Pars 11 Field, Iran, prepared by Fugro	Doc No. 160626-1-R2, March 2017, prepared by Total S.A.
[8]	GEOTER report	GTR/TFE/1201-158 Rev1, February 2002

1.5.3 Available Survey Reports

[9]	Geophysical Survey Report SPD11-A proposed platform location and westward extension of SPD11-A site	Doc. IR-S11-00-FUGRO-104001 Rev1 (Nov.2017-Mar.2018)
[10]	Phase 4,5 onshore basic design- section 3.2.2 Soil conditions (Identical with South Pars Phase 2&3)	Doc. No. DB-2017-999-P332-204

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2. FACILITY DESCRIPTION

The SP11A gas field shall be developed to produce 1000 MMSCFD reservoir fluid to supply gas to Tombak (SP 12 part) with a 32" export pipeline.

The SPD11A wellhead platform consist of a four-legged jacket substructure and a topside consist of a truss-framed structure. Facilities to be designed during the engineering phase are as follows.

2.1 Jacket Tripods

Tripods facilities to be installed at SP11A location are as follows:

- Tripod support structure for Bridge Support Platform, including piling (BSP11A);
- Tripod support structure for Flare Support Platform, including piling (RP11A);

2.2 Topside and ancillaries

A brief description of topside facilities to be installation at SPD11A location is as follows:

- 1) One WHP (SPD11A) with 15 slots; with below main equipment:
 - Well Heads;
 - Production/Test manifold;
 - Test separator;
 - Export metering system;
 - Scraper launcher;
 - HP relief KO drum;
 - Closed drain/LP flare drum;
 - Open drain system;
- 2) Associated utilities (Diesel, MEG, Methanol, KHI, Chemicals, Nitrogen, Fresh Water);
- 3) One Relief Platform (RP), including deck and flare tower, installed on the RP11A being connected by bridge to BSP11A;
- 4) One Deck installed on the BSP11A, being connected by bridges to the wellhead platform and RP11A;
- 5) Two bridges connecting SPD11A to BSP11A and BSP to RP11A;

2.3 Onshore Facilities

An Onshore Facility after sealine onshore tie-in that includes:

- Valve station;
- Pig Receiver;
- Onshore pipeline to Phase 12 Plant;
- ICSS and Telecommunication

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3. DEFINITIONS

3.1 Definitions

3.1.1 Extreme value

Means most probable greatest value during the given period

3.1.2 Waves

H_{max} : Maximal wave height;
 T_{Hmax} : Period of the maximal wave height;

3.1.3 Sea State

duration: 3 hours;
 H_s : significant wave height;
 T_p : spectral peak period;
 T_s : Associated Period to H_s

3.1.4 Wind

V_{1hr} : mean wind velocity over 1 hour, at an altitude of 10m;
 V_{10mn} : mean wind velocity over 10 minutes, at an altitude of 10m;
 V_{1mn} : mean wind velocity over 1 minute, at an altitude of 10m;
 V_{3s} : 3s gust, at an altitude of 10m;

3.1.5 Current

$U(z)$: mean current velocity over 10 minutes, at water depth z ;

3.1.6 Directions

Means directions from which waves and winds come, and where currents flow

3.1.7 Water Level

A.S.B: Above Sea Bottom
L.A.T.: lowest astronomical tide
H.A.T.: highest astronomical tide
MHWS: mean high water springs
MSL: mean sea level
Surge: highest elevation of mean water level during storms

3.1.8 Seismic Data

A.L.E.: Abnormal Level Earthquake
E.L.E.: Extreme Level Earthquake

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3.2 System of Measurements

Metric, with oilfield flowrates (MMSCFD, bpd) at interfaces;

Pipe diameters shall be: inches;

As a general rule, the SI metric system of units shall be used and particularly:

• Temperature	°C
• Pressure (gauge)	barg
• Pressure (absolute)	bara
• Mass	kg
• Length	km, m & mm
• Pipe Diameter	Inches or mm (structural)
• Liquid relative density	SG (T°C/15°C)
• Liquid density	kg/m ³
• Vapour flowing density	kg/m ³
• Flow rates	
Mass	kg/h
Vapour	kg/h
Liquid	Nm ³ /h
	m ³ /h
	kg/h
• Normal Temperature	0°C (32°F) & 760 mm Hg (1.01325 bara) Pressure conditions (NTP)
• Standard Temperature	15.6°C (60°F) & 760 mm Hg (1.01325 bara) Pressure conditions (STP)
• Specific enthalpy	kJ/kg
• Heat rate	kW
• Calorific value (Heating Value)	kJ/kg
• Viscosity (dynamic)	cP
• Viscosity (kinematic)	cSt
• Force	N, KN, Kg, ton
• Stress	MPa, N/mm ² , N/m ²

For complete list of SI-Units refer to ISO 8000-1;

In addition to the above units, the following units shall be used for material balance purposes:

• Vapour flow rate	MMSCFD Million Standard cubic feet per day (at 15.6°C & 1.013 bar a)
• Liquid flow rate	SBLPD or SBOPD Standard barrel of liquid, or of oil, per day (at 15.6°C & 1.013 bar a)

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4. ENVIRONMENTAL DATA

The following environmental data are extracted from the reference documents listed in section 1.5.1 of this specification.

4.1 Geographical

4.1.1 General

Country:	IRAN
Location:	South Pars field
Water Depth:	69.2m @ SPD11A 80m @ lowest point of export lines

4.1.2 Geodetic Parameters

Horizontal Coordinates System:	International / UTM
Spheroid:	WGS 1984
Projection:	Universal transverse Mercator (UTM)
Central Meridian:	51° 00' 00" East (Zone 39 North)
False Easting:	500 000m
False Northing:	0 m
Scale factor at CM:	0.9996

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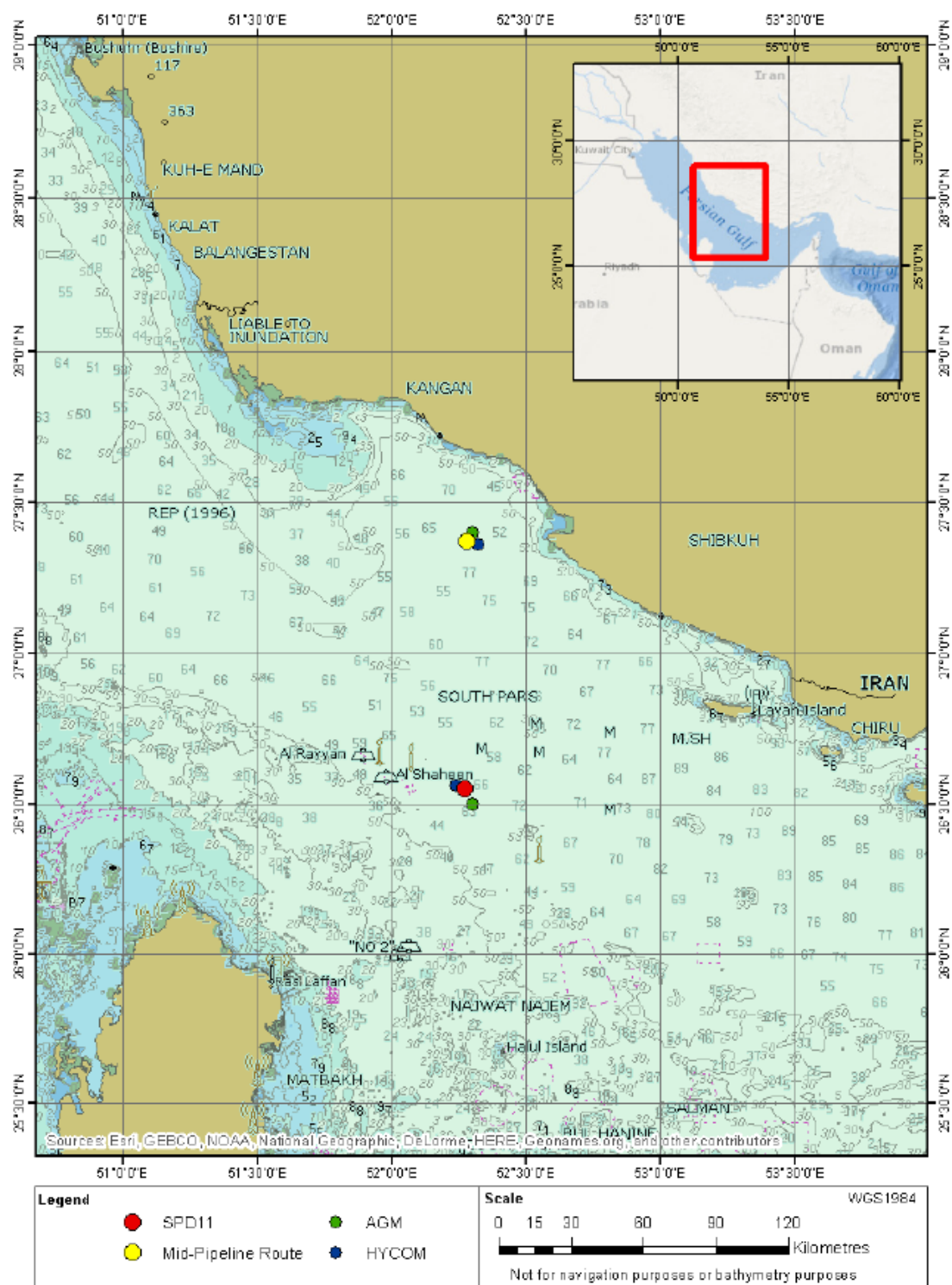


Figure 1- Locations of interest

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4.1.3 Offshore

The platforms are located in Iranian waters in the Persian Gulf approximately 100 km away from the Iranian coast. Preliminary UTM coordinates of the geometrical Topside, BSP & RP Jackets centers are given below.

Table 1 – UTM Coordinates of Structural Centers

	X (Longitude) E-W	Y (Latitude) N-S
SPD11A Topside Centre	628 146 m	2 942 126 m
BSP Jacket Centre	628 204.68 m	2 942 042.22 m
RP Jacket Centre	628 268.26 m	2 941 978.64 m

Geodetic system is as per section 4.1.2. Centre is the geometrical centre of the Platform LEGS.

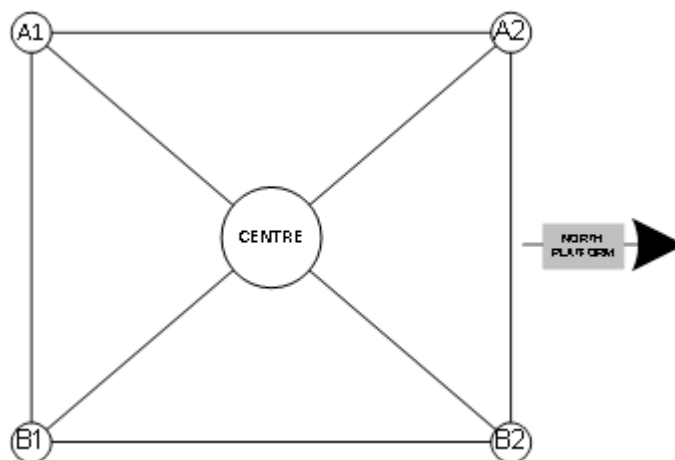


Figure 2 –SPD11A Topside Center

4.1.4 Onshore / Nearshore (Landfall Point at Tombak)

Pipeline from SP11A goes to Tombak. Landfall points of the pipeline connection are given below.

Table 2 –Tombak Landfall Coordinate

X (Longitude) E-W	Y (Latitude) N-S
615 645 m	3 067 283 m

4.2 Overall Extreme Data

All data are from Memo Updated design criteria & operational conditions [6], except:

- Onshore air temperatures: from Geophysical / Environmental Survey [9].
- Soil temperatures: from Phase 2/3 documents [\[10\]](#).

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4.2.1 Offshore

The extreme omni-directional criteria for winds, waves, currents and water levels and operational conditions for winds, waves, currents, at SP11 location are summarized below. The details of met-ocean data are presented in Metocean Design Criteria prepared by Fugro [7]

Table 3 –Overall Extreme Wind Criteria at SP11

Return Period	1-hr Mean Wind Speed at 10 m [m/s]	10-min Mean Wind Speed at 10 m [m/s]	1-min Mean Wind Speed at 10 m [m/s]	3-sec Gust Speed at 10 m [m/s]
1-year	17.5	18.9	20.6	22.9
10-years	20.7	22.5	24.7	27.6
100-years	23.9	26.1	28.8	32.4
1000-years	27.1	29.7	33.0	37.3
10000-years	30.3	33.4	37.3	42.5

Table 4 –Overall Extreme Wave Criteria

Return Period	Significant Wave Height [m]	Mean Zero-Crossing Period [s]	Peak Period [s]	Maximum Crest Height [m]	Maximum Wave Height [m]	Wave Period Associated with Maximum Wave Height [s]		
						Lower	Central	Upper
1-year	3.9	5.5	8.4	3.7	7.3	5.6	7.6	9.6
10-years	5.2	6.2	9.3	5.0	9.7	6.4	8.4	10.4
100-years	6.4	6.9	10.2	6.1	11.9	7.2	9.2	11.2
1000-years	7.7	7.5	10.9	7.4	14.3	7.8	9.8	11.8
10000-years	8.9	8.0	11.6	8.5	16.6	8.4	10.4	12.4

Table 5 –Overall Extreme Current Criteria

Return Period	Current Speed [m/s]. at depth levels							
	0m	10m	20m	30m	40m	50m	60m	nearbed
1-year	0.81	0.80	0.79	0.77	0.75	0.72	0.68	0.45
10-years	0.92	0.90	0.89	0.87	0.85	0.82	0.76	0.58
100-years	1.02	1.01	0.99	0.97	0.95	0.91	0.85	0.64
1000-years	1.13	1.11	1.09	1.07	1.04	1.00	0.93	0.71
10000-years	1.23	1.21	1.19	1.17	1.14	1.10	1.02	0.78

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Table 6 –Overall Extreme Positive Storm Surge Level Criteria

Return Period	Positive Surge Height [m]
1-year	0.33
10-years	0.41
100-years	0.49
1000-years	0.56
10000-years	0.62

4.2.2 Onshore / Nearshore – Tombak

Field:	Tombak	Area of validity
Geographic:	27°42'N	27°41'N – 27°43'N
Coordinates:	52°11'E	52°09'E – 52°11'E
Water depth:	15 m	8 – 45m

* Geodetic system: as per Section 4.1.2.

Wave data are specified at the following locations:

- Point 1 – 27°42'N - 52°11'E - Water depth: 8.0 m/LAT;
- Point 2 – 27°42'N - 52°11'E - Water depth: 15.0 m/LAT;
- Point 3 – 27°42'N - 52°10'E - Water depth: 40.0 m/LAT;

Table 7 –Tombak Environmental Data

Parameter		Return Period			Prevailing Direction
		100 years	10 years	1 year	
Wave					
Point 1	H _{max} (m)	Wave breaking area			From SW
	T _{Hmax} (s)				
	H _s (m)	3.6	2.7	2.1	
	T _p (s)	9.0	8.0	7.0	
Point 2	H _{max} (m)	7.0	5.7	4.7	From W to SW
	T _{Hmax} (s)	8.5	8.0	7.5	

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Parameter		Return Period			Prevailing Direction
		100 years	10 years	1 year	
	H _s (m)	3.7	2.9	2.5	
	T _p (s)	8.5	8.0	7.5	
Point 3	H _{max} (m)	7.5	6.2	5.1	From NW To W
	T _{Hmax} (s)	8.5	8.0	7.5	
	H _s (m)	3.9	3.2	2.6	
	T _p (s)	8.5	8.0	7.5	
Wind					
Sustained Wind at 10m (m/s) V _{1hr}		26	25	22	From W-NW
Gust at 10m (m/s)					
V _{10mn}		28	27	24	
V _{1mn}		32	30	26	
V _{3s}		36	34	30	
Current (m/s)					
U _{surface-Point 1}		0.9	0.9	0.8	To SE
U _{surface-Point 2}		0.8	0.8	0.7	
U _{surface-Point 3}		0.8	0.8	0.7	
Water Levels (m)					
HAT/LAT		2.2			
MHWS/LAT		1.9			
MSL/LAT		1.2			
Annual Var.		+0.15 / -0.07			
Storm Surge		0.7	0.6	0.4	

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4.3 Oceanographic Design Conditions

4.3.1 Sea water Characteristics

Table 8 –Seawater Parameters

S	References [1]
Specific gravity at 15 °C	1.023 to 1.029
pH	8.2
Dynamic Viscosity	1.05 cP
Salinity	36.9 to 42 psu
Dissolved Oxygen	8-10 ppm
Suspended solids	0.092 g/l
Dissolved solids	45.56 g/l

4.3.2 Temperature of Air, Sea Water and Soil

Table 9 –Seawater Temperatures

Parameters		SPD11A	Onshore
Air T°	Max.	41.7°C	50°C
	Min.	9°C	4°C
Sea Surface T°	Max.	35° C	-
	Min.	18.1°C	-
Sea Bottom (+1 m) T°	Max.	32.5 °C	-
	Min.	16°C	-
Soil (-1 & -2 m) T°	Max.	-	30°C
	Min.	-	15°C

4.4 Offshore Climatic Data

4.4.1 Offshore

4.4.1.1 Air properties, Hydrometry and Solar Radiation

- Air properties

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- Salt laden marine & corrosive atmosphere
- Potential sand storm

- Air temperature:

Yearly Maximum	41.7°C
Yearly Minimum	9°C
Yearly Mean	26.4°C

 Temperature design conditions for electrical equipment:
 - Outdoor: 41.7° maximum temperature
 - Outdoor installed equipment shall be suitable to run at 42°C with a reduced load (when not submitted to solar radiations)
 - Indoor: 40°C design temperature
- Mean Air Pressure:

Maximum	(Winter)	1031 hPa
Minimum	(Summer)	897.1 hPa
- Rainfall:

Maximum (mm/day):	87 mm
-------------------	-------
- Mean Relative humidity:

Yearly Maximum	100%
Yearly Minimum	10.5%
Minimum	Relative Humidity (used for radiation calculations purpose): 30%
- Solar radiation:

Solar radiation (maximum):	1010 W/m ²
Black body temperature:	85°C (to be used as minimum hot design temperature for equipment and piping submitted to solar radiation)

4.4.1.2 Wind Characteristics

Refer to section 4.2.1.

4.4.2 Nearshore (Tombak)

4.4.2.1 Air Properties, Hygrometry and Solar Radiation

- Air properties
 - Salt laden marine & corrosive atmosphere
 - Potential sand storm
- Mean Air temperature:

Maximum	(Summer)	50°C
Minimum	(Winter)	4.5°C
- Mean Air pressure (extract from [\[9\]](#)):

Maximum	(Winter)	1020 hPa
Minimum	(Summer)	1000 hPa

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- Rainfall (extract from [9]):
Maximum (24 hours period): 96 mm
- Mean Relative humidity:
Maximum 90% at minimum temperature
Minimum 8% at maximum temperature
Extreme Relative Humidity 0% to 100%
- Solar radiation:
Solar radiation (maximum): 1150 W/m²

4.4.3 Wind Characteristics

For wind characteristics refer to sections 4.2.2.

4.5 Soil Data

4.5.1 Soil Characteristics

Refer Structural Design Basis [1].

4.5.2 Earthquake

4.5.2.1 Offshore

The accelerations at deck elevation to be considered are as follows:

Table 10 –Horizontal component, 5% Damping, Mean Spectral Acceleration

Spectral period (s)	Mean. Spectral acceleration (g)		
	Design level - Return periods.		
	ELE 1,400 years	ALE 3,400 years	ALE2 5,000 years
0	0.245	0.344	0.394
0.03	0.259	0.367	0.424
0.05	0.300	0.433	0.503
0.1	0.462	0.662	0.768
0.15	0.546	0.760	0.873
0.2	0.561	0.762	0.865
0.25	0.565	0.759	0.856
0.3	0.568	0.762	0.860
0.4	0.550	0.744	0.842
0.5	0.529	0.721	0.818
0.75	0.445	0.613	0.700
1	0.346	0.478	0.546
1.5	0.229	0.319	0.366

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Mean. Spectral acceleration (g)			
Spectral period (s)	Design level - Return periods.		
	ELE 1,400 years	ALE 3,400 years	ALE2 5,000 years
2	0.160	0.224	0.258
3	0.089	0.126	0.145
5	0.032	0.045	0.052

Table 11 –Vertical component, 5% Damping, Mean Spectral Acceleration

Mean Spectral acceleration (g)			
Spectral period (s)	Design level - Return periods.		
	ELE 1,400 years	ALE 3,400 years	ALE2 5,000 years
0	0.162	0.236	0.274
0.03	0.201	0.298	0.349
0.05	0.291	0.438	0.517
0.1	0.414	0.613	0.717
0.15	0.388	0.564	0.656
0.2	0.347	0.497	0.576
0.25	0.301	0.428	0.495
0.3	0.271	0.381	0.438
0.4	0.232	0.324	0.371
0.5	0.211	0.294	0.336
0.75	0.180	0.252	0.289
1	0.151	0.210	0.240
1.5	0.115	0.163	0.188
2	0.086	0.123	0.142
3	0.050	0.071	0.082
5	0.018	0.197	0.631

Equipment installed offshore shall be designed to withstand the resulting accelerations specified in appendix A. These accelerations shall be confirmed at detail engineering stage.

Pressure vessels shall be designed accordingly. Refer to Specification for Pressure Vessels [2].

Note: for more information for earthquake analysis see [\[5\]](#).

4.5.2.2 Onshore & Nearshore

The onshore & nearshore sites are located in a highly seismically active zone. A report is available [\[8\]](#).

The selection of the lateral-force procedure shall be selected as per UBC 1997, paragraph 1629.8.

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With the simplified static and static lateral-force procedures, all structures, buildings and equipment foundations shall be designed as per UBC 97 using following coefficients:

- Seismic zone 4;
- Seismic Importance factor I: 1,25 (for critical equipment);
- 1,00 (for others equipment and structures);
- Seismic zone factor: 0.4;

Seismic coefficients

- Soil profile type: Sc (UBC section 1636, Table 16-J) ;
- Seismic source type C;
- Near source factor Na: 1.0 (UBC Table 16-S);
- Near source factor Nv: 1.0 (UBC Table 16-T);
- Seismic coefficient Ca: $0.40 N_a = 0.40$ (UBC Table 16-Q);
- Seismic coefficient Cv: $0.56 N_v = 0.56$ (UBC Table 16-R);

The site-specific Uniform Response Spectrum to be used in the dynamic lateral-force procedure is provided [\[8\]](#).

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5. UTILITIES

5.1 Water

Table 12 –Water Parameters

Description	Utility Water	Fire Water
Supply Pressure, barg.	4.6	10 ⁽¹⁾
Return Press. at grade, barg	N.A.	N.A.
System Design pressure, barg	6 ⁽²⁾	18 ⁽³⁾
Supply °C	Ambient	Ambient

Notes:

- 1) Pressure to be confirmed. Minimum supply pressure at the 12" connection point at upper deck necessary to provide the maximum required water. Supply pressure to be confirmed by Drilling Contractor upon drilling rig's FW pumps selection;
- 2) 6 barg is the Design Pressure for fresh water distribution pumps;
- 3) Based on B92 piping material class design pressure;

5.2 Nitrogen

Nitrogen for purging shall be provided from cylinders to normal industrial standards.

Suggested purity	99.9% min
Supply pressure	7 barg
Supply Temperature	Ambient

5.3 Diesel

The diesel fuel provided for offshore platforms will be standard commercial grade ASTM D975 n°2 or equivalent. In accordance with Iranian local regulations, diesel fuel shall be low Sulphur content.

5.4 Electricity

• Main Low Voltage System	400 VAC ± 5 %, 3 phase, 4 wire, 50 Hz ± 5 %,	Neutral
• system TNS		
• Lighting and small power	230 VAC ± 5 %, 1 phase, 50 Hz ± 5 %,	Neutral system TNS
• Space heaters	230 VAC ± 5 %, 1 phase, 50 Hz ± 5 %	
• Motor starters control	230 VAC UPS ± 5 %, 1 phase, 50 Hz ± 5 %, IT	Neutral system
• Electrical controls	24 VDC ± 10 % unearthed	
• Instrument supply	24 V DC ± 10 % unearthed	
• Telecom	230 VAC ± 5 % UPS, 1 phase, 50 Hz ± 5 %, IT	Neutral system
• P.A. systems	230 VAC ± 5 % UPS, 1 phase, 50 Hz ± 5 %, IT	Neutral system
• Navigational Aids system	Fed from 400 VAC (Manufacturer's Standard	inside package)

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6. EQUIPMENT DESIGN CONDITIONS

Equipment shall be designed for in-place, seismic, lifting and transportation conditions whichever is the more stringent. Tropicalization is required for all equipment located onshore and on the offshore platforms.

Environmental data and available utilities for equipment design are summarized in Appendix B.

6.1 Design of the Facilities

Offshore facilities shall be designed and constructed for 20 years of service, with an overall availability of 99%, programmed Plant Shutdown excluded.

6.2 Design Conditions for Equipment Inside Battery Room & Technical Room

Technical Room:

Maximum temperature (summer):	26°C
Minimum temperature (winter):	16°C
Normal relative humidity:	40 to 60%

Battery Room:

Maximum temperature (summer):	30°C
Minimum temperature (winter):	10°C
Normal relative humidity:	40 to 60%

6.3 Design Conditions for Sea Transportation

The following conditions shall be considered to check the equipment for sea transportation. It also applies for transportation of Equipment to Offshore Site.

Note: for more information for transportation analysis see [\[5\]](#).

Table 13 –Motion Parameters

Type	Single Amplitude (10 sec full cycle period)		Heave
	Roll	Pitch	
• Larger Barges	20°	12.5°	0.2 g
• Small cargo barge (less than 76 m LOA or 23 m beam)	25°	15°	0.2 g
• Small vessels	30°	15°	0.2 g

As a general conservative approach and in case of no additional information, acceleration forces transmitted to the package by sea transportation shall be:

- Roll and pitch +/- 0.9 g (horizontal acceleration)
- Heave +/- 0.4 g (vertical acceleration)

These acceleration forces must be combined with a 25 m/s wind.

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6.4 Noise

The objectives for Noise levels on the South Pars 11 project is to limit values for specific external, process related equipment, packaged items and individual components, to a maximum sound pressure level (SPL) of 82 dB(A) at 1 meter distance in free field conditions per Package.

Acceptable individual noise limit values are specified in Offshore Safety Concept [3].

A noise datasheet (Ref.[4]) shall be filled for each equipment.

No external noise attenuation devices and/or enclosures are allowed on pump packages.

6.5 Explosion Overpressure

The design overpressure resulting from an explosion to be taken into account for the blast wall design of the Offshore platforms is 350 mbars.

For further details, refer to the project Offshore Safety Concept [3].

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Appendices

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Appendix A

Seismic Accelerations For Design of Equipment

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(based on ALE ground accelerations: Refer to section 4.5.2.1)

Topsides + Bridge to flare + Future Bridge + Drilling loads

LOCATION		JOINT	Accelerations		
			Ax (g)	Ay (g)	Az (g)
Leg A1	Lower Deck	LDA1	0.10	0.13	0.45
	Mezzanine Deck	MDA1	0.11	0.12	0.45
	Upper Deck	UDA1	0.12	0.13	0.45
Leg A2	Lower Deck	LDA2	0.10	0.12	0.37
	Mezzanine Deck	MDA2	0.11	0.14	0.37
	Upper Deck	UDA2	0.12	0.14	0.38
Leg B1	Lower Deck	LDB1	0.12	0.12	0.44
	Mezzanine Deck	MDB1	0.13	0.12	0.44
	Upper Deck	UDB1	0.13	0.13	0.44
Leg B2	Lower Deck	LDB2	0.11	0.12	0.37
	Mezzanine Deck	MDB2	0.13	0.14	0.38
	Upper Deck	UDB2	0.12	0.14	0.38

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Appendix B

Summarized Equipment Design Conditions

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SP11-10-D-10-4-005-D5			

 		DATA SHEET OFFSHORE SITE & UTILITY																																								
1																																										
2																																										
3																																										
4	SITE AND METEOROLOGICAL DATA (Offshore)				ELECTRICAL SUPPLY																																					
5	Elevation above sea level, m : 26 At upper deck				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th></th> <th>V</th> <th>ph</th> <th>Hz</th> <th>AC/DC</th> </tr> <tr> <td>E-motors up to : 0.25 kW</td> <td>230</td> <td>1</td> <td>50</td> <td>AC</td> </tr> <tr> <td>To : 160 kW</td> <td>400</td> <td>3</td> <td>50</td> <td>AC</td> </tr> <tr> <td>Above : 160 kW</td> <td>NA</td> <td>NA</td> <td>NA</td> <td>NA</td> </tr> <tr> <td>Heaters</td> <td>400</td> <td>3</td> <td>50</td> <td>AC</td> </tr> <tr> <td>Control equipment</td> <td>230</td> <td>1</td> <td>50</td> <td>AC</td> </tr> <tr> <td>Solenoid valves</td> <td>24</td> <td></td> <td></td> <td>DC</td> </tr> </table>				V	ph	Hz	AC/DC	E-motors up to : 0.25 kW	230	1	50	AC	To : 160 kW	400	3	50	AC	Above : 160 kW	NA	NA	NA	NA	Heaters	400	3	50	AC	Control equipment	230	1	50	AC	Solenoid valves	24			DC
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Control equipment	230	1	50	AC																																						
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6	Barometric pressure, mbar : max 1031 (peak) min 897.1 (peak)																																									
7	Range of ambient temp., °C																																									
8	Rated 41.7																																									
9	Normal																																									
10	Maximum 42																																									
11	Minimum 9																																									
12	Design temperature, °C Max : 42																																									
13	Black bulb temperature, °C : 85																																									
14	☒ Atmospheric conditions : ☒ Corrosive atmosphere due to: salt water spray ☒ Coastal/maritime climate ☐ Tropicalization required ☒ Winterization required ☒ Sand storms ☐ Earthquake zone																																									
15	Factor : ALE: 0.344g (Vert.) 0.236g (Hor.)																																									
16	Design code																																									
17	m/s-2 Resulting accelerations: Vertical Horizontal																																									
18	Atmospheric dust<10microns :																																									
19	Atmospheric dust>10microns :																																									
20	Special conditions :																																									
21	Humidity, % (1)																																									
22	Average 74.1 74.1																																									
23	Design 100 100																																									
24	Rainfall average, mm/year :																																									
25	Rainfall maximum, mm/day : 87																																									
26	Snowfall average, mm/year : N.A.																																									
27	Snow and ice thickness, mm : N.A.																																									
28	Wind speed at 10m above LAT see table below (2)																																									
29	Condition 1 minute sustained 3 second gust																																									
30	1 year operating 20.6 (offshore) 22.9 (offshore)																																									
31	100 years storm 28.8 (offshore) 32.4 (offshore)																																									
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	Minimum	Normal	Maximum	Design																																						
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Notes:

(1): Minimum Relative Humidity is 10.5%

(2): for other elevations and averaging duration, the wind velocity shall be calculated in accordance with § 4.2.

(3): Fire Water Supply from drilling rig at 10barg (Under Drilling rig responsibility)

(4): Utility water supply from fresh water tank. 6 barg design pressure at fresh water distribution pump outlet.

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Appendix C

Geodetic Systems Used for SP11A

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1 - On land, Tombak area and offshore datum for South Pars phase 11:

Horizontal Datum name : NAKHL-E GHANEM

Origin of datum : Bench Mark Nakhl-e Ghanem, National Cartographic Center of Iran (NCCI), 2001

- Spheroid :

WGS 1984 (GRS 1980)

Semi major axis a = 6 378 137.000

Semi minor axis b = 6 356 752.314

Inverse flattening 1/f = 298.257 223 563

Excentricity squared e² = 0.006 694 380

- Projection : **UNIVERSAL TRANSVERSE MERCATOR (UTM)**

Zone : = 39

Central meridian : = 51° East

Latitude of origin : = Equator

False Easting : = 500 000.00

False Northing : = 0

Scale factor on C.M. : = 0.999 6

2 – Vertical Datum:

CD (Chart Datum) at TAHERI, 1.25m below original MSL level at Bandar Abbas which is supposed to be determined around 1990-1995. Now (2005.2) this CD is at 1.07m below the MSL. A 2cm/year uplift impacts the elevation of the benchmarks with regard to the constant MSL.

Construction works and surveys: only use spirit or trigonometrical levelling for mm or cm accuracies. The geoid model, in conjunction with GPS, only provides decimetre accuracy.

3 - Local grid, Tombak area for South Pars Field Phase 11:

ORIGIN: UTM39N/NEG XE = 618336.748 YN = 3067774.210 Local x = 20000.000 y = 10000.000

Bearing of the general axis = 045° / 225° exactly

Scale factor at ORIGIN = 0.999773 in UTM, Scale factor at ORIGIN =1.000000 in local grid

Dist UTM = 0.999773 x True Horizontal Distance on the field at Origin (Dist Local Grid).

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$dX = -2587066.294$ $dY = -1722407.385$ $x = dX + X*Scale*cos(Rot) + Y*Scale*sin(Rot)$
 $Rot = +45^{\circ}00'00.000''$ $Scale = 1.0002272184$ $y = dY - X*Scale*sin(Rot) + Y*Scale*cos(Rot)$
 X, Y: easting, northing NEG,UTM39N. x, y: local grid.

Origin UTM39N/NEG XE = 618336.748 YN = 3067774.210 Local x = 20000.000 y = 10000.000

Check Point UTM39N/NEG XE = 604197.825 YN = 3053635.287 Local x = 0.000 y = 10000.000