

IDC: Inter-Discipline Check
IFC: Issued For Comment
IFA: Issued For Approval
AFD: Approved For Design
AFC: Approved For Construction
AFP: Approved For Purchase
AFQ: Approved For Quotation
IFI: Issued For Information
AB-R: As-Built for CLIENT Review
AB-A: As-Built –Approved

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: 053-073-9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 2 از 20	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

REVISION RECORD SHEET (Generally Revised)

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
GENERAL CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of :Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This document covers minimum necessary requirements for basis of design and main equipment's to be used for the Heating, Ventilating, Air-Conditioning and pressurizing and plumbing system for buildings for project

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3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS Iranian petroleum standards
- INBC Iranian National Building Code

3.2 INTERNATIONAL CODES AND STANDARDS

- ASTM American Society for Testing Materials Relevant Parts
- API 610 Centrifugal Pumps for General Refinery Service, 10th Edition
- ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H2S Containing Environments in Oil and Gas Production
- AMCA Air Movement and Control Association
- ANSI American National Standards Institute.
- ASHRAE American Society of Heating, Refrigeration and Air-conditioning Engineer
- ASTM American Society for Testing and Material
- BOCA Building Officials and Code Administrators international
- BS British Standards
- CIBSE Chartered Institute of Building Services Engineers.
- NFPA National fire protection association
- SBCCI Southern Building Code Congress International
- SMACNA Sheet Metal and Air Conditioning Contractors' National Association
- AWWA American Water Works Association
- ASME The American Society of Mechanical Engineers

Note: The latest issued or revised edition of all above mentioned codes and standards shall be considered as reference.

3.3 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No BK-GNRL-PEDCO-000-PR-DB-0001 .

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4.0 HVAC CALCULATION

4.1 DESIGN WEATHER PARAMETERS:

DESIGN PARAMETERS:

City Namebink

Location.....IRAN

Latitude.....30.3

Deg.Longitude.....-50.2

Deg.Elevation10.0 m

Summer Design Dry-Bulb.....41.0 °C

Summer Coincident Wet-Bulb.....30.5 °C

Summer Daily Range.....15.0

°K Winter Design Dry-Bulb.....6.0 °C

Winter Design Wet-Bulb.....6.0 °C

Atmospheric Clearness Number.....1.00

Average Ground Reflectance.....0.20

Soil Conductivity.....1.385

W/(m-°K)Local Time Zone (GMT +/- N hours).....-1.0 hours

Consider Daylight Savings Time.....No

Simulation Weather Data.....none N/A

Current Data is.....User Modified

Design Cooling Months.....January to December

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DESIGN DAY MAXIMUM SOLAR HEAT GAINS

(The MSHG values are expressed in W/m²)

Month	N	NNE	NE	ENE	E	ESE	SE	SSE	S
January	76.4	76.4	104.1	335.1	577.4	722.3	796.4	786.7	764.0
February	88.0	88.0	230.9	458.1	662.9	773.4	774.9	717.7	674.9
March	100.7	108.6	368.7	585.3	707.6	758.3	705.1	595.4	528.1
April	113.1	256.3	472.2	642.7	716.0	679.9	580.0	422.9	334.5
May	124.2	353.9	534.8	663.8	694.2	620.4	475.0	290.9	209.6
June	157.8	384.6	558.6	667.1	676.8	585.8	428.0	240.6	172.3
July	127.6	344.7	537.1	656.3	678.1	598.4	463.4	281.6	203.3
August	118.2	248.3	466.5	623.6	687.8	654.3	558.9	407.2	322.5
September	104.5	113.3	336.6	555.0	683.3	716.4	681.4	580.5	517.4
October	90.9	90.9	201.8	462.7	636.7	736.7	756.5	701.7	660.0
November	77.8	77.8	98.3	345.3	551.3	718.6	773.6	774.1	756.1
December	71.4	71.4	71.4	269.7	530.8	696.4	785.4	795.0	786.8
Month	SSW	SW	WSW	W	WNW	NW	NNW	HOR	Mult
January	789.5	796.9	721.1	569.2	354.1	83.2	76.4	579.3	1.00
February	722.0	781.4	766.3	669.5	467.5	224.5	88.0	702.0	1.00
March	596.6	704.4	761.1	720.6	569.4	368.1	116.6	809.9	1.00
April	421.4	576.3	689.2	714.5	631.4	476.0	257.9	863.7	1.00
May	289.5	470.8	624.0	691.1	655.0	542.6	355.7	877.6	1.00
June	238.3	421.9	590.9	670.1	656.4	565.4	389.3	873.7	1.00
July	278.1	456.2	609.2	671.7	644.3	540.2	353.4	863.9	1.00
August	405.5	554.8	664.2	689.2	610.9	463.3	256.0	845.0	1.00
September	580.7	681.6	714.0	684.8	554.4	333.4	114.2	785.9	1.00
October	698.5	750.4	744.7	624.3	458.7	216.5	90.9	693.3	1.00
November	770.3	775.6	718.6	559.7	335.4	103.0	77.8	579.1	1.00
December	796.5	774.3	701.4	517.9	296.9	71.4	71.4	527.6	1.00

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4.2 CONSTRUCTIONS U-VALUE:

External Wall

Wall Details

Outside Surface Color Medium
Absorptivity 0.675
Overall U-Value 0.589 W/(m²-°K)

Wall Layers Details (Inside to Outside)

Layers	Thickness mm	Density kg/m ³	Specific Ht. kJ / (kg - °K)	R-Value (m ² -°K)/W	Weight kg/m ²
Inside surface resistance	0.000	0.0	0.00	0.12064	0.0
concrete block	250.000	2000.0	0.84	0.23750	500.0
insulation	50.000	40.0	0.92	1.19000	2.0
100mm face brick	100.000	2002.3	0.92	0.09000	200.2
Outside surface resistance	0.000	0.0	0.00	0.05864	0.0
Totals	400.000	-		1.69678	702.2

External Roof

Roof Details

Outside Surface Color Dark
Absorptivity 0.900
Overall U-Value 0.642 W/(m²-°K)

Roof Layers Details (Inside to Outside)

Layers	Thickness mm	Density kg/m ³	Specific Ht. kJ / (kg - °K)	R-Value (m ² -°K)/W	Weight kg/m ²
Inside surface resistance	0.000	0.0	0.00	0.12064	0.0
50mm HW concrete	50.000	2242.6	0.84	0.03000	112.1
poly styrene block	200.000	10.0	0.84	0.59000	2.0
Built-up roofing	100.000	1121.3	1.47	0.61467	112.1
terrazzo	25.000	0.0	0.84	0.14449	0.0
Outside surface resistance	0.000	0.0	0.00	0.05864	0.0
Totals	375.000	-		1.55844	226.3

DOOR (1.0 x 2.5)

Door Details:

Gross Area 2.5 m²
Door U-Value 5.8 W/(m²-°K)

Glass Details:

Glass Area 0.0 m²
Glass U-Value 3.293 W/(m²-°K)
Glass Shade Coefficient 0.880
Glass Shaded All Day? No

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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DOOR (2x2.5)

Door Details:

Gross Area 5.0 m²
Door U-Value 5.8 W/(m²-°K)

Glass Details:

Glass Area 0.0 m²
Glass U-Value 3.293 W/(m²-°K)
Glass Shade Coefficient 0.880
Glass Shaded All Day? No

4.3 SPACE INPUT DATA:

SWITCHGEAR ROOM

1. General Details:

Floor Area 57.0 m²
Avg. Ceiling Height 5.5 m
Building Weight 341.8 kg/m²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 L/s
OA Requirement 2 0.00 L/(s-m²)
Space Usage Defaults . ASHRAE Standard 62.1-2007

2. Internals:

2.1. Overhead Lighting:

Fixture Type Free Hanging
Wattage 368.00 W/m²
Ballast Multiplier 1.20
Schedule Lighting

2.4. People:

Occupancy 0.0 Person
Activity Level Office Work
Sensible 71.8 W/person
Latent 60.1 W/person
Schedule None

2.2. Task Lighting:

Wattage 0.00 W/m²
Schedule None

2.5. Miscellaneous Loads:

Sensible 0 W
Schedule None
Latent 0 W
Schedule None

2.3. Electrical Equipment:

Wattage 8000.0 Watts
Schedule Equipment

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (m ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
NW	37.6	0	0	0
SW	30.0	0	0	1
NW	56.0	0	0	0
NE	30.0	0	0	1

3.1. Construction Types for Exposure NW

Wall Type External Wall

3.2. Construction Types for Exposure SW

Wall Type External Wall
Door Type 2*2.5

3.3. Construction Types for Exposure NW

Wall Type External Wall

3.4. Construction Types for Exposure NE

Wall Type External Wall

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Door Type 1*2.5

4. Roofs, Skylights:

Exp.	Roof Gross Area (m ²)	Roof Slope (deg.)	Skylight Qty.
H	57.0	0	0

4.1. Construction Types for Exposure H

Roof Type External Roof

5. Infiltration:

Design Cooling 0.00 ACH
Design Heating 0.00 ACH
Energy Analysis 0.00 L/s

Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 57.0 m²
Total Floor U-Value 2.0 W/(m²-°K)
Exposed Perimeter 22.0 m
Edge Insulation R-Value 0.00 (m²-°K)/W

7. Partitions:

7.1. 1st Partition Details:

Partition Type Wall Partition
Area 15.0 m²
U-Value 2.839 W/(m²-°K)
Uncondit. Space Max Temp 25.0 °C
Ambient at Space Max Temp 41.0 °C
Uncondit. Space Min Temp 10.0 °C
Ambient at Space Min Temp 6.0 °C

7.2. 2nd Partition Details:

(No partition data)

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4.4 SYSTEM INPUT DATA:

1. General Details:

Air System Name **SWITCHGEAR BUILDING OF WELL PADS**
 Equipment Type **Terminal Units**
 Air System Type **Split DX Fan Coil**
 Number of zones **1**
 Ventilation **Direct Ventilation**

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
SWITCHGEAR ROOM	x1

Thermostats and Zone Data:

Zone	Cooling T-Stat Occ. (°C)	Cooling T-Stat Unocc. (°C)	Heating T-Stat Occ. (°C)	Heating T-Stat Unocc. (°C)	T-Stat Throttling Range (°C)
1	30.0	30.0	10.0	10.0	0.83

Thermostat Schedule **Fan**
 Unoccupied Cooling is **Available**

Common Terminal Unit Data:

Cooling Coil:

Design Supply Temperature **14.5 °C**
 Coil Bypass Factor **0.100**
 Cooling Source **Air-Cooled DX**
 Schedule **JFMAMJJASOND**

Heating Coil:

Design Supply Temperature **35.0 °C**
 Heating Source **Electric Resistance**
 Schedule **JFMAMJJASOND**

Fan Control **Fan On**
 Ventilation Sizing Method **Sum of Space OA Airflows**

Terminal Units Data:

Zone **All**
 Terminal Type **Fan Coil**
 Minimum Airflow **0.00** L/s/person
 Fan Performance **0** Pa
 Fan Overall Efficiency **50** %

4. Sizing Data (Computer-Generated):

System Sizing Data:

Sizing Data:

Cooling Supply Temperature **14.5 °C**
 Heating Supply Temperature **35.0 °C**

Hydronic Sizing Specifications:

Chilled Water Delta-T **5.6 °K**
 Hot Water Delta-T **11.1 °K**

Safety Factors:

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Cooling Sensible 10 %
Cooling Latent 10 %
Heating 10 %

Zone Sizing Data:

Zone Airflow Sizing Method Sum of space airflow rates
Space Airflow Sizing Method Individual peak space loads

Zone	Supply Airflow (L/s)	Zone Htg Unit (kW)	Reheat Coil (kW)	Ventilation (L/s)
1	572.1	-	-	0.0

5. Equipment Data

Terminal Cooling Units - Air-Cooled DX

Zone	Estimated Maximum Load (kW)	Design OAT (°C)	Equipment Sizing	Gross Cooling Capacity (kW)	Capacity Oversizing Factor (%)	Compressor + OD Fan Power (kW)	ARI Performance Rating	Units	Conventional Cutoff OAT (°C)
1	10.6	35.0	Auto-Sized	-	0	-	3.224	EER	-17.8

4.5 SYSTEM RESULT DATA:

Air System Sizing Summary

Air System Information

Air System Name **SWITCHGEAR BUILDING OF WELL PADS**
Equipment Class **TERM**
Air System Type **SPLT-FC**

Number of zones **1**
Floor Area **57.0** m²
Location **binak, IRAN**

Sizing Calculation Information

Calculation Months **Jan to Dec**
Sizing Data **Calculated**

Zone L/s Sizing **Sum of space airflow rates**
Space L/s Sizing **Individual peak space loads**

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Zone Sizing Summary

Zone Sizing Data

Zone Name	Maximum Cooling Sensible (kW)	Design Airflow (L/s)	Minimum Airflow (L/s)	Time of Peak Load	Maximum Heating Load (kW)	Zone Floor Area (m²)	Zone L/(s-m²)
Zone 1	12.2	633	633	Jul 1500	0.6	58.0	10.91

Terminal Unit Sizing Data - Cooling

Zone Name	Total Coil Load (kW)	Sens Coil Load (kW)	Coil Entering DB / WB (°C)	Coil Leaving DB / WB (°C)	Water Flow @ 5.6 °K (L/s)	Time of Peak Load
Zone 1	15.1	11.9	30.6 / 20.9	15.0 / 14.2	-	Jun 1500

Terminal Unit Sizing Data - Heating, Fan, Ventilation

Zone Name	Heating Coil Load (kW)	Heating Coil Ent/Lvg DB (°C)	Htg Coil Water Flow @11.1 °K (L/s)	Fan Design Airflow (L/s)	Fan Motor (BHP)	Fan Motor (kW)	OA Vent Design Airflow (L/s)
Zone 1	0.9	9.9 / 11.1	-	633	0.000	0.000	0

Space Loads and Airflows

Zone Name / Space Name	Mult.	Cooling Sensible (kW)	Time of Load	Air Flow (L/s)	Heating Load (kW)	Floor Area (m²)	Space L/(s-m²)
Zone 1							
SWITCHGEAR ROOM	1	10.7	Jul 1800	572	0.8	57.0	10.04

Ventilation Sizing Summary

1. Summary

Ventilation Sizing Method Sum of Space OA Airflows

2. Space Ventilation Analysis Table

Zone Name / Space Name	Mult.	Floor Area (m²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/(s-m²))	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 1									
SWITCHGEAR ROOM	1	57.0	0.0	572.1	0.00	0.00	0.0	0.0	0.0
Totals (incl. Space Multipliers)				572.1					0.0

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: 053-073-9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S								شماره صفحه: 14 از 20
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	W046S	PEDCO	110	HV	CN	0001	D02	

AIR SYSTEM DESIGN LOAD SAMMARY:

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1800 COOLING OA DB / WB 37.9 °C / 29.9 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 6.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m ²	0	-	0 m ²	-	-
Wall Transmission	146 m ²	660	-	146 m ²	344	-
Roof Transmission	57 m ²	714	-	57 m ²	146	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	8 m ²	199	-	8 m ²	120	-
Floor Transmission	57 m ²	0	-	57 m ²	82	-
Partitions	15 m ²	-293	-	15 m ²	0	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	442 W	442	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	8000 W	8000	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	972	0	10%	69	0
>> Total Zone Loads	-	10693	0	-	761	0
Zone Conditioning	-	10575	0	-	767	0
Plenum Wall Load	0%	0	-	0	0	-
Plenum Roof Load	0%	0	-	0	0	-
Plenum Lighting Load	0%	0	-	0	0	-
Exhaust Fan Load	0 L/s	0	-	0 L/s	0	-
Ventilation Load	0 L/s	0	0	0 L/s	0	0
Ventilation Fan Load	0 L/s	0	-	0 L/s	0	-
Space Fan Coil Fans	-	0	-	-	0	-
Duct Heat Gain / Loss	0%	0	-	0%	0	-
>> Total System Loads	-	10575	0	-	767	0
Terminal Unit Cooling	-	10575	0	-	0	0
Terminal Unit Heating	-	0	-	-	767	-
>> Total Conditioning	-	10575	0	-	767	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

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شماره پیمان: 053 - 073- 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	W046S	PEDCO	110	HV	CN	0001	D02

ZONE DESIGN LOAD SAMMARY:

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1800 COOLING OA DB / WB 37.9 °C / 29.9 °C OCCUPIED T-STAT 30.0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 6.0 °C OCCUPIED T-STAT 10.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m ²	0	-	0 m ²	-	-
Wall Transmission	146 m ²	660	-	146 m ²	344	-
Roof Transmission	57 m ²	714	-	57 m ²	146	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	8 m ²	199	-	8 m ²	120	-
Floor Transmission	57 m ²	0	-	57 m ²	82	-
Partitions	15 m ²	-293	-	15 m ²	0	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	442 W	442	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	8000 W	8000	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	972	0	10%	69	0
>> Total Zone Loads	-	10693	0	-	761	0

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: 053 – 073 – 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 16 از 20	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

SPACE DESIGN LOAD SAMMARY:

TABLE 1.1.A. COMPONENT LOADS FOR SPACE " SWITCHGEAR ROOM " IN ZONE " Zone 1 "						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1800 COOLING OA DB / WB 37.9 °C / 29.9 °C OCCUPIED T-STAT 30.0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 6.0 °C OCCUPIED T-STAT 10.0 °C		
		Sensible	Latent		Sensible	Latent
SPACE LOADS	Details	(W)	(W)	Details	(W)	(W)
Window & Skylight Solar Loads	0 m ²	0	-	0 m ²	-	-
Wall Transmission	146 m ²	660	-	146 m ²	344	-
Roof Transmission	57 m ²	714	-	57 m ²	146	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	8 m ²	199	-	8 m ²	120	-
Floor Transmission	57 m ²	0	-	57 m ²	82	-
Partitions	15 m ²	-293	-	15 m ²	0	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	442 W	442	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	8000 W	8000	-	0	0	-
People	0	0	0	0	0	0
Infiltration	-	0	0	-	0	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	972	0	10%	69	0
>> Total Zone Loads	-	10693	0	-	761	0

TABLE 1.1.B. ENVELOPE LOADS FOR SPACE " SWITCHGEAR ROOM " IN ZONE " Zone 1 "						
				COOLING	COOLING	HEATING
	Area	U-Value	Shade	TRANS	SOLAR	TRANS
	(m ²)	(W/(m ² -°K))	Coeff.	(W)	(W)	(W)
NW EXPOSURE						
WALL	38	0.589	-	165	-	89
SW EXPOSURE						
WALL	25	0.589	-	115	-	59
DOOR	5	4.000	-	132	-	80
NW EXPOSURE						
WALL	56	0.589	-	245	-	132
NE EXPOSURE						
WALL	28	0.589	-	135	-	65
DOOR	3	4.000	-	66	-	40
H EXPOSURE						
ROOF	57	0.642	-	714	-	146

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شماره پیمان: 053 – 073– 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 17 از 20	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

SYSTEM PSYCHROMETRICS:

July DESIGN COOLING DAY, 1700

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	37.9	0.02352	0	400	0	0
Vent - Return Mixing	Outlet	-17.8	0.00000	0	0	-	-
Ventilation Fan	Outlet	-17.8	0.00000	0	0	0	-
Zone Air	-	30.7	0.00000	572	0	10575	0
Return Plenum	Outlet	-17.8	0.00000	572	0	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.207; At site altitude = 1.206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947.6; At site altitude = 2944.1 W/(L/s)

Site Altitude = 10.0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 1 (Cooling)							
Ventilation Air	-	-	-	0	-	-	-
Cooling Coil Inlet	-	30.7	0.00002	572	0	-	-
Cooling Coil Outlet	-	15.4	0.00002	572	0	10575	0
Heating Coil Inlet	-	15.4	0.00002	572	0	-	-
Heating Coil Outlet	-	15.4	0.00002	572	0	0	-
Zone Air	-	30.7	0.00002	572	0	10575	-

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شماره پیمان: 053 – 073– 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 18 از 20	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

WINTER DESIGN HEATING

TABLE 1: SYSTEM DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Ventilation Air	Inlet	6.0	0.00580	0	400	0	0
Vent - Return Mixing	Outlet	-17.8	0.00000	0	0	-	-
Ventilation Fan	Outlet	-17.8	0.00000	0	0	0	-
Zone Air	-	10.0	0.00000	572	0	-767	0
Return Plenum	Outlet	-17.8	0.00000	572	0	0	-

Air Density x Heat Capacity x Conversion Factor: At sea level = 1.207; At site altitude = 1.206 W/(L/s-K)

Air Density x Heat of Vaporization x Conversion Factor: At sea level = 2947.6; At site altitude = 2944.1 W/(L/s)

Site Altitude = 10.0 m

TABLE 2: ZONE DATA

Component	Location	Dry-Bulb Temp (°C)	Specific Humidity (kg/kg)	Airflow (L/s)	CO2 Level (ppm)	Sensible Heat (W)	Latent Heat (W)
Zone 1 (Deadband)							
Ventilation Air	-	-	-	0	-	-	-
Cooling Coil Inlet	-	10.0	0.00002	572	0	-	-
Cooling Coil Outlet	-	10.0	0.00002	572	0	0	0
Heating Coil Inlet	-	10.0	0.00002	572	0	-	-
Heating Coil Outlet	-	11.1	0.00002	572	0	767	-
Zone Air	-	10.0	0.00002	572	0	-767	-

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: 053 – 073– 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 19 از 20	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

5.0 Equipment Selection

5.1 AIR CONDITIONING UNIT

Switchgear Room Total Cooling Load= 10700w $\approx$ 36500 btu/hr

Actual Total Cooling Load with considering 10% over capacity = 40200 btu/hr

Actual Total heating Load with considering 10% over capacity = 800 * 1.1 * 3.412=3002 btu/hr

Split Unit Actual Cooling/Heating Capacity= 20100/1501 btu/hr

Switchgear Room load ÷ Quantity = 40200 btu/hr ÷ 2 = 20100 btu/hr → 2*split unit 24000 nominal load-wall mounted (Tropical-heat pump type)

Indoor Unit Equipment No: 1301-SUI-01 A,B

Quantity: 2

Type : wall mounted

Outdoor Unit Equipment No: 1301-SUO-01 A,B

5.2 EXHAUST FAN SELECTION

Equipment No:	1301-EF-01
Quantity	1
Type	WALL MOUNTED
Air Flow Rate	190 L/S (ACH-10 , A:11m ² , H:5.5m)
Static Pressure	Sand trap louver: 44pa Exhaust Air Louver: 38 pa Total pr. Drop With 10% over design→90 pa
Service Area	Battery Room
Remarks	

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: 053 – 073– 9184	HVAC CALCULATION NOTE FOR SWITCHGEAR BUILDING – W046S							شماره صفحه: 20 از 20	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	W046S	PEDCO	110	HV	CN	0001		D02

Battery Room Exhaust Fan:

Air Flow Rate: Area: $11m^2$, H: 5.5 with considering ACH: 10 → Air Flow Rate 170 L/S
A Wall mounted Exhaust fan with 190 L/S has selected.

Wall mounted Exhaust fan Pressure drop: Sand trap louver Pressure Drop: 44pa, Exhaust Air Louver: 38 pa
Total pr. Drop With 10% over design → 90 pa

5.3 SAND TRAP LOUVER SELECTION

Battery Room Sand Trap Louver (STL-01):

Pressure Drop = 44 pa $\approx$ 0.174 inwg

Air Flow Rate: 190 l/s

from “Shahrokhi Manufacturing co.” catalogue for Sand Trap Louver:

0.174 inwg Pressure Drop (from the SH.SAL.L table) → $V_k=300$ FPM

Air Flow Rate: l/s $\approx$ 403 CFM →

$A_k=403/300=1.34$ → W=36” , H=18”