

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
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طرح نگهداشت و افزایش تولید ۲۷ مخزن

HVAC CALCULATION NOTE FOR GCS WAREHOUSE

نگهداشت و افزایش تولید میدان نفتی بینک

D00	FEB. 2024	IFC	K.Ahmadi	M.Fakharian	S.Faramarzpour	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval
Class: 2		CLIENT Doc. Number: F0Z-709532				

Status:

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

	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان:	HVAC CALCULATION NOTE FOR GCS WAREHOUSE								شماره صفحه: ۲ از ۲۱
۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	HV	CN	0006	D00	

REVISION RECORD SHEET

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نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

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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

The main purpose of this document is to define the HVAC system load calculation has been carried out by computer program (HAP software) as per ASHRAE method in order to evaluate cooling load (summer) and heating load (winter) and also to select HVAC equipment for the calculated cooling and heating load.

	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	HV	CN	0006		D00

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.

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نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

3.3 ENVIRONMENTAL DATA

- ▶ Latitude 29° 73' N
- ▶ Longitude 50° 35' E
- ▶ Elevation 10 m
- ▶ Summer dry bulb temperature : 41° C
- ▶ Summer wet bulb temperature : 30.5° C
- ▶ Summer daily range temperature : 15.0° C
- ▶ Winter dry bulb temperature : 6° C
- ▶ Winter relative humidity : 78%

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

4.0 HVAC CALCULATION

4.1 DESIGN WEATHER PARAMETERS:

Design Parameters:

City Name	Binak
Location	IRAN
Latitude	29.7 Deg.
Longitude	-50.4 Deg.
Elevation	10.0 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	4.4 °C
Atmospheric Clearness Number	1.00
Average Ground Reflectance	0.20
Soil Conductivity	1.385 W/(m-°K)
Local Time Zone (GMT +/- N hours)	-3.5 hours
Consider Daylight Savings Time	No
Simulation Weather Data	noneN/A
Current Data is	User Modified
Design Cooling Months	January to December

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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	HV	CN	0006	D00	

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	77.5	77.5	95.1	360.4	561.2	730.9	794.1	786.3	762.3
February	89.1	89.1	206.7	484.1	668.9	760.8	782.0	718.9	671.9
March	101.4	120.5	367.4	576.2	723.5	759.6	702.5	590.8	520.1
April	113.0	252.7	487.2	636.6	705.1	688.3	568.6	408.7	322.0
May	124.3	351.1	551.9	666.3	679.9	619.4	469.6	279.8	199.5
June	161.0	389.1	570.0	664.8	662.8	586.8	421.4	228.9	165.7
July	128.9	355.9	541.6	644.7	671.3	606.9	452.1	270.2	196.1
August	118.3	256.1	470.7	606.2	686.0	663.8	546.8	395.4	311.9
September	104.3	109.2	354.3	538.8	681.8	728.9	670.0	569.4	503.5
October	91.2	91.2	226.5	441.2	642.7	746.9	748.8	692.4	650.8
November	78.1	78.1	103.7	341.8	572.3	707.9	785.7	774.1	747.8
December	71.9	71.9	71.9	306.4	524.4	699.0	788.1	799.2	780.7
Month	SSW	SW	WSW	W	WNW	NW	NNW	HOR	Mult
January	779.8	791.7	733.2	577.4	337.4	108.2	77.5	591.4	1.00
February	716.3	777.2	772.2	650.4	482.8	225.6	89.1	714.5	1.00
March	590.5	703.8	755.6	713.7	589.1	369.6	114.3	816.8	1.00
April	413.5	574.6	682.6	707.6	645.8	485.9	241.4	863.3	1.00
May	282.1	471.6	614.4	688.4	669.7	550.4	343.5	875.1	1.00
June	233.1	424.2	577.0	674.2	670.6	567.0	376.4	872.9	1.00
July	274.2	458.7	596.0	677.5	657.5	539.9	345.0	865.3	1.00
August	398.9	554.0	657.3	682.8	624.7	473.1	240.3	846.4	1.00
September	569.0	669.3	728.9	681.0	540.4	354.6	108.6	783.8	1.00
October	697.0	755.4	737.2	647.9	457.7	216.5	91.2	696.8	1.00
November	775.6	786.0	708.0	568.2	351.0	91.0	78.1	582.8	1.00
December	798.2	790.7	685.6	536.9	295.2	71.9	71.9	533.5	1.00

Mult. = User-defined solar multiplier factor.

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D00	0006	CN	HV	120	PEDCO	GCS	BK																			

Cooling Design Temperature Profile

Location: Binak, IRAN

(Dry and Wet Bulb temperatures are expressed in °C)

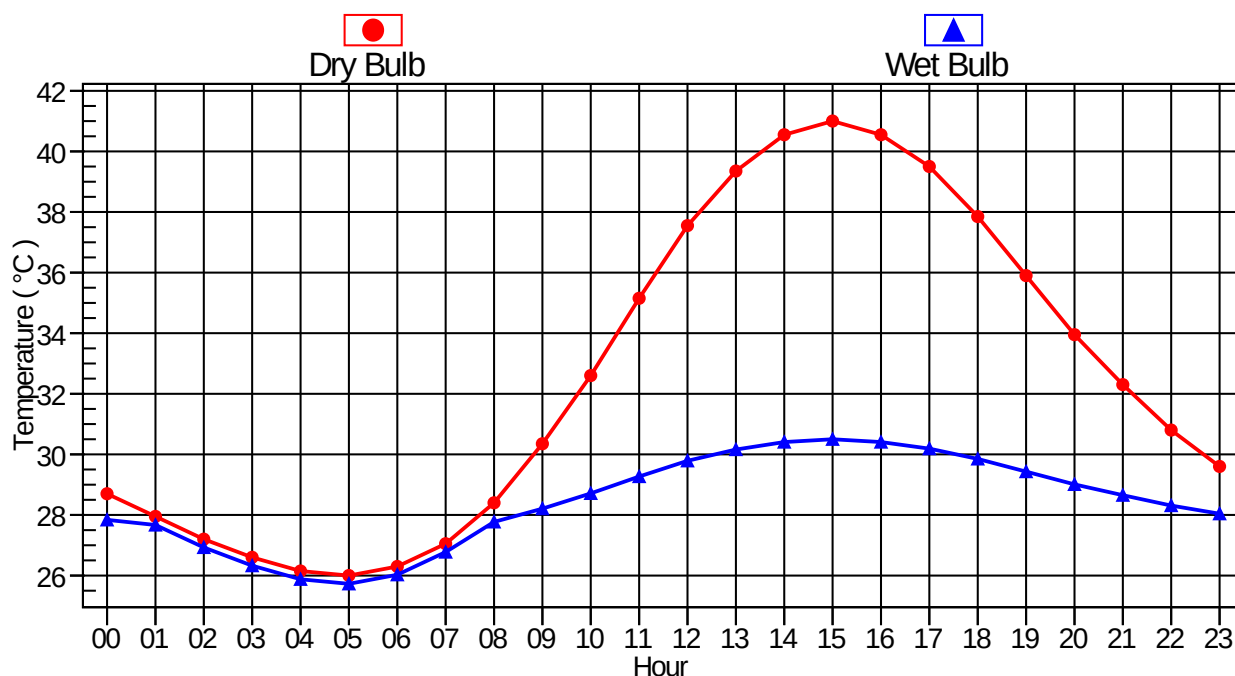
Hr	January		February		March		April		May		June	
	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB
0000	19.4	19.1	20.5	20.2	23.0	22.8	24.5	24.2	26.7	26.4	28.1	27.8
0100	18.6	18.3	19.7	19.5	22.3	22.0	23.7	23.5	26.0	25.7	27.4	27.1
0200	17.9	17.6	19.0	18.7	21.5	21.3	23.0	22.7	25.2	24.9	26.6	26.4
0300	17.3	17.0	18.4	18.1	20.9	20.7	22.4	22.1	24.6	24.3	26.0	25.8
0400	16.8	16.5	17.9	17.7	20.5	20.2	21.9	21.7	24.2	23.9	25.6	25.3
0500	16.7	16.4	17.8	17.5	20.3	20.1	21.8	21.5	24.0	23.7	25.4	25.2
0600	17.0	16.7	18.1	17.8	20.6	20.4	22.1	21.8	24.3	24.0	25.7	25.5
0700	17.7	17.4	18.8	18.6	21.4	21.1	22.8	22.6	25.1	24.8	26.5	26.2
0800	19.1	18.8	20.2	19.9	22.7	22.5	24.2	23.9	26.4	26.1	27.8	27.6
0900	21.0	20.7	22.1	21.9	24.7	24.4	26.1	25.9	28.4	27.0	29.8	28.2
1000	23.3	22.2	24.4	23.2	26.9	25.6	28.4	26.6	30.6	27.5	32.0	28.7
1100	25.8	22.9	26.9	23.9	29.5	26.2	30.9	27.2	33.2	28.1	34.6	29.3
1200	28.2	23.6	29.3	24.5	31.9	26.8	33.3	27.7	35.6	28.6	37.0	29.8
1300	30.0	24.1	31.1	25.0	33.7	27.2	35.1	28.1	37.4	29.0	38.8	30.2
1400	31.2	24.4	32.3	25.3	34.9	27.5	36.3	28.4	38.6	29.3	40.0	30.4
1500	31.7	24.5	32.8	25.4	35.3	27.6	36.8	28.5	39.0	29.4	40.4	30.5
1600	31.2	24.4	32.3	25.3	34.9	27.5	36.3	28.4	38.6	29.3	40.0	30.4
1700	30.2	24.1	31.3	25.0	33.8	27.3	35.3	28.2	37.5	29.1	38.9	30.2
1800	28.5	23.7	29.6	24.6	32.2	26.9	33.6	27.8	35.9	28.7	37.3	29.8
1900	26.6	23.1	27.7	24.1	30.2	26.4	31.7	27.3	33.9	28.3	35.3	29.4
2000	24.6	22.6	25.7	23.5	28.3	25.9	29.7	26.9	32.0	27.8	33.4	29.0
2100	23.0	22.1	24.1	23.1	26.6	25.5	28.1	26.5	30.3	27.4	31.7	28.6
2200	21.5	21.2	22.6	22.3	25.1	24.9	26.6	26.1	28.8	27.1	30.2	28.3
2300	20.3	20.0	21.4	21.1	23.9	23.7	25.4	25.1	27.6	26.8	29.0	28.0

Hr	July		August		September		October		November		December	
	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB	DB	WB
0000	28.7	27.8	28.7	27.8	27.6	27.2	25.6	25.3	22.5	22.2	19.9	19.6
0100	28.0	27.7	28.0	27.7	26.8	26.6	24.8	24.6	21.7	21.5	19.2	18.9
0200	27.2	26.9	27.2	26.9	26.1	25.8	24.1	23.8	21.0	20.7	18.4	18.1
0300	26.6	26.3	26.6	26.3	25.5	25.2	23.5	23.2	20.4	20.1	17.8	17.5
0400	26.2	25.9	26.2	25.9	25.0	24.8	23.0	22.8	19.9	19.7	17.4	17.1
0500	26.0	25.7	26.0	25.7	24.9	24.6	22.9	22.6	19.8	19.5	17.2	16.9
0600	26.3	26.0	26.3	26.0	25.2	24.9	23.2	22.9	20.1	19.8	17.5	17.2
0700	27.1	26.8	27.1	26.8	25.9	25.7	23.9	23.7	20.8	20.6	18.3	18.0
0800	28.4	27.8	28.4	27.8	27.3	27.0	25.3	25.0	22.2	21.9	19.6	19.3
0900	30.4	28.2	30.4	28.2	29.2	27.6	27.2	26.4	24.1	23.9	21.6	21.3
1000	32.6	28.7	32.6	28.7	31.5	28.1	29.5	26.9	26.4	25.4	23.8	23.4
1100	35.2	29.3	35.2	29.3	34.0	28.7	32.0	27.5	28.9	26.0	26.4	24.1
1200	37.6	29.8	37.6	29.8	36.4	29.2	34.4	28.1	31.3	26.6	28.8	24.7
1300	39.4	30.2	39.4	30.2	38.2	29.6	36.2	28.5	33.1	27.0	30.6	25.2
1400	40.6	30.4	40.6	30.4	39.4	29.8	37.4	28.7	34.3	27.3	31.8	25.5
1500	41.0	30.5	41.0	30.5	39.9	29.9	37.9	28.8	34.8	27.4	32.2	25.6
1600	40.6	30.4	40.6	30.4	39.4	29.8	37.4	28.7	34.3	27.3	31.8	25.5
1700	39.5	30.2	39.5	30.2	38.4	29.6	36.4	28.5	33.3	27.0	30.7	25.2
1800	37.9	29.9	37.9	29.9	36.7	29.3	34.7	28.1	31.6	26.6	29.1	24.8
1900	35.9	29.4	35.9	29.4	34.8	28.9	32.8	27.7	29.7	26.2	27.1	24.3
2000	34.0	29.0	34.0	29.0	32.8	28.4	30.8	27.2	27.7	25.7	25.2	23.8
2100	32.3	28.7	32.3	28.7	31.2	28.0	29.2	26.8	26.1	25.3	23.5	23.2
2200	30.8	28.3	30.8	28.3	29.7	27.7	27.7	26.5	24.6	24.3	22.0	21.7
2300	29.6	28.0	29.6	28.0	28.5	27.4	26.5	26.2	23.4	23.1	20.8	20.5

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">HVAC CALCULATION NOTE FOR GCS WAREHOUSE</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادر کننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>D00</td><td>0006</td><td>CN</td><td>HV</td><td>120</td><td>PEDCO</td><td>GCS</td><td>BK</td></tr></table>	HVAC CALCULATION NOTE FOR GCS WAREHOUSE								نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه	D00	0006	CN	HV	120	PEDCO	GCS	BK	شماره صفحه ۹: از ۲۱
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D00	0006	CN	HV	120	PEDCO	GCS	BK																			

Design Temperature Profile

Design Temperature Profiles for July



 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
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HVAC CALCULATION NOTE FOR GCS WAREHOUSE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

4.2 CONSTRUCTIONS U-VALUE:

Wall

Wall Details

Outside Surface Color Medium
Absorptivity 0.675
Overall U-Value 0.419 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
face brick(P99-19NR)	30.000	2000.0	1.09	1.00000	60.0
cement plaster(P87-19NR)	20.000	1600.0	0.80	0.02500	32.0
concrete wall(P87-19NR)	400.000	2400.0	0.84	0.16000	960.0
cement plaster(P87-19NR)	20.000	1600.0	0.80	0.02500	32.0
face brick(P99-19NR)	30.000	2000.0	0.03	1.00000	60.0
Outside surface resistance	0.000	0.0	0.00	0.05864	0.0
Totals	500.000	-		2.38928	1144.0

Roof

Roof Details

Outside Surface Color Medium
Absorptivity 0.675
Overall U-Value 1.220 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
concrete wall(P87-19NR)	400.000	2400.0	0.84	0.16000	960.0
high density polyurethane(P8-19N)	50.000	1300.0	0.84	0.23810	65.0
light weight concrete(P87-19NR)	50.000	1800.0	0.84	0.03704	90.0
waterproofing layer(P96-19NR)	20.000	1100.0	1.67	0.08696	22.0
sand cement mortar(P88-19NR)	50.000	1600.0	0.80	0.09615	80.0
terrazzo tile(P89-19NR)	30.000	2000.0	1.35	0.02222	60.0
Outside surface resistance	0.000	0.0	0.00	0.05864	0.0
Totals	600.000	-		0.81975	1277.0

B.P.D./T-1

Door Details:

Gross Area 2.6 m²
Door U-Value 3.000 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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HVAC CALCULATION NOTE FOR GCS WAREHOUSE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

4.3 SPACE INPUT DATA:

01-Instrument Workshop

1. General Details:

Floor Area 19.4 m²
Avg. Ceiling Height 3.4 m
Building Weight 634.7 kg/m²

1.1. OA Ventilation Requirements:

Space Usage User-Defined
OA Requirement 1 0.0 L/s/person
OA Requirement 2 0.00 L/(s-m²)
Space Usage Defaults . ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type Recessed (Unvented)
Wattage 20.00 W/m²
Ballast Multiplier 1.00
Schedule Lighting

2.2. Task Lighting:

Wattage 0.00 W/m²
Schedule None

2.3. Electrical Equipment:

Wattage 2000.0 Watts
Schedule Electrical Eq.

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (m ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
NNW	16.1	0	0	0
SSE	9.6	0	0	1

3.1. Construction Types for Exposure NNW

Wall Type Wall

3.2. Construction Types for Exposure SSE

Wall Type Wall
Door Type B.P.D./T-1

4. Roofs, Skylights:

Exp.	Roof Gross Area (m ²)	Roof Slope (deg.)	Skylight Qty.
H	19.4	0	0

4.1. Construction Types for Exposure H

Roof Type Roof

5. Infiltration:

Design Cooling 131.20 L/s
Design Heating 131.20 L/s
Energy Analysis 131.20 L/s

Infiltration occurs at all hours.

6. Floors:

Type Slab Floor On Grade
Floor Area 19.4 m²
Total Floor U-Value 0.568 W/(m²-°K)
Exposed Perimeter 7.7 m
Edge Insulation R-Value 0.00 (m²-°K)/W

7. Partitions:

7.1. 1st Partition Details:

Partition Type Wall Partition
Area 27.6 m²
U-Value 1.260 W/(m²-°K)
Uncondit. Space Max Temp 35.0 °C
Ambient at Space Max Temp 41.0 °C
Uncondit. Space Min Temp 12.8 °C
Ambient at Space Min Temp 6.0 °C

7.2. 2nd Partition Details:

(No partition data).

2.4. People:

Occupancy 5.0 People
Activity Level Heavy Work
Sensible 153.9 W/person
Latent 271.1 W/person
Schedule People

2.5. Miscellaneous Loads:

Sensible 0 W
Schedule None
Latent 0 W
Schedule None

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
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HVAC CALCULATION NOTE FOR GCS WAREHOUSE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

02-Instrument Storage

1. General Details:

Floor Area	17.6	m ²
Avg. Ceiling Height	3.4	m
Building Weight	634.7	kg/m ²

1.1. OA Ventilation Requirements:

Space Usage	User-Defined
OA Requirement 1	0.0 L/s/person
OA Requirement 2	0.00 L/(s-m ²)
Space Usage Defaults	ASHRAE Standard 62.1-2010

2. Internals:

2.1. Overhead Lighting:

Fixture Type	Recessed (Unvented)
Wattage	20.00 W/m ²
Ballast Multiplier	1.00
Schedule	Lighting

2.2. Task Lighting:

Wattage	0.00 W/m ²
Schedule	None

2.3. Electrical Equipment:

Wattage	500.0 Watts
Schedule	Electrical Eq.

2.4. People:

Occupancy	1.0 Person
Activity Level	Heavy Work
Sensible	153.9 W/person
Latent	271.1 W/person
Schedule	People

2.5. Miscellaneous Loads:

Sensible	0 W
Schedule	None
Latent	0 W
Schedule	None

3. Walls, Windows, Doors:

Exp.	Wall Gross Area (m ²)	Window 1 Qty.	Window 2 Qty.	Door 1 Qty.
NNW	12.6	0	0	0
SSE	12.6	0	0	0
ENE	15.7	0	0	0

3.1. Construction Types for Exposure NNW

Wall Type Wall

3.2. Construction Types for Exposure SSE

Wall Type Wall

3.3. Construction Types for Exposure ENE

Wall Type Wall

4. Roofs, Skylights:

Exp.	Roof Gross Area (m ²)	Roof Slope (deg.)	Skylight Qty.
H	17.6	0	0

4.1. Construction Types for Exposure H

Roof Type Roof

5. Infiltration:

Design Cooling	65.60	L/s
Design Heating	65.60	L/s
Energy Analysis	65.60	L/s

Infiltration occurs at all hours.

6. Floors:

Type	Slab Floor On Grade
Floor Area	17.6 m ²
Total Floor U-Value	0.568 W/(m ² -°K)
Exposed Perimeter	12.2 m
Edge Insulation R-Value	0.00 (m ² -°K)/W

7. Partitions:

7.1. 1st Partition Details:

Partition Type	Wall Partition
Area	5.4 m ²
U-Value	1.260 W/(m ² -°K)
Uncondit. Space Max Temp	35.0 °C
Ambient at Space Max Temp	41.0 °C
Uncondit. Space Min Temp	12.8 °C
Ambient at Space Min Temp	6.0 °C

7.2. 2nd Partition Details:

(No partition data).

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
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	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	HV	CN	0006		D00

4.4 SYSTEM INPUT DATA

1. General Details:

Air System Name System
Equipment Type Terminal Units
Air System Type Packaged DX Fan Coil
Number of zones 2
Ventilation Direct Ventilation

2. Ventilation System Components:

(Common Ventilation System not used: no inputs)

3. Zone Components:

Space Assignments:

Zone 1: Zone 1	
01-Instrument Workshop	x1
Zone 2: Zone 2	
02-Instrument Storage	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	23.9	26.7	21.1	18.3	0.83
2	30.0	35.0	15.0	10.0	0.83

Thermostat Schedule Fan
Unoccupied Cooling is Available

Common Terminal Unit Data:

Cooling Coil:
Design Supply Temperature 18.0 °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 18.0 °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:

Cooling Sensible 10 %
Cooling Latent 10 %
Heating 10 %

	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک							
شماره پیمان:	HVAC CALCULATION NOTE FOR GCS WAREHOUSE							شماره صفحه: ۱۴ از ۲۱
۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه
	BK	GCS	PEDCO	120	HV	CN	0006	D00

4.5 ZONE SIZING SUMMARY

Air System Information

Air System Name System
Equipment Class TERM
Air System Type PKG-FC

Number of zones 2
Floor Area 37.0 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

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 (m ²)	Zone L/(s-m ²)
Zone 1	7.1	997	997	Jul 1500	3.7	19.4	51.37
Zone 2	2.1	144	144	Jul 1500	1.2	17.6	8.21

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	10.8	6.9	24.4 / 21.2	18.7 / 18.4	-	Aug 1400
Zone 2	4.0	1.9	30.6 / 25.8	19.6 / 19.3	-	Jul 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	3.7	21.1 / 24.2	-	997	0.000	0.000	0
Zone 2	1.2	15.1 / 22.2	-	144	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 (m ²)	Space L/(s-m ²)
Zone 1							
01-Instrument Workshop	1	7.1	Jul 1500	997	3.7	19.4	51.37
Zone 2							
02-Instrument Storage	1	2.1	Jul 1500	144	1.2	17.6	8.21

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
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HVAC CALCULATION NOTE FOR GCS WAREHOUSE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
D00	0006	CN	HV	120	PEDCO	GCS	BK																			

4.6 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 (m ²)	Maximum Occupants	Maximum Supply Air (L/s)	Required Outdoor Air (L/s/person)	Required Outdoor Air (L/(s-m ²))	Required Outdoor Air (L/s)	Required Outdoor Air (% of supply)	Uncorrected Outdoor Air (L/s)
Zone 1									
01-Instrument Workshop	1	19.4	5.0	996.7	0.00	0.00	0.0	0.0	0.0
Zone 2									
02-Instrument Storage	1	17.6	1.0	144.5	0.00	0.00	0.0	0.0	0.0
Totals (incl. Space Multipliers)				1141.1					0.0

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE								شماره صفحه: ۱۶ از ۲۱
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	HV	CN	0006	D00	

4.7 AIR SYSTEM DESIGN LOAD SUMMARY:

	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Aug 1400 COOLING OA DB / WB 40.6 °C / 30.4 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 4.4 °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	64 m ²	195	-	64 m ²	300	-
Roof Transmission	37 m ²	625	-	37 m ²	551	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	3 m ²	109	-	3 m ²	118	-
Floor Transmission	37 m ²	0	-	37 m ²	114	-
Partitions	33 m ²	337	-	33 m ²	304	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	0 W	17	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2500 W	2500	-	0	0	-
People	6	923	1627	0	0	0
Infiltration	-	3470	4360	-	3102	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	817	599	10%	449	0
>> Total Zone Loads	-	8992	6586	-	4938	0
Zone Conditioning	-	8753	6586	-	4953	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	-	8753	6586	-	4953	0
Terminal Unit Cooling	-	8753	6186	-	0	0
Terminal Unit Heating	-	0	-	-	4953	-
>> Total Conditioning	-	8753	6186	-	4953	0
Key:	Positive values are clg loads Negative values are htg loads			Positive values are htg loads Negative values are clg loads		

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE								شماره صفحه: ۱۷ از ۲۱
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	HV	CN	0006	D00	

4.8 ZONE DESIGN LOAD SUMMARY:

Zone 1	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 41.0 °C / 30.5 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 4.4 °C		
	OCCUPIED T-STAT 23.9 °C			OCCUPIED T-STAT 21.1 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	23 m²	98	-	23 m²	146	-
Roof Transmission	19 m²	413	-	19 m²	358	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	3 m²	112	-	3 m²	118	-
Floor Transmission	19 m²	0	-	19 m²	68	-
Partitions	28 m²	325	-	28 m²	289	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	0 W	9	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2000 W	2000	-	0	0	-
People	5	769	1356	0	0	0
Infiltration	-	2707	3394	-	2391	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	643	475	10%	337	0
>> Total Zone Loads	-	7077	5224	-	3706	0

Zone 2	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 41.0 °C / 30.5 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 4.4 °C		
	OCCUPIED T-STAT 30.0 °C			OCCUPIED T-STAT 15.0 °C		
ZONE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m²	0	-	0 m²	-	-
Wall Transmission	41 m²	103	-	41 m²	154	-
Roof Transmission	18 m²	243	-	18 m²	193	-
Window Transmission	0 m²	0	-	0 m²	0	-
Skylight Transmission	0 m²	0	-	0 m²	0	-
Door Loads	0 m²	0	-	0 m²	0	-
Floor Transmission	18 m²	0	-	18 m²	46	-
Partitions	5 m²	22	-	5 m²	15	-
Ceiling	0 m²	0	-	0 m²	0	-
Overhead Lighting	0 W	8	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	500 W	500	-	0	0	-
People	1	154	271	0	0	0
Infiltration	-	870	863	-	712	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	190	113	10%	112	0
>> Total Zone Loads	-	2090	1247	-	1232	0

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک							
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE							شماره صفحه: ۱۸ از ۲۱
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	PEDCO	120	HV	CN	0006	D00

4.9 SPACE DESIGN LOAD SUMMARY:

TABLE 1.1.A. COMPONENT LOADS FOR SPACE " 01-Instrument Workshop " IN ZONE " Zone 1 "						
	DESIGN COOLING			DESIGN HEATING		
	COOLING DATA AT Jul 1500 COOLING OA DB / WB 41.0 °C / 30.5 °C OCCUPIED T-STAT 23.9 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 4.4 °C OCCUPIED T-STAT 21.1 °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	23 m ²	98	-	23 m ²	146	-
Roof Transmission	19 m ²	413	-	19 m ²	358	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	3 m ²	112	-	3 m ²	118	-
Floor Transmission	19 m ²	0	-	19 m ²	68	-
Partitions	28 m ²	325	-	28 m ²	289	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	0 W	9	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	2000 W	2000	-	0	0	-
People	5	769	1356	0	0	0
Infiltration	-	2707	3394	-	2391	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	643	475	10%	337	0
>> Total Zone Loads	-	7077	5224	-	3706	0

TABLE 1.1.B. ENVELOPE LOADS FOR SPACE " 01-Instrument Workshop " IN ZONE " Zone 1 "						
	Area	U-Value	Shade	COOLING TRANS	COOLING SOLAR	HEATING TRANS
	(m ²)	(W/(m ² ·°K))	Coeff.	(W)	(W)	(W)
NNW EXPOSURE						
WALL	16	0.419	-	68	-	102
SSE EXPOSURE						
WALL	7	0.419	-	30	-	44
DOOR	3	3.000	-	112	-	118
H EXPOSURE						
ROOF	19	1.220	-	413	-	358

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک								
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE								شماره صفحه: ۱۹ از ۲۱
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	HV	CN	0006	D00	

TABLE 2.1.A. COMPONENT LOADS FOR SPACE " 02-Instrument Storage " IN ZONE " Zone 2 "						
DESIGN COOLING			DESIGN HEATING			
COOLING DATA AT Jul 1500 COOLING OA DB / WB 41.0 °C / 30.5 °C OCCUPIED T-STAT 30.0 °C			HEATING DATA AT DES HTG HEATING OA DB / WB 6.0 °C / 4.4 °C OCCUPIED T-STAT 15.0 °C			
SPACE LOADS	Details	Sensible (W)	Latent (W)	Details	Sensible (W)	Latent (W)
Window & Skylight Solar Loads	0 m ²	0	-	0 m ²	-	-
Wall Transmission	41 m ²	103	-	41 m ²	154	-
Roof Transmission	18 m ²	243	-	18 m ²	193	-
Window Transmission	0 m ²	0	-	0 m ²	0	-
Skylight Transmission	0 m ²	0	-	0 m ²	0	-
Door Loads	0 m ²	0	-	0 m ²	0	-
Floor Transmission	18 m ²	0	-	18 m ²	46	-
Partitions	5 m ²	22	-	5 m ²	15	-
Ceiling	0 m ²	0	-	0 m ²	0	-
Overhead Lighting	0 W	8	-	0	0	-
Task Lighting	0 W	0	-	0	0	-
Electric Equipment	500 W	500	-	0	0	-
People	1	154	271	0	0	0
Infiltration	-	870	863	-	712	0
Miscellaneous	-	0	0	-	0	0
Safety Factor	10% / 10%	190	113	10%	112	0
>> Total Zone Loads	-	2090	1247	-	1232	0

TABLE 2.1.B. ENVELOPE LOADS FOR SPACE " 02-Instrument Storage " IN ZONE " Zone 2 "						
	Area	U-Value	Shade	COOLING	COOLING	HEATING
	(m ²)	(W/(m ² -°K))	Coeff.	TRANS	SOLAR	TRANS
				(W)	(W)	(W)
NNW EXPOSURE						
WALL	13	0.419	-	28	-	47
SSE EXPOSURE						
WALL	13	0.419	-	28	-	47
ENE EXPOSURE						
WALL	16	0.419	-	47	-	59
H EXPOSURE						
ROOF	18	1.220	-	243	-	193

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک							
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE							شماره صفحه ۲۰: از ۲۱
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	PEDCO	120	HV	CN	0006	D00

5.0 Equipment Selection

5.1 AIR CONDITIONING UNIT (SPLIT UNIT)

Item	Service Area	
	Instrument Workshop	Instrument Storage
Calculated Sensible Cooling Load(w)	7077	2090
Calculated Latent Cooling Load(w)	5224	1247
Calculated Total Cooling Load(w)	12301	3337
Calculated Total Cooling Load (btu/hr)	42010	11396
Calculated Sensible Heating Load(w)	3706	1232
Calculated Sensible Heating Load (btu/hr)	12657	4208
Eq. ID (1202-SUI/SUO-GCSWH-XX)	01,02	03
Equipment QTY.	2	1
Equipment Type	W.M.*	W.M.*
Calculated Cooling Load+ 10% Over Cap. (btu/hr) (each)	23106	12536
Calculated Heating Load+ 10% Over Cap. (btu/hr)	13923	4629
Selected Eq. Nominal Cooling Cap. (btu/hr)	B.V.**	B.V.**
Selected Eq. Actual Cooling Cap. (btu/hr)	B.V.**	B.V.**
Selected Eq. Actual Heating Cap. (btu/hr)	B.V.**	B.V.**
Power Supply (V/PH/Hz)	230/1/50	230/1/50
Max. Power Consumption (w) Eq. (Cooling/Heating)	B.V.**	B.V.**
REMARKE ***	Cooling & Heating (Heat Pump)	Cooling & Heating (Heat Pump)

*Wall Mounted

**By Vendor

***Indoor & Outdoor Unit-T3, With Thermostat and All Standard Accessory

5.2 EXHAUST FAN SELECTION

1202-EF-GCSWH-01 (Storage, Instrument Workshop, Toilet and Instrument Storage)

Storage

Air Flow = $22.28 \text{ (area, m}^2\text{)} \times 3.35 \text{ (height, m)} \times 4 \text{ ACH} \div 60 \text{ min} = 4.98 \text{ m}^3/\text{min} = 83 \text{ L/S} = 176 \text{ cfm}$

Instrument Workshop

Air Flow = $19.39 \text{ (area, m}^2\text{)} \times 3.35 \text{ (height, m)} \times 6 \text{ ACH} \div 60 \text{ min} = 6.50 \text{ m}^3/\text{min} = 108.33 \text{ L/S} = 229.54 \text{ cfm}$

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک							
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	HVAC CALCULATION NOTE FOR GCS WAREHOUSE							شماره صفحه: ۲۱ از ۲۱
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	PEDCO	120	HV	CN	0006	D00

Toilet

Air Flow = $2.44 \text{ (area, m}^2\text{)} \times 3.35 \text{ (height, m)} \times 10 \text{ ACH} \div 60 \text{ min} = 1.36 \text{ m}^3/\text{min} = 22.67 \text{ L/S} = 48 \text{ cfm}$

Instrument Storage

Air Flow = $17.58 \text{ (area, m}^2\text{)} \times 3.35 \text{ (height, m)} \times 4 \text{ ACH} \div 60 \text{ min} = 3.93 \text{ m}^3/\text{min} = 65.5 \text{ L/S} = 139 \text{ cfm}$

Item		1202-EF-GCSWH-01
Service Area		Storage, Instrument Workshop, Toilet and Instrument Storage
Equipment QTY.		1
Air Flow(L/S)		279.4
Air Flow(CFM)		592
Component Pressure Drop (External) (In.WG.)	Sand Tarp Louver	0.03
	Blast Proof Valve-01	0.08
	Fire Damper-01	0.01
	Intake Air Duct	0.032
	Intake Air Duct Volume Damper	0.04
	Intake Air Diffuser	0.062
	Exhaust Air Diffuser/Register	0.065
	Exhaust Air Duct Volume Damper	0.04
	Exhaust Air Duct	0.029
	Blast Proof Valve-02	0.08
	Fire Damper-02	0.01
Total Pressure Drop * + 10% Over S.F.	(In.WG.)	0.478
	(Pa)	118.95
Exhaust Fan type		Utility Ex. Fan
Power Supply (V/PH/Hz)		230/1/50
Power Consumption (w) Each Eq.		By Vendor
REMARKE		Equipped With Bird Mesh and Gravity Damper – Standard Type

*Total Pressure Drop Should Be Specified By Vendor.