

**Cost Estimate - MULTI V****Date: 2020/12/11****5. Pipes**

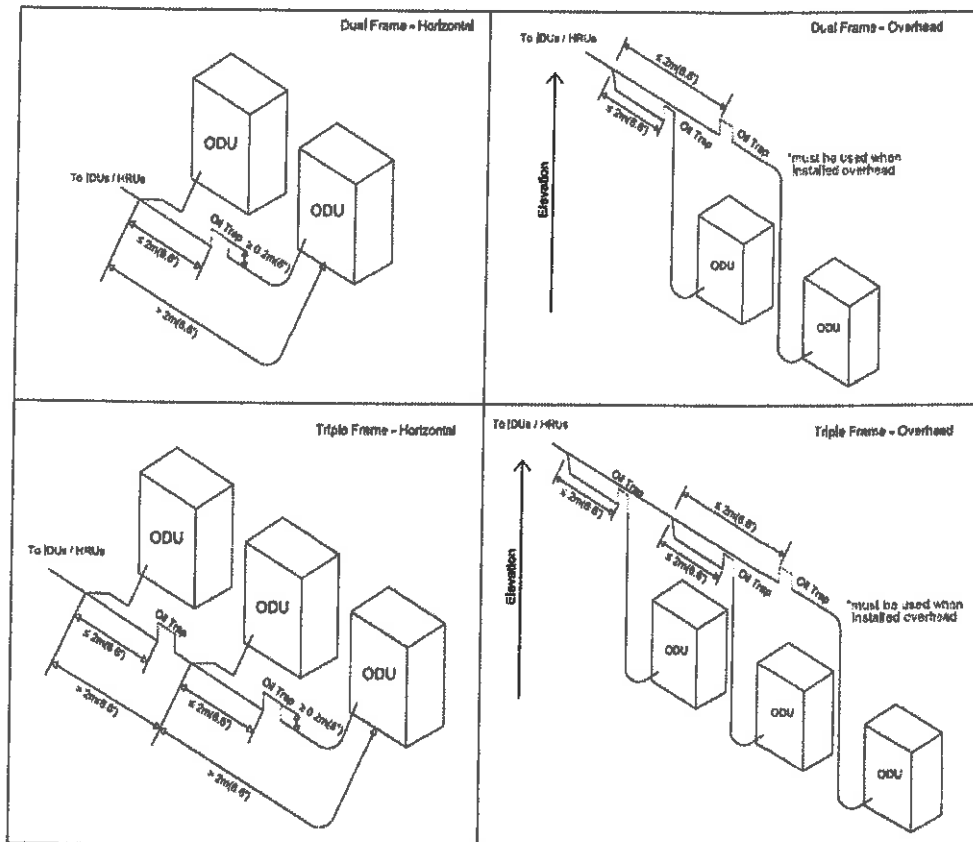
Diameter(mm)	Length(m)	Unit Cost	Total Cost
19.05	21.0		0
22.2	9.0		0
28.58	21.0		0
34.9	15.0		0
<b>Sub Total</b>			<b>0</b>

**6. Refrigerant**

Refrigerant	Additional Refrigerant(kg)	Unit Cost	Total Cost
R410A	12.79		0
<b>Sub Total</b>			<b>0</b>

## Oil Trap Requirement

Date: 2020/12/11



### Oil trap required:

- Overhead piping (Water case)
- Horizontal piping when distance between the frame and connecting Y-branch exceeds 2 m (6.6 ft).
- High Gas and Low Gas pipes only
- Oil trap must be minimum 0.2 m (8 inch) high, 0.2 m (8 inch) wide.
- Oil trap must be located close to connecting Y-branch (no farther than 2 m (6.6 ft)).

Connecting Y-branch must be installed horizontally.

# **VRV SYSTEM2 : ODU2**

Date: 2020/12/11



Prepared by: Bvi Consulting Engineers

**Customer/Contractor Information**

***Customer***

Name : DPW / DOJ

Address : Chapel Street

City : Kimberley

State/Province : Northern Cape

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## Abbreviations

Abbreviations	Description
TC	Total Cooling Capacity
SC	Sensible Cooling Capacity
HC	Heating Capacity
Capacity Ratio(%)	Corrected Capacity / Room Load
PI	Power input
IDU	Indoor Unit
ODU	Outdoor Unit
DBT	Dry Bulb Temperature
WBT	Wet Bulb Temperature
IAT	Indoor Air Temperature
OAT	Outdoor Air Temperature
EWT	Entering Water Temperature
LWT	Leaving Water Temperature
RH	Relative Humidity
OA	Outdoor Air
RA	Return Air
SA	Supply Air
EA	Exhaust Air
MCA	Minimum Circuit Ampere
MFA	Maximum Fuse Ampere
MOP	Maximum rating of Overcurrent Protective device
FLA	Full Load Ampere
RLA	Rated Load Ampere
EER	Energy Efficiency Ratio
COP	Coefficient of Performance
ESP	External Static Pressure
AFR	Air Flow Rate
EDT	Estimated Discharge Temperature
Qty	Quantity
Liq	Liquid
WxHxD	Width x Height x Depth
H / M / L	High / Middle / Low
CR	Combination Ratio
Freq.	Frequency
Volt	Voltage
CF(%)	Correction Factor (Total Cooling Capacity / Total Rated Cooling Capacity)

## Building Load Summary

1. Project name: Kimberley High Court ODU 2 Project\_20201211
2. Date: 2020/12/11
3. Location : Nation (BLOEMFONTEIN, South Africa), Altitude (1348m)
4. Design conditions

		Cooling	Heating
OAT	DBT(°C)	34.0	-2.2
	WBT(°C)	15.4	-3.0
	RH(%)	13.8	86.0
IAT	DBT(°C)	27.0	20.0
	WBT(°C)	19.0	13.4
	RH(%)	49.2	50.0

### 5. Cooling and Heating Loads

Floor Name	Room Name	Cooling Load(kW)		Heating Load(kW)
		Total	Sensible	
	AC2.1	As Shown	See System tree	As Shown
	AC2.2	As Shown	See System tree	As Shown
	AC2.3	As Shown	See System tree	As Shown
	AC2.4	As Shown	See System tree	As Shown
	AC2.5	As Shown	See System tree	As Shown
	AC2.6	As Shown	See System tree	As Shown
	AC2.7	As Shown	See System tree	As Shown
	AC2.8	As Shown	See System tree	As Shown
	AC2.8	As Shown	0.00	As Shown

## Model Selection - Summary

Date: 2020/12/11

### 1. Outdoor Units

No.	Model Name	Quantity	Description
1	ARUM280LTE5		
1.1	ARUM160LTE5	1	50,60Hz/R410A/Heat Recovery/MULTI V 5/Southern Africa
1.2	ARUM120LTE5	1	50,60Hz/R410A/Heat Recovery/MULTI V 5/Southern Africa
Total		2	

### 2. Indoor Units

No.	Model Name	Quantity	Description
1	ARNU18GSKN4	3	Wall Mounted(Standard)
2	ARNU24GSKN4	6	Wall Mounted(Standard)
Total		9	

### 3. Branch/Header

No.	Model Name	Quantity
1	ARLB07121	1
2	ARCNB21	1
3	PRHR063	2

### 4. Pipes

No.	Diameter(Liq-Gas,mm)	Length(m)
1	6.35 : 12.7	11.0
2	9.52 : 15.88	51.0
3	9.52 : 19.05 : 22.2	1.0
4	12.7 : 22.2 : 28.58	17.0
5	19.05 : 28.58 : 34.9	20.0

### 5. Accessories

Index	Model Name	Quantity	Description
IDU	PREMT8001	8	Standard II Wired Remote Controller (White)



## System Model Selection - ODU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 1. Design conditions

	Cooling			Heating		
	DBT(°C)	WBT(°C)	RH(%)	DBT(°C)	WBT(°C)	RH(%)
OAT	34.0	15.4	13.8	-2.2	-3.0	86.0
IAT	27.0	19.0	49.2	20.0	13.4	50.0

### 2. Outdoor Units

Model Name	Maximum Indoor Units	Maximum CR (kW(%))	Current CR(%)	Precharged Refrigerant (kg)	Additional Refrigerant (kg)
ARUM280LTE5	66	125.4(160%)	75.8 %	23.00	15.26

Model Name	Combination
ARUM280LTE5	ARUM160LTE5 + ARUM120LTE5

Rated / Corrected Capa. (kW)		Rated / Corrected Power Input (kW)	
Cooling	Heating	Cooling	Heating
75.4/56.4	85.2/57.8	17.3/9.1	20.6/18.9

Efficiency(W/W)		Weight(kg)	Dimension (WxHxD) (mm)	Electrical Characteristics				
Cooling	Heating			Volt (V)	Phase	Freq. (Hz)	MCA (A)	Breaker(A)
6.2	3.1	(237)+(215)	(194x189x700)x1+(320x189x700)x1	380-415	3	50/60	80.9	63

### 3. Pipes

Diameter(Liq/Gas,mm)	Length(m)
6.35 : 12.7	11.0
9.52 : 15.88	51.0
9.52 : 19.05 : 22.2	1.0
12.7 : 22.2 : 28.58	17.0
19.05 : 28.58 : 34.9	20.0

### 4. Branch/Header

Model Name	Quantity
ARLB07121	1
ARCNB21	1
PRHR063	2
-	-
-	-

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length. The result can be slightly different from Product Data Book due to simulation.

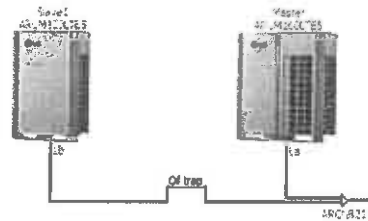
### System Model Selection - ODU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

#### 5. Branch-Branch



Branch-Branch		
Pipe	Diameter(mm)	Length(m)
LA	-	-
LB	-	-

Outdoor Unit-Branch		
Pipe	Diameter(mm)	Length(m)
La	12.7 : 22.2 : 28.58	-
Lb	12.7 : 19.05 : 28.58	-
Lc	-	-
Ld	-	-

Height Difference	
Pipe	Length(m)
Hb (Master-Slave1)	-
Hc (Master-Slave2)	-
Hd (Master-Slave3)	-

#Notes: Height difference is calculated based on master ODU.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 6. Indoor Units(1)

Room	Room Load(kW)			IAT(°C)				Model Name	Rated / Corrected Caps.(kW)			Capacity Ratio(%)		
	TC	SC	HC	Cooling		Heating			TC	SC	HC	TC	SC	HC
				DBT	WBT	DBT	WBT							
AC2.1	-	-	-	27.0	19.0	20.0	13.4	ARNU18GSKN4	5.6/5.3	4.0/3.8	6.3/5.4	-	-	-
AC2.2	-	-	-	27.0	19.0	20.0	13.4	ARNU18GSKN4	5.6/5.3	4.0/3.8	6.3/5.4	-	-	-
AC2.3	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-
AC2.4	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-
AC2.5	-	-	-	27.0	19.0	20.0	13.4	ARNU18GSKN4	5.6/5.3	4.0/3.8	6.3/5.4	-	-	-
AC2.6	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-
AC2.7	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-
AC2.8	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-
AC2.8	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.7	5.0/4.7	7.5/6.9	-	-	-

#Notes: Correction factor is corrected by such as, but not limited to, Indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 7. Indoor Units(2)

Tag	Model Name	Type	EDT (°C)		AFR (CMM)	Remark
			Cooling	Heating		
1	ARNU18GSKN4	WALL MOUNTED	13.6	39.3	14.0	NA
2	ARNU18GSKN4	WALL MOUNTED	13.6	39.3	14.0	NA
3	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA
4	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA
7	ARNU18GSKN4	WALL MOUNTED	13.6	39.3	14.0	NA
8	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA
9	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA
10	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA
11	ARNU24GSKN4	WALL MOUNTED	11.5	42.5	15.2	NA

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 8. Indoor Units(3)

Tag	Model Name	Weight	Dimension (WxHxD)	Electrical Characteristics				
				Volt (V)	Phase	Freq. (Hz)	MCA (A)	FLA (A)
1	ARNU18GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
2	ARNU18GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
3	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
4	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
7	ARNU18GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
8	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
9	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
10	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52
11	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.65	0.52

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Validation Check

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 9. System Validation Check - General Condition

Contents	Limit	Current(Max value : connected unit)
Total pipe length	1000.0 m	100.0 m
Longest equivalent pipe length	175.0 m	50.0 m : ARNU24GSKN4[9]
Longest pipe length after 1st branch	40.0 m	27.0 m : ARNU24GSKN4[9]
Height difference [Above: IDU, Below: ODU]	110.0 m	0.0 m
Height difference [Above: ODU, Below: IDU]	110.0 m	3.0 m : ARNU24GSKN4[11]
Height difference [IDU to IDU]	40.0 m	0.0 m : ARNU18GSKN4[1]-ARNU18GSKN4[1]
Longest actual pipe length	150.0 m	47.0 m : ARNU24GSKN4[9]
Height difference [HRU to HRU]	30.0 m	0.0 m
Height difference [HRU to HRU connected in series (same branch)]	5.0 m	0.0 m
Height difference [HRU to IDU]	15.0 m	0.0 m

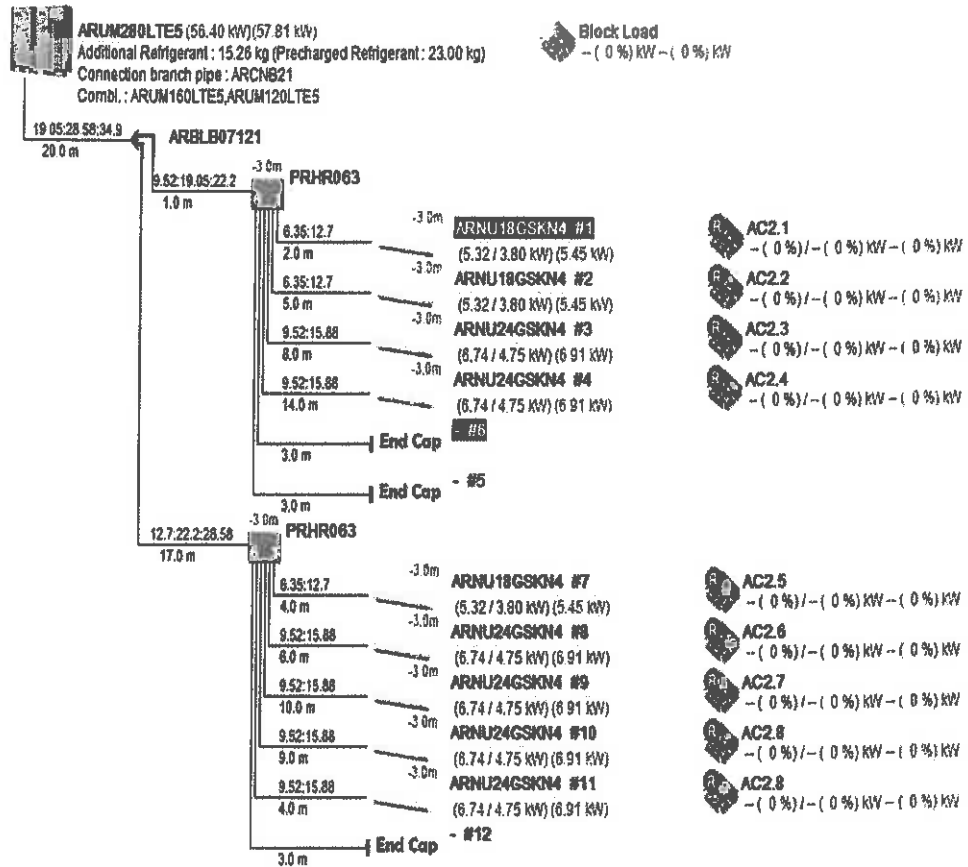
Note : Except "Longest equivalent pipe length", the other pipe length limitations are actual length.

## System Tree Diagram 2

System Name: Multi V1

Date: 2020/12/11

System No : 1/1



\*\* : Conditional Application

Three pipe : Liquid: High Gas : Low Gas

Two pipe : Liquid: Gas

- Remote Controller,
- Leakage Detector,
- Group Control,
- Temperature Sensor
- Dry Contact
- Air purification kit







Indoor Units : 9 of 56  
 Combination Ratio : 59.4 of 78.4 ( 76% )  
 Total Pipe : 100.0 of 1000.0 m

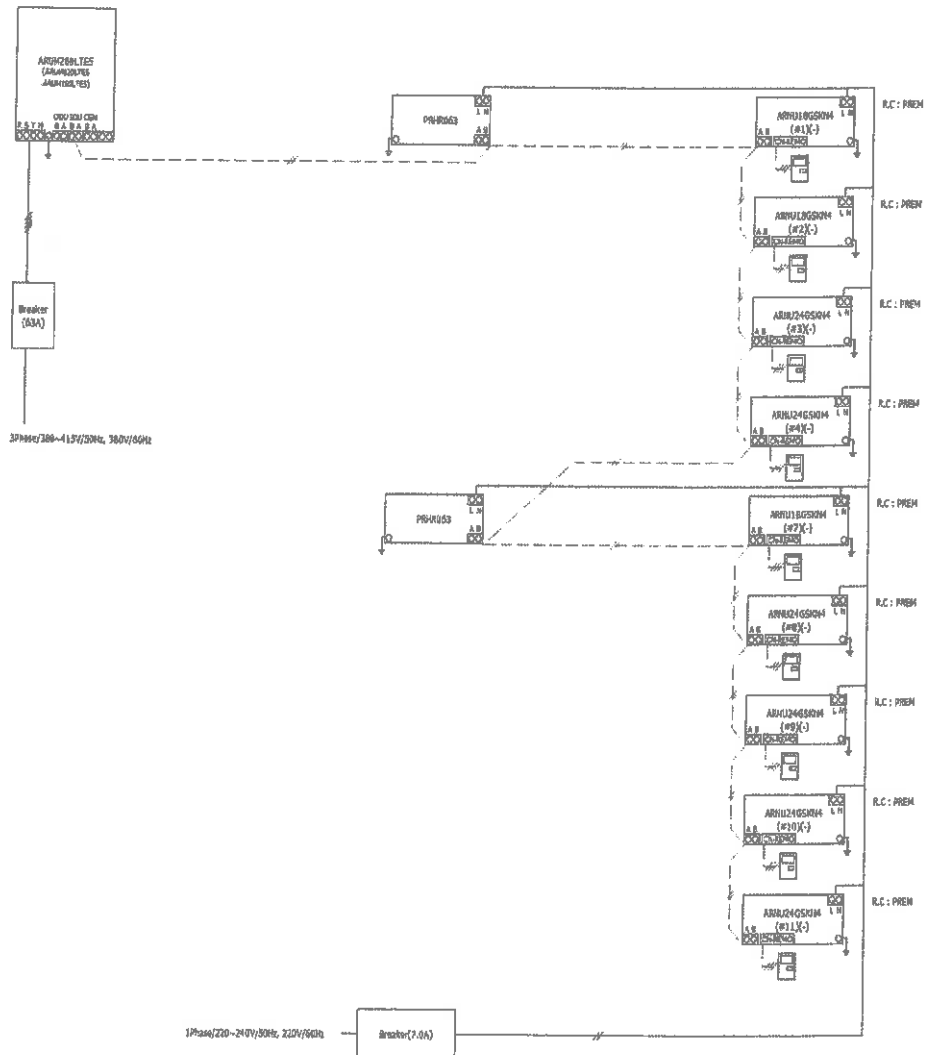
# System Schematic Diagram 2

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

-  Power line(Outdoor unit)
-  Power line(Indoor unit/HR unit)
-  Communication line (ODU-ODU / ODU-ODU) VCTF-SB 2C x 1.3 - 1.5 mm<sup>2</sup>
-  Communication line (ODU-CEU) VCTF-SB 2C x 0.75 - 1.5 mm<sup>2</sup>
-  \*VCTF-SB 4C x 0.75 - 1.5 mm<sup>2</sup>(AC Ex: Simple central controller)
-  Communication line(Remote controller) NYG 2A x 3C



# Note :  
We recommend one size bigger circuit breaker than the calculated size.



## System Cost Estimate

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

Total Cost	0
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### 1. Outdoor Units

Model Name	Quantity	Unit Cost	Total Cost
ARUM120LTE5	1		0
ARUM160LTE5	1		0
<b>Sub Total</b>	<b>2</b>		<b>0</b>

### 2. Indoor Units

Model Name	Quantity	Unit Cost	Total Cost
ARNU18GSKN4	3		0
ARNU24GSKN4	6		0
<b>Sub Total</b>	<b>9</b>		<b>0</b>

### 3. Accessories

Model Name	Quantity	Unit Cost	Total Cost
PREMTB001	9		0
<b>Sub Total</b>	<b>9</b>		<b>0</b>

### 4. Branch/Header

Model Name	Quantity	Unit Cost	Total Cost
ARLB07121	1		0
ARCNB21	1		0
PRHR063	2		0
<b>Sub Total</b>	<b>4</b>		<b>0</b>

### 5. Pipes

Diameter(mm)	Length(m)	Unit Cost	Total Cost
8.35	11.0		0
9.52	52.0		0
12.7	26.0		0
15.88	51.0		0
19.05	21.0		0

## System Cost Estimate

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 5. Pipes

Diameter(mm)	Length(m)	Unit Cost	Total Cost
22.2	18.0		0
28.58	37.0		0
34.9	20.0		0
<b>Sub Total</b>			<b>0</b>

### 6. Refrigerant

Refrigerant	Additional Refrigerant(kg)	Unit Cost	Total Cost
R410A	15.26		0
<b>Sub Total</b>			<b>0</b>

**Cost Estimate - MULTI V****Date: 2020/12/11**

<b>Total Cost</b>	<b>0</b>
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**1. Outdoor Units**

Model Name	Quantity	Unit Cost	Total Cost
ARUM120LTE5	1		0
ARUM160LTE5	1		0
<b>Sub Total</b>	<b>2</b>		<b>0</b>

**2. Indoor Units**

Model Name	Quantity	Unit Cost	Total Cost
ARNU18GSKN4	3		0
ARNU24GSKN4	6		0
<b>Sub Total</b>	<b>9</b>		<b>0</b>

**3. Accessories**

Model Name	Quantity	Unit Cost	Total Cost
PREMTB001	9		0
<b>Sub Total</b>	<b>9</b>		<b>0</b>

**4. Branch/Header**

Model Name	Quantity	Unit Cost	Total Cost
ARLB07121	1		0
ARCNB21	1		0
PRHR063	2		0
<b>Sub Total</b>	<b>4</b>		<b>0</b>

**5. Pipes**

Diameter(mm)	Length(m)	Unit Cost	Total Cost
6.35	11.0		0
9.52	62.0		0
12.7	28.0		0
15.88	51.0		0
19.05	21.0		0
22.2	18.0		0
26.58	37.0		0

### Cost Estimate - MULTI V

Date: 2020/12/11

#### 5. Pipes

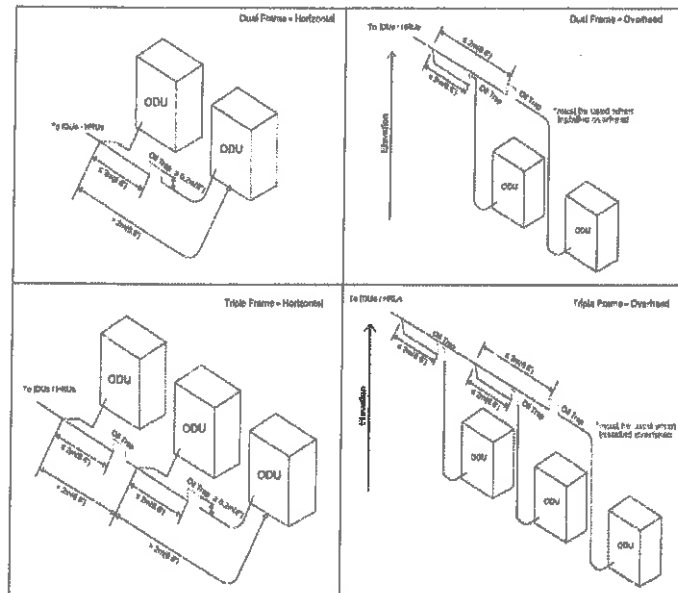
Diameter(mm)	Length(m)	Unit Cost	Total Cost
34.9	20.0		0
SubTotal			0

#### 6. Refrigrant

Refrigerant	Additional Refrigerant(kg)	Unit Cost	Total Cost
R410A	16.26		0
SubTotal			0

## Oil Trap Requirement

Date: 2020/12/11



### Oil trap required:

- Overhead piping (Water case)
- Horizontal piping when distance between the frame and connecting Y-branch exceeds 2 m (6.6 ft).
- High Gas and Low Gas pipes only
- Oil trap must be minimum 0.2 m (8 inch) high, 0.2 m (8 inch) wide.
- Oil trap must be located close to connecting Y-branch (no farther than 2 m (6.6 ft)).

Connecting Y-branch must be installed horizontally.

# **VRV SYSTEM3 : ODU3**

**Date: 2020/12/11**



**Prepared by: BVI Consulting Engineers**

**Customer/Contractor Information**

***Customer***

Name :  
Address :  
City :  
State/Province :  
Country :  
Phone Number :  
Fax Number :  
E-mail :

***Contractor***

Name :  
Address :  
City :  
State/Province :  
Country :  
Phone Number :  
Fax Number :  
E-mail :

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11. Pipe Summary



**Abbreviations**

Abbreviations	Description
TC	Total Cooling Capacity
SC	Sensible Cooling Capacity
HC	Heating Capacity
Capacity Ratio(%)	Corrected Capacity / Room Load
PI	Power Input
IDU	Indoor Unit
ODU	Outdoor Unit
DBT	Dry Bulb Temperature
WBT	Wet Bulb Temperature
IAT	Indoor Air Temperature
OAT	Outdoor Air Temperature
EWT	Entering Water Temperature
LWT	Leaving Water Temperature
RH	Relative Humidity
OA	Outdoor Air
RA	Return Air
SA	Supply Air
EA	Exhaust Air
MCA	Minimum Circuit Ampere
MFA	Maximum Fuse Ampere
MOP	Maximum rating of Overcurrent Protective device
FLA	Full Load Ampere
RLA	Rated Load Ampere
EER	Energy Efficiency Ratio
COP	Coefficient of Performance
ESP	External Static Pressure
AFR	Air Flow Rate
EDT	Estimated Discharge Temperature
Qty	Quantity
Liq	Liquid
WxHxD	Width x Height x Depth
H / M / L	High / Middle / Low
CR	Combination Ratio
Freq.	Frequency
Volt	Voltage
CF(%)	Correction Factor (Total Cooling Capacity / Total Rated Cooling Capacity)

## Building Load Summary

1. Project name: Kimberley High Court ODU 3 Project\_20201211
2. Date: 2020/12/11
3. Location : Nation (BLOEMFONTEIN, South Africa), Altitude (1348m)
4. Design conditions

		Cooling	Heating
OAT	DBT(°C)	34.0	-2.2
	WBT(°C)	15.4	-3.0
	RH(%)	13.8	86.0
IAT	DBT(°C)	27.0	20.0
	WBT(°C)	19.0	13.4
	RH(%)	49.2	50.0

### 5. Cooling and Heating Loads

Floor Name	Room Name	Cooling Load(kW)		Heating Load(kW)
		Total	Sensible	
	AC3.1	0.00	0.00	0.00
	AC3.2	0.00	0.00	0.00
	AC3.3	0.00	0.00	0.00
	AC3.4	0.00	0.00	0.00
	AC3.5	0.00	0.00	0.00
	AC3.6	0.00	0.00	0.00

**Model Selection - Summary****Date: 2020/12/11****1. Outdoor Units**

No.	Model Name	Quantity	Description
1	ARUM180LTE5	1	50,60Hz/R410A/Heat Recovery/MULTI V B/Southern Africa
Total		1	

**2. Indoor Units**

No.	Model Name	Quantity	Description
1	ARNU18GSKN4	2	Wall Mounted(Standard)
2	ARNU24GSKN4	4	Wall Mounted(Standard)
Total		6	

**3. Branch/Header**

No.	Model Name	Quantity
1	PRHR083	1

**4. Pipes**

No.	Diameter(Liq:Gas,mm)	Length(m)
1	6.35 : 12.7	17.0
2	9.52 : 15.88	39.0
3	15.88 : 22.2 : 28.58	15.0

**5. Accessories**

Index	Model Name	Quantity	Description
IDU	PREMTB001	5	Standard II Wired Remote Controller (White)

## System Model Selection - ODU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 1. Design conditions

	Cooling			Heating		
	DBT(°C)	WBT(°C)	RH(%)	DBT(°C)	WBT(°C)	RH(%)
OAT	34.0	15.4	13.6	-2.2	-3.0	88.0
IAT	27.0	19.0	49.2	20.0	13.4	50.0

### 2. Outdoor Units

Model Name	Maximum Indoor Units	Maximum CR (kW(%))	Current CR(%)	Precharged Refrigerant (kg)	Additional Refrigerant (kg)
ARUM180LTE5	45	100.8(200%)	78.8 %	16.00	8.03

Rated / Corrected Capa. (kW)		Rated / Corrected Power Input (kW)	
Cooling	Heating	Cooling	Heating
50.4/38.1	56.7/38.8	9.8/5.8	11.9/11.4

Efficiency(W/W)		Weight(kg)	Dimension (WxDxD) (mm)	Electrical Characteristics				
Cooling	Heating			Volt (V)	Phase	Freq. (Hz)	MCA (A)	Breaker (A)
6.6	3.4	300	1240x1690x760	380-415	3	50/80	42.7	50

### 3. Pipes

Diameter(Liq:Gas,mm)	Length(m)
6.35 : 12.7	17.0
9.52 : 15.88	39.0
15.88 : 22.2 : 28.58	15.0

### 4. Branch/Header

Model Name	Quantity
PRHR083	1
-	-
-	-

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length. The result can be slightly different from Product Data Book due to simulation.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 5. Indoor Units(1)

Room	Room Load(kW)			IAT(°C)				Model Name	Rated / Corrected Caps.(kW)			Capacity Ratio(%)		
	TC	SC	HC	Cooling		Heating			TC	SC	HC	TC	SC	HC
				DBT	WBT	DBT	WBT							
AC3.1	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.8	5.0/4.8	7.5/7.0	-	-	-
AC3.2	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.8	5.0/4.8	7.5/7.0	-	-	-
AC3.3	-	-	-	27.0	19.0	20.0	13.4	ARNU18GSKN4	5.8/5.4	4.0/3.8	6.3/5.5	-	-	-
AC3.4	-	-	-	27.0	19.0	20.0	13.4	ARNU18GSKN4	5.6/5.4	4.0/3.8	6.3/5.5	-	-	-
AC3.5	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.8	5.0/4.8	7.5/7.0	-	-	-
AC3.6	-	-	-	27.0	19.0	20.0	13.4	ARNU24GSKN4	7.1/6.8	5.0/4.8	7.5/7.0	-	-	-

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 6. Indoor Units(2)

Tag	Model Name	Type	EDT (°C)		AFR (CMM)	Remark
			Cooling	Heating		
2	ARNU24GSKN4	WALL MOUNTED	11.3	42.7	15.2	NA
1	ARNU24GSKN4	WALL MOUNTED	11.3	42.7	15.2	NA
3	ARNU18GSKN4	WALL MOUNTED	13.4	39.4	14.0	NA
4	ARNU18GSKN4	WALL MOUNTED	13.4	39.4	14.0	NA
5	ARNU24GSKN4	WALL MOUNTED	11.3	42.7	15.2	NA
6	ARNU24GSKN4	WALL MOUNTED	11.3	42.7	15.2	NA

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Model Section - IDU

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 7. Indoor Units(3)

Tag	Model Name	Weight	Dimension (WxHxD)	Electrical Characteristics				
				Volt (V)	Phase	Freq. (Hz)	MCA (A)	FLA (A)
2	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52
1	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52
3	ARNU18GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52
4	ARNU18GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52
5	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52
6	ARNU24GSKN4	12.2 kg	975x354x209 mm	220~240	1	50/60	0.85	0.52

#Notes: Correction factor is corrected by such as, but not limited to, indoor unit combination, temperature, and pipe length.

The result can be slightly different from Product Data Book due to simulation.

EWT=Entering Water Temperature / LWT=Leaving Water Temperature.

## System Validation Check

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

### 8. System Validation Check - General Condition

Contents	Limit	Current(Max value : connected unit)
Total pipe length	1000.0 m	71.0 m
Longest equivalent pipe length	175.0 m	37.5 m : ARNU24GSKN4[6]
Longest pipe length after 1st branch	40.0 m	20.0 m : ARNU24GSKN4[8]
Height difference [Above: IDU, Below: ODU]	110.0 m	0.0 m
Height difference [Above: ODU, Below: IDU]	110.0 m	3.0 m : ARNU24GSKN4[8]
Height difference [IDU to IDU]	40.0 m	0.0 m : ARNU24GSKN4[2]-ARNU24GSKN4[2]
Longest actual pipe length	150.0 m	35.0 m : ARNU24GSKN4[6]
Height difference [HRU to HRU]	30.0 m	0.0 m
Height difference [HRU to HRU connected in series (same branch)]	5.0 m	0.0 m
Height difference [HRU to IDU]	15.0 m	0.0 m

Note : Except "Longest equivalent pipe length", the other pipe length limitations are actual length.

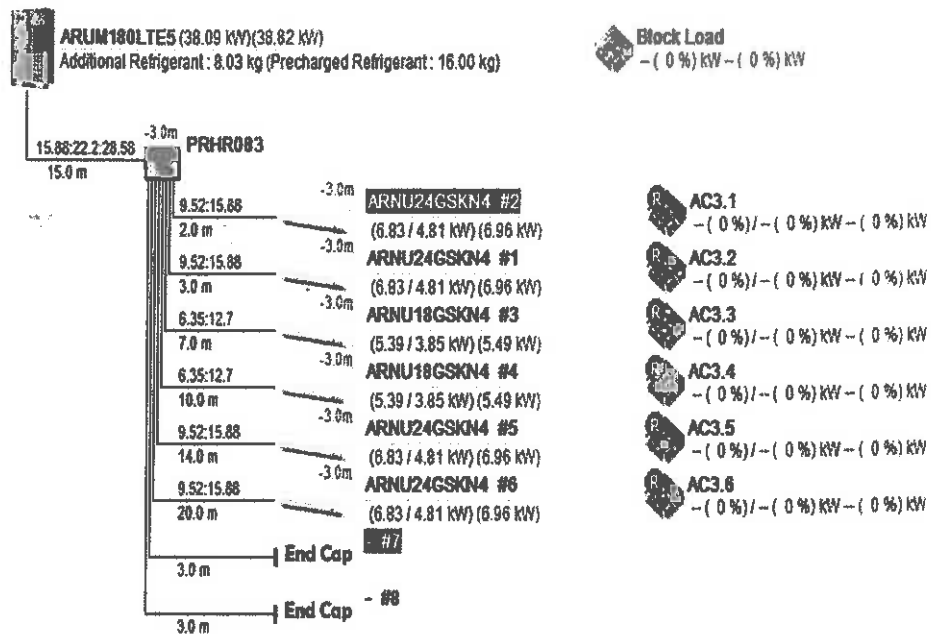


### System Tree Diagram3

System Name: Multi V1

Date: 2020/12/11

System No : 1/1



\*\* : Conditional Application  
 Three pipe : Liquid : High Gas : Low Gas  
 Two pipe : Liquid : Gas

- R** Remote Controller,      **G** Group Control,      **D** Dry Contact
- L** Leakage Detector,      **S** Temperature Sensor      **A** Air purification kit

Indoor Units : 6 of 45  
 Combination Ratio : 39.6 of 50.4 ( 79%)  
 Total Pipe : 71.0 of 1000.0 m

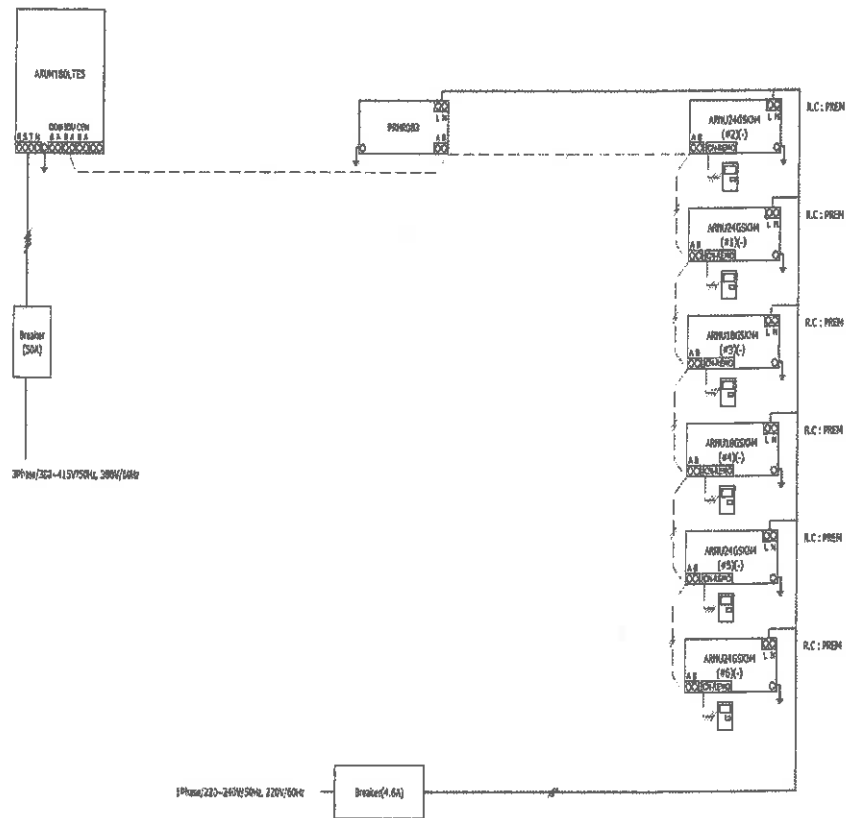
# System Schematic Diagram3

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

- Power line(Dedicated)
- Power line(Other unit/HR unit)
- - - Communication line (ODU-ODU / ODU-ODU) VCTF-8B 2C x 1.0 - 1.5 mm<sup>2</sup>
- - - Communication line (ODU-CB) VCTF-8B 2C x 0.75 - 1.0 mm<sup>2</sup>
- - - \*VCTF-8B 4C x 0.75 - 1.0 mm<sup>2</sup>AC B2. Single central controller
- - - Communication line(remote controller) AG6 24 x 3C



# Note:  
We recommend one size bigger circuit breaker than the calculated size.

## System Cost Estimate

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

Total Cost	0
------------	---

### 1. Outdoor Units

Model Name	Quantity	Unit Cost	Total Cost
ARUM180LTE5	1		0
SubTotal			0

### 2. Indoor Units

Model Name	Quantity	Unit Cost	Total Cost
ARNU18GSKN4	2		0
ARNU24GSKN4	4		0
SubTotal			0

### 3. Accessories

Model Name	Quantity	Unit Cost	Total Cost
PREMTB001	8		0
SubTotal			0

### 4. Branch/Header

Model Name	Quantity	Unit Cost	Total Cost
PRHR083	1		0
SubTotal			0

### 5. Pipes

Diameter(mm)	Length(m)	Unit Cost	Total Cost
6.35	17.0		0
9.52	39.0		0
12.7	17.0		0
15.88	54.0		0
22.2	15.0		0
28.58	15.0		0
SubTotal			0

### System Cost Estimate

System Name: Multi V1

Date: 2020/12/11

System No : 1/1

#### 6. Refrigerant

Refrigerant	Additional Refrigerant(kg)	Unit Cost	Total Cost
R410A	8.03		0
<b>SubTotal</b>			<b>0</b>

**Cost Estimate - MULTI V****Date: 2020/12/11**

Total Cost	0
------------	---

**1. Outdoor Units**

Model Name	Quantity	Unit Cost	Total Cost
ARUM180LTE5	1		0
SubTotal	1		0

**2. Indoor Units**

Model Name	Quantity	Unit Cost	Total Cost
ARNU18GSKN4	2		0
ARNU24GSKN4	4		0
SubTotal	6		0

**3. Accessories**

Model Name	Quantity	Unit Cost	Total Cost
PREMTB001	6		0
SubTotal	6		0

**4. Branch/Header**

Model Name	Quantity	Unit Cost	Total Cost
PRHR083	1		0
SubTotal	1		0

**5. Pipes**

Diameter(mm)	Length(m)	Unit Cost	Total Cost
8.35	17.0		0
9.52	39.0		0
12.7	17.0		0
15.88	54.0		0
22.2	15.0		0
28.58	15.0		0
SubTotal			0

### Cost Estimate - MULTI V

Date: 2020/12/11

#### 6. Refrigerant

Refrigerant	Additional Refrigerant(kg)	Unit Cost	Total Cost
R410A	8.03		0
Sub Total			0

**PART 4**

**SCHEDULE OF EQUIPMENT OFFERED BY CONTRACTOR**

**PART 4**

**SCHEDULE OF EQUIPMENT OFFERED BY CONTRACTOR**

<b>1</b>	<b>AIR HANDLING UNITS</b>	
1.1	Make	<u>HC Heat Exchangers Pty Ltd</u>
1.2	Type	.....
1.3	Casing insulation type and thickness	.....
1.4	Supply fan make	.....
1.5	Supply fan type	.....
1.6	Cooling/heating coil make	.....
1.7	Primary filter make	.....
<b>2</b>	<b>HEAT RECOVERY R410 VRV/VRF SYSTEMS</b>	
2.1	Make	.....
<b>3</b>	<b>SINGLE R410A DC INVERTER AIR-CONDITIONING SYSTEMS</b>	
3.1	Make	.....
<b>4</b>	<b>AIR DUCT WORK</b>	
4.1	Duct work manufacture	.....
4.2	Grille manufacture	.....
4.3	Weather louver manufacture	.....
<b>5</b>	<b>ELECTRICAL</b>	
5.1	Specialist contractor	.....
5.2	Make of DB's	.....



## **Part C4: Site Information**



## PG-03.1 (EC) SITE INFORMATION – (GCC (2004)1<sup>st</sup> EDITION: 2004)

Project title:	<i>Kimberley:Justice:High court including masters office: Installation of airconditioners</i>		
Tender no:	<i>KIM 01/2021</i>	Reference no:	<i>19/2/4/2/2/2327/489</i>

### C4 Site Information

*The High Court site is located in Kimberley ,Cullinan Cresent, Northern Cape. Kimberley is 1184 m above the sea level. The average rainfall per year is about 120 mm. Most of the rainfall is during the summer months. The average midday temperatures can be as high as 41 °C in the summer months and as low as 5 °C in the winter months. The average night-time temperatures can be as high as 25 °C in the summer months and as low as -5 °C in the winter.*

**Part C5: Occupational Health and Safety Specification**

## OCCUPATIONAL HEALTH AND SAFETY SPECIFICATION

For

**Kimberley: Justice: High Court including Masters Office: Installation of Air Conditioners**

**NOTE: In addition to this specification the following legislation must be referred to and adhered to where necessary:**

- ❖ **OHS Act 85 of 1993(Full Version)**
- ❖ **The Gazette Draft Construction Regulations**
- ❖ **The Gazette Draft General health and Safety Regulations**

<b>PROJECT NAME</b>	<b>Kimberley: Justice: High Court including Masters Office: Installation of Air Conditioners</b>
<b>CLIENT</b>	<b>PUBLIC WORKS-KIMBERELY</b>
<b>CLIENT REPRESENTATIVE</b>	<b>MR. G MARTIN</b>
<b>PRINCIPAL AGENTS/PROJECT MANAGER</b>	<b>MR G MARTIN (PROJECT MANAGER)</b>
<b>CLIENT REPRESENTATIVE SIGNATURE</b>	<b>BVI</b>

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## 1. INTRODUCTION

This Health and Safety Specification has been prepared in terms of Client's responsibility [Construction Regulation 5(1)] to provide the principal Contractor and Contractors with a documented Specification of all Health and Safety requirements pertaining to the associated works on the proposed construction site/so as to ensure the health and Safety of all persons affected by the works. This health and Safety specification highlights, but in no way replaces legal requirements that the principal Contractor and Contractors are bound to comply with in terms of the Department of Public Works program.

- The client has made provisions in the tender for the Principal Contractor to price for the cost of health and safety measures before and during the construction process [Construction Regulation 5(1)(g)]. The Principal Contractor in turn needs to make the same provision when Contractors (Sub-Contractors) tender or quote on work [7(c)(1)].
- The principal Contractor and Contractors are required to prepare a Health and Safety plan based on the Client's health and Safety Specification, which shall be applicable from the date of commencement of and for the duration of work [Construction Regulation 7(1)(a)]. This documented plan must be based on a Hazard Identification and Risk assessment (HIRA) which will serve to identify the hazards, and their associated risks, anticipated for the scope of works [Construction regulation 9].

**Principal Contractor tendering must provide the client with an appropriate Preliminary Hand Safety Plan (including a Preliminary Hazard Identification and Risk Assessment) as in Construction Regulation 5(1). This plan must be submitted with the tender.**

## 2. APPLICATION

The Health and Safety specification contains clauses that are applicable to occupational health and safety in construction and the document is intended to impose pro-active controls associated with the activities, plant machinery and other aspects of the proposed construction work that impact on health and safety of persons, by means of a documented H&S Plan prepared by Principal Contractors.

Compliance to the requirements of the OHS act and relevant legislation is in addition to the requirements of the H&S Specification and forms parts of the Principal Contractor's responsibility. The Client and Client's agents will monitor the Principal Contractor to ensure that the Principal Contractor and Contractors comply with the requirement of OHS Act and will not prescribe to the Principal Contractor how such compliance is to be achieved.

## 3. PURPOSE

The purpose of the Health and Safety Specification is to provide the Principal Contractor and Contractor's tendering for the proposed construction work and /or appointed for the above mentioned construction work with the necessary detail of all health and safety requirements, and hazards pertaining to the associated scope or works, so as to enable the principal Contractor and Contractors to develop a Health and Safety Plan-to be implemented on site in order to ensure the health and safety of all persons while undertaking the said works.

#### **4. REFERENCE DOCUMENTS AND HEALTH AND SAFETY STATUTORY REQUIREMENTS**

The following Acts and Regulations are referred to in this document followed by their abbreviations in brackets. Note that this is not an exhaustive list and other documents may be referred to if necessary in order to compile your Site Specific Health and Safety plan:

##### **4.1 Occupational Health and Safety Act,(Act No.85 of 1993)-[OHSA] and Regulations as follows:**

- Construction Regulations[CR]
- General Administrative Regulations[GAR]
- General Safety Regulations[GSR]
- Environmental Regulations for Workplaces[ERW]
- General machinery Regulations [GMR]
- Hazardous Chemical Substances Regulations[HCSR]
- Electrical Installations Regulations[EIR]
- Electrical Machinery Regulations[EMR]
- Pressure Equipment Regulation [PER]

##### **4.2 Compensation for occupational Injury and Diseases Act-[COIDA]**

##### **4.3 Act, Regulations and site safety rules applicable to Department of Public works Construction Sites.**

With regards to workplace health and safety, the following Acts, Regulations and safety rules shall apply to all Department of Public works Construction Site and must be fully complied with at all times by all contractors on site:

- Occupational Health and Safety Act(85 of 1993) and Regulations
- Compensation for Occupational Injuries and Diseases Act and Regulations
- This Health and Safety Specification
- Any other relevant statutory laws, including Municipal By-laws where applicable
- As well as any amendments that may arise from time to time;
- As well as any draft amendments to legislation-it is good practice to comply

##### **4.4 Contractor's General Requirements for Health and Safety**

- 4.3.1 The contractor shall be solely responsible for carrying out the work under the contract.
- 4.3.2 The contractor shall have the highest regards for health and safety of its employees, the Company and any persons at or in the vicinity of the site. This regard shall extend to include the works, temporary work materials, the property of third parties and any purpose relating to the contractor carrying out its obligations under the Contract.
- 4.3.3 The contractor shall initiate and maintain safety programmes to conform to all applicable safety and health laws or other requirements, including ground rules, and the project health and safety specification.
- 4.3.4 The contractor shall, at its own cost, erect and maintain safeguards for the protection of workers and public.
- 4.3.5 The contractor shall manage all reasonably foreseeable hazards created by performance of the work under the contract.



- 4.3.6 Provide all things and take all measures necessary for maintaining proper personal hygiene, ensuring safety of persons and property and protecting the environment at or near the site.
- 4.3.7 Avoid unnecessary interference with the passage of people and property at or near the site.
- 4.3.8 Prevent nuisance and excessive noises and unreasonable disturbances in performing the work under Contract.
- 4.3.9 Be responsible for the adequacy, stability and safety of all of its site operations, of all its methods of design, construction and work and be responsible for all of the work, irrespective of any acceptance, recommendation or consent by the Client, its Contractors, employees, agents and invitees, or any Government body.
- 4.3.10 The contractor shall comply, and shall be responsible for ensuring that all of its subcontractors comply, with the relevant statutory regulations for safety and the Client's requirements included in the contract.

#### **4.5 Site Rules for Contractor**

The site rule for contractors' document is the minimum standard with regard to specifications for construction work on this site. Contractors may have existing standards for each specific trade, but where conflict may arise between the contractor's and these Site rule for contractors, the more stringent shall apply.

##### **4.5.1 Rules of Conduct**

Contractors and all employees under their control, including any visitors brought onto site must adhere to the following Rules of Conduct on Site:

- Partake of, possess or sell drugs or alcoholic beverages on site. Any employee or visitor whose actions and demeanour show symptoms of possible narcosis or drunkenness shall be removed from site.
- Indulge in practical jokes, horseplay, fighting or gambling.
- Make use of water from fire hydrants.
- Destroy or tamper with safety devices, symbolic signs or wilfully and unnecessarily discharge fire extinguisher.
- Bring onto site or have in your possession a firearm, lethal weapon, camera, or any other recording device, unless authorised to do so
- Assault, intimidate or abuse any other person
- Operate construction equipment (vehicle or plant) without the necessary training and authorisation.
- Display insubordination toward any supervisor, foreman or manager in respect to carrying out of properly issued instructions or orders for health and safety reasons.
- Negligently, carelessly or wilfully cause damage to property of others.
- Refuse to give evidence or deliberately make false statements during investigations.
- Enter into any areas where you have no business unless authorised to do so by the person in charge.
- Bring animals onto site.

Insubordination towards any foreman, supervisor or manager could lead to removal from site and or dismissal and or prosecution. Except insofar as the principles of common law, or conditions as determined by any relevant statutes are concerned, the decision of the Client or his agent shall be final and binding in respect of any disputes that may arise from the interpretation of these rules.

## **5 Definitions**

The following definitions apply.

For the purpose of the General Health and Safety Specification, the abbreviations or definitions given hereunder shall apply:

“CR” refers to the Construction Regulations, 2014

“GHSS” refers to this document (the General Health and Safety Specification (including any project specific annexures that the engineers and designers could attach.

“OHSA” refers to the Occupational Health and Safety.

“S” refers to a section in Occupational Health and Safety Act of 1993.

“H&S” refers to Health and Safety.

“Client” Department of Public Works

Incident; means any unplanned event that causes, or has the potential to cause, an injury or illness and/or damage to equipment, buildings, plant or the natural environment. Incident range from near miss incidents to serious incidents and emergencies.

“Near Miss” means an incident which has the potential to cause an injury or illness or damage to company.

“Regulations” means, specifically, the Construction Regulations, 2003 as issued on 18 July 2003, under the Occupational Health and Safety Act of 1993, but not excluding the other applicable regulations existing under the Act.

“Site” means the lands and other places, made available by the Municipality or the Client for the purposes of the Contract, on under over in or through which the construction work is to be executed or carried out.

“Principal Contractor” and contractor shall be as defined in the Regulations.

### **Construction Work [CR1]:**

Means any work in connection with-

- a) The erection, maintenance, alteration, renovation, repair, demolition or dismantling of or an addition to a building or any similar structure.
- b) The installation, erection, dismantling or maintenance of a fixed plant where such work includes the risk of a person falling.
- c) The construction, maintenance, demolition or dismantling of any bridge, dam canal, road, railway, runway, sewer or water reticulation system or any similar civil engineering structure; or
- d) The moving of earth, clearing of land or making of an excavation or work on any similar type of work.

**Hazard, Identification, Risk assessment and risk control (HIRA)**

Means a documented plan, which identifies hazards assesses the risk and detailing the control measures and safe working procedures, which are to be used to mitigate and control the occurrence of hazards and risks during construction or operation phases.

**Site**

Means the area in possession of the Contractor for the construction of the works. Where there is no demarcated boundary it will include all adjacent areas, which are reasonably required for the activities for the Contractor, and approved for such use by the client.

**Hazards**

Means a source of or exposure to danger (source which may cause injury or damage to persons, or property)

**Risk**

Means the probability or likelihood that a hazard can result in injury or damage.

**Construction Supervisor [CR 8(1)]**

Means a full time, competent employee appointed in writing by the Contractor to supervise construction work. The appointment, as required by OHSA, shall stipulate health and safety responsibilities, area of responsibility and the proposed duration of the project.

**Hazardous Chemical Substance (HCS)**

Means any toxic, harmful, corrosive, and irritant or asphyxiate substance, or mixture or substance for which an occupational exposure limit is prescribed, or an occupational exposure limit is not prescribed but which creates a hazard to health.

**Construction Plant**

Encompasses all type of plant including but not limiting to, cranes, piling frames, boring machines, excavators, dewatering equipment and road vehicles with or without lifting equipment

**Contractor [CR 1]**

Means an employer who performs construction work and includes principal contractors and sub-contractor.

**Health & Safety Plan (HSP) [CR 1]**

Means a documented plan, which addresses hazards identified and includes safe work procedures to mitigate, reduce or control the hazards identified

The plan shall be applied from the date of commencement of and for the duration of construction work [CR 5(1)]

### **Health and Safety File (HSF) [CR1]**

The file holding all documentation and records on health and safety for the project, which shall be available at all times for evaluation, and copy of which will be forwarded to the client upon completion of the project.

### **Disabling Injury Frequency Rate (DIFR)**

The number of disabling injuries multiplied by a constant (man hours relative to period worked divided by total man hours worked over a rolling period (usually 12 months, but can be less)).

### **Disabling Injury Severity Rate (DISR)**

The number of days lost due to (DI's) multiplied by a constant (man hours relative to period worked) divided by total man hours worked over a rolling period (usually 12 months, but can be less).

### **Confined Space**

An enclosed, restricted or limited space in which, because of its construction, location or contents, or any work carried on therein, a hazardous substance may accumulate or an oxygen deficient atmosphere may occur, and includes any chamber, tunnel, pipe, pit, sewer, container, valve, machinery or object in which a dangerous liquids or dangerous concentration of gas, vapour, dust or fumes may be present.

## **6. Responsibility of Contractors for Construction Work [CR 4, 7, 8]**

### **6.1 Notification of Intention to Commence Construction Work [CR 4]**

The principal contractor shall notify the Provincial Director of the Department of labour before any work commences, in accordance with the following requirements:

- The demolition of a structure exceeding a height of 3 meter; or
- The use of explosives to perform construction work; or
- The dismantling of fixed plant at height greater than 3 meters; or
- The work exceeds 30 days or will involve more than 300 person days of construction work; and
- Includes excavation work deeper than 1 meter; or
- Includes working at height greater than 3 meters above ground or landing.

The notification and submission to the local Department of labour must be done on a form similar to that shown in Annexure A of this document and a copy of the completed form kept in the HSF for inspection by inspector, the client or an employees

### **6.2 Principal Contractor's Responsibilities [CR 7]**

#### **6.2.1. Compile a HSP [CR 7]**

#### **6.2.2. Ensure co-operation between all contractors [CR 7(c), to comply with the Act**

#### **6.2.3. Ensure compliance to the Act in terms of [CR 5(v)]**

- a) Provide relevant sections of these specifications to contractors as required
- b) Appoint each contractor in (a) above in writing. Only contractors who have the necessary competencies and resources may be appointed [CR 7(c) (iii)]
- c) Ensure each contractor's HSP is implemented and maintained on site
- d) Stop any contractor from work which is not in accordance with HSP's or which pose a threat to health and safety of persons
- e) Sufficient information is provided to contractors where there are changes to design and construction
- f) Ensure every contractor is registered an in good standing with the Compensation Commissioner

g) Ensure potential contractors have made provision for the cost of health and safety measures.

**6.2.4** Negotiate and approve the HSP of each contractor [CR 7(f)]

**6.2.5** All HSP's including the principal contractor's to be available on site [CR 7(b)]

**6.2.6** All HSF's including the principal contractor's to be available on site [CR 7(d)]

**6.2.7** A consolidated HSF to be handed over to the client on completion of construction including records of drawings, designs etc. [CR 7(e)]

**6.2.8** HSF to include updated list of all contractors, the agreements and their type of work [CR 7(f)]

### **6.3 Contractor's Responsibilities [CR 7] (including sub-contractors)**

6.3.1 Provide their HSP to the principal contractor [CR 7(2)]

6.3.2 Where a contractor appoints another contractor (sub-contractor) it is the responsibility of that contractor to apply 4.2 above as if he were the principal contractor [CR 7(3)]

6.3.3 No contractor to appoint another contractor (sub-contractor) unless the latter has the necessary competency and resources to perform the required work [CR 7(3)]

6.3.4 To provide any information which affects the health and safety of any persons at work to the principal contractor

### **6.4 Supervision of Construction Work [CR 8]**

The appointments embodied in this regulation are as follows:

6.4.1 Construction supervisor [CR 8(1)]

6.4.2 Assistant Construction Supervisor [CR 8(2)]

6.4.3 Safety Officer [CR 8(5)] or Safety Representative OHS Act S17 (1)

The detailed requirements of these appointments can be found under the relevant regulation.

The contractor shall appoint a dedicated competent Safety Officer who will perform his duties at the work Site for the duration of the work under the Contract.

## 6.5. Legal Appointments

The principal contractor shall ensure copies of the appointment letters of all responsible persons appointed on site will be kept in the HSF. All legal appointments shall be conducted in accordance with the requirements set out in the OHSA and as per this specification. The tables below set out the appointment protocols for CR and OHSA.

**NB: It should be noted that these represent complete lists and not all these appointments may be required.**

### 6.5.1

Item	Regulation	Appointment	Responsible Person
1.	4	Notification of construction work.	Contractor
2.		Contractor	Principal Contractor
3.		Contractor	Contractor
4.	8(1)8	Construction supervisor	Contractor
5.	8(2)	Construction supervisor sub-ordinates	Contractor
6.	8(5)	Construction Safety Officer	Contractor
7.	9(1)	Person to carry out risk assessment	Contractor
8.	9(3)	Trainer/Instructor	Contractor
9.	10(1)(a)	Fall protection planner	Contractor
10.	12 (2)	Temporary /Formwork & support work supervisor	Contractor
11.	12(e) + (f)	Temporary works/Formwork & support work examiner	Contractor
12.	13(a)	Excavation supervisor	Contractor
13.	11(2)(bb)	Structures-Professional engineer or technologist	Contractor
14.	21	Explosives expert	Contractor
15.	14(1)	Supervisor demolition work	Contractor
16.	14(1) + (2)	Demolition expert	Contractor
17.	21(b)	Explosives expert	Contractor
18.	16(1)	Scaffold supervisor	Contractor
19.	17(1)	Suspended platform supervisor	Contractor
20.	17(2)(c)	Compliance plan developer	Contractor
21.	17(8)(b)(c)	Suspended platform expert	Contractor
22.	17(13)	Outrigger expert	Contractor
23.	19(8)(a)	Material hoists inspector	Contractor
24.	20(1)	Bulk mixing plant supervisor	Contractor
25.	20(2)	Bulk mixing plant operator	Contractor
26.	21(1)(b)	Explosive actuated fastening device	Contractor
27.	21	Explosive actuated fastening device	Contractor
28.	22(e)(f)	Tower crane operator	Contractor
29.	23(1)(d)(i)(ii)	Construction vehicle and mobile plant operator	Contractor
30.	23(1)(k)	Construction vehicle and mobile plant inspector	Contractor
31.	24(d)	Temporary electrical installations inspector	Contractor
32.	24 (c)	Temporary electrical installations controller	Contractor
33.	28 (a)	Stacking and storage supervisor	Contractor
34.	29 (h)	Fire equipment inspector	Contractor
35.	OHSA16.2	Contract Manager	CEO
36.	OHSA 17(1)	Health and Safety Rep	CEO
37.	GAR 9(2)	Incident investigator	Contractor
38.	GSR 3(4)	First Aider	Contractor
39.	GSR13	Ladder inspector	Contractor
40.	DMR 18(11)	Lifting Equipment Operator	Contractor
41.	DMR 18 (5)	Lifting Equipment Inspector	Contractor

The responsibilities of each appointment are detailed in the relevant form, which are signed by both the authorised person and the appointee and kept in the Health and Safety File. An example of an appointment form for a Construction Supervisor can be found under Annexure B.

## **7. Documentation and Procedures**

All required HSE documentation for the construction work, shall be kept in the HSF, which shall be available on site. The Construction Supervisor shall be responsible for the file and the Project manager shall ensure that documentation is valid and up to date. The procedures to be used for the project are to be in accordance with contractor policy and as per the outcome of the HIRA exercise. It is required that the documentation is filled in an orderly fashion for easy access. The following sections are suggested:

- Policy permits etc.
- Health & safety plans, specifications
- Appointments
- Incidents management
- Inspection check lists
- Risk assessments
- Training
- Safe work Procedure
- Hazardous Chemical Substances

## **8. Application of COIDA and OHSA to Construction Work**

**8.1 Compensation of Occupational Injuries and Diseases Act, Act No.130 of 1993(COIDA)**  
Every contractor shall provide proof of registration and letter of good standing with the Compensation Commissioner.

**8.2 Occupational Health and Safety Policy [OHSA 7]**  
Every contractor's OH&S Policy statement should be available for security and as evidence of their commitment to their employees' occupational health and safety

**8.3 Health and Safety Training and Competency**  
Training of personnel is a necessity and a legal requirement when required. A record of all training shall be kept and provided on request.

**8.3.1 Induction Training**  
The principal contractor shall be responsible for the induction of all personnel entering the site including visitors, inspectors etc. Contractors doing specific construction work shall be responsible for the induction of their employees with respect to that specific work. Records to be kept of all personnel that undergo induction training.

**8.3.2 Awareness Training**  
In addition, the client would favour awareness training to be carried out such as weekly Toolbox Talks on relevant topics e.g. wearing PPE, manual lifting, safe use of portable electric tools etc.

### **8.3.3 Competency and CV's**

Where applicable, valid copies of certificates of competency of appointed personnel to be provided and kept in the HSF. Other training requirements such as those identified through the HIRA process, to be completed and proof of that training also kept in the HSF. Where competency is achieved through experience, a brief CV will be required.

### **8.3.4 Specific OH&S Training**

Valid certificates of training from registered service providers preferably accredited by the appropriate SETA are required for First Aiders, H&S Reps, Fire Marshals, Fire Equipment Inspector etc.

### **8.3.5 Medical Fitness**

All work in elevated positions [tower crane operators (CR 20(g)), workers on elevated structures requiring fall protection (CR 8 (2b)), suspended platform workers (CR 15(12a)] and operators of construction vehicles and mobile plant (CR 21(d)) require certificates of physical and psychological fitness.

Valid certificates of training from registered service providers preferably accredited by the appropriate SETA are required for First aiders, H&S reps, Fire Marshals (CR 221 Fire Equipment Inspectors) etc.

## **8.4 Hazards and Potential Hazardous Situations [OHSA 13]**

The principal contractor is responsible to ensure that all contractors and any visitors are warned of any hazardous or potentially hazardous situations, which may affect them on site and shall put any additional measures in place to assist in mitigating the risk of these hazards.

### **8.5 Health and Safety Reps [OHSA 17 and 18]**

The principal contractor shall be responsible to ensure compliance to this section of the OHSA as required and to ensure similar compliance of all contractors. If a rep is not required, the appointed Safety officer will be responsible for these functions.

### **8.6 Health and safety Committee [OHSA 19 &20]**

The principal contractor shall be responsible to ensure compliance to this section of the OHSA as required. If a committee is not convened, health and safety matters will need to be tabled and discussed at site meetings.

### **8.7 General Record Keeping**

The principal contractor shall ensure that all Health and safety records, required by OHSA and Regulation are kept for reference purpose and auditing.

#### **8.7.1 Inspections**

The principal Contractor shall keep all records of inspections undertaken during the contract. An assessment will need to be made of what inspections are required and their frequency. The principal contractor is also responsible to ensure compliance to this requirement by all contractors



### **8.7.2 Audits [CR 5(o) and 5 (p)]**

The client's agent shall carry out regular audits on the principal contractor at least once per month. Similarly, principal contractor shall be responsible for carrying out regular audits on their contractors at least once per month. The results shall be tabled for action and discussed at health and Safety Committee meetings or site meetings as appropriate.

### **8.8 Incident Management and Emergency Plans**

The principal contractor shall create and Emergency Plan for the construction site. The plan shall be clearly laid out for all types of emergencies including responsibilities, evacuation routes, siren, emergency no's etc. The plan shall fully explain to all personnel during the induction training. All contractors will become completely familiar with the requirements of the plan and will participate in any evacuation drills that may take place.

#### **8.8.1 First Aid [GSR 3]**

The principal contractor shall be responsible to ensure compliance to this regulation as required. In particular, a first aid box with the minimum stock as specified in the regulation will be located at the site office and there will be signage to indicate the location of the box. Attention is drawn to GSR 3(4) for the requirement of trained first aiders. It is also suggested that a trained first aider be made responsible for the box in terms of the following:

- Security-the box should not be left open but it must be accessible in case of emergency(spare key availability)
- Injuries – a record of first aid box injuries treated and the stock issued.
- Stock- regular inspection to maintain stock levels and check expiry dates

In addition, the first aid requirement should be noted for high risk substances or hazardous chemical substances and if these are to be used, then it should be addressed in the HIRA and the need for eye wash facilities assessed.

**NOTE: It is strongly recommended and good practice to comply with the Draft Health and Safety Regulation 7**

#### **8.8.2 Incidents and Injuries-Investigation and Reporting**

The principal Contractor will ensure there is a management system to report and investigate all incidents. All incident including all near miss, first aid box treatment, and all other serious incidents involving any form of disabling injury or fatality are to be reported to the Client and the Clients H&S Agents telephonically immediately. This shall be confirmed in writing as soon as possible after the incident. Failure to comply with these provisions will be considered as serious offence. Recording and Investigation of Near Miss.

##### Incidents

The principal Contractor shall provide evidence by means of a procedure or chart that he is fully aware of the hierarchy of incidents that can occur e.g. unsafe situations, near miss first aid box injuries, medical cases, disabling injuries etc. He shall keep an incident register of all such incidents, investigate and apply corrective action where required. The client also reserves the right to request incident statistics from the principal contractor such as Di's DIFR and DISR and it is advised that these are maintained.

## Injuries

First aid box injuries have been addressed under 8.7.1 above. More serious injuries requiring transport of the injured person to the nearest hospital or doctor or the calling of an ambulance and paramedic personnel will be the responsibility of the principal contractor's appointed personnel such as the Construction Supervisor, First Aider, and Safety Officer. It is advised that all required emergency numbers be on hand and prominently displayed, as all contractors are registered and in Good Standing with the Compensation Commissioner, it will be the responsibility of the contractor whose employee has been injured; to make the necessary report and claims to the Commissioner.

### **8.8.3 Accident and Incident Reporting and Investigation [OHSA 24, GAR 8, 9(1) & (2)]**

Should an incident or accident investigation need to be conducted, a competent person shall be appointed to conduct the said investigation. The procedure to be followed will be in accordance with Annexure 1 of GAR 9-“Recording and Investigation of incidents”. Particular attention is also drawn to OHSA 24, reporting of certain incidents to an inspector of the department of labour. The principal contractor shall ensure that the investigations are kept for record purposes and he shall ensure that the outcome of the investigation is communicated to all affected parties as required i.e. the Client, Client's H& S Agent and contractors. The Client reserves the right to participate in all investigations into accidents or incidents and to conduct their own investigation if required.

### **8.9 Contractors and Suppliers**

The client shall enter into an Agreement with Mandatory in terms of Section 37(2) of the OHS Act 85 of 1993, with all appointed principal contractors. Likewise all principal contractors shall enter into a similar agreement with all contractors, sub-contracted to them for any period of the contract. Please note that if contractors hire any construction vehicle or mobile plant, the companies from which the equipment is hired must provide any maintenance and test certification as required. In addition, if operators are hired with the equipment, proof of competency and medical certification must be provided.

The principal Contractor shall ensure that all contractors are issued with this safety specification where *reasonable*. The principal contractor shall assist and ensure that contractors engaged comply with all of these requirements and adhere to the requirements set out OHSA. Contractors will be stopped from working in the event of unsafe conditions and activities being observed. All contractors shall be subject to the requirements specified in the HSP and will be issued with a copy of the plan. If the contractor is not able to comply with the requirements set out in the plan, he shall not be appointed as contractor.

### **8.10 Personal Protective equipment, Intoxication, Signage and Access Control [GSR 2]**

#### **8.10.1 Personal Protective Equipment (PPE)[GSR 2]**

The principal contractor shall through the Risk Assessment process identify the specific PPE needs per activity. Contractors, as employers, will be responsible for the issue of the required PPE. Should PPE be lost or stolen, then the employee will be issued with new PPE. Should PPE be worn out or damaged, the user shall return the worn or damaged PPE and will be issued with a replacement. Training in the use of this shall be provided. Visitors shall be informed of PPE requirements prior to their visit so that they may enter the site.

### **8.10.2 Intoxication [GSR 2A]**

The principal contractor shall be responsible to ensure that no persons may enter or remain at the construction site if under or apparently under the influence of intoxicating liquor or drugs.

### **8.10.3 Display of signs [GSR 2B]**

The principal contractor should make use of signage to assist in enforcing compliance to any requirement specified in this document or as required by law. Standard symbolic signs are acceptable for conveying these requirements where applicable.

### **8.10.4 Access control [GSR 2C]**

The principal contractor shall be responsible to ensure control of access to all persons entering the construction site. The reason for this is as follows;

- The principal contractor is the employer on the site and all intents and purposes is responsible for section 8 of OHSA of employees and contractors and section 9 for any other person on site such as visitors and inspectors
- All persons entering the site must undergo induction training to inform them of the hazards present on site. This includes contractors, visitors, inspectors etc.
- The construction supervisor will be aware of who is on site and their function
- The construction supervisor will be able to control tasks that may impact on other work being carried out on the site by a permit to work system.
- The number of people and their purpose on the site must be known in case of emergency and evacuation
- Security reasons

### **8.11 Ladders [GSR 13A]**

**The following requirements shall be complied with regarding Ladders and Ladder Works:**

- A competent person shall be identified and appointed as ladder inspector
- Where aluminium ladders cannot be used, then wooden ladders shall be straight grained, unpainted to allow for proper inspection of the grain for cracking
- Ladders shall be secured at the top and choked at the base to prevent slipping.
- Where choking of the base is not possible, then the user shall ensure that the ladder is held in position by another employee when ascending the ladder.
- Ladders shall be inspected a minimum once per month by the person appointed as the ladder inspector.
- Proper storage shall be provided for all ladders when not in use.

### **8.12 Pressure Equipment Regulations, 2009(Gas Bottles)[PER 2009]**

If gas bottle sets (Oxy-Acetylene for heating, cutting, welding) are used, these regulations, as required, shall be adhered to. Regular inspection of the sets shall be carried out. In particular;

- Only trained personnel shall operate such equipment.
- The construction Supervisor shall ensure operation of the equipment is in accordance with the HIRA requirements and Safe working Procedure (SWP) and /or method statement.
- All users shall undergo regular awareness training (toolbox) to ensure compliance.
- The Construction supervisor shall ensure the required PPE is used.

### **8.13 Portable Electric Tools [EMR 9]**

This regulation shall be complied with as a minimum requirement. Regular inspections of all Portable Electric Tools such as drill, angle grinder's etc. shall be carried out. In particular:

- Only trained personnel shall operate such equipment.
- The Construction Supervisor shall ensure operation of the equipment is in accordance with the HIRA requirements and Safe working Procedure (SWP).
- All users shall undergo regular awareness training (toolbox talks) to ensure compliance.
- The Construction Supervisor shall ensure the required PPE is used.

### **8.14 Permit to work [including hot work]**

**The principal contractor shall be responsible to ensure that:**

- All work being carried out on site has been approved through the necessary project control system.
- Permit require from third parties such as vetting for security clearance
- A permit system is operational so that work consisting of many tasks related to the construction on site, can be carried out without endangering the health and safety of personnel on site, neighbours and the public surrounding the site and or causing damage to property.
- In particular, attention is drawn to GSR 9, which details the requirements for welding, flame cutting, soldering and similar operations.

### **8.15 Working in confined spaces [GSR 5]**

The principal contractor shall be responsible to ensure that no work is carried out in a confined space unless it is safe to do so. All the requirements of this regulation shall be met. Attention is drawn to the fact that further precautions are required if hot work is to be carried out in a confined space as per GSR 5(5) and GSR 9(2). In addition, CR 11(3j) specifies that excavations are regarded as confined spaces and these precautions need to be applied.

### **8.16 Environmental Rules**

The contractor shall give effect to maintain all safeguards and standards and take such measures as may be necessary for the protection of the environment.

#### **8.16.1 Clearing**

The contractor shall comply with the following conditions and requirements for clearing:

- Follow the Occupational health and Safety Act, the Environmental Regulations for workplaces and Project EMP.
- Areas to be cleared will have boundaries clearly marked by tape, pegs or other means and will conform to limits on design drawings.
- No clearing is to occur without a written permit from the Engineer.
- Clearing will not commence until drainage control works are in place.
- Cleared vegetation should be windrowed along the contour to assist with erosion control.
- Any area which is not to be disturbed under requirements of the Cultural Heritage management Plan will be clearly identified.
- Vegetation clearance will be restricted to that necessary for the works.

- The Engineer is to be notified immediately if contaminated soil is discovered.
- Traffic shall be confined to maintained tracks and roads.
- Particular care shall be taken to minimise disturbance to the bed and banks of watercourses.

#### **8.16.2 Noise and Vibration**

The contractor shall ensure that each of its mobile and fixed plant and that of its subcontractor' are fitted with appropriate noise suppression equipment to ensure that noise levels from such plant are contained within the relevant limits prescribed by relevant industrial safety and environmental legislation, regulations and site standards. If there is a noise problem with electrical power generating equipment, compressors, or other facilities under the control of the contractor, additional noise suppression shall be erected by the Contractor at the Contractor's cost around the offending unit(s). Any deviation from the above listed practices is to be rectified at the Contractor's cost.

#### **8.16.3 Transport, Storage and Handling of Hazardous Substances and Dangerous Goods**

The contractor shall comply with the following conditions and requirements for storing and handling hazardous and dangerous goods:

- Comply with HCS Regulations 14. The storage and handling of flammable and combustible liquids.
- Provide a list of hazardous substances and corresponding MSDS prior to bringing substances on Site.
- Substances register to be held at each storage facility.
- Corrosive materials to be stored and handled in accordance with HCS Regulation 14.
- Fuels, oils and substances in containers of 200 litres or more shall be stored in a bunded area with capacity of at least 110% of largest container/tank.
- Fuel, oils and substances in less than 200 litre drums shall be stored as above or in a fenced and roofed compound.
- All fuels, oils and substances must be clearly labelled.
- Transfer of bulk fuel and handling of hazardous substances shall be conducted only by appropriately trained personnel
- Spill clean-up kits including absorbent materials shall be kept at each storage facility.

#### **8.16.4 Erosion and Oil Traps**

The Contractor shall comply with the following conditions and requirement for erosion, sedimentation, silt and oil traps:

- Land disturbance will be restricted to that necessary for the works.
- Topsoil will be salvaged for use in rehabilitation
- Storm water from upstream catchments will be diverted away from construction areas.
- Drains will be protected to prevent scouring if necessary.
- Sediment traps, silts fences or hay bales will be installed to control sediment where necessary and where directed by Engineer.
- Sediment traps will be cleaned periodically.

#### **8.16.5 Dust Prevention**

The contractor shall comply with the following conditions and requirements for air quality and dust:

- Dust generated by construction activities will be suppressed by water spraying, to levels that are safe for Site personnel.
- Speed limits on unsealed roads will be limited to a maximum speed consistent with the minimisation of dust generation.
- Earthworks Supervisors must pay particular attention to the management of topsoil stripping such that dust does not become a safety hazard or severe nuisance.
- All dust complaints will be investigated promptly and appropriate action initiated to reduce nuisance.

#### **8.16.6 Waste Management**

- The contractor shall provide suitable rubbish receptacles at the Site and shall ensure that all litter is collected in them and properly disposed of off Site in accordance with the requirements of the relevant statutory requirements
- The contractor shall ensure proper collection and off-site disposal of all industrial wastes in accordance with relevant statutory requirements.
- The contractor shall apply the principles of Waste Minimisation by reducing the amount of waste generated on Site by their operations and activities as much as possible. The contractor shall provide for cycling of glass, metals, plastics and papers.

#### **8.16.7 Weed management**

The contractor shall comply with the following conditions and requirements for weed management:

- Contractors shall ensure that all machinery, equipment and vehicles are washed down at a wash facility before the Site and again when leaving the site.
- Plants and soil shall not be removed from Site without authorisation.
- Soil or other material shall not be brought onto Site if it has originated from an area known to contain environmental weeds or declared weeds under the Rural Land Protection Act 1995.
- Areas disturbed or rehabilitated as part of a Contract will be inspected upon completion of the works. The Contractor shall eradicate any declared weeds found.
- Seeds used in rehabilitation shall be free of declared weeds
- Control measures (including use of herbicides) must be consistent with manufacturer's recommendations, safe practice and recommendations in the Department of Natural Resources Pest Fact series.
- Include information on the importance of weed control inductions.

**Any deviation from the above listed practices is to be rectified at Contractor's cost**

#### **8.16.8 Found Object**

All fossils, coins, articles, minerals of commercial value and objects of antiquity and structures and other remains and things of archaeological interest discovered at the Project site shall be deemed to be the absolute property of the Company. The Contractor shall take reasonable precautions to prevent the Contractor's employees, subcontractors and the employees of subcontractors and any other persons from removing and damaging any such article and thing and shall immediately upon discovery thereof acquaint the Engineer of such discovery and carry out, at the expense of the company and at the engineer's direction, the protection and or disposal of same,.

## **8.17 Monitoring, Audit and Review**

- The Client's Agent/DPW Safety Manager shall have the right to conduct audits/inspections of the Contractor's operations, equipment and procedures at any time, and the Contractor shall fully co-operate with the client's agent during such audits/inspections.
- The client's agent rights under this clause shall not relieve the contractor of its obligations to conduct audits and reviews of its own safety and health performance.
- Where such Client's Agent/DPW Safety Manager audits reveal deficiency in the Contractor's procedure equipment, training, drills, etc. the contractor shall rectify such deficiencies as soon as practicable, and provide to the Client's agent a status report on all outstanding corrective actions. Where such deficiencies include an unsafe practice or breach of the Statutory or the Contract's requirements, the Client's Agents/DPW Safety Manager may in accordance with the general Conditions of Contract suspend the work associated with the unsafe practice or breach until the deficiency is rectified.

## **8.18 Penalties and Fines**

Any contractor employees who is found not adhering to the ESH specification, Site Ground Rules ,ESH Plan or any other statutory requirement, or who is observed committing unsafe acts or contributing to unsafe conditions will be issued with a Non-Conformance Report and the relevant Contract will be issued a fine according to the scale of fines nominated below.

**Contractor employees will also be reprimanded as per the relevant company HR procedures:**

- First transgression constitutes a verbal warning.
- Second transgression constitutes a written warning.
- Third transgression constitutes a full disciplinary hearing according to the company' HR procedures
- Any life-threatening unsafe act or unsafe condition must be treated as a Gross Neglect of Company Environmental, safety and Health Rules and Procedures and Disciplinary hearing shall be conducted to determine the root cause of the incident and the appropriate action which must be taken to prevent the similar unsafe situation from occurring in the future.

Copies of Non-Conformance Reports (NCR) and disciplinary hearings must be kept on record on the OHS File.

### **8.18.1 Offences and Penalties**

All offences and penalties will be dealt according to CR (33)

## **9 Applications of the Construction Regulations [CR]**

[Please note; this is the complete list. Item 9.1 is compulsory and the rest are applicable if relevant to the work being carried out]

### **9.1 Hazard Identification, Risk assessment and Risk Control (HIRA) [CR 9]**

The contractor shall prior to the commencement of any construction work perform a HIRA exercise which will form part of the HSP and file for the project. A copy of HIRA shall be made available for viewing to the client's OHS agent and shall be kept in the Health and Safety File.

NB: The contractor shall ensure that the outcome of all HIRA exercises will be conveyed to all relevant employees with respect to the hazards and the related control measures before any work commences.

Below is the list of activities, which may be considered for HIRA if the activity is to be carried out on site. The list is not exhaustive but gives examples of activities for a construction site:

- Site security and access.
- Traffic management-restrictions etc.
- Ground conditions.
- Existing structures for demolishing or modification.
- Excavation.
- Positioning of cranes including mobile cranes.
- Activities that affect adjacent sites.
- Excavations in particular those adjacent to roads or sidewalks.
- Lifting operations such as offloading and moving equipment.
- Lifting equipment such as offloading and moving equipment
- Stacking, storage of equipment and materials, and good housekeeping.
- Use of hand tools
- Use of portable electric equipment(power tools)
- Use and storage of flammable and hazardous chemicals such as paint, adhesives, solvents, thinners, cement etc.
- Scaffolding.
- Painting.
- Welding.
- Electric installations.
- Mechanical installation.
- Waste management including removal of hazardous waste.
- Environmental restraints such as boundary noise and dust.
- Brick work
- Temporary site accommodation.
- General hazards to site personnel such as cleaning noise and dust.

**The control of several of these risks may be specified in the OHSA or the CR but this does not mean that the HIRA exercise does not have to be carried out.**

### **9.2 Excavations [CR 13]**

Section 1 of this regulation states that this work must be carried out under the supervision of a competent person, who has been appointed in writing. All the requirements of CR 13 shall be met. For inspection of excavations attention is drawn to section 2(h), the records of which must be available on site.

### **9.3 Demolition [CR 14]**

Section 1 of this regulation states that this work must be carried out under the supervision of a competent person. All the requirement of CR 14 shall be met.

### **9.4 Scaffolding [CR 16]**

Section 1 of this regulation states that this work must be carried out under the supervision of a competent person, who has been appointed in writing the standard referred to in section 2 is SANS 10085 and this shall be complied with respect to the use of scaffolding on site.



### **9.5 Bulk mixing Plant (20)**

Section 1 of this regulation states that bulk mixing plant must be operated and supervised by a competent person, who has been appointed in writing. All the requirement of CR 20 shall be met.

### **9.6 Construction vehicle and mobile plant [CR 23]**

It will be the responsibility of each contractor on site to ensure compliance of their construction vehicles and mobile plant to these regulations.

This includes vehicles to be used for transporting personnel to and from site, which will be subject to relevant requirements such as licensing and roadworthiness checks. In addition the following will apply:

- Safe transport for personnel working on the project to and from the workplace, which shall include proper seating, side restraints and cover.
- Road safety principles shall be adhered to on and off site.

If a mobile crane or other mobile plant is hired, only approved hire companies shall be contracted to provide such equipment. The Construction Supervisor shall ensure compliance of the provider to these regulations. In particular attention is drawn to the competence and fitness of the operator [section 1(d)] and the inspection of the equipment [section 1(j)].

### **9.7 Electrical Installations [CR 24], including [EIR] and [EMR]**

The requirement of these regulations shall be met as required by the appointed electrical contractor. Competent person will be appointed for inspection and control of all temporary electrical installations as per CR 24(d) and (e) respectively.

The person /Contractor who does electrical installation work as an electrical contractor shall be registered as an electrical contractor in terms of electrical Installations Regulations.

### **9.8 Use and storage of flammable liquids [CR 25], and hazardous chemical substances [HCSR]**

All the requirements of CR 16 shall be met.

In terms of HCSR, contractors shall ensure that all hazardous chemicals brought to site have Material Safety Data Sheet (MSDS) and the users are made aware of the important sections of the MSDS such as:

- Hazards
- First aid measures
- Fire fighting measures
- Accidental release measure
- Handling storage
- Exposure control especially PPE
- Disposal

First aider shall be made aware of the MSDS and how to treat HCS incidents appropriately. Copies of MSDS's will be available on site and in the HSF.

### **9.9 Water Environments [CR 26]**

The requirements of this regulation shall be met.

### **9.10 Housekeeping [CR 27] including [ERW (6)]**

All contractors shall ensure that housekeeping standards as per these regulations shall be maintained at all times.

### **9.11 Stacking of Materials [CR 28] including [GSR (8)]**

All contractors shall ensure that materials are only stored in defined and allocated storage areas and that materials being stored are stacked in accordance with sound stacking principle as per these regulations.

### **9.12 Fire precautions [CR 29]**

All contractors on site will comply fully with the requirements of this regulation. In particular, the principal contractor will be responsible for the evacuation plan (section (1) the details of which will be imparted to contractors, visitors etc. through the site induction.

### **9.13 Construction employee welfare facilities [CR 30]**

The principal contractor shall be responsible for implementing this regulation and shall ensure that adequate facilities are provided for the personnel on site in terms of the following:

- Change room facilities
- Adequate toilets
- Hand wash facilities
- Drinkable water

No food preparation shall be conducted on site. Eating and drinking will only be permitted in the designated eating areas, which must be provided with adequate seating. Waste bins shall be strategically placed and cleared regularly.

## **10. Site Specific and Design Risks**

**[Please note; this is not a complete or exhaustive list. The principal contractor is expected to assess all risks to which his employees may be exposed during the construction process, as well as the hazards identified and listed below].**

### **10.1 Hazard Identification and Risk Assessment Methodology**

#### **10.1 Baseline Risk Assessment**

A baseline Hazards Identification and Risk assessment must be carried out during the preliminary stages of the construction/demolition project for the purposes of attempting to reduce the possibility of accidents or ill health occurring.

Taking into account the constraints of time and resources, every effort must be made to identify the hazards and recommend possible solutions. It is not reasonably practicable to expect the baseline risk assessment to identify all hazards, which is why task risk assessment are carried out on site.

### 10.1.2 Task Risk Assessment

Once on site, every contractor shall perform task risk assessment, using the baseline risk assessment as a guide.

The Risk assessment should be reviewed once on site and thereafter after any incident, change in design or every one-year period, whichever occurs first. Additional hazards highlighted or change in the risk factor should have a separate risk assessment carried out and filed.

The risk assessment is based on the combination of the CONSEQUENCE and PROBABILITY associated with each hazards.

### 10.1.3 Definitions

Term	Meaning
HAZARDS	Anything that can cause harm
RISK	The chance, great or small, that someone will be harmed by hazard
CONSEQUENCE	The possible outcome of an incident/ accident, e.g. broken leg, explosion.
PROBABILITY	The possibility of the accident/incident occurring

### 10.1.4 Risk Assessment

The following evaluation must be used to determine risk:

Probability X Consequence= RISK

#### Risk Matrix

#### Calculating the risk

1. Take the consequences rating(1-5) and select the correct column
  2. Take the likelihood rating(A-E) and select the correct row
  3. Select the risk rating where the two ratings cross on the matrix below.
- VH=Very, High=High, M= Medium, L=Low

		CONSEQUENCES				
		1	2	3	4	5
Likelihood	A	M			VH	VH
	B	M	M			VH
	C	L	M			VH
	D	L	L	M	M	
	E	L	L	M	M	

### 10.2 Site Specific risks

The following site-specific risks have been identified for this project. These must be catered for in the contractor's health and safety plan (that which is applicable to their scope of work), and included in the site-specific risk assessment.

#### 10.2.1 Traffic-restrictions, existing system, site traffic

Traffic accommodation must be arranged with the principal agent.

**10.2.3 Site security and access-this is controlled by principal contractor.**

### **10.3 Design risks**


The following design risks have been identified by the designer for this project. These must be catered for in the contractor's health and safety plan (that which is applicable to their scope of work), and included in the site-specific risk assessment.

10.3.1 Electrical

10.3.2 Mechanical.


10.3.3 Civil Work

## Part C6: Drawings




**ENGINEERING  
PROCUREMENT  
MANAGEMENT**

Upington Office  
Registration no. 190600204/07



BBBEE Level 2



SERIE SERIAL	DRW00
PROJEK NR. PROJECT NO.	KIM01/2021
DATUM DATE	Mar-21

**PROJEK:** KIMBERLEY HIGH COURT: MECHANICAL SERVICES INSTALLATION OF AIR  
**PROJECT:** CONDITIONERS

**TO:** DEPARTMENT OF PUBLIC WORKS

**AANDAG:**  
**ATTENTION:**

TEKENING NR. DRAWING NO.	TITEL EN BESKRYWING TITLE AND DESCRIPTION	SOORT TYPE	GROOTTE SIZE	
34280.00-740-01	HVAC LAYOUT GROUND FLOOR	PAPER	A0	
34280.00-740-02	HVAC LAYOUT FIRST FLOOR	PAPER	A0	
34280.00-740-03	HVAC LAYOUT SECOND FLOOR	PAPER	A0	
34280.00-740-01-Z	HVAC LAYOUT GROUND FLOOR - As buildt	PAPER	A0	
34280.00-740-02-Z	HVAC LAYOUT FIRST FLOOR - As buildt	PAPER	A0	
34280.00-740-03-Z	HVAC LAYOUT SECOND FLOOR - As buildt	PAPER	A0	

**OPMERKINGS** TENDER DRAWINGS  
**REMARKS**

<b>AFSENDER</b> SENDER	<b>BVI RAADGEWENDE INGENIEURS</b>
<b>DATUM ONTVANG</b> DATE RECEIVED	
<b>ONTVANG DEUR</b> RECEIVED BY	<b>GETEKEN</b> SIGN

TEKEN ASB. EN STUUR AFSCRIF TERUG AAN INGENIEUR.  
 PLEASE SIGN AND RETURN COPY TO ENGINEER