Base Load Power Hub (BLPH)

INSTALLATION, OPERATING AND MAINTENANCE MANUAL

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

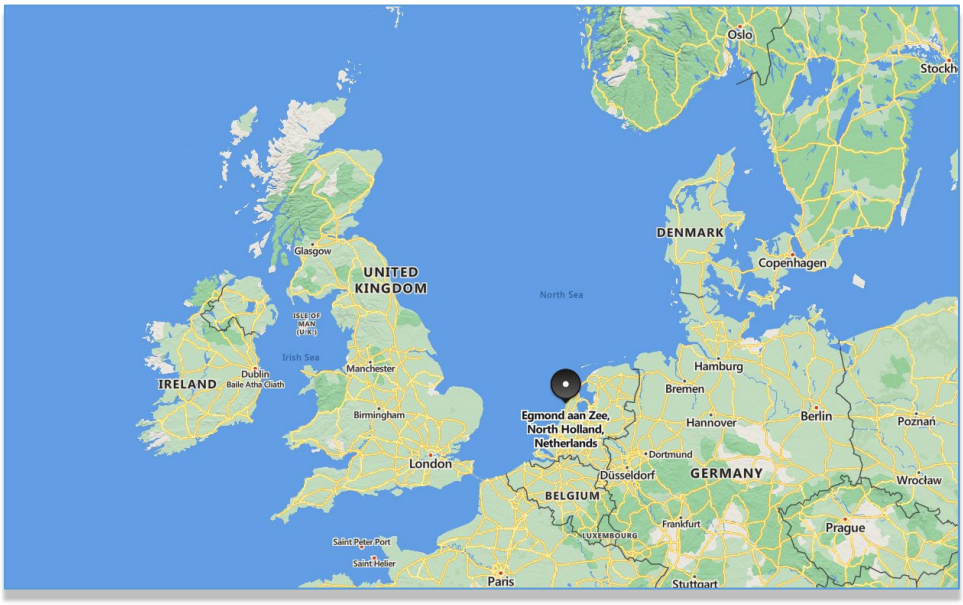


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

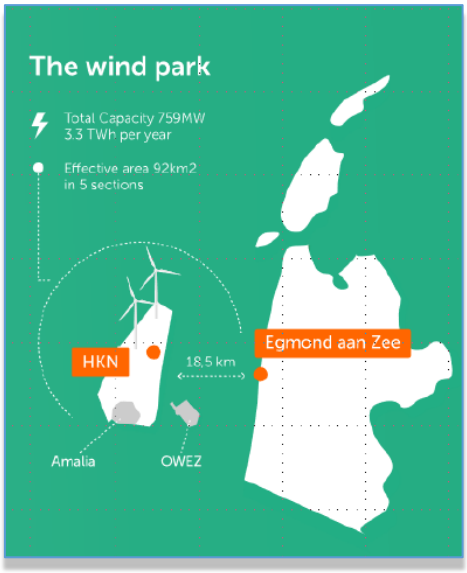


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

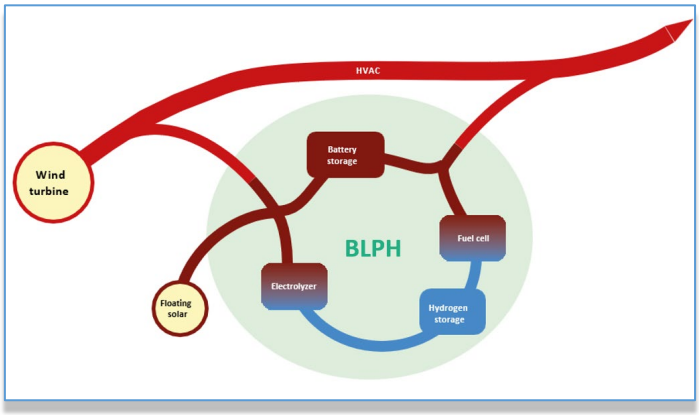


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

Text

2.1 REFERENCES

Doc. No.	Description

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project

Table 2 - Definitions and Abbreviations

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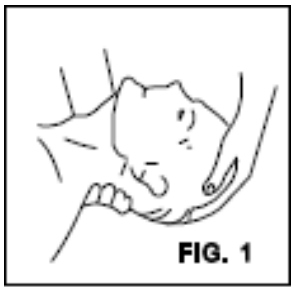
3 FIRST AID AND GENERAL SAFETY ADVICES

- IN CASE OF ELECTRIC SHOCK DO NOT TOUCH THE PATIENT WITH BARE HANDS until the circuit has been interrupted.

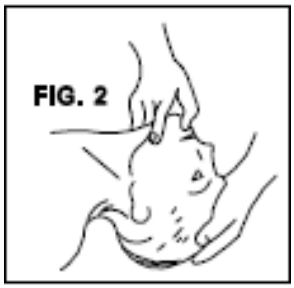
Interrupt the circuit by opening the mains circuit breakers; if this is not possible PROTECT YOURSELF WITH DRY MATERIAL and then free the patient from the conductor.

ARTIFICIAL RESPIRATION - Mouth-to-mouth Method

It is essential to start respiration at once and immediately ask for a doctor's intervention.


FIG. 1

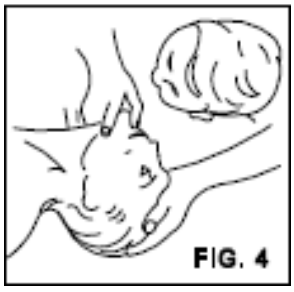
1) Place the patient with face upwards and arms parallel to the body;
If the patient is lying on an inclined plane, make sure that the stomach Is slightly lower than the chest. Open the patient's mouth and check that there are no foreign bodies (denture - chewing-gum– etc).
Kneel near the patient at the same height of his head, place one hand under his head and one under his neck (Fig. 1).
LIFT THE PATIENT'S NECK AND TILTS HIS HEAD BACK AS FAR AS POSSIBLE.


FIG. 2

2) Move your hand from the patient's neck to his chin: place your thumb between chin and mouth, your forefinger along the maxillary bone, keep the other fingers closed (Fig. 2). During these operations, start self-ventilation by breathing in deeply with open mouth.


FIG. 3

3) With your thumb between the patient's chin and mouth, keep his lips closed; apply your lips onto the patient's nostrils and blow into his nasal cavities (Fig.3).


FIG. 4

4) During these operations watch to check whether the patient's chest rises (Fig. 4). If not, the nose may be obstructed: then, levering on his chin with your hand, open the patient's mouth as wide as possible, put your lips around it and blow into the oral cavity. Watch if the patient's chest rises. You can use this latter method instead of the former even when the patient's nose is not obstructed, provided his nostrils are kept closed by your hand after moving

the latter from his head.
THE PATIENT'S HEAD MUST BE KEPT TILTED BACK AS FAR AS POSSIBLE.

5) Start by breathing out quickly and deeply for ten times, then go on with about twelve/fifteen expirations per minute. Continue until the patient has regained consciousness, or until a doctor ascertains his death.

TREATMENT FROM BURNS

This treatment must be applied after the patient has regained consciousness. It may be applied even during artificial respiration (however, there must be at least two persons).

a. DO NOT TRY TO REMOVE CLOTHING FROM THE BURNED PARTS.
b. Apply dry gauze on burns.
c. DO NOT apply ointments or other oily tinctures.

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of installation, operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

All personnel are warned not to engage in repairs or adjustments within live, high-voltage equipment. Moreover, though power has been removed from equipment circuits, dangerous potentials may still exist due to charges retained by capacitors. Always remove power, discharge and ground a circuit prior to touching it. Before making adjustments, trained personnel should ensure that circuits are grounded. If possible, adjustments should be made with one hand, keeping the other free of the equipment.

DO NOT SERVICE LIVE EQUIPMENT UNASSISTED

When repair, replacement, or alignment is required with power applied, under no circumstances should it be attempted alone. Only trained personal with adequate personal protective equipment should be permitted. The immediate presence of someone capable of rendering aid is required.

RESUSCITATION

All personnel working with or near high-voltage shall be instructed in the latest methods of cardiopulmonary resuscitation. Should someone be injured by electricity and stopped breathing, begin resuscitation immediately. Warnings appear in the text in this manual, and are emphasized where necessary.

4 WARNING SIGNS AND NOTICES – TO READ BEFORE USE



HIGH VOLTAGE

In presence of this signal be sure not to come in contact with electrical components as you may be affected by an electrical shock.



FLAMMABLE MATERIAL

In presence of this signal be sure not to use anything that could inflame the components.



DANGER OF DEATH

In presence of this signal be absolutely sure not to do anything if you are not a certificate operator. These components are the most dangerous as they may cause the death.



IRRITATION HARMFUL SUBSTANCES

In presence of this signal be sure not to come in contact with reported substances, as they could damage irreversibly your skin.



GENERAL BAN

In presence of this signal don't exceed the stopping point. This because there is one or more dangers after that and isn't a safe area.



GEARS BAN

In presence of this signal don't put your hands in the gears of the machine or in it working areas.



GENERIC DANGERS

In presence of this signal pay attention at all the component in this area. This signal has two reasons for be used:

1) There are many signs to be reported and not enough space for them;

2)There isn't an exact signal for the danger in this area



GENERAL NOTICE SIGN

1) The practice of the component equipped inside cabin must be execute by expert and technically prepared staff.
2) Use the component equipped inside cabin only after reading carefully this manual and under the respect of the indications.



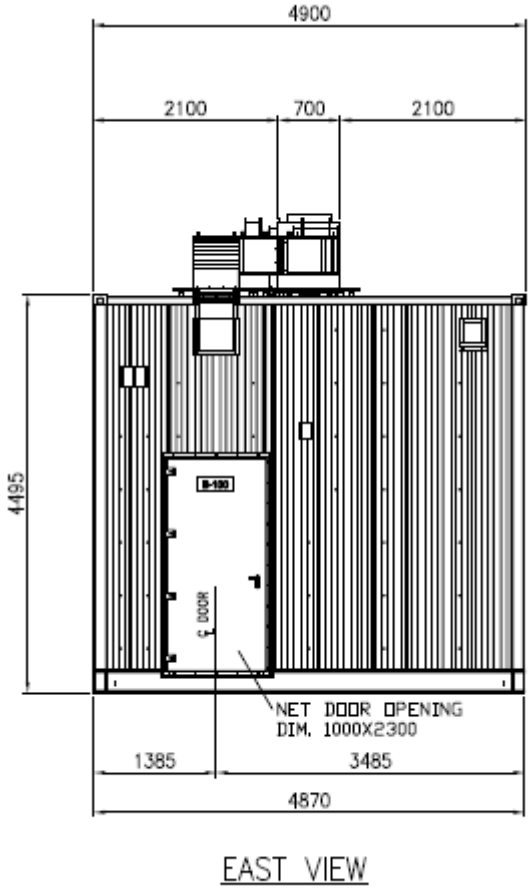
RISK OF EXPLOSION In presence of this signal, the area is under risk of fire or explosion. No welding, cutting or brazing in this area.

Combustible gas explosion hazard.

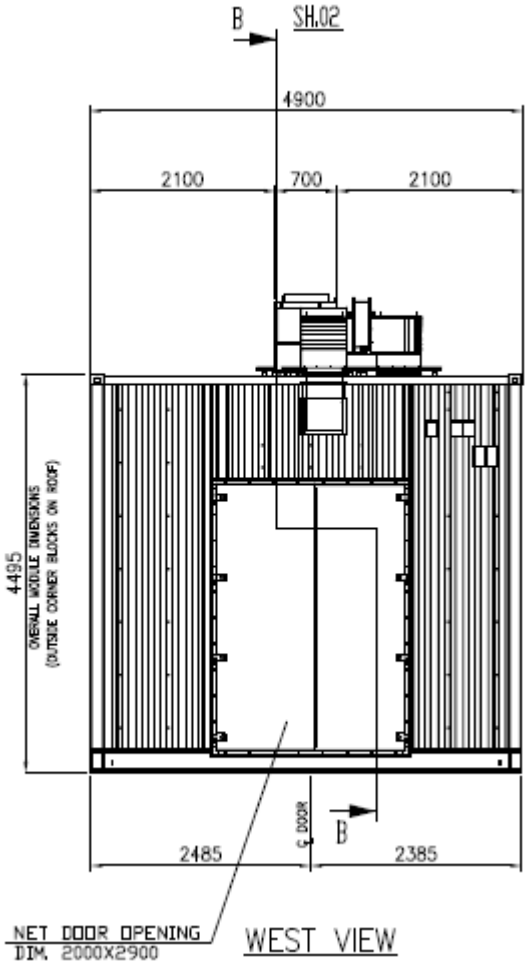
5 GENERAL LAYOUT

- Shelter's External General Layout:

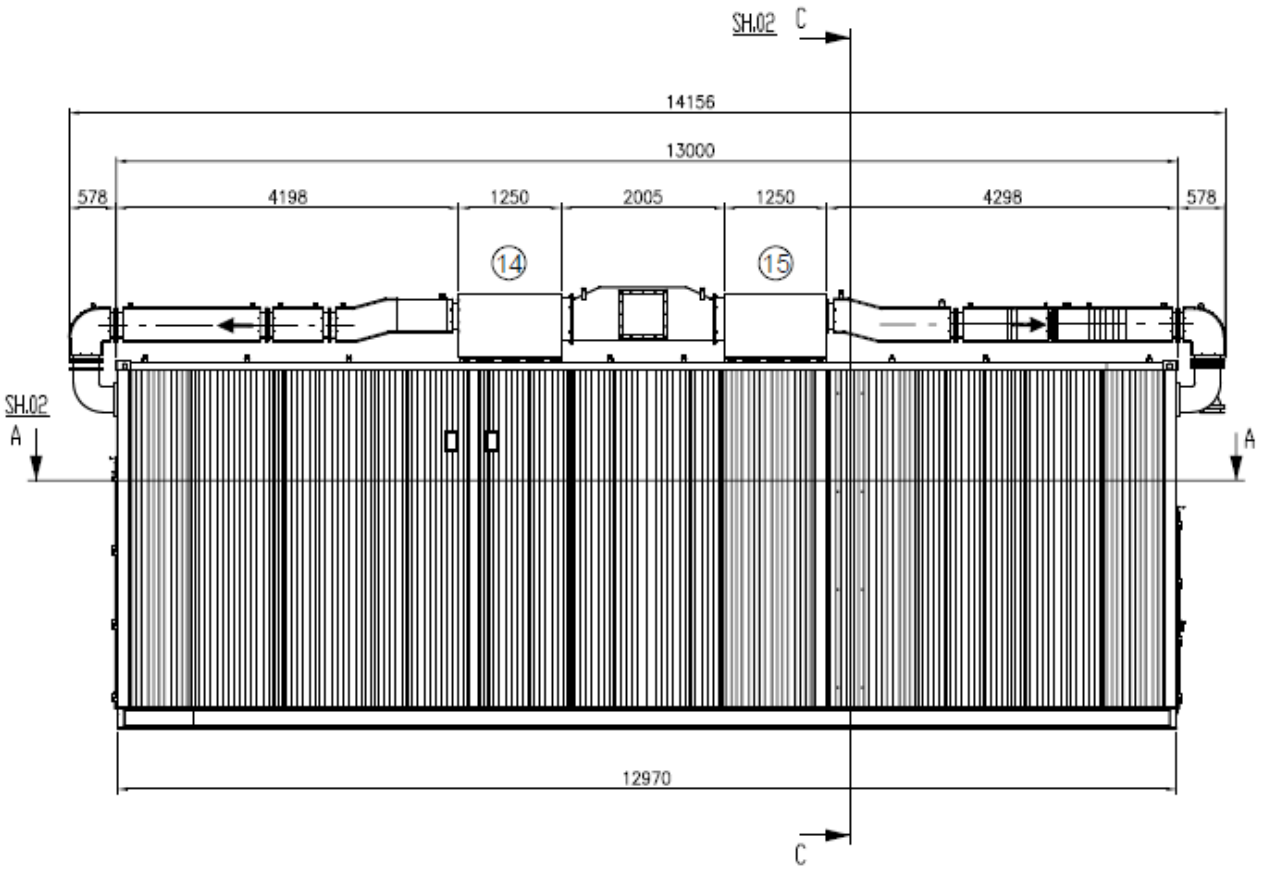
B-100 HV (66kV/6.6kV) SWITCHGEAR ROOM



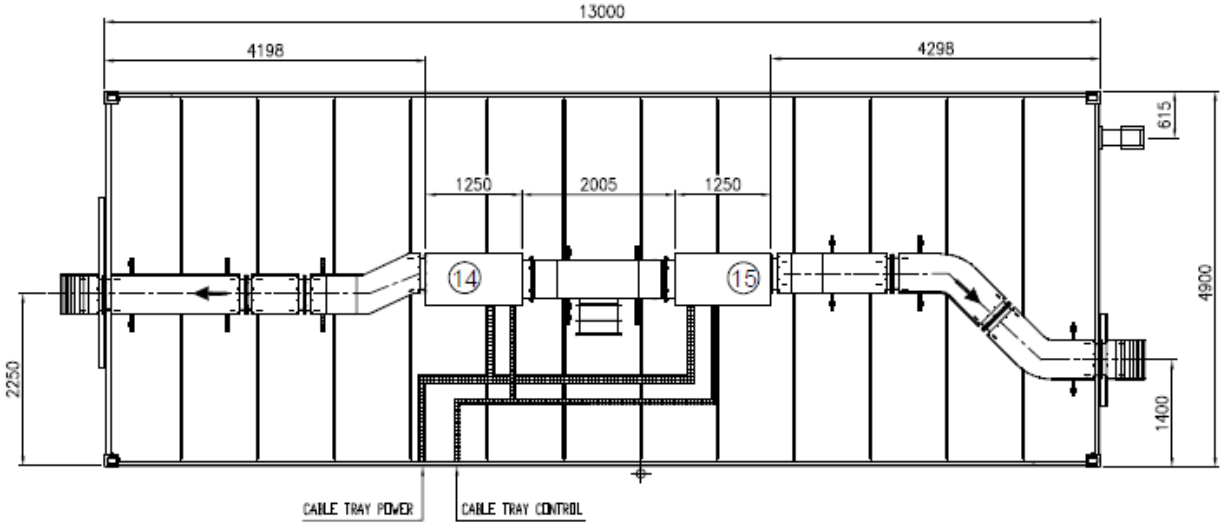
EAST VIEW



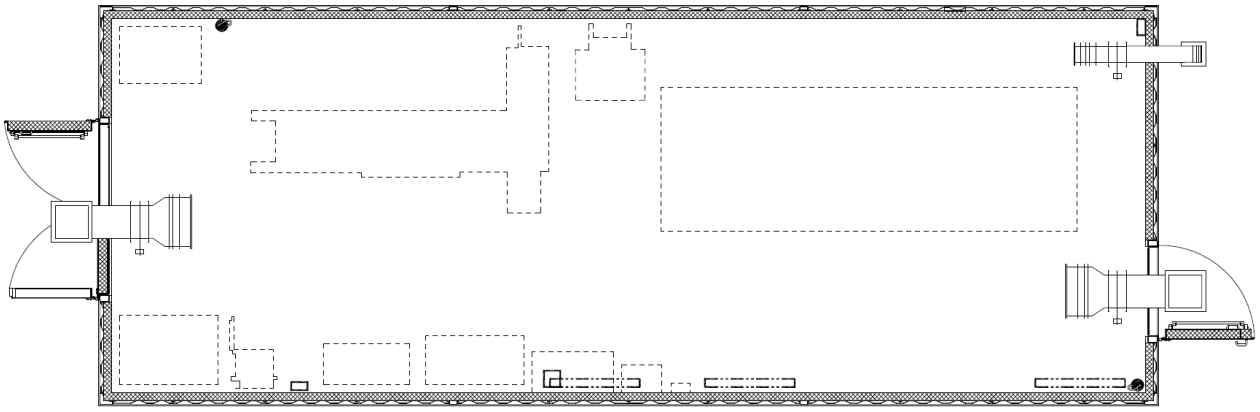
WEST VIEW


SH.02
C
14156
13000
578
4198
1250
2005
1250
4298
578
14
15
SH.02
A
A
12970
C

SOUTH VIEW

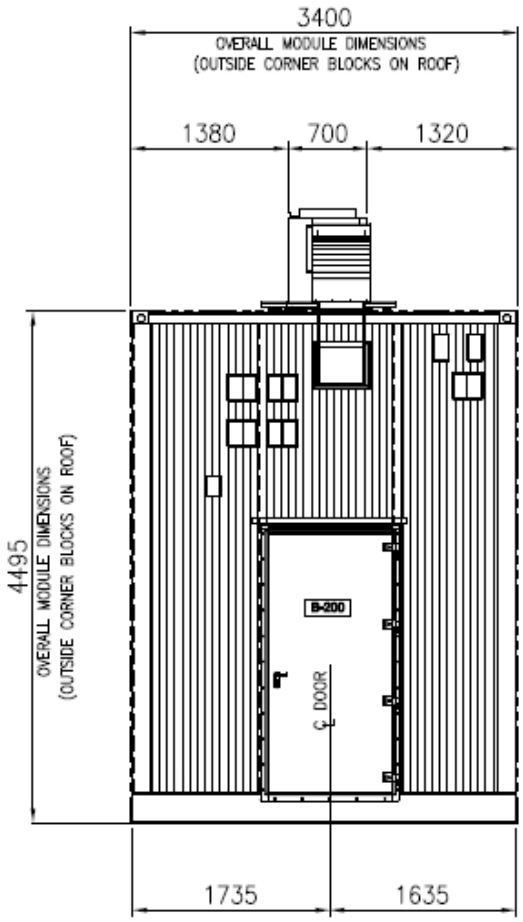


TOP VIEW

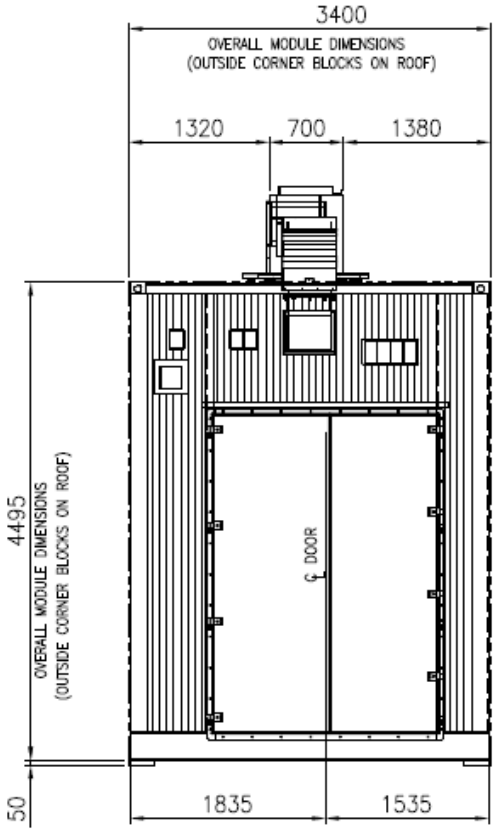


PLAN

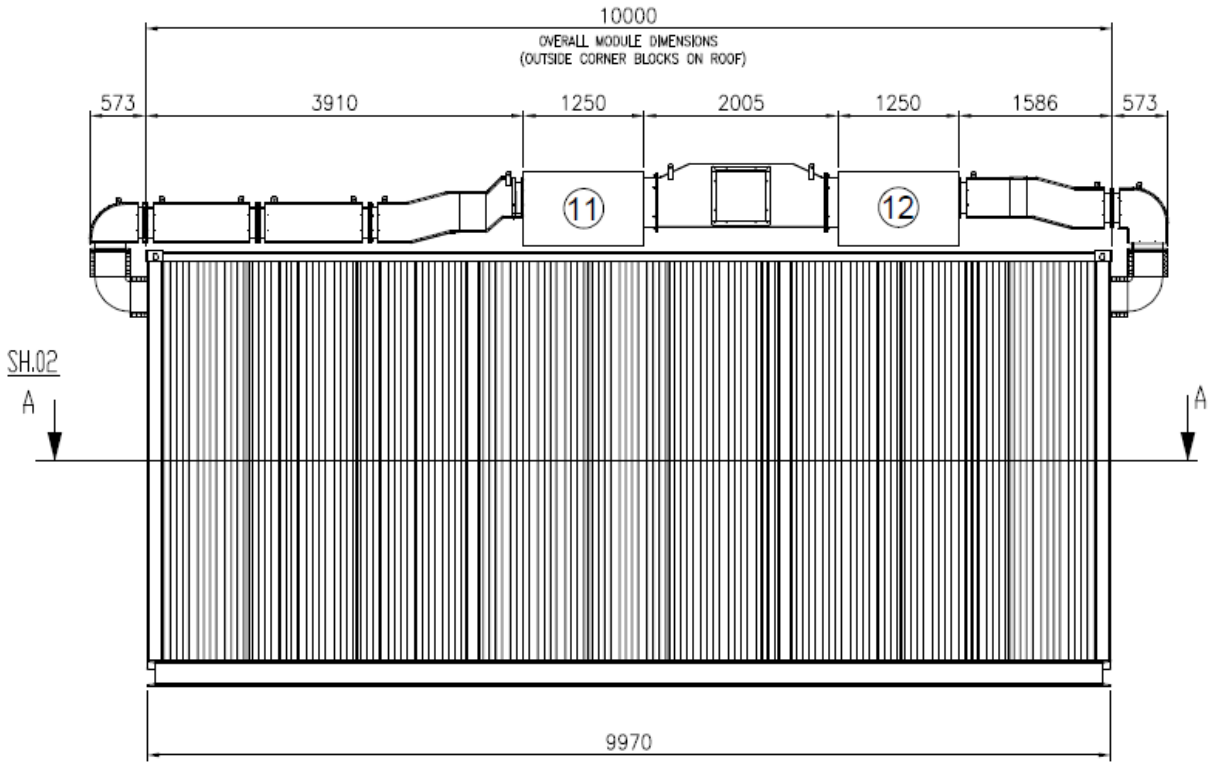
B-200 LV (400V) SWITCHGEAR ROOM



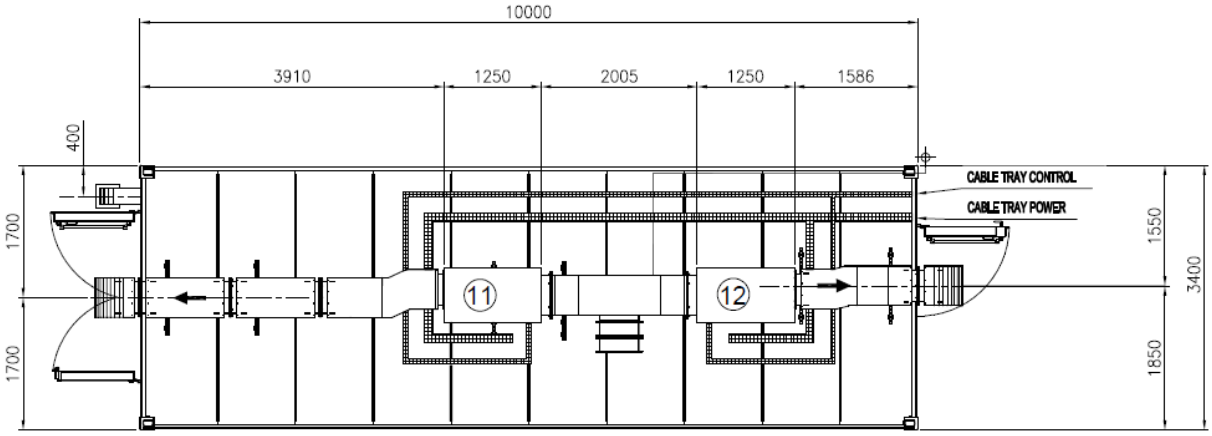
EAST VIEW



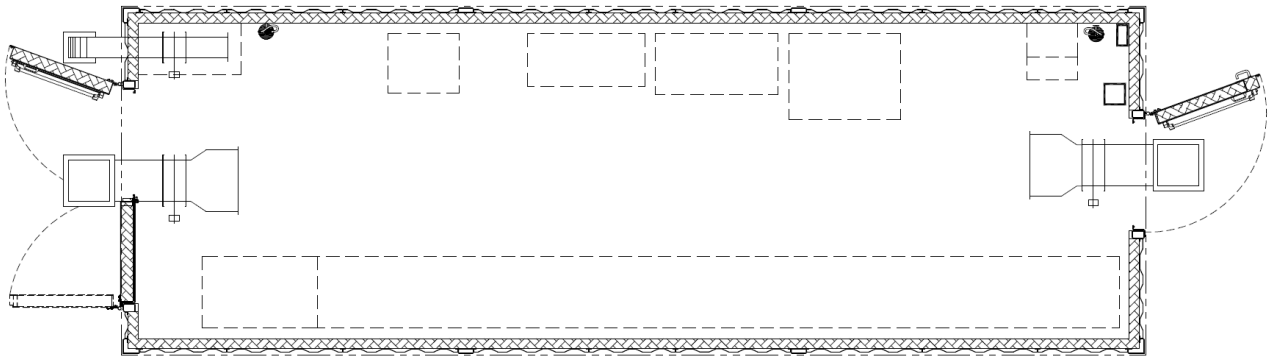
WEST VIEW


10000
OVERALL MODULE DIMENSIONS
(OUTSIDE CORNER BLOCKS ON ROOF)
573
3910
1250
2005
1250
1586
573
11
12
SH.02
A
A
9970

SOUTH VIEW

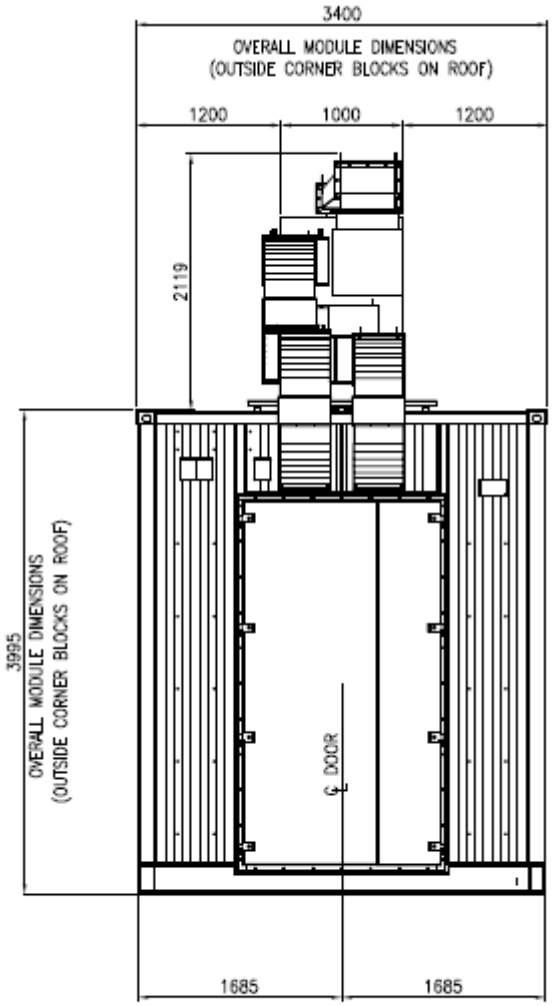


TOP VIEW

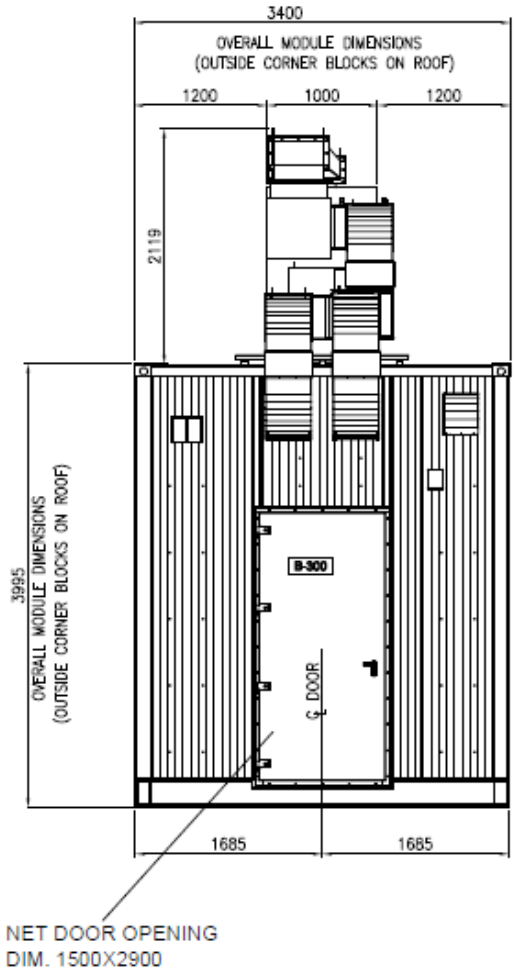


PLAN

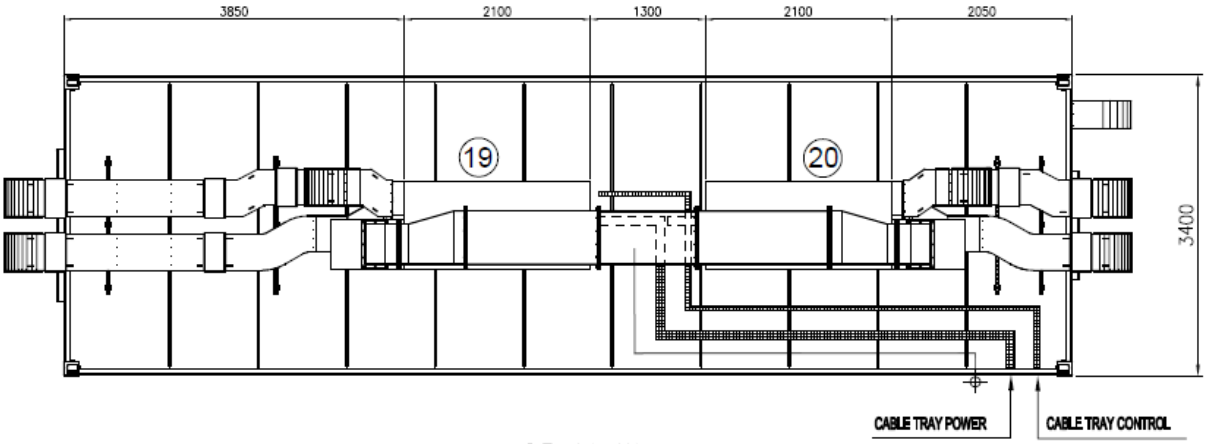
B-300 AC UPS FITTED WITH UPS SYSTEM EQUIPMENT ROOM



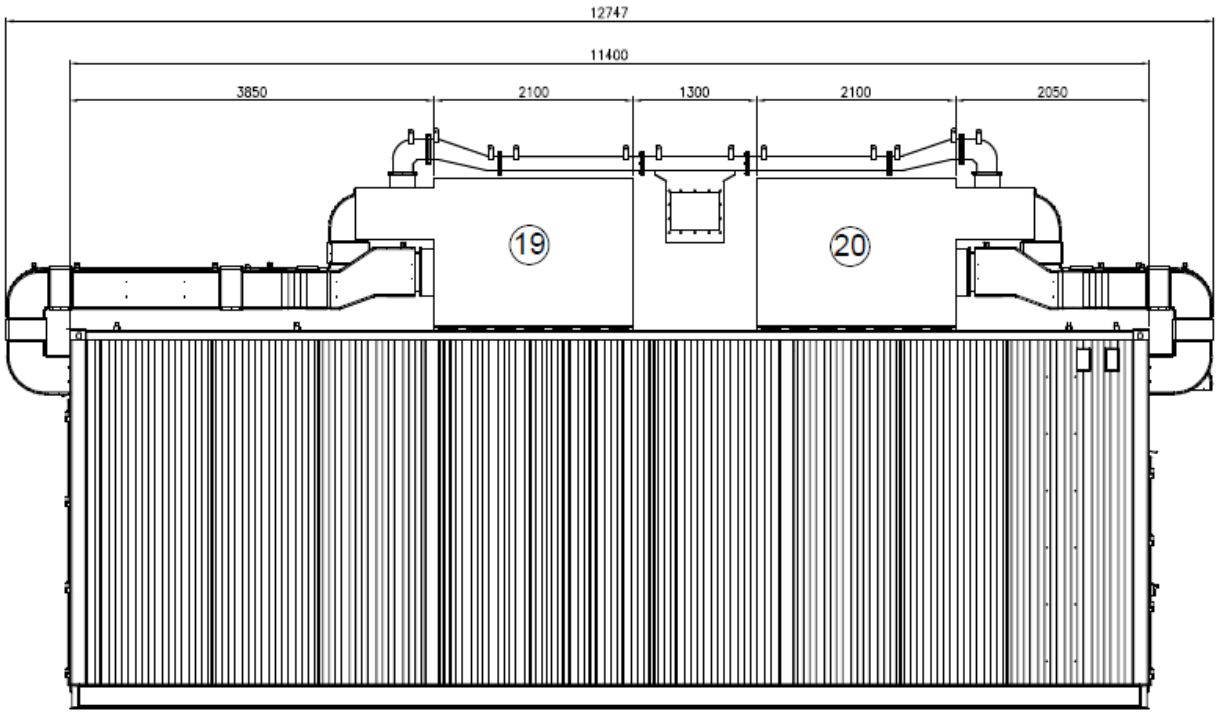
WEST VIEW



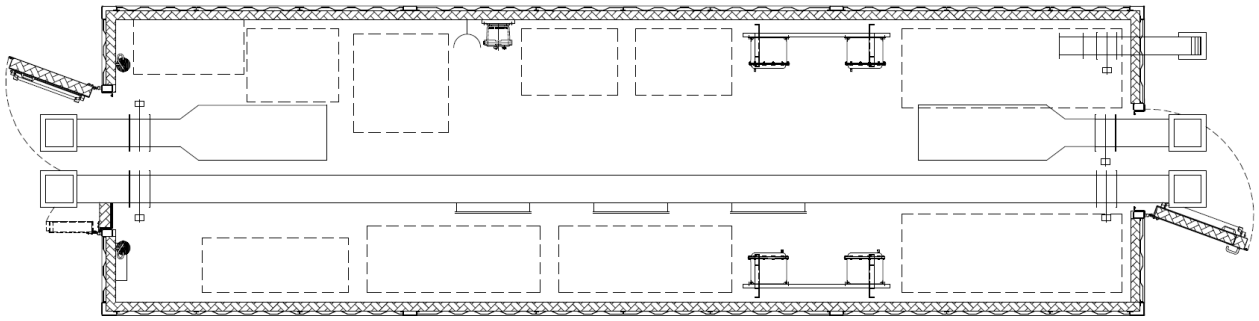
EAST VIEW



TOP VIEW



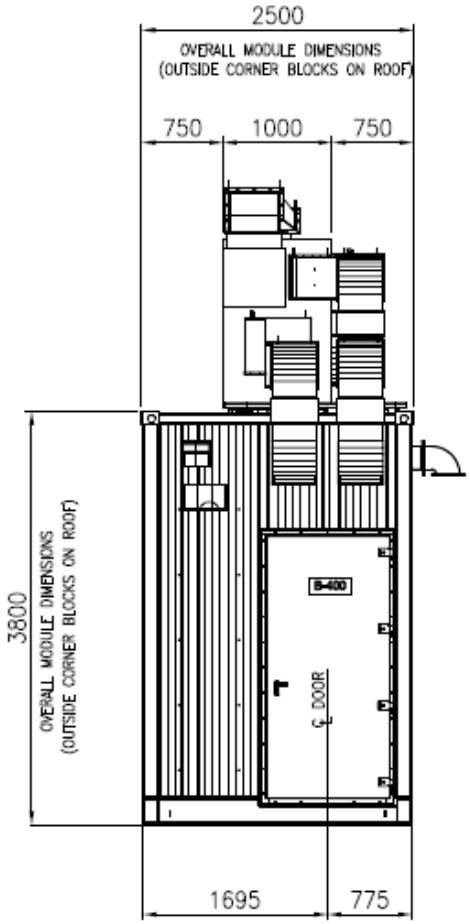
SOUTH VIEW



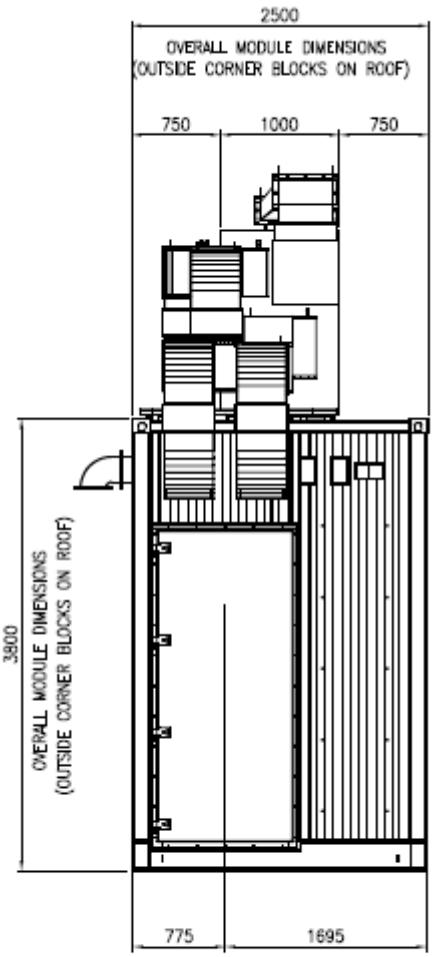
PLAN

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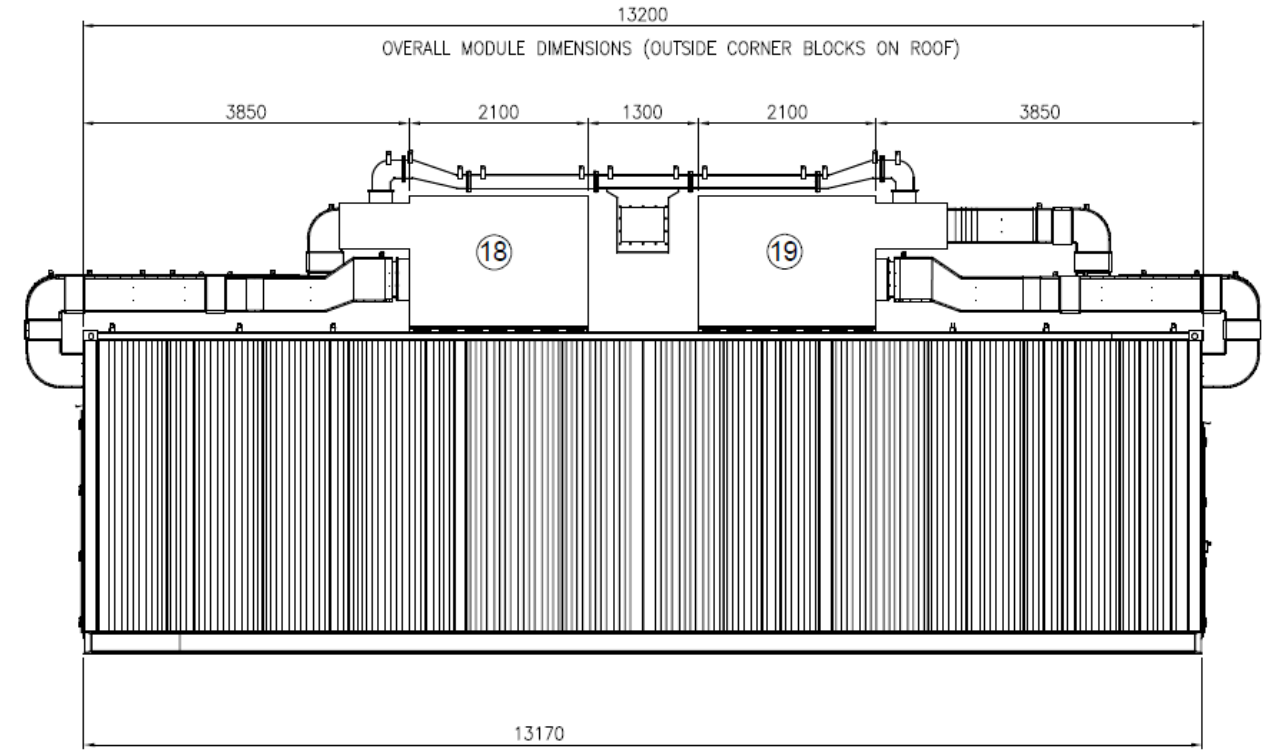
B-400 I&T EQUIPMENT ROOM



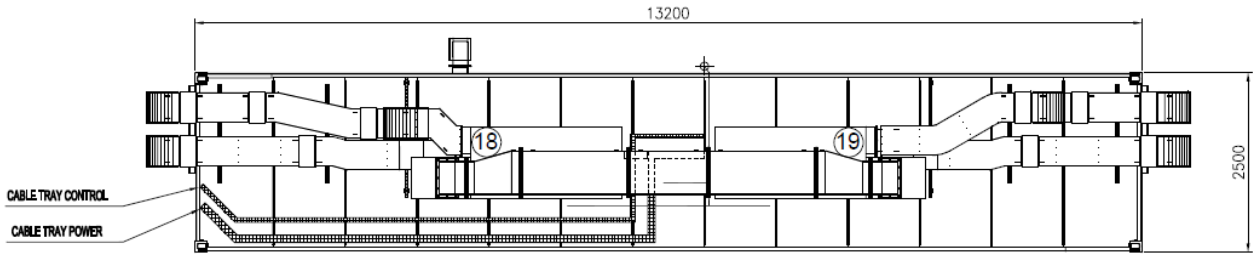
EAST VIEW



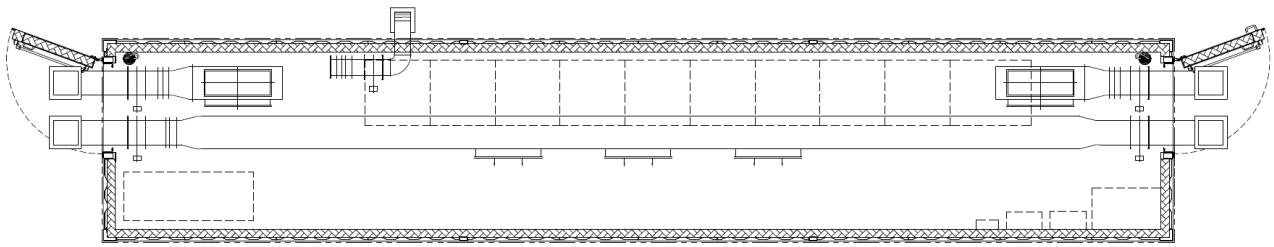
WEST VIEW



SOUTH VIEW



TOP VIEW



PLAN

6 GENERAL NOTES

- SHELTERS:

B-100 HV (66kV/6.6kV) SWITCHGEAR ROOM:

Cabin's weight: 40000 kg. (Approx.) fully equipped
Dimension: 13000 x 4900 x 4500 mm (L x W x H)

B-200 LV (400V) SWITCHGEAR ROOM:

Cabin's weight: 33000 kg. (Approx.) fully equipped
Dimension: 10000 x 3400 x 4500 mm (L x W x H)

B-300 AC UPS FITTED WITH UPS SYSTEM EQUIPMENT ROOM:

Cabin's weight: 35000 kg. (Approx.) fully equipped
Dimension: 11400 x 3400 x 4000 mm (L x W x H)

B-400 I&T EQUIPMENT ROOM:

Cabin's weight: 20000 kg. (Approx.) fully equipped
Dimension: 13200 x 2500 x 3800 mm (L x W x H)

⚠ NOTES:

Cabin has been designed and engineered to be weather-proof and, externally, according with UL/American certifications for hazardous area only for Analyzer room.

Shelter is composed of a module, divided in N. 1 rooms and Air Pressurizers, externally mounted.

During the commissioning phase make sure to enable the Power Input Feed ONLY when all the other internal cables have been connected and preliminary tested as correct.

Once having mechanically installed all the electrical panels, a different routing of the cables layout could become impossible to perform.

The necessary cables have to be pulled before the Cabin's electrical activation.

- All the external openings, on each module, have been sealed for transportation purpose, and the external elements isolated and sealed, to protect them from humidity, dust or damages, during transportation.

- Please remove every protection, before any of the mounting or re-connection procedures!

  - Floor is composed of 18mm thick plywooden panels with embossed metal sheet.
  - All threaded joints have been designed to use metric Tools.

⚠ LIFTING NOTE:

- Use always certified hoisting devices with adequate SWL.
- Use adequate crane evaluating the weight of Shelter and the outreach.
- Each chain must have a hoist certified of adequate load.
- Lifting of the Shelter must be done with always four lifting point.
- The crane hoisting power depend on the working range.

⚠ NOTES:

- The control cabins can be lifted from proper lifting points, placed in the upper edges of Cabins' Lifting pillars.
- To fix the lifting chains take off hooks from each corner.
- Important issue is taking care to the lifting system: it MUST be one of the represented in the dedicated annexed schemes. NO OTHER LIFTING SCHEME IS ADMITTED. Refer

to chapter n.7 Lifting Scheme

⚠ ATTENTION: for technical details please see Reference Documents.

- BE SURE THAT THE ROPES/CHAINS' SWL (Safety Working Load) HAS ENOUGH SAFETY LIFTING MARGIN TO LIFT THE SHELTER WEIGHT.
- TO CALCULATE THE CORRECT ROPE/CHAIN SWL PLEASE REFER THE WEIGHT ON DATA PLATE LOCATED CLOSE TO THE MAIN DOOR.
- To lift the Shelter, use appropriate lifting eyes, placed on the top corners, with metallic ropes.
- According to the weight indicated on the data plate, use the hooks of the appropriate SWL weight capacity, taking in consideration the lifting strain values.

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7 ASSEMBLY, TESTS AND MAINTENACE

- After having successfully passed **Alex-sistemi**'s FAT and all certificated controls, it has been necessary to disassemble some equipments due to the shipment limitations.
- The reconnection procedure, all tests of correct operation and subsequent maintenance should be entrusted to qualified technicians.
- Technicians have to be qualified to issue certificates of working proper execution and correct installation of all systems, according to local regulations.
- Tests that have to be performed prior to the re-activation of the shelter.
- Be sure to use only the specified accessories and parts for installation work.

DO NOT ACTIVATE ANY INSTALLATION BEFORE HAVING PERFORMED ALL TESTS AND OBTAINED LOCAL REGULATION CERTIFICATIONS.

- **Alex-sistemi** recommend to perform maintenance procedures in time-needed: IN CASE OF MALFUNCTIONS DUE TO A MAINTENANCE DEFICIENCY,

- **Alex-sistemi** WON'T ASSUME THE RESPONSIBILITY FOR DAMAGES CAUSED TO THE SHELTER OR OTHER LINKED STRUCTURES.

- Please store this manual for future reference.

⚠ ATTENTION:

All the assembly procedures and other operations indicated in this manual have to be performed by qualified technicians, paying attention to the instructions here contained.

8 TOOLS NEEDED

- All the operations on the shelter have to be performed by qualified technicians, acting following the worksite safety standards, using the proper protections (a helmet, protective glasses and gloves, reinforced shoes) and slings, if necessary.

- Shelter has been designed by choosing to use only threaded joints with metric heads.
- Tools that are necessary during the process of mounting and maintaining of the shelter are listed below:
  - > Properly dimensioned cranes
  - > Lifting cricket, to lift from the perimetral eyebolts
  - > A series of 6mm to 36mm metric wrench
  - > Manual HEX wrench, for lifting eyebolts only
  - > Phillips-head screwdrivers
  - > A series of 6mm to 36mm Torques
  - > A series of 6mm to 36mm Allen wrenches
  - > A multimeter tester
  - > A clamp meter
  - > An hacksaw
  - > A cutter

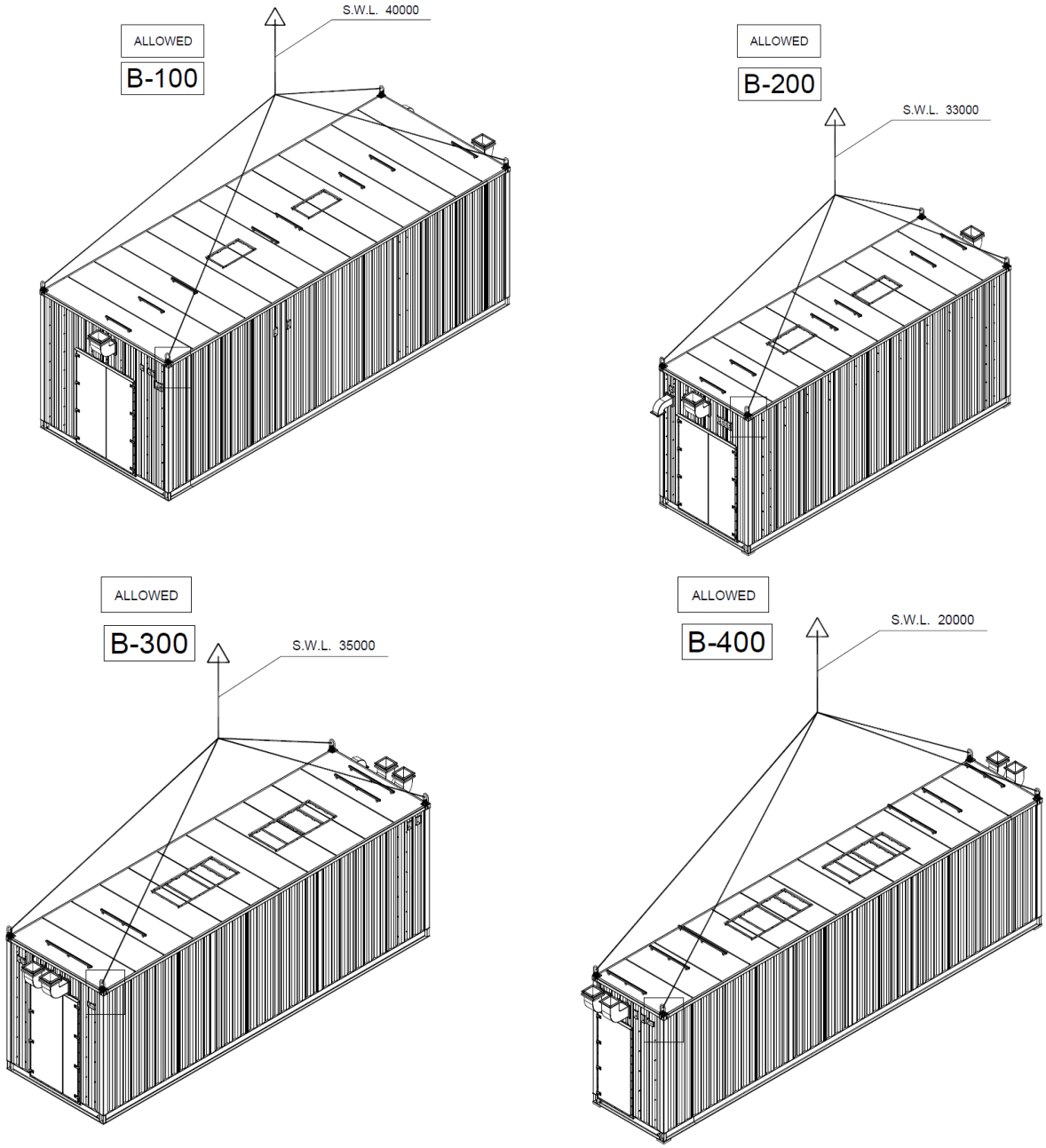
- Also CONSUMABLE materials are needed:
  - > Electrical sealing / Gasketing tape
  - > Teflon tape
  - > Sylicone grease
  - > Hacksaw blades
  - > Cutter blades

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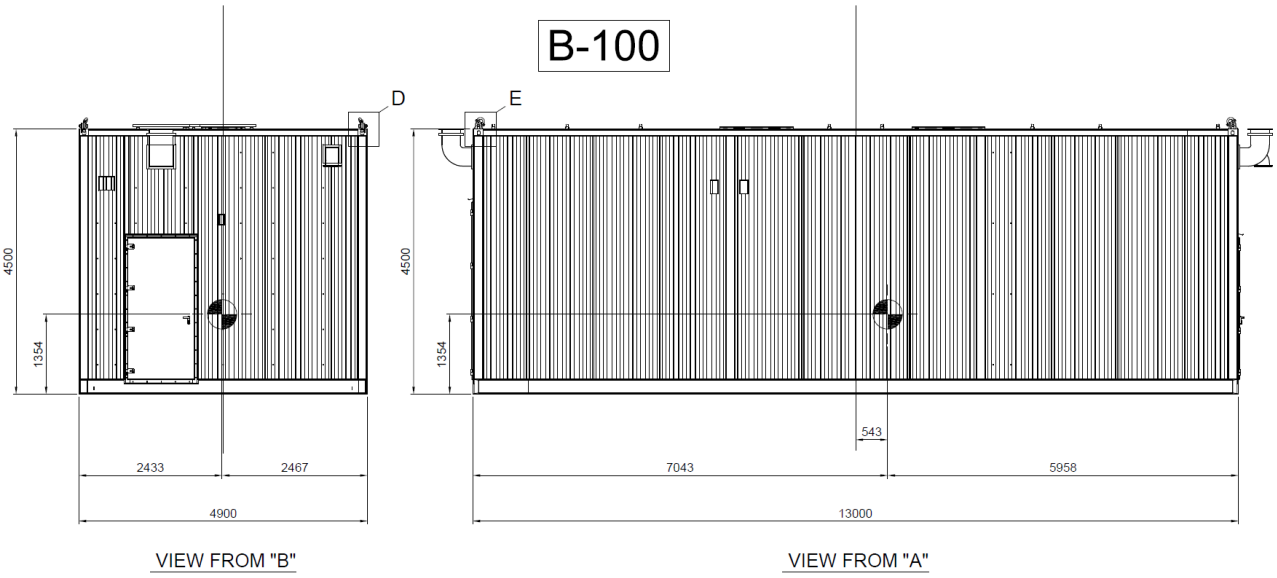
9 LIFTING SCHEME

Rif. Doc. 1724000049-AR-DD-00062 Lifting Drawing E&I Shelters

- Use proper chains, or ropes, with hooks (not provided)



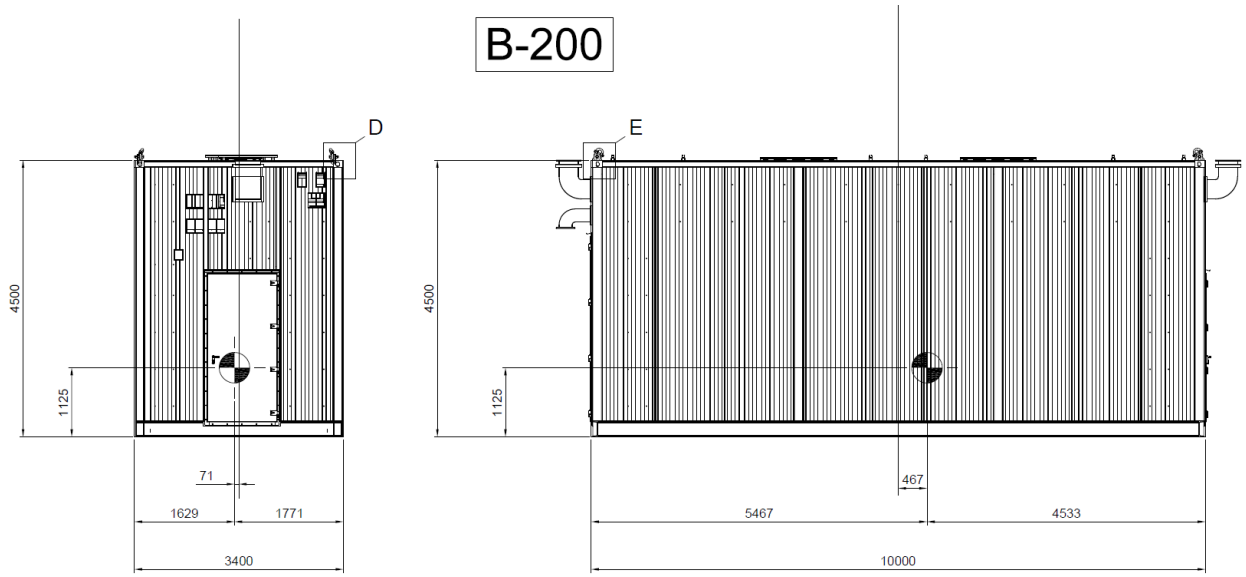
B-100



VIEW FROM "B"

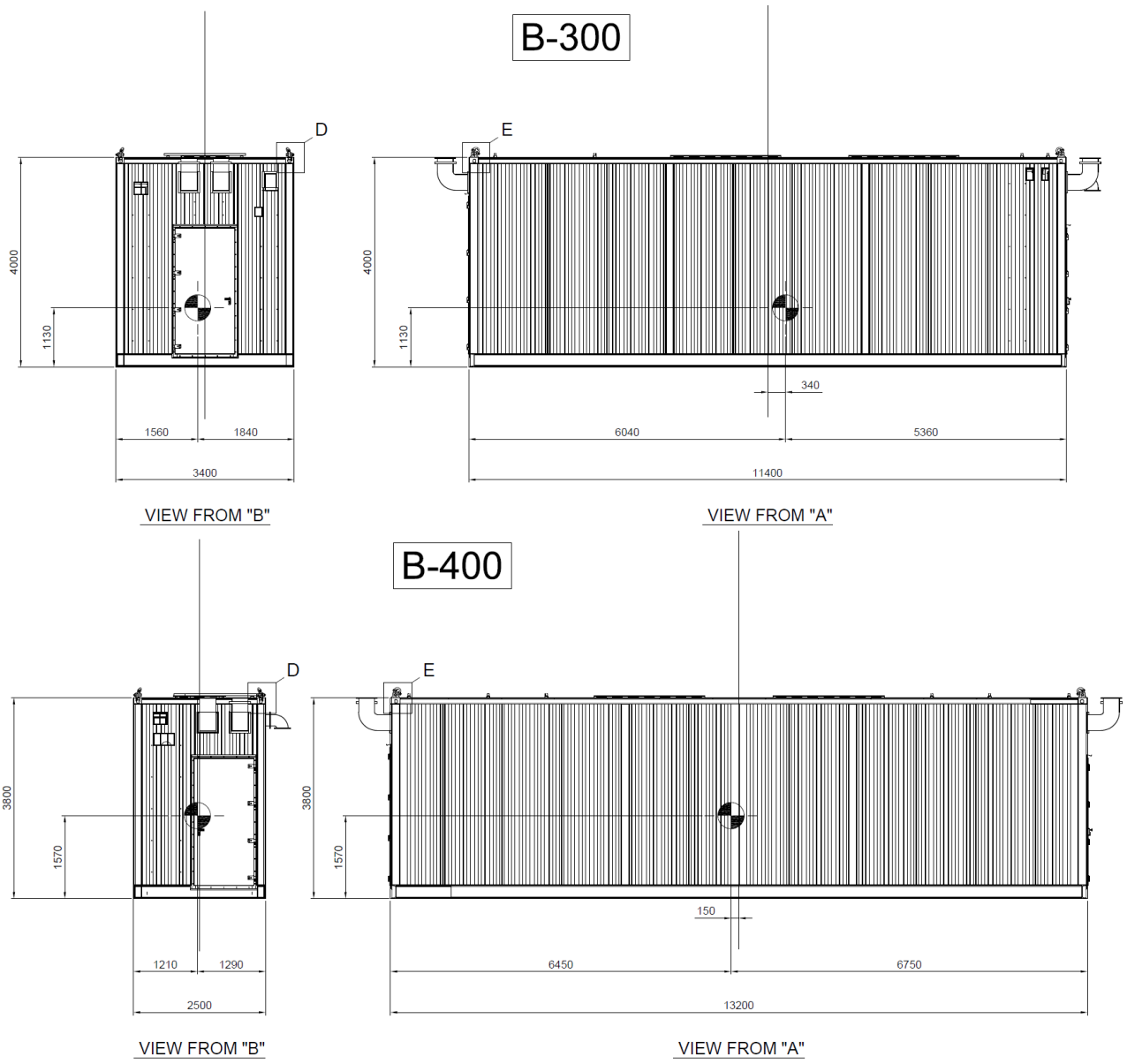
VIEW FROM "A"

B-200

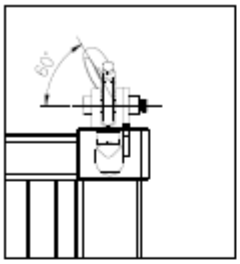


VIEW FROM "B"

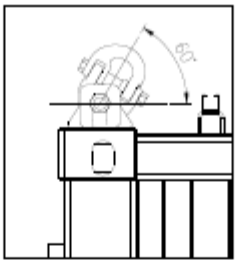
VIEW FROM "A"


B-300
D
E
4000
1130
1560
1840
3400
340
6040
5360
11400
VIEW FROM "B"
VIEW FROM "A"
B-400
D
E
3800
1570
1210
1290
2500
150
6450
6750
13200
VIEW FROM "B"
VIEW FROM "A"

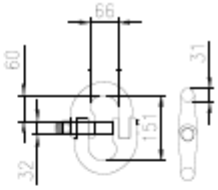
The shelters must be lifted by ISO LUG ASS'Y



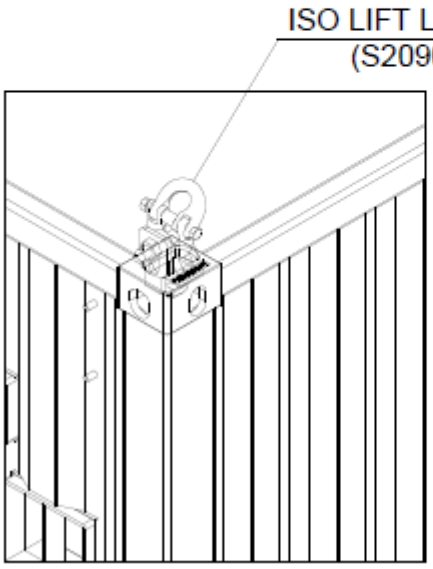
DETAIL D



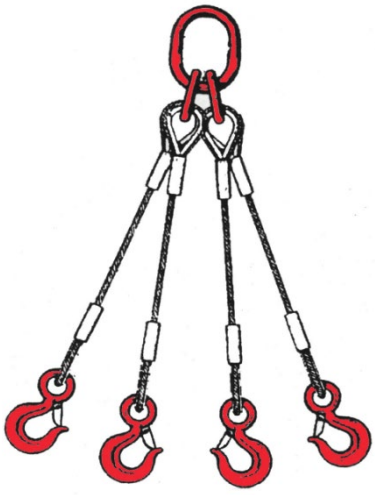
DETAIL E



FLEX LINK DIMENSIONS

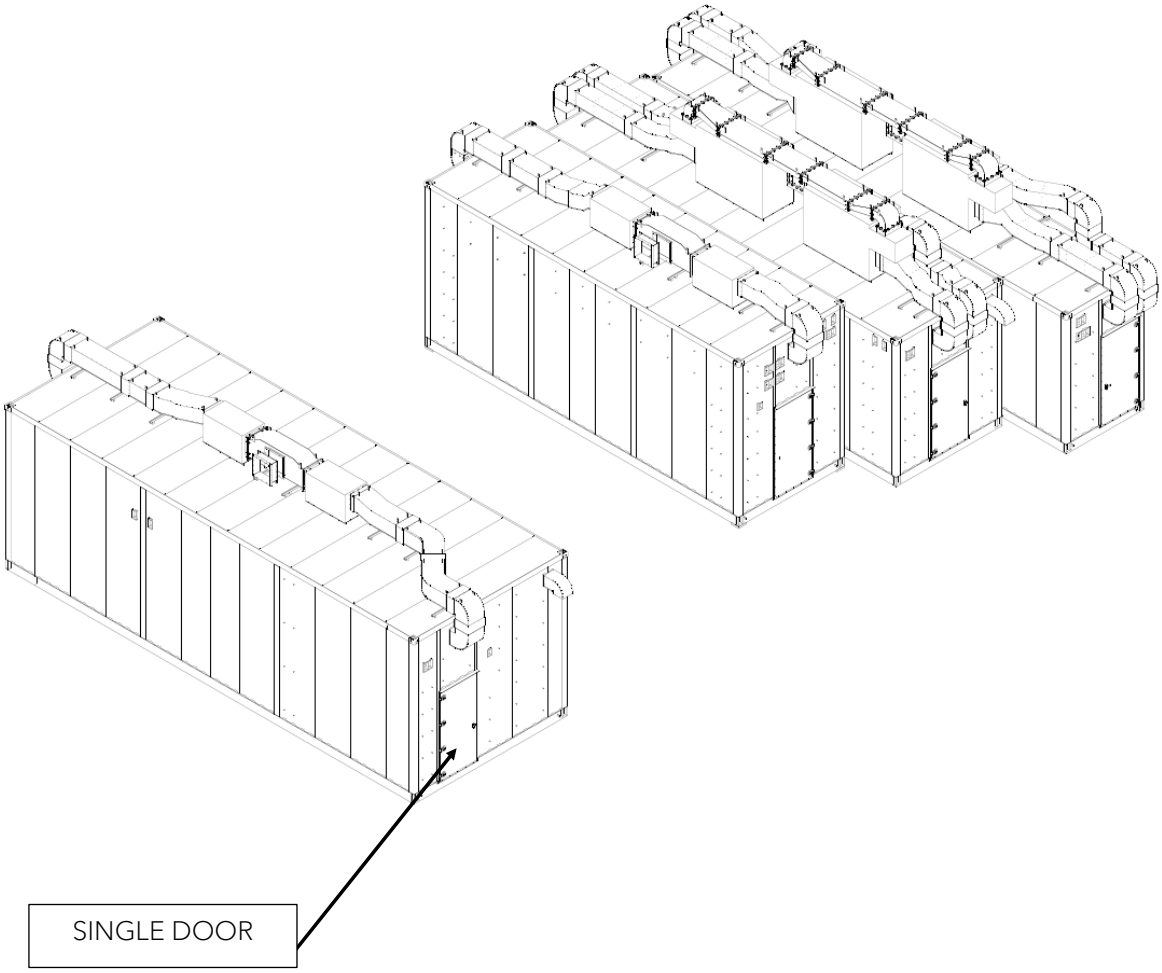


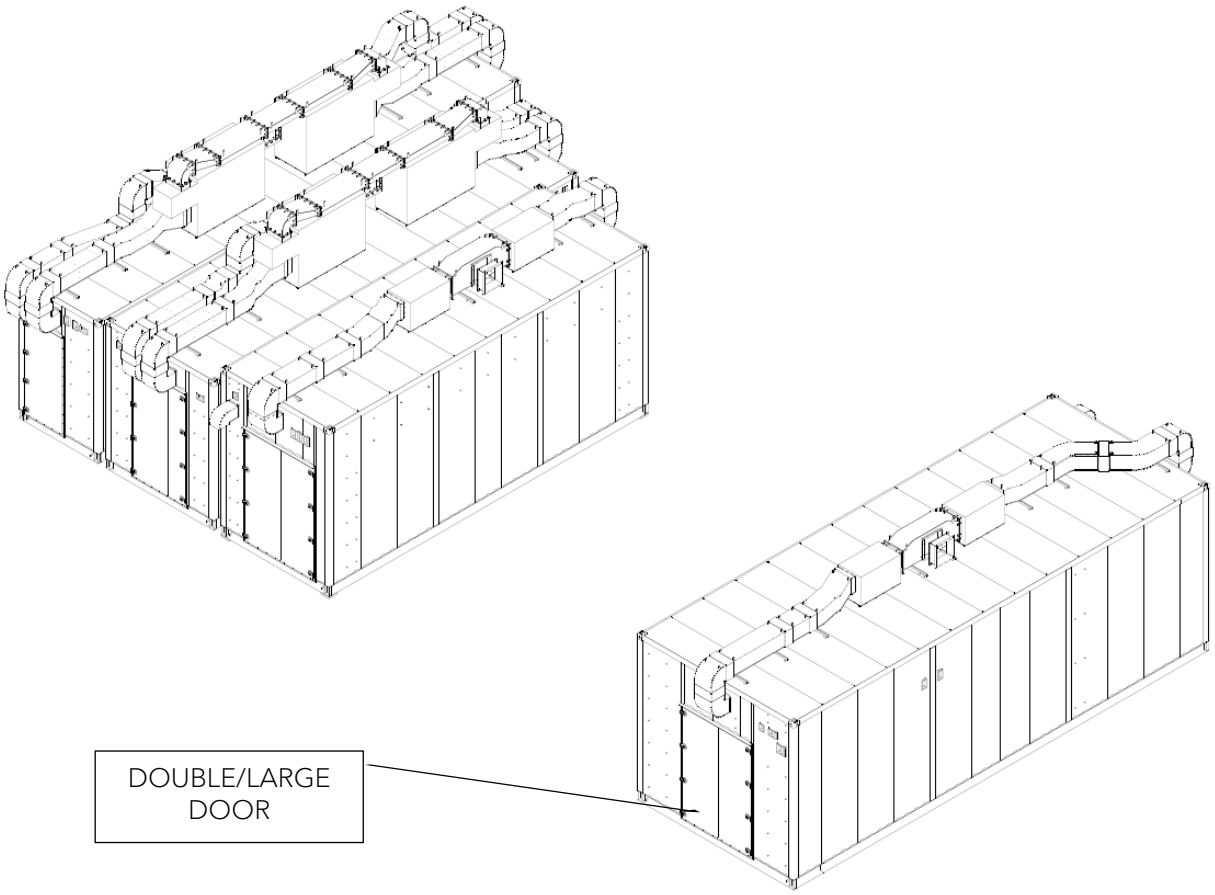
DETAIL C



EXAMPLE OF PROPER CHAINS TO BE USED FOR LIFTING OPERATION

10 DOORS OPENING





- To open the door, use the handle:
- The keys of each door have been fixed to the external handle:



- There are two doors positioned on the short side of the cabinet

- As the other metallic elements, also the External Door has a grounding connection, composed of an copper braid:

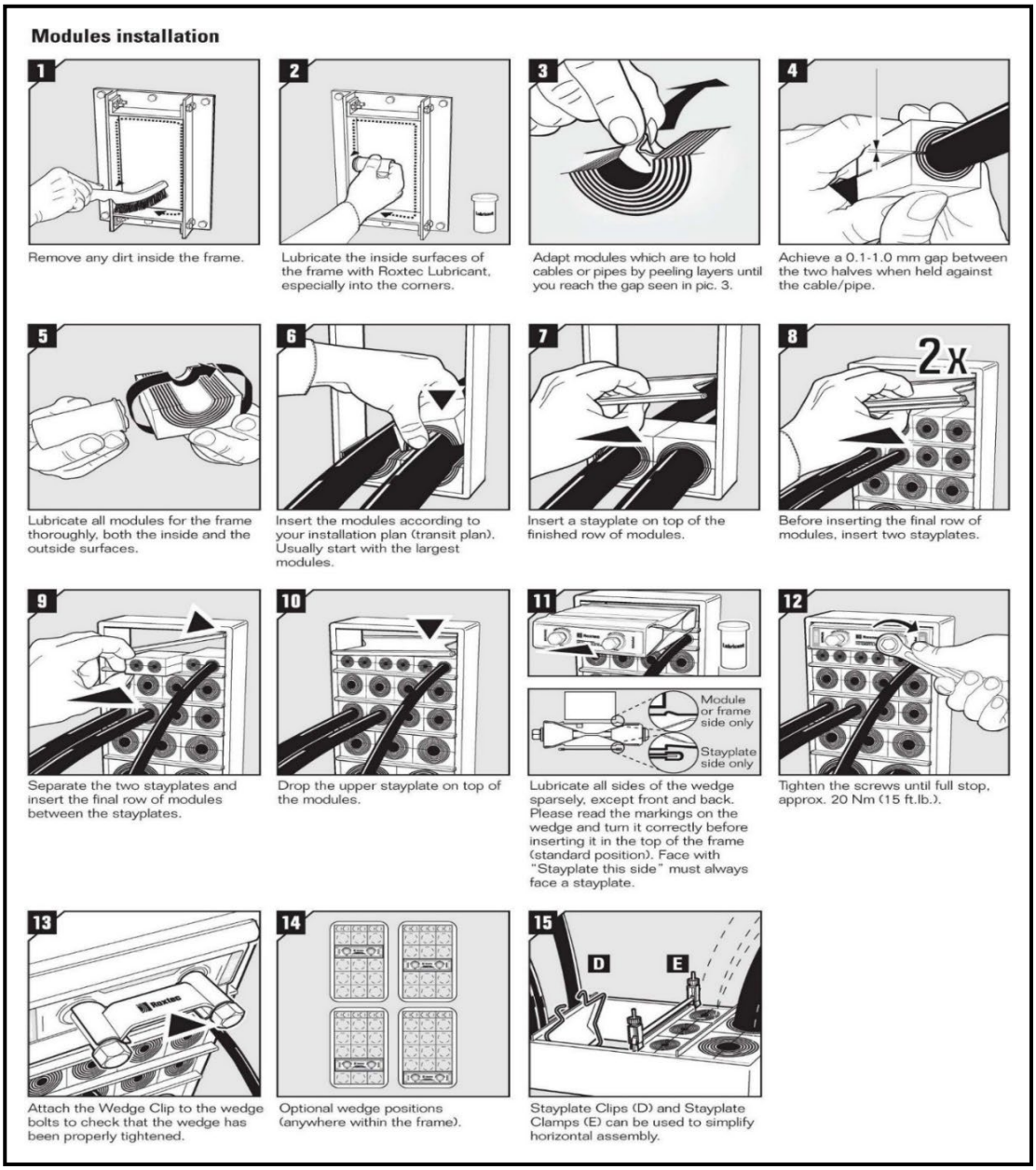


TYPICAL PICTURES

11 ROXTEC CABLE ENTRIES

Rif. Doc. 1724000049-AR-DD-00018 B-100 DETAILED DRAWINGS-E&I SHELTERS
1724000049-AR-DD-00019 B-200 DETAILED DRAWINGS-E&I SHELTERS
1724000049-AR-DD-00020 B-300 DETAILED DRAWINGS-E&I SHELTERS
1724000049-AR-DD-00021 B-400 DETAILED DRAWINGS-E&I SHELTERS

- Cables From Field and HVAC cables goes inside-out the Module through a series of Roxtec Gateways: a system that consents the rapid insertion and fixing of the cables and that guarantees the ATEX protection level of the entries.
- Refer to General Arrangements.



12 AIR CONDITIONING SYSTEM

TBD

13 MAINTENACE

- Verify every six months the general conditions of the shelter structure, scratches and damage shall be promptly restored following the procedures for touch-up paint usage.
- Verify every six months the good shape of the door gasket, if is necessary restore the damaged section.
- Verify every six months the efficiency of the door closer and the correct function of closing the door.
- Verify every six months the correct function of the door handle and cleanness of the cylinder.

14 REFERENCE DOCUMENTS

Client Document No.	Document
1724000049-AR-DA-00014	B-100 General Arrangement drawings
1724000049-AR-DA-00015	B-200 General Arrangement drawings
1724000049-AR-DA-00016	B-300 General Arrangement drawings
1724000049-AR-DA-00017	B-400 General Arrangement drawings
1724000049-ST-DD-00010	B-100 Foundation drawings-E&I Shelters
1724000049-ST-DD-00011	B-200 Foundation drawings-E&I Shelters
1724000049-ST-DD-00012	B-300 Foundation drawings-E&I Shelters
1724000049-ST-DD-00013	B-400 Foundation drawings-E&I Shelters
1724000049-HV-DA-00064	B-100 HVAC System-G.A. and details
1724000049-HV-DA-00065	B-200 HVAC System-G.A. and details
1724000049-HV-DA-00066	B-300 HVAC System-G.A. and details
1724000049-HV-DA-00067	B-400 HVAC System-G.A. and details
1724000049-AR-DD-00062	B-100 Lifting drawings - E&I Shelters
1724000049-AR-DD-00063	B-200 Lifting drawings - E&I Shelters
1724000049-AR-DD-00064	B-300 Lifting drawings - E&I Shelters
1724000049-AR-DD-00065	B-400 Lifting drawings - E&I Shelters

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