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代码 | Stock Code

Prefabricated Container Solution

汇报人：

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PART. 01

Overview

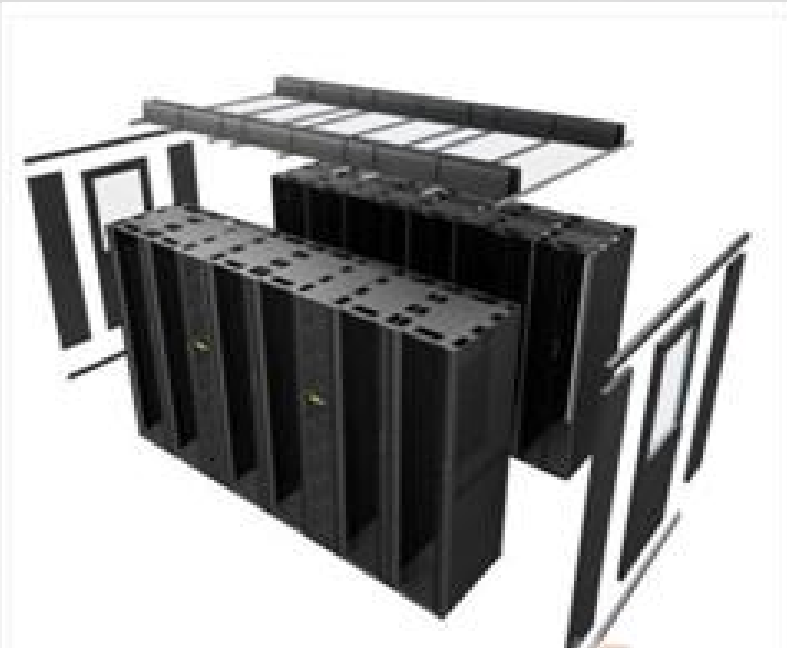
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Overview

- The most convenient solution to reduce on-site electrical installation work are the Cabin-type Electrical Room: this kind of solution allows to build in the cabins or the parts of them, and once arrived on site, the only activities to be performed are installation, final cabling and site acceptance tests.

Modular design



Factory Assembling and Commissioning



Site Construction



Overview

- Based on modular design , the prefabricated cabin consists of cabin, secondary equipment, HVAC, lighting, fire protection, security, CCTV and other equipment. Complete the related wiring and equipment debugging in the factory, and transport to the site as a whole or 2 to 3 units and achieve "plug and play" between the primary equipment and second equipment through prefabricated cables.



Overview



- **Standardized design** for all substations to simplify management
- All potential problems solved in factory to reduce field risk
- Easy Installation in field to save time and cost

PART. 02

| Solutions & Products

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Applications



Applications



Applications



Applications



Applications



Figure 1 Vehicle mobility cabin



Figure 2 Double deck cabin



Figure 3 Corrugated panel exterior cabin



Figure 4 Rack cabinet



Figure 5 Rear wiring cabinet



Figure 6 Front wiring cabinet

Applications



Turnkey Solution



Conceptual & Detailed Design

Manufacture & Procurement

Maintenance & Training

- Modular substation delivered by CYG is a turnkey solution, which adapted to the specific requirements of customer, **including equipment selection according to accreditation.**

Tailored for Diverse Applications

Standardized-Container Application

- A single container mounted on concrete foundation.



Combined Container Application

- Large container can be flexible to split for transportation, and can be combined on site



Mobile SS Application

- A single container mounted on a truck which can be moved and relocated.



Typical Twelve (12) Months Leading Delivery Period

| Item | 1st Month | 2nd Month | 3rd Month | 4th Month | 5th Month | 6th Month | 7th Month | 8th Month | 9th Month | 10th Month | 11th Month | 12th Month |
|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|
| Civil work | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | |
| Procurement and manufacturing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | | | | | |
| FAT | | | | | | ✓ | | | | | | |
| Shipping and Delivery | | | | | | ✓ | ✓ | | | | | |
| Installation and erection Works | | | | | | | | ✓ | | | | |
| Pre-commissioning and test | | | | | | | | | ✓ | ✓ | | |
| Site training | | | | | | | | | | | ✓ | |
| Final commissioning | | | | | | | | | | | ✓ | |
| Hand over | | | | | | | | | | | | ✓ |

The delivery period based on the project drawing be approved.

Factory assembly and installation



- Pre-assembled and pre-tested in factory.
- Standardized assemble procedure and the well-proven quality control.
- Professional factory with 50+ containers manufacturing capacity.
- Strict quality control processes to guarantee the high quality from procurement, manufacturing, integration, commissioning, delivery and services.

Life Cycle and Equipment Selection

Longest Life Cycle of Container in market

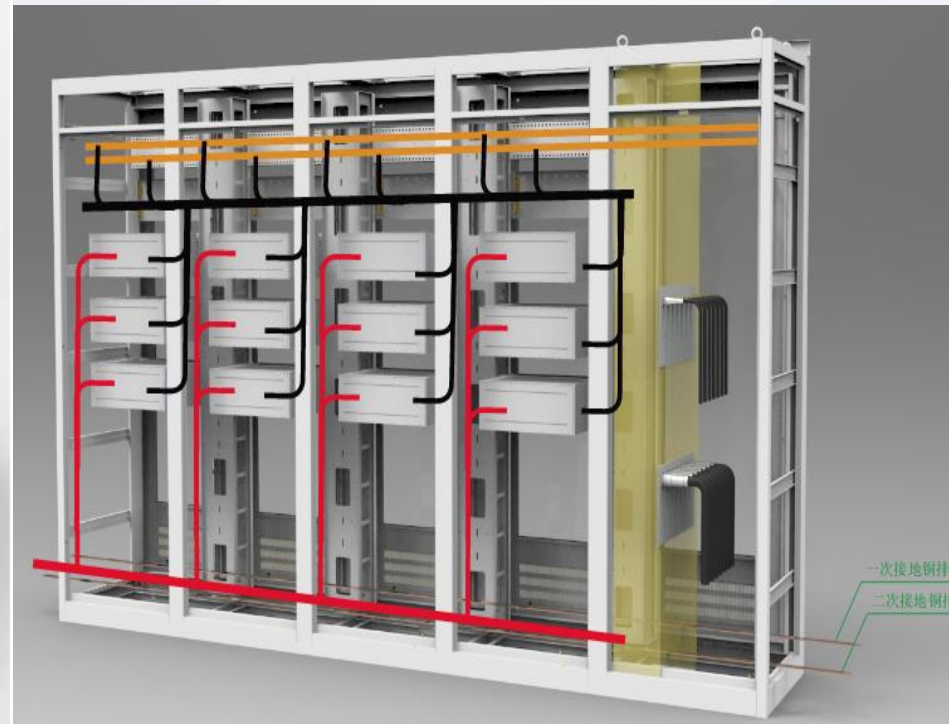
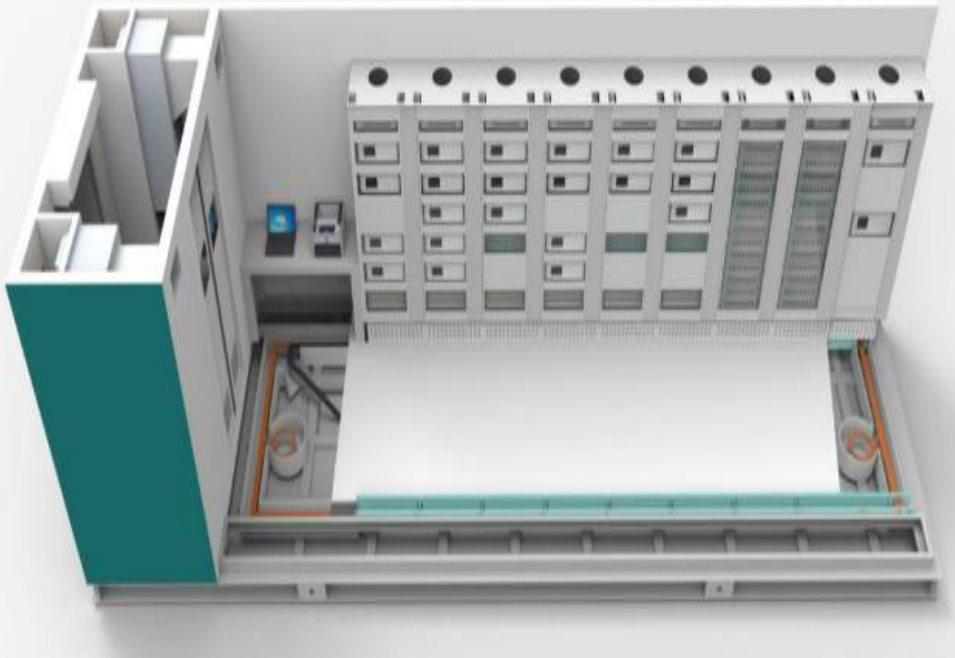
- 40+ years Life Cycle of Container
- Full comply with the life cycle of primary equipment
- Avoid to retrofit the container during the whole life cycle

Fully Comply with Customer's Accreditation List

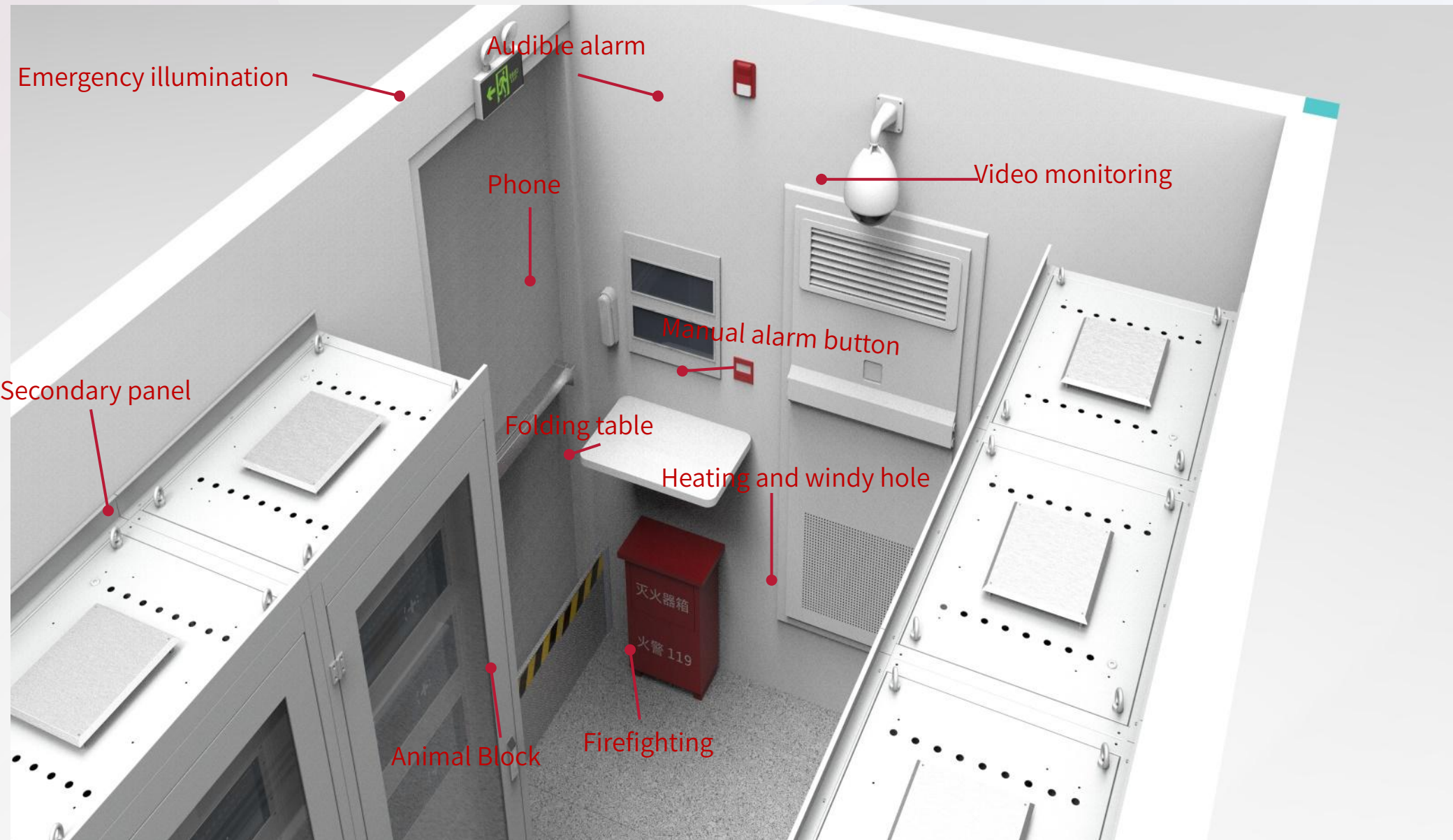
- Primary & secondary equipment selected as per customer's accreditation list
- Accept “Product Transfer Mode” from customer
- Proposal for Non-APL equipment for approval and pilot

Provide The Most Fitted Solution for Global Customers

- Professional & Experienced Design Team with 150+ Engineers
- Customization based on Customer's requirements



Container



Container features

40HC/HQ
standard container



Fire resistance
class A1
(6 hours)



Temp control in
container:
Without human:10~30°C
With human:18~25°C



Noise < 55dB



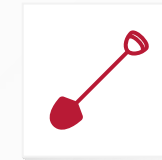
IP55



No metal corrosion
after 336 hours of
Neutral Salt Spray
Test(NSST)



Relative Humidity:
45%~95%



Container lifespan :
40+ years

Accessories



Distribution box



Wall telephone



Camera



Folded desk



Manual alarm button



Audible alarm

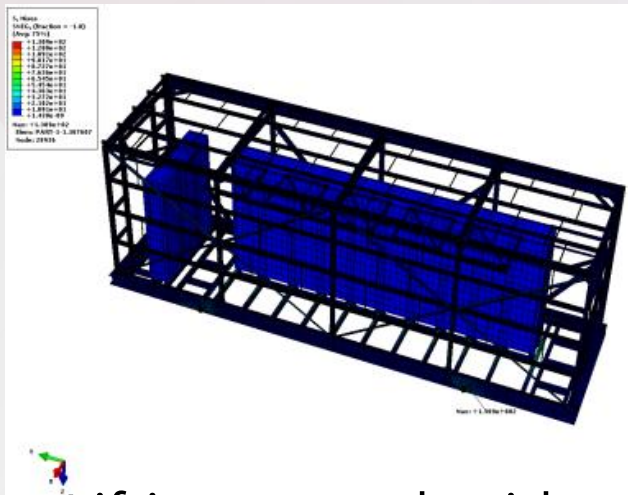


Smoke sensor

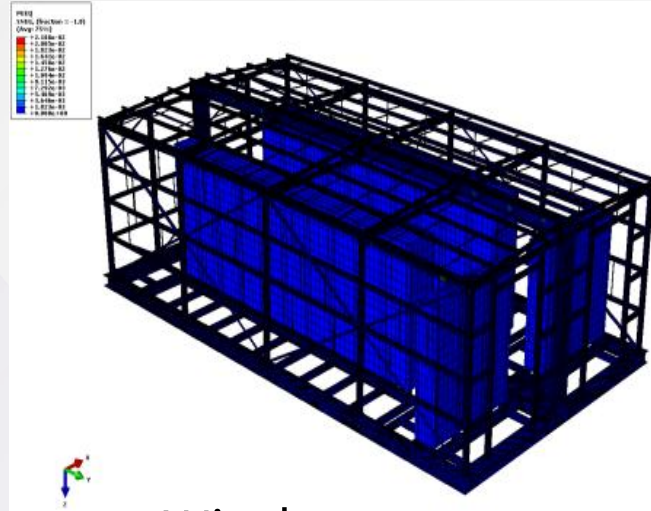


Fire extinguisher

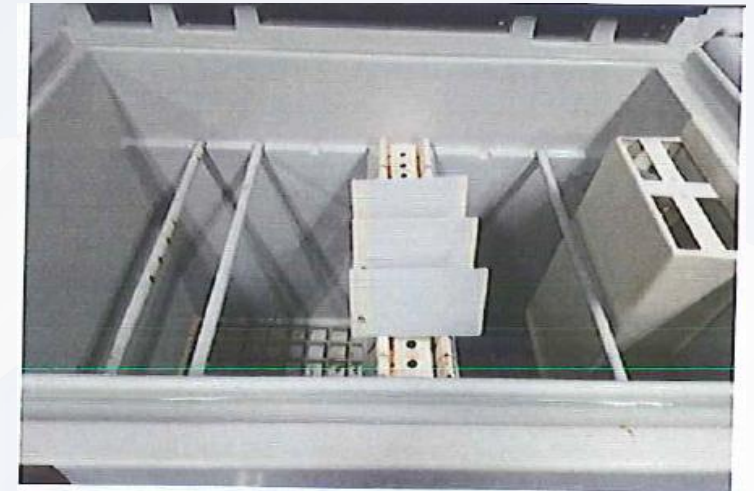
Test Parameters of Container



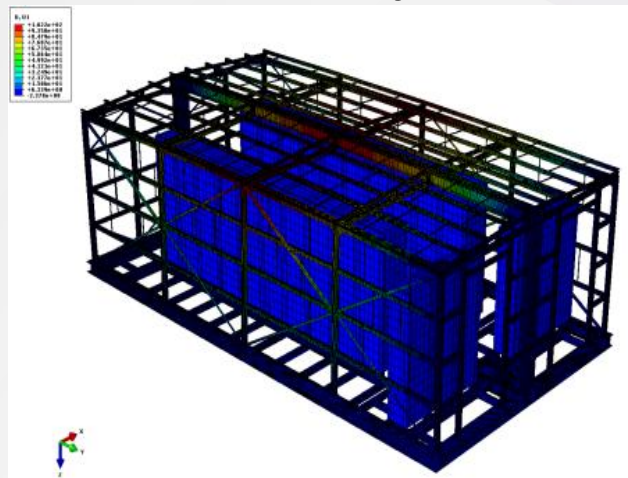
- Lifting strength with 3 times safety factor



- Winder power test of class 13



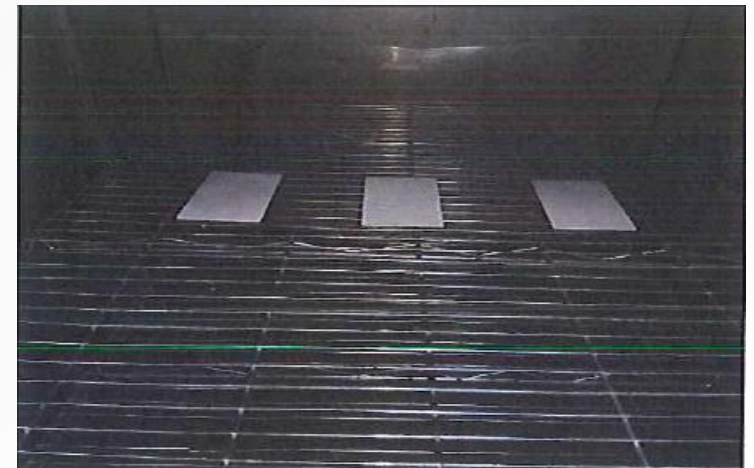
- salt spray resistance: More than 672h



- 9 degree earthquake resistant



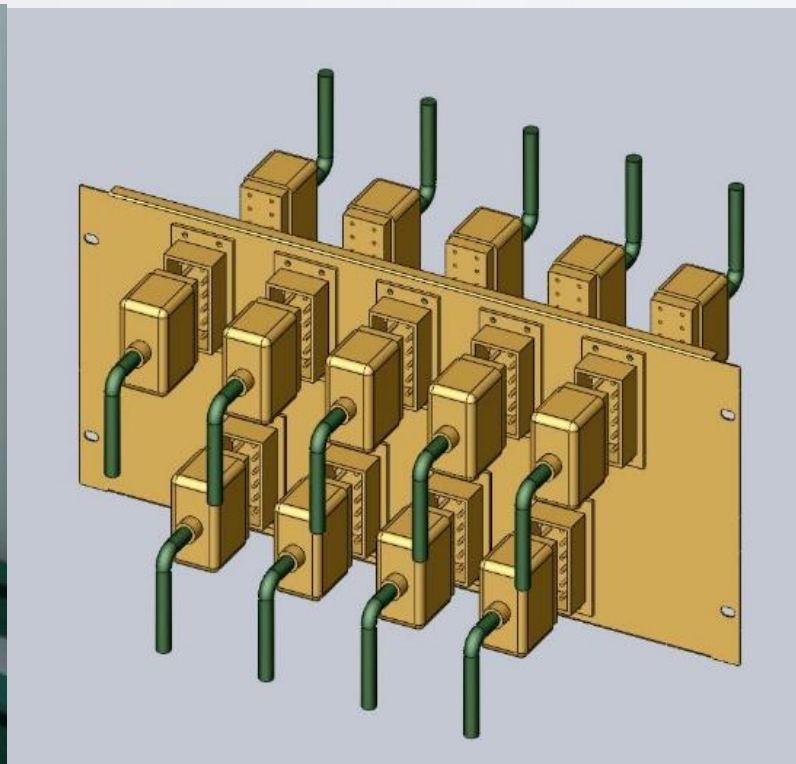
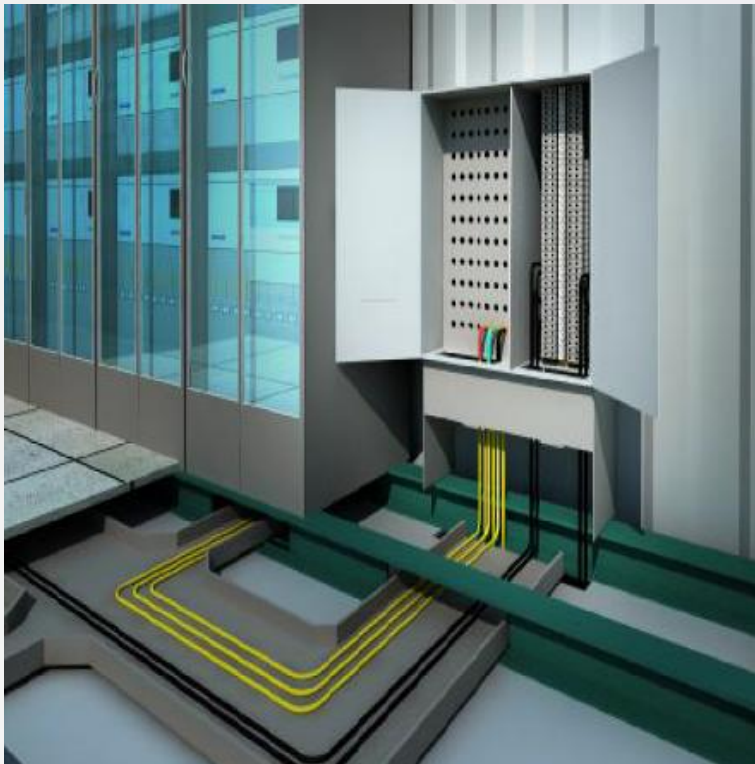
- Enclosure protection class: IP55



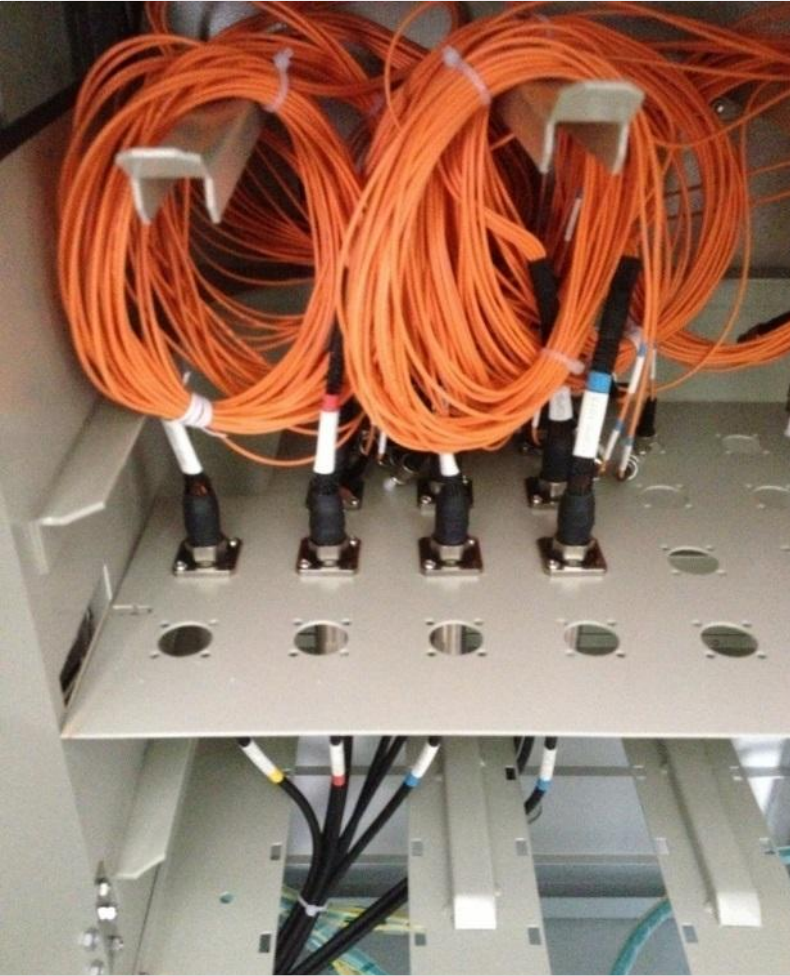
- Alternate damp and heat resistance: More than 144h

Well-Arrangement of Wires and Aviation Plug

- Well Designed Wires Arrangement
- Standardized Plug in/Plug Out Interface
- Easy-to-Maintenance



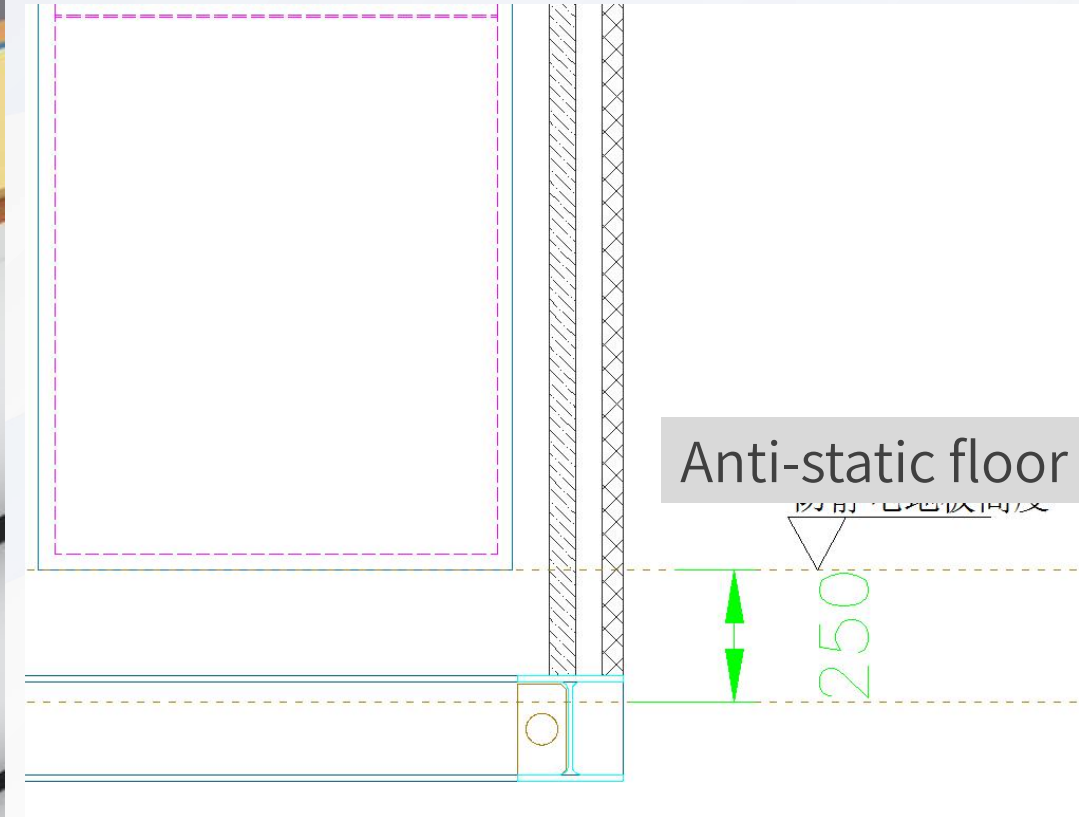
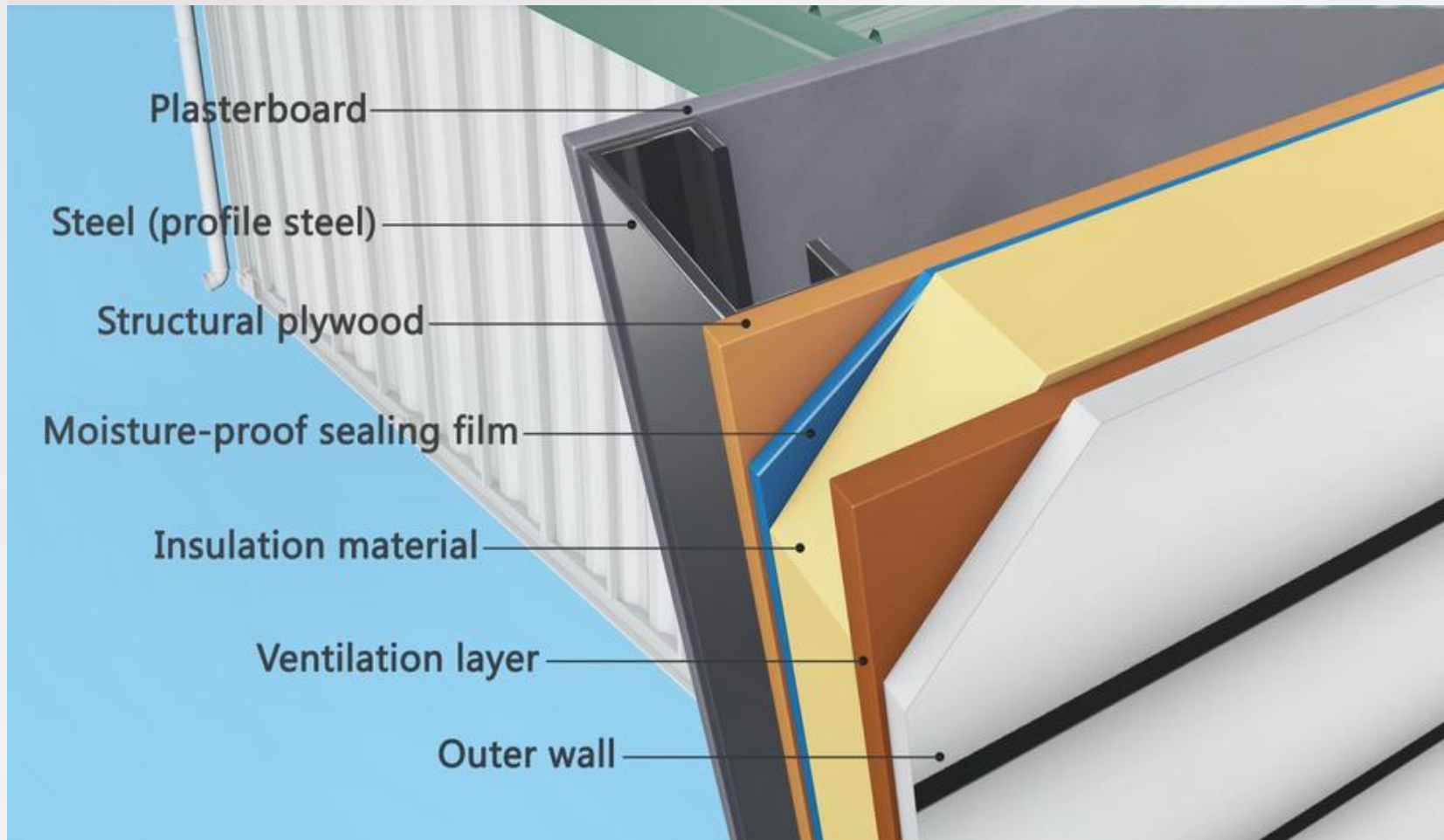
Plug and Play



■ Centralize interface and aviation plug

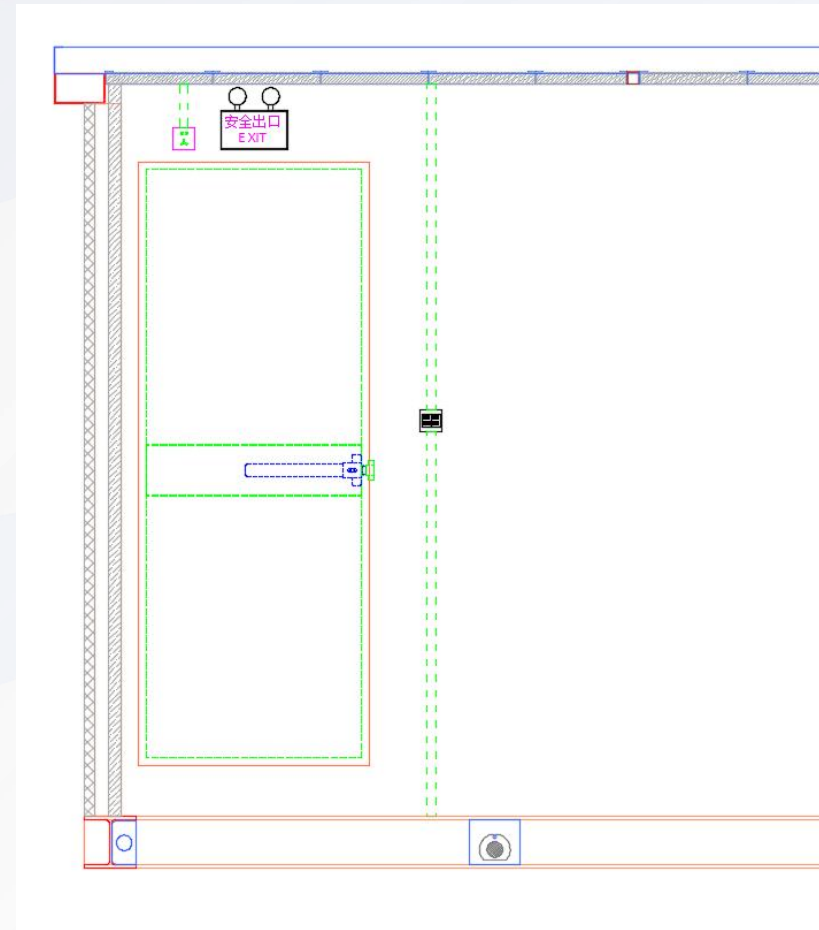
- Adopt centralize interface cabinets specially for internal and external cable and optical fiber.
- Control cable and optical fiber trenches are separate, convenient and friendly.
- Manufacture in factory, standard construction technology, convenient installation, high safety, high efficiency, neat and beautiful.

Wall structure



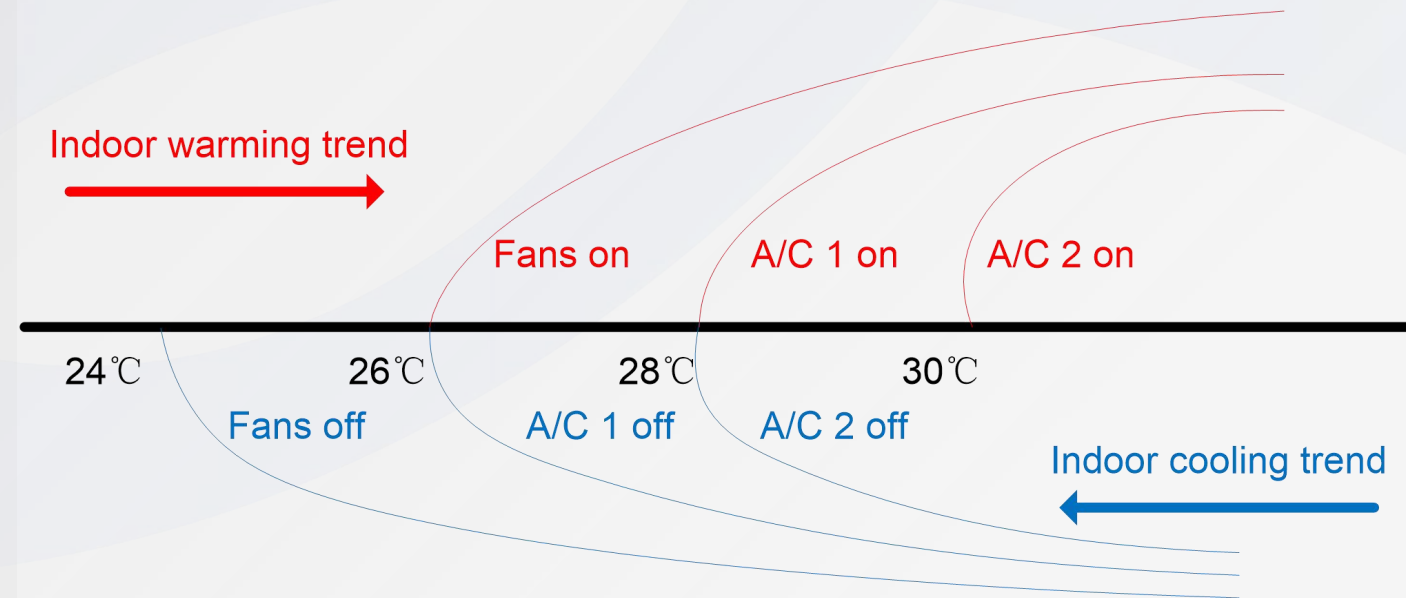
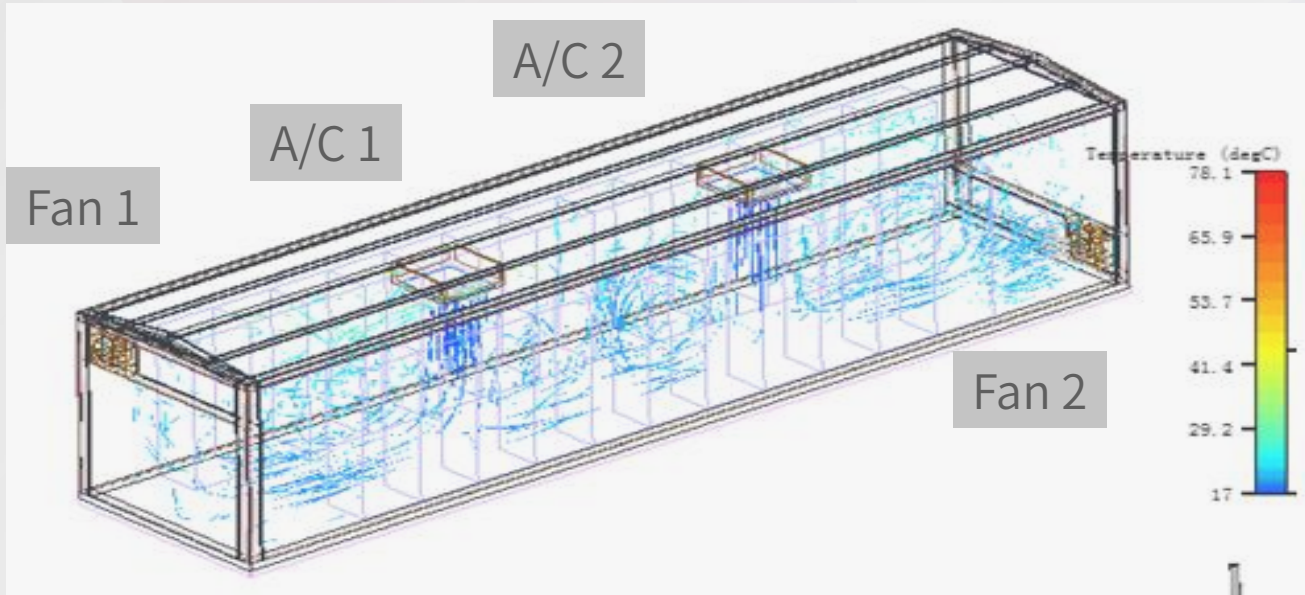
- The wall make up of Corrugated steel sheet, Heat insulating strip, Rock wool board, Aluminium plastic plate.
- Anti-corrosion., anti-EMI, heat-proof, fire-resistant, rain-resistant, anti-condensation, anti-radiation.
- With the ceramic anti-static moving floor, and the moving floor steel bracket is fixed to the bottom of container.

■ ■ ■ Illumination design



- Normal illumination and emergency lighting.
- The emergency lighting includes, evacuation lighting and accident lighting.
- The LED lights are embedded in the ceiling, and evenly arranged.

Air-conditioners and fans design



Smart temperature regulation system

- Switch air conditioning and fan by system automatic, to reduce energy consumption.
- With different initiate setting of temperature and take turns on duty, to improve equipment reliability.
- Keep the temperature in container between 18~25°C .

Air-conditioner features

| Status | Height | Distance(1.5m) |
|---------|--------|----------------|
| Blowing | 1.1m | 48.4dB |
| | 1.5m | 47.6dB |
| Cooling | 1.1m | 53.9dB |
| | 1.5m | 53.6dB |



| Sound sources (noise) Examples with distance | Sound pressure Level L_p dB SPL |
|---|--------------------------------------|
| Jet aircraft, 50 m away | 140 |
| Threshold of pain | 130 |
| Threshold of discomfort | 120 |
| Chainsaw, 1 m distance | 110 |
| Disco, 1 m from speaker | 100 |
| Diesel truck, 10 m away | 90 |
| Kerbside of busy road, 5 m | 80 |
| Vacuum cleaner, distance 1 m | 70 |
| Conversational speech, 1 m | 60 |
| Average home | 50 |
| Quiet library | 40 |
| Quiet bedroom at night | 30 |
| Background in TV studio | 20 |
| Rustling leaves in the distance | 10 |
| Hearing threshold | 0 |

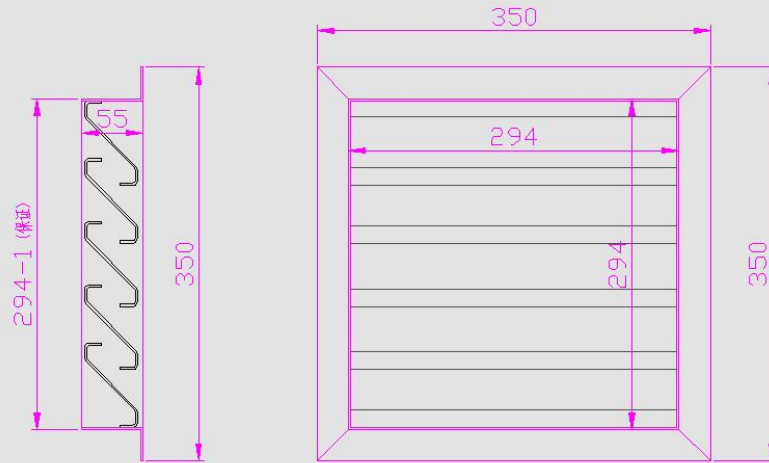
Advantages and features

- The air conditioner is very quiet when working.
- With RS485 port, can send air conditioning status information in real time;
- Strong corrosion resistance, simple maintenance and easy to installation;
- With the temperature and humidity control self-starting function, which is energy-efficient.

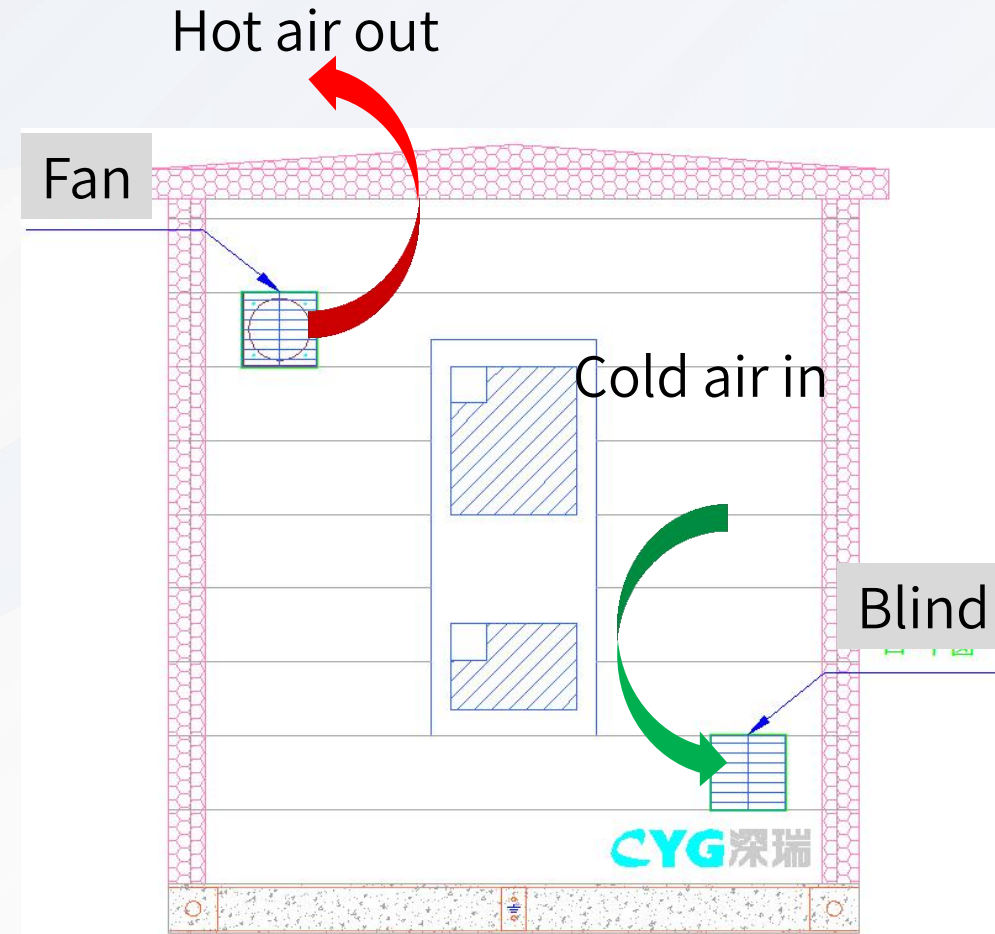
Fan and blind design



Fan



Aluminum blinds(water-proof)



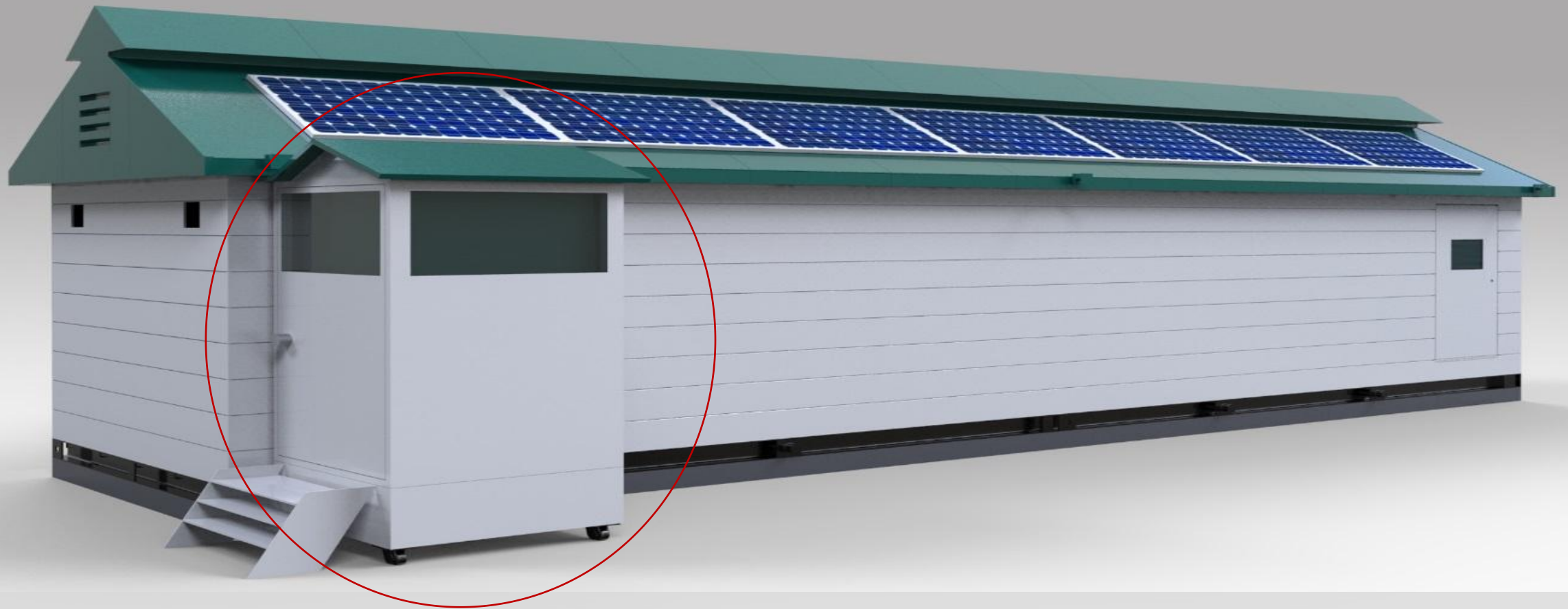
- Smart temperature regulation system, which automatically starts the fan according to the temperature and humidity.
- The exhaust air volume of each fan in the container is 1,800m³/h.
- A double control switch is arranged outside the cabin..

Containers Joint



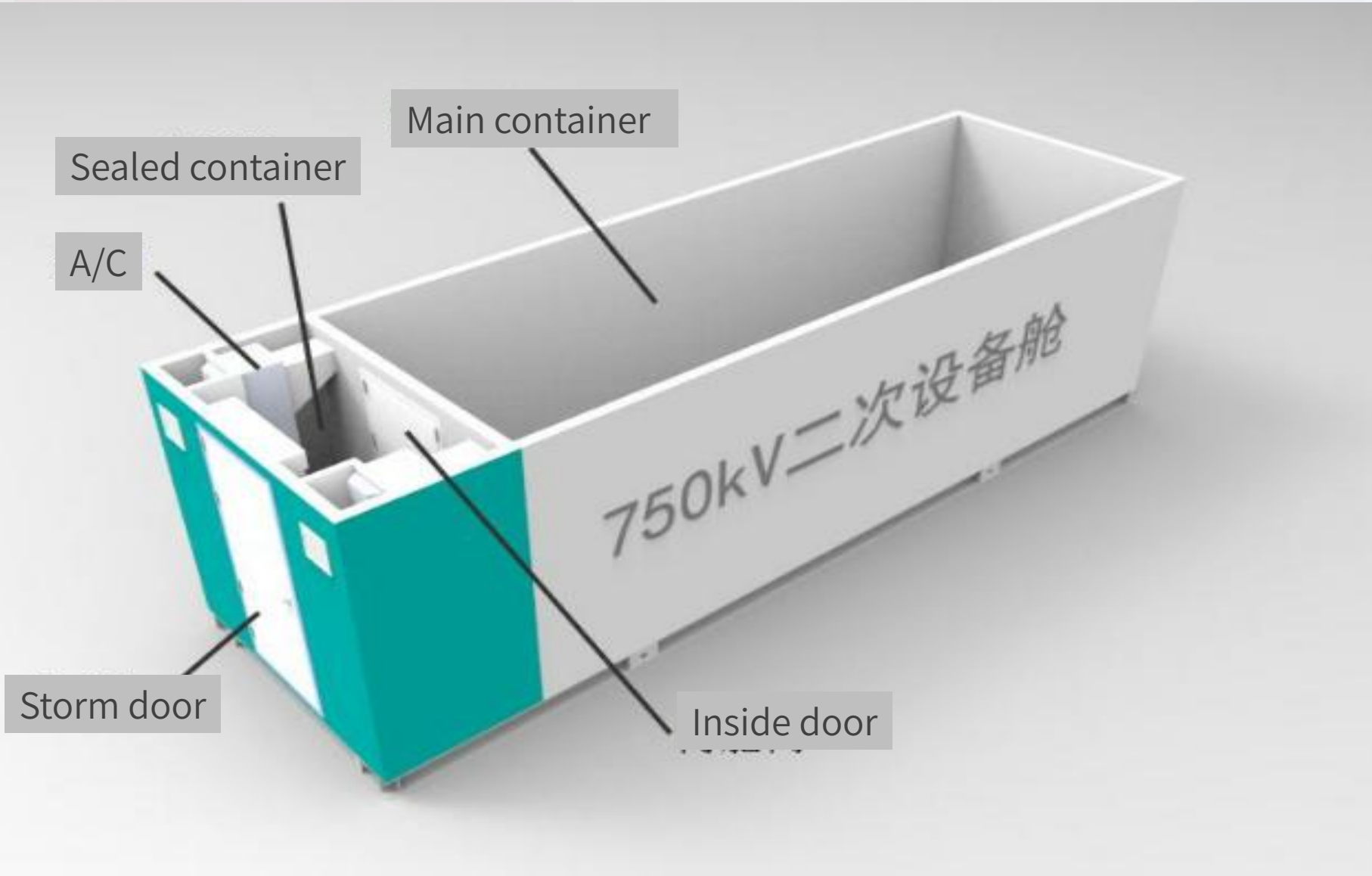
- The road to access the substation is very narrow (**Two-way single lane**).
- Very hard to transport the over-sized containers to site.
- Transport **international standard 40HC/HQ containers** to site and assemble them into a big-container on site.
- **30+ projects** using this technology and gained abundant experience on it.

Detachable Buffered Cabinet



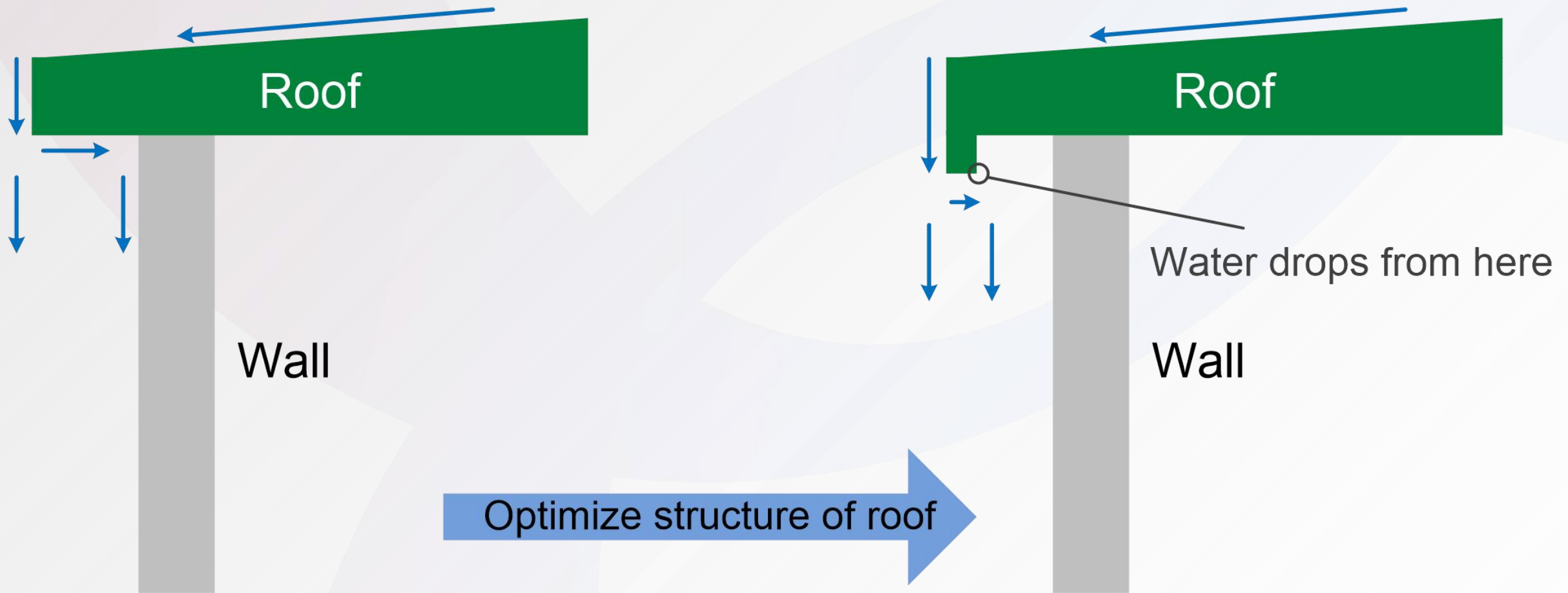
- Detachable cabinet as **buffer zone to block heavy rain** in the rainy season.
- **Safety Facility** Preparation Zone

Fixed Buffered Cabinet



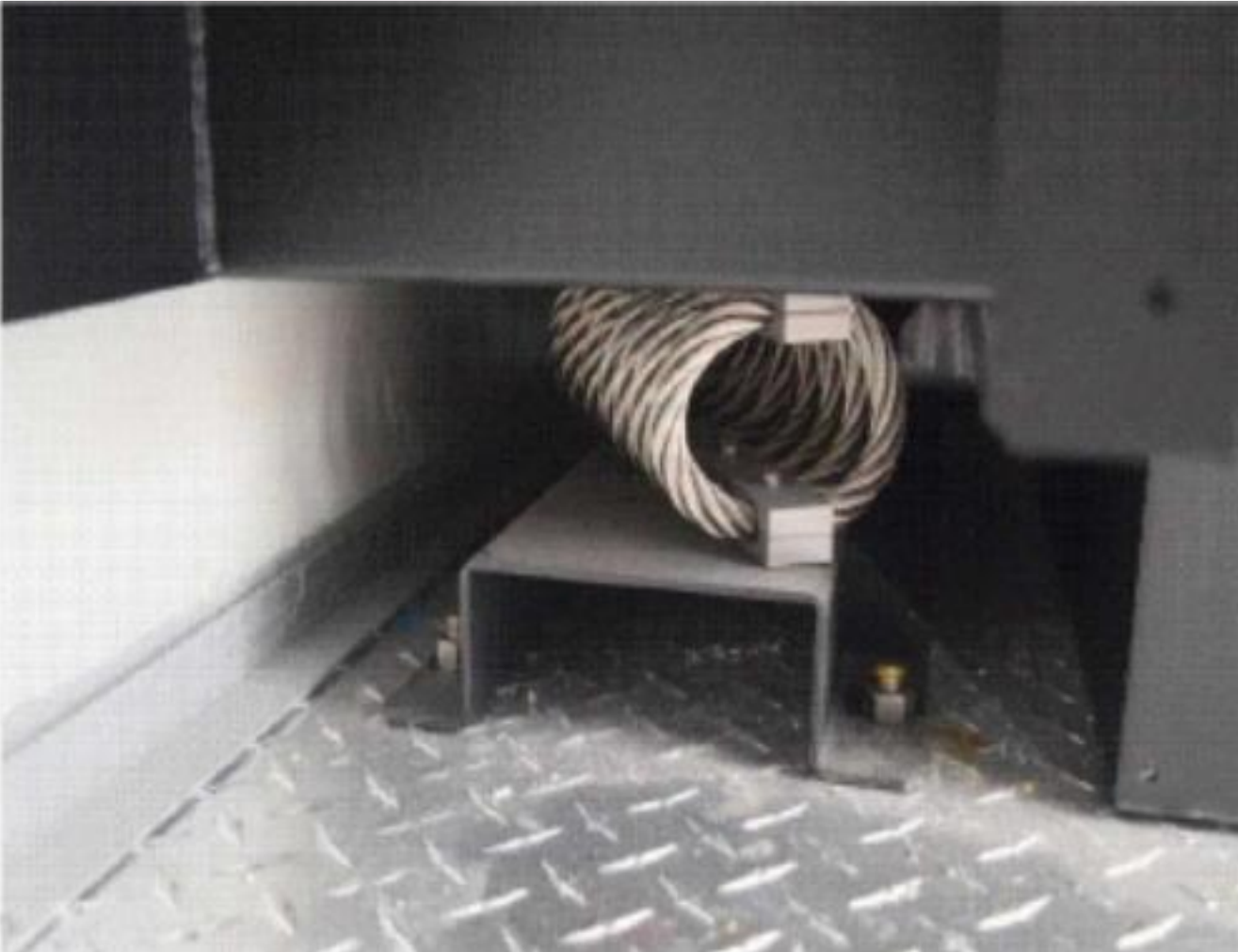
- Detachable cabinet as **buffer zone to block heavy rain** in the rainy season.
- **Safety Facility** Preparation Zone

Anti-rain corrosion design



- Before, the joint is washed for long periods of rain and are easily corroded;
- After, the rain can't wash the joint.

Absorber and Foundation Sensor



■ Anti-asymmetrical subsidence design

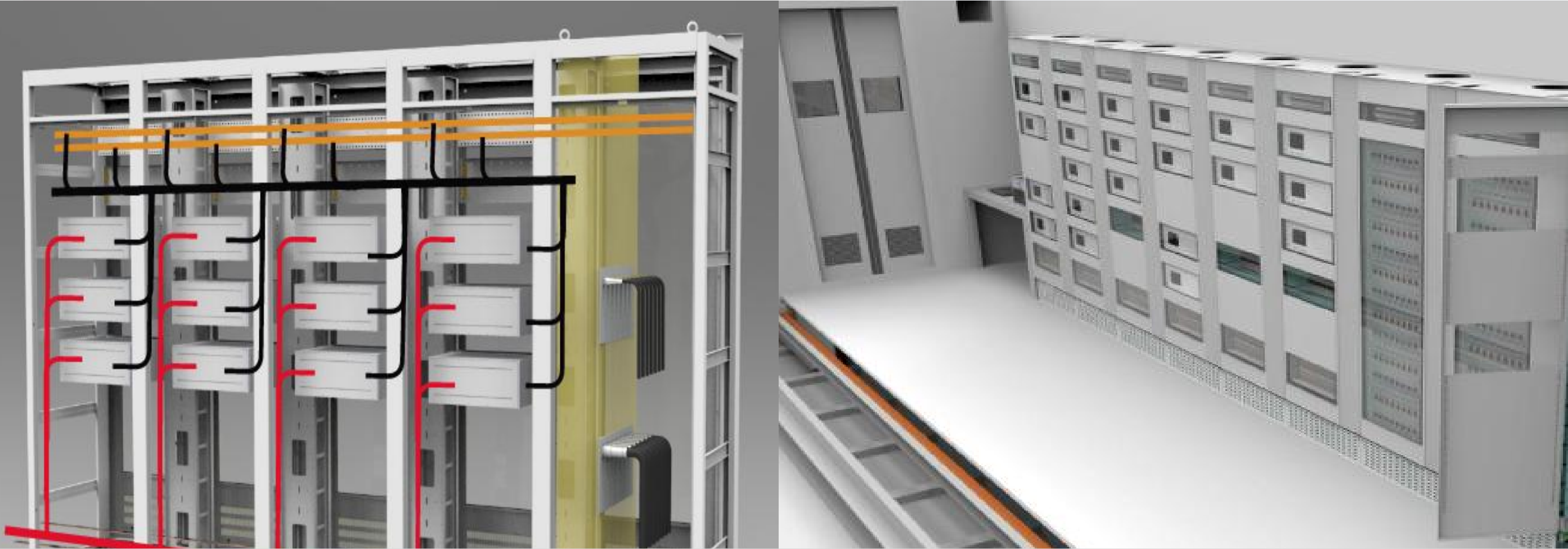
- Observe the ground subsidence on a regular basis by the method of precision leveling.
- Install the steel wire shock absorber in the bottom. When the ground subsidence, adjust the height of the base support of corresponding side, to make the container stability.

Cabinet door design



- Sliding door.
- Folding door.
- Expand the space of operation and maintenance.

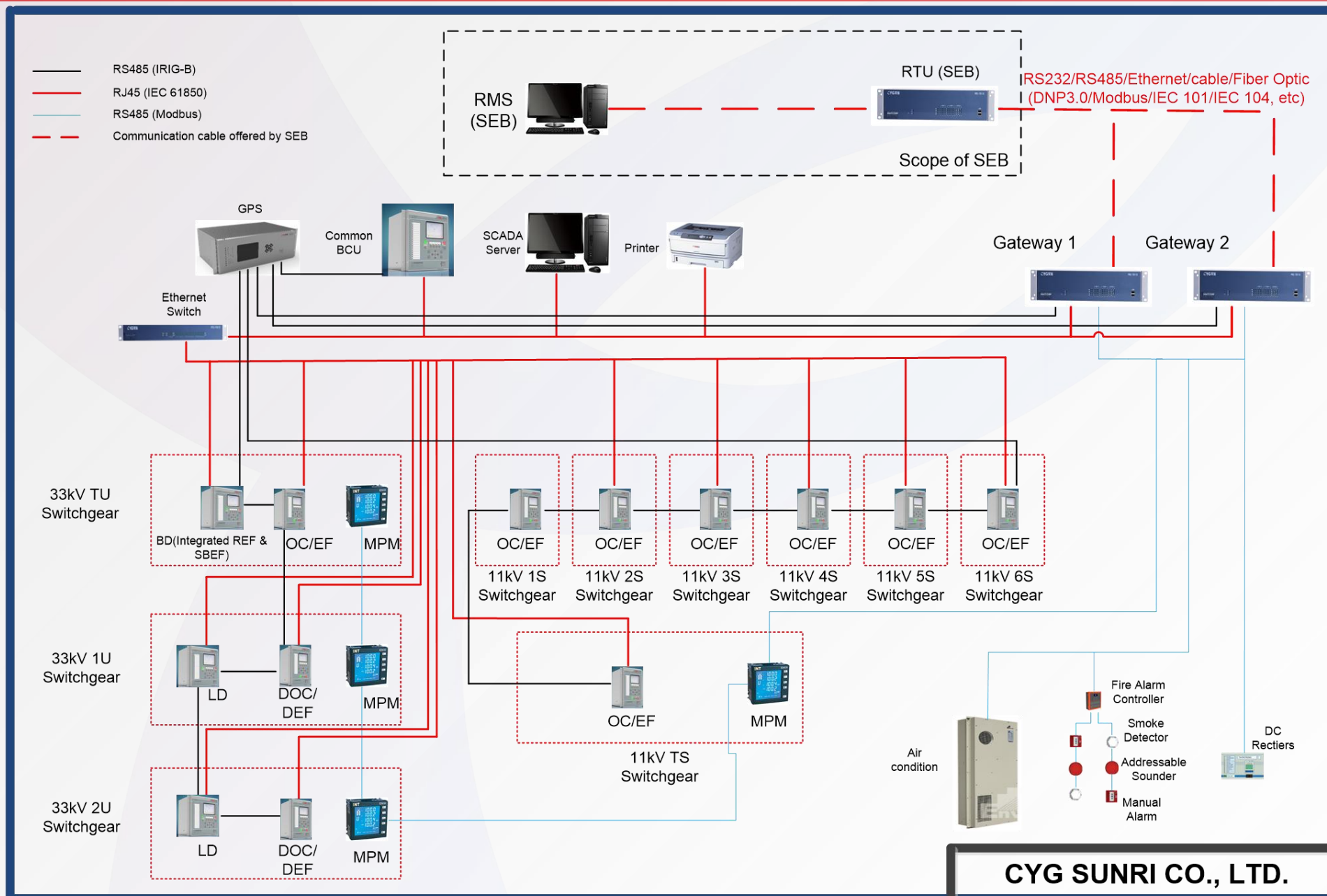
New Designed Structure for Better Wire Arrangement



■ Modular structure cabinet and respective wiring

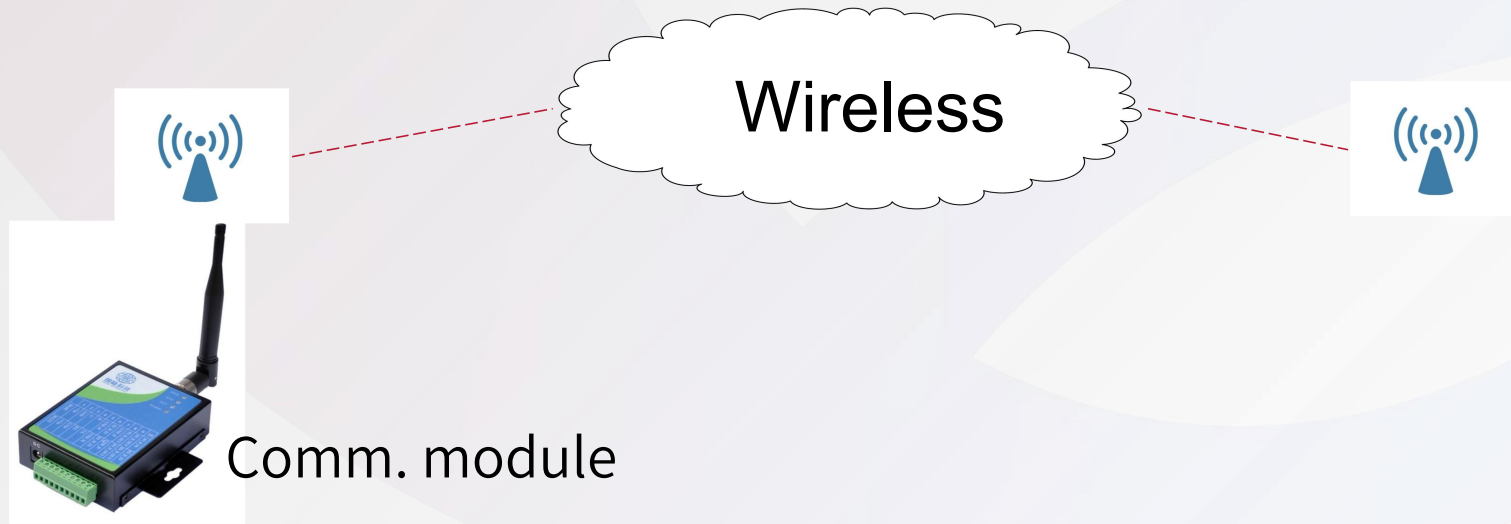
- Cancel the side and back door of the cabinet, frame of cabinet can be designed and fixed in integration.
- Adopt Integrated, frame-type and modular structure cabinet according the function of bays, such as transformer unit, line unit, common unit, complete assembly and wiring in factory to improve efficiency.
- Control cable and optical fiber trenches are separate, convenient and friendly.

Easy-to-Maintenance SS for Far-away Rural Area



■ For easy-to-maintenance, Mini-SCADA is adopted

Wireless Communication for Far-away Rural Area



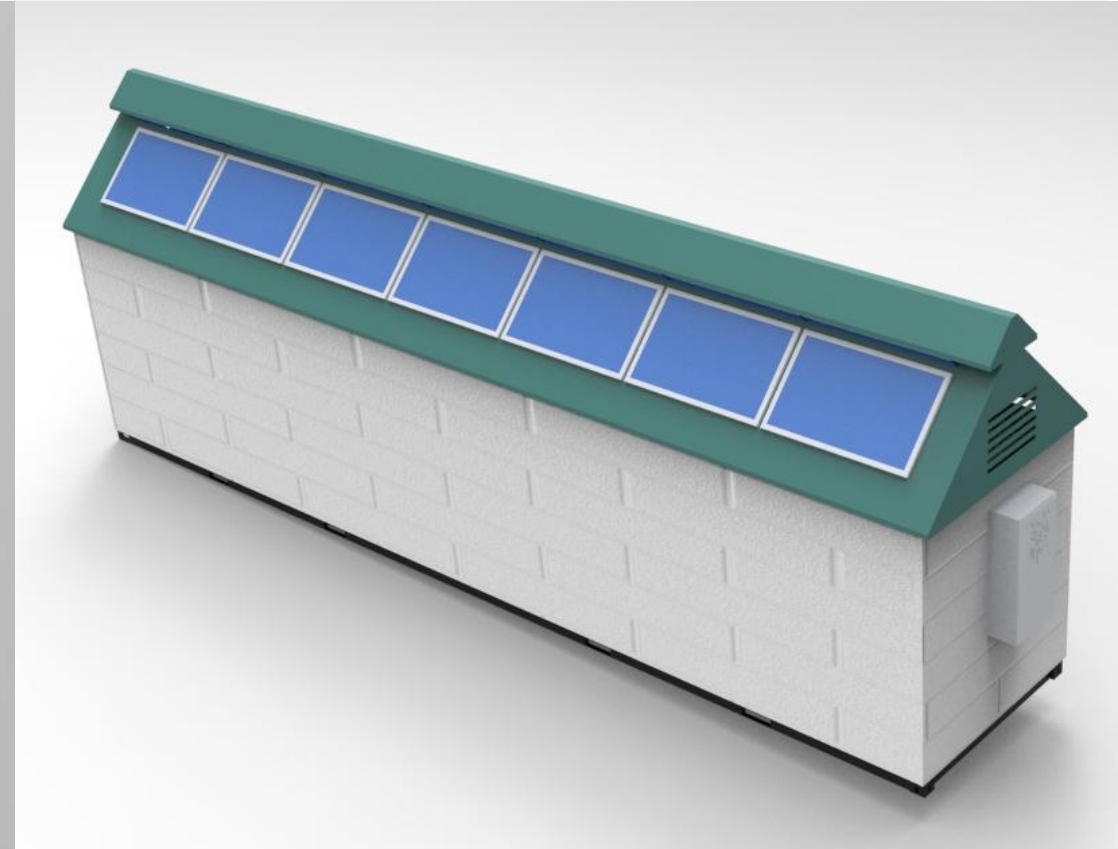
Remote monitoring center



Modular/Mobile substation

- Cellular communication can be adopted
- Reduce maintenance and troubleshooting work

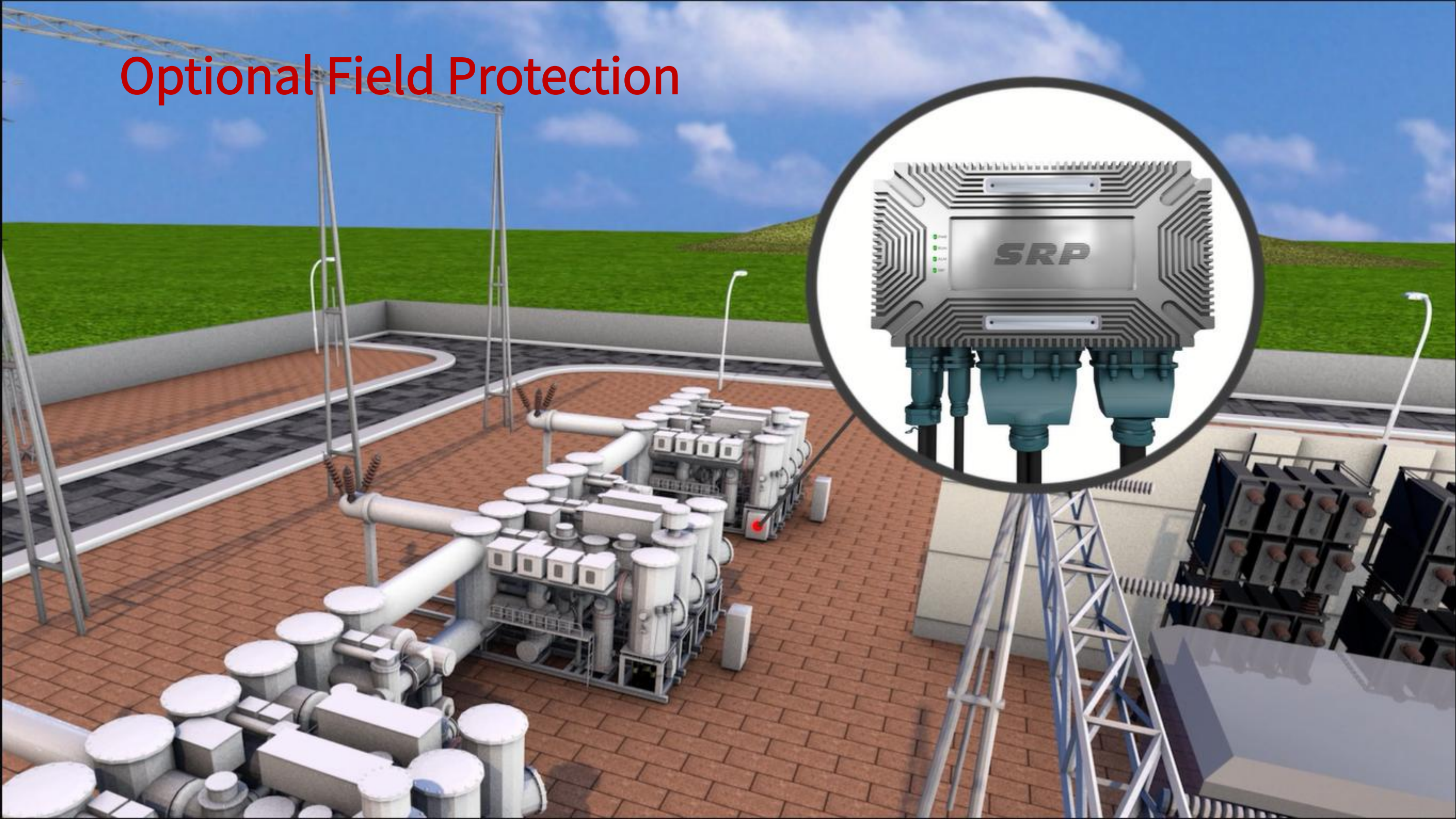
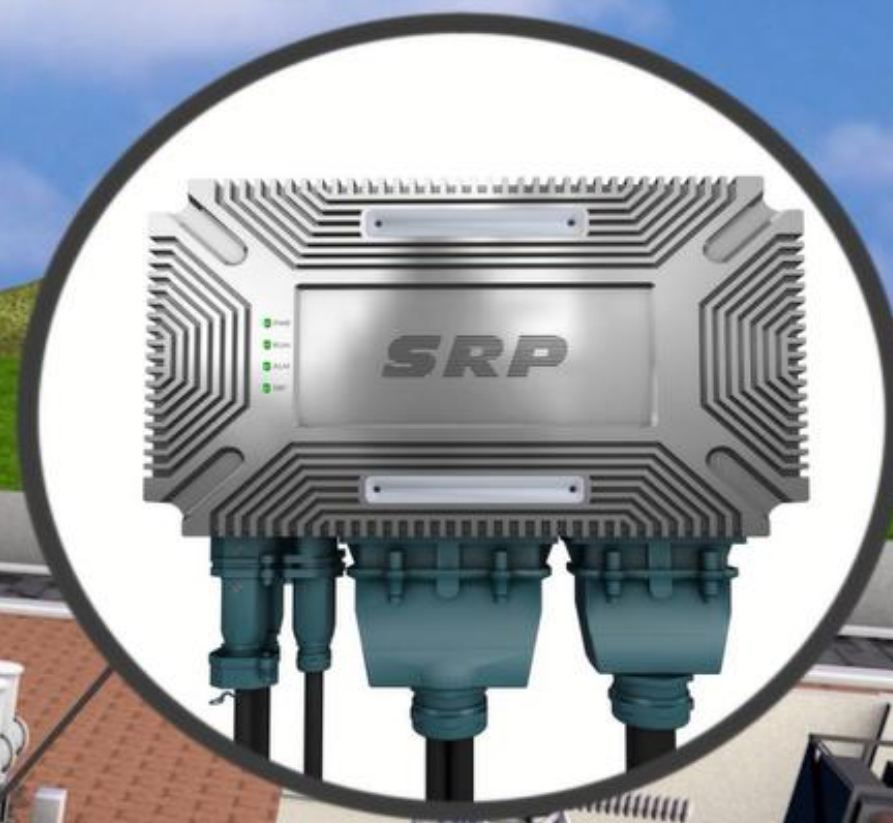
Optional Solar Power



■ Solar power self-supply and snow removal design

- Installs Solar power module on the roof, supply the lights, A/C, fans.
- Increase the slope of roof, hard to store the snow.
- Installs air curtain machine can blow the accumulated snow.

Optional Field Protection



Optional Living Container

Living Container



- In consideration of daily office work and staff rest
- Improve the operation personnel working environment
- Suitable for special conditions like short construction period/complex building construction environment

■ Dimensions of container

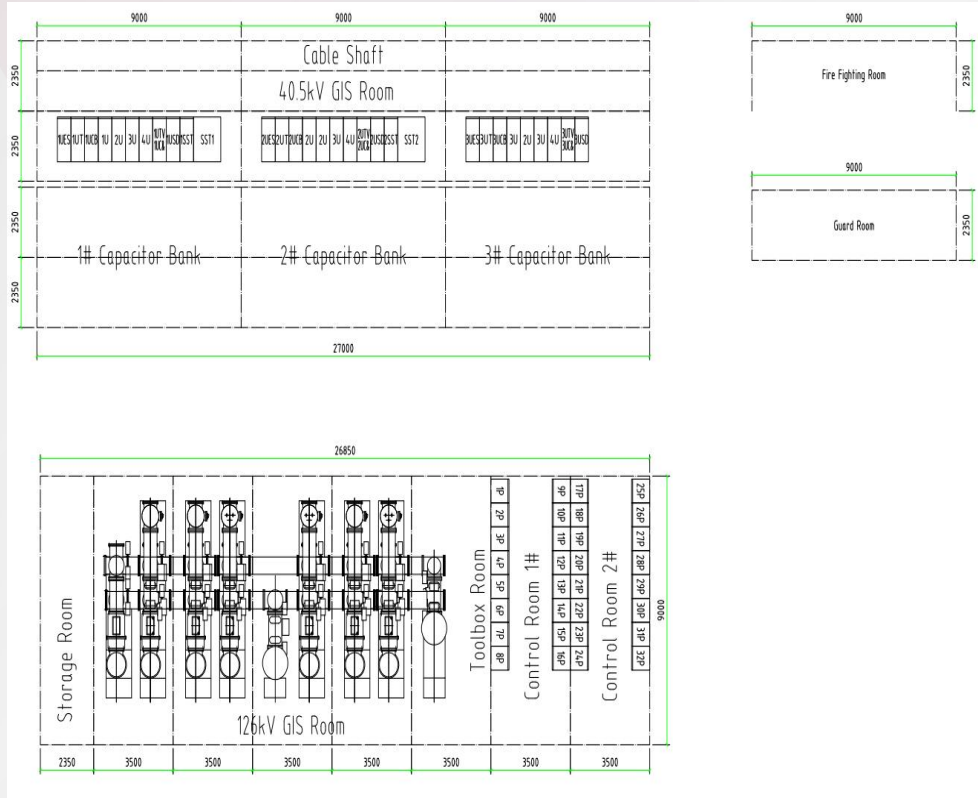
| Dimensions (L x W x H) (mm) | |
|-----------------------------|---------------------|
| I-type | 6200 × 2800 × 3133 |
| II-type | 9200 × 2800 × 3133 |
| III-type | 12200 × 2800 × 3133 |

Note: the dimensions of container can be **customized** according the project requirement.

■ Before customized, parameter need be confirmed:

- Floor area.
- Location and arrangement of container.
- Carrying parameter of vehicle.
- Road transport situation.
- Width of road.
- Minimum turning radius.

Combination Technology of Containers



Containerized Plan

Constraint conditions

- Oversized equipment
- Transportation limitation

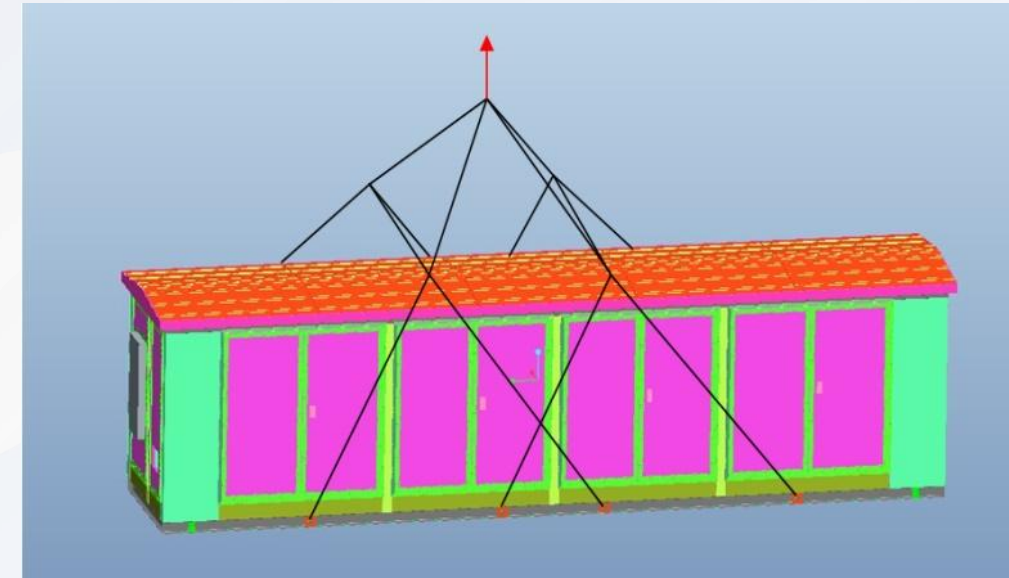
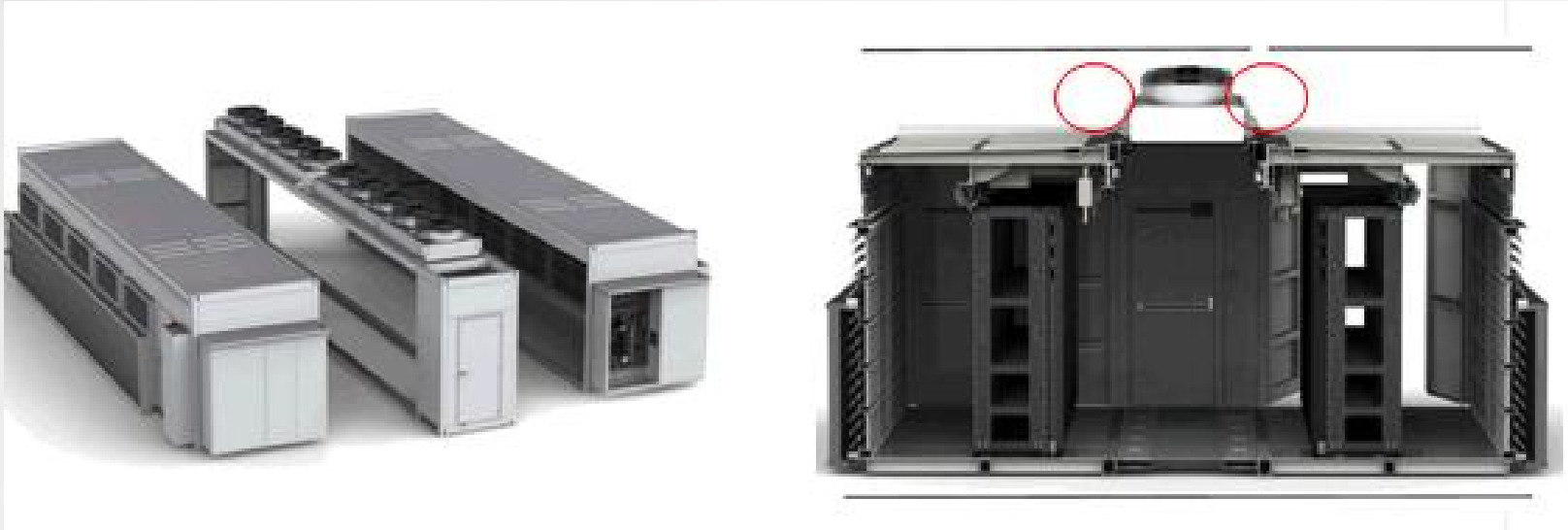


Solution

Combination along with the width direction
Complete the splicing work on site with welding and sealant



Combination Technology of Containers



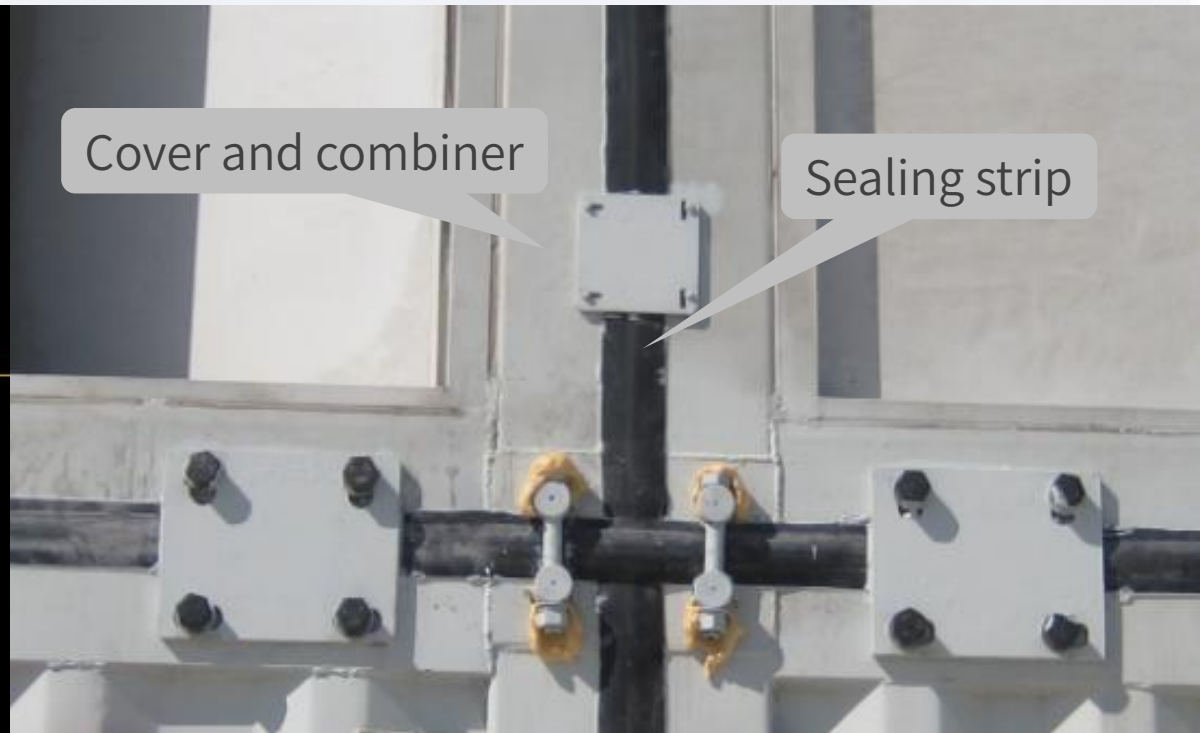
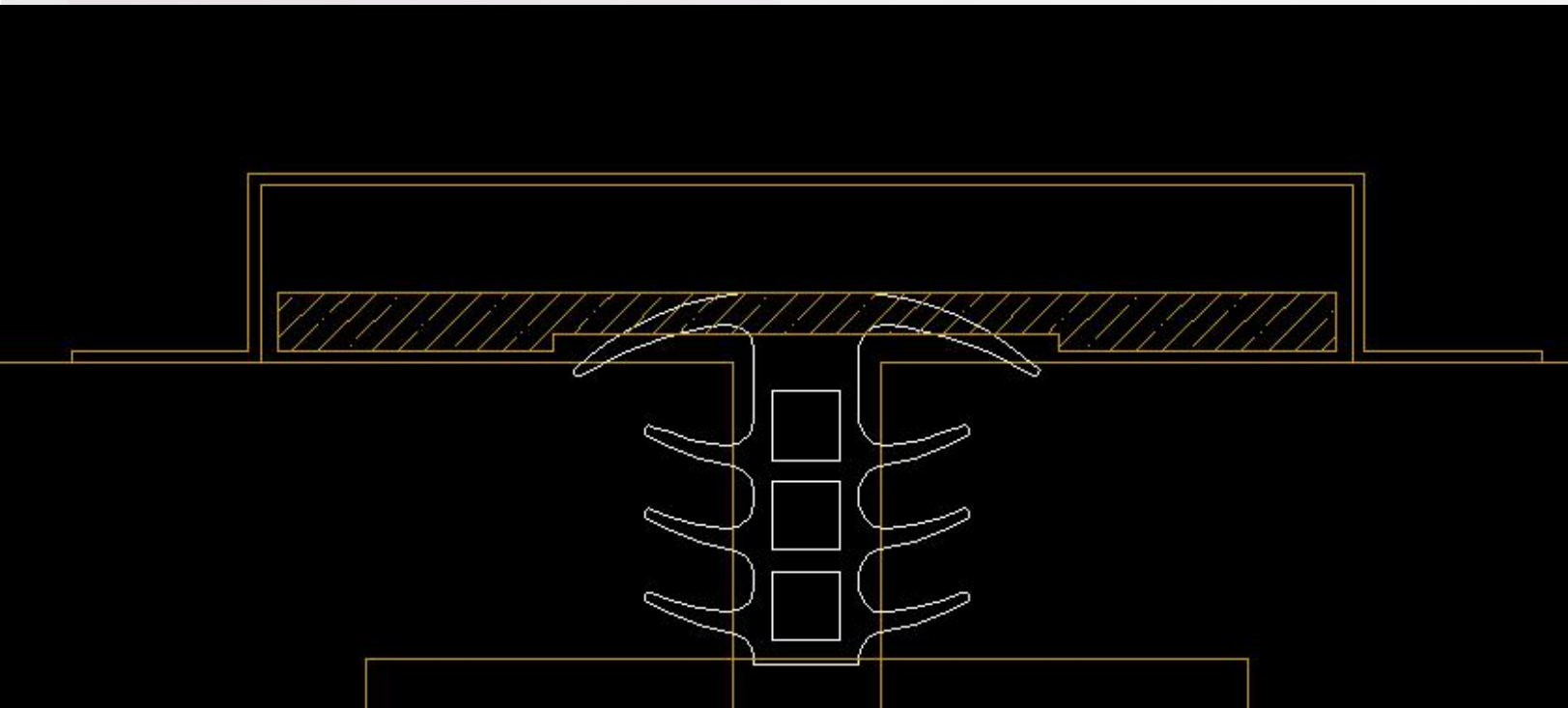
- Combination of containers

- Hoisting Scheme



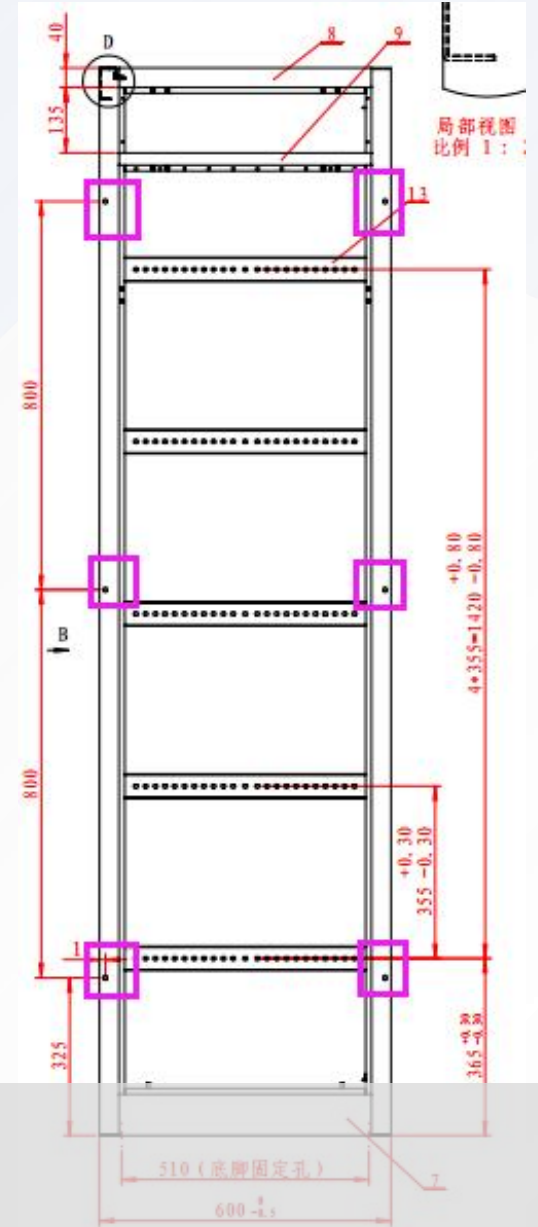
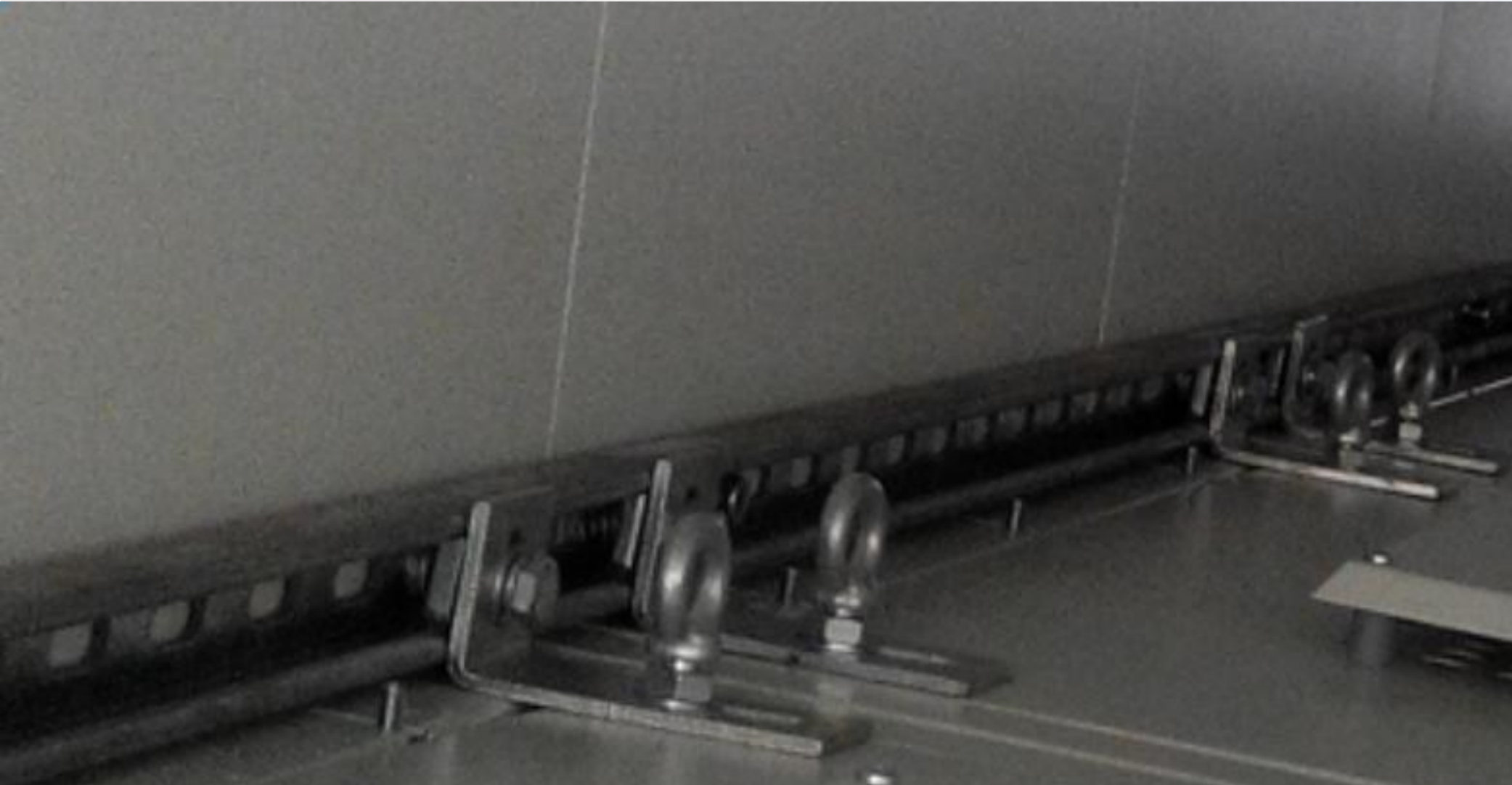
Pre-designed structure for
Combination

Containers Joint



- Easy to joint the containers, joint two 40ft containers only need 1 person for half a day.
- After joint, the IP level can be IP55.
- The lifespan of container is 40+ years, free retrofitting the container during the whole life cycle
- Sealing strip used for the joint point is EPDM, whose performance is stable with the service life of up to 55 years .

Delivery Protection



- Combine the adjacent panels by combined hole.
- Fix the top of panel to the ceiling part of container.
- Fix the side of panel to the wall of container.

PART. 03

Reference & Case Study

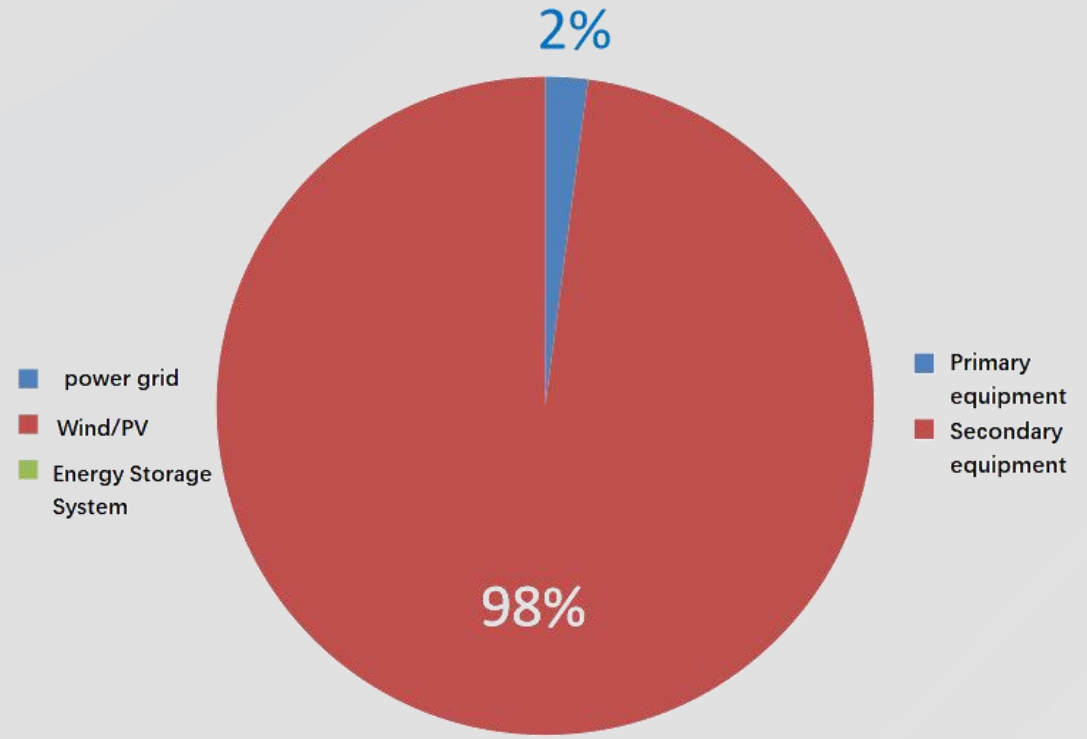
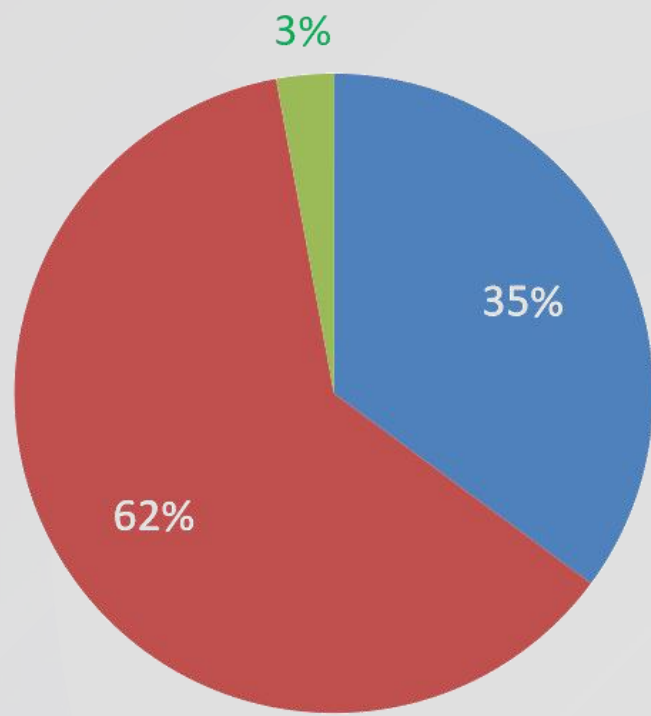
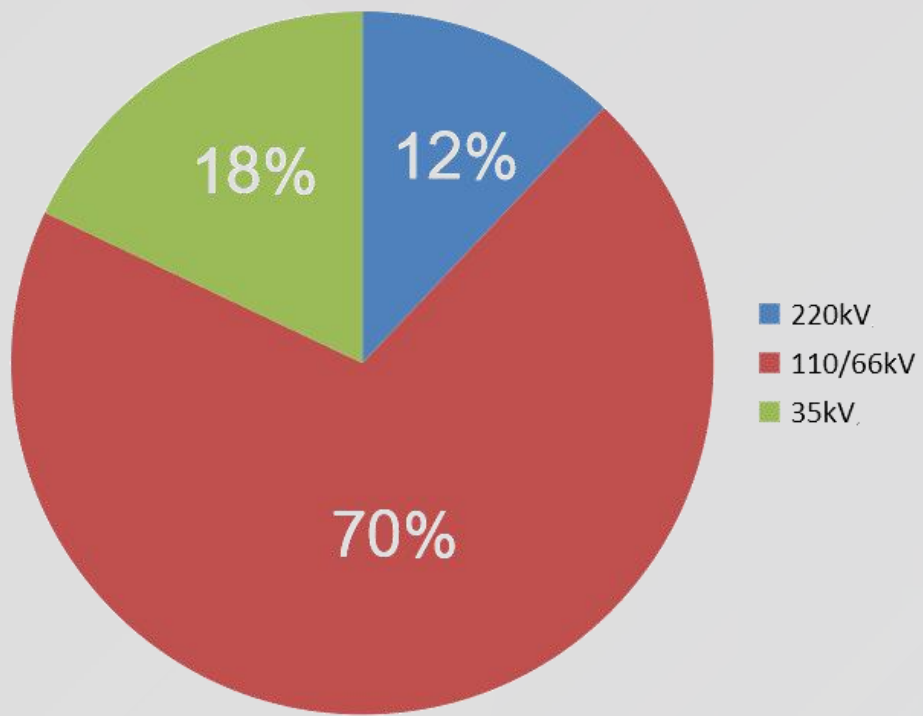
CYG长园





CYG Experience

- Since 2013, CYG participated in the construction scheme of modular prefabricated substations of State Grid with the idea of "standardized design, factory processing and prefabricated construction", and carried out pilot construction and application, and has put into operation more than 400 prefabricated substations so far.



References

■ One of the leading modular substation supplier worldwide

■ 400+ Modular/Mobile substations

| Location | Voltage | Project |
|------------------------|---------|--|
| Colombia | 117KW | Colombia 117kW PREMEX Plant Project |
| Sierra Leone | 1MW | Sierra Leone 1MW/1MWh BESS Project |
| Malaysia | 33kV | Malaysia SESCO 33kV Bakam Modular substation |
| Malaysia | 33kV | Malaysia SESCO 33-11kV Mobile substation |
| Shanghai of SGCC | 110kV | Shanghai Jiading 110kV Miaoshan Substation |
| Fujian of SGCC | 110kV | Fujian Luoyuan 110kV Dongqu Substation |
| Zhejiang of SGCC | 110kV | Zhejiang Shaoxing 110kV Tangxia Substation |
| Hebei of SGCC | 110kV | Hebei Tangshan 110kV Bubuchuan Substation |
| Jilin of SGCC | 220kV | Jilin 220kV Yongji Substation |
| Gansu of SGCC | 110kV | Gansu baiyin 110kV Zhenglu Substation |
| TBEA Sunoasis | 50MW | Xinjiang Hami southeastern 50MWp PV |
| Ningxia of SGCC | 110kV | Ningxia Shizuishan 110kV Gaozhuang Substation |
| Hebei of SGCC | 110kV | Hebei Shijiazhuang 110kV Shenze Smart Substation |
| Jiangsu of SGCC | 110kV | Jiangsu Xuzhou 110kV Yaoji Smart Substation |
| Jiangsu Xindian | 10MW | Inner Mongolia Wuhai 10MW switch station |
| Shangdong | 110kV | Shandong Linyi 110kV Jinzhengyangguanye Substation |
| Shandong | 30MW | Shandong Yicheng 30MW PV Project |
| Sichuan Huian Nengtong | 20MW | Sichuan Panzhihua 20MW PV Project |
| Sichuan of SGCC | 35kV | Sichuan Aba 35kV Rangtangshili Substation |
| Shandong | 20MW | Shandong Zibo Gaoxing Luhua 20MW PV Project |
| BOEET | 20MW | Hebei Baoding Dingzhou 20MW PV Project |

Case study

- CYG is the EPC contractor of the project.
- Equipment supplied: 2 x transformers(10~15 MVA),6 x 33kV feeders(1 Subsection),10 x 11kV feeders(1 Subsection), 4 x PT,container, automation system, RTU, GPS, protection, BCU, AC&DC system, metering, waveform recorder, video monitoring system, fire alarm system, lightning protection system and etc.
- Well design of salt spray resistance, weather resistance and insulation measurements.



Case study

- The BESS is 1MW/1MWh, which consists of 2 nos. of 500kW PCS, 1MWh battery systems, 1000kVA transformers, grid-connected cabinets, container and auxiliary equipment (air conditioning, fire fighting, CCTV), communication management equipment and energy management system. Well design of salt spray resistance, weather resistance and insulation measurements.



Case study

- The 1st modular substation in Yunnan province of China.
- The 1st substation without building in Yunnan province of China.
- Equipment supplied: 110kV transformer, arrester, 110kV GIS, 10kV switchgear, 10kV SVC, container, automation system, RTU, GPS, protection, BCU, AC&DC system, metering, waveform recorder, video monitoring system, fire alarm system, lightning protection system and etc.
- Container: 110kV GIS container, 10kV switchgear container, SVC container, secondary container, living and tool container



Case study

- The first modular substation in PV industry, put into service in the October 2015.
- After the project, CYG SUNRI and Owner have signed “Framework Agreement on Equipment and Technical Cooperation and Development of PV station” in March 2016.



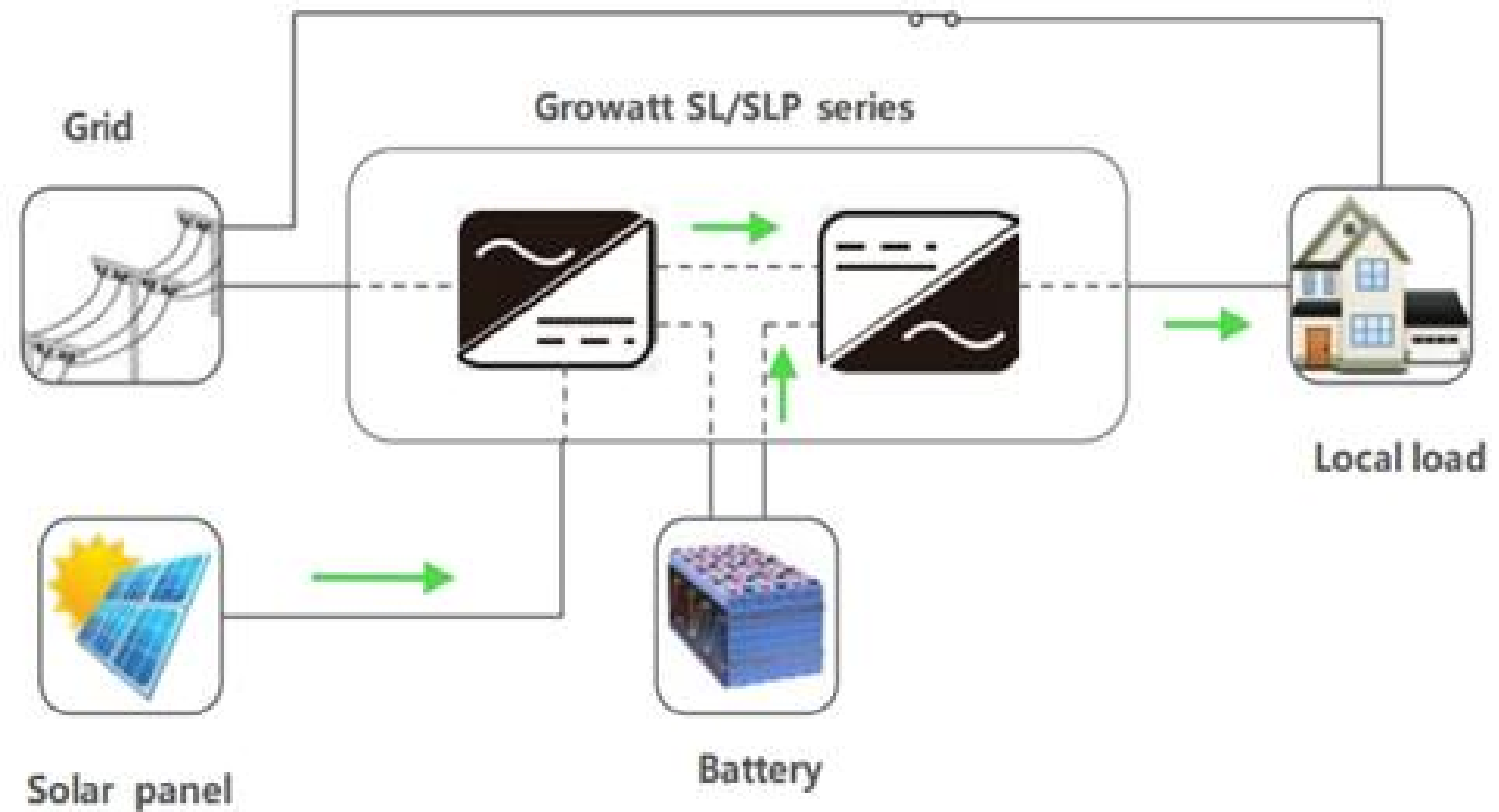
Case study

- Owner: SGCC, the first light steel structure 220kV modular substation in Zhejiang Province, put into service in May 2014.
- First company applied two doors for one cabinet, to realize redundant protections have different area.
- First company applied ceiling-mounted mute A/C, to solve the problems of wall-mounted A/C, such as uneven refrigerating, loud noise.
- First company applied Smart temperature regulation system.



Case study

- Owner: SGCC, the first new-generation 220kV substation in northeast China (high altitude and extremely cold climate).
- Applied frame-type and modular structure cabinet to integrate of container and cabinet.
- Applied front-wiring IEDs, the cabinet double-row layout, applied front folding door, to expand the space.
- Applied PV power generation system, to supply lights, A/C and fans in container.
- Applied auto snow clearing system which supplied by PV system.



Case study

- Owner: SGCC, the first 220kV modular substation in Fujian Province, put into service in the end of 2013.
- First company applied centralized interface design and the cabin of 2.8m wide, the case was absorbed in the standard of modular substation in 2014.
- First company applied field protection.
- Applied double containers joint to extend the space.



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