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Zenith Switchgear Mobile HV and MV Substations

An innovation of its own kind

Introduction

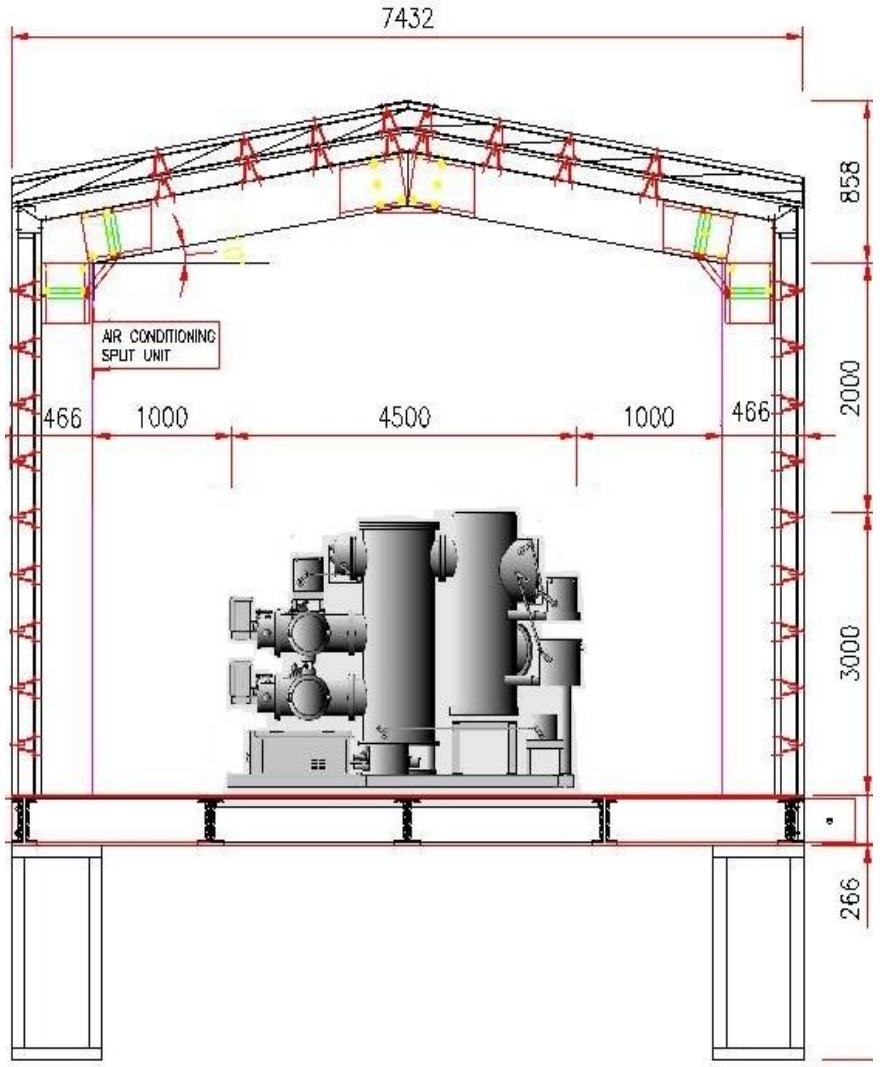
- Zenith Switchgear Mobile HV/MV Substation, is an excellent total power solution for providing a very quick delivery of High and Medium Voltage substation.
- Zenith Switchgear can design and construct a Mobile HV/MV Substation completed with all the required substation equipment and facilities for various aspects of application, with approximately 70% or less of the cost and delivery time of a conventional concrete HV/MV Substation.
- The Mobile Substations can have the features of withstanding 9G Richter Scale Earthquake, 250kM Cyclone wind speed, 2-hour fire rating, explosion proof with pressure relief and rigid structure for transportation by low loaders. Anchoring eyes are provided for shipping purpose.

Mobile Substation Near Completion

Standards

- IEC 60529 Degrees of protection provided by enclosures (IP code)
- AS/NZS 2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
- AS 2700 Colour standards for General Purposes
- AS 3000 Electrical installations (Known as SAA wiring rules)
- NEC/IEE Wiring Installation Practice
- ANSI/IEEE/NEMA Standards
- IEC62271-200 for 1 ~ 52kV Switchgear
- IEC62271-100 for 1 ~ 52kV Circuit Breakers
- Other relevant standards of practice

Mobile Substation for 145kV GIS and Control Relay Panels



Mobile Substation for 145kV GIS and Control Relay Panels

Structure Erection In Progress

Structure Erection In Progress

Structure Erection In Progress

Installing of Air Conditioning Insulation

Key Features of Mobile Substation Mobile Substation

- Zenith Switchgear Mobile HV/MV Substation is constructed by Mobile galvanized ZINCALUME steel structure, with COLORBOND steel cladding to protect against severe saline and corrosive environment.
- ZINCALUME Steel has the properties of half the weight of Mild Steel with double of its mechanical strength.

Image shows internal ZINCALUME Alloy structure with external color bond and weatherproof cladding with antirust against salty environment for 30 years

Image shows the installation of an HVAC system with fresh air boosting intake to maintain the internal pressure.

Design Features.

- Internal insulation can be provided to achieve one or two-hour fire rating options.
- Optional explosion proof sheet metal cladding can be provided internally with pressure relief flap in case of internal arc fault happened in the Mobile Substation.
- Zenith Switchgear Mobile HV/MV Substation can be design-proven by computer simulated calculation for (i) withstand severe earth-quake; (ii) Cyclone and typhoon wind speed conditions; (iii) Heat loss and air conditioning (iv) Optional Pressurized switch-room. All calculations are certified by Malaysian Professional Engineers.

Mobile Substation Base Frame Structure Construction

6.0 Wind Load Calculations

Section1.
Calculate design wind-speed.
Wind-loading parameters to be calculated by: AUTO
Region = D
Importance = 2
Cyclonic = C (taken from the region)
Wind-speed = 88 m/sec (Strength) (from Table 1)
Wind-speed = 51 m/sec (Serviceability) (from Table 1)
Wind-speed = -1 m/sec (Footing calcs) (from Table 1)
Structure height = 2969 mm.
Terrain = 2
Mzcat = 0.9 (From Table 2/3)
MdA = 0.95 (Analysis-A)
MdB = 1 (Analysis-B)
Ms = 1
Mt = 1
Vsite(Strength) = 75.24 m/sec Analysis-A
Vsite(Service) = 44.09 m/sec Analysis-A
Vsite(Strength) = 79.2 m/sec Analysis-B
Vsite(Service) = 46.41 m/sec Analysis-B
Vsite(Footings) = -0.91 m/sec Analysis-C

COMPUTER CALCULATION OF STRUCTURAL FORCES

5.0 Short Design Summary

Strength Limit State

Structural System	Status	Safety factor, %	Reference Check	Load Comb
Portal Frame, Grid 1	Passed	9.12	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
Portal Frame, Grid 2	Passed	22.71	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
Portal Frame, Grid 3	Passed	27.11	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
Portal Frame, Grid 4	Passed	23.62	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
Portal Frame, Grid 5	Passed	24.51	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
Portal Frame, Grid 6	Passed	12.2	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
C1 - Main Shed	Passed	27.11	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
C2 - Main Shed	Passed	8.08	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
R1 - Main Shed	Passed	18.86	Ref: 2.9.6.5 | Shear Capacity (of C30030) (YY)	1009
R2 - Main Shed	Passed	9.12	Ref: 2.9.6.9(a,b,c) | Combined Bending & Compression Capacity (A,B,C)	1014
P2 - Main Shed	Passed	25.87	Ref: 2.9.6.18 | Moment Capacity - Lateral Buckling Topspan	2007
P3 - Main Shed	Passed	52.25	Ref: 2.9.6.5 | Shear Capacity (of TS96060) (XX)	2004
G1 - Main Shed	Passed	57.11	Ref: 2.9.6.5 | Shear Capacity (of TS96060) (XX)	2090
G2 - Main Shed	Passed	56.24	Ref: 2.9.6.5 | Shear Capacity (of TS96060) (XX)	2068

Design Features..

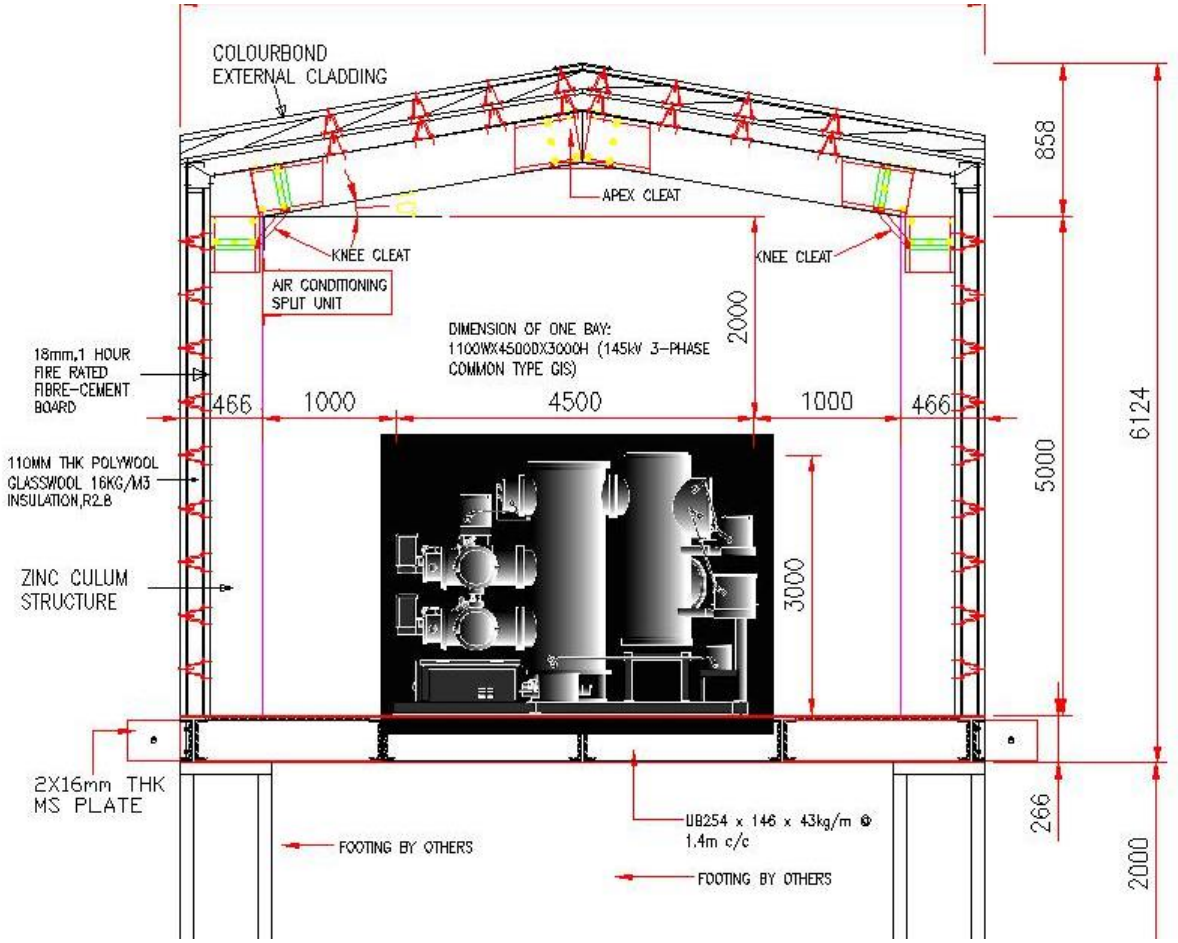
- Zenith Switchgear Mobile HV/MV Substation, houses High and Medium Voltage switchgear, low voltage switchgear and all other substation accessories, which are interconnected to provide maximum system safety and reliability.
- The Mobile Substation can be facilitated with specially designed HVAC or normal air-conditioning to ensure optimum environmental conditions of operation.
- In addition, fire detection, fire alarm and harmless gas fire extinguishing systems can also be designed and installed to prevent fire hazards.

Base frame and steel floor is leveled to switchgear manufacturer's requirement. The floor is installed with fire rated materials to specification.

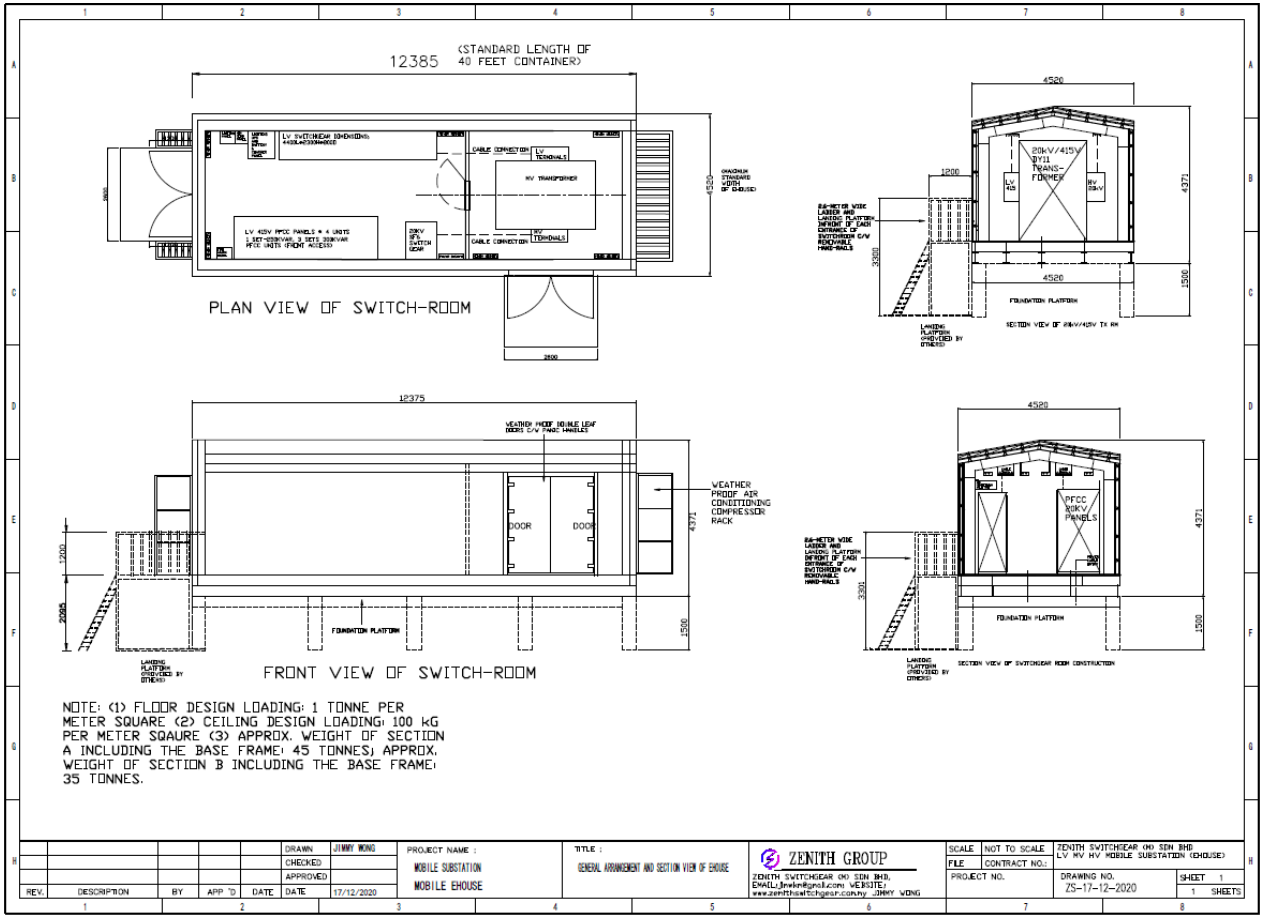
Fire Alarm and Smoke Detection Panel

ZINCALUME Modular Joints

Detail Construction of Mobile Substation



Detail Construction of Mobile Substation



Advantages

- The main advantages of providing a Mobile HV/MV Substation are the significant reduction of construction time and cost as compared to a normal concrete substation building;
- Zenith Switchgear Mobile HV/MV Substation is adequately designed for perfection where valuable internal space is fully utilized.
- It is compatible to a conventional concrete substation with about 70% or less of its time and cost of construction.

Advantages..

- Reduces the time for site commissioning and eliminates errors during hook up of power as these are fully tested at factory before delivery.
- The equipment selection and layout in the MOBILE / Mobile HV/MV Substation can be customized and designed to suit customers' applications for a modern High and Medium Voltage Substation.
- HV/MV AIS and GIS, LV MCC, Control relay panels, SCS, SCADA and telecommunication systems can be incorporated and integrated on request and linked to the central control system of power network.
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145/36/12kV Substation Layout with 145KV GIS Showing Exposed (Can be installed in Mobile Substation as described above)

Transportation of 50 tones Mobile Substation to the Port

Loading of 50 tones Mobile Substation to the Ship

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Thank you for your attention