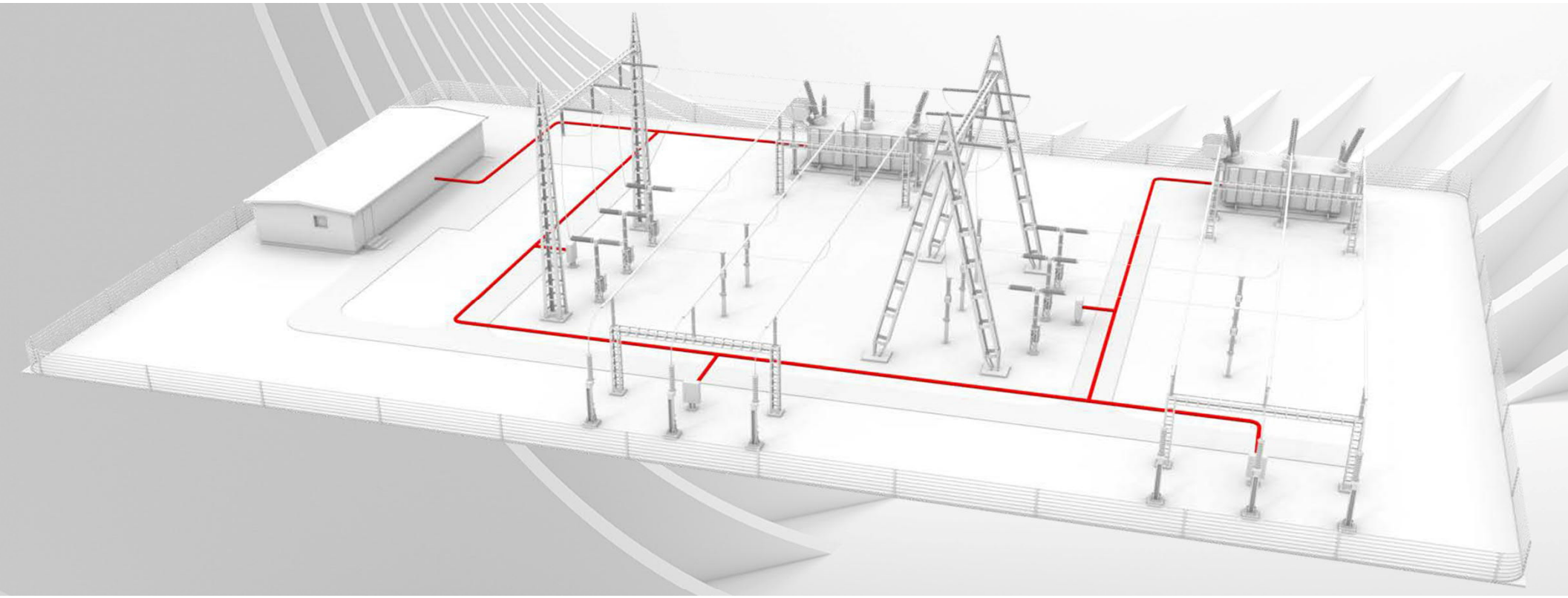


INDUSTRIAL AUTOMATION ENERGY INDUSTRIES (IAEN)

ABB E-House Solutions

Andres Illarramendi, Electrification Business Solutions Consultant, IAEN

Agenda

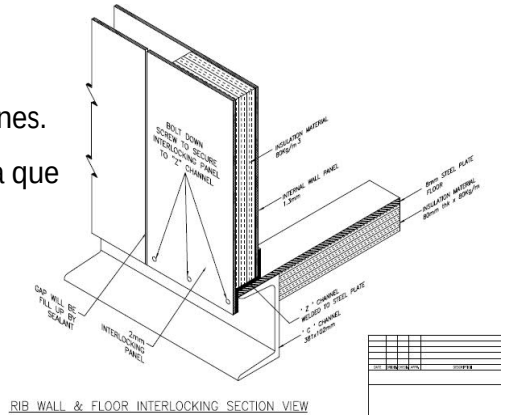
1. Que es un E-House?
2. Tipos de E-House
3. Ventajas de E-House vs Construction Tipica en Sitio
4. Estandares a seguir
5. Clasificaciones
6. Cuarto de Baterias
7. Aires Acondicionados y Sistemas de Presurizacion
8. Sistemas de Alarma y Supresion de Incendios

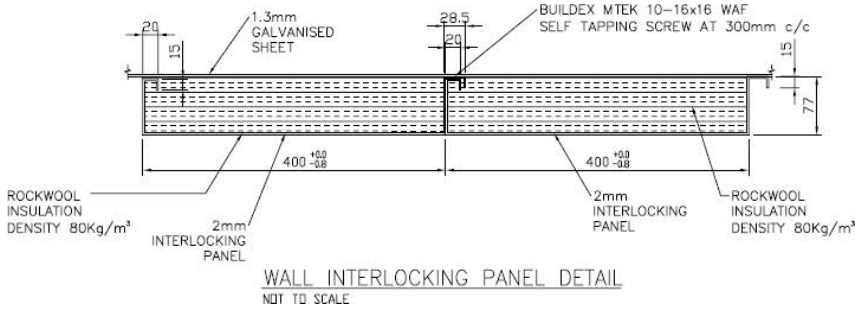
¿Qué es un E-House?

Es un cuarto prefabricado que puede ser de hierro, metal laminado galvanizado y/o de cemento.

Estos también pueden ser llamados: PDC (Power Distribution Center), cuartos electricos, etc…

- Pueden ser construidos de paneles galvanizados que se interconectan unos con otros para darle rigidez a la estructura.
- También pueden ser construidos de hierro para aumentar fuerza estructural resistente a explosiones.
- Otro tipo de fabricación es hacerlo de cemento ya que sirven para protección balística.
- Pensar siempre en el transporte/envio

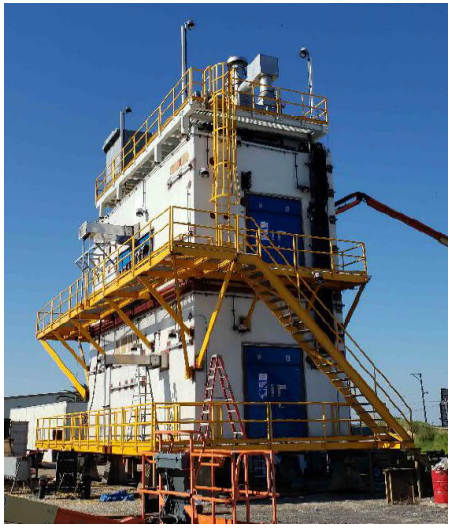




Tipos de E-House

De Varias Piezas o multi-piece

De Una Sola Piezas o single-piece



De Un Solo Piso o Varios – Multi-stories

Ventajas de E-House vs Construction Tipica en Sitio

What can go wrong during standard on-site building construction?

By supplier

Tracking of material: During site fabrication, there is a lot of extra work and lost hours from the supplier and customer side tracking material. Material is received and sent to a warehouse and needs to be found later to bring it to construction area and time is wasted. Sometimes material is lost and have to be re-ordered and hurts the schedule.

Labor cost: For any supplier, the cost of labor in a site/remote area is sometimes twice the price than in their factory in a controlled environment. Also, there are more training required (safety, site specific, etc..) and other hidden costs like transportation, hotels, etc..

By Customer

Site coordination: In construction site, there is a lot of coordination that needs to be done by customer and suppliers to make sure they follow a sequence and also suppliers and/or customer do not interfere with other construction activities being done at the same time.

Schedule: customer sometimes overlook the details of the construction activities by different suppliers and schedules are delayed.

Pre-Commissioning: site pre-commissioning is a task that most of the time is missed and surprises occurs when it's too late for the project. Also, the risk associated and amount of personnel needed on site for commissioning is higher when pre-commissioning is not done properly.

Others

Weather: The #1 problem for all outdoor construction activities is the weather. Weather is completely unpredictable and can cause mayor delays in schedules. Also, weather can damage a lot of equipment (mostly electrical due to water and humidity) and sometimes damage is not seen when it happens but in the future.

Safety: Safety trainings and measurements helps to reduced the risk in construction areas but doesn't eliminate it completely. When manufacturing in a controlled and more reduced area, safety accident are reduced considerable and also if it happens, normally are very minor.

Estandares a seguir

Onshore vs Offshore

Codigos y Regulaciones

El cliente final debe de asegurarse antes de empezar la fabricación y especificaciones del E-House cuál es el standard que debe seguir y los códigos que deben cumplirse. Cambios de los estándares pueden ser bastante costosos si son identificados muy tarde y pueden dañar por completo el cronograma de trabajo.

Algunos de los items costosos de los cuartos onshore/offshore pueden ser:

- Materiales utilizados (galvanizado vs acero inoxidable vs aluminio)
- Clasificación (C1D2, C1D1, HVAC y presurización)
- Supresión de incendios (Agentes - Inergen, FM200, NFPA92)
- A prueba de explosiones (puertas, ventanas, paredes, nivel de dano)
- Sistemas Redundantes (HVAC, UPS, F&G)
- Contra fuego (paredes, pisos/barriga, penetraciones, chartek, H-60)

Estandares

SOLAS – Safety of Life At Sea

- Penetraciones en paredes, techos y pisos
- Dampers/compuertas corta fuego
- Clasificación de los cuartos

ANSI/NEC

- Espacio Seguro y libre alrededor de los equipos
- Tipo de equipos y de dispositivos a utilizarse

IEC

- Diferente de ANSI/NEC (Color de los cables, aterrizaje a tierra)
- Clasificación de luces y botoneras (cable glands)

A prueba de explosiones

- Luces y dispositivos internos y externos
- HVAC y presurizacion (Z-purge, arranque negro)

North America/ATEX/IECEx

Clasificacion

Target Scope of Work

Atmosphere Groups

Substance	Hazard Class	Division Groups	Zone Groups
Acetylene	Class I Flammable Gases	Group A	IIC
Hydrogen		Group B	IIB + H2
Ethylene		Group C	IIB
Propane		Group D	IIA
Methane		Group D	IIA[6]
Combustible Metal Dusts	Class II Combustible Dusts	Group E[5]	IIIC
Combustible Carbonaceous Dusts		Group F	IIIB
Combustible Dust not in Group E or F (Flour, Grain, Wood, Plastics, Chemicals)		Group G	IIIB
Combustible Fibers and Flyings	Class III Fibers and Flyings	Not Applicable	IIIA

Note 5: Group E is applicable to Class II Division 1 only
Note 6: Methane is a group IIA Gas for non-mining applications

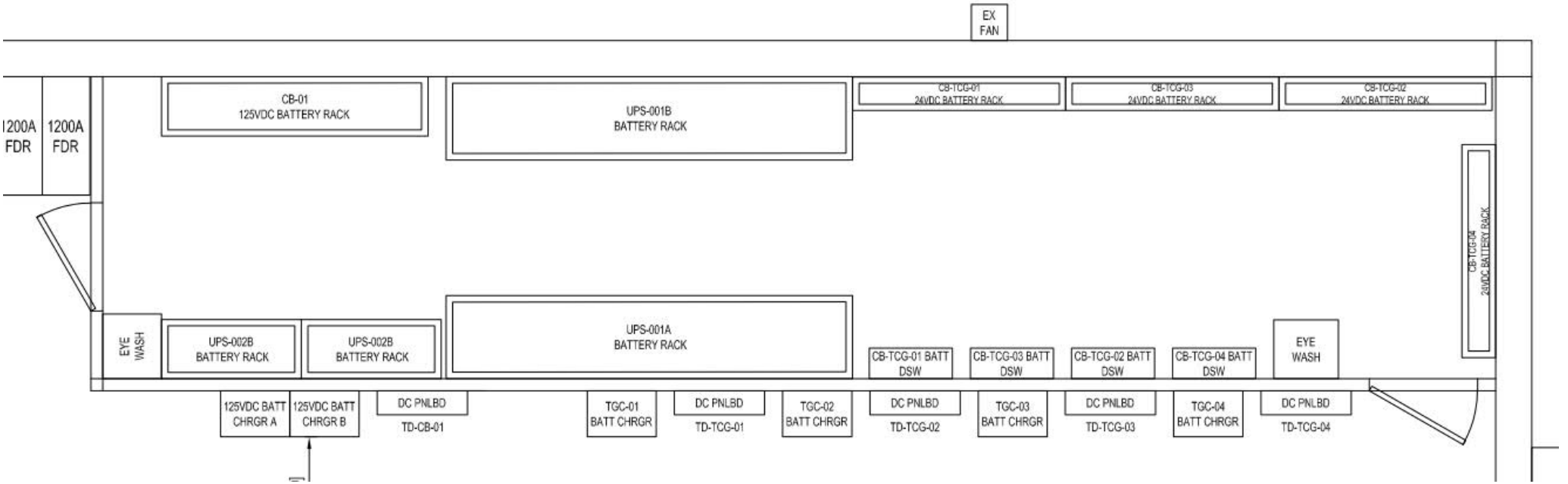
Classification of Divisions and Zones

Hazard Level	Division Scheme	Zone Scheme Gas/Dust	Type of Explosive Atmosphere
Continuous Hazard	Division 1	Zone 0 / Zone 20	Continually present
Intermittent Hazard		Zone 1 / Zone 21	Likely to occur during normal operations
Hazard Under Abnormal Conditions	Division 2	Zone 2 / Zone 22	Not likely to occur during normal operations, but may occur for short periods

Cuartos de Baterias

Algunas consideraciones de los cuartos de baterias:

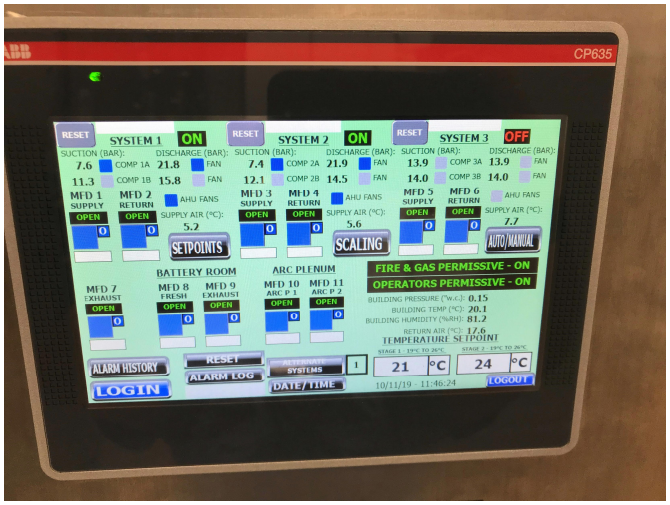
1. El tipo de baterias puede influir en la clasificación del cuarto
2. Sistema de extracción de gases
3. Alarma de hidrógeno
4. Interruptores, luces, etc...
5. Paredes A-60



Aires Acondicionados y Sistemas de Presurizacion

Información necesaria para diseñar los aires acondicionados:

1. Sitio final donde estará ubicado el E-House para saber la temperatura ambiente máxima y mínima
2. Disipación de calor de todos los equipos eléctricos y el personal
3. Aislamiento térmico de las paredes y techo
4. Temperatura interna deseada
5. Clasificación del área donde sera instalado finalmente el E-House
6. Compuertas
7. Comunicación



Aires Acondicionados y Sistemas de Presurizacion

Información necesaria para diseñar los sistemas de presurización:

1. Presión interna deseada en los cuartos
2. Redundancia
3. Arranque en negro necesario o no
4. Fugas de aire de los cuartos en caso de haberlas (arc plenums)
5. Dampers y lovers

Sistema de Alarma y Supresion de Incendio

Consideraciones para diseñar los sistemas de alarma y supresión de incendio:

1. Sensores de Gas Combustible
2. Sensores de Hidrógeno
3. Filosofia de Voting (2oo3)
4. Agente supresor
5. Sistema de apagado de emergencia del HVAC u otros sistemas
6. Conexión al DCS (Modbus, etc…)
7. Extinguidores portátiles

IAEN Electrification Team Capabilities

Target Scope of Work

Engineering & Design Services
- Pre-Feed / Early Engagement
- Site Assessments
- Detailed Electrical Systems Design
- Engineering & Installation Work Packages

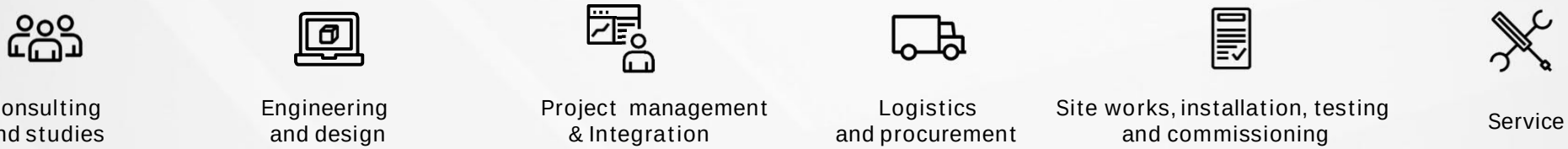
Engineered Solutions:
- PMS Systems
- Site Erected “Pre-Engineered” Buildings
- “Pre-Fabricated” Buildings (On/Off Shore Applications)
- Distribution Skids & Mobile/Trailer Applications
- Turnkey Substations (69kV and Below)
- Retro-fit / Rip & Replace Applications

System Studies & Relay Programming
- SKM / ETAP Power System Studies
- Arc Flash Studies
- Relay Application Engineering

Site Services:
- Training
- After Sales Support
- Start-up and Commissioning Support

IAEN Electrification (Introduction)

IAEN Electrification Team as the “System Integrator”



Plan | Execute | Maintain

Health, safety and environment

Electrical Solutions

Example wins (Huntsman JWW-1 Electrical Building)

Electrical Solutions

Example Turnkey BASF Elyria 69kV-12.47kV-480V Substation

Competitors: Eaton, Siemens

Evaluation: Price/Solution

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Solution/Price

Electrical Solutions

Example wins (ENI / Mizton)

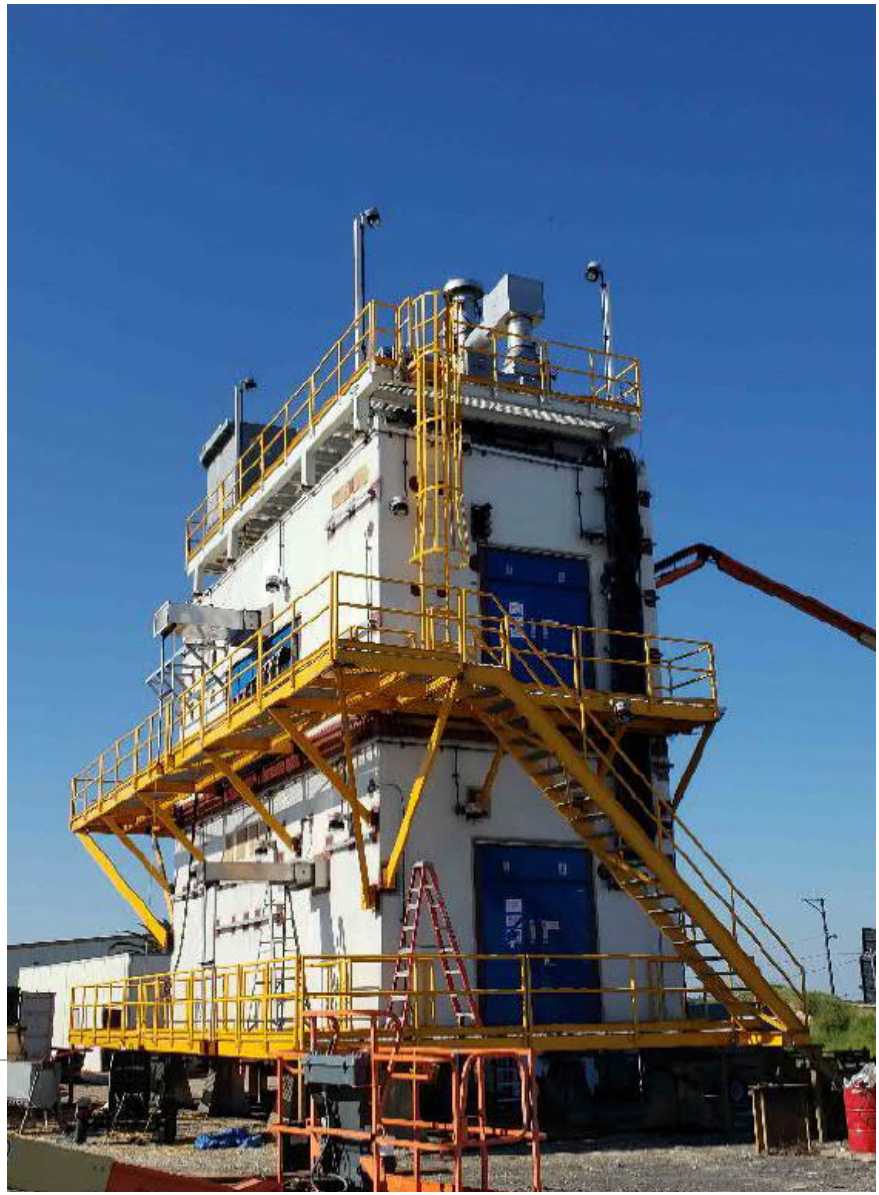
Competitors: Powell

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Solution/Price



Electrical Solutions

Example wins (PPG Allision Park 27kV Switchgear Rip & Replace)

Before

After

Competitors: Eaton / Schneider

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Solution/Price

Electrical Solutions

Example wins (Chevron Mobile Substation)

Competitors: Delta Star

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Execution

Electrical Solutions

Example wins (Orascom)

Competitors: Powell

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Execution

Electrical Solutions

Example wins (Hokchi – Electrical Buildings – Satellite & Central Platforms)

Competitors: Powell, Siemens

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Execution

Electrical Solutions

Example wins (IMG Wolf Run / Oxbow)

Competitors: Eaton, Siemens

Evaluation: Price/Solution/Comfortability

Key stakeholders: Engineering/PM

ABB Team: IA/EP

Value Proposition: Execution