

Safety Hazards during battery charging

- High Voltage
- Chargers
- Heat Generation
- Coolant Flow
- Environment

Safety Hazards during swapping

- High Voltage
- Chargers
- Heat Generation
- Coolant Flow
- Handling of heavy objects

Safety Risks – identification, mitigation, handling

- Electric Shock
- Electric Arcing
 - Grid failures due to overload
 - Grid supply fluctuations leading to failures
- Fire
- Explosion
- Chemical Leak
- Physical Injury (during swapping)

Controls

- Engineering Control
 - HV: Interlock, Fuse, Relay, etc.
 - Chargers: protection for over current, over voltage, over charging, isolation check, etc.
 - Heat Generation: temperature monitoring, auto cut-off, etc.
 - Coolant Flow: Leak detection, pressure check, etc.
 - Heavy objects: Interlocks, etc.
- Building code
- Installation guidelines
 - Protection against over charge, temperature abnormalities, one bad cell / module, etc.
- Skill development / design controls: handling batteries swaps mishandling, wrong insertion, etc.

Controls

Skill development
Certification program

- Administrative Control
 - Training as per BGI/GUV-I 8686, SOP, Warning display, etc.
- Personal Control
 - Authorized personnel, PPE such as electrical safety shoes, insulated mat, face shield, DUSPOL[®] tester, qualified equipment, etc.

Standards for the PPE, what PPE for what use

Opportunities

- Skill development

Gaps

- Building code (chargers)
- Charger installation guidelines
- Battery – charger communication specifications (safety related)
 - Temperature
 - Over charge, etc.

Challenges

- Design controls / specifications to avoid problems related to handling of batteries during swap (mishandling / wrong usage, etc.)

Next Steps

- Curriculum development
- Skill development
- Standards for PPE
- What PPE to use when