



# ATS Automation

Lithium Battery Fire Safety



INDUSTRIAL AUTOMATION

*Every day matters.*



Wixom and Corporate HSE



# Rescue Hook and Electrical Shock

A Thermal Runaway is not the only way to get seriously injured from a Lithium Battery

As noted in this presentation, these batteries have enormous amounts of power and can kill and maim instantly

Unsafe contact with a module or pack can cause serious shock

If you see a person that is in contact with a battery or machine and is in trouble, hit estop, DO NOT TOUCH THEM.

There are 4 Rescue Hooks in the building, North and South Pack Cell in Bay 6 and North and South Module Cell in Bay 1

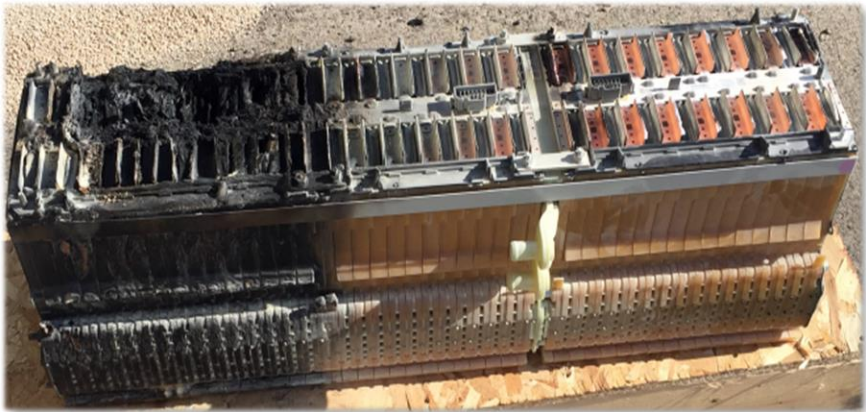
As in the illustration use the hook to pull them away from the power

Page the ERT or Battery Emergency Team



# ATS Lithium Battery Incidents 2022

- May 12, 2022 Thermal Event IA Lewis Center Bldg 3
- June 15, 2022 Lithium Fire IA Lewis Center Bldg 2
- Sept. 9, 2022 Lithium Battery Smoking IA Natura Way
- Sept. 30, 2022 Lithium Battery Electrical Arc IA Wixom



# Why Lithium Batteries Catch Fire or Explode

- Lithium batteries are made to deliver high output with minimal weight. Battery components are designed to be lightweight, which translates into thin partitions between cells and a thin outer covering. The partitions or coating are fairly fragile, so they can be punctured. If the battery is damaged, a short occurs. This spark can ignite the highly reactive lithium.
- Another possibility is that the battery can heat to the point of thermal runaway.



# Lithium Battery Fire Danger Signs

- **Heat:** It's completely normal for batteries to generate some heat when charging or in use. But if your device's lithium-ion battery feels extremely hot to the touch, there's a good chance it's defective and at risk to start a fire.
- **Swelling:** When a lithium battery fails, another common sign is battery swelling. If your battery looks swollen, you should stop using it immediately. Similar signs include any type of lump or bulge, or leakage from the device.
- **Noise:** Failing lithium batteries have also been reported to make hissing or cracking sounds.
- **Odor:** If you notice a strong or unusual odor coming from the battery, this is also a bad sign. Rubber, oil etc...casing material
- **Smoke:** This one's a little more obvious. But if your device is smoking, a fire has already started.
- **Leaking Batteries** (Electrolytes): very caustic to the touch
- **Fire**

# Lithium Battery Fire Danger Signs

- Battery Temperature Increases
- Battery is leaking electrolytes
- Battery Expands and you hear “hissing & crackling” sounds
- Odor of material heating
- Smoke Appears
- Fire





# Thermal Runaway

Thermal runaway is one of the primary risks related to lithium-ion batteries. It is **a phenomenon in which the lithium-ion cell enters an uncontrollable, self-heating state**. Thermal runaway can result in: Ejection of gas, shrapnel and/or particulates (violent cell venting) and Extremely high temperatures

Battery cells **first begin to fail** when it is subjected to an abuse factor like heat, overvoltage, etc. **The second step** is off-gassing. **The third step** is smoke, and the **fourth step** is fire. Smoke and fire often occur almost simultaneously. So, by the time smoke is detected, thermal runaway has typically already begun.”

Lithium battery fires can reach 3600°F



# Lithium Battery Emergency

- Contact the local fire department immediately
- If batteries are showing evidence of thermal runaway failure, be very cautious because the gases may be flammable and toxic and failure modes can be hazardous. DO NOT engage without Proper PPE protection.
- Remove the battery from the equipment (if possible). Using one of the carts or forklift might be possible to move the battery module or pack out of the building away from any other hazards.
- If the thermal runaway failure is minimal it may be possible to use sand and or ABC extinguisher to get the fire under control, then remove to the outside of the building.



# Battery Emergency Cart



Fire Resistant Blanket Rated to 1800 Degrees

3/16 Steel Plate over Blanket with length to fold completely over Module

5 Gallon Bucket of Play Sand

2 Pair of Welding Gloves

2 Respirators P100 Full Face Organic Vapors and Acid Gases

Air Horn To be used to alert ERT Personnel

1 Tube Calgonate for emergency First aid

5 LB ABC Fire Extinguisher

# Emergency First Aid

- Calgonate Gel for skin contact
- Emergency Battery Carts



# Emergency Carts



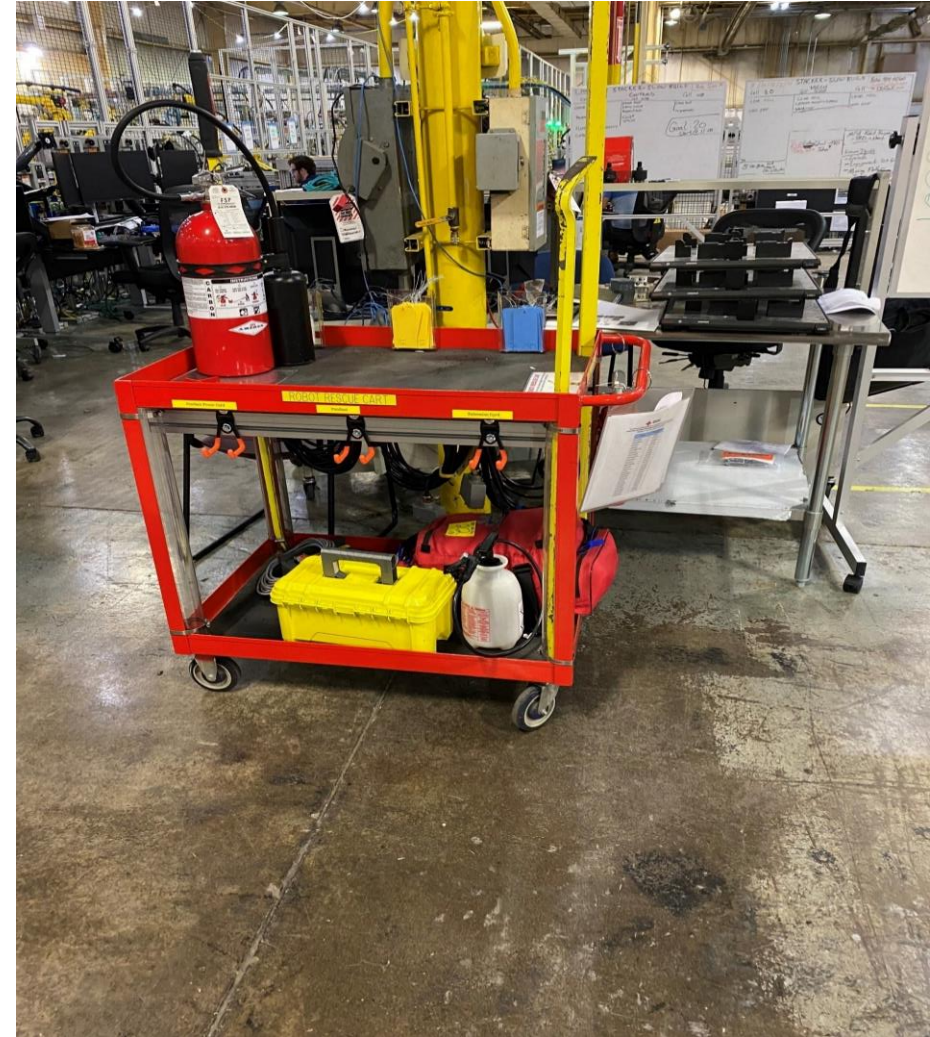
Must have a sufficient number of  
Emergency Carts

All are located at or near any  
active battery machine or storage  
areas

Not to be moved unless needed

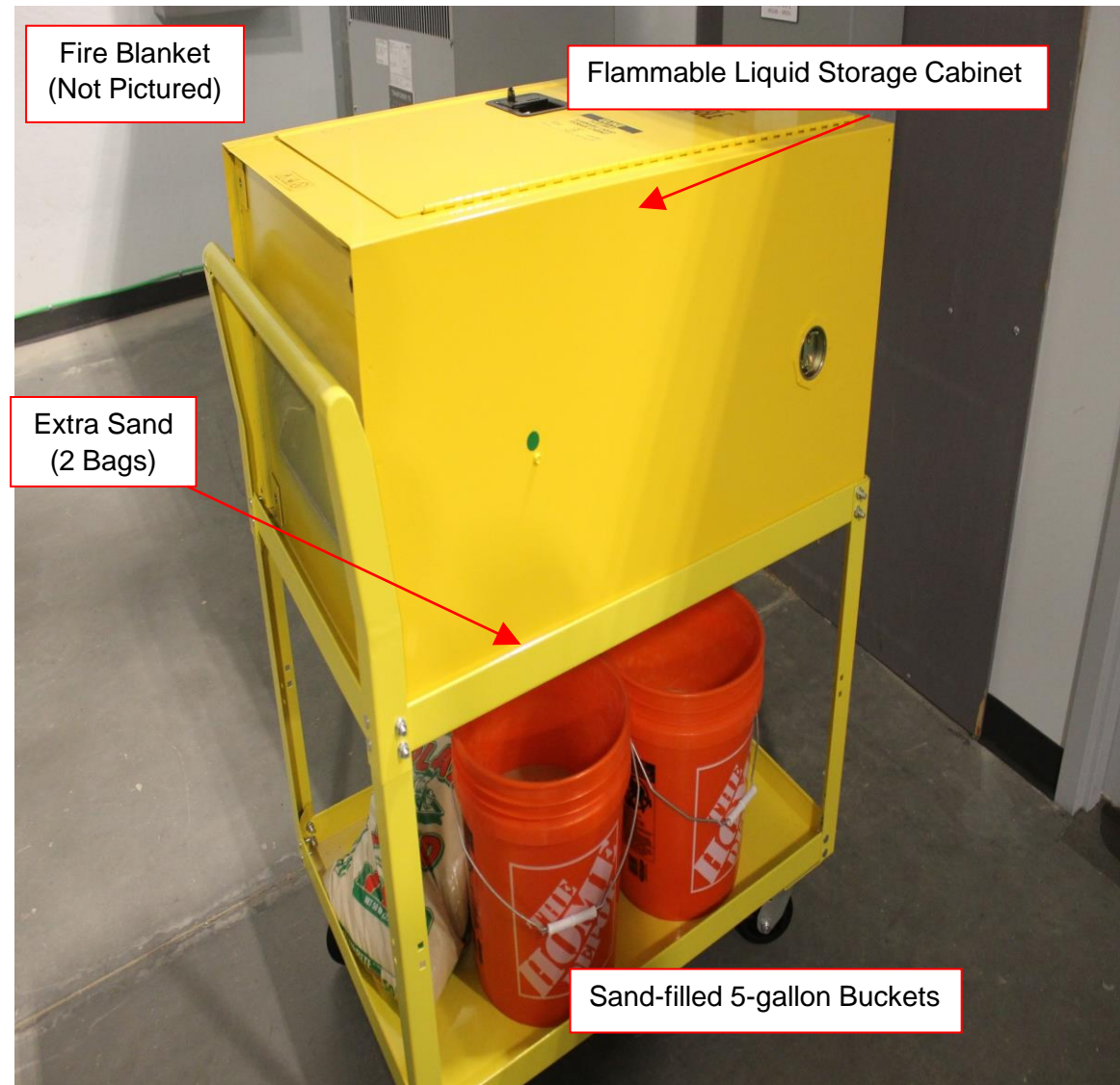
Do not store anything on these or  
block access

# Emergency Carts from other Locations



# Minimum Fire Equipment

- Minimum Equipment:
  - ABC or Lithium Fire Extinguishers
  - Sand
  - Thermal Gloves – 2 pair
  - Respirators
  - Thermal Blanket(s)
  - Calgonate Neutralizer
  - Storage Container sized to battery unit
  - Hydrofluoric Acid Neutralizer
  - Apron
  - Face shield

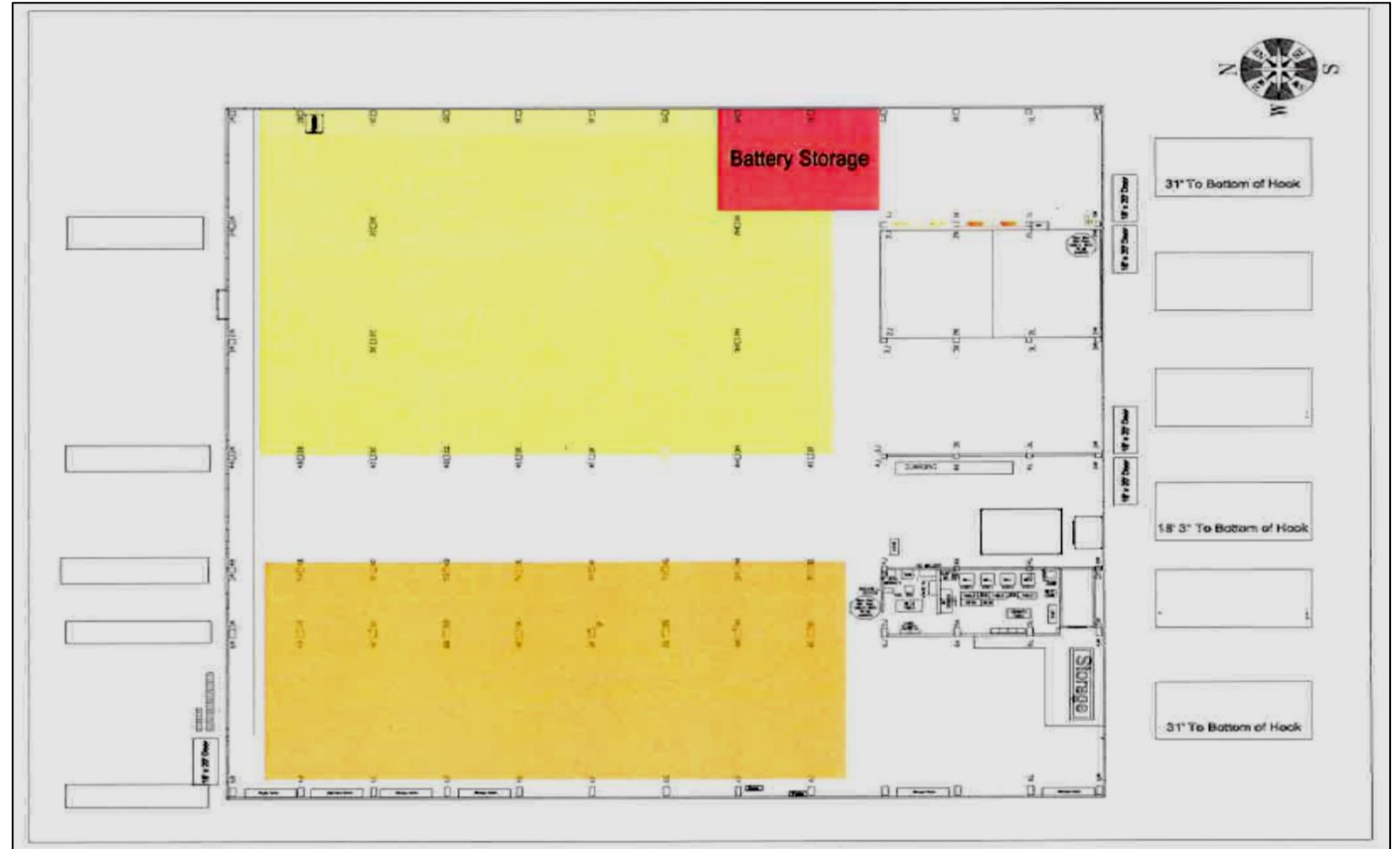


# Lithium Battery Fire Response Planning

- Local Fire Department has been contacted in advance and notified of Lithium batteries and invited to tour facility and review Fire Response Plan
- Access to batteries
  - All projects need to have clear pathways
  - May need tools to remove from machine
- Storage area clearly identified and protected
- Determine how to transport unit outside away from any drains or outfalls
  - Forklift
  - Cart – Metal
  - Cabinet
- Obtain additional equipment
- Update plan if battery lines change and communicate changes to employees, local fire department and ERT

# Battery Storage and Build Area

**Only Trained  
and Authorized  
Personnel to  
Enter Storage  
Area  
or Handle  
Batteries**

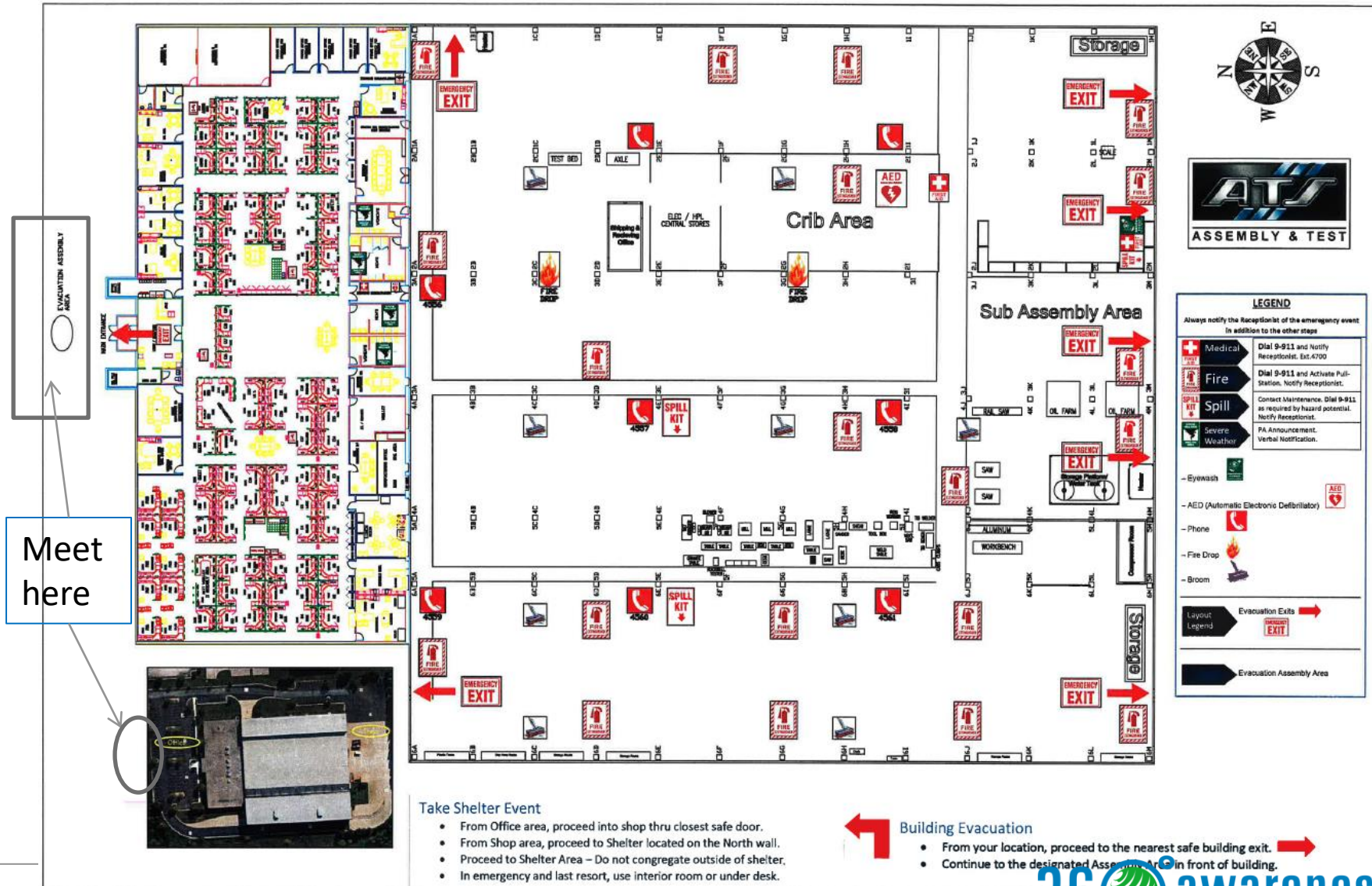


# Emergency Battery Response

- Identify emergency: Smoking, Fire-Thermal runaway, arcing, smelling odor?
  - Everyone and anyone can identify
  - Feel Heat
  - Smell Smoke/Burning Plastic
  - See Smoke/Fire
- Evacuate Building
  - All Occupants to evacuate building are notified based on facility system
  - Exit the building and gather in the Evacuation area
  - Call 911 – Identify “Lithium battery fire” and direct to back of the building
- ERT members
  - Go to location and evaluate emergency
  - Determine level of emergency and then determine level of response and coordinate based on current Fire Response plan
  - Obtain Fire Cart if needed



# Evacuation Routes



# Evacuation Muster Area

- Post #1 – Mech. Engineering, Purchasing & Service
- Post #2 – Controls Engineering & Software
- Post #3 – All Assembly
- Post #4 – PM, Sales/Apps & Office Personnel
- Post #5 – PA Solutions & General Visitors



# First Responder Battery Team

- First Responder Battery Team to go to Scene
  - Team adorns PPE (mask needs to go on first)
  - Put machine in home position
  - Disconnect power/E-stop
  - Identify severity of event
    - Use extinguisher if appropriate
    - Cover with fire blanket
- Scenario 1: Compromised Battery (If SAFE TO DO SO!!!)
  - Pack: Move to container or incapsulate in sand
    - Disconnect cables if connected to machine
    - Battery moved with Forklift or carts to a safe area outside of building
    - Close doors
    - Wait for Fire Dept to arrive
  - Module: Move to cabinet or incapsulate in sand
    - Team brings emergency cart to move Module onto cart.
    - Both Team members, one with Fire Extinguisher in hand, move cart to outside (ERT member to pull backwards – avoid smoke to the face)
    - Close doors
    - Wait for Fire Dept to arrive



# First Responder Battery Team

## ■ Scenario 2: Smoking Battery

- Pack: Two Trained ERT members don Respiratory Protection
  - Disconnect cables if connected to machine
  - Move to container or incapsulate in sand
  - Battery moved with Forklift or carts to a safe area outside of building
  - Close doors
  - Wait for Fire Dept to arrive
- Module: Two Trained ERT members don Respiratory Protection
  - Move to cabinet
    - Team brings emergency cart to Module and using tabs on side, moves module from conveyor to cart.
    - Both Team members, one with Fire Extinguisher in hand, move cart to outside (ERT member to pull backwards – avoid smoke to the face)
    - Close doors
    - Wait for Fire Dept to arrive

# First Responder Battery Team

- Scenario 3: Battery on Fire
  - Pack: Two Trained ERT members don Respiratory Protection
    - Disconnect cables if connected to machine
    - Use fire extinguisher and fire blanket to contain flame.
    - Incapsulate in sand
    - If safe to do so, battery moved with Forklift or carts to a safe area outside of building
    - In not safe evacuate
    - Close doors
    - Wait for Fire Dept to arrive
  - Module: Two Trained ERT members don Respiratory Protection
    - Move to cabinet
      - Use fire extinguisher and fire blanket to contain flame.
      - Incapsulate in sand
      - If safe to do so, battery moved with Forklift or carts to a safe area outside of building
      - In not safe evacuate
      - Team brings emergency cart to Module and using tabs on side, moves modulee to outside.
      - Both Team members, one with Fire Extinguisher in hand, move cart to outside (ERT member to pull backwards – avoid smoke to the face)
      - Close doors
      - Wait for Fire Dept to arrive



Safety is everyone's responsibility and a worker's safety should NEVER be compromised.

Let's have a safe day!

**ATS** <sup>TM</sup>

The logo features the letters 'ATS' in a bold, italicized, sans-serif font. The letters are filled with a dark grey color and have a white outline. Above and below the letters are three parallel blue diagonal stripes. To the right of the letters is a small 'TM' trademark symbol.