Safety plan

Safety will be very important during this project. The electrical team will have to be the most careful when it comes to safety. The high voltage of the batteries poses a risk if they are not properly handled. It is very important for the people working with the batteries so they do not cause harm to themselves or ruin the batteries

1) **General**
    a) No eating or open drink containers in the labs or when using any equipment.
    b) Being aware of your surroundings and not staring at your phone when using potentially dangerous equipment is mandatory.
    c) Anyone who has not slept in 24 hours or has slept less than 5 hours should not be working with potentially dangerous devices.
    d) You should not be under the influence of any substances while working.
    e) Have an ABC fire extinguisher present in the lab where work is being done. It is added to our BOM. Everyone should be aware of how to use it and where it is.
    f) The Public Safety Emergency number, **610-330-4444,** should be posted in the lab.
    g) Always have someone with you if you are working with the battery.
    h) There should be no music above a level you can talk over in case someone needs to get others' attention quickly.
    i) Keep workspace clean
    j) Return labeled parts you were working with to their necessary location
        i) Examples: arduinos, powerboard, any mechanical components
    k) If you work with another team members components, coordinate with them for proper use
    l) If you are not confident you can pick something up by yourself, ask for help.
    m) If you are not comfortable or not certain in any way, don't handle the high current battery or interfaces

2) **Battery Safety**
    a) Batteries are "always on", in that their terminals are always energized. Thus, steps should always be taken to prevent accidental shorts.
    b) When in storage, keep terminals covered. We should use a very low gauge wire to connect the battery leads directly to a breaker which is also capable of handling the high current pulled from the battery. The breaker should remain off unless in use.
    c) Completely cover the leads in a non-conductive jacket from the battery itself to the breaker, including the lug nuts. Additionally, make efforts to prevent the breaker from accidentally being shut.
    d) Batteries are made from strong acid and alkaline materials. A spill can prove dangerous, thus, a universal spill kit has been added to the BOM. Review

instructions before working with the battery. and become familiar with using it. If damaged, report it immediately, call public safety if the spill is particularly dangerous or difficult to contain. Finally, ensure that the battery itself, along with the rest of the system is electrically isolated from the frame/exterior

e) When you hear "-1"(Jouny) sound alert back away from the battery as it has overheated and is not safe to use. Unplug any loads from the inverter if it is not dangerously hot.
f) While testing the system indoors before it is fully assembled, turn on the warning light to warn others that battery testing is in progress. This light is from the car project, and will be placed in a location visible from the hallway.
g) When using any high voltage or high current components, work within the buddy system
    i) Do not work alone with battery

3) Clothing

a) Some of the precautions are universal to batteries, **no jewelry, especially necklaces or rings**, caution using tools, well shielded live terminals, treating all connections as being live at all times, appropriate disconnects, etc.
b) Wear rubber-soled (or Electrical Hazard Certified), closed toed shoes when working with or near the battery.
c) Long hair should be up/back, especially if working with any rotating equipment.
d) Don't wear loose clothing that may get caught on equipment or obstruct what you're working on (use your judgment).
e) When soldering or connecting/disconnecting things to the battery, safety glasses should be worn.

4) Setup & Disassemble

a) Follow all instructions described in the User Manual
b) Make sure system is powered off when disabling the turret from the base
c) Work with a partner, don't disassemble alone

5) Soldering

a) Follow good soldering practices and iron maintenance as posted by Adam Smith in AEC412
b) Using proper soldering iron safety is needed to make sure people do not get hurt.
c) Always wear safety glasses when soldering and make sure that the soldering fans are on to make sure you are not breathing in harmful fumes.
d) No open toe shoes when using a soldering iron in case of accidental drops.

e) Turning off soldering irons are important and putting them back in the proper place when you are done.
f) Always wash your hands with cold water and soap after soldering.

6) What to do while System is in Operation

a) While the system is operating, the panel will be moving as the system will be adjusting the position of the sun. Anytime the panel will move, a speaker will audibly notify the user that the panel is going to move so that they are aware of the situation.
    i) Users should be aware of the movement of the system and act accordingly.
b) As mentioned in Section 2f, the warning display must be on when the system is in operation to visibly warn the team.
c) Do not operate alone, work with a partner
d) Follow instructions of user manual when in operation
e) Avoid touching the base after extended operation. While the system should remain cool, there is a danger for burns near the battery terminal.

7) If Accidents Happen

a) If accidents do occur people will need to know what to do to make sure they are handled safely. Minor injuries like burns from soldering irons or small cuts will need to be treated with proper first aid so they do not get infected. If something more serious happens the emergency number for public safety is **610-330-4444**. Any form of injury should not be taken lightly because the safety of every member of this project is of the utmost importance.
b) Report accident to team members and Professor Wey
c) In case of electrocution(source):
    i) Turn off the source of electricity, if possible. If not, use a dry, nonconducting object made of cardboard, plastic or wood to move the source away from you and the injured person.
    ii) Do not touch the person being electrocuted.
    iii) Begin CPR (if certified) if the person shows no signs of circulation, such as breathing, coughing or movement.
    iv) Try to prevent the injured person from becoming chilled.
    v) Apply a bandage. Cover any burned areas with a sterile gauze bandage, if available, or a clean cloth. Don't use a blanket or towel, because loose fibers can stick to the burns

8) Labeling

a) Design, print and stick warning stickers on the system components we're going to work with

i) Battery: high temperature warning
ii) Circuitry: high voltage warning, electric shock hazard warning, authorized personnel only warning

b) Make sure to label the components you're working with when leaving in the senior design lab, so that everyone knows who's responsible for it
   i) Include part number, drawing number, and a point of contact for the part.