

NAVIGATOR Class Safety Inspection Sheet Tutorial

COMPANY NAME: _____ COMPANY NUMBER: _____

2016 MATE ROV COMPETITION

From the Gulf of Mexico to Jupiter's Moon Europa: ROV Encounters in Inner and Outer Space

NAVIGATOR CLASS SAFETY CHECK LIST

Companies must bring this check list, the ROV, tether, surface controls, and any other item used in the deployment and operation of the ROV; they will all be inspected as part of the safety check. In addition, the SID, technical documentation, and any additional documentation needed to verify compliance must be made available to Safety Inspectors during the inspection process.

1.0 Initial Inspection Results	
0, 5 or 10 points	
Fluid Power Used & Approved for Use?	
If yes to both, see item #4	
2.0 ROV Physical	
All items attached to ROV are secure.	
Hazardous items are identified and protection provided.	
ALL Propellers are completely shrouded or are enclosed inside the frame of the ROV.	
No sharp edges or elements of ROV design that could cause injury to personnel or damage to pool surface.	
3.0 ROV Electrical	
Tether is properly secured at the ROV.	
No exposed motors.	
Brushless motors are considered exposed unless electrically sealed after purchase. Companies should provide proof of sealing procedure.	
No exposed copper or bare wire.	
All wiring securely fastened and properly sealed*	
Any splices in tether are properly sealed*	
3.1 Surface Controls Electrical & Physical	
Single attachment point to power source.	
Anderson Power Plugs for electrical attachment (or banana plugs if still used by regional)	
15 amp single inline fuse or circuit breaker within 30cm of power supply attachment point.	
Surface control station is built in a neat and workmanship like manner. No Loose components or unsecured wires. All electrical components covered inside an enclosure.	
Tether is properly secured at the surface control.	
No exposed copper or bare wire.	
All wires entering and leaving the surface control station must have adequate strain relief and wire abrasion protection as the wires pass through the enclosure. Tape, zip ties, string and similar methods are not acceptable	
No AC Power Sources	
Cameras operate off the MATE 12VDC power supply through the single attachment point to power source	
All connectors utilized are properly type rated for their application. AC only rated connectors not be used for DC	

*Properly sealed means that the wires cannot be exposed to water. Tape only sealing will allow the conduction of electricity through water.

At minimum joints must be soldered, then sealed with silicone sealant and then finally taped. For in water taping, silicone self-vulcanizing tape is preferred over thermoplastic tape. Cables with exposed male connections on both ends are not allowed.

4.0 Pneumatic / Hydraulic (if applicable)	
Passed pneumatics/hydraulics test.	
Pneumatic or hydraulic diagrams present?	
Hand or Foot pump only?	
Uses water or air only?	
No Pressure Accumulators?	
Any container that air is being pumped into is vented to the pool with vent holes at least 1/4" (6.35mm) diameter?	
5.0 Lasers	
No Lasers Present – Not permitted in NAVIGATOR class	

INSPECTION #1	PASSED: 10 POINTS
FAILED: Items to correct: (see rear of this sheet)	
INSPECTION #2	PASSED: 10 POINTS
FAILED: Items to correct: (see rear of this sheet)	
INSPECTION #3	PASSED: 10 POINTS
FAILED: Reason (see rear for details)	
Total Safety Points	
Initial Inspection [0 to 10] _____	
On Site Inspection [0 to 10] _____	
Total Points [0 to 20] _____	

Documentation – All companies must bring an electrical schematic of their vehicle. If hydraulics or pneumatics are used, companies must provide a fluid power schematic.

Physical – The ROV will be inspected for any items that may be unsafe to the participants, divers or the facility.

Electrical – All electrically powered systems must run through a single point of connection and a single fuse (15 amps or less). All systems on the ROV (going into the water) with electricity running through them must be waterproof. **Electrical issues are the most common safety violation.**

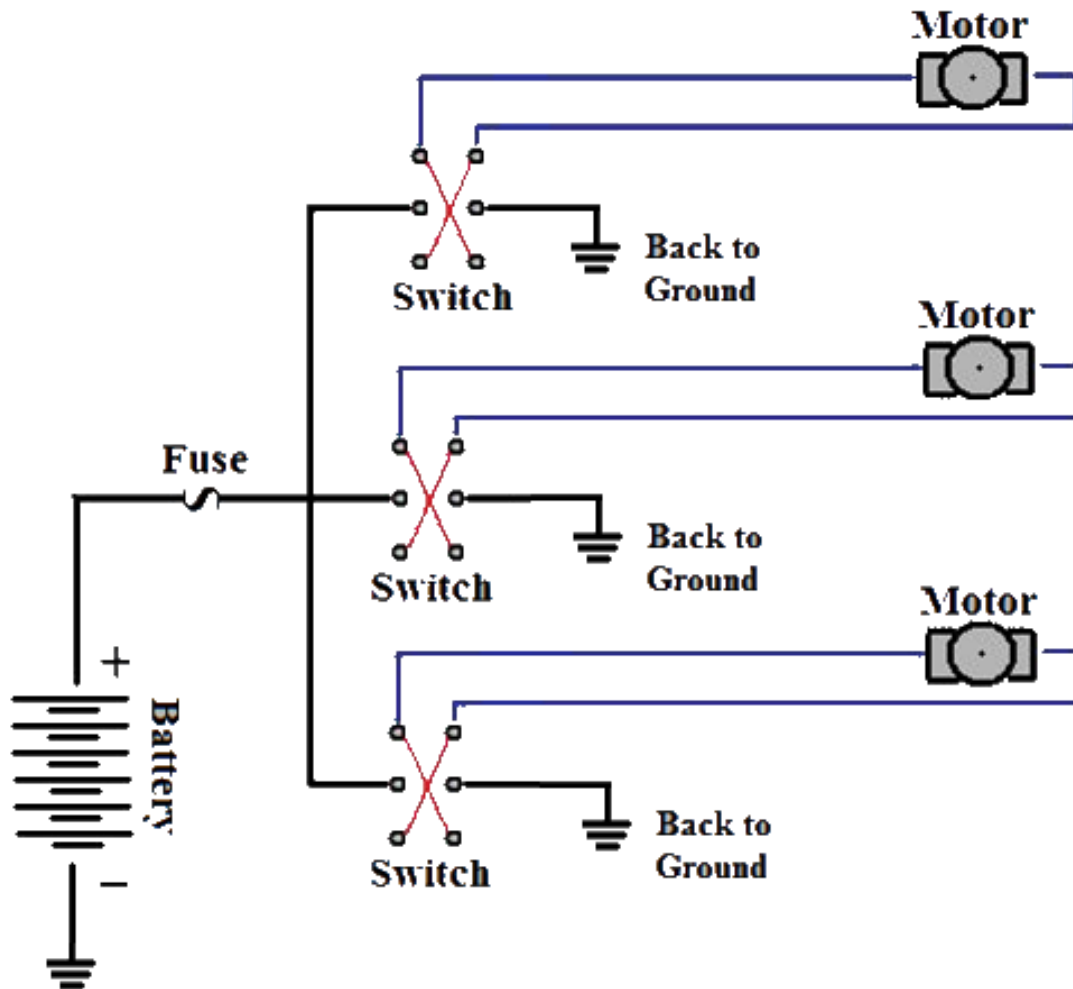
Pneumatic/Hydraulic – Team may only use manually powered pumps (no electrical pumps). All containers that air is pumped into must be open to the water. Air and water are the only fluids companies may use in their fluid power systems.



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1.0 Documentation:

Schematic of a three switch box controller.

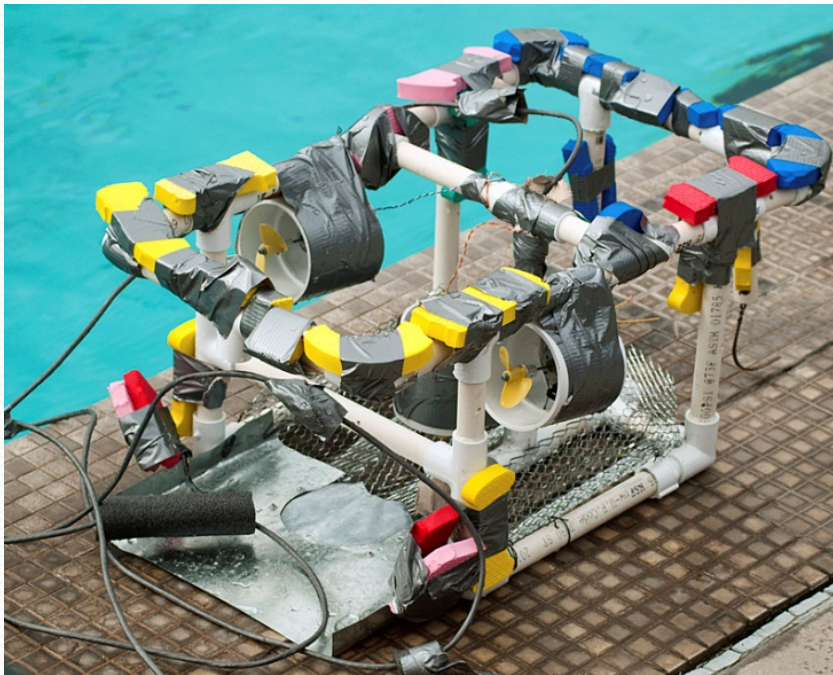


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2.0 Physical

Propellers are enclosed inside the frame of the ROV or shrouded such that they will not make contact with items outside of the ROV.

Both examples are correct.



Shrouded



Inside the vehicle frame

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2.0 Physical

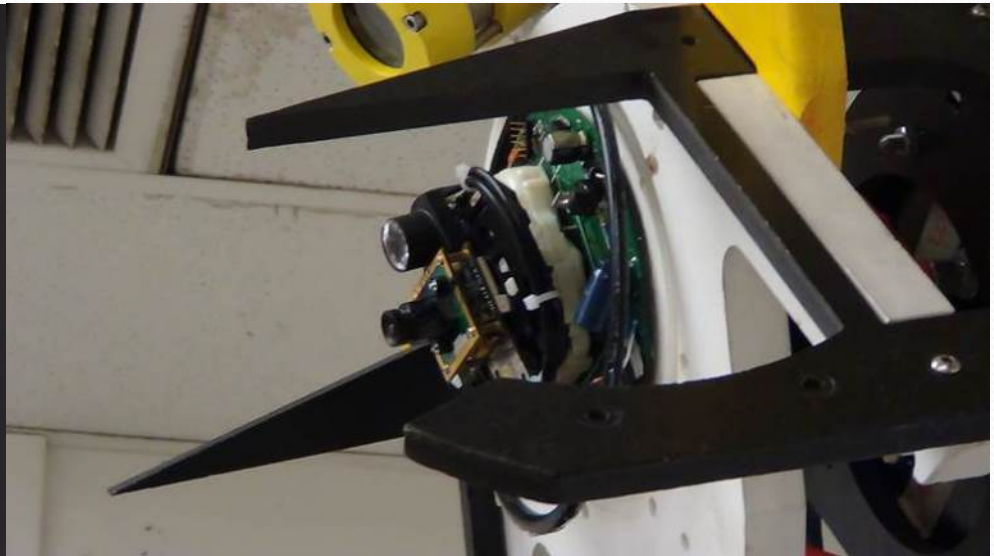
All items attached to ROV are secure and will not fall off.

No sharp edges or elements that may cause injury or damage.

Motor is secured to ROV



Sharp points will not be allowed



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3.0 Electrical

Single attachment point to power source.

Anderson power connectors are required to connect to MATE power source.

Single Inline fuse within 30cm of attachment point.

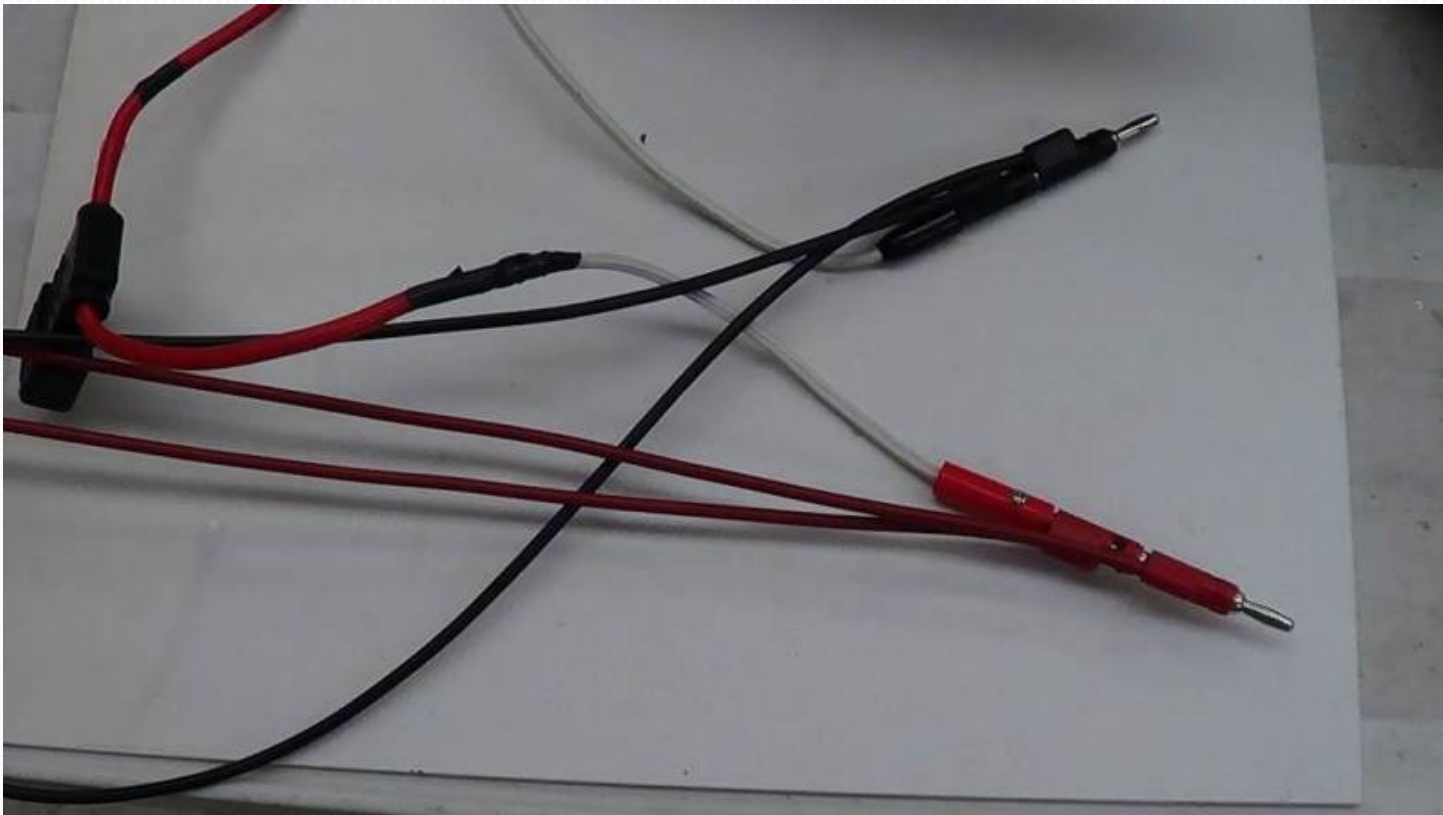


Note: If a company does not have Anderson power pole connectors, send them to the repair table. MATE will have them available and the crimpers to connect them to the power wire.

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3.0 Electrical

This is an example of multiple attachments ahead of the fuse that **WILL NOT PASS**. Note that one line is properly fused, but two others are not fused.



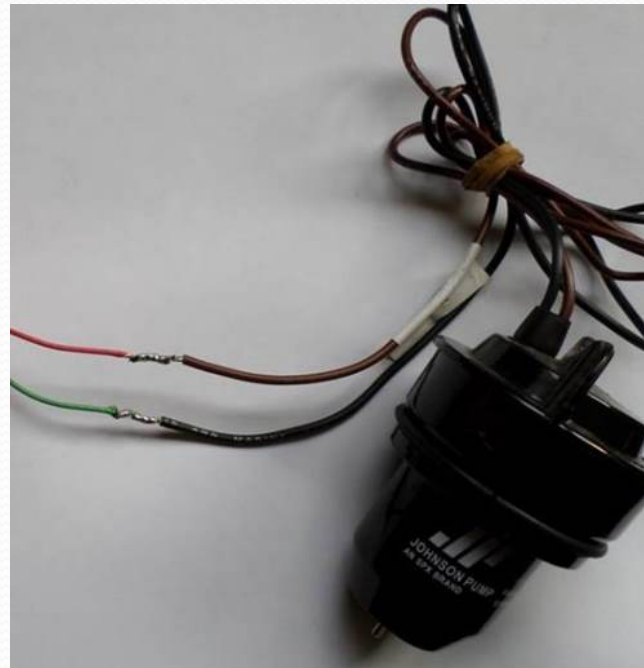
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3.0 Electrical

No exposed copper or bare wire. No exposed motors. All wiring is properly sealed.

Examples:

These **WILL NOT** PASS. The motor on the left is both exposed and has bare wire. The motor on the right is waterproof but the connections are not sealed. Tape over the connections is not sufficient. To properly waterproof connections sealant or glue should be used underneath shrink wrap.



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3.0 Electrical

Tether is properly secured at surface control point and at ROV.

Examples:

This **WILL NOT** pass. The wires are loose and unsecured. They could entangle themselves in a propeller or with a mission prop.

Tether wires should be secured to the frame of the vehicle with tape, zip ties or by another method.



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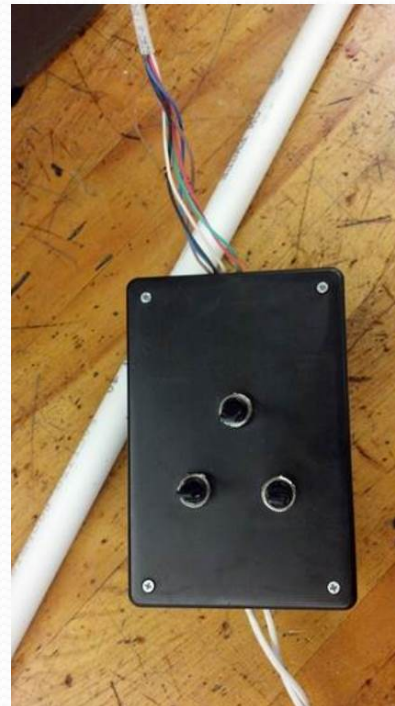
3.0 Electrical

Surface controls: All wiring and devices properly secured.

Surface controls: All control elements are mounted with wiring inside an enclosure.

Examples:

Although the wiring and control elements are mounted within an enclosure, there is no strain relief. If these wires were pulled, strain would be directly onto the solder joints. A simple overhand knot tied inside the box works as strain relief.



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3.0 Electrical

No AC power sources.

Cameras and monitors operate off the MATE 12VDC power source through the single attachment point. These cameras and monitors **CANNOT** plug into AC power. Both the camera and monitor **MUST** be powered from the MATE 12VDC supply.

NO EXCEPTIONS.

No AC power can be used to power the vehicle or its components. AC plugs and wiring should not be used anywhere in the vehicle (even to carry DC power). **If there is an AC plug carrying DC, an inexperienced user may think the ROV plugs into the wall.**



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4.0 Pneumatic / Hydraulic Checklist

Hand or foot pump only. No electrical pumps are allowed.

All buoyancy chambers must vent to the pool (holes in the bottom).

Vent holes are at least $\frac{1}{4}$ -inch in size.

Examples: Hand and foot pumps.

Buoyancy chamber opened at bottom.



5.0 Lasers

Lasers are not permitted on any vehicles.

No exceptions.

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Safety First!

Our goal is not to fail teams and keep them from competing, but rather to run a fair and **SAFE** competition for all.

If you have a question or concern, please contact the MATE Center at jzande@marinetech.org or (831) 646-3082. In this case it is better to ask for permission, not forgiveness. Remember, it is better to be safe than sorry.

