SCOUT & NAVIGATOR Class Safety Inspection Sheet Tutorial

DOC-001: Companies must provide a system interconnection diagram (SID) of their vehicle control system. An SID is an electrical diagram of their wiring, including their control box, motors, and any other electrical systems on their vehicle. The SID should separate and show what systems are on the surface and what systems are on the vehicle.

The SID is the starting point for Scout & Navigator Safety.

Companies should be aware of safety and everyone is required to submit a SID, if not early by the regional, it must be present for the on-site safety inspection.

DOC-002: Any electrical diagram should use ANSI, NEMA, or IEC symbols. They should be neatly hand drawn or created using a CAD software program.

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SCOUT & NAVIGATOR Class Safety Inspection Sheet Tutorial

Initial Safety Inspection & Documentation Review Score Sheet

Company Name:		Company Number:	

2018 MATE ROV Competition
Jet City: Aircraft, Earthquakes, and Energy
NAVIGATOR/SCOUT CLASS INITIAL SAFETY AND DOCUMENTATION REVIEW

Submission is on time, within the given size limit, uses the proper naming convention, is a PDF file, and is submitted with the other documents.		
1	0	All documentation complies with submission guidelines
1	0	SID is 1 page in length and differentiates between above and below surface components
1	0	SID shows a fuse and fuse uses a proper IEC, NEMA, or ANSI symbol
1	0	SID shows fluid power components or company states fluid power is not used on ROV
1	0	ROV uses Anderson powerpole connectors and fuse is within 30 cm of connection to power
1	0	All components are securely attached to ROV
1	0	Tether is properly secured with strain relief at both ends
1	0	Motors are waterproofed and propellers are shrouded or completely inside the ROV frame
1	0	No sharp or hazardous items
1	0	Camera operates of 12VDC supply or a camera is NOT used on the vehicle.

TOTAL POINTS:	

Initial Safety Review

Simple Check Points

- **Turned in on time?**
- **Documentation correct format and size?**
- **SID neatly done and includes industry standard fuse symbol?**
- **Any Fluid Power?**
- **Any issues seen will be listed.**

*The Initial Safety Inspection and Documentation Review score sheets will only be used if your regional requires prior submission of documents. Contact your regional coordinator.

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Safety Inspection

Safety is the competition's primary concern and guiding principle. Any system that is considered unsafe by competition officials will not be allowed to compete.

If a concern is found during the first safety inspection, companies are permitted to attempt to correct it and have their ROV re-inspected. However, the competition schedule will NOT change to allow companies more time.

Companies are allowed to have their vehicle re-inspected twice. If a company fails to pass its third and final safety inspection, it is disqualified from the underwater competition portion of the event. There are NO APPEALS once your ROV has been disqualified.

Safety Inspection

Examples of safety violations from previous ROV competitions include:

- The ROV does not use Anderson Powerpole connectors to attach to main power.
- No SID was provided at the safety check.
- The SID did not show a main fuse.
- The ROV used pneumatics, but the technical documentation did not include a pneumatics diagram.
- Sharp items, or potentially sharp items, (fishing hooks, glass bottles) were included on the vehicle.
- The vehicle motors were not waterproofed.
- Propellers were not protected inside the framework or not shrouded.
- Camera did not operate off the 12 volt MATE power supply.

SCOUT & NAVIGATOR Class Safety Inspection Protocol

Competition staff will conduct a safety inspection of the vehicle using the safety inspection rubric.

If the safety inspector(s) identify a safety violation, companies will have the opportunity to address it. The pool practice or product demonstration run schedule will NOT change to allow companies more time.

If during the second safety review the

a. violation has not been properly addressed or

b. another violation is revealed

companies will have ONE additional opportunity to address the issue.

MATE

2018 SCOUT SAFETY INSPECTION SHEET

COMPANY NAME:_____ **COMPANY NUMBER:**_____

2018 MATE ROV COMPETITION

Jet City: Aircraft, Earthquakes and Energy

SCOUT 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 Report 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 to 10 points
	Fluid Power appropriate for class (manual pumps only – see section 4.0.
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
	15 amp (or less) single inline fuse 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)	
	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 ¼" (6.35mm) diameter?
5.0 Lasers	
	No Lasers Present – Not permitted in SCOUT 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] _____.

Inspection #1: Items to address **Judge:** _____

Inspection #2: Items to address **Judge:** _____

Inspection #3: Reason **Judge:** _____

MATE

2018 NAVIGATOR SAFETY INSPECTION SHEET

COMPANY NAME:_____ **COMPANY NUMBER:**_____

2018 MATE ROV COMPETITION

Jet City: Aircraft, Earthquakes and Energy

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 to 10 points
	Fluid Power appropriate for class (manual pumps only) – see section 4.0.
2.0 ROV Physical	
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	No exposed copper or bare wire.
	All wiring securely fastened and properly sealed*.
	Any splices in tether are properly sealed*.
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	Single attachment point to power source.
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	15 amp (or less) single inline fuse 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
	If used, 120VAC wiring is separated from the DC wiring (used for AC powered monitor).
	If used, 120VAC wiring must be clearly identified from the DC and control voltages with signage and/or wire color schemes. If color schemes, key provided for identification.

	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)	
	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 ¼" (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] _____.

Inspection #1: Items to address **Judge:** _____

Inspection #2: Items to address **Judge:** _____

Inspection #3: Reason **Judge:** _____

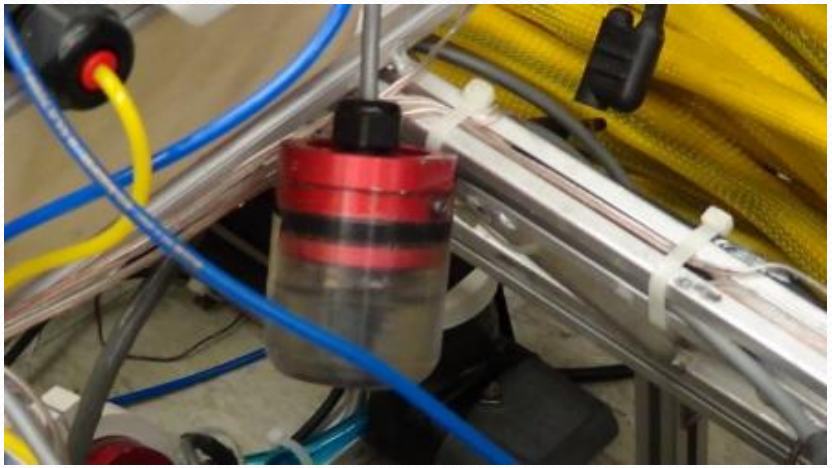
MATE

2.0 Physical

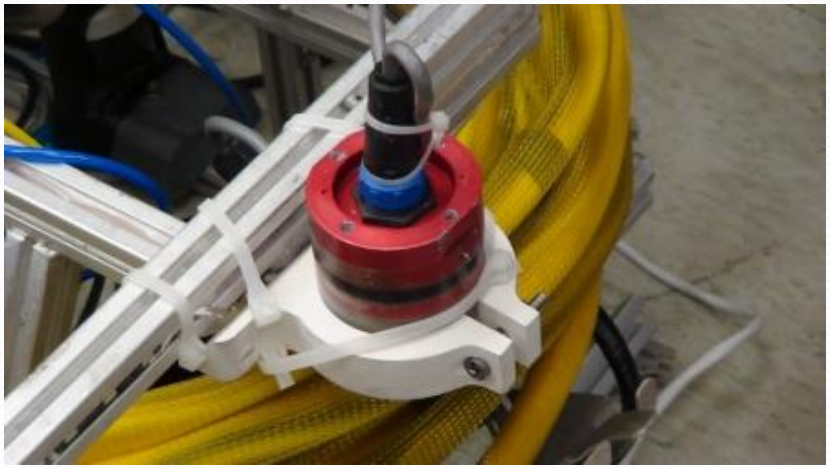
All items attached to ROV are secure and will not fall off.

Examples:

loose camera



securely attached camera



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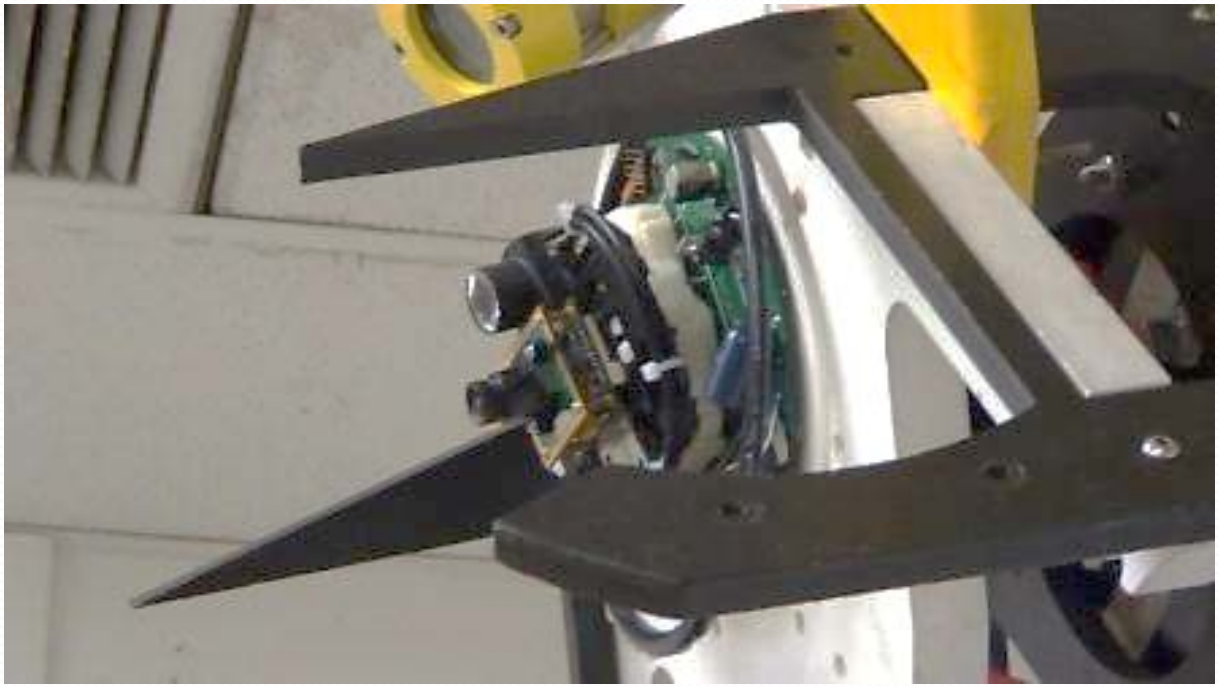
2.0 Physical

No sharp edges or elements of ROV design that could cause injury to personnel or damage to pool surface.

Examples:

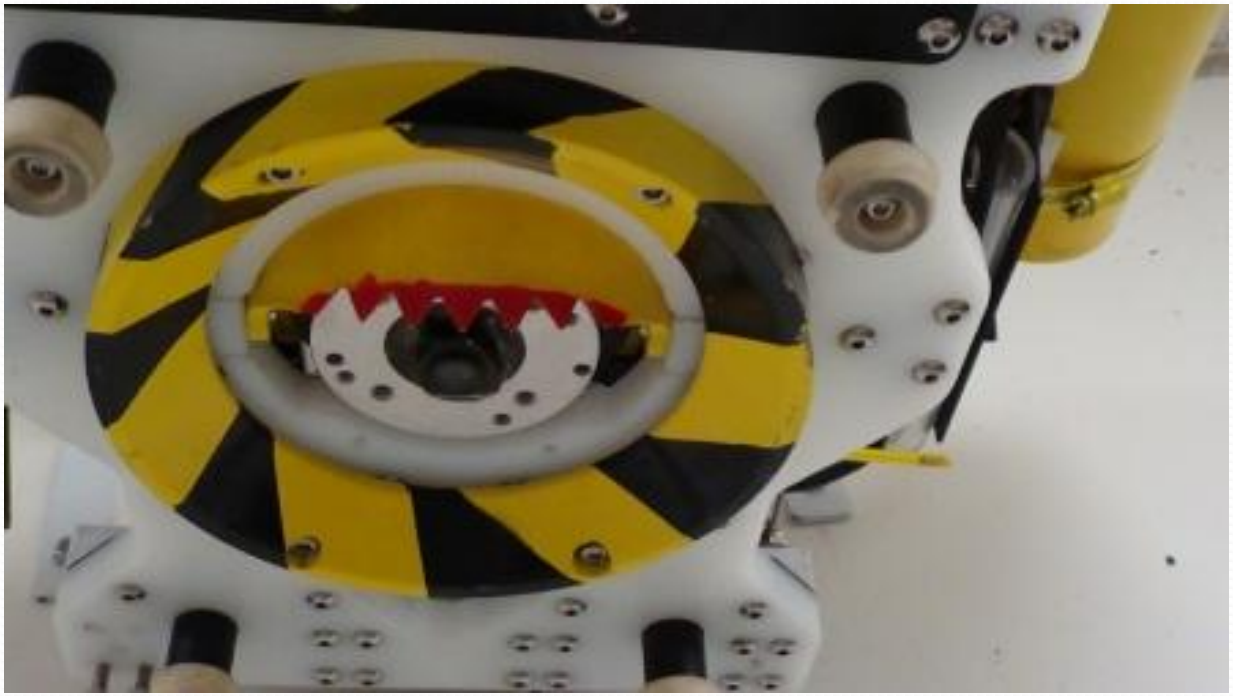
The points on the front of this ROV may look cool, but the judge disqualified this vehicle for putting something that could be a danger to the divers.



2.0 Physical

Necessary hazardous items are identified and protection provided.

Examples:
If something sharp is required to complete a mission, sharp edges on the scoop are painted red; yellow and black safety warning colors are used elsewhere.



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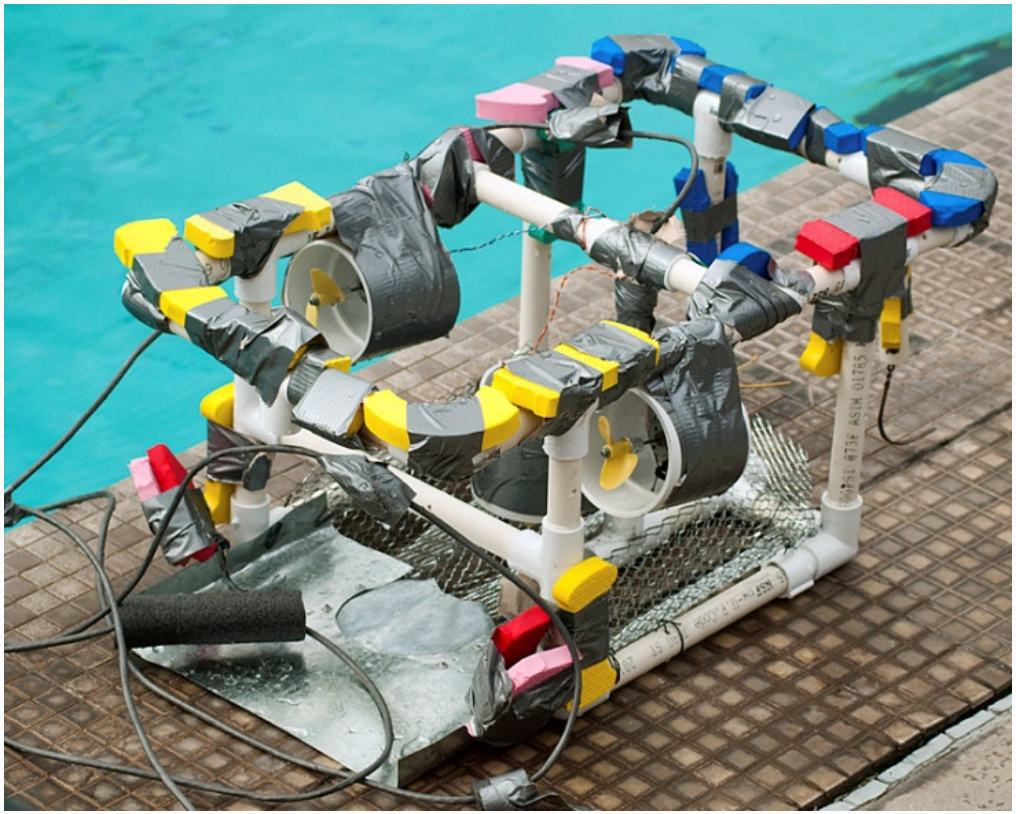
2.0 Physical

ALL Propellers must be shrouded even if they are enclosed inside the frame of the ROV



Shrouded

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3.0 Electrical (SCOUT & NAVIGATOR)

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 (power connectors). Fuses in each line are acceptable.

Scout & Navigator Classes utilize the RED & BLACK power connectors. Looking at the end of the connectors, you will see a small A on the end of each. With the tip of the A pointing up, Black should be on the left and Red on the right

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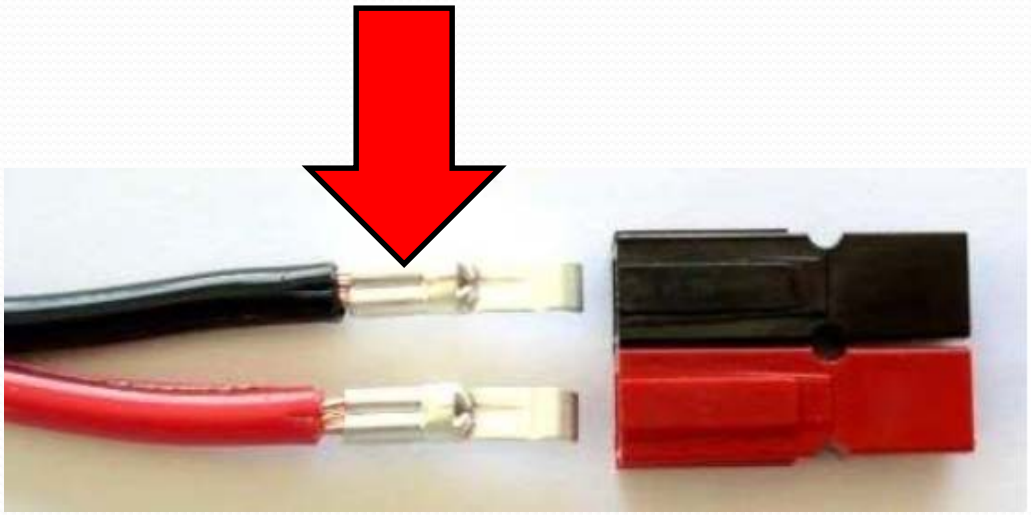
3.0 Electrical

Problems with the Anderson Power Poles have developed when companies do NOT use the proper crimper for these connectors. Standard Electricians Crimpers will NOT work!

The crimp must be a roll crimp not a “squish” crimp



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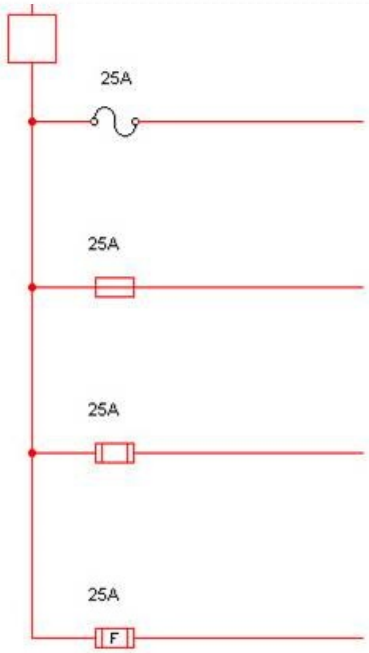
3.0 Electrical System Interconnection Diagram (SID)

- **System Interconnection Diagram (SID)** A SID is a system-level, connection diagram that includes electrical and, if applicable, fluid power wiring information. Board-level and component-level schematics should not be included; however, these may be brought to the engineering evaluation for reference purposes. The intent is to provide the competition judges with a one-line diagram showing how the various systems are interconnected without the detail of each and every wire.



These are the only acceptable fuse symbols.
A fuse is not a box, a line with an letter S over it, or any other non-standard symbol

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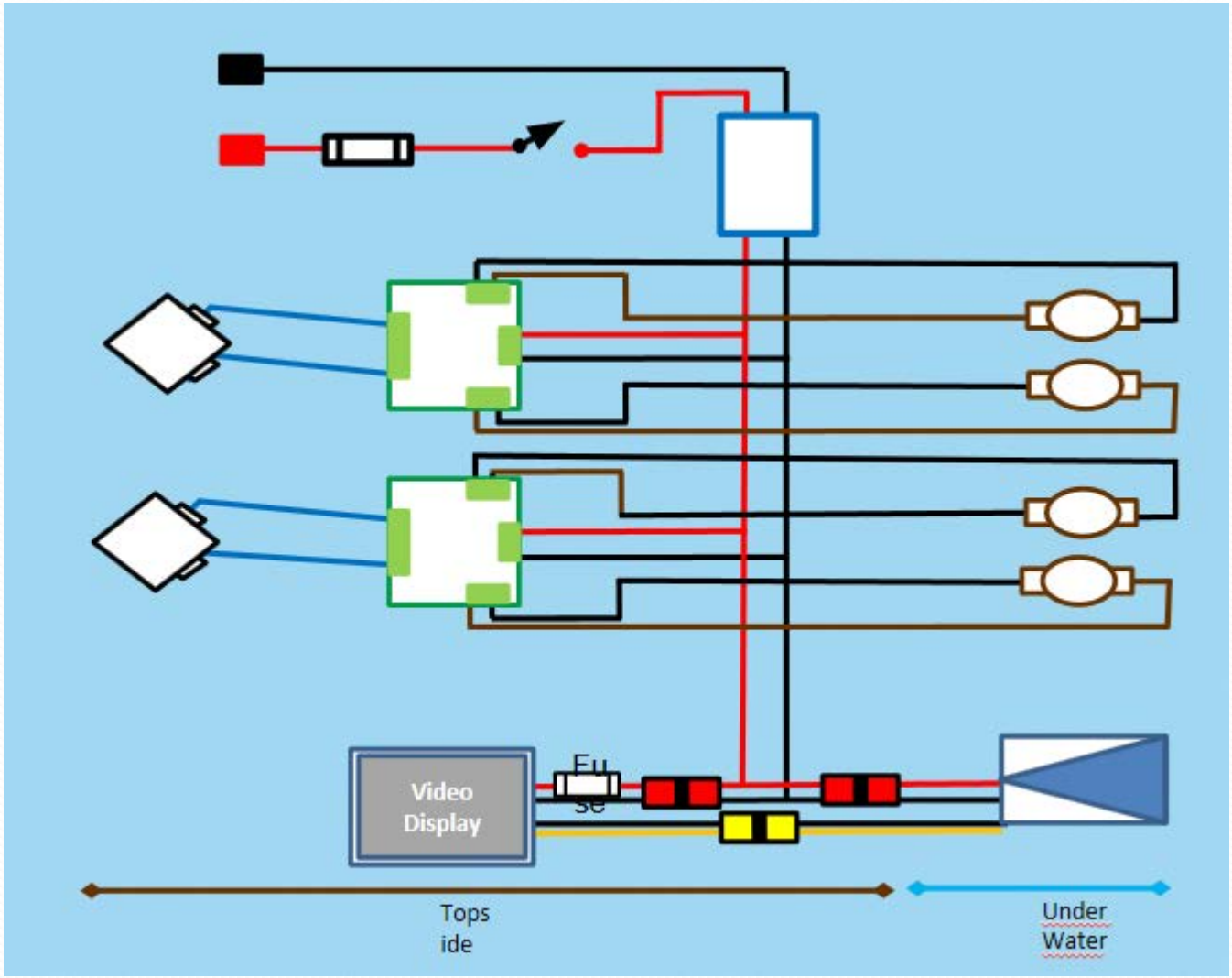
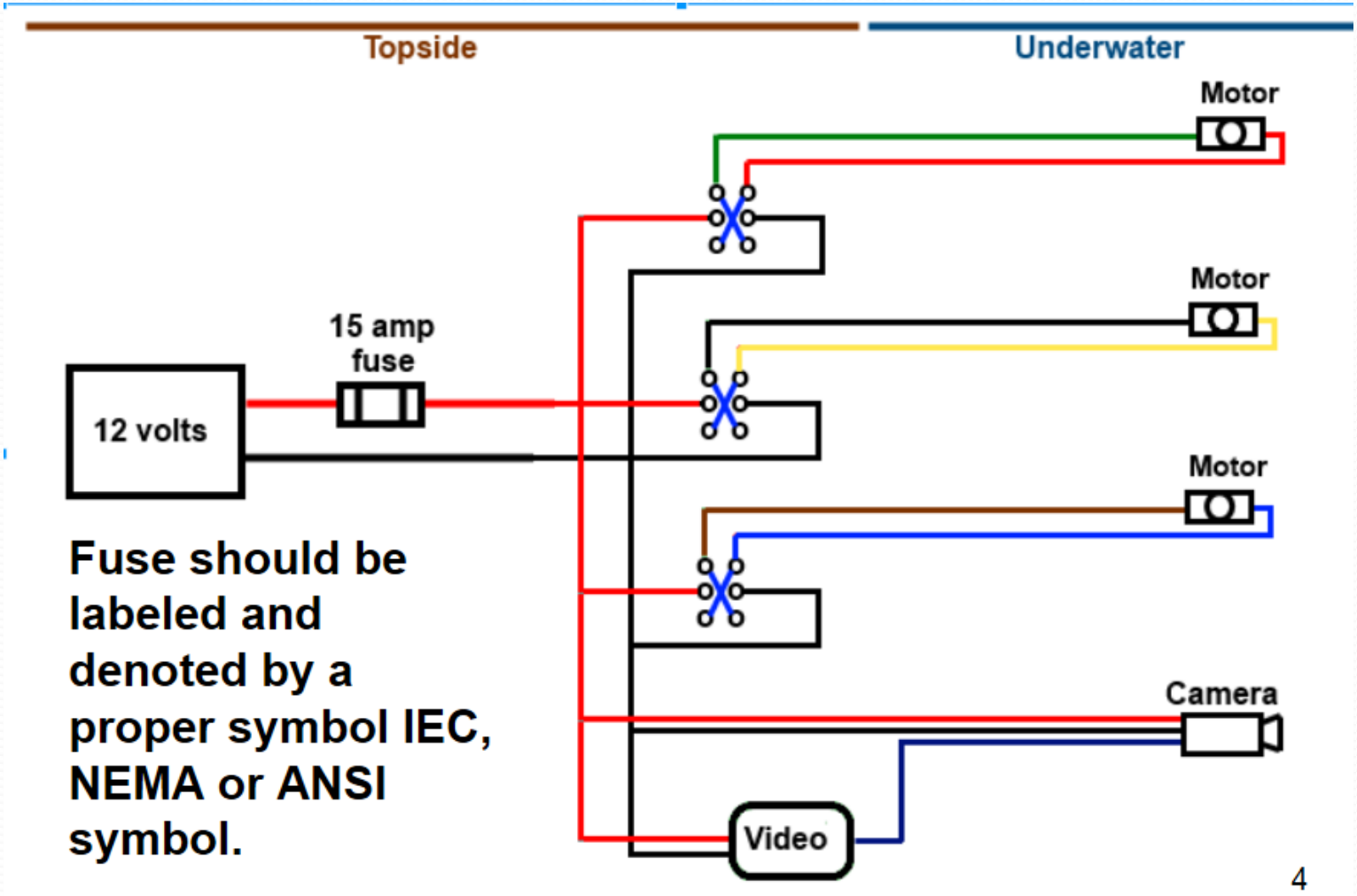
Example SID 1



Example SID 2



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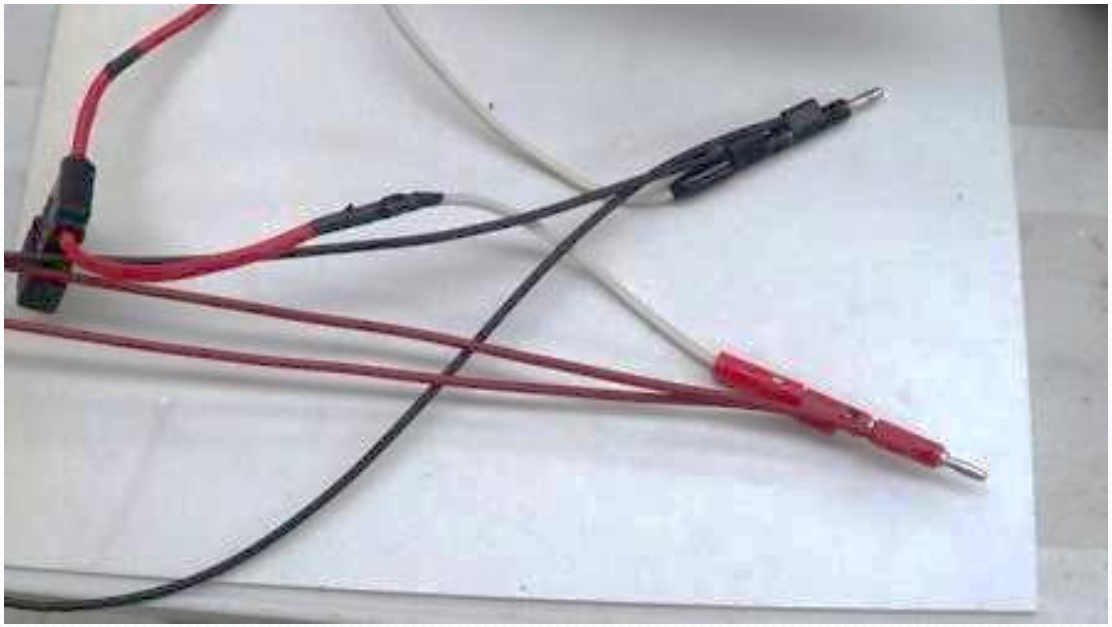
3.0 Electrical

Single inline fuse within 30cm of attachment point.

Examples:

This is an example of multiple attachments ahead of the fuse that WILL NOT PASS.
In addition, MATE no longer uses banana plugs for power attachment.



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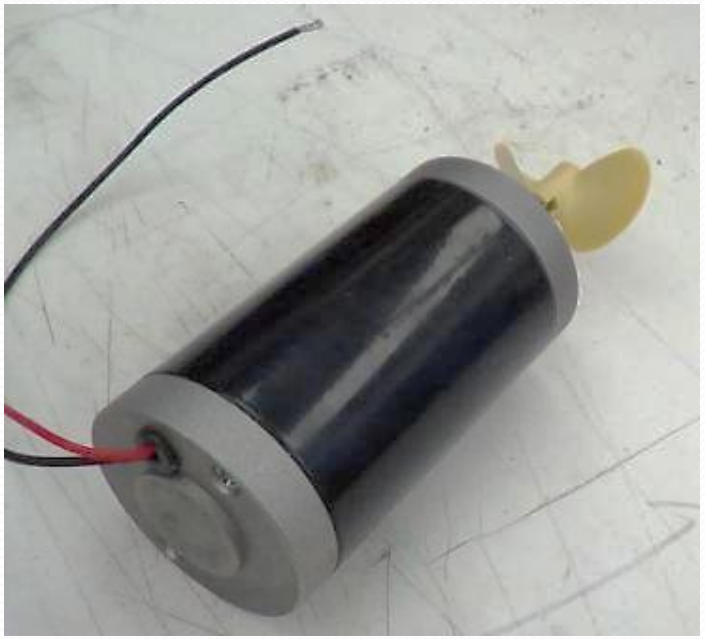
3.0 Electrical

No exposed copper or bare wire. No exposed motors.

Examples:
These WILL NOT PASS. The motor on the left is both exposed and has bare wire. The motor on the right is exposed and not sealed.



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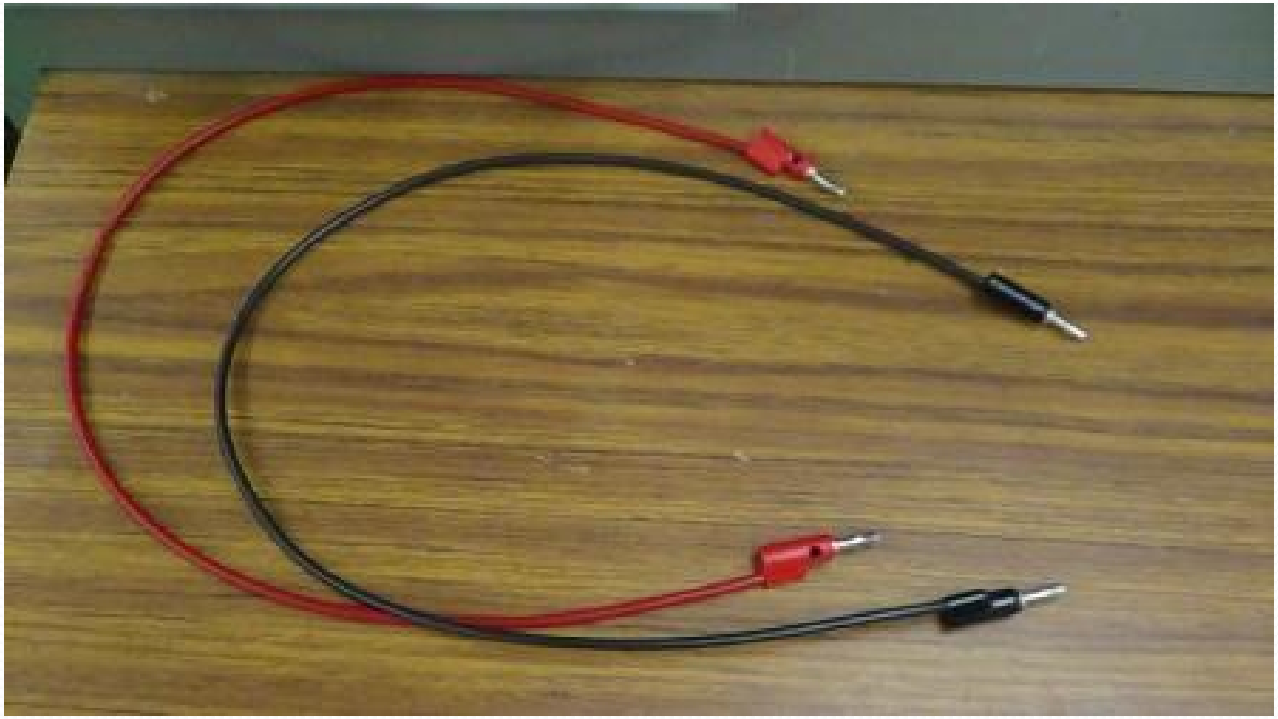
3.0 Electrical

No exposed copper or bare wire.

Examples:

This WILL NOT PASS. Using banana plugs at both ends of the wire to route power from one section to another. It is possible for the hot end of the wire to become unplugged and create a safety hazard.



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3.0 Electrical

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

Examples:
On the left, all the wires are loose and unsecured. On the right is an example of a well-secured tether.

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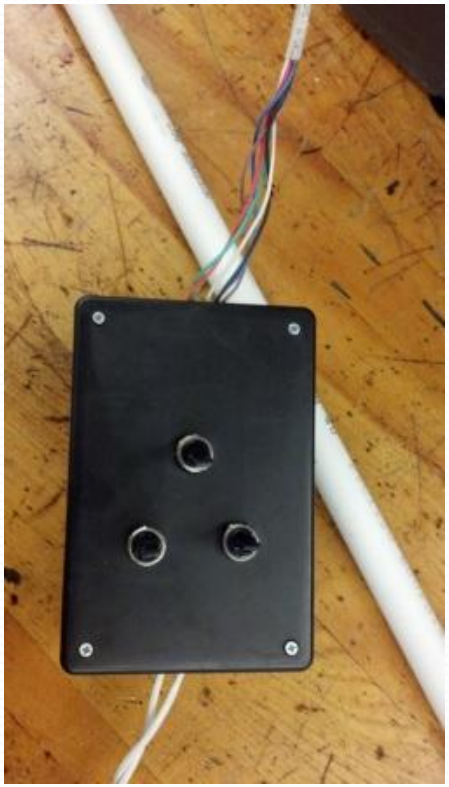
SCOUT & NAVIGATOR Class Safety Inspection Sheet Tutorial

3.0 Electrical

Surface controls: All wiring and devices properly secured.

Examples:

The two pictures below are examples of loose wiring. There is no strain relief and the wires can easily pull loose from their connections. Hot melt glue and tape are not acceptable strain relief items.



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SCOUT & NAVIGATOR Class Safety Inspection Sheet Tutorial

3.0 Electrical

Surface controls: All wiring and devices properly secured.

Examples: Properly secured

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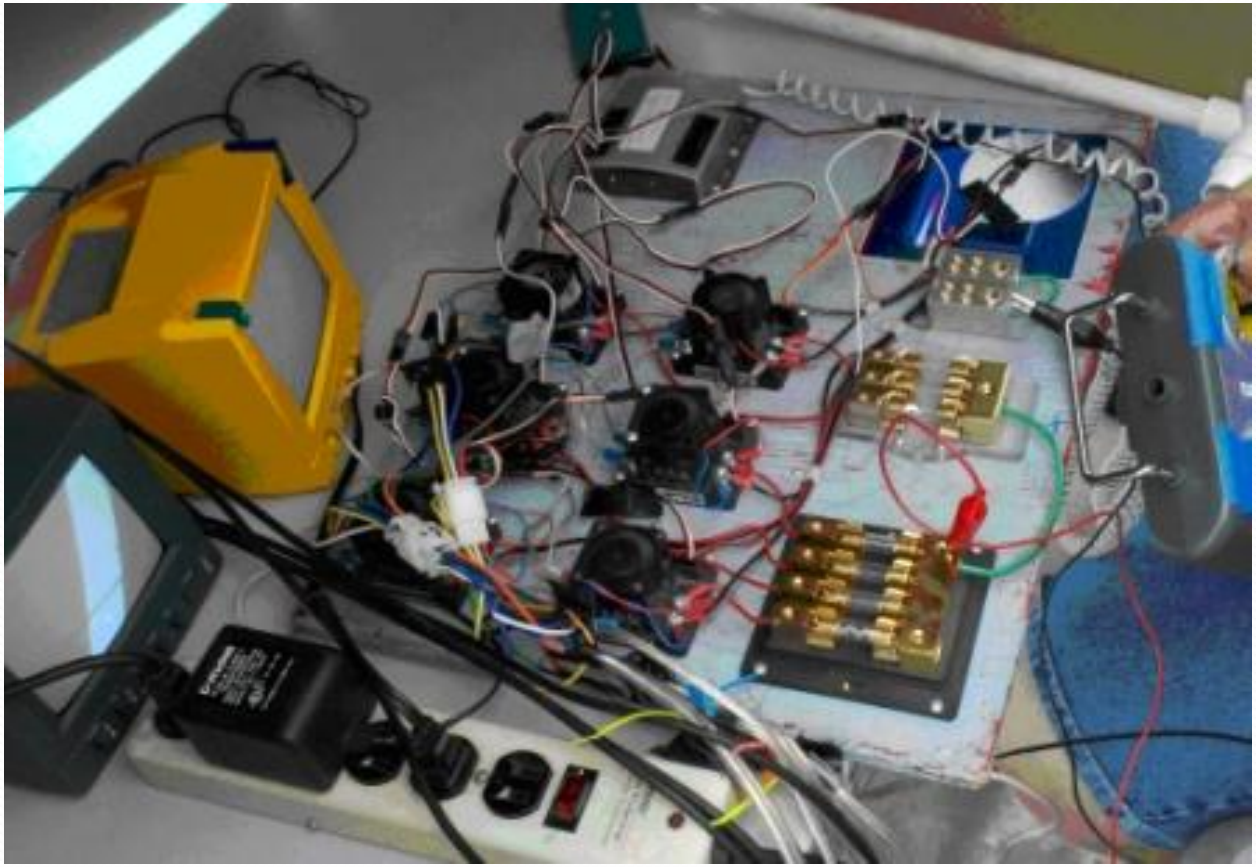
SCOUT & NAVIGATOR Class Safety Inspection Sheet Tutorial

3.0 Electrical

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

There are multiple FAILS in the picture below!



- **Exposed wiring**
- **Multiple fuses instead of single point fuse for power.**
- **Loose wires.**
- **Alligator clips used for connections.**
- **No strain relief provided for wires coming from power or going to ROV.**

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4.0 Pneumatic / Hydraulic Checklist

- 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 ¼”
- (6.35mm) diameter?

5.0 Laser Checklist

LASERS ARE NOT PERMITTED IN SCOUT OR NAVIGATOR CLASS

MATE

Dangerous Wiring Methods.

When building your ROV, think about potential danger issues
Ask if someone were not told about a wiring issue, would they be safe.

An example of this was seen in the use of 120VAC connectors to provide power for the ROV. One team distributed power on the surface using a 120VAC plug strip that had been modified to plug into the 12VDC MATE supply. Each thruster then had a 120VAC connector that plugged into the plug strip. This presents a very real safety hazard for the student who unknowingly plugs the thruster into 120VAC and ends up getting shocked or burned.

Safe wiring should need no warnings.

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, You can ask your question on the MATE forum boards at: https://www.marinetech.org/forums/ or contact that MATE Center at mgardner@marinetech.org. In this case it is better to ask for permission, not forgiveness. Remember, it is better to be SAFE than sorry!