

RANGER & EXPLORER Class Safety Inspection Sheet Tutorial

COMPANY NAME: _____ COMPANY NUMBER: _____

2014 MATE ROV COMPETITION EXPLORING THE GREAT LAKES RANGER 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, documentation listed below must be provided to the Safety Inspectors during the inspection process.

1.0 Documentation	
<input type="checkbox"/>	Electrical schematics & power distribution diagrams
<input type="checkbox"/>	Technical report
<input type="checkbox"/>	Fuse shown in electrical schematics?
<input type="checkbox"/>	Pneumatics or Hydraulics Used? See item 4.0
<input type="checkbox"/>	Lasers Used? If YES, see attached Laser Safety Sheet
2.0 Physical	
<input type="checkbox"/>	All items attached to ROV are secure and will not fall off.
<input type="checkbox"/>	Hazardous items are identified and protection provided.
<input type="checkbox"/>	Propellers are enclosed inside the frame of the ROV or shrouded such that they will not make contact with items outside of the ROV.
<input type="checkbox"/>	No sharp edges or elements of ROV design that could cause injury to personnel or damage to pool surface.
3.0 Electrical	
<input type="checkbox"/>	Single attachment point to power source.
<input type="checkbox"/>	Standard male Banana plugs to connect to MATE power source.
<input type="checkbox"/>	25 amp Single In-line fuse or circuit breaker within 30cm of attachment point.
<input type="checkbox"/>	No exposed copper or bare wire.
<input type="checkbox"/>	No exposed motors.
<input type="checkbox"/>	All wiring securely fastened and properly sealed*.
<input type="checkbox"/>	Tether is properly secured at surface control point and at ROV.
<input type="checkbox"/>	Any splices in tether are properly sealed*.
<input type="checkbox"/>	Surface controls: All wiring and devices properly secured.
<input type="checkbox"/>	Surface controls: All control elements are mounted with wiring inside an enclosure.
*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. Male to male connectors are not allowed.	

PASS/FAIL STAMP

4.0 Pneumatic / Hydraulic (if using)	
<input type="checkbox"/>	Passed pneumatics/hydraulics test.
<input type="checkbox"/>	Pneumatic or Hydraulic diagrams present?
<input type="checkbox"/>	Pneumatic and/or Hydraulic component documentation provided?
<input type="checkbox"/>	Hydraulic fluid MSDS (if used) Fluid is compatible with the Biodegradable Food-Grade specification. Teams using water do not need to provide an MSDS.
<input type="checkbox"/>	All pressure lines have minimum pressure rating 100psi (pneumatic) or 300psi (hydraulic) stamped on line or verified with specification.
<input type="checkbox"/>	Valves meet the minimum pressure of 100 psi pneumatic or 300 psi hydraulic.
<input type="checkbox"/>	Attachment to pressure source is secure.
<input type="checkbox"/>	Pressure is regulated to 40psi max for pneumatics and 150 psi max for hydraulics.
<input type="checkbox"/>	Pressure vessels have a stamped pressure rating or verification by specification.
<input type="checkbox"/>	Pressure vessels have current inspection sticker.
<input type="checkbox"/>	Pressure vessels can be secured on pool deck.
<input type="checkbox"/>	Company fabricated pressure accumulator test results are provided (if used).
<input type="checkbox"/>	No hydraulic fluids are leaking.
<input type="checkbox"/>	Pneumatics utilize compressed air or inert gas.

INSPECTION #1	PASSED: 30
POINTS	
FAILED: Items to correct:	
INSPECTION #2	PASSED: 20
POINTS	
FAILED: Items to correct:	
INSPECTION #3	PASSED: 10
POINTS	
FAILED: Reason	
Cleared to enter the water:	
Signature of competition official	

Documentation — Be sure and bring these items to the safety inspection table; they will be used to help answer questions.

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

Electrical — This is a major contribution to failed safety checks. Sloppy electrical wiring will run the risk of being disqualified. Everything should be done in a neat and workmanship-like manner.

Pneumatic/Hydraulic — If you are not using either, this section can be ignored. If you are using either or both, be sure that you passed the MATE fluid power quiz.

RANGER/EXPLORER Differences — The differences are in voltage and power supply attachments. Be sure you have the correct terminations for your class.

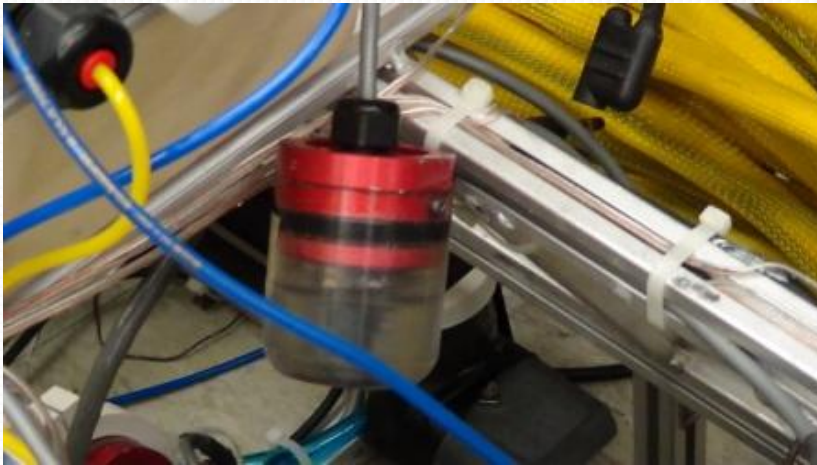
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2.0 Physical

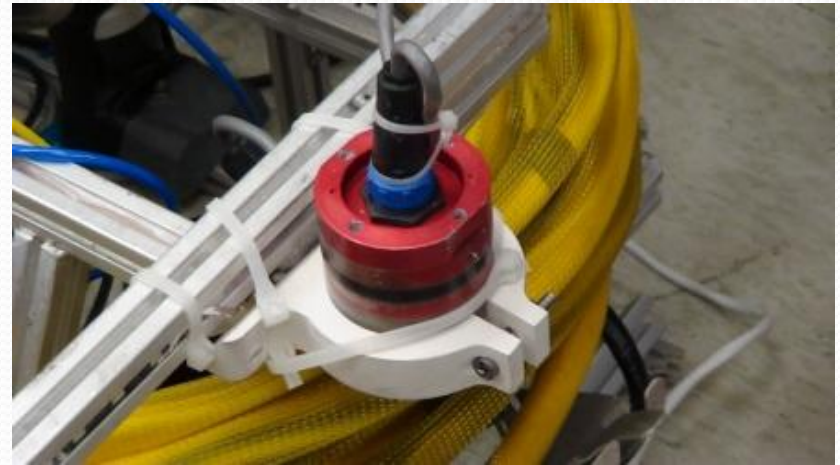
All items attached to ROV are secure and will not fall off.

Examples:

loose camera



securely attached camera



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2.0 Physical

Hazardous items are identified and protection provided.

Examples:

Sharp edges on the scoop are painted red; yellow and black safety warning colors are used elsewhere.



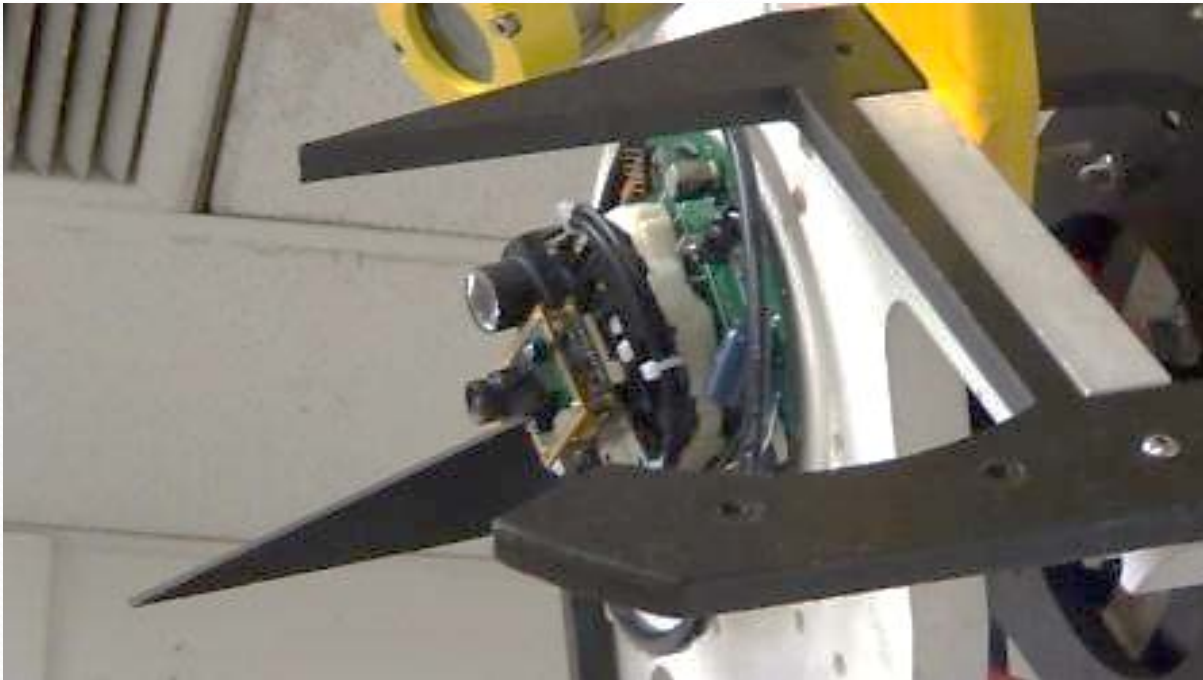
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2.0 Physical

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 deducted points for putting something that could be a danger to the divers.

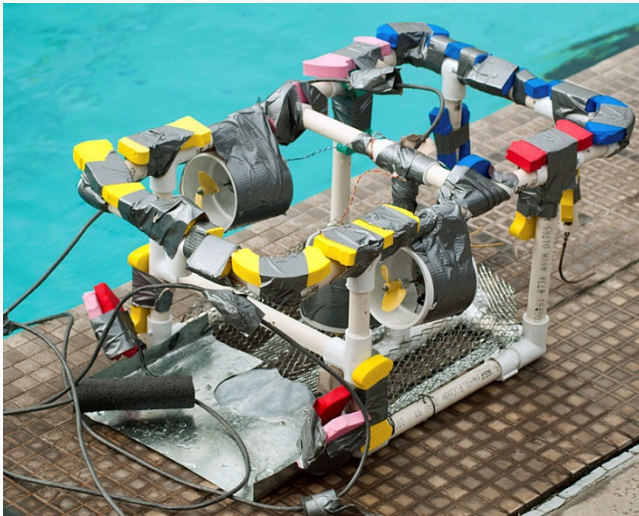


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2.0 Physical

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

Examples:



Shrouded



Inside the vehicle frame

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3.0 Electrical

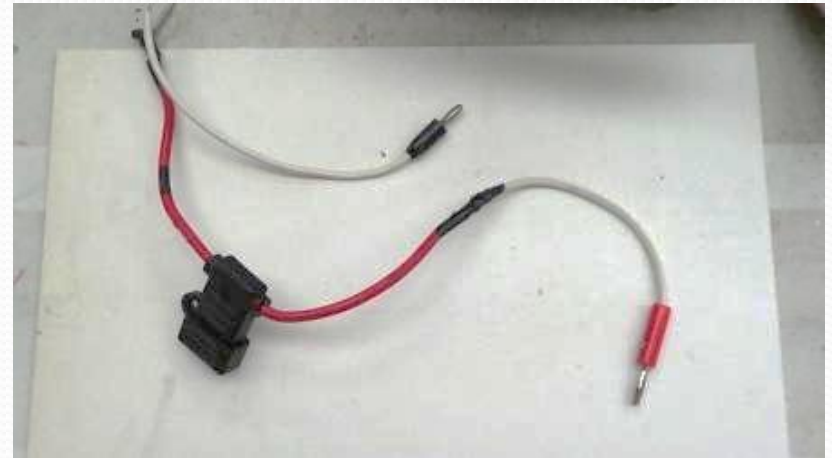
Single attachment point to power source.

Standard male banana plugs to connect to MATE power source.

Single Inline fuse or circuit breaker within 30cm of attachment point.

Examples:

Correct RANGER Class power attachment shown in both pictures. Fuse is within 30cm of the attachment points. EXPLORER class will use ¼" eye terminals.

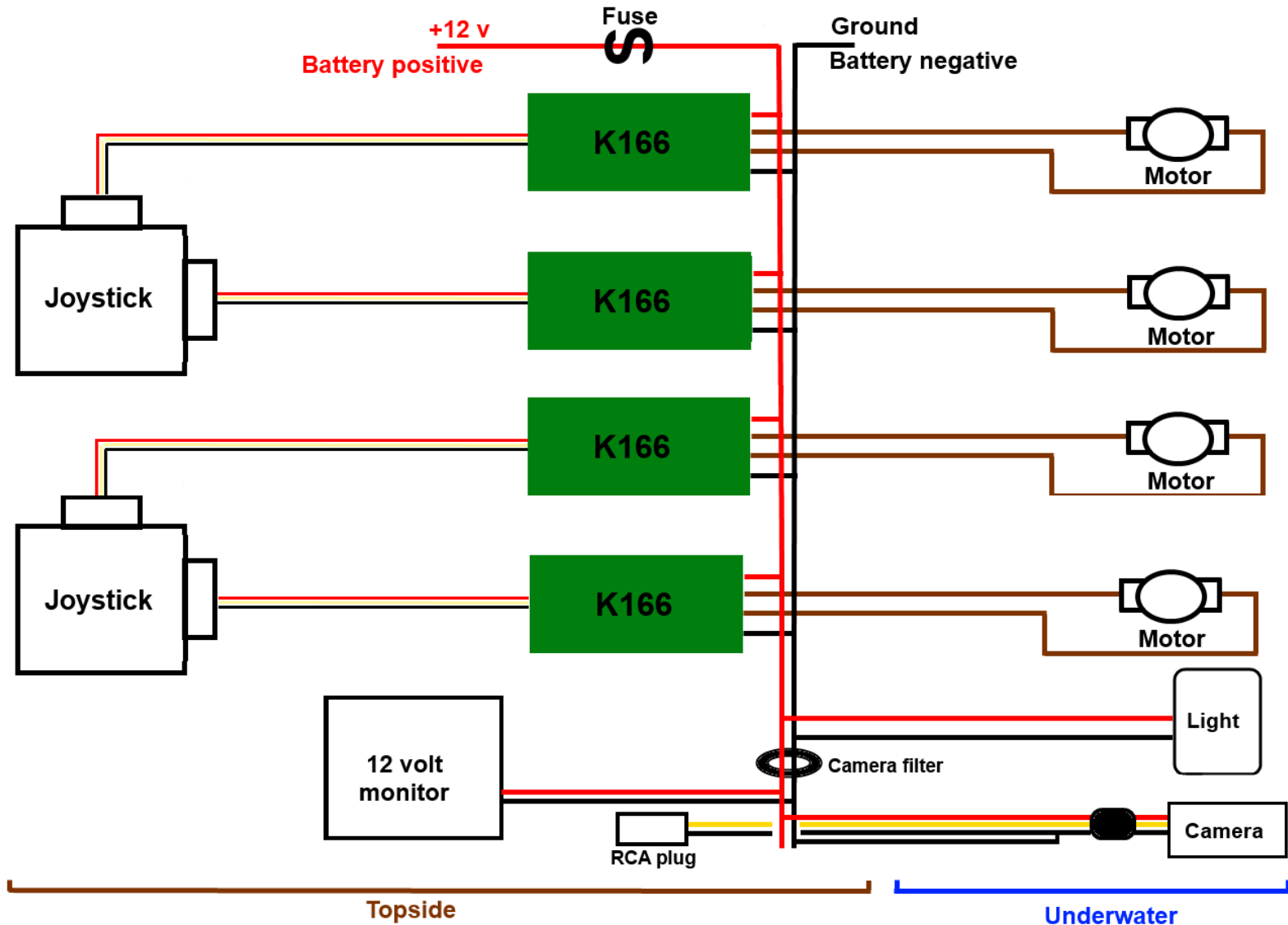


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3.0 Electrical System Interconnection Diagram (SID)

- **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.

Example SID



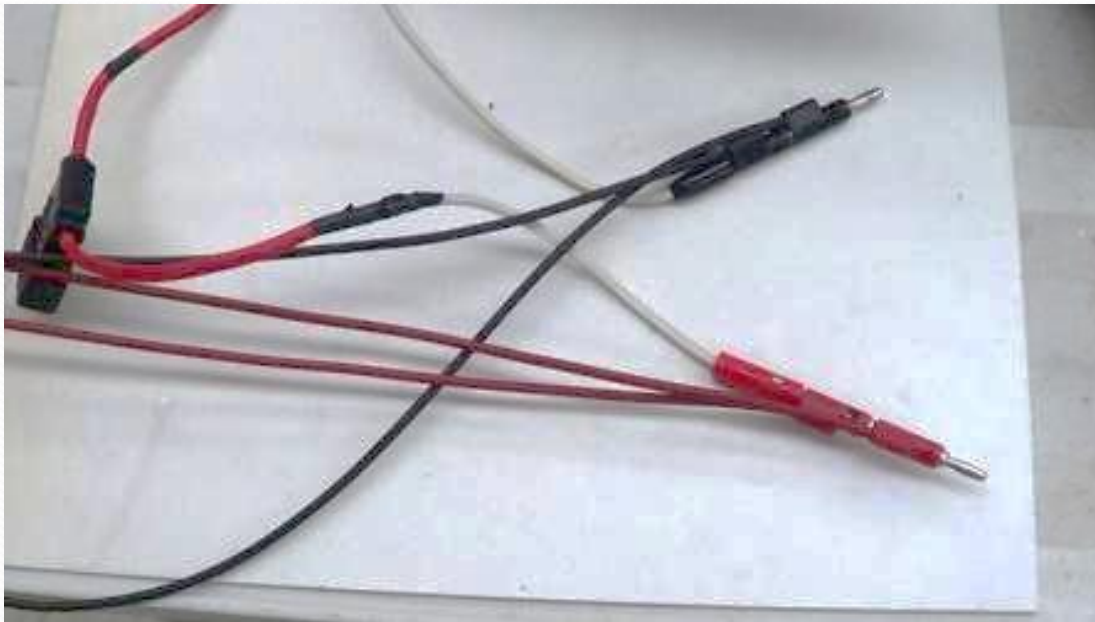
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3.0 Electrical

Single inline fuse or circuit breaker within 30cm of attachment point.

Examples:

This is an example of multiple attachments ahead of the fuse that **WILL NOT** PASS.



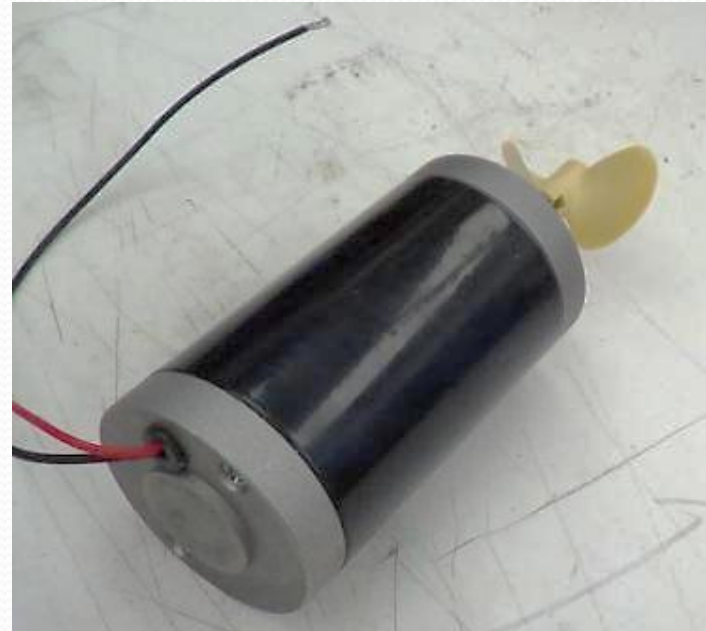
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3.0 Electrical

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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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.



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3.0 Electrical

Surface controls: All wiring and devices properly secured.

Examples: Properly secured

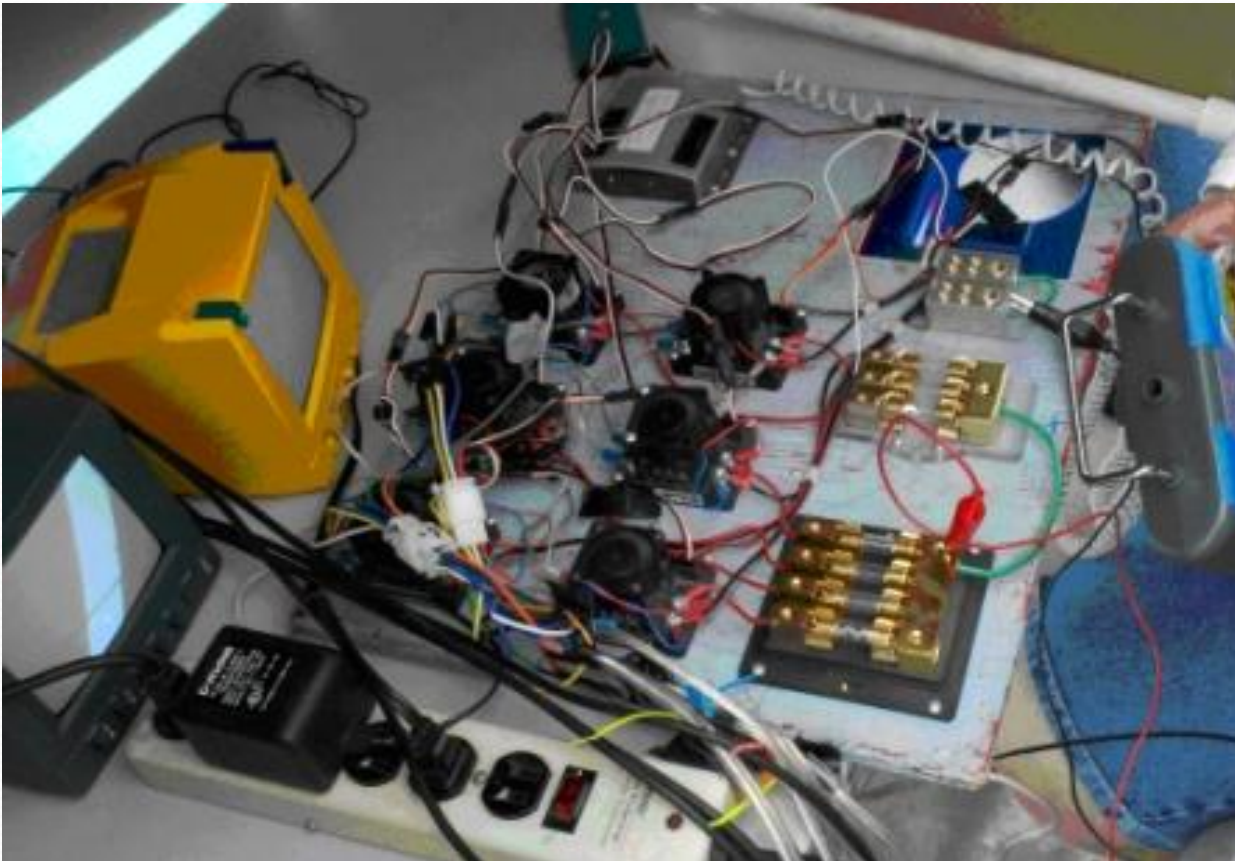


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3.0 Electrical

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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3.0 Electrical

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.

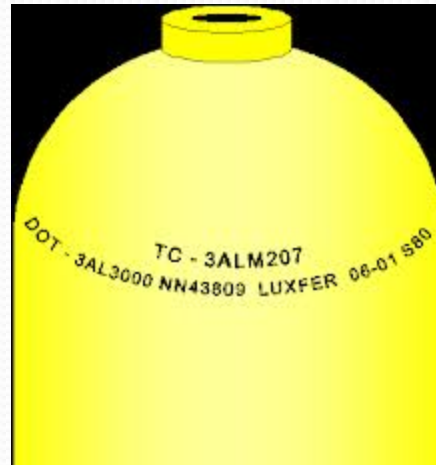
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4.0 Pneumatic / Hydraulic Checklist

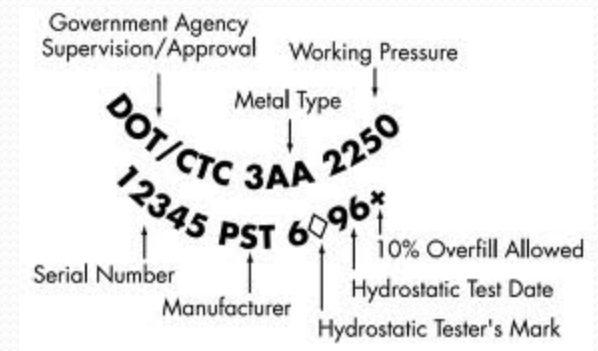
- ◆ Did you PASS the pneumatics/hydraulics test?
- ◆ Do you have your pneumatic or hydraulic diagrams present?
- ◆ Pneumatic and/or hydraulic component documentation provided?
- ◆ Are you using pressure rated lines and fittings?
- ◆ Is your attachment to pressure source is secure?
- ◆ Is your pressure is regulated to 40psi max for pneumatics and 150 psi max for hydraulics? **YOU MUST PROVIDE THE REGULATOR.**
- ◆ Are your pressure vessels have a stamped pressure rating or verification by specification and do the pressure vessels have current inspection sticker?
- ◆ Are your pressure vessels secured on pool deck and not rolling around?
- ◆ Company fabricated pressure accumulator test results are provided (if used).
- ◆ No hydraulic fluids are leaking.
- ◆ Do your pneumatics utilize compressed air or inert gas?

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4.0 Pneumatic / Hydraulic Examples of Tank Certifications and Inspection Stickers



The tank must have a current visual inspection certificate (above) AND current hydrostatic test stamp (on the right)



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5.0 Laser Checklist

- ◆ Did the team send the laser specs to the competition coordinator two weeks prior to the regional?
- ◆ Do your electrical schematics show the laser driver?
- ◆ Does your laser have an on/off switch on the surface controller?
- ◆ Is the laser powered through the MATE surface power supply?
- ◆ No batteries in the ROV powering the laser?
- ◆ Are your lasers the proper type? Visible Laser in 630-680 nm (red) or near 532 nm (green) Class I, Class II, or Class IIIa Category; Red Laser: 5mW or less Green Laser: 1 mW or less. **Be sure and bring your laser specs.**
- ◆ Is the laser voltage at or below laser rated voltage & current?
- ◆ EXPLORER class: Notification sheet showing laser specifications sent to MATE Center 2 weeks prior to their qualification event
- ◆ Does your ROV have a Laser shield or beam stop attachment within 30 cm of laser when out of water?
- ◆ Do the team members have laser safety glasses, regardless of the laser output power?

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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 that MATE Center at izande@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!

