

# **RANGER, PIONEER, & EXPLORER Class Safety Inspection Tutorial**

This tutorial goes through the safety practices required by the MATE ROV Competition. It covers:

- **Initial Safety Inspection**
  - Company safety review**
  - Non-ROV device specifications and documentation**
  - Initial safety inspection scoring**
- **Onsite Safety Inspection**
- **Examples and photographs of what will and will not pass safety inspection**

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Initial Safety Inspection - Company Safety Review

All EXPLORER, PIONEER and RANGER companies advancing to the world championship competition must submit a company safety review that demonstrates compliance with the following specifications ([regionals may or may not require this document](#)):

- Anderson Powerpole connectors are the main point of connection to the MATE supply (ELEC-010-).
- A properly sized fuse ([based on full load amp measurement](#)) is within 30 cm of the main point of connection. The company must use a ruler to show this distance (ELEC-008-). EXPLORER class and PIONEER class using 48-volts must use a Littelfuse. RANGER class and PIONEER using 12-volts must use an ATO or Mini blade fuse (ELEC-001).
- Full Load Amp (FLA) values (ELEC-008-) or (ELEC-008-) must be included and the properly determined fuse used.

For FLA value, submerge your completed ROV in water and run all thrusters full forward/down. Measure your amps with all motors running full. That is your Full Load Amps Value.

**CHOOSE YOUR FUSE BASED ON THAT VALUE.**

## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### Company Safety Review (cont.)

- The inside of the control box is does not have exposed wiring, **the control box is neatly laid out with attention to workmanship**, separation and identification of 120VAC wiring from DC and control voltages (ELEC-023-). If AC wiring is not used in the control box, include a statement saying no AC is used.
- All wires entering and leaving the both the ROV and control station have proper strain relief (ELEC-024-). See [MATE Expected Work Practices](#) for more information.
- If hydraulics / pneumatics are used that the company has passed the Fluid Power Quiz (FLUID-014). **If fluid power is not used on the vehicle, include a statement saying no fluid power is used.**
- Hydraulic / pneumatic systems include a pressure release valve and regulator in the system (FLUID-007, FLUID-011), and that any pressurized cylinder, pressure storage device meets the MATE specifications (FLUID-012, FLUID-013). **Note for 2025!!! Teams should supply pressure ratings of their components!**

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Company Safety Review (cont.)

- All propellers are shrouded and guarded to IP-20 standards (MECH-006). The guard / shroud must completely enclose the thruster so no object of 12.5 mm can reach the propeller.
- The ROV has no sharp edges or elements of the ROV that could cause damage (MECH-006, ELEC-017-).

The **Company Safety Review** should include an explanation of how the system meets the safety specifications [and photographs](#) of the relevant system for review by the MATE Center staff.

Each item on the lists should be accompanied by photographs and text explanations showing how each specification is satisfied.

Upon reading this document, it should be clear to the safety inspector how the ROV meets all the required safety items.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Examples of Company Safety Reviews using 48-volt systems:

- [Purdue University Company Safety Review 2023](#)  
This company includes all components in their company safety review
- [Colorado School of Mines Company Safety Review 2023](#)  
This company does not use fluid power or a non-ROV device, and clearly state that fact in the company safety review.

## Examples of Company Safety Reviews using 12-volt systems:

- [St. Francis Geneseas Company Safety Review 2023](#)  
This company includes all components in their company safety review
- [Oostburg High School Company Safety Review 2023](#)  
This company does not use fluid power or a non-ROV device, and clearly state that fact in the company safety review.

Note: There are a few new rules in 2025 (Full Load Amps) that are not reflected in these 2023 Reviews. The Competition manual should be your guide.

## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

Companies advancing the world championship competition must submit their Company Safety Review to the MATE Center by **May 21<sup>st</sup>, 2025**, along with (but as a **separate** document from) their technical documentation.

Companies that do not submit a Company Safety Review by the required date will be **DISQUALIFIED** from advancing to the world championship competition.

World championship competition safety inspectors will review companies' documentation for an **initial safety inspection** worth 20 points. Safety inspectors will also compile a list of the safety violations and publish them to the competition web site. This is not done to “call out” or embarrass companies in any way. It is to emphasize the fact that **EVERYONE** is responsible and accountable for ensuring a safe, successful event. It also allows the company to correct the safety violations before arriving at the world championship competition.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Non-ROV-Device / Independent Sensors

- Only the vertical profiling float is considered a non-ROV-device for 2025. Nothing else qualifies.
- A pH sensor and/or the 360 photosphere device can be considered independent sensors.
- Non-ROV Device Power: This must be from on-board batteries. Power is limited to 12V and 5 amps.
  - On-board batteries must have a 5-amp (or less) fuse at the point of connection.
  - Onboard power must be AAA, AA, C, D or 9-volt alkaline batteries, NiMH or AGM batteries.
  - See manual for amperage limits for each battery pack.
  - Onboard batteries should be mounted, not loose, in the container.
  - The battery container must be designed so it will open or release if pressure inside becomes greater than the external pressure.
    - One end of container pops off
    - A stopper plugs a pressure release hole at least 2.5 cm in diameter.

**A SID is required for any powered Non-ROV Device. This SID must be submitted separately from, and in addition to, any SID included in the technical manual.**

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Documentation of powered Non-ROV Device

- Companies must provide a written explanation of their non-ROV devices. This should include information on how the device(s) is powered, as well as information on the systems on the device (cameras, movement/thrusters, water-tight housings, etc.).

## REQUIRED ELEMENTS (New for 2025!)

- A photo or diagram (CAD model) of your float
- The type of battery used and a photo of the battery pack and fuse.
- Table of measurements showing the full load amps
- Description of how the battery pack was designed to safely fulfill the full load current needs and voltage requirements
- Description of the buoyancy engine or method for the float to move vertically.
- Description of how the float communicates to the shore side station
- Float SID

Failure to provide the necessary documentation or SID means companies will not be allowed to use their device during the product demonstration.



## Initial Safety Inspection Penalty points

The Company Safety Review, SIDs and Non-ROV device documentation will be used to evaluate teams in an Initial Safety inspection.

Penalty points will be deducted from the initial safety inspection if:

- Companies do NOT submit the documentation by the specified date ([May 21<sup>st</sup>, 2025](#), for the world championship competition).
- Documents are not submitted with the proper naming format.
- The SID does not show a fuse or a fuse that does not use an ANSI, NEMA or IEC symbol.
- Full Load Amp values are not shown on the SID or in the Company Safety Review (don't refer from one to the other – show in both documents).
- The vehicle uses fluid power, but a fluid power diagram is not included. Companies not using fluid power should state that fact in their company safety review.
- The non-ROV device specifications are not documented.

If a team is not doing Task #3: MATE Floats!, or not using fluid power, state that in your company safety review.

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## Job Safety and Environmental Analysis (JSEA)

A JSEA is a checklist of the steps required to do a task, identifying the potential hazards for each task and what measures are taken to eliminate or remove the hazards involved.

In 2025, the JSEA is a **REQUIRED** document for teams advancing to the World Championship. Check with your regional (if attending a regional) regarding JSEA requirements.

JSEA must focus on the product demonstrations. The JSEA should be specific for the product demonstration run (operating the ROV in the water). Deck side setup, operations, and breakdown of the system should be considered in any JSEA.

For each specific step of ROV set up, operations, and breakdown, potential hazards should be identified, measures taken to mitigate risk should be listed, and person(s) responsible for hazard mitigation should be listed.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## Job Safety and Environmental Analysis (JSEA)

JSEA links:

[Oceaneering International HSE Employee Handbook](#). See chapter 33 on JSEAs. The Oceaneering International handbook, including additional suggested reading, can also be found here: [MATE ROV Competition – Oceaneering HSE Handbook link](#)

### Examples of JSAs:

- [2024 Alexandria University Aquaphoton - EXPLORER](#)
- [2024 Sea Cows Robotics - RANGER](#)

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## ONSITE SAFETY INSPECTION

Before entering the water for practice or for a product demonstration run, the ROV system must successfully complete an onsite safety inspection.

Once the company successfully passes their safety inspection, the safety inspector will keep their onsite safety inspection score sheet and the company will receive is **Blue PASSED card**.

Companies must present their Blue PASSED card to the pool practice coordinator and/or product demonstration judges before their vehicles are permitted to enter the water. Each company's card will be uniquely identified with company name and number, as well as allowed features of their ROV (fluid power use, laser use, etc.).

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## ONSITE SAFETY INSPECTION

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.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## ONSITE SAFETY INSPECTION

If during the third safety review a violation still exists, companies will not be permitted to participate in the underwater product demonstration component of the competition.

However, companies can still participate in the engineering and communication (technical documentation, engineering presentation, and marketing display) component.

Reminder: All companies must present the **Blue PASSED card** to the pool practice or product demonstration judge before placing their vehicles in the water. In addition, product demonstration station judges and competition officials can pause or stop a product demonstration run at any time if they feel that there is a potential safety concern.

Note: Companies do not need to present their **Blue PASSED card** to the judges during their engineering presentation.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## SCORESHEETS / RUBRICS ARE ALL POSTED

If you are want to know **EXACTLY** how you will be scored for safety specifications, check out the scoresheets. All scoresheets are posted ... Safety, Engineering & Communication, Product Demo, etc.

[EXPLORER Class](#)

[PIONEER Class](#)

[RANGER Class](#)

[All Scoresheets](#) (select your competition class)

Company Name: \_\_\_\_\_ Company Number: \_\_\_\_\_

2025 MATE ROV COMPETITION. UN Decade of the Ocean, MATE Year of the Great Lakes

Companies must bring this checklist, 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, company safety review, technical documentation, and any additional documentation needed to verify compliance must be made available to the Safety Inspectors during the inspection process.

	Fluid power approved? Fluid power used? If yes to both, see Section 4.0 Pneumatics / Hydraulics
	Laser approved? Laser used? If yes to both, see attached laser safety inspection sheet.

	All items attached to ROV are secure.
	Hazardous items are identified and protection provided.
	ALL propellers are completely shrouded to IP-20 standards. Mesh size is less than 12.5 mm.
	No sharp edges or elements of the ROV design that could cause injury to personnel or damage the pool surface.

Tether has proper strain relief at the ROV.
<b>PIONEER 48V system only: No power conversion before the ROV.</b>
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.*

Single attachment point to the power source.
Anderson powerpole attachment to power source.
Proprietary sized inline ATO or MINI fuse (12V systems) or Littelfuse (48V systems) within 30 cm of power supply attachment point. Fuse sized based on full load amps measured.
The surface control station is built in a neat and workmanship like manner. No loose components or unsecured wires. All electrical components are covered inside an enclosure.
No exposed copper or bare wire.
120VAC wiring is separated from the DC wiring.
120VAC wiring must be clearly identified from the DC and control voltages with signage and/or wire color schemes. If the color scheme is used, a key must be provided for identification.
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.
All connectors utilized are properly rated for their application. AC only rated connectors cannot 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, sealed with a proper waterproof sealant, and covered in tape or shrink wrap. For in water taping, silicone self-vulcanizing tape is preferred over thermoplastic tape. Cables with exposed male connections on both ends are not allowed.

	Passed fluid power quiz.
	Pneumatic or hydraulic diagram (SID) present?
	Hydraulics utilize water. Pneumatics utilize compressed air or gas.

All pressure lines have a minimum pressure rating of 100 PSI (pneumatic) or 300 PSI (hydraulic) stamped on the line or verified with specifications.

Valves meet the minimum pressure rating of  
100 PSI (pneumatic) or  
300 PSI (hydraulic)

300 PSI (hydro bulb)
Attachment to the pressure source is secure

	Pressure is regulated to: 40 PSI max for pneumatics 150 PSI max for hydraulics
	Company fabricated pressure accumulator test results are provided (if used).
	No hydraulic fluids are leaking

PASSED: 30 POINTS

Failed: Items to correct noted on rear of this sheet.

PASSED: 20 POINTS

Failed: Items to correct noted on rear of this sheet.

PASSED: 10 POINTS

Failed: Reason / details are noted on rear of this sheet

## Total Safety Points:

0 to 30 points

**Judge:**

[illegible]

**Judge:**

[illegible]

**Judge:**


[materovcompetition.org/rov-kits](http://materovcompetition.org/rov-kits)



# EXPLORER SAFETY INSPECTION SHEET

Company Name: \_\_\_\_\_

Company Number: \_\_\_\_\_

2025 MATE ROV COMPETITION. UN Decade of the Ocean, MATE Year of the Great Lakes

## EXPLORER CLASS SAFETY INSPECTION CHECKLIST

Companies must bring this checklist, 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, company safety review, technical documentation, and any additional documentation needed to verify compliance must be made available to the Safety Inspectors during the inspection process.

### 1.0 Initial Safety Inspection

Fluid power approved? Fluid power used?  
If yes to both, see Section 4.0 Pneumatics / Hydraulics  
Laser approved? Laser used?  
If yes to both, see attached laser safety inspection sheet.

### 2.0 ROV Physical

All items attached to ROV are secure.  
Hazardous items are identified and protection provided.  
ALL propellers are completely shrouded to IP-20 standards. Mesh size is less than 12.5 mm.  
No sharp edges or elements of the ROV design that could cause injury to personnel or damage the pool surface.

### 3.0 ROV Electrical

Tether has proper strain relief at the ROV.  
No power conversion before 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 the power source.  
Anderson powerpole attachment to power source.  
Properly sized (Littlefuse brand) fuse within 30 cm of power supply attachment point. Fuse size based on full load amps measurement.  
The surface control station is built in a neat and workmanship like manner. No loose components or unsecured wires. All electrical components are covered inside an enclosure.  
No exposed copper or bare wire.  
120VAC wiring is separated from the DC wiring.  
120VAC wiring must be clearly identified from the DC and control voltages with signage and/or wire color schemes. If the color scheme is used, a key must be provided for identification.  
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.  
All connectors utilized are properly rated for their application. AC only rated connectors cannot 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, sealed with a proper waterproof sealant, and covered in tape or shrink wrap. 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 fluid power quiz.  
Pneumatic or hydraulic diagram (SID) present?  
Hydraulics utilize water. Pneumatics utilize compressed air or inert gas.  
All pressure lines have a minimum pressure rating of 100 PSI (pneumatic) or 300 PSI (hydraulic) stamped on the line or verified with specifications.  
Valves meet the minimum pressure rating of 100 PSI (pneumatic) or 300 PSI (hydraulic).  
Attachment to the pressure source is secure.  
Pressure is regulated to:  
40 PSI max for pneumatics  
150 PSI max for hydraulics  
Company fabricated pressure accumulator test results are provided (if used).  
No hydraulic fluids are leaking.

### SAFETY INSPECTION #1

PASSED: 30 POINTS

Failed: Items to correct noted on rear of this sheet.

### SAFETY INSPECTION #2

PASSED: 20 POINTS

Failed: Items to correct noted on rear of this sheet.

### SAFETY INSPECTION #3

PASSED: 10 POINTS

Failed: Reason / details are noted on rear of this sheet.

Total Safety Points:

On Site Inspection

0 to 30 points

Inspection #1: Items to address

Judge: \_\_\_\_\_


Inspection #2: Items to address

Judge: \_\_\_\_\_


Inspection #3: Reason

Judge: \_\_\_\_\_


<http://materovcompetition.org/scoring>

[materovcompetition.org/rov-kits](http://materovcompetition.org/rov-kits)



# Examples and photos of items the will (and will not) pass a safety inspection.

The following section has examples (with photos) of what will or will not pass safety inspection.

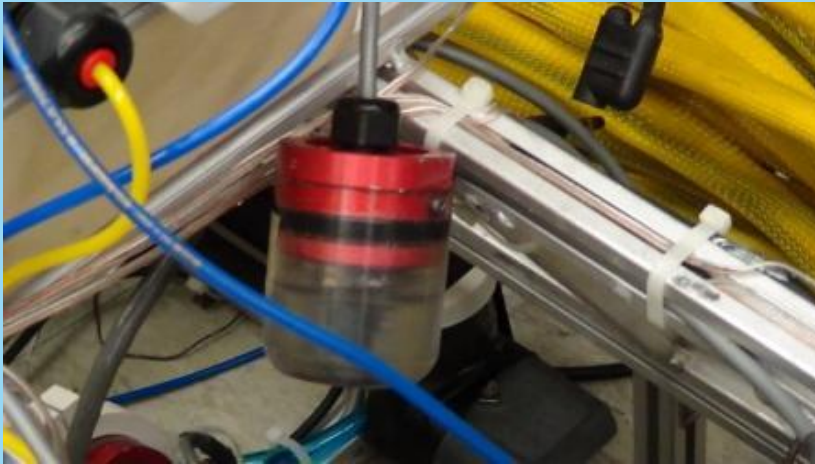
# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 2.0 Physical

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

**Examples:**

**loose camera**



**securely attached camera**



Note: Large monitors not secured to the control station will be considered a loose item. Any monitor / video screen should be secured to the control station or stabilized on the table.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

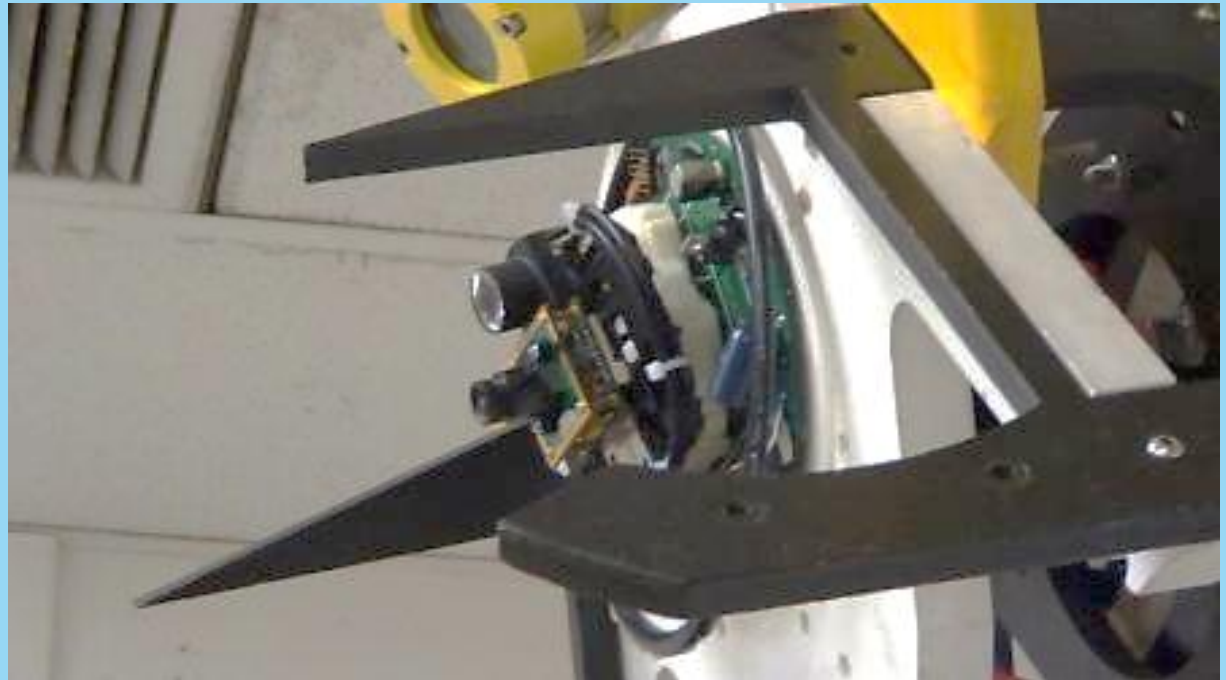
## 2.0 Physical

***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 inspector failed the company during safety inspection for putting something that could be a danger to the divers.

NOTE: Monitors with glass fronts could create sharp edges if they become broken! Monitors with glass fronts will not pass safety inspection.



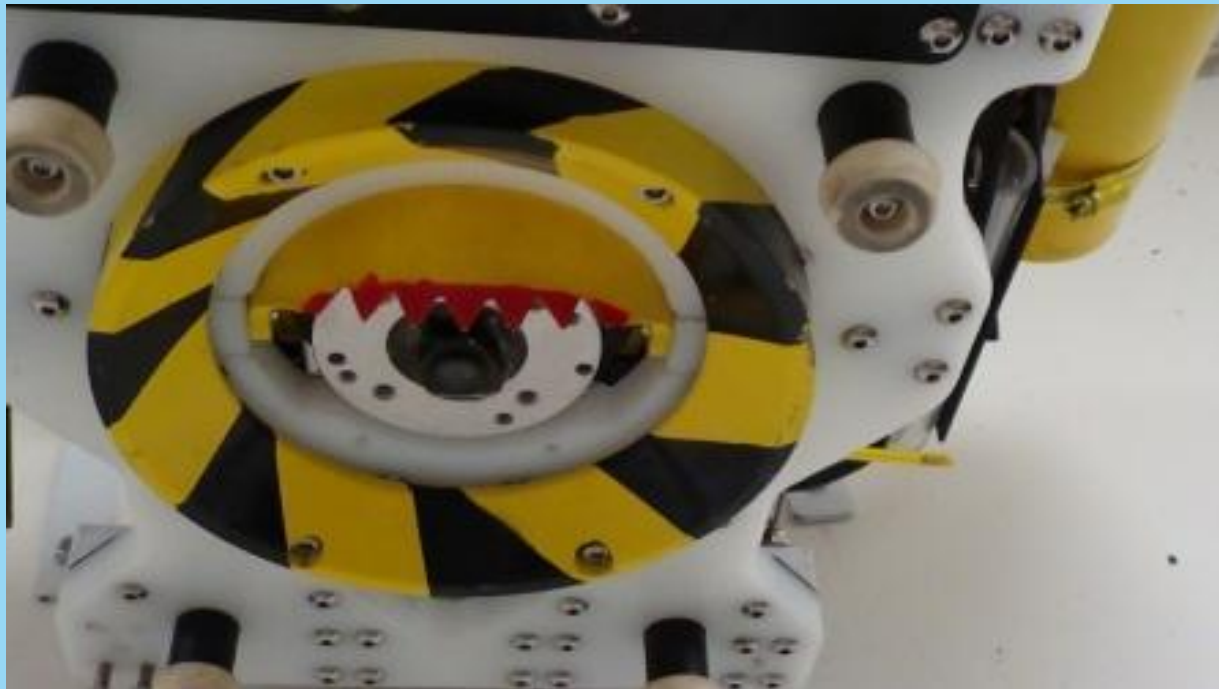
# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 2.0 Physical

***Hazardous items are identified and protection provided.***

Examples (if something sharp is required for a mission task):

Sharp edges on the scoop are painted red; yellow and black safety warning colors are used elsewhere. The company successfully passed their safety inspection because potentially hazardous items that are needed to complete a task are identified and protected.





# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 2.0 Physical

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



Eastern Edge Robotics shrouds. Photo credit: Stephen Fudge

Propellers are properly shrouded to IP-20 standards on both sides of the propeller.

## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### 3.0 Electrical (RANGER)

Single attachment point to power source.

**Anderson powerpole connectors** are required to connect to the MATE power source.

A single inline fuse (not shown) must be within 30cm of attachment point (power connectors). Fuses in each line are acceptable.

RANGER class (and PIONEER class using 12 volts) utilizes the RED & BLACK powerpole 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



### 3.0 Electrical (RANGER)

**Problems with the Anderson powerpoles in RANGER & PIONEER class have developed when teams 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.**





# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical (EXPLORER)

Single attachment point to power source.

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

A single inline fuse within 30cm of attachment point (power connectors) is required. **This must be a Littelfuse!**

**EXPLORER class (and PIONEER class using 48 volts) utilizes the Blue SBS50BLU (50 amp) power connectors. Positive and Negative are marked on the connectors.**



The terminals for these connectors must be crimped with a hydraulic or a ratcheting crimper designed for the terminals.

A 30A (or smaller) Littelfuse must be within 30cm of these terminals.



**Companies without the SBS50 connector will not pass safety inspection!**

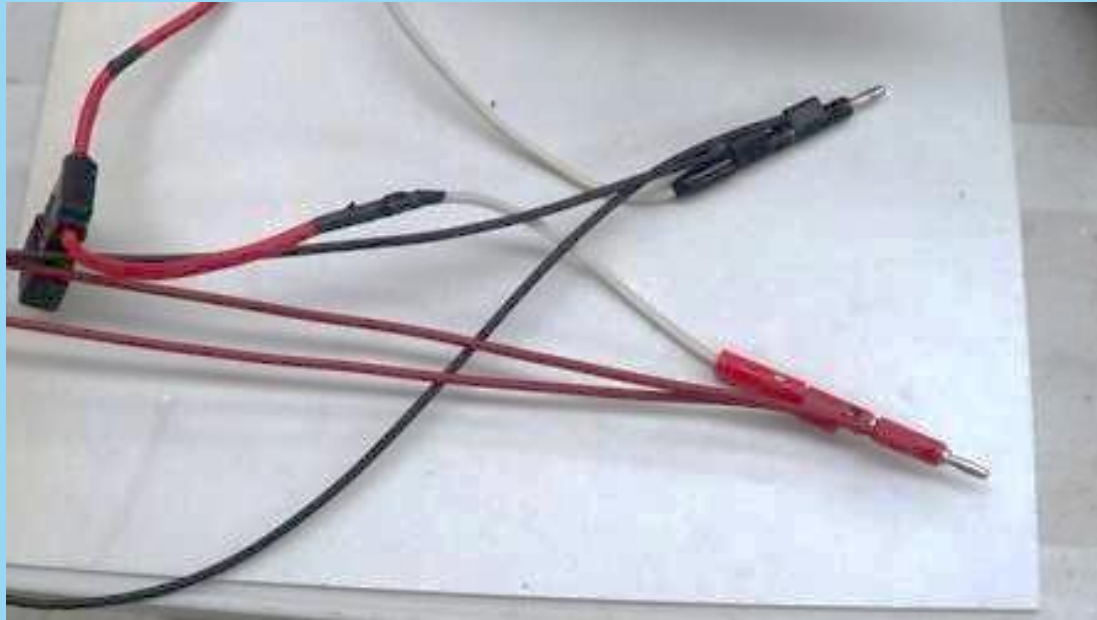
## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### 3.0 Electrical

*Single inline fuse within 30cm of attachment point.*

Examples:

This is an example of multiple attachment points ahead of the fuse and **WILL NOT** pass safety inspection.



Single point of connection must be Anderson connectors.

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical

*Single inline fuse within 30cm of attachment point.*



Long Beach  
City College

X-Academy

Safety inspectors want to see the proper Anderson connection to the MATE power supply (where you plug into the power supply) and a fuse within 30 cm.

**Nothing should be in between this connection to power and the fuse!**



# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical (RANGER, PIONEER, & EXPLORER)

### New for 2025!

Full Load Amp (FLA) values.

**The team should have their full load amp value somewhere on their SID. It should also be included on the Company Safety Review. The fuse chosen should match to this FLA value.**

With the ROV in water, run all thrusters at full forward at the same time. Measure the amperage. **THAT IS YOUR FULL LOAD AMPS VALUE.** It should not exceed 30 amps (for a 48-volt system) or 25 amps (for a 12-volt system).

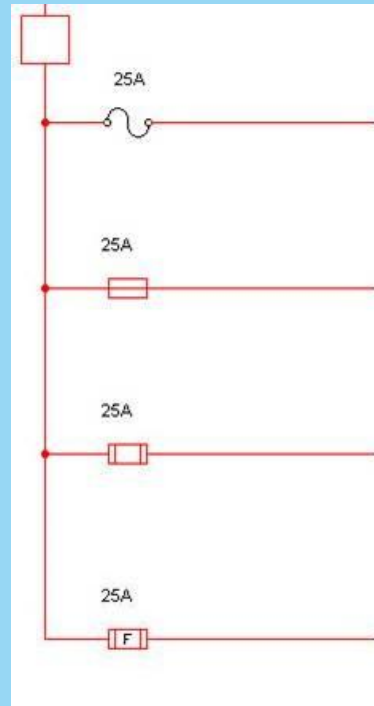
Condition: Full Down Thrust, Full Forward Thrust ROV Full Load Amps (FLA) in water = 25.1 A Fuse size selected based on FLA = 25 amp

**Circuit breakers are not allowed.**

# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical System Interconnection Diagram (SID)

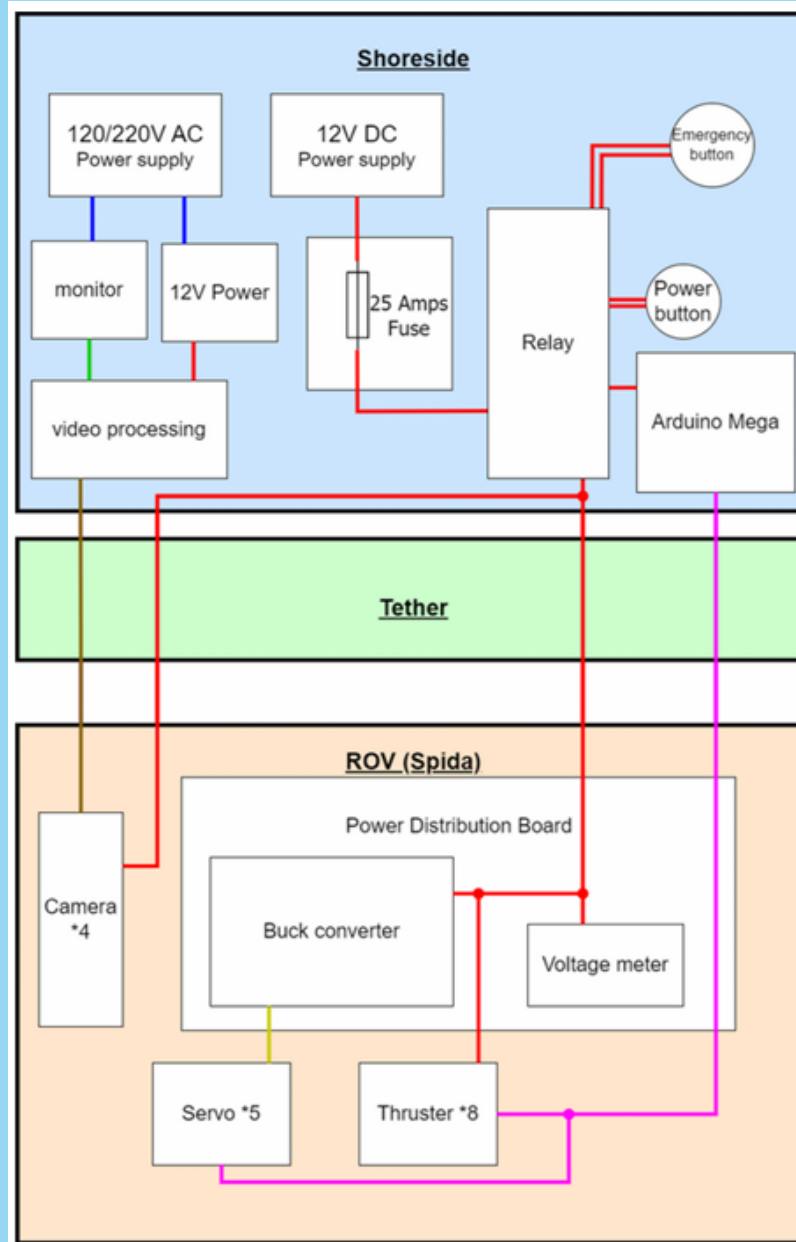
- **System Interconnection Diagram (SID)** A SID is a system-level, connection diagram that includes electrical and, if applicable, fluid power wiring information. Board-level and component-level schematics should not be included; however, these may be brought to the engineering evaluation for reference 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

A link to an example of an acceptable SID can be found in the **Competition Manual**. Additional SIDs can be found in technical reports from previous years.

# Example RANGER (12-volt) SID



**ROV Full Load Amps (FLA) in water = 25.1 A**

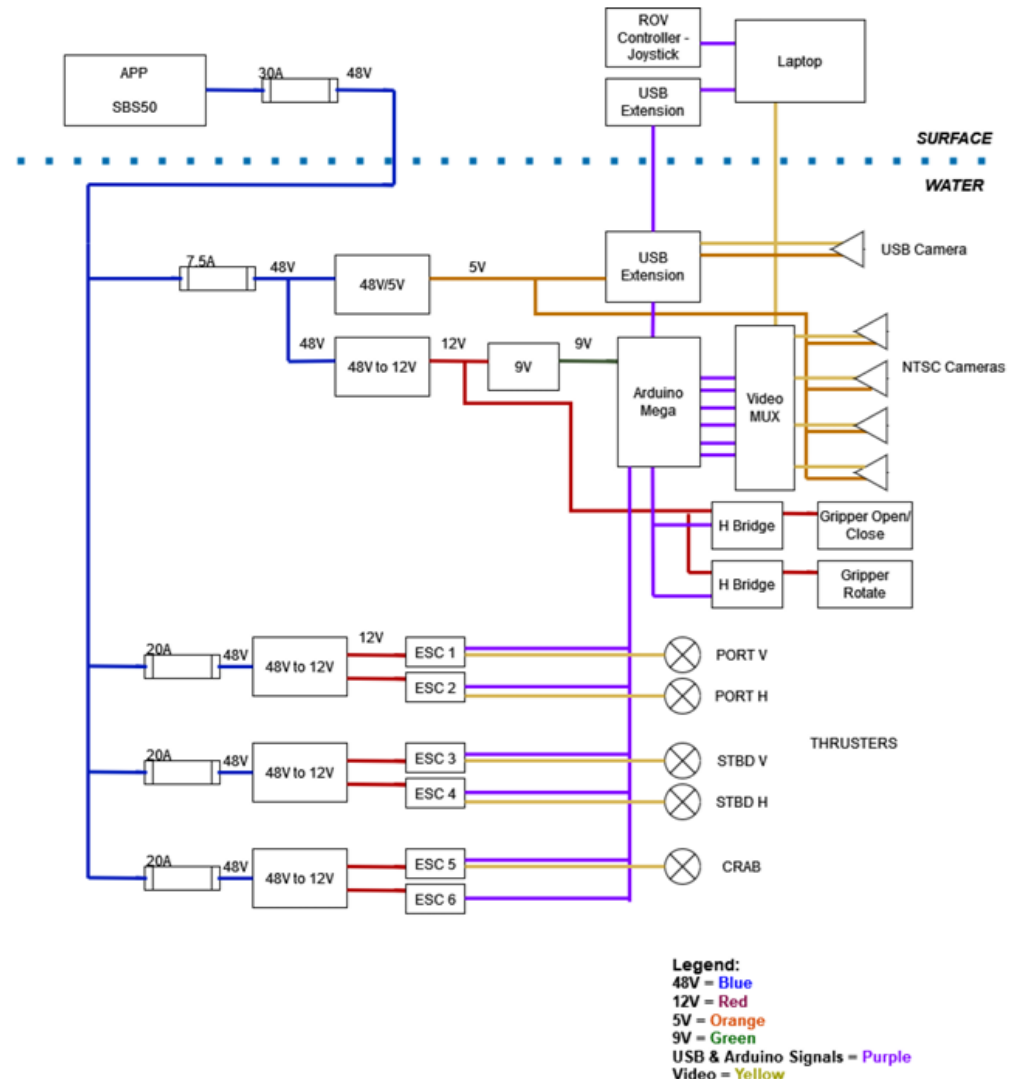
**Fuse size selected based on FLA = 25 amps**



# Example EXPLORER 48-volt SID

## 1. ROV SID

Condition: Full Down Thrust, Full Forward Thrust  
ROV Full Load Amps (FLA) in water = 28.5 Amps.  
Fuse size selected based on FLA: 30 amps



## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

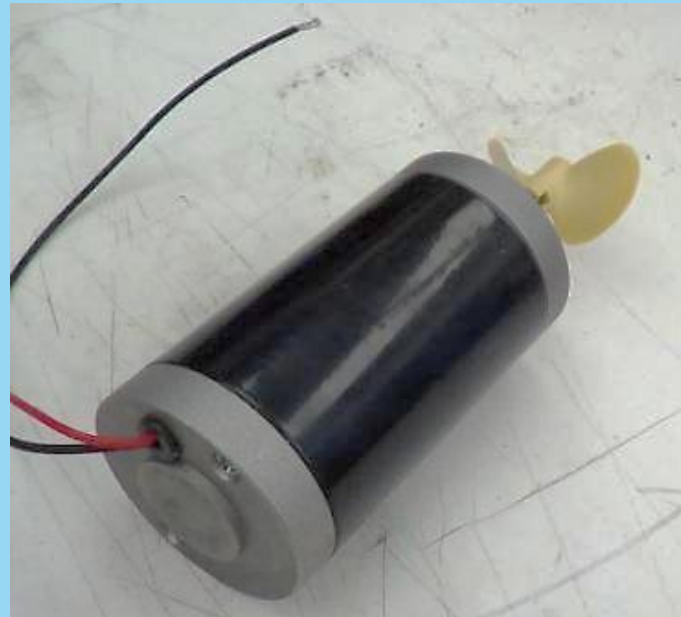
### 3.0 Electrical

***No exposed copper or bare wire. No exposed motors.***

Examples:

These motors with exposed connections, that are not waterproof, **WILL NOT** pass safety inspection. The motor on the left is both exposed and has bare wire.

The motor on the right is exposed and not sealed.





## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### 3.0 Electrical

***No exposed copper or bare wire.***

Examples:

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



## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### 3.0 Electrical

***Tether is properly secured at ROV.***

Examples:

On the left, all the wires are loose and unsecured. On the right is an example of a well-secured tether. If safety inspectors are unsure of ROV-side strain relief, they may ask companies to lift their ROV by the tether to ensure proper strain relief.

If the tether is pulled on, any strain **MUST NOT** impact a connection.

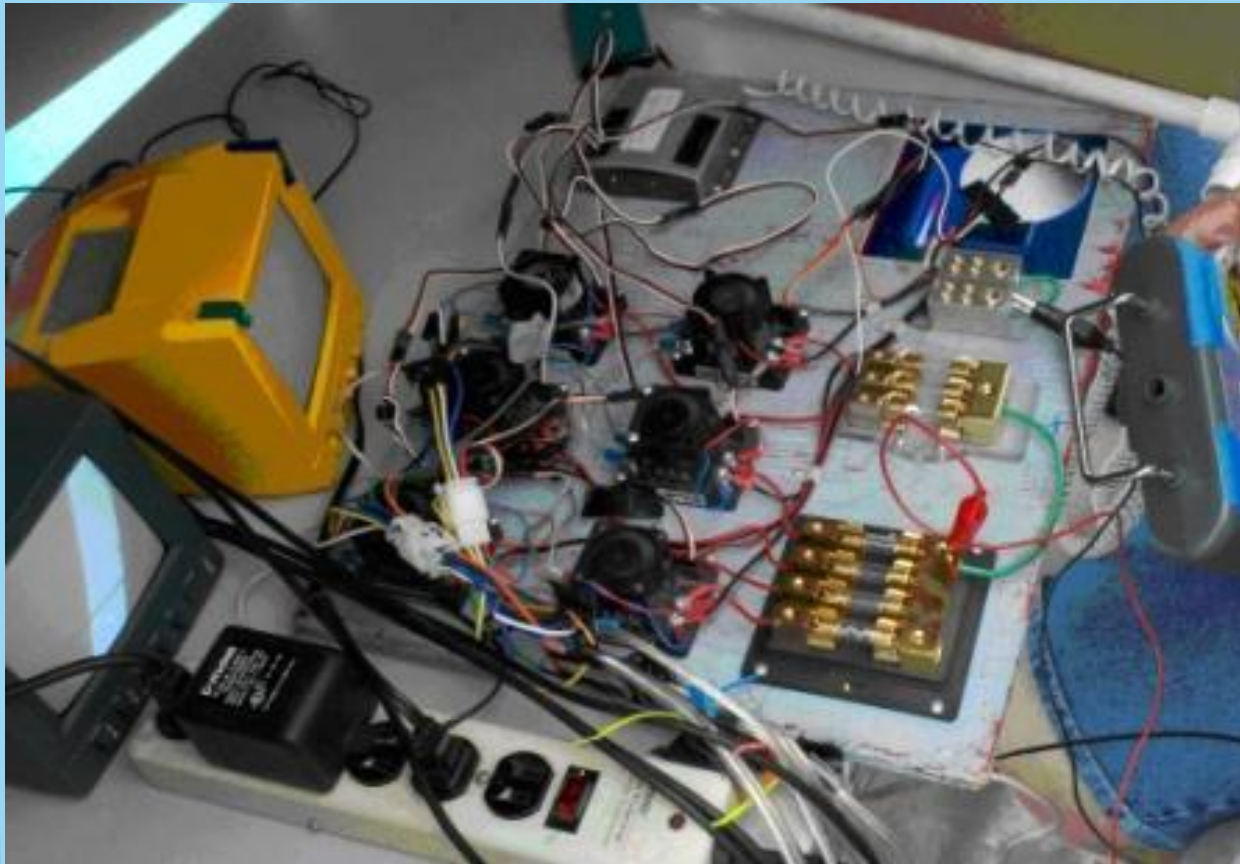


## RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

### 3.0 Electrical

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

There are multiple FAILS in the photograph 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.



# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical

**Surface controls:** Surface control stations must be built in a neat and workmanship like manner. Loose components and unsecured wires will not pass safety inspection.

Both images to the right show industry wiring. Note the labeling of boards, that all boards are secure, and there is good wire discipline (wires laid out nicely and secured with ties).



# RANGER, PIONEER & EXPLORER Class Safety Inspection Sheet Tutorial

## 3.0 Electrical (Related to ELEC-025R)

### *Dangerous Wiring Methods.*

*When building your ROV, think about potential safety/danger issues. Ask yourself whether 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 power strip that had been modified to plug into the 12VDC MATE supply – it was using 12 volts, but over AC plugs. Each thruster then had a standard plug that plugged into the power 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.*

See [MATE Expected Work Practices](https://materovcompetition.org/rov-kits) for more information

[materovcompetition.org/rov-kits](https://materovcompetition.org/rov-kits)



## 4.0 Pneumatic / Hydraulic Checklist

- ◆ Did you PASS the pneumatics/hydraulics test?
- ◆ Do you have your pneumatic or hydraulic SID(s) present?
- ◆ Are pneumatic and/or hydraulic component specifications provided? **Did you provide the ratings of your hydraulic tubing?**
- ◆ Are you using pressure rated lines and fittings?
- ◆ Is your attachment to pressure source is secure?
- ◆ Is your pressure regulated to 40psi max for pneumatics and 150 psi max for hydraulics? **Companies MUST provide the regulator, on/off valve, and manual pressure release.**
- ◆ If a company fabricated pressure accumulator is used, are pressure test results provided?
- ◆ Are hydraulic fluids leaking?
- ◆ Do your pneumatics utilize compressed air or inert gas?

**See [Compressed Air Guidelines](#) for what components you should have in your system.**

### 5.0 Laser Checklist

- ◆ Does your SID show the laser power source?
- ◆ Does your laser have an on/off switch on the surface controller?
- ◆ Is the laser powered through the MATE surface power supply?
- ◆ Are batteries used to power the laser? (**this is not allowed**)
- ◆ 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 to the safety inspection.**
- ◆ Is the laser voltage at or below laser rated voltage & current?
- ◆ Was a specification sheet showing laser and laser glasses sent to, **and approved by**, MATE ROV Competition officials prior to 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?

### 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. We work with **industry** to align the MATE safety specifications with **industry standards**. We want to familiarize our competitors with the safety specifications they may see one day in the workforce.

If you have a question or concern, contact that MATE ROV Competition Technical Manager on the [MATE Q&A Forum Board](#). In this case it is better to ask for permission, not forgiveness. Remember, it is better to be **SAFE** than sorry!