



Job Site Safety Analysis

The following document is a Job Site Safety Analysis completed by the R-Matey's Chief Executive Officer Gavin Bentley. The purpose of this document is to list the sequence of task needed to complete the design and build of the company's remotely operated vehicle, Proklisi. Then the potential hazards that could arise during each sequence is listed. Last the controls and resources needed to prevent these hazards are listed. Additionally the date in which the CEO communicated these safety protocols was recorded.

Job Site Safety Analysis	<u>Type of Job:</u> Construction of ROV for MATE Competition	
	<u>Date:</u> August 27, 2018	
Basic Job Steps	Potential Hazards	Recommended Action or Procedure
Traveling to STEM Gym for Work Space***	Members walking alone are at in increased risk. Members riding together in the car are subject to potential injury in the event of an accident.	Member's POG must given written permission to ride with other members or the coaches. Members walking must walk in groups.
Soldering Workshop	Members are inexperienced during the soldering workshop and are subject to burns, hazardous gases, and serious injury if misused.	Members are required to: -wear safety glasses -tie hair back -wear closed-toed shoes -wash hands upon completion Explanations of potential hazards will be clearly communicated before beginning. Coach and mentor supervision will be

		required.
Construction of Control Box	Members are subject to all hazards of soldering. Members are subject to cuts from working with small metal components. Members are also subject to electrocution from working with electrical components. Due to the heatsink on the sabertooth motor controls, members may also be subject to chemical irritants.	Members are required to: - wear safety glasses - tie hair back - wear close-toed shoes - wash hands upon completion - wear gloves when applying heatsink Proper handling of sharp objects will be clearly explained as well as the location of an up to date First Aid Kit (STEM Gym bathroom). This kit will be checked every month for expiration dates or to restock. Power supplies will be turned off and disconnected before beginning work.
Construction of Frame	Members will be cutting pieces of aluminum L-Channel with hand saws and band saws. Members could potentially cause serious bodily harm. Additionally, member could inadvertently cut themselves on sharp edges produced from the cutting process. Members are also going to be using a drill and pop-rivet gun to create the frame. This also has the potential to cause serious bodily harm if improperly used. Also, metal shavings after cutting can cause splinters if left in the workspace.	Members will be trained by a mentor on proper handling of hand saw, band saw, drill, and pop-rivet gun. Member will also be supervised by mentors or coaches while using heavy machinery. Members will also file down any cut edges of aluminum immediately to prevent accidental cuts and scrapes. Members are required to: - wear safety glasses - wear closed-toed shoes - wear gloves when filing metal - clean up metal shaving from workspace
Attachings Motors	Members have to use a drill to attach the motor shrouds to the frame. This could potentially cause bodily harm if improperly used. Members are also subject to injury	Members will be trained by a mentor on proper handling of a drill. Members will be supervised by mentors or coaches. Members will also produce a 3D printed

	from the propellers of the motor when they are moving.	shrouds and shroud covers to prevent members from injury themselves during testing.
Waterproofing Cameras	The products and processes using in the waterproofing process could cause several potential hazards. The two components mixed to create the epoxy can cause skin irritation and eye irritation. Also it can adhere to the skin and be difficult to get off. Also once mixed, the epoxy heats up can could cause burns.	Members are required to: -wear protective gloves when mixing and pouring. -wear safety glasses when mixing and pouring. -securely place housing before pouring epoxy -once poured, not touch housing for 48 hours
Attaching Buoyancy Foam	Members had to cut large rectangular planks of R-33 subsea buoyancy foam using a bandsaw. This has the potential for serious bodily harm if improperly used. Additionally, members will be attaching the foam with zip-ties and cutting off excess. This could potential cut or scrap team members if grazed.	Members will be trained by a mentor on proper handling of a bandsaw. Members will be supervised by mentors or coaches. Members are required to: -wear safety glasses -wear closed-toed shoes Members will also immediately file down the cut edges of zip ties to avoid injury.
Electrical Testing	During electrical testing, member could come into contact with live current if any wires are exposed. This is a shock hazard. Members could also cause harm to the system if improper fuse calculations are made for the power supply. There is also a shock hazard if any component comes in contact with water.	Members will inspect all wiring before introducing an current to the system. Members will inspect all fuses and test them to make sure they are still functioning. Members will also use GFCI outlets only when using
Pneumatics Testing	Members conducting a Pneumatics Test are at risk of large amounts of stored energy	While testing Pneumatics, members are required to wear safety glasses and must be

	being released. This could result in injuries while operating or testing a Pneumatics system.	supervised by a coach. In addition, members are required to stand a safe distance away from the system during testing. There is also a pressure relief valve which protects the system from exceeding 40 psi.
Hydraulics Testing	Members conducting a Hydraulics are at risk of large amounts of stored energy being released. This could result of injuries while operating or testing a Hydraulic system.	While testing Hydraulics, members are required to wear safety glasses and must be supervised by a coach. In addition, member are required to stand a safe distance away from the system during testing. There is also a pressure relief valve which protects the system from exceeding 40 psi.
Full Scale Testing (Dry)	Members had to test all the individual components of the ROV simultaneously. Members will test the electrical systems, pneumatics systems, and hydraulics systems. This poses the potential for multiple failures to occur which could cause electric shock or serious bodily injuring from rapid depressurization.	Member are required to wear safety glasses and closed-toed- shoes during testing. Also they must stand a safe distance away from the testing site. Members will be supervised by mentors or coaches during the testing process.
Full Scale Testing (Wet)	Members had to test all the individual components of the ROV simultaneously. Members will test the electrical systems, pneumatics systems, and hydraulics systems. This poses the potential for multiple failures to occur which could cause electric shock or serious bodily injuring from rapid depressurization.	Member are required to wear safety glasses and closed-toed- shoes during testing. Also they must stand a safe distance away from the testing site. Member will use GFCI outlets. Members will be supervised by mentors or coaches during the testing process.

***This is an ongoing step due to the teams necessity to travel to the work space.

<u>Job Site Safety Analysis</u>	<u>Type of Job:</u> Poolside Set-Up at MATE Competition	
	<u>Date:</u> April 27th, 2019	
Basic Job Steps	Potential Hazards	Recommended Action or Procedure
Handling of ROV	If any sharp edges are present on the ROV, members are at risk of getting cut. If any energy is stored in the pneumatics or hydraulic system, members are at risk of an unintentional release of stored potential energy. This could cause injury to members.	Members will be required to wear safety glasses and closed-toed, non-slip shoes while handling ROV. All power supplies will be disabled or detached from ROV or control boxes. Pressure relief valve of the pneumatics systems will have a lockout-tagout (LOTO) system so that it will be locked open during the handling and transportation of ROV. The hydraulics will also have a LOTO system. This will lock the topside cylinder in place to prevent accidental pressurization of the hydraulic system.
Assembly of ROV System	If any kill switch is in the ON position during assembly, there could be a surge of power that blows of fuse and damages the system. This also presents a spark hazard for the members of the team. If any pressure exists inside the pneumatics system during assembly, members run the risk of overpressuring it during testing.	Member will be required to wear safety glasses, closed-toed non-slip shoes, and tied back hair while assembling ROV system. All kill switches will be check and confirmed to be in the OFF position plugging in power supply. Pressure relief valve will be checked and confirmed to be open while pump is being attached. Topside cylinder of the hydraulic system will be check and confirmed to be locked in place during assembly.

<p>Electrical Testing</p>	<p>During electrical testing, member could come into contact with live current if any wires are exposed. This is a shock hazard. Members could also cause harm to the system if improper fuse calculations are made for the power supply. There is also a shock hazard if any component comes in contact with water.</p>	<p>Members will inspect all wiring before introducing an current to the system. Members will inspect all fuses and test them to make sure they are still functioning. Members will also use GFCI outlets only when using</p>
<p>Pneumatic Testing</p>	<p>Members conducting a Pneumatics Test are at risk of large amounts of stored energy being released. This could result in injuries while operating or testing a Pneumatics system.</p>	<p>While testing Pneumatics, members are required to wear safety glasses and must be supervised by a coach. The pressure relief valve should be open prior to testing. The LOTO system will be deactivated and then the system will be tested. This valve prevents the system of exceeding 40 psi.</p>
<p>Hydraulic Testing</p>	<p>Members conducting a Hydraulics are at risk of large amounts of stored energy being released. This could result of injuries while operating or testing a Hydraulic system.</p>	<p>While testing Hydraulics, members are required to wear safety glasses and must be supervised by a coach. In addition, member are required to stand a safe distance away from the system during testing. The topside cylinder should be locked in place prior to testing. The LOTO system will be deactivated and then pressure applied to test hydraulics system.</p>
<p>Deployment of ROV</p>	<p>During the deployment of the ROV, members are at risk of slips, trips, or falls due to wires and wet surfaces. Members are at risk of shorts due to the close</p>	<p>Member will be required to wear safety glasses, closed-toed non-slip shoes, and tied back hair while deploying ROV system. Pilot will run final all-systems check. All</p>

	proximity of moisture to the electrical systems.	tethers will be properly managed by a member. GFCI outlets will be used. Kill switches will be clearly labeled and discussed before deployment. Pilot will be final que to deploy ROV.
--	--	--