Risk Assessment
Safety Plan

I. Project information:

Design of a Multifunctional Robot for Athletic Environments	01/20/20017
Name of Project	Date of submission

Team Member	Phone Number	e-mail
Michael Jones	954-240-6822	Michael5.jones@famu.edu
Abdur-Rasheed Muhammed	904-238-1176	abdurrasheed1.muhammed@famu.edu
Ben Edwards	813-943-9614	bje12b@my.fsu.edu
Natalia Cabal	954-536-5852	nc11b@my.fsu.edu
Troy Marshall	850-832-6719	tam14d@my.fsu.edu
Ryan Alicea	561-358-4232	rla11h@my.fsu.edu

Faculty mentor	Phone Number	e-mail
Dr. Camillo Ordonez	850-980-1296	cordonez@fsu.edu

II. Project description:

Each year the American Society of Mechanical Engineers (ASME) hosts a unique Student Design Competition (SDC) at its Student Professional Development Conference (SPDC). For the 2016-2017 school year teams have been tasked with the development of a multi-functional robotic platform to compete in a series of five athletic-based competitions: a sprint, tennis ball throw, stair climb, golf ball hit, and weight lift.

II. Describe steps from project initiation to completion:

In order to succeed, the team had to first, become familiar with the rules of the Competition. Once acquainted with these guidelines, background research and brainstorming were conducted in an attempt generate design ideas. From these concepts a design was selected and calculations were done in order to determine the feasibility of the chosen design. The next stage is to start modelling and prototyping from test rigs and components can be tested producing real world data to be analyzed. After testing and the finalization of the design parts can be ordered and manufactured then assembled with the completed design being tested and ran through a full spectrum of competition conditions with minor tweaks and optimization.

III. Given that many accidents result from an unexpected reaction or event, go back through the steps of the project and imagine what could go wrong to make what seems to be a safe and well-regulated process turn into one that could result in an accident. (See examples)

This project requires the seamless operation of several individual subsystems. The “Throw” and “Lift” competitions both require the use of a pneumatic circuit. These systems utilize air at high pressures to accomplish tasks. At these high pressures, any crack or imperfection in the container can be exploited, Potentially leading to catastrophic failure of the device. Likewise, electrical power is a potential risk as well. While wiring a device can seem straight forward, it is quite possible to start an electrical fire by improperly connecting or overloading different electrical components. Lastly, the testing process poses a host of Issues as well. For instance, while testing the configuration for the “Lift” competition, it is possible for the weight to shift during the process, causing the weight to inevitably fall off of the lifting structure. It is also

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unrealistic to expect that the motors may be overloaded during testin

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Performance of the device during compe	

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IV. Perform online research to identify any accidents that have occurred using your materials, equipment or process. State how you could avoid having this hazardous situation arise in your project.

Ex. 1. On May 20, 1989 a Memorandum was established through the OSHA Hazard Information Bulletin stating that Polyvinyl Chloride (PVC) is not suitable to transport or store gasses. In this case a plant worker in Texas was injured after a compressed air line built from PVC ruptured under pressure. Furthermore, this document cites the Plastic Pipe Institute's 1972 "Recommendation B", that recommends against using PVC to transport or store compressed air, as well as statute B31.8-1986 as established by ANSI/ASME.

V. For each identified hazard or "what if" situation noted above, describe one or more measures that will be taken to mitigate the hazard. (See examples of engineering controls, administrative controls, special work practices and PPE).

1. 24 hours will be allowed for all points produced through the joining of two or more PVC components by means of a bonding agent
2. Personal Protection Equipment (PPE) shall be used when operating any powered equipment.
3. A working distance of 5 feet is to be maintained while robot testing is in progress.

VI. Rewrite the project steps to include all safety measures taken for each step or combination of steps. Be specific (don't just state "be careful").

1. Plan the design of the robot such that any excessive motion and vibrations are minimized.
2. Assemble the structure of the robot such that all connections are snug, and such that any contact of different metals is separated by epoxy or thin film
3. Before operating the pneumatic system, pressurize to a low psi and spray all connecting joints with soapy solution. If

Any sort of bubbling occurs, the connection is not sealed and should be attended to. Repeat at increasingly higher

Psi until no bubbling occurs.

4. Carefully review each motors operation curves to identify how the motor can be overloaded and how it can be avoided.

VII. Thinking about the accidents that have occurred or that you have identified as a risk, describe emergency response procedures to use.

If an accident were to occur due to over-pressurizing the air tanks, it is very unlikely that any person would be able to react in time to

Avoid injury. If an accident were to occur, the best course of action would be to first identify if anybody in the area was injured during

The failure. If this is the case, emergency services would have to be called. The next course of action would be to attempt to work

Backwards and identify why the failure occurred in the first place. With this knowledge, we can work toward ensuring that this cannot

Happen another time.

VIII. List emergency response contact information:

- Call 911 for injuries, fires or other emergency situations
- Call your department representative to report a facility concern

Name	Phone Number	Faculty or other COE emergency contact	Phone Number
Ryan Alicea	561-358-4232	Camilo Ordonez	850-980-1296

IX. Safety review signatures

- Faculty Review update (required for project changes and as specified by faculty mentor)
- Updated safety reviews should occur for the following reasons:
  1. Faculty requires second review by this date:
  2. Faculty requires discussion and possibly a new safety review BEFORE proceeding with step(s)
  3. An accident or unexpected event has occurred (these must be reported to the faculty, who will decide if a new safety review should be performed.
  4. Changes have been made to the project.

Team Member	Date	Faculty mentor	Date
Ryan Alicea	1/20/17	Camilo Ordonez	1/20/17
Ben Edwards	1/20/17		
Natalia Cabal	1/20/17		
Abdur-Rasheed Muhammed	1/20/17		
Troy Marshall	1/20/17		
Mike Jones	1/20/17		

Report all accidents and near misses to faculty mentor.