

## **MECH 202 Fall 2015 Competition Project: Rescue Portal**

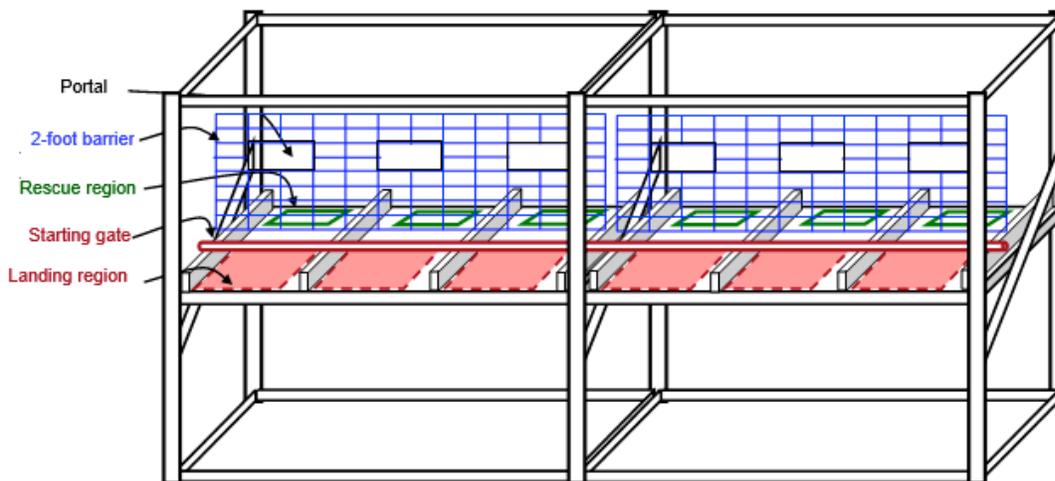
(rev 1 / Oct. 8, 2015)

Your team must design, fabricate, and compete with a working device that safely “rescues” a balloon into a rectangular space on the competition fixture visible in Engineering A08. Your team must also submit a report describing your design process and device.

- The competition is on **Friday, Nov 13<sup>th</sup>** in Engineering 120 (note: the place might change).
- Your project report must be submitted as a single PDF to the drop-box folder by 3 pm that day.
- Check-in starts at 3 pm (see schedule in Appendix E).
- Competition starts at 3:40 pm and ends at about 6:30 pm.

### **Competition Overview**

1. Your team is competing to design and build a safe, most reliable, and lightest weight device that autonomously retrieves a balloon from behind a 2 ft. barrier in a CSU Rams license plate holder and return it safely back through a portal to the Landing region as described in this document.



2. The sketch above shows the fixture. Lanes are spaced about 19 inches apart. Appendix B provides additional detail. Groups should measure the fixture and design their device to handle all potential variability they may encounter.
3. Devices must stay within their “lane” of the fixture. They must stay as one piece. No part of the device can ever go outside of the boundaries of their lane as shown in Appendix B.
4. Devices must fit under the starting gate and operate autonomously when the starting gate is lifted or when the starting gate is placed in its second slot. The maximum initial dimensions for the device are 18 inches (wide) x 3.5 inches (tall) x 11 inches (deep). The devices must retrieve a balloon that we will place in the holder at beginning of the round and bring the balloon back to the starting region through the portal. The balloon must remain with some of the balloon surface touching the region. See Appendix B.
5. The TA will keep the fixture locked prior to competition day, except during viewing times. Your team should schedule with the TA to see and measure the fixture and use your measurements and analysis to ensure that your device will work correctly and reliably. You are not allowed to visit the fixture outside of scheduled times or place your device on the competition fixture until the first time you compete on Nov. 13th. You can make your own test fixture to develop and test your device. We will also provide a simplified fixture (to be located in the basement of the Engineering building about two weeks before the competition) that you can use for testing.

**More detailed competition rules**

6. Each heat can have up to 6 autonomously competing devices. The winner of a heat is determined based on (i) the correct sequence of tasks safely completed during the 30 seconds from the time the starting gate is lifted and (ii) device weight.

7. The correct sequence of tasks to be safely completed is as follows:

| Task |  |
|------|--|
| 1.   | You must <b>place the device in its starting location within the 45 seconds</b> from when we announce “place your devices.” After placing your device, your team must completely leave the starting area. You cannot have contact with your device until after the heat is over. |
| 2.   | The <b>entire device must fit</b> into the starting area, <b>weigh less than 3 pounds</b> , and contain functionality designed to perform all other tasks (3-6) listed below.  |
| 3.   | The device must <b>start autonomously</b> when the starting gate is lifted.  |
| 4.   | The device must then <b>pick up and elevate the balloon through the portal in the barrier to the landing region of the fixture.</b>  |
| 5.   | After performing task 4 (above), the device must <b>place inflated balloon</b> such that there is contact between the balloon and the surface of the landing region.   |
| 6.   | After performing task 5 (above), <b>nothing should remain in the rescue region.</b>  |

8. The winner of a heat will be determined as follows:

|   |   |
|---|---|
| a.  | If only one device in the heat safely completes all six tasks listed above in the allocated time and stayed in bounds until the end of the heat, this device and team wins this heat.   |
| b.  | If multiple devices safely complete all six tasks in the allocated time, and stay in bounds, <b>the lightest device</b> that safely completed the tasks and stayed in bounds wins this heat.  |
| If no devices safely complete all tasks in the allocated time and stay in bounds until the end of a heat, the winner of the heat will be determined as described in the next sections.        |   |
| c.  | If only one device in the heat safely completes the first five tasks in the allocated time and stays in bounds until the end of the heat, this device and team wins this heat.  |
| d.  | If more than one device in the heat safely completes the first five tasks in the allocated time and stayed in bounds until the end of the heat, <b>the lightest device</b> that safely completed the tasks in the allocated time and stayed in bounds wins this heat.   |
| If no devices safely complete five or six tasks in the allocated time and stay in bounds until the end of a heat, the winner of the heat will be determined as described in the next sections |   |
| e.  | If only one device in the heat safely completes the first four tasks in the allocated time and stayed in bounds until the end of the heat, this device wins this heat.  |
| f.  | If more than one device in the heat safely completes the first four tasks in the allocated time and stayed in bounds until the end of the heat, <b>the lightest device</b> that safely completed the four tasks in the allocated time and stayed in bounds wins this heat.  |
| If no devices safely complete at least 4 tasks as described in the sections a through f above, we will do the steps described below.  |   |
| g.  | The heat will be re-run with the same participants. However, if there had been a gross safety violation (see below), that device will be removed from the competition and from this heat. If there had been a device damaged, up to 15 minutes will be provided during all heats except the final heats for this group to repair their device. The rerun heat will then be judged based on the criteria in a through f above. |
| h.  | If during the rerun no devices safely completes at least four tasks as described in the sections a - f above, but at least one device safely started autonomously (task 3) and stayed on the fixture, <b>the lightest device that safely started autonomously</b> will be declared the winner.  |
| i.  | If during the rerun, no devices safely started autonomously (task 3) and stayed on the fixture until the end of the heat, the heat will be rerun one last time and judged based on the criteria in a-h. If no devices moved during this final rerun, all devices will be deemed to have lost the heat and will be eliminated from the competition   |

9. The safety requirements and their impact on competition results are as follows:

|    |  |
|----|--|
| a. | Each device must pass a safety audit prior to 3 pm on Thursday, Nov 12. This audit will be conducted by the TA. Your team should schedule a time with the TAs during the Monday-Thursday before the competition to conduct this audit. Bring your device to the audit so they can identify anything that is hazardous or might be considered hazardous. If you have concerns or questions prior to the week before the competition, please contact the TA.   |
| b. | Gross violations of the safety rules will result in your group's device being eliminated from the competition. Examples of gross violations include damaging (or altering) the fixture including the use of adhesives or heat on the fixture, damaging or altering the balloon in any way including the use of adhesives, or any part of your device wandering so far out of bounds or causing a disturbance so significant that another device is damaged or touched. Note that minor vibrations or air disturbances caused by your device on the fixture do not count. All devices must be tolerant of minor vibrations and still stay on the fixture. If you have any questions about your device and any potential areas of risk, check with the TA. When judging whether a safety violation is a gross violation, we will also look at your design intent and what you did to ensure that a safety violation could not occur. |
| c. | Your device cannot win a heat if it has a minor safety violation. Minor safety violations are things such as: <ul style="list-style-type: none"><li>- Any part of the device moving out of bounds during any time in a heat. See boundaries in Appendix B.</li><li>- A balloon that was released and ended up anywhere other than inside lane and landing region at the end of the heat.</li><li>- Any part of your device falling off. Your device must stay as a single unit during the entire heat.</li></ul>   |

10. All devices will be run first in a "test round". The results of this "test round" do not affect the competition results, but do provide a first attempt for all teams to prove that their devices can accomplish all of the tasks required to not lose the 2 points on their final report as described for the grading of the project reports.

11. Once the test round is completed, the competition is double elimination (except in any special cases that might have been mentioned above when a device is eliminated due to a safety violation). The schedule of the rounds and heats and how the winners and losers move from round to round will be available prior to the day of the competition. Only the first place winners in each heat will advance to the next round. We will try to record which devices came in second, third, fourth, and fifth places and all tasks that each device accomplished, but will not use this for determining competition results.

#### **Further Clarification about the Competition**

12. As mentioned previously, you can build your own test fixture. Our fixture includes several expensive components, but the same geometry can easily be replicated using prototype materials (mainly wood). See Appendix B for more info about how we made the competition fixture.

13. The components used to make the competition fixture will not be perfect or exactly like a test fixture that you might fabricate from the same parts. It is important that your device can tolerate these types of differences. This is an important aspect of having a robust design. Note that you cannot place your device on the test fixture prior to the competition. You can take measurements. Every year there are many devices that fail to operate due to dimensional differences between the competition fixture and the test fixtures built by students. This is your warning to ensure this doesn't happen to your device.

14. Your device can be made from any materials that you would like to use. However, you cannot use any energy storage method or device that might be deemed hazardous. Examples of hazardous energy storage devices include, but are not limited to:

- Explosives, combustion processes, or highly exothermic reactions (such as model rockets).
- A compressed fluid that might release too quickly
- Anything deemed to be unnecessarily harmful to either the fixture or another competitor's device. This includes having motors that overheat, generate sparks, etc or wheels that leave a residue.

15. If your team is not willing to stand next to your device without protective clothing or safety glasses, your device will be considered hazardous! However, since some individuals are braver than others. The judges reserve the right to deem a device hazardous.
16. No human contact with the device is allowed at any time during the time from the start of a round until that round has been declared finished and the results have been announced.
17. The device cannot contain any biological components. For example, you are not allowed to employ a trained hamster (or very small dog) as part of your device.
18. Since in each round your team has very little time to place your device onto the fixture and move away prior to the start. You should design a device that does not need to be calibrated to the lane it will be running in.
19. Your team must check into the registration table at the designated time given in Appendix E. If your team is more than 5 minutes late, and this is deemed to hold up the competition, your team will lose its first round.
20. Damaging the fixture. Your team will be disqualified if your device intentionally or unintentionally damages the fixture in any manner including but not limited to: breaking any part of the fixture, overheating any part of the fixture, generating noticeable nicks or notches that will impact the integrity of the competition, or adding foreign substances such as oil, adhesives (or adhesive specks), or lubricants onto the fixture.
21. Judging. The TA (helped by TAs from previous years) will determine which device accomplished which tasks during each round. They are also the primary referees to observe any safety violations. Device weights will be recorded at checkin and may be rechecked later if devices have been modified.
22. Protests. All protests must be registered immediately after the competing round. You must qualify your protests based on the ground rules and the project definition. Keep good engineering records (engineering book) of your development process to use to defend your positions. If you have no supporting documentation at the day of the competition, your protest will be disallowed. Bert Vermeulen will be the final judge on all protests.
23. And keep in mind. This competition is a lot of fun and an opportunity to cheer and encourage everyone. Feel free to invite your friends and family as well. You can see elements previous competitions at [www.mech202.com](http://www.mech202.com).
24. Can we use a spring? There's no problem in using a spring, rubber band, or other means of propulsion as long as it does not generate so much force as to be dangerous. Using a crossbow, for example would be considered dangerous because we don't think any of your team members would feel safe standing in front of it.
25. Can we grab our device after it completes the task? Not until the round has been declared completed. Please ensure that your device cannot fall off the table, damage itself, or spin its wheels in a way that will damage the table or generate excessive heating.
26. Will there be any changes made to the competition fixture prior to Nov. 13? We may make minor improvements to ensure that the fixture is stable and race worthy. These changes may slightly affect the geometry of the fixture and the starting gate, but not alter any of the fundamental functionality.
27. Note that, although we will do the best we can, we cannot guarantee that the fixture will be absolutely rigid. Please design your device to be as tolerant as possible of any movement that may occur to the fixture as it is used during the competition.

28. Your group is not allowed to supply your own balloon for the competition. You will be given a balloon by one of the judges. You should plan that this balloon will not be exactly the same as the balloons that you might have purchased. We are aware that there is variability between balloons, and that some may not even meet standards. If your design is sensitive to some parameters of the balloon we recommend that you buy some from multiple stores and manufacturers, analyze them, and design your device to work with as broad of a range of balloons as you think might exist. The balloon must remain within the provided size range 4-6 inches by the end of the tasks, i.e. you cannot pop it. Note that comets are also not very consistent.

### **Judges Decisions Disclaimer**

In a competition of this nature it is hard to anticipate all the interpretations of the rules and situations that will arise in the competition. Therefore, the judges will decide anything not covered by these rules and the interpretations of these rules. These rules are subject to optimization, and may be altered by the staff to preserve the “spirit” of the contest.

### **The Rewards**

1. The winning team will receive an A for the course and will not have to take the final examination
2. The 2nd place team will receive an A for the project and a 100 for the final
3. The 3rd place team will receive an A for the project

Note that all three winning teams must be present during the lecture on Nov. 17 to explain to others in the class how you designed your device and some of its more successful features.

We will ask other faculty members to help judge the devices for other areas of merit, which might include:

- Manufacturing craftsmanship.
- The use of mechatronics.
- Design simplicity and elegance
- Low cost

### **Sharing the Experience**

You are encouraged to bring friends, family, and supporters to the competition.

We need a photo of your device by 6 pm on Thursday, Nov. 12. These images will be shown on the screen at the competition.

After the competition, we would like to keep your device until after next semester's competition. We have a display area where devices can be seen by anyone.

### **The Lead Up**

Your design group may ask any questions whatsoever of Dr. Troxell or Betsy. This is strongly encouraged to ensure that your device meets the spirit of the competition. If you have any of us sign a “non-disclosure agreement” (sample attached), we will then discuss with you confidentially those issues you have, and will not disseminate your questions or the answers to the entire class.

## Required Report

If you did not get one of the top three places in the competition, your grade for this project will be based almost entirely on the report that you submit, except for the following:

- A. Only 1<sup>st</sup>, 2<sup>nd</sup>, or 3<sup>rd</sup> place groups will be graded based on how the device placed in competition.
- B. Your report score will be reduced by 2 points if your device did not at least once safely accomplish the first four tasks and stay in bounds during an entire round on the day of the competition as described in section 6 on page 2.
- C. We reserve the right to further lower your project report grade for the project if we feel that you did not make a serious effort to build a device capable of meeting at least the first four tasks described in section 6 on page 2.

The report must be turned in as a correctly labeled single PDF (GroupXX\_Project2.pdf) with any supplemental materials in a zip file or folder that is also correctly labeled (GroupXX\_Project2.zip). These items must be turned into Canvas before the date and time given on page 1 of this document. The zip file (if needed) can be emailed directly to the TA. We encourage you to submit your project early. You cannot compete if we have not received the electronic copy of your report on time as a single PDF.

### The report will consist of:

- a. **Page 1** (1 point) is the cover sheet in the exact format shown in Appendix C. It must show:
  - Group number
  - Names and email address for each member of your group
  - Checklist of all report content and page(s) where this content can be found.
- b. **Page 2** (2 points) is the title page that needs to show:
  - A title identifying the device
  - A photo of the device to fit in the remainder of the space on this page

**Pages 3 and beyond of the report** will have all of the other information required as listed below. Note that it is important that each section has page numbers that correspond to the pages listed on the cover sheet and that the first page of each section is labeled so that we can identify which section we are reading as we go through the report. We strongly prefer and recommend that you compile your report in exactly the order below.

- c. **Project plan** (5 points). Your project plan should include all of the information that we requested for Project 1. This includes: tasks, milestones, owners, planned completion dates, actual completion dates, dependencies, the critical path, and weekly status snapshots. For the second project, we also want to see how many hours total for the group that you estimated the project would take and how many total hours the product did take. There would be some kind of analysis of planned versus actual schedule and planned hours versus total actual hours for the group.
- d. **Specification development** (10 points). You should show how you developed the specifications for your device and its various systems. This should include identification of customers and requirements, competitive analysis, metrics for your specifications, targets, and tradeoffs. Your specification development should be as clear and easy to follow as possible. There should be a table that clearly shows the “how much” (step 7 of QFD). The “importance to customers” part of this “how much” should then be used for your concept generation, concept selection, etc. Your specification should be in your own words, drawings, charts, equations, etc. Your specification should attempt to quantify as much as possible using measurements that can later be verified. Please also your prioritized the musts and wants (delighted and disgusted) for functional specifications and list all

constraints. Note that since this is a unique problem, you may not be able to define competitors the way we have done in QFD so far. In class I will present some alternate ways to generate targets.

e. **Engineering analysis** (15 points). You should demonstrate how you have used engineering concepts learned in other classes you've taken (such as Statics) to help understand and solve this design problem. You can use any other type of analysis and any other resources as long as you tell us what you used for your analysis. This is an important section and has historically been significant in the report grades, and success in the competition.

f. **Concept generation and concept selection** (10 points). There should be a description of the concepts your group considered, the methods used to generate concepts, and the process used to make the choices that lead to the design (or designs) your group decided to build and test as prototypes. The conclusion of this section needs to tie back to the specifications, constraints, and analysis performed in steps d and e above.

g. **Device description** (15 points). There should be annotated drawings or annotated photos that explain the following in a way that we can understand:

- How to make a device similar to yours. This could be photos of all of your parts and how they are to be assembled, an exploded view, or any other method you think conveys all of the information.
- The process (movement steps and sequence) of how your device has been designed to accomplish the tasks given in section 7 on page 2.
- Any critical elements or features that making your device work and work reliably.
- Any clever ideas that you think make your device unique.

We do not require Creo drawings or solid models, but you can use Creo or another CAD package to help you generate your design prior to fabrication. CAD software can also be useful for you to generate the images that explain how to build your device and how it works. If you do create any models, include the important images in the main body of the report and put all source files into a ZIP file.

h. **Bill of materials** (5 points). The bill of materials (BOM) for this project is different than the one for the first project Appendix D provides a sample. The BOM for this project must include:

- The cost of each item required to fabricate your device
- Where each item can be obtained (where you got it)
- There should be a total cost so we see how much it would cost to buy the components to build a device similar to yours.

Also please tell us how much in total you spent (including spares, parts you didn't end up using, things that broke, etc)

i. **Testing** (10 points).

- Describe the tests you performed to verify that your device could meet the specifications you established as part of your QFD. This can best be in the form of a test plan that describes each test you performed.
- Show the actual test results from the tests that you conducted according to your test plan.

Note that for your specification, it is best to have target values, not just a yes/no or pass/fail. The same is true for your testing. It is best to have actual values (such as your actual device weight, or average and standard deviation of distance traveled), not just whether it passed or failed a particular test.

j. **Reliability and design margin analysis** (8 points).

- Identify and statistically analyze the key areas of variability that will affect the performance of your device and the ability for your device to accomplish all tasks.
- Analyze your test results from the previous section and anticipated variability to identify how to make your design more robust. FMEA may be a good tool to use along with detailed technical analysis or problems and how to solve them.
- List improvements made to your device based on the analysis that you've performed.

- k. **Safety analysis** (2 points). A safety analysis of your design or design choices that shows (a) risk areas (b) hazard risk and (c) what your team did to minimize the most critical hazards. See pages 229-233 in Ullman 4<sup>th</sup> edition for a recommended approach.
- l. **Service and support plan** (2 points). This should show what you plan to do in case any part of your device should fail and you need to make emergency repairs during competition day. What spares will you have?
- m. **Teamwork analysis** (5 points). This requirement is the same as it was for the first project. We encourage you to use team contracts, health assessments, meeting minutes, and other tools that allow you to work effectively as a team and include this information. We recommend that you have a summary of lessons learned in preparing the device and the report for the competition.

To summarize, the grading of this report is done using the same approach as for Project 1, but we do not need CREO models and we expect significantly better technical analysis and grade to a higher standard based on the things that you've learned in this class. Just like for Project 1, we expect that reports worthy of a grade of 90 or above will demonstrate initiative by including additional relevant material, demonstrate critical thinking in the analysis, and have a "WOW" factor to them.

#### **After the Competition**

We would like to keep all of your devices for one semester after the competition. We have a display case near the EMEC where your devices will be displayed until after the MECH 202 competition the next semester. Once that display period next semester is complete, you will be able to collect your device if you'd like to keep it.

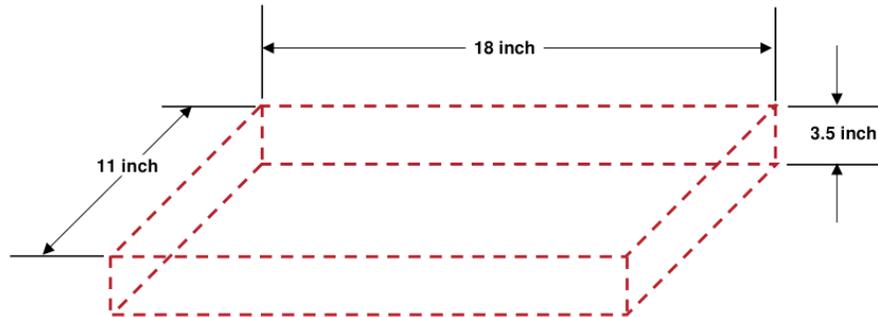
#### **Post Mortem**

By Monday evening Nov. 16 (at 6pm), all groups including those that won first, second, or third place must turn in brief post-mortem listing at least eight things they learned from the project, including competition day. Doing a post-mortem is a good idea for any project. This post mortem is your homework assignment for Nov. 16 and will be described in a homework assignment that will be posted on canvas.

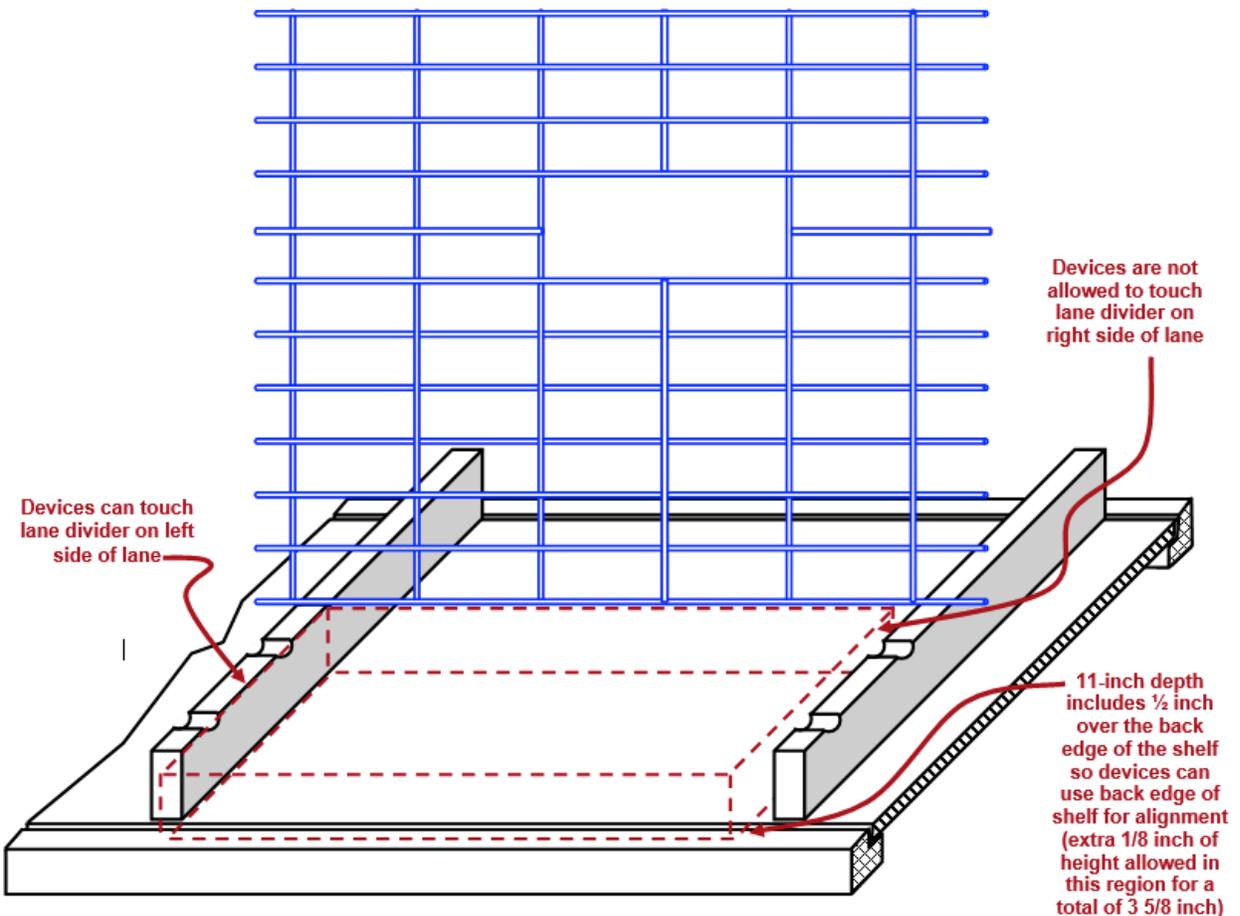
## APPENDIX B

### Supplementary Fixture Info and Parts List (Updated March 14, 2015)

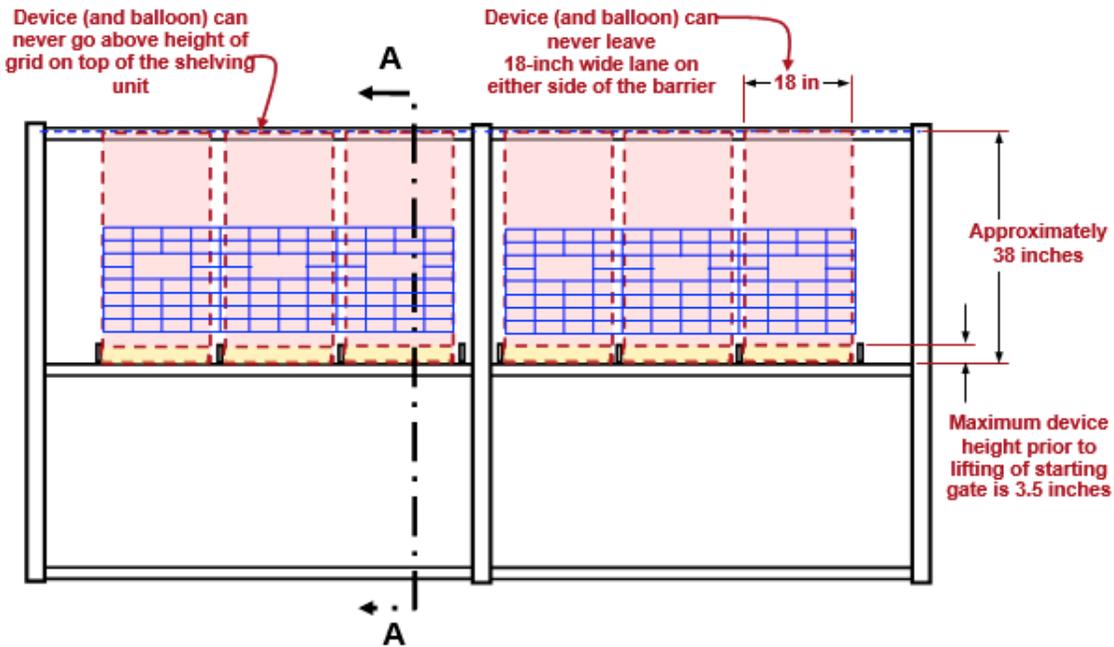
Below are the maximum dimensions for the device at the time it is placed in the starting region before the starting gate is lifted. Note that there is a small region occupied by the starting gate that the device cannot be in so that the starting gate can sit in the groove of the lane dividers.



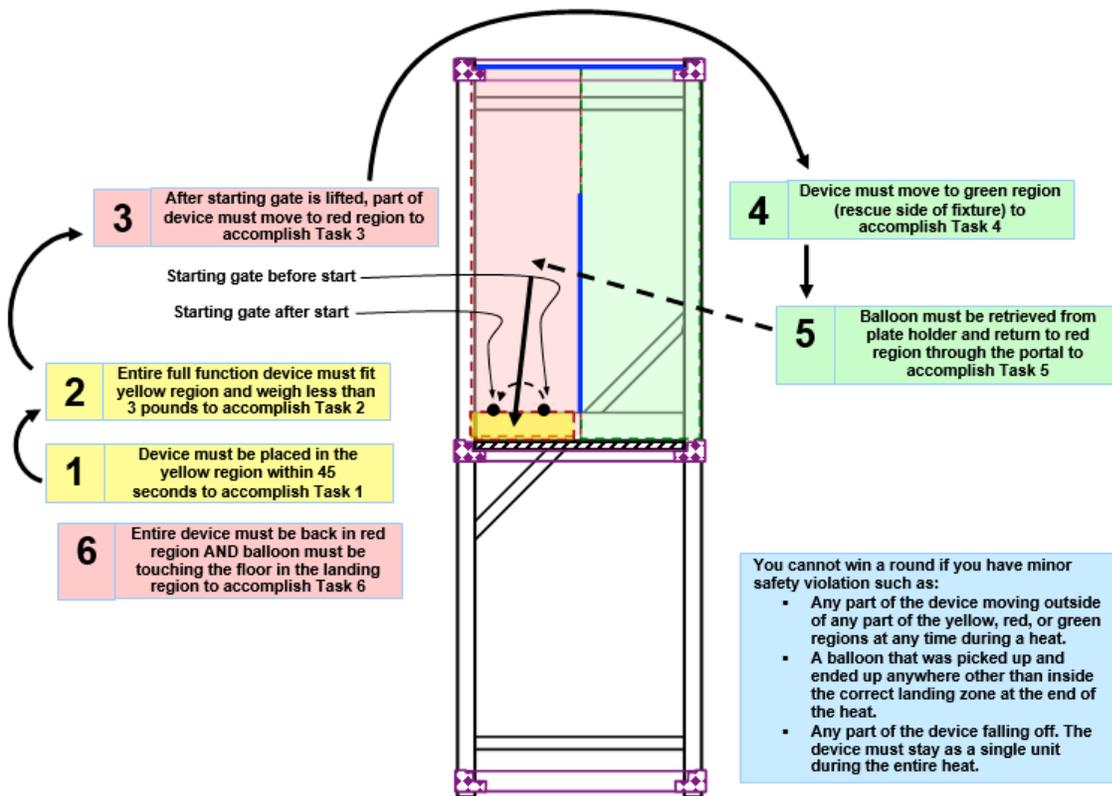
The diagram below is a section view of part of the fixture that shows the positioning of a device having the maximum dimensions in one lane of the fixture. Note how  $\frac{1}{2}$  inch of the total 11 inches are behind the back of the shelf. The portal is located approximately 12 inches from the bottom of the barrier, i.e. 6 rectangles up. Note that the portal may or may not be centered with the lane.



Below is a rear view of the fixture that more clearly shows the lane your device (and the balloon) must stay in at all times. This also shows where your device must start and the maximum height your device (and balloon) can achieve. Note that at no time can your device touch the lane barrier that is to the right of your device when the fixture is looked at from the back.



Below is a side view (taken at Section A-A in the sketch above) that shows the regions and tasks:



Below are some photos and illustrations of the test fixture (Updates will be given to the class later):



Here is the information needed to purchase the most important parts for building an identical test fixture or analyzing these components when the competition fixture is not available:

| <b>Item</b> | <b>Name</b>          | <b>Description</b>   | <b>Where bought</b> |
|-------------|----------------------|--|---------------------|
| 1           | Shelving units       | 77 inch wide x 72 inch high x 24 inch deep steel commercial shelving units model E RTP7224W3. Manufacturer is Edsal. | Home Depot          |
| 2           | White shelf          | 5/8" Melamine board cut to about 22 in x 71 in   | Home Depot          |
| 3           | Starting gate        | 6 ft x 3/4 in metal pipe (2 pieces) screwed together with a joint  | Home Depot          |
| 4           | Barrier              | 22" x 71" metal grid that came as part of shelving unit  | With shelving       |
| 5           | License plate holder | CSU Rams metal license plate holder  | CSU Bookstore       |
| 6           | Balloon              | Inflated to have diameter 4-6"   | TBD                 |

**Appendix C  
Cover Sheet Template**

**Group Number** \_\_\_\_\_

| <b>Group Members</b> | <b>Email Addresses</b> |
|----------------------|------------------------|
|                      |                        |
|                      |                        |
|                      |                        |
|                      |                        |

| <b>Section</b>                                | <b>Pages where found</b> |
|---|--------------------------|
| a. Cover sheet                                | 1                        |
| b. Title and photo of device                  | 2                        |
| c. Project plan & hours spent                 |                          |
| d. Specification development                  |                          |
| e. Engineering analysis                       |                          |
| f. Concept development and choice             |                          |
| g. Illustrated description of device function |                          |
| h. Bill of materials                          |                          |
| i. Description of testing                     |                          |
| j. Reliability and design margin analysis     |                          |
| k. Safety analysis                            |                          |
| l. Service and support plan                   |                          |
| m. Teamwork analysis                          |                          |

| <b>Supplemental Information</b> | <b>Where located</b> |
|---------------------------------|----------------------|
|                                 |                      |
|                                 |                      |
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|                                 |                      |
|                                 |                      |
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**Appendix E**  
**Competition Day Schedule (April 17)**

To be provided later

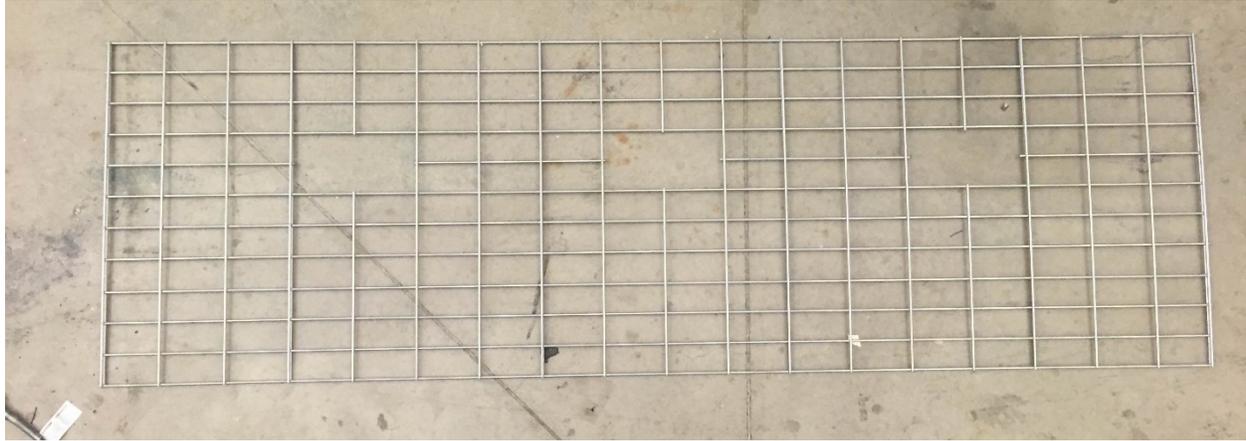
**Appendix F  
Revision History**

| <b>Date</b> | <b>Revision</b> | <b>Changes made</b>                               |
|-------------|-----------------|---|
| 05-Oct      | Rev 0 (Draft)   | Not applicable                                    |
| 08-Oct      | 1               | Dates and locations; balloon must remain inflated |
|             |                 |   |
|             |                 |   |

Addendum 10/18/2015

Further explanation of project two fixture:

**Dimensions of Barrier:**



Barrier position over lanes can vary up to an inch.

“Portals are 8x4”

All rectangles are 4x2” +- 1/2”

Portals may have rough protrusions up to 1/4”

**Barrier Touching:**

RULE CHANGE:

Your device can only incidentally touch the barrier, i.e. around the portal for balloon transfer.

However, it is at the discretion of the judges whether or not your device interfered with other group’s operations. You will be disqualified if they decided there was interference because of the barrier moving.

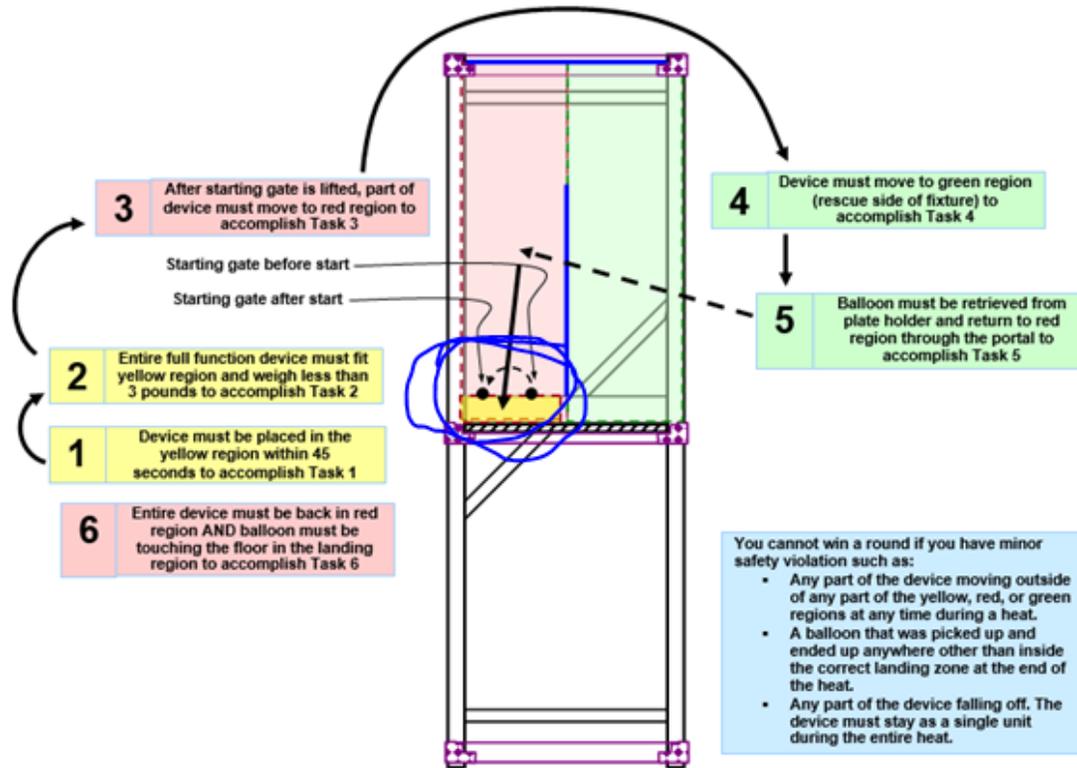
**Start Gate:**

Go watch last semester’s video: [www.mech202.com](http://www.mech202.com)

**Returning Balloon to Start (RULE CHANGE):**

The balloon must have a visible amount of its body in the start region of the fixture upon completing the task. This is a change from having to have the balloon touch the surface. This should be able to be verified easily by sight. Looking at the diagram below: some of the balloon must reside in the yellow region.

Below is a side view (taken at Section A-A in the sketch above) that shows the regions and tasks:

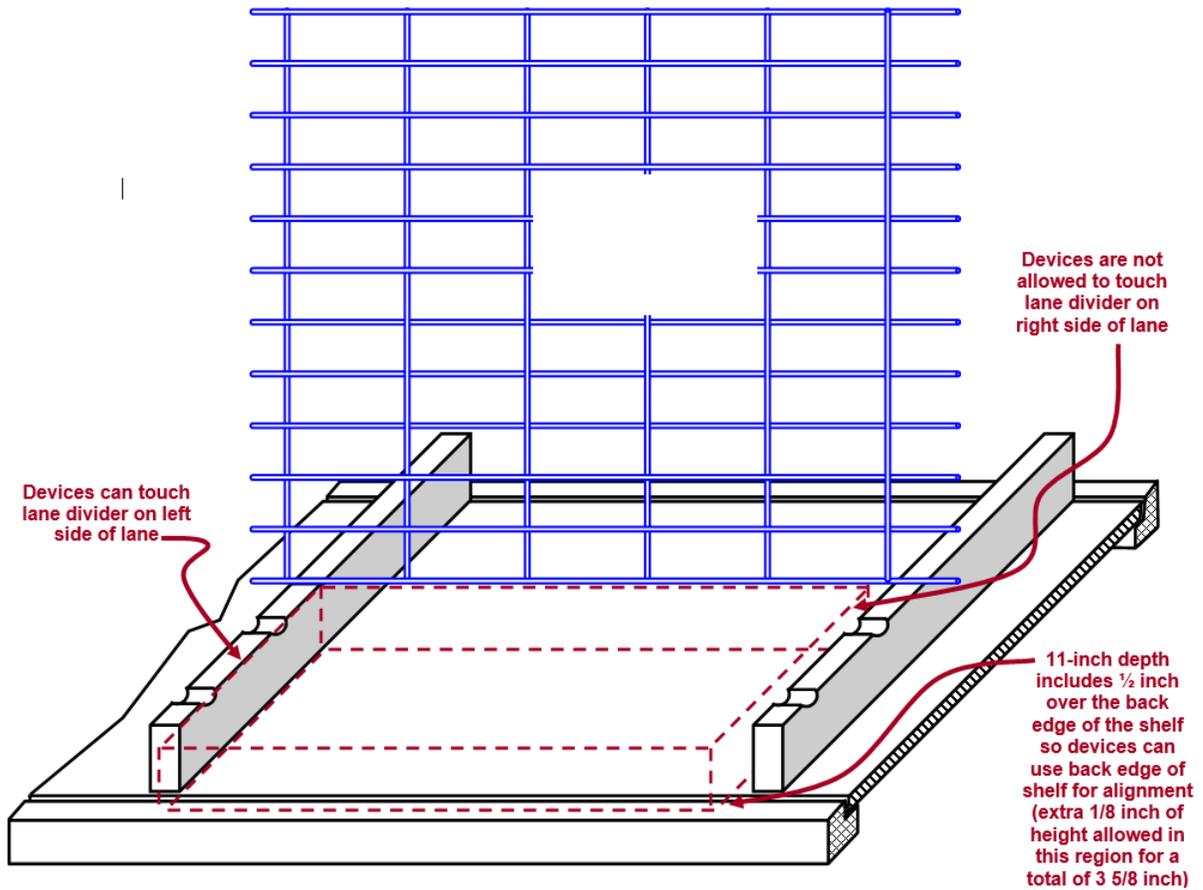


### Other Questions:

You can go under the barrier at the start.

You may not break the balloon.

Mech 202 Fall 2015 Project 2



Great news! The portal lords called and told us that due to unforeseen circumstances, the portal has grown! It has grown almost 2" below its original position. The keepers of the balloons are worried but we think it will only increase our chances of performing a successful rescue.

GOOD LUCK!

# Clarification of Safety Rule 9b

**Adhesives: permanent (i.e., glues) and semi-permanent (i.e., static electricity, suction cups, certain kinds of tape).**

**Safety check in: teams using tape gripper were tested for residual left behind. Green Scotch Guard approved for competition. Available for use. Other kinds of tape not tested, risk of DQ.**

**Inspection for residual on balloon will be simple visual and tactile examination immediately following round. Judges determination is final.**