Element G: Construction of a testable prototype

This entry would be likely to receive a score of 3, based on the EDPPSR.

The students involved presented as their goal the reinvention of the life jacket to be more comfortable so that more people would be likely to wear a PFD (portable floatation device). The design requirements that were identified in the entry for Element C included adjustable size, inexpensive material, appealing appearance, safety, ergonomics, life cycle (capable of repeated uses) minimal maintenance, and customer needs for comfortable and non-restricting floatation device. In the entry for Element G, the focus is on comfort, mobility, and cost. Each of these is explained briefly. However, the explanation of the construction of a testable prototype provided detailed information only about adjustments to address comfort and capacity to adjust for size differences.

Thus, the final prototype iteration is explained only partially, and is constructed with enough detail to assure that objective data on a few—but not all—of the design requirements could be determined. Some attributes of the solution that can be tested are addressed; however, there is no justification provided for those that cannot be tested or modeled mathematically and would therefore require expert review. The omission of this justification may cause some readers to assign a lower score (most likely a 2) to this entry.

Although those who review each portfolio can certainly move back and forth among entries, it would probably have been helpful if the entry included a brief reiteration of the design requirements/parameters—not just for those evaluating the portfolio but for the students engaged in this engineering design project. With attention to the design requirements that had been previously identified and with justification for those that cannot be tested (along with documentation of expert review where needed), this entry could easily rise to a score of 4 or even 5.

Engineering Design Process Portfolio Scoring Rubric
Component and Element Titles

Component I: Presenting and Justifying a Problem and Solution Requirements

- Element A: Presentation and justification of the problem
- Element B. Documentation and analysis of prior solution attempts
- Element C. Presentation and justification of solution design requirements

Component II: Generating and Defending an Original Solution

- Element D: Design concept generation, analysis, and selection
- Element E: Application of STEM principles and practices
- Element F: Consideration of design viability

Component III: Constructing and Testing a Prototype

- ***Element G: Construction of a testable prototype***
- Element H: Prototype testing and data collection plan
- Element I: Testing, data collection and analysis

Component IV: Evaluation, Reflection, and Recommendations

- Element J: Documentation of external evaluation
- *Element K: Reflection on the design project*
- Element L: Presentation of designer's recommendations

Component V: Documenting and Presenting the Project

- Element M: Presentation of the project portfolio
- Element N: Writing like an Engineer

Please Note: Elements M and N require no submission from the portfolio author(s) and are intended to be scored based on the portfolio work as a whole from what has been submitted from Elements A through L

Element G: Construction of a testable prototype

5 The final prototype iteration is clearly and fully explained and is constructed with enough detail to assure that objective data on all or nearly all design requirements could be determined; all attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and a well-supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

4 The final prototype iteration is clearly and adequately explained and is constructed with enough detail to assure that objective data on many design requirements could be determined; most attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and a generally supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

3 The final prototype iteration is clearly and adequately explained and is constructed with enough detail to assure that objective data on some design requirements could be determined; some attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed and an adequately supported justification is provided for those that cannot be tested or modeled mathematically and thus require expert review.

2 The final prototype iteration is explained only somewhat clearly and/or completely and is constructed with enough detail to assure that objective data on at least a few design requirements could be determined; a few attributes (sub-systems) of the unique solution that can be tested or modeled mathematically are addressed but there may be insufficient justification for those that cannot be tested or modeled mathematically and thus require expert review.

1 The final prototype iteration is only minimally explained and/or is not constructed with enough detail to assure that objective data on at least one design requirements could be determined; no more than one attribute (sub-system) of the unique solution that can be tested or modeled mathematically is addressed and any attempt at justification for those that cannot be tested or modeled mathematically and thus require expert review is missing.

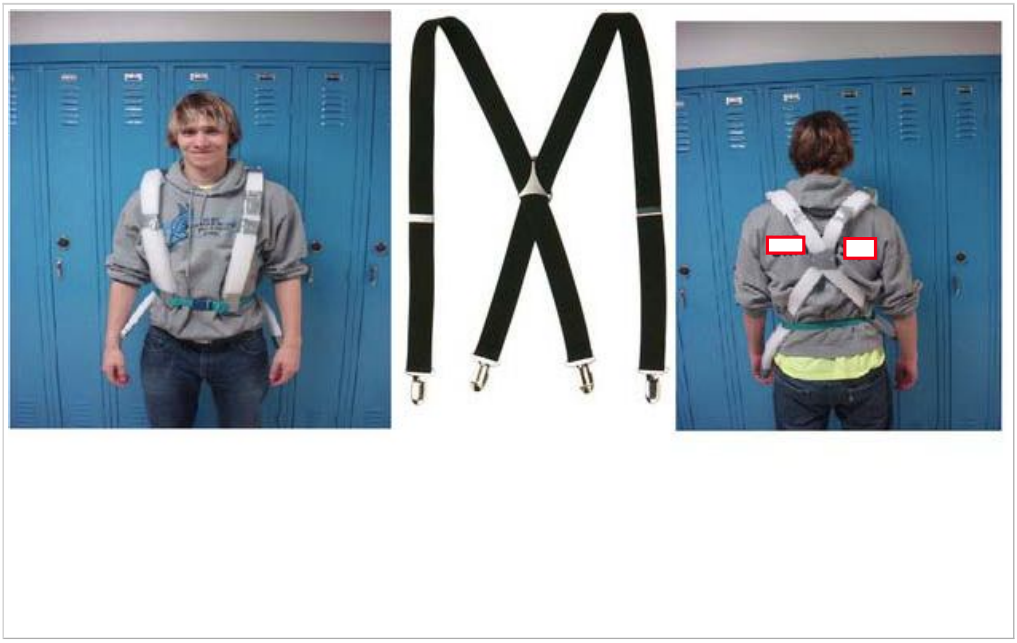
0 Any attempt to explain the final prototype iteration is unclear or is missing altogether; there is no evidence that the prototype would facilitate testing by suitable means for any of the design requirements.

Prototypes

In designing our first prototype we spent a lot of time researching past and current solutions. That ranged from traditional life jackets to life jackets that are not United States Coast Guard approved to wet suits and water toys. We also looked into what makes life jackets work, what materials were used and what fabrics are most comfortable when wet. Some life jackets are inherently buoyant and others need to be activated, most commonly by pulling a rip cord that inflates a bladder.

The main elements from our research that we integrated in our design comfort, mobility, and cost. Comfort was the highest priority in our design. We wanted to make our life jacket comfortable because if it is not comfortable people are not going to want to wear it. Next was mobility. We wanted to maintain complete arm motion while the jacket was on so you could comfortably drive a boat, cast a lure, or paddle a canoe. Finally cost. The first trend we noticed was inflatable life jackets are much more expensive than foam jackets. Also they can only be used once; than you have to refill the CO_2 cartridge. The cost and added maintenance were the reasons we decided not to design an inflatable life jacket.

When we created our first prototype we used all the information gathered from our research in the design. The design we came up with resembles suspenders.After the first tests our prototype worked surprisingly well. There were some things we wanted to change about it like the chest strap and making it more adjustable but were added to our second prototype.



Final Prototype

Our final prototype iteration is that we made three complete prototypes. This first prototype most closely resembles the original idea of the suspenders. As we tested the prototype and tweaked the design we came up with our second prototype.

What is different in the second prototype is we added straps to the end of the foam so that the jacket cold be adjustable in the back and at the waist. In The first prototype the foam connected straight to the waist strap in the back limiting the jacket to fit only a certain amount of people. Also we added a strap that would go across the chest. This strap is adjustable and it helps keep the jacket tight on the chest so the jacket stays in place.

In our third and final prototype we bought duel adjusting clips so that they can be adjusted on both sides. Also instead of sewing the foam directly to the waist strap we fixed the foam on top and below the strap. Doing this allows the foam to slide side to side on the strap while keeping the foam attached to the strap. We did this so when a smaller person wears the jacket and has the straps pulled tight decreasing the circumference of the waist strap the foam will be in the correct position and if a larger person wears the life jacket and loosens the straps making the circumference of the waist strap larger the foam will be in the correct position for them too.

Please ask to see the videos that were submitted with this portfolios regarding testing. Or access the video directly at http://www.youtube.com/watch?v=gJVcLDtejIQ
The video can be found by accessing the You Tube Site and they typing "Aqua Bouy" in to the search string. This search string was still active as of 2.15.2012