

The majority of a large group of engineering educators who scored this entry gave it a **score of 4** based on the EDPPSR, although several assigned and defended a score of 3. The design requirements are listed and prioritized, and are generally (but not consistently) clear and detailed (e.g., defining minimization of spillage as “no spills if liquid is ½ inch or greater below the top of the cup”), although additional detail (e.g., whether a “standard crutch” is a specific material or may be wood, aluminum, etc.) could have been included. The design requirements are measurable and appear likely to lead to a viable solution to the problem of transporting beverages when using an underarm crutch for mobility. The engineering educators who scored this portfolio as a 3 rather than a 4 consistently cited the limited stakeholder input when explaining their score decisions. Although several pointed to evidence of validation by only one representative stakeholder (an individual currently on crutches), the designers also refer to “discussions with the physical therapists”—who would also be legitimate stakeholders. Consideration of only a few rather than several primary stakeholder groups, by itself, would not outweigh the presentation of the design requirements in this entry, given the scoring policy of assigning the score the descriptors which are the “best fit” the entry. Nevertheless, inclusion of additional evidence that requirements represent the needs of—and have been validated by—several primary stakeholder groups would have solidified a score decision of 4.

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 C - Presentation and justification of solution design requirements

- 5** Design requirements are listed and prioritized, and they are consistently clear and detailed; these design requirements presented are consistently objective, measurable, and they would be highly likely to lead to a tangible and viable solution to the problem identified; there is evidence that requirements represent the needs of, and have been validated by, many if not all primary stakeholder groups.
- 4** Design requirements are listed and prioritized, and they are generally clear and detailed; these design requirements presented are nearly always objective and measurable, and they would be likely to lead to a tangible and viable solution to the problem identified; there is evidence that requirements represent the needs of, and have been validated by, several primary stakeholder groups.
- 3** Design requirements are listed and prioritized, and they are generally clear and somewhat detailed; these design requirements presented are generally objective and measurable, and they have the potential to lead to a tangible and viable solution to the problem identified; there is evidence that requirements represent the needs of, and have been validated by, at least a few primary stakeholder groups.
- 2** Design requirements are listed and prioritized, but some/all of these may be incomplete and/or lack specificity; these design requirements may be only sometimes objective and/or measurable, and it is not clear that they will lead to a tangible and viable solution to the problem identified; there is evidence that the requirements represent the needs, of/and or have been validated by, only one primary stakeholder group.
- 1** An attempt is made to list, format, and prioritize requirements, but these may be partial and/or overly general, making them insufficiently measurable to support a viable solution to the problem identified; there is no evidence that the requirements represent the needs of, or have been validated by, any primary stakeholder groups.
- 0** Design requirements are either not presented or are too vague to be used to outline the measurable attributes of a possible design solution to the problem identified.



A

B

C

D

E

F

G

H

I

J

K

L

M

N

Our primary stakeholders will be individuals on crutches, since they will be the end user of our product. Frequent in-person, email, and telephone interviews with an individual currently on crutches, and discussions with the physical therapists led us to establish a base-line of requirements, which were based on their concerns and desires.

We then looked at similar existing products, and filed patents, and we listed those product attributes that we liked, and those characteristics we wanted to add. These steps enabled us to refine and establish the final design specifications

The results of this research and evaluation are listed below. The specifications are listed in order from highest priority to lowest.

Performance Benchmark Design Constraints

1. Minimize spillage: no spills if liquid is $\frac{1}{2}$ inch or greater below top of cup. It is impractical to fill a beverage cup above this line- it cannot be carried effectively without a cover.
2. Inexpensive, selling price \$9.00 - \$14.00 based on similar existing products
3. Must fit on standard crutch, since this is the type issued to most patients.
4. Will hold mugs with diameters of no less than 3 inches and no greater than 4 inches. These dimensions will encompass most of the commercially available mugs and disposable cups.
5. Will hold mugs with heights of no less than 4 inches and no great than 6 inches. These dimensions will encompass most of the commercially available mugs and disposable cups.
6. Sturdy: won't break if:
 - dropped from a typical hand "holding height" of 3 ft
 - the crutch falls from an upright position or slides down from a resting position
 - while being attached to crutch
7. Light weight- weighs 2 lbs or less. Our consumer expressed that when she is trying to carry objects more than 3 lbs, her balance is thrown off.
8. Suitable for holding other non-food items (keys, coins, Rx bottles,...) so as to be more useful and convenient.
9. Top rack dishwasher safe and made of BPA-Free Plastic due to health concerns.