

CAD 2

2016 FINAL EXAM PROJECT – CARDBOARD ERGONOMIC CHAIR DESIGN

Situation

Cardboard (corrugated and single sheet), made from a renewable resource, has one of the best environmental records. In 2014, more than 33 million tons of corrugated cardboard were recovered and recycled in the US – that is 80% of all the cardboard produced in that same year as per Recycle Across America states. (<http://recycleacrossamerica.org/recycling-facts>)

Problem

To design and build a full-size ergonomical chair from cardboard and fastening materials that will hold a few persons for a specified amount of time.

DESIGN BRIEF

1. Your chair will be made from cardboard (corrugated) materials only.
2. The chair must hold one member from your team for at least 5 minutes. The person seated will be in a “comfortable” position with his/her back leaning against the chair.
3. Your chair must integrate the following:
 - a. Function (does the chair work)
 - b. Aesthetics (is it pleasing to the eye, painting)
 - c. Ergonomics (is it comfortable for the average person)
 - d. Details (are my drawing and actual construction accurate)
4. The chair must have a seat and a back.
5. The seat of the chair must be at least 16-1/2” from the floor (measure to the bottom of the seat (the lowest point)).
6. A rocking chair designs not permitted.
7. Your team will make a PowerPoint to hand in at the conclusion of the activity.
8. Fastening design materials – glues and tapes (plastic) only – no duct tape allowed. If we do not have the tape then you must supply it. You may only tape the seams with 1.5 inches on each side of the seam, not the entire side.
 - a. Minus 10 to 15 point deduction for not adhering to this rule on the testing aspect grade
 - i. 1-2 areas minus 10 points
 - ii. 3 areas minus 15 points
 - iii. 4+ areas you will not test your chair – a conscience rebuttal to the rules
9. People: groups of two
10. Time: 10 -13 class meetings
 - i. One for research
 - ii. Two - Three for drawings – possible solutions
 - iii. Four to Five to build and test your prototype designs
 - iv. One for evaluation/redesign
 - v. One for testing

The Design Loop:

Research:

As a team you will research 10 chair designs each and record these findings in your PowerPoint. Copy and paste the picture and provide a caption, heading or description of the picture. Five pictures per page please.

Brainstorming/Possible Solutions:

Each team will produce two (2) orthographic projections CAD drawings of your possible solutions to this problem.

Best Solution:

- a. From your 2 possible solutions you will choose a best solution.
- b. You will produce a final solution working drawings – an orthographic, a perspective drawing (isometric, oblique or one point perspective) and a 3 dimensional rendered drawing, and a sectional drawing (full, half, offset.)
- c. Changes to Final Design: can be made but must be made to the CAD drawing, reviewed and approved by Mr. Mugno with the original drawing before making changes to the chair – just like in the manufacturing world.

Prototype

You will build a full scale model from your drawings made completely out of corrugated cardboard and the specified fastening material of your choice

Test/Analyze/Evaluate/Redesign/Modify

Test your chair to see if it does work and what needs to be modified or redesigned.

GRADING:

3 possible solution CAD designs – 12%

Project – (100 pts) – 60%

- a. Form aesthetics paint the chair – 25 pts – 10%
 - b. Ergonomically comfortable – 25 pts – 20%
 - c. *Structural integrity – 50 pts – 30%
 - I. 10% - large mass test (faculty humans)
 - II. 10% - student test (requirement) – 5 minutes
 - III. 10% - test to the max (weight room) – chair is no longer usable
- Your weight divided by the weight of your chair equals a strength design factor. High numbers are best! We will have teachers of large mass test them as well for their integrity too! They weight must be held for three (3) minutes multiple times – two/three separate tests.

- After the teachers test we will test the chairs in the weight room/wellness for their integrity taking the chairs to the maximum possible weight it can hold before it is no longer useable (leg breaks, seat dips below the 16-1/2” height, back falls off, etc.) We will test multiple chairs at the same time and put the weights on in increments of 25 to 45 lbs. weights.
- Final team rankings will be based on the total score from the competition components. A maximum of 100 points are available. In the case of a tie the team with the lighter chair will be declared the winner.
- Extra Points are available for the following:
 - Chair that will swivel/rotate – 3pts
 - Arms/rests for the chair – 2 pts
 - Cup holder – 1 pt per holder max two holders

Documentation

- I. Title page –
 - i. Includes your names
 - ii. Course
 - iii. Instructor
 - iv. Name of company and product
- II. Slides of 10 of your team’s researched designs 5 each? (Remember you must research at least 10!)
 - v. 4-6 pictures per page
- IV. Discuss where you came up with the possible solutions – there are two (2) so each one.
- V. Timeline of pictures – showing your progress every day of the construction phase (Day 1, Day 2 etc)
- VI. Slides of final solution – pictures/photos showing 4 views: front, top, side and bottom. Explain why you chose this as your final solution design?
- VII. Discuss any problems you may have encountered.
- VIII. How did it do when tested? Explain/analysis in a paragraph. Discuss the structural integrity.

Documentation Report – 40%

To be organized in the following order when handing in:

- A. Word Document (60%)
- B. Cad possible solution drawings (10%) - corrected

- C. CAD final design drawings (20%)
 - a. Orthographic projection (7%)
 - b. Perspective (5%) – isometric, oblique, one or two point perspective, axonometric
 - c. Sectional View (5%) – Full, Half, Removed, Offset
 - d. 3 dimensional drawing (3%)

D. Personal Evaluation (10% each)

Each group member provide a two (2) paragraph personal evaluation of the project – likes, dislikes, was it interesting, boring, etc. Explain your thoughts on this project, things you may suggest I change for future classes.

Discuss in a few sentences how you and your partner worked together with this project.

E. 3 Dimensional Model Print out to a normal scale (1/2,1/4) of the final design (?)

THIS IS TO BE HANDED IN AS ONE COMPLETED DOCUMENT - NO PIECE MEAL!!

DECISION

****YOU WILL BE BROUGHT FOR THE FINAL WRITTEN EXAM ON THE PRESCRIBED DATE FOR THE FOLLOWING:**

- FOOLING AROUND @ TEACHER DISCRETION

i.e. playing games on the computer, surfing on computer not related to this project, texting/ using your cell phone or personal device for “other” needs.

YOU WILL RECEIVE A ZERO (0) FOR NOT HANDING IN ANY ASPECT OF THE PROJECT ON TIME – POSSIBLE SOLUTIONS, DOCUMENTATION, CAD DRAWINGS, PROTOTYPE FINISHED.

**THIS IS YOUR FINAL AND NO EXTENSIONS !!!!!!!
HANDING IN LATE OR THE NEXT DAY/MORNING –
NYET, NADA NO!!!**