

ME 360L Project Phase II – Spring 2012

In Phase I of this project, you developed the preliminary design of a high performance pogo stick that can be used by people of varying weights and heights. The requirements for Phase I were:

1. Research modern high performance pogo sticks on the web.
2. Come up with a design idea for your pogo stick.
3. Develop performance criteria (how high can one jump – how high of an object can someone jump off ...)
4. Develop appropriate safety factors to be used in the design.
5. Sketch a preliminary design.
6. Decide what materials you will use in your design.
7. Develop testing scenarios for the analysis you intend to perform in your design process.
8. Analyze loads using hand calculations, Adams and/or Working Model using each of these testing scenarios.
9. Develop analysis procedures for each part. What are the loads and constraints you will use in testing each of the major parts in your design?



Turn in a brief summary of your results. Much of this summary information can be presented in tables and in sketches. Indicate in this summary how you computed the loads. Show pictures and diagrams depicting how you will apply the loads and constraints to the parts for testing.

In Phase II of the project, you will complete the design using your preliminary work as a basis. The stresses on parts will be computed with Mechanics. All of the loading cases developed in Phase I will be analyzed along with additional loading cases necessary for the comprehensive design of the pogo stick. The maximum stresses on each part will be used to compute safety factors for that part. In all cases, the computed safety factor will equal or exceed the planned safety factor in Phase I. Metal fatigue will be considered where appropriate.

Deliverables:

This project will culminate in both written and oral reports. The reports will contain:

1. A discussion of the Pogo Stick's performance characteristics. These should include a graph showing the maximum height a rider can attain versus the rider's weight and the maximum upward force on the rider's feet and how it varies with the rider's weight. The method used to calculate the performance characteristics must be included in the discussion.
2. An assembly drawing showing how the parts go together. There should be a bill of materials associated with this drawing.
3. Detailed dimensioned drawings of the pogo stick parts. These should be drawn at a scale that allows them to be easily seen and understood. All parts should be shown.
4. The results of each load case explaining:
 - a. How the loads were derived. Show any necessary computations. List all assumptions.
 - b. Show the loads and where they are applied. Illustrate with a drawing or diagram showing the magnitude, direction, and area of application for the loads. A Mechanics fringe plot is not sufficient for this diagram.
 - c. Show the constraints used in the analysis and where they are applied. Illustrate with a drawing or diagram (this can be the same drawing or diagram as used for the loads).

- d. Fringe plots showing both the stresses and the displacement of the pogo stick or pogo stick parts. These plots should be reasonably large so that stress details can be easily seen. The maximum stress should be shown on the fringe plot. The maximum value in the fringe plot legend should be set to the maximum design limit (the maximum allowable stress divided by the design safety factor) for the part.
 - e. A comparison of the load and displacement limits you set for the problem with those computed in the analysis. In every case, the computed safety factor must not be less than the safety factor proposed and approved in Phase I.
5. The written report for the project is due May 4, 2012.
6. The oral presentations will be made during the week of April 29th, 2012.