Needs to Project Specification

Senior Design Group #4

Eglin Air Force Base: Crushed Test

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**Introduction**

AFRL is interested in studying the mechanical and dynamic properties of a steel cylinder as it undergoes an external quasi-hydrostatic pressure. The purpose is to be able to apply a variety of compressive forces at varying lengths along the cylinder. The pressure will be applied using an incompressible media, like concrete, through an applied external compressive force. Plates will then be placed around the substrate and be tightened uniformly until a multi-axial compressive load is applied to the surface of the steel cylinder. A series of dynamic tests would then be performed on the cylinder to determine the system behavior under these loading conditions.

**Product Objective**

The principle objective of the project is to design this system such that compressive force on the outer diameter of the cylinder can be determined based on the stresses in the plate and the applied torque. For the final design no sensors can be applied to the cylinder or in the incompressible media. This system must be segmental in nature can be combined to apply a continuous load over the entire length of the cylinder and the steel forms must be able to be re-used. Future iterations of this project will include looking at a variety of media to compress the cylinder through such as gravel, sand, or crushed concrete.

**Product Specifications**

The design will consist of two major parts; the mechanism to hold the incompressible media and the incompressible media. This project is constrained to be completed no later by the end of spring 2011, and within a budget of $2000. The product specifications were determined by the group and Dr. Janet Wolfson, of Eglin Air Force Base, through e-mails, face to face meetings, and conference calls. These product specifications are going to be the constraints that the group will have to work within in order to achieve a design that is satisfactory to the customer. The constraints are as follows:

* Cylinder
  + The cylinder that the compressive force is applied to should be 6” in diameter and 24” long.
  + For the first iteration the compressive area of the cylinder is 12” long.
  + The thickness of the cylinder needs to be designed to withstand the applied loads, i.e. cylinder does not fail.
  + The applied force to the cylinder will be hydrostatic in nature and be between 1,000 lbs to 10,000 lbs
  + Must be a Commercial Off The Shelf (COTS) tube

There are additional suggested constraints but are not necessarily needed to come up with successful design. The incompressible media is suggested to be concrete and since the product is segmental, each segment should be around one inch long. The system consists of individual segments that are