

## The Tuned Mass Damper

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### Introduction

My research aims to design a tuned mass damper for a model structure. The concept of the tuned mass damper is illustrated using the two-mass system shown in Fig. 3. Here, the tuned mass damper, referred to with subscript d, is connected to a structure that is idealized as a single degree of freedom system (SDOF). In the real world, tuned mass dampers are designed to limit the motion of buildings when they are subjected to external excitations, such as an earthquake or hurricane.

### Design

The preliminary design of the mass damper involves determining the value of the device's mass and stiffness based on analytical results from literature. With these values, the dimension of the mass, its material, and the springs to provide the stiffness can be determined. With these, the details of the mechanism can be designed.

The resulting tuned mass damper system design is comprised of a number of components including: The main mass and four bearings, with a total weight of 4 lbs. Two rails that go through the mass and the four springs that provide the device's stiffness. Two cover plates are designed to prevent the springs from making direct contact with the bearings. Four supports that hold the rails. Two minor buffer plates that are designed to increase the clearance between the base plate and the mass. And two adaptor plates that are designed to connect the device to a model test structure.

The overview of the TMD design is shown in Fig.1. and Fig.2.

### Future Work

Once the tuned mass damper is fabricated, I will conduct experimental testing to identify the effectiveness of the tuned mass damper to control the response of a four-story model building. I expect that the mass damper, once properly tuned, has an excellent capacity for vibration control. Furthermore, I expect that this device provides a useful platform for exploring the dynamics of impact dampers and semi-active systems in the future.

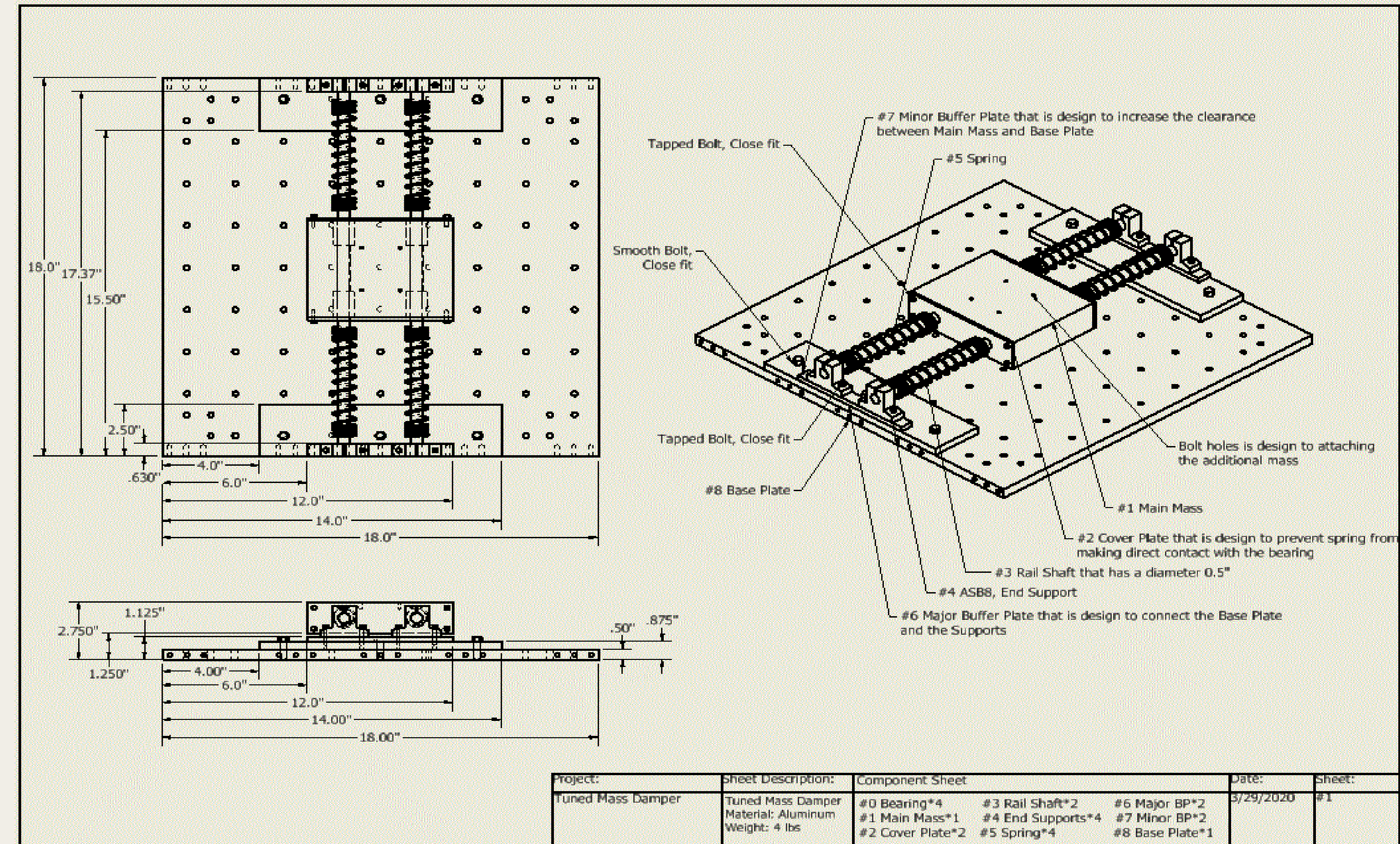


Fig.1. Overview of the Tuned Mass Damper

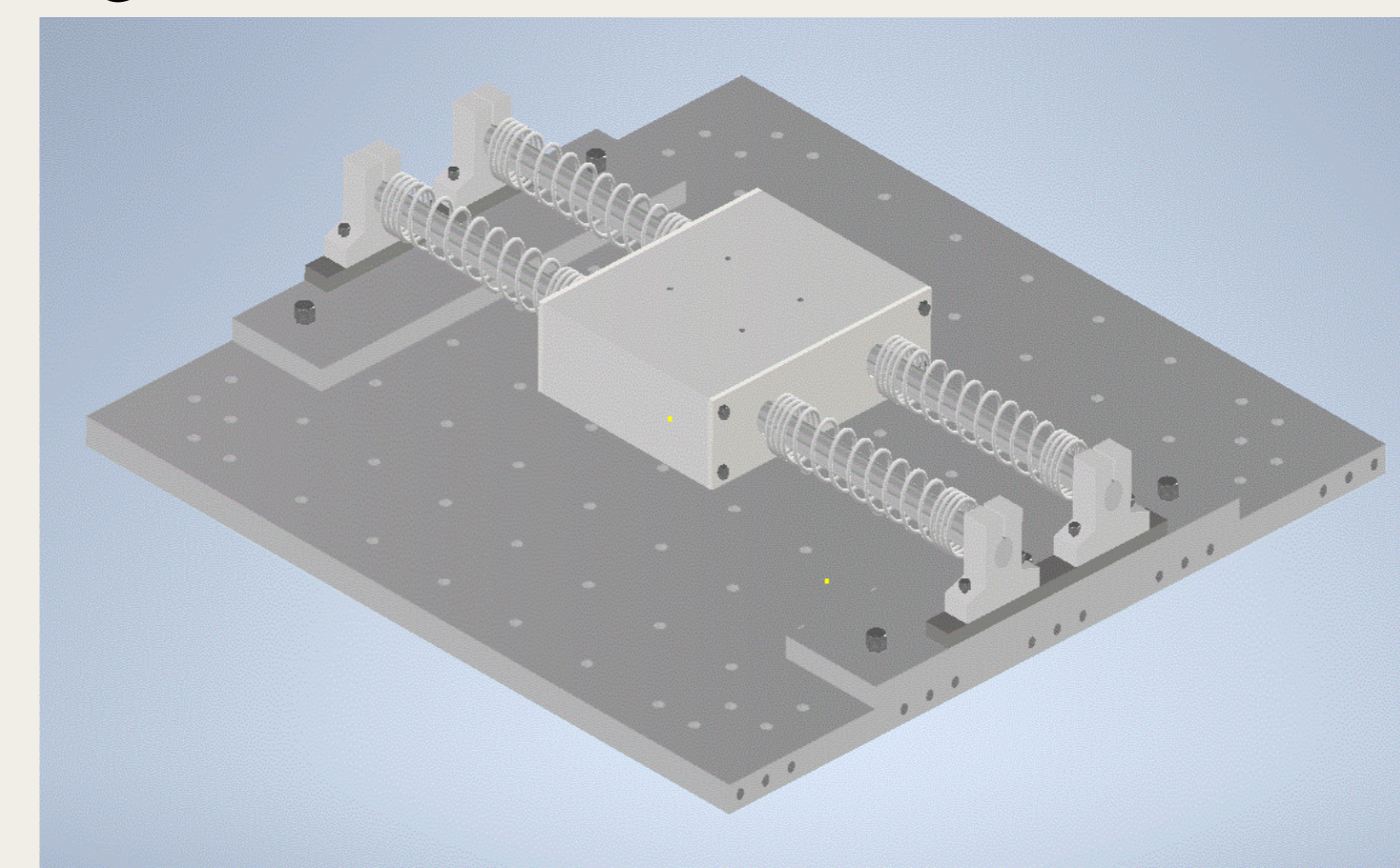


Fig.2.

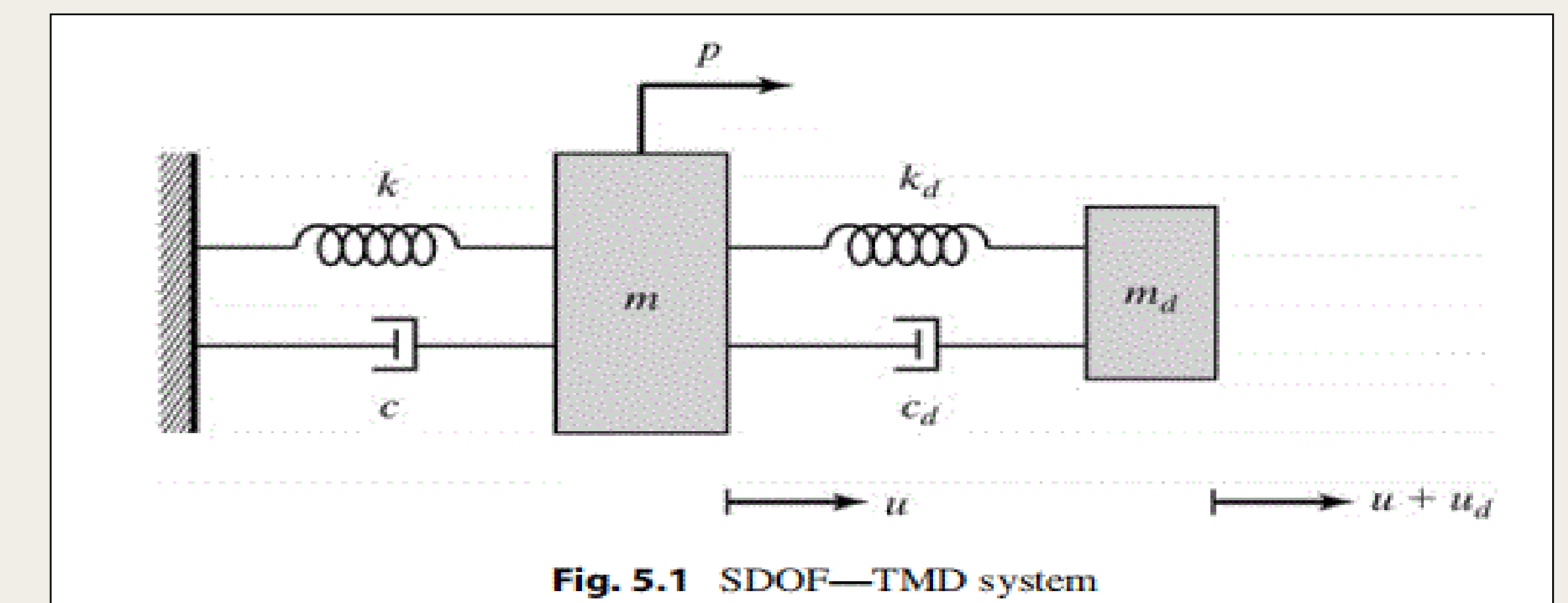


Fig. 5.1 SDOF—TMD system

Fig.3.