

Written Proposal



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HGS – Large Scale Manufacturing Facility
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Executive Summary

To complete my senior thesis, I will provide a more detailed analysis on the LSM project with respect to current building systems and processes. The three analyses that will be explained in this proposal include: analyzing floor systems for pharmaceutical and health related buildings; analysis of exterior wall system; and 4-D coordination of equipment move-in and construction processes. Each one of these analyses will touch on one or more of the following investigation areas: Research/Developing Methods Study, Value Engineering Analysis, Constructability Review, and Schedule Reduction/Acceleration Proposal.

Below is a weighted distribution that depicts the amount of emphasis that will be placed on each of the investigation areas for each analysis.

Description	Research	VE	Constructability Review	Schedule Reduction	Total
Flooring systems	10	10	5	10	35
Ext. Wall system	15		5	10	30
4-D Coordination	10	5	10	10	35
Total	35	15	20	30	100

Analysis #1: Flooring System Redesign

Issue

Within the LSM facility there are numerous areas that are considered “clean rooms”. This requires the flooring system to provide a smooth hard surface that is not only durable to daily wear and tear but also to chemical exposure. An epoxy flooring system was used at the LSM facility, which is a very good system, but there is a lot of time associated with the installation process.

Goal

I plan on analyzing different floor systems that can be used with this type of facility. Multiple aspects need to be taken into account to determine the best flooring system. Human Genome Sciences is trying to finish this project at the lowest cost possible and within the determined schedule, so the flooring system with the lowest cost and installation time would be sufficient. Some factors that need to be analyzed are maintenance costs, availability of product, durability, and reaction to certain chemicals.

Research Steps

Initially, I plan on researching flooring systems that have been used on pharmaceutical manufacturing facilities and containment rooms on the internet to determine all of the different types of systems. This will include determining cost per square foot, durability, and availability throughout the US and other countries.

For some other sources of outside information I plan on contacting different Construction Managers that I have contacts with to find out what flooring systems they have used. I will also be able to determine which systems they feel work the best as well as specific details on each system.

By with different Construction Managers and researching websites on the internet I plan on devising a list of flooring manufacturers that I can speak with and send surveys to. On the surveys I am going to try and determine basic information (most widely used, easiest to install) on the flooring systems as well as detailed information (durability, cost).

From my research I will be able to determine an alternate system to the epoxy flooring system used at the LSM Facility. I will be able to determine any benefits and disadvantages related to cost, schedule, installation, and durability.

Analysis #2: Exterior Wall System

Issue

The LSM facility was originally designed to entirely have a brick façade. VE was performed and three of the facades were changed to metal wall panels. It saved HGS money, but the building lost its aesthetic value. It also no longer resembled the three other buildings in the research park that are owned by HGS.

Goal

My goal is to find a wall system to replace the three facades that were changed to the metal wall panels. In doing so, my primary objective will be to increase the aesthetic value of the facility. I will also try to find a wall system that is either less expensive or will take less time to install.

Research Steps

My research steps for this analysis will be similar to how I will perform my research on flooring systems. I plan on researching different wall systems online, and I will also try to get in touch with some contacts I have made in Construction Management firms to collect some general data. I also plan on researching online journals to find out more information of specific wall systems.

Once I have found a few wall systems to research, I will look into all of the advantages and disadvantages to each system. I plan on using R.S. Means as my main source of collecting cost and schedule data. I will also speak with manufacturers about products.

From my research I will be able to determine an alternate system to the metal wall panels used at the LSM Facility. I will be able to determine any benefits and disadvantages related to cost, schedule, installation, and durability.

Analysis #3: 4-D Coordination

Issue

One major issue on the LSM project was coordination associated with the arrival of new equipment. Most of the equipment in the building is of a large scale and if it cannot be set in its respective location there needs to be a place set aside to store the equipment. To further explain the situation, eleven large air handling units are located in eastern side of the building. Each unit is placed on an elevated pad that requires a painted on epoxy finish. Most of the flooring throughout the building consists of an epoxy grout that must be installed in three steps: sand blasting the concrete, placing the initial layer of the grout, and then placing the finish coat. This makes moving equipment throughout the building quite difficult.

Goal

I plan on creating a 4-D CAD model that will incorporate a majority of the first floor (Figure 1 on the next page). The model will consist of equipment movement, the pouring of equipment pads, installation of the epoxy paint, and installation of the epoxy floor grout. The model will show the installation of all of these construction processes and the movement of the equipment within the building so that there are no coordination issues with other trades.

The use of 4-D CAD modeling can be applied to various construction processes such as MEP installation and storage/movement of extra materials within the building. If these models can be developed early in the construction process many issues can be avoided. There will be no delays in the schedule and also contractors will not be delayed due to materials in their way.

Research Steps

I will be taking a virtual prototyping class next semester at The Pennsylvania State University. This class will incorporate Auto CAD with Primavera to create a 4-D model. With this knowledge I will be able to create a model of the LSM Facility that will depict equipment size, equipment pad location, flooring installation, and equipment movement paths.

To develop the best working model I will need to obtain a schedule of all the equipment deliveries, when each section of flooring was completed, and when each equipment pad was poured.

Some things that will be taken into account for the schedule are curing times for concrete, epoxy pain, and the epoxy flooring.

To determine the usefulness of this technique I plan on creating a survey that will be sent to Construction Managers. It will be a basic survey that will determine the usefulness of any type of 4-D model, whether it be related to MEP systems; steel or concrete installation; or equipment deliveries. I want to find out if people think this is a necessary step in the coordination process for detailed projects, or if it is just added cost and time that does not provide desirable outcomes.

Figure 1

