

A. EXECUTIVE SUMMARY

The proposed thesis for Shaare Tefila Congregation includes a project background description, four separate areas of research and analysis, a weight matrix, and an expected outcome summary. Analysis I is a research of the Spanish-English language barrier. Analysis II is a study on the acoustics of the worship space. Analysis III is a life cycle study of the renewable energy systems. Analysis IV investigates prefabrication delivery. Further detail on the proposal sections include:

Project Background

This section describes some details about Shaare Tefila, for the purpose of better acquainting the reader before going in depth on research topics. Project background includes information on the function of the building, site description, and interesting features.

Analysis I: Spanish-English Language Barrier in Construction

This section investigates the spanish-english language barrier as an issue with several innovative solutions. Research will focus on construction professionals, construction workers of varying experience levels, construction management students, and architectural engineering professors.

Analysis II: Worship Space Acoustical Analysis

This section investigates the sound quality in the worship space of Shaare Tefila Congregation. Different finish materials, as well as music systems will be analyzed for optimum affect. Research will focus mainly on value engineering.

Analysis III: Renewable Energy System Life Cycle Analysis

This section analyzes the life cycle cost associated with the building's renewable energy systems, including geothermal wells. Research will focus on specifically on value engineering and constructability.

Analysis IV: Prefabrication Delivery Analysis

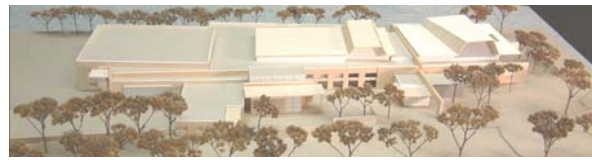
This section analyzes the benefits of applying prefabrication to the project's construction. Research for this investigation will focus on constructability and schedule acceleration.

Weight Matrix

This section consists of a table matrix, breaking down the thesis work into sections and assigning percentages of emphasis out of 100%. The emphasis sections are: critical industry knowledge, value engineering, constructability, and schedule acceleration.

Expected Outcome Summary

This section basically serves to summarize the proposal topics and research methods. This will include any additional notes as well as goals.

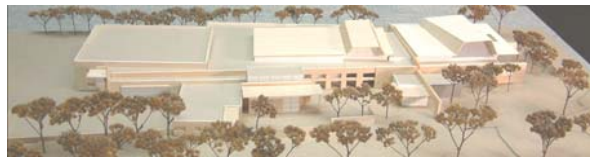


B. PROJECT BACKGROUND

Located in the small town of Olney, the project is currently in pre-construction, with Forrester Construction Company as the general contractor, and Walton Madden Cooper Robinson Pones, Inc. as the architect. Shaare Tefila will serve as a new place of worship for the Jewish community of Montgomery County, Maryland. The two story building area footprint is 43,000 SF and has a total project cost of \$10.79 million.

The project construction includes a 90 person sanctuary and worship space, a social hall, a kosher dual kitchen, classrooms, library, administrative offices, parking lot and walled courtyard. The structural system includes cast-in-place foundation walls, concrete and steel composite framing, as well as a wood- beam, steel joist roof system. The mechanical building systems include indoor/ outdoor ventilation zones, occupancy sensors, and geothermal well renewable energy systems.

Project delays have pushed back the 12 month construction schedule until January. The site work is quite extensive including demolition of an existing residential building, garage, greenhouse and trees. A mobile crane will be for steel erection. The design also allows for expansion on the south courtyard. Shaare Tefila Congregation, as a thesis building provides an excellent backdrop for investigation into research topics ranging from value engineering, to constructability to schedule reduction. The multi-use functionality, additional mechanical systems, and potential for expansion, all open opportunity for analysis and investigation. Additionally the theme of education and community, which Shaare Tefila embraces, serves to reinforce the purpose of thesis exploration; to improve and learn.



C. ANALYSIS I: Spanish-English Language Barrier in Construction

Problem Statement

Language barriers in our profession is a prevalent issue which affects communication and construction, however rather than treat it as a problem that needs to be fixed, there is the potential for innovation and industry growth.

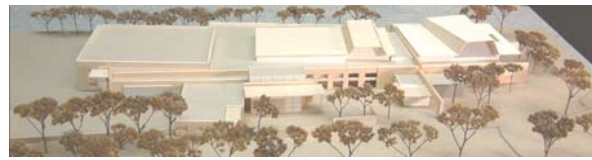
A vast majority of workers in the construction field come from Spanish speaking countries and have only a working knowledge of the English language. They are highly competent in their trade as well as in communicating with other industry peers. By the same token, construction professionals are highly skilled in management and technical skill. However it is in the exchange between technical English and technical Spanish that communication breaks down. Without effective communication, information is lost, mistakes are made and projects schedules get delayed.

Goal

This research will analyze the direct and indirect costs associated with Spanish-English language barriers in the Washington, DC construction industry. Through analysis of interview/surveys, it will be determined what strategies will most likely be successful if implemented in the field or in the class rooms.



The eventual goal of this research will be to create a prototype program for English-Spanish training which can be implemented in the field, corporate offices and in the classroom. In time this will create a viable way of helping the issue of labor shortages, as well as educate the next generation of construction professionals.



Research Steps

- Step 1.** Review literature and periodical information on subject of construction language barrier, paying special attention to any programs based in universities
- Step 2.** Get input on research topic from Forrester Construction, as well as from contacts from PACE and AE career fair
- Step 3.** Develop interview/survey questions with input from AE advisor, which addresses production cost, schedule delays, and time commitments. Focus on three groups: industry professionals, labor force, construction students
- Step 4.** Interview: 5 project managers and superintendents of varying experience levels, 5 construction workers of varying experience levels, 8-10 construction students with internship experience
- Step 5.** Analyze data for patterns
- Step 6.** Develop strategies which address the issues and present to AE advisor
- Step 7.** Summarize results

Expected Goals

I expect that construction students and labor work force will be more responsive and willing to participate in a committed language program. From cursory observations it appears that the desire for change and the willingness to learn is from the next generation of construction professionals. I believe that a developed program in the Penn State AE curriculum emphasizing technical communication in Spanish-English would be well received and successful.

Sample Survey/ Interview

Below is a sample of the interview/survey which will be conducted, targeting operations and superintendent management. Ideally this will be a 5-10 minute exercise which will ask vital questions without being intrusive. Personal information, including name and company affiliation will be kept entirely anonymous. The only unique information that is important is the company size, company position, and level of Spanish-language competency. Besides this the questions will determine the desire and willingness to cooperate with a language communication program. A secondary goal will be to develop and conduct Spanish, construction worker surveys, which will complement the English version.



-----SAMPLES INTERVIEW-----

Date:

Interview Information

Company Size (Large/ Mid/ Small)

Position/ Duties

Spanish Competency (proficient?)

To the Interviewee:

Please assign a value from 0 to 5, corresponding to the degree of agreement you have with the statement.

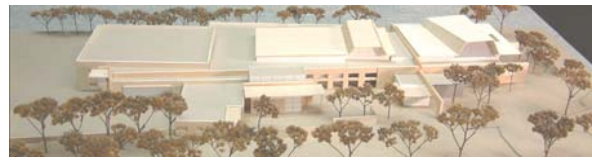
0 = completely disagree, **1** = disagree, **2** = no opinion, **3** = agree, **4** = agree completely

1. I love the work that I do	0	1	2	3	4
2. I work with a predominantly Spanish speaking work force	0	1	2	3	4
3. I would be willing to spend two half-hour sessions learning Spanish vocabulary and construction phrases	0	1	2	3	4
4. I would be willing to spend one hour per week learning Spanish vocabulary and construction phrases.	0	1	2	3	4
5. I would benefit from taking Spanish lessons in technical vocabulary	0	1	2	3	4
6. I need to learn Spanish proficiently in order to be more successful in my profession	0	1	2	3	4
7. ¿Puedes leer y entender este oracion completamente?	0	1	2	3	4

You say:

Thank you for participating in this research survey. The purpose of this information is to gauge the need for language and communication training in the field. All responses to questions will be kept entirely anonymous. Again, thank you for your support.

Figure 2. Language survey (English)



D. ANALYSIS II: Worship Space Acoustical Analysis

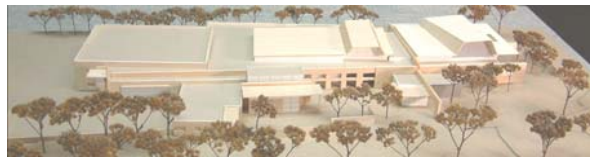
Problem Statement

As well as being a community center for religious education and social gatherings, Shaare Tefila is above all else a place of worship where religious programs are held daily, including group prayer and canting. With these strong singing and speaking ceremonies, it is important that the highest quality of audio engineering is implemented. To this affect, an acoustical analysis of the space including value engineering solutions will determine how to maximize the sound quality for its occupants.



Goal

This acoustical investigation will analyze the finish materials and physical geometry of the worship space in order to produce optimum quality, while staying conscious of additional construction cost. This analysis will also serve as a breadth study in acoustical engineering.

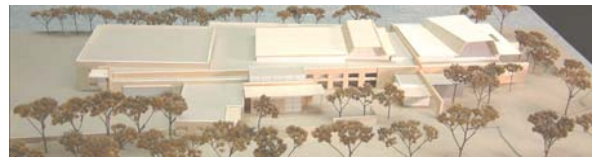


Research Steps

- Step 1.** Review construction drawings and specifications, focusing on materials and construction which affects audio quality
- Step 2.** Research literature and periodicals for audio solutions in worship spaces
- Step 3.** Brainstorm ideas and receive input competent faculty
- Step 4.** Develop strategies for at least two alternative systems
- Step 5.** Calculate results for all acoustical scenarios using *Mechanical and Electrical Equipment for Buildings, 9th Edition* by Ben Stein and John Reynolds.
- Step 6.** Present alternative systems to an authority
- Step 7.** Summarize findings

Expected Results

I expect that the investigative research will result in many possible alternatives, at least one of which will be a more efficient acoustical quality and cost value. I also expect to research acoustical solutions which are state of the art and were not an option during the initial design.



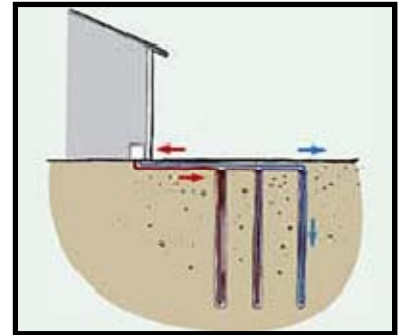
E. ANALYSIS III: Renewable Energy System Life Cycle Analysis

Problem Statement

The mechanical design for Shaare Tefila Congregation includes several renewable energy systems which support geothermal water heating and additional energy saving devices. Because of the additional space requirement and connections, a life cycle cost analysis will compare the initial cost versus life-cycle cost to determine when the renewable energy system will start adding value to the project.

Goal

This analysis will compare the initial cost versus life-cycle cost to determine when the renewable energy system will start adding value to the project. Additionally this analysis will serve as a breadth study in the mechanical option.

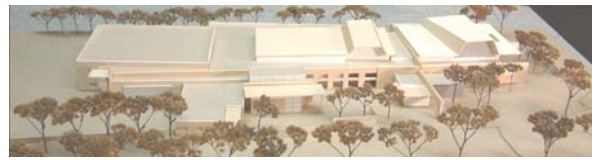


Research Steps

- Step 1.** Review literature and periodicals relevant to geothermal wells and renewable energy systems
- Step 2.** Determine difference between ground sourcing and geothermal well
- Step 3.** Calculate heat and energy costs for standard heat pump system using *Mechanical and Electrical Equipment for Buildings, 9th Edition* by Ben Stein and John Reynolds
- Step 4.** Brainstorm and receive input from competent faculty on determining energy and cost associated with energy renewable system
- Step 5.** Calculate heat and energy costs for geothermal system
- Step 6.** Calculate future cost vs present cost using *Engineering Economic Analysis: An Introduction* by Michael R. Lindeburg
- Step 7.** Present findings before a building authority
- Step 8.** Summarize analysis

Expected Outcome

I expect to find initial difficulty in developing an accurate estimate for renewable energy output and cost associated. I further expect to make assumptions in the energy calculations in order to make significant arguments.



F. ANALYSIS IV: Prefabrication Delivery Analysis

Problem Statement

The use of prefabrication and offsite delivery has the potential to increase constructability and schedule reduction on Shaare Tefila Congregation. In order to fully explore alternative systems and add value to construction, an analysis of project delivery alternatives will be conducted, specifically on the curtain wall system, structural roof system and mechanical kitchen equipment.

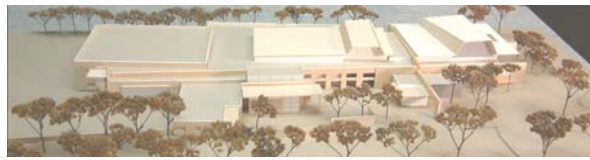
Goal

This analysis will compare offsite delivery versus on-site construction of different assemblies, including curtain wall system, structural roof system and mechanical equipment.



Research Steps

- Step 1.** Review building drawings and specifications, focusing on the curtain wall system, room structural system and kitchen equipment
- Step 2.** Review literature and periodicals on prefabrication design on curtain wall systems, roof systems, and mechanical equipment
- Step 3.** Brainstorm ideas for project delivery of prefabricated systems, receiving input from competent faculty
- Step 4.** Perform a detailed cost and assemblies estimate for prefabricated systems versus existing building systems using *RS Means* and *Cost works*.
- Step 5.** Analyze data for desirable systems
- Step 6.** Determine which Prefab system to develop
- Step 7.** Present research analysis to a building construction authority
- Step 8.** Summarize findings



Expected Outcome

I expect that the prefabrication method analysis will find at least one system unfeasible to implement into construction. I also expect that the cost, and preconstruction phase associated with the alternative construction will be increased. However I expect that the actual construction schedule to be reduced.

G. WEIGHT MATRIX

Description	Research	Value	Constructability	Schedule	Total
		Engr.		Accel.	
Language Development	30				30
Acoustical Analysis		15			15
Renewable Energy System		15	10		25
Prefabrication Delivery			20	10	30
Total	30	30	30	10	100

H. EXPECTED OUTCOME SUMMARY

I believe that after in-depth analysis of these research topics I will gain a deeper appreciation for the construction industry, in particular issues of value engineering, constructability and schedule reduction. I further expect to gain a better appreciation for the Shaare Tefila project team as I research and become much more acquainted with my thesis building.

Shaare Tefila Congregation
Olney, Montgomery County, Maryland
FINAL THESIS PROPOSAL

