



# TECHNICAL ASSIGNMENT III

Alternative Methods and Research

**Steve J. Horna**

Construction Management

Faculty: Dr. Messner

**SHAARE TEFILA CONGREGATION**

Olney, Montgomery County, Maryland

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## EXECUTIVE SUMMARY

Technical report 3 is an opportunity to apply the existing project data gathered in the previous two assignments into alternative methods and explore research topics. This report discusses critical industry issue and technical problems which affect the progress of Shaare Tefila Congregation in Olney Maryland. Specifically the topics include: a summary of **critical industry issues**, a description of my proposed **research methods**, a list of **potential problems** for my thesis project, a description of **analysis activities** for those problems, and a proposed **weight matrix** for all of this proposed effort.

The **critical industry issues** section summarizes the discussion and events which took place during the October 23<sup>rd</sup> PACE roundtable meeting. On this day students, professors, and building construction professionals, took part in discussions ranging from prefabrication, to BIM, to labor management shortages. This was an important meeting which highlighted potential research topics and problems for Shaare Tefila Congregation.

The **critical research methods** section focuses on content from the number of topics discussed in the preceding section. This will be important for the second portion of thesis when I will develop alternative building practices which delve from the existing. The actual research topic of labor management will be discussed in this section. Also included is a sample interview/survey.

The **problem identification** section identifies the specific problems in the building systems to be developed upon. These analyses are meant to explore and hopefully positively affect the production of the project. For my analyses I have decided to: one, analyze the sound attenuation and music quality in the service space on the lower upper floor; second, look at the delivery of the renewable energy systems affecting the mechanical and electrical systems; third, the delivery and erection of key building equipment such as dual kitchens and glass curtain wall and roof system, lastly I will develop the research into language and communication in the field.

The **technical analysis methods** directly follow upon the listed items from the previous section. During this portion of the report I will explain exactly what sources, materials and persons I will use to conduct the research.

The final summary of event for this technical report is the **weight matrix** which breaks down exactly how much effort I will be putting into each identified problem. The four analyses are divided in to part which total 100% for convenience.

## CRITICAL INDUSTRY ISSUES

The PACE Roundtable Meeting provided a unique opportunity for students to take part in critical discussions concerning the present and future of the construction industry. The meeting was very orderly separated into four distinct sections: prefabrication, BIM, labor management shortages, and student panel. In each session the format consisted of: opening comments by a panel of speakers, followed by question and answers with the audience, and finally concluded by closing statements from the panel. Construction students were strongly encouraged to attend the meetings in order to develop arguments and ideas for this technical assignment specifically.

The first topic of discussion revolved around the merits and disadvantages of **prefabrication** as a regular practice in domestic construction. That is, the off-site construction and delivery of large components or assemblies of a project, scheduled and built in some type of sequence. As the panel explained, use of preconstruction is not as prevalent in the US as in international markets. Some reasons cited included: increased planning, increased upfront costs, early coordination among trades, and limited creativity. An argument was made that the increased time spent in preconstruction was good for the project and ultimately saved in cost for accidents, damages, and change orders. As far as architectural limits, it was suggested that it would then become necessary for builders to build within the constraints of prefabrication. This would be an entirely new way of thinking. A theme which began during this section was the need for the next generation of builders to develop new perceptions and ideas in order to solve today's "problems". As it relates to my thesis building I see prefabrication as a legitimate building alternative. Using some of the suggestions given during the PACE conference it might be possible to reduce the schedule as well as increase constructability. This topic will be developed further in the research methods section of this report.

**Building-information-model** or BIM was the topic of discussion for the next panel of speakers. In general the discussion revolved around how to define BIM, challenges of implementing it, current standards and practices, and the changing definition of BIM. Although there are many ways to use BIM, the most common use, as the panel explained is clash detection of MEP and other systems. Using 3d and 4d information makes future conflicts and problems apparent before construction begins. BIM requires however that everyone involved in the design process is "on-board",



that is the builder, subcontractors and most of all, the owner. A possibility for BIM in the future is instant estimating, where cost is associated with the 3d components.

Figure 1. Architectural model, SE

The final professional panel discussed **labor and management shortages**, identifying the problem and possible solutions facing the industry. During the opening comments it was stated that the construction field will need to produce 250,000 workers per year to keep up with project demands. Many of the factors which have attributed to the current problem stem from the image that construction has generated. For many people the title of “construction worker” brings to mind the image of an unskilled, uncouth, degenerate with no prospects for the future. The question and challenge then became, how do we as professionals and future professionals generate interest in a career in construction while overcoming negative images. Possible solutions include training and apprenticeship programs as well as increased medical benefits. The idea is that if a worker sees a future and a chance for advancement he will be more likely to treat construction as a career than a transition job, even as a high school graduate. Many of the roundtable participants recounted stories of extremely competent tradesmen and superintendents who came up through the field. Another sometimes-overlooked factor involves immigrants who come to America with formal training and certification but because of their legal status they are not allowed to practice their trade. It is then up to construction professionals to survey and recognize those candidates as assets to be developed. I think that the success of many of these solutions depend on location and are project specific. It would require some uniform conditions but it would not be entirely impossible.

At the conclusion of the third professional panel, a collection of **students from the fifth year CM class** sat for a fourth panel discussion concerning the outlook of the construction field; its present and future. Mostly this was a chance for a professional and students Q & A session. The industry professionals asked what they could do to attract students to their companies and the students told industry professionals to give us challenging work and responsibility. It was very much like a group interview. It was also suggested during this session that it would be advantageous to begin more aggressive teaching of Spanish as a second language to improve communication between labor and management, starting perhaps by including language requirement in the AE curriculum. I think that this is a great suggestion and something that I will develop on in the research method section of this report. Overall I would say that it was a worthwhile panel discussion with some interesting exchanges.

I was very interested to hear about development with BIM, as far as specific applications or anything that would create a focus for my thesis work. Unfortunately there was not very much new information during the roundtable discussion. This is not say that there was no content, rather it was repeated information from project management classes. I would say that this lack of new BIM information was the most surprising part of the conference, especially considering that there was an entire section devoted to this topic.

I was very interested to speak with *Ted Border from Whiting Turner Construction* concerning prefab construction. During the Roundtable, Mr. Border was very vocal with his concerns about performance and coordination. I believe that with his experience with the 90 day construction of Lowell College dorms, he would be a great contact to retain for technical and cost questions with prefab systems. I will also be keeping in close contact with *Seth Glinski and Mike Barnhart from Forrester Construction*, as they have had extensive experience working with labor forces in the Washington DC, Maryland, Virginia area.

## CRITICAL ISSUES RESEARCH METHOD

Communication is the single most important skill set in contributing to the success of the individual, a team and ultimately the construction project itself. Without effective communication, information is lost, mistakes are made and projects schedules get delayed. For these reasons I would like to research into the communication between management and construction worker, specifically the Spanish language barriers. 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, however it is in exchange between technical English and technical Spanish that communication breaks down. What I am suggesting is a push into increasing the communication and team work of a project group, beyond a handful of words and half understanding nods. It's important that we understand that this lack of communication is just as bad on the management side as it is on the labor side. The cultural phenomena and migration habits of Latin American workers and spanish-speaking citizens is beyond the scope of this report rather I am dealing with the current construction industry and the changing global economy. Latino men and women are the fastest growing minority in the nation and it is in response to these changing times, in the spirit of construction excellence and business excellence, that this effort was made.

In order to gage the need and level of language competency I will be using an interview/survey with 7 questions. 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.

Below is a sample of the interview/survey that I will be conducting with Industry professionals, targeting operations and superintendent management. Ideally this will be a 5-10 minute exercise which will ask vital questions without being intrusive.

-----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, 3 = no opinion, 4 = agree, 5 = agree completely**

- |  |          |          |          |          |          |          |
|--|----------|----------|----------|----------|----------|----------|
| 1. I love the work that I do   | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 2. I work with a predominantly Spanish speaking work force   | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 3. I would be willing to spend two half-hour sessions learning Spanish vocabulary and construction phrases | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 4. I would be willing to spend one hour per week learning Spanish vocabulary and construction phrases.     | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 5. I would benefit from taking Spanish lessons in technical vocabulary                                     | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |
| 6. I need to learn Spanish proficiently in order to be more successful in my profession                    | <b>0</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> |

7. ¿Puedes leer y entender este oracion completamente?

0

1

2

3

4

5

**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)

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What I am suggesting is an actual dialogue and exchange, between field engineer and laborer, between mechanical foreman and structural steel foreman, between superintendent and drywall laborers in order to achieve construction excellence. There are of course other factors to consider in terms of program cost, companywide assimilation, generational gaps, and project sizes. I also hope to develop and conduct a Spanish, construction worker survey, which will complement the English version above. During the course of the data retrieving process I will begin fine tuning these ideas.

As an additional item I would also like to analyze the value and benefit of using selected prefabrication systems. This will also tie into the structural breadth and constructability analysis. At this point it is too early to determine whether or not this would be a worthwhile endeavor. Given the limited budget of the public owned project, it is difficult to sell the idea of scheduling a large amount of prefabrication work. The positive characteristics of Shaare Tefila Congregation is that there is a large site plan with plenty of prep and laydown areas. The steel that is already scheduled for upper floor requires a single movable crane which, if switching to prefab erection would warrant an additional mobile crane on site. Some ideal items to pursue for prefabrication work is the large angled roofs and fastened curtain wall system. Also the dual kitchen equipment and storage system might be worth pursuing, due to the repetition. During the course of the proposal I will develop these ideas further.

## **PROBLEM IDENTIFICATION**

There are several problem topics with the worship and religious education center, which could be analyzed and pursued for results. One is sound quality in the worship area and hall. The second is the MEP and control systems that run through the building, including the renewable energy systems. This interesting building system offers additional work that could stand use of BIM detailing and clash detection.

- **Sound Attenuation and music quality in the service space**
- **Renewable Energy systems analysis for optimum project delivery**
- **Prefabrication delivery of selected building components, curtain wall and dual kitchens**
- **Language and communication development**



## TECHNICAL ANALYSIS METHODS

As stated in the above section I will be looking into three different building system analyses:

- **Sound Attenuation and music quality in the service space**

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 is observed. With these strong singing ceremonies and installed sound systems it is important that the highest quality of audio engineering is implemented. That is why I will study the affect of sound attenuation and absorption in the finish materials as

well as through windows. This will be done using distance and factor calculations. I will be using *Mechanical and Electrical Equipment for Buildings, 9<sup>th</sup> Edition* by Ben Stein and John Reynolds.



- **Renewable Energy systems analysis for optimum project delivery**

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, I will analyze the use of BIM design for MEP systems. I will be researching using *Sustainable Energy Systems Engineering* by Peter Gevorkian. Additionally I will be using RSMMeans and CostWorks 2002 for cost data.

- **Prefabrication delivery of selected building components**

Shaare Tefila congregation has several items which could stand to implement prefab design. There are several factor, mentioned in a previous section, which make Shaare Tefila ideal for such a scenario, including the large site plan for laydown and materials storage, also the extensive amount of site work done prior to construction could be used in engineering the coordination with trades and producing a curtain wall system and dual kosher kitchen design. I will be using RSMMeans and CostWorks 2002 for cost data



- **Language and communication development**

As state in the previous section, I will be conducting research and study based on the use and development of stronger communication skills, specifically cross-language barriers. The interview and surveys will be conducted over the course of several week, the data will then be analyzed to determine the best course of action for a strong program. I will be talking to 25 construction professionals from various companies of various sizes, as well as to 25 Spanish-speaking construction laborers in the Maryland, DC, Virginia area.

**WEIGHT MATRIX**

Description	Research	Value Engr.	Constr. Rev.	Schd. Reduction	Total
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Sound Analysis	<b>10</b>	<b>10</b>	--	--	<i>(10 to 40%)</i>
Renew Energy Sys Delivery	--	--	<b>10</b>	<b>15</b>	<i>(10 to 40%)</i>
Prefab Assemblies	--	<b>10</b>	<b>10</b>	<b>10</b>	<i>(10 to 40%)</i>
Language Develop	<b>25</b>	--	--	--	<i>(10 to 40%)</i>
<b>Total</b>	<i>(10 to 30%)</i>	<i>(10 to 30%)</i>	<i>(10 to 30%)</i>	<i>(10 to 30%)</i>	<b>100%</b>