

-MARCH-

MONTHLY REPORT

“WE DO NOT ENHERIT OUR LANDS FROM
OUR ANCESTORS, WE BORROW IT FROM
OUR CHILDREN.”

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SUMMARY

This month's experience gave the fellowship a new challenge in researching because of traveling to countries with dissimilar languages. Though German, Danish, and Swedish languages are all quite different, they do have one thing in common...IT IS NOT ENGLISH! Though English is the world's universal language, it can be challenging to translate descriptions, expressions or positions on certain situations. The Google Translate program has been the translation tool for all of the different languages however when I am unable to understand the translation, I have been fortunate to have fellow Couchsurfing friends to describe the meanings. Frustration presented itself many times through the difficulty of effectively communicating but I was able to admire the situation at the same time for each region thinks, speaks, and acts differently. As a result, I would have different points of view to establish the most effective solution to a situation.

Building deconstruction is similar to languages in that they are all different in different parts of the world. Such factors as building codes, labor, money and materials available all influence the design and deconstruction of a building. So how can we effectively design for deconstruction? The most effective way is to understand the deconstruction approach and decision making process. As mentioned in previous monthly reports, tools are currently available online to help determine the material recovery potential of a construction project. These programs are continuously being improved based on the comments that are received from deconstruction companies and design users. Though these programs are improving they are limited because they only focus on one aspect of deconstruction, the building materials. In order for such a program to be modeled into the real world, other factors such as material transportation, material resale value, labor availability, etc. must also be factored in order to help the deconstruction company make decisions on how to properly deconstruct any type of building. Proper implementation of such a program could also be used at the early stages of building design. Having such a tool for the design phases of a project can help in addressing the objectives of the stakeholder. The issue with implementing a tool that can handle these objectives is that it is so complex.

Such a program has been developed though at the University of Siegen. It is not available to the common public yet because it is so complex. However the mixed-integer program has been used for many deconstruction projects in order to improve closed loop system. The majority of this month's interviews/conferences/project visits section will discuss about the potential advances the deconstruction industry may be heading in the near future.

INTERVIEWS/CONFERENCES/PROJECT VISITS

Professor Frank Schultmann and Nicole Sunke both work at the University of Siegen and have focused toward building deconstruction and material flow management. Professor Schultmann is one of three coordinators for the CIB Task Group on Construction Materials along with Abdol Chini who is on the Victor L. Regnier Traveling Fellowship Committee. Nicole Sunke is the Germany Chair of Construction Management and Economic and has researched topics such as sustainable construction in project management, supply chain management, project scheduling and project management. Together these two individual have dissected the deconstruction process and have written many publications reports on how building deconstruction can become more sustainable without effecting economics through proper material flow management.

In understanding the deconstruction industry, both Professor Schultmann and Nicole Sunke have laid out the different stakeholder's objectives for both the construction and deconstruction industry. They have shown that current deconstruction projects can meet stakeholder's objectives while also improving sustainability in project management through the life cycle approach. This

process is called material flow management and is the same as what a manufacturing industry uses. The difficulty with applying material flow management to the construction industry however is that there is such a large variety of construction materials, components, and assemblies that all have different recovery uses. To simply demolish a building results in a large mass of mixed materials that would be difficult to separate therefore the best way to make the deconstruction process sustainable is to separate the large variety of materials and to do it onsite.

The first step to organize and separate the materials is to do a building audit and record the quantities of the of the materials and the quality they are in. Hazardous materials must also be recorded during the building audit system. At the end of the audit, the program gives an inventory of the building materials, components and elements and lists their volume, mass and toxicity in terms of which recovery strategy they fall under. The audit system also analyzes the quality of the materials to be recovered in order to help determine the value for reuse. This value is called *reuse and recovery potential* (RRP) and the total building RRP value can be used as a stakeholder's objective, such as deconstruction time or project cost. The stakeholders objectives can be weighted based on the demands of the stakeholder.

Ecological impacts can both be positive or negative and vary considerably based on the type of recovery process. Positive impacts would consist of saved energy in the production process of new input materials and less environmental pollution. Negative impacts consist of additional energy consumption as well as environmental burdens such as emissions of air, water and soil. From the deconstruction process to the transporting of components and materials from one place to another, to the recovery process, a life cycle assessment (LCA) must be evaluated to determine that the type of recovery uses less energy than it is to create a new product.

In order to determine the best deconstruction and material recovery technique for the project, a schedule with precedent relations must be determined. Typically the application of Gantt charts, the critical path method (CPM) or Program Evaluation and Review Technique (PERT) is used, however such a simple technique will not be adequate enough for all of these methods focus only on time requirements and neglect the resource demand for the retrieved items. The objective of a sustainable project schedule ought to enable the deconstruction of a building and recover/reuse as many components and materials as possible. Recovery of the highest amount of materials results in costs saving from tipping fee and revenue generated by the selling of materials to the regional markets. As long as there is knowledge of the region's recycling and reuse market, the Integrated Dismantling and Recycling Planning System (DRPS) can be accurately used. The DRPS is a series of equations which analyze and integrate the dismantling planning with the recycling planning operations. It can generate;



- Optimal dismantling strategies for each building type
- Optimal assignment of building components and parts to recycling techniques
- Minimal dismantling and recycling costs
- Cost efficient combinations of waste duties and taxes on natural resources

During the analysis of the program, potential conflicts arise with different dismantling activities and costs. The program is able to determine the most optimal solution by picking the most feasible option with the least number of objective conflicts.

The next step is to create a deconstruction plan that can layout a detailed technological and environmental order of dismantling techniques to be carried out. This process can be completed with a series of equations and the use of a Multi-Mode Resource Constrained Project Scheduling Program (MRCPS). As each activity is added to the deconstruction process it is evaluated in terms of optimal recycling, deconstruction procedure and order of deconstruction to other activities. The process of using this method increasingly becomes more complex as activities are added because more relationships are developed causing more potential effects with one another. The end result is a guided tool for a project manager to meet the objectives of the client while also being as sustainable as possible.

Professor Schlutmann says that, "the analysis is a way of establishing a cost competitive approach to fulfill future legislative obligations concerning the recycling of waste." This tool seems to do so based on the number of case studies that they have implemented. One of the case studies specifically took an 1860's housing project divided it into two halves. One side was to be used for demolition and the other was selectively deconstructed. The program generated an inventory of materials, deconstruction schedule, an estimated cost for both deconstruction and demolition as well as other graphs including contaminated aggregates graphs, activity charts, material transportation costs and a graph of poor quality material. The result of the case study showed there was a cost increase of 59% to selectively deconstruct the building however the aggregates provided from the demolished half had less pollutant contamination than the demolished building. Being able to provide this type of information will help governments with establishing proper environmental regulations as well as give demolition contractors a more accurate estimate.

The purpose of technology is to create an accurate model of an existing project. This model then can be used to find ways of meeting the goals established by all stakeholders. The more accurate the model, the more capable in determining the best practices for dismantling the building. Technology is limited though because each project is unique. For example, the issue site tightness is not factored into the program and therefore the impacts must be observed. If all of the waste bins can not be located on-site, then the construction manager must figure how to best recover as many construction materials while still meeting the objectives of the client.

WEBSITE



No progress has been made on the website. While in Germany, I have focused on gathering case studies of projects which have implemented Design for Deconstruction concepts.

PERSONAL LIFE



Another aspect of Siegen which is unique compared to the rest of the world is that the buildings have slate for both the roof and for the façade. For cities in the North Rhine territory, slate quarries are dense and deposits can be found throughout woods, parks, and trail walkways. Having a façade such as this is proven to last more than 200 years if maintained properly. Though slate has a higher first cost than asphalt shingles, the overall life cost for such a product is the least expensive roofing and façade products. I am not sure if there are other types of rock that can be applied in similar ways as slate, but rock is long lasting and can withstand weather. Having the material literally in your back yard could have some potential benefits if applied in a correct way.



When I visited Copenhagen I was surprised to see how well laid out the city was. The population in the downtown area is about half a million but such things as mass transit and bike lanes made it easy to get around to the different areas of the city. I enjoyed spending most of my days walking with no exact destination in mind. To me, this is the best way to fully explore a city because when stumbling upon such things as small antique shops, random cemeteries, and beautiful cathedrals and statues, it is more gratifying because they were “discovered”. Generally when scouting a city, I would not have a timed schedule because I wanted to have the flexibility for if a situation would ever arise. This is one of many benefits of traveling alone, I do what I want and I grow from it in my own

way.



Based on the architecture, convenient close markets, nightlife, locals and variation in architecture, I see Copenhagen as one of my most favorite cities to visit as well as to live. A few favorite attractions were the Little Mermaid Statue, Christiania, the Frederik's Church, and Tivoli Gardens.

The Little Mermaid is located along the Nyhavn Canal where many boats pass through. I was surprised to find the Little Mermaid story was created 172 years ago here in Denmark. The statue is surprisingly small and quite far from



the downtown area yet this statue is the most visited by tourists from all over the world. I believe that because of Disney coming out with their version is how this statue became so popular.

Christiania is a famous squatter settlement of roughly 850 residents. The freetown was formed in 1971 after the military moved out and abandoned the area for four years. Inhabitants from around the area broke down the fence to take over parts of the unused area as a playground for their children. Many homeless people then moved into the empty military buildings and in a short amount of time, the area was recognized as being open to the public. Since this time, there have been many times when the government has tried to take over the area. For every time the government tried to go into Christiania, the Christianites would strongly protest to the point now where the government mainly just leaves them alone. Christiania has its own electrical plant, bath house, and a giant athletic building. The area is approximately 85 acres and the community values their common wealth and family life. I feel this place is motivational in finding something that was once seen as a wasted plot of land and turned into one of the main areas of appeal. This couldn't have happened without the dedication of the Christianites.

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During my second to last weekend in Sweden, I was offered a discounted ticket for a three day cruise from Stockholm to Helsinki. I had never been on a cruise ship before and I was ahead on my budget so I took the offer and had prepared myself for a good weekend. From what I understand, the cruise to Helsinki and back is a very popular way for the locals "to get away". The ship can hold 2,850 passengers at a time and travels at a maximum speed of 23 knots. Inside the cruise ship is packed with English speaking entertainment ranging from casinos, bars, dance performances, restaurants, pools, and shopping. When on

international waters, many items are tax free and the Swedes take advantage of this through purchasing alcohol and chocolates. For one of my meals I ate a real smorgasbord and took

advantage of it as much as I could and tried all of the foods that I have never seen before. I enjoyed all of the fish meat, casseroles, and cheeses except for the sweet pickled herring with caviar eggs and mustard and dill dressings. It was beneficial being on vacation with the locals for many of them seem to be open to meeting me and interested in sharing stories about their lives.

One of my favorite instances with meeting the locals however was when I was in Siegen. Through some friends that made, I met two individuals that know much about the city's history and how it was impacted by the war. We occasionally ventured into the woods and I was shown areas where bombs had fallen and the damage that still remained. I was also pointed out bomb shelters within the city and we spoke about the war and how it impacted their family's lives directly. Fear, hatred, confusion and disbelief were only some of the emotions shared during that time. I was told that normally Germans don't talk to other Germans about the war but having me there was nice because we could discuss the event openly. Having the German perspective showed me how I probably would have done the same things as their families did if I were to have been in the same situation. Both of them feel embarrassed for what had happened but the way I see it, is that we are all people and we make mistakes, I am pleased to see that the majority of Germany has looked at this point of history as a lesson learned to be never forgotten. The picture below shows one of many remembrance statues and sculptures that can be found in cities, towns, and villages, throughout Germany. When I discover one of these statues somewhere, I would usually find a bench of some sort with an older person sitting there and reflecting. I can't even imagine the thoughts that are going through his head.



Once again “thank you” for this wonderful opportunity and if there is anything that ought to be addressed more directly, please feel free to email me at stephand@msoe.edu.