

# -FINAL REPORT-

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

Prepared by:  
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## SUMMARY

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It is hard for me to believe that the fellowship is reaching its final completion. I can still remember the day when Mr. Victor Regnier called and congratulated me for being awarded the fellowship. I was walking through the corridors of MSOE, on my way to the laser cutting lab to prepare a model for my senior design project. I answered a call from a number that I did not recognize and instantly froze in my tracks when I heard "Hello Dustin, this is Victor L. Regnier and I want to congratulate you for being awarded this year's traveling fellowship!" At first, I was in shock and thought that the whole thing wasn't real but as Mr. Regnier continued to talk, my excitement level was barely controllable. Much was said in our conversation but what stood out to me was when Mr. Regnier said, "this is a wonderful opportunity and it's going to change your life Dustin, I wish you the best of luck." Hearing those words temporarily paralyzed me for I had felt like I was hit by a fully stocked milk truck, but instead of feeling pain, it was uncontrollable excitement all throughout my body. There were a few times when Mr. Regnier asked me a few questions, my replies were rather slow and sluggish simply because I was being overloaded. As we ended our conversation, the only thing that I was physically able to say was "thank you" and when the call was ended, I looked at my phone and wondered if this was really happening to me or did I fall asleep again in one of my classes. It took the rest of the day and night for me to really fathom what had actually happened and what that means to me and my future.

Change my life is exactly what this fellowship has done for me. It has given me the opportunity to further explore a building design method that I am interested in, allowed me to travel to multiple countries and explore a variety of cultures over a nine month period. I have been pushed to discover myself without the daily influences and distractions of my family, friends and overall American lifestyle. I have traveled before but traveling solo meant that I have no limits in what it is that I want to see, learn and do. Everything that I did was through self motivation and now that I am able to look back at the places I have been, people I have met, and experiences I have encountered, I am happy to say that I don't have any regrets. Through this experience, I have enjoyed learning about different design concepts and building techniques yet I was challenged to face conflicts while balancing cultural experiences with the academia world. I have learned about myself and what my strengths are as well as improving my weaknesses to be make me a better overall person. Not too many people get to have the experience that I have had the past year and for that, I am proud and grateful to represent the 2008 Victor L. Regnier Traveling Fellowship.

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## MY EXPERIANCES

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After reviewing the proposal I had written during the winter of 2007, I know that I have addressed everything that I said I would do but what is interesting is how different I did things simply because better opportunities developed while I was traveling. For example, I interviewed the owner of one of the best reclamation companies in England by going to where his yard was, working with him for a day and spending a night with him in his house. I was able to see how he operates his system, understand what makes him so good at what he does, and also give advice to what may help him in the future (based on what I have learned). He is so passionate about his work that he was able to even tell me what to expect with the reclamation industry in the US and why. These types of experiences happened quite frequently, but the best place for me to meet people was always through conferences, seminars, and what the local people knew. From these interviews, I was able to get a wide variety of perspectives on what people thought about building designs and construction material reuse.

I don't know exactly how many emails I sent out throughout the fellowship however I know that there were many. All of them were personalized from me (no boiler plate) and I had to constantly be

emailing in advance while preparing my next travels and following up with those that I had talked with. Some people were excited to hear about what I was doing and took the time to chat with me while with others, I had to really be on some of their backs just to get a reply back. I had to be very clear about what it is that I would like to know from them and always be prepared for any situation when interviewing someone.

A difficulty for me with researching is all of the information that is available. There are many books, reports, and articles that I have read throughout the past nine months that addressed sustainable building designs however there were a select few that specifically dealt with D4D building concepts. It took some effort to stay focused on what I ought be researching but what had helped me significantly are my original objectives that Dr. Abdol Chini told me to establish before my travels. The objectives are as follows.

- To determine ways to utilize new and existing materials in the most ecological, social, and economical manner possible
- To establish standard practices which can be used in the United States.

Sticking to these objectives help me realize what information I can weed out and what information I can use and write about. D4D is such a specific design strategy and I feel that it is important to not be so conventional when it comes to sustainability because there are no specific right answers on how to design because each situation is different. The whole objective is to reduce the environmental impact of construction materials. I owe Dr. Chini a big “THANKS” for giving me that advice.

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## THE WEBSITE

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The website is now in its final stages and is available for others. As mentioned in the original proposal, I wanted to create a website that was educational for not only fellow students but also for other professions in the construction and design industries. Creating a website is the best way to get information out such a wide variety of people all with different interest levels. The website may seem to provide too much information, but that is simply because of this reason, Some people may want to use this simply to explore the D4D design concept while others, may want to know results of other projects, what works, and what does not, therefore, I feel that it is important to provide as much valuable information as I can. The website can also used to try and spark new minds to re-evaluate the current waste stream and establish others ideas to current and future problems in C&D waste stream.

The following bulleted points are the different tabs of the website which are broken down by their meaning and functionality. Each tab plays an important role in delivering important information to the reader and is organized in such a way for easy navigation. The tabs are as follows;

- **Home Page** – This is the first tab of the website and it delivers the mission statement as well as what to expect when browsing the website. As mentioned previously, the use of this website is to educate as well as inspire others to come up with solutions on reducing construction and demolition waste in the design and building industries.
- **What is D4D?** – This tab breaks down what designing for deconstruction (D4D) is, why to consider it for building design and what the advantages are for implementing it into the project. I chose to have these three questions on their own page to best give someone a the background in knowing and understanding what D4D is. I feel that it is important to get people to think about the end use of a product once its intended use has been completed. Providing this information right away gets people to think about the impacts of the materials that we use. Hopefully then, the reader would be more interested in reading further on in the website.
- **Common Principles** – These common principles have been established by me through reading various books and reports written on D4D. When reading these 10 principles, you can actually start to understand how to implement D4D in a project. All of these principles help make D4D a more applicable option for when the building project is in its design phase. Some of the principles require no or little cost while others, may have substantial cost but of course all of this depends on the project itself as well as the location, owner desires, regulations, and education and commitment of the architectural and engineering departments. Two illustrations were used from different reports and I felt that they were important to include to help readers understand the construction waste stream as well as visualize the multiple layered buildings concept.
- **Case Studies** – This is where a great deal of information was provided in order to help show readers that such principles can be implemented at a real level. I spent a lot of time finding such projects and getting information about them and how they were designed. Some case studies have more information than others, but it all depended on the information that I could find through interviews, reports, research or tours. All of the case studies have a standardized template which establishes the basics of the project. Other documentation such as pictures, floor plans, graphs and other sustainable practices may also be included. With over 100 case studies shown on the website, it was important to establish a few ways of organizing the information. One way of organizing the information is to group the case studies in terms of their functionality. This will narrow down different types of buildings and help the reader look for specific type projects if need be. The other way of organizing the information was to create a rating system that would prioritize the cases studies in terms of which projects were best D4D. The rating system was established by myself with the assistance from Dr. Abdol Chini. The case studies are set up on the website where they can be quickly organized in either of the two organizational methods. A simple click can get you a certain type of building
- **Discussion Forum** – I did not want this website to be considered out of date within only one year of its completion so I decided to create a forum which can be used as a continual center hub of communication of current projects. I have set it up so in a way to encourage the reader to feel free to ask questions as well as share files, pictures, and other documents of valuable information. Anyone who is a member of the forum may

feel free to answer questions or make comments about the website. There are no issues in taking the responsibility for properly maintaining the website as well as forum.

- **Additional Resources** – As mentioned before, I wanted to provide as much information as I could on the website so I made a tab which would provide a plethora of information on D4D, deconstruction, flexibility, and waste reduction. Each piece of information has a small description along with a picture and a link to where the additional information can be found. The information has been broken down into four different categories; books, websites, software and reports. Having this information allows the reader flexibility in discovering how much she/he is willing to learn on the subjects.
- **FAQ** – These are some of the main questions that have received throughout the fellowship. I have also included some others which I felt were important. If the reader would like to know the answer to one of those questions, she/he would have to click on the question in order to see the answer. Organizing this page in such a way, avoids a lot of text to be shown when it is not needed
- **Contact Us** – This page is needed in order for someone to get in contact with either myself or the Victor L. Regnier Traveling Fellowship. This allows people to make comments about the fellowship or about the website. I am always interested in listening from others' opinions toward the website and how I can make it a more effective tool.

At this moment, I would like to thank Mark Dryer for helping me create a website in which was pictured in my head and making it a reality. There is a lot of content on the site and there are a number of times when the website went through some major changes. For that, I thank Mark for his patience and willingness to work with me on this project. In return for his efforts, I have agreed to help him restore his kitchen and other rooms in his newly purchased house. With this opportunity for both him and myself, I have all ready been thinking of ways to apply some of the D4D principles and would like to discuss them with him in greater detail to see if I can actually apply them the principles on a real project.

Even if D4D is not popular in today's current building and construction market, over time the importance will become more significant as cost raise for construction material extraction and disposal. From big construction projects to what happens at home, someone ought to be able to learn something valuable from the website.

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## D4D

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So in this section of the final report, I have made a few questions that some people may have wanted to know about what I have learned about D4D. My opinions are mainly based off of my own personal experiences and what I have read throughout the past year on D4D.

### **Is America focusing on D4D more or less than other countries?**

By no means is America a leader in this area of design nor they are not the weakest link. America is a little above average for how they focus on D4D. In terms of research, America is one of the big players on delivering accurate and effective information. As an example to this, one of CIB's main coordinators is Dr. Abdol Chini who has researched and published many articles on reducing building material waste. Each year the CIB group meets with other international branches to discuss new innovations that are improving the material reuse of construction materials. As far as actually implementing D4D in the real world, I have found only a few projects which have shown

interest toward the D4D principles. I feel that this is many because clients, designers, and contractors are not properly educated on how to implement the principles and understand the benefits that D4D offers to clients, manufactures, designers, and the construction crew. Typically in the industries, the initial cost is the bottom line and because of this, spending more upfront costs to save money at the end of the building's life is not a desirable option. This is changing now because programs such as Green Globes and LEED are showing industries that buildings are capable of saving money through technologies which analyze efficient systems, payback periods, and higher production levels. Both of these programs have created building rating systems as well as teaching tools to educate different building systems and techniques that ought to be considered and why.

Another reason why I feel D4D is not widely practiced is because the US does not have a strong reclaimed material reuse market. This is changing though because of nonprofit organizations such as WasteCAP Wisconsin, the Re-Use Stores and the Building Materials Reuse Association (BMRA) which are establishing reclaimed building material markets on both national and local levels. The internet and other technologies have helped these organizations create online inventories of their used materials as well as provide valuable information to the general public through their websites about "wasting materials." As the American public continues to be educated on the term "waste" and what the effects are of putting more effort into material reuse and waste reduction, these organizations will be more successful in establishing a stronger reclaimed materials market.

Though D4D is not a common practice, construction material reuse and waste diversion are proving to be more and more important as time progresses. This makes sense because as our population increases, it is exponentially important to understand, respect and preserve our resources instead of labeling it all just "waste." This needs to continue and as it does, D4D will be a more viable option in American building and design industries because once the materials have been exhausted, they are gone and society will be forced to put an extreme amount of energy toward retrieving and preserving these resources to order to maintain the quality of life that we currently have.

### **What are some ways in which Americans can reduce waste? Can it be done on a daily level?**

We as Americans are the one of the largest consumers of the world's resources. Because of our culture and our actions, we are effecting our future generations and their ability to live with the quality of resources that we have. One step in improving our culture is to first recognize what we are doing and then acknowledging the effects that we have created.

Before leaving for the fellowship, I had done a calculation (with the help from Adbol Chini) on how much C&D waste was generated in 2007. To my surprise I found a total of 188.5 million tons was generated in US alone which is equivalent to demolishing 849 Willis A.K.A. Sears Tower (tallest building in North America) and throwing them into our landfills just for the year of 2007. I discovered that the majority of the waste generated came from residential renovations and non-residential demolition. People use the word "waste" loosely as a common word to mean "unwanted material," when it actually means "the producer or holder discards or intends to or is required to discard" according to Waste Management Licensing Regulations. We shape our buildings and our buildings shape our lives, knowing this, we are able to better understand that these areas have the greatest potential and opportunities for change. D4D is one way of reducing both of these sectors though the results will not show until later on in life. The best bet would be to reuse as many existing materials as possible depending on the demands of the project. I have written about case studies which have found economic incentives to sell unneeded materials instead of throwing it away or find and use existing materials than purchasing new ones.

What our culture can do on a daily basis is to first of all, reduce the rate at which we are consuming. We are one of the highest consumers in food, material objects and other products. After watching the documentary called "*The Human Footprint*", I was blown away by how many

products each American on average uses throughout a lifetime. Because we consume so much, we often don't realize how much we are taking for granted. Just for an example, on that documentary, it said that we use about 48.4 gallons of water a day resulting in 1.8 million gallons per lifetime. We must learn how to do more with less and make less the new more. We need to control our wants and fight against how easy it is to spend money. For myself, I have been working with my friend to come up with a "conservation contract" to keep my amount of materials I consume to a minimum. For an example in terms of water usage, taking showers either every other day or showering with the knobs turned only half way will greatly reduce the daily 48.4 gallons. Living out of a backpack and experiencing many different cultures has helped me in establishing the consumption rates for the contract. For others, I would expect them to analyze the things that they can and cannot live without and then making an effort to remove it from their daily lives. Reducing in this way, makes the consumer more aware of what they actually are consuming while also greatly reducing the amount of waste that is generated and improving the lives for future generations.

### **Is D4D practical for building design?**

Absolutely, and the simple reason for that is that we have a limited supply of raw materials. Being careful to respect the materials that we are using only will prolong our supply. Another reason why it is practical to use is that it also gives greater flexibility to building design. The difficulty with implementing D4D though, is that there is not just one way on how to do it. Each project is different from one another in terms of what materials are available, client's budget, what skills and equipment are available for constructing the building. The best way to approach D4D for a project is to understand the goals of the client, the limits of the project, as well as D4D principles, and effectively communicate with the project team to best come up with a viable solution for the project.

From my research, I have found D4D is especially practical in areas of the world that are susceptible to rapid population fluctuation within the life of a building. Some reasons of how a population could fluctuate quickly could be caused by physical changes of city plan layouts, demographics, and environmental effects (this could include extreme weather such as flooding, droughts, earthquakes, snow and hurricanes or slower environmental effects such as erosion, flooding or damage from sun or wind). As an example, buildings located down in the Italy region may benefit from consideration of applying D4D principles to their building simply because the buildings in this region have a higher chance to become flooded as the water level rises. Having a building that can be relocated will save the owner costs from purchasing a new building or existing facilities.

The D4D principles are also practical in areas of design because it forces the design to be simplified based on material selection and building system integration. To design with fewer materials and consistent connections will assure the building to be constructed quicker with less confusion to all traits. The simplified design with separation of building systems and access points to critical connections allows for easier maintenance or upgrading. Providing these possibilities as well as giving the option to install future systems will improve the usefulness over the building's lifetime. Once the building has completed its use, the deconstruction process and material separation will also be quicker with less confusion resulting in many materials being redirected from landfills.

D4D can only go so far though and once the building is in operation, proper maintenance is then the key factor how long a building will last and how easily it will be taken down in the future. Throughout my research, I had found building designs that were advertised to have no or very low maintenance over its lifetime. Owners were attracted to this idea because it meant that their facilities department could then be reduced which directly saves in operating costs. From what I have found, this design scheme cannot work because over time, things will need to be cleaned, repaired or replaced otherwise it will breakdown resulting in high costs. Designing to make these activities easier will help in prolonging the life of the building. Proper education and user friendliness must also be factored when designing a simple yet practical building that meets the needs of its owners.

The current needs for a building will change over time and in order to cut future costs is to allocated more time toward the design of the building and understanding its effects to the owner and

its surrounding environment. Making this investment will help the company remain competitive in the future because the longer that the building can last, the more that the building is paying for itself. Saving this money will allow for future opportunities for the company to excel in their own business.

Though D4D is not the only building design answer in addressing our clients needs, it is only a stepping stone to get us to think long-term, about the design of our buildings and the effects they have toward the future. Construction and demolition waste is often overlooked however; it has the potential to be a key factor for successful companies. Consideration ought to be emphasized in reuse of building materials because it reduces future costs, energy demand, raw material demand and landfilling.

### **What do I see to be the drivers in the building industry for material reuse and C+D waste diversion?**

There were many times that I have heard in interviews that “we thought that it would be worth the small amount of expense and effort to create the best place for the long term future.” These types of people saying this seem to get the overall picture of thinking for the future instead only focusing on the present moment. Enlightened and committed clients are as crucial of a part of the design team as the architect and the engineer. In the end, the client will have a building that will reflect dedication and sensitivity to the environment as well as the future demands of the company.

A realistic option for the future is to spend more time in understanding the changing demands for a building and design in such as way to allow for flexibility and adaptability to be more present within the design. In this day, there are more factors than just the bottom line cost to constructing a building. A client can have their building needs change all within a few years after a building has been completed because such things as technology improving or the business market changing. Because of this, more and more companies are looking at payback periods and energy efficiency to find ways to subsidize their building cost over the building’s life. Flexible buildings can serve multiple purposes and can be modified over time to continue meeting the clients demand. Adaptability must be looked at not only to meet the needs of the client, but also the city or town that the building will be located in. Questions such as, how can this building be used in a way that could benefit the people in the future, must be asked. Being innovative on how to help the surrounding community and environment will have many benefits in both short and long term.

There is also much room for improvement in terms of how contracts are written. There are few standards or incentives anywhere for D4D principles or even designing with reclaimed materials to be implemented. Building codes are not written to support the use of reclaimed materials because of the issue of quality of the materials that are received. Even with the USGBC, the LEED building rating system fails to mention anything about D4D while our Canadian neighbors have a point system that focuses on building durability with the intent to minimize the materials use and construction waste over a building’s life resulting from premature failure of buildings and its constituent components and assemblies. I believe that over time, our standards will change but the reason why they haven’t yet is because the construction and building industry are slow to change.

I would like to see companies in these industries choose to invest more in flexible, adaptable, and constructible projects because they feel that it is a profitable and valuable option in remaining competitive. If this happens then, they will be able to educate clients and others about the benefits and profitability that these designs have both long and short term.

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## **PERSONAL LIFE**

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As I mentioned previously, I can’t believe that the fellowship is near completion yet I am proud of what I have done from the experience. I have personally benefited from the fellowship because it has allowed me to take an idea in my head and actually make it a reality. Everything that I wanted to do, I did and if it wasn’t for the flexibility of the fellowship, I would not been able to fully accomplish this. Recently I was even asked by Dr. Chini to review a proposal that he wrote for the

United States Green Building Committee on implementing D4D into the LEED checklist. I thought he did a great job and gave him a few comments of what I thought were some issues that need to be addressed in greater detail. His response to my comments was that they were very useful and that we would have to discuss his proposal in greater details. If Dr. Chini makes some adjustments on his proposal based off the suggestions that were made and if the USGBC accepts the proposal, then that means that I have helped in establishing D4D as standard in sustainable design in America. Setting my ego aside that alone is a wonderful opportunity. I look forward to the outcome of Dr. Chini's proposal.

The next steps for me are still in the decision making process. I have not yet made a concrete decision on what I am doing merely because I want to focus on one major project at a time. Once the fellowship is completed, I am interested in exploring some of the options and then letting my life take me in the direction that it is suppose to. My first option is to get in touch with the Oneida Nation who have helped support me with getting through MSOE. They are always interested in what I am doing and very supportive in the decisions that I have made. I would like to try and establish a position with them that would review their current building and community development practices for their reservation and see if I could assist in making it more sustainable. I believe that the Native Americans were once the most sustainable people on the world and to find ways to keep their culture may be important to them. I have recently found that the USGBC has established a LEED for neighborhoods and I would like to research that a bit and see if the tribe is interested in changing their current practices. This would be my way of giving back to the people while also further developing my sustainability learning skills.

Another option, is to get back in touch with A. Epstein and Sons International, for they are an in-house company that does architecture, construction, engineering, graphic design, interiors, strategic services and sustainable development. I am interested in working with them to better my design and construction experience while continuing to develop my skills in learning new programs and technology that would make a meaningful contribution to their corporate goals.

Though the job market is slow for hiring, I am currently working on building a sustainable Victorian style house in Door County where I have been born and raised in. I feel that with this experience as well as for the fellowship, I am continuing to remain competitive in both the design and building industry. However, I must consider that because of the market, it may be difficult to find a position that fits with what I want to do. If this is the case, then I like the idea of going back to a university to work on getting my masters. Going in this direction will give me opportunities for either my PhD later in life, future teaching or working with a company on sustainable design concepts. Dr. Chini knows of many universities nationwide that offer programs that I may be interested in. Personally, I enjoy the idea of working under him at the University of Florida, but this option is only in the idea stages at the current moment. Dr. Chini mentioned that the masters program ought to be considered even after I have been working in the building design field for a couple of years or so. I will consider this option strongly in the future and make it known to my employer.

I am taking this time to thank the people who have helped make my experience as enjoyable and educational as possible. The fellowship has been one major opportunity that has strongly influenced my life on many different levels and will continue to do so for years to come. The group of people that I would like to thank first is my family for their love and support in me and my dreams and goals for my career as well as for the fellowship. I love you all and I am glad to be home again!

Thank you Mr. Regnier for giving me the opportunity for making difference in this world. Though it is possible that there is the option that nobody will ever look at the website, I have personally grown in a way that will help me continue to do things I am passionate about, especially on a professional level. I hope to meet you sometime to personally thank you for what you have done to my life. I appreciate the support from Mike Holland and Dr. Chini for their efforts in challenging me while I was abroad by taking the time to proof read my work, make suggestion and ask good questions that helped keep me focused while abroad. Your efforts are much appreciated.

I would also like to thank the faculty at Milwaukee School of Engineering (MSOE) for preparing me with excellent organization and self discipline skills. Attending MSOE had been a very challenging but enjoyable experience in my life and I have not regretted attending the 5 year double undergraduate program. I am especially thankful to Dr. Jackman, Professor Carol Digglemen and Professor Emmer for keeping me on track and providing valuable advice along the way.

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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](mailto:stephand@msoe.edu).