

2008 VICTOR L. REGNIER TRAVELING FELLOWSHIP

**DESIGNING FOR DECONSTRUCTION**  
**(REVISED)**

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TAKING ONE STEP AT A TIME TOWARDS  
SUSTAINABLE DESIGN

**“WE DO NOT INHERIT THE EARTH FROM OUR  
ANCESTORS, WE BORROW IT FROM OUR CHILDREN.”**  
– NATIVE AMERICAN PROVERB

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## PROPOSAL

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Over the past few years, the concept of green building has progressed considerably; it is now much better understood as a practice and strongly considered by many owners. Though sustainable design has been practiced for many decades, it has more recently been catching the eye of various professions across the United States. With more and more consideration for delivering triple the bottom line, thinking green is the new swing for the construction industry and its professionals. Thanks to programs such as LEED™ and Green Globes, buildings are able to save money through technologies which analyze efficient systems, payback periods, and higher production levels. Investing in these technologies, owners save throughout the duration of the building's operations. Such practices are as simple as converting from incandescent to fluorescent light bulbs. With an initial cost \$1 more than incandescent, fluorescent light can save \$50 in electricity throughout the lifetime of the bulb.

Though the push for sustainability is growing rapidly in the United States, we are still thought to be behind compared to many other countries in the world. Europe, for instance, has a plethora of countries in which a sustainable mentality is not only upheld, but benefited from in numerous ways. By looking to our contemporaries, we enhance our understanding of these benefits and perhaps will adopt this mentality. Americans then will be better prepared to address our own problems through sustainable solutions.

I am focusing my proposal on the concept of deconstruction for both publicly and privately driven buildings. Current construction practices focus solely on the assembly of materials and components with the goal of simply producing a final building. With such a linear view of the built environment, the life-options for materials when a building has reached the end of its service life are severely limited. I am aware that in America we have already found ways of benefiting through salvaging materials for reuse or recycling, and while I support these practices, I would like to push my focus further and discuss the concept of *Designing for Deconstruction*. This concept is simply thinking about how to design a building to be deconstructed after its intended use. Once the building has been deconstructed, the designing also needs to take into account the economical benefits of diverting the building materials elsewhere; whether it is reusing the material, recycling, or refabrication into a new product.

My goal is to look at case studies of projects that have been designed for deconstruction. I want to determine ways to utilize new and existing materials in the most ecologically, environmentally, socially and economic manner possible. With this information, I want to establish standard practices which can be used in the United States for designing transformable buildings and extend the service life of construction materials.

Because of the complexity and integration of building components, I plan to interview a wide range of professionals to better understand the concept from each angle. Speaking with demolition contractors, structural engineers, architects, and construction managers will help me understand the cost, schedule and difficulties of a building's design and how to make it economically feasible. Professional societies, government agencies, code consultants

and manufacturers will help in determining the restrictions toward the design which need to be considered for establishing standard practices. For example, buildings demolished in California have 75% of their materials reused in Mexico rather than the US because of the restrictions in US codes. By interviewing the manufacturers and suppliers, I want to understand the practice of prefabrication and the benefits towards waste, cost and schedule of a project. Also understanding the refurbishing process of what construction materials go through before they are used again will play a part in refining the art of deconstruction.

Throughout the duration of my travels I plan to create a website of case studies and lessons learned. This information hopefully can be used as a framework of standard practices for professionals into real practical daily uses. I would also like to see other professionals and organizations such as USGBC implement my research into their LEED™ rating system. I also would like to see professors reference the website into their course syllabus to better educate future generations. In addition to the website, I would feel comfortable presenting my findings to classes and professionals of all sorts when I get back.

Some may feel that gathering this information may be difficult considering that I will be seen as a foreigner who recently graduated. However I feel very confident with my proposal, and believe that my experience traveling abroad as a foreign exchange student in Prague will be a great asset in overcoming these initial misconceptions. While abroad, I was asked to research and document the difficulties of the Czech's sewer system and to give a speech regarding European architectural history to students upon my return. To better understand the traveling fellowship I have contacted previous winners Joe Karten and Mary Evens. They have mentored me by giving their advice on subjects such as their personal day-to-day activities while living abroad, the “do's” and “don'ts” while traveling, as well as help me establish contacts in various countries. I have garnered a lot of support regarding this proposal, and everyone involved is interested in the potential outcome.

I am a driven individual who is very focused on my career and where I want it to go and why. If I were to be accepted for the 2008 Victor L. Regnier Traveling Fellowship, I would become capable of creating physical evidence that could potentially change the way we design and construct buildings. Because of economic issues in the construction industry, the information I have collected and put into a final report may not be useful immediately. I know, however, that the data collected will be useful one day due to the demand for construction and the limited supply of materials. The concept of green building is becoming more popular and we need to continue to find new and innovative ways to build better. Thirty percent of *all* waste is due to construction and deconstruction of materials. As the demand for reuse of land in urban areas increases, so should the need for refurbishment and redevelopment of existing infrastructures. Just because a building is up and running one day and no longer needed the next, that doesn't mean that all of the materials used to create the building need to be thrown away. Changing the way we waste in construction could change the way we waste in other markets as well. If I were able to further pursue my proposal with the Victor L. Regnier Traveling Fellowship, I would be able to live my dream of making a true difference.

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## TRAVELING PLAN

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I plan to leave the United States in the fall of 2008 for the purpose to acquire a better understanding the deconstruction and demolition process practiced in the United States. I want to contact various professional organizations to gain a better grasp of the research of demolition and deconstruction. I will continue to establish contacts and case studies, interview US professionals and refine my schedule all to better myself and the experiences while abroad.

My first travel stop will be in Edinburgh, Scotland where I will live for 1.5 months with two of my current roommates, Erik Peil and Andrew Haas. I plan on visiting the Robert Gordon University in Aberdeen, where designing for deconstruction experiments are conducted. Such practices include material cycle handling, material identification, simplicity of construction techniques, exposure of mechanical connections, independence of structure and partitioning, and making short life-cycle components readily accessible. Here, material systems are identified at three levels: the systems or building level, product level and materials level. The university would not only provide me with an excellent example of case studies throughout Scotland but also a better understanding of how to compare material's durability and the assemblies of these materials.

Also in Scotland is the Scottish Ecological Design Association, where they promote the ecological design of buildings with materials and systems which do not negatively affect the quality of life for future generations. They are the first committee in the UK to create a website strictly for designing for deconstruction. They have documented numerous case studies throughout the UK including the Arup Camus in the West Midlands. This building was designed with sustainability in mind by having the structural steel components with site bolted connections with precast concrete to allow for ease of dismantling in the future. The Scottish Ecological Design Association is looking to educate young professionals to facilitate the spread of eco-design through training programs. The cost to become a member is only 10 Euros and I will then have access to a wide variety of members from numerous professions.

The United Kingdom will be the next country I will visit. From there I will travel to the University of Brighton and meet with A.J. Miller where I will be engaged with the environmental consequences of construction, its impact on the UK society at large and its implications for a sustainable future. I will be exposed to many case studies and travel to these locations to see the reality of the deconstruction concept and the impacts toward building maintenance and society. I will make my way towards Watford where the Building Research Establishment (BRE) is headquartered. This private organization carries out research, consultancy, and testing for the construction and built environment sectors. BRE has areas of interest in the preparation of national and international standards, building codes and regulations for the United Kingdom. BRE also has two environmental rating programs for buildings in which I wish to be exposed to.

After my three months travel in Scotland and the UK, I will focus my travels in Sweden. The Swedish government is focused on being labeled as “the greenest country in the world” therefore I believe I will find many projects that are financed through the government

instead of private companies. Lisa MacKinnon, policy director for 1000 Friends of Wisconsin, will aid in establishing many contacts with professional contacts who have designed buildings for deconstruction before. While traveling, I will make sure to stop at Lund Institute of Technology departments to visit as the Architecture and Built Environment, Buildings and Environmental Technology, and Construction Services. These departments will help me understand how Sweden has implemented designing for deconstruction into their society.

For the next two months I will be in Germany visiting universities, architectural firms, construction management and demolition companies, professional agencies, and engineers. My main contacts at this moment are Frank Schultmann and Nichole Sunke at the University of Siegen. Both contacts are members of the International Council for Research and Innovation in Building and Construction (CIB) and are dedicated to finding ways to drastically reduce the deployment and consumption of non-renewable construction materials by replacing these materials with renewable materials while delivering the greatest financial, social, environmental, and ecological outcomes. Both individuals have agreed to offer case studies of projects that have been designed for deconstruction.

For the next month, I will be in the Netherlands at the University of Delft. At the University of Delft, Elma Durmisevic, Inge Blom, and Professor Itard have agreed to aid me by providing a list of contacts and case studies of buildings that have been designed for deconstruction. I am interested in attending the 3<sup>rd</sup> annual CIB International Conference on Smart and Sustainable Built Environment. This event is also located in Delft and has a “closing cycles” conference which focuses on ways to close the material loops.

My last stop will be at one of the greenest places in the world, Vancouver, British Columbia. There is a case study of the Roy Stibbs Elementary School, which was completely destroyed by a fire on December 28 1993. The design team ended up dismantling a nearby secondary school and reusing 75% of the entire structure where it was re-erected using the original shop drawings. Ultimately, the contractors were able to shave five months off of the project schedule by salvaging the steel members. I am interested in interviewing professionals and community members on the effects of designing for deconstruction.

As mentioned earlier, the goal is to use the information gathered to establish common practice for professionals here in the United States. I am curious about discovering the differences between the Canadian Green Building Council (CaGBC) and USGBC’s LEED™ programs when considering designing for deconstruction. Currently, CaGBC has a LEED™ credit for “Durable Buildings” which emphasizes durability of construction materials compared to traditional. The idea is the owner saves money by reducing the maintenance and replacement costs by using durable exterior construction materials. Visiting project sites and talking with the facility departments will help me understand the practices used to maintain the building and its materials.

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## CONTACTS

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Through the large amount of support I have received, I have been able to develop a solid contact list of different professionals. The following list has been broken down by the region where I plan on traveling.

### Scotland and the U.K. –

- **Former roommates Erik Peil and Andrew Haas** – These two individuals will be residents by the time I fly out to Edinburgh, Scotland. They are both graduate students studying structural engineering at Milwaukee School of Engineering and they are more than excited to welcome me and help get my feet wet in Scotland.
- **Mary Kelly** – Scottish Ecological Design Association Development Officer – will be a great asset in getting case studies and personal contacts from a variety of professionals working on projects dealing with deconstruction.
- **A.J. Miller** – Faculty member of Science and Engineering at the University of Brighton, U.K. Mr. Miller is a member of the CIB and is an asset in obtaining a number of case studies.

### Sweden –

- **Lisa MacKinnon** – Policy Director of 1000 Friends of Wisconsin – Tour coordinator for Sustainable Sweden Tours. Knows of a number of different projects and personnel for sustainable building.
- **Mats Williamson** – President of Skanska Sweden. He is in contact with a large number of deconstruction and construction projects throughout Sweden.
- **Filip Henley** – Translator of the book “The Ecology of Building Materials,” by Bjorn Berge. Mr. Henley is a great person to interview to better understand many benefits to alternative building materials. He will elaborate on how to design and manufacture reusable building materials.
- **Hans Norgren** – Project Leader at MKB Fastighets, a sustainable construction and renovation company which will be able to help me understand which construction materials are feasible to reuse and recycle.

### Germany –

- **Dr. Frank Schultmann and Nichole Sunke** – Each Chairs of the Construction Management and Economics Department at the University of Siegen. Both contacts will help me in understanding the governmental policies in Germany and standard practices used when designing for deconstruction.

- **Ekkenhard Voss** – President of NPS Tchoban Voss, an large architectural firm located in Berlin. This firm is dedicated to sustainable design and uses up to date technology for implementing sustainable designs.
- **Bernard Heiming** - President of Tarragon GMBH (construction manager firm) located in Hamburg.

### The Netherlands –

- **Elma Durmisevic** – Faculty of Architecture at Delft University. Elma focuses on finding ways to make buildings become more transformable. This concept is intended to maintain a high flexibility level for the building so future owners will find incentives to keep and maintain the building properly.
- **Inge Blom and L.C.M. Itard** – Both contacts research in the Institute for Housing, Urban and Mobility Studies Department at Delft University. Both will help me understand how designing for deconstruction can be applied and found feasible for residential and other urban buildings.
- **Lilliana Abarca** – Eindhoven University of Technology. This University is ranked third among all research universities based on the impact of its scientific research. Lilliana will be helping me get me feet wet by helping to find research conducted in the Netherlands as well as aid in finding deconstruction companies, architectural professionals, and professional organizations.

### Canada -

- **Bob Marshall** – Chair for the Canada Green Building Council. He is a great resource for understanding durable building envelope systems which will reduce the life cycle costs of buildings. Bob has my examples of good, bad, and ugly building envelope systems and will be able to breakdown the essentials for long lasting building facades.
- **Ben Ramos** – Executive Assistant at Recycling Council of British Columbia. Mr. Ramos will be my main contact to numerous construction and deconstruction companies. He will show me how the company has been tracking British Columbia’s environmental footprint and ways they are shooting for their “zero waste” goal.
- **Malcolm and Jessica** – Spokes personnel for Encorp Pacific in Canada. Both of these individuals will be able to discuss the effectiveness for having an online source to buy and sell used construction materials and equipment. I will be able to better understand which materials are in demand and hold the greatest value and reasons why.

### United States –

- **Peter Templeton** – VP of Education for USGBC, Peter will be my hub of communication for USGBC. Peter will get me in contact with the right people for discussion of how designing for deconstruction can be implemented into the LEED™ checklist.
- **Building Materials Reuse Association (BMRA)** – Allow me to better understand the deconstruction process and the feasibilities of it throughout the entire United States.
- **Joe Karten and Mary Evens** – Former Regnier Traveling Fellowship winners who have given me great advice throughout the traveling fellowship proposal process.
- **Charles J. Kibert** – Professor at M.E. Rinker, Sr. School of Building Construction and the author of “Sustainable Construction Green Building Design and Delivery.” Professor Kibert has a large amount of information on sustainable design and will be an excellent resource for getting me in touch with the proper people at the Robert Gordon University in Aberdeen.

#### Resources To Be Purchased and read –

- **Deconstruction and Materials Reuse – an International Overview** – CIB Task Group 39 was formed to produce a comprehensive analysis of worldwide building deconstruction and materials reuse programs that address the key technical, economic and policy issues needed to make deconstruction and reuse of building materials a viable option to demolition and landfilling. This publication addresses the subject of deconstruction in the Netherlands, UK, Germany, USA, etc.
- **CIRIA’s Designing for Deconstruction** – addresses opportunities for maximizing the use of components and recycling of materials when a building is wholly or partially deconstructed. The guide also reviews the processes by which buildings are demolished and can be deconstructed, the opportunities for reusing components and recycling materials, and current expenses of deconstruction.
- **The Ecology Of Building Materials** – by Bjorn Berge, this book is more than an introduction to the ideas of sustainability. There is a clear and scientific case for many changes from how we build and which materials we choose to build with. Each section gives an overview with just enough history, technical understanding and chemistry to give the reader the background and real understanding of the issues and choices. The book is broken down into three sections: issues of material production; energy and pollution; and tables with quantifiable environmental effects of each material.
- **ENR’s Top 200 International Design Firms** – July 23, 2007 – A great resource to get information on the main design firms in the locations desired.

- **A Report on the Feasibility of Deconstruction: An Investigation of Deconstruction Activity in Four Cities** – This book addresses the methodology of deconstruction and includes the recommended actions for various types of governments. One of the cities listed is Milwaukee, Wisconsin, where I will be able to contact members from organizations on the success of project deconstruction. ALREADY PURCHASED!
- **A Guide to Deconstruction** – An overview of deconstruction with a focus on *Community Development Opportunities* complete with deconstruction project profiles and case studies. ALREADY PURCHASED!

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### INTERVIEW QUESTIONS TO THE ARCHITECT

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1. What recycled materials should be considered for designing for deconstruction and why?
2. How can the number of construction materials be reduced yet maintain its aesthetic appeal?
3. Which hazardous materials should be avoided for designing for deconstruction?
4. How are the construction materials identified throughout the entire building life?
5. What type of information is important to record for designing for deconstruction?
6. Are there ways of standardizing pieces identified?
7. What is the best practice in creating an open building that has interchangeable parts?
8. What are the incentives for owners to design for deconstruction?
9. What concerns are addressed when designing building component sizes for deconstruction? What are some of the main challenges?
10. How are the construction materials handled differently?
11. How do you reduce the number of connections of a building?
12. What technologies are used for joints and connectors in order to withstand repeated assembly and disassembly?
13. How is the weight of materials addressed when designing for deconstruction?
14. How do you identify the stages and points of disassembly?

15. Who retains the information on the building assembly process in order to deconstruct?
16. How is weather factored when designing for deconstruction?
17. Which materials ought not to be considered for recycling and why?
18. If an owner wants green roofs but also would like to design for deconstruction, what steps need to be considered?
19. Are manufactures interested in purchasing back materials after a buildings use?

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### **INTERVIEW QUESTIONS TO THE CONSTRUCTION MANAGER**

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1. Is there any special training for deconstruction? What types of training is needed for the owner to properly maintain the building?
2. Which practices ought to be considered for offsite assembly technologies and standard onsite building practices?
3. What are the differences in the way construction materials are handled during the construction phase and the deconstruction phase? How would you like to see this change?
4. Where is first begin the disassembly stages of a building?
5. How long does it take for steel to be constructed by bolt connections verses welding? What about deconstruction?
6. How do you identify the stages and points of disassembly?
7. Which areas are best used for cast in place verses precast concrete?
8. What mortar mix is recommended to best preserve brick and CMU?
9. What steps are taken in handling construction material during the deconstruction phase?
10. How does winter effect deconstruction? Rain? Wind?
11. How can materials like concrete, gypsum board, wood and be used for a new project?
12. Which materials ought not to be considered for recycling and why?