

Construction Practices in Austria and the European Union

Comparisons and Recommendations for the Construction Industry in the United States

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Abstract

It is my belief that a lot can be learned in the United States from practices employed in other countries, and this paper is an exploration of this with specific recommendations that should be implemented in the United States. My research question that I aimed to answer is "What construction practices can be changed in the United States in order to improve efficiency and reduce environmental impact?"

I chose this topic while studying Construction Management at California Polytechnic State University and after completing an internship with a small commercial builder in Phoenix, Arizona. Like many industries, there is a lot of waste and room for improvement in the construction industry and fixing this is a major focus for myself. I have witnessed waste and inefficiency firsthand in the field, as well as learned about it in classes and now I have researched this further and looked for possible solutions or improvements.

I specifically focused on construction business ethics as well as the role the government plays in the construction industry in Europe. I was also on the lookout for innovations and practices that can be implemented effectively in the United States to improve efficiency. During my initial research I met with construction professionals in the Austrian area in order to gain a broad view, from many perspectives. Specific questions I wanted answered were about the government's involvement in the industry, what recent practices have been implemented to reduce waste and improve efficiency, and also I was curious about efforts to provide more "green" construction in Europe. In

addition, throughout my research I made contact with construction professionals in the United States, in order to supplement my research. I will be determining the feasibility of implementing new practices in the United States and the input of current professionals is invaluable.

It is my belief that having a broad perspective when facing challenges helps to face those challenges and solve problems the most effectively. The challenge being faced in the construction industry is maximizing efficiency and minimizing waste and the opportunity to research solutions to this challenge in Europe provided possible solutions that would not be otherwise discovered.

Construction in Europe

Materials Used

When observing construction in Austria, and many places in Europe, one cannot help but notice the overwhelming dominance of concrete and masonry construction. In Europe, the majority of large forests were clear cut many years ago, leaving only young growth or growth that is too inaccessible or unrealistic to use on a large scale. This combined with the relatively cheap cost of concrete and the strength of its endorses, leads to this dominance of concrete and masonry construction. In addition, the area of disruption for a concrete and masonry is relatively limited and can continue to provide for many years (European Construction). This factors into the historically heavy use of concrete and masonry design, which continues into the modern era.



Figure 1. Ringstrasse Vienna, Austria showing the dominance of concrete and masonry construction (photo from imagesbyar.com)

A big push recently in the European Union is to reuse material within the construction industry, for new and modern construction. According to a new report from analysts Frost & Sullivan, the market for recycled construction materials such as PVC, gypsum, aggregates and recycled glass generated revenues of €744.1 million in 2010, and is estimated to reach €1.3 billion by 2016 (M, Ben). Currently the European Quality Association for Recycling (EQAR) reported that the recycling quota for construction and demolition waste is on average to be increased to 70% of the waste produced until 2020 in the European Union. According to the report, “In construction the readiness to recycle differs remarkably in Europe. In Austria, Denmark, Germany and the Netherlands a recycling quota of more than 70% was stated. However, potentials are still available in the remaining European states” (Easy, Cost-effective).

Government Involvement

Politics and government involvement vary widely throughout Europe between the different countries. In Austria, the government is a Federal Republic and the Austria has a market economy. The government has historically had heavy involvement in the economy, and with construction being one of Austria’s main industries, the government is also involved in construction. This is mainly played out in the issuing of permits and the zoning of cities as well as with inspections and safety checks.

This government involvement can have some negative and positive effects on the building process. For example, when looking at the building of a standardized warehouse

the cost of permitting is approximately 1.1 percent of the entire costs while the average cost for Europe and Central Asia is 5 percent (Doing Business). However, the days to build this standard warehouse in Austria are estimated at 192 days while the average is 177 days for Europe and Central Europe (Doing Business). This has some to do with materials procurement and construction style in Austria, but it is also a function of the permitting process. In Vienna, Austria to obtain a building permit takes approximately 80 days and costs around 300 Euro (doing business). This timing is far longer than the average in Berlin, Germany, which is only 25 days, but the cost is far less than the 6,000 Euro cost in Berlin (Doing Business). When compared with Germany, a country that is widely considered similar to Austria, the timing for permits is far longer however costs are, at times, substantially lower.

According to the 2010 Corruption Perceptions Index, Austria ranks 15th with regards to absence of corruption, this is fairly good. However, as with any country, corruption in the government is still present and this often involves the construction industry. According to governmentsecurity.org “During the year 2010 prosecutors and the federal auditor's office were still investigating the failed expansion of the Vienna airport terminal that, due to cost overruns, triggered a controversy regarding political influence in the appointment of the managers and consultants handling the project. The investigation of the federal auditor's office focused on allegations of embezzlement and related statutory offenses by the board of Airport Vienna in connection with contracts for construction companies and consultants”. This is a limited example of corruption in an industry that needs to reform its practices.

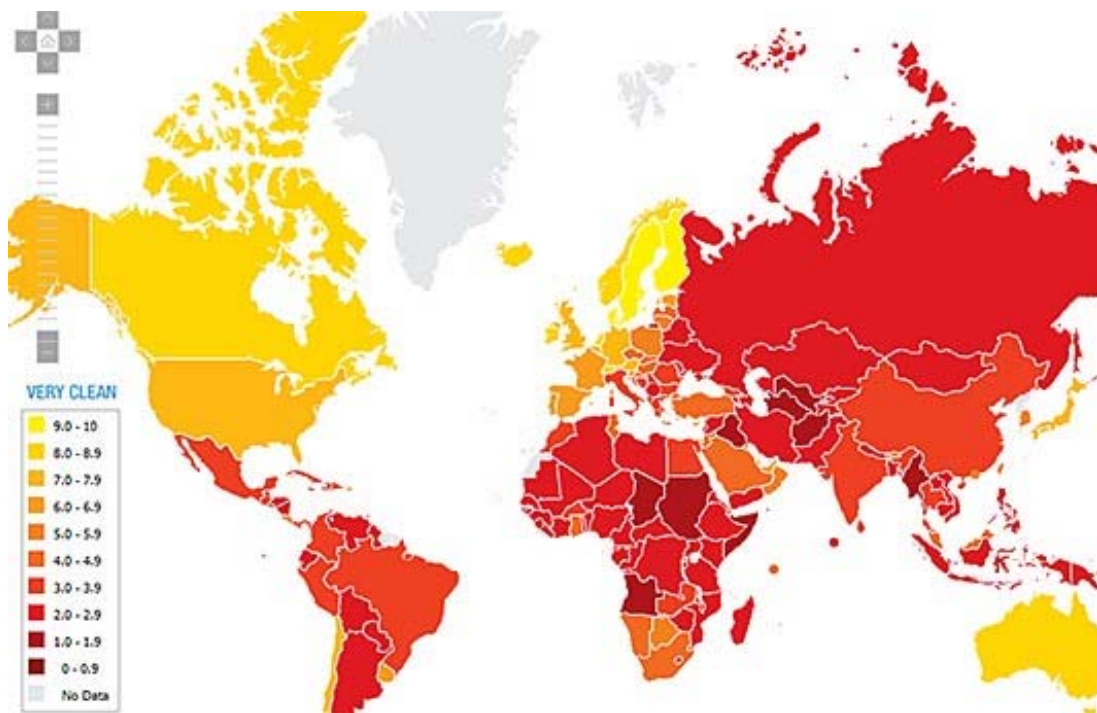


Figure 2. Results of the 2010 Corruption Perceptions Index (image from payvand.com)

Construction Delivery Methods

The construction delivery methods vary within the European Union and even within each country, as different projects and clients may require or prefer different delivery methods. In Germany, the traditional design-bid-build method with low bid procurement is often used and design-build is also used, but on a very limited basis. In the Netherlands, design-bid-build is also primarily used, with construction being completed under the supervision of an engineering department (Project Delivery).

Additionally in Germany, the last decade has seen the implementation of Public, Private Partnerships (PPP), mostly in the infrastructure system. In these projects contractors are chosen based on price, quality, and scheduling and they are responsible for design, construction, and maintenance of the project for a set period of time. The contracted company collects fees for the section of road it maintains, and after the given period of time expires the project is turned back over to the government. Germany is not the only country taking advantage of the Public, Private Partnership delivery method. In 2008 the A5 Nordautobahn was being constructed as a PPP north of Vienna, Austria. This project was one of the largest the region had seen and was the first project in Austria to be delivered by a PPP, with an investment of around 933 million Euro (Austria's First). PPP projects ensure that the construction is of higher quality and also take the initial cost burden off the government that may not have the funds immediately needed.



Figure 3. Section of the A5 Nordautobahn PPP Project (photo from hochtief-construction.at)

Environmental Effort

Europe, and Austria specifically, has made a conscious effort in the recent years to reduce their environmental impact as a result of the construction industry. One way this is accomplished is focusing on the energy use of constructed buildings. In the European Union, buildings account for a 40% share of energy consumption and CO2 emissions, which is well ahead of traffic and industry (Sustainable Building). Construction companies are using highly modern windows and doors to ventilation systems suitable for passive houses and automated biomass heating and solar systems in addition to other new technologies to accomplish this, and by 2020 it is hoped that government buildings in Austria will use little to no outside energy.

Another way the European Union is addressing the environmental issues is by using sustainable materials. The construction sector is the largest consumer of raw materials in the EU; construction and demolition activities also account for about 33% of waste generated annually (O'Brien, Meghan). Frost and Sullivan industry analyst Deepan Kannan explains below how sustainable materials can help eliminate the negative impact of building and construction activities on the environment:

"The widespread use of recycled material by the construction industry will result in multiple benefits including reduced waste, energy consumption and transportation costs as well as lowered pollution levels and conservation of natural resources and biodiversity"

According to the report done by Frost and Sullivan, in order to be successful in this market will require investment in technology. If new technology and products come to the current construction market, and they are affordable, manufacturers and contractors will be able to differentiate themselves from others based on their “green” products. Constant product optimization and upgrades according to the changing demands of customers will help companies to gain a competitive edge, said the analysts in the report (M, Ben). This brings up a further point, that in order for green construction to be viable, the customers must demand it and be willing to pay the upfront initial costs for this new technology.

Similarities and Differences with the United States

Materials Used

The United States, and North America in general, has historically constructed heavily with wood, often in combination with concrete foundations. This is due to the vast forests of old growth that are easily accessible and that provide large amounts of relatively cheap construction material. Wood is also very easy to work with and transport and there is a vast industry committed to providing wood for construction, from tree to lumber supplier. Because of the historical practices of building in wood, modern construction firms are very familiar with it and continue to use wood to this day, despite the shrinking forests in the United States.



Figure 4. Typical wood framed home (photo from brijetblog.com)

In addition, ever since the Industrial Revolution of the 1800s, steel has also been a major source of material, especially for the commercial and industrial construction

industries. From 1875 to 1920 American steel production grew from 380,000 tons to 60 million tons representing a very large portion of the world's production of steel. Between 1870 and 1913, United States steel production grew 7% annually as opposed to 1% in Britain or 4.3% in France and Russia (History of). Iron ore, coal, and employees were in high supply contributing to this large increase and dominance of steel production in the United States. Cities such as Pittsburgh, Pennsylvania quickly became hubs for this production and even to this day Pittsburgh is often referred to as the "Steel City". There are many benefits to steel construction in the United States, not the least of which is the cost which has decreased since 1980 and the speed of construction is also less when compared with concrete, saving further costs. Steel has a long life and will not decay quickly and additionally is a very safe form of construction.



Figure 5. Typical light steel framed building (photo from urbannirmaan.com)

The construction of large skyscrapers such as those seen in New York City, San Francisco, Los Angeles, and many other United States cities lends itself to primarily steel construction. This is because of its strength, flexibility, and light weight when compared

to concrete construction. However, steel construction in smaller structures, especially the residential industry has become far more common in the United States as well. In fact, data supplied by the National Association of Home Builders reveals that use of this product HAS increased by as much as 44 percent in 1998 alone. In addition, use of steel for framing in residential construction also grew by over 52 percent, while steel products used in floor joists grew by 25 percent in the same time period (Advantages). Steel is generally considered more sustainable than wood construction, and with the diminishing forests in the United States, its use in the residential industry is becoming more dominant.

Government Involvement

From the 1800s, the United States government has often had a fairly heavy involvement in the construction industry. One of the first major projects that had a large amount of government was the transcontinental railroad, also known as the “Pacific Railroad” or the “Overland Route”. This railroad was constructed between 1863 and 1869 and involved massive government support with the issuing of 30-year U.S. government bonds to fund its construction and large grants of government-owned land (LK). Bonds and land are not the limit to the United States government’s involvement in the construction industry, primarily involvement occurs in the permitting, zoning, and safety regulations.

When looking at the construction of a standard warehouse in the United States, permitting costs account for 1% of the total construction costs and the days to build is

approximated at 78 days (Doing Business). When compared with Canada, a country that borders the United States to the north and is relatively similar, these costs and times are significantly less. In Canada, the permitting cost to build a standard warehouse are 1.3% of the total construction costs and it takes approximately 249 days to build (Doing Business). The speed and costs for construction can be contributed to a relative ease and efficiency in the permitting process that is regulated by the government. In Los Angeles, CA it takes 5 days to obtain a building permit, as opposed to 15 days for the same permit in Canada (Doing Business). Granted, the times and costs for permits in different cities vary widely based on local city and state governments, but ultimately the government allows for a quick and relatively cheap construction.

According to the 2010 Corruption Perceptions Index, the United States ranks 22 in regards to a lack of corruption. Although this is very good compared to a worldwide standard, corruption within the government and especially relating to the construction industry is still prevalent. This corruption often arises in the allocation of government funds, as well as speeding up some construction practices such as the permitting and inspection processes. It is noted that public and private corruption can have a range of negative effects: lower-quality work, reduced economic productivity and higher levels of income inequality and poverty (Kille, Leighton). According to a 2014 study, construction projects are a primary contributor to corruption because of the many opportunities they provide: “First, construction involves large, complex, nonstandard activities, so the quality of construction can be very hard to assess. Second, domestic and international construction industries are dominated by a few monopolistic firms. Third, the industry is

closely linked to the government. Governments have major roles as ‘clients, regulators, and owners’ of construction companies. It is very common to bribe government officials to gain or alter contracts and to circumvent regulations related to construction.” (Kille, Leighton).

Construction Delivery Methods

Design-bid-build is and has been the primary delivery method in the United States, although its market share is decreasing as the years go on. Design-Bid-Build, also known as the traditional method, is giving way to a number of alternative methods. The two other most common methods are design-build and construction manager at risk (Konchar, Mark) with the design-build method being the fastest growing (Friedlander, Mark). Other popular delivery methods that are becoming more prominent are Integrated Project delivery, and Public Private Partnership.

In September 2013 the Governor George Deukmejia Court house in Long Beach, California opened ahead of schedule and was the first major civic building in the United States to be constructed as a PPP. The project additionally earned the Los Angeles Business Journal’s Commercial Real Estate Award for the 2014 Best Public Project (Long Beach). This \$340 million dollar, 531,000 square foot project is atypical for a Public, Private Partnership delivery method but was considered a huge success. PPP has

continued to be used in California and throughout the United States, although it is normally used for infrastructure projects.



**Figure 6. Governor George Deukmejian Court house in Long Beach, California
(image from aecom.com)**

Environmental Effort

In the United States, especially in states such as California and New York, green sustainable building is being pushed heavily by designers, contractors, and clients. The U.S. green building market continues to accelerate, according to McGraw-Hill Construction's 2013 Dodge Construction Green Outlook report. And furthermore, Green is expected to represent 44% of all commercial and institutional construction in the United States in 2012, growing up to 55% by 2016 (Green Building). This green construction is often pushed by the client's wants and needs but is also a big effort of the national and state governments. Starting January 2013 in California, a new law has begun

bringing in up to \$550 million annually for efficiency and clean energy school construction projects (Ward, Jennifer) and additionally, California was the first state to institute a green building code. These are just a few examples of sustainable construction being a priority in the United States.

In March 2000, the United States Green Building Council, also known as the USGBC, released a standardized certification system for analyzing the sustainability of building projects. This certification system is known as the Leadership in Energy and Environmental Design, or LEED, and has different levels for how “green” a building is. According to the USGBC website, “LEED stands for green building leadership. LEED is transforming the way we think about how buildings and communities are designed, constructed, maintained and operated across the globe”. To achieve a LEED certificate, a project must earn a certain number of points in twelve LEED credit categories. These categories include, but are not limited to; Materials and Resources, Water Efficiency, Sustainable Sites, Indoor Environmental Quality, Energy and Atmosphere, and Innovation (LEED). Although LEED is not the only green analysis system, it is predominant in the commercial industry and many companies pride themselves on meeting the high LEED standards in many or all of their projects.

Four Certification Levels



Figure 7. The four LEED certification levels (image from valleycresttakeson.com)

Sustainable construction has grown in popularity and will continue to grow, both because of its low environmental impact but also because of the long term cost savings. Although sustainable construction can often have a higher initial cost, the long term savings can recoup these costs and save the client money in the future. With the advancement of technology and techniques, these large upfront costs will continue to be reduced and the long term cost benefit will continue to increase.

Recommendations for Improvement

Construction practices in this modern era are fairly similar throughout the developed world with the ease of communication and information sharing that the internet and other technology provide. However, as with anything, there is still room for improvement in the United States construction industry. In order to be more sustainable, the United States construction industry should make an effort to use more concrete and masonry construction instead of wood. The area of disruption for a concrete and masonry production is relatively limited and can continue to provide for many years. Additionally, concrete and masonry construction is widely considered more sustainable than wood construction (European Construction). This is particularly applicable to the residential construction industry, which is a major consumer of wood. The United States has fairly advanced sustainable construction initiatives that should continue to be advanced and mandated from the government level. A focus should be put on the reuse of construction materials as a sustainable source and the technology for this should continue to advance and mandates should be implemented for a minimum of reusable material to be used on projects. Finally, in order to improve construction ethics in the United States, an effort should be made to reduce the corruption in the United States. Public and private corruption can have a range of negative effects: lower-quality work, reduced economic productivity and higher levels of income inequality and poverty (Kille, Leighton) and it should not be tolerated within the United States. The United States is ranked 22nd in lack of corruption based on the 2010 Corruption Perceptions Index, and the goal should be for a ranking of number 1.

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