

Contractual Suggestions for Engineer in Green Buildings

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Abstract

This paper discusses green buildings construction contracts with very important suggestions related to an engineer who is either a consultant, a designer, a site engineer or a supervisor over such constructions. This research discusses the commitment of an engineer to the green buildings' code and the importance of previous consultancy on such constructions in addition to the commitment of an engineer to green engineer standard and adoption of typical contracts. The engineer should consider the consequences of using green materials and the additional works, services and guarantees that should be provided after the implementation. In addition, an engineer should avoid the disadvantages of offering his previous experience and promises extensively. This paper concludes with many results and recommendations, most important of which is that the commitment to green codes is absolutely different from traditional standards required by an engineer to avoid liability.

Keywords: Green engineer, green engineer standard, green buildings, green code, construction materials, additional works, experience, LEED, and traditional buildings.

1. Introduction

Green buildings design is completely different from traditional buildings design. Therefore, such buildings require special professional practices. Thus, engineers have to negotiate with the owner on many issues before contracting. Given the great benefits of green buildings, all are eager to promote such buildings and to develop engineering designs and legal remedies as well as to issue special codes. For this reason, this research aims to set typical legal contractual suggestions that protect engineers upon their design, implementation, and pre or post consultancy on green buildings.

Contractual suggestions for green buildings' engineers is an attempt to reduce liability related to design, implementation or supervision upon contracting with the owner as much as possible and to eliminate negligence liability.

The impact of environmentally friendly green buildings is huge. Traditional buildings consume large amounts of water, energy, land and raw materials for their construction and operation. These types of traditional buildings are the reason behind large greenhouse gas (GHG) emissions as well as other air pollutants that harm our health. Also, they cause vast amounts of construction and demolition (C&D) waste, which has a great impact on wildlife and plants.³

While green construction procedures may initially seem daunting, the challenges for developers, designers, contractors, and their attorneys in following these new methods will be offset by a growing demand for the benefits of green construction and the introduction of new and better technologies within the entire building process from design through implementation, thus creating greater value for the end user.⁴

In this research, we will discuss the contractual suggestions for protecting architects (designers), civil (constructional) engineers and supervisors from hidden risks of green buildings contracts. This is through the engineers' commitment to specific green standards or codes and through providing consultations, remedies, ordinary and additional warranties as well as to show the defect of relying on typical contracts and the procedures of green materials supply and use. After the explanation of all these issues that are distinctive from traditional buildings contracts, we will suggest terms to engineers that would lessen their liabilities through adding contractual provisions to their contracts with owners. Also, an engineer should be aware to avoid or amend any risky condition inserted by the owner.

2. risks of engineer's commitment to the green buildings' codes

When an architect is committed to a specific code standard, it shall be generally liable to the general standards in design and green buildings standards related to such code. An engineer shall be liable to guarantee that such designs match the owner's demands in terms of landscaping of the building and the purposes and uses of the building as well as abiding by engineering laws, regulations and instructions. In green buildings, the architect also has such commitments though in accordance with green standards or the accredited code.

Thus, once the agreement upon contracting relies on a specific green code, the contracting engineer on the green building shall abide by all technical details stated by such code. In some countries, abiding by a specific

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³ Howe, J. (2010). Overview of Green Buildings , (Chapter 1) The Law of Green Building, ELI PRESS, USA., p 5

⁴ Baker, M., Cooley, P. , Levi M. , McLoughlin S. & Sachs S. (2010), Green Materials and Construction, (chapter.9). The Law of Green Building, ELI PRESS, USA., p219

code could be mandatory. For example, in Jordan, Article 6 of the National Building Law states that the “Technical Committee for Jordanian National Codes” shall undertake the following tasks:

- “1- Preparing the basics and principles of the national building code and raising its recommendations to the board of directors.
- 2- Recommend to the board of directors any amendments on accredited codes.
- 3- Review the objections related to the raised codes and recommend its recommendations thereof.
- 4- Monitoring specialized committees and scientific bodies assigned to prepare, amend and develop codes.
- 5- Any other assigned tasks and obligations related to codes denoted to the committee pursuant to the instructions issued by the board of directors.”

Sometimes, countries may issue clarifications and information on green buildings through special bulletins for this purpose. For example, a green buildings guide has been issued in Jordan to clarify the technical standards required to reach sustainability demands in buildings and their assessment. This guide includes the mandatory requirements derived from the Jordanian Codes for building. However, these requirements do not have points or degrees. Whereas, no building shall be entitled to assessment in terms of green buildings requirements unless these prerequisites were applied and it shall not be granted points.

Meanwhile, the mandatory requirements are those requirements that must be applied by the architect or the contractor, if they wish to achieve green buildings accreditation, and then it shall be granted its eligible points. However, no building or construction shall be eligible for green buildings assessment unless they meet such prerequisites with the specified points.

On the other hand, voluntary requirements are free to be chosen by either an architect or a contractor as appropriate, and after meeting them they shall be entitled to their specified points. They should also be encouraged to achieve the upper limit of voluntary requirements specified in the guide to get higher marks or grades and to achieve the green building certificate.¹

In some cases, the partners of a green project such as engineers, contractors and even engineering offices might be forced to apply efficient engineering codes that save energy and water while using insulators and recycling techniques. Jordanian legislation states in the Environmental Protection Law No.52 of 2006 what is meant by environment protection: “Protection of the components and elements of the environment and improvement of same and prevention of the deterioration or pollution thereof or the reduction thereof to within the safe pollution thresholds, and these components include air, water, soil, natural beings, humans, and the resources thereof.”

Usually, an engineer or architect protects himself against negligence claims through insurance. However, sometimes the contract language may include that an engineer or architect insure that the project will be granted LEED Certification. Once an engineer warrants or guarantees the LEED certificate, this might be explained as an accidental waiver of the insurance on negligence. Therefore, when an engineer or architect guarantees LEED Certification, he should insert such obligation clearly in the insurance contract in order to insure the failure of achieving such certification.

In addition, a contract may include liability of specific codes; however, there might be additional services in such codes that are not covered by a traditional insurance policy. The contractual liability could be according to the latest code issued by a specific body or according to multiple codes. Therefore, recently the AIA developed AIA 503 – 2011, (Guide for Sustainable Projects), which aims to provide extensive model contract language that can be added to other construction contracts unlike the old AIA B101-2007, which did not do much to help in liability distribution among partners and did not give solutions for the innovative developments in construction and design sectors.

As mentioned above, the new AIA 503-2011 code provides extensive model contract language (expanding the scope). This new code also sets the parameters for the Sustainability Plan, sets out Sustainable Objectives, leads to the Sustainability Certification, defines Documentation for Certification and the Certifying Authority. On the other hand, an engineer may follow more than one code. For example, the standard contract for an architect’s services for doing the LEED Certification is the AIA B214-2004. This code actually defines all phases of design and construction for the scope of work to be done. The major drawback is that it does not address the failure to achieve LEED Certification, which means that involved parties should add a clause to their contract “specifying consequences for the failure to achieve LEED Certification.”²

The contracting parties need to comprehensively understand and to be aware of the incentives and building requirements as well as the mandatory compliance with green building standards in order to guarantee meeting such requirements. This includes comprehensive knowledge of green certificate procedures, such as, the project end date (timeline) and documentation requirements of technical issues, correspondences, approvals required at each stage of green construction and other relevant issues.

¹Green House Concept and Application, 2013 Available <http://qac.jo/Files/GreenHouseConcept.pdf>

² O’Connor, H., (2012) Architect’s Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

Sometimes an engineer might be committed to the required standards of a specific code to achieve green certification, but the defect that might occur is due to the delay in the work timeline. Delay could occur due to some administrative procedures required for obtaining approvals or the authentication process; however, an engineer should realize the estimated time required.

Therefore, such unexpected delays in certification or authentication procedures might lead to delay in the comprehensive timeline in the project or the building as well as a loss of financial incentives or tax credits.¹

Thus, an architect or engineer should be very careful when referring to specific codes or specifications in green contracts, as they should understand such codes or specifications to ensure that they are included in the insurance policy in order to cover any negligence and to verify the required time to achieve the certification or accreditations.

The parties of a green project may follow a specific mandatory code issued by the concerned authorities in a particular country. However, at the same time there are energy saving regulations in the same country. Should a contradiction occur between the green building specific code and the energy saving regulations, this will create a legal conflict in terms of applying or ignoring this code. It is similar to what happened in 2007 when the city officials in Albuquerque, New Mexico enacted the Albuquerque Energy Conservation Code. This code, set to take effect in June 2008, was put forward to greatly reduce carbon dioxide and greenhouse gas emissions by making it mandatory for new and renovated buildings to meet specific energy efficiency standards. There are two volumes to this code. The first one was supposed to be applied to recently built and renovated commercial and multifamily residential buildings. The second one was supposed to be applied to recently constructed or renovated one and two family homes and townhouses. This code has options for reducing energy use. The first volume contains two options: a simplified approach that gave certain energy efficiency criteria for each building component and secondly it gave a performance rating method that encouraged compliance with the code if the proposed building was 30 percent more energy efficient than a regular building that would meet the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-1999 standards. The second volume also provides two options that buildings could meet: compliance with standards similar to the 2006 International Energy Conservation Code (IECC) or a 30 percent increase in energy efficiency over a baseline residence. Since many bodies in the city were affected by direct and indirect injuries after the enforcement of this code, the Air Conditioning, Heating and Refrigeration Institute (AHRI) and other heating/ventilation/air-conditioning and water-heating equipment trade organizations, contractors, and distributors sued the city of Albuquerque in federal district court seeking to prevent or cancel parts of the code from taking effect. In their complaint, the plaintiffs argued that EPCA preempted the code's provisions that related to requiring certain energy-efficiency levels with respect to heating, ventilation, and air-conditioning (HVAC) products. In addition, the plaintiffs alleged that EPCA and related federal laws established standards for the performance of HVAC equipment energy, efficiency, energy use, and water use of any product with limited exceptions. The plaintiffs moved for preliminary injunction to prevent the code from taking effect as scheduled, alleging irreparable harm on the following grounds:

1. They would not be able to sell non-compliant HVAC and water-heating products in the city under the new regulations;
2. because of the price increase of the equipment, businesses and consumers would repair the products rather than replace them;
3. the price increase on the same equipment would raise the cost of new homes, thus impacting the sale of new homes; and
4. there would be confusion caused by the new regulations about what standard manufacturers, contractors and distributors would have to follow.

In its opposition papers, the city denied that the harms alleged by AHRI were irreparable, and noted that many of the costs cited by AHRI would affect consumers rather than the plaintiffs. The court in 2008 granted the preliminary injunction and they stated that the code was indeed preempted. The court realized that the plaintiffs more than likely would prevail on the merits of their claim, so they analyzed the provisions of the EPCA and came to the conclusion that Congress had intended to preempt state regulation that would require specific building appliances to be energy efficient so that they could have express, uniform, national energy efficiency standards. The court noted an astonishing fact: "at the time the Code was drafted, the Green Building Manager, by his own admission, was unaware of federal statutes governing the energy efficiency of HVAC products and water heaters and the City attorneys who reviewed the Code did not raise the preemption issue."²

Thus, states and municipalities seeking to enact green building laws or regulations must determine that these laws and regulations have gone through a rigorous legal review to ensure constitutional compliance and to avoid a conflict with previously enacted federal regulations.

From the above, we conclude that official authorities issuing green codes should take into account that such issued codes should not contradict with the national issued green building laws or regulations. Otherwise, plaintiffs (engineers and others) may claim to exclude such codes.

¹ Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal. Winter 2010, vol. 9 issue 2.

² Shapiro, S. and Cheatham, C. (2010), Emerging Legal (Chapter14) The Law of Green Building, ELI PRESS, USA.p362,363

3. engineer pre-advice

Should an owner ask the engineer for pre-advice, in terms of a green contract, he should be fully familiar with laws, regulations and instructions related to green buildings to give the correct advice. Otherwise, an engineer might bear liability in the future. Hence, a consultant should have the required experience and practice in such field since he will be treated as a green building specialist.

The engineering consultancy contract might be committed by a specialized person in a particular engineering branch provided that he has previous experience and practice in such field. In addition, such a person might be licensed for practicing consultancy work.¹

Generally, there are essential duties to be undertaken by the consultant engineer, either before or after contracting on green or traditional buildings.

Therefore, a consultant engineer should analyze all the details of data related to the construction work, either in terms of infrastructure or origin itself. He should then show the owner or the customer a picture of a preliminary project by using available high-tech means to achieve the best project. He should also discuss the matters of interest with him in the field of construction, so that he can give him the advice that suits the goal behind the contract.²

Engineers should be honest and faithful in any consultation requested by the owner, whether before the start or during the designs work as well as after the completion of the work. In addition, he must warn the owners from building high prospects and expectations of things that cannot be achieved or may be realized except at a very high cost. These practices reflect the creation and professionalism of engineers as well as not to expose them to any ethical or technical responsibility in the future.

In green buildings, prior consultation before contracting is more important than in traditional buildings. Prior consultation, i.e. "green thinking" from the very beginning planning for a sustainable project will reduce the chance of problems arising during the design and construction part and it will prevent the automatic obsolescence of the building. With green building projects there is a great chance of increased costs and problems could come up that are not present in the construction of traditional buildings.³

Sustainable design has been defined as meeting the needs of the present needs without compromising the needs of the future generations financially and environmentally. Sustainable technologies are used in sustainable construction, in terms of used materials, energy systems and others. Sustainable buildings are usually cold in the summer and warm in the winter, therefore less energy is used to heat or to cool the building.⁴

There is a potential legal liability of the engineer even before the start of engineering work when the owner consults the architect to know the benefits of this green building compared to the traditional building and the benefit of green alternate design. Should the engineer fail to show the differences between the green buildings and traditional buildings, this may be considered a breach of the contract, which might lead to the liability of an architect. Therefore, the engineer must confirm the owner's precise demands and specify this accurately as well as verify the owner's approval to start with full or partial green design or to reject it.

Accordingly the contractual conditions issued by the AIA related to the consultant green building specialized engineer in terms of alternate design and its liability thereof, namely:

Article (3-2-5-1): "An architect shall consider the environmental liability related to design alternatives, such as materials selection and the orientation of the building in such a manner while taking into account the landscape and design development harmonized with the owner's program, schedule and budget."

Article (3-2-3): "An architect shall provide to the owner a primary assessment and discuss with him the alternative designs and construction means, including environmental liability to the design. An architect shall reach a compromise with the owner in terms of the building's requirements."

From our above analysis of both articles, the engineer shall discuss the following issues upon contracting:

- 1- Discuss the inclusion of environmental liability in the design.
- 2- Reach an understanding with the owner, in terms of the building's requirements.
- 3- Take into account the environmental liability for design alternatives, which is limited to material selection and construction guidance. In short, it does not necessitate the concern that AIA has made unreasonable contractual obligations. However, these contractual duties and non-performance of one of them will result in a breach of contract.

In any case, the owner can prove the engineer's liability for the existence of damage as a result of the engineer's failure to discuss the details of the design alternatives. Compensation may include unachieved energy costs as well as loss of public financial incentives or credits.⁵

¹Aljbory, I. (2013), Engineer Counsltancy, Manshorat Alhalabi Alhoqoqhyah, Birut, Libanon, p23.

²Oden, S., (2004), The Liability of Consultant Engineer and Contractor in the Field of Civil Contracts, Masha Mare, Alexandria, Egypt, P27-28.

³Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal. Winter 2010, vol. 9 issue 2.

⁴Green House Concept and Application, 2013 Available <http://qac.jo/Files/GreenHouseConcept.pdf>

⁵Manies R. "AIA "Esq. (2014), WHITE PAPER: Managing the Risks and Embracing the Benefits of Going Green Prepared for The AIA

If the engineer chooses alternative methods of design prior to commencement of work or during implementation, the owner or owner's consultant shall be given an explanation for the reasons for the use of these methods and the details shall be discussed as well as the feasibility and benefits of using these methods, in accordance with green building requirements. He should get a written approval after agreeing upon these alternative methods.

On the other hand, if the owner refuses to start a green building after consulting with the engineer, the latter should be careful to take a written document indicating the owner's approval, regardless of the green building for any reason, i.e. the owner retreated from the green building to the traditional building.

Another important task for the consultant engineer of a green building is to discuss with the owner alternative methods, including the feasibility of incorporating environmental design and other green building matters.

Architects should keep records of such discussions and consultations with the owner, including the owner's decisions regarding the application of environmental design methods. It is also important to keep written records, as contractual duties may include "discussing" green design or "taking into consideration or interest" green alternatives. Failure to comply with these obligations shall be deemed a breach of the usual engineering standard.

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When a design professional is working on a project and is a LEED consultant, he must think about the impact the submittal might have on his professional liability insurance. For design professionals, most insurance policies declare that they do not apply to guarantees and warranties and they also do not cover any claims coming from express warranties and guarantees. If a design professional failed to get a specific LEED Certification level, this could cause a dispute between him and his insurance company if he is declared liable.

To avoid this potential exposure, the design professional as such engineer should add the following statement to the application of LEED certification: "The signing of this and any other submittal template is solely for the satisfaction of this LEED certification process and does not constitute any guarantee or warranty of any work or product."

Design professionals, who also are engineers, should discuss this issue with their insurance companies ahead of time and note that this disclaimer might not be enough to avoid the coverage issue without confirmation from their insurance company. The engineer should make sure in their contracts to state that they cannot guarantee LEED Certification while they will observe a reasonable standard of care for their performance of services relating to LEED design as they would do for any other professional services.²

4. The commitment of the engineer to green engineering standard

Green project management and performance is expected to begin from the early stages of design. This sets out a clear concept of the project's scope of work that requires a balance between aesthetics and other green building requirements. The legal practitioner must clearly determine the level of performance and level of care required from project team participants in project agreements or contracts. The default provisions should clearly specify the compensation in the contract and the consequences that would result if the design were not able to be reached at the desired level of building certification requirements, namely, obtaining the green certificate.³

In order to assess developmental impacts on the environment, green building standards have been established and seek to implement measurable achievements. Among green building standards, there is the common theme that the Green Engineer is seeking to reduce the building's impact on the environment and human health while seeking to increase the building's efficiency. This can be accomplished through the efficient use of water, energy building materials and operational work. While the idea of sustainability remains constant, construction methods evolve. The standards used to measure green buildings are evolving. In order to measure performance, green building standards has established benchmarks or requirements within specific measurable categories. For example, LEED credits go to a building that utilizes high efficiency bathroom fixtures, so the benchmark to gain this credit point under the LEED system would require that the whole building consume 20 percent less water than the building's baseline calculation. Of course, this is without including landscaping. As for energy, the performance measure should increase the building's energy efficiency incrementally beyond standard specifications.⁴

In determining sustainable building practices, most green building standards focus on the following six

Trust February 2008 revised: September 2014 ·P15, Available <http://www.theiaitrust.com> (April 1, 2017), P10.

¹ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

² White, G., Nichols, J. & York, J. (2011). Green Building Rating Systems and Green Leases, 41 *Envtl. Rep. News & Analysis* 10049, 10057, p22

³ Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, *Energy Litigation Journal*. Winter 2010, vol. 9 issue 2.

⁴ White, G., Nichols, J. & York, J. (2011). Green Building Rating Systems and Green Leases, 41 *Envtl. Rep. News & Analysis* 10049, 10057, p15.

categories: ¹

1. Site location
2. Energy conservation
3. Water conservation
4. Material selection
5. Indoor air quality
6. Building operations and maintenance

Green buildings are environmentally friendly, in terms of energy issues, and are divided into two categories, passive design and active design. Passive design is most often used with respect to architecture and infrastructure of the buildings, i.e. to utilize daylight, natural ventilation to reduce need for electricity and mechanical heating, and ventilation and air conditioning. Green buildings rely on sunlight for the contribution to the internal thermal comfortability over the daily and yearly sun cycle. In the meantime, it reduces the need for active heating and air conditioning systems. Passive design is also importantly concerned with the building's site, dominating weather, design and construction, reliance on solar energy and shading. This passive design should reduce the need for artificial lighting and may mean that cooling systems and mechanical ventilation are not necessary.

The ability to achieve passive design goals of solar energy depends on the seasonal changes in the daily sun track. Whereas active design of buildings depends upon developed technical systems to control the internal environment of the building by using particular heating, ventilating, and air conditioning (HVAC) systems that are based on energy efficiency related functions, where such systems are utilized as electric generators by the solar systems. Active design is also characterized by three pillars of heating, ventilating, and air conditioning that provide thermal comfortability, healthy air in closed places within a reasonable framework of installation and operation, maintenance costs, air leakage reduction and pressure balance between different areas. ²Among other additional features of green buildings standards that should be taken into account by engineers, contractors and occupants is the social benefit. As often, green buildings' occupants and laborers enjoy a better life and suffer less sanitary problems. Moreover, focusing on the selection of an appropriate site for the green building can prevent the new building from stressing the surrounding buildings' infrastructure.

Among other green standards, the engineer should take into consideration that green buildings should not only be distinguished in terms of their architectural and ornamental aspects and provision of comfortability, but also they should achieve good outcomes and benefits at other levels, such as the economic side in the long-run as a kind of saving. Such green buildings should also be environmentally friendly and reduce hazardous gas emissions. Also they depend on clean and renewable energy and many other related benefits.

Furthermore, a green building's specialized engineer should be aware that the required professional standards while he/she establishes contracting on green building is a specialized green architect standard. As the contract indicates to such a condition related to a green building or green designs, the required standard shifts from ordinary architectural standard to a green building's specialized architectural standard, which might raise the liability of the engineer.

Once an engineer or an architect works on a green building, he or she should be careful in terms of the green building's design and construction since it needs accuracy, where green work is based on integral strategies. Thus, any defect in design or construction works might cause liability. Sometimes an engineer could be asked by another engineer or other party to change or amend, and then unless an engineer knows the mutual strategies, he or she might fail to fulfill the required conditions to achieve green certification.

An owner may ask for making some changes during construction. Based on this demand, an architect shall undertake such changes. This could be normal in traditional buildings; however, in green buildings there are many crossed strategies in a single building. This can lead to opening new particular windows that in turn could lead to energy loss and then provide less efficiency, or it could permit for more sunlight, and then there would be more demand for heating or air-conditioning. Consequently, such change approved by an engineer or architect shall be deemed a technical error, or the building at whole might lose a particular certificate. Therefore, the knowledge of such detailed and accurate strategies would be a liability before the owner.

Changes in design can have a profound effect on green buildings, since the accredited systems can affect each other as well as materials that are affected by the performance of each system and its relationships with other systems. For example, a simple change in the type of glass can affect energy performance and lighting calculations. This "simple" change can cost additional LEED points and can expose the entire LEED certification process to risk, so the architect should be aware of changes to the design, and analyze future impacts correctly as well as inform the owner, who may prefer another type of glass, but certainly not at the expense of the standard green certificates. ³

¹ (STRATEGIC OUTCOMES PRACTICE,2009)

²Green House Concept and Application, 2013 Available <http://qac.jo/Files/GreenHouseConcept.pdf>

³ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

Green buildings specialized engineers recommend using steel constructions rather than concrete constructions. As when a building is constructed with steel, there are advantages that magnify its green properties: first, any steel generated from demolition of a building can be recycled. Thus, any use of recycled steel would contribute toward the waste diversion by weight or volume for the LEED Construction Waste Management credit. A second advantage of steel is that it can be used for a subsequent project. Third, steel's inherent recyclability presumably satisfies the Materials Reuse and Recycled Content Credit under LEED. A fourth advantage of steel is that it is usually made to order for assembly, thereby cutting the amount of waste on a construction site. In fact, steel can be designed for deconstructability or prefabricated to exact specifications to reduce material volumes and for integration of structure and services.¹

Usually, when engineers seek LEED certificates through its commitment to green standards, they shall be awarded specific points for each green performance done by them. Green innovation and design category shall be awarded as a maximum 6 points, where using a LEED-accredited professional is worth one point. Up to four additional points can be awarded for developing and implementing strategies that address sustainability issues in ways that are either not covered in the LEED guidelines or that substantially exceed LEED requirements.²

An engineer may definitely abide by the criteria of a professional specialist in green buildings. Sometimes, an engineer might be specialized in LEED contracts; whereas some professional engineers seek the LEED AP (Accredited Professional) called (LEED® AP). However, the question herein is whether the accreditation of green engineer is associated with a typical contract that exceeds the ordinary standard, or in other words what is the strength of such standard if an engineer does not add any title to his or her name, or if he or she is not a green buildings professional. Is it possible to accept his or her defaults related to green works?

To answer the above questions, the researchers recommend herein that an engineer who abides by the green buildings standard, except if he or she fails to show capacity or expertise in such buildings, shall be deemed to have accepted all of these new buildings standards, i.e. his or her commitment shall be equal to any other like specialized engineer. If the engineer added to his name the (Accredited Professional) title, then it would be a moral aspect to reassure the contractor with his expertise and specialization in this new construction and would definitely reflect his standard of care as a professional of green buildings.

Usually, an engineer takes into consideration his legal responsibility by knowing the applicable laws and not exceeding these controls, otherwise he is exposed to liability. And the green engineer's responsibility is double compared with a traditional engineer because the green engineer shall, in addition to his compliance with the engineering laws and regulations, adhere to the standards of green buildings, which may be specific specifications for building, or obtaining a certain green certificate.

However, the researchers recommend herein that the engineer's commitment to the green engineering standard shall be achieved through a double commitment. The first commitment is to be an engineer as in the traditional buildings while the second is to be committed to the standards of green buildings. In the following, we will show examples of the double commitment of the green building engineer:

- 1- In traditional buildings, the engineer is obliged to provide a design that complies with the laws and regulations. Whereas, in green buildings, it is also necessary to comply with the design of the green building standard.
- 2- In traditional buildings, the engineer is committed to a design that is identical to the external environment of the site and its specifications while in the green contracts, the green architect shall additionally be committed to undertaking innovative designs that reflect the presence of green building.
- 3- In traditional buildings, the engineer must achieve the purpose of the building, such as a theater, commercial building, private housing and other buildings. While in green buildings, in addition to the achievement of the purpose, he or she also have to achieve the green economic aspects.
- 4- In traditional buildings, an engineer or architect should achieve all-round comfort in general while in the green environment, a green architect has, in addition to the demand of general comfort, to further be committed to achieving particular and exceptional comfort as well as welfare.

5. Reliance on pre-prepared typical contracts

A common problem faced by architects, engineers and owners is their inability to understand that there are differences between a traditional building project and a green building project. Thus, the parties might rely on standard contracts that may not address the risks of such projects. If such risks are not recognized, it could create potential conflicts and disagreements that would cause them to end up in arbitration and judgment. There are many green building issues that can be accepted on pre-prepared models because they are known and common. For example, drafting and discussing contracts, green building lease contracts, advising clients in terms of regulations, incentives and legal issues.

¹ Baker, M., Cooley, P., Levi M., McLoughlin S. & Sachs S. (2010), Green Materials and Construction, (chapter.9). The Law of Green Building, ELI PRESS, USA. p224

² (Chp.2 Green Building Rating Systems and Green Leases, p22)

There are many legal issues that would be considered new. For instance, how are buildings affected by the economy? Are buildings flexible enough to adapt to the impact from climate change? What laws could be approved and established to make sure that buildings will continue to be energy efficient as well as more reliant upon renewable sources of energy? Also, there are other issues to be dealt with as well as the fact that lawyers will play a key role in answering them.¹

One of the risks to the design of green buildings is to rely on special models for green engineering contracts. The engineer agrees with this model and the contract is signed with the owner according to this model. LEED-Submittal molds may give liability to the engineer in all circumstances and therefore not be covered by insurance for normal negligence. Therefore, the architect must show that the signature on the templates is only to meet the classification requirements of the certificate and therefore does not constitute any additional guarantee for the rest of the parties to the contract.

Architects and other team members can use form templates to upload information and to submit the data to “complete” the requirements to apply for that credit and to satisfy those requirements. Thus, this would mean that when the architect is completing a specific credit that he is attesting the accuracy of specific green components or systems that would not have coverage under his E&O policy. Architects should make all parties agree in writing that “the architect’s signature on a LEED submittal template is solely for the satisfaction of the LEED rating system and does not constitute any warranty or guarantee on behalf of the signatory.”²

Therefore, LEED-Submittal templates involve many risks, as it could be an implicit approval by the architect on certain green requirements. And he would be liable, after signing such a template, only for the green component of the construction.

Alternatively, instead of relying on pre-prepared contractual templates, an architect may depend on united contracting forms to help, suggest and advise the green building’s parties. Hence, this research is called contractual suggestions that warns and informs engineers, architects and other implementers who work in green buildings.

To focus on legal risks involved in green buildings design and construction, and the appropriate allocation of such risks, all are seeking united contracting documents to help in performance requirements and surrounding risks orientation.

Due to the disadvantages and risks of pre-prepared templates on green buildings contracts, one institution set the ConsensusDoc recognized as (Green Building Addendum) to meet such need in this sector. The Green Building Addendum is used perfectly in the contractual practices in order to identify the project parties’ roles, who will have primary responsibility for specifying the green criteria for the project and for assuring the necessary coordination, particularly for those who seek a third party certification.

The Green Building Addendum is concerned with the determination of the required green performance elements of green projects and/or its green certification. In addition, the Green Building Addendum also automatically adapts to third party contracting project while providing high standards. However, if the projects meet the design-construction track, the Green Building Addendum demands specific changes in design and construction for one entity or for all parties.

The Green Building Addendum also takes into account the high risks associated with green buildings design/innovative strategies that may affect such risks, material components, equipment and design associated with such projects.³

6. Implications of green building materials use

Today, there are many types of materials attempting to gain market attention by labeling themselves as “green”. One of the difficulties in discussing the topic of green building materials is determining what is truly green.

As previously mentioned, some define green construction materials as those that create a healthier place to work or live in while others define green materials as those that create less carbon emissions or a more energy-efficient place to work or live. Additionally, certain organizations, such as the U.S. Green Building Council (USGBC), intend to keep the definition of green construction material fluid so that our technology and abilities to deconstruct and reuse materials increase; what once was considered green will no longer suffice.⁴

Green materials are relatively new and widely unavailable. Once such materials are not obtained on time, this may cause significant delays in project implementation. Green materials or equipment sources should also be previously determined before sufficient time to be available at the commencement of work, as they are not

¹ Chp.1 J. Cullen Howe , Overview of Green Buildings , p 11))

² O’Connor, H., (2012) Architect’s Professional Liability Risks in the Realm of Green Buildings, ResearchH Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

³ ConsensusDocs Guidebook, ConsensusDocs 310 – Green Building Addendum, Edition Comments and Recommendations regarding ConsensusDocs 310* Green Building Adden.

⁴ Baker, M., Cooley, P., Levi M., McLoughlin S. & Sachs S. (2010), Green Materials and Construction, (chapter:9). The Law of Green Building, ELI PRESS, USA, p 221.

easily available in the market.

Green design professionals have to make decisions about sustainable products by using technical data provided by manufacturers and not through promotional leaflets because "green laundry" claims are becoming a growing threat to markets. These technical performance criteria should be included in the guarantees and performance guarantees attached to the agreements. Engineers must keep their customers informed and regularly informed of any risks (performance, schedule, or cost) that they have not covered during their support of their project.¹

Most of the materials used in green buildings have distinct characteristics as compared to traditional building materials. However, there are four key benefits of green materials and green construction methods that address the traditional construction problems mentioned above.²

First, green construction methods can conserve natural resources and reduce the generation of waste caused by the demolition of old structures by reusing and recycling existing building materials whenever possible. This, in turn, reduces the amount of materials going to landfills with the added benefit of reducing landfill fees for builders.

Second, green construction takes into account conserving natural resources by reusing existing materials.

Third, green construction can reduce the energy needed to construct and operate buildings.

Fourth, green construction seeks the use of new, healthy and fast renewable construction materials.

The engineer may have to make decisions about the building's design and materials, as he is considered responsible for choosing appropriate materials to be used in the green construction and he should exercise caution in adopting internet ads or other means where such marketed specifications are inaccurate. Rather, he or she has to depend on the written leaflet using technical data provided by manufacturers, not promotional leaflets. Sometimes, rather than making promises to meet a certain level of certificate requirements in the contract, "specifications" can be provided by implementing parts that meet certificate level requirements.

In addition, before addressing any new materials and products in specifications, contracting parties should verify their ability to deliver such materials or products to project sites to avoid delays in project completion. However, any changes or amendments to the construction works and schemes and use of alternate materials may significantly affect LEED certification achievement.

It is necessary to know the product data for the green materials used in the building and to address this data during the submission process of LEED certificates because they require the specifications of the materials used. And the suppliers should supply these materials through the provision of such data continuously during the construction work so that the contractors and subcontractors can see the technical specifications of these materials as well as material information that can be taken from the manufacturer. LEED Certification may require this information and therefore should be uploaded to LEED models to verify compliance with the requirement or requirements. Engineers should take into account the language of the contract that authorizes the payment certificates only after receipt of LEED product information that is required to obtain project certificates.³

Achieving construction approval according to the intended level may depend upon materials, equipment and system options. The design contract, particularly supporting certification and certification, requires specific performance-based green materials and systems. If the materials or regulations required to meet the specifications of the building are not present or are delayed, then the materials or its similar specifications shall apply, provided that they allow the replacement with another material or similar system.⁴

Most green buildings seek certification that the building is green, and one of the world's most widely recognized certificates is LEED Certification. What is the significance of LEED? It is a point-based system that measures performance based upon a building's design, construction, operation and maintenance. LEED is voluntary for those who choose to gain their certification. LEED addresses comprehensively the ecological footprint of a building from the beginning stage through the planning phase and throughout the life of the building. The USGBC may grant one of the LEED-registered building projects the new construction rating system (LEED-NC) up to 100 points according to six specified categories, including materials and resources. This category demands: using materials with less environmental impact, reducing and managing waste and reducing the amount of materials needed. This category is given a maximum of 14 points.⁵

Many believe that green buildings are expensive. Whereas, it is in fact very reasonable considering its many

¹ Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal, Winter 2010, vol. 9 issue 2.

² Baker, M., Cooley, P., Levi M., McLoughlin S. & Sachs S. (2010), Green Materials and Construction, (chapter.9). The Law of Green Building, ELI PRESS, USA, p218.

³ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

⁴ Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal, Winter 2010, vol. 9 issue 2.

⁵ White, G., Nichols, J. & York, J. (2011). Green Building Rating Systems and Green Leases, 41 Env'tl. Rep. News & Analysis 10049, 10057, p22.

benefits. Despite the great benefits of green buildings, there are some average associated costs. Many people wrongly believe that the costs associated with green buildings are too high, but if compared to "green advantages", the cost will be much lower than their expectations.

Moreover, the data indicates that the more construction contractors lack experience in green construction, the greater the cost will be. Researchers often find it difficult to calculate the exact cost increase in green building projects. Other reasons why costs are not accurately counted are because green certification programs do not require cost information, and many companies want to keep this information confidential.

There is growth in the data related to this issue as some examples show that the average growth in green buildings can be more than two percent of the typical buildings. But when green materials become more widespread and engineers and architects become more experienced, even such modest increases in costs may be exaggerated as a real incremental cost of green building. There is a firm conviction among researchers that regardless of the initial incremental costs of green facilities, such costs can be recovered or exceeded during the life of the building. For example, a green certification study found that an additional investment of 2% gave 20% on the construction life cycle. On the other hand, a comprehensive study proved that "green buildings" are cost-effective and are today considered financially viable projects.¹

Certainly, the supplier of both traditional and green materials in accordance with Jordanian Civil Law guarantees exposure and entitlement while ensuring the hidden defects of these materials. The first paragraph of Article 503 states: "The seller shall ensure the safety of the sale from any right of the third party to the buyer if it is the cause of the previous entitlement." In addition, Articles (503-511) of the Civil Code provides the detailed provisions to ensure exposure and entitlement. And there is the guarantee of exposure and entitlement to which the seller (material supplier) commits to when transferring the ownership of the sale to the buyer or transferring the technical knowledge to the recipient, which is calm and stable.²

While the same law deals with the guarantee of hidden defects in Articles (512-521), and of these Articles 512, states: "1. Sale shall be held on the basis of free sale of defects except what has traditionally been tolerated. 2. General provisions apply to the defect on the sale contract."

The researchers herein believe that these provisions can be taken to ensure the supplier of building materials in terms of exposure and merit. However, in the case of guaranteeing hidden defects, it may be different when the construction is green or a statement indicates that the materials to be supplied are suitable for green buildings, and therefore may be considered as traditional materials defective as green materials in accordance with the Green Building Standard while at the same time the contract did not mention that the required green materials may be considered as defective according to the standard of the traditional buildings.

7. Additional works, services and warranties

Of course, the engineer should specify when contracting, accurately and without doubt, what are the additional works, what is their scope, and that sometimes there would be new additional works; these works should be signed as addendum by the engineer with the owner.

In the Sustainability Project, it is important to establish a clear scope for the additional services provided by the architect in the owner-engineer Agreement with respect to the sustainable design functions of the architect and those assigned to the owner and his consultants. In all cases, the engineer shall set limits on what should be included in his additional sustainable services. There should also be established guidance for compensation for services provided in the normal framework of the project because sustainable services may require several revisions to the sustainability plan, additional unforeseen meetings and additional explanatory answers to the institution authorized to grant the certificate.³

If the owner asked the architect for wider services in the sustainable design, such a condition may be addressed in their agreement under Article 4 of (AIA Document) B101 under the title "Additional Services". There is a specific template for diverse additional services that includes the services covered by Article (4-1-23) of (extensive environmentally responsible design) and Article (4-1-24) of LEED certification (B214-2012).⁴

It is worth mentioning that engineers have to take care when contracting with the owner of green buildings to ensure the presence of an owner's agent who plays an important role with a highly efficient quality assurance. To prevent the destruction of "good design" by doing work that is incompatible with the nature of the green buildings or the installation of weak structures and to help the agent develop operations and maintenance of the management of buildings as well as that of training and maintenance staff. For example, in terms of issues

¹ Alfano J. ,Can We (Anti)Trust LEED?: An Analysis of the Antitrust Implications for the Green Building Movement, Boston College Environmental Affairs Law Review [Vol. 41:427 2014]

² Oden, S., (2004), The Liability of Consultant Engineer and Contractor in the Field of Civil Contracts, Masha Mare, Alexandria, Egypt, P214.

³ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

⁴ Manies R. ,AIA, Esq. (2014), WHITE PAPER: Managing the Risks and Embracing the Benefits of Going Green Prepared for The AIA Trust February 2008 revised: September 2014 ·P15, Available <http://www.theaiatrust.com> (April 1, 2017), p10.

related to indoor air quality of the building (ventilation), improving indoor air quality in indoor buildings is to protect the health of occupants and it is one of the main objectives of green buildings.

Nevertheless, an owner's agent should be assigned to operate and maintain these systems because after delivery it will be the responsibility of the owner. Also, the operation must be proper and appropriate so such systems can perform their functions properly. Architects should require that the owner appoints well-trained building managers to operate and maintain the building or contract with specialized companies in this area.¹

Building commissioning is a critical stage of the project, just like design and construction. However, this phase is often overlooked and neglected. Commissioning is meant to reduce the risk of new construction or improvements because green construction needs a systematic and documented process of operating construction systems and project documentation specifications and to meet the actual operational requirements for which the new works have been added. Commissioning is critical, especially for green buildings, which tend to be more complex in terms of designs and systems. Specifically the commissioning of green buildings is critical because they tend to be more complex in terms of design and systems. In the commissioning phase, construction needs to be treated as an integrated system for top functional performance to improve the overall energy performance as well as other elements of non-energy performance like renewable energy performance, air quality, water use and the integration of control systems. Also, note that even after the commissioning phase, accountability is required for green buildings for the dynamic systems in the building from different parties over various periods of time.²

On the other hand, the engineer shall refrain from any additional guarantees, concessions or compensations provided for in the contract. It is preferable to establish constraints on the engineer's obligations to protect him from assuming any additional responsibilities, and it is possible to put limitations on the liability of the engineer for his or her benefit. If the engineer accepted such additional risk management, he should be entitled to additional fees and should have to be paid on account of the risks of such liability as well as to enable the engineer to contract with insurance companies to cover such liability.

8. Non-expansion of the engineer in displaying his or her experience and promises

The owner may ask the engineer to provide experience certificates on his or her green construction works. Therefore, the engineer should display such experience, but specifically and precisely, because exaggerating these experiences will increase the standard of care applied to the green buildings.

Often, engineers exaggerate in their expectations of what the new or renewed green building is. Based on these statements or expressions, decisions will be made and certainly these administrative decisions will be turned into decisions and financial authorizations incurred by the owners who could end up suffering. If such misleading statements are not achieved, the engineer will be liable.

There is a commitment to the engineer to highlight his expertise in some important points in the green buildings and to clarify such matters to the owner, contractors or owner's representatives. Among these matters: the obligations of the engineer should be submitted to the owner and it should be part of his main duties. The engineers also have to clearly indicate what roles will be carried out by the joint project team and the responsibilities of the owner as well as the role of the engineer in achieving sustainable performance standards and objectives. It should also be explained that the success of green buildings depends upon many factors such as the performance of systems and products, on the means and methods used by the contractor, the choice of materials and systems, and the operation and maintenance of the owner's construction. Engineers should demonstrate and explain reasonably the effects of acceptable scheduling and the cost as well as strive to document this process.

Engineers should highlight their expertise in showing that the long-term costs of green building may be lower than traditional buildings. And also to show that green buildings are initially more expensive than traditional buildings, but in the longer term the cost will be lower. They have also to fully explain to the owner this potential increase in costs at the beginning of the green project and what is the expected return for it. For example, to maximize sustainability objectives, the used materials and systems can be more expensive. And the construction wastes can often be used after having been recycled. The Green Building Planning process is longer and requires the addition of new project participants, such as Sustainability Advisers, Power Modelers and the Authorized Agent. It may require, during operations, more specialized maintenance professionals.

All post-construction and budgetary implications, such as construction and maintenance, should also be discussed with the owner. The architect should explain "how these systems will be operated and explain their impact on the use and occupancy of the building. Owners should also be clear about each part of the project, which will be affected, and how to take a rationale decision when setting the total cost budget, and the quality of the project."³

¹ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

² Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal. Winter 2010, vol. 9 issue 2.

³ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com /

Green buildings may have many benefits to the owner, such as cash incentives, reduced operation costs, and improved marketing. However, there are risks and responsibilities that a professional designer may face or suffer as a result of customer disappointment because opportunities and benefits associated with green buildings also increase expectations and such disappointing expectations may lead to disputes and litigation.¹

We may suggest some encouraging incentives to promote green buildings in Jordan, including increasing the floor rate, tax exemptions, raising engineering quotas, payment facilities and other offered incentives.² Therefore, if the green building does not achieve the equivalent of the experience, statements or promises made by the engineers, they would be under responsibility and negligence.

In any case, if the engineer finds that the items in the green contract or his contract are not able to be met, he has several options like either training his staff to carry out these tasks professionally or conversion of the implementation of these items with the help of specialized consultants in this area. If either suggestion is not achievable, we recommend the contractor to cancel these items. And in the case of refusal of the owner, the best choice is to reject the entire contract because lack of experience in the areas of green buildings may certainly impose future liability on the owner.

9. Conclusion

Engineers, architects and contractors need to be vigilant when contracting for green buildings because if they lack experience or do not know all of the standards, laws or risks they could be liable. They need to keep in mind that they have to discuss and disclose everything with the owner and his representatives. They need to remember that if applying for LEED Certification that if they do not add a clause to their contract they could be liable, and that some insurance providers might not cover them if they are doing LEED. The following are points that need to be taken into consideration:

- 1- In green buildings, parties abide by two types of codes: firstly the obligatory public codes issued by the government, and secondly the private codes. The involved parties may agree on using any of these codes in their works.
- 2- Engineer pre-advice in green buildings has an exceptional importance as compared to traditional buildings.
- 3- The commitment of an engineer to the green standards not only means the economic engineering designs, but also it includes saving, landscaping, social well-being and the welfare of the occupants as well as the typical internal atmosphere of the building.
- 4- In green buildings contracts, the parties usually rely on standard or pre-prepared contracts.
- 5- Materials used in green construction have different specifications and work mechanisms than what is used in traditional buildings. The responsibility of the engineer may arise when he chooses these materials; however, the use of green materials has many benefits.
- 6- Additional works or changing plans in green buildings have different characteristics than those found in traditional buildings.
- 7- Usually the owner requests certificates of experience in green buildings from the engineers, and this experience more crucial as compared to the standard engineer. Thus, his responsibility will be measured at the level of a specialized green buildings engineer.

Recommendations

The following are some recommendations:

- 1- When engineers comply with a certain green code, they should be aware of and have extensive knowledge of the approved code because any breach by the engineer of the terms of this agreement will raise responsibility.
- 2- The engineers must work honestly for any advice requested by the owner and warn him or her of any difficulties or high future costs as well as to identify and discuss with the owner any alternative methods.
- 3- The engineer's commitment to the green engineering standard means that the engineer knows the common strategies among all works in the green buildings, and this is considered one of the axioms of green work.
- 4- Engineers should not rely on pre-established contract forms because each green engineering contract has its own specificity. However, it can be relied upon for the proposals in the ConsensusDoc recognized as (Green Building Addendum). The suggestions and contractual warnings mentioned in this research endeavor to warn and to guide the engineer while contracting.
- 5- The engineer who is responsible for the adoption of green materials should be careful to know the exact

VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

¹ O'Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, Research Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)

² Green House Concept and Application, 2013 Available <http://qac.jo/Files/GreenHouseConcept.pdf>

technical details of the specifications of such materials and follow the instructions/guides from their manufacturers, rather than relying upon promotional sources and inaccurate general publications.

- 6- Engineers should not accept any new changes or additions to the Green Building unless after consultation with all the participating parties because the green construction and its economic saving and benefits is the outcome of the interdependence of the construction elements to achieve this goal.
- 7- The engineer should not exaggerate in displaying his or her expertise in green buildings because the higher the level of expertise provided to the owner or in the contract, then the more the responsibility will become and the greater the possible liability.

References

- Alfano J. ,Can We (Anti)Trust LEED?: An Analysis of the Antitrust Implications for the Green Building Movement, Boston College Environmental Affairs Law Review [Vol. 41:427 2014]
- Aljbory, I. (2013), Engineer Counsltancy, Manshorat Alhalabi Alhoqoqhyah, Birut, Libanon,
- Baker, M., Cooley, P. , Levi M. , McLoughlin S. & Sachs S. (2010), Green Materials and Construction, (chapter.9). The Law of Green Building, ELI PRESS, USA.
- ConsensusDocs Guidebook, ConsensusDocs 310 – Green Building Addendum, Edition Comments and Recommendations regarding ConsensusDocs 310* Green Building Adden
Green House Concept and Application, 2013 Available <http://qac.jo/Files/GreenHouseConcept.pdf>
- Howe, J. (2010). Overview of Green Buildings , (Chapter 1) The Law of Green Building, ELI PRESS, USA.
- Jordanian Law for environment protection no (52) for 2006.
- Jordanian National Code for buildings no (7) for 1993 and its amendments Manies R. ‘
- AIA ‘Esq. (2014), WHITE PAPER: Managing the Risks and Embracing the Benefits of Going Green Prepared for The AIA Trust February 2008 revised: September 2014 ‘P15, Available <http://www.theaiatrust.com> (April 1, 2017)
- O’Connor, H., (2012) Architect's Professional Liability Risks in the Realm of Green Buildings, ResearchH Journal www.perkinswill.com / VOL 04.02, available: <https://perkinswill.com> (December 5, 2016)
- Oden, S., (2004), The Liability of Consultant Engineer and Contractor in the Field of Civil Contracts, Masha Mare, Alexandria, Egypt.
- Shapiro, S. and Cheatham, C. (2010), Emerging Legal (Chapter14) The Law of Green Building, ELI PRESS, USA.
- White, G., Nichols, J. & York, J. (2011). Green Building Rating Systems and Green Leases, 41 Envntl. Rep. News & Analysis 10049, 10057
- Zimmer m. & Rohleder j., Green Building Risks: Avoiding Litigation Traps, Energy Litigation Journal. Winter 2010, vol. 9 issue 2.