Design-Build/EPC Contractor’s Heightened Risk—Changes in a Changing World

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Although design-build/engineer, procure, construct (EPC) contracting can potentially save millions of dollars up front, as well as dollars paid in change orders while construction proceeds, design-build/EPC contracting may not be the silver bullet for construction that design-build/EPC contractors perceive it to be. Owners often question whether the checks and balances are in place and question who really pays for alterations in design. Owners look toward the design-build/EPC contractor to be the one-stop shop and the last stop for all the costs to be incurred for a project—from inception to project closeout. Thus, change becomes an issue that may not be well defined in today’s design-build/EPC construction environment.

In a changing world, what does uncertainty mean for the design-build/EPC industry? What do the current world economic conditions, as well as the current U.S. economic conditions mean to a design-build/EPC contractor wanting to play in the construction industry today? Factors such as labor supply restrictions, loss of intellectual knowledge, and fund availability for these infrastructure projects have considerably shrunk from previous years. Recent project experience and recent trends within the construction industry today? Factors such as labor supply restrictions, loss of intellectual knowledge, and fund availability for these infrastructure projects have considerably shrunk from previous years.

In a changing world, what does uncertainty mean for the design-build/EPC industry? What do the current world economic conditions, as well as the current U.S. economic conditions mean to a design-build/EPC contractor wanting to play in the construction industry today? Factors such as labor supply restrictions, loss of intellectual knowledge, and fund availability for these infrastructure projects have considerably shrunk from previous years. Recent project experience and recent trends within the construction industry indicate that executing projects is going to be more difficult and more risky in the future. Understanding these risks and their legal implications will be critical so that both the owners and the design-build/EPC contractors can be successful.

Dr. Kris R. Nielsen (2006), in his presentation on risk management to the Deutsche Bank Global Oil and Gas Conference in 2006, described the current stakeholders’ perceptions of success. He quoted his remarks from the May 2004 Offshore Technology Conference (OTC) in Houston, Texas, as follows:

Certainly, as an industry we can point to amazing technological successes. Every day we are pressing the technology envelope and moving the technology bar higher, even for mature developments or regions. Yet, our industry grumbles and rumbles in the commercial reality behind many of these successes. A reality is that in the last decade we have concentrated the number of Owner “Players” at all levels and sectors. A co-reality today is that many of the key Contractor “Players” of a decade ago no longer exist, are combined, or are no longer willing or capable of “playing.” There are many reasons, but query: has there been a significant change in the way we have handled these increasing risks as we execute today’s projects? The answer is partially “YES.” But we must ask: are we achieving success from the perspective of the both the project itself and its execution stakeholders? Clearly, the answer is “NO.”

Although there are examples of successes (commercially and otherwise) to which we can all point, there are also many near or actual commercial disasters that are still in the throes of resolution. There is, as a result, extensive mistrust between the Owners and the Contractors. This mutual mistrust leads Operators to claim the Contractors want too much for the work. The Contractors claim all the Owners want to do is shift their risks to Contractors without compensation. Much of the mistrust has evolved from the manner in which we are accomplishing project execution coupled with the conditions and contexts that are created or result there from.

Today, the commercial risk in offshore and frontier regions is huge. Projects are often packaged as a single mega-project requiring a long development period. Then as an industry, we try to control risk contractually, with nonnegotiable terms, and generally through lump sum pricing. These are exacerbated by contracting approaches that are driven by transparency requirements of national oil and gas companies or the financial community funding many of the projects. To further create commercial complexity, local content requirements have been handed down to the lowest tiers of the execution hierarchy, where there is the least capability. Deep water offshore regions and frontier regions have reduced the capability and capacity to successfully execute in these contract formats—especially in the time-driven environment required today.

Concurrently, as oil and gas prices gyrated in the last two decades, Owners have shed both research efforts and comprehensive in-house engineering/project management capacity to rationalize costs. Conversely, Contractors too have shed research efforts, but have heavily promoted EPCI (Engineering, Procurement, Construction and Installation) contracting. Yet, most Contractors oversold in-house capacity to do so and have not had the required management processes to manage lump sum EPCI contracts on this scale.

What then is the commercial reality we face now: Risk in project execution in all forms is not being effectively managed. Execution is delayed, costs of execution soar, and parties must protect their commercial status. Owners must minimize CAPEX impacts. Contractors must recover real out-of-pocket costs and some profit. Risk shedding has become everyone’s game. Owners are forced to reduce exposure through even transfer of even equity risk to entities whose business model is based on near term execution profits and slim capitalization. Needed return on investment requires maintenance of production timing and production cost requirements. In reality, Contractors can and should only accept risk that can be reasonably defined. The reality is that Owners are not achieving their risk management needs and Contractors have a fraction of shareholder value of a decade ago. Out of commercial necessity then, both Owners and Contractors are employing “hardball” project management/contract administration that further breeds mistrust and further exacerbates the conditions and context that bred the mutual mistrust in the first place.
The oil and gas industry is not handling efficiently or effectively project execution risk. The projects are suffering and the stakeholders are not meeting goals, especially perceived and actual commercial goals. We are turning into groups of “risk accepting” and “risk adverse” stakeholders—both on the sides of Owners and Contractors. As the project execution risks are growing almost exponentially, the challenge is to seek joint methods to enable both Owner and Contractor stakeholders to manage risk appropriate to their corporate and project needs while achieving the very technological marvels our executed projects represent. No industry is viable over time if the stakeholders are not viable.

The observations of 2004 hold true today, especially for the oil and gas, power, and transportation industries. It is not surprising that the amount of design-build/EPC contracting is enormous. The surprise is the conditions under which the design-build/EPC contractor has to execute the projects. In reviewing change in a changing world, the key factors facing a design-build/EPC contractor today include the following:

- Lump sum/fixed price versus cost-reimbursable contracting;
- The prudence requirement;
- Meeting a standard of care; and
- Assuring sustainability.

In design-build/EPC contracting, there are shifting patterns of risk. All the key factors noted in the preceding are interrelated, and one cannot be truly discussed without knowledge of the other.

Prudence is taking an interesting twist in the new age of construction. In the United States, public utility commissions (PUCs) or public service commissions (PSCs) are looking to approve construction costs in advance of the construction starting. In this case, the design-build/EPC contractor must provide a means of estimating or providing a contract price and dividing out the fixed-price portion from the variable portion and link those variables to something that will allow the utility and the design-build/EPC contractor the protection yet can be approved by the PUC. In fact, the real action will not come from the nuclear regulatory area, which drove the costs and delay in the previous nuclear area, but from balance-of-plant issues, which in turn will be governed by standards of care.

For example, in the nuclear power industry, which promises to have huge growth potential globally and in the United States during over the next 10 years, utility companies are again faced with having to demonstrate that the billions of dollars of construction expenditures are prudently spent, just as they did 20 years ago. For example, one nuclear utility has recently made a filing with its public service commission regarding the costs for new nuclear units, for which it hopes to receive certification from the PSC in March 2009, along with the PSC’s adoption of the estimate for construction deemed to be prudent on the basis of its application, including testimony of experts and the individuals that will be working on the nuclear plant. Much of the proof centers on the contracting strategies and what the design-build/EPC contractor will be providing under its contract terms, including how change will be managed, costed, and reimbursed. SCANA Corporation expects to file a combined application for a certificate of environmental compatibility, public convenience and necessity, and for a base-load review order with the South Carolina PSC, also later in 2008. The application will document South Carolina Electric and Gas (SCE&G’s) need for new electric generation and provide information that will allow regulators to determine, up front, the prudence of the company’s plans to construct two new nuclear units to meet part of that need (Warner 2008).

Even with such nonnuclear plant construction as coal plants, the concept of prudence has taken hold in many of the PSCs. For example, Kansas City Power and Light (KCP&L) recently filed a rate case, KCP&L-Missouri PSC, on its Latan I coal-fired unit to defend the costs of environmental upgrades to Unit 1. The same is expected for the construction costs of its new Latan 2 unit. Design-build/EPC contractors will have to deal with providing convincing proof to a utility that they have the resource planning and means to assure the utility, or prove up the costs incurred that came from change—and that the entire cost or schedule extensions were appropriately and reasonably incurred.

Design-build/EPC contractors will need to have the ability to prove and assure the utility and the regulator that the changes were consistent with standards of care and that the changes were not the result of design-build/EPC contractor “screw-ups.” Utilities will look to the design-build/EPC contractor to “eat” any costs that cannot be proved to be a prudent expense or that resulted from contractor claims—from the design-build/EPC contractor or subcontractors to the design-build/EPC contractor. In effect, the utilities are now hyper about change, and the utilities believe that it is critical to know whether they can recover costs that flow from change.

Who is in the best position to guard against change? It is the design-build/EPC contractor. The owners will look to the design-build/EPC contractor to provide the expected standard of care in the execution of the projects undertaken and will hold the design-build/EPC contractor responsible for changes and cost overruns that they believe could have been avoided had the design-build/EPC contractor used a standard of care that would be expected in the industry. Considerations must be given to the differences between fixed-price contracts and cost-reimbursable contracts. Design-build/EPC contractors need to recognize that contract administration issues and change management have business culture practice that are quite different from cost-reimbursable contracts because an owner will try to get as much as possible for the price. The design-build/EPC contractor has to meet what it has agreed to and nothing more. They contractor have in place a rigorous program in which all the actions can be reviewed at a detailed level and rolled up, to why specific decisions were made.

The design-build/EPC contractor also has to be aware of what is going on in sustainability. Sustainability in today’s changing world is more than simply looking at life-cycle costs or finding ways to make a project last longer. Sustainability includes looking toward the means by which construction is undertaken and how to minimize carbon emissions. Sustainability includes looking toward the future and the ways that the project will provide both economic and quality-of-life benefits for future generations as well as for the planet.

This paper explores our changing design-build/EPC industry with regard to contracting strategy, prudence concepts, standard of care, and sustainability, as well as the effects and legal implications of these key factors for changes that occur, including the design-build/EPC contractor’s responsibility.

Contracting Strategies

The design-build/EPC process merely establishes the roles and relationships among the key members of the project team. To achieve the specific project goals, however, the delivery system must be compatible with the owner’s contracting methodology and procurement process (Loulakis 1999). One of the single most important decisions that any design-build/EPC contractor will make is on the type of contract that it enters into with an owner. The contract strategy represents the way in which the delivery
systems are packaged and paid for by the owner. What is common across all types of contract delivery is that the Owner will insist via the contract provisions that the contractor, in return for being paid to execute those functions, also accepts the risks of performing those functions according to the standards and conditions laid down in the contract [Deutsche Bank (DB) and Pegasus Global Holdings, Inc. (PGHI) 2008].

In lump-sum contracting, the owner pays a fixed price. Typically, in fixed-price contracting, any unforeseen cost is not strictly underwritten within the original contract and likely to be assumed by the contractor. The fixed price that envelops the contract should accommodate a worst-case scenario if execution risks become a reality. This buffer is calculated in the form of a contingency and can represent up to 15% of the asking price. The best-case scenario is that these are not exercised, in which situation they are released and materialize as additional “cream” on top of the base price/margin. In the worst-case scenario, these risks exceed the contingencies put in place and erode the base margin to an extent that the contractor loses money on the project (DB and PGHI 2008).

For the last decade, the largest source of disputes between owners and contractors has been under lump-sum or fixed-price contracts. When the contractor provides a price for the design-build/EPC scope, it is obligating itself to provide the project scope and quality that meets the owner’s requirements (functionality), that can be accomplished within the time required (timeliness), and thus affirms that its costs are sufficient to meet both requirements in terms of resources (labor, equipment, and so on)—all for a fixed cost.

Executing a project under a lump-sum or fixed, price contract is quite different from what was expected in the past. In prior decades, a contractor could execute the project in any manner that it deemed sufficient, as long as it completed the work on time and on budget and provided sufficient documentation to support any change that occurred. However, in today’s changing world, in which the owner must account for every dollar spent and must ensure that costs incurred before a change were not the cause for the change and were indeed within the original contract scope, the design-build/EPC must recognize that accountability is its number-one issue. The owner assumes and expects that the contractor will perform to industry best practices in executing its projects. The practices and processes should assure the use of industry best practices and provide for transparency, uniformity, and accountability in project execution. The design-build/EPC must evaluate these issues, show that there is adequate planning to meet these issues, and report its performance against plan.

In a cost-reimbursable contract, the contractor is able to recover its costs within a contractually defined structure. These costs typically include construction labor, materials, equipment, subcontractors, and overhead. The asking price is equivalent to the sum of a base portion of subcontractors, and overhead. The asking price is equivalent to a cost that must cover its costs within a contractually defined structure. These must evaluate these issues, show that there is adequate planning and reporting against plan. In lump-sum contracting, the owner pays a fixed price. Typically, in fixed-price contracting, any unforeseen cost is not strictly underwritten within the original contract and likely to be assumed by the contractor. The fixed price that envelops the contract should accommodate a worst-case scenario if execution risks become a reality. This buffer is calculated in the form of a contingency and can represent up to 15% of the asking price. The best-case scenario is that these are not exercised, in which situation they are released and materialize as additional “cream” on top of the base price/margin. In the worst-case scenario, these risks exceed the contingencies put in place and erode the base margin to an extent that the contractor loses money on the project (DB and PGHI 2008).

Outright poor execution that sees multiple risks manifested. Across the life cycle of a project, the financial impact of an execution risk may be far more exaggerated for a lump sum than for a cost reimbursable. For example, a technological risk (e.g., change in definition of scope) manifesting itself during the design or procurement phase will negatively affect a project’s overall margin less than if it occurred during construction and installation. This is in contrast to a cost-reimbursable contract, in which the amplification of risk is broadly uniform across the project’s life and is not dependent on the phase in which the problem occurred.

DB and PGH have modeled the relative risk/reward potential of various contracting strategies. As shown in Fig. 5, three hypothetical scenarios were applied:

- Excellent execution that would see contingencies (in the case of lump sum) released, the fee at risk materializing (cost reimbursable);
- Worse-than-expected execution that is, margin erosion because of additional cost incurred as a result of poor performance of the contractor; and
- Outright poor execution that sees multiple risks manifested.

As is shown in Fig. 5, in the context of excellent execution, lump sum and cost reimbursable have the potential to achieve similar margins. In the worse-than-expected execution, a lump-sum contract could see almost complete erosion of profits. This contrasts with a cost-reimbursable-type contract, which offers a safety net or floor (typically the base margin). However, all contract types are vulnerable to profit loss. Lump sum appears to be under a cost-plus contract. Equally, given the increased management attention and performance measures, an owner may actually hold the contractor to a much more stringent interpretation of the standard of care expected (and paid for) than under any other contract strategy.

The key difference between lump-sum and cost-plus contract strategy is the way that risk is distributed between the owner and contractor. Each phase of a project’s development from initial conception to final commissioning will vary both in relative and absolute terms in its revenue contribution to the contractor, depending on the contract strategy in place. See Figs. 1 and 2 (DB and PGH 2008).

The aggregate value of a lump-sum contract will be sufficiently higher than that of a cost-reimbursable contract since all phases go through the contractor’s books in the form of periodic payments and are reflected as working capital. The cost-reimbursable contract strategy will require the contractor to manage each (or all) of these work scopes, and the owner will provide the necessary funds directly to the contractor. The weighting of each work scope with respect to the total contract value is more uniform across the life cycle of a cost-reimbursable contract than for the lump sum. This is not surprising, since the revenue-intensive constituents such as construction and procurement are not passed through the contractor’s books and therefore contribute far less on an absolute basis to the contract’s aggregate value. Further, although the figures show the various work scopes flowing back to back, the reality is that engineering and procurement would not be sequential, because the long lead items on major equipment items would, in theory, have been ordered in parallel with executing engineering.

The impact of execution risk on a contractor’s profitability will depend on the type of contract strategy and may not be linked to the point across the project life at which the problem occurred. This is shown in Figs. 3 and 4. Similarly, the following profiles mirror the contract-specific revenue profiles depicted in Figs. 1 and 2.
the most exposed on the downside; assuming complete responsibility in an environment of rising material costs and skilled labor shortages that may be detrimental to a company’s profitability, especially when the original contingencies set a buffer against these issues, is not sufficient.

When one imposes change on top of the inherent risks contained within the choice of contract, one can easily see why in today’s design-build/EPC environment, it is critically important to have the project policies, procedures, and control systems in place to not only monitor progress and budget, but to also record and track the decisions that were made, the context in which those decisions were made, and the alternatives available to the design-build/EPC contractor when the decision was made. Uniformity, transparency and accountability will be key factors in assessing
change. Consistency in which change is managed will be para-
mount. Change must be recorded in a way that demonstrates that
costs incurred were reasonable and prudent.

Prudence in the 21st Century

The 1980s through the mid-1990s saw prudence as the number-
one issue facing utility companies with respect to the costs of
construction of the nuclear plants in the United States. Utilities
and their respective shareholders lost billions of dollars in the
previous nuclear era when PSCs made determinations of impru-
dent spending. Utilities caught in the midst of nuclear regulatory
changes as the result of accidents, such as Three Mile Island and
Browns Ferry, along with costs that could not be accurately docu-
mented as to the reasonableness of the change expenditures, have
become gun shy about embarking on major nuclear power-plant
construction. Today’s utility environment requires added capacity
in the power area and demands new power-plant construction.
Thus, the utility companies and PSCs alike recognize that any
construction that goes forward—which it be for fossil, wind, or
nuclear power—is going to require the demonstration of pru-
dently expended costs before these projects are approved, and the
actual costs to be passed on to the ratepayers must continue to be
prudently incurred.

In addition to the South Carolina, Texas, Georgia, Kansas, and
Missouri commissions that are actively involved in new power-
plant construction cases involving the demonstration of prudent

![Fig. 3. Typical amplification of execution risk on unit cost—lump sum contract or unit price](image)

![Fig. 4. Typical amplification of execution risk on unit cost—cost plus or cost plus+KPI contract](image)
costs, the state of Ohio is wrestling with the issue of transparency and the administrative law process. In a January 16, 2008, testimony by the Ohio Consumer’s Counsel Office to the Ohio House Public Utilities Committee, prudence is specifically discussed. As noted within the testimony (Migden-Ostrander 2008):

Costs for which utilities seek recovery that fall within the zone of reasonableness are not necessarily—and should not be presumed to be—prudent. . . . The importance is that a cost the utility seeks to recover could fall within the zone of reasonableness but it may not have been the most prudent option. The removal of the word “prudence” withdraws a standard of care to which customers are entitled. It is entirely appropriate and fitting to include a prudence standard under which the electric utilities are held accountable for costs they seek to pass on to the customers. . . . OCC recommends that the word “prudent” be reinserted.

This definition is slightly different from the one that is commonly accepted in the utility industry which generally defines prudence as

Decisions are prudent, if made in a reasonable manner, in light of conditions and circumstances which were known or reasonably should have been known when the decision was made. (Galloway and Nielsen 1986)

Utilities will thus be looking toward the design-build/EPC contractor to have in place the mechanisms that will prove the prudent costs and the prudence of any changes to the original estimate. The prudence evaluation will focus on the decision-making process and the decision implementation efficiency and typically includes the following:

- Identification of the data that was available, including how the management systems and procedures were organized and implemented to produce the information to enable analysis. Was the data reliable? What was the timeliness of the data to the decision?
- Flow of the information, including to whom and when the data was transmitted and what available data was communicated.
- Analysis of the information, including what the information meant, what alternatives were considered, what benefits and impacts were projected, and how the decision meshed with project, corporate, and ratepayer needs.

- Determination of the decisions that were made, including when the decision was made, how it was monitored, and how it was reviewed as assumptions and circumstances changed.

As the project unfolds, change occurs. Thus, with any change, additional review may be necessary. New situations may require new decisions, and each decision is subject to a prudence evaluation, especially any change to the preconstruction costs approved.

Industry references confirm the need to ensure that proper management controls are in place. As noted in the book Construction Insurance, Bonding and Risk Management (Palmer et al. 1996), although construction problems do occur that result in schedule and cost overruns, most are avoidable. Knowledge of the construction management process is essential to controlling the many factors that influence project results. To be in a proactive mode when managing the cost of risk, it is imperative that the design-build/EPC contractor use state-of-the-art information systems that are reliable, accessible, and user-friendly. Without the proper information systems, the design-build/EPC contractor continues to react and is unable to fully embrace a particular role and thus risk. Palmer et al. (1996) notes an axiom to remember:

Today represents the first indication of what your costs of risk will be for the next five years.

Effective management begins with planning the project. Good project management requires the systematic collection, preservation, and retrieval of project information and information that provides support for the decision-making process and the costs incurred to execute the project.

So what does the design-build/EPC contractor need to assure that it has in place to identify, capture, monitor, and manage change? It needs to apply sound project management that meets industry best practices and meets a standard of care that would be expected of a design-build/EPC contractor under the same circumstances in the same locale.

**Meeting a Standard of Care**

The standard jury instructions for professional malpractice actions contain the traditional definition of the Standard of Care:

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**Fig. 5.** Relative risk/reward profile for lump sum, cost plus, and unit price contracting
[In] performing professional services for a client, owes that client the following duties of care: (1) the duty to have that degree of learning and skill ordinarily possessed by reputable (engineers) practicing in the same or a similar locality and under similar circumstances; (2) the duty to use care and skill ordinarily exercised in like cases by reputable members of the profession practicing in the same or similar locality under similar circumstances; and (3) the duty to use reasonable diligence and (his or her) best judgment in the exercise of skill and the application of learning. A failure to fulfill any one of these duties is negligence (Sido 2006).

The Standard of care is based upon the context of the place and time when the work was executed. Standards-of-care arguments use the following types of documents to argue that a Design-build/EPC contractor may not have followed a standard of care that would have reasonably been expected (Sido 2006):
- Text, papers, and treatises;
- Written standards and regulations;
- Firm guidelines and manuals;
- QA/QC reports; and
- Contract agreements and conditions (i.e., warranties and expressed limitations).

In the end, the basis of whether the Design-Build/EPC contractor performed to a reasonable standard of care will be based on the following questions:
- What was known about the technology and/or systems at the time that the project was executed?
- Who had that knowledge?
- Was it reasonable for the design-build/EPC contractor to have that knowledge at that time?
- Did the design-build/EPC contractor have that knowledge?

According to a 2007 book published by the American Bar Association (Hess et al. 2007), even when there may not be legislation governing construction management specifically, the licensing and registration laws of the various states applicable to contractors and architects may include performance functions closely associated with construction managers. For instance, the Construction Management Association of America (CMAA) promulgated its Construction Management Standards of Practice in 1987. Seven primary areas of construction management are covered, including the following: (CMAA 2008a):
- Project management;
- Time management;
- Cost management;
- Quality management;
- Contract management;
- Safety management; and
- Program management.

CMAA also began its Construction Manager certification program, which when completed provides the individual with a certificate as a Certified Construction Manager (CCM), meaning that the individual is a practitioner who meets all the certification requirements.

Accordingly, as an agent of the owner, a professional construction program manager is expected to represent the interest of the owner above those of other construction professionals involved in a program to attain and maintain the following:
- Optimum use of available funds;
- Control of the scope of work;
- Project scheduling;
- Optimum use of design and construction firm’s skills and talents;
- Avoidance of delays, changes and disputes;
- Enhancing project design and construction quality; and
- Optimum flexibility in contracting and procurement.

Comprehensive management of every stage of the project, beginning with the original concept and project definition, yields the greatest possible benefit to owners from Construction Management. (CMAA 2008b)

As with other relationships, both in and outside the construction industry, the construction manager’s performance will be measured by reference to a legal standard of care. As further noted in the ABA construction law book (Hess et al. 2007):

The Construction Manager will be held to a standard of care normally applied to persons and professions or trades requiring special skills. As a general rule, when a person holds himself out to the public as a member of a particular profession or trade, there is an implied agreement with those who employ him that he 1) possess that degree of knowledge and skill ordinarily possessed by others in the profession or trade; and 2) will perform the services for which he was engaged with that degree of prudence and care ordinarily possessed and observed by others engaged in the same or like employment.

Hence, we again see the reference to prudence and thus the tie that will be made during any prudence proceeding relative to how the design-build/EPC contractor conducted itself in the protection of the utility’s and ratepayers’ monies.

Even if a contract is silent concerning the standard of care, according to Palmer et al. (1996), a construction manager will still be expected to exercise a standard of care and will be held to the ordinary negligence standard. However, when the contract contains a specific clause setting forth a standard of care, the design-build/EPC contractor needs to be sure to closely follow the language of the clause. For example, a clause may state that the Consultant/ Contractor represent that the services will be performed in a manner consistent with the highest standard of care, diligence and skill exercised by nationally recognized consulting firms for similar services. (Palmer et al. 1996)

Warranty to perform in accordance with this higher standard could subject the consultant or contractor to liability even though all work has been performed in accordance with generally accepted standards in the industry. Furthermore, this failure to meet the required standard of care could constitute a contractual liability that may not be covered by insurance policies (Palmer et al. 1996).

It is again stressed that design professionals may be insured for professional negligence, that is, conduct that falls below the standard of care for architects or engineers. But with design-build/EPC contracting, there is a risk of contract standards replacing common law standards for design professionals. As noted in Return of the Master Builder (Quatman and Sell 2005), the Design-Build Institute of America (DBIA)’s standard form of subcontract between the design-builder and the designer includes an insurable standard of care clause in Paragraph 2.2.1 that is consistent with state law in most jurisdictions holding the designer to that level of care and skill “... ordinarily used by members of the design profession practicing under similar conditions at the same time and locality of the Project” (Quatman and
Sustainability

The role of the design-build/EPC contractor is vastly different from the role that may have been perceived in previous generations. Designing and constructing a project in the 21st Century involves new considerations that were often overlooked or not thought of in the past. As engineers and constructors, we have chosen a profession that enhances the quality of life. The role and responsibility of the engineer has always been to protect the public, health, safety, and welfare. Thus, the main objective of engineers is to develop proper infrastructure for supporting the effort in achieving its welfare. However, today the design-build/EPC contractor’s role and responsibility goes beyond protecting today’s public and seeks to protect of future generations and the environment.

There is perhaps no greater need on earth at this moment than sustainability. Distilled into its simplest form, sustainability is the practice of adequately meeting current needs while ensuring that future needs will be adequately met. Fleshted out a bit more, sustainability is the practice of ensuring that all the world’s inhabitants—from those living in the most developed nations to those living in the most underdeveloped nations—are ensured adequate food, shelter, and sanitation, now and in the future. A major factor influencing the major shifts in the global engineering and construction landscape stems from the global nature of many societal challenges. These challenges include building more secure national infrastructures in the wake of terrorist threats and actions, decaying infrastructure, increasing food shortages, lack of sanitation and clean drinking water, energy resources, increasing national capacity and disseminating technology to underdeveloped and developing countries, preventing environmental changes and degradation, improving weather forecasting to improve the response to catastrophic national disasters, and diminishing the threat of widespread health epidemics—all which have global consequences and require a global team to resolve. The next generation of engineers and constructors will need to lead the world in combating these global problems.

The UN Commission highlighted these fundamental components to sustainable development: environmental protection, economic growth, and social equity. These components led to a concept of the triple bottom line, developed by John Elkington, the founder of the firm sustainability in the United Kingdom. The triple bottom-line concept requires a balanced approach to economic development, environmental protection, and social well being, or EES for short.

The biggest impact of the triple bottom-line concept is on how engineers, planners, designers, and managers continue to deliver a best-practice solution to our clients. Over the coming years, social impact is going to be a major consideration for all design-build/EPC projects. Although environmental impact assessments are now common, we will begin to see social, economic, and human impact assessments performed before projects can proceed.

When to apply best practice is different when looking at the perspectives of the both the client and the design-build/EPC contractor. Simple questions that design-build/EPC contractors should now be asking in this triple bottom-line concept include questions from economic, environmental, and social perspectives. The design-build/EPC contractor should be providing the best value and longevity to the taxpayer in public project considerations.

Relative to economic considerations, what is the project cost that represents the best values from the perspective of achieving the project objectives? Have the life-cycle costs been analyzed to determine the total cost of project delivery over its expected life? Economic analysis is critical in the material-selection process. Have environmental factors been included in the valuation of assets and services? According to the U.S. Army Corps of Engineers, selection of all components, systems, and materials for civil works projects should be based on their long-term performance. Before making final recommendations to a client, the design-build/EPC contractor has a responsibility to analyze life-cycle costs and to inform the client about the short-term and long-term cost considerations. Design-build/EPC contractors must recognize that materials and their service life differ greatly, especially between different types of projects.

With respect to environmental questions, how does the project interact with the natural environment? Are there any concerns relative to the material or product proposed that may have potential future negative impacts on the project depending on the use application? Has the design-build/EPC contractor looked at the impact of carbon emission that the project will produce once operating or the carbon levels that will be introduced into the atmosphere with the construction means and methods during the construction? How much energy will be required to construct the...
project, and how much energy will be required to keep the project operating? What will the costs be from, and what will be the potential penalties from potential future carbon disallowances?

Looking at social impacts, the design-build/EPC contractor should ask how the person living next door is going to view the project. How can the project be best integrated into the community? Will the health, diversity, and values of the community be maintained or enhanced for the benefit of future generations? This will require the design-build/EPC contractor to look at specific aspects of the project relative to its materials and products. Is the life expectancy of the selected materials and/or products the same relative to the social expectation of how long the project will function as designed? Is there a need for future inspections of any aspect of the project regarding its structural integrity to assure its sustainability over the expected design life? The design-build/EPC contractor has a legal responsibility to determine whether the product being specified will perform its intended function for the specific project in which the design is performed. Hence, before specifying a particular project, the design-build/EPC contractor must be aware of the characteristics, applications, potential deficiencies, and limitations of the product.

Sustainability then represents the best engineering approach and the recognition that no project exists in a vacuum, but in a social and natural context that affects the project and is affected by it in turn. Sir Mark Moody Stuart commented at the 2002 United Nations World Summit on Sustainable Development in Johannesburg, that those companies which are at the forefront of sustainable development are the closest to the start of the journey. (Stuart 2002).

Summary Observations

The new construction environment is dictating that the design-build/EPC contractor reevaluate how it does business. In a world economy in which both governments and shareholders are looking to owners for transparency and accountability, owners are in turn looking toward their design-build/EPC contractors to prove up whether their costs—whether in the original contract scope or in changes—were reasonably incurred. In the past, a contractor was allowed to manage a lump-sum contract any way it desired as long as it was completed within the contract time and price. In today’s environment, owners are requiring the design-build/EPC contractor to prove that the costs expended were reasonable and prudently spent—including both original scope and any changes to that scope. Owners are now holding design-build/EPC contractors to a standard of care that compares what the contractor did on the basis of what it knew or should have known to what other contractors would have based on the basis of similar projects in the same locale. Finally, owners are looking toward the design-build contractor to incorporate the concepts of sustainability into the entire design, procurement, and construction process. The failure to consider these new emerging risks and document the decision-making process for any of these factors could result in a design-build/EPC contractor being faced with potential losses and/or disputes with the owner that could further lead to being deemed to be negligent or even grossly negligent.

List of Cases


C. L. Maddox, Inc. v. The Benham Group, Inc., 88 F. 3rd 592 (8th Cir. 1996).

References


