

# Managing design contracts

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## Key Points

- In the construction industry, the design is only a small part of the overall project cost, but its quality has an overarching effect on the life cycle cost of the facility.
- Employers should ensure that designers are appropriately engaged to deliver the required quality.
- There are actions that an employer can take to manage a design contract to ensure that it obtains the best value from the designer's services.

## Introduction

Every construction project has a substantial element of design in it. The cost of design is generally a small proportion of the overall cost of a construction project, and a much smaller proportion of the life cycle cost of a project. However, as it is the design that determines not only the form and nature of the construction, but also the characteristics of the constructed facility that determine the ongoing operating and maintenance costs over its entire life, its importance is substantially greater than the proportion of its cost of the project.

There are actions that an employer in a construction project can take to manage the design to ensure, to the greatest extent possible, that the final constructed facility will fulfill its expectations. (The term "employer" is used in this paper to refer to the entity that engages the designer, irrespective of whether the employer is an owner or a design and construct contractor).

This paper looks at the design risks inherent in any project, and the actions an employer can take to minimize those risks. The thesis of this paper is that, because of the fundamental importance of design to the functionality and overall cost of a constructed facility, the quality of design is of overarching importance in construction contracts. The corollary of this is that the design contract should be implemented and managed to ensure that the required quality is achieved.

## What is design?

The design of a facility involves all the large and small decisions required to determine its form, how its elements work individually and in combination to fulfill their functional requirements, what materials will be

used in construction, how these are connected together, how the facility is to be constructed, and how it should be operated.

Decisions made during the design of a facility will determine its maintenance requirements, what the operating costs will be, and the requirements for repairs, renovation and refurbishment. A critical distinction between design and construction is that the former exclusively involves the production of intellectual property (IP), whereas the latter involves the assembly of components of real property into a constructed facility on the land.

The design of a facility thus has a pervading influence, not just on the cost of construction, but even more importantly, on the life cycle costs. In many construction projects there is a well-known trade off between the capital cost of construction, and the life cycle costs: cheaper construction costs, achieved by the selection of less durable materials or less robust equipment, often lead to significantly higher maintenance and operating costs and ultimately a higher life cycle cost.

The significance of design cost in relation to a project is succinctly encapsulated in the 1:10:100 "rule":

Over one typical "life cycle" of a facility, for every One Dollar \$1 spent on Design, at least Ten Dollars \$10 are spent on Construction and At Least One Hundred Dollars \$100 are spent on OM&R [operation, maintenance and repairs/refurbishment]<sup>1</sup>

Thus, whilst design may represent of the order of 10% of the construction cost, it is typically less than 1% of the total life-cycle costs of a facility. These relative cost figures indicate that in the overall picture, the cost of design itself is of far less significance than the quality of the design that determines the project life cycle costs.

## What are the design risks to be managed?

### Scope

The extent of the works to be designed, ie the scope of the design, is likely to be the biggest single determinant of the cost of design. In a competitive environment where the cost of the design services is a significant factor in selecting a designer, a designer will minimize fees by tailoring the scope of its services to deliver precisely what is required by the contract and no more. The employer's major scope risk is that the designer has not allowed for completing all of the scope required by the employer in the design price.

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## *Time*

The time taken to prepare the design, as well as its cost, are usually important considerations in selecting a designer. The inherent time risk for the employer is that the design will not be completed on time, thereby delaying construction with an inevitable increase in cost. This risk is particularly acute once a contractor has been appointed and has been given possession of the site; significant delay in completing the design which delays construction may have substantial cost consequences, perhaps out of proportion to the cost of the design itself.

## *Cost*

The inherent employer's risk in the cost of design is that it will not get the value it is expecting for the price paid; that may be a consequence of the employer's unreasonable expectations not supported by the provisions of the design contract, or the designer not delivering the value required by the contract.

In a competitive environment for consulting services, competition is likely to have a leveling effect on the cost of design for many projects. Designer's fee rates will generally fall within a limited range, however consultants with greater skill and experience may have higher employment costs and may also be able to command a premium for their skill. Higher quality design may therefore entail higher cost.

Conversely, a low cost design for a defined scope of work may be based on under bidding, or a lack of understanding of the work necessary to complete a competent design. Whatever the reason, the designer may limit its resources in the face of a significant financial loss in completing its design scope. The consequences of inadequate resources typically include inadequate checking to correct mistakes, failure to coordinate designs between different disciplines, or inadequate consideration of what the appropriate design solution should be. The almost inevitable result is that the quality of the design will be less than required.

## *Design quality*

It is submitted that, because of the role of the design in determining the characteristics of the completed project, the quality of the design is of overarching importance to the employer. The major quality risk for the employer is that the design will not be of the appropriate quality to satisfy its manifold requirements, including aesthetics, functionality, maintainability, operability, and economic performance and design life.

## *IP Risk*

The employer's IP risk is that it may suffer delay or additional cost in construction, operation, maintenance, repair or renovation of the facility because of an aspect of design IP that it does not have legal title to.

## *Interface Risk*

The interface risk is that the facility will not be constructed in accordance with the design.

## *Insolvency*

In addition to the "execution" risks identified above, there is also the risk of the designer's insolvency. Whilst that may normally be a remote risk, if it eventuates it will inevitably have severe consequences for the employer. Those consequences include delays in appointing another designer and the time taken for that designer to come up to speed, as well as the additional costs for the new designer completing another's unfinished work, and possibly rectifying defects in that work.

## **Managing design risk by the employer**

For a particular project, one of the important factors in managing design risk is to ensure the appropriate interface between designer and constructor. This interface can occur in a variety of ways contractually, eg:

- In a traditional "construct only" construction contract or under other contractual mechanisms such as construction management/engineer-procure-construction manage (EPCM) or project management, the designer and constructor are separately engaged by the employer;
- In design and build or engineer-procure-construct (EPC) project delivery, the designer is engaged by the constructor; or
- The design team is assembled from individuals employed by various organizations comprising an alliance.

The selection of the form of contract for the design services is likely to be made as part of the employer's overall procurement strategy. Consideration of the best method of procuring the design within the constraints of a specific project is usually a significant factor in that procurement strategy. In some cases there may be no choice of designer, such as a situation where proprietary technology or IP must be used, or there is only one designer who is appropriately qualified.

It is suggested that where an employer wishes to have maximum control over the design, this can be achieved via a contractual mechanism in which the designer is directly contracted to the employer. Where the contractor engages the designer under a design-build or EPC contract, the employer inevitably has less control over the design, and arguably its quality. Such a contract may however achieve completion of the project earlier than under a traditional construct only contract, because of the ability to "fast track" by overlapping design and construction. A properly managed alliance gives perhaps

the greatest control to the employer in regard to quality, as sourcing the individual members of the design team is not confined to a specific design organization.

The employer can manage its scope risk by careful attention to the details of the design contract before it is entered into, and appropriate supervision of the designer during preparation of the design. This includes ensuring that the total scope of the required design is fully and unambiguously defined in the design contract, and that there is a proper mechanism for the issuing and approval of scope variations. During the design, the employer should monitor completion of the contractually defined deliverables, and insist on compliance with contractual procedures for scope variations.

As with time and quality, the scope of the design task cannot be divorced from a consideration of its cost. Where the scope is clear and well defined, a fixed price will provide certainty for the employer, and leave the risk of managing the design within the price with the designer. Conversely, where the scope is not well defined, where research or innovation may be necessary, or where there are complex requirements that require considerable investigation and consideration of a range of alternatives, it may be impossible to pre-estimate the amount of design effort needed. In these situations, a fixed price for design is inappropriate, and a more appropriate fee arrangement would be based on payment for the amount of design work necessary for the actual scope of work. By requiring regular reporting by the designer, the employer can be kept apprised of its financial commitment for the design work carried out, as well as the projected design expenditure over the coming period. In this way, the employer can limit its commitment for design fees by limiting the scope of the design.

Bearing in mind the 1:10:100 “rule” referred to above, the most effective way for an employer to ensure that the life-cycle costs of the project are minimized may well be to have a greater, rather than a lesser scope for the design concept work; the more conceptual design work in determining the most appropriate form of the project, the more likely it is that adequate consideration will have been given to all of the critical issues that will ultimately determine its life cycle cost.

Appropriate management of interface risk generally requires that the designer’s scope include inspections during construction to ensure that the design intent is met. In a design and construct contract where the designer’s scope is fixed by the contractor, it may be necessary to include a contractual requirement for some form of formal designer’s certification, to ensure that the contractor maintains adequate designer involvement during the construction phase.

There are limits to the extent to which the employer can manage the time risks. The normal contractual mechanisms of requiring a programme of works which must be kept up to date and regularly reported on (similar to that used in a construction contract) will at least give the employer early warning of time problems. In the event of schedule slippage the employer can implement appropriate contractual mechanisms such as requiring acceleration or a “show cause” notice, if these are provided for in the design contract. Milestone payment mechanisms may also provide a powerful financial incentive for a designer to perform to an agreed timetable.

Managing the quality risks of design is perhaps the most challenging of all for the employer. Typically, the employer engages the designer because it does not have the appropriate design skills itself. It may not have sufficient technical skills to adequately review the quality of the design being prepared. It is suggested that an employer can nevertheless minimize its design risks by:

- Careful selection of the designer, based on its proven knowledge, experience and skill, and an assessment of its capability to design the particular facility to the required quality within the defined time;
- Requiring the designer to have adequate internal procedures for checking the quality of the design against the contractual requirements;
- Auditing the designer’s internal procedures to ensure that the design and checking has been carried out in accordance with the defined procedures; and
- Appointing a checking or “proof engineer” where independent assurance of design quality is deemed to be appropriate.

It should be noted that each of these actions might have cost consequences for the employer. It is not however suggested that the cost of design should be a primary basis for the selection of designer, as this is likely to run counter to the selection of the designer who will produce the required design quality. A designer with a number of qualified employees and a sophisticated quality assurance system to the requirements of ISO 9000 will inevitably have a higher cost structure than a single person design company; it would be naïve to assume that such disparate organizations were in any way comparable in their ability to produce quality checked designs.

Auditing of the designer’s internal quality procedures, and appointing a proof engineer will significantly decrease the risks that the design is not of the required quality.

# Inhouse Counsel

Bearing in mind the 1:10:100 “rule”, any such additional cost spent during the design phase is “insurance” that the life cycle costs will be minimized because the design has been prepared to the appropriate quality.

The employer can manage its IP risk by appropriate warranties, indemnities and undertakings in the design contract. It will require an indemnity from the designer for any breach of any other party’s IP by the designer. As the entity paying for the design, the employer would normally expect to have sufficient title to all of the design IP required to construct, operate, maintain, renovate, alter or demolish the facility as it sees fit, without payment of additional cost over that agreed to in the design contract.

It is submitted that, in the majority of construction contracts, the employer will manage those IP risks appropriately by ensuring that it has a royalty free, irrevocable license to use the IP in connection with the facility for any purpose during its life; it would not normally be necessary to require a complete assignment of all IP by the designer to the employer.

There are limits to the ability of an employer to manage the risk of a designer’s insolvency, as this may be triggered by events over which the employer has no influence. An employer should carry out appropriate due diligence on the designer’s Professional Indemnity (PI) insurance and financial strength before the design contract is entered into. A financially strong designer that maintains its commercial viability and PI insurance is likely to be in the best position to satisfy any liability for damages. However, the balance sheet assets of most design organisations are confined to intangible assets that will quickly dissipate in the event of insolvency. Their ability to meet a claim for damages is often confined in reality to the PI insurance they carry.

It is submitted that it is therefore not in the employer’s interests to insist on contractual terms which might have the effect of jeopardising the coverage or existence of the designer’s PI insurance. Further, whilst properly drawn up contractual warranties are legally enforceable, to the extent that they are not supported by the terms of an appropriate insurance policy, the designer may have inadequate financial resources to meet any substantial liability for damages.

## Conclusion

This paper has emphasised the fundamental importance of design in achieving a project that satisfies the employer’s requirements of aesthetics, functionality, constructability, operability, maintainability and economic performance over its life cycle.

The 1:10:100 “rule” brings into sharp focus the impact that design decisions made at the earliest stage of a project have on the ultimate outcome over its life. The corollary to this “rule” is that one of the most effective investments in ensuring project success is that made to obtain the most appropriate design. A “better” design, even if it costs more to produce, can reap substantial financial returns over a long period of time in the form of lower operating or maintenance costs, or a reduced requirement for upgrading or refurbishment.

The employer can manage its design risks by appropriate selection of the right designer, agreeing to reasonable and equitable terms in the design contract which protect the employer’s interests without an unreasonable or unrealistic shifting of risks to the designer, and by agreeing to reasonable remuneration and time to perform an agreed scope of work to the required quality. In addition to reporting by the designer and auditing of its compliance with the contractual requirements, in some cases it may be appropriate to engage an independent “proof engineer” to ensure the quality of the design. The employer’s best management of the design will be to have an unrelenting focus on its quality, and to provide an appropriate contractual setting in which this has the maximum opportunity of being achieved.



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## Footnotes

1. <[http://www.barchanfoundation.com/index.php?option=com\\_content&view=article&id=47:life-cycle-methods-will-remain-after-the-gfc&catid=3:public-content&Itemid=9](http://www.barchanfoundation.com/index.php?option=com_content&view=article&id=47:life-cycle-methods-will-remain-after-the-gfc&catid=3:public-content&Itemid=9)> accessed 18 November 2011.