

# Quality in the Constructed Project: Designer's Viewpoint

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Controversial provisions contained in ASCE Manual 73, *Quality in the Constructed Project*, are outlined and commented on from a designer's viewpoint. The provisions include design professionals' participation during the construction phase of a project, site safety responsibility, design professionals' responsibility for contractor submittals, and procedures for selecting a design professional. Also included are suggestions for computer data retention, use of large data bases, and need for a software quality certification program. The peer review process is briefly explained and is recommended for use since it adds to the quality of the constructed project.

ASCE Manual 73, *Quality in the Constructed Project (I)*, serves as a guide for owners, designers, and constructors. As stated in the manual, the purpose of the Guide is

- To achieve quality in the constructed project;
- To provide guidance for establishing roles, responsibilities, relationships, and limits of authority for project participants; and
- To stress the importance of concepts and practices that may help achieve quality in the constructed project.

The Guide is a comprehensive document that details, very well, the steps from initiation to completion and operation of a project. It is not another book to be put on the shelf and forgotten. It is important that it be implemented and used by all in the construction industry. Those who do not agree with some of the provisions can work to have them changed. They can also suggest additions to be included in the next edition of the Guide. It will be a living, working document that, it is hoped, will be revised and updated every 3 to 5 years.

From a designer's viewpoint, the Guide is a valuable document because it outlines not only the designer's duties and responsibilities but those of the owner and constructor as well. Most experienced designers would probably note that much in the Guide was well known and presently a part of the construction process. However, they would also welcome the fact that there is now a written document that they can refer to. The Guide is excellent for study by young designers and is already being used as a textbook in several engineering colleges.

Whereas most of the provisions of the Guide are readily accepted by all those participating in the constructed project, there are some that are controversial and deserve some comment.

## CONSTRUCTION SERVICES

The Guide contains a recommendation that the design professional be fully involved in the construction phase of the project. Why should the design professional participate during construction? One obvious reason is that design team members are the most knowledgeable about important design aspects and the intent of the design in satisfying the requirements of each discipline as well as project directives. But there are other reasons. The design team is proud of what it has accomplished on paper and has a greater interest than others in ensuring that the project follows the design intent and quality standards. Site visits not only allow the design engineer to see that the work is progressing as planned but also educate the engineer to appreciate problems that arise in the field. The design engineer is also readily available to attend site meeting with the contractor and promptly answer any questions on design interpretation. Communication is best and most productive when the site engineers and design team are members of the same firm.

Construction inspection services for bridge projects are usually provided by the consulting firm that executed the design, another consulting engineering firm or construction management firm, or the owner, which for bridge projects is usually a state or city government.

The reasons usually given for using a firm other than the design professional's for construction services include a desire to spread fees among more engineering firms, dissatisfaction with the work of the design consultant, or the idea that any design error would be hushed up and buried by a site team that belonged to the same firm as the design team. It appears that any significant design errors will become known by the owner because usually these errors result in a claim for extras by the constructor.

Some city and state governments have excellent construction service departments. They are familiar with all of the quality control standards established by the state and know the capabilities and limitations of most of the contractors working for the state.

However, some city and state governments are under severe budget constraints and sometimes cannot supply knowledgeable site engineers. On one bridge construction project the owner sent a highway engineer to provide the construction inspection services. In addition, they usually do not have the experience to adequately staff a large project.

The design professional who is not invited to participate in the construction phase should probably seek a hold harmless clause in the contract with the owner. Some engineers will

not accept a design assignment unless the contract provides for construction involvement.

The writer endorses the manual's recommendation that the design engineer, if possible, be contracted with to provide the required construction services.

The manual clearly spells out the responsibilities of the owner, the design professional, and the constructor. It states that the constructor is responsible for means, methods, techniques and sequencing of construction, and planning and enforcement of site safety programs. It further states that the designer has no authority over or responsibility for these items.

These are strong statements, and one must remember that the manual is a guide, and sometimes deviations will need to be taken to get the job done. For example, on a major bridge project the design engineer may need to provide guidance to the contractor to develop a satisfactory erection scheme, even if the contractor has hired another engineer to assist in developing an erection scheme. In so doing, the design engineer must weigh the legal responsibilities that may be incurred against the need to prevent unnecessary delay of the project.

In addition, it is sometimes necessary for the engineer to sketch solutions for details that are then given to the contractor for full development and subsequently submitted for approval by the contractor.

## SITE SAFETY

The construction industry is the most hazardous of any other industry in the United States. One in seven construction workers is injured on the job each year (2). There is an alarming tendency among some government agencies and other owners to require that the engineering firm providing construction services also be made responsible for the job safety of the contractor's employees. In general, they are not satisfied with the present state of site safety conditions and believe that, by having the engineering firm in charge of job safety, safety rules will be enforced and the number of accidents reduced. It seems apparent that this cannot work, since the engineering firm's resident project representative has no direct authority over the contractor's employees.

Engineers better take care and seek legal counsel before signing a contract that requires even only an approval of a job safety plan. An interesting recent court case has ruled against an engineer on this issue (2).

One of the most troublesome liability issues in providing construction services concerns workmen's compensation. Workmen who are injured are restrained by workmen's compensation from bringing suit against the contractor. They are not so restrained in regard to the consulting engineer, and they usually initiate suits against the engineer. The manual is clear that the worker's safety is the concern of the contractor. I do not think that this is enough. The engineer needs to be protected in the same manner as the contractor is by workmen's compensation.

## CONSTRUCTOR SUBMITTALS

The responsibility of the design professional in constructor submittals, including shop drawings, has always been vague and controversial. The Guide states:

The professional services contract between the owner and design professional, who may also be the structural engineer of record, and the construction contract between the owner and constructor should define clearly the authorities and responsibilities of each party, including design services, scope and purpose of contract submittal review by the design professional, and scope of work to be performed by the constructor and subcontractors, such as fabricators, detailers, suppliers, and manufacturers, so as to avoid misunderstandings and vague, implied, or implicit responsibilities.

As a minimum, the design professional should review, approve, and be responsible for any design that the contract required the contractor to accomplish.

Further, the Guide states:

The design professional reviews submittal for conformance with the design concept of the project and information given in the construction contract documents, but does not review those aspects of a submittal that pertain to the construction process, such as the means, methods, techniques, sequences, and procedures of construction; detailing dimensions; fit or erectability in the field; or safety precautions and programs.

The Guide is silent on submissions of contractor's alternative designs, but it appears that the design professional should review and approve such designs. As far as responsibility is concerned, a good rule to follow is "a firm must be responsible for its own work." This would ensure that everyone concerned have a good quality assurance/quality control program in place. Top management must enthusiastically support such programs and be serious about their implementation. If they are not, how can they expect the rest of the firm to take the programs seriously?

## DESIGNER SELECTION

Chapter 5 of the Guide is entitled "Procedures for Selecting Design Professional." The recommendation in the Guide is as follows:

Design professionals submit statements of interest and qualifications in response to an owner's invitation and statement of requirements for a specific project. The responses are evaluated by the owner according to previously announced selection criteria. Often, an owner conducts personal interviews with the three design professionals who appear to be most qualified for the assignment.

After the design professional is selected on the basis of qualifications to meet project requirements, contract negotiations between the owner and design professional are initiated. During these negotiations, scope of services, schedule, compensation, and other contractual matters are defined, agreed upon, and documented in a written contract. If the owner and design professional are unable to reach an agreement, then the negotiations are terminated and the owner initiates negotiations with the next most qualified design professional.

It has been proven many times that following this procedure best serves the owner's interests, expectations, and requirements.

Price bidding for the procurement of professional design services is not recommended. Bidding discourages innovation and the study of alternatives. The scope of work is usually deficient, which leads to claims for extra work and extension of time for completion of the contract. In addition to these

reasons, the low bidder may be only marginally qualified to do the work.

Another method of procurement of professional design services is called the two-envelope system, because three to five firms are requested to submit technical and price proposals but keep them in separate envelopes. The technical proposals are evaluated first and a firm is selected as having the best. Only then is the price proposal looked at and negotiations initiated. The two-envelope system is also not recommended because it requires unnecessary work and expense by the firms not selected.

## COMPUTER USE

The Guide chapter on "Project Quality Through Use of Computers" deserves careful study by all concerned with the construction process. Experience has shown that relying on archival storage of computer data and programs and then being able to reproduce computer output years in the future is fraught with difficulties. Hardware, software, and operating systems change and are updated often without much regard for past use. Hard copies of as-built drawings of a construction project should be retained as well as the design and material specifications used. Design and detailers' calculations need not be saved upon completion of a project since they can be reproduced as necessary probably more accurately, with better programs in the future. Future editions of the Guide may well give guidelines as to the length of time various documents should be retained.

There has been an explosive growth of information that design professionals must somehow cope with. Most design firms have small libraries, which are quickly outdated. Designers need to become familiar with and use expert information retrieval systems to access commercial computer data bases to identify technical publications that might help them. ASCE has such a computer data base of all its publications.

The Guide mentions quality certification programs and sources of information on acceptance standards but none concerning computer use. There is a need for a quality certification program for software. Such a software clearing house would be valuable and save time and expense on the part of

design professionals. In addition, there would be less chance of errors attributable to computer software use.

## PEER REVIEWS

The Guide notes that peer reviews are gaining acceptance, and they have successfully advanced quality in the construction process. Peer reviews are basically examinations of the quality of an organization's structure, or with what quality a project is managed and designed. It is important that such a review be done by an experienced independent professional, who could be an outsider or an insider and who could well be from another office of the firm. Such reviews could result in suggested changes in an organization's structure and the identification of problems of a current project, thus allowing immediate corrective action to be taken. The Guide goes into great detail explaining the implementation and benefits of peer reviews. Project peer reviews are usually paid for by the owner. They should be used more often, since their implementation will add to the quality of the constructed project.

## WHAT TO DO

The main purpose of this paper is to interest you and your organization in obtaining a copy of the Guide, *Quality in the Constructed Project*, studying its provisions, and implementing it in your organization. Your suggestions for improving editions of the Guide will be most welcome and carefully considered.

## REFERENCES

1. *Quality in the Constructed Project*. Manual 73, ASCE, New York, 1990.
2. M. C. Loulakis and W. L. Cregger. Liability for On-the-Job Safety. *Civil Engineering*, Vol. 61, No. 7, July 1991.

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