



## Shop Drawings - Learning to Live with Them - Part One

By Arthur F. O'Leary, FAIA,  
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To the construction industry, shop drawings seem to be a necessary evil. Contractors find them expensive to produce and architects find them unappealing to review. Both find them time-consuming and costly to administer. We seemingly cannot construct buildings without them; but they have become a perennial source of annoyance and confusion and more importantly, a significant source of professional liability claims against architects.

Undiscovered mistakes in shop drawings will often lead to unexpected or undesired construction results as well as exorbitant eco-

nomie claims against architects, engineers, and contractors. Some shop drawing anomalies have resulted in costly construction defects, tragic personal injuries, and catastrophic loss of life.

### Shop Drawing Procedures in AIA Documents

The contractor is obligated by the contract documents to submit shop drawings, product data, and samples for certain parts of the work. The architect is obligated by the owner-architect agreement to "review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples...." (B-141, Subparagraph 2.6.4). This is included among the architect's Contract Administration Services.

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This analysis of shop drawing problems and procedures is based on the situations that would prevail if the owner, architect, consultants, and contractor contracted with each other using the standard form agreements issued by the American Institute of Architects. Use of the following documents will be assumed:

General Conditions of the Contract for Construction AIA Document A201-1997 (Incorporated as part of the Owner-Contractor Agreement.)

Owner-Architect Agreement Standard Form of Architect's Services: Design and Contract Administration AIA Document B141-1997

Architect-Consultant Agreement AIA Document C141-1997

Shop Drawing and Sample Record AIA Document G-712

## Benefits of Membership in CSI

- CEU's (LU's) earned by attending the monthly meetings and seminars
- Low cost insurance
- *Construction Specifier* magazine
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Minutes of the Board Meeting  
Santa Clara Valley Chapter CSI  
(Draft – Board Approval Pending)

Place: Ramada Inn, Sunnyvale

Date: July 10, 2003

Time: 5:00 p.m.

Present: Jim Balboni,  
Marvin Bamburg,  
Carl Bredl,  
Gil Johnston,  
Hannah Moyer,  
Krista Nelson,  
Mike O'Donnell,  
Gus Sharvey

**1. The meeting was called to order at 5:00 PM by Chapter President Jim Balboni.**

**2. Minutes from last Board meeting were accepted.**

**3. President's Report, Jim Balboni:** For the upcoming Regional Convention we need to determine which delegates to send, and how much we can afford to pay. We have about \$20,000 in the budget. With \$400 for air fare, 2 nights at \$140/day and \$200 for registration, total cost will be about \$900 per person. We might offer \$500 per Board member, which for 5 members will run \$2,500. Offer registration fee for Chapter members, probably two will go. We need an income stream to afford this level of expenditure. Only members should be required to give a report, Board members have enough with their duties. Next Regional Conven-

tion will be in San Diego. Mike O'Donnell mentioned that we need more incentives for Chapter members to attend. \$150 contribution toward Chapter member registration was moved, seconded and passed.

**4. Unfinished business:** Marvin Bamburg brought Membership Roster for distribution to Board members.

#### **5. New Business:**

**a. Contribution in memory of Bill Hawley:** \$100 was moved, seconded and passed.

**b. Krista Nelson and Carl Bredl attended CSI Institute.**

Krista pointed to the value for leadership development. Krista and Carl will present new proposals for next Board meeting. About 300 people attended the session. Jim Balboni: There are 140 CSI Chapters, which amounts to about two people per Chapter. This seems acceptable from a Chapter point of view, but apparently not satisfactory from an Institute perspective. There were two simultaneous events at the time, which conflicted with each other.

#### **6. Committee Reports:**

**a. Income Stream:** Jim Balboni: The Chapter needs more income to survive. Revert to product show? Marvin Bamburg: Pacific Coast Building Show is a good example. Gil Johnston: Hard-

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**Board** *continued from Page 2*

ware Show could be held for one day. Carl Bredl: we should look to manufacturers for support. Mike O'Donnell: What about a gambling venture? (!) Gus Sharvey: Our dinners are too cheap. Jim Balboni: Maybe we should raise the dues. There has not been a Chapter dues increase in 10 years. Hannah Moyers moved to increase dinner dues to \$25, which was seconded and passed. Newsletter goes out in 2 months, it should announce increase to \$25 effective from September 2003.

**b. Educational Programs:** Gil Johnston is interested in elevator specification programs. Mike O'Donnell: AIA had a program which they did not get out in time. It takes 3-4 months to get a program together, and should be advertised in advance. Jim Balboni: Architects, Engineers and Contractors should be contacted for ideas. 50-60 APMs pay \$100 to get info to their people. Jim thinks he can market programs with contractors he is acquainted with. Gil Johnston: What about Design/Build teams?

**c. Operating/House:** Jim Balboni: We want to see new faces. Krista Nelson: Talk to visitors, so that they will come back.

**7. Jim Balboni adjourned the meeting at 6:25 PM.**



## TechTalk

### Y CSI

I'm taking a short break from the technical issues of the day to ask the question: "Why CSI?" As in why join, why participate, why be involved?

All good questions. I said the same thing to myself before I became an active member. I have to be honest and admit that I am not a big "volunteer person."

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**When I attend a monthly chapter meeting, it's like going home for a family reunion.**

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Like everyone else, my personal time (what little there is these days) is at a premium, with a high value placed on those precious few hours (minutes?!). CSI would be my first venture into the "volunteer" realm. My initial reason for joining was more of a curiosity, and certainly with no long-term commitment in mind. When I first joined, if someone had asked me why he or she should become a member, I wouldn't have had an answer, much less a convincing one.

Well, it's been about four years now and if someone approached me today and asked me "Why CSI?" I'd have plenty of reasons for becoming a member. For one

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## GUIBytes

### Twenty Years Ago, Part 2 - RAM-page

“Data expands to fill the space available for storage.” — *Parkinson’s Law of Data.*

Computers use a few different types of memory. Some are volatile - information is lost when the power goes off - and some are permanent. The first type is used to store things that change while you work, while the second type is used to save your work for future use. Random access memory (RAM) is where the computer does its thinking. The operating system goes in first, followed by programs, and then whatever calculations and data are needed for your work.

#### Paper on Steroids

I saved a single page of text in a few different formats to see how much space each would take. I don’t recall exactly how much space a single page required on the QX-10, but it was about 2K.

| Format    | Size (K) |
|-----------|----------|
| QX-10     | 2.0      |
| text file | 3.0      |
| Word 2.0  | 5.5      |
| Word 6.0  | 13.0     |
| Word 2000 | 27.5     |

Why are pages bigger now than they were twenty years ago? Because pages are a lot smarter now. Back then, you had twenty-six letters, ten digits, and a handful of special characters, plus bold or italic, and that was

about all there was to work with. Today the letters can be super or subscript, different sizes, different colors, the background can have color, and we have automatic numbering, links, and so on. Even if you don’t use any of those features, the document has to be ready to handle them; even though the text may look “normal”, it still has all of those characteristics defined. It’s just that most of them say “nothin’ special here.”

#### RAM Tough

The QX-10 was an advanced machine in its day, with a whopping 256 kilobytes (K) of memory, four times as much as the IBM PC’s 64K. That isn’t much today, when a new computer will probably have 256 megabytes of RAM. To get a better idea of how much memory these computers have, let’s think of the memory as pages, and do a little math.

First, we’ll assume that the entire RAM of each computer can be used to store text pages. In fact this is not the case, because, as noted before, the memory is cluttered with all sorts of other stuff. Something called virtual memory also comes into play, but that may be the subject of another discussion.

The QX-10, with 256K of RAM, could hold about 130 pages. According to a reliable source, this would be enough for a small novel. If pages had stayed the same size, a computer with 256 meg of RAM would hold 130,000 pages - enough room even for Tom Clancy to work on

all of his books at once without breaking a sweat!

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thing, it’s an organization with a very diverse membership. Outside of the “big three” (product manufacturers, contractors and architects), members include industry related folks such as interior designers, engineers, real estate agents and attorneys, just to name a few. Each person brings a wealth of knowledge and experience to the table, with many opportunities to share their information with other CSI members.

Why CSI? It’s the members themselves. When I attend a monthly chapter meeting, it’s like going home for a family reunion. What a terrific group of people! Yes, it may take a little while for a new member to recognize this, but I’m sure that anyone who has been a regular attendee would say the same thing. Sure there’s networking opportunities, but the camaraderie transcends the business side of the organization.

Why CSI? It’s fun! The chapter meetings are always a light-hearted affair, while still being informative and educational. The golf tournament, product show and holiday season gathering are all no-miss events. I’ve

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## SUMMARY

### MENTORING, EDUCATION & VOLUNTEERING

*By Tim White, President*

In today's hectic business world, many companies lament the lack of qualified, well-rounded employees and candidates for employment. In the construction arena and its related supporting fields, this issue remains the foremost challenge. With limited resources available in view of the ever-expanding workload, a three-part solution exists. Have you or your company established a mentoring program, explored inexpensive educational opportunities or encouraged an employee to give time to an organization?

Mentoring consists of spending time with enthusiastic, yet lesser experienced members of your company. In the right situation, a senior, more proven and knowledgeable person imparts understanding, perspective and sagacity to junior firm members. This "sharing" can be accomplished through various methods. By

consistently working with someone, a mentor directs and guides an individual through opportunities to excel and grow. Over time and done constructively, a company will develop more effective, well-rounded employees. The best part of mentoring is that there is little or no cost other than an interest to help an individual grow and mature into a stronger team member.

Education still remains the best avenue to develop, expand and improve an employee's knowledge and skill. Educational opportunities abound with various costs associated with them. One must carefully weigh the cost and time commitment of these sessions versus the current workload. Yet, the problem of inexperienced employee's will continue if education is deferred because "there just is not enough time." By overlooking education, a company will limit its ability to expand and meet tomorrow's challenges.

Encouraging employees to volunteer in an organization in which they have interest provides a

**Mentoring** *continued on Page 6*

### Planning Calendar 2003

August 7 - Board meeting only, no chapter meeting

September 4 - Concrete in Sustainable Design

October 2 - Storm Water Prevention Plan - Fact vs. Fiction

November - W.I.C.

**Unfortunately our chapter dinner charge will need to be increased to cover costs. The new charge of \$25.00 will begin in September, please make note of the change.**

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## HOW TO USE AN OPEN SPECIFICATION FOR “NO SUBSTITUTION” PRODUCTS

There is a way to specify “no substitution” products and still get competitive bids.

For example, an existing building has one type of lockset and the Owner wants the new building addition to match their existing lockset manufacturer, no substitutions. The door hardware specification nonetheless lists several acceptable manufacturers. When the bids come in, the Owner looks over the price difference between the low bid and the “no substitution” locksets. The Owner may then approve the added cost and accept the no substitution product, or the owner may take a different product and decide to redo the existing building’s door hardware to match the low bid product. By keeping the specification open, other manufacturers have a chance to be used even on a “NO SUBSTITUTION” project.

Another added benefit is that the Specifier will be able to find out what products are the best value for ongoing and future projects.

From the bidder’s standpoint, it may be worthwhile to bid a “voluntary alternate” to the “no substitution” products just to let the owner see what savings are available by switching brands.

The “voluntary alternate” approach allows review of a proposed substitution by the Architect AFTER bidding and before contracts are signed. This is a less hectic time for the Architect than during bidding.

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### **TechTalk** continued from Page 4

attended the last two CSI West Region Conferences in the Fall, and there’s as much opportunity to have a little fun (the pumpkin carving contest and grape stomping competition come to mind) as there is to learn a thing or two. Why CSI? There’s a great deal of personal satisfaction to be had for those who choose to become involved with one (or more) of the many chapter committees or assist in providing direction for the chapter by becoming a member of the Board of Directors. I have done both, and there’s not much more satisfying than being part of the Product Show Committee and seeing the event be successful and go off without a hitch (thanks Beal!), or writing these articles and getting feedback (positive or negative, it lets me know that they’re being read!), or by being part of the Board decision-making process that determines the direction our chapter will be heading in the future.

Why CSI? All of the above and more. And the time commitment is surprisingly small. I’ll bet that I don’t spend more than an average of seven hours a month

for the level of involvement described above. A pretty small investment in yourself and your career for the rewards you reap.

So if you or someone you know is considering becoming involved, come on and make the leap. After all, who would have thought that “Mr. No-Volunteer” would have gotten this involved just a few short years ago? Not me!

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### **Mentoring** cont’d from Page 5

unique situation for them to develop added talents. One of the best abilities that can be refined is effective time management. In addition to specific work related skills, effective time management remains one of today’s greatest business hurdles. An additional benefit of encouraging volunteerism is that your employees will develop a sense of satisfaction gained from their contributions to an organization.

At both the Institute and Chapter levels, CSI strives to offer several avenues for your employees to expand their skills. Volunteering with the Denver Chapter in various positions at either the committee or board level abound. Mentoring is achieved through senior board members encouraging and counseling committee chairpersons. Educational opportunities are offered by the educational and technical committees along with the certification testing for Construction Document

Technologist, Certified Construction Specifier, Certified Construction Product Representative and Certified Construction Contracts Administrator.

All of the ideas presented above offer companies multiple avenues to expand the abilities of its workforce. Retaining an existing employee base continues to be another formidable task. By offering more than just monetary compensation and benefits, firms can foster employee satisfaction at the place where they spend a majority of their waking hours.

Developing a better workforce should be a staple in a company's strategic planning. By ignoring various methods of additional training, the lack of qualified employees will not decrease without proactive measures.

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**Drawings** *continued from Page 1*

**Submittals Defined**

The AIA General Conditions provides definitions for each of the contractor's submittals:

**“Shop Drawings** are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.” (A201, 3.12.1)

**“Product Data** are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.”

(3.12.2)

**“Samples** are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.”

(3.12.3)

These and similar submittals are not considered contract documents. The only documents that can rise to the stature of contract documents are (1) those that were in existence at the time of the signing of the construction contract and that were incorporated by reference into the contract, and (2) those that are added later as contract modifications and that are signed by the owner and the contractor, such as change orders and construction change directives.

Shop drawings, product data, and samples are submitted for the purpose of illustrating how the contractor proposes to conform to the requirements and design concepts expressed in the construction drawings and specifications. (3.12.4)

**Are Shop Drawings Really Needed?**

The drawings and specifications prepared by architects and engineers show the general design concept of the project and each of the major components and their relationships to each other. Some of the subcontractors and suppliers must prepare additional drawings, diagrams, schedules, and other data to illustrate the specific way in which their particular company or shop will undertake

to furnish, fabricate, assemble, or install their products.

Shop drawings are needed by the fabrication shops for their own use in instructing their own personnel how to carry out the requirements of the contract documents. Fabricators will produce the shop drawings even if they are not asked to submit them for architect's approval. In many cases, the building could have been built satisfactorily even if the architect had not reviewed the shop drawings.

The principal reason architects and engineers need to review the shop drawings is to ascertain that the contractor understands the architectural and engineering design concepts and to correct any misapprehensions before they are carried out in the shop or field. They review shop drawings of any particular trade or component to determine if the contract drawings and specifications have been properly understood and interpreted by the producers and suppliers.

The shop drawings should prove to the architect's satisfaction that the work of the contract would be fulfilled. If the shop drawings indicate that the work depicted will not comply with the intent of the contract drawings and specifications, the architect has an opportunity to notify the contractor before the costs of fabrication, purchase, or installation have been incurred.

The costly and wasteful alternative to this procedure would be

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### **Drawings** *continued from Page 7*

simply to wait until the work is in place and then examine it and condemn or reject it. It is much more economical to review and correct the shop drawings than to remove and replace erroneous construction. Proper use of the shop drawing review system should prevent costly errors caused by misunderstanding of the contract requirements.

### **Professional Standard of Care.**

As long as it remains the practice of a majority of architects in the vicinity to specify the submittal of shop drawings for certain trades, then for architects it is a matter of complying with the professional standard of care. The architect's position would be difficult to justify if shop drawings had not been required for the usual trades if some party has been injured or suffered economic disadvantage where the checking of shop drawings could have prevented the loss or injury.

### **Specifying Shop Drawings**

There is no standard list of trades that must have their shop drawings reviewed. It is still a matter for the professional judgment and discretion of the individual architect or engineer in each unique situation.

The sensitive trades are those involving structural stability, safety, appearance, function, or building code compliance. However, errors or anomalies in any trade's shop drawings could involve large sums of money even if these significant elements are absent.

The general understandings as to the definition and purpose of shop drawings and limitations of the architect's approval appear in the AIA General Conditions. (3.11, 3.12, and 4.2.7)

The architect's approval of the shop drawings will often be conditioned on the correction of various errors or misinterpretations of the contract documents. In the event that the corrections are extensive the architect will usually completely disapprove them and require correction and resubmission. They are then sent back to the general contractor, approved, conditionally approved, or disapproved.

### **Unspecified Shop Drawings**

If the architect does not specify submission of shop drawings for a specific trade, they usually will not be submitted for review. In fact, most architects will not accept unspecified shop drawings for review. (A201, 3.12.5) To accept them would merely create the duty to review them. This would not only increase the architect's uncompensated workload but would also unnecessarily increase the possibility of erroneous approval, carrying with it potential liability to anyone who might suffer injury or incur loss.

### **Specifying Unneeded Shop Drawings**

One way of lessening the exposure to risk of error in reviewing shop drawings is to refrain from specifying them in any case where the contract documents are sufficiently explicit to

adequately depict the product or assemblage. Unnecessary shop drawings are a wasted effort and expense imposed on the contractor as well as the architect.

### **Unsubmitted and Unreviewed Shop Drawings**

If shop drawings of a certain trade have been specified, but not submitted and therefore not reviewed, the architect could be found negligent if mistakes were carried out in the construction which could have been prevented if the shop drawings had been checked. The architect's liability position would have been better if submission of the shop drawings had not been specified at all.

Architects should be certain that all specified submittals are actually received from the contractor. It is a good idea to prepare a checklist of all specified submittals at the beginning of the construction period so that each may be checked off as received. The contractor should then be reminded to submit any missing submittals.

This discussion of shop drawings will be continued in the September 2003 issue of *Summary*.

### **Notes**

Various provisions of AIA standard form documents (A201 and B141) have been quoted briefly and should be reviewed in their entirety for their complete language and context to avoid possible misinterpretation.

For a fuller discussion of Shop Drawings, see Chapter 12 in "A Guide to Successful Construction - Effective Contract Administration," by Arthur F. O'Leary, FAIA, MRIAI, published by BNi Publications, Anaheim, California.



# Going to Extremes

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(Come Visit)