
 <p>The cornerstone of confidence™</p>		<p>August 2004</p>
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<p>SEMINARS PinnacleOne Institute</p> <p>P1/Lorman Seminars</p>	<p>Constructibility Reviews</p>	
<p>SERVICES Program & Project Management</p> <p>Dispute Avoidance & Resolution</p> <p>Real Property Advisory Services</p>	<p>Given the complexities of design and construction, even the best designs will not be error-free. Most architects and engineers or owners have not competitively bid or built projects as contractors. It is also not uncommon for architects not to completely understand or be intimidated by the other discipline drawings or simply have not been provided all of the documents impacting the quality of the design. By using constructibility reviews at key points in the design process, it is usually possible to eliminate a high majority of these mistakes prior to bid before the 1-10-100-1000 Effect comes into play. This series of articles provides pointers on how to get the most out of your constructibility reviews and describes the trends that were encountered on projects that instituted a formal constructibility review process.</p>	
<p>PinnacleOne is a national construction consulting firm that provides sound advice, strategic solutions and peace of mind to its clients. Its diverse, highly trained professionals guide its clients through every step of the design, construction and contract closeout process to help them achieve their goals, and at the same time, avoid and manage risk. PinnacleOne's unimpeachable</p>	<p style="text-align: center;">MEASURE TWICE, CUT ONCE</p> <p>Any project whether small or large stands to benefit by a properly conducted constructibility review. Why? By verifying that the contract documents are coordinated, complete, and buildable, constructibility reviews reduce the occurrence and extent of change orders, claims, and schedule delays and thus promote a better relationship between owner, construction manager, contractor, and architect. While accomplishing that primary objective, constructibility reviews also eliminate redundancy in quality control reviews being performed by different entities involved in the project such as architects, peer reviewers, and permitting agencies. The best constructibility reviews concurrently review all documents and focus on their buildability. In all cases, the specific methodology or approach to conducting a constructibility review should be consistent with the</p>	<p>Ken Pruett</p> <p>Ken Pruett has extensive experience managing large capital improvement bond programs. Currently he is serving as Project Director at Los Angeles Harbor College for their Proposition A Bond Program which consists of \$220 million of construction of new campus facilities and the modernization of their existing educational facilities.</p> <p>Prior to his current project, Ken developed and ran the Los Angeles School District's Constructibility Review Program. The LAUSD Constructibility Program, consisting of 16 in-house reviewers and 5 outsourced review firms, conducted over 100 reviews on \$1 billion</p>

objectivity, along with a proven approach to planning and attention to detail, has earned the company a reputation as one of the finest consultants in the construction industry.

Headquartered in Phoenix, PinnacleOne regional operations are located in Irvine, Los Angeles, Sacramento, and Hartford.

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goals of the review.

Consider ALL of the Contract Documents

Traditionally, owners provide integral portions of the Contract Documents such as survey, as-built, geotechnical, hazardous material, environmental, and other pre-construction documentation. All elements that make up the contract documents need to be concurrently reviewed -- drawings, as-built conditions, specifications, geotechnical reports, environmental documents, site topographic, utility surveys, etc. Often times constructibility reviews are conducted on behalf of an owner and erroneously exclude the "owner-furnished" bid package elements. The scope of the review should not be limited to a review of only the Contract Documents prepared by the architect.

Focus on Buildability

We use the term *buildable* to help define and usually limit the scope of our constructibility review to a review of those elements that make a design constructable by contractors and subcontractors. On many projects, the jurisdictional review agency looks for code-related errors and omissions in the construction documents often outsourcing the reviews to design engineering firms. In some cases, owners conduct independent "peer" reviews by engineering or architectural firms to validate design and engineering assumptions. To eliminate redundancies in the document review by multiple entities, our constructibility reviews focus on those aspects of the Contract Documents that really make it buildable for contractors and subcontractors and they do not typically address the code or engineering aspects of the documents.

Typical questions we ask while conducting the review of the buildability of the Contract Documents include:

- | Are there a sufficient number of wall sections/elevations?
- | Are there a sufficient number of details?
- | Is sufficient information provided in the sections/elevations/details?
- | Are the plans, sections, elevations, and details coordinated

worth of design in an 8-month period of time. He also created a Constructibility Audit Program for the LAUSD in order to develop and apply a lessons learned database to future LAUSD programs.

Prior to his work at LAUSD, he managed the Constructibility Review Program for the \$818 million USC replacement hospital for the County of Los Angeles, Department of Public Works.

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between architectural, structural, civil/site, and MEP drawings?

These questions are indicative of the type of questions that should be asked and answered when validating whether documents are buildable.

Consider the Timing of the Review

The timing of the review needs to be considered as well. A review should occur when enough detailed information is available to conduct a constructibility review. The 50% construction document stage and after the submittal of the 100% construction documents to the jurisdictional review agency are good milestone dates to conduct reviews. Not as much information is available at the 50% construction document stage so the review should be pared to match the level of information provided.

Formalize the Review Processor

The review team needs to have management tools that act as a guide to finding missing or uncoordinated contract document information, including a detailed constructibility scope of work. A detailed scope of work for the constructibility should be prepared that defines areas to be reviewed in the documents and assigns multi-disciplinary team members to be responsible for their completion. In practice, each reviewer should be tasked with catching comments such as "see structural" or "provided by others" and then verifying that the design does in fact address the comment in the "structural" documents or that some other discipline, owner-furnished product, or utility agency is the "by others."

Visit the Site

Site visits should be an integral part of most constructibility reviews whether it is a remodel, addition, or new construction. This portion of the review cannot be stressed enough. Many projects start off wrong simply because no one has checked the site information which is customarily derived early in the project phase and by the owner. Site conditions can change dramatically from the time a project owner conducts a site survey or an architect initially visits the site to the

time of bid. The individual on the review team that is reviewing the civil portion of the bid documents is usually the most appropriate person to visit the site on a new construction project.

Utilize Reviewers with Construction Field Experience

The initial Program, Design, and Peer reviews are typically done by architects and engineers and are viewed from a "designer's" perspective. The best constructibility review teams view the documents through a "builder" perspective. Individuals with direct *construction field* experience should be selected to perform constructibility reviews. Wouldn't it be great to get the grouchy old field superintendent who declares on every project "...this is the worst set of drawings I've ever seen!" to review and comment on the documents during the design phase?

Superintendents, inspectors, or managers who have been involved in resolving unclear construction conditions or settling change orders and claims have an excellent background that can be applied in the up front constructibility reviews. If at all possible, corral these individuals from the field and have them sit down in an office to assist with the constructibility review. Their knowledge combined with some form of a constructibility checklist derived from audits of previous projects will substantially improve the quality of the constructibility review. These people, who have to deal with the end result of bid document errors and omissions and lack of coordination, are perfect candidates for review team members.

Use Constructibility Audits to Identify Trends

Constructibility audits identify typical or frequently repeating errors or omissions that have resulted in change orders on completed or under construction projects. On large construction programs, trends in the errors and omissions in the contract documents often become apparent after conducting only a limited number of constructibility audits. The audit should be the genesis of any lessons learned database that is ultimately used to prevent design mistakes from continuing to occur on future projects. All this information should be fed back to the reviewers conducting constructibility reviews on other projects in the

program, so that there can be a continual improvement in the quality and thoroughness of the reviews.

A constructibility review that includes a site visit and considers all of the Contract Documents, not just those prepared by the architect, when conducted properly and focused on those issues that affect buildability will pay for itself. It can be difficult to quantify in dollars what the review has saved an owner, since the stage of construction in which the error is discovered has the biggest impact on its cost. However, you need only uncover a few of the major and recurring issues to realize its value. Remember the old carpenter adage, "Measure twice, cut once."

Editor's Note - This series of articles is adapted from a paper presented by Mr. Pruett in the Construction Management Association of America's EJournal dated May 2004.

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