

# A Construction Industry Revolution

## ConsensusDOCS 300 + BIM + LEAN Construction = Amazing Results

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In past issues, The VOICE has covered ConsensusDOCS<sup>1,2</sup>, Building Information Modeling<sup>3</sup> (BIM) and LEAN Construction<sup>4</sup>...albeit all separately. Combining these collaborative ideas within one article has yet to be done here on paper and, to a large extent, blending these ideas in the same contract and project is virtually unheard of within the industry. Doing so, however, will truly be revolutionary for the U.S. construction industry.

### ConsensusDOCS 300: part one of this revolutionary combination

The model for ConsensusDOCS 300 was drafted by a group which included owners, designers, contractors and sureties using a successful collaborative agreement from a project that had just been completed. ConsensusDOCS 300 responds to the

question, “What if owners, contractors, subcontractors, designers and sureties could all agree on a standard contract that was fair to all parties? According to the ConsensusDOCS 300 website ([www.consensusdocs.org](http://www.consensusdocs.org)) the creation of these contract documents—which brings together 21 leading construction associations—has done just that.

ConsensusDOCS 300 is a landmark agreement that adopts a collaborative project delivery (paragraph 3.2) where the owner, designer and constructor (construction manager/general contractor) are all equal parties to the same agreement whose interests are aligned to make consensus decisions in the “best interest of the project” through a management group (Article 4) and a collaborative project delivery (CPD) team that also includes

the major trade or subcontractors at the beginning of the design (paragraph 3.3). ConsensusDOCS 300 is also groundbreaking because the parties can share risks and rewards up to specified limits (Article 11), agree to a Safe Harbor Risk Allocation (paragraph 3.8), it implements Target Value Design (paragraph 6.13), and calls for unique Cost Modeling and Project Target Cost Estimates (PTCE) (Article 8).

### BIM: part two of this revolutionary combination

ConsensusDOCS 300 provides that the owner, designer and constructor may optionally establish a BIM approach to design and construction that provides for a continuous and immediate availability of reliable, integrated and coordinated



design, scope, schedule and cost information and execute a BIM Addendum for BIM parameters, standards and technological requirements (paragraph 6.9). The ConsensusDOCS organization released a universal BIM Addendum for all of its ConsensusDOCS agreements in June 2008, which can be tailored to and supplemented for ConsensusDOCS 300.

ConsensusDOCS 300 also expressly permits the constructor to sign joining agreements with key trade contractors and suppliers early on or at the beginning of the design process to provide preconstruction services and facilitate an integrated, collaborative design process as part of the CPD Team (paragraph 12.1). This design process with key trade contractors and suppliers can include the use of BIM, if that option is used under paragraph 6.9.

### **LEAN construction: part three of this revolutionary combination**

LEAN construction principals are the foundation of ConsensusDOCS 300 and are generally incorporated through the adoption of collaborative project delivery and the principals of LEAN construction project delivery that require parties to recognize:

- 1) Success of all members of the CPD team is intertwined;
- 2) Roles, responsibilities and expertise must be organized and integrated to benefit the whole;
- 3) Expectations and objectives must be articulated and aligned;
- 4) Open communications, transparent decision-making, proactive and non-adversarial interaction, innovative problem-solving and the sharing of ideas must be their hallmark; and
- 5) Continuous improvements to the project planning, design and construction processes must be sought while the risks and rewards of achieving the project objectives are shared (paragraph 3.2).

ConsensusDOCS 300 requires the designer and constructor, along with the CPD team, to employ a LEAN Construction inspired quality plan that addresses standardized and continuous improvement of work practices, task-based quality

checklists, methods to provide for a review of early work products and assure quality performance, procedures for immediately addressing quality failures and outstanding performance and standards by which to measure and track quality performance (subparagraph 3.10.1).

ConsensusDOCS 300 also requires the CPD team to develop a project planning system that includes the collaborative development of a milestone schedule that

embraces the pull scheduling approach, phase or progression schedules, "make-ready" look-ahead plans, weekly work plans and methods for recording, measuring and improving the reliability of project planning (paragraph 7.2). This process appears to be inspired by LCI's Last Planner System.

ConsensusDOCS 300 also mandates the constructor, trade contractors and subcontractors submit a construction operations quality plan that includes LEAN Construction

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techniques and processes such as locating items that will be used during construction so as to facilitate their efficient and responsible use, standardizing and constantly improving construction operations practices and creating a culture of discipline and continuous improvement (paragraph 13.2).

### The academic underpinnings of this revolutionary combination

The mission statement of the twenty year old Center for Integrated Facility Engineering

(CIFE) at the prestigious Stanford University is, "To be the world's premier academic research center for Virtual Design and Construction (VDC) of architectural, engineering, construction (AEC) industry projects."<sup>5</sup> CIFE defines VDC as, "The use of multi-disciplinary performance models of design-construction projects, including the product (i.e., facilities), work processes and organization of the design-construction-operation team in order to support business objectives."<sup>6</sup> CIFE is the coordinator of

and repository for an extensive collection of academic Bulletins, Technical Reports and Working Papers on VDC.

CIFE's Working Paper (#093) entitled, "A Guide to Applying the Principals of Virtual Design & Construction (VDC) to the LEAN Project Delivery Process," dated December 2006, found the following support for combining collaborative or integrated project delivery with BIM and LEAN Construction:

1. "VDC tools such as product, process and organization modeling tools can be applied very effectively to accomplish the objectives of the LEAN Project Delivery Process (LPDS).
2. Product modeling tools like 3D modeling can be effectively applied to the project definition, LEAN design and LEAN assembly phases of the LPDS.
3. Product and process modeling tools like 4D models can be applied during the LEAN supply and LEAN assembly phases of the LPDS.
4. Product, organization and process modeling tools such as the product-organization-process or POP method can be used to analyze the tradeoffs between product, organization and process during the Lean Design phase of the LPDS."<sup>7</sup>

### Sutter Health's revolutionary success

The Sutter Health Camino Medical Group Mountain View Project<sup>8</sup>—a \$96.9 million, 250,000 square foot medical office complex with 410,000 square feet of parking, completed in 2007—is one of the first U.S. construction projects to utilize the revolutionary combination of collaborative or integrated project delivery, BIM and LEAN Construction, even though the actual contracts entered into by the parties were traditional in form and pre-dated the previously mentioned Form of Integrated Agreement (FOIA) and ConsensusDOCS 300. The project, which was the winner of the San Francisco American Institute of Architects (AIA) 2007 Honor Award for Integrated Practice, is considered a prime example of best practices used throughout the previously mentioned CIFE Working Paper (#093) dealing with the application



"Just three years out of school and I'm already changing the infrastructure of NYC."

Barbara Moses, Engineer, Skanska in New York

As a participant in Skanska's mentorship program Barbara Moses gets to work on six job sites in three years. "I wanted to be out in the field – and here I am," she says. So far she's worked as an estimator in the main office, as a field engineer on a water treatment plant and now she's a cost engineer on the FDR expressway. Throughout the program she receives mentoring support from VP Mike Cobelli. "It's great to have someone I can talk to about my work and my career," she says. But what Barbara appreciates the most is the wide variety of people she's encountered: "Everyone knows so much and they're all willing to pass it down." Read more about the mentorship program and the different projects Barbara has worked on at [skanska.com](http://skanska.com).

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of VDC to the LEAN Construction Project Delivery Processes.

In the independent 2007 CIFE/CURT VDC and BIM Value Survey Case Study, a part of CIFE's December, 2007 Technical Report (#TR171) entitled, "VDC Use in 2007: Significant Value, Dramatic Growth and Apparent Business Opportunity," the Sutter Health Camino Project was one of the projects closely examined and highlighted.<sup>9</sup> In that case study, the Sutter Health Camino Project was found to have used an integrated 3D BIM model of the building built by the Construction Manager/General Contractor DPR Construction and its subcontractors (Cupertino Electric, Southland Industries, JW McLenahan, AFco) from conceptual 2D MEP drawings and used it to maximize clash elimination and field productivity.

According to this independent case study, the following successes were achieved on the Sutter Health Camino Project:

1. Mechanical Subcontractor Southland

Industries was able to process and fabricate and assemble over 90 percent of its duct and piping materials in production shops off-site resulting in 30 percent fewer sheet metal and 55 percent fewer pipe fitter hours in the field, with a savings of over \$400,000. In addition, there were only 43 hours of rework on 25,000 hours of total labor.

2. Across all trades, there was a 20 to 37 percent increase in field crew productivity.
3. The BIM effort cost Sutter Health an extra \$410,000 (0.5 percent of the project's budget), but resulted in a project with zero change orders due to field conflicts, a completion that was nearly 6 months early and nearly \$3 million in avoided costs.
4. Sutter Health's LEAN Construction Project Delivery Processes required early interaction between the design and construction teams and used 3D BIM models to capitalize on value engineering worth nearly \$6 million.

5. Sutter Health's owner's representative said the project, "Had proceeded better than any he had ever seen in his 30 years of experience and that Sutter Health will now be requiring the use of BIM from initial design on all future projects."

Another detailed study of the Sutter Health Camino Project entitled, "Integration of Virtual Design & Construction and Lean Project Delivery Process—Case Study of Medical Group Project, Mountain View, CA, USA" was prepared by Atul Khanzode, Director of Virtual Building, DPR Construction, Inc.<sup>10</sup> ●

*This article provides general information about the subjects covered and is not meant to be all-inclusive or comprehensive, and is not legal advice. Readers should obtain their own legal counsel on the subject matters as needed.*

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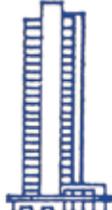
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- 2 The VOICE, Spring 2008, Legal Brief, Page 39.
- 3 *Id.* Page 18.
- 4 The VOICE, Summer 2007, Page 14.
- 5 See Stanford University Center for Integrated Facility Engineering's Mission Statement on its website, <http://cife.stanford.edu/>, at [www.stanford.edu/group/CIFE/Mission/index.html](http://www.stanford.edu/group/CIFE/Mission/index.html).
- 6 *Id.*
- 7 See, CIFE Working Paper (#093) at <http://cife.stanford.edu/online.publications/WP093.pdf>.
- 8 The VOICE, Summer 2007, Page 15.
- 9 See, CIFE Technical Report (#TR171) at <http://cife.stanford.edu/online.publications/TR171.pdf>.
- 10 The DPR Construction, Inc. Sutter Health Camino Project Case Study can be viewed at [http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/Sara/fi/Dokumenttiarkisto/Viestinta\\_ja\\_aktivointi/Seminaarit/Seminaari2007/Integration\\_of\\_VDC\\_and\\_Lean\\_-\\_Sara\\_Technology\\_Program\\_Nov\\_28\\_2007.ppt](http://akseli.tekes.fi/opencms/opencms/OhjelmaPortaali/ohjelmat/Sara/fi/Dokumenttiarkisto/Viestinta_ja_aktivointi/Seminaarit/Seminaari2007/Integration_of_VDC_and_Lean_-_Sara_Technology_Program_Nov_28_2007.ppt).