

OSHPD Office of Statewide Health Planning and Development



Hybrid Hospital Building Safety Board

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**HOSPITAL BUILDING SAFETY BOARD
Technology Committee Workshop**

Building Design/Review Systems Technologies

**Tuesday, November 10, 2015
10:00 a.m. - 4:00 p.m.**

At the
**California Lottery Operations Division
Pavilion 1
700 North 10th Street
Sacramento, CA 95811
(916) 822-8033**

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Kathi Zamora, Acting HBSB Executive Director
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1. Welcome and Introductions

- 2 Committee Chair Eric Johnson opened the third Technology Committee Workshop and
- 3 welcomed everyone present.

1 **2. First Presentation: *Building Information Modeling (BIM) Design, 3D Modeling***
2 ***and Augmented Reality Technologies***

- 3 ▪ **Brett Young, Building System Planning, Inc.**
4 ▪ **John Griffiths, Mazzetti & Associates**

5 **This presentation will cover the following topics:**

6 **A. The Architecture/Engineering (A/E) industry tools of today and tomorrow,**
7 **based on current 3D modeling trends, (BIM) and the ability to interface with the**
8 **building industry for constructible projects**

9 **B. The future interface of Plan Reviewers, Builders and Owners to ensure**
10 **successful designs and expectations**

11 **C. Market trends for A/E community and legacy tools that are being replaced**

12 Mr. Johnson introduced Mr. Young and Mr. Griffiths.

13 They began the presentation.

- 14 • Hospitals are extremely complex buildings that must operate at a high occupancy
15 after a major seismic event. They are an essential part of California's
16 infrastructure. Hospitals are complex not only as products of what you are trying
17 to build, but also as cultural and political places to try to do contracting.
- 18 • Technology helps to manage the complexity.
- 19 • With the technology of today we need to look at established metrics and
20 processes to identify the best technology for the health care project.
- 21 • Mr. Young offered the perspective that OSHPD and SB 1953 revolutionized the
22 entire hospital building requirements industry.
- 23 • The biggest risk in a project is labor, and labor is expensive. The available
24 technology should be leveraged to reduce labor as well as to minimize changes
25 in the field.
- 26 • Current technology that the speakers considered particularly important are 3-D
27 printing, drones, and Apple products enabling consumers.

- 1 • Mr. Griffiths ran through the top four technologies from his field.
- 2 1. Bluebeam, a souped-up pdf tool that is enabling the transition in
- 3 construction from paper that decreases the possibility of errors.
- 4 2. BIM 360 Glue, a client-based viewing tool.
- 5 3. Laser scanning, which increases accuracy – the cost of change in
- 6 construction is high. It can be used with as-built conditions to verify
- 7 against a model, and with creation of new models. The Revit laser tools
- 8 and LIDAR laser range finder are commonly used laser scanning tools.

9 Mr. Griffiths stressed the importance of inspection in OSHPD work. Inspectors in the

10 field need to be able to validate that what is designed is the same as what is installed.

11 Mr. Young stated that the future looks bright for this type of laser technology. Google

12 cars drive down the road spinning their lasers; yet they are not creating a 3-D model on

13 the fly – they are comparing the readings coming back from the LIDAR to a model that

14 has already been built.

15 Many companies are now doing two-camera technology that brings the process to a 3-D

16 model.

17 An audience member asked about specifying a laser survey for an existing building

18 remodel. Mr. Young explained the use of a tripod with a ratchet that pushes the LIDAR

19 unit vertically. The work involves popping ceiling tiles out – it is not clean work and

20 must be done after hours.

21 An audience member commented that a common challenge is the space above the

22 ceiling tiles being very congested – the same space must be looked at from two

23 different angles. Can the BIM software actually create a 3-D image from different

24 angles? Mr. Young answered that you then use targets (usually round spheres) that

25 you can reference from both sides, and align them. It isn't easy work.

26 Mr. Griffiths explained how laser scanning provides an added value point for the future

27 in scanning thermal points of a building, finding ducts and duct leakage.

1 Mr. Young described a contractor that sends its LIDAR units to the job site via FedEx.
2 The project engineer takes half a day to watch the CD and do some scans to figure it
3 out. The technology is that good that collecting data in the field is not difficult.

4 Mr. Griffiths stressed that Glue and other tools are very much helping communication
5 and collaboration.

6 4. The fourth of the important tools is Artificial Intelligence (AI). Mr. Young
7 showed two videos of the type of tools his company is developing.

8 ■ The first video showed the use of Revit to demonstrate the current
9 workflow for putting in a pipe in a mechanical room. It uses
10 individual systems and applies rules to them, in order to model
11 them without the manual input of clicking and dragging – trying to
12 turn modeling into a strategic game with just parameters.

13 Mr. Griffiths commented regarding set-based design – fairly major
14 decisions are traditionally made with very little information, but now
15 there are metrics provided quickly that can be considered in
16 decision-making.

17 Mr. Young showed the use of Revit with hanger placement
18 feasibility – it can be automated to be done ahead of time.

19 Mr. Young said that his company tries to follow the rules so that when a product goes in
20 to OSHPD for review, there are fewer things to check – they are designing in a reliable,
21 codified way using algorithms.

22 He felt that the builder's should dictate the preference of the contractor who wants to put
23 in a pipe in one way versus another.

24 Mr. Young spoke about the formal definition of Level of Development (LOD), an
25 American Institute of Architects (AIA) standard. He felt that LOD 300 is a bit
26 problematic – at that level you should be fully coordinated, but that doesn't happen very
27 often. Mr. Griffiths added that this is a term that engineers and architects have had to

1 become more comfortable with. When signing contracts they have to be very clear on
2 what they are committing to.

3 Mr. Young spoke about Automated Plan Checkers and specified an article for
4 recommended reading. We should certainly be using Automated Plan Checkers as a
5 way to reduce workload. He recommended Lakshmi Sankaran's software blog.

6 **Questions and Discussion**

7 An audience member referred to the lack of consistency and standards in BIM models.
8 Mr. Young responded that you need to have skilled people do multiple runs of the
9 software. The quality is not perfect but it has gone way up. Mr. Griffiths added that the
10 traditional project delivery process has changed; the people doing the setup of writing
11 and negotiating the contracts need to be familiar with the technologies in order to
12 correctly represent the clients and the design firm – not committing to things they won't
13 be compensated for and won't be of value to an owner.

14 Mr. Young addressed the liability of the BIM modeling; it is important, but people are not
15 being sued over this. He knew of just one lawsuit that mentioned BIM, and it actually
16 had very little to do with BIM.

17 Regarding Computer-Aided Facility Management (CAFM), as a Facilities Manager asks
18 questions during the course of his day, the CAFM system should support the answering
19 of those questions.

20 An audience member asked about archiving all the data collected on existing facilities
21 and the shelf life of the data. Mr. Young responded that there is a significant close-out
22 problem at the end of a project. He recommended contracting with a separate agency
23 to referee and ensure that you get what you want – don't rely on a contract team. Mr.
24 Griffiths said that his firm uses Newforma, which is a little cumbersome but indexes all
25 the information.

26 An audience member asked about workflow using the disparate models. Mr. Griffiths
27 explained how flattened drawings figure in to workflow. Information is pulled out of
28 Revit.

1 An audience member asked if the speakers could foresee a time when we won't need to
2 maintain two models (the design model and the construction model). Mr. Griffiths
3 hoped that it could be done somehow. The conundrum with health care is that
4 improved drawings also must be maintained.

5 Mr. Johnson commented on the Technology Committee Workshops in terms of the big
6 picture: questions that come to light during the workshops can indicate to OSHPD what
7 we need to do to better align this industry.

8 **3. Second Presentation: *The Future of Plan Review – OSHPD Automation /***
9 ***Electronic Review***

10 ▪ **Paul Coleman, FDD Deputy Director**

11 **Mr. Coleman's presentation will include:**

12 **A. Future plans for improving plan reviews, compatibility with A/E industry**
13 **standards and advanced tools for tracking the entire plan review process**

14 **B. The evolution of plan review, field staff tools, project record-keeping, and the**
15 **end-to-end plan review process with tomorrow's technology.**

16 **C. A review of the AutoCode software being considered by OSHPD**

17 **D. An update on Electronic Plan Review program.**

18 After an introduction by Mr. Johnson, Mr. Coleman began the presentation.

19 • He talked about how architectural design used to be done strictly on paper.
20 Today drawings are done in 3-D.

21 • He described the five-step design review process, still involving paper.

22 **ePC**

23 Diana Scaturro, OSHPD Rapid Review Unit Supervisor, described the move to
24 Electronic Plan Review. She explained the Electronic Plan Check (ePC) process is now
25 in use.

26 • OSHPD sends approved plans back electronically.

- 1 • Bluebeam is a great tool for design and construction coordination – but for
- 2 OSHPD right now, the constant interactive collaboration is very difficult for plan
- 3 review, which checks for code enforcement and conformance with Title 24.
- 4 • For a static snapshot in time, OSHPD uses ePC software. It allows staff to see
- 5 comments as they add them. It allows searches on comments; OSHPD is trying
- 6 to create a more uniform language for comments.
- 7 • As OSHPD scales up to larger and larger projects, the navigation features of the
- 8 software are going to be critical.
- 9 • The overlay function and parallel view feature are important.
- 10 • ePC allows an enhanced deliverables package, demonstrated by Ms. Scaturro,
- 11 to go back to the design professionals.
- 12 • ePC allows digital stamping of approved plans so that each drawing does not
- 13 have to be signed manually.
- 14 • OSHPD is working on a platform for ePC to the Electronic Services Portal (eSP)
- 15 to allow direct communication between two parties.
- 16 • OSHPD is looking at electronic document management processes for archiving
- 17 drawings.
- 18 • With ePC the different disciplines can review concurrently. Refreshing the
- 19 screens enables viewing of each other's comments.
- 20 • Mr. Coleman stated that OSHPD would like Electronic Plan Review ready to roll
- 21 out completely in the Rapid Review Unit by next spring, and Division-wide by
- 22 next summer. Some protocols will have to be followed. (OSHPD will still accept
- 23 paper.)

24 **eOC**

25 Dr. Hussain Bhatia, Supervisor of the FDD Seismic Compliance Unit, spoke on
26 Electronic Over the Computer Review (eOC).

- 27 • Over the counter reviews can now be done over the computer – eOCR. Dr.
- 28 Bhatia described the necessary software.

- 1 • Where most FDD office staff do not have cameras and audio devices, most field
2 staff have laptops with cameras and audio devices.
- 3 • Dr. Bhatia explained how to set up a meeting. He showed a meeting he initiated
4 with a colleague. Drawings can be marked up during the meeting; BIM models
5 can be shown. A few issues remain to be worked out.
- 6 • Dr. Bhatia showed a view of an augmented reality meeting.
- 7 • Mr. Coleman explained that over-the counter meetings in person are quite costly
8 – that is what OSHPD is trying to address with the eOC.

9 **XBP**

10 Mr. Coleman introduced the new Expedited Building Permit (XBP). It is geared towards
11 Skilled Nursing Facilities (SNFs), because of the statute that gives OSHPD the authority
12 to develop Standard Details that facilities can use without having to hire a design
13 professional.

14 Mr. Coleman introduced Gary Dunger, FDD Chief Fire and Life Safety Officer, who gave
15 the presentation.

- 16 • The three “How-To Guides” for XBPs (Water Heater Replacement, Installation of
17 TV or Monitor Brackets, and Replacement of Handrails) have been updated.
18 Additional guides are in the works for Re-Roofing, Replacement of a Small Air
19 Handling Unit, and Replacement of a Small Emergency Generator.
- 20 • Mr. Dunger explained how to access the guides and obtain an expedited permit.
- 21 • XBP use is discretionary rather than mandatory. Because it is discretionary,
22 certain aspects that would be permitted in a SNF become mandatory –
23 specifically, an Inspector of Record (IOR).
- 24 • Mr. Dunger demonstrated how to go through the XBP online steps via screen
25 shots. The user receives feedback immediately on whether the project is eligible
26 or ineligible. Some of the questions may drive additional requirements, which are
27 populated into a Compliance Report.
- 28 • Even though a licensed professional is not required, a licensed contractor or
29 Owner-Builder Contractor is.

- 1 • The system will generate a Compliance Summary with answers to questions as
2 well as requirements of the project. Details are also generated that show how to
3 construct that particular project based on the answers that were given.
- 4 • The system will generate official documents that are emailed and automatically
5 attached to the record.

6 Mr. Dunger explained that once the permit is issued, the project becomes a regular one
7 with the usual requirements.

8 Payment can be done via credit card or invoice.

9 An audience member asked about the advisory guide for fire sprinkler installation. Mr.
10 Dunger explained that it is about how to expedite a sprinkler project – it is not a
11 replacement for the project itself.

12 An audience member asked about specific difficulties for installation of a water heater in
13 a particular facility. Mr. Dunger answered that the questions have been redone and
14 should work to address each individual project.

15 Mr. Coleman stated that the impetus for this effort was patient safety – there have been
16 situations where water heaters were being bootlegged because the cost of hiring the
17 design professional was much more than actually doing the installation. A number of
18 facilities were opting to forgo the permit and Plan Review process. OSHPD wanted to
19 make the process less onerous.

20 **eCL**

21 Mr. Coleman introduced Chris Dickey, FDD Associate Construction Analyst. He spoke
22 about the new program eCheck List (eCL).

- 23 • eCL is intended to shorten the turnaround time for Plan Review and to reduce the
24 number of backchecks.
- 25 • Consultants are given a Code Requirement Checklist, who then tell OSHPD
26 where on the drawings to find each of the items. OSHPD then verifies that the
27 drawings are correct.

- 1 • For any noncompliant areas, a remark letter is automatically generated, speeding
2 up the process and giving the consultant the answers up front – they know
3 exactly what the program will be looking for.
- 4 • Mr. Coleman explained that OSHPD will develop these Code Requirement
5 Checklists for various standard types of projects (for example, equipment
6 replacement). The Checklist will indicate the item and its code reference. The
7 Design Professional will input where in the drawings the compliance with that
8 item is shown.

9 An audience member asked if the Checklist will be available as a downloadable pdf
10 from the OSHPD website. Mr. Coleman replied that OSHPD could do that; however
11 unless it is actually going through the program, it won't have the benefit of the
12 hyperlinks, automated Plan Check comment sheets, and so on.

13 Mr. Young asked if people in the community can suggest small typical jobs as
14 candidates for Checklists. Mr. Coleman responded that first OSHPD will work with the
15 HBSB Standard Details Committee; as meetings are held on the topic, stakeholders can
16 attend and offer input. OSHPD will also be looking at the records of the 15,000 reviews
17 per year that it performs, to discern which small projects are common.

18 **Auto Codes**

19 Mr. Coleman gave the presentation.

- 20 • Plans are now done in 3-D. Instead of checking 3-D plans on paper in a two-
21 dimensional format, a program can be used to check some of them. The
22 Building Codes are basically a set of rules; the model is developed to show that
23 the rule is being met, and a program can then do the checking.
- 24 • OSHPD is looking for consistency and accuracy of the code review. A statewide
25 standard rule can promote this as well as faster turnaround and reduced costs.
- 26 • OSHPD has been working with several companies since 2012 on this process.
- 27 • In order for the model to work, there must be guidelines and protocol.

- 1 • The process will be discretionary for the designers, if they do not want to be tied
2 down to protocols and guidelines. However, using the model will expedite the
3 process.
- 4 • Mr. Coleman showed examples of Egress Analysis & Occupancy Rules and
5 Accessibility Analysis in the model.
- 6 • Design professionals would actually use the model to check their work.
7 OSHPD's main role would be model validation.

8 Mr. Dickey noted that when Auto Code was first developed, it was based on the
9 International Building Code. It took a lot of work to get the California Building Code
10 transferred into it. He added that developing the matrix was the key to the success of
11 the project.

12 He said that right now the guidelines are proprietary because the program is not
13 released yet. In the future they will be public knowledge.

14 An audience member asked if the matrix could relate to the national computer-aided
15 design (CAD) standard. Mr. Dickey and Mr. Coleman said that it is a possibility.

16 Mr. Coleman explained that Auto Code is a standalone program into which a model is
17 inserted. Mr. Dickey explained that the matrix allows the program to understand the
18 model.

19 **Access to Electronic Information**

20 Mr. Dunger began the presentation.

- 21 • The new OSHPD Report Center was originally designed to assist with closing
22 projects. However, more and more information is being made available in the
23 Report Center. The website is <http://report.oshpd.ca.gov>.
- 24 • Mr. Dunger demonstrated use of the Report Center.
- 25 • You can check the status of a project, for example, the date it will come out of
26 Plan Review.

- 1 • Any Amended Construction Documents (ACDs) and Alternate Methods of
2 Compliance (AMCs) are listed.
- 3 • Every payable invoice for the facility is listed; any Past Due invoice is also listed.
4 Invoices can be printed.

5 **Facility Information in Google Earth**

6 Dr. Bhatia continued the presentation.

- 7 • Every two weeks OSHPD publishes a file that can be used by Google Earth – it
8 plots all the facilities and gives information about them on an interactive map.
- 9 • Dr. Bhatia demonstrated access and use of the Google Earth map.
- 10 • The map shows the presence of SPC1 and SPC2 buildings in a facility.
- 11 • There are search and zoom functions as well as hyperlinks.
- 12 • Licensing information is available.
- 13 • Access to Accela Citizen Access is available for all related projects.
- 14 • There are links to the seismic instruments of buildings that have them.
- 15 • Certain facilities have links to the SB499 reports.
- 16 • There is a similar page for SNFs.
- 17 • Dr. Bhatia demonstrated overlay of a shake map on top of the hospital page and
18 the SNF page.
- 19 • A vehicle version of a facility app for Android phones is posted on the OSHPD
20 website with installation instructions. Dr. Bhatia demonstrated the app.

21 **Moving On**

22 Mr. Coleman described the building to which OSHPD will be moving in about a year, at
23 2020 El Camino Ave. OSHPD will occupy the top five floors with FDD on the 8th and 9th
24 floors. It is a 12-year lease.

1 Mr. Coleman described the stand-up spaces, counter spaces, task rooms, and huddle
2 rooms in the staff work areas. There will be a videoconference room.

3 **4. Third Presentation: *Building/Constructing Technologies, Future Tools,***
4 ***Model/Augmented Reality***

- 5 ▪ **Ed Kustanovich and Vernon Southerland, Turner Construction**
- 6 ▪ **Matthew Hudelson, Project Inertia and Kaushal Diwan, DPR Construction**

7 **This presentation will discuss future tools for the construction of complex**
8 **medical facilities, including:**

9 **A. Implementation of BIM models**

10 **B. Advance integration of building models**

11 **C. Record- keeping, project status and communication with key team-members**

12 **D. Use of multiple project-data-tracking tools and communication methods**

13 **E. Look-Ahead tools to anticipate building conflicts**

14 Mr. Johnson introduced the speakers.

15 **Latest Tools and Future Tools**

16 Kaushal Diwan began the presentation. He discussed modeling details and tools.

- 17 • Modeling is a communication tool that allows greater communication and
18 success on a project.
- 19 • Mr. Diwan displayed a graph showing differences between 2012-2013 data and
20 2014 data among the countries that utilize BIM.
- 21 • He showed an AIA progression matrix: the LOD scale from 100 to 500. He
22 described models according to the assigned LOD. At Level 300 a model would
23 be checked for code compliance. At Level 400 the contractors get involved.
- 24 • A true as-built model, once installed and in place, requires a laser scan for
25 verification and a model comparison.
- 26 • All tools belong to six different categories that are very specific to their use:
27
 - Offering

- 1 ○ Coordination
- 2 ○ Visualization
- 3 ○ Analysis and Measurement
- 4 ○ Sequencing
- 5 ○ Estimating

6 Mr. Diwan discussed the categories and some of their corresponding tools, and
7 how the tools currently work out in the field.

- 8 ● He spoke about Bluebeam as an increasingly popular tool with very useful
9 sharing and communication capabilities.
- 10 ● For work in the field, several tools can be used on iPads in place of paper: BIM
11 360 Field, Latista, and FreightTrain.
- 12 ● Mr. Diwan discussed drywall modeling.
- 13 ● He spoke about MEP pre-fabrication, which is used increasingly.
- 14 ● He showed a video about panel pre-fabrication.

15 An audience member asked about off-site prefabrication: at what point should you bring
16 in an IOR to the manufacturing facility? Mr. Coleman replied that OSHPD is considering
17 a Policy Intent Notice (PIN) on pre-fabrication addressing plumbing trees, wall sections,
18 etc. The Building Code states that all phases of all stages of construction must be
19 observed or inspected; some work does not require the continuous presence of the
20 inspector.

- 21 ● Mr. Diwan explained the use of laser scanning.
- 22 ● He showed the application of drones in construction. Drone video captures allow
23 a lot of analytics on what's happening on the job site.
- 24 ● He discussed modulizing construction.
- 25 ● AR-media is a company that takes a video camera and merges it with a model
26 view.
- 27 ● Photo documentation – taking 360° spherical photos – is a huge topic. The idea
28 behind it is to maintain documentation of a project as it is being constructed.

- 1 • Mr. Diwan showed a video of his on YouTube that demonstrates drones building
2 structures – something coming in the future. Drones can also be used for bridge
3 inspections.
- 4 • A company in China has built a robot that pours concrete in a certain pattern.
5 NASA is working on the capability for a robot to build a structure on Mars or the
6 moon using native soil.
- 7 • Another possibility is to plug in coordinates to a robot and have it perform layout.
- 8 • Large projects might be able to utilize models and technology for supply chain
9 management.

10 Mr. Coleman mentioned that there are projects in California that are already using
11 bathroom pods.

12 **Technology Trends in the Smart Phone Era**

13 Vernon Southerland opened the presentation.

- 14 • Technology is almost open-sourced now. It has moved from a PC environment
15 to a cloud base.

16 Ed Kustanovich spoke about Turner Construction’s history with OSHPD and how the
17 company has seen that market change.

- 18 • He explained the three phases of Quality Control: Preparatory, Initial, and
19 Follow-Up.
- 20 • Technology enables inspectors to spend more time on quality.

21 **Project Inertia**

22 Matthew Hudelson spoke about Project Inertia.

- 23 • Project Inertia is a complete project management solution; its initial emphasis
24 was OSHPD compliance.
- 25 • The software works with BIM. It focuses on compliance and integrated project
26 delivery. The company has built a series of inspection tools and a series of
27 project management tools.
- 28 • One of the keys is Artificial Intelligence to do the smart coding.

- 1 • Targeted user groups were contractors, the jurisdiction, the design professionals,
2 and the owners. Each of the four has a different user interface for inputting the
3 data.
- 4 • Mr. Hudelson explained the Project Inertia tools: Inspection Tracking,
5 Construction Management, Interactive Maps, Scheduling, File Sharing, and
6 Asset Tracking. He showed the program's reports, checklists, and schedules.
- 7 • Mr. Southerland discussed Visual Management, which saves managers from
8 having to look through pages of data. It is a simple color-coded, one-page
9 report.
- 10 • He discussed the project technologies that NASA is using to put a man on Mars.
- 11 • LED lighting that is used to affect the circadian rhythms of astronauts can also be
12 used in hospitals to prevent the night staff from becoming sleepy.
- 13 • BIM is being used by everyone in the construction industry in all kinds of areas.
- 14 • With the significant improvement in model development, the trades are being
15 brought in sooner on projects. The trend is for the trades to finish the CDs.
- 16 • Virtual reality mock-ups are real and Mr. Southerland felt there is a possibility for
17 virtual inspections.

18 **(7.) Wrap-up and adjournment**

19 Mr. Johnson thanked all the presenters and ended the workshop at approximately 3:45
20 p.m.