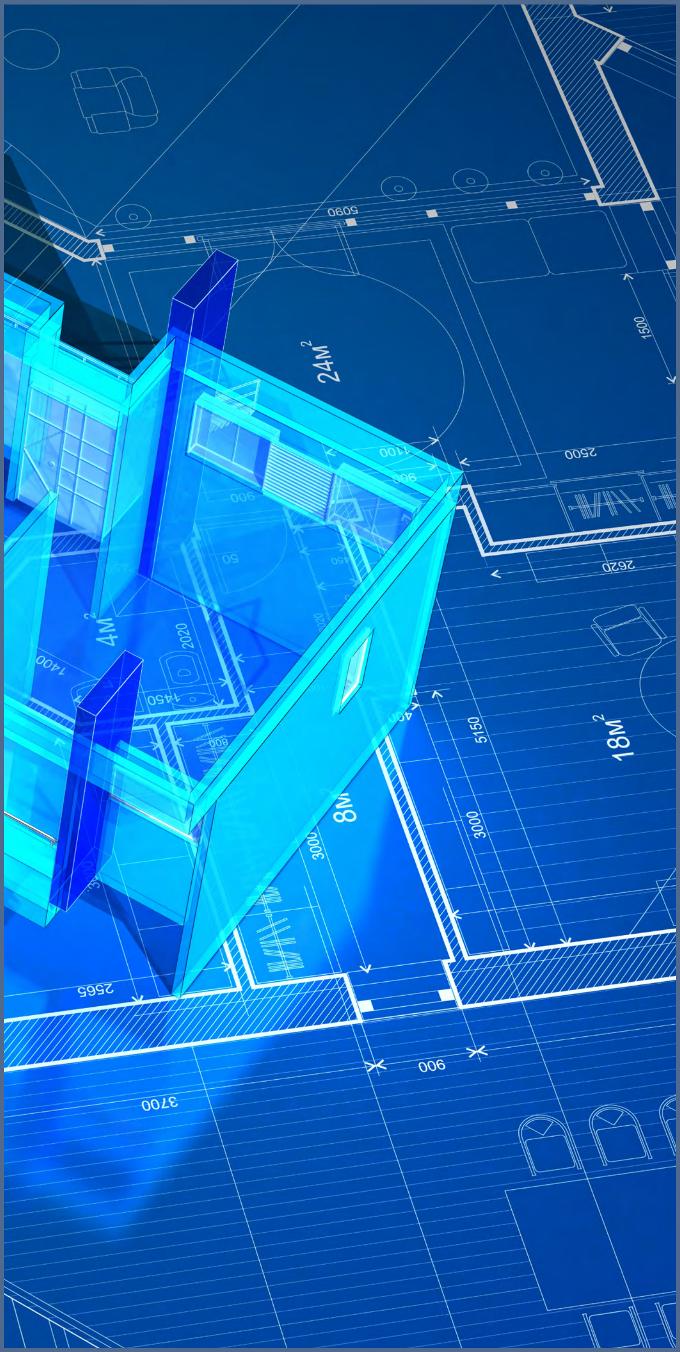

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PERSPECTIVES

The Value of Computer Modeling & LIMS™ in Insurance Claims

Our perspectives feature the viewpoints of our subject matter experts on current topics and emerging trends.

INTRODUCTION

Complex property losses in the insurance industry are a critical part of the business, requiring an expeditious response and a clear understanding of the scope of the damages. The parties involved in the process should have a skill-set in analyzing, prioritizing, sorting, and comprehending sizable amounts of information. LIMS™, a new leading-edge tool and methodology to assist in understanding the merits of a claim or litigation process, has transformed the insurance industry by improving communication of and interaction with the information.

LIMS™ (Loss Information Modeling System) is employed to communicate property losses graphically. It is a system used in conjunction with Building Information Modeling (BIM) that allows us to reverse engineer any project, providing the integration of the information and the interactivity necessary to validate the data contained within a repair or construction delay estimate.

With LIMS™, all types of information and drawings are compiled to summarize and communicate the data in a simple, reconstructed virtual environment.

COMPUTER MODELING BACKGROUND

It was only as recent as the 1980s that design and construction industries began utilizing digital tools and implementing computer-aided drafting (CAD).

Layer based systems allowed for classifying information graphically, including geometric details, and eventually objects' attributes became available. This evolution continued, eventually transforming this graphical representation methodology into an object-oriented methodology in the 1990s.

This new type of object contained metadata[1] that provided information expanding beyond its shape and size. The use of objects in three dimensions opened a path to create consistent and reliable models with valuable embedded information. The objects could then be integrated by constructive category, quantities, specification, master format code, etc., thus becoming the work methodology we know today as BIM (Building Information Modeling).

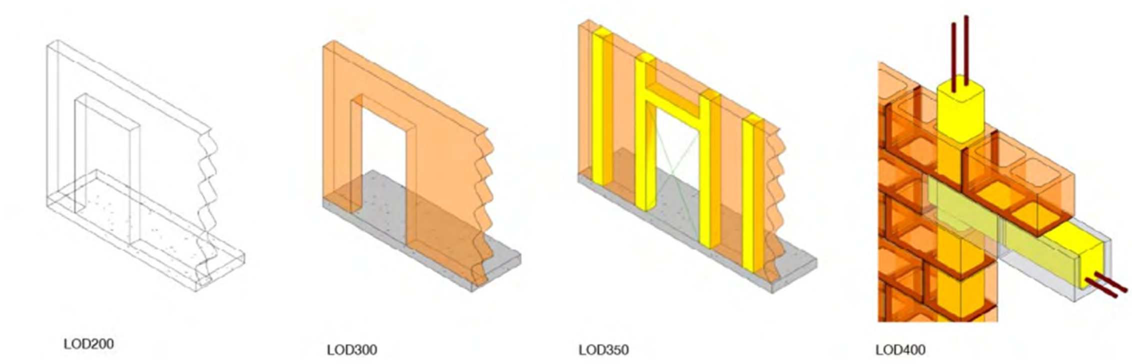


Figure 1 *- BIM Levels of Development (LOD) / Levels of Information. Masonry wall element progression.*

[1] Metadata Definition: The metadata are properties that further describe or classify an object. In a LIMS model the metadata provides information such as material, color, weight, size, etc

BIM is an ever-evolving work methodology that has created great opportunities in all areas of the AEC (Architecture-Engineering-Construction) industries. This evolution expanded the horizons of simulation, analysis, and project exploration to multiple dimensions.

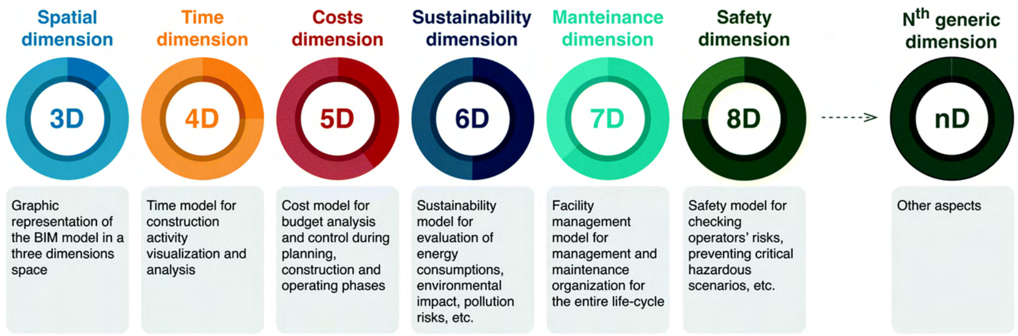


Figure 2 *- BIM Dimensions.*

By using these processes and technologies, forensic architecture and engineering—as well as property loss industries—have begun developing more interactive, reliable, and communicative tools to graphically validate the findings and results on a property loss.

COMPUTER MODELING EVOLUTION AND THE BIRTH OF LIMS™

LIMS™ is a methodology of reverse engineering that has its foundation in BIM. LIMS™ is being used in the insurance industry to assist with the evaluation of complex property losses requiring a virtual building reconstruction.

An insured loss could be defined as complex when the information needed to assess the damage is so scarce that obtaining a final reconstruction cost to bring the property back to its pre-loss condition becomes a daunting task. Buildings with intricate geometries or multiple combined systems could also be considered a complex loss.

LIMS™ provides clear, understandable information that graphically supports the scope of damage and reconstruction cost of any building or infrastructure project, thus providing further assistance as part of the claim process. Reliable data is obtained from quantities extracted directly from the LIMS™ model. In turn, the virtual models are constructed from information collected manually on-site or with more advanced tools such as drones, 3D laser scanners, and 360° cameras. Graphical information is undoubtedly the most notable advantage of using computer modeling and LIMS™.

LIMS™ analytical models can be used as a starting point of an engineering Finite Element Analysis (FEA), as well as in computational fluid dynamics analyses (CFD). Simulation and data visualization are two exciting areas where the LIMS™ methodology is revolutionizing the claims industry.

VISUAL COMMUNICATION IN INSURANCE CLAIMS AIDED BY LIMS™

Regardless of their professional background, all the stakeholders involved in a property insurance claim should understand the information employed to substantiate the loss and be able to interact with that information. LIMS™ aids the claims process by visually communicating a virtual reconstruction environment, thus reducing interpretations and presenting conclusive information in an intuitive, discernible form.

The range of possibilities with LIMS™ is vast, from simple color-coding diagrams representing the type of damages to illustrations of repair processes or sequences showing the stages in which a loss occurred. Still, the most crucial aspect of LIMS™ is the validation of the information supported by the 3D graphical material.

LIMS™ visually communicates complex sets of data and information, creating engagement and expediting the claim process.

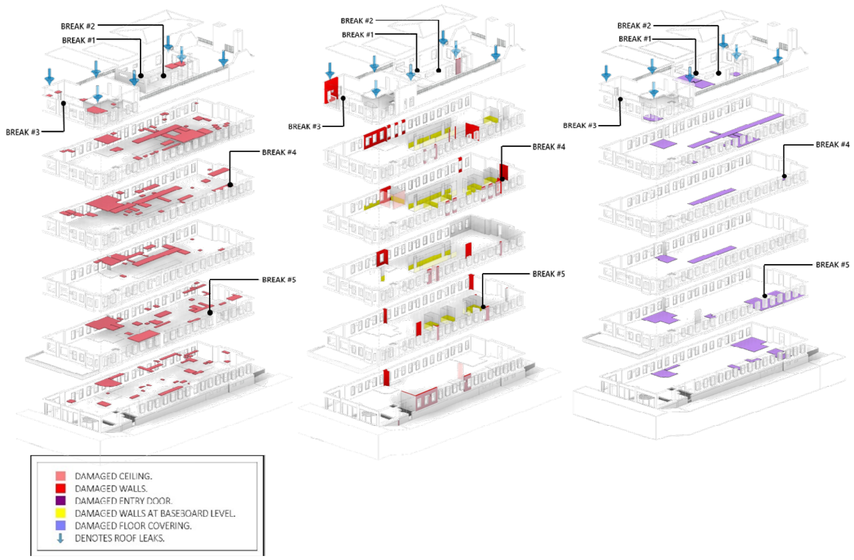


Figure 3 *- Water damage project, animation representing sequence of pipe breaks, affected elements, and quantification of the damages.*

Another excellent example of improved communication is transforming the period of restoration schedule from a Gantt chart to an animated and interactive 4D LIMS™ model. Reconstruction activities are easily visualized for any given date or time, with the possibility to include linked information about contractors, construction estimates, and any other type of documentation required to convey the project details. Even snapshots of the construction schedule can be taken at a given time to uncover relationships between construction defects, costs, subcontractors, locations in space, etc.

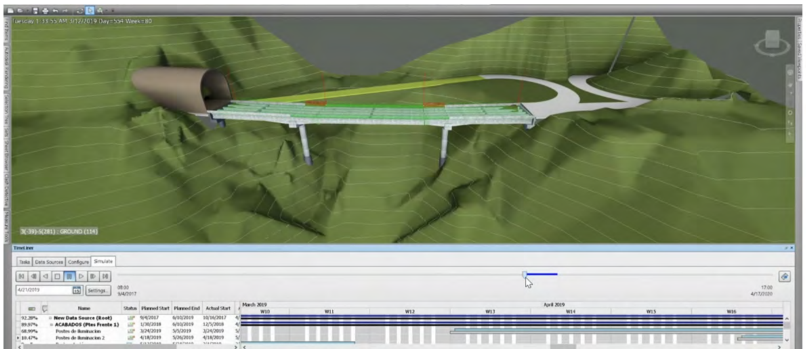


Figure 4A *- Bridge delay analysis and Building Construction defect analysis.*

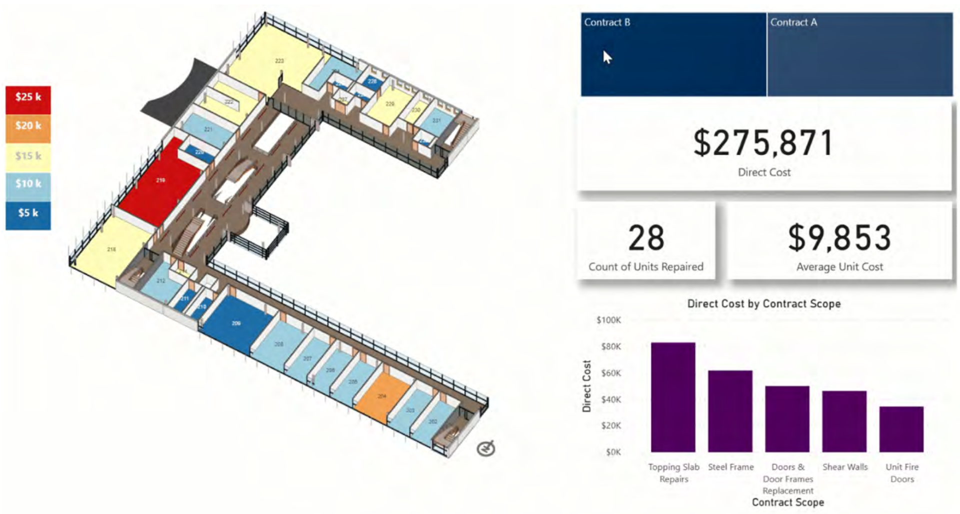


***Figure 4B** - Bridge delay analysis and Building Construction defect analysis.*

LIMS™ AS A RELIABLE SOURCE OF INFORMATION

LIMS™, as a derived work process of computer modeling, supports and validates all exported data with the model itself. Previously, procedures such as quantity take-offs were done by hand, scribbled on a printed plan. This process of quantifying was time-consuming and allowed more room for error. 2D solutions became the best next option thanks to the evolution of digital tools, allowing on-screen take-offs. The limitations on the 2D processes were mostly addressed with the arrival of BIM and the use of federated models[2]. Having a federated model as a primary source of information—with the ability to integrate many data sources—grants a certain level of flexibility. It allows for presenting and evaluating multiple scenarios or several points of view from a single conclusion.

The work methodology derived from LIMS™ still presents one main challenge: "planning." This often-overlooked concept becomes essential for generating better deliverables in shorter timeframes.

Advantages of Federated LIMS™ models:

- **Speed** - Models automate building elements classification, meaning that sorting, filtering, querying, and quantifying activities become faster than in a 2D process. Once the model is appropriately produced, the take-off process can be done in a matter of hours.

- **Flexibility** – Reports are automated, quickly updating and analyzing design variations made within the models, linking elements to databases to produce estimates, and more.

- **Accuracy** - Human errors are reduced when compared to a 2D work process. Complex geometries are quantified at the same time they are modeled, and quantities are inherent to the size, volume, and shape of the element just as they are in a real-life environment. Models consider the natural, built characteristics and conditions, and, as a result, they become the source of information.

However, it is important to understand that just as with any other work methodology and new technology, those in charge of implementing it should have the knowledge

[2] Federated Model Definition: "A federated model is a combined building information model that is compiled from several BIM models from different disciplines into one. The input models are read-only and can include 2D documentation such as sheets" Ariza, J. (2018, March 18), Create a federated BIM model with sheets for owners. Autodesk Knowledge Center. Retrieved from: https://knowledge.autodesk.com/support/navisworks-products/learn-explore/caas/simplecontent/content/construction--E2-80-94-collaboration--E2-80-94-create-federated-bim-model-sheets-for-owners.html#:~:text=A%20federated%20model%20is%20a,involved%20during%20the%20entire%20project.

and experience required to get the most out of these magnificent tools.

LIMS™ models are produced in a virtual environment yet conceived with constructibility logic, just as a construction project is built in a real environment. Likewise, the project scope and deliverables should be clear and well planned, and the accuracy of the inputted information on LIMS™ must be analyzed previously to start the modeling process.

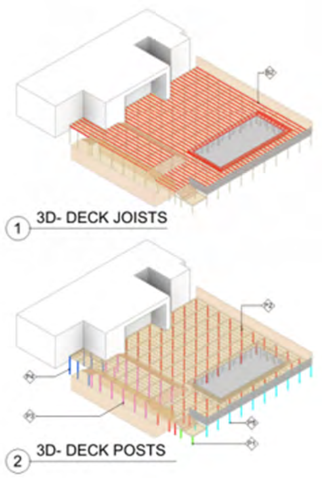
Figure 5 *- LIMS - virtual reconstruction of a property affected by a fire event.*

INTERACTIVE INFORMATION

The most valuable end-product of the LIMS™ work methodology is the interactive information produced. The computer model makes it possible to filter, sort, categorize, replace, and modify any value or information associated with an element within the virtual reconstruction environment.

With LIMS™, the array of documents, 2D drawings, and raw data received is built into graphical information. LIMS™ models have attracted great interest due to the ease of interpretation of the information that is visually appealing and metadata-driven.

Likewise, data exported from a model can interact with numerous platforms and applications, from traditional spreadsheets to cost estimation platforms to facilities management solutions or project management tools. For example, a LIMS™ model can automatically reflect the changes made in a spreadsheet containing cost estimation line items.



DECK JOISTS 2"x6"	
MARK	LINEAR FT
B2	2387' - 1 1/4"

DECK POSTS 4"x4"			
MARK	HEIGHT	LINEAR FT	COUNT
P1	4' - 6 3/4"	9' - 1 1/2"	2
P2	6' - 0"	462' - 0"	77
P3	9' - 0"	162' - 0"	18
P4	9' - 6"	57' - 0"	6
P5	10' - 0 3/4"	110' - 8 1/4"	11

Figure 6 *- Lims model reflecting spreadsheet data for deck joists and posts.*

CONCLUSION

LIMS™ and computer modeling simplify interactions with complex projects involving considerable volumes of information. Visual and simulation environments allow stakeholders to manage the information and interact with it, using images, spreadsheets, or immersive environments like those experienced in a video game. The objective of LIMS™ is to visually communicate and integrate vast amounts of information, drawings, pictures, and raw data to make informed decisions, support solid arguments in negotiation processes, and make such information accessible to all types of audiences.

ACKNOWLEDGMENTS

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Sebastian Serna is an Assistant Vice President in J.S. Held's Building Consulting Practice. He specializes in the implementation and handling of digital tools applied to many of the processes of buildings life cycle, design, communication, as well as technical coordination, project monitoring and building envelope design assessment. He has collaborated with contractor companies and design studios in Colombia and the UK as BIM Manager. With J.S. Held, Sebastian collaborates as Building Envelope assessment consultant and as BIM Manager, structuring the implementation of BIM applied to forensics and in charge of the LIMS™ (Loss Information Modeling System) which uses digital platforms to communicate, monitor, quantify and analyze the losses in building structure.

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Diana Acosta is a Vice President and Global Head of Quality & Process Operations at J.S. Held. Diana brings forensic civil engineering skills and extensive experience with infrastructure projects, as well as commercial, healthcare, and other projects to J.S. Held. She has provided risk engineering and damage assessments to large infrastructure projects throughout North and South America and the Caribbean. Diana has provided consultative services, performed site inspections, and investigated cause/effect of major structural and infrastructure losses due to natural catastrophes, design defect damages, and failures. Her work has included evaluating the suitability of contractors, construction methodology, and the exposures and vulnerabilities of projects.

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