

BLD226659

How to Utilize the Suite of National BIM Standards to Improve Project Delivery

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Learning Objectives

- Understand the “why” behind the suite of documents that make up the national BIM standards
- Understand the content contained within the current national standards and how each interrelates
- Discover how the standards can be implemented today
- Understand the road map for the next generation of BIM standards

Description

A suite of national standards exists today to help teams execute BIM (Building Information Modeling) for architecture, engineering, and construction projects: United States National CAD Standard (NCS), National Building Information Modeling Standard (NBIMS-US™), and National BIM Guide for Owners (NBGO). The NCS contains sheet-centered project-delivery information and defines graphical standards. The latest version also includes a BIM implementation section to help teams make the transition from a CAD-to-BIM workflow. NBIMS-US contains many reference standards, as well as information exchanges and practice guidelines that help the project team move beyond sheet-centered delivery and include facility data in project delivery. NBGO is a concise guide aimed at providing the facility owner with the necessary knowledge and tools to successfully implement BIM for their projects. We'll look at the “why,” “what,” and “how” of the BIM standards, as well as forecast what's next.

Speaker(s)

Johnny Fortune
BIM Director



Johnny Fortune serves as BIM director at Bullock Tice Associates in Pensacola, Florida and has led the complete transition from CAD to BIM production for the firm and directs the company's overall BIM strategies, standards, technology operations, and integration with external team members. He is currently a member of several national committees, including the National CAD Standards Project Committee, the United States National BIM Standard Project Committee, and the United States Army Corps of Engineers / Industry BIM CIM Consortium. Additionally, he is immediate past chair of the buildingSMART alliance® Board of Direction and is a contributing author for several national/federal standards documents. He has often presented on the topic of standards at venues such as Autodesk University, BIMForum, National Institute of Building Sciences Innovation Conference and Expo, GeoBuiz, and various Society of American Military Engineer and Construction Specification Institute chapter events.



Bullock Tice Associates

Bullock Tice Associates, Inc. (BTA) is a 35-person architectural and interior design firm based in Pensacola, Florida. The practice offers services in architecture, sustainable design, strategic facility planning, programming and budgeting, space planning, interior design, and construction administration. Its practice focuses on the US Southeast region in three target markets: Department of Defense, Commercial Development, and Governmental/Institutional. The firm is leader in BIM implementation in its region and beyond. The firm is also a member of Structured Parking Solutions (SPS), a parking focused total solution provider. Solution sets include: design, construct, turnkey, lease back, and operate.

**Professor
Carrie Sturts Dossick,
P.E.**



Dr. Carrie Sturts Dossick is a Professor of Construction Management at the University of Washington, College of Built Environment and the Director of the Communication, Technology and Practices Lab at the Center for Education and Research in Construction (CERC). Dr. Dossick has over a decade of research and teaching experience primarily focused on emerging collaboration methods and technologies such as Integrated Project Delivery (IPD) and Building Information Modeling (BIM). She is an active member of the National Institute of Building Sciences, buildingSMART Alliance and the Academic Interoperability Coalition (AiC). Current research projects include the use of Virtual Reality for project decision making, BIM Standards and Processes for the Port of Seattle, and technology and collaboration strategies for integrated design and construction. She has received funding from the National Science Foundation, U.S. Army, U.S. Department of Education, General Services Administration, Mechanical Contractors Association of Western Washington, Sound Transit, Port of Seattle, Skanska USA Building, Mortenson Company, Turner Construction, University of Washington Innovation Award and the Royalty Research Fund, and University of Washington Capital Projects and Facilities services.

<http://cm.be.uw.edu/cerc/research-areas/ctop-lab/>

The Center for Education and Research in Construction



The Center for Education and Research in Construction (CERC) develops scholarship with broad impact on industry practices from project planning to operations. CERC Labs work on several interrelated streams of research including Safety and Health, Project Delivery and Management, Virtual Design and Construction, Infrastructure Development, Collaboration and Sustainable Built Environments. Alongside industry partners, CERC faculty and students champion construction education and applied research, and use their expertise to translate cutting-edge scholarship into excellent construction education to train tomorrow's construction professionals.

Paul Audsley

As Chief Information Officer, Paul Audsley leads NBBJ's technology strategy and operations in the areas of design, building information modeling, design computation, collaboration, infrastructure, security and project collaboration. He has a deep commitment to enhancing the effective use of technology to optimize the design and delivery process.

Paul has served in leadership roles on several of the world's largest and most complex design and construction projects, including London Heathrow Airport's Terminal 5, the Channel Tunnel between the UK and France, Hong Kong International Airport and more recently providing strategic design technology oversight for Kaiser Oakland Medical Center in California, South Eastern Louisiana VA Medical Center Replacement Hospital and a wide variety of both domestic and international projects.

He is the Past Chair of the buildingSMARTalliance overseeing development of the US National BIM Standard (US-NBIMS), he's a member of the National Institute of Building Sciences, Autodesk User Group International, AIA CIO Large Firm Roundtable and Past Chair of the AIA Columbus-Technology in Architectural Practice Group (TAP).

Paul's contributions have been widely recognized, including an AIA Presidential Citation for Integrated Project Delivery, an AIA Special Commendation for Technology - Model Progression Specification.

Paul has also presented/lectured at a wide variety of venue's including the annual Design Build Institute of America (DBIA) conference, ENR FutureTech, Penn State University, Forrester's CXNYC and the American Bar Associations Forum on the Construction Industry.

Why the Content Exists

A suite of national standards exists today to help teams execute Building Information Modeling for Architecture, Engineering, Construction, and Owner/Operator facility-related projects. Why do these standards exist? What problem is the suite of standards trying to solve?

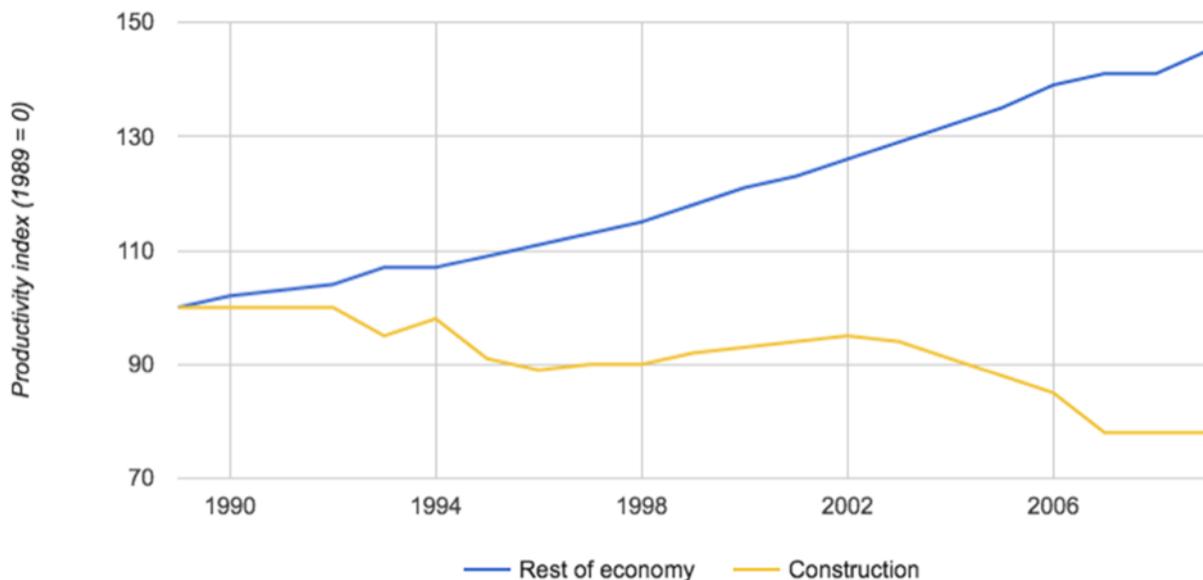
Original Problem Statement

It has been well-documented that the building construction industry needs to increase in interoperability and productivity. Both of these topics have huge implications on not only the AEC team but also the Owner. Both of these challenges is everyone's problem. Almost every presentation or dialogue about why we should use BIM includes two very popular references regarding interoperability and productivity.

Interoperability

A 2004 NIST Report ¹ estimates the cost of inadequate interoperability in the U.S. capital facilities industry to be \$15.8 billion per year.

Productivity



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More recent data indicates that the Construction productivity index is improving. No doubt BIM adoption has played a role in this.

Proposed Solution

Standards to the rescue. Standardization is crucial to address the interoperability and productivity that the industry still faces. The aim of the national suite of standards is basically

¹ <https://nvlpubs.nist.gov/nistpubs/gcr/2004/NIST.GCR.04-867.pdf>

² <https://turnercenter.berkeley.edu/construction-costs>

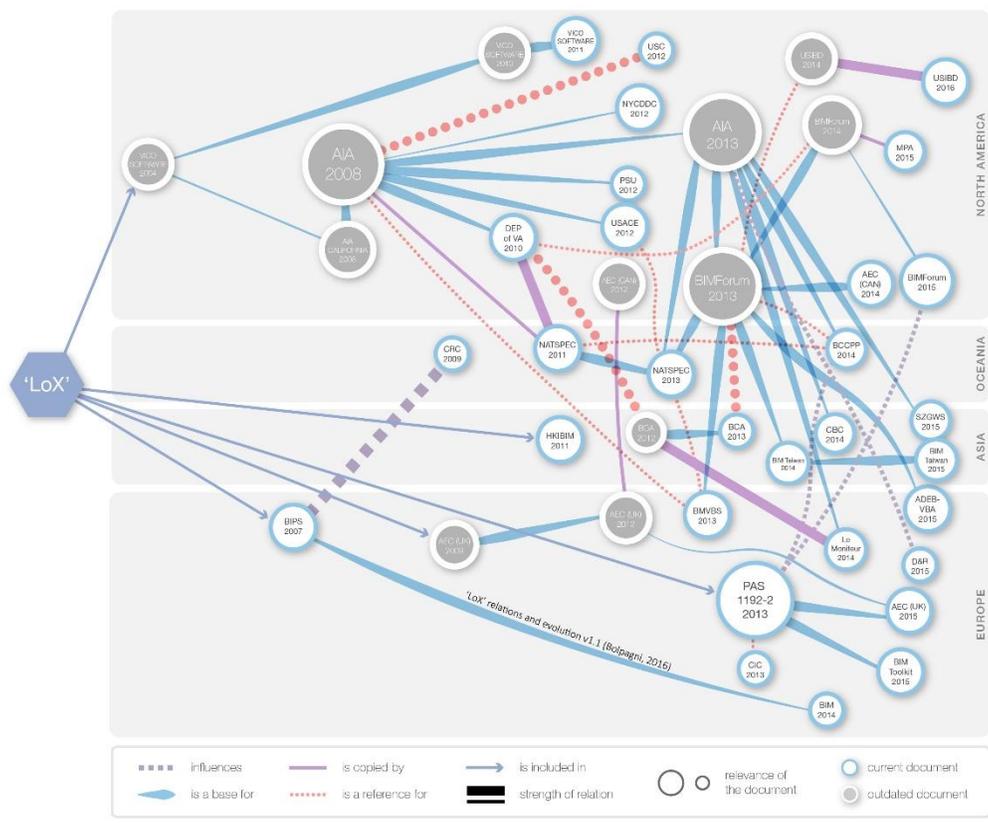
the same as it would be for anything that needs to be standardized. When there is a lack of standards process and outcomes are typically inefficient. Standards aim to solve problems by promoting:

- Efficiency,
- Integration,
- And Innovation.

Revised Problem Statement

Unfortunately, with the slow development of standards related to BIM mixed with the rapid changes in technology; people and organizations set out to develop solutions to address the problem. The result is an abundance of various standards that are not necessarily aligned and some of which are developed in silos; many of which compete or overlap.

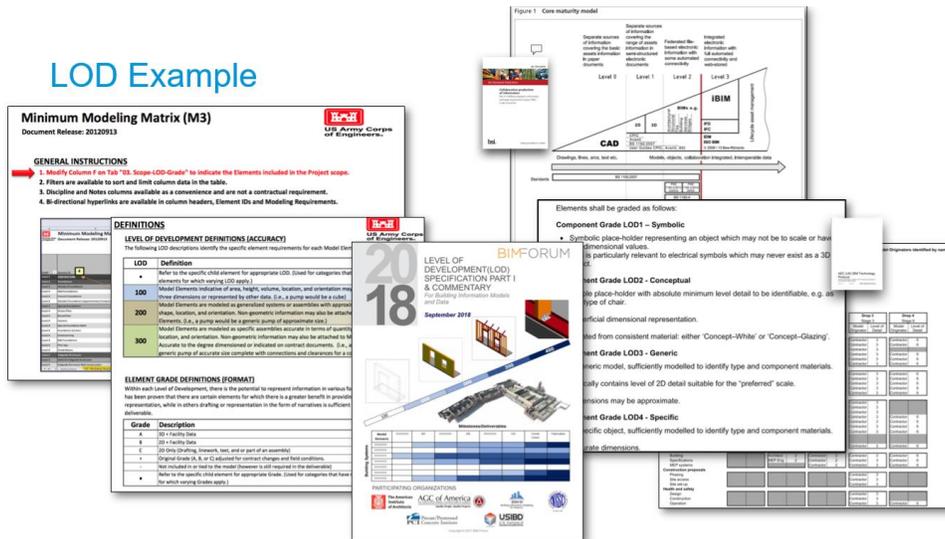
Take the topic of LOD as an example. Marzia Bolpagni in her guest blog post “The Many Faces of LOD” for BIMthinkspace.com graphically represents the proliferation of the LOD idea and the many derivatives thereof.



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³ Image Source: The Many Faces of LOD, BIM Thinkspace, Guest post by Marzia Bolpagni, Available at: <http://www.bimthinkspace.com/2016/07/the-many-faces-of-lod.html>

LOD Example



Having too many standards and guides attempting to define or address the same topic introduces additional challenges of standardization.

Where does the content Come From?

buildingSMART alliance®

The buildingSMART alliance® (Alliance) is comprised of various representatives (sponsors, associated organizations, & volunteers) from the AECO industry. The Alliance is a council of the National Institute of Building Sciences created to advance digital technology from concept, design and construction through operations and management for the built environment. We accomplish this by promoting lifecycle BIM and developing National Standards and Guides such as:

- The United States National CAD Standard® (NCS)
- The National Building Information Modeling Standard-United States® (NBIMS-US™)
- The National BIM Guide for Owners (NBGO)

Vision

A sustainable and efficient architecture, engineering, construction, owner and operator industry enabled with effective work processes based on collaboration, information technology and open standards.

Mission

To lead the development and deployment of broadly adopted national information standards and practices focused on significantly improving the built environment delivery and operation processes.

Goals

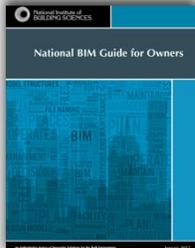
The Alliance will achieve our vision for effective information technology adoption within the industry by:

- Providing **thought leadership** for industry work process improvements
- Enabling and promoting the development **of information standards**

- Providing a forum to share and develop **proven practices**
- Developing, promoting and delivering **education** on information standards and proven practices
- Developing a business model that sustains the **programs and activities** through the investment and involvement of **members and non-members alike, representing both the public and private sectors**

Content Currently Available

A suite of national standards exists today to help teams execute BIM for AEC projects.

United States National CAD Standard (NCS)	National BIM Standard - United States (NBIMS-US)	National BIM Guide for Owners (NBGO)
		

NCS

The primary aim of the NCS is to define CAD and Graphical Standardization. The main sections of the NCS are as follows:

Section	Content
AIA CAD Layer Guidelines	Layer Name Format, Drawing View Layer List, Annotation Layer List
Uniform Drawing System	Drawing Set & Sheet Organization, Schedules, Drafting Conventions, & Symbols
BIM Implementation	References, Clarifications, & Basic BIM Guidelines
Additional Sections	Introduction, Plotting Guidelines, Appendices

This portion of the session focuses mainly on the BIM Implementation Section

BIM Implementation Section

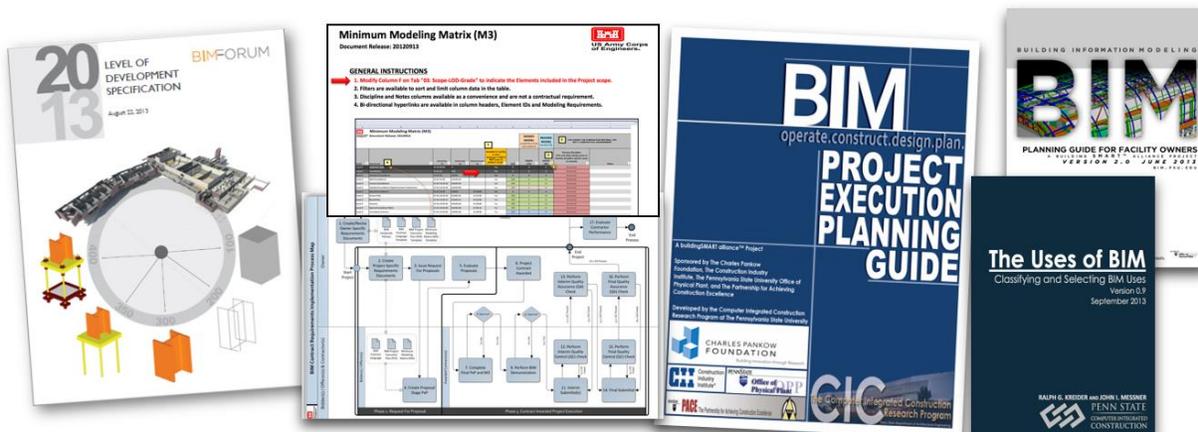
The intent of this section is to outline the implementation of the NCS for BIM use. The BIM Implementation section identifies relevant topics within the NCS that can be incorporated within BIM workflow by adding clarification as needed without displacing an established CAD workflow. The aim of the section is to help bridge the gap between CAD and BIM workflows. The Section contains the following subsections.

- Introduction
- References:
 - Creates the link to NBIMS-US™
- Clarifications:
 - Provides commentary and examples relating to each section of the NCS
 - Provides basic clarifications and/or exclusions
- Basic BIM Guidelines:
 - Authoring Content
 - Model Coordination and Delivery
- Summary

NBIMS

The primary aim of NBIMS is to standardize BIM for the industry. The standard contains a lot of industry vetted and usable content. The current version of the standard is mostly a collection of various other works and standards. The main sections of NBIMS are as follows:

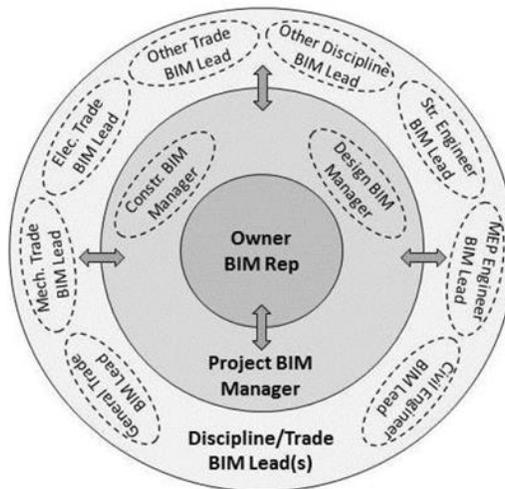
Section	Content
Reference Standards	IFC 2x3, W3C XML, OmniClass Tables, IFD/BSDD (dictionary), BCF, LOD Spec, & National CAD Standard
Information Standards	COBie, Spatial Program Validation, Building Energy Analysis, Quantity Takeoff, Building Programing, & MEP
Practice Documents	BIM Project Execution Planning Guide, MEP Coordination, BIM Planning Guide for Facility Owners, Planning, Executing and Managing Information Handover, Practical BIM Contract Language, & The Uses of BIM
Commentary	Scope (v.3), Introductions, Terms and Definitions, & Methodology (Version 1, Pt 1)



NBGO

NBGO is a guide aimed at helping the Owner implement BIM

Section	Content
Process	BIM Requirements, Team Roles and Responsibilities, BIM PXP, Managing Project Requirements, & Deliverables
Infrastructure & Standards	Technology Infrastructure Standards, Space & Drawing Standards, File Structure, Model Structures, & Modeling Requirements
Execution	BIM Execution Plan (Pxp), BIM Uses, & Model Deliverables
Additional Sections	Foreword, Purpose, & Scope



How to use the Content

It may be stating the obvious, but to be able to use these resources one must make the commitment to read through them and understand them. In addition to that, the following are some pointers for using the content.

NCS

The NCS is the most mature of the products and is often referenced in contract requirements. For BIM usage:

- Specifiers should reference the NCS by way of the BIM Implementation Section so as to avoid an unreasonable requirement for BIM projects
- Practitioners should use the NCS for sheet setup and graphical representation of annotation symbols
- All should understand that full compliance with a CAD standard is not reasonable for BIM and highlight the fact that a section has been dedicated to bridging the gap between CAD and BIM workflows

NBIMS

The NBIMS is the most complicated of the three as it is a collection of various guidelines and standards.

- Specifiers should avoid referencing the entire standard. To require compliance with all of the NBIMS is a misnomer and is ambiguous at best. Specify only the sections of the standard that apply to the project.
- Practitioners should utilize the standard to connect with recommended information exchange standards as well as guides for BIM Execution Planning and implementation.

NBGO

The NBGO is the shortest of the three and the most direct in terms of implementation.

- Specifiers should use the Guide to write requirements that align with the Owners objectives
- Practitioners should use the Guide to align with the requirement
- All should use the Guide as an educational tool for other team members and to target exactly what the project needs

All three documents have pieces and parts that can be used now. Revisions are coming soon that will help streamline the use of these standards and guidelines.

Coming Soon

There is activity for all three documents in the suite.

- NCS – Preliminary review preparing for the next and potentially final version
- NBIMS – Organizing effort for the next-gen Standards and Guidelines
- NBGO – the Guide is being translated into an ASHRAE standard

NBIMS

Shifting primary focus to Lifecycle BIM:

Transitioning from
Building Information Modeling
to
Building Information Management

A new vision is emerging:

National Building Information Management Standards & Guidelines

To develop a clear, industry focused set of standards and guidelines that can be used by capital facility (buildings and infrastructure) owners and teams to define their information requirements, procure the services needed to successfully obtain quality information, and enable a project team to effectively deliver a high-quality facility along with facility asset information.

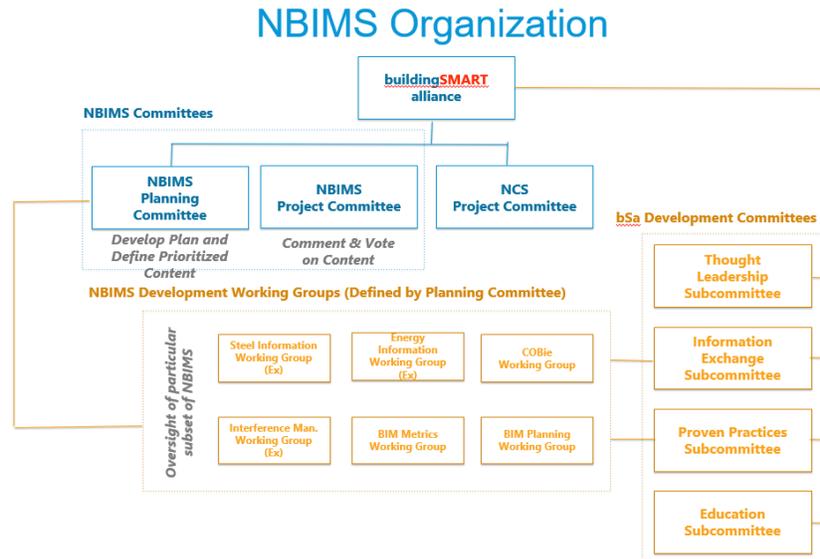
Key Improvements

- Information cataloged for easy access
- Clear distinction between standards content & guidelines
- Ability to Reference individual sections making it scalable to any project size or type

- Modules are updated independently and more frequently (e.g. 6 mo. or annual cycles)
- Consider candidate standards

Project Team Structure

- Project Committee (For All Members)
 - Review and final approval of content
- Planning committee (15-20 technical experts)
 - Identify priorities, review and approve content
 - Create working groups to champion priorities
- Working Groups (8-12 technical experts)
 - Solicit as well as author content
 - Vet and approve content



Some of the key milestones for NBIMS revision and bSa activities include:

- Nov. 2018: bSa All Members Meeting
- Nov. 30, 2018: Revised Rules of Governance Approved
- Dec. 15, 2018: NBIMS Planning Committee Formed
- Jan. 15, 2019: Working Groups Formed
- Summer 2020: Release consensus approved NBIMS-US Version 4**

Highlights for the NBIM Standard V4 include:

- Convert to website (currently pdf): The goal is to convert the format of the NBIMS to a collection of guides and standards that are available via a website that provides navigation and interpretation support to the end users of the standard.
- Collection of standards, guidelines and tools: we see the future of the standard not as a single document, but a collection of documents that provides support for a variety of BIM planning and BIM use cases.
- Create "core" BIM standard: in this next version cycle, the master planning committee suggests that we define a core standard that describes a minimal scope for BIM-enabled project uses. This will include some existing NBIMS content as well as necessitate the creation of new content. One of the new working groups will be focused on this topic.

Session Summary

- BIM Standards and Guidelines are critical to support integration & innovation
- NCS, NBIMS, and NBGO all contain usable information now
- The next-gen of National BIM Standards will bring these together in a modular library
- Your involvement is needed!
 - NCS is a well-developed standard but needs a final revision
 - NBIMS-US™ currently contains valuable content, but it is not a complete library. We need your help to build the library!
 - NBGO standard is in development and will need industry review – stay tuned.
 - Other initiatives will be forthcoming.

The Alliance serves as a portal for getting involved with various efforts like NCS, NBIMS, & NBGO. Visit: https://www.nibs.org/page/bsa_getinvolved

Resources and Links

buildingSMART alliance
<https://www.nibs.org/page/bsa>

National BIM Standard
<http://nationalbimstandard.org/>

National CAD Standard
<https://www.nationalcadstandard.org>

National BIM Guide for Owners
<https://www.nibs.org/general/custom.asp?page=nbgo>