National BIM Standard - United States®
an initiative of the National Institute of Building Sciences buildingSMARTalliance®

National BIM Standard - United States® Version 3

5 Practice Documents

5.4 BIM Project Execution Plan Content – Version 2.1

CONTENTS

5.4.1 Scope

This standard provides guidelines on the content that should be contained in a BIM project execution plan. A project execution plan defines uses for BIM on the project (e.g., design authoring, design review, and 3D coordination), along with a detailed design of the process for executing BIM throughout the project life-cycle. The intent of the content document is to assist project teams when developing their BIM project execution plans. It is not the intent of this content/template to replace contract language, rather to support and supplement it. The BIM project execution plan content includes BIM project execution plan overview, project information, key project contacts, project goals/BIM uses, organizational roles/staffing, BIM process design, BIM information exchanges, BIM and facility data requirements, collaboration procedures, quality control, technological infrastructure needs, model structure, project deliverables, delivery strategy/contract, and necessary attachments.

The BIM project execution plan content was developed by the Computer Integrated Construction Research Group at The Pennsylvania State University with generous support from The Charles Pankow Foundation, the Construction Industry Institute, The Pennsylvania State Office of Physical Plant and the Partnership for Achieving Construction Excellence.

5.4.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

- Computer Integrated Construction Research Program; *BIM Project Execution Planning Guide – Version 2.1*; Print; Version 2.1; University Park, PA, USA; The Pennsylvania State University; May 2011; Access, http://bim.psu.edu, 12/22/2011
- *BIM Uses – Project Execution Planning Guide*, http://bim.psu.edu/uses
- *BIM Project Execution Planning Guide and Templates*, BIM Goal/Use Analysis Worksheet, http://bim.psu.edu/project/resources
- *BIM Project Execution Planning Guide and Templates*, BIM PxP Process Map Templates, http://bim.psu.edu/project/resources
- *BIM Project Execution Planning Guide and Templates*, Information Exchange Worksheet, http://bim.psu.edu/project/resources

5.4.3 Terms, definitions, symbols, units and abbreviated terms

For the purposes of this document, the following terms, definitions, symbols, units and abbreviated terms apply.

Reference terms in *BIM Project Execution Planning Guide*, see Chapter 5.3.

5.4.4 BIM Project Execution Plan Content – Version 2.1, May 2011

5.4.4.1 Introduction

BIM Project Execution Plan Content was developed through a multistep research procedure that included a detailed literature review; industry expert interviews; focus group meeting; and surveys. After the Content was developed, it was implemented on several case study projects to evaluate the ease of implementation and identify areas for improving the Content. The Content was developed as a

complement to the BIM Project Execution Planning Guide which is submitted via a separate submission to the NBIMS-US™.

5.4.4.2 BIM Project Execution Planning Guide and content background

A project team must perform detailed and comprehensive planning to successfully implement BIM. A well-documented BIM Project Execution Plan helps to ensure that all parties are clearly aware of the opportunities and responsibilities associated with the incorporation of BIM into the project workflow. A completed BIM Project Execution Plan should define the appropriate uses for BIM on a project (e.g., design authoring, cost estimating, or design coordination), along with a detailed design and documentation of the process for executing BIM throughout a project's lifecycle. Once the plan is created, the team can follow and monitor their progress against this plan to gain the maximum benefits from BIM implementation.

The Content is based upon the BIM Project Execution Planning Guide which provides a structured procedure, as displayed in Figure 5.4-1, for creating and implementing a BIM Project Execution Plan. The four steps within the procedure include:

1. Identify goals and high value BIM uses during each project phase

2. Design the BIM execution process through the creation of process maps

3. Define the BIM deliverables in the form of information exchanges

4. Develop the infrastructure to support the implementation such as contracts, communication procedures, technology and quality control.

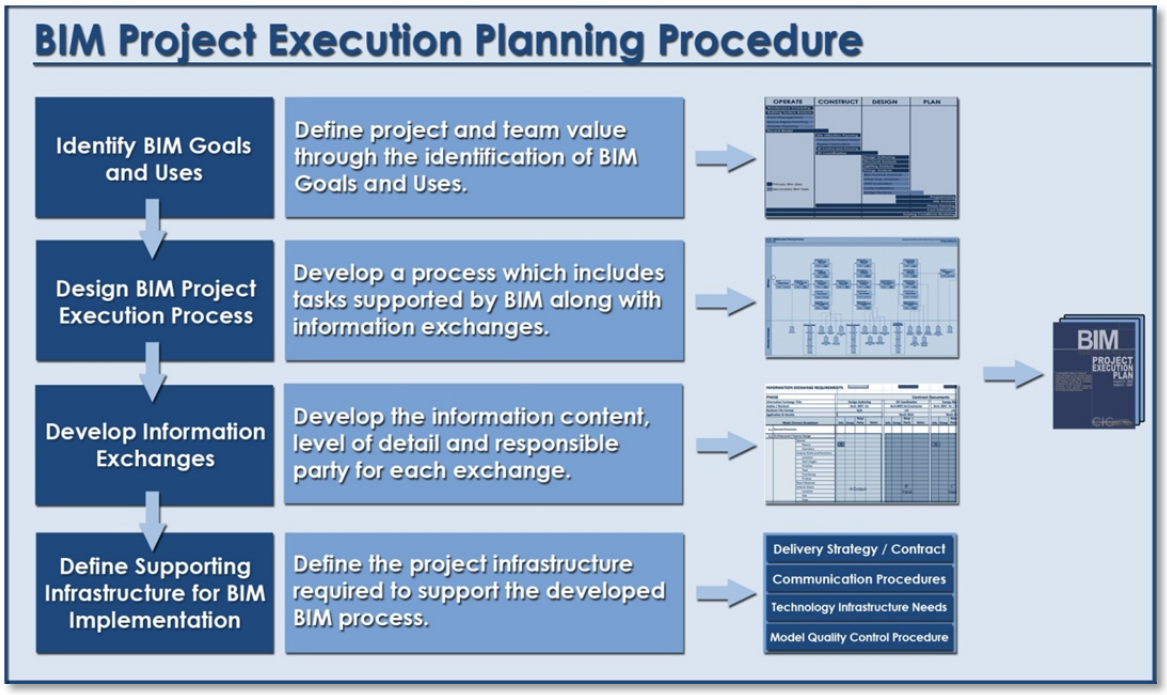


Figure 5.4-1 – The BIM Project Execution Planning Procedure

The goal for developing this structured procedure is to stimulate planning and direct communication by the project team during the early phases of a project. The team leading the planning process should include members from all the organizations with a significant role in the project. Since there is no single best method for BIM implementation on every project, each team must effectively design a tailored execution strategy by understanding the project goals, the project characteristics, and the capabilities of the team members.

The BIM Project Execution Plan Content is a product of the BIM Project Execution Planning buildingSMART alliance® (Alliance or bSa) Project. The Content was developed to provide a practical template that can be used by project teams to document their BIM Project Execution Plan.

The Building Information Modeling (BIM) Project Execution Plan Content includes the following sections:

SECTION A: BIM PROJECT EXECUTION PLAN OVERVIEW

SECTION B: PROJECT INFORMATION

SECTION C: KEY PROJECT CONTACTS

SECTION D: PROJECT GOALS / BIM USES

SECTION E: ORGANIZATIONAL ROLES / STAFFING

SECTION F: BIM PROCESS DESIGN

SECTION G: BIM INFORMATION EXCHANGES

SECTION H: BIM AND FACILITY DATA REQUIREMENTS

SECTION I: COLLABORATION PROCEDURES

SECTION J: QUALITY CONTROL

SECTION K: TECHNOLOGICAL INFRASTRUCTURE NEEDS

SECTION L: MODEL STRUCTURE

SECTION M: PROJECT DELIVERABLES

SECTION N: DELIVERY STRATEGY / CONTRACT

SECTION O: ATTACHMENTS

Additionally, the Content references a number of items from the BIM Project Execution Planning Guide. The guide has been submitted as separate document and can be downloaded at the project website (bim.psu.edu) or in the supplemental material for this approved practice document.

5.4.4.3 Content development

The Content was developed to supplement the BIM Project Execution Planning Guide. The Guide was developed as part of a research project sponsored by the Charles Pankow Foundation, the Construction Industry Institute, the Penn State Office of Physical Plant, and the Partnership for Achieving Construction Excellence (PACE).

The following research steps were conducted. Overall the research team developed the initial draft planning Content. The steps that were employed to create the BIM Project Execution Plan Content include:

5.4.4.3.1 Collect BIM Execution/Implementation Plan data

The first step of the process to develop the defining supporting infrastructure procedure and Contents was to collect data about the current execution plans and what should be put into the creating of new execution plans

5.4.4.3.2 Literature review the elements of a BIM execution/implementation plan

Several documents have been published that explain the necessary elements that should be contained in BIM Implementation/Execution Plan. Some examples of these are:

1. AIA BIM Protocol (E202)
2. Autodesk Communication Specification
3. Consensus Docs BIM Addendum
4. US Army Corp of Engineers BIM Roadmap
5. Capital Facilities Information Handover Guide, Part 1. By Fallon, K., and Palmer, M.

5.4.4.3.3 Reviewed BIM implementation plans and templates

In addition to the published documents, the team had the opportunity to review proprietary BIM implementation plans provided by companies that were collaborating with the research team. At least six industry partners contributed examples for this purpose.

5.4.4.3.4 Interviews and focus group

The team conducted focus group meetings and interviews **to help determine the** necessary elements of an implementation plan.

5.4.4.3.5 Development procedure and content

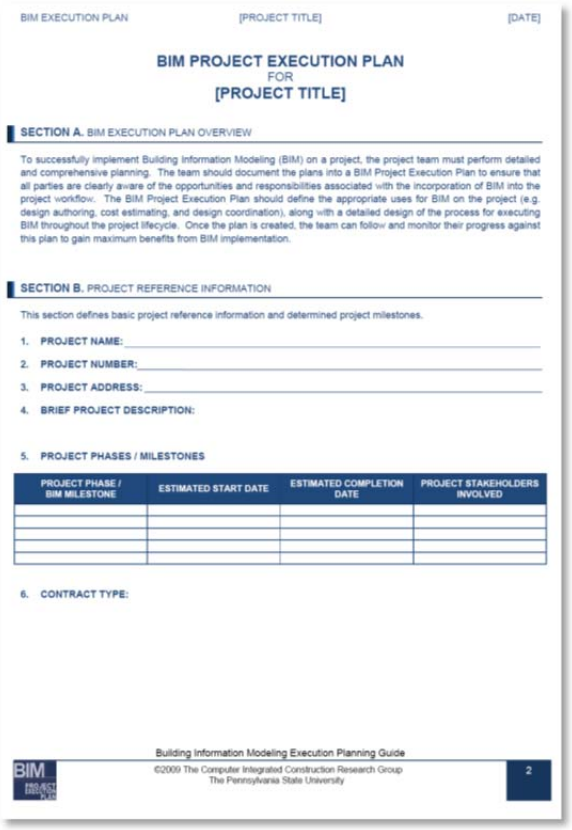
After all the data was collected, the team located common elements from all the various resources. Table 5.4-1 shows a category breakdown of all of the elements contained in the published documents. Additional information from the proprietary BIM implementation plans was also considered. These common elements were compiled and documented in the initial version of the BIM Project Execution Plan Content (termed the BIM Project Execution Plan Template upon initial release).

BIM Execution Planning Guide	AIA BIM Protocol Ex.	Autodesk Comm. Spec.	Consensus Docs BIM Add.	US ACE BIM Roadmaps
Project Reference Information				
Project Overview Information		X		
BIM Contractual Requirements			X	
Key Project Contacts		X	X	X
Project Goals/BIM Objectives				
Purpose of BIM Implementation		X		X
Why Key BIM Use Decisions		X		X
BIM Process Design				
Process Maps for BIM Project Activities		X		
Define Information Exchanges		X		X
Delivery Strategy/Contract				
Definition of Delivery Structure		X	X	
Definition of Selection				

BIM Execution Planning Guide	AIA BIM Protocol Ex.	Autodesk Comm. Spec.	Consensus Docs BIM Add.	US ACE BIM Roadmaps
Definition of Contracting			X	
BIM Scope Definitions				
Model Elements by Discipline	X			
Level of Detail	X	X	X	X
Specific Model Attributes	X	X	X	X
Organizational Roles and Responsibilities				
Roles and Responsibilities of Each Organization	X	X		X
Define Contracting Strategies for Organizations			X	
Communication Procedures				
Electronic Communication Procedures		X		
Meeting Communication Procedure				
Technology Infrastructure Needs				
Hardware		X		X
Software		X	X	X
Space			X	
Networking Requirements		X		X
Model Quality Control Procedures				
Methods to ensure model accuracy	X	X	X	X
Glossary of Terms	X	X	X	X

Table 5.4-1 – BIM Execution Planning Category Guide

After the common elements were identified, the team began to develop a series of documents that that project teams could use to assist them when developing a BIM Project Execution Plan. In order to develop the Content, a rough draft was created and then reviewed by the research team in small focus group meetings. Suggests for improvement were made and the Content was updated. Figures 5.4-2 and 5.4-3 show examples of the BIM Project Execution Plan Content.



BIM EXECUTION PLAN [PROJECT TITLE] [DATE]

BIM PROJECT EXECUTION PLAN
FOR
[PROJECT TITLE]

SECTION A. BIM EXECUTION PLAN OVERVIEW

To successfully implement Building Information Modeling (BIM) on a project, the project team must perform detailed and comprehensive planning. The team should document the plans into a BIM Project Execution Plan to ensure that all parties are clearly aware of the opportunities and responsibilities associated with the incorporation of BIM into the project workflow. The BIM Project Execution Plan should define the appropriate uses for BIM on the project (e.g. design authoring, cost estimating, and design coordination), along with a detailed design of the process for executing BIM throughout the project lifecycle. Once the plan is created, the team can follow and monitor their progress against this plan to gain maximum benefits from BIM implementation.

SECTION B. PROJECT REFERENCE INFORMATION

This section defines basic project reference information and determined project milestones.

1. **PROJECT NAME:** _____
2. **PROJECT NUMBER:** _____
3. **PROJECT ADDRESS:** _____
4. **BRIEF PROJECT DESCRIPTION:**

5. **PROJECT PHASES / MILESTONES**

PROJECT PHASE / BIM MILESTONE	ESTIMATED START DATE	ESTIMATED COMPLETION DATE	PROJECT STAKEHOLDERS INVOLVED

6. **CONTRACT TYPE:**

Building Information Modeling Execution Planning Guide

2

Figure 5.4-2 – BIM Project Execution Plan Content

[PROJECT TITLE] [DATE]

SECTION D. PROJECT GOALS / BIM OBJECTIVES

See the BIM Goals worksheet in Appendix A for the detailed BIM Goals.

1. **LIST MAJOR BIM GOALS / OBJECTIVES**

BIM GOAL	DESCRIPTION	COMPLETE

BIM GOAL WORKSHEET: [FILE NAME AND LOCATION] ATTACH

2. **BIM USE SELECTION WORKSHEET:** [FILE NAME AND LOCATION] ATTACH

3. **CHOOSE FINALIZED BIM USES:**

OPERATE	CONSTRUCT	DESIGN	PLAN
BUILDING MAINTENANCE SCHEDULING	SITE UTILIZATION PLANNING	DESIGN AUTHORING	PROGRAMMING
BUILDING SYSTEM ANALYSIS	CONSTRUCTION SYSTEM DESIGN	DESIGN REVIEWS	SITE ANALYSIS
ASSET MANAGEMENT	DIGITAL FABRICATION	STRUCTURAL ANALYSIS	
SPACE MANAGEMENT / TRACKING	3D CONTROL AND PLANNING	LIGHTING ANALYSIS	
DISASTER PLANNING	3D COORDINATION	ENERGY ANALYSIS	
RECORD MODEL		MECHANICAL ANALYSIS	
		OTHER ENG. ANALYSIS	
		LEED EVALUATION	
		CODE VALIDATION	
4D MODELING	4D MODELING	4D MODELING	4D MODELING
COST ESTIMATION	COST ESTIMATION	COST ESTIMATION	COST ESTIMATION
EXISTING CONDITIONS MODELING	EXISTING CONDITIONS MODELING	EXISTING CONDITIONS MODELING	EXISTING CONDITIONS MODELING

BUILDING INFORMATION MODELING EXECUTION PLAN
4

Figure 5.4-3 – Image of Version 1.0 of the BIM Project Execution Plan Conten

Once Version 1.0 of the Content was completed in late October 2009, it was released for review and use on the research project website.

5.4.4.3.6 Validate procedure and content

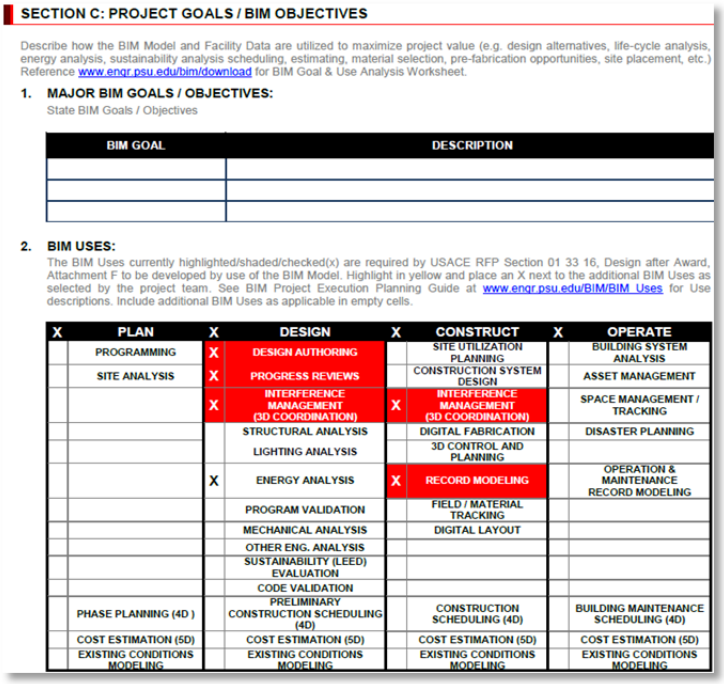
After the Content was released it was reviewed by industry members on a general level as well as making minor modifications. More importantly the Content was reviewed at length through a line by line analysis by the US Army Corps of Engineers BIM industry advisory group when they were adapting the document for adoption within the USACE contract requirements.

5.4.4.3.7 Unsolicited industry review

The research team made an announcement to those who had downloaded the BIM Project Execution Planning Guide that the Content was available for download. As soon as this occurred, the Content received numerous downloads, and the Content was published and referenced on several other industry websites. Thereafter, the research team started to receive comments on the Content. These comments were then used to update the Content.

5.4.4.3.8 Reviewed by USACE BIM contract language team

After the Content was released, the project team worked with Steve Hutsell, lead of the US Army Corps of Engineers (USACE) BIM Contract Language Workgroup to modify the Content with some minor customization for the USACE. To accomplish this, the USACE BIM Contract Language Workgroup conducted three 2-day workshops to review and update the Content. Each workshop was about one month apart. At the workshops, the workgroup went through each line of the Content and discussed whether or not it should be contained in the USACE Specific Project Execution Plan (PxP) Template. To accomplish this task, about an hour was spent on each section of the Content during each workshop. Between workshops additional revisions were made to the USACE Specific PxP Template which is directly based upon the Content. At the next workshop, all revisions were reviewed in detail. Figure 5.4-4 shows a section from the USACE Specific PxP template that was created by the workgroup. This template is directly structured from the Content, with only very minor modification to make some sections optional and to appropriately provide descriptions that are consistent with USACE contract requirements.



SECTION C: PROJECT GOALS / BIM OBJECTIVES

Describe how the BIM Model and Facility Data are utilized to maximize project value (e.g. design alternatives, life-cycle analysis, energy analysis, sustainability analysis scheduling, estimating, material selection, pre-fabrication opportunities, site placement, etc.) Reference www.engr.psu.edu/bim/download for BIM Goal & Use Analysis Worksheet.

1. **MAJOR BIM GOALS / OBJECTIVES:**
State BIM Goals / Objectives

BIM GOAL	DESCRIPTION

2. **BIM USES:**
The BIM Uses currently highlighted/shaded/checked(x) are required by USACE RFP Section 01 33 16, Design after Award, Attachment F to be developed by use of the BIM Model. Highlight in yellow and place an X next to the additional BIM Uses as selected by the project team. See BIM Project Execution Planning Guide at www.engr.psu.edu/BIM/BIM_Uses for Use descriptions. Include additional BIM Uses as applicable in empty cells.

X	PLAN	X	DESIGN	X	CONSTRUCT	X	OPERATE
	PROGRAMMING	X	DESIGN AUTHORING		SITE UTILIZATION PLANNING		BUILDING SYSTEM ANALYSIS
	SITE ANALYSIS	X	PROGRESS REVIEWS		CONSTRUCTION SYSTEM DESIGN		ASSET MANAGEMENT
		X	INTERFERENCE MANAGEMENT (3D COORDINATION)	X	INTERFERENCE MANAGEMENT (3D COORDINATION)		SPACE MANAGEMENT / TRACKING
			STRUCTURAL ANALYSIS		DIGITAL FABRICATION		DISASTER PLANNING
			LIGHTING ANALYSIS		3D CONTROL AND PLANNING		
		X	ENERGY ANALYSIS	X	RECORD MODELING		OPERATION & MAINTENANCE RECORD MODELING
			PROGRAM VALIDATION		FIELD / MATERIAL TRACKING		
			MECHANICAL ANALYSIS		DIGITAL LAYOUT		
			OTHER ENG. ANALYSIS				
			SUSTAINABILITY (LEED) EVALUATION				
			CODE VALIDATION				
	PHASE PLANNING (4D)		PRELIMINARY CONSTRUCTION SCHEDULING (4D)		CONSTRUCTION SCHEDULING (4D)		BUILDING MAINTENANCE SCHEDULING (4D)
	COST ESTIMATION (5D)		COST ESTIMATION (5D)		COST ESTIMATION (5D)		COST ESTIMATION (5D)
	EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING

Figure 5.4-4 – Section of the USACE Project Execution Plan Template

5.4.4.3.9 Updated procedure and content

The unsolicited review and the review by USACE were then used to update the Content. Figure 5.4-5 shows the current version of the Content.

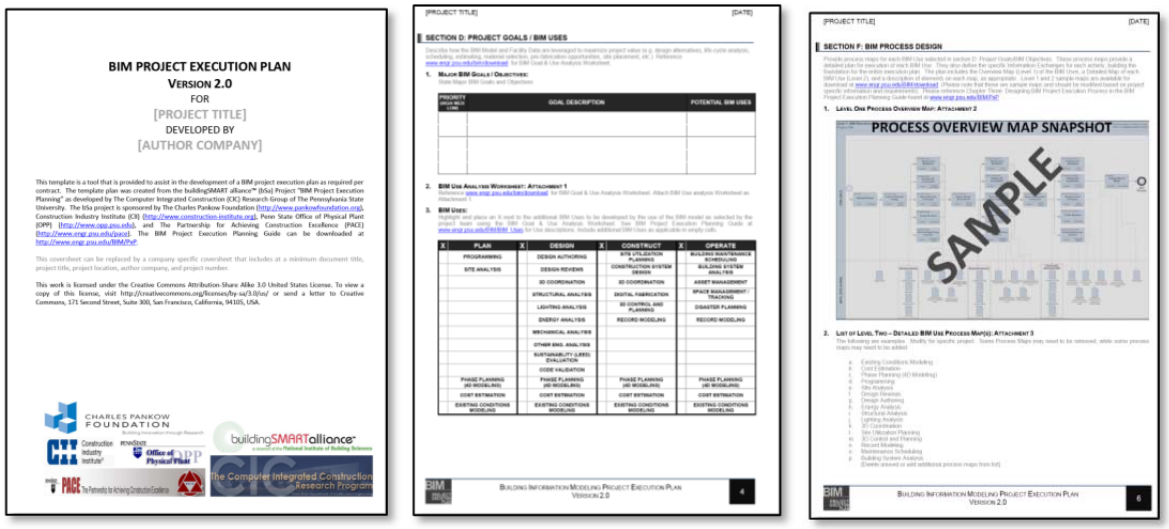


Figure 5.4-5 – Portions of Current BIM Project Execution Plan Content

5.4.4.3.10 Industry acceptance of the Guide

The use of the BIM Project Execution Plan Content has quickly become common practice for multiple organizations and is rapidly gaining acceptance as an industry standard within the building industry. To assist with documenting the Content's acceptance, a survey was distributed to those who have downloaded the BIM Project Execution Planning Guide and its related resources. The following statistics, which are gathered from that survey and various other sources, support the claim of wide acceptance across the industry.

5.4.4.3.11 Owners requiring submission

Since the start of this project a number of large organizations have been using the Content. Some organizations have adopted a requirement to submit BIM Project Execution Plans through the use of the Content. The following is a list of three owner organizations that have confirmed this requirement:

- US Army Corps of Engineers (embedded into Attachment F);
- US Air Force; and
- Penn State Office of Physical Plant.

5.4.4.4 Conclusions

The BIM Project Execution Plan Content provides a structure to the information that should be included in a BIM Project Execution Plan. Based on the level of industry acceptance and the rigorous methodology used to develop the Content, we request that the BIM Project Execution Plan Content be accepted as a practice standard within NBIMS-US™.

5.4.4.5 Acknowledgements

We wish to thank the sponsors for the Guide development which include:

- The Charles Pankow Foundation;
- The Construction Industry Institute;
- The Pennsylvania State University, Office of Physical Plant; and
- The Partnership for Achieving Construction Excellence at Penn State.

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- Deke Smith, Executive Director of buildingSMART alliance® (Industry Champion)
- Victor Sanvido, Ph.D., Senior Vice President, Southland Industries (Industry Champion)
- Mark Butler, Chair, US National CAD Standard Project Committee, Systems Integration Manager, and Senior Professional Associate, HDR, Inc.
- Derek Cunz, Director of Project Development, Mortenson Construction
- Mark Falzarano, CAD Coordinator, Barton Malow Company
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- Steve Hagan, Project Knowledge Center, U.S. General Services Administration
- Steve Hutsell, Chief, Geospatial Section, Seattle District, US Army Corps of Engineers
- Mark Konchar, Vice President, Balfour Beatty Construction
- Soad Kousheshi, President, AEC Strategy
- Robert Leicht, Ph.D., BIM Project Manager, DPR Constructors
- Kurt Maldovan, Balfour Beatty Construction
- Alexander Zolotov, Skanska

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- John Messner (Principle Investigator), Director, CIC Research Program and Associate Professor of Architectural Engineering, Penn State
- Chimay Anumba (Co-Principle Investigator), Professor and Head, Department of Architectural Engineering, Penn State
- Craig Dubler, Graduate Research Assistant, Penn State
- Shane Goodman, former MAE/BAE student, Penn State
- Colleen Kasprzak, Graduate Research Assistant, Penn State
- Ralph Kreider, Graduate Research Assistant, Penn State
- Robert Leicht, Assistant Professor of Architectural Engineering, Penn State
- Chitwan Saluja, former Graduate Research Assistant, Penn State
- Nevena Zikic, former Graduate Research Assistant, Penn State

5.4.4.6 Sources for additional information

For more information and resources, please see the project website at: bim.psu.edu. Additional information on the creation of the guide can be located in the following publications:

- Computer Integrated Construction Research Program. (2010). *BIM Project Execution Planning Guide: Final Research Methods Report, The Charles Pankow Foundation, Claremont CA (available at http://www.pankowfoundation.org/grants.cfm and in the supplemental documents folder)*

- Computer Integrated Construction Research Program. (2010). *BIM Project Execution Planning Guide: Second Interim Research Report, The Charles Pankow Foundation, Claremont CA (available in the supplemental documents folder)*

- Computer Integrated Construction Research Program. (Submitted for Review). *Project Execution Planning for Building Information Modeling: Research Report*. The Construction Industry Institute, Austin, TX, USA.

- Computer Integrated Construction Research Program. (2010). *Project Execution Planning for Building Information Modeling.* The Construction Industry Institute, Austin, TX, USA, 21 Pages.

5.4.5 Bibliography

1. Computer Integrated Construction Research Program; *BIM Project Execution Planning Guide – Version 2.1*; Print; Version 2.1; University Park, PA, USA; The Pennsylvania State University; May 2011; Access (bim.psu.edu, 12/22/2011)