

# **Indiana University**

## **RECORD DOCUMENT REQUIREMENTS FOR AS-BUILT & CONSTRUCTION DOCUMENTS DELIVERABLES**

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**INDIANA UNIVERSITY**

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**UNIVERSITY ARCHITECT'S OFFICE**

## **Record Document Requirements As-Built & Construction Documents Deliverables**

Indiana University has changed the As-Built and Construction Documents requirements to now include BIM (Building Information Modeling) as well as shift the responsibility to the A/E for the submittal of the CAD Record Documents and associated formats, or BIM As-Built Model and associated formats, for projects initiated in design as of 10/1/2009. Indiana University has also established an expectation of a BIM As-Built Model deliverable to replace CAD As-Built by the Contractor for any projects in design prior to 10/1/2009 estimated to cost over \$5 million. Finally, a new requirement for Contractors on all projects as of 10/1/2009, is to produce and submit a COBIE (Construction Operations Building Information Exchange – COBie format) spreadsheet that records installed equipment data. All Contractor As-Built deliverables will be submitted to the Architect and appropriate Owner's representative for review and approval prior to the submittal of the Contractor's final payment application. If review of the preliminary As-Built drawings/BIM models(s) reveals errors and/or omissions, the drawings/BIM models will be returned to the Contractor for corrections. The Contractor shall make all corrections and return the drawings to the Architect or Owner's representative within ten (10) calendar days of receipt. If more than two reviews are required, the Architect will be compensated by the Contractor. Full compliance with this section is a condition precedent to Substantial Completion and the commencement of any warranty periods set forth in the Contract Documents.

### **General**

The Contractor shall keep at the construction site a complete set of full size prints of the contract drawings, reproduced at Contractor expense. During construction, these prints shall be marked to show all deviations in actual construction from the contract drawings. The color red shall be used to indicate all additions and green to indicate all deletions. The drawings shall show the following information but not be limited thereto:

- a. The locations and description of any utility lines and other installations of any kind or description known to exist within the construction area. The location includes dimensions to permanent features.
- b. The locations and dimension of any changes within the building or structure, and the accurate location and dimension of all underground utilities and facilities.
- c. Correct grade or alignment of roads, structures, and utilities if any changes were made from contract plans.
- d. Correct elevations if changes were made in site grading from the contract plans.
- e. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including, but not limited to, fabrication erection, installation, and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

- f. The topography and grades of all drainage installed or affected as part of the project construction.
- g. All changes or modifications from the original design and from the final inspection.
- h. Where contract drawings or specifications allow options, only the option actually used in the construction shall be shown on the as-built drawings. The option not used shall be deleted.

These deviations shall be shown in the same general detail utilized in the contract drawings. Markings of the prints shall be pursued continuously during construction to keep them up to date. This information shall be maintained in a current condition at all times until the completion of the work. The resulting field-marked data shall be referred to and marked as "As-Built Field Data" and shall be used for no other purpose. They shall be made available for inspection by I.U.'s representative whenever requested during construction and shall be jointly inspected for accuracy and completeness by I.U.'s representative and a responsible representative of the Contractor prior to submission of each monthly pay estimate. Failure to keep the As-Built Field Data (including Equipment-in-Place lists in the COBIE spreadsheet) current shall be sufficient justification to withhold a retained percentage from the monthly pay estimate.

## **Construction Documents Deliverable Requirements**

Indiana University requires that the Construction Documents Deliverable be submitted via hard copy (CD or DVD). The deliverable should include: .DWG files for each document sheet, and all addenda & specification files. Please use AutoCAD e-transmit to bind all .DWG files! This is the best way to insure that no x-ref files, text files, or plot styles are lost in your submittal. Follow the Construction Document Deliverable Matrix below to determine the responsible party for each deliverable, and in what format.

**If your project has installed building system components then it requires a COBie submittal.** The Design Team shall submit a COBie spreadsheet using the most current version of COBIE (Construction Operations Building Information Exchange). This data set shall include those COBie "designer" worksheets related to architectural program. The designer shall specifically identify spatial and systems zoning to reflect the space circulation zones and building service zones that are reflected in the design drawings and specifications. The following COBie Design worksheets shall be provided:

- (2) Facility - Facility(ies) referenced in the file*
- (3) Floor - Description of vertical levels*
- (4) Space - Spaces referenced in a project*
- (5) System - Systems referenced in a project*

**If your project is a BIM project, your project deliverable includes design models for each discipline.**

For more information on this specific requirement please refer to the Indiana University BIM Guidelines and Standards for Architects, Engineers, and Contractors.

## Construction Documents Deliverable Matrix

The following matrix outlines the various Construction Document deliverables that are required on four different project categories with the associated responsible parties that will be in place as of January 2012. All deliverables identified in this article are to be provided as indicated.

### Project Categories

1. Projects under design prior to 10/1/2009 and with an estimated project cost over \$5 million
2. Projects under design prior to 10/1/2009 and with an estimated project cost under \$5 million
3. Projects initiated for design on or after 10/1/2009 and with an estimated project cost over \$5 million
4. Projects initiated for design on or after 10/1/2009 and with an estimated project cost under \$5 million

Deliverable	Project Categories	Responsible Party	Quantity	Format	Due Date
COBie Construction Data (COBie format)	1, 2, 3, 4	A/E	1 set	.xls	10 days after Bid contract is awarded
IU BIM Proficiency Matrix	1, 3	A/E	1 set	.xls	Prior to selection as required
IU BIM Execution Plan	1, 3	C (1,3) A/E (1,3)	1 set	.doc	30 days after contract is awarded
Design BIM Model(s)	3	A/E	1 set	.rvt	10 days after Bid contract is awarded
Construction Document CAD Drawings	1, 2, 3, 4	A/E	1 set	.dwg	10 days after Bid contract is awarded
Addenda	1, 2, 3, 4	A/E	1 set	.doc or .pdf	10 days after Bid contract is awarded
Specifications	1, 2, 3, 4	A/E	1 set	.doc or .pdf	10 days after Bid contract is awarded

**Responsible Parties** A/E = Architect/Engineer C = Contractor

### Close-out / As-Built Documents Deliverable Requirements

Indiana University requires that the As-Built Documents Deliverable be submitted via hard copy (CD or DVD and Paper). The electronic deliverable should include: .DWG files for each document sheet, .PDF files for each document sheet, As-built Field Data Set Scans, and O & M Manuals. Please use AutoCAD e-transmit to bind all .DWG files. This is the best way to insure that no x-ref files, text files, or plot styles are lost in your submittal. Follow the As-Built Document Matrix below to determine the responsible party for each deliverable, and in what format.

For projects that are category 2 where there will not be a design intent BIM model available, the Contractor is expected to develop and utilize the BIM model for coordination purposes throughout the construction process as indicated in Article 3.6 of [The Indiana University Building Information Modeling \(BIM\) Guidelines For Architects, Engineers, and Contractors](#). All deliverables identified in this article are to be provided as indicated.

### O&M (Operations & Maintenance) Manuals

The contractor shall submit the following information to Indiana University – one pdf of the O&M Manuals along with the Construction Operations Building Information Exchange (COBIE) format: (1) the make, model and serial number of each piece of installed equipment, (2) the location of any equipment installed in the building,

and (3) manufacturer's documents including cut sheets, installation instructions, and recommend maintenance tasks, testing or other reports.

**If your project is a COBIE Project**, the Design Team shall submit a COBIE spreadsheet using the most current version of COBIE (Construction Operations Building Information Exchange).

- (2) Facility - Facility(ies) referenced in the file
- (3) Floor - Description of vertical levels
- (4) Space - Spaces referenced in a project
- (5) System - Systems referenced in a project
- (6) Register - Material/equipment/etc. types (submittal register)
- (7) Component - Individually named materials and equipment

The As-Built set shall be an update to the COBIE Schematic Design Set. The Contractor shall update the COBIE Construction Beneficial Occupancy Set. Tag numbers for valves, controls, or other "tagged" items shall be individually identified in the "Component" worksheet. All worksheets required for the Beneficial Occupancy set shall be updated to fully reflect as-built conditions (due at substantial completion).

Updated information for COBIE design set - worksheets 1-7  
Worksheets 11, 14-17

**If your project is a BIM project, your project deliverable includes all As-Built models for each discipline.**

For more information on this specific requirement please refer to the Indiana University BIM Guidelines and Standards for Architects, Engineers, and Contractors.

#### **As-Built and Record Document Deliverable Matrix**

The following matrix outlines the various As-Built and Record Documents deliverables that are required on four different project categories with the associated responsible parties that will be in place as of October 1, 2009. All deliverables identified in this article are to be provided as indicated.

#### **Project Categories**

1. Projects under design prior to 10/1/2009 and with an estimated project cost over \$5 million
2. Projects under design prior to 10/1/2009 and with an estimated project cost under \$5 million
3. Projects initiated for design on or after 10/1/2009 and with an estimated project cost over \$5 million
4. Projects initiated for design on or after 10/1/2009 and with an estimated project cost under \$5 million

Deliverable	Project Category	Responsible Party	Quantity	Format	Due Date
IU BIM Proficiency Matrix	1,3	C	1 set	.xls/pdf	at Bid Submittal
IU BIM Execution Plan	1,3	C	1 set	.doc/.pdf	30 days after contract is awarded
Owner's Architectural Floor Plan – Interim As-Built Drawing	1, 2,	C	1 set	.dwg	3 months prior to Substantial Completion
Owner's Architectural Floor Plan – Interim Record Drawing	3, 4	A/E	1 set	.dwg	3 months prior to Substantial Completion
Telecommunications Drawings – Interim As-Built Drawings	1, 2,	C	1 set	.dwg/.pdf.	3 months prior to Substantial Completion
Telecommunications Drawings – Interim Record Drawings	3, 4	A/E	1 set	.dwg/.pdf.	3 months prior to Substantial Completion
As-Built Field Data Set Scans	1, 2, 3, 4	C	1 set	.tif	At Substantial Completion
	1, 2,	C	1 set	paper	At Substantial Completion
Operations & Maintenance Manuals (O&M)	1, 2, 3, 4	C	1 set	.pdf	At Substantial Completion
COBie Construction Data	1, 2, 3, 4	C	1 set	.xls	Prior to Final Payment
As-Built CAD Drawings - by Contractor	2	C	1 set	.dwg	Prior to Final Payment
	2	C	1 set	.pdf	Prior to Final Payment
	2	C	3 sets	paper	Prior to Final Payment
As-Built BIM Model(s) - by Contractor	1	C	1 set	.rvt	Prior to Final Payment
As-Built BIM Model(s) - by A/E	3	A/E	1 set	.rvt	Prior to Final Payment
Record Document CAD Drawings – by A/E	3,4	A/E	3 sets	paper	Prior to Final Payment
	3,4	A/E	1 set	.dwg	Prior to Final Payment
	2	A/E	1 set	.pdf	Prior to Final Payment

**Responsible Parties** A/E = Architect/Engineer C = Contractor

## Submittal Standards

**BIM (Building Information Modeling)** - refer to requirements in **The Indiana University Building Information Modeling (BIM) Guidelines For Architects, Engineers, and Contractors** at:

<http://www.indiana.edu/~uao/iubim.html>

**CAD (Computer Aided Design)** - refer to the Indiana University and National CAD Standards as outlined at:

[http://www.indiana.edu/~uao/html/cad\\_gis\\_standards.html](http://www.indiana.edu/~uao/html/cad_gis_standards.html)

**COBIE (Construction Operations Building Information Exchange)** - for spreadsheets, instructions, and guidance go to:

<http://www.wbdg.org/resources/cobie.php?r=om> (**COBie2.6 is the version to be used**)

## File Format Standards

**BIM** - Autodesk Revit .rvt - Revit version should closely be coordinated with entire team and Owner and indicated in IU BIM Execution Plan

**CAD** - Autodesk AutoCAD .dwg - format should be AutoCAD version 2010 .dwg (AutoCAD release 2012-2012) and each file named for each individual drawing sheet

**PDF** - Adobe pdf format should be configured to allow for text searches and printing. Pdfs should also be rotated to drawing/sheet orientation. Files should be named to match the individual sheet/drawing number.

**TIF** - Scanned tif files for each sheet of the original as-built field set. Format: 400 dpi/CCITT Group 4 (Black & white), each tif file should be named to match the individual sheet /drawing number.

\*\*\* all electronic data is to be submitted on DVD/CD-Rom and labeled with IU project #, IU project title, general contents, and firm name submitting. A transmittal should accompany any deliverable submittal.

## Definitions

**As-Built Documents** - As-built documents are the collection of paper drawings or electronic drawings that typically reside in the contractor's onsite trailer that contain mark-ups, annotations, and comments about changes that have been made to the contract documents during the construction phase.

**As-Built Model** - Design Intent Models that have been updated throughout the construction process. These changes and updates have been communicated from the Contractor to the Design Team through the comments, annotations, and mark-ups from the As-Built Documents. These typically, but not always, are discipline specific models.

**Building Information Model (BIM)** - A digital representation of physical and functional characteristics of a facility; a shared knowledge resource for information about a facility forming a reliable basis of decisions during life-cycle, which is defined as existing conception to demolition.

**BIM Execution Plan (BEP)** - A plan that is created from Indiana Universities BIM Execution Plan Template that is to be submitted thirty (30) days after contract award. The BEP helps to define roles and responsibilities within a project team.

**BIM Proficiency Matrix (BPM)** - A matrix that was designed to measure the expertise of a firm as it relates to using a BIM process on projects. It will be used as one of the many selection criteria during the selection process.

### **C.O.B.i.e. – Construction Operations Building Information Exchange –**

the COBIE spreadsheet is to replace the submission of multiple copies of paper documents delivered at the conclusion of construction. The data required by COBIE is the same information as is currently required by project handover/O&M data. The contractor is to insert installed equipment data in the spreadsheet that will link into designer provided space, and installation information.

**Owner's Architectural Floor Plans – Interim Record Documents** – A complete current electronic CAD set of Owner's Architectural floor plan drawings with room names, room numbers, and room square footages indicated. The Owner's Representative shall not be relieved of responsibility when files are delivered if the files do not meet established requirements or are defective. Indiana University shall verify all files and the Owner's Representative shall be notified of acceptance. These are to be submitted 3 months prior to

Substantial Completion.

**Record Drawing** - The production of Record Drawings is the capturing of the As-Built Document's annotation, comments, and mark-ups in a drawing format only. This does not typically include the updating of any models.

**Telecommunications Drawings – Interim As-Built Documents** – A complete current electronic CAD and PDF set of as-built Telecommunication drawing for Indiana University use in coordinating selection and procurement of telecommunications/data equipment.