Life Cycle information exchange (LCie): Product Installation

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BACKGROUND

During construction material, products, and equipment are delivered to the site, installed in place, connected to appropriate building services, tested and invoiced. Information about the installation of bulk material installation is captured as a combined activity in a cost loaded progress schedule. Payment for such materials is based upon a fiscal percent complete. Information relating to the installation of specifically scheduled, named, or tagged assets must be captured and provided to the owner since that information is needed to justify billing for installed equipment.

BUSINESS CASE

Capturing installed asset information, as that information is installed will reduce or eliminate the need for end of project "job crawls" to recapture such information. Given that these site surveys occur, today, as the project is completed and the contractor is awaiting the first payments that allow them to turn a profit on the project, the collection of asset installation information, as the information is installed, has a direct bearing on decreasing the project overhead and the cost of producing equipment lists, valve lists, door hardware schedules, and other asset information schedules found in today's contracts.

EXAMPLE CONTRACT CLAUSE

Contract clauses for payment for installed equipment and delivery of operations and maintenance manuals, equipment lists, and tag lists should be updated to mandate the delivery of scheduled and tagged equipment installation within 24 hours of the installation of that equipment. Failure to provide this information in real-time should be grounds for retainage equal to the cost of hiring an external commissioning agent to ensure that a post-project job crawl is conducted.

ORGANIZATION

The buildingSMART international Information Delivery Manual process identifies information exchanges according to the table shown below. Use this table to determine if this information exchange applies to your area of responsibility for a given project.

Code	Phase	Used
0	Portfolio requirements	
1	Conception of need	
2	Outline feasibility	
3	Substantive feasibility	
4	Outline conceptual design	
5	Full conceptual design	
6	Coordinated design and procurement	
7	Production information	
8	Construction	✓
9	Operation and maintenance	
10	Disposal	

The buildingSMART alliance classifies information exchanges according to a number of different classification tables, called OmniClass, provided by the Construction Specification Institute. In addition to OmniClass references

to the subject exchange, the buildingSMART alliance provides an overall business activity diagram node referenced in the table below.

LCie Worksheet	OmniClass Table 31 Phase	OmniClass Table 34 Actors	OmniClass Table 32 Services	Activity Node Tree
Product Installation	**31-40 40 11 17** Installation Phase	**34-35 14 00** Contractor	**32-21 17 41** Installing	**4.3** Build Building

EXCHANGES

The sections below describe the inputs required to apply this information exchange. The processing that is accomplished to process these inputs, and the resulting outputs that should be expected as a result of performing this information exchange. This information exchange can be characterized as a "transactional" update of the as-built construction building model.   A general description of the requirements for transactional exchanges is found in the LCie Overview (URL).

Inputs

Product Installation requires the user authentication and project authorization wrappers described in the LCie Overview (URL). In addition, the information below is the minimum data set that will be processed; however, additional worksheets may be provided by the creator of the COBie file. Please note that additional worksheets may be needed to produce a proper ifc file.

- o Component Worksheet
  - ▪ The following information would be expected
    - • Installation date
    - • (Optional) Serial number
    - • (Optional) Bar Code
    - • (Optional) Warranty start date
  - ▪ Data on previously submitted required fields may not be changed.
- o Attribute worksheet.

The following table summarizes the expected content in the COBie file. Referenced rows are for informational purposes and should not be changed. New rows require the addition of new row items to the designated worksheet. Updated rows require the addition of information to an existing row item. It may also be appropriate to add a new row item to a worksheet as part of an update. Optional rows are not required but will be processed if provided.

Key: Referenced Rows= Y or – (not reqd.)
New Rows= Y or – (not reqd.)
Updated Rows = Y or – (not reqd.)
Optional Rows = Y or – (not reqd.)

Worksheet	Referenced Rows	New Rows	Updated Rows	Optional Rows
Facility	Y	-	-	-
Floor	Y	-	-	-
Space	Y	-	-	-
Zone	-	-	-	-
Type	Y	-	-	-
Component	-	-	Y	-
System	-	-	-	-

Spare	-	-	-	-
Resource	-	-	-	-
Job	-	-	-	-
Document	-	-	-	-
Attribute	-	-	Y	-
Connection	-	-	-	-
Coordinate	-	-	-	-
Issue	-	-	-	-

Processing

The capture of this transactional information may be seen as a type of building information survey where the appropriate portion of the building information is requested to generate a data entry form, the user completes that form, and the information is returned to update the building information.

Preparation of building information template

The first stage is the preparation of a template data set from the current building information. Implementation of the template information may be accomplished through specific software solutions using appropriate menus. To create realistic examples, bimServices demonstration scripts automatically create COBie spreadsheets containing the minimum set of information needed to provide the required BIM sub-set. All worksheets with the exception of the component and attribute worksheets are set to be "hidden"

- Select current project from building information database
- Select specific product type from current project
- Select specific product component from current product type
- Generate component COBie worksheet
- Provide component COBie worksheet

Building information capture

The second stage is the captured of the required new information in the data entry form. As with step one this would be expected to be accomplished within proprietary software solutions. To provide a realistic example the COBie file provided in the first step may be used to:

- Access component data entry form
- Provide required component data

Building information transmission and processing

The final stage is the transmission and processing of that information by the target information system. For this specific information exchange the following steps are required. To provide a realistic example the completed COBie building information survey form is used as the input artifact that updates the model.

- Access component data entry form
- Provide user credential information (if needed)
- Provide required component data
- Send information to the building information server

Processing information sent to the building information server will require the following steps.
- User authentication
- User authorization
- Checking file compliance with COBie
- Checking file compliance with LCie exchange requirements

- Checking the requested transaction with targeted information
- Backing-up prior building information
- Identification of matching component
- Updating mandatory component information
- (optional) updating optional component attribute data
- (optional) verification of product type attributes from product nameplate data
- Completion of the transaction and reporting

Output

There are two types of outputs created with this transaction. The first is the creation of the product component installation form. This output may be shown on a screen as part of an information system or may be produced as a standalone template file, as is accomplished with the bimServices engine.

The second outputs are files that demonstrate proper processing of the submitted information. The following reports would be expected:
- Incoming file compliance with COBie
- Incoming file compliance with information exchange requirements (identification of optional data)
- Verification of mapping to target model
- Results of completing the transactions
- Comparison of prior and current model states.

Follow On

The following processes are expected to occur after or concurrently with this process:
- Other product installation reports
- Survey Inspection
- Maintenance Orders
- Warranty Claims

EXAMPLES

Duplex Apartment

- Example 1:
  - Input:
    - Prior building model (DuplexApartment_ProductInstallation_SwingingDoor_0.750_before)
    - Exported template for Product Installation (URL)
    - Completed template for Product Installation (DuplexApartment_ProductInstallation_SwingingDoor_0.750)
  - Output:
    - Incoming file compliance with COBie
    - Incoming file compliance with exchange requirements (identification of optional data)
    - Verification of mapping to target model
    - Results of completing the transactions
    - Comparison of prior and current model states.

- Example 2:
  - Input:

- Prior building model
  (DuplexApartment_ProductInstallation_SwingingDoor_0.885_before)
- Exported template for Product Installation (URL)
- Completed template for Product Installation
  (DuplexApartment_ProductInstallation_SwingingDoor_0.885)
  - o Output:
    - Incoming file compliance with COBie
    - Incoming file compliance with exchange requirements (identification of optional data)
    - Verification of mapping to target model
    - Results of completing the transactions
    - Comparison of prior and current model states.

Medical Clinic

- Example 1:
  - o Input:
    - Prior building model (MedicalClinic_ProductInstallation_DoorTypeA_before)
    - Exported template for Product Installation (URL)
    - Completed template for Product Installation
      (MedicalClinic_ProductInstallation_DoorTypeA)
  - o Output:
    - Incoming file compliance with COBie
    - Incoming file compliance with exchange requirements (identification of optional data)
    - Verification of mapping to target model
    - Results of completing the transactions
    - Comparison of prior and current model states.

- Example 2:
  - o Input:
    - Prior building model (MedicalClinic_ProductInstallation_DoorTypeB_before)
    - Exported template for Product Installation (URL)
    - Completed template for Product Installation
      (MedicalClinic_ProductInstallation_DoorTypeB)
  - o Output:
    - Incoming file compliance with COBie
    - Incoming file compliance with exchange requirements (identification of optional data)
    - Verification of mapping to target model
    - Results of completing the transactions
    - Comparison of prior and current model states.

Software Implementation Guidance

SCRIPTED PROCESS

To recreate the example files identified in this information exchange documentation the bimServices engine was used based on information from two projects a Duplex Apartment building and a Clinic building. The following batch file was used to process the appropriate files through the bimServices engine.

```
echo off
set a0=ProductInstallation
rem Replace %1 with MedicalClinic or DuplexApartment
set a1=%1
rem  Replace %2 with appropriate type name
set a2=%2

call goCI       %a1% %a0%_%a2%
call goMerge2    %a1% %a0% %a2%
call goIC       %a1% %a0%_%a2%

time /t
```

Figure 1 doProductInstallation batch file