

Life Cycle information exchange (LCie): Product Type Selection

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BACKGROUND

During construction material, products, and equipment are selected based on the requirements identified in contract specifications. Information about these products is documented prior to purchase of the products by prime and subcontractors. Depending on the specific contract requirements there may also be requirements for the prime contractor to have the owner or designer review or acknowledge the receipt of the selected products. Information for “approved submittals” becomes the basis upon which facility handover data sets are prepared.

BUSINESS CASE

Today contractors capture, reproduce, handle, and transmit paper-based submittal documentation prior to product installation and recover and reproduce such information at the conclusion of the project to create facility management handover information. Providing a standard framework for the electronic exchange of product information will allow a significant reduction of waste as demonstrated in an upcoming paper by East and Love.

EXAMPLE CONTRACT CLAUSE

Language as follows should be included in the submittal procedures related to contractor certified submittals. Construction contractors shall submit both PDF product data sheets of all building materials, products, and equipment as well as a data files describing the attributes of these products. The data file shall conform to the requirements specified by the LCie Product Type Selection Specification.

Project teams should only use submittal, specification and BIM software that has been self-certified to automatically use and evaluate the selected product against the type requirements (Product Type Template) and the three or equal product candidates (Product Type Candidate).

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 selection	31-40 20 27 Submittal Processing Phase	34-35 14 00 Contractor	32-21 00 00 Execution Services	4.2 Provide Resources (Goods and Services)

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 Type Selection 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.

- Type Worksheet
 - The following required COBie fields must be present in this file:
 - Type name
 - Category
 - Description
 - Asset type
 - Manufacturer
 - Model number
 - Who created the entry and when
 - The following required COBie fields may not be present in this file:
 - Warranty guarantor-parts
 - Warranty duration-parts
 - Warranty guarantor-labor
 - Warranty duration-labor
 - Warranty duration unit
 - Replacement cost
 - Expected life and it’s duration unit
 - Warranty description
- Document worksheet.
- 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	-	-	-	-
Space	-	-	-	-
Zone	-	-	-	-
Type	-	-	Y	-
Component	-	-	-	-
System	-	-	-	-
Spare	-	-	-	-
Resource	-	-	-	-
Job	-	-	-	-
Document	-	-	Y	-
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.

- Select current project from building information database
- Select specific product type from current project
- Generate product type selection data entry form
- Provide product type selection data entry form

Building information capture

The second stage is the capture 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 product type selection data entry form
- Provide user credential information (if needed)
- Provide required type data

- Provide required product document data
- Provide required attribute 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 product type selection data entry form
- Provide user credential information (if needed)
- Provide required type data
- Provide required product document data
- Provide required attribute 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 type
- Updating mandatory type information
- Updating product document data
- Updating attribute 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 type selection 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 selection reports
- Product installation

EXAMPLES

Duplex Apartment

- Example 1:
 - Input:
 - Prior building model (DuplexApartment_ProductTypeSelection_SwingingDoor_0.750_before)
 - Exported template for Product Type Selection (URL)
 - Completed template for Product Type Selection (DuplexApartment_ProductTypeSelection_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_ProductTypeSelection_SwingingDoor_0.885_before)
 - Exported template for Product Type Selection (URL)
 - Completed template for Product Type Selection (DuplexApartment_ProductTypeSelection_SwingingDoor_0.885)
 - 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:
 - Input:
 - Prior building model (MedicalClinic_ProductTypeSelection_DoorTypeA_before)
 - Exported template for Product Type Selection (URL)
 - Completed template for Product Type Selection (MedicalClinic_ProductTypeSelection_DoorTypeA)
 - 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 (MedicalClinic_ProductTypeSelection_DoorTypeB_before)
 - Exported template for Product Type Selection (URL)
 - Completed template for Product Type Selection (MedicalClinic_ProductTypeSelection_DoorTypeB)

- 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=ProductTypeSelection
rem Replace %1 with MedicalClinic or DuplexApartment
set a1=%1
rem Replace %2 with appropriate type name
set a2=%2

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

time /t
```

Figure 1 doProductTypeSelection batch file