

# Life Cycle information exchange (LCie): Product Type Maintenance

by E. William East, PhD, PE, F.ASCE and Danielle Love - Engineer Research and Development Center, U.S Army, Corps of Engineers and Nicholas Nisbet MA (Cantab) DipArch (UNL) - AEC3

## BACKGROUND

The compilation of commissioning information requires the collection of a variety of different types of information from product manufactures. This information includes: product attributes, replacement parts, warranty terms and conditions, and preventative maintenance tasks. Currently such information is provided by manufacturers in documents whose information cannot be effectively compiled during the construction commissioning stage or effectively used by the facility manager during the operations stage of the building.

## BUSINESS CASE

Commissioning agents can directly use commissioning information directly provided by product manufacturers to eliminate the requirement to manually load such information into owner CMMS systems.

Product manufacturers can provide recommended maintenance information to the facility manager in a way that the information can be used. Currently many owners use generic, rather than manufacturer-specific PM schedules.

Facility operators use the actual manufacturer's PM schedules to improve the reliability of their assets.

## EXAMPLE CONTRACT CLAUSE

Construction Contractor shall provide manufacturers' preventative maintenance instructions required in the contract in electronic format in accordance with the Product Type Maintenance specification of the LCie model.

## 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 Maintenance	31-40 50 00 Commissioning Phase	34-35 17 00 Sub Contractor	32-21 00 00 Execution Services	4.4 Perform Commissioning

## 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 Maintenance 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.

- Job worksheet.
- Resource worksheet as needed.
- Document 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	-	Y	-	-
Job	-	Y	-	-
Document	-	Y	-	-
Attribute	-	-	-	-
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 maintenance data entry form
- Provide product type maintenance 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 maintenance data entry form
- Provide required resource data
- Provide required job data
- Provide required document 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 maintenance data entry form
- Provide user credential information (if needed)
- Provide required resource data
- Provide required job data
- Provide required document 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 resource data
- Updating job data
- Updating document 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 maintenance 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 type maintenance reports
- Product type parts reports
- Product type warranty reports

## EXAMPLES

The LCie project has two example projects, a duplex apartment and a medical clinic. For each example project, example product type maintenance COBie files have been created. The type, resource, job, and document worksheets in each product type maintenance file have been completed in accordance with the COBie instruction worksheet. Example product type maintenance files for both example projects can be found below.

### Duplex Apartment

- Example 1:
  - Input:
    - Prior building model  
(DuplexApartment\_ProductTypeMaintenance\_SwingingDoor\_0.750\_before)
    - Exported template for Product Type Maintenance (URL)
    - Completed template for Product Type Maintenance  
(DuplexApartment\_ProductTypeMaintenance\_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 (URL)
  - Exported template for Product Type Maintenance (DuplexApartment\_ProductTypeMaintenance\_SwingingDoor\_0.885\_before)
  - Completed template for Product Type Maintenance (DuplexApartment\_ProductTypeMaintenance\_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\_ProductTypeMaintenance\_DoorTypeA\_before)
    - Exported template for Product Type Maintenance (URL)
    - Completed template for Product Type Maintenance (MedicalClinic\_ProductTypeMaintenance\_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\_ProductTypeMaintenance\_DoorTypeB\_before)
    - Exported template for Product Type Maintenance (URL)
    - Completed template for Product Type Maintenance (MedicalClinic\_ProductTypeMaintenance\_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=ProductTypeMaintenance
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 doProductTypeMaintenance batch file