

# Life Cycle information exchange (LCie): Product Parts Replacement

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## BACKGROUND

During the operations of a facility products will have to be maintained. The capture of information about the work accomplished on a specific product might include, for example, the use of replacement parts to repair or maintain that equipment. For most facility management tasks the specific corrections made to a given piece of equipment are not documented.

## BUSINESS CASE

The determination of the minimum level replacement parts and lubricants for facilities is essential for the facility manager to have the right balance of minimizing facility down-time and also minimizing cost of parts in inventory. With through a standard method for collection of the parts and lubricants used during facility operations, standard inventory control models may be correctly applied to facility management business practices.

## EXAMPLE CONTRACT CLAUSE

The processing of work orders and preventative maintenance tickets is often based upon the underlying CMMS/CAFM software utilized. Facility managers using CMMS/CAFM systems should require that in addition to simply reporting the completion of a given work order that the status of the equipment and any parts used by mandatory data fields.

## 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 | OmniClass Table 34 | OmniClass Table 32 | Activity Node Tree |
|----------------|--------------------|--------------------|--------------------|--------------------|

|                       | Phase  | Actors                                     | Services                                    |                              |
|-----------------------|--|--|---|------------------------------|
| Equipment replacement | <b>31-50 20 11</b><br>Facility Operation Phase | <b>34-41 21 00</b><br>Facility Maintenance | <b>32-41 47 11 11</b><br>Facility Repairing | <b>5.4</b> Develop Solutions |

## 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

Project Definition 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.

- Attribute worksheet.
- (Optional) Spare worksheet.
- (Optional) 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  | Y               | -        | -            | -             |
| System     | -               | -        | -            | -             |
| Spare      | -               | -        | -            | Y             |
| 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
- Select specific product component from current product type
- Generate product parts replacement COBie worksheet
- Provide product parts replacement COBie worksheet

#### 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 parts replacement data entry form
- Provide required component data
- Provide required attribute data
- (Optional) Provide spare data
- (Optional) Provide 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

- Access product parts replacement data entry form
- Provide user credential information (if needed)
- Provide required component data
- Provide required attribute data
- (Optional) provide spare data
- (Optional) provide 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 component
- Updating mandatory component information
- Updating attribute information

- (Optional) Updating spare information
- (Optional) Updating document information
- 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 parts replacement 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 parts replacement reports

## EXAMPLES

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

### Duplex Apartment

- Example 1:
  - Input:
    - Prior building model (DuplexApartment\_ProductPartsReplacement\_Doors--Door-3\_before)
    - Exported template for Product Parts Replacement (URL)
    - Completed template for Product Parts Replacement (DuplexApartment\_ProductPartsReplacement\_Doors--Door-3)
  - 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\_ProductPartsReplacement\_Door-2A12\_before)
- Exported template for Product Parts Replacement (URL)
- Completed template for Product Parts Replacement (MedicalClinic\_ProductPartsReplacement\_Door-2A12)
- 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=ProductPartsReplacement
rem Replace %1 with MedicalClinic or DuplexApartment
set a1=%1
rem Replace %2 with appropriate component name
set a2=%2

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

time /t
```

Figure 1 doProductPartsReplacement batch file