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# FM Handover (COBie2) MVD Workspace Guide

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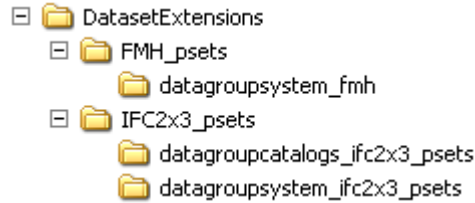
## Notes

Committed to interoperability, Bentley is currently developing the IFC export utility delivered with Bentley Architecture [www.bentley.com/architecture](http://www.bentley.com/architecture) to support the buildingSMART 'FM Handover' Model View Definition (MVD). IFC-files compliant with this MVD can be transformed into COBie2 spreadsheets with the BimServices utility of AEC3. As certification for the FM Handover MVD is not available yet, Bentley's support for this MVD and COBie2 is to be regarded as 'Beta', 'Uncertified' and 'Work in Progress'.

Bentley Architecture supports the FM Handover MVD by extending the installed workspace with 'dataset extensions' that include the IFC2x3 and additional FMH property sets. These files are available from the COBIE project website of the buildingSMART Alliance <http://projects.buildingsmartalliance.org>. for testing and pilot projects.

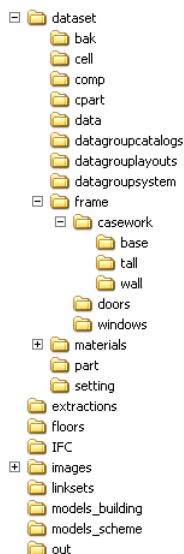
## FM Handover workspace

- create a subfolder 'DatasetExtensions' in the 'Bentley\MicroStation\WorkSpace\TriForma' folder
- unzip 'FMH\_DatasetExtensions.zip' with the 'Use Folder Names' option set to 'on'; this creates two subfolders FMH\_psets and IFC2x3\_psets



## Project folders

- copy an appropriate Bentley Architecture project template and rename to desired project name
- copy a Bentley Architecture Project Configuration File (\*.pcf) and rename to <projectname>.pcf
- add a sub-folder 'IFC' to the project folder
- add the following sub-folders to the project dataset
  - datagrouppcatalogs
  - datagroupsystem
  - settings
- add further sub-folders to the project dataset as required, e.g.
  - datagrouplayouts
  - frame\door
  - frame>window
  - frame\casework\base
  - frame\casework\tall
  - frame\casework\wall
  - etc.



## Project Configuration File

- Open the Project Configuration File for the project, i.e. <projectname>.pcf
- Ensure that the correct dataset is configured, e.g.  
 TF\_DATASETNAME = ArchDatasetNcsUS

- Add the following configuration variables:

```

#===== FM Handover MVD Support =====
# Append search path for any additional project-level portion of the dataset as required
# (these folders need to be added manually to the project dataset)
#-----
ATFDIR_CELL < $(PROJ_DATASET)cell
MS_CELLLIST < $(PROJ_DATASET)cell/*.*
DG_CATALOGS_PATH < $(PROJ_DATASET)datagroupcatalogs/
DG_SCHEDULE_LAYOUT_PATH < $(PROJ_DATASET)datagrouplayouts/
DG_PATH < $(PROJ_DATASET)datagroupsystem/
TFDIR_FRAME < $(PROJ_DATASET)frame/
ATFDIR_Window < $(PROJ_DATASET)frame/windows/
ATFDIR_Door < $(PROJ_DATASET)frame/doors/
ATFDIR_CASEBASE < $(PROJ_DATASET)frame/casework/base/
ATFDIR_CASETALL < $(PROJ_DATASET)frame/casework/tall/
ATFDIR_CASEWALL < $(PROJ_DATASET)frame/casework/wall/
TFDIR_SETTING = $(PROJ_DATASET)setting/
IFC_PART_MAPPING = $(PROJ_DATASET)setting/ifcmapping.set

#-----
# Define folder for IFC imports and exports
#-----
TFDIR_IFC = $_(USTN_PROJECTDATA)IFC/

#-----
# Define directory for ifcimportdgooverrides.set and ifcdgooverrides.set
#-----
IFC_PROPERTY_OVERRIDES = $(PROJ_DATASET)setting/

#-----
# Define file for mapping of Parts to IFC entities
#-----
# IFC_PART_MAPPING = $(PROJ_DATASET)setting/ifcmapping.set

#-----
# Append search paths to support the IFC 'FM Handover (COBie 2)' Model View Definition
# (folders and files created by unzipping 'FMH_DatasetExtensions.zip'
# in ...\\Workspace\\Triforma with 'create folder option' on)
#-----
IFC_Psets = $(TF_DATASETS)DatasetExtensions/IFC2x3_psets/
DG_PATH < $(IFC_Psets)datagroupsystem_ifc2x3_psets/

FMH_DATASET = $(TF_DATASETS)DatasetExtensions/FMH_psets/
DG_PATH < $(FMH_DATASET)datagroupsystem_fmh/

#-----
# Set default IFC Export to IFC2x3
#-----
IFC_VERSION = 2x3
  
```

```
#-----
# Make duplicate asset and spatial object names unique according to COBie2 requirement
#-----
TFIFC_UNIQUE_NAMES          = 1

#===== FM Handover MVD Support =====
```

## Project Hierarchy

### DataGroup catalog items

- using the DataGroup catalog editor, create catalog items in <project>\dataset\datagroupcatalogs for Project, Building, Site, Zone, Floors, Spaces, HVAC Devices, PlumbingFixtures, EnergyConversionDevices, etc. as required, e.g.

**Note: make sure the catalog items are created in the appropriate xml-files in the <projectname>/dataset/datagroupcatalogs folder**

#### Project:

Definition	Property	Value
FMH_Project	Project/Name	NBH
FMH_Project	Project/Description	
FMH_Project	Project/LongName	Neues Bauen am Horn, Weimar
FMH_Project	Project/Phase	Design
pset_projectcommon	ConstructionMode	
pset_projectcommon	BuildingPermitId	
pset_projectcommon	GrossAreaPlanned	

#### Site:

Definition	Property	Value
FMH_Site	Site/Name	Baufeld J
FMH_Site	Site/LongName	
FMH_Site	Site/Description	
FMH_Site	Site/City	Weimar
FMH_Site	Site/State	
FMH_Site	Site/Zip	99423
FMH_Site	Site/Country	Germany
FMH_Site	Site/Latitude	
FMH_Site	Site/Longitude	
FMH_Site	Site/Address	Albrecht-Duerer-Strasse 18
FMH_Site	Site/BaseQuantities/Perimeter	
FMH_Site	Site/BaseQuantities/Elevation	
FMH_Site	Site/BaseQuantities/GrossArea	
FMH_Site	Site/BaseQuantities/ExcavationBackfillVol.	
FMH_Site	Site/BaseQuantities/ExcavationCutVolume	
pset_sitecommon	Description	

#### Building:

Definition	Property	Value
ArchBuilding	Building Name	NBH-Haus-J.1
ArchBuilding	ID	
ArchBuilding	Description	
ArchBuilding	Address 1	Albrecht-Duerer-Strasse 18
ArchBuilding	Address 2	
ArchBuilding	City	Weimar
ArchBuilding	State	
ArchBuilding	Country	Germany
ArchBuilding	Postal Code	99423
ArchBuilding	Year Constructed	
ArchBuilding	Gross Area	
ArchBuilding	Description 1	Neues Bauen am Horn - Baufeld J -
ArchBuilding	Description 2	
ArchBuilding	Notes	
ArchBuilding	Web Address	
FMH_Building	Building/BuildingConstructionType	
FMH_Building	Building/BuildingUseClassification	
FMH_Building	Building/LongName	
FMH_Building	Building/BaseQuantities/Elevation	
FMH_Building	Building/BaseQuantities/Height	
pset_buildingcommon	MainFireUse	

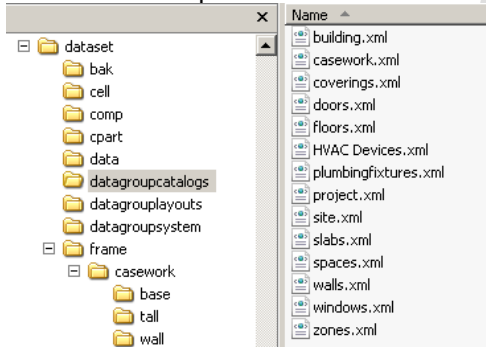
#### Floor:

Definition	Property	Value
ArchFloor	Floor Name	Ground Floor
ArchFloor	Finished Floor Elevation	100
ArchFloor	Description	
ArchFloor	Approx. Length	200000
ArchFloor	Approx. Width	120000
ArchFloor	DEM Template	
ArchFloor	Cut Plane Delta	1000
ArchFloor	Forward View Depth	20000
ArchFloor	Reflected View Depth	5000
ArchFloor	Typical Floor	<input type="checkbox"/>
ArchFloor	Typical Floor Height	
ArchFloor	Typical Floor Base Elevation	
ArchFloor	ACS Rotation Angle	
ObjectDiscipline	Discipline	
StructuralFloorCommon	Column Splice Floor	<input type="checkbox"/>
FMH_Floor	Floor/LongName	Ground Floor
FMH_Floor	Floor/BaseQuantities/Elevation	0
FMH_Floor	Floor/BaseQuantities/NetHeight	2900
FMH_Floor	Floor/BaseQuantities/Perimeter	
FMH_Floor	Floor/BaseQuantities/GrossVolume	
FMH_Floor	Floor/BaseQuantities/StoreyHeight	3100
pset_buildingstoreycommon	EntranceLevel	<input checked="" type="checkbox"/>
pset_buildingstoreycommon	AboveGround	<input checked="" type="checkbox"/>

### Zone:

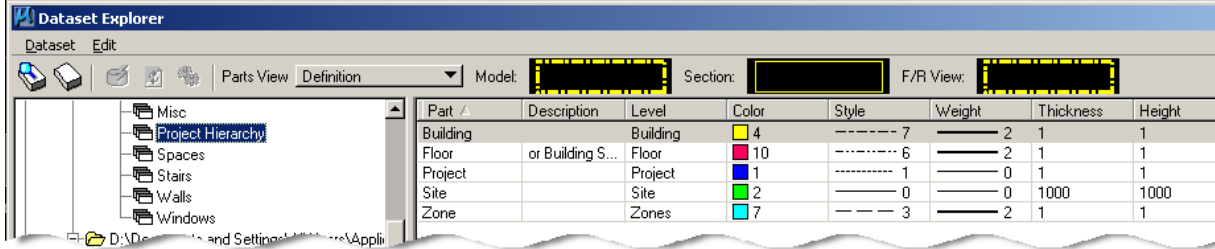
Definition	Property	Value
FMH_Zone	Name	Flat 1
FMH_Zone	Description	Flat Number One
FMH_Zone	Reference	
pset_zonecommon	Reference	
pset_zonecommon	Category	
pset_zonecommon	GrossAreaPlanned	
pset_zonecommon	NetAreaPlanned	
pset_zonecommon	PubliclyAccessible	<input type="checkbox"/>
pset_zonecommon	HandicapAccessible	<input type="checkbox"/>
pset_zonecommon	OccupancyType	Residential
pset_zonecommon	OccupancyNumber	0
pset_zonecommon	NaturalVentilation	<input checked="" type="checkbox"/>
pset_zonecommon	NaturalVentilationRate	0
pset_zonecommon	MechanicalVentilationRate	0
pset_zonecommon	Description	
pset_zonecommon	maxCeilingHeight	2800
pset_zonecommon	maxFlooringHeight	100

These DataGroup items are stored in the corresponding xml-files in the datagroupcatalogs folder.

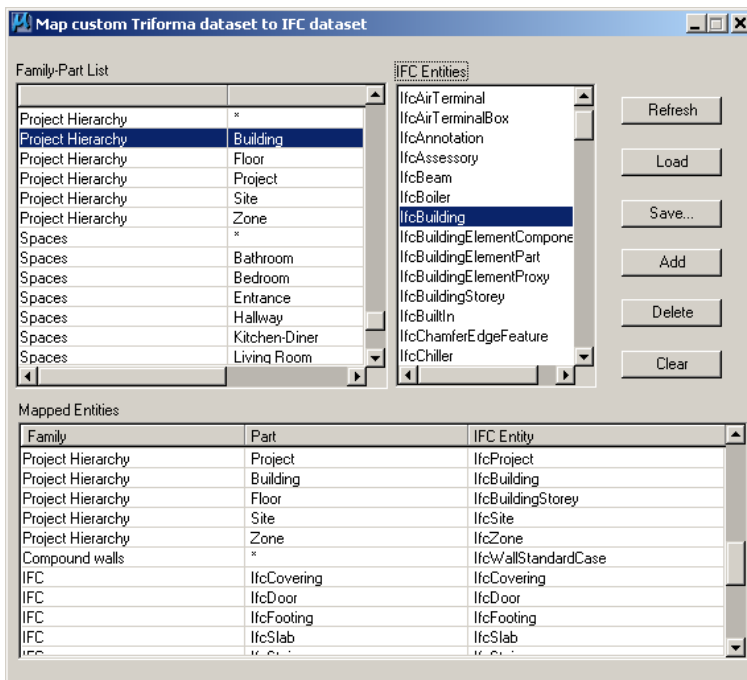


### Parts

- using the Dataset Explorer, create a Part family, e.g. 'ProjectHierarchy' or similar
- create Parts for Project, Building, Site, Zone, Floor (Building Storey) and define Levels and Symbology as desired, e.g.

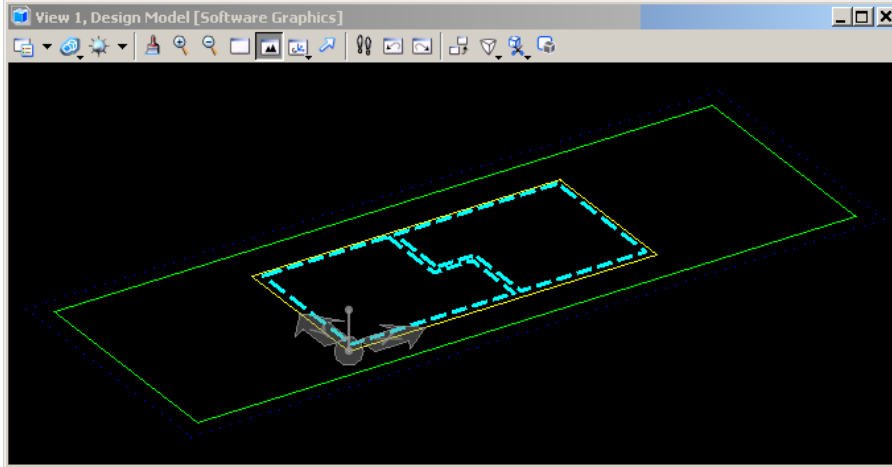


- open the 'Map custom TriForma dataset to IFC dataset via key-in 'ifcmap'
- map the Family/Parts to the corresponding IfcEntity  
**Note: make sure the entries are written to the ifcmapping.set file in the <projectname>/dataset/settings folder**



## Placement

- create a Bentley Architecture file for Project information, e.g. <projectname>.dgn  
**Note: this is the file from which the IFC Export will be initiated.**
- place MicroStation shapes for Project, Site, Building, and Zone (if desired) with the appropriate Family/Part active (alternatively, the Family/Part can be applied afterwards using the 'Apply Part' tool), e.g.



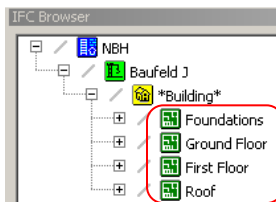
- ❑ attach the appropriate DataGroup instance data to the shapes using the 'Add Instance Data' tool

## Floors (Building Storeys)

- ❑ create a design file for each floor, e.g. Foundation.dgn, Floor1.dgn, Floor2.dgn, Roof.dgn, ...
- ❑ in <projectname>.dgn, attach the 'floor' design files as references

Slot	File Name	Model	Description	Logical	Orientation	Presentation	Visible	Locked
1	Foundation.dgn	Design Model	Aligned with Master...	Foundations	Coincident	Wireframe	✓	✓
2	Ground Floor.dgn	Design Model	Aligned with Master...	Ground Floor	Coincident	Wireframe	✓	✓
3	First Floor.dgn	Design Model	Aligned with Master...	First Floor	Coincident	Wireframe	✓	✓
4	Roof.dgn	Design Model	Aligned with Master...	Roof	Coincident	Wireframe	✓	✓

Note: the logical names will be exported to IFC as the Building Storey (Floor) names:

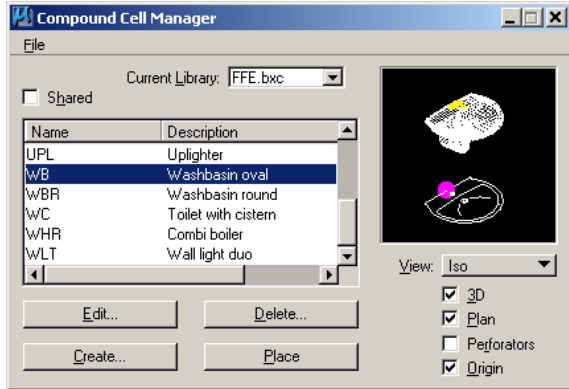


## FFE and MEP Components

### Compound Cells

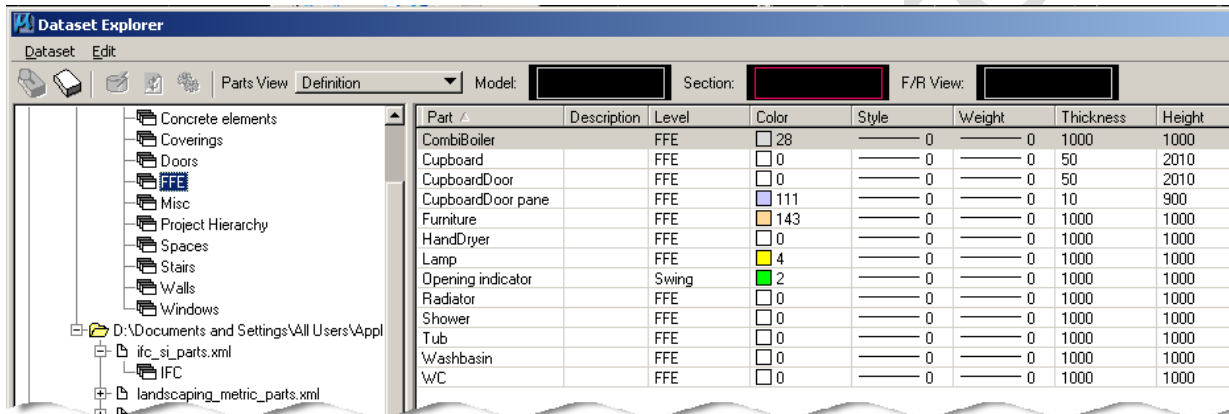
- ❑ using the Compound Cell Manager, create compound cells comprising 3D, Plan, and origin for FFE (furniture, fixture, equipment) and MEP (mechanical, electrical, plumbing) devices as require, e.g.



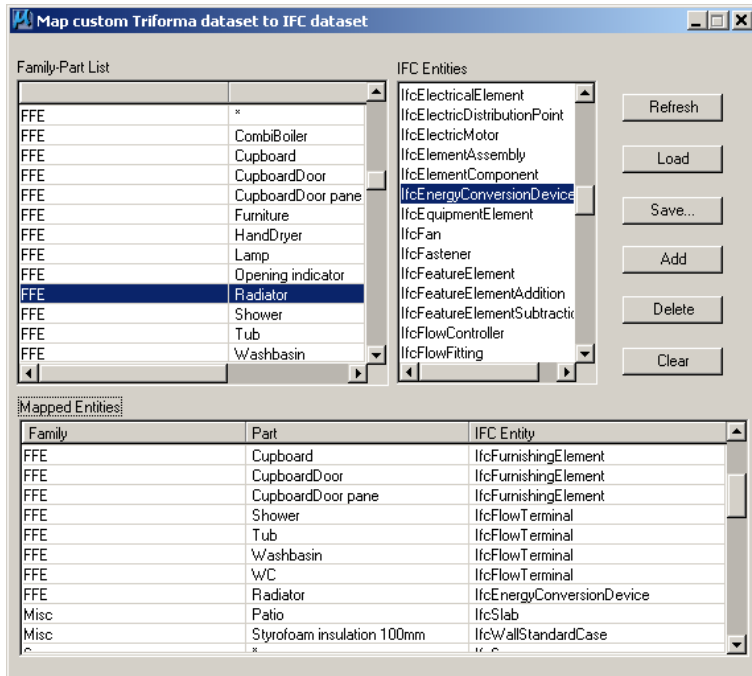


## Parts

- using the Dataset Explorer, create corresponding Families and Parts, e.g.

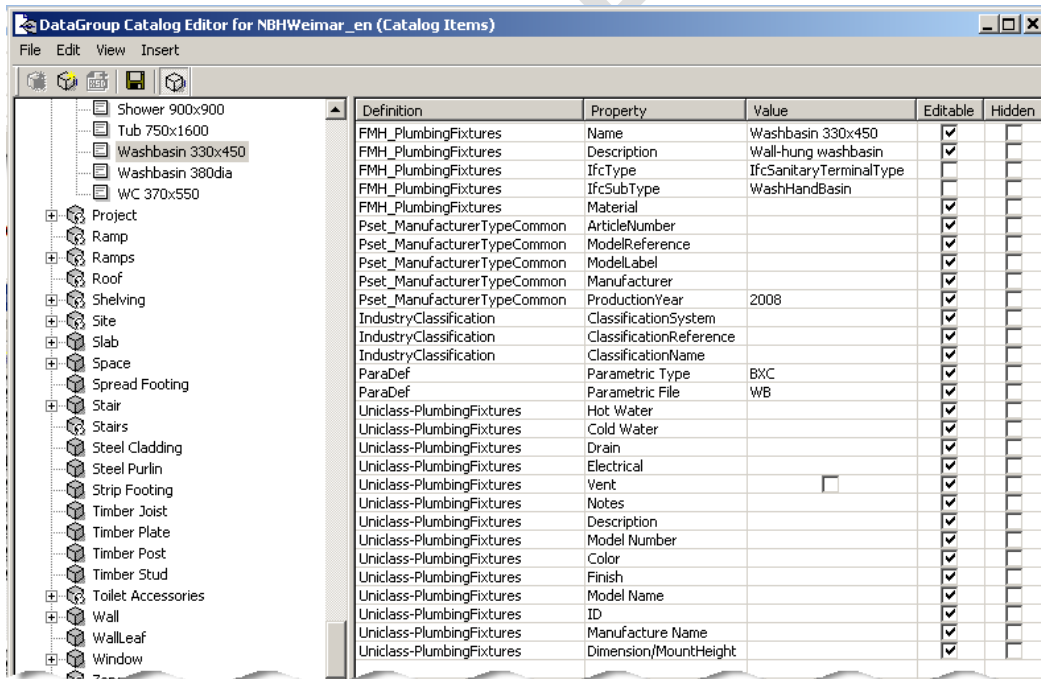


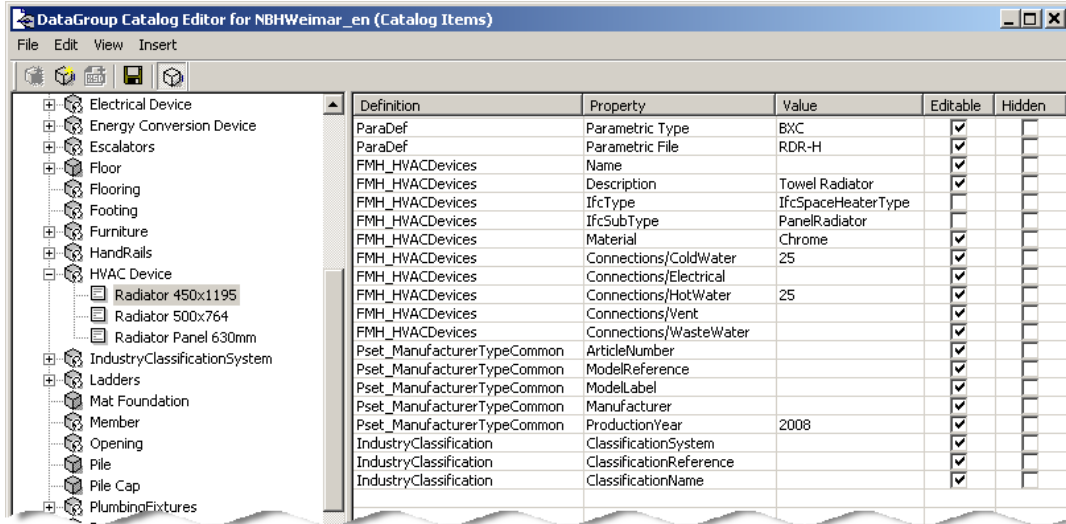
- open the 'Map custom TriForma dataset to IFC dataset via key-in 'ifcmap'
- map the Family/Parts to the corresponding IfcEntity  
**Note: make sure the entries are written to the ifcmapping.set file in the <projectname>/dataset/settings folder**



### DataGroup catalog items

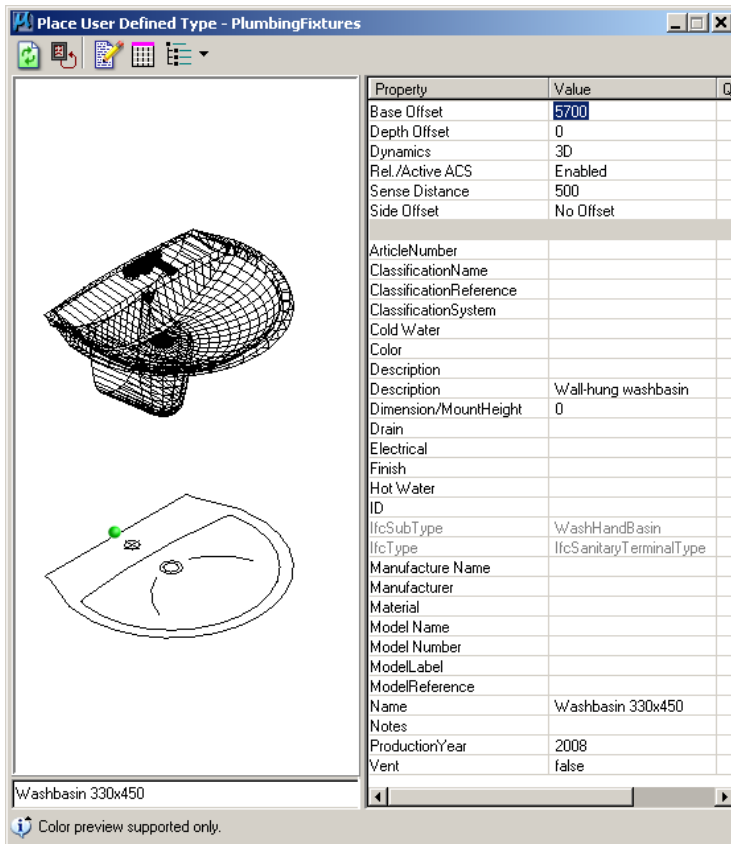
- ❑ create corresponding DataGroup catalog items for FFE and MEP components with appropriate IfcTpe and IfcSubType data, e.g.

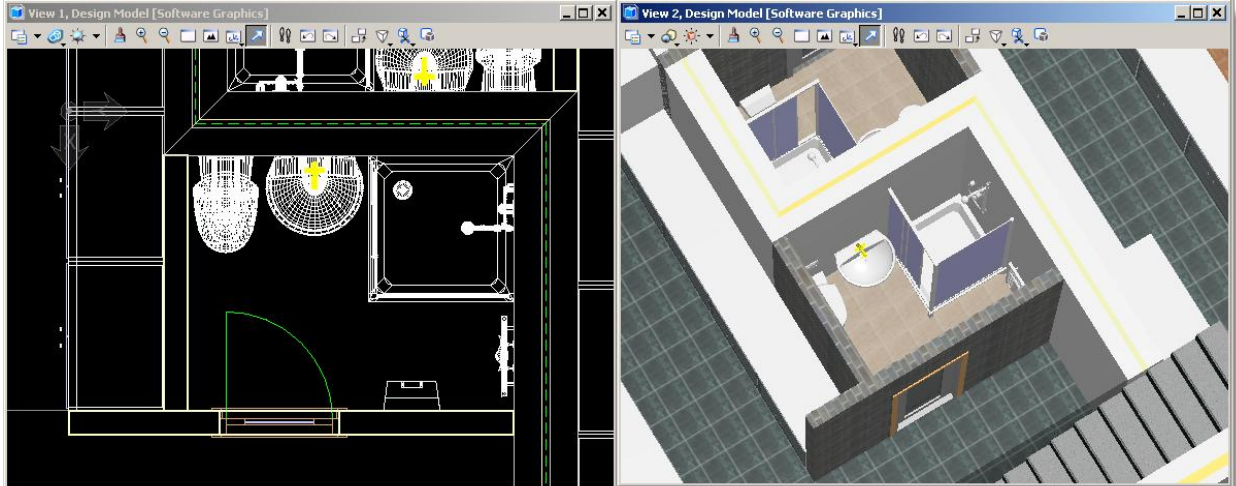




## Placement

- using the 'Place User Defined Type' tool, place FFE and MEP components, e.g.

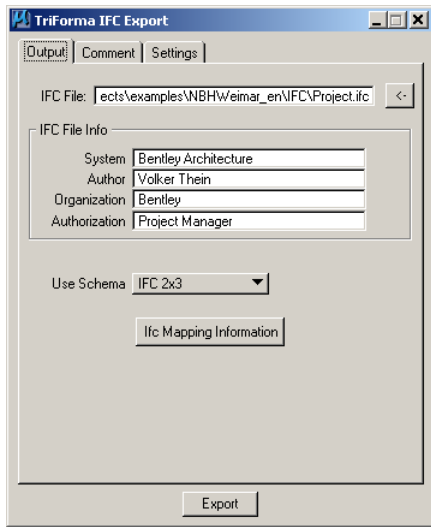




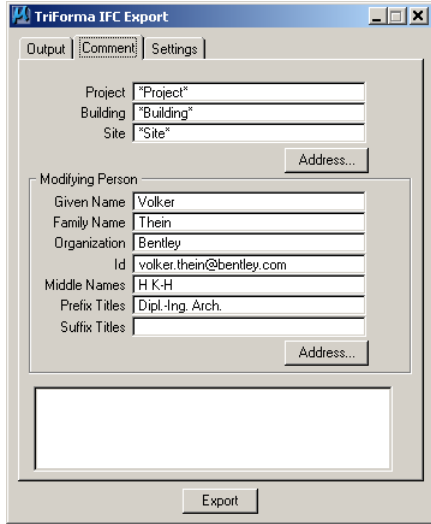
- if necessary, apply the appropriate Family and Part to the components using the 'Apply Part' tool

## IFC export

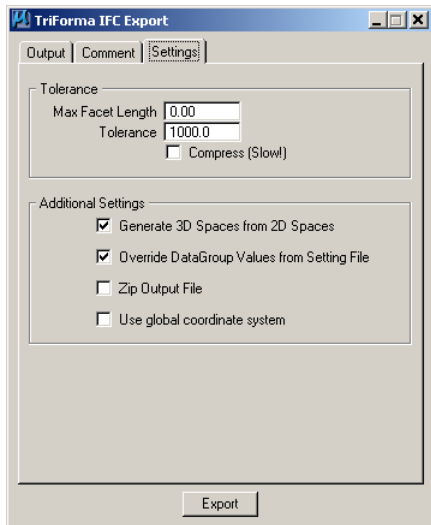
- open the TriForma IFC Export tool (File > Export > IFC)
- if desired, change the destination folder for the IFC File and change the file name  
default folder set by configuration variable TFDIR\_IFC; default name <dgnfilename>.ifc
- enter IFC File Info
- use Schema 'IFC 2x3'
- if not done previously, click the 'Ifc Mapping Information' button and map Families/Parts to IfcEntities



- As there should be shapes for Project, Building, and Site in the design file, names for Project, Building, and Site don't need to be entered, because they are exported from the instance data on the shapes
- Enter data for the Modifying Person  
**Note: for 'Id', enter an email address**



- Tick 'Generate 3D Spaces from 2D Spaces' and 'Override DataGroup Values from Setting File'



- click the 'Export' button to create the IFC-file

## BIMservices

- if necessary download the BimServices suite of command line utilities from [http://www.aec3.com/6/6\\_04.htm](http://www.aec3.com/6/6_04.htm) and install  
**Note: The tools are offered with no warranty or support, but comments are welcome. Please contact the author [nn@aec3.com](mailto:nn@aec3.com), especially if you would like to be notified of any enhancements, issues or new configuration files.**
- open a Command Prompt window (Programs > Accessories > Command Window)
- run the 'Transform1' utility according to the instructions and references supplied with the BimServices
- open the resulting <IfcFilename>\_asCOBie226.xlsb file (right-click on the file and choose Open With > Microsoft Office Excel  
**Note: you can save the file as .xlsx**

	A	B	C	D	E	F	G	H
	Name	CreatedBy	CreatedOn	TypeName	Space	Description	ExtSystem	ExtObject
60	Radiator 207.F2-207	volker.thein	2010-02-08	Radiator 500x765	F2-207	Towel Radiator	TriForma	IfcEnergyConversionDevice
61	Wall light duo.F2-207	volker.thein	2010-02-08	Wall light duo	F2-207	2-light wall lamp	TriForma	IfcFlowTerminal
62	Candellabra_6 lights.F2-105	volker.thein	2010-02-08	Candellabra_6 lights	F2-105	6-light candellabra	TriForma	IfcFlowTerminal
63	Wall light duo.F1-204	volker.thein	2010-02-08	Wall light duo	F1-204	2-light wall lamp	TriForma	IfcFlowTerminal
64	Wall light duo.F1-104	volker.thein	2010-02-08	Wall light duo	F1-104	2-light wall lamp	TriForma	IfcFlowTerminal
65	Wall light duo.F2-107	volker.thein	2010-02-08	Wall light duo	F2-107	2-light wall lamp	TriForma	IfcFlowTerminal
66	Electric Hand Dryer.F1-103	volker.thein	2010-02-08	Elec Hand Dryer	F1-103	Electric Hand Dryer	TriForma	IfcEnergyConversionDevice
67	Combi Boiler.F2-207	volker.thein	2010-02-08	Combi Boiler	F2-207	Combination boiler hot water and central heating	TriForma	IfcEnergyConversionDevice
68	Floor Tiles.F2-207	volker.thein	2010-02-08	Floor Tiles	F2-207	Ceramic Floor Tiles	TriForma	IfcCovering
69	Slate.F2-208	volker.thein	2010-02-08	Slate	F2-208	Slate Tiles	TriForma	IfcCovering
70	Washbasin 2072.F2-207	volker.thein	2010-02-08	Washbasin 380dia	F2-207	Wall-hung waschbasin 380 mm diameter	TriForma	IfcFlowTerminal
71	KUE 2021-1.F1-202	volker.thein	2010-02-08	Cabinet_base 937.5mm	F1-202	Base cabinet with glass doors	TriForma	IfcFurnishingElement
72	Doors--Door	volker.thein	2010-02-08	Swinging Door 1.250	F1-104	2,Ground Floor.dgn,Design Model:34027	TriForma	IfcDoor
73	Windows--Window-12	volker.thein	2010-02-08	Skylight	F2-108	4,Roof.dgn,Design Model:10229	TriForma	IfcWindow
74	Slate.F1-204	volker.thein	2010-02-08	Slate	F1-204	Slate Tiles	TriForma	IfcCovering
75	ESP 102-2.F1-102	volker.thein	2010-02-08	Cabinet_tall 1025mm	F1-102	Tall cabinet with glass doors	TriForma	IfcFurnishingElement
76	Doors--Door-2	volker.thein	2010-02-08	Swinging Door 1.250	F1-204	2,Ground Floor.dgn,Design Model:33485	TriForma	IfcDoor
77	KUE 1022-3.F1-102	volker.thein	2010-02-08	Cabinet_base 937.5mm	F1-102	Base cabinet with glass doors	TriForma	IfcFurnishingElement
78	Floor Tiles.F1-203	volker.thein	2010-02-08	Floor Tiles	F1-203	Ceramic Floor Tiles	TriForma	IfcCovering
79	Tub 207.F2-207	volker.thein	2010-02-08	Tub 750x1601	F2-207	Bathtub 750 x 1600 mm	TriForma	IfcFlowTerminal
80	FFE--Radiator.F1-103	volker.thein	2010-02-08	Radiator 500x764	F1-103	Towel Radiator	TriForma	IfcEnergyConversionDevice
81	Windows--Window-5	volker.thein	2010-02-08	Fixed Glazing with single Caser	F2-205	3,First Floor.dgn,Design Model:27131	TriForma	IfcWindow
82	Wooden Flooring.F1-201	volker.thein	2010-02-08	Wooden Flooring	F1-201	Wooden Flooring	TriForma	IfcCovering
83	ESP 202-1.F1-202	volker.thein	2010-02-08	Cabinet_tall 1025mm	F1-202	Tall cabinet with glass doors	TriForma	IfcFurnishingElement
84	Slate.F1-104	volker.thein	2010-02-08	Slate	F1-104	Slate Tiles	TriForma	IfcCovering
85	Windows--Window-11	volker.thein	2010-02-08	Skylight	F2-208	4,Roof.dgn,Design Model:10364	TriForma	IfcWindow
86	Washbasin 1072.F2-107	volker.thein	2010-02-08	Washbasin 380dia	F2-107	Wall-hung waschbasin 380 mm diameter	TriForma	IfcFlowTerminal