

Content

Prologue..... 16

1 Introduction: openBIM and buildingSMART20

1.1 buildingSMART as Home of openBIM21

1.2 The History of IFC (Industry Foundation Classes).....23

2 Basic knowledge30

2.1 Digitalisation basics32

2.2 International standardisation.....36

2.2.1 ISO 16739-1 – Industry Foundation Classes (IFC).....36

2.2.2 ISO 12006-3 – Framework for object-oriented information (for bSDD)36

2.2.3 ISO 19650 series – Information management using BIM37

2.3 Tools41

2.3.1 BIM software applications41

2.3.2 Collaboration platforms / Common Data Environment CDE.....43

2.3.3 Data structure tools.....44

2.4 Technical basics of openBIM45

2.4.1 IFC data schema45

2.4.2 bSDD platform.....46

2.4.3 IDM methodology.....48

2.4.4 UCM platform49

2.4.5 MVD concept.....50

2.4.6 IDS format51

2.4.7 Software certification and IFC validation service51

2.4.8 BCF comments53

2.4.9 DataSheets54

2.5 Organisation55

2.5.1 Roles and service specifications55

2.5.2 BIM implementation documents58

2.5.3 openBIM collaboration61

3 Advanced knowledge64

3.1 Standardisation.....67

3.1.1 International standards68

3.1.2 European standards69

3.1.3 Standards in Austria.....70

3.1.4 Standards in Switzerland73

3.1.5 Standards in Germany74

3.2	IFC – Industry Foundation Classes	75
3.2.1	Overview of data schema, file format, and file.....	75
3.2.2	Basics of IFC data schema.....	77
3.2.3	Contents of an IFC file	86
3.2.4	Epilogue.....	105
3.3	Model View Definition (MVD)	106
3.3.1	Benefits of MVDs.....	106
3.3.2	Established MVDs and their objectives	106
3.3.3	Future MVDs and their objectives	107
3.4	BCF comments	109
3.5	Common Data Environment (CDE)	112
3.5.1	Development history.....	112
3.5.2	Objectives of a CDE	114
3.5.3	Criteria for a CDE.....	115
3.6	Level of Information Need (LOIN) and level of detail (LOG, LOI)	116
3.6.1	Methods in EN 17412-1 vs. established practice.....	117
3.6.2	Procedure for determining the Level of Information Need	117
3.6.3	Processing in practice (in a project)	118
3.6.4	Application example	119
3.6.5	Terms in the application.....	122
3.7	IDS – Information Delivery Specification.....	123
3.7.1	Data structure.....	124
3.7.2	Relation between IDS and IFC	126
3.7.3	Relation to the bSDD	128
3.7.4	Facet parameters.....	128
3.7.5	Simple values and complex restrictions	130
3.7.6	Scope and usage of IDS	131
3.7.7	Relation to other initiatives	132
3.7.8	Different ways to visualise IDS	132
3.8	bSDD – buildingSMART solution for data dictionaries	135
3.8.1	User groups and use cases.....	136
3.8.2	Practical usage	138
3.8.3	Content of bSDD.....	138
3.8.4	Referencing from bSDD to IFC	141
3.8.5	Referencing to bSDD in IDS	144
3.8.6	Publishing content in bSDD.....	144

Content

3.9	UCM – buildingSMART Use Case Management Service.....	145
3.9.1	Basics	145
3.9.2	UCM Service, an offer from buildingSMART International	146
3.9.3	Information management and use cases in openBIM projects.....	148
3.9.4	Development of a use case.....	149
3.9.5	Outlook Use Case Management Service	152
4	BIM project implementation	154
4.1	Project initiative.....	165
4.1.1	Determining the project-related objectives.....	165
4.1.2	Determining the financing model.....	166
4.1.3	Coordinating the performance indicators	166
4.2	Project initiation.....	168
4.2.1	Identify and compile project-related requirements.....	168
4.2.2	Creating and setting up the BIM service specifications, BIM implementation documents, contracts	169
4.2.3	Model-supported requirements design (requirements model).....	170
4.2.4	Basic structure (surveying, as-built model, terrain model).....	171
4.2.5	Tendering, awarding, and installation of the collaboration platform.....	172
4.2.6	Tendering and awarding of design services.....	172
4.2.7	Conduction of model-based studies/competitions.....	173
4.2.8	Organisation of the design team / Design Contractor review.....	173
4.2.9	Verification of the Design Contractor’s qualification.....	176
4.3	Design (planning).....	177
4.3.1	Handover of the basis models and documents to the Design Contractor... ..	177
4.3.2	Structure of the model basics	178
4.3.3	Organisation of collaboration.....	182
4.3.4	Performing model management / BIM quality management.....	186
4.3.5	Conducting the coordination meetings	194
4.3.6	Performing the information delivery	198
4.3.7	Performing the model-based cost calculation.....	199
4.3.8	Updating the project specifications during design.....	200
4.3.9	Updating the model data.....	200
4.3.10	Model-based building permission process	201
4.3.11	Performing test run of the connection to the operator's CAFM system	203

Content

4.4 **Procurement – tendering and awarding..... 204**

4.4.1 Assessment and need/requirement..... 204

4.4.2 Preparing and performing the tender..... 206

4.4.3 Tendering proposal / bid 207

4.4.4 Awarding (procurement) / appointing party 208

4.5 **Construction 211**

4.5.1 Performing the model-based construction scheduling 211

4.5.2 Performing the assembly and work planning (A+W planning)..... 212

4.5.3 Performing the as-built documentation during construction 214

4.5.4 Performing the model-based product documentation 216

4.5.5 Compiling and handover of construction documentation 217

List of BIM relevant standards..... 218

List of Figures 221