INTEROPERABILITY TESTS BETWEEN IFC CERTIFIED SOFTWARE FOR OPEN BIM BASED QUALITY ASSURANCE

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ABSTRACT: The construction industry consists of various and massive architectural information as an architectural process includes a variety of design stages with cooperation of many disciplines. A Building Information Modeling (BIM) serves as a shared knowledge resource for information about a facility forming a reliable basis for decisions during its life-cycle from inception onward. buildingSMART has developed Industry Foundation Classes(IFC) standard for interoperability of BIM based information. Several software tools are already IFC-compliant. However, there are a lot of problems related to efficient interoperability of software owing to the lack of guide regarding the software usage and insufficiency IFC interfaces of software. The purpose of this study is to suggest efficient IFC support interface development methodologies of existing IFC certified software. The scope of this study is interoperability test for open BIM based quality assurance. To achieve this purpose, the authors have classified subject of open BIM based quality assurance and investigated IFC certification process and certified software. In addition, the authors have exported and imported via IFC files using different IFC interfaces in the software for interoperability of architectural objects and their properties. Finally, the authors have suggested IFC support interface development methodologies and hereafter direction for efficient interoperability of IFC certified software based on open BIM

Keywords: Building Information Modeling (BIM), Industry Foundation Classes (IFC), Interoperability, Quality Assurance, IFC Certified Software
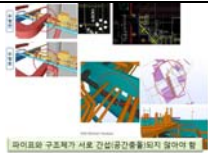
1. BIM

A Building Information Modeling (BIM) is a digital representation of physical and functional characteristics of a facility. The construction industry consists of various and massive information as a construction process includes a variety of stages with cooperation of many disciplines. BIM applies parametric technology and intelligent building objects (wall, slab, window, door, etc.) can represent property (function, structure, usage, regulation information). Therefore, BIM is possible application in various disciplines.

2. QUALITY ASSURANCE BASED ON OPEN BIM

Quality Assurance (QA) can be divided according to target and subject of works as following (Table 1).

Table. 1 Classification of Quality Assurance based on Open BIM

QA for Physical Information	QA for Logical Information	Data Quality
• Required shape expression for individual components • Suitable location for individual field's models • Clash between spaces for individual field's	• Suitability of required information for individual components (based current law/regular) • Circulation system for fire projection and egress	• Suitability of shape expression method • Validation of inputting data properties

3. INTEROPERABILITY TESTS BETWEEN IFC CERTIFIED SOFTWARE

In this study, the authors have progressed interoperability tests as following.

- Architectural object: wall, window, door, slab, space(included geometry and property)
- Extension of property information that apply Property set(PSET): Pset_DoorFireResistance

Table. 2 Results and Problems of interoperability tests (Architectural object: Wall, Generated in Revit Architecture)
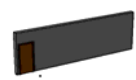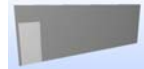
Wall		Orign(*.rvt)	ArchiCAD	Revit Architecture	Digital Project	SMC
Geometry	1.Center Line 2 Left Line 3. Right Line 4. Curve 5. L-connections					

Property	A. Type Name
	B. Material
		A-1. Family :
		  System Family:
		  Basic Wall
		A-2. Type :
		  1. Center_Line_Wall
		  2. Left_Line_Wall
		  3. Right_Line_Wall
		  4. Curve_Wall
		  5. L-connection_Wall
		
		B. Structure : Concrete
			A. ID :
			  1. Basic Wall:Cent
			  2. Basic Wall:Left
			  3. Basic Wall:Righ
			  4. Basic Wall:Curv
			  5. Basic Wall:L-co
			
			B. Cut Fill : Concrete
				A-1. Family :
				  System Family : Basic Wall
				A-2. Type :
				  1. Basic Wall:
				  Center_Line_Wall:135892
				  2. Basic Wall:
				  Left_Line_Wall:135721
				  3. Basic Wall:
				  Right_Line_Wall:135760
				  4. Basic Wall:
				  Curve_Wall:135797
				  5. Basic Wall:
				  L-connections_Wall:135824
				B. Structure : Concrete
					A. Type:
					  1. Basic Wall:
					  Center_Line_Wall:130035
					  2. Basic Wall:
					  Left_Line_Wall:130232
					  3. Basic Wall:
					  Right_Line_Wall:130361
					  4. Basic Wall:
					  Curve_Wall:131423
					  5-1. Basic Wall:
					  L-connectionsWall:131423
					  5.2. Basic Wall:
					  L-connections-Wall:131487
					B. Material: Concrete
						A. Name :
						  1. Basic Wall:
						  Center_Line_Wall:135892
						  2. Basic Wall:
						  Left_Line_Wall:135721
						  3. Basic Wall:
						  Right_Line_Wall:135760
						  4. Basic Wall:
						  Curve_Wall:135797
						  5. Basic Wall:
						  L-connections_Wall:135824
						B. Material : Concrete

Problems			ID have limitation (15 characters)	Output form of Type value is different	Name value is indicate in Part Number	Output form of Name value is different

Table. 3 Results and Problems of interoperability tests (PSET, Generated in Revit Architecture)

Door	Orign(*.rvt)	ArchiCAD	Revit Architecture	Digital Project	SMC
PSET/Property					

A. Pset_DoorFireResitance
 	
B. FireDoorCertification
  = True
C. FireDoorCategory
  = Gabjong
D. FireResistanceHours
  = 1.5
	A. Pset_DoorFireResitance
	  -none-
	B. FireDoorCertification
	  = True
	C. FireDoorCategory
	  = Gabjong
	D. FireResistanceHours
	  = 1.5
		A. Pset_Revit_Other
		
		B. FireDoorCertification
		  = True
		C. FireDoorCategory
		  = Gabjong
		D. FireResistanceHours
		  = 1.5
			A. Pset_DoorFireResitance
			  -none-
			B. FireDoorCertification
			  = -none-
			C. FireDoorCategory
			  = -none-
			D. FireResistanceHours
			  = -none-
				A. Pset_DoorFireResitance
				  -
				B. FireDoorCertification
				  = -
				C. FireDoorCategory
				  = -
				D. FireResistanceHours
				  = -
					A. Pset_Revit_Other
					
					B. FireDoorCertification
					  = True
					C. FireDoorCategory
					  = Gabjong
					D. FireResistanceHours
					  = 1.5

Problems	New PSET definition is impossible New PSET definition is possible by Pset_Revit_Other	Pset_Door_Resistance is defined by Pset_Revit_Other	Property is unexpressed	Property is unexpressed	Pset_Door_Resistance is defined by Pset_Revit_Other

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