

# ISPRS EuroSDR GeoBIM benchmark<sup>1</sup> 2019

# Task 2 – Options for **geo-referencing IFC** data

Results of the tests delivered by participants



<sup>&</sup>lt;sup>1</sup> https://3d.bk.tudelft.nl/projects/geobim-benchmark/

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# Autodesk Revit 2019

Software	Proprietary or	Software Name Autodesk Revit 2019					Software house Autodesk				
	Proprietary or open source software?					and of s	software	-			
So	proprietary				В	SIM					
Computer	Model and year	Operating system and version	CPU	GF	PU		Memory (RAM)	Hard capad		Hard drive free space	
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		ıl		it's almo	ost imn	nediate	,				
oref, l s it tal ately,	Rotate the mo	del		it's almo	ost imn	nediate	<b>!</b>				
ge does win	Query an obje	ect		it's almo	ost imn	nediate					
Before long de approx	Make a simple edit it's ali				ost imn	nediate	;				
Bel lol ap	Please, explai	n what edit was	made	Changi	ing size	of win	dow				
Georef erencin g tool	Query an object it's almost immediate  Make a simple edit it's almost immediate  Please, explain what edit was made Changing size of window  2.1) Are georeferencing tools available in the standard version of the software or are specific extensions or plugins required? They are available in the standard version of the software										
CRS	Managed CRS  • geographical CRS  • projected CRS										
Model orientation	6.1) As part of the georeferencing process, does the rotate the model in order to set the correct orientatio North?								es		
orie		the workflow ne orm the operation					set its orientation, Rotate True			, then from the	
_		the georeference lel to the correct				tware a	allow the user to	Yes	3		
Model location	7.1.1) What is needed to cor operation?	the workflow rectly perform th	e Base	hould be able to modify the N/S and E/W parameters of the Project Point. But, I get an error message that it cannot be placed more 6 kilometers from its startup location							
Mode		e supported coo to question 3) be						No			
	7.3.1) Which o	ones can be use	d for this ta	sk? C	Could n	ot find	any predefined	CRS	in Revit		
, <u>=</u>	Zoom into	the model to see	more deta	il it's a	almost i	immed	iate				
efer		odel		it's a	almost i	immed	iate				
geore ong d	Rotate the	model		it's a	almost i	immed	iate				
lon ta	Query an c	bject		it's a	almost i	immed	iate				
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	iviante a em	•			almost				1		
Settings		re-processing st able a correct a						the	No		
	9.2) short com	nments to the pre	evious ques	stion	I	do not	think that any p	arame	eters need	to be changed	
Export	10) How long	does it take for t	he georefer	enced r	model t	to be ex	xported to IFC?		1-5 minute	es	

# FME 2019.2

Ф	Software Na	ame	[version]		FME	[2019.2]	Software h	nous	e Safe S	Safe Software	
Software	Proprietary	or op	en source softv	ware?	Kind o	of software					
oft	proprietary				Extra	ct/Transform/Loa	ad				
0)	IFC Certifica	ation			Not ce	ertified					
Computer	Model and ye	ear	Operating system and version	CPU	GPU M		Memory (RAM)		Hard drive capacity	Hard drive free space	
Com	Dell Latitude 3400 x64 i7- 8586U MS Windows 10.0.18362 x64 i7-858			6U	GeForce MX- 130 NVidia	16		940	405		
	Warnings logged in Data Inspector Log while reading the dataset. Many of these are incidental and do not necessarily indicate an error or problem. The coordinate system when importing the file  Warnings logged in Data Inspector Log while reading the dataset. Many of these are incidental and do not necessarily indicate an error or problem. The coordinate system when imported in the dataset, and some traits might have been dropped, though these are like not significant. The warning included text as follows: "Worker 86976 > Coordinate system when importing the dataset. Many of these are like not significant. The warning included text as follows: "Worker 86976 > Coordinate system when importing the dataset. Many of these are like not significant. The warning included text as follows: "Worker 86976 > Coordinate system when importing the file warning included text as follows: "Worker 86976 > Last line repeated 25 time when importing the file warning included text as follows: "Worker 86976 > Last line repeated 25 time when importing the file warning included text as follows: "Worker 86976 > Last line repeated 25 time when importing the file warning included text as follows: "Worker 86976 > Last line repeated 25 time when importing the file warning included text as follows: "Worker 86976 > Last line repeated 25 time when importing the dataset. Many of these are like and the coordinate system when importing the dataset. Many of these are like and the coordinate system was a solid text as follows: "Worker 86976 > Last line repeated 25 time when importing the dataset. Many of these are like and the coordinate system was a solid text as follows: "Worker 86976 > Last line repeated 25 time when importing the dataset. Many of these are like and the coordinate system was a solid text as follows: "Worker 86976 > Last line repeated 25 time when importing the dataset. Many of these are like and the coordinate system was a solid text as follows: "Worker 86976 > Last line repeated 25 time when im										
	Zoom into the	he m	odel to see moi	e detail				less	than a minute		
	Pan the mod	del							Ilmost immedia		
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	Query an ob							it's a	Ilmost immedia	te	
				-		ough a relations	-		than a minute		
approximately, to:	Relationships such as parent id are read when the dataset is initially read, so these can be used to locate parent feature using a filter query. Takes a few mouse clicks to do this and user needs to copy the parent_i select the IFC_Stair feature type, open the filter query, select GlobalID and then paste the parent id value, select why it takes about a minute.									by the parent_id,	
Ž	Make a sim	ple a	nalysis			less th			than a minute		
Before georef, how long does it take, approxir	Note that these tests were also attached FME workspace Myra Surfaces and Solids test group (VolumeCalculator transforme  Please, explain what analysis was made  Picturanyal Calculator transforme					C Analysis.fmw	performs getransformer)  Scale	eommon and and and and and and and and and an	GeometryValidator (Geometry Validator (Geometry Validator) Validator Validat	Asing the sumes  waldator)  the sand Solids  Parameters  Parameters  Parameters  Also Check Self-Touching Polygon: No Connect 2 Mode: Pirat Wins  Tolernoics Nome  Parameters  Also Check Areas: No  Tackness Mode: Automatic  Angular Mode: Automatic	
			netry validation					,			

Extract/Transform/Load

3 - Expert user (knows very well the technical details and tricks)

How long does it take, approximately, to: Make a simple edit

1-5 minutes

FME Data Inspector does not have any edit functionality, so the edit was made in an FME Workspace that reads the whole IFC file, makes a change and then writes it back out. An AttributeCreator and GeometryPropertySetter are used to define new values for the IfcBuilding Address properties and then set them on the IfcBuilding element.

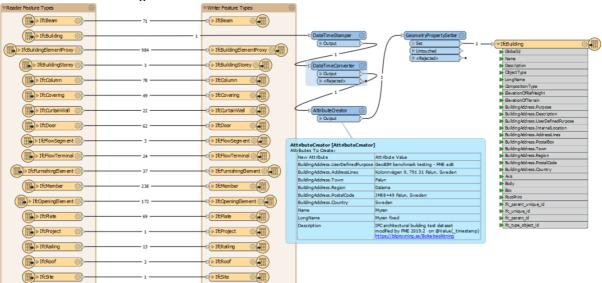


Fig 2. Myran IFCtoIFC editBuilding.fmw FME workspace to edit IFC Building Address,Name, LongName and Description. See also the log file.

FME Data Inspector does not have any edit functionality, so the edit was made in an FME Workspace that reads the whole IFC file, makes a change and then writes it back out. An AttributeCreator and GeometryPropertySetter are used to define new values for the IfcBuilding Address properties and then set them on the IfcBuilding element.

Note that the time it takes to make the edit depends on how many edits are made. Once an edit workflow / workspace is developed, then modifying a single value and regenerating the ifc dataset can be done in less than a minute. Also, workflows can be defined that automate the update of features, perhaps from a status value retrieved from a real time online source, so it is possible to configure workflows that take 0 seconds of user time.

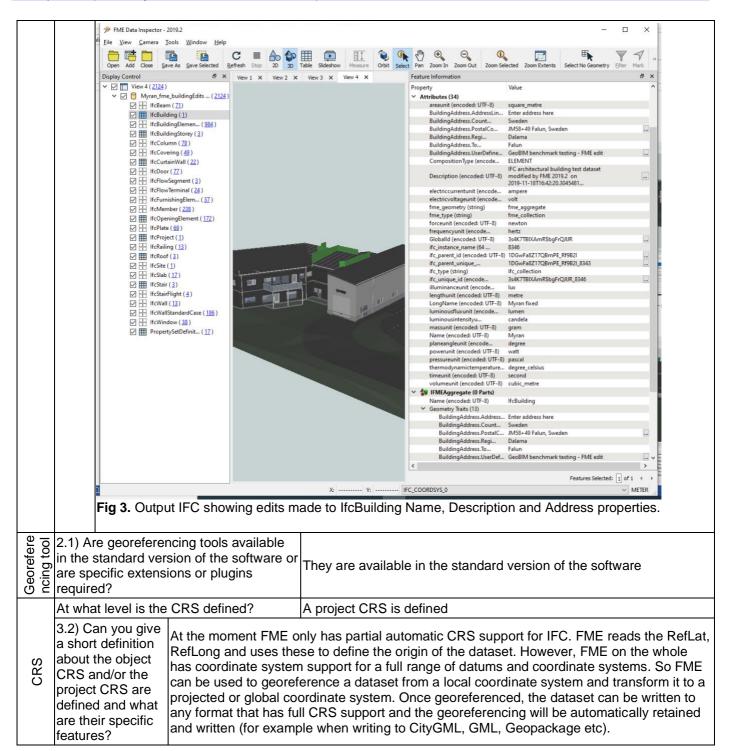
Link to the Myran\_IFCtoIFC.fmw

Pleas e, explai n what edit was

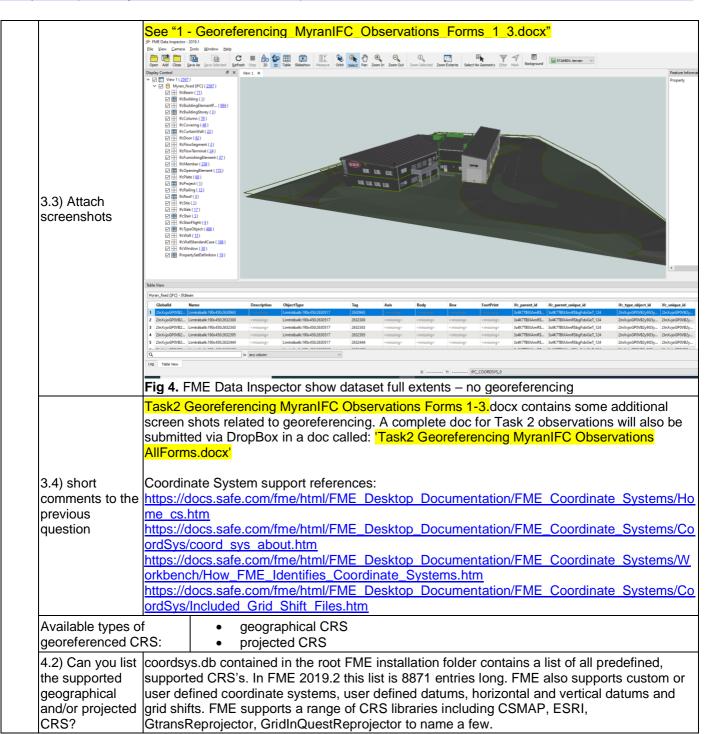
made

Extract/Transform/Load

3 - Expert user (knows very well the technical details and tricks)



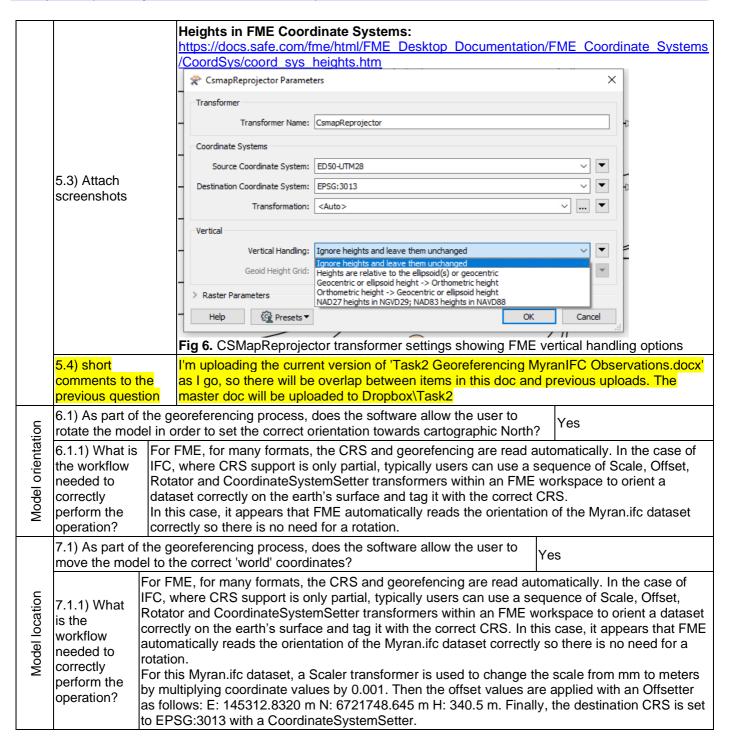
3 - Expert user (knows very well the technical details and tricks)



Proprietary
Extract/Transform/Load
3 - Expert user (knows very well the technical details and tricks)

			Gallery				
		Name	Description	Group	Datum	Ellipsoid	Projecti.
		SPAIN-UTM	Spain; UTM Zone 30 (cent. merid 3d W), Europe 1950	UTMN	ERP50-W	INTNL	TM
		SW-0GONV	RT90 0 gon 0:-15 [EPSG #3022]	EUROPE	RT90-3-7P	BESSEL	TM
		SW-25GONO	RT90 2.5 gon O 0:-15 [EPSG #3023]	EUROPE	RT90-3-7P	BESSEL	TM
	03	SW-25GONV	RT90 2.5 gon V 0:-15 [EPSG #3021]	EUROPE	RT90-3-7P	BESSEL	TM
		SW-5GONO	RT90 5 gon O 0:-15 [EPSG #3024]	EUROPE	RT90-3-7P	BESSEL	TM
	re	SW-5GONV	RT90 5 gon V 0:-15 [EPSG #3020]	EUROPE	RT90-3-7P	BESSEL	TM
		SW-75GONV	RT90 7.5 gon V 0:-15 [EPSG #3019]	EUROPE		BESSEL	TM
		SW-NAT90	National synonym for SW-25GONV [EPSG #3021]	EUROPE	RT90-3-7P	BESSEL	TM
		SWEREF-99-12-00	SWEREF 99 12 00 [EPSG #3007]	EUROPE	SWEREF99		TM
		SWEREF-99-13-30	SWEREF 99 13 30 [EPSG #3008]	EUROPE	SWEREF99	GRS1980	TM
		SWEREF-99-14-15	SWEREF 99 14 15 [EPSG #3012]	EUROPE		GRS1980	TM
	al	SWEREF-99-14-13	SWEREF 99 15 00 [EPSG #3009]	EUROPE	SWEREF99	GRS1980	TM
	4 2) Attach	SWEREF-99-15-45	SWEREF 99 15 45 [EPSG #3013]	EUROPE	SWEREF99	GRS1980	TM
	4.3) Attach screenshots	SWEREF-99-16-30	SWEREF 99 16 30 [EPSG #3010]	EUROPE	SWEREF99	GRS1980	TM
	Scieensiiois			EUROPE			TM
	9	SWEREF-99-17-15	SWEREF 99 17 15 [EPSG #3014]		SWEREF99	GRS1980	TM
		SWEREF-99-18-00 SWEREF-99-18-45	SWEREF 99 18 00 [EPSG #3011]	EUROPE	SWEREF99	GRS1980	
	in		SWEREF 99 18 45 [EPSG #3015]		SWEREF99	GRS1980	TM
	<u>"</u>	SWEREF-99-20-15	SWEREF 99 20 15 [EPSG #3016]	EUROPE	SWEREF99	GRS1980	TM
	e	SWEREF-99-21-45	SWEREF 99 21 45 [EPSG #3017]	EUROPE	SWEREF99	GRS1980	TM
		SWEREF-99-23-15	SWEREF 99 23 15 [EPSG #3018]	EUROPE	SWEREF99	GRS1980	TM
		SWEREF-99-TM	SWEREF 99 TM [EPSG #3006]	EUROPE	SWEREF99	GRS1980	TM
		SWEREF99.ST74	ST74 [EPSG #3152]	EUROPE	SWEREF99	GRS1980	TM
		SYR-PAT	Patya System, 36 deg East to 39 deg East, Europe 1950		ERP50-IQ	INTNL	TM
	e	SYR-SEST	Sestya System, East of 39 deg East, Europe 1950 datum	EUROPE	ERP50-IQ	INTNL	TM
		Show Coordinate System	ns:		Ontio	Dec Dec	ti
		Where Any Column	v contains euro		Оршс	ons Pro	operties
	F	ig 5. Some suppo	orted Swedish coordinate systems.				
	5.1) What types of	FME supports h	neight measurements in 5 possible differe	nt ways	and can	convert b	etweer
	height reference		nchanged • Relative to ellipsoid or geoce	entric • E	Ilipsoid he	eight to	
SU	systems are	orthometric heig	ght • Conversion between vertical datums	• Use c	of Offsette	r, Affine	and
tems	available?	AffineWarper tra	ansformers to specify a implement a spec	cific heig	transfo	rmation.	
e syst		FME supports the Geoid96 (GEO	ne following vertical grid formats:				
SU.		• Geoid99 (bin)	•				
ere	5.2) Can you list th	OSGM91 (txt)					
Гef	supported height	• Byn (byn)					
Height reference	reference systems	• Egm96 (grd)					
eig	Totolollog ayatema	See.					
I			e.com/fme/html/FME Desktop Documen	tation/F	ME Coor	<u>dinate S</u>	ystems
		/CoordSys/verti					
		Additional vertic	al grid shifts can be added.				

3 - Expert user (knows very well the technical details and tricks)



7.1.

Atta ch scre ens hots

3 - Expert user (knows very well the technical details and tricks)

### See "4 - Georeferencing\_MyranIFC\_Observations.docx" in OSF

Georeferencing: Orientation

We used the georeferencing information available for Myran IFC on the GeoBIM website: <a href="https://3d.bk.tudelft.nl/projects/geobim-benchmark/ifcmyran.html#georeferencing-details">https://3d.bk.tudelft.nl/projects/geobim-benchmark/ifcmyran.html#georeferencing-details</a>

Coordinate reference system: EPSG::3013 SWEREF 99 15 45, RH2000

Coordinates of the reference point (blue in Figure 1):

E: 145312.8320 m N: 6721748.645 m H: 340.5 m

Rotation to the true North of the reference direction (blue in Figure 2): 48°.

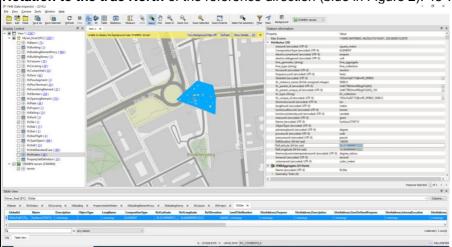
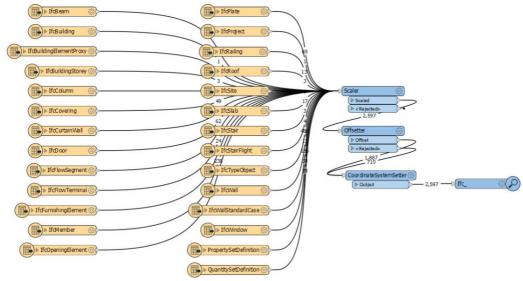
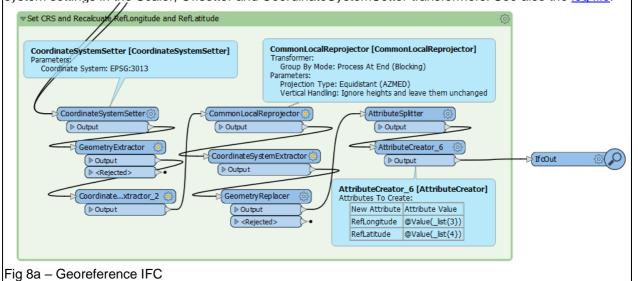


Fig 7. Default 2D placement without georeferencing



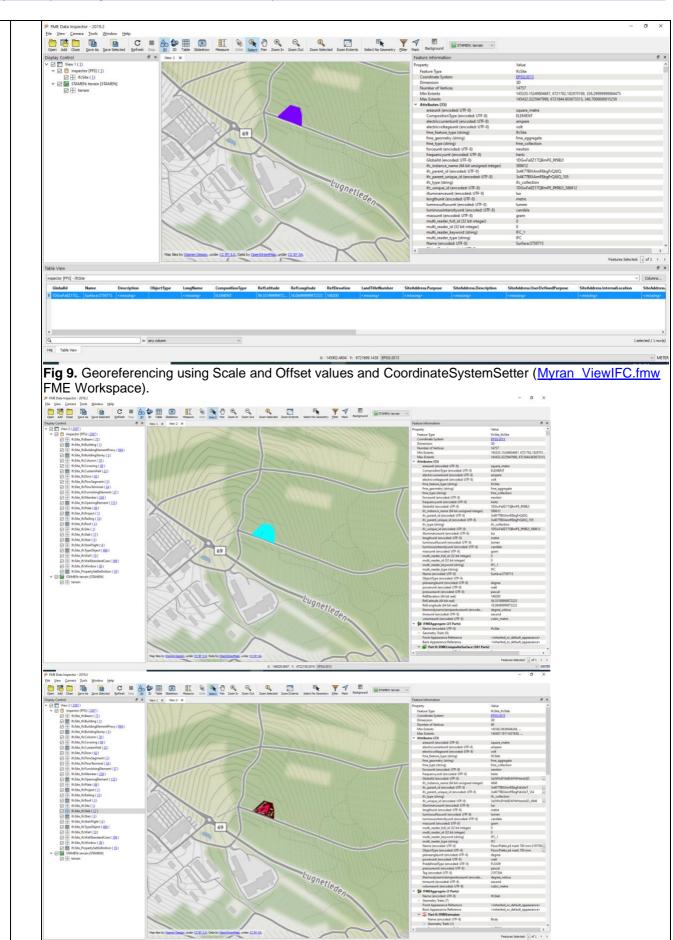
**Fig 8.** Myran ViewIFC.fmw FME Workspace used to geolocate model using scale, offset and coordinate system settings in the Scaler, Offsetter and CoordinateSystemSetter transformers. See also the log file.



Extract/Transform/Load

3 - Expert user (knows very well the technical details and tricks)

Fig.10 - Myran georeferenced - building slab



Extract/Transform/Load

3 - Expert user (knows very well the technical details and tricks)

		7.3) Can all the	supporte	d coordinate refe	erence systems and projections (cited in				
		the answer to q	uestion 3	be used while p	performing the 'move' operation?	J			
		7.3.1) Which on be used for this		system and and to make use of are typically mo sufficient if the a	ove should work when moving between one projected coordinate ther. To convert between geographic and projected it would be best a reprojection library as part of the workflow given that the transforms are complex. However, in some cases an Affine transformation may be affine transformation coefficients are known, or a series of vectors for known control points can be applied using an				
	е	Zoom into the n	nodel to s	ee more detail	it's almost immediate				
Sing	tak to:	Pan the model			it's almost immediate				
ren(	s it	Rotate the model			it's almost immediate				
efe	doe	Query an object			it's almost immediate				
r geor		Inspect the objects linked to the queried one through a relationship			less than a minute				
√ffe	WOU	Make a simple analysis			less than a minute				
	L	Make a simple edit			1-5 minutes				
	9	<ol><li>9.1) Are any pre-processing steps or consoftware to enable a correct and consiste</li></ol>				Yes			
	Settings	9.1.1) Can you add a short description of the steps involved in the preprocessing?	RefLongitude=18.06499999972222). To preserve the dataset geolocation so that FME can read it back in at the correct location, new values need to be derived for RefLongitude and RefLongitude. Once the dataset is correctly placed using the georefencing parameters above ved in the a CommonLocalReprojector is used to temporarily move the dataset to a local coordinate system. FME automatically names this local CRS with the long, lat of the centroid of the						
	Ê	10) How long dogeoreferenced IFC?	model to I	pe exported to	less than a minute				
		<b>Exporting Geo</b>	reference	ed Model to IFC					

For FME, for many formats, the CRS and georefencing are read automatically. In the case of IFC, where CRS support is only partial, typically users can use a sequence of Scale, Offset, Rotator and CoordinateSystemSetter transformers within an FME workspace to orient a dataset correctly on the earth's surface and tag it with the correct CRS.

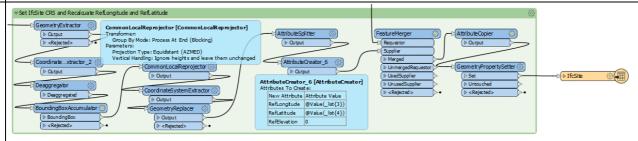
For this Myran.ifc dataset, a Scaler transformer is used to change the scale from mm to meters by multiplying coordinate values by 0.001. Then the offset values are applied with an Offsetter as follows: E: 145312.8320 m N: 6721748.645 m H: 340.5 m. Finally, the destination CRS is set to EPSG:3013 with a CoordinateSystemSetter.

The method above should work when moving between one projected coordinate system and another. To convert between geographic and projected it would be best to make use of a reprojection library as part of the workflow given that the transforms are typically more complex. However, in some cases an Affine transformation may be sufficient if the affine transformation coefficients are known, or a series of transformation vectors for known control points can be applied using an AffineWarper.

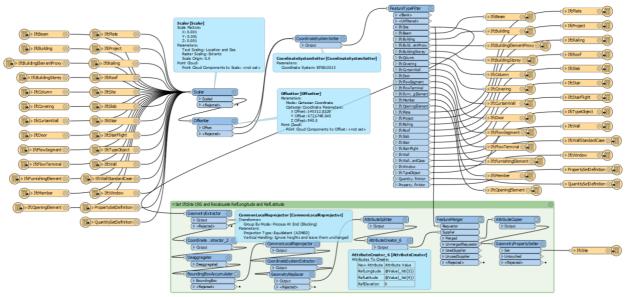
Because FME uses RefLongitude and RefLongitude to geolocate IFC upon read, it's important to update these values to accurately represent the dataset's location on the earth's surface.

3 - Expert user (knows very well the technical details and tricks)

FME uses the IfcSite RefLatitude and RefLongitude to geolocate the model. In the original source Myran\_fixed.ifc dataset provided, these values seem to be not very accurate and places the model somewhere near Stockholm (RefLatitude=59.33199999972223, RefLongitude=18.06499999972222). To preserve the dataset geolocation so that FME can read it back in at the correct location, new values need to be derived for RefLongitude and RefLongitude. Once the dataset is correctly placed using the georefencing parameters above, a CommonLocalReprojector is used to temporarily move the dataset to a local coordinate system. FME automatically names this local CRS with the long, lat of the centroid of the dataset. String parsing was then used to extract these values from the local CRS name. These values are then used to set correct values for RefLatitude and RefLongitude before the original geometry is restored and the updated IFC dataset is written.

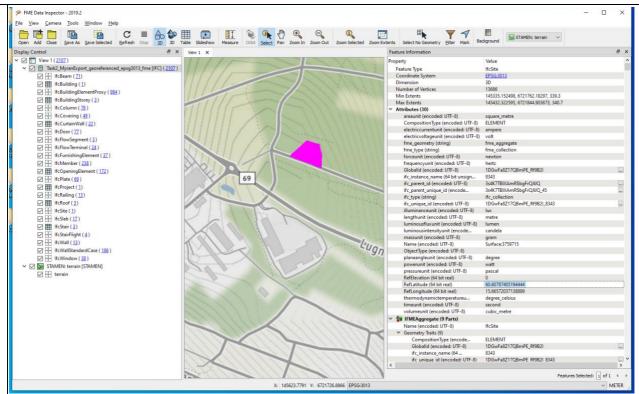


**Fig 10.** Recalculate RefLatitude and RefLongitude using CommonLocalReprojector and overwrite source incorrect values in order to correctly to geolocate the model for EPSG:3013 for writing to IFC.



**Fig 11.** MyranIFC georeference.fmw - complete georeferencing model which applies scale, offsets, sets the CRS name and recalculates RefLatitude and RefLongitude model before writing to IFC.

3 - Expert user (knows very well the technical details and tricks)



**Fig 12.** Viewing Task2\_MyranExport\_georeferenced\_epsg3013\_fme.ifc, the georeferenced output from MyranIFC georeference.fmw. See also the log file. This is the view from FME Data Inspector without any preprocessing workspace. The only requirement is the user needs to set the CRS to EPSG:3013 on the IFC reader. Note data source = IFC (not FFS as is the case for preprocessed) and CRS = EPSG:3013 (not \_FME0 or IFC\_COORDSYS\_1 as is the case for unknown CRS).

=== END OF Myran.ifc Task 2 ===

(other datasets not evaluated with FME)

Would you like to share any other comments or observations?

In general, IFC2X3 does not have full CRS support, so that is the main reason the FME IFC reader / writer does not have full CRS support. However, using the approach and conventions above, it is possible to create workflows that transform IFC datasets to be georeferenced using RefLatitude and RefLongitude so that all that is needed is for the user to know the CRS name and then they are able to read the IFC dataset as georeferenced and display it as such or convert directly to other formats which have full CRS support such as CityGML.

We anticipate that since IFC v4 has inherently better potential to support for CRS, we should be able to improve our CRS support soon. However, we still need to review what conventions are used across the BIM industry to ensure that whatever approach we take for IFC4 is as widely useful as possible.

For more info see: https://thinkmoult.com/ifc-coordinate-reference-systems-and-revit.html

# eveBIM 2.10.0.300

Software	Software Name [version] Proprietary or o	I 300] ware?	developer CSTB https://logiciels.cstb.fr/contact/?dmd=telecharge &log=eveBIM%20derni%C3%A8re%20version8 m-et-maquette-numerique  Kind of software									
	proprietary	ı		T		3	D view	/er	1	T		
uter	Model and year	Operating system and version		CPU	PU			Memory (RAM)	Hard drive capacity	Hard drive free space		
Computer	precision 7510	Windows 7 Professionnel 64 bit		Intel Core i 6820HQ 2.70GHz	IQ Quad		4Go	16	1000	347		
	Zoom into the m	nodel to	see moi	re detail	•	it's almo	st imn	nediate				
<u>.</u>	Pan the model it's						st imn	nediate				
take to:	Rotate the mode	el				it's almo	st imn	nediate				
it t V, t	Query an object	t				it's almo	st imn	nediate				
How long does it take, approximately, to:	nspect the objects linked to the queried one through a relationship					it's almo	st imn	nediate				
lon (or or o	Make a simple analysis					it's almo	st imn	nediate				
ow api	Please, explain what analysis was made					export a	export all properties of the elements to en excel sheet					
エ	Make a simple o	edit				less tha	less than a minute					
	Please, explain	what ec	lit was m	nade		Add pro	perties	s to an element	(add Description	on to an IfcStair)		
sloc	2.1) Are georeferencing tools available in the stand version of the software or are specific extensions of plugins required?						They	y are available ir vare	n the standard	version of the		
Georef tools	to the previous	lots of possibilities for the g 2.2) short comments 1) use by default the IFC lo					ement ferenc		e north - and t	ne		
	At what level is	the CRS	S defined	d? A projec	ct CRS	S is defin	ed					
	3.2) Can you give the project CRS	ve a sho are def	rt defini	tion about the	ne obj heir s	ject CRS pecific fe	and/o	r ? EPSG 2154				
CRS	Système de coordi Méthode de géoréf Visualisation IF Paramètres - Utilise le ;				coordonné géoréféren ition IFC mètres mult ise le géore ise le nord ise le place	nt : es par défaut : cement IFC : ti-échelles : éférement du site du projet ement local du site ement local du site	Multi-écl	EPSG:215	4 Personnalisé  Annuler Appl	fran est k c'ess est		

Proprietary
3D viewer
2 - Current user

	3.4) short comments to the previou	s question (optional) Possibility to change the default CRS								
RS	What type of georeferenced CRS are available?	geographical CRS     projected CRS								
Georef CR	4.2) Can you list the supported geographical and/or projected CRS?	EPSG WKT PROJ4 Aliases								
	5.1) What types of height reference	e systems are available? vertical Datum								
nce system	5.2) Can you list the supported height reference systems?	Geodetic EGM84 geoid EGM96 geoid EGM2008 geoid								
Height reference system	5.3) Attach screenshots	Geodetic - the default; osgEarth uses the Horizontal datum ellipsoid as a reference  EGM84 geoid  EGM96 geoid - commonly called MSL; used in DTED and KML  EGM2008 geoid								
	6.1) As part of the georeferencing process, does the software allow the user to rotate the model in order to set the correct orientation towards cartographic North?  Affichage > Georeferencement > Personnalisé > select to "Nord du projet" YES or NO									
Model orientation	6.1.2) Attach screenshots  6.2) short comments to the	Géoréférencement  Système de coordonnées par défaut :  Méthode de géoréférencement IFC :  Visualisation IFC  Modèle  Géoref. du site  Nord projet  IFCgeometries  Non  Non  Utilisé comme t  Oui  EPSG:2  IFCgeometries_I  Non  Non  Utilisé comme t  Oui  EPSG:2  Wyran_fixed  Non  Non  Utilisé comme t  Oui  EPSG:2  Utiliser le géoréférencement du site :  Oui  Oui  Oui  Oui  Oui  Oui  Utiliser le placement du site :  Utiliser le placement du site :  Utiliser l'altitude du site :  Oui  Appliquer valeurs par défaut  Utiliser l'altitude du site :  Oui  Appliquer  Choose yes or no to the appropriate line. Possible to select by project the								
	previous question (optional)	orientation								
Model		process, does the software allow the ect world coordinates?								
Mo	user to move the model to the correct 'world' coordinates?  7.1.1) What is the workflow needed to correctly perform the operation?  In the same area possible to select YES or NO for "Georef du site" "placement du site" "altitude du site" "srs"									

Proprietary
3D viewer
2 - Current user

			ment					X				
		Système de coordo	nnées par défaut	:		EPSG:2154	5G:2154					
		Méthode de géoréfé		_								
		Visualisation IFG     Modèle		Multi-échel	Placement site	Persi     Altitude site						
		IFCgeometries	Géoref. du s	Nord projet Non	Utilisé comme t	Oui Altitude site	Srs EPSG:2154					
		IFCgeometries I	Non	Non	Utilisé comme t	Oui	EPSG:2154	=				
	7 1 2) Attach care anabata	Myran_fixed	Non	Non	Utilisé comme t	Oui	EPSG:2154					
	7.1.2) Attach screenshots	Savigliano	Non	Non	Utilisé comme t	Oui	EPSG:2154					
		Valeurs par défau	t		ouise comme c.:	0.01	Li 30.2134					
		Utiliser le géoréfére Utiliser le Nord du p		Oui Oui		Non     Non		Ц				
		Utiliser le placemer Utiliser l'altitude du		Utilisé comme	translation locale	○ Non						
		Othisel Falattide do	one.	© oui		Non	Appliquer valeurs par défaut					
						ОК	Annuler Ap	ppliquer				
	7.2) short comments to the previous question same location to personnalize the georeference											
	7.3) Can all the supported coordinate reference systems and projections (cited in the											
	answer to question 3) be used while performing the 'move' operation?											
	7.4) short comments to the previous question (optional)  Possible to move the model in another srs											
_	Zoom into the model to see more	detail				it's a	lmost imme	diate				
ono	Pan the model					it's a	it's almost immediate					
e, S	Rotate the model					it's a	it's almost immediate					
georef, how does it take,	Query an object					it's a	it's almost immediate					
oref ss it	Inspect the objects linked to the	queried or	ne throu	ıgh a relati	onship	it's a	it's almost immediate					
ged	Make a simple analysis					it's a	lmost imme	diate				
After georef, how long does it take,	Make a simple edit					it's a	lmost imme	diate				
Settings		ps or configuration/setting changes e a correct and consistent export of No										
Export	10) How long does it take for the g exported to IFC?	eoreferen										

## **ArcGIS Pro**

Ф	Software Name		ArcGIS F	Pro	Soft	ware house		ESRI				
Software	Proprietary or o software?	pen source	Kind of so	oftwa	are							
S	proprietary		GIS									
_	Model and year	Operating system and version	CPU		GPU	Memory (RAM)	Hard capac		Hard drive free space			
Computer	Assembled (Motherboard TUF Z390- PRO GAMING) 2018	Windows 10	Intel (R) Co (TH) i7-970 CPU @3.60GHz 3.60GHz	00K	Nvidia Geforce GTX 1660Ti	64 GB	465 G GB	6B + 3630	353 GB + 77.9 GB			
	Zoom into the model to see more detail				it's almost immediate							
	Pan the model			it's a	almost immediate	Э						
e,	Rotate the mod	el		it's a	almost immediate	Э						
take, to:	Query an object				almost immediate	Э						
How long does it approximately,	Inspect the objects linked to the queried one through a relationship				almost immediate	Э						
ng c	Make a simple analysis				almost immediate	Э						
low lo	Please, explain what analysis was made				I used Layer 3D to Feature Class analysis which exports features layers with 3D display properties to 3D lines or multipatch features.							
-	Make a simple e	edit		it's a	almost immediate	Э						
	Please, explain what edit was made				ed to edit the pro te, etc	eject using "Mod	ify feat	tures" with	tools as move,			
Georef tool		erencing tools avor are specific ex			They are availa the software	ble in	the standa	ard version of				
Geore	2.2) short comm previous question		I have the	e georeference tool but ArcGis didn't allow me to use it on IFC file.								
	At what levels is	s the CRS define	d?	<ul><li>Each object has its own CRS</li><li>A project CRS is defined</li></ul>								
	object CRS and	ve a short definit /or the project C at are their speci	RS are	c	Even if the project did not positioned even if are shown	d it in the right pl	lace. S	So all the c	coordinates,			
CRS	3.3) Attach scre	enshots	Windows Goodman Zerosan State Communication	tion Foodon Comment of the Comment o	77 28 //	Supply Pages and Control of the Supply Suppl						

	What types of georeferenced CRS are available?	<ul><li>geographical CRS</li><li>projected CRS</li></ul>								
	4.2) Can you list the supported geographical and/or projected CRS?	Geographical CRS: Africa, Antartica Zealand, Caribbean, County System Pacific Ocean, Solar system, South Projected CRS: ARC (equal Arc - se	cond), Continental, County Systems, , State Plane, State Systems, Tribal,							
	4.3) Attach screenshots	Sector of the Company's Conform System    Variety   Vari								
	5.1) What types of height reference	ce systems are available?	Vertical Coordinate System							
e system	5.2) Can you list the supported he	eight reference systems?	Vertical CS including: Africa Asia Australia and New Zealand Ellipsoidal - based Europe Ireland an UK North America Oceans Portugal South America World							
Height reference system	5.3) Attach screenshots	General Extent Clip Layers Metadata Coordinate Systems to view the available options. Clurrent XV  Coordinate Systems Transformation Illumination Labels Color Management  Z Coordinate Systems Available  Transformation Illumination Labels Color Management  Z Coordinate Systems Available  Transformation Illumination Labels Color Management  D Elipsidate D Elipsidate D Elipsidate Systems	None>     P →							
Model orientation		process, does the software allow the o set the correct orientation towards	e No							
Model	7.1) As part of the georeferencing user to move the model to the col	process, does the software allow the rect 'world' coordinates?	e No							

# ArcGIS Pro – Windows 10 Pro Proprietary GIS 2 - Current user

		nate reference systems and projections ) be used while performing the 'move'	No				
	7.3.1) Which ones can be used for	or this task?	I couldn't georeferenceted the file.				
	Zoom into the model to see more detail	the software does not allow this					
	Pan the model	the software does not allow this					
ref,	Rotate the model	he software does not allow this					
georef,	Query an object	the software does not allow this					
After (	Inspect the objects linked to the queried one through a relationship	the software does not allow this					
	Make a simple analysis	the software does not allow this					
	Make a simple edit	the software does not allow this					
Settings	9.1) Are any pre-processing steps or configuration/setting changes needed in the software to enable a correct and consistent export of the georeferenced file?	No					
	9.2) short comments to the previous question (optional)	I couldn't georeferenceted the file. So, I	couldn't export an IFC file.				

# IfcGeoRefChecker 0.3.2.2

Software	So	ftware Name [version]	IfcGeoRefChe	ecker	developer Dresden, University of Applied Sciences / https://github.com/dd-bim/lfcGeoRef/releases					
Sof	Pro	oprietary or open source	software?		Kind of softw	are				
	ор	en source	_		Georef IFC Extractor					
Computer	Мс	odel and year	Operating system and version	CPU	GPU	Memory (RAM)	Hard drive capacity	Hard drive free space		
Com	LE	NOVO T480s, 2018	Windows 10, Enterprise	Intel i5- 8250U	Intel UHD Graphics 620	8	475	200		
		Zoom into the model to s	see more detai			the sof	ware does not	allow this		
Zing ake,	.: ::	Pan the model				the soft	ware does not	allow this		
enc it ta	y, t	Rotate the model				the sof	ware does not	allow this		
efel	atel	Query an object				the soft	ware does not	allow this		
eor g dc	Ξ	Inspect the objects linked	d to the querie	d one through	a relationshi	the soft	ware does not	allow this		
e g	approximately,	Make a simple analysis				the soft	ware does not	allow this		
Before georeferencing, how long does it take,	ab	Make a simple edit			the soft	the software does not allow this				
tools available in the standard version of the software or are specific extensions or plugins required?  Tool reads existent Georef in  When heater form Controlly User Destinate Lindoler 30 - True  Existing addresses referenced by Incline or Inhabitating  Treferences no address.  Lindoler 10 - Yalize  Geographic coordinates referenced by Incline or Inhabitating  Treferences no address.  Lindoler 10 - Yalize  Geographic coordinates referenced by Incline or Inhabitating  Treferences no address.  Lindoler 10 - Yalize  Geographic coordinates referenced by Incline or Inhabitation  Treferences in establish-Inclines  Lindoler 10 - Yalize  Geographic coordinates referenced by Incline or Inhabitation  Treference of the standard or Information of Incline or Inhabitation  Treference or address.  Lindoler 10 - Yalize  Geographic coordinates referenced by Incline or Inhabitation  Treference or address.  Lindoler 10 - Yalize  Lindoler 10 - Yalize				information o	out of the IFC					
		e screenshot of protocol	Project control collections Project collections of the Project collection Project Collect							
CRS		what level the CRS is fined?	• geog	raphical CRS cted CRS						

	suppo	an you list the rted geographical projected CRS?	geographical: WGS8	eographical: WGS84_LatLon / projected: user-defined				
Hieaht reference	system	5.1) What types of hei	ght reference system	s are available?	user-defined			
				ing process, does the software allow the user to rotate the ct orientation towards cartographic North?				
Model orientation	workflo	What is the	save JSON with cont load JSON with conto follow the steps	our ur in the opened Bu y to rotate the build DN er window to IFC"	uilding contour will be iilding Locator ng around the base po	·		
		s part of the georefere er to move the model			Yes			
Model move	7.1.1) operat	What is the workflow ion?	needed to correctly pe	rform the	\-same workflow - or manual update for IFC attributes viaUpdate GeoRef ->via manual setup			
Mo	projec	an all the supported co tions (cited in the answ ming the 'move' opera	ver to question 3) be i		Yes			
ort settings	config softwa	re any pre-processing uration/setting change tre to enable a correct georeferenced file?	s needed in the	Yes				
Expo		Can you add a short of involved in the pre-pro		choose the wished georef for the IFC file (regarding LoGeoRef level, e.g. MapConversion, SitePlacement,)				
Export		ow long does it take for to be exported to IFC		less than a minute				

Proprietary
3D viewer
Level of tester expertise: 1 - Very beginner user (it is nearly the first time you use the software)

# FZKViewer V 5.1

Software	Software Name	[version] F	ZKViewer [x64 V	Karlsruhe Institute for Technology. Institute for Automation and Applied Informatics						
Sof	Proprietary or o	pen source so	oftware?	vare? Kind of software						
	proprietary			3D viewer						
ē	Model and year Operating system and version		CPU	GPU	Memory (RAM)	Hard drive capacity	Hard drive free space			
Computer	HP ZBook Studio G3, 2015	Windows 10 Pro	Intel(R) Core(TM) i7- 6700HQ CPU@2.60GH z 2.59GHz	NVIDIA Quadro M1000M	32 GB	218 GB	30,6 GB			
ke	Zoom into the more detail	nodel to see	less than a min	ute						
t tak ', to:	Pan the model		less than a min	ute						
es i	Rotate the mod	el	1-5 minutes							
l do	Query an object	t	less than a min	ute						
How long does it take, approximately, to:	Inspect the obje the queried one relationship		it's almost imme	it's almost immediate						
	Make a simple	edit	the software do	the software does not allow this						
sing tools	2.1) Are georefe available in the version of the se specific extension required?	standard oftware or are	They are available in the standard version of the software							
Georeferencing tools	2.2) short comm previous question		is imported. By System" but we not available. T measure the S\	We have used Myran_fixed. It is necessary to choose a CRS when the model is imported. By default shows "Local CRS – Local Cartesian Coordinate System" but we change it to "Unknown SRS" because the CRS EPSG:3013 is not available. The Local Placement position for the ifcProject is (0,0,0). To measure the SW performance we consider only when it works. Frequently it is not responding.						
	Kind of CRS ma	anaged	projected CRS							
	4.2) Can you lis geographical ar CRS?		Screenshoots:							
CRS	4.3) Attach screenshots  Open parameters	2002-2009 - Anne Alb J. Offensin Grid 200595 - TERSBY J. Offensin Anne 200595 - TERSBY J.		1952.13.14.06 - DUNN J / Depper Gas	ser-Golge Zone 2 (Note )  File Schild (1995)	Front (122 - 122 -	Wood Condoors, Sharen 1984  **TISCAN, NATA Look 11 Youngs  **TISCAN, NATA Look 12 YOUNGS  **T			

Proprietary
3D viewer
Level of tester expertise: 1 - Very beginner user (it is nearly the first time you use the software)

	4.4) short com previous ques			It is not available the CRS	S EPSG::301	3 SWERE	EF 99 15 45, R	H2000.	
reference stem	5.1) What type reference syst available?	es of heigh	nt	It is not possible to choose any 'world' height reference system.					
	6.1) As part of the georeferencing process, does the software allow the user to rotate the model in order to set the correct orientation towards cartographic North?						el in	No	
	7.1) As part of the georeferencing process, does the software allow the user to move the model to the correct 'world' coordinates?  We load the model changing the Spatial Reference System to "Unknown (screenshot 2_Open_parameters.JPG). At the Browser toolbar we se								
	7.1.1) What is needed to conthe operation?	rectly perf		ifcProject and choose the 8_TransformElement.jpg) (screenshot 9_Transform	ransform elem ordinates at de	ent" (scr			
Model move	7.1.2) Attach screenshots Open parameters	_	2320.498047; 19490.594800 I SRS Identifi rence System	13537.970169	Transform elements	∰ File View Rep	View Element Select element Zoom to element EXPRESS Data El C Transform Element asi asi isolate Element asi isolate Element asi Remove Element		497 5500 5508 5509
	Transform elements - parameters			Position  X Value: 145312.8320 m  Y Value: 6721748.645 m  Z Value: 340.5 m  Scaleing Scale Value: 1.0  Usage Relative Transformation    Apply to Child Elements   OK   Abbrechen					
	7.4) short comments to the previous question (optional)  We did not find any option to change the CRS while performing the operation.								ove'
oes	Zoom into the		see mor	e detail			less than a m		
How long does it take,	Pan the model						less than a m		
/ long c it take,	Rotate the mo	less than a minute							
Jow i	Query an obje		- المحاد	augrical and through a mil	less than a minute				
р <del>Т</del>	Inspect the objects linked to the queried one through a relationship   it's almost immediate								

## FZKViewer V 5.1 – Windows 10 Pro

Proprietary
3D viewer
Level of tester expertise: 1 - Very beginner user (it is nearly the first time you use the software)

	9.1) Are any pre-processing steps or configuration/setting changes needed in the software to enable a correct and consistent export of the georeferenced file?						
oort	9.1.1) Can you add a short description of the steps involved in the pre-processing?	neters_IFC4.jpg).					
_	10) How long does it take for the georeferenced model to be exported to IFC?	less than a minute					

Autodesk Revit 2020.0.0.377 – Windows 10 Pro
Proprietary
BIM
1 - Very beginner user (it is nearly the first time he/she use the software)

# FME Desktop 2018.1

	Software Name FME Desktop 2018.1				Software house Safe Software				
	Proprietary or o	pen source softv	vare?		Kind of software				
	proprietary				Extract/	Transform	n/Load	<u> </u>	
	Model and year	Operating system and version	CPU	GPU		Memory (	RAM)	Hard drive capacity	Hard drive free space
	2018	Windows 10 Enterprise	Intel Core i7- 8700 BOX (Coffee Lake)	GeFord 1060 60 Asus TI GTX10	GB URBO-	32		500	270
ng, es	4	e model to see r	nore detail				less t	han a minute	
georeferencing, how long does	Pan the mod							most immediate	
long	Rotate the mod							most immediate	
ove owc	= ¡¡Query an ob	•						most immediate	
		objects linked to	•					most immediate	
Geor	$\frac{9}{6}$ 2.1) Are geore $2$ of the software	eferencing tools a e or are specific						lable in the stan	dard version of
			https://3d.bk.tu benchmark/link				<u>Town</u>	georeference.fn	<u>nw</u>
	Used FME wo	benchmark/link https://3d.bk.tu	os://3d.bk.tudelft.nl/projects/geobim- nchmark/linkedfiles/T2/FME_script/Myran_georeference.fmw os://3d.bk.tudelft.nl/projects/geobim- nchmark/linkedfiles/T2/FME_script/Savigliano_georeference.fmw						
	At what level the	e CRS is defined			ct has its CRS is d	s own CRS efined	3		
CRS	3.2) Can you gi about the objec project CRS are are their specifi	The CRS to PROJCS[" GEOGO DATL SP 10C",6378 at UNIT AUTH PROJECT PARAM PARAM PARAM	hat is as "IFC_CC S["WGS JM["WG HEROIL 137,298 AUTHOI THORIT EM["Gree HORITY  CTION[" ETER["I ETER["I ETER["I	ssigned in post of the post of	Geodetic Geodetic G563, PSG","703 G","6326" ",0], H53292519 ",4326"]], al_Equidis of_center" e_of_centes sting",0], rthing",0],	80"]], ]], 99433] stant"] ',59.33		<b>]</b> ,	
	What types of gare available?	eoreferenced Cl	_	<ul><li>geographical CRS</li><li>projected CRS</li></ul>					
	4.2) Can you lis geographical ar CRS?			https://docs.safe.com/fme/html/FME_Desktop_Documentation/FME_Workbench/CoordSys/coord_sys_about.htm					tion/FME Work

Autodesk Revit 2020.0.0.377 – Windows 10 Pro
Proprietary
BIM
1 - Very beginner user (it is nearly the first time he/she use the software)

ø.	5.1) What types of heig systems are available?		Height reference systems are not explicitly supported						
Height reference systems	5.2) Can you list the su height reference system		an EGM96 geoid grid is available to convert between WGS84 ellipsoid eights and tide-free EGM96/WGS84 orthometric heights, anywhere in the world.  GEOID96/99/03 grids convert between NAD83 ellipsoid heights and IAVD88 orthometric heights in the United States.  GERTCON converts between NGVD29 (a legacy vertical datum) and IAVD88 orthometric heights, also in the United States.						
Model orientation	6.1) As part of the geo the model in order to s	ate	Yes						
Mc orien	6.1.1) What is the work	rflow needed t	o correctly perform the operation?			Transform data using Rotator transformer			
dels	7.1) As part of the geo move the model to the		ocess, does the software allow the use coordinates?		Yes				
Move models	-		o correctly perform the operation?		Offset	form data using tter tranasformer			
	question 3) be used wh	hile performing				res			
georeferencing, How long does	Zoom into the mode	it's almost immediate							
g g	ာ ဗြုံPan the model	it's almost immediate							
georeferencing, How long does	Rotate the model	it's almost immediate							
ref v _ •	≟ Guery an object	less th	an a r	minute					
g E	Inspect the objects	linked to the o	ueried one through a relationship	it's alm	nost immediate				
	9.1) Are any pre-proce software to enable a co		Υ	Yes					
		Reader Version In FME 2014 a new IFC reader v	reral options available to set the way th  TEP Files (IFC) Parameters  as implemented. The previous reader implementation is now deprecated, and no longer maintained. Files and implementation may be used by changing this parameter.  Use Deprecated Reader: No		file is r	read.			
		* Reduct Paralleters	Data Model: Relational		•				
			Read all Geometric Representations: Yes		•				
			Representations to Read: No items selected.  Additional Representations to Read:						
Sc		Property/Quantity Set Parame							
ting	0.1.1) Con you add a		Create Property/Quantity Set Definition Features: Yes		•				
set	9.1.1) Can you add a short description of		Read Property/Quantity Sets As: Geometries		•				
nc 3rt	the steps involved in	Type Object Parameters	Read Type Objects As: Single IfcTypeObject Feature Type		•				
Export setting	the pre-processing?	Merge Property/Quantity Sets	of Type Objects into Property/Quantity Sets of Real Objects:		•				
ш	and pro processing.	> Deprecated Reader Parameter							
		Geometry	Read IfcSpace Geometries: No		•				
			Subtract Opening Geometries: Yes		•				
			Add Projecting Geometries: Yes		•				
			Evaluate CSG Solids: No Simplify Extrusion Base Faces: No		<b>▼</b>				
		Encoding							
			String Encoding:		•				
		> Schema Attributes > Use Search Envelope							
		Help Defaults ▼		OK (	Cancel				
	10) How long doop it to	oko for the cas	proformed model to be experted to IT	<u> </u>	1	5 minutos			
	To) how long does it ta	are for the get	preferenced model to be exported to IFO	ن ب	[1	-5 minutes			

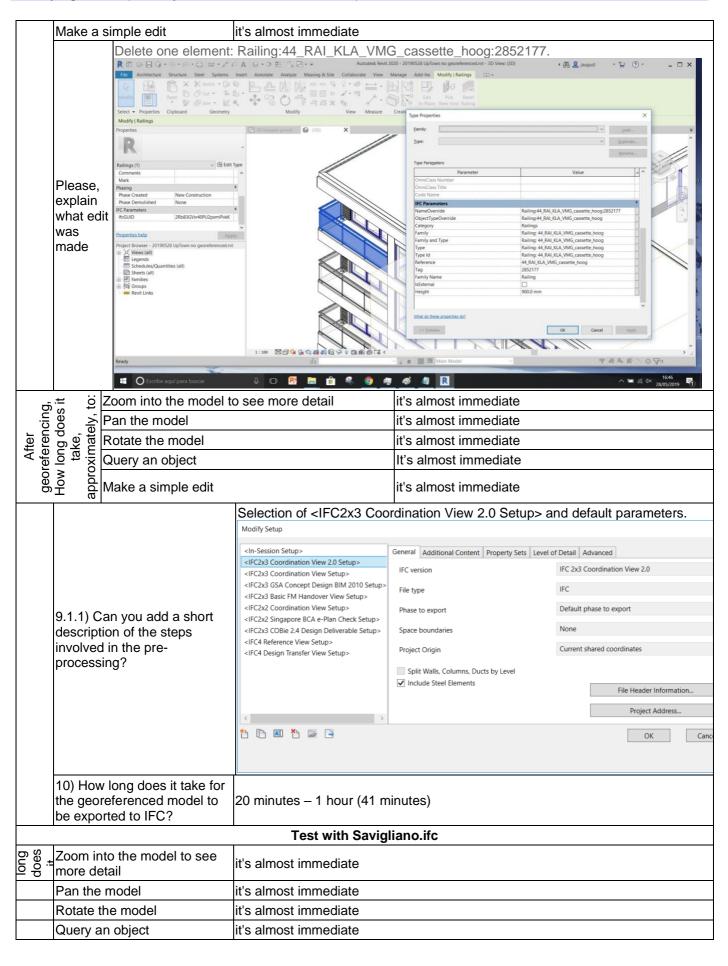
Autodesk Revit 2020.0.0.377 – Windows 10 Pro
Proprietary
BIM
1 - Very beginner user (it is nearly the first time he/she use the software)

# Autodesk Revit 2020.0.0.377

Software				evit [2020.0.0.377 20190327_2315(x64))]		Software house			Autodesk			
offv	Proprieta	ary or o	pen source s	oftware?		Kind of software						
S	proprieta	ary				BIM						
er	Model and year Operating system and version		system and	СРИ	PU GPU		IIVIAMON/ / RAIVIII		d drive acity	Hard drive free space		
Computer	HP ZBook Studio G3, 2015 Windows 10		Windows 10 Pro	Intel(R) Core(TM) i7- 6700HQ CPU@2.60GH z 2.59GHz	NVIDIA Quadro M1000M		32 GB	218 GB		25 GB		
				Test	with My	ran.ifc						
ong ately,	Zoom in more de		nodel to see	it's almost immed	diate							
w lo	Pan the	model		it's almost immed	diate							
유 ố	Rotate t			it's almost immed								
apk	Query a			it's almost immed								
gec ike,	Make a	simple 6	edit	it's almost immed	diate							
Before georef, How long does it take, approximately,	Please, made	explain	what edit wa	Delete window F18.02 and delete related wall openings.								
Georef	2.1) Are georeferencing tools available in the standard of the software or are specific extensions or plugins req											
Ge	2.2) sho	rt comm	nents to the p	revious question (d	evious question (optional)			The imported file in Revit has the Project Base Point = (0,0,148) and the Survey Point = (0,0,0).				
_ uo	6.1) As part of the georeferencing process, does the software allow the user to rotate the model in order to set the correct orientation towards cartographic North?								es .			
Model orientation		to corre	ne workflow ctly perform	we visualize the	From 3D View, in TOP orientation, with Properties/Phasing/Phase Filter=None we visualize the Site/Project Base Point in Properties/Graphics/Visibility Graphics Overrides. Then modify the Angle to True North of the Project Base Point.							
del	7.1) As part of the georeferencing process, does the s the model to the correct 'world' coordinates?						ftware allow the user to move Yes					
Model	7.1.1) W operatio		ne workflow n	eded to correctly perform the			Modify N/S and E/W of the Project Base Point.					
i.	e,	Zoom ir	nto the model	to see more detail		it's almost immediate						
rend	tak nate	Pan the	model			it's al	it's almost immediate					
After efere	ss it oxir tb	Rotate t	the model			it's al	most immediate					
After georeferencin	g, now long does it take, approximately, to:	Make a	simple edit		it'		it's almost immediate					
	10) How long does it take for the georeferenced model to be exported to IFC?											
	1			Test v	with UpT	own.if	;					
How long does it take,	Zoom in more de		nodel to see	it's almost immediate								
/ long d it take,	Pan the	model		it's almost immed								
w i	Rotate t			it's almost immed								
Ĕέ	Query a	n object	<u> </u>	it's almost immediate								

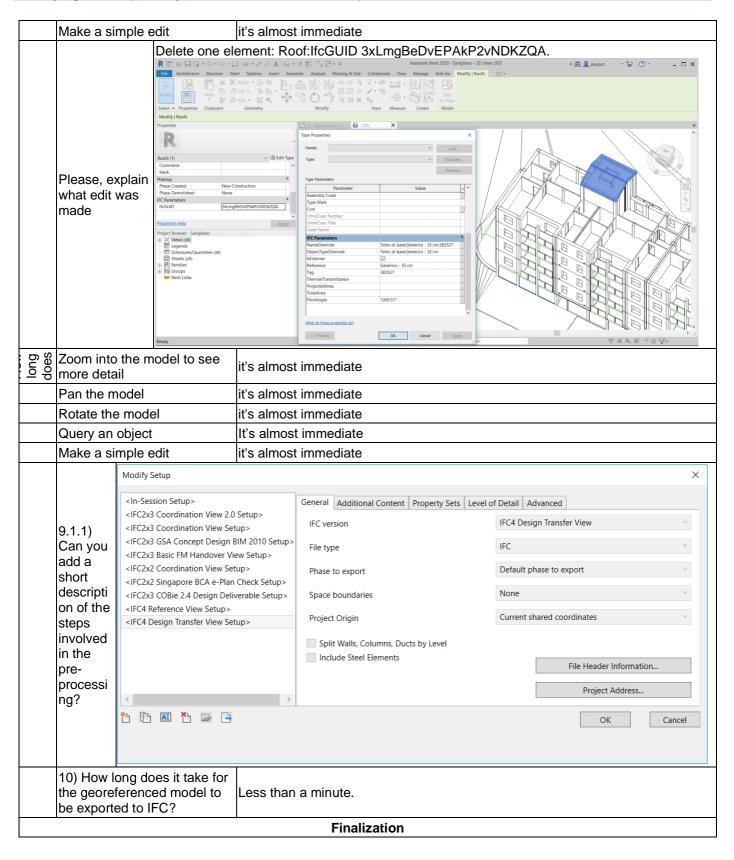
BIM

1 - Very beginner user (it is nearly the first time he/she use the software)



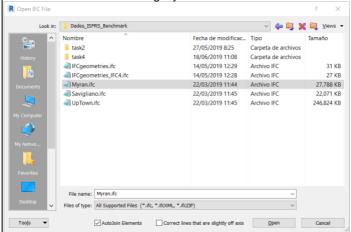
BIM

1 - Very beginner user (it is nearly the first time he/she use the software)



1 - Very beginner user (it is nearly the first time he/she use the software)

 Import Myran.ifc into Revit takes 3 minutes and 45 seconds, with the options AutoJoin Elements=ON and Correct lines that are slightly off axis=OFF.



2. Import Myran.ifc into Revit with the same options gives errors. See <a href="https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190527">https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190527</a> Myran.ifc.log and error reports:

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190527 Myran Error Report 1.html

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190527 Myran Error Report 2.html ,

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190527 Myran\_Error Report 3.html

- 3. Import UpTown.ifc into Revit takes 4 hours and 27 minutes, with the options AutoJoin Elements=ON and Correct lines that are slightly off axis=OFF.
- 4. Import UpTown.ifc into Revit with the same options gives errors. See the attached log <a href="https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528">https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528</a> UpTown.ifc.log and error reports:

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528 UpTown\_Error Report 1.html

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528 UpTown Error Report 2.html

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528 UpTown Error Report 3.html

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528 UpTown Error Report 4.html

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190528 UpTown Error Report 5.html

- 5. Import Savigliano.ifc into Revit takes 4 minutes, with the options AutoJoin Elements=ON and Correct lines that are slightly off axis=OFF.
- 6. Import Savigliano.ifc into Revit with the same options gives errors. See the attached log <a href="https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190717">https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190717</a> Savigliano.ifc.log and error reports:

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190717 Savigliano Error Report 1.html and

https://3d.bk.tudelft.nl/projects/geobim-benchmark/linkedfiles/T2/20190717 Savigliano\_Error Report 2.html

7. Import Savigliano.ifc into Revit. It seems that some roofs cannot be visualized (for example, IfcGUID= 2W3r2Zrw12RQ5NDhqyzMP\_.

14) Would you like to share any other comments or observations?