buildingSMART	Exchange Requirements (ER) for Georeferencing and Creation of Site Local Geometric Representation						Mapping to IFC Definitions
Object Type / Attribute Groups / Property	Definitions and notes	Examples and further explanations	Comments	Export	Import	MySuppor	IFC Model Representation
Exchange Purpose: The purpose of this exchange is to provide correct georeferencing of a site in a project. The data exchanged will map the site's local origo correctly to the earths surface and correctly give the deviation of the site's local Y axis from True North. (See IFC 2x4 specification for IfcSite.) The file may optionally contain map or terrain representation of the site. This representation must be in the site's local coordinate system, not in a map coordinate system. (See IFC 2x4 specification for IfcSite.).							There is no limitations by a specific MDV. The ER's mandatory and optional data must be read and interpreted correctly by the receiving applications. Other data can be ignored by the receiving application but must not cause the application to fail. The minimum IFC version is 2x3. Where 2x3 has shortcomings to 2x4, the workaround for 2x3 is documented.
Process outline: Advanced map and terrain handling is outside the scope of the current IFC Model. In projects these data are proveded on other formats defined by the GIS community. Deciding the site's local origo must be done in a GIS system with IFC export capabilities or in a BIM system with GIS capabilites. This application must have an user interface (UI) that allows the user to pick the site's local origo on the map and give the direction of the site's local Y axis relative to True North. Elevation for the site origo must be obtained. How the UI obtains these data is entirely up to the designers of the application as long as the data obtained are correct. When this application wants to export the georeferencing data to a BIM application these Exchange Requirements must be met. Any geometric representation of the site must be transformed to local site coordinates by the application during the IFC export. See process map shown in the document "IDM-Georeferering-10-04-14.doc"							
NOTE: Deciding the origo of the site does not lock the posisition of the building(s). The local origo and orientation of the building can be set later relative to the site coordinate system. Placing the building relative to the site coordinate system does not require a GIS system once the site has been properly georeferenced. NOTE2: Applications certified for IFC 2x3 coordination view should by definition be able to read an IFC which follows these ERs							
NOTE: Any BIM application that imports an IFC with georeferencing must store all site related information in this ER. When the site is re-exported the original georeferencing data must be kept without any loss of precision etc.							
NOTE: If a BIM application has created a project and a dummy site, then it must be able to update the site information from the imported IFC file with georeferencing data and site geometry.							
Meta data							
Exchange file							HEADER section
Exchange purpose	Designation of the exchange file to be "Georeferencing"	No view limitation. Mark the file to comply to ER for Georeferencing. -- system to assign the standard view definition name		**M**			file_description
Author	Name of the creator of the Georeferencing data	user setting - application need to provide UI		**M**			file_name with field author
Company	Company name of the Author	user setting - application need to provide UI		**M**			file_name with field organization
Originating application	Name of the software application that created the data set	system setting by software vendor, shall be specific, i.e. including version information		**M**			file_name with field originating_system
Date of creation	Time stamp of the creation time	2008-04-12T15:27:46		**M**			file_name with field time_stamp
Project		there has to be exactly one project object in the exchange file					**IfcProject**
Project Attributes							
Software unique id	Object identifier (formated as GUID or UUID) to uniquely identify the software object	70ce2f2b-a5f8-4ab7-bc7f-6a838a353f25, has to be maintained by the application (e.g. for re-export)		**M**			IfcProject.GlobalId
Number (or ID)	User assigned (short) name or number	delivery contracts may demand a certain naming convention		**M**			IfcProject.Name
Name	User assigned name (full name)	for informational purposes only		**M**			IfcProject.LongName
Description	*OPTIONAL User assigned optional description*	*not required for export*	*[General]: Optional, not checked*	**O**			
Phase	*OPTIONAL Design stage*	*conceptual design, detailed design, ..., for informational purposes only*		**O**			IfcProject.Phase

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Project units						
Length unit	Default length unit for all length measures in the data set	[m], [mm], [inch], [feet]		M		IfcProject.UnitsInContext (IfcUnitAssignment) with IfcSIUnit.Name = METRE
Area unit	Default area unit for all length measures in the data set	[m²], [square feet]		M		IfcProject.UnitsInContext (IfcUnitAssignment) with IfcSIUnit.Name = SQUARE_METRE
Volume unit	Default volume unit for all length measures in the data set	[m³], [cubic feet]		M		IfcProject.UnitsInContext (IfcUnitAssignment) with IfcSIUnit.Name = CUBIC_METRE
Project decomposition						
Site contained in Project	Link to the top-level node of the spatial structure, being a site		*Must be present.*	M		IfcRelAggregates
Building contained in Project	Link to the top-level node of the spatial structure, being a building		*Not allowed.*	-		IfcRelAggregates
Site		There must be exactly one site in the project				**IfcSite**
Site Attributes						
Software unique id	Object identifier (formated as GUID or UUID) to uniquely identify the software object	70ce2f2b-a5f8-4ab7-bc7f-6a838a353f25, has to be maintained by the application (e.g. for re-export)		M		
Number (or ID)	User assigned unique number or key of the site (short name).		***NOTE: This is a user assigned value - manually specified as the unique ID of the construction site in Norway. Value shall be equal to what's to be given for the LandTitleNumber. See LandTitleNumber further down in this document for format***	M		IfcSite.Name
Name	User assigned name (long name)			M		IfcSite.LongName
Description	User assigned optional description	not required for export		O		ifcSite.Description
Site Georeferencing Attributes						
Longitude	Geo location	geographic longitude in geodetic system WGS84, e.g. Chicago Harbor Light -87.35.40 ("-" = W)	*Resolution is millionth-second. Redundant in 2x4, but must still be given.*	M		IfcSite.Longitude
Latitude	Geo location	geographic latitude in geodetic system WGS84, e.g. Chicago Harbor Light 41.53.30 ("+" = N)	*Resolution is millionth-second. Redundant in 2x4, but must still be given.*	M		IfcSite.Latitude
Elevation	Site height datum	elevation above the height datum Always NN1954.Is up for revision;Implicit: local convention; what the municipality uses	***IFC 2x3: Given according to the height datum used at this location (implicit).*** *IFC 2x4: Defined in IfcCoordinateReferenceSystem.VerticalDatum. Redundant in 2x4, but must still be given.*	M		IfcSite.RefElevation
True North	True North	Orientation of site coordinate system relative to True North Always [0,1]	*2x3: It is given by a 2 dimensional direction within the xy-plane of the project coordinate system. If not resent, it defaults to [0.,1.] - i.e. the positive Y axis of the project coordinate system equals the geographic northing direction. Redundant in 2x4 (XAcisAbscissa/Ordinate)), but must still be given.*	M		IfcProject.RepresentationContexts.IfcGeometricRepresentationContext.TrueNorth
Geodetic Coordinate Reference System	Identification of datum used		***Information not present in 2x3. Information must be exchanged outside the IFC 2x3 Model.***	M		
Name	Name of coordinate reference system	"EUREF89-NTM-<NTMSone>"		O		IfcMapConversion.IfcCoordinateReferenceSystem.Name
Description	Description			O		IfcCoordinateReferenceSystem.Description
Geodetic Datum	Name by which this datum is identified.	Only "EUREF89" allowed		M		IfcCoordinateReferenceSystem.Description
Vertical Datum	Name by which the vertical datum is identified	Only "NN1954" allowed.Is up for revision; Implicit; local convension; what the municipality is using. Use what's defined in SOSI 4, ref section 7.3.6.25 in:http://www.statkart.no/filestore/ny/sosi/SOSI_pdf/del1_2_RealiseringSosiGml.pdf		M		IfcCoordinateReferenceSystem.Name
Map Projection	Identification of Map Projection Used		*Information needed for transformation from local site coordinates to map coordinates. (NOTE: Not map to geodetic coordinate reference system).* ***Information not present in 2x3. Information must be exchanged outside the IFC 2x3 Model.***	M		

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MapProjection	Name of map projection	Only "NTM" allowed(the discussion UTM/NTM must be clarified by the Norwegian GIS-community)		O			IfcProjectedCRS.MapProjection
MapZone	Name of sone within map projection	Legal NTM zone range is 5..30		O			IfcProjectedCRS.MapZone
MapUnit	Length unit for map coordinates	Only M (meter) is allowed		M			IfcProjectedCRS.MapUnit
Site to Map Conversion	Site to map conversion parameters		*Information needed for transformation from local site coordinates to map coordinates. (NOTE: Not map to geodetic coordinate reference system).* ***Information not present in 2x3. Information must be exchanged outside the IFC 2x3 Model.***	M			
Eastings		NTM east coordinate		O			IfcMapConversion.Eastings
Northings		NTM north coordinate		O			IfcMapConversion.Northings
OrthogonalHeight	Orthogonal height relativ to the vertical datum	NN1954 value in meter		M			IfcMapConversion.OrthogonalHeight
XAxisAbscissa				M			IfcMapConversion.XAxisAbscissa
XAxisOrdinate				M			IfcMapConversion.XAxisOrdinate
Scale	Scale to be used when site length unit are different from map length unit	Always 1.0	*Not present in 2x3, assumed 1.0.*	M			IfcMapConversion.Scale
Coordinate Operation	Relationship between local site coordinate system and map coordinate system (Conversions and Transformations)		*Information needed for transformation from local site coordinates to map coordinates. (NOTE: Not map to geodetic coordinate reference system).* ***Information not present in 2x3. Information must be exchanged outside the IFC 2x3 Model.***	M			
SourceCRS	Coordinate system of site			M			IfcCoordinateOperation.SourceCRS='IfcGeometricRepresentationContext'
TargetCRS	Coordinate system of map projection			M			IfcCoordinateOperation.TargetCRS is a IfcProjectedCRS
Site Geometry Representation	Site map and/or terrain geometry.	OPTIONAL	*Note; the position, scaling and orientation of map and terrain must be converted to fit the local site coordinate system.*				
Foot Print Representation	Geometric Representation	Lines and curves. Footprint of Site	*See also Geographic Element below.*	O			IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationIdentifier = 'FootPrint' IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationType = 'GeometricCurveSet', or 'Annotation2D'
Survey Point Representation	Geometric Representation	Survey points and breaklines.		O			IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationIdentifier ='SurveyPoints' IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationType = 'GeometricSet'
Body Representation	Geometric Representation	Surface or volume representation		O			IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationIdentifier = 'FootPrint' IfcSite.IfcProductDefinitionShape.IfcShapeRepresentation.RepresentationType = 'GeometricCurveSet', or 'Annotation2D'
Site Address		REQUIRED		M			
Address	Address lines	depending on local usage, street number, street name, etc.		M/O			IfcSite.SiteAddress.AddressLines
City	Town or city name			M/O			IfcSite.SiteAddress.Town
State	State, Region, or "Länder"	optional in many countries		M/O			IfcSite.SiteAddress.Region
Zip	Postal code			M/O			IfcSite.SiteAddress.PostalCode
Land Title Number							
Land Title Number	Unique identification of the construction site.	In Norway; matrikkelnummer **MANDATORY**	*Matrikkelnummer consist of the following: Knr+Gnr+Bnr+Fnr+Snr, where Knr = four digit municipality number (possible leading zero included), the other terms shall not have leading zeros. Terms separated by blank space, all terms shall be given. If Fnr and/or Snr is undefined, they shall be set to 0 (zero).*	M			IfcSite.LandTitleNumber
Site Classification							
Classification	*Site Classification*		*(National) Standard(Classification system used for the terms around IfcSite.*	-			IfcClassificationReference (through relationship IfcRelAssociatesClassification)
Classification Item Key	*Key of classification item within the classification system*			-			IfcClassificationReference.ItemReference
Classification Item Name	*Clear name of the classification item*			-			IfcClassificationReference.Name
Classification System Name	*Name of the classification system*			-			IfcClassification.Name (through IfcClassificationReference.ReferencedSource)

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Classification System ID	*Identifyer of the classification system*			-			IfcClassification.Source (through IfcClassificationReference.ReferencedSource)
Site Base Quantities							IfcElementQuantity (through relationship IfcRelDefinedByProperties)
Site Perimeter	*Total perimeter of the side*			-			IfcQuantityLength.Name="GrossPerimeter"
Site Gross Land Area	*Total area of the building site, as projected to the horizontal plane.*			-			IfcQuantityArea.Name="GrossArea"
Site Properties							IfcPropertySet (through relationship IfcRelDefinedByProperties)
~~Site Common Properties~~	*Properties that are specified in the standard property definitions (or a relevant subset of) as defined in IFC site common properties*			-			IfcPropertySet with Name = "Pset_SiteCommon"
~~Site Catalogue properties~~	*Property that is specified by an external catalogue. Names are valid in the local context (e.g. by country, jurisdiction, building owner), only applicable in local context by additional agreements*			-			IfcPropertySet with Name = /* to be decided in local context */ and locally defined properties
~~e.g. "tatsächliche GRZ"~~	*"Grundflächenzahl" Ratio between the buildable area and the total area of a site*			-			IfcPropertySingleValue .Name="tatsächliche GRZ", .Description="D_Merkmalkatalog_BFR || ZL008.11.2.102" .Value=0.65
Spatial Decomposition							
Site contained in Project	"backlink" to the project as highest node in the project structure		*[General]: one project object allowed*	**M**			IfcRelAggregates with RelatingObject = IfcProject
Building contained in Site	Reference to all buildings that are situated on this site.			**M**			IfcRelAggregates with RelatedObject = IfcBuilding
~~Site contained in Site~~	*NOT ALLOWED Needed in case a site is split into smaller parts.*		*[General]: used for project structures, where a site has partial sites, not included*	**N**			IfcRelAggregates with RelatedObject = IfcSite
Geographic Element	Geographic objects from the GIS system that are relevant to show on the site in a BIM system.	Objects representing trees, roads, pipes, infrastructure, etc.	*Note; the position, scaling and orientation of these objects must be converted to fit the local site coordinate system.* *Ifc2x4: IfcGeographicElement and IfcGeographicElementType Ifc2x3: IfcProxy and IfcProxy.Name (for element type) and IfcProxy.Tag (for element ID/position-number/instance identification). See Ifc2x4 documentation.* *Owned by IfcSite through IfcSite.ContainsElements*	**O**			Ifc2x4: IfcGeographicElement and IfcGeographicElementType Ifc2x3: IfcProxy and IfcProxy.Name (for element type) and IfcProxy.Tag (for element ID/position-number/instance identification). See Ifc2x4 documentation.