MINnD s2 GT1.4 IFC-Tunnel Commentaires AFTES GT45
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MINnD GT1-4 - Review of buildingSmart Int'l RAR v1

Chapte	Subject	Page	Date	Chrono	Comments	Associated doc/img/lnk	Author	Date	Review GT1-4	Decision GT1-4	Transmission bSI
1	**Overview and methodology**	6	17/12/2020	1	Underground works are, among all civil engineering, the most hazardous and dangerous works due to the high level of interactions between anthropic and natural structures. Identification and management of risks, most of them related to geosciences, represents the highest value to be created during the design and construction process. This high level characteristic of underground works should be highlighted upfront the document and not wait until the chapter 8 on geotechnical requirements. A resumé of the risk scope should be brought from chapter 8 to this chapter. Minimizing and controlling the risk is a main factor when designing use cases and prioritizing them. This will also explain why incorporation of geosciences field in IFC are so crucial, although it should have beeen developed much earlier in IFC roadmap: I don't know of any building or infrastructure that are not supported on ground!		GT1-4				
				…							
				…							
2	**Scope**	8	17/12/2020	2	To further explain the remark on risk mentioned under chrono 1, a resumé of the risk scope should be brought from chapter 8 to this chapter.		GT1-4				
			17/12/2020	3	The graphic mentions "mined conventional" and "mined mechanical". For consistency - the mine tunnels are excluded - it would be better to have only "conventional" and "mechanical". Similarly and in view of several geo-* models it should be considered to express "geoscience models" rather than just "geotechnical models".		GT1-4				
2.1	Tunnel types	8	17/12/2020	4	From tunnel engineering point of view, and in consideration of the higher risks presented by these structures, access shafts (function priorization) and vertical excavation (construction method priorization) should be considered as high priority.		GT1-4				
2.2	Tunnel subsystems	9									
				…							
				…							
3	**Use cases**	10	17/12/2020	5	Although the size of the physical space that needs to be modelled during a tunnel project is not linked to the conceptual data model, it has a great importance as to the level of details and to the total size of the digitalized data (and this is a consideration later called in for advocating a technical solution rather than another one as in geometry discussions). This should be the time to intorduce geotechnical impacted zones" which are dimensioned in consideration of each specific risk. If one excepts the very early planning phase where as for other linfrastructure a large deca to hecto kilometrix corridor shall be considered, most of the time, an area of a few hundred meters should be considered with data related to all structures be they anthropic or natural.		GT1-4				

			17/12/2020	6	The exchanges considered in the use cases identifications chapter are most of the time bilateral exchanges between at most two or three disciplinary domains. This is of course true but does not underline the unavoidable role in complex structures and projets of the systems architect that must integrate all disciplines and technologies in one coherent solution and obtain the convergence of all actors. There is then a high level supervisory role that must perform all types of exchanges to guarantée the final performance of the tunnel. This should be present at all moments of the IFC Tunnel project.	GT1-4		
			17/12/2020	7	Although geologists and hydrogeologists share a large number of concepts, they are different specialists having specific models developing specific risks. Their impact ranges are also quite different. Use case 1 b should be described as geologic and hydrogeologic factual data.	GT1-4		
			17/12/2020	8	The use case 6b (D2D w full logic) is at the core of all engineers works when developing functional models (i.e. theories of how the tunnel system works all along its life cycle). It is understood that tha amount of works is fairly large and that it should be posponed but this is a decision whcih will make the furutrre works harder. There is no doubt that this will have eventually to be developed if IFC technology wants to last, the sooner the better. The same comment applies to the split to operate between functional objects and real objects.	GT1-4		
			17/12/2020	8	Use case 7 is a core analysis to consider mechanical and hydrostaboility at the excavation front and at longer range near the existing strures present in the vicinity. Excavation stability analysis should be a better name for such a use case.	GT1-4		
			17/12/2020	10	Use cases 8a and 8b are formulated for air and water flows in terms that refer only to permanent exploitation of the tunnel (and even only the water transfer tunnel for water). The title of later cases do not seem to cover the construction phase. But designing the construction phase is a must of the design phase and ventilation air and exhaust water systems durung construction should also be considered at desgin stage 8a and 8b.	GT1-4		
			17/12/2020	11	Use case 11 should take on board "excavation front stabilization" in the designation itself. The excavation front is the most dangerous place in tunnel works and this demands a special attention.	GT1-4		
			17/12/2020	12	Use case 12a and 12b should be a single one.	GT1-4		
			17/12/2020	13	Use case 17 requires an extensive semantics to record all types of damages and time alterations. These semantivcs were well developed during the FP7 European Innovation Project NETTUN.	GT1-4		
			17/12/2020	14	Use case 18 on settlement monitoring implies all ground and anthropic structures inside the geotechnical impacted zones.	GT1-4		
4	**Use cases prioritization**	19	17/12/2020	15	Apart the comments made above on the use case 6b having been taken out of scope, risk considerations should raise the level of priority from lower to highest for cases 7, 8a and b during construction, 15c and 18.	GT1-4		
5	**Process map and exchange scenarios**	21	17/12/2020	16	Figure 5,1 is in a low definition mode preventing anyone to read and use it. It is suggester to have it at hich definition in pdf and to have it as an A3 folded page.	GT1-4		

			17/12/2020	17	Pursuant to one of the basic comments made above, the exchange scenario fromm and towards the systems architect should be explicitely mentioned. It should indeed be later supported by a "universal MVD".	GT1-4		
			17/12/2020	18	For more clarity on scope it is suggested to name the Maintenance model as Operation and Maintenance Model	GT1-4		
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6.3	Alignment and tunnel axis	27						
6.4	Geometry	30						
6.4.1	Explicit Geometry	30						
6.4.2	Procedural Geometry	31	17/12/2020	19	This long development is welcome. Procedural geometry is indeed at the core of any engineers modelisation work (the functional or theoretical view of anything to be built) during design and construction. It is really of use to end-users of digitalized descriptions of infrastructures. At page 39 it shoould be worth stating that relative rotations of two successive segments (one surface perpendicular to the axis and another not parrallel to the first surface, the next segment vice-versa) is the way to realize direction changes imposed by the alignment.	GT1-4		
6.5	Voxel grids and octrees for representing geological data	40						
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7	**Spatial structure and spaces**	41						
7.1	Spatial Structure / Project Hierarchy	41	17/12/2020	20	At page 42/176, longitudinal sectioning may be dictated by geotechnical, hydrological or geological constraints even when construction methods do not differ (for example a section connected to a specific aquifer having a specific extension and range and a special function for a given water course basin.	GT1-4		
7.2	Spaces	46	17/12/2020	21	For spaces, it should be worth considering making different spaces according to the definition methods: either a defined geometry, or the resulting geometry between two concrete surfaces, or the envelope of the space occupied by a mobile gauge of fixed geometry (such as the gauge for the rolling stock being the envelope of two or three cars running in curves on rail tracks). Mobile gauges should be part of the IFC in order to compute dynalic or kinetic envelopes. .	GT1-4		
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8.5	Existing standards	70						

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8.5.c	IFC-geotech by Ifc4.3 (Common-schema) project	72						
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9	**Excavation requirements**	76						
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9.2.1	Conventional tunnelling	81						
9.2.2	Mechanised tunnelling	82						
9.2.3	Cut-and-cover tunnelling	82						
9.3	Geometry	82						
9.3.1	Conventional tunnelling	82	17/12/2020	22	The longitudinal section is not discussed. One shall not forget the importance of the free span excavation lentgth in the longitudinal section as it relates to the unsupported length of excavated tunnel . This is indeed one of the key factor to control excavation front stability. It varies a lot depending upon grounds conditions. Determined lengthes of the tunnel are also dedicated to drilling, mucking, supporting, lining ...	GT1-4		
9.3.2	Mechanised tunnelling	83						
9.3.3	Cut-and-cover tunnelling	84						
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10	**Excavation support, ground improvement, waterproofi**	86						
10.1	Excavation support	86						
10.1.1	Conventional tunnelling	86	17/12/2020	23	It is worth emphasizing the fact that most support measures (p86 to 98) refer to drilling holes in a certain geometric facshion or arrangement). The same applies to drilling holes for blasting. Drilled holes is a very generic object.	GT1-4		
10.1.2	Mechanised tunnelling	106	17/12/2020	24	Considerations on longitudnal section should also be given to see the length of tunnel with the annular space between virgin ground and segments in place, this void being later injected. And also to see the extent of the front excavation ahead of the cutting head, partially filled with excavated slurry.	GT1-4		
10.1.3	Cut-and-cover tunnelling	112						
10.2	Ground improvement and water control	116	17/12/2020	25	The method of compensation grouting is not mentioned although it is used for general stability control. Grout injection rates ares controlled by in situ measurement of settlements or of overcut estimates.	GT1-4		
10.2.1	Conventional tunnelling	116						
10.2.2	Mechanised tunnelling	119						
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11	**Tunnel systems requirements**	135						
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11.5	Power supply – High voltage	151						
11.5.1	Power supply under tunnel operation	151						
11.5.2	Power supply during tunnel construction	151						
11.5.3	Main components and characteristics	152						
11.6	Energized equipments	153						
11.6.1	Energized equipments under tunnel operation	154						
11.6.2	Energized equipments during tunnel construction	154						
11.6.3	Main components and characteristics	155						
11.7	Drainage	158						
11.7.1	Drainage system during tunnel operation	158						
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11.7.3	Main components and characteristics	160						
11.8	Safety & evacuation	161						
11.8.1	Safety & evacuation during tunnel operation	161						
11.8.2	Safety & evacuation during tunnel construction	162						
11.8.3	Main components and characteristics	163						
11.9	Fire protection	165						
11.9.1	Firefighting during tunnel operation	165						
11.9.2	Firefighting during tunnel construction	166						
11.9.3	Main components and characteristics	167						
				…				
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12	**Model View Definitions**	169	17/12/2020	26	To cover the needs of the tunnel system's architect there should be also a "universal MVD". It could also be used by controlling organisations.	GT1-4		
13	**Next Steps**	171						
14	**Conclusion**	172	17/12/2020	27	There should be a comment as to the necessity to introduce risk control or reducing hazards as the main control. Ceotechnical models are a must in tunnel as for all the domains of the construction industry. There are no construction object unsupported on ground and in close interaction with its environment.	GT1-4		

MINnD GT1-5 - Review of buildingSmart Int'l RAR v1

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1	**Overview and methodology**	6		…							
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2	**Scope**	8									
2.1	Tunnel types	8									
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6.4	Geometry	30									
6.4.1	Explicit Geometry	30									
6.4.2	Procedural Geometry	31									
6.5	Voxel grids and octrees for representing geological data	40	25/01/2021	5	Section xy		MBE				
			25/01/2021	6	ISO19123 provide definition of coverages that encompasses grids. In case an IFC extension is proposed, interoperabilty with that standard shall be adressed.		MBE				
7	**Spatial structure and spaces**	41									
7.1	Spatial Structure / Project Hierarchy	41	25/01/2021	7	Very different scales between site and facility part that may lead to the use of different CRS. Spatial structure / Project hierarchy shall take this into account.		MBE				
7.2	Spaces	46									
				…							
				…							
8	**Geology and geotechnics modelling requirements**	50									
8.1	Introduction	50	01/03/2021	18	It is indicated that Geological / Geotechnical model should be covered by IFC. It could be interesting to expand this idea to other consistent model description as those studied in Minnd (Geosci ML, Water ML, RESQML)		BLH				
			01/03/2021	19	Modelisation of waterground should be added at the same level as Geological or Geotechnical model		BLH				
8.1.a	Requirements in a tunnel lifecycle	50		20							

8.1.b	Special characteristics of the geological/geotechnical models	50	01/03/2021	21	It could be interesting to add characteristic of hydrogeological Model	BLH		
8.1.c	Terminology	51	19/01/2021	1	In view of the importance of the water associated risks, I would recommend that a particular § be devoted to "Hydrological model" ine the same way that geological and geotechnical models are presented. The scientific disciplin is in some way almost autonomous of geology with their own sub-specialists. Unlike geological models one may compute hydrological models. The impacted zone can be very large depending upon the size of the aquifers.	VCO		
			25/01/2021	8	Geological Tunnel Documentation is also factual data. It should be paid attention in phase 2 not defining twice some Observations & Measurements because they can appear either during the pre-construction phase, construction and maintenance.	MBE		
			25/01/2021	9	Geotechnical model normally based on geological model. Actually, for tunnel projects geotechnical model are always built from geological models. Case where geological models are skipped are for small projects in geotechnics.	MBE		
			01/03/2021	22	It could be interesting to add terminology linked to hydrogeological Model	BLH		
			01/03/2021	23	It could be interesting to add the notion of ZIG, Geotechnical influence Area defining by volume of soil layer impacted by the project	BLH		
8.1.d	Abbreviations	52						
8.1.e	Focal points: exchanged geological/geotechnical information and models	52	19/01/2021	2	Books A, B and C are designed at design and construction to enable a fully informed call for tender mainbly. As such they cover incompletely the phase of exploitation and maintenance which shall be fed and supplemented by inputs coming from on going surveys, audit and diagnostic to understand weathering processes and progressive damages to tunnel structures whether or not in line with ground and water conditions or with anthropic activities. In that respect contacts should ne taken with the 6th PCRD project NETTUN which has developed a complete semantics and ontology dedicated to this domain.	VCO		
8.1.f	Ground classification and risk assessment for tunneling: Important aspects	55	19/01/2021	3	In line with comment 1, it would be worth introducing hydrological between geological and aspects box. In the text, one should mention that mosts risks find their origin in ground, water or air. Case A7 could be titled "Faults and disturbed zones with or without water" or "Water bearing fault zones" case be singled out. A15, A16, A17 could be grouped into a single one "Dangerous materials"	VCO		
			01/03/2021	24	It could be added the principle of limiting the risk by performing investigation during the project phase until construction phase (PRELI, AVP, PRO, EXE). At least, it could be important to indicated that tunnel could be seen as the "final investigation" representing the real model (model without any uncertainty)	BLH		

			01/03/2021	25	It could added the lifetime / lyfecycle of model (evolution of soil mechanical parameter during construction, addition of investigation, etc)	BLH		
	Table 1	57	25/01/2021	10	What does "semantics sufficient" mean? No geometry is required? Location of the possible appearance of noxious gas, aggressive water or cavities is really helpful as they can be very local.	MBE		
	Table 1	57	28/01/2021	1	"Instability of natural slope" The geometrical representation expected is a part of the geological / geotechnical model? Or could we have another model issued from the geological/geotechnical model exploitation (object) : a surface or volume representing the hazard area? Wich must be combine to the tunnel location to obtain a risk ranking zone?	CGA		
	Table 2	61	25/01/2021		Missing H to geotechnical	MBE		
			25/01/2021		"The relevant information is transported in the semantics" : does it mean there will be no proposal risk / hazard description?	MBE		
8.2	Semantics	64	19/01/2021	4	In the § "interpreted models" one could mention that hydrogeo models include sources and wells. And it is worth mentioning here that the range of impacted zones and studies should be larger than for mechanical hazards.	VCO		
		64	25/01/2021	11	Shall remind that the Appendix C is a draft proposal, as indicated in the previous chapter	MBE		
		64	25/01/2021	12	Hydromodel appearing yet not mentionned in previous sections. Link to comment 1	MBE		
		64	25/01/2021	13	TunnelDocu inside GeoDocu	MBE		
		65	25/01/2021	14	HydroGeoModel. See comment 12.	MBE		
		65	25/01/2021	15	"Both options should be supported". Not very clear.	MBE		
8.3	Geometry	66	25/01/2021	16	Point representation. Cartesian vs along an alignment is just about coordinate expression. Why mentioning Annotation?	MBE		
		66	25/01/2021	17	IFC Curve > Replace by Curve at this RAR step.	MBE		
8.4	Uncertainty	69	01/03/2021	24	It could be indicated example of uncertainty modelisation (varation of soil layer by different volume, data uncertainty, etc..)	BLH		
8.5	Existing standards	70						
8.5.a	OGC-standards	70						
8.5.b	Inspire	72						
8.5.c	IFC-geotech by Ifc4.3 (Common-schema) project	72						
	other		01/03/2021	25	Geological, geotechnical model reprensent the initial state of the soil before tunneling. It could be interesting to add mechanical parameter of the soil layer after tunnel construction: reused soil after excavation (storage, embankment, etc) , reinforced soil (nailed or injected soil volume), fractured soil behavior, etc... To reach this goal, it is important to integrate the maximum information from investigation from the start of the project	BLH		
	other		01/03/2021	26	Neighboring modelisation could be presented (impact with tunnel)	BLH		
9	**Excavation requirements**	76						

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9.2	Semantics	81						
9.2.1	Conventional tunnelling	81						
9.2.2	Mechanised tunnelling	82						
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9.3	Geometry	82						
9.3.1	Conventional tunnelling	82						
9.3.2	Mechanised tunnelling	83						
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10	**Excavation support, ground improvement, waterproofing and tunnel lining requirements**	86						
10.1	Excavation support	86						
10.1.1	Conventional tunnelling	86						
		94	28/01/2021	2	In addition to wire mesh, steel straps, and bolts, is there any use of wire ropes to fix wire meshes to the rock surface? If this is the case, this object can be added in the list on page 94.	CGA		
10.1.2	Mechanised tunnelling	106						
10.1.3	Cut-and-cover tunnelling	112						
10.2	Ground improvement and water control	116						
10.2.1	Conventional tunnelling	116						
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10.2.3	Cut and Cover tunnelling	120						
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