

Use Case 20: Handover to/from Asset management systems

Purpose

The most significant part of the lifecycle of a tunnel is its operational phase that includes inspection, damage detection, condition rating, predictive (planned) and ad-hoc (repair) maintenance.

To best prepare this operational phase, information of the construction phase as it's been executed (as-built) is to be collected in a model of the project with different objectives: a/confirm the functional (programmatic) requirements are sustained by the structure built and the systems installed, b/document and justify any variants between as-designed and as-built, c/prepare the information (at the proper level of detail) that is awaited by the asset management system to be used in the operational phase.

Furthermore, advanced asset management is expected to leverage a Digital Twin of a tunnel, in the form of a continuously updated digital mirror of the current conditions (as-maintained) of the civil engineering components as well as of the different technical systems that permit its operation. Such a Digital Twin will notably be based upon the as-built model recollected.

In case components of the structure or systems equipments are to be upgraded (i.e., replaced with different functional capacities), the as-built model of the project has to be re-synchronized with the information managed in the asset management system (that records this upgrade) in order to ensure consistency between the two data repositories. It should be noted that some re-shaping needs to take place whilst exporting data from the as-built model to the AM model and vice-format (BIM and AM solutions do not operate at the same level of details).

Geometries, location and semantic information of the tunnel project must be transferred. This includes the as-built model with detailed components construction-related and equipments installation-related information, as well as as-identified/as-encountered geology.



Exchange scenario

IFC-Tunnel must support the exchange of models from BIM applications (authoring and coordination tools) to BIM-based asset management systems.

Vice versa, for the design and engineering of tunnel modifications and or constructive maintenance actions, the model must be transferred back from asset management systems into BIM authoring tools. Given the fact that design-to-design is only supported to a limited extend by IFC (see Use case 6b), there are limitations regarding the transport of parametrics and the modifiability of the model.

An important requirement is the management of all information related to the equipment of the tunnel. The original functional requirements must be managed alongside the installed equipments.

Requirements for IFC-Tunnel:

The requirements for IFC-Tunnel lie in the geometries, location & semantic description of

- the tunnel itself (detailed construction information, rock support etc.)
- the systems that equip the tunnel (detailed equipment installation information)
- geology (as encountered)

Geometry: Asset management systems are regularly only capable to use explicit geometry descriptions, such as `IfcTriangulatedFaceSets`. This results in limitations for the re-import into design applications. Most probably, the explicit tunnel model can only be used as a reference model (compare Use Case 6a vs Use Case 6b).

Semantics: All existing entities must be described with appropriate semantics: components construction materials (concrete quality), tolerances and identification (RFID, equipments manufacturer, capacities and maintainability spaces. A complex aspect remains the proper description of geology and classification plays an important role for asset management system.