

Use Case 17: Damages recording

Purpose

Damages control is done during construction, at acceptance of works and during operation.

It aims at recording the damages affecting the quality of the structure during construction and operation.

- In case of mechanized excavation: damages to segments (due to casting, demoulding, handling, overturning, preliminary and final storage, transportation, installation, thrust, grouting and operational life), to gaskets (improper installation, damage during transport and installation, gap, offset) and other accessories;
- In case of conventional excavation: damages to temporary support during excavation, to final lining, to waterproofness systems (water ingress, cracks, deformations, drainage failure, waterproofing failure, etc.)

Such conditions usually could arise from a combination of adverse ground and groundwater regimes, (i.e., high overburden, rockburst events, swelling and creep behaviour, high water load), or to technological aspects (i.e. realization, installation, curing,...)

During the operation, with time, these deformations in the lining can be considered non-acceptable for the road/train tunnels or hydraulic galleries from geometrical, structural and esthetical point of view. These aspects are more driven by observation (surveys), as well as by measurement with proper monitoring (cracks width, clearance,...)

Three actions are required in the framework of quality plan for damage control and must be considered in any phase, with information that would have to be recorded:

- traceability and data record: location and time history recording (for precast element, presence of an identification label)
- inspection: identification, type, location, description of damages (quantitative and/or qualitative)
- acceptance/repair works: analysis of causes and selection of mitigation measure, corrective actions performed

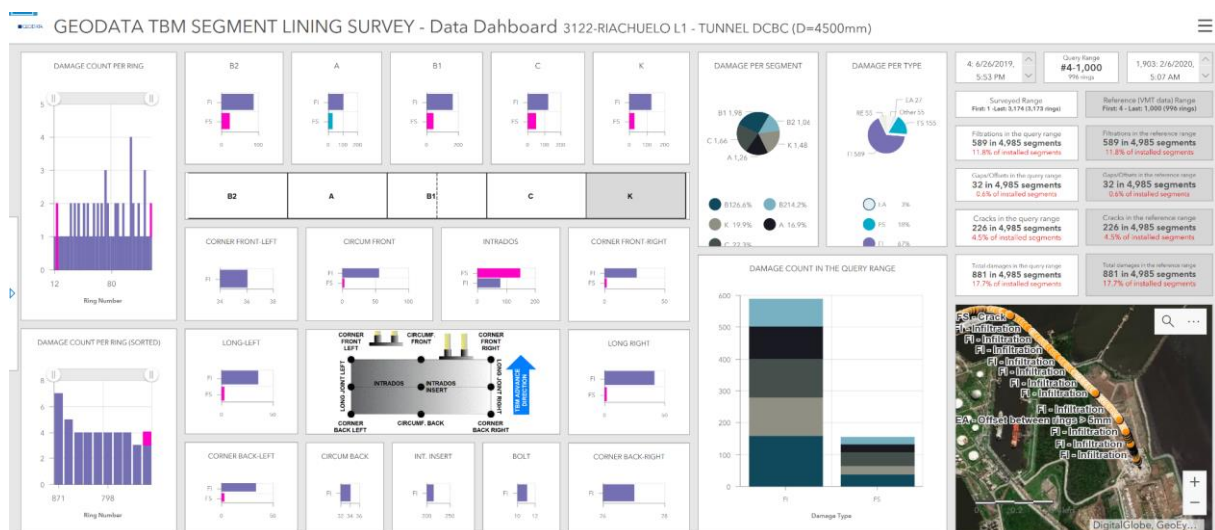


Figure 1: Example of damage data recording and integration with GIS, courtesy Geodata

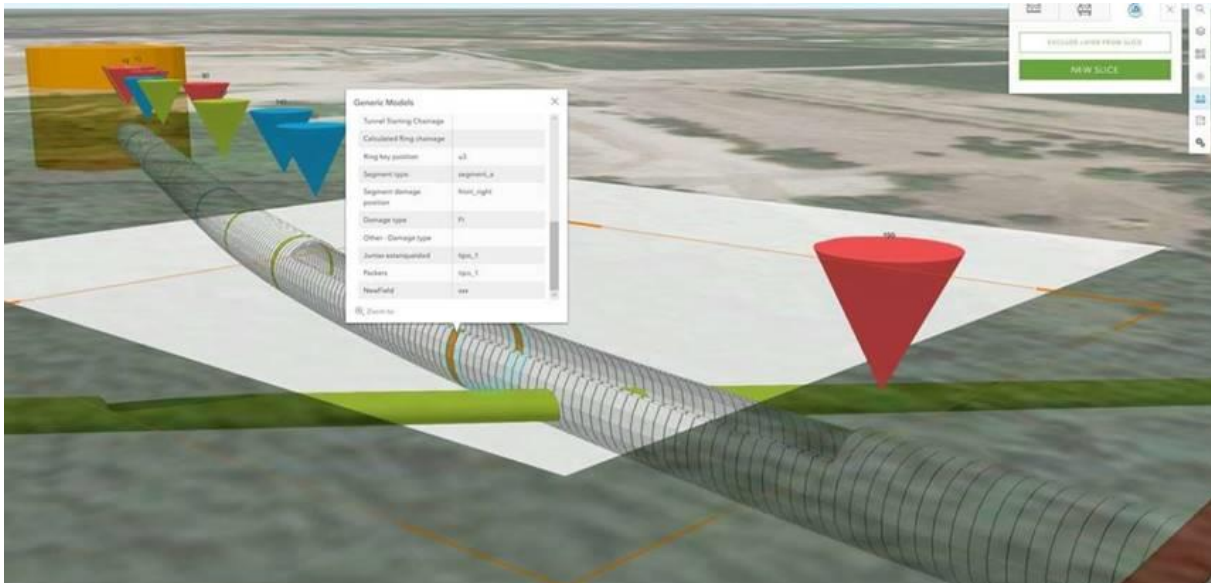


Figure 2: Example of damage data recording and integration with BIM, courtesy Geodata

The IFC exchange scenario has to take into account:

- BIM as-designed application to field application
- Field application to BIM as-built application

In IFC, component-specific condition information has to be transported, including a high-level description of damages and geotechnical conditions, documentation (photos, survey forms).



Figure 3: Example of tool for damage data recording on-site by a mobile phone app, courtesy Geodata

Where no fine-grained components are available, linear referencing along the tunnel is required for localization of damages.

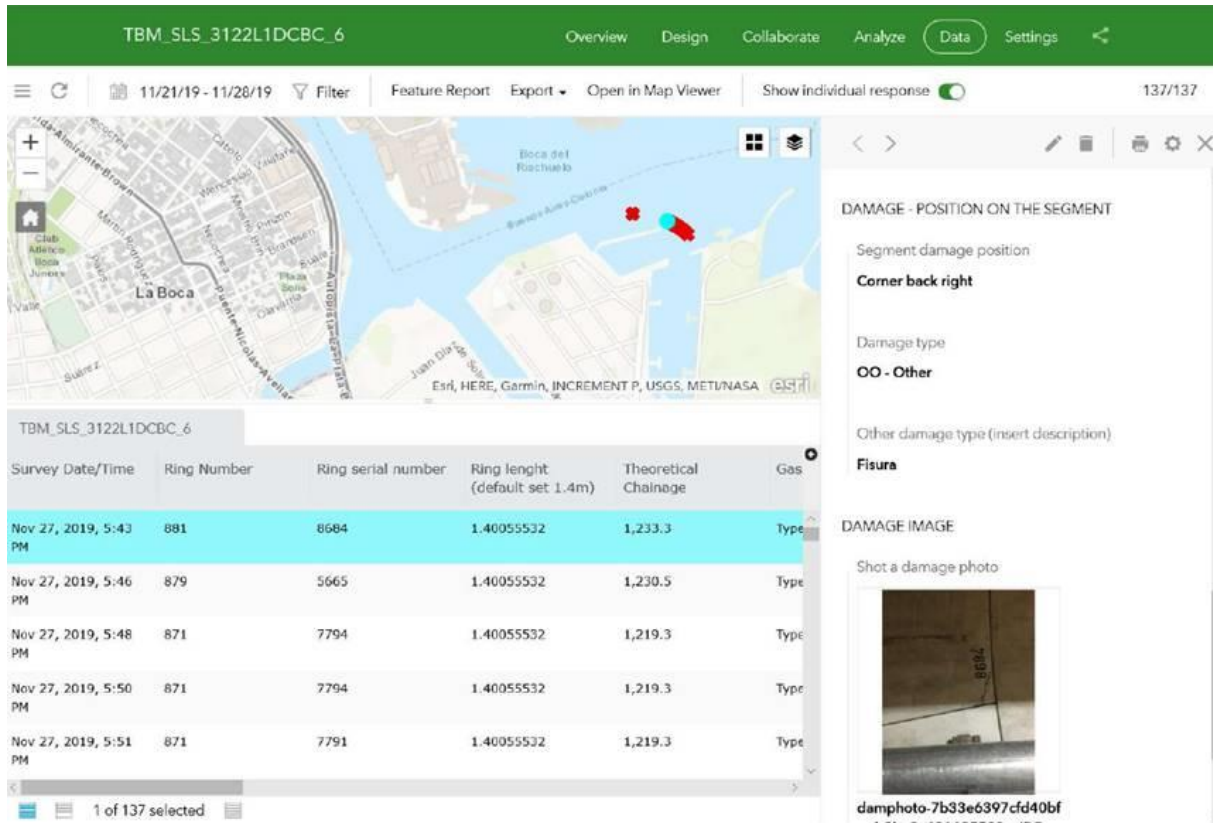


Figure 4: Example of damage data collection with pictures, courtesy Geodata

Requirements for IFC-Tunnel:

- Tunnel itself at different stages (initial – state 0 and through operational lifecycle)
- Terrain
- Information related to construction process
- Geophysical property and deformation of lining and surrounding ground
- Links to UC7, 8b, 15b, 18

Coordinate Systems: Whereas some BIM software provide 1:1 modeling, BIM for Infrastructure solutions and professional GIS systems operate in projected coordinate system. Thus, a transformation might be necessary, and all required parameters must be provided by the IFC format.

Geometry:

Particular attention must be paid to the interface with GIS systems. For surveys, information about geometry could be transferred through identification numbers or volumetric representations. In case a laser scanner survey for cracks recognition, points-clouds could be included.

Semantics:

All existing entities must be described with appropriate semantics. Information to be exchanged is well defined by rigid forms, whose information must be structured for sharing. Link to documentation in other format must be supported (photos, videos)