

Use Case 7: Numerical (structural & geotechnical) analysis

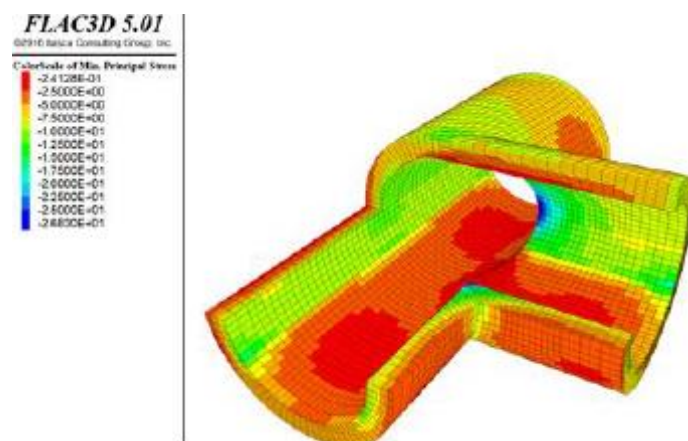
Purpose

Engineers tend to use different software to perform different tasks such as geometry modelling, database management, numerical analysis and data visualization. This may cause decrease of productivity and losses of information during the conversion/exchange process between different data sources. In the early design phase, numerical analysis becomes more and more important to:

- Ensure stability of the ground and underground structures
- Predict surface settlements
- Assess built environment / compensation claims

In many cases, particularly for the feasibility study, is desirable to visualize geometric CAD models and computational simulations results simultaneously, in order to increase the understanding of a phenomenon under study.

Therefore, the exchange scenario is expected to allow a model-based transfer of information/data in IFC format from the tunnel design software to numerical analysis software.



Source : Cigéo Project (ANDRA, France)

Requirements for IFC-Tunnel:

A proper representation of geometry and semantic of :

- Geology,
- Existing tunnels and infrastructure,
- New designed tunnel.

This should be coordinated with other use cases and define which LOD is needed.

Input use cases:

- UC 2b – Geotechnical modelling for design
- UC 2c – Geotechnical modelling for construction

- UC 4a – Technical visualization
- UC 18 – Settlement monitoring

Output use cases:

- UC 10a – Quantity take-off
- UC 11 – Construction sequencing (4D modelling)
- UC 15a – Progress monitoring
- UC 15d – Quantity determination for billing / payment

Geometry:

Similar to use case 2b, the model of the geological layers can be represented as cross-sections, surface models, and solid models (BREPs). The same is also valid for structural elements (e.g. lining, support). Simplified geometry of the existing infrastructure can be considered.

Semantics:

All entities should contain all required information to perform the numerical simulation, e.g. material properties, modelling parameters, design parameters. This information differ base on the individual entity/ domain considering several components included in the numerical model.