TEMP3D

3D Heat Transfer Analysis

Add TEMP3D to TEMP/W to unlock the power of 3D heat transfer analysis in porous media. TEMP3D provides the tools to quickly create 3D geometry, apply materials and boundary conditions to 3D objects, generate finite element mesh, and solve and interpret 3D results.

SEAMLESS 2D-3D INTEROPERABILITY

Project files may contain both 2D and 3D analyses, allowing for easy generation of 3D geometries from 2D analyses. Material and boundary condition assignments from the 2D analysis are automatically applied in 3D.

MATERIALS & BOUNDARIES

TEMP3D supports a comprehensive set of boundary conditions and the same material properties as TEMP/W. Directly apply materials and boundary conditions like convective surfaces and thermosyphons to geometric objects.

3D COUPLING CAPABILITIES

Analyze coupled 3D problems by integrating TEMP3D with SEEP3D to investigate forced convection of heat via 3D groundwater flow, free convection of water due to thermally-induced changes in density, and 3D thermal vapour flow.

RESULTS INTERPRETATION

TEMP3D builds on the traditions of TEMP/W, with a powerful graphing engine at the heart of interpretation. Easily create graphs at any location using geometric objects or polylines. Extract data from GeoStudio with a single click.

TEMP3D extends the functionality of TEMP/W to model a greater range of thermal problems

DESIGN OF GROUND FREEZING SYSTEMS

Controlling groundwater flow and stabilizing ground is critical in many tunnelling, waste management, and civil engineering projects. The convective surface and thermosyphon boundary conditions in TEMP3D can be used to analyze and design 3-dimensional ground freezing systems. Combined with SEEP3D, forced convection heat transfer can be analyzed in even the most challenging physical systems.

EFFECT OF INFRASTRUCTURE ON PERMAFROST

Infrastructure projects like roadways and foundations can impact the integrity of permafrost in northern regions. TEMP3D provides the tools to assess warming caused by the construction and presence of these systems, and to design active or passive measures to minimize their overall impact.

DESIGN OF CONTAINMENT METHODS

Containment systems for mine waste, landfills, and mine reclamation in northern regions often involve complex thermal and hydraulic behaviour that effect the long-term
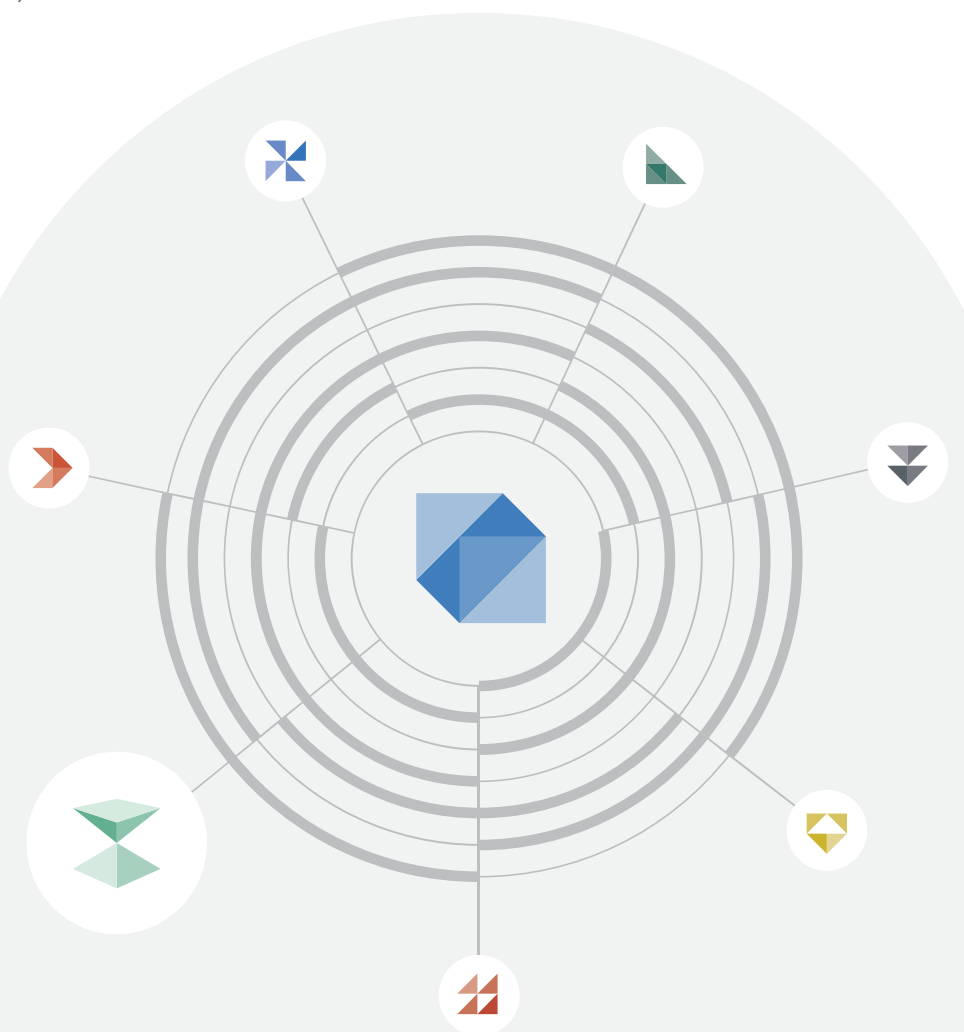
performance of these structures. TEMP3D provides the ideal tool for understanding the 3-dimensional thermal response of saturated-unsaturated cover systems and may be combined with SEEP3D to analyze moisture movement in seasonally frozen systems.

CLIMATE CHANGE IMPACTS

Climate change may threaten the integrity of northern infrastructures. TEMP3D provides a rigorous phase change formulation for addressing problems that involve freeze-thaw of saturated-unsaturated porous media.
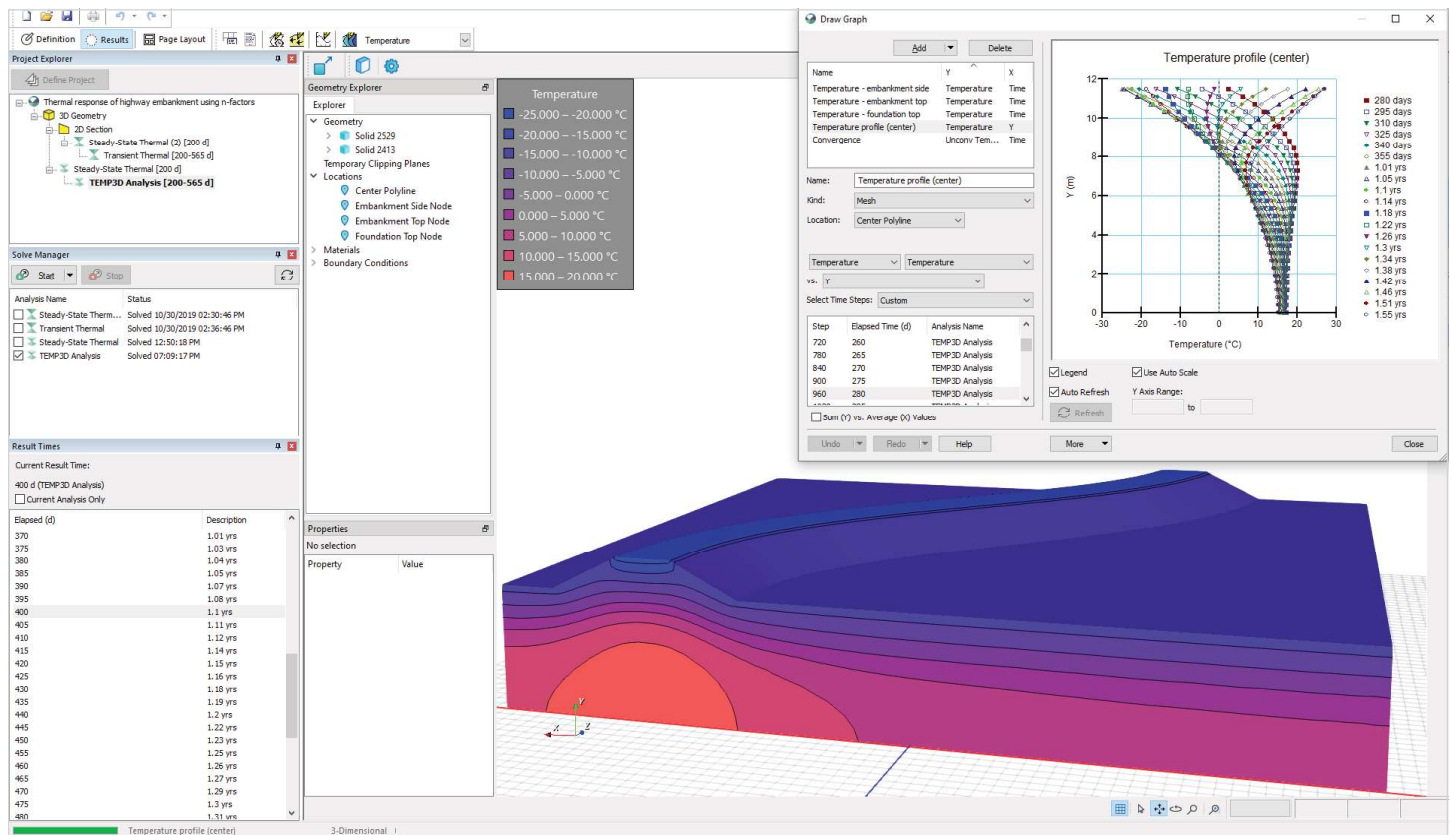
The power of integration

TEMP3D offers powerful analytical capabilities when used in combination with other GeoStudio products.

TEMP3D + TEMP/W comprehensive feature set

- ✓ Comprehensive formulation, including phase change
- ✓ Rigorous under-relaxation and convergence strategies
- ✓ Thermal functions estimation

- ✓ Complete range of boundary conditions
- ✓ Steady-state or transient flow
- ✓ Forced convection with water, air, and vapor transfers

- ✓ Clean mesh generation with single click of the mouse
- ✓ Integrate with BUILD3D for complex 3D geometries
- ✓ Powerful results graphing

SEEP3D INTEGRATION FOR COUPLED FLOW ANALYSIS

TEMP3D offers full integration with SEEP3D such that 3-dimensional heat transfer analyses can be coupled with 3-dimensional pore-water pressure results to assess forced convection via water or vapour flow. Similarly, thermally-induced 3-dimensional water and vapour flow can be analyzed by coupling SEEP3D and TEMP3D. This greatly expands the modeling capabilities for those using TEMP3D, as groundwater flow is often an important consideration in heat trransfer problems.

ADD BUILD3D FOR COMPLEX GEOMETRY CREATION

BUILD3D is a revolutionary tool for constructing 3-dimensional, analysis-ready geometries. TEMP3D includes a free, feature-limited version of BUILD3D; however, adding the full-featured BUILD3D unlocks several additional tools allowing for unlimited geometry creation. BUILD3D's feature-based design can create models with: complex topography and soil layers; tunnels, rivers, dams and levees swept along arbitrary paths; and 3D geometry features imported from CAD files.

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