

Transient hygro-thermal analysis during concrete hardening: frame bridge

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1. Input Receipt 2. Results			

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A1:1
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1. GENERAL / MEASUREMENT

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1.1 CONSTRUCTION TYPE

Concrete frame bridge casted in 2 stages.

1.2 TIME PERIOD

The risk of cracking is studied over a time period of 30 days for casting stage 1, and 10 days for casting stage 2.

1.3 REMOVAL OF FORMWORK

Form work (plywood) s removed after 3 days.

1.4 AIR TEMPERATURE

Outside air (T_{air}) : +20° C

1.5 GROUND TEMPERATURE

Outside air (T_{air}) : +10° C

1.6 CONCRETE

Concrete : C35/45

Water/cementious ratio ($v_{ct_{ekv}}$) : 0.45

Cementhalt: 390 kg/m³

Type : II (LH)

Casting temperature: +15° C

Casting speed: max. 1 m/h

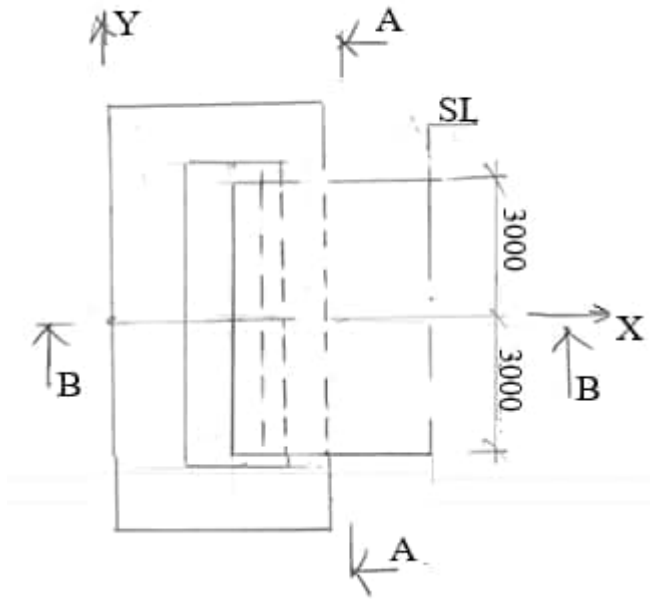
	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A1:3
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1.7 CONCRETE NONLINEAR MODELL

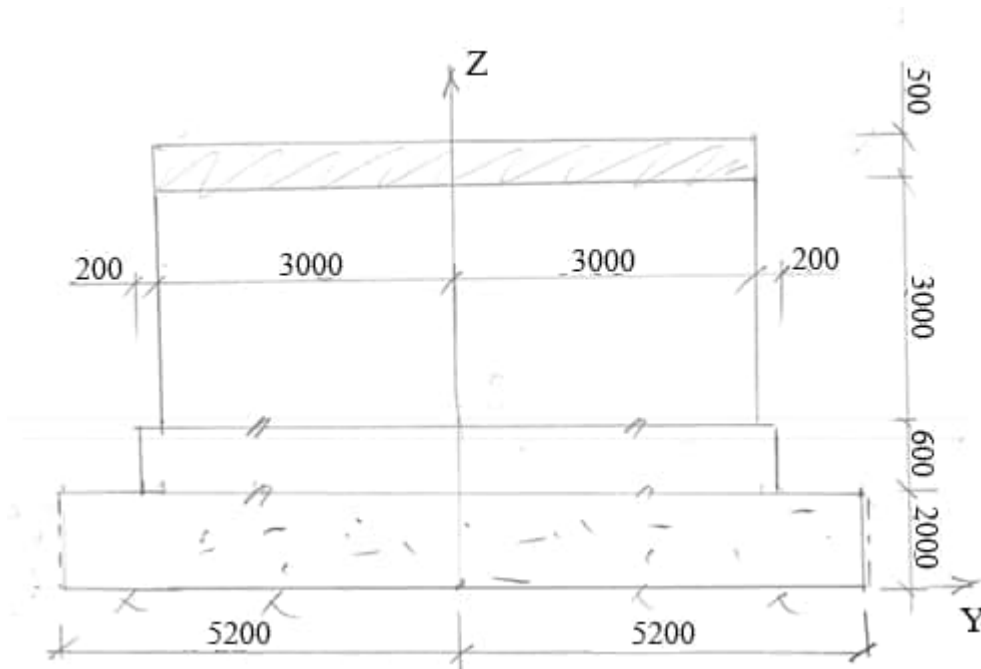
When studying risk of cracking and occurring crack width the concrete nonlinear model CEB-FIP modell 109 is used. This material model takes into account the effects of heat of hydration, creep and shrinkage, along when deteminating transient evolution of properties $E_c(t)$, $f_{cc}(t)$ and $f_{ct}(t)$.

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1.8 MEASUREMENTS

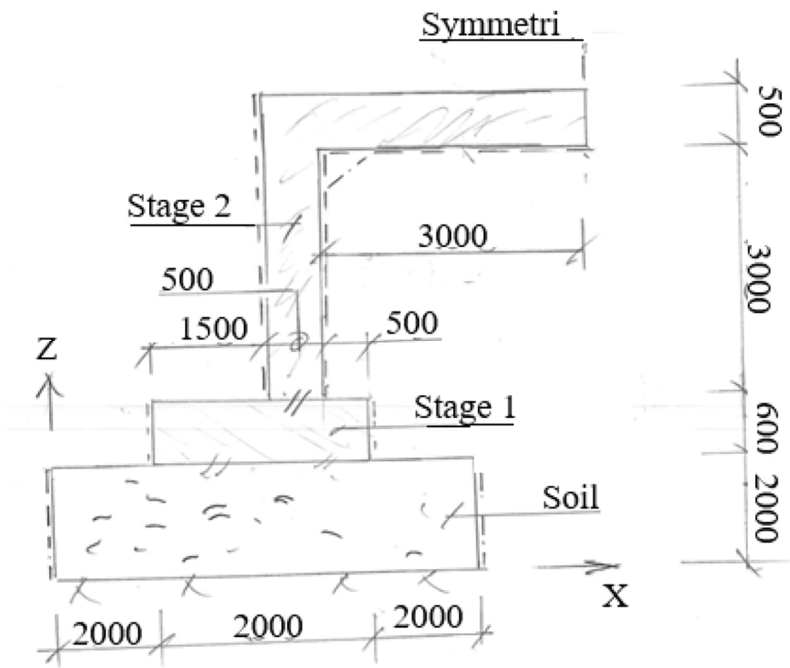


PLAN



SECTION A-A

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SECTION B-B

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:1
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2. SYSTEM ANALYSIS

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2.3	MATERIAL	page 2:9-10
2.4	BOUNDARY CONDITIONS	page 2:11-14
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	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:2
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2.1 GENERAL

The frame RC bridge is modelled only as one quarter due to symmetry.

Both soil and bridge is modelled in 3D using *volume elements*, however two different are needed.

One for "thermal" analysis (element HHT8) and the other for "structural" analysis (element HX8).

These are applied to two different analysis (Analysis 1 & Analysis 2).

In "thermal" analysis heat properties are applied to concrete and soil.

For "structural" analysis concrete is modelled using non linear material according to CEB-FIP concrete modell 109 (nonlinear). This modell can determine the account the effects of heat of hydration, creep and shrinkage, along with the hydration dependent evolution of properties $E_{ct}(t)$, $f_{cc}(t)$ and $f_{ct}(t)$. In this analysis the effects of shrinkage are not considered. In this analysis soil is modelled as a isotropic material.

Analysis	Elements	Description	Material
1	HHT8	Thermal exothermic (isotropic)	Concrete
-"	HHT8	Thermal none exothermic (isotropic)	Soil
2	HX8	CEB-FIP concrete modell 109 (nonlinear)	Concrete
-"	HX8	Isotropic (linear)	Soil

The analysis have two casting stages (stage 1 & stage 2). At stage 1 structure associated to stage 2 are "Decativated". These elements are "Activated" during stage 2 as seen in table below.

Stage	Soil	Slab	Abutment	Deck
1	Active	Active	Deactive	Deactive
2	Active	Active	Active	Active

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:3
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The analysis is transient over 40 days many calculations, to reduce the amount of calculations time step is varied as seen below. Removal of form is performed after 3 days (subtime b) as seen in table below.

Stage	Subtime	Time step	Time	Form
1	a	0.05	0.5	Yes
-"	b	0.10	1.0	Yes
-"	c	0.20	3.0	Yes
-"	d	0.50	10.0	No
-"	e	1.00	30.0	No
2	a	0.05	30.5	Yes
-"	b	0.10	31.0	Yes
-"	c	0.20	33.0	Yes
-"	d	0.50	40.0	No
-	-	day	day	-

Appendices:

Appendix	Name
1	Input receipt
2	Results

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:4
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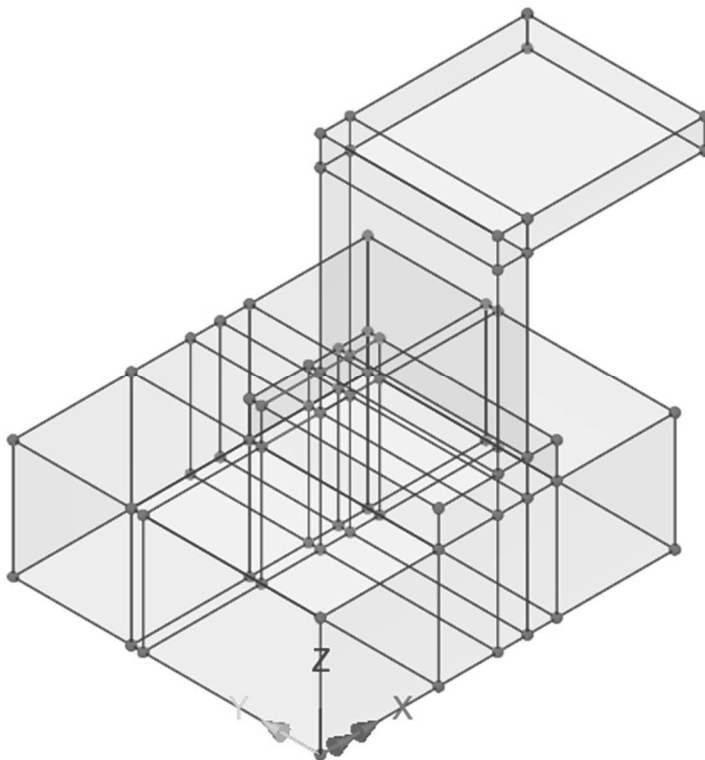
2.2 SKETCH SYSTEM ANALYSIS

All coordinates needed to describe POINTS are found in appendix 1.

All POINTS needed to describe LINES are found in appendix 1.

All LINES needed to describe SURFACE are found in appendix 1.

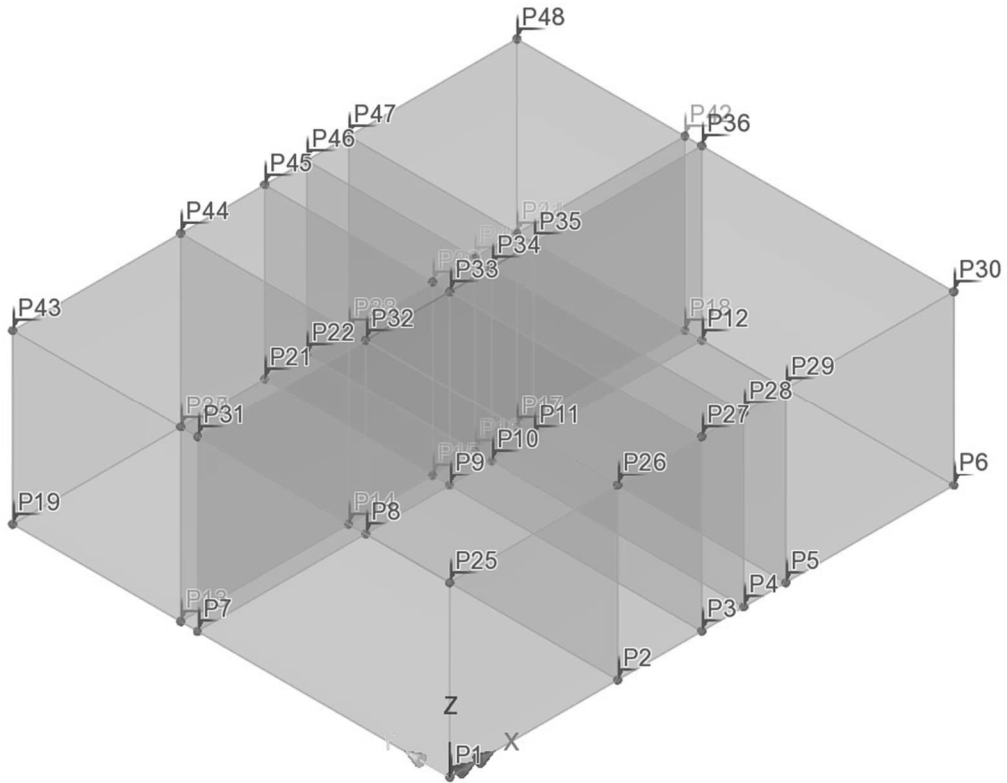
All SURFACES needed to describe the SOLIDE are found in appendix 1.



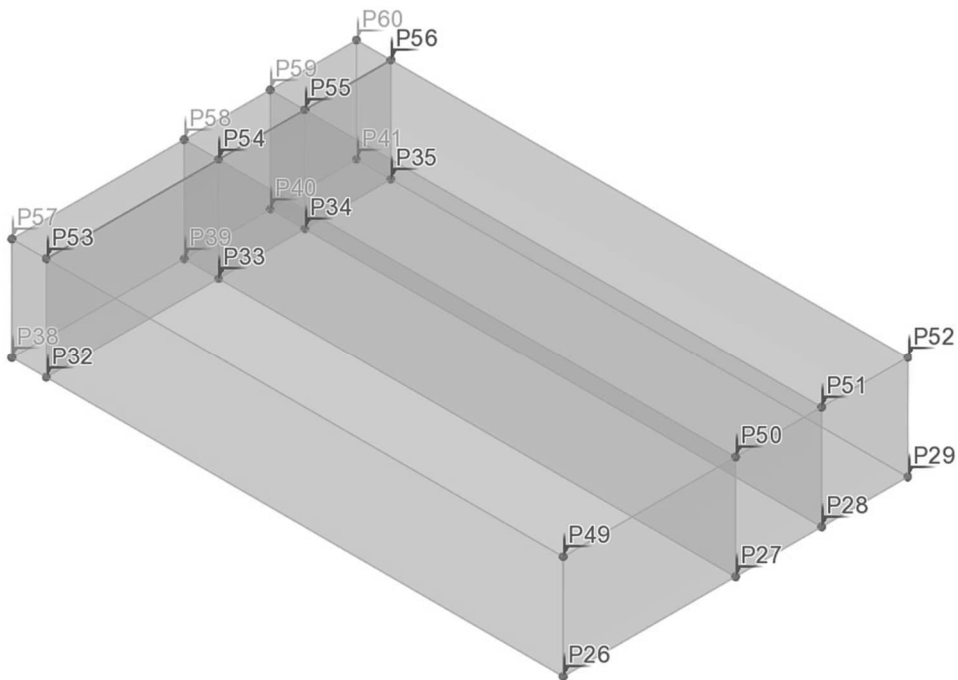
Overview 3D Geometry

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:5
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2.2.1 Points

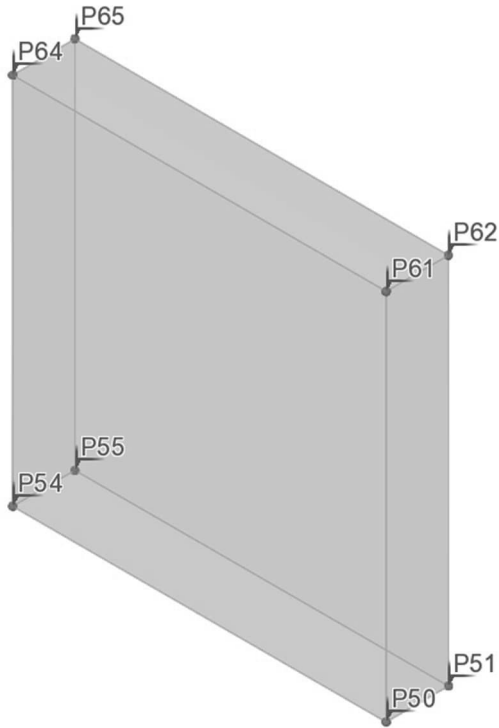


Overview 3D Soil

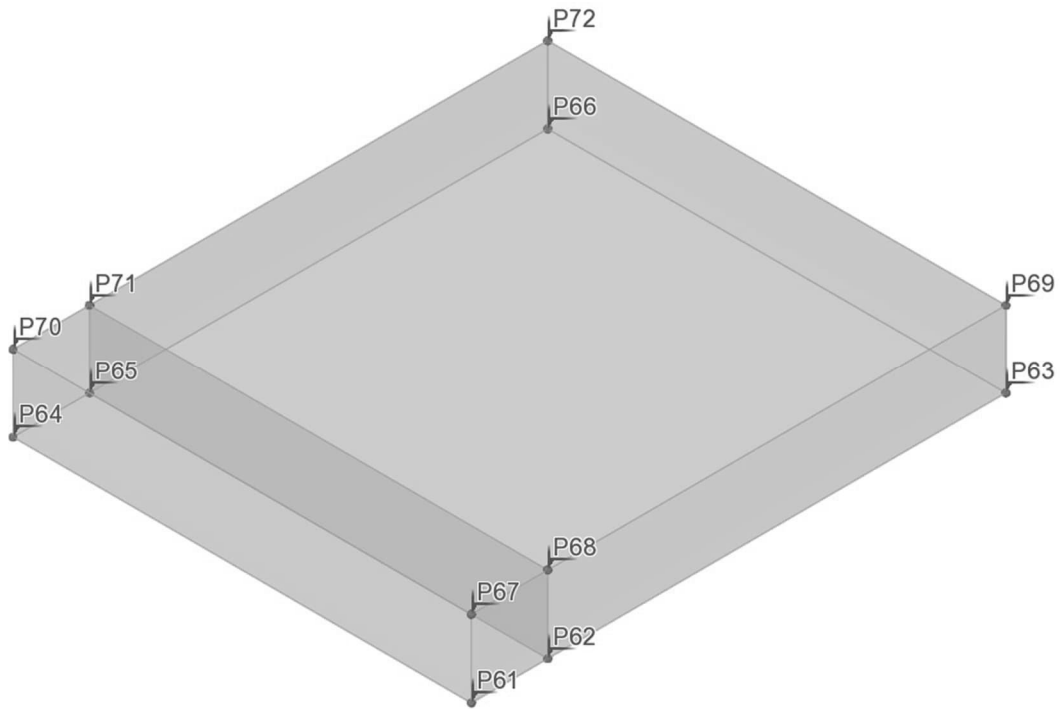


Overview 3D Slab

	<p>Part A – CALCULATION ASSUMPTIONS</p> <p>Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage</p>	<p>Status :</p>	<p>Page: A2:6</p>
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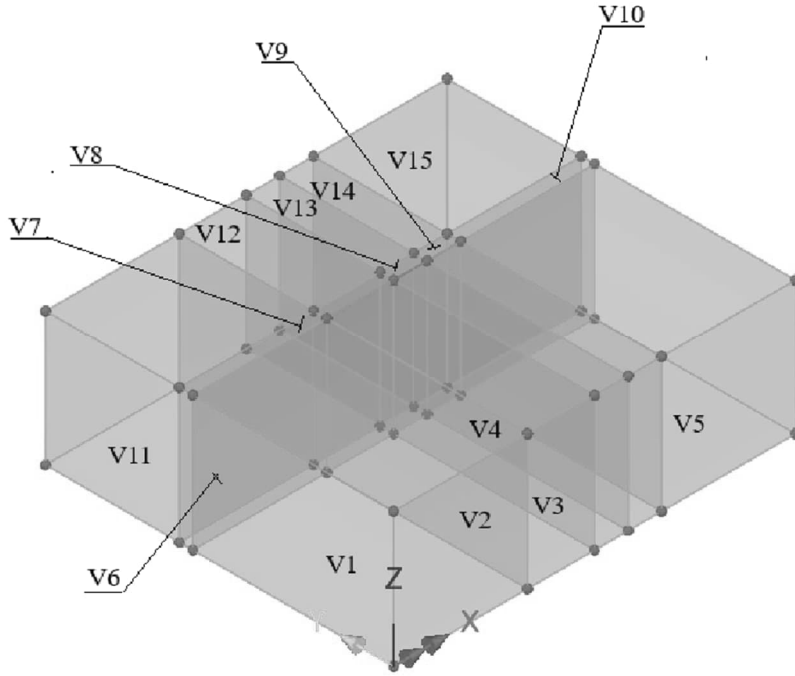
Overview 3D
Abutment



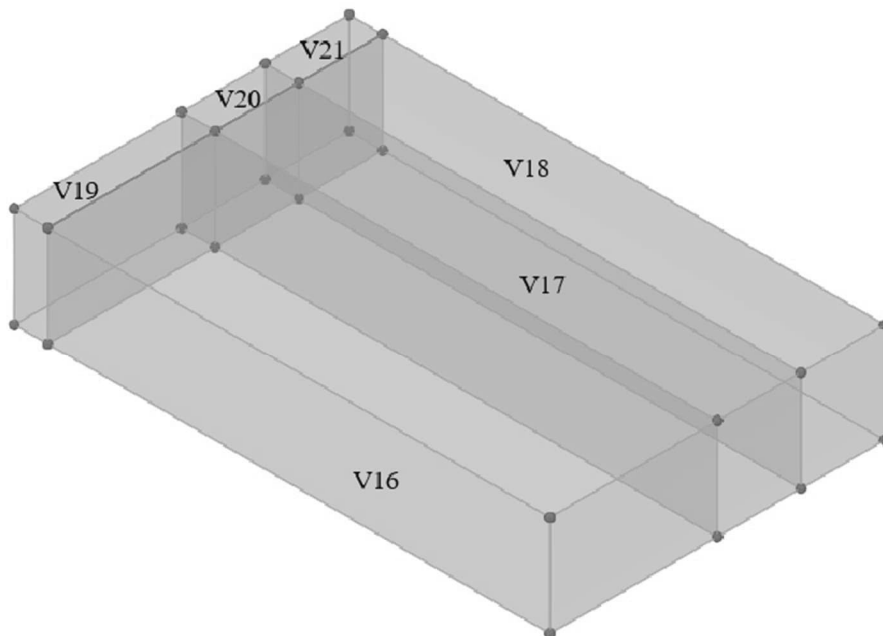
Overview 3D
Deck

	<p>Part A – CALCULATION ASSUMPTIONS</p> <p>Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage</p>	Status :	Page: A2:7
		Date :	Created :

2.2.1 Solides

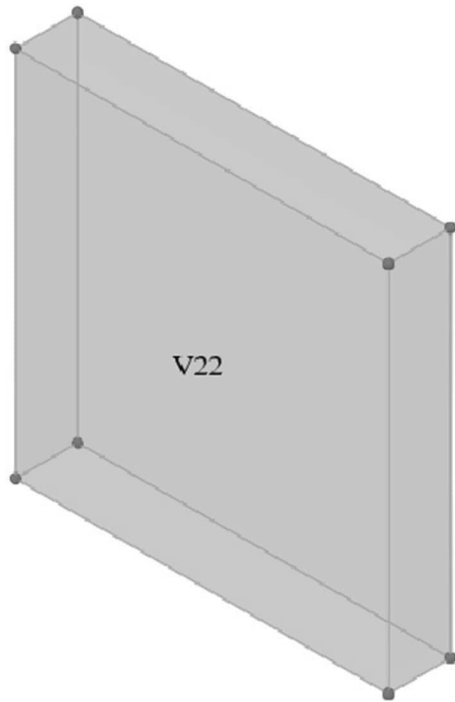


Overview 3D
Soil

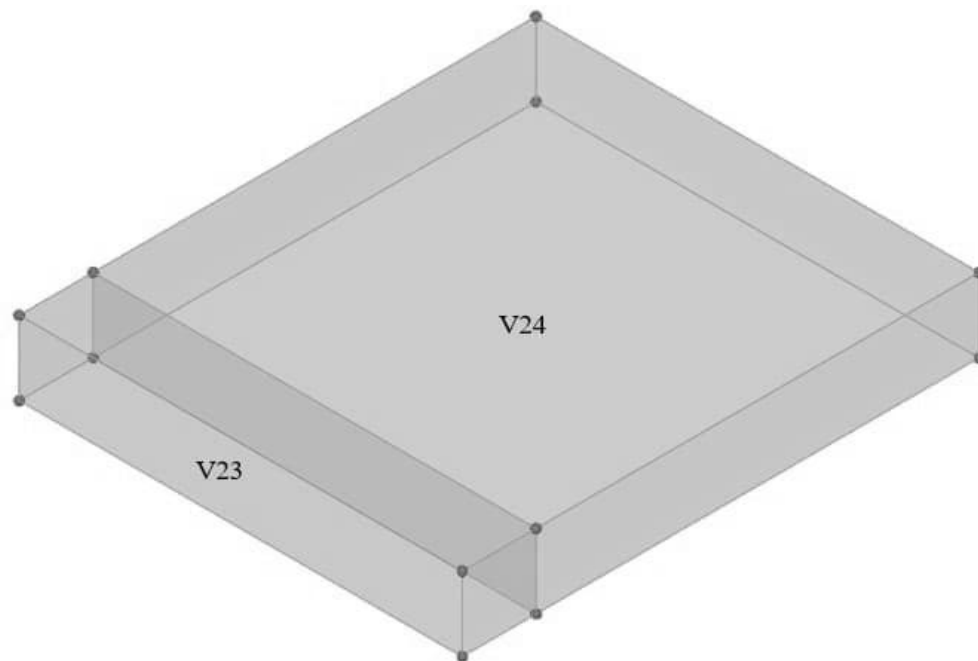


Overview 3D
Slab

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:8
		Date :	Created :



Overview 3D
Abutment



Overview 3D
Deck

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:9
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2.3 MATERIAL

2.3.1 Thermal analysis (Analysis 1)

Concrete:
Isotropic thermal material below is applied to all concrete.

Isotropic

Hygro-thermal

Material type: Hygro-thermal concrete

Input density and specific heat capacity for:

Kiln dry concrete
 Concrete at ambient conditions

Porosity:

Automatically determined
 Specify

	Value
Thermal conductivity	2.0
Specific heat capacity	900.0
Density	2.4E3
Permeability	0.1E-018
Entrapped air volume ratio	0.023

Advanced...

Exothermic behaviour:

None
 Concrete Heat of Hydration

Cement type: Type V

	Value
Mass of cement per unit volume	400.0
Water/Cementitious mass ratio	0.4
Mass of slag per unit volume	0.0
Mass of fly ash per unit volume	0.0
CaO content of fly ash (%)	0.0
Delay for heat of hydration	0.0

Advanced...

Name: Concrete C35/45 HT (1)

Concrete:
Isotropic thermal material below is applied to soil.

Isotropic

Hygro-thermal

Material type: Hygro-thermal

Phase change state: None

Darcy's equation: Use gravity

	Value
Thermal conductivity	2.0
Specific heat capacity	900.0
Density	1.8E3
Porosity of medium	0.1
Permeability	0.1E-018
Tortuosity coefficient	2.0

Exothermic behaviour:

None

Name: Soil HT (2)

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:10
		Date :	Created :

2.3.2 Structural (Analysis 2)

Concrete:

Nonlinear material below is applied to all concrete.

Concrete (Nonlinear) ✕

Concrete: Transient smooth multi-crack (model 109) ▾ Advanced...

Creep: EN1992 (2004-2014) ▾ Options...

Shrinkage: None ▾

Component	Value
Young's modulus	36.75E9
Poisson's ratio	0.2
Mass density	2.5484E3
Coefficient of thermal expansion	10.0E-6
Uniaxial compressive strength	48.0E6
Uniaxial tensile strength	3.5E6
Strain at peak uniaxial compression	2.2E-3
Fracture energy per unit area	130.0

Thermal properties Dynamic properties

Fracture energy

Name: Concrete C35/45 STR (excl. shrinkage) ▾ ⬆️ ⬆️ (3)

Soil:

Isotropic material below is applied to soil.

Isotropic ✕

Plastic Creep Damage Shrinkage Viscous Two phase Ko Initialisation

Elastic

Dynamic properties Thermal expansion

	Value
Young's modulus	30.0E6
Poisson's ratio	0.0
Mass density	1.8E3
Coefficient of thermal expansion	1.0E-6

Name: Soil STR ▾ ⬆️ ⬆️ (5)

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:11
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2.4 BOUNDARY CONDITIONS

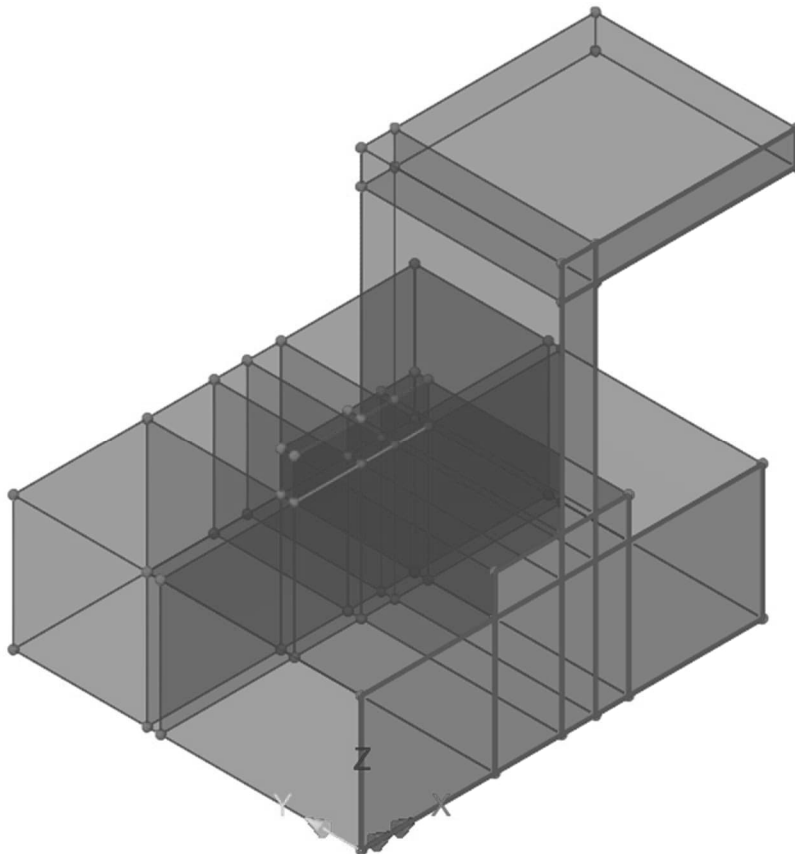
2.4.1 Thermal analysis (Analysis 1)

Thermal boundary conditions are either "free" or "fixed", however since they vary over time at most surfaces thus are not applied directly.

However along symmetry surfaces are "free" but since are surfaces are "free" by default no attribute is added.

Definitions:

- **Free** - heat will not flow through the node (adiabatic).
- **Fixed** - heat will flow through the node to maintain temperature at zero.



Overview 3D

"Free" surfaces.

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:12
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2.4.2 Structural analysis (Analysis 2)

There are 2 boundary conditions. One at bottom of soil (acts at stage 1 and stage 2). The other is assumed to act along symmentri surface along of deck (acts only during stage 2).

Boundary at bottom of soil:

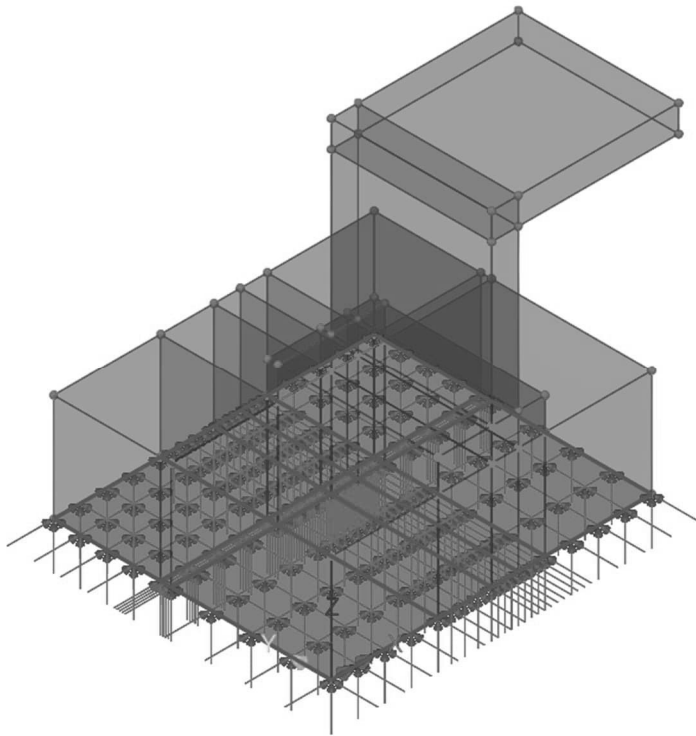
Structural Supports
✕

Analysis category

		Free	Fixed	Spring	Spring stiffness
Translation in	X	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
	Y	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
	Z	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
Rotation about	X	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
	Y	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
	Z	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
Hinge rotation	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	
Torsional warping	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>	
Pore pressure	Closed Seepage Drainage Open			Pressure	
	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

Name (1)

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:13
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Overview 3D

Boundary at bottom soil.

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:14
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

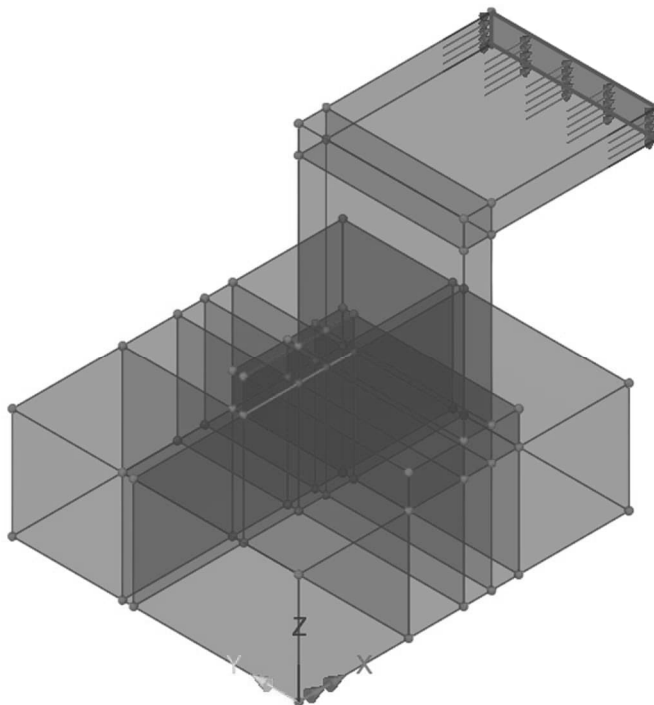
Boundary along symmetri surface of deck :

Structural Supports

Analysis category

		Free	Fixed	Spring	Spring stiffness
Translation in	X	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="text"/>
	Y	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
	Z	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
Rotation about	X	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
	Y	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
	Z	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
Hinge rotation		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
Torsional warping		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
Pore pressure		Closed Seepage Drainage Open			Pressure
		<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Name (2)



Overview 3D

Boundary along symmetry surface.

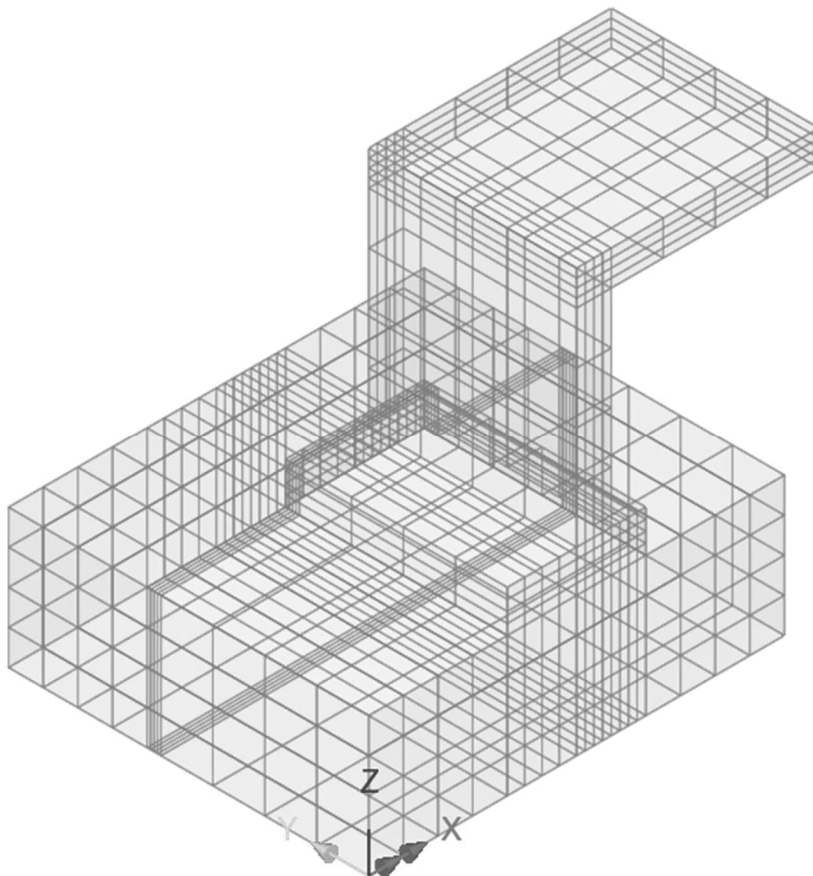
	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:15
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2.5 MESH

Different element types are used for both Analysis 1 and Analysis 2 but they have same number of elements and nodes, that are located at same location.

The mesh has in this case been performed automatically (Auto). A

Name	Division x-direction	Division y-direction	Division z-direction
Solide	Auto	Auto	Auto



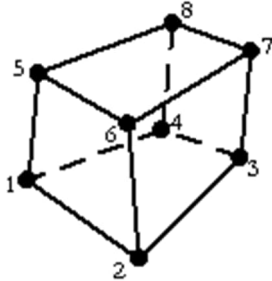
Overview 3D

MESH elements. In this model only 5 nodes in thickness direction.

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:16
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2.5.1 Thermal analysis (Analysis 1)

Same element to soil and bridge (element HHT 8).



Input

Initial conditions	TMPE	Initial temperature (T_0) and concrete relative humidity (RH) per element.
	TMP	Initial temperature (T_0) and concrete relative humidity (RH) per global nodes.
Prescribed values	TDSP	Temperature (T) and concrete relative humidity (RH) at nodes.
	RGN	Rates of heat (QT) and/or water inflow (QW) concentrated at nodes.
	RBVE	Rates of heat and/or water inflow per unit volume, per element, can vary across the element.
	RBV	Rates of heat and/or water inflow per unit volume, per global nodes.
	RIHG	Rates of heat and/or water inflow per unit volume, per element at a specific reference nodal temperature (See Notes.)
Boundary conditions	FFL	Rates of heat and/or water inflow per unit area (flux).
	ENVT	<u>Environmental boundary condtions</u> . Tenv, hc, hr, RH, hw: external environmental temperature, convective and radiative heat transfer coefficients, environmental relative humidity, water mass transfer coefficient.
	TDET	<u>Temperature dependent environmental boundary conditions</u> . Tenv, hc, hr, RH, hw, T: external environmental temperature, convective and radiative heat transfer coefficients, environmental relative humidity, water mass transfer coefficient and reference nodal temperature.

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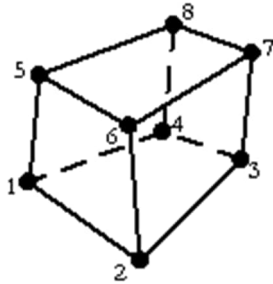
Output

Results	Temperature gradients	G_{TX}, G_{TY}, G_{TZ} (in global directions)
	Water saturation gradients	G_{wX}, G_{wY}, G_{wZ} (in global directions)
	Temperature fluxes	q_X, q_Y, q_Z (in global directions)
	Water fluxes	J_{wX}, J_{wY}, J_{wZ} (in global directions)
	Vapour fluxes	J_{vX}, J_{vY}, J_{vZ} (in global directions)

	Part A – CALCULATION ASSUMPTIONS	Status :	Page: A2:18
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

2.5.1 Structural analysis (Analysis 1)

Same elements (HX8) are used for soil and bridge.



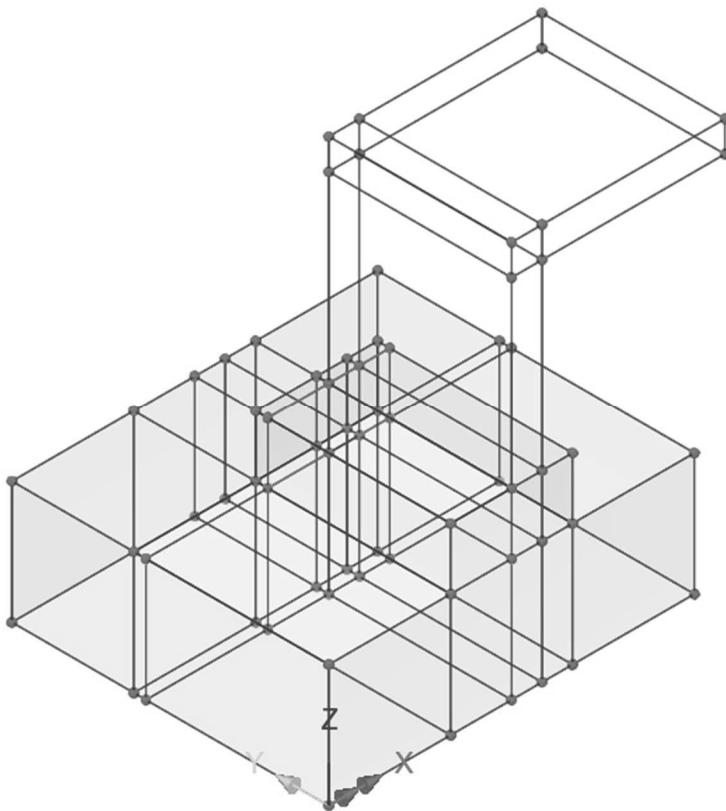
Element Group	3D Continuum
Element Subgroup	Solid Continuum
Element Description	A family of 3D isoparametric solid continuum elements with higher order models capable of modelling curved boundaries. The elements are numerically integrated.
Number Of Nodes	4 or 10 (tetrahedra). 6, 12 or 15 (pentahedra). 8, 16 or 20 (hexahedra). The elements are numbered according to a right-hand screw rule in the local z-direction.
Freedom	U, V, W: at each node.
Node Coordinates	X, Y, Z: at each node.

	Part A – CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A2:19
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2.6 ACTIVE STRUCTURE

There are 2 casting stages with requires both activation and deactivation as seen below. This is performed by adding function “Deactivate” and “Activate” to elements during different stages as seen in table below.

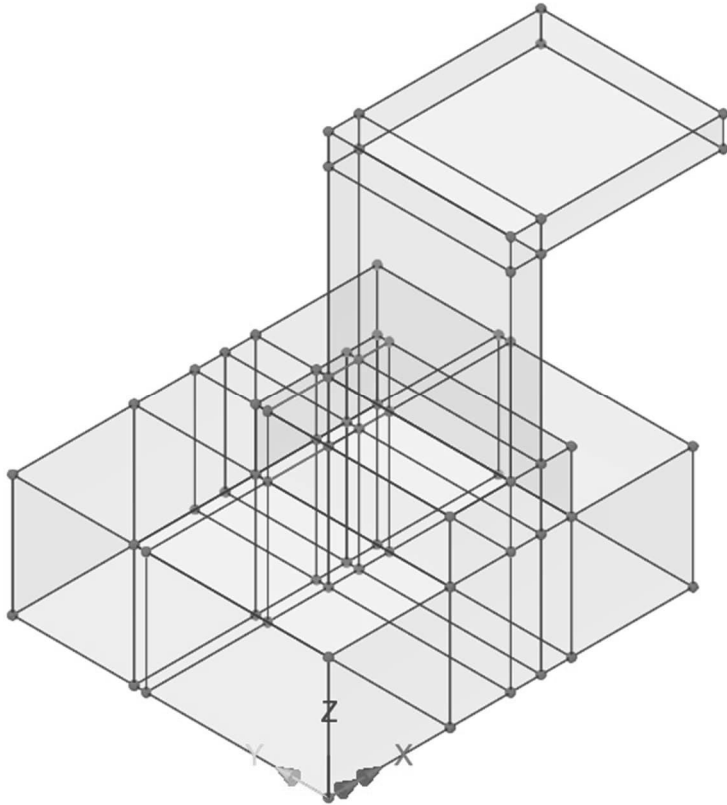
Stage	Load cases	Soil	Slab	Abutment	Deck
1:a	HT stage 1a	Acitive	Acitive	Deactive	Deactive
1:b	HT stage 1b	Acitive	Acitive	Deactive	Deactive
1:c	HT stage 1c	Acitive	Acitive	Deactive	Deactive
1:d	HT stage 1d	Acitive	Acitive	Deactive	Deactive
1:e	HT stage 1e	Acitive	Acitive	Deactive	Deactive
2:a	HT stage 2a	Acitive	Acitive	Acitive	Acitive
2:b	HT stage 2b	Acitive	Acitive	Acitive	Acitive
2:c	HT stage 2c	Acitive	Acitive	Acitive	Acitive
2:d	HT stage 2d	Acitive	Acitive	Acitive	Acitive



Overview 3D

Active elements stage 1.

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Overview 3D

Active elements stage 2.

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3. LOADING

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3.3	LOAD: INIITAL CONDITIONS SOIL	page 3:4
3.4	LOAD: ENVIROMENT AIR CONDITIONS	page 3:5-6
3.5	LOAD: ENVIROMENT FORMWORK	page 3:7-13

Only transient thermal loads are considered.

Static structural loads are handled separately in static structural analysis.

	Part A - CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A3:2
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3.1 TRANSIENT LOAD CASES

There are in total 9 transient loadcases. To these loadcases thermal loads are added.

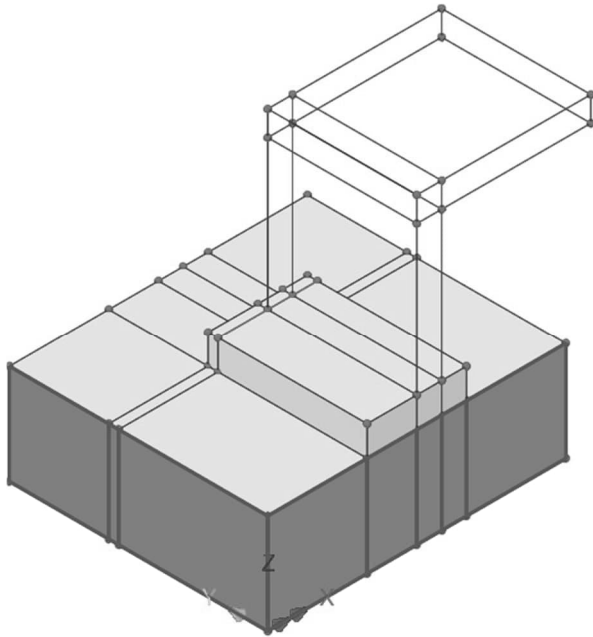
Load cases	Time (t)	Activity	Form
HT Stage 1a	0 → 0.5	Casting stage 1	Yes
HT Stage 1b	0.5 → 1.0	-	Yes
HT Stage 1c	1.0 → 3.0	Removal form	Yes
HT Stage 1d	3.0 → 10.0	-	No
HT Stage 1e	10.0 → 30.0	-	No
HT Stage 2a	30.5 → 30.5	Casting stage 2	Yes
HT Stage 2b	30.5 → 31.0	-	Yes
HT Stage 2c	31.0 → 33.0	Removal form	Yes
HT Stage 2d	33.0 → 40.0	-	No
-	day	-	-

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:3
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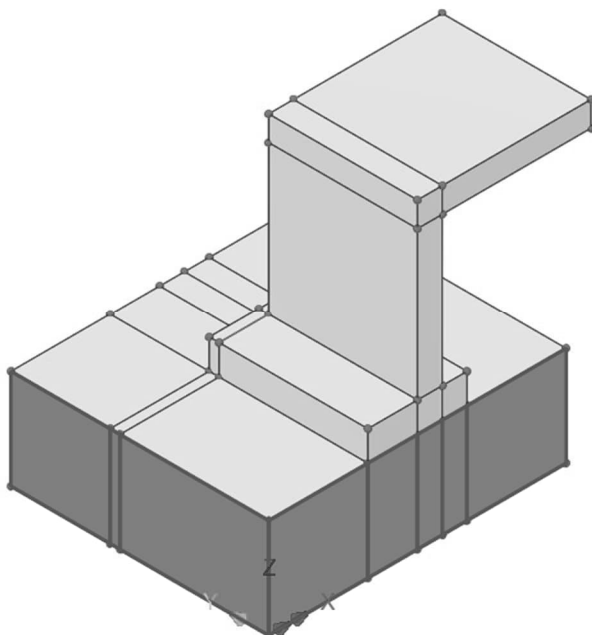
3.2 LOAD: PRECRIBED SOIL TEMPERATURE

The soil temperature is assumed be constant $T = +10^{\circ} \text{C}$ against soil surfaces located 2 m from bottom slab. This temperature is assumed constant during all stages $t: 0 \text{ day} \rightarrow 40 \text{ day}$). This thermal load is applied as seen below.

Load stage 1:a-1:c (t: 0 day \rightarrow 3 day)



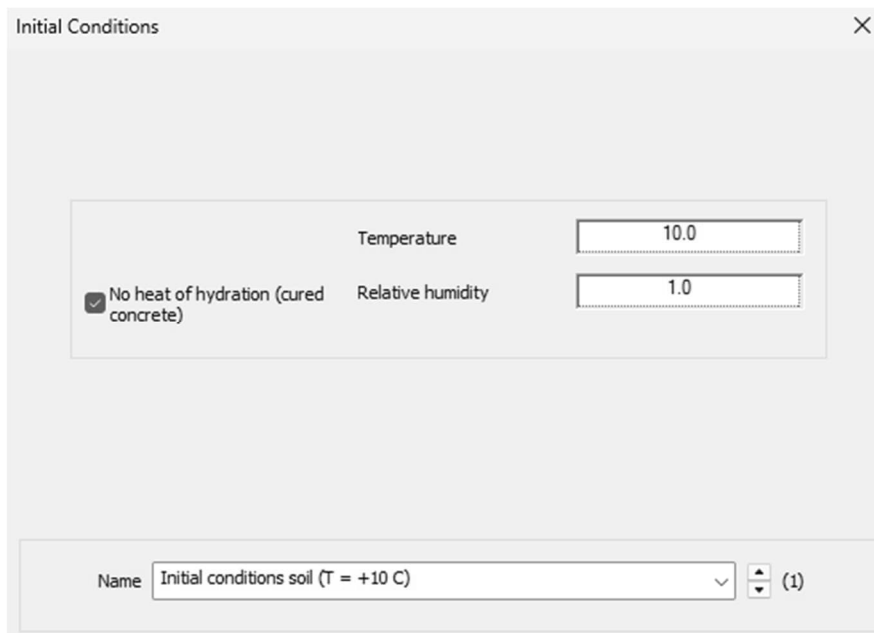
Load stage 2 (t: 30 day \rightarrow 40 day)



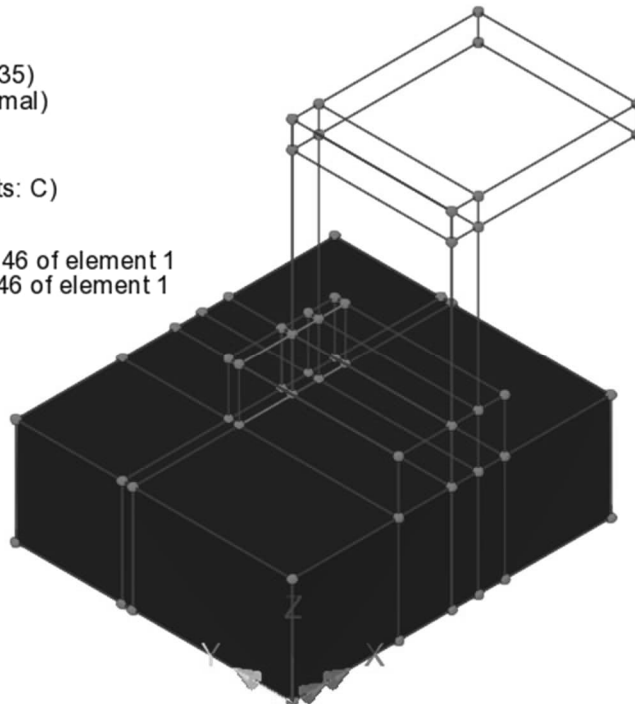
	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:4
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.3 LOAD: INITIAL CONDITIONS SOIL

Initial soil temperature is $T = +10^{\circ}\text{C}$ and is applied as thermal load in Analysis 1. This load is applied to start of load case “HT Stage 1a “ ($\therefore t = 0$ days).



Scale: 1: 90.8115
Zoom: 79.7194
Eye: (-0.57735, -0.57735, 0.57735)
Analysis: Analysis 1 (Hygro-thermal)
Loadcase: 1:HT Stage 1a
Contour entity: Loading (model)
Contour component: Temp (Units: C)
Number of contours: 9
Contour interval: 0.0
Contour maximum 10.0 at node 46 of element 1
Contour minimum 10.0 at node 46 of element 1



3D VIEW

Load applied to soil at $t = 0$ day.

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:5
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.4 LOAD: INITIAL CONDITIONS CONCRETE

Initial concrete temperature is $T = +15^{\circ}\text{C}$ and is applied as thermal load in Analysis 1. This load is applied to at start of casting stage 1 (“HT Stage 1a”; $t = 0$ days) and casting stage 2 (“HT Stage 2a”; $t = 0$ days).

Initial Conditions
✕

Temperature

15.0

No heat of hydration (cured concrete)

Relative humidity

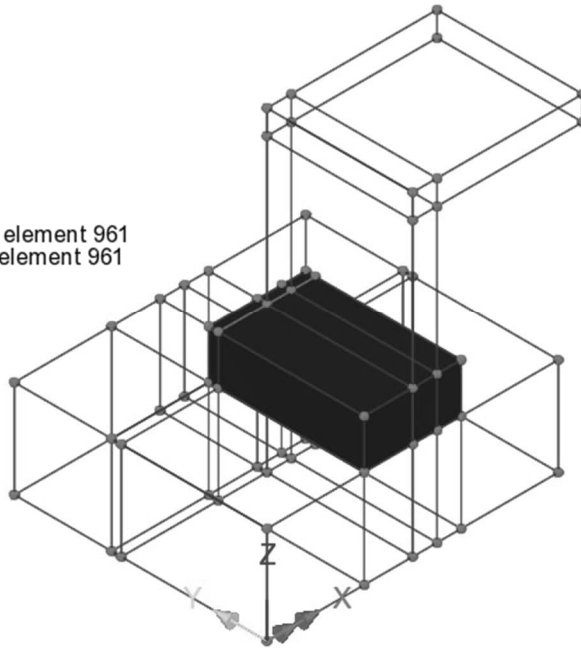
1.0

Name (2)

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:6
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

Scale: 1: 90.8115
Zoom: 79.7194
Eye: (-0.57735, -0.57735, 0.57735)
Analysis: Analysis 1 (Hygro-thermal)
Loadcase: 1:HT Stage 1a

Contour entity: Loading (model)
Contour component: Temp (Units: C)
Number of contours: 9
Contour interval: 0.0
Contour maximum 15.0 at node 1386 of element 961
Contour minimum 15.0 at node 1386 of element 961

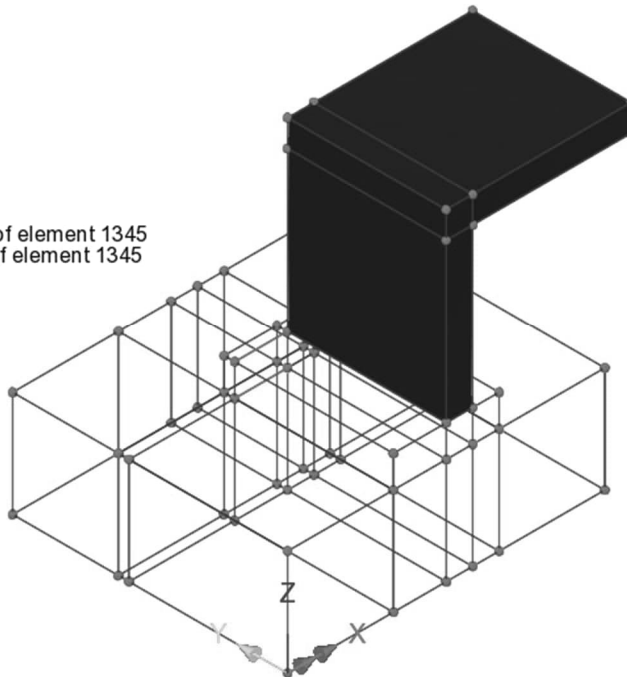


3D VIEW

Load applied to casting stage 1 (t = 0 day).

Scale: 1: 87.5827
Zoom: 89.2857
Eye: (-0.57735, -0.57735, 0.57735)
Analysis: Analysis 1 (Hygro-thermal)
Loadcase: 7:HT Stage 2a

Contour entity: Loading (model)
Contour component: Temp (Units: C)
Number of contours: 9
Contour interval: 0.0
Contour maximum 15.0 at node 1466 of element 1345
Contour minimum 15.0 at node 1466 of element 1345



3D VIEW

Load applied to casting stage 2 (t = 30 day).

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:7
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.5 LOAD: ENVIROMENT AIR CONDITIONS

Air temperature is constant $T = +20^{\circ}\text{C}$ against soil and concrete, however the latter is removed over time.

Environment Conditions ✕

Temperature dependent

	Environmental temperature	Convection heat transfer coefficient	Radiation heat transfer coefficient	Relative humidity	Vapour mass transfer coefficient
1	20.0	10.0	0.0	0.8	-1.0

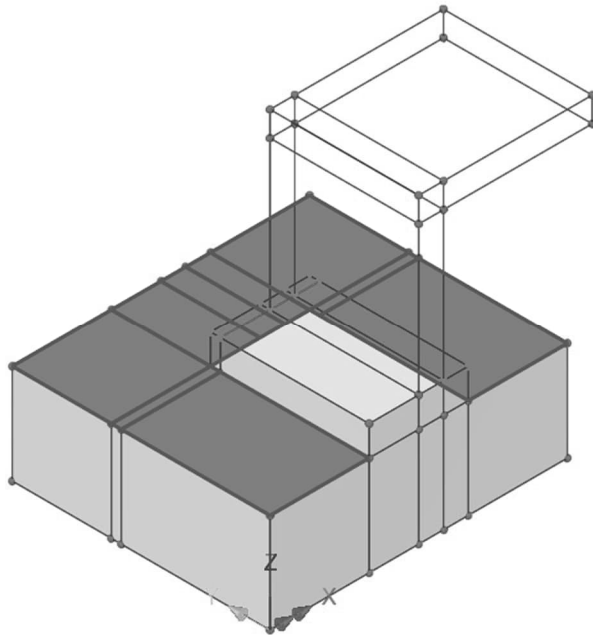
Name (3)

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:8
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

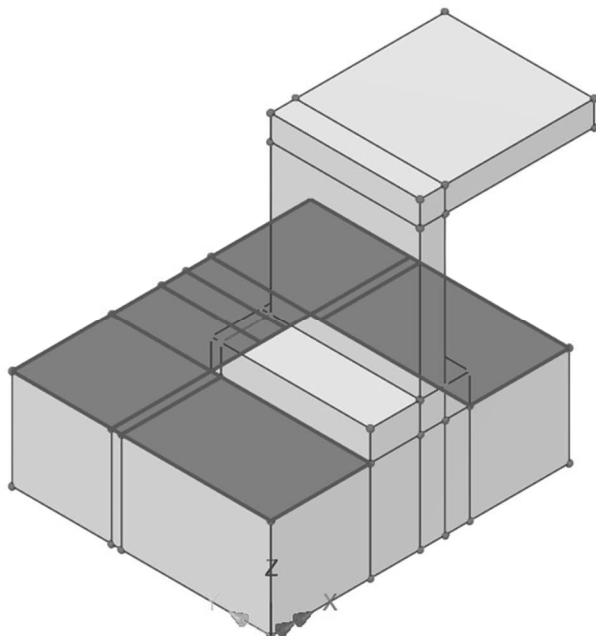
3.5.1 Air temperature against soil

This thermal load is applied as seen below.

Load stage 1:a-1:e (t: 0 day → 30 day)



Load stage 2 (t: 30 day → 40 day)

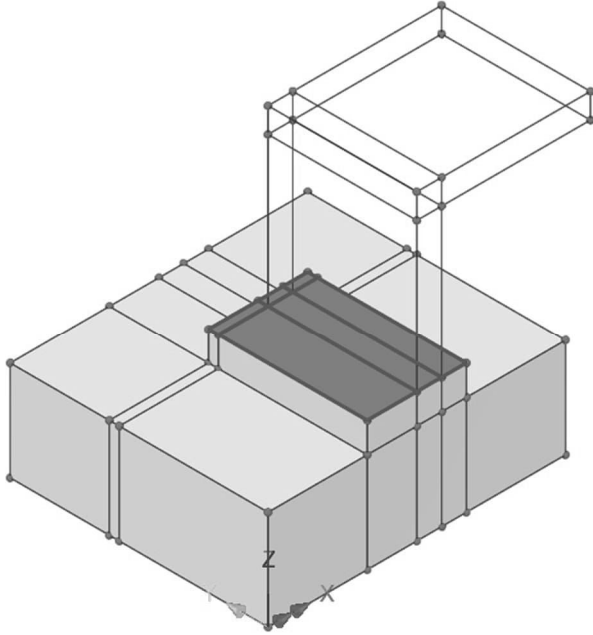


	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:9
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

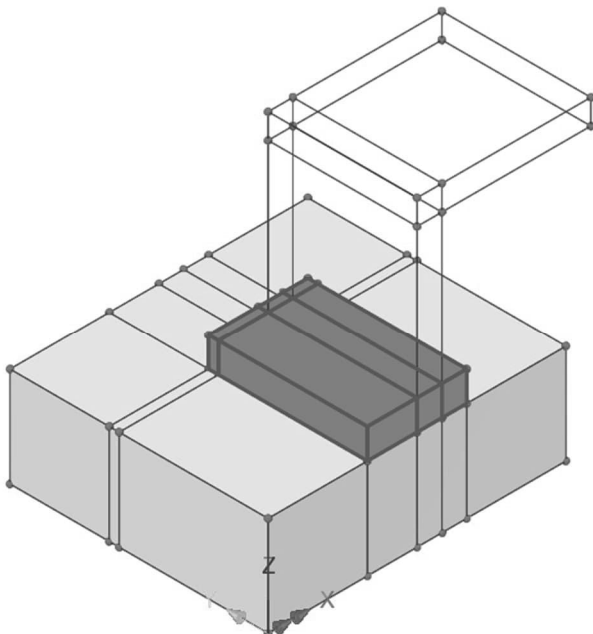
3.5.2 Air temperature against concrete stage 1

This thermal load is applied as seen below.

Load stage 1;a-1:c (t: 0 day → 3 day)



Load stage 1;d-1:e (t: 3 day → 30 day)

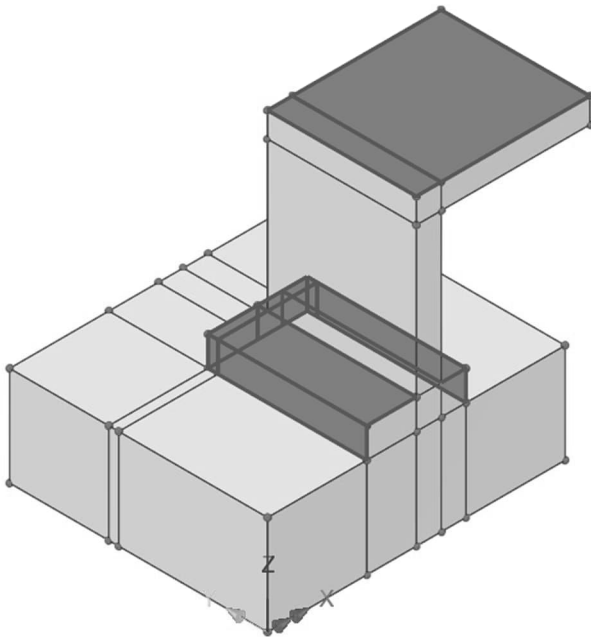


	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:10
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

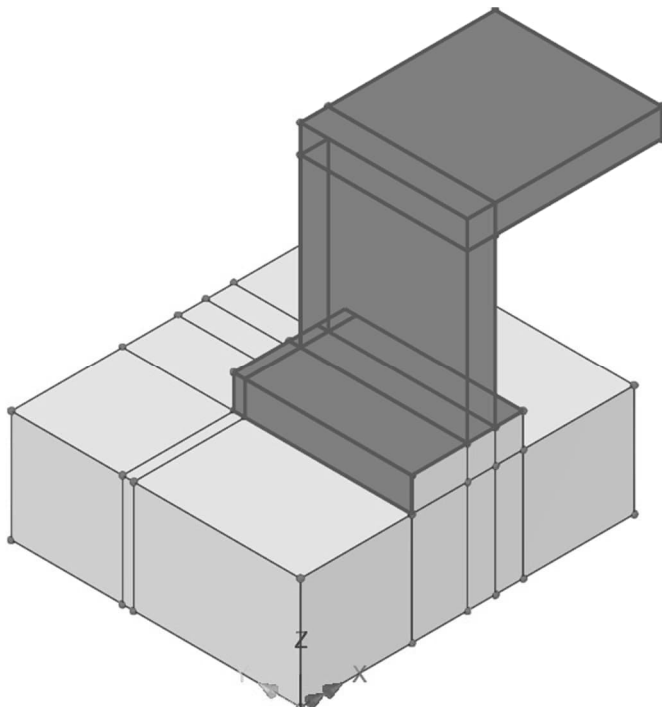
3.5.3 Air temperature against concrete stage 2

This thermal load is applied as seen below.

Load stage 2:a-2:c (t: 30 day → 33 day)



Load stage 2:d (t: 33 day → 40 day)



	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:11
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.6 LOAD: ENVIROMENT FORMWORK

Formwork temperature is $T = +20^{\circ}\text{C}$ against concrete, however is removed over time.

Environment Conditions ✕

Temperature dependent

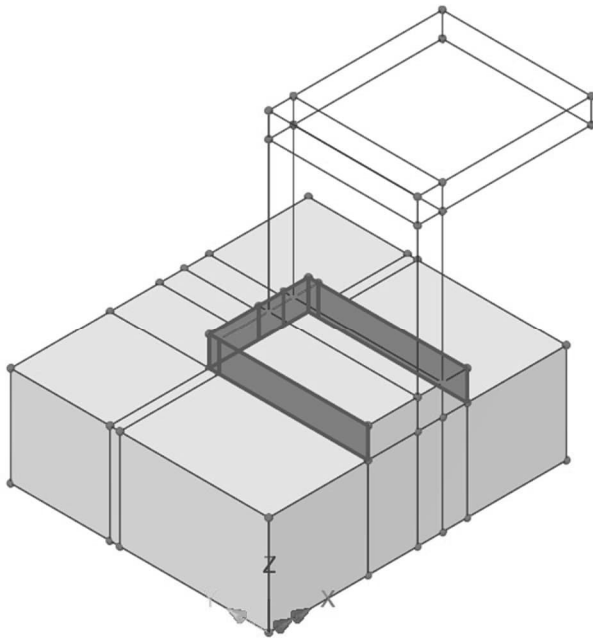
	Environmental temperature	Convection heat transfer coefficient	Radiation heat transfer coefficient	Relative humidity	Vapour mass transfer coefficient
1	20.0	10.0	0.0	0.8	-1.0

Name (3)

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:12
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.6.1 Formwork against concrete stage 1

This thermal load is applied as seen below is applied during stage 1:a-1:c (t: 0 day → 3 day)

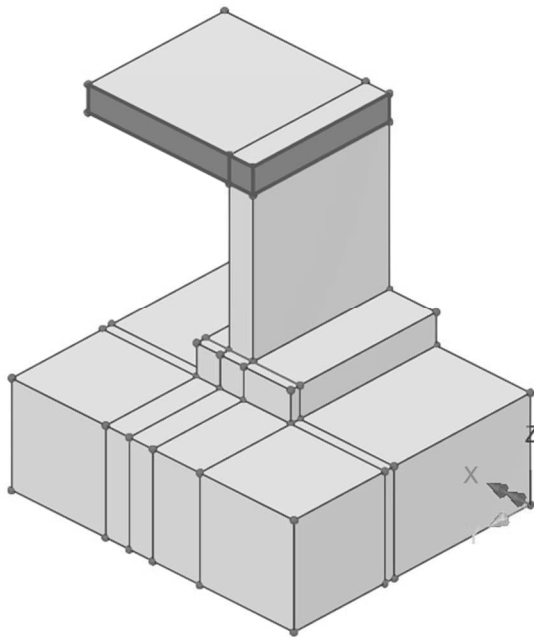


Overview 3D
Load stage 1

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A3:13
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created :

3.6.2 Formwork against concrete stage 2

This thermal load is applied as seen below is applied during stage 2:a-2:c (t: 30 day → 33 day)



Overview 3D Load stage 2

	Part A - CALCULATION ASSUMPTIONS Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: A4:1
		Date :	Created :

4. RESULTS

- 4.1 TEMPERATURE ANALYSIS
- 4.2 STRUCTURAL ANALYSIS

page 4:2
page 4:2

	Part A - CALCULATION ASSUMPTIONS	Status :	Page: A4:2
	Transient hygro-thermal analysis during concrete hardening: concrete slab	Date :	Created :

4.1 TEMPERATURE ANALYSIS

See appendix 2, see chapter 1.

4.2 STRUCTURAL ANALYSIS

Tensional strength $f_{ct}(t)$ ($\therefore F_{ten}$) see appendix 2, chapter 3.

Compressive strength $f_{cc}(t)$ ($\therefore F_{comp}$) see appendix 2, chapter 4.

Principal stress strength $\sigma_I(t)$ ($\therefore S1$) see appendix 2, chapter 5.

Crack safety:

$$s(t) = \left(\frac{S1(t)}{F_{ten}(t)} \text{ if } S1(t) > 0 \text{ MPa}; \frac{|S1(t)|}{F_{comp}(t)} \text{ if } S1(t) \leq 0 \text{ MPa}; \right) < 1.0$$

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 1
		Date :	Created:

Title: Input receipt

Model Units: N,m,t,Day,C
Report Units: N,m,t,Day,C

Model Title: System 001
Model File: System 001

Clarification of definitions.

In the report, the letter “T” is used to describe a range. The letter is an abbreviation of “to”.

See example of assignment below.

Assignment to Lines:

105T110;114T119

This expression means that the assignment occurs to the lines L105 → L110 and L114 → L119.

Assignment to Surfaces:

3T17;19T24

This expression means that the assignment occurs to the surfaces S3 → S17 and S19 → S24.

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 2
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	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 3
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1. Points

Point	X coordinate	Y coordinate	Z coordinate
1	0.0	0.0	0.0
2	2.0	0.0	0.0
3	3.0	0.0	0.0
4	3.5	0.0	0.0
5	4.0	0.0	0.0
6	6.0	0.0	0.0
7	0.0	3.0	0.0
8	2.0	3.0	0.0
9	3.0	3.0	0.0
10	3.5	3.0	0.0
11	4.0	3.0	0.0
12	6.0	3.0	0.0
13	0.0	3.2	0.0
14	2.0	3.2	0.0
15	3.0	3.2	0.0
16	3.5	3.2	0.0
17	4.0	3.2	0.0
18	6.0	3.2	0.0
19	0.0	5.2	0.0
20	2.0	5.2	0.0
21	3.0	5.2	0.0
22	3.5	5.2	0.0
23	4.0	5.2	0.0
24	6.0	5.2	0.0
25	0.0	0.0	2.0
26	2.0	0.0	2.0
27	3.0	0.0	2.0
28	3.5	0.0	2.0
29	4.0	0.0	2.0
30	6.0	0.0	2.0
31	0.0	3.0	2.0
32	2.0	3.0	2.0
33	3.0	3.0	2.0
34	3.5	3.0	2.0
35	4.0	3.0	2.0
36	6.0	3.0	2.0
37	0.0	3.2	2.0
38	2.0	3.2	2.0
39	3.0	3.2	2.0
40	3.5	3.2	2.0
41	4.0	3.2	2.0
42	6.0	3.2	2.0
43	0.0	5.2	2.0
44	2.0	5.2	2.0
45	3.0	5.2	2.0
46	3.5	5.2	2.0
47	4.0	5.2	2.0
48	6.0	5.2	2.0
49	2.0	0.0	2.6
50	3.0	0.0	2.6
51	3.5	0.0	2.6
52	4.0	0.0	2.6
53	2.0	3.0	2.6
54	3.0	3.0	2.6
55	3.5	3.0	2.6
56	4.0	3.0	2.6
57	2.0	3.2	2.6
58	3.0	3.2	2.6
59	3.5	3.2	2.6
60	4.0	3.2	2.6
61	3.0	0.0	5.6
62	3.5	0.0	5.6
63	6.5	0.0	5.6
64	3.0	3.0	5.6
65	3.5	3.0	5.6
66	6.5	3.0	5.6
67	3.0	0.0	6.1
68	3.5	0.0	6.1
69	6.5	0.0	6.1
70	3.0	3.0	6.1
71	3.5	3.0	6.1
72	6.5	3.0	6.1

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 4
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2. Lines

Line	Points	Line	Points
274	8,2	278	5,11
291	26,2	293	32,8
294	26,32	314	53,32
315	26,49	316	49,53
317	29,52	319	35,56
320	56,52	324	3,2
325	3,4	326	4,5
327	11,10	328	10,9
329	9,8	331	3,9
334	10,4	344	33,9
345	32,33	346	27,3
347	33,27	348	26,27
349	28,4	350	27,28
351	34,10	352	34,28
353	34,33	354	5,29
355	28,29	356	11,35
357	29,35	358	35,34
362	54,33	363	53,54
364	50,27	365	54,50
366	50,49	367	28,51
368	51,50	369	55,34
370	51,55	371	54,55
373	52,51	376	55,56
377	1,2	378	26,25
379	25,1	380	8,7
381	31,32	382	7,31
383	1,7	384	31,25
385	5,6	386	30,29
387	6,30	388	12,11
389	35,36	390	36,12
391	12,6	392	30,36
393	8,14	394	38,32
395	14,38	396	9,15
397	39,33	398	15,39
399	14,15	400	38,39
401	10,16	402	34,40
403	16,40	404	15,16
405	39,40	406	11,17
407	35,41	408	17,41
409	16,17	410	40,41
411	53,57	412	57,38
413	58,54	414	39,58
415	58,57	416	55,59
417	59,40	418	59,58
419	60,56	420	41,60
421	60,59	422	13,7
423	14,13	424	37,31
425	38,37	426	13,37
427	18,12	428	17,18
429	42,36	430	41,42
431	18,42	510	14,20
511	44,38	512	20,44
513	15,21	514	45,39
515	21,45	516	20,21
517	44,45	518	16,22
519	46,40	520	22,46
521	21,22	522	45,46
523	17,23	524	47,41
525	23,47	526	22,23
527	46,47	539	19,13
540	20,19	541	43,37
542	44,43	543	19,43
544	24,18	545	23,24
546	48,42	547	47,48
548	24,48	549	64,54
550	50,61	551	61,64
552	62,51	553	61,62
554	55,65	555	65,62

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 5
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Line	Points	Line	Points
556	64,65	557	70,64
558	61,67	559	67,70
560	68,62	561	67,68
562	65,71	563	71,68
564	70,71	565	65,66
566	72,71	567	66,72
568	62,63	569	63,66
570	69,68	571	72,69
572	63,69		

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 6
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3. Surfaces

Surface	Lines	Surface	Lines
1	377,383,380,274	2	274,329,331,324
3	331,328,334,325	4	334,327,278,326
5	385,278,388,391	6	393,423,422,380
7	406,428,427,388	8	393,329,396,399
9	396,328,401,404	10	401,327,406,409
11	510,540,539,423	12	523,545,544,428
13	510,399,513,516	14	513,404,518,521
15	518,409,523,526	16	377,291,378,379
17	346,350,349,325	18	349,355,354,326
19	385,387,386,354	20	379,384,382,383
21	291,294,293,274	22	344,347,346,331
23	380,293,381,382	24	293,345,344,329
25	344,353,351,328	26	351,358,356,327
27	388,390,389,356	28	422,426,424,382
29	393,395,394,293	30	401,403,402,351
31	427,431,429,390	32	396,344,397,398
33	406,356,407,408	34	423,395,425,426
35	428,408,430,431	36	539,543,541,426
37	510,512,511,395	38	544,548,546,431
39	513,398,514,515	40	518,403,519,520
41	523,408,524,525	42	540,512,542,543
43	545,525,547,548	44	291,324,346,348
45	354,278,356,357	46	387,391,390,392
47	351,334,349,352	48	395,399,398,400
49	398,404,403,405	50	403,409,408,410
51	512,516,515,517	52	515,521,520,522
53	520,526,525,527	54	378,294,381,384
55	347,353,352,350	56	352,358,357,355
57	386,392,389,357	58	294,348,347,345
59	394,400,397,345	60	394,381,424,425
61	397,353,402,405	62	402,358,407,410
63	407,389,429,430	64	511,517,514,400
65	514,522,519,405	66	519,527,524,410
67	511,425,541,542	68	524,430,546,547
69	364,350,367,368	70	367,355,317,373
71	315,316,314,294	72	362,365,364,347
73	362,353,369,371	74	369,358,319,376
75	394,314,411,412	76	402,369,416,417
77	397,414,413,362	78	407,420,419,319
79	315,348,364,366	80	317,357,319,320
81	369,352,367,370	82	314,345,362,363
83	412,415,414,400	84	414,418,417,405
85	417,421,420,410	86	316,363,365,366
87	365,371,370,368	88	370,376,320,373
89	411,363,413,415	90	413,371,416,418
91	416,376,419,421	92	554,555,552,370
93	549,556,554,371	94	550,368,552,553
95	549,365,550,551	96	568,569,565,555
97	551,553,555,556	98	568,560,570,572
99	562,563,560,555	100	567,569,572,571
101	565,567,566,562	102	558,553,560,561
103	557,551,558,559	104	557,564,562,556
105	559,561,563,564	106	566,571,570,563

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 7
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4. Volumes

Volume	Surfaces	Volume	Surfaces
1	16,1,23,54,21,20	2	21,24,22,44,2,58
3	22,17,47,25,3,55	4	47,18,45,26,4,56
5	19,5,27,57,45,46	6	6,60,29,28,23,34
7	29,32,8,59,24,48	8	32,30,9,61,25,49
9	30,33,10,62,26,50	10	7,63,33,31,27,35
11	11,67,37,36,34,42	12	37,39,13,64,48,51
13	39,40,14,65,49,52	14	40,41,15,66,50,53
15	12,68,41,38,35,43	16	71,82,72,79,58,86
17	72,69,81,73,55,87	18	81,70,80,74,56,88
19	75,59,77,89,82,83	20	77,61,76,90,73,84
21	76,62,78,91,74,85	22	95,94,92,93,87,97
23	103,102,99,104,97,1	24	101,96,106,98,99,100

5. MESH: Volume

Attribute: 5 Title: Solide elements

Sub Type = Volume Mesh Element Type = HX8, HHT8

Property

Element size
Number of divisions in x
Number of divisions in y
Number of divisions in z direction
Transition mesh
Allow irregular mesh
Element defined by name
Single feature joint

Symbol	Value
size	-1.0
xDivisions	0
yDivisions	0
zDivisions	0
transition	false
allowIrregular	false
DefinedByName	false
isSingleFtrJnt	false

Assignment to Volumes:

1T24

	Appendix 1: Input receipt SYSTEM 001	Status :	Page: 8
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6. Material thermal

Attribute: 1 Title: Concrete C35/45 HT

Sub Type = Isotropic Material

Assigned in: Analysis 1 (Hygro-thermal)

Property	Symbol	Value
Density(thermal)	rhoT_3	1.0
Initial density	DensityT	2400.0
Porosity	poro	0.0
Permeability	perm	0.0
Tortuosity coefficient	tort	0.0
Change of thermal conductivity with temperature	facK	0.0
Change of specific heat capacity with temperature	facSHC	0.0
Change of density with temperature	facRho	0.0
Entrapped air volume ratio	Vea	0.0
Water saturation factor	wSat	0.0
Ultimate degree of hydration	ultH	0.0
Delay for heat of hydration	admix_2	0.0
Acceleration X component	gx	0.0
Acceleration Y component	gy	0.0
Acceleration Z component	gz	-9.8
acceleration type	gravType	"vertical"
Density type	densityType	"kiln"
Conductivity type	conductType	"dependent"
Porosity type	porosityType	"automatic"
Mass of cement per unit volume	wcem	400.0
Mass of slag per unit volume	wslg	0.0
Mass of fly ash per unit volume	wpfa	0.0
Delay for heat of hydration	admix_1	0.0
Water/Cementitious mass ratio	wcra	0.4
CaO content of fly ash (%)	pfacao	0.0
C3S content (%)	C3S	0.0
C2S content (%)	C2S	0.0
C3A content (%)	C3A	0.0
C4AF content (%)	C4AF	0.0
Free CaO content (%)	FCaO	0.0
SO3 content (%)	SO3	0.0
MgO content (%)	MgO	0.0
Blaine value	Blaine	0.0
Cement type	icem	"Type V"
Ultimate degree of hydration	rdh	1.0
Heat of hydration	rhh	1.0
Hydration time	rht	1.0
Activation energy	rae	1.0
Hydration slope	rhs	1.0

Loadcase ID: 1 Title: HT Stage 1a

Assignment to Volumes:

16T24

Loadcase ID: 7 Title: HT Stage 2a

Assignment to Volumes:

16T23

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 9
		Date :	Created:

Attribute: 2 Title: Soil HT

Sub Type = Isotropic Material

Assigned in: Analysis 1 (Hygro-thermal)

Property	Symbol	Value
Density(thermal)	rhoT_2	1800.0
Density(thermal)	DensityT	1800.0
Porosity of medium	poro	0.1
Permeability	perm	0.0
Tortuosity coefficient	tort	2.0
Acceleration X component	gx	0.0
Acceleration Y component	gy	0.0
Acceleration Z component	gz	-9.8
acceleration type	gravType	"vertical"
Mass of cement per unit volume	wcem	0.0
Mass of slag per unit volume	wslg	0.0
Mass of fly ash per unit volume	wpfa	0.0
Delay for heat of hydration	admix_1	0.0
Water/Cementitious mass ratio	wcra	0.0
CaO content of fly ash (%)	pfacao	0.0
C3S content (%)	C3S	0.0
C2S content (%)	C2S	0.0
C3A content (%)	C3A	0.0
C4AF content (%)	C4AF	0.0
Free CaO content (%)	FCaO	0.0
SO3 content (%)	SO3	0.0
MgO content (%)	MgO	0.0
Blaine value	Blaine	0.0
Cement type	icem	"Type I"
Ultimate degree of hydration	rdh	0.0
Heat of hydration	rhh	0.0
Hydration time	rht	0.0
Activation energy	rae	0.0
Hydration slope	rhs	0.0

Loadcase ID: 1 Title: HT Stage 1a

Assignment to Volumes:

1T15

Loadcase ID: 7 Title: HT Stage 2a

Assignment to Volumes:

1T15

	Appendix 1: Input receipt SYSTEM 001	Status :	Page: 10
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created:

7. Material structural

Attribute: 3 Title: Concrete C35/45 STR (excl. shrinkage)

Sub Type = Isotropic Material

Assigned in: Analysis 1 (Structural)

Property	Symbol	Value
Young's modulus	E	36750000000.0
Poisson's ratio	nu	0.2
Density	rho	2548.4
Coefficient of thermal expansion	alpha	0.0
Uniaxial compressive strength	fc	48000000.0
Tensile strength	ft	3500000.0
Peak strain	ec	0.0
Effective strain	e0	0.0
Fracture energy per unit area	Gf	130.0
Principal ratio	betar	1.1
Initial relative position of yield surface	z0	0.6
Dilatancy factor	dilat	-0.1
Constant interlock state function	mg	0.4
Contact multiplier on e0	mhi	0.5
Final contact multiplier on e0	mful	5.0
Shear intercept to tensile strength	rsigma	1.3
Limiting friction ratio	fric	0.8
Multiplier on e0 to define crack fixity strain	crack	0.1
Fracture process zone width	zone	0.1
Residual Softening Factor	soft	0.0
Material constant Ap	matAp	0.6
Material constant An	matV	0.8
Contact Sharpness Z1	shpZ1	8.0
Contact Sharpness Z2	shpZ2	8.0
Limit of Contact Transition	shpLM	3.0
Ultimate degree hydration	ultDeg	0.0
Coefficient drying shrinkage	dryShk	0.0
Coefficient chemical shrinkage	chmShk	0.0
Scaling for stress	sc1Str	1.0
28 day creep factor	crpFac	0.0
Relaxation multiplier	mulRel	1.0
Creep factor multiplier	mulCrp	1.0
Pickett factor multiplier	mulPic	1.0
Degree of percolation	degPec	0.1
Degree hydration first cure	degHyd	0.5
Moisture rate Pickett effect	mstRat	0.0
Saturation start Pickett effect	satPic	0.8
Age when nonlinear/creep starts	tmVico	0.0
Short relaxation time	shtRex	864000.0
First long relaxation time	fstRex	12960000.0
Second long relaxation time	sndRex	95040000.0
Proportion short term viscous	shtVis	0.0
Proportion long term elastic	lnfVis	0.0
Logistic model coefficient for E	logCnf	12.5
Power model coefficient for fc	powFc	3.0
Power model coefficient for ft	powFt	1.0
Temperature when degradation starts	tmpStr	40.0
Temperature when degradation finishes	tmpFsh	80.0
Finishing degradation coefficient for E	dgraE	0.9
Finishing degradation coefficient for fc	dgraFc	0.8
Finishing degradation coefficient for ft	dgraFt	0.9
Iterations for crack fixity	nIter	2
Maximum iterations for fracture strain update	mxIter	2
	useDefCrp	true

Loadcase ID: 12 Title: STR Stage 1a

Assignment to Volumes:

16T24

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 11
		Date :	Created:

Attribute: 5 Title: Soil STR

Sub Type = Isotropic Material

Assigned in: Analysis 1 (Structural)

Property

	Symbol	Value
Young's modulus	E	30000000.0
Poisson's ratio	nu	0.0
Density	rho	1800.0
Coefficient of thermal expansion	alpha	0.0

Loadcase ID: 12 Title: STR Stage 1a

Assignment to Volumes:

1T15

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 12
		Date :	Created:

8. Boundary condition: thermal

Attribute: 1 Title: Free

Sub Type = Thermal Support

Assigned in: Analysis 1

Property	Symbol	Value
Reference temperature	T	"Free"
Stiffness distribution type	springType	"Total"
Conductance	Tstiff	0.0
Capillary pressure stiffness	CPStiff	0.0

Assignment to Surfaces: 1T106

9. Boundary condition: structural

Attribute: 1 Title: Rock

Sub Type = Structural Support

Assigned in: Analysis 1 (Structural)

Property	Symbol	Value
Translation in X	U	"R"
Translation in Y	V	"R"
Translation in Z	W	"R"
Rotation about X	THX	"F"
Rotation about Y	THY	"F"
Rotation about Z	THZ	"F"
Torsional warping	Torsion	"F"
Moment about hinge	L1	"F"
Pore pressure	pore	"C"

Loadcase ID: 12 Title: STR Stage 1a

Assignment to Surfaces:

1T15

Attribute: 2 Title: Symmetri

Sub Type = Structural Support

Assigned in: Analysis 1 (Structural)

Property	Symbol	Value
Translation in X	U	"R"
Translation in Y	V	"F"
Translation in Z	W	"F"
Rotation about X	THX	"F"
Rotation about Y	THY	"F"
Rotation about Z	THZ	"F"
Torsional warping	Torsion	"F"
Moment about hinge	L1	"F"
Pore pressure	pore	"C"

Loadcase ID: 17 Title: STR Stage 2a

Assignment to Surfaces:

100

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 13
		Date :	Created:

10. Loads: thermal

Attribute: 1 Title: Initial conditions soil (T = +10 C)

Sub Type = Initial temperature

Property	Symbol	Value
Attribute type	type	"element"
Reference temperature	Temp	10.0
Using hygro-thermal	isHygro	true
Is humidity	isHum	true
Is liquid	isLiqd	false
Humidity	Humidity	0.9

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Assignment to Volumes:

1T15

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Loadcase ID: 3 Title: HT Stage 1b Factor = 1.0

Loadcase ID: 4 Title: HT Stage 1c Factor = 1.0

Assignment to Surfaces:

54T63I3;64T68;86T91

Attribute: 2 Title: Initial conditions concrete (T = +15 C)

Sub Type = Initial temperature

Property	Symbol	Value
Attribute type	type	"element"
Reference temperature	Temp	15.0
Using hygro-thermal	isHygro	true
Is humidity	isHum	true
Is liquid	isLiqd	true
Humidity	Humidity	1.0

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Assignment to Volumes:

16T21

Loadcase ID: 7 Title: HT Stage 2a Factor = 1.0

Assignment to Volumes:

22T24

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 14
		Date :	Created:

Attribute: 3 Title: Environment air T = +20 C

Sub Type = Environmental

Property	Symbol	Value
Environmental temperature	envT	20.0
Convection heat transfer coefficient	hc	10.0
Radiation heat transfer coefficient	hr	0.0
Relative humidity	humidity	0.8
Vapour mass transfer coefficient	vapourMass	-1.0
Reference temperature	T	0.0

Loadcase ID: 10 Title: HT Stage 2d Factor = 1.0

Load component All

Assignment to Surfaces:

54T63I3;64T68;71;75;78;80;83T86;88T91;93;95;101;103;104T106

Loadcase ID: 5 Title: HT Stage 1d Factor = 1.0

Loadcase ID: 6 Title: HT Stage 1e Factor = 1.0

Load component All

Assignment to Surfaces:

54T63I3;64T68;71;75;78;80;83T91

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Loadcase ID: 3 Title: HT Stage 1b Factor = 1.0

Loadcase ID: 4 Title: HT Stage 1c Factor = 1.0

Load component All

Assignment to Surfaces:

54T63I3;64T68;86T91

Loadcase ID: 7 Title: HT Stage 2a Factor = 1.0

Loadcase ID: 8 Title: HT Stage 2b Factor = 1.0

Loadcase ID: 9 Title: HT Stage 2c Factor = 1.0

Load component All

Assignment to Surfaces:

54T63I3;64T68;71;75;78;80;83T86;88T91;105;106

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 15
		Date :	Created:

Attribute: 4 Title: Environment formwork T = +20 C

Sub Type = Environmental

Property	Symbol	Value
Environmental temperature	envT	20.0
Convection heat transfer coefficient	hc	7.0
Radiation heat transfer coefficient	hr	0.0
Relative humidity	humidity	0.8
Vapour mass transfer coefficient	vapourMass	0.0
Reference temperature	T	0.0

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Loadcase ID: 3 Title: HT Stage 1b Factor = 1.0

Loadcase ID: 4 Title: HT Stage 1c Factor = 1.0

Load component All

Assignment to Surfaces:

71;75;78;80;83T85

Loadcase ID: 7 Title: HT Stage 2a Factor = 1.0

Loadcase ID: 8 Title: HT Stage 2b Factor = 1.0

Loadcase ID: 9 Title: HT Stage 2c Factor = 1.0

Load component All

Assignment to Surfaces:

93;95;101;103;104

Attribute: 5 Title: Prescribed soil T= +10 C

Sub Type = Prescribed Temperature

Property	Symbol	Value
Attribute type	type	"Total"
Prescribed temperature	T	10.0
Fixed temperature	havePhi	true
Humidity	humidity	0.0
Fixed humidity	haveHumidity	false
Saturation	saturation	0.0
Fixed Saturation	haveSaturation	false
using humidity	isDlgHumidity	true

Loadcase ID: 1 Title: HT Stage 1a Factor = 1.0

Loadcase ID: 3 Title: HT Stage 1b Factor = 1.0

Loadcase ID: 4 Title: HT Stage 1c Factor = 1.0

Loadcase ID: 5 Title: HT Stage 1d Factor = 1.0

Loadcase ID: 6 Title: HT Stage 1e Factor = 1.0

Loadcase ID: 7 Title: HT Stage 2a Factor = 1.0

Loadcase ID: 8 Title: HT Stage 2b Factor = 1.0

Loadcase ID: 9 Title: HT Stage 2c Factor = 1.0

Loadcase ID: 10 Title: HT Stage 2d Factor = 1.0

Assignment to Surfaces:

20;28;31;36;38;42;43;46;51T53

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 16
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11. Activation structure

Attribute: 1 Title: Deactivate

Sub Type = Deactivate

Property

Percentage of internal forces to be redistributed
Stiffness reduction factor
Process constraint equations
Constraint equation type
Increments
Basic Deactivation Options
Redistribution of Internal Forces

Symbol

percent
stfscf
createConstr
constrEquType
ninc
deactType
deactRedist

Value

100.0
0.0
false
"activeMesh"
1
"custom"
"number of increments"

Loadcase ID: 1 Title: HT Stage 1a

Assignment to Volumes:

22T24

Loadcase ID: 12 Title: STR Stage 1a

Assignment to Volumes:

22T24

Attribute: 1 Title: Activate

Sub Type = Activate

Property

Process constraint equations
Constraint equation type
Increments

Symbol

createConstr
constrEquType
ninc

Value

true
"tangent"
1

Loadcase ID: 7 Title: HT Stage 2a

Assignment to Volumes:

22T24

Loadcase ID: 17 Title: STR Stage 2a

Assignment to Volumes:

22T24

	Appendix 1: Input receipt SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 17
		Date :	Created:

12. Transient loadcases: thermal

Loadcase	Title	Analysis	Time step	Total time
1	HT Stage 1a	Analysis 1 (Hygro-thermal)	0.05	0.5
3	HT Stage 1b	Analysis 1 (Hygro-thermal)	0.10	1.0
4	HT Stage 1c	Analysis 1 (Hygro-thermal)	0.20	3.0
5	HT Stage 1d	Analysis 1 (Hygro-thermal)	0.50	10.0
6	HT Stage 1e	Analysis 1 (Hygro-thermal)	1.00	30.0
7	HT Stage 2a	Analysis 1 (Hygro-thermal)	0.05	30.5
8	HT Stage 2b	Analysis 1 (Hygro-thermal)	0.10	31.0
9	HT Stage 2c	Analysis 1 (Hygro-thermal)	0.20	33.0
10	HT Stage 2d	Analysis 1 (Hygro-thermal)	0.50	40.0

13. Transient loadcases: thermal

Loadcase	Title	Analysis	Time step	Total time
12	STR Stage 1a	Analysis 1 (Structural)	0.05	0.5
13	STR Stage 1b	Analysis 1 (Structural)	0.10	1.0
14	STR Stage 1c	Analysis 1 (Structural)	0.20	3.0
15	STR Stage 1d	Analysis 1 (Structural)	0.50	10.0
16	STR Stage 1e	Analysis 1 (Structural)	1.00	30.0
17	STR Stage 2a	Analysis 1 (Structural)	0.05	30.5
18	STR Stage 2b	Analysis 1 (Structural)	0.10	31.0
19	STR Stage 2c	Analysis 1 (Structural)	0.20	33.0
20	STR Stage 2d	Analysis 1 (Structural)	0.50	40.0

	Appendix 2: Results SYSTEM 001	Status :	Page: 1
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created:

Title: Results

Model Units: N,m,kg,Day,C
Report Units: N,m,kg,Day,C

Model Title: System 001
Model File: System 001

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 2
		Date :	Created:

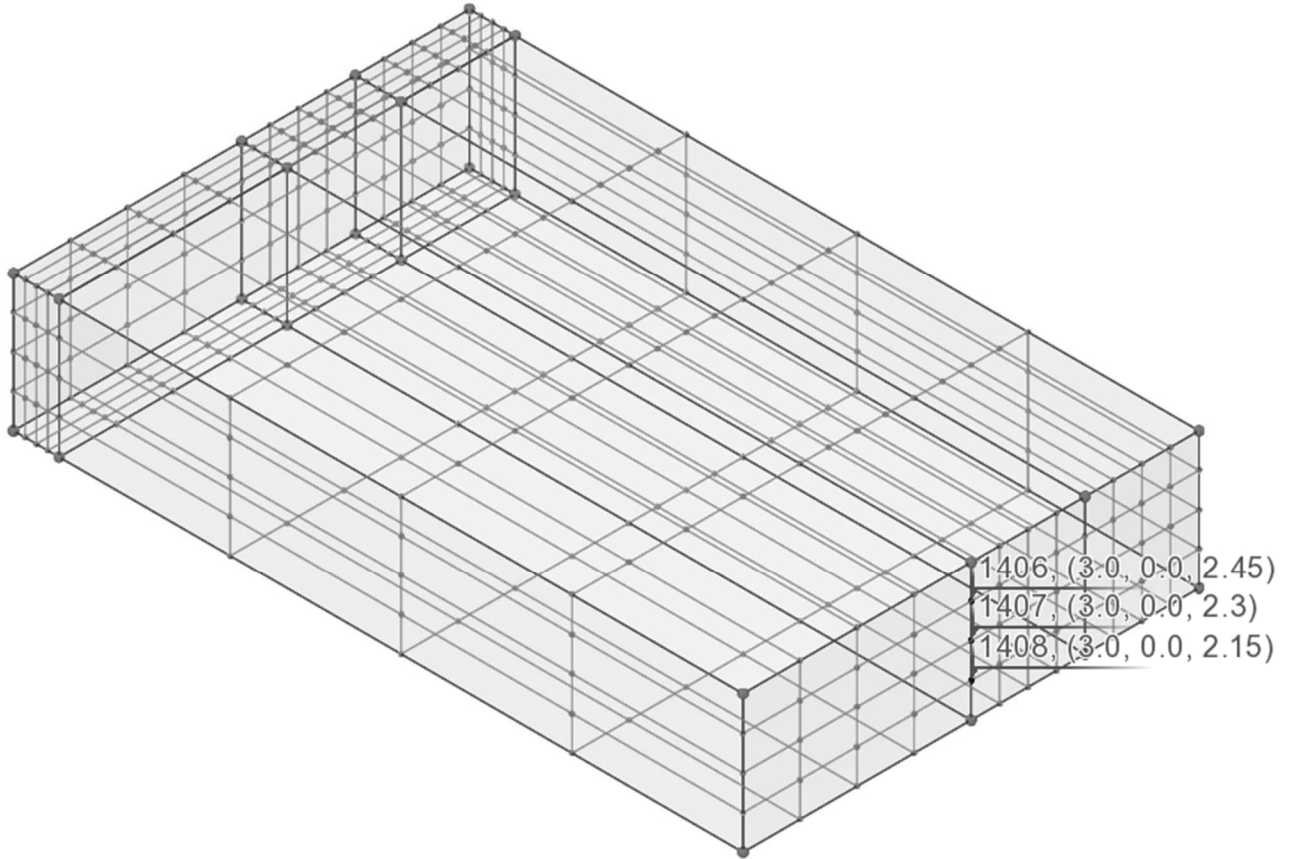
Table of Contents

1.	Result nodes	3-5
2.	Analysis 1: temperature	6-14
3.	Analysis 2: tension strength (Ften)	15-19
4.	Analysis 2: compressive strength (Fcomp)	20-24
5.	Analysis 2: major principal stress (S1)	25-28

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 3
		Date :	Created:

1. Result nodes

1.1 Results slab

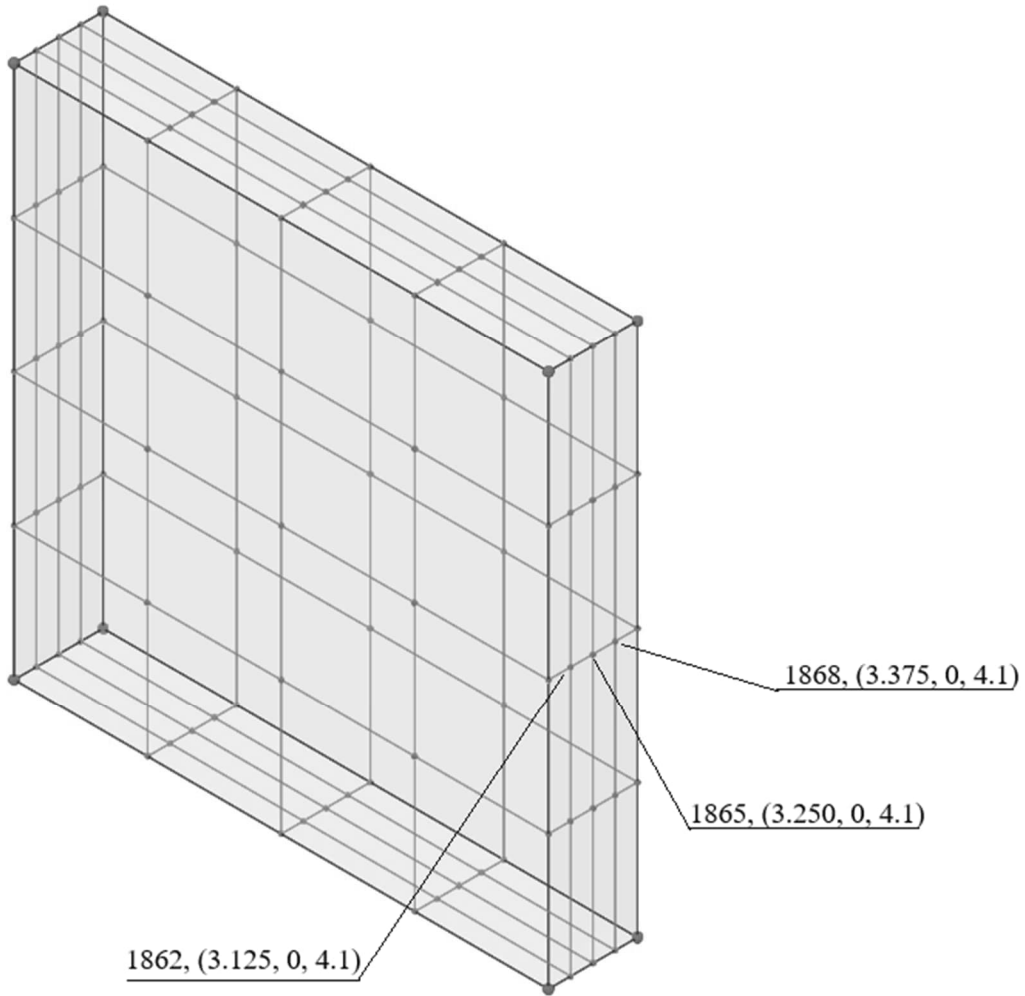


3D Overview

Location N1406, N1407 & N1408

	Appendix 2: Results SYSTEM 001	Status :	Page: 4
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created:

1.2 Results abutment

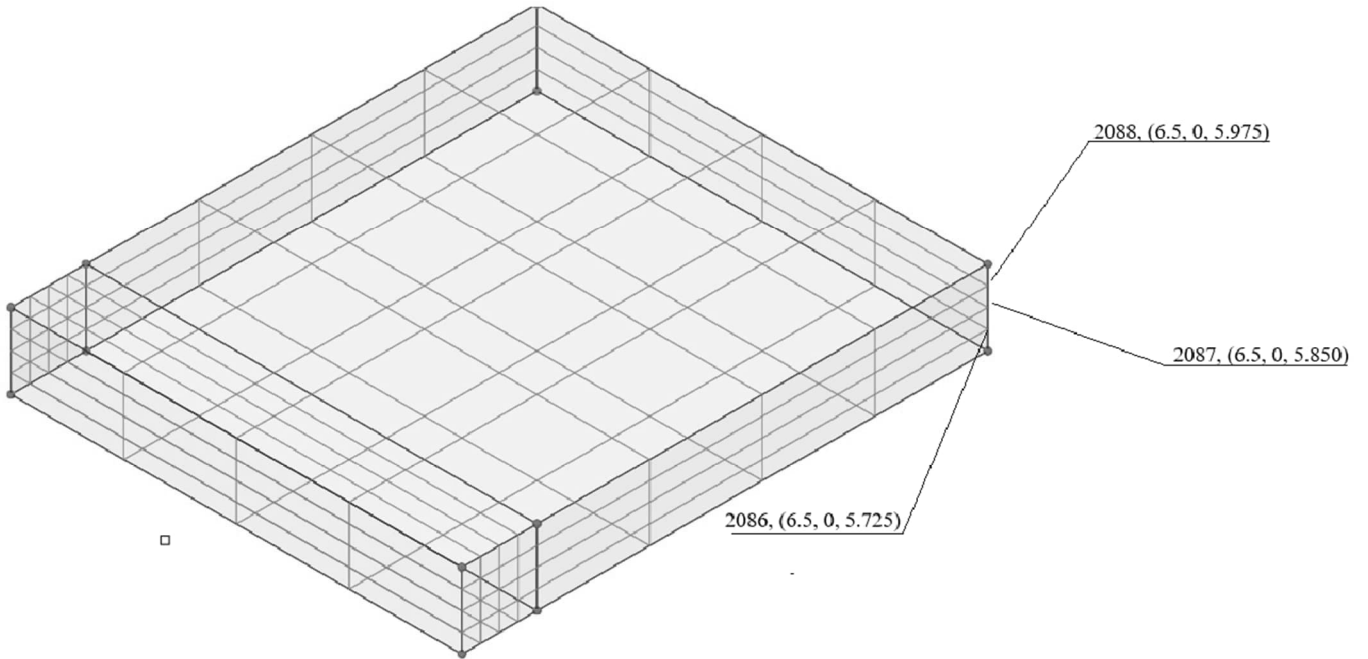


3D Overview

Location N1862, N1865 & N1868

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 5
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1.3 Results deck



3D Overview

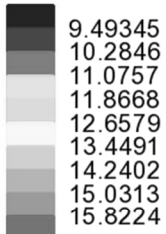
Location N2086, N2087 & N2088

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 6
		Date :	Created:

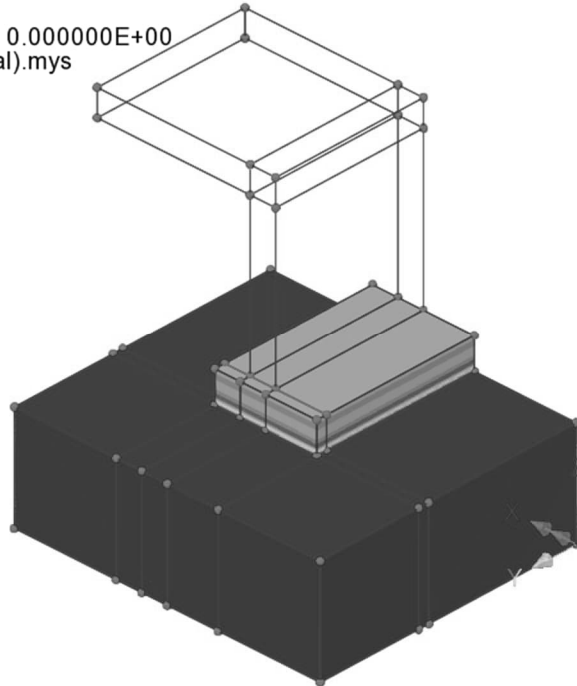
2. Analysis 1: temperature

2.1 Contour

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 1:HT Stage 1a, 1:Time Step 0 Time = 0.000000E+00
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



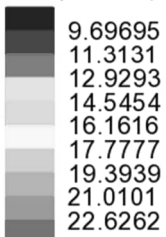
Maximum 16.5051 at node 1827
 Minimum 9.38497 at node 827



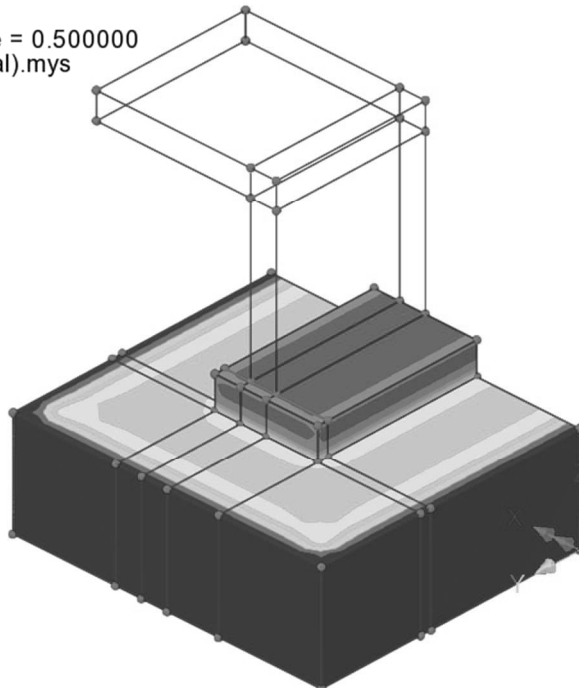
3D Overview (left)

t = 0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 1:HT Stage 1a, 11:Time Step 10 Time = 0.500000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 0.5
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



Maximum 24.1667 at node 1393
 Minimum 9.62128 at node 1043

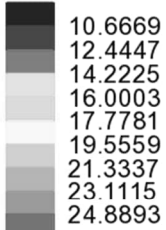


3D Overview (left)

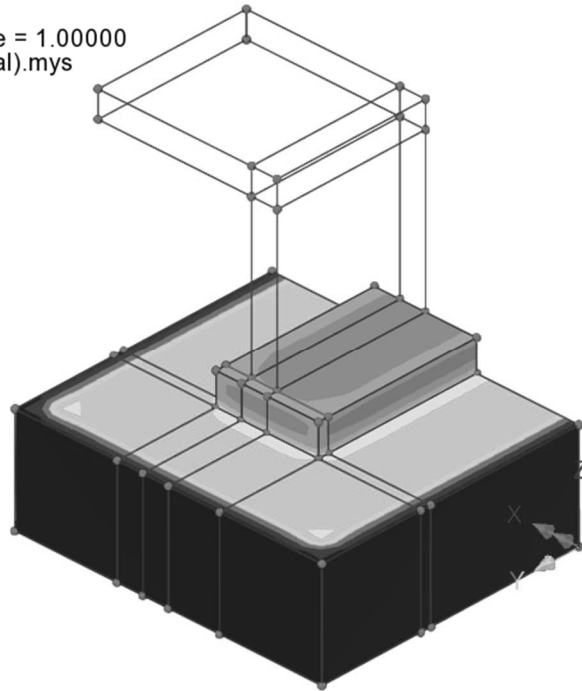
	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 7
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t = 0.5 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 3:HT Stage 1b, 16:Time Step 15 Time = 1.00000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 7.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



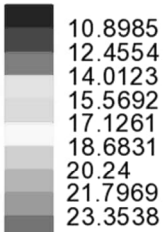
Maximum 25.8035 at node 1464
 Minimum 9.80316 at node 223



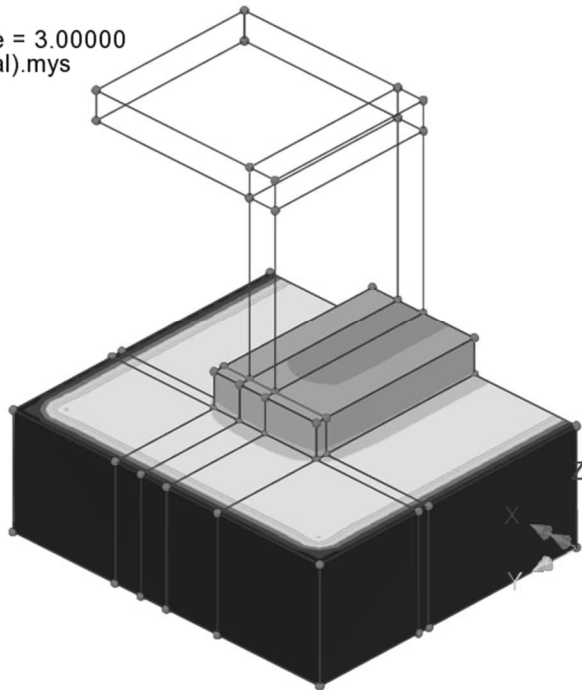
3D Overview (left)

t = 1.0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 4:HT Stage 1c, 26:Time Step 25 Time = 3.00000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 3.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



Maximum 24.0114 at node 1413
 Minimum 9.99912 at node 965

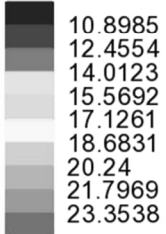


3D Overview (left)

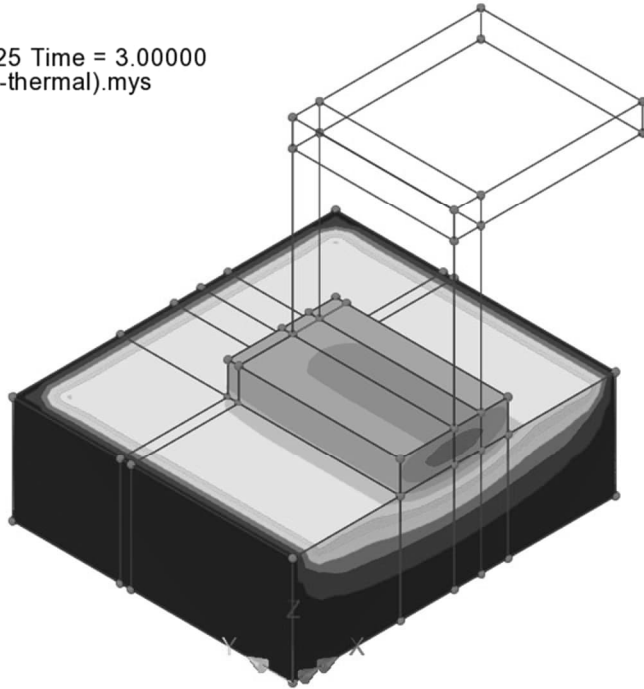
t = 3.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 8
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Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 4:HT Stage 1c, 26:Time Step 25 Time = 3.00000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 3.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



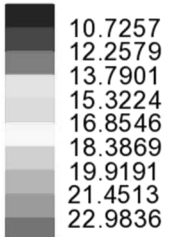
Maximum 24.0114 at node 1413
 Minimum 9.99912 at node 965



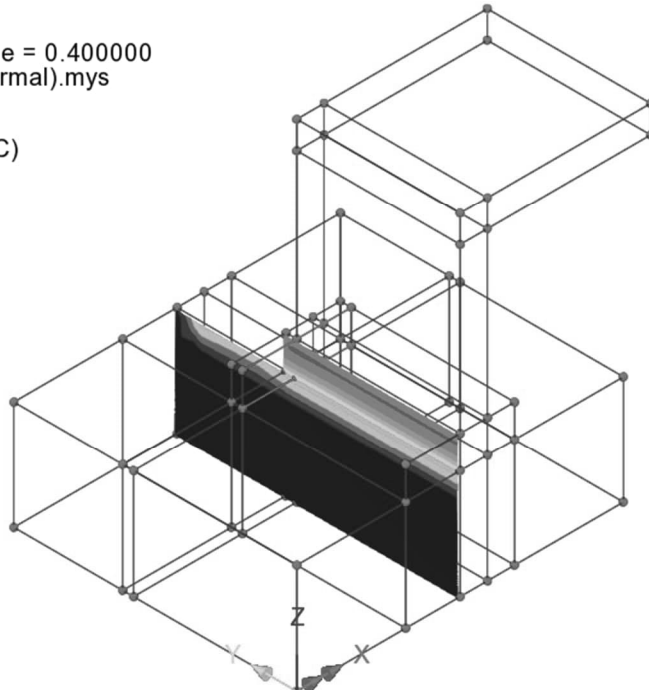
3D Overview (right)

t = 3.0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 1:HT Stage 1a, 9:Time Step 8 Time = 0.400000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 0.4
 Entity: Temperature
 Component (Averaged nodal): Temp (Units: C)



Maximum 23.2735 at node 44838
 Minimum 9.4834 at node 41578

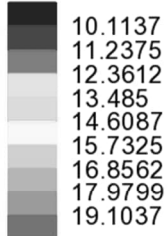


3D Overview (right): "slice" center slab

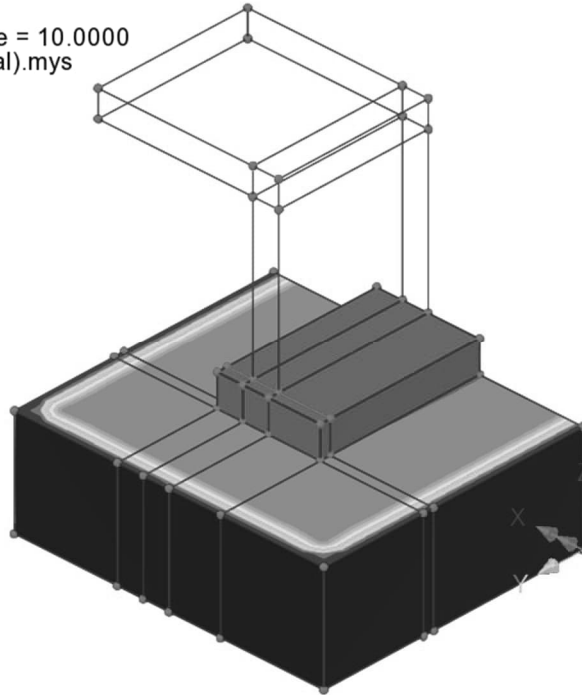
t = 3.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 9
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Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 5:HT Stage 1d, 40:Time Step 39 Time = 10.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 10.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



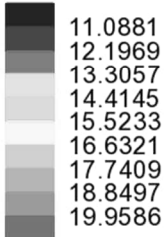
Maximum 20.1137 at node 1406
 Minimum 10.0 at node 1



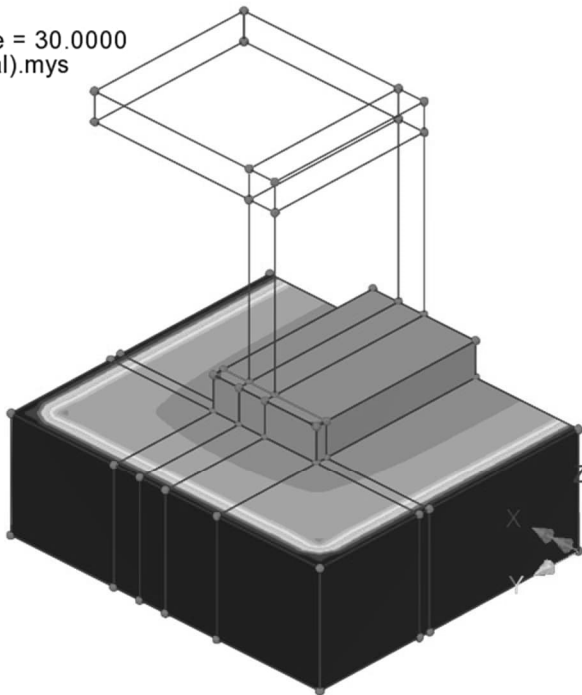
3D Overview (left)

t = 10.0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 6:HT Stage 1e, 60:Time Step 59 Time = 30.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 30.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



Maximum 19.9793 at node 1626
 Minimum 10.0 at node 1

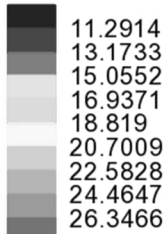


3D Overview (left)

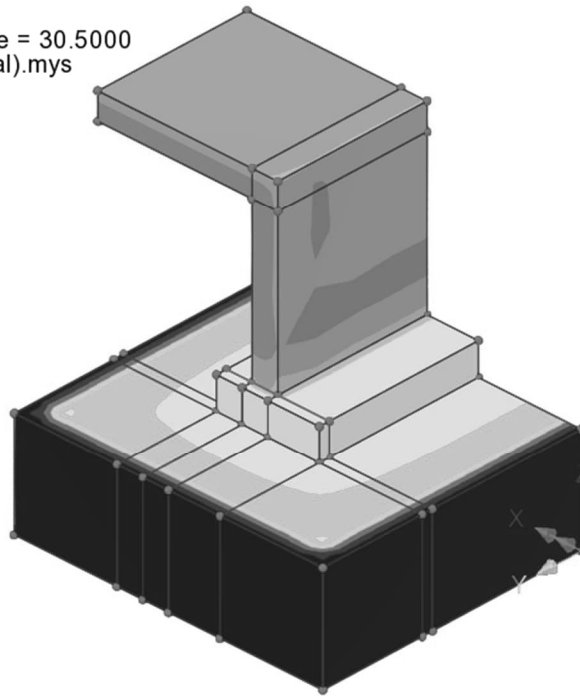
t = 30.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 10
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Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 7:HT Stage 2a, 70:Time Step 69 Time = 30.5000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 30.5
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



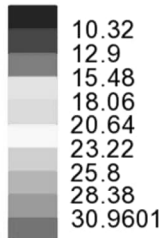
Maximum 26.9371 at node 1879
 Minimum 10.0 at node 1



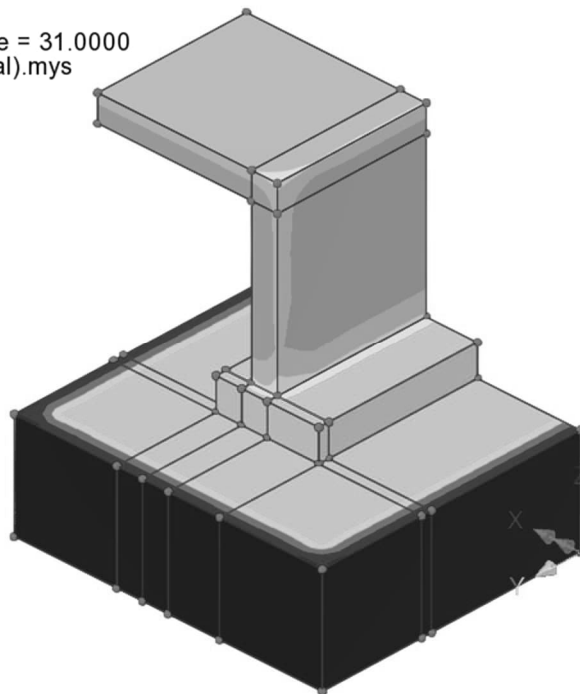
3D Overview (left)

t = 30.5 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 8:HT Stage 2b, 75:Time Step 74 Time = 31.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 31.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



Maximum 33.22 at node 1879
 Minimum 10.0 at node 1

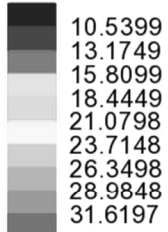


3D Overview (left)

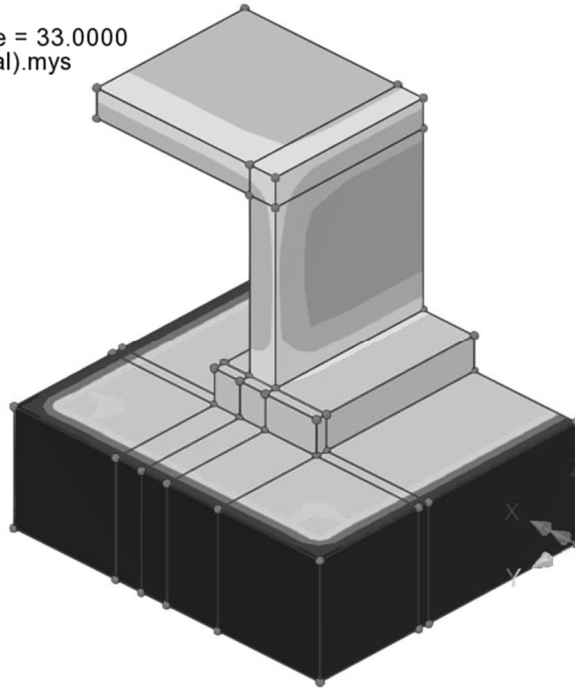
t = 31.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 11
		Date :	Created:

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 9:HT Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 33.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



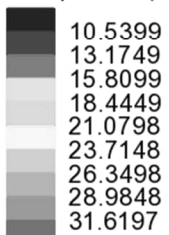
Maximum 33.7148 at node 1881
 Minimum 10.0 at node 1



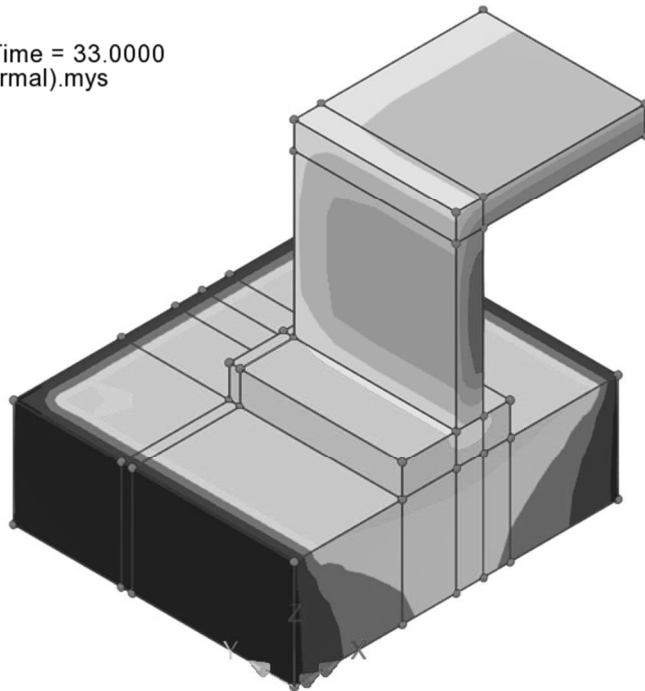
3D Overview (left)

t = 33.0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 9:HT Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 33.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



Maximum 33.7148 at node 1881
 Minimum 10.0 at node 1

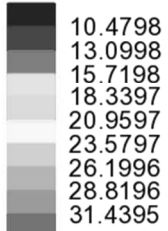


3D Overview (right)

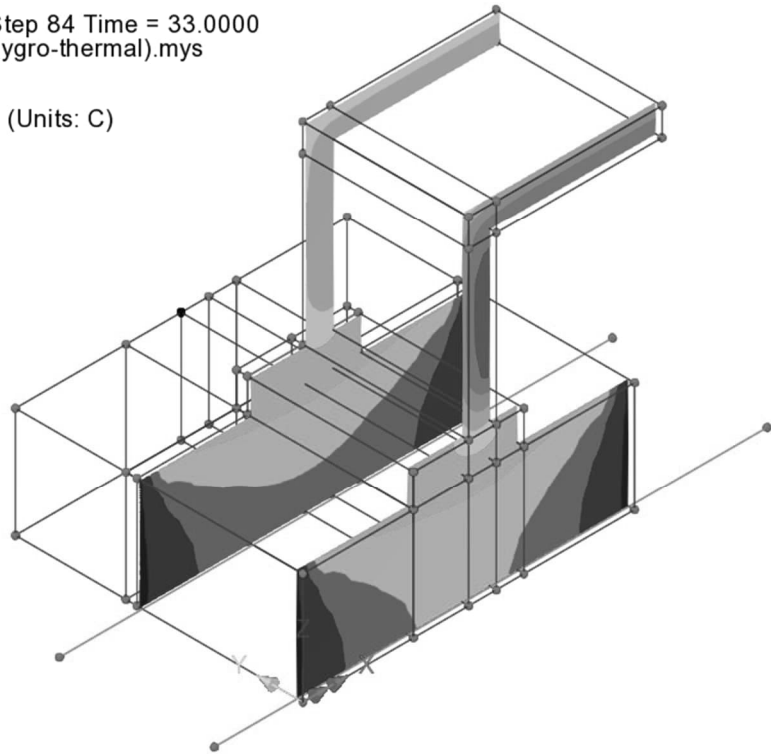
t = 33.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 12
		Date :	Created:

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 9:HT Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 33.0
 Entity: Temperature
 Component (Averaged nodal): Temp (Units: C)

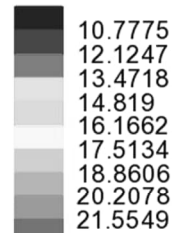


Maximum 33.5797 at node 50733
 Minimum 10.0 at node 45838

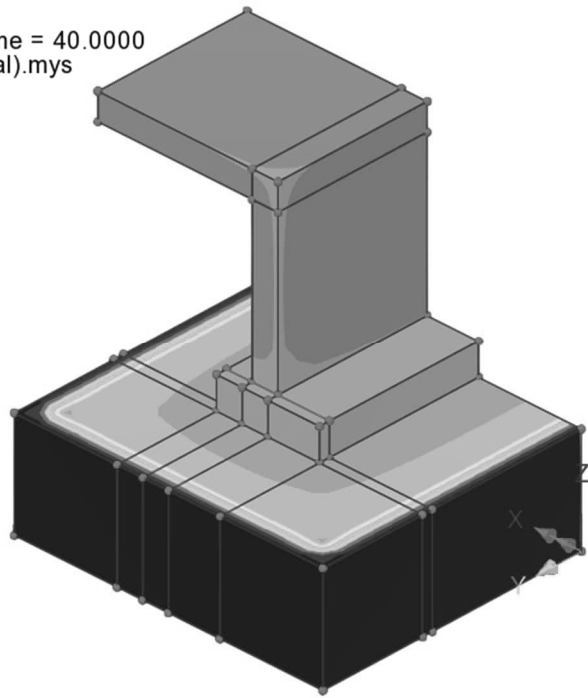


3D Overview (right): "slice" at X = 0.1 m & X = 2.9 m
 t = 33.0 days

Analysis: Analysis 1 (Hygro-thermal)
 Loadcase: 10:HT Stage 2d, 99:Time Step 98 Time = 40.0000
 Results file: Bro_10G3~Analysis 1 (Hygro-thermal).mys
 Response time: 40.0
 Entity: Temperature
 Component (Nodal): Temp (Units: C)



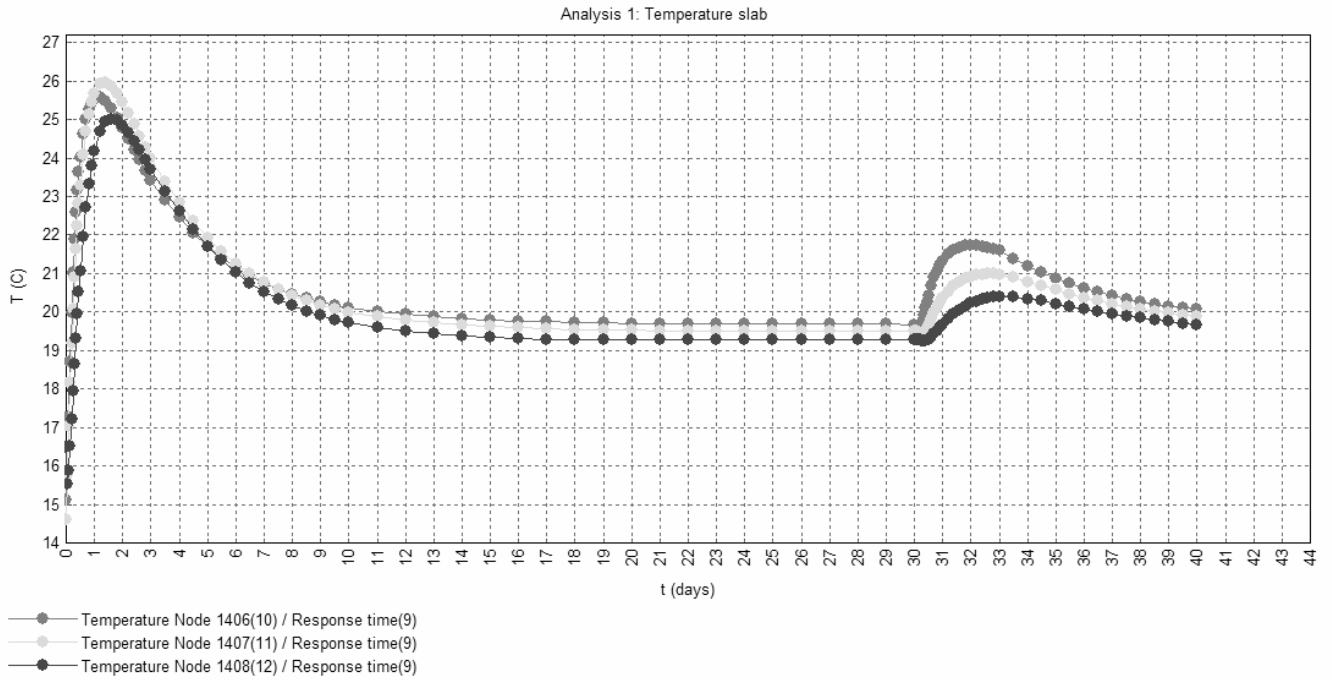
Maximum 22.1247 at node 2054
 Minimum 10.0 at node 1



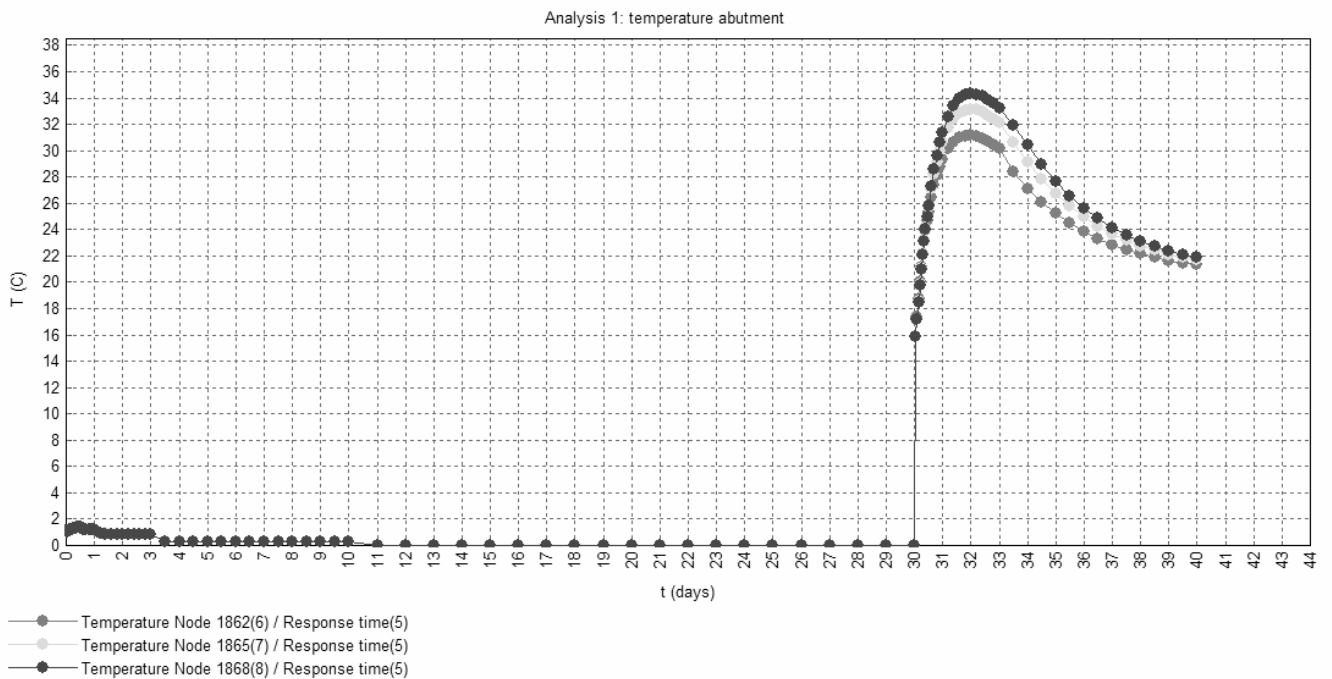
3D Overview (left)
 t = 40.0 days

2.2 Diagram

2.2.1 Slab

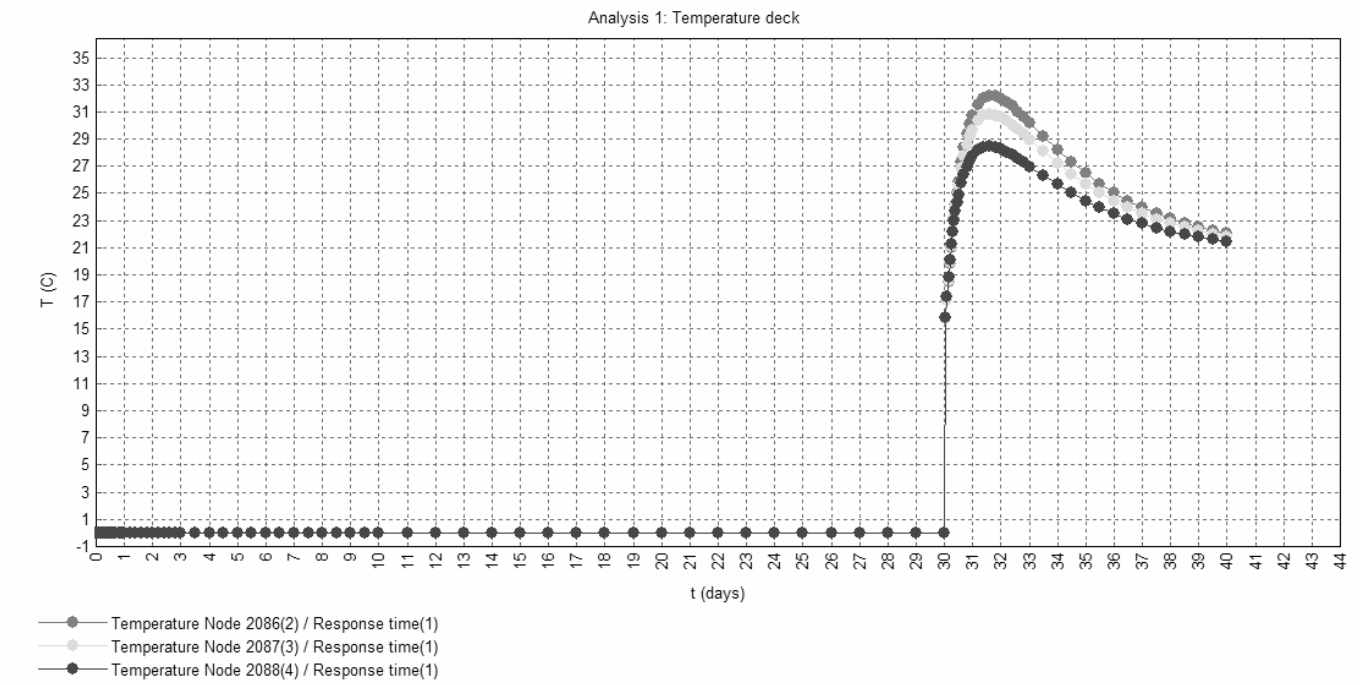


2.2.2 Abutment



Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 14
	Date :	Created:

2.2.3 Deck

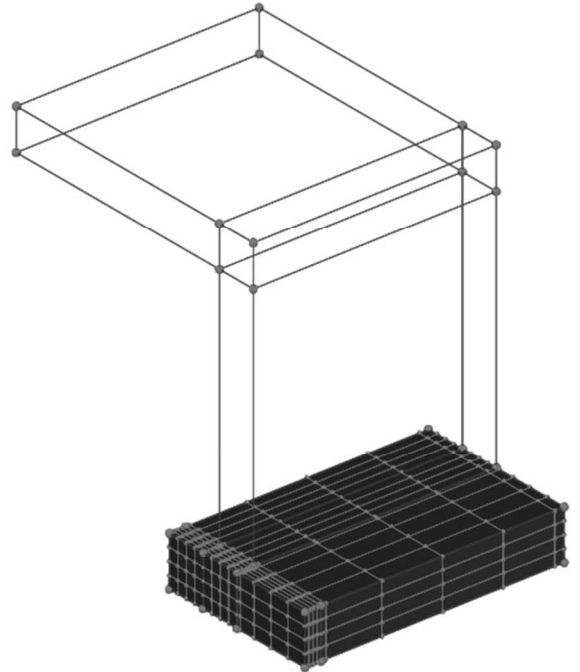


	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 15
		Date :	Created:

3. Analysis 2: tension strength (Ften)

3.1 Contour

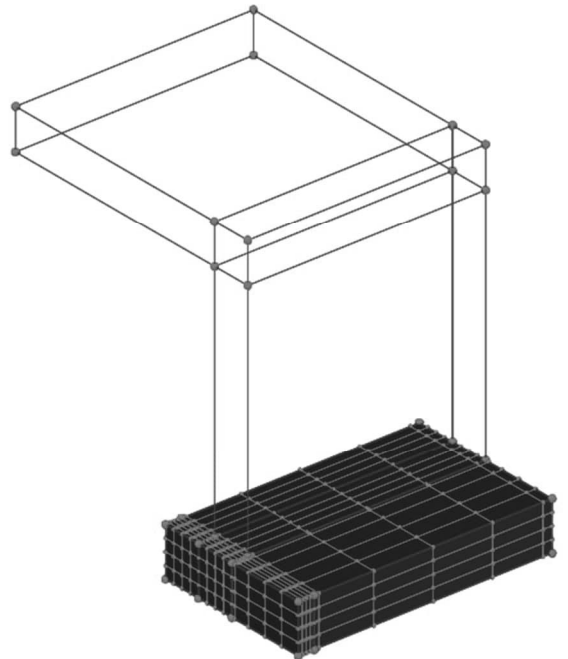
Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 1:Time Step 0 Time = 0.000000E+00
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)
 ■ 1.75E6
 Maximum 1.75E6 at node 6 of element 1024
 Minimum 1.75E6 at node 6 of element 1024



3D Overview (left)

t = 0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 11:Time Step 10 Time = 0.500000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 0.5
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)
 ■ 1.75E6
 Maximum 1.75E6 at node 6 of element 1024
 Minimum 1.75E6 at node 6 of element 1024

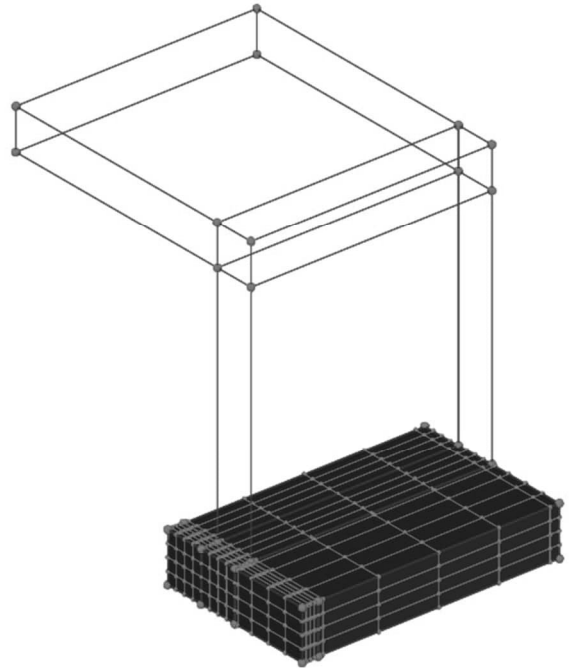


3D Overview (left)

t = 0.5 days

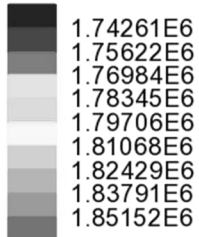
	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 16
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 13:STR Stage 1b, 16:Time Step 15 Time = 1.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 1.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)
 ■ 1.75E6
 Maximum 1.75E6 at node 6 of element 1024
 Minimum 1.75E6 at node 6 of element 1024

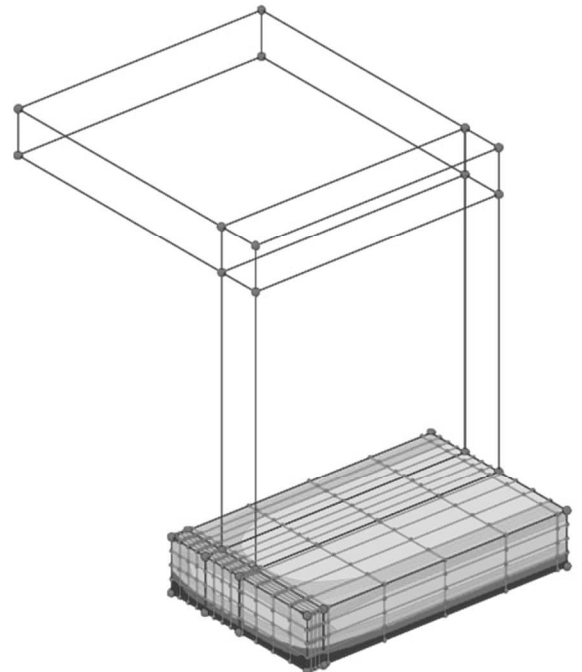


3D Overview (left)
 t = 1.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 14:STR Stage 1c, 26:Time Step 25 Time = 3.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 3.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



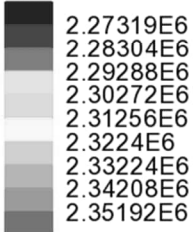
Maximum 1.85786E6 at node 1416 of element 965
 Minimum 1.73533E6 at node 128 of element 974



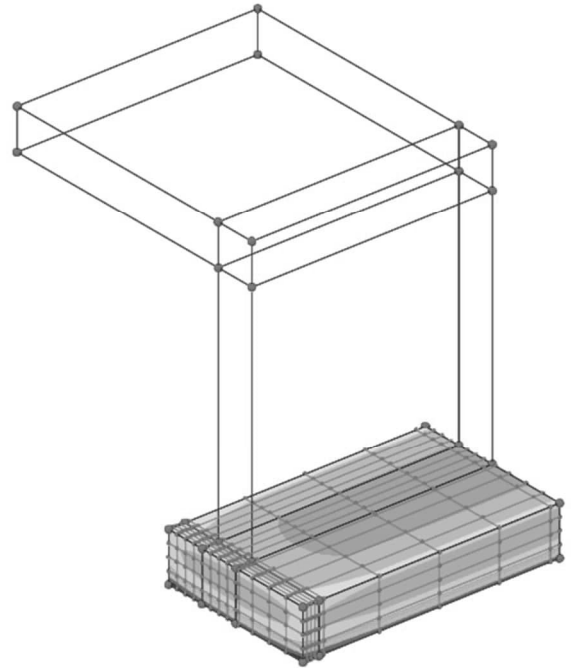
3D Overview (left)
 t = 3.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 17
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 15:STR Stage 1d, 40:Time Step 39 Time = 10.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 10.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



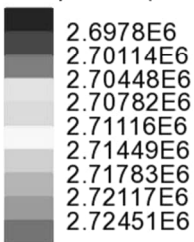
Maximum 2.35935E6 at node 1407 of element 1013
 Minimum 2.27078E6 at node 790 of element 1341



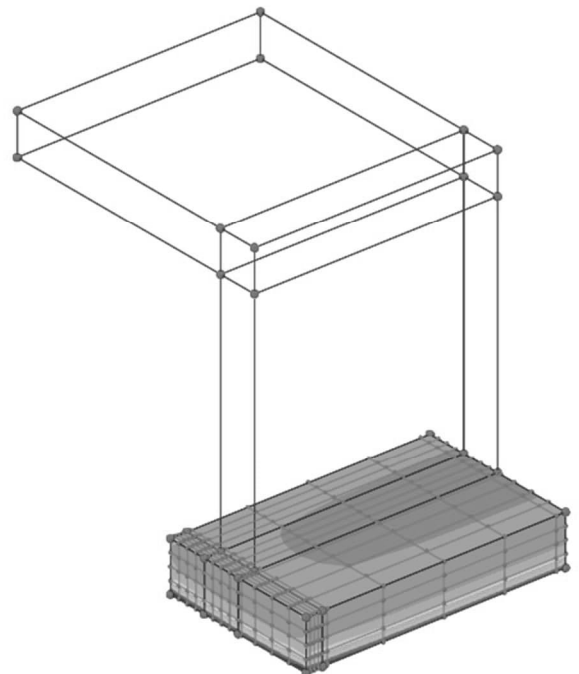
3D Overview (left)

t = 10.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 16:STR Stage 1e, 60:Time Step 59 Time = 30.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



Maximum 2.72652E6 at node 1406 of element 1009
 Minimum 2.69647E6 at node 790 of element 1341

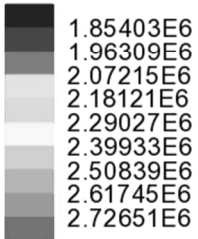


3D Overview (left)

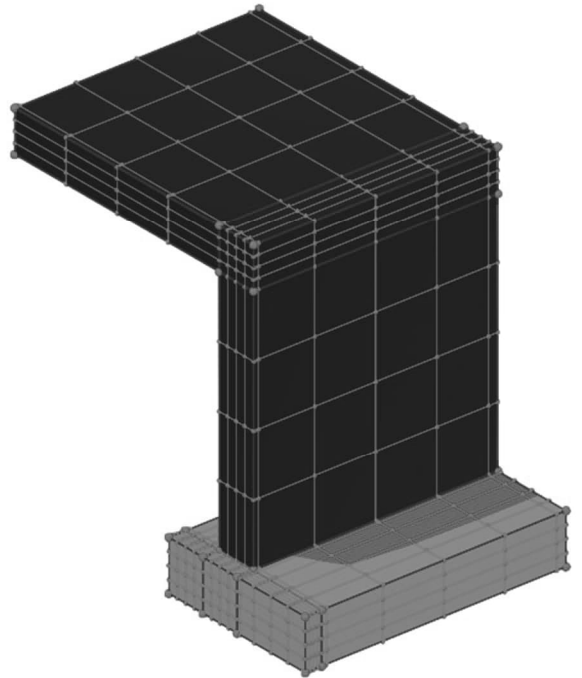
t = 30.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 18
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 17:STR Stage 2a, 70:Time Step 69 Time = 30.5000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.5
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



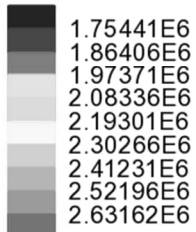
Maximum 2.73154E6 at node 1406 of element 1009
 Minimum 1.75E6 at node 1386 of element 1396



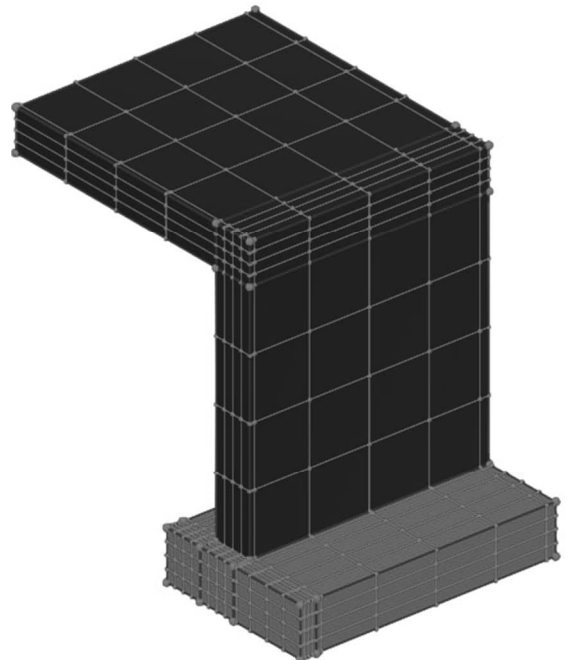
3D Overview (left)

t = 30.5 days

Analysis: Analysis 1 (Structural)
 Loadcase: 18:STR Stage 2b, 75:Time Step 74 Time = 31.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 31.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



Maximum 2.73686E6 at node 1473 of element 1075
 Minimum 1.75E6 at node 1386 of element 1396

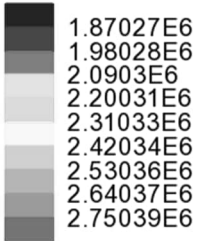


3D Overview (left)

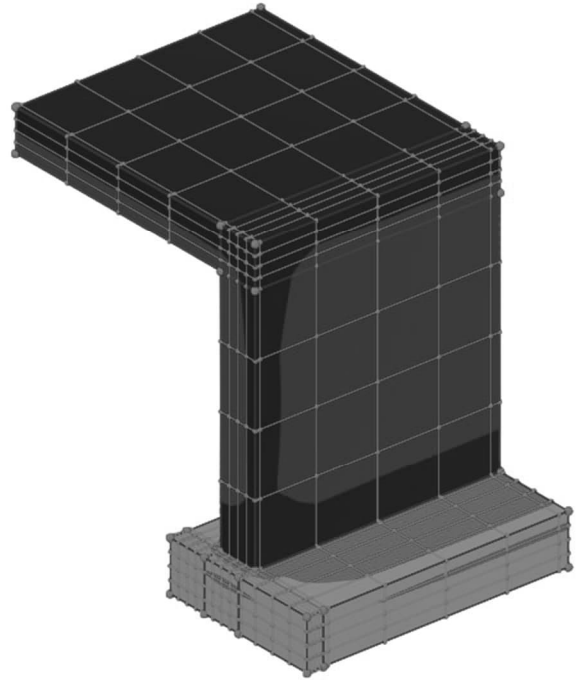
t = 31.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 19
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 19:STR Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 33.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



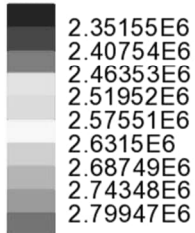
Maximum 2.75853E6 at node 1476 of element 1074
 Minimum 1.76839E6 at node 1386 of element 1396



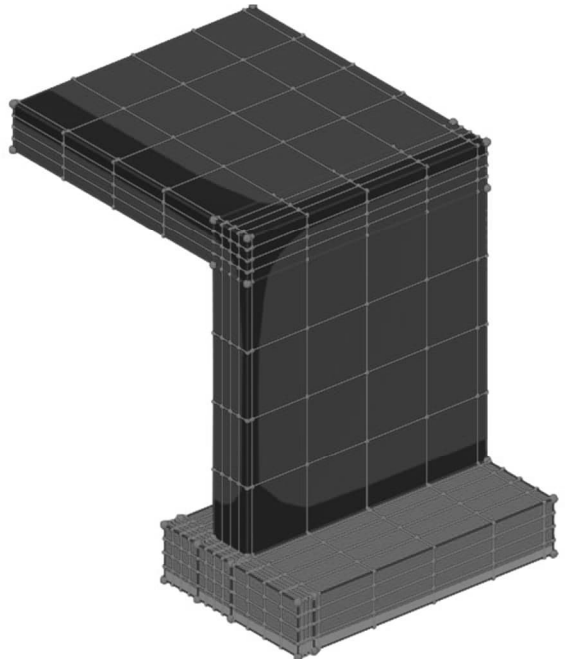
3D Overview (left)

t = 33.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 20:STR Stage 2d, 99:Time Step 98 Time = 40.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 40.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Ftens (Units: N/m²)



Maximum 2.8195E6 at node 1471 of element 1074
 Minimum 2.31559E6 at node 1386 of element 1396



3D Overview (left)

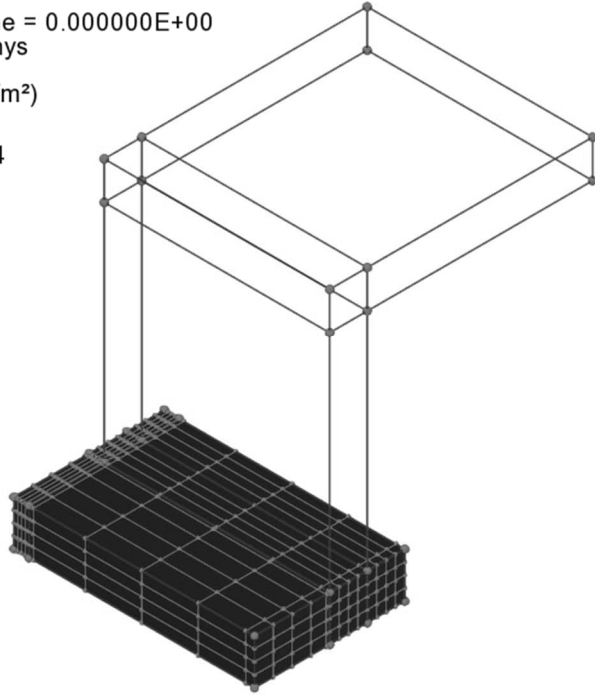
t = 40.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 20
		Date :	Created:

4. Analysis 2: compressive strength (Fcomp)

4.1 Contour

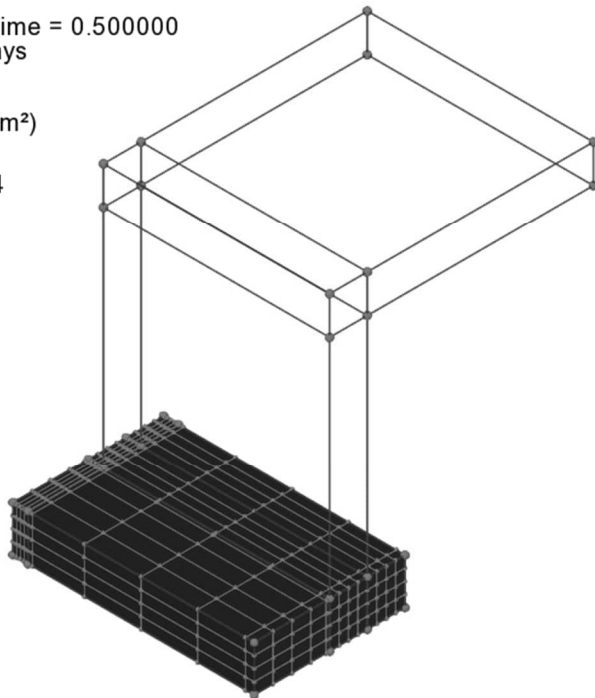
Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 1:Time Step 0 Time = 0.000000E+00
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)
 ■ 5.94127E6
 Maximum 5.94127E6 at node 6 of element 1024
 Minimum 5.94127E6 at node 6 of element 1024



3D Overview (right)

t = 0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 11:Time Step 10 Time = 0.500000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 0.5
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)
 ■ 5.94127E6
 Maximum 5.94127E6 at node 6 of element 1024
 Minimum 5.94127E6 at node 6 of element 1024

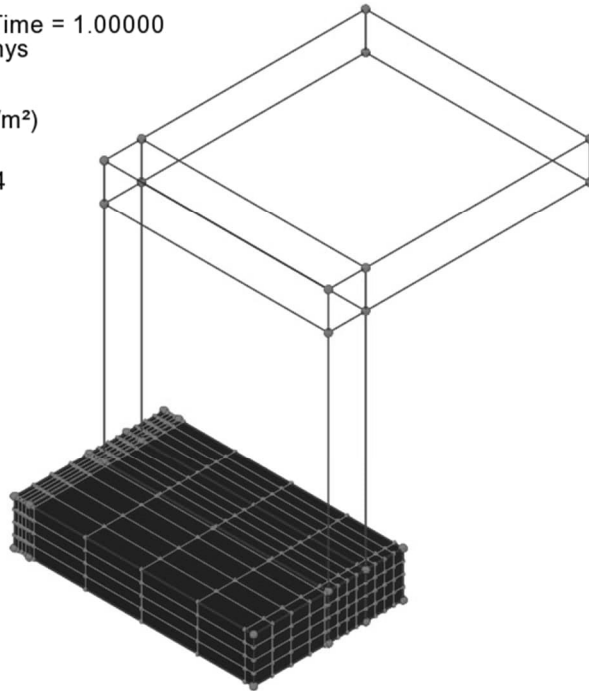


3D Overview (right)

t = 0.5 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 21
		Date :	Created:

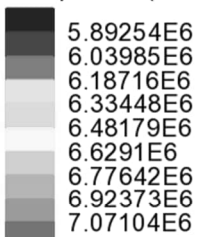
Analysis: Analysis 1 (Structural)
 Loadcase: 13:STR Stage 1b, 16:Time Step 15 Time = 1.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 1.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)
 ■ 5.94127E6
 Maximum 5.94127E6 at node 6 of element 1024
 Minimum 5.94127E6 at node 6 of element 1024



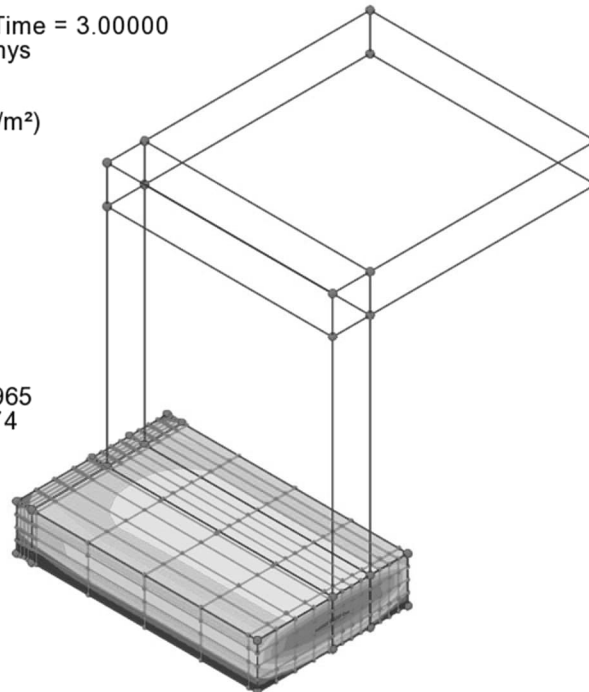
3D Overview (right)

t = 1.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 14:STR Stage 1c, 26:Time Step 25 Time = 3.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 3.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



Maximum 7.11416E6 at node 1416 of element 965
 Minimum 5.78834E6 at node 128 of element 974

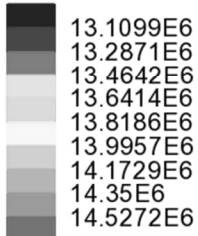


3D Overview (right)

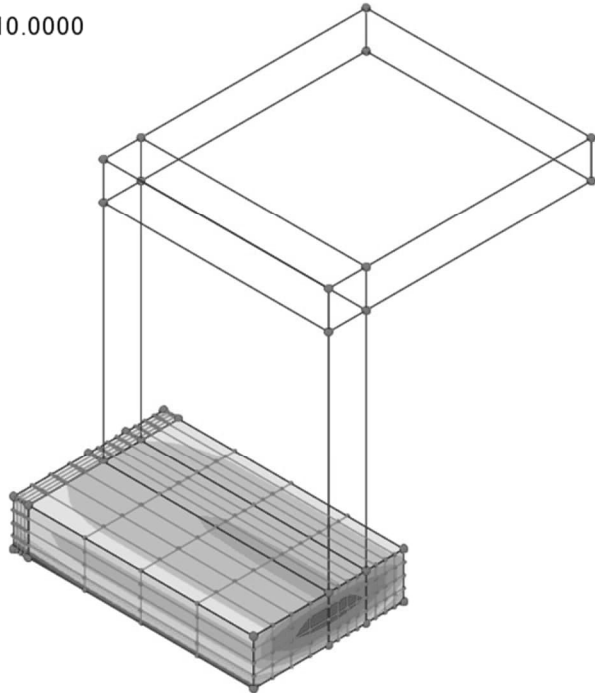
t = 3.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 22
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 15:STR Stage 1d, 40:Time Step 39 Time = 10.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 70.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



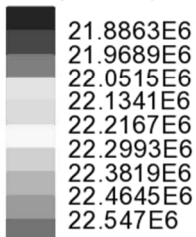
Maximum 14.621E6 at node 1407 of element 1013
 Minimum 13.0266E6 at node 790 of element 1341



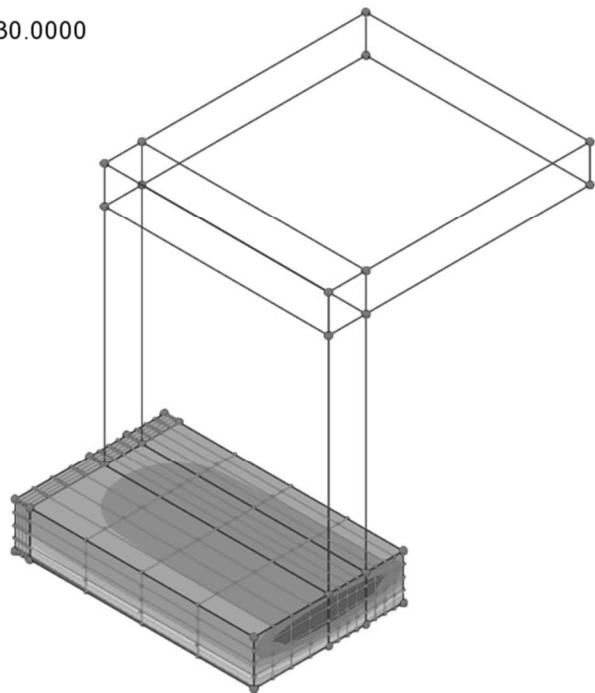
3D Overview (right)

t = 10.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 16:STR Stage 1e, 60:Time Step 59 Time = 30.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



Maximum 22.6112E6 at node 1406 of element 1009
 Minimum 21.8679E6 at node 790 of element 1341

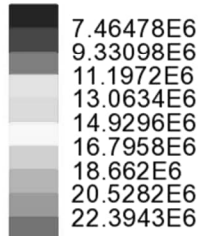


3D Overview (right)

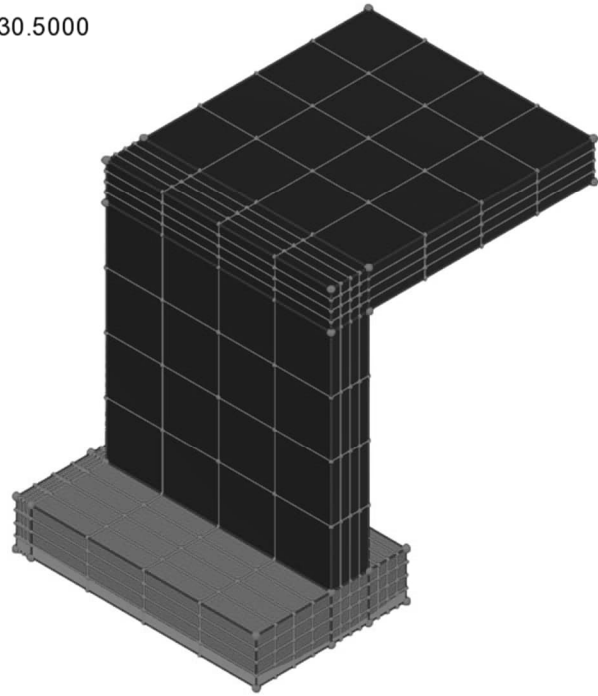
t = 30.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 23
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 17:STR Stage 2a, 70:Time Step 69 Time = 30.5000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.5
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



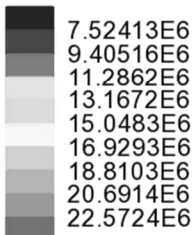
Maximum 22.737E6 at node 1406 of element 1009
 Minimum 5.94127E6 at node 1386 of element 1396



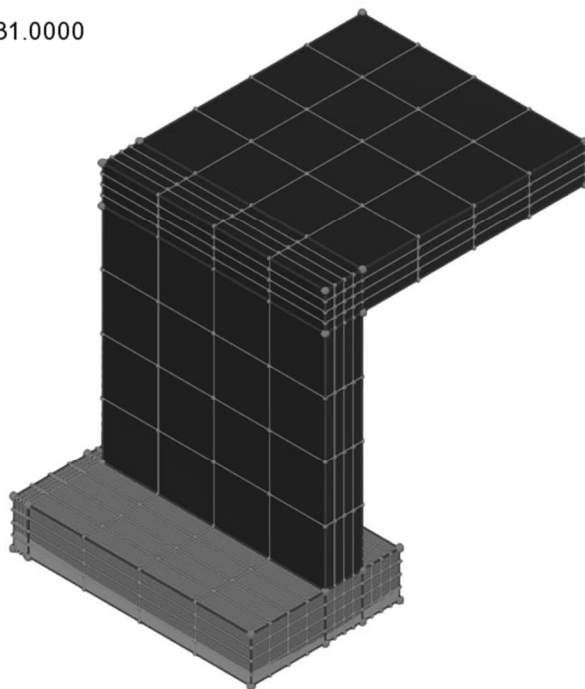
3D Overview (right)

t = 30.5 days

Analysis: Analysis 1 (Structural)
 Loadcase: 18:STR Stage 2b, 75:Time Step 74 Time = 31.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 31.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



Maximum 22.8706E6 at node 1473 of element 1075
 Minimum 5.94127E6 at node 1386 of element 1396

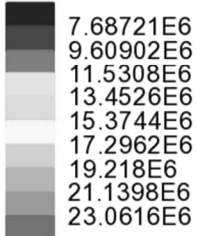


3D Overview (right)

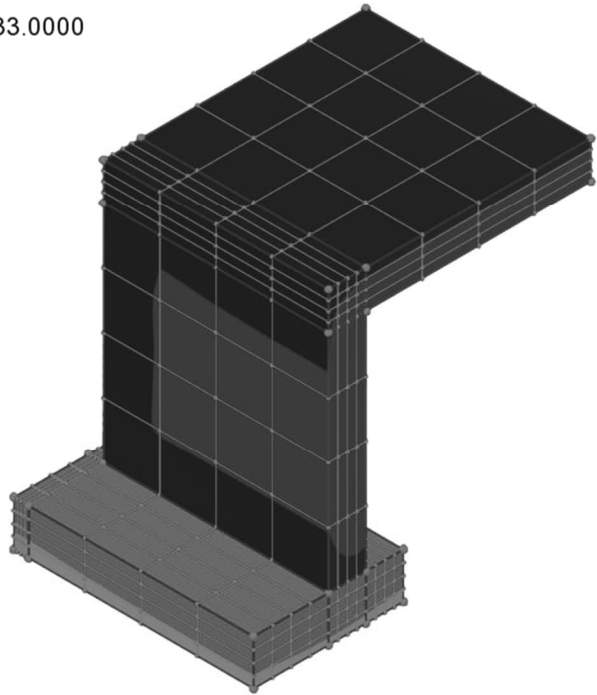
t = 31.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 24
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 19:STR Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 33.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



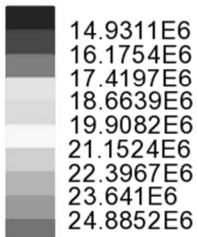
Maximum 23.421E6 at node 1476 of element 1074
 Minimum 6.12473E6 at node 1386 of element 1396



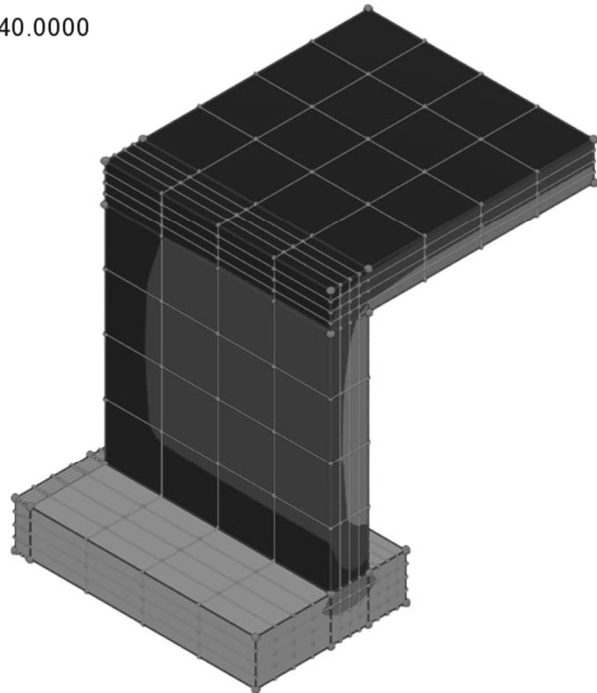
3D Overview (right)

t = 33.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 20:STR Stage 2d, 99:Time Step 98 Time = 40.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 40.0
 Entity: Concrete Results - Solids
 Component (Averaged nodal): Fcomp (Units: N/m²)



Maximum 25.0162E6 at node 1471 of element 1074
 Minimum 13.8178E6 at node 1386 of element 1396



3D Overview (right)

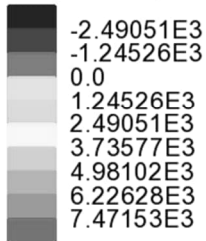
t = 40.0 days

	Appendix 2: Results SYSTEM 001	Status :	Page: 25
	Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Date :	Created:

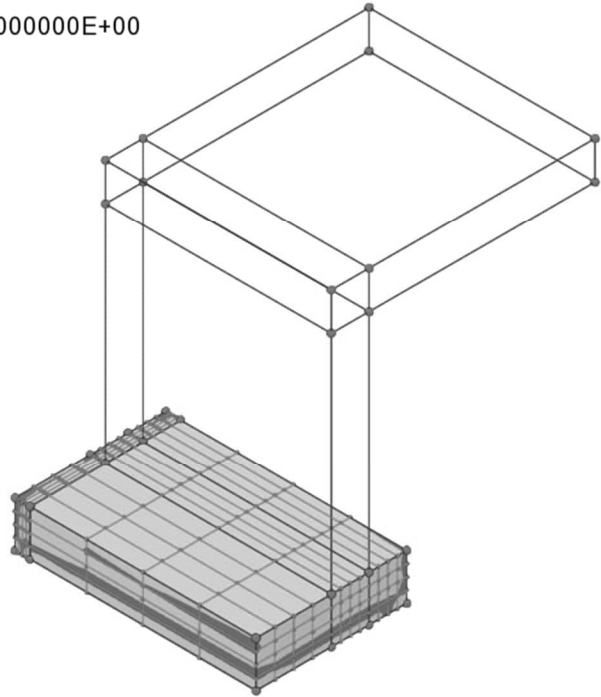
5. Analysis 2: major principal stress (S1)

5.1 Contour

Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 1:Time Step 0 Time = 0.000000E+00
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



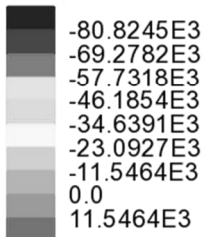
Maximum 8.31548E3 at node 546 of element 1216
 Minimum -2.89182E3 at node 668 of element 1205



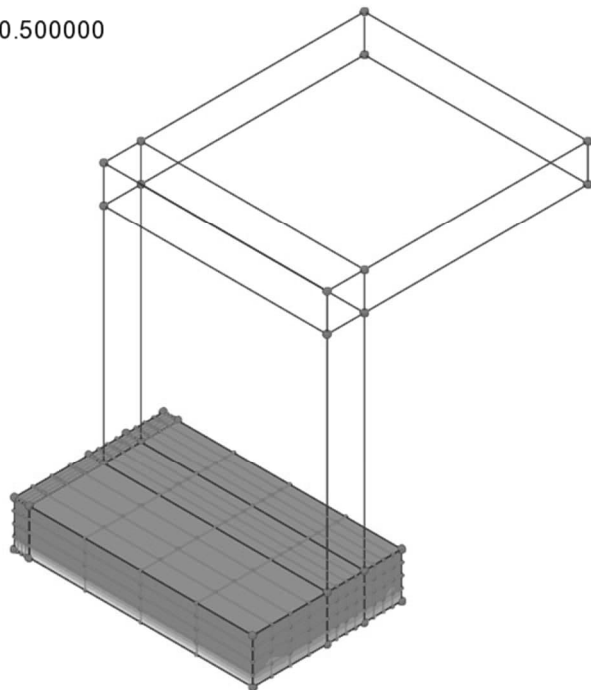
3D Overview (right)

t = 0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 12:STR Stage 1a, 11:Time Step 10 Time = 0.500000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 0.5
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



Maximum 19.4736E3 at node 1771 of element 1325
 Minimum -84.4436E3 at node 790 of element 1341

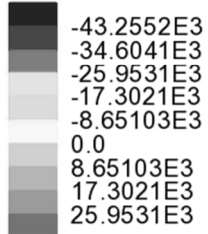


3D Overview (right)

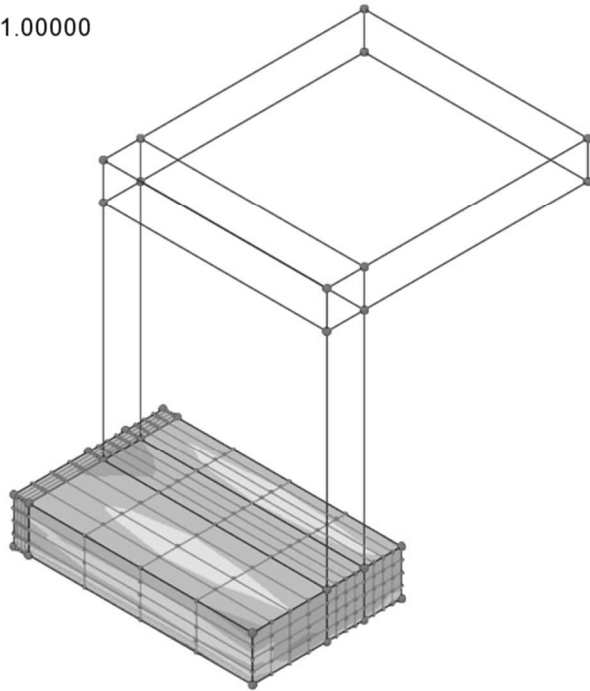
t = 0.5 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 26
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 13:STR Stage 1b, 16:Time Step 15 Time = 1.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 1.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



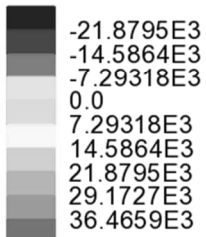
Maximum 32.1991E3 at node 1401 of element 969
 Minimum -45.6602E3 at node 790 of element 1341



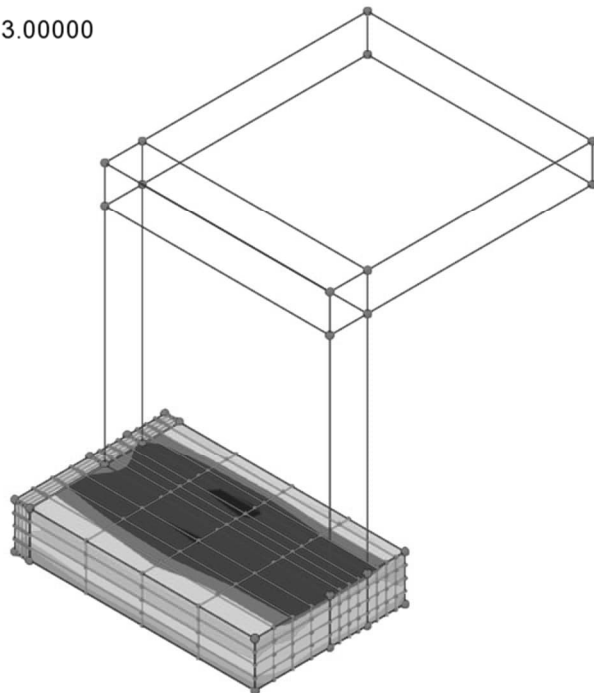
3D Overview (right)

t = 1.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 14:STR Stage 1c, 26:Time Step 25 Time = 3.00000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 3.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



Maximum 43.0988E3 at node 790 of element 1341
 Minimum -22.5398E3 at node 1487 of element 1041

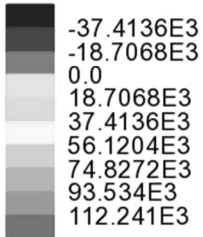


3D Overview (right)

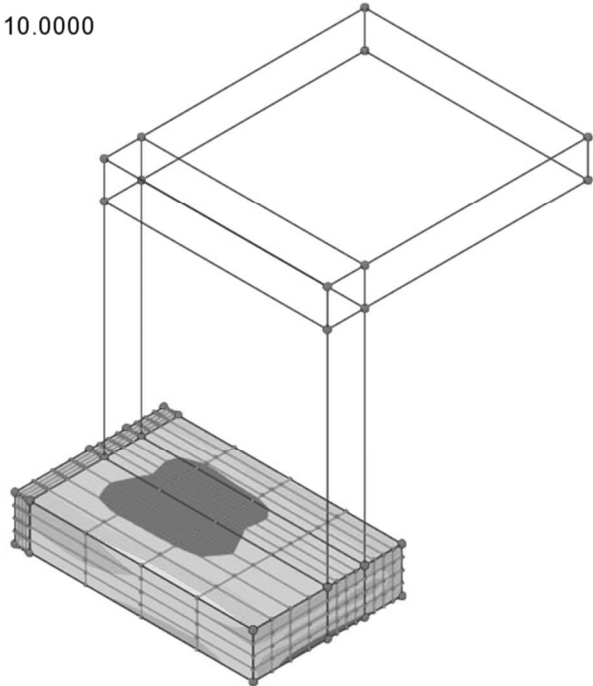
t = 3.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 27
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 15:STR Stage 1d, 40:Time Step 39 Time = 10.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 10.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



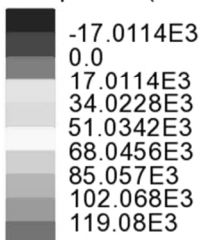
Maximum 120.862E3 at node 1526 of element 1063
 Minimum -47.4996E3 at node 297 of element 1053



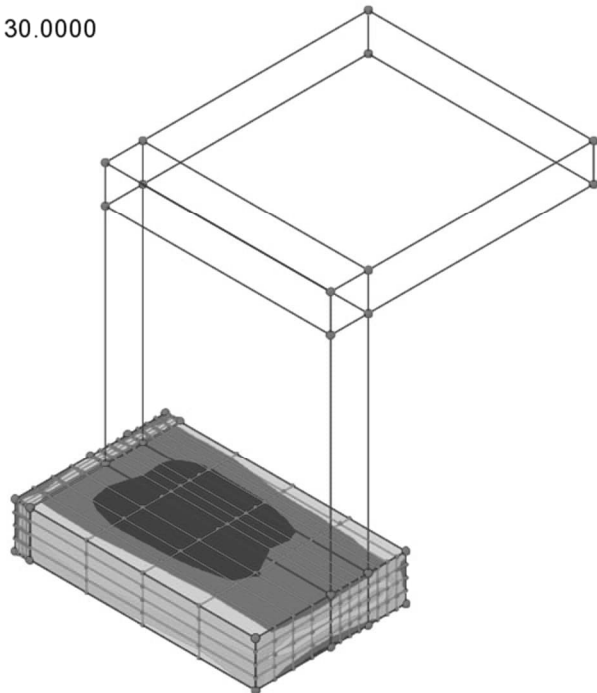
3D Overview (right)

t = 10.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 16:STR Stage 1e, 60:Time Step 59 Time = 30.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



Maximum 126.827E3 at node 1527 of element 1047
 Minimum -26.2756E3 at node 297 of element 1053

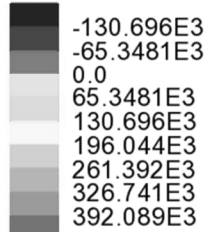


3D Overview (right)

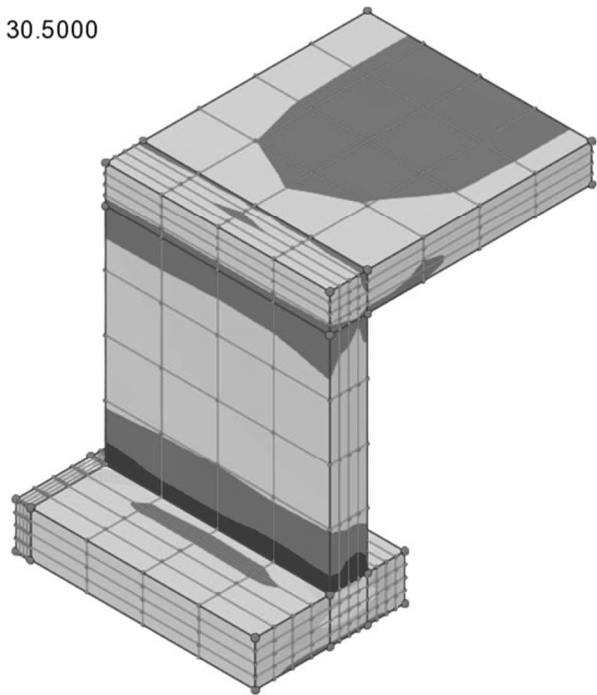
t = 30.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 28
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 17:STR Stage 2a, 70:Time Step 69 Time = 30.5000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 30.5
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



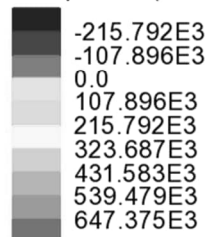
Maximum 426.643E3 at node 1723 of element 1230
 Minimum -161.49E3 at node 1500 of element 1393



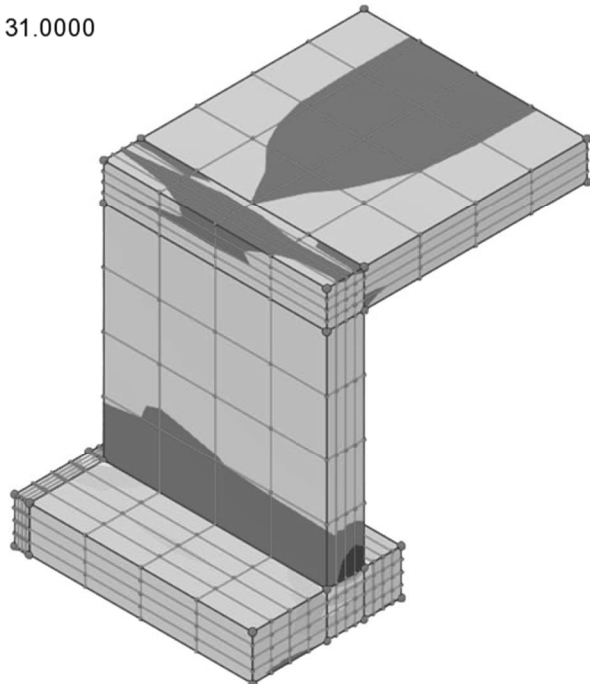
3D Overview (right)

t = 30.5 days

Analysis: Analysis 1 (Structural)
 Loadcase: 18:STR Stage 2b, 75:Time Step 74 Time = 31.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 31.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



Maximum 696.683E3 at node 1517 of element 1041
 Minimum -274.379E3 at node 1517 of element 1361

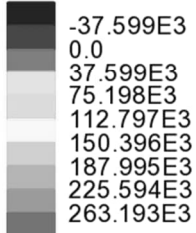


3D Overview (right)

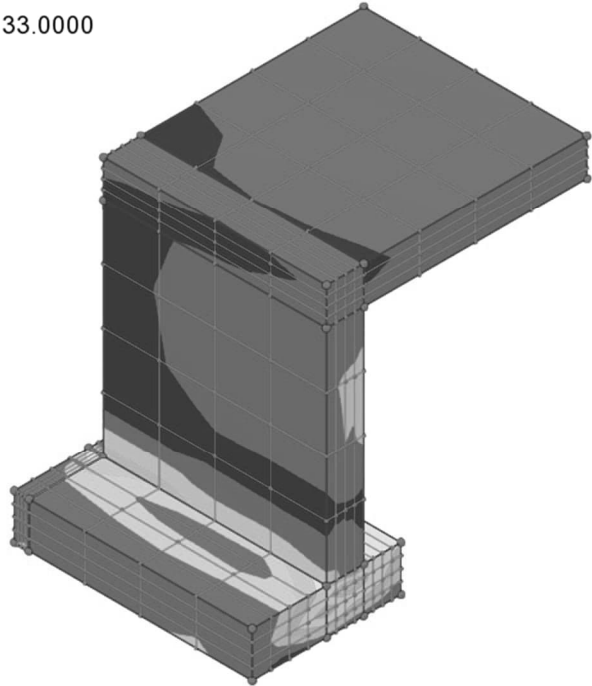
t = 31.0 days

	Appendix 2: Results SYSTEM 001 Transient hygro-thermal analysis during concrete hardening: frame bridge excl. shrinkage	Status :	Page: 29
		Date :	Created:

Analysis: Analysis 1 (Structural)
 Loadcase: 19:STR Stage 2c, 85:Time Step 84 Time = 33.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 33.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



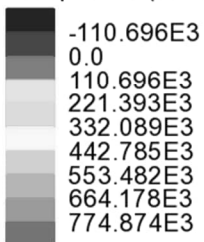
Maximum 276.48E3 at node 1517 of element 1041
 Minimum -61.9104E3 at node 1871 of element 1393



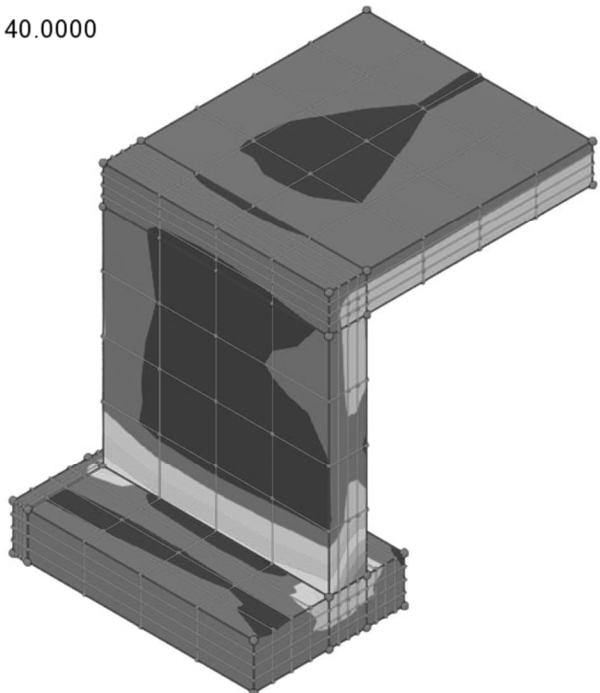
3D Overview (right)

t = 33.0 days

Analysis: Analysis 1 (Structural)
 Loadcase: 20:STR Stage 2d, 99:Time Step 98 Time = 40.0000
 Results file: Bro_10G3~Analysis 1 (Structural).mys
 Response time: 40.0
 Entity: Stress - Solids
 Component (Averaged nodal): S1 (Units: N/m²)



Maximum 863.62E3 at node 1517 of element 1361
 Minimum -132.647E3 at node 1405 of element 993



3D Overview (right)

t = 40.0 days