Dezember 2008

AnTherm

Programmpaket zu Analyse des Thermischen Verhaltens von Baukonstruktionen mit Wärmebrücken

zwei- und dreidimensionales, stationäres Präzisionsverfahren („Klasse A – Verfahren“) für die Berechnung des Wärmedurchgangs durch Rahmen von Fenstern, Türen und Abschlüssen

Validierung des Programmpakets gemäß Europanorm EN ISO 10077-2:2003

Anhang

- Allgemeine Kriterien der EN ISO 10077-2:2003
- Allgemeine Kriterien der EN ISO 10211:2007
- Eingabe und Ergebnisberichte der Prüfreferenzfälle erstellt mit dem Programmpaket AnTherm Version 4.66

Allgemeine Kriterien

der

EN ISO 10077-2:2003

Kriterien der EN10077-2:2003:

4.1 Grundlagen

1. Die Berechnung wird mit einem **zweidimensionalen numerischen Verfahren nach EN ISO 10211-1** durchgeführt.
2. Die Bauteile müssen so unterteilt werden, dass eine weitere Unterteilung das Ergebnis des Wärmestroms nicht wesentlich ändert. In **EN ISO 10211-1 sind Kriterien aufgeführt**, mit denen beurteilt werden kann, ob genügend Unterteilungen verwendet wurden.

3. Es wird angenommen, dass der Hauptwärmestrom in dem Profil senkrecht zu einer Ebene, parallel zu den außen- und raumseitigen Oberflächen erfolgt.
4. Es wird vertikale Ausrichtung von Profilen und Lufträumen angenommen.
5. Es wird ferner angenommen, dass der Emissionsgrad der die Lufträume begrenzenden Oberfläche 0,9 beträgt (es wird angenommen, dass der normale Emissionsgrad 0,85 beträgt). Werden andere Werte verwendet, müssen sie mit Verweisungen im Bericht genau angegeben werden.

4.2 Nachweis des verwendeten Berechnungsprogramms

1. Um die Eignung des verwendeten Berechnungsprogramms sicherzustellen, müssen Berechnungen zu den **in Anhang D beschriebenen Beispielen** durchgeführt werden.
2. Die **Abweichung der längenbezogenen Wärmestromdichte L^{2D} und des Wärmedurchgangskoeffizienten** dürfen die in Tabelle D.3 angegebenen Werte um **nicht mehr als ± 3 %** überschreiten. Dies führt zu einer Genauigkeit von ca. 5 % des Wärmedurchgangskoeffizienten U und des längenbezogenen Wärmedurchgangskoeffizienten Ψ.

4.3 Bestimmung des Wärmedurchgangskoeffizienten

Der Wärmedurchgangskoeffizient eines Profilabschnitts und der längenbezogene Wärmedurchgangskoeffizient infolge der Wechselwirkung von Rahmen und Verglasung **müssen nach Anhang C** bestimmt werden, unter Anwendung der außenseitigen und raumseitigen **Oberflächenresistenz aus Anhang B**.

5.2 Randbedingungen

1. Die außen- und raumseitigen Wärmeübergangswiderstände hängen von der Wärmeübertragung durch Konvektion und Strahlung an die außen- und raumseitige Umgebung ab.
2. Wenn eine Außenfläche nicht den üblichen Windbedingungen ausgesetzt ist, kann der Anteil durch Konvektion verringert werden.
3. Der Strahlungsanteil kann in Ecken oder Verbindungen zweier Flächen reduziert werden (siehe EN ISO 10211-1:1995, Anhang E).
4. Der Wärmeübergangswiderstand **für waagerechten Wärmestrom** ist in Anhang B angegeben.
5. Die Grenzebene der Füllung und die Grenzebene zu angrenzenden Werkstoffen müssen als adiabat angenommen werden.
6. Für die **Berechnung des Kondensationsrisikos siehe EN ISO 10211-1**.

6 Behandlung von Hohlräumen

1. Der Wärmestrom in Hohlräumen wird durch eine äquivalente Wärmeleitfähigkeit λ_{eq} dargestellt. Diese äquivalente Wärmeleiffähigkeit umfasst den Wärmestrom durch Leitung, durch Konvektion und durch Strahlung und hängt von der Geometrie der Hohlräume der angrenzenden Materialien ab.
2. Die äquivalente Wärmeleitfähigkeit eines unbelüfteten Zwischenraumes zwischen Glasscheiben der Verglasung muss nach ISO 10292 bestimmt werden. Die sich ergebende äquivalente Wärmeleitfähigkeit muss im ganzen Hohlraum bis zum Rand verwendet werden.
3. Lufträume sind unbelüftet, wenn sie vollständig verschlossen oder durch einen Schlitz von höchstens 2 mm mit der Außenseite oder der Raumseite verbunden sind. Anderenfalls muss der Hohlraum als belüftet behandelt werden.
4. Hohlräume mit einem Maß nicht größer 2 mm in einer Richtung oder Hohlräume mit einer Verengung nicht größer 2 mm werden getrennt betrachtet.
5. Vertiefungen mit kleinen Querschnitten (siehe Bild 4) an den außen- oder raumseitigen Oberflächen von Profilen und Hohlräume, die durch einen Schlitz von mehr als 2 mm, jedoch nicht größer als 10 mm, mit der Außenseite oder der Raumseite verbunden sind, müssen als leicht belüftete Hohlräume angesehen werden. Die äquivalente Wärmeleitfähigkeit beträgt das Zweifache des unbelüfteten Hohlraums derselben Größe
6. In (anderen) Fällen, insbesondere wenn die Breite b einer Vertiefung oder eines Schlitzes, der einen Hohlraum mit der Umgebung verbindet, 10 mm überschreitet, wird angenommen, dass die

gesamte Oberfläche der Umgebung ausgesetzt ist. Daher muss an der abgewickelten Oberfläche der Wärmeübergangswiderstand Rsi oder Rse verwendet werden.
7. Bei einem großen Hohlraum, der durch einen einzigen Schlitz verbunden ist, und einer abgewickelten Oberfläche, die die Schlitzbreite um den Faktor 10 überschreitet, ist der Wärmeübergangswiderstand für eine **verringerte Einstrahlzahl** zu verwenden.

7 Bericht
1. Der Bericht über die Berechnung muss alle erforderlichen Angaben enthalten, die für eine Wiederholungsberechnung notwendig sind. Insbesondere sind alle nicht aus dieser Norm stammenden Quellen im Bericht anzugeben.
2. Eine maßstäbliche Zeichnung (vorzugsweise Maßstab 1:1), die die Profile mit den Abmessungen und der Werkstoffart der verschiedenen Rahmenteile angibt, sowie mindestens die nachfolgend genannten Details sind im Bericht anzugeben:
    a. bei metallischen Rahmen: die Dicke, Lage, Art und Anzahl von thermischen Trennungen;
    b. bei Kunststoffrahmen: das Vorhandensein und die Lage der Metallaussteifungen (Verstärkungen);
    c. die Dicke von Holzrahmen und die Dicke von Kunststoffrahmen;
    d. die raum- und außenseitigen Projektionsflächen sowie die entsprechenden abgewickelten Flächen der Rahmen (Abwicklung).
3. Die **Unterteilung des Ausschnitts für die numerische Berechnung** oder zumindest die Anzahl von Knotenpunkten in beiden Richtungen müssen angegeben werden.
4. Alle Werkstoffe des Rahmenquerschnitts müssen zusammen mit den Wärmeleitfähigkeiten aufgeführt werden.
5. Für Hohlräume muss der Emissionsgrad der umgebenden Oberflächen angegeben werden. Werden Werte unter 0,9 verwendet, so muss ein entsprechender Nachweis mit Angabe der Quellen erbracht werden.
6. Die raumseitigen und außenseitigen Wärmeübergangswiderstände und die adiabaten Begrenzungen müssen auf der Zeichnung zusammen mit den Raum- und Außenluft-temperaturen angegeben werden.
7. Der Gesamtwärmestrom oder die Wärmestromdichte und der Wärmedurchgangskoeffizient von Rahmenprofilen und der längenbezogene Wärmedurchgangskoeffizient **nach Anhang C** müssen auf **zwei wertanzeigende Stellen** angegeben werden.

Literaturhinweise

EN 673, Glass in building – Determination of thermal transmittance (U value) – Calculation method.
prEN 12412-2, Thermal performance of windows, doors and shutters – Determination of thermal transmittance by hot box method – Part 2: Frames.
EN 12524, Building materials and products – Hygrothermal properties – Tabulated design values.
EN 12664, Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter methods – Dry and moist products of medium and low thermal resistance.
ISO 6946, Building components and building elements – Thermal resistance and thermal transmittance – Calculation method.
ISO 10456, Building materials and products – Procedures for determining declared and design thermal values.

sowie:
prEN 12519:1996, Fenster und Türen - Terminologie.
EN ISO 7345:1995, Wärmeschutz - Physikalische Größen und Definitionen (ISO 7345:1987).
EN ISO 10211-1:1995, Wärmebrücken im Hochbau - Wärmeströme und Oberflächentemperaturen - Teil 1: Allgemeine Berechnungsverfahren (ISO 10211-1:1995).
ISO 10292, Glass in building ¾ Calculation of steady-state U-values (thermal transmittance) of multiple glazing.

Allgemeine Kriterien

der

EN ISO 10211:2007

Kriterien der EN10211:2007:

4. Grundsätze

1. Die Temperaturverteilung innerhalb einer Konstruktion und der Wärmestrom durch eine Konstruktion können berechnet werden, wenn die Randbedingungen und die Konstruktionsdetails bekannt sind. Zu diesem Zweck wird ein geometrisches Modell in eine Anzahl benachbarter Materialzellen mit jeweils homogener Wärmeleitfähigkeit unterteilt.
2. Die Kriterien, die bei der Modellbildung erfüllt werden müssen, sind in **Abschnitt 5** angegeben.
3. Die Temperaturverteilung wird entweder durch iterative Berechnungsverfahren oder durch direkte Lösungsverfahren bestimmt, wonach die Temperaturverteilung innerhalb der Materialzellen durch Interpolation ermittelt wird. Die Berechnungsregeln und das Verfahren zur Bestimmung der Temperaturverteilung sind in **Abschnitt 7** beschrieben.
4. Die Ergebnisse der Berechnungen können für die Bestimmung der längenbezogenen und punktbezogenen Wärmedurchgangskoeffizienten und der Innen-Oberflächentemperaturen verwendet werden. Die entsprechenden Gleichungen sind in den **Abschnitten 9, 10 und 11** angegeben.
5. Spezielle Verfahren für Fensterrahmen sind in ISO 10077-2 angegeben.

5.2.7 (Unterteilung durch Hilfsebenen)

Die Anzahl der Hilfsebenen im Modell muss so sein, dass mindestens eines der folgenden Kriterien erfüllt ist:

1. Verdoppelung der Anzahl der Unterteilungen ändert den berechneten Wärmestrom nicht um mehr als 1 %; oder
2. Verdoppelung der Anzahl der Unterteilungen ändert den Temperaturfaktor fRsi an der Innenoberfläche nicht um mehr als 0,005.

6.2 Wärmeleitfähigkeit von Baustoffen

Die Bemessungswerte der Wärmeleitfähigkeit von Baustoffen und Bauprodukten sollten entweder nach ISO 10456 berechnet oder Tabellenwerten, wie z. B. den in ISO 10456 angegebenen, entnommen werden.

6.3 Wärmeübergangswiderstände

1. Für die Berechnung des Wärmestroms müssen die Wärmeübergangswiderstände in Abhängigkeit von der Richtung des Wärmestroms ISO 6946 entsprechen. Es kann jedoch für alle Oberflächen ein einem horizontalen Wärmestrom entsprechender Wert von Rsi angenommen werden, wenn: a) Die Richtung des Wärmestroms unsicher oder mutmaßlich wechselnd ist; oder b) Das gesamte Gebäude in einer einzigen Berechnung modelliert wird.
2. Für die Berechnung der Innenoberflächentemperaturen für die Beurteilung des Risikos der Tauwasserbildung müssen die Wärmeübergangswiderstände ISO 13788 entsprechen.

6.7 Bestimmung der Temperatur in einem benachbarten, unbeheizten Raum

1. Stehen ausreichend Angaben zur Verfügung, so kann die Temperatur in einem benachbarten, unbeheizten Raum nach ISO 13789 berechnet werden.
2. Ist die Temperatur in einem benachbarten, unbeheizten Raum nicht bekannt und kann sie nicht nach ISO 13789 berechnet werden, weil die notwendigen Angaben nicht zur Verfügung stehen, so können die Wärmeströme und Innenoberflächentemperaturen nicht berechnet werden. **Es können jedoch alle geforderten thermischen Leitwerte und Temperaturgewichtungsfaktoren nach Anhang C berechnet und dargestellt werden**.

7.1 Lösungsverfahren

1. Das geometrische Modell wird in eine Anzahl von Zellen mit je einem charakteristischen Punkt (der als Knotenpunkt bezeichnet wird) unterteilt.
2. Durch Anwendung der Gesetzes der Erhaltung der Energie ($\mathrm{div}\ q = 0$) und des Fourierschen Gesetzes ($q = -\lambda\ \mathrm{grad}\ \theta$) und bei Berücksichtigung der Randbedingungen erhält man ein Gleichungssystem, das eine Funktion der Temperaturen in den Knotenpunkten darstellt.
3. Die Lösung dieses Systems entweder mit Hilfe eines direkten Lösungsverfahrens oder durch ein Iterationsverfahren liefert die Knotenpunkt-Temperaturen, aufgrund derer das Temperaturfeld bestimmt werden kann.
4. Aus der Temperaturverteilung lassen sich durch Anwendung des Fourierschen Gesetzes die Wärmeströme berechnen.
5. Die Berechnungsprogramme sind nach den in **Anhang A** angegebenen Anforderungen zu überprüfen.

7.2.4 Berechnung der Temperaturverteilung

Die Temperaturverteilung innerhalb jeder Materialzelle muss durch Interpolation zwischen den Knotenpunkt-Temperaturen berechnet werden. ANMERKUNG Lineare Interpolation ist ausreichend.

9.2 Berechnung der längen- und punktbezogenen Wärmedurchgangskoeffizienten

Bei der Bestimmung der Ψ- und χ-Werte muss angegeben werden, welche Maße (z. B. innen oder außen) verwendet wurden, da die Ψ- und χ-Werte bei bestimmten Wärmebrückentypen von dieser Wahl abhängen.

10.3 Bestimmung des längenbezogenen Wärmedurchgangskoeffizienten

Bei der Bestimmung des längenbezogenen Wärmedurchgangskoeffizienten muss angegeben werden, welche Maße (z. B. innen oder außen) verwendet wurden, weil für mehrere Arten von Wärmebrücken der Wert des längenbezogenen Wärmedurchgangskoeffizienten von dieser Wahl abhängt.

11.1 und 2 Bestimmung der Temperatur an der Innenoberfläche für 3D- und 2D-Berechnungen

1. Wenn nur zwei Temperatur-Randbedingungen vorliegen (und das Erdreich nicht Teil des geometrischen Modells ist,)können die Oberflächentemperaturen in dimensionsloser Form fRsi ausgedrückt Werden. **Der Temperaturfaktor ist mit einer Unsicherheit unter 0,005 zu berechnen**.
2. Bei mehr als zwei Temperatur-Randbedingungen ist der Temperaturgewichtungsfaktor g zu verwenden. Die Innenoberflächentemperatur θsi für den betreffenden Ort ist durch Einsetzen der berechneten Werte g_ji und der tatsächlichen Temperatur-Randbedingungen θi zu berechnen.

12.1 Eingabedaten

Der Bericht über die Berechnungen muss folgende Angaben enthalten:

a) Beschreibung der Konstruktion:
- Baupläne, einschließlich Maße und Materialien;
- für ein fertig gestelltes Gebäude alle bekannten Änderungen an der Konstruktion und/oder Ergebnisse
- physikalischer Messungen und Detailergebnisse von Kontrollen;
- sonstige relevante Bemerkungen.

b) Beschreibung des geometrischen Modells:
- 2D- oder 3D-geometrisches Modell mit Maßen;
- Eingabedaten, die die Anordnung der Konstruktionsebenen und gegebenenfalls Hilfsebenen sowie die Wärmeleitfähigkeiten der verschiedenen Materialien angeben;
- die angewendeten Temperatur-Randbedingungen;
- eine Berechnung der Temperatur-Randbedingungen in einem benachbarten Raum, sofern zweckmäßig;
- die Wärmeübergangswiderstände und die Oberflächen, für die sie gelten;
- Angabe aller nach 5.3.2 durchgeführten Maßkorrekturen;
- Angabe aller quasihomogenen Schichten und der nach 5.3.3 berechneten Wärmeleitfähigkeiten;
- sonstige verwendete nichtgenormte Werte und Begründung für deren Verwendung (siehe 6.1).

12.2 Ausgabedaten

12.2.1 Allgemeines

Folgende Berechnungsergebnisse sind **als von den Temperatur-Randbedingungen unabhängige** Werte anzugeben:

1. Der thermische Leitwert L3D oder L2D zwischen benachbarten Räumen, sofern letztere den Wärmedurchgang durch die Bauteile beeinflussen;
2. falls angemessen, der längenbezogene Wärmedurchgangskoeffizient Ψ der linienförmigen Wärmebrücke unter Angabe, ob Innen- oder Außenmaße verwendet wurden;
3. der Temperaturfaktor fRsi für die Punkte mit niedrigster Oberflächentemperatur in jedem beteiligten Raum (einschließlich der Lage dieser Punkte);
   falls mehr als zwei Temperatur-Randbedingungen verwendet werden, sind die Temperaturgewichtungsfaktoren anzugeben.

Von allen Ausgabewerten sind **mindestens drei signifikante Stellen** anzugeben.

12.2.4 Weitere Ausgabedaten

Für eine spezifische Kombination von Temperatur-Randbedingungen sind folgende weitere Ergebniswerte anzugeben:

1. Wärmeströme, in W/m (für 2D-Fälle) oder in W (für 3D-Fälle), für jedes interessierende Raumpaar;
2. die niedrigsten Oberflächentemperaturen, in °C, und die Lage der Punkte mit der niedrigsten Oberflächentemperatur im betreffenden Raum.

12.2.5 Fehlerabschätzung

Numerische Verfahren führen zu Näherungslösungen, die zu den analytischen Lösungen konvergieren, sofern es solche gibt. Um die Zuverlässigkeit der Ergebnisse bewerten zu können, sollte der Restfehler, wie nachfolgend angegeben, abgeschätzt werden.

1. Um Fehler infolge einer unzureichenden Anzahl von Zellen abschätzen zu können, ist eine (sind) zusätzliche Berechnung(en) **nach A.2** auszuführen**. Die Differenz der Ergebnisse aus beiden Berechnungen ist anzugeben.**
2. Um Fehler, die bei einer numerischen Lösung des Gleichungssystems entstehen, abschätzen zu können, muss die Summe der Wärmeströme (positiv und negativ) über alle Grenzen des Bauteils, dividiert durch den gesamten Wärmestrom, angegeben werden.
   ANMERKUNG Nach A.2 muss dieser Quotient kleiner als 0,000 1 sein.

A.1 Validierung der Berechnungsverfahren – **Prüfreferenzfälle**

1. Ein dreidimensionales stationäres Berechnungsverfahren ist dann als genaues Verfahren einzustufen, wenn die Berechnungsergebnisse den Prüfreferenzfällen 1, 2, 3 und 4 entsprechen.
2. Ein zweidimensionales stationäres Berechnungsverfahren ist dann als genaues Verfahren einzustufen, wenn die Berechnungsergebnisse den Prüfreferenzfällen 1 und 2 entsprechen.

A.1.2 Fall 1:
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten Temperaturen **darf 0,1 °C nicht überschreiten**.
A.1.3 Fall 2:
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten Temperaturen **darf 0,1 °C nicht überschreiten**.
Die Differenz zwischen dem nach dem zu validierenden Verfahren berechneten und dem aufgelisteten Wärmestrom **darf 0,1 W/m nicht überschreiten**.
A.1.4 Fall 3:
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten niedrigsten Temperaturen an der Innenoberfläche **darf 0,1 °C nicht überschreiten**.
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten Wärmeströmen **darf 1 % nicht überschreiten**.
A.1.5 Fall 4:
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten niedrigsten Temperaturen an der Innenoberfläche **darf 0,005 °C nicht überschreiten**.
Die Differenz zwischen den nach dem zu validierenden Verfahren berechneten und den aufgelisteten Wärmeströmen **darf 1 % nicht überschreiten**.
A.2 Allgemeine Hinweise und Anforderungen an Berechnungsverfahren
Das zu validierende numerische Verfahren muss folgende Anforderungen erfüllen:

1. Das Verfahren muss die Berechnung von Temperaturen und Wärmeströmen ermöglichen.
2. Der Umfang der Diskretisierung des Objektes (d. h. die Anzahl der Zellen, Knotenpunkte) ist nicht „verfahrensbestimmt“, sondern „anwenderbestimmt“, obgleich in der Praxis der Grad der Aufteilung „maschinenlimitiert“ ist.
   Deshalb muss bei Betrachtung der Prüfreferenzfälle das zu validierende Verfahren ermöglichen, **Temperaturen und Wärmeströme an anderen als den aufgelisteten Orten** zu berechnen.
3. Mit steigender Anzahl der Unterteilungen muss die Lösung des zu validierenden Verfahrens gegen die analytische Lösung konvergieren, wenn eine solche gegeben ist (z. B. Prüfreferenzfall 1).
4. Die Anzahl der Unterteilungen ist wie folgt zu bestimmen:
   a. Die Summe der Absolutwerte aller in das Objekt eindringenden Wärmeströme wird **zweifach berechnet: für n und für 2n Unterteilungen**.
   b. Die Differenz zwischen diesen **beiden Ergebnissen darf 1 % nicht überschreiten**.
   c. Anderenfalls sind weitere Unterteilungen vorzunehmen, bis dieses Kriterium erfüllt ist.
5. Wird das Gleichungssystem iterativ gelöst, so ist die Iteration so lange fortzuführen, bis die Summe aller in das Objekt eindringenden (positiven oder negativen) Wärmeströme, dividiert durch die **halbe Summe** der Absolutwerte aller dieser Wärmeströme, **kleiner als 0,000 1 ist**.

C.2 Angabe der thermischen Leitwerte L

a. Im Falle von Wärmebrücken sind nur die thermischen Leitwerte Li,j für jedes Raumpaar, das mit dem betrachteten Bauteil wärmetechnisch verbunden ist, von Interesse.
b. Die thermischen Leitwerte Li,j sollten in der Form der Tabelle angegeben werden.
c. Für Raumpaare, die nicht wärmetechnisch miteinander verbunden sind, sollte L im Prüfbericht als gleich 0 angegeben werden.
d. Die bei der Berechnung der L-Werte verwendeten Rsi-Werte sollten zusammen mit einer Skizze, die zeigt, für welchen inneren Oberflächenbereich jeder Rsi-Wert gilt, angegeben werden.

C.4 Angabe der Temperaturgewichtungsfaktoren, g

a. Die Temperaturgewichtungsfaktoren für die Orte der niedrigsten Oberflächentemperatur eines Bauteiles mit n beteiligten Räumen sollten als Tabelle angegeben werden
b. Die bei der Berechnung der g-Werte verwendeten Rsi-Werte sollten zusammen mit einer Skizze, die zeigt, für welchen inneren Oberflächenbereich jeder Rsi-Wert gilt, angegeben werden.

Literaturhinweise

ISO 10211, Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations
ISO 10077-2, Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 2: Numerical method for frames
ISO 10456, Building materials and products — Hygrothermal properties — Tabulated design values and procedures for determining declared and design thermal values
ISO 13789, Thermal performance of buildings - Transmission and ventilation heat transfer coefficient - Calculation method
ISO 14683, Thermal bridges in building construction - Linear thermal transmittance – Simplified methods and default values
EN 673, Glass in building - Determination of thermal transmittance (U-value) – Calculation method

Eingabe und Ergebnisberichte der Prüfreferenzfälle erstellt mit dem Programm

AnTherm Version 4.66

Dezember 2008

T.Kornicki

Prüfreferenzfall 1

Validierungsberechnung (Unterleitungsraster 9.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 18.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_1.antherm

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 1 (siehe Bild D.1)
Aluminiumprofil mit thermischer Trennung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 1 9k Zellen\D 1.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, 24, 0) x (300, 75, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.69$
    2. Raumzelle - (0, -10, 0) x (300, 24, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    3. Baustoffzelle - (0, 0, 0) x (110, 63, 1000) Bez.: "Aluminium" $\lambda = 160$
    4. Raumzelle - (0, 53, 0) x (40, 63, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.69$
    5. Baustoffzelle - (0, 2, 0) x (7, 51, 1000) Bez.: "L1" $\lambda = 0.174$
    6. Baustoffzelle - (7, 6, 0) x (9, 21, 1000) Bez.: "L1" $\lambda = 0.174$
    7. Baustoffzelle - (9, 2, 0) x (11, 25, 1000) Bez.: "Polyamid" $\lambda = 0.3$
    8. Baustoffzelle - (11, 6, 0) x (13, 21, 1000) Bez.: "L3" $\lambda = 0.107$
    9. Baustoffzelle - (13, 2, 0) x (40, 25, 1000) Bez.: "L3" $\lambda = 0.107$
    10. Baustoffzelle - (9, 27, 0) x (44, 51, 1000) Bez.: "L2" $\lambda = 0.115$
    11. Baustoffzelle - (40, 6, 0) x (42, 21, 1000) Bez.: "L3" $\lambda = 0.107$
    12. Baustoffzelle - (42, 2, 0) x (44, 25, 1000) Bez.: "Polyamid" $\lambda = 0.3$
    13. Baustoffzelle - (44, 6, 0) x (46, 21, 1000) Bez.: "L7" $\lambda = 0.113$
    14. Baustoffzelle - (46, 2, 0) x (60, 25, 1000) Bez.: "L7" $\lambda = 0.113$
    15. Baustoffzelle - (60, 10, 0) x (70, 25, 1000) Bez.: "L7" $\lambda = 0.113$
    16. Baustoffzelle - (70, 14, 0) x (72, 27, 1000) Bez.: "L7" $\lambda = 0.113$
    17. Baustoffzelle - (54, 25, 0) x (70, 27, 1000) Bez.: "L7" $\lambda = 0.113$
    18. Baustoffzelle - (65, 27, 0) x (70, 32, 1000) Bez.: "L7" $\lambda = 0.113$
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    20. Baustoffzelle - (50, 25, 0) x (54, 34, 1000) Bez.: "EPDM" $\lambda = 0.25$
    21. Baustoffzelle - (60, 2, 0) x (63, 4, 1000) Bez.: "L13" $\lambda = 0.031$
    22. Baustoffzelle - (60, 6, 0) x (65, 8, 1000) Bez.: "L8" $\lambda = 0.0321$
    23. Baustoffzelle - (65, 0, 0) x (70, 8, 1000) Bez.: "L9" $\lambda = 0.094$
    24. Baustoffzelle - (46, 34, 0) x (70, 61, 1000) Bez.: "L4" $\lambda = 0.125$
    25. Baustoffzelle - (54, 32, 0) x (60, 34, 1000) Bez.: "L4" $\lambda = 0.125$
    26. Baustoffzelle - (72, 34, 0) x (88, 61, 1000) Bez.: "L5" $\lambda = 0.115$
    27. Baustoffzelle - (90, 46, 0) x (108, 61, 1000) Bez.: "L6" $\lambda = 0.071$
    28. Baustoffzelle - (72, 10, 0) x (74, 32, 1000) Bez.: "Polyamid" $\lambda = 0.3$
    29. Baustoffzelle - (74, 14, 0) x (86, 27, 1000) Bez.: "L10" $\lambda = 0.086$
    30. Baustoffzelle - (76, 10, 0) x (84, 32, 1000) Bez.: "L10" $\lambda = 0.086$
    31. Baustoffzelle - (72, 2, 0) x (88, 8, 1000) Bez.: "L12" $\lambda = 0.127$
    32. Baustoffzelle - (90, 2, 0) x (102, 10, 1000) Bez.: "L12" $\lambda = 0.127$
    33. Baustoffzelle - (90, 38, 0) x (102, 44, 1000) Bez.: "L12" $\lambda = 0.127$
    34. Baustoffzelle - (90, 10, 0) x (95, 38, 1000) Bez.: "L12" $\lambda = 0.127$
    35. Baustoffzelle - (95, 10, 0) x (300, 38, 1000) Bez.: "Dämmblock" $\lambda = 0.035$
    36. Baustoffzelle - (86, 10, 0) x (88, 32, 1000) Bez.: "Polyamid" $\lambda = 0.3$
    37. Baustoffzelle - (88, 14, 0) x (90, 27, 1000) Bez.: "L12" $\lambda = 0.127$
    38. Baustoffzelle - (102, 38, 0) x (110, 40, 1000) Bez.: "EPDM" $\lambda = 0.25$
    39. Baustoffzelle - (102, 8, 0) x (110, 10, 1000) Bez.: "EPDM" $\lambda = 0.25$
    40. Baustoffzelle - (104, 2, 0) x (108, 8, 1000) Bez.: "EPDM" $\lambda = 0.25$
    41. Baustoffzelle - (104, 40, 0) x (108, 44, 1000) Bez.: "EPDM" $\lambda = 0.25$
    42. Baustoffzelle - (40, 53, 0) x (46, 57, 1000) Bez.: "EPDM" $\lambda = 0.25$
    43. Baustoffzelle - (42, 57, 0) x (44, 61, 1000) Bez.: "EPDM" $\lambda = 0.25$
    44. Raumzelle - (30, 53, 0) x (40, 63, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" $\alpha = 5$
    45. Raumzelle - (110, 38, 0) x (135, 63, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" $\alpha = 5$

Räume :

Room 0
Room 1

Wärmequellen :

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A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
email: tkornicki@chello.at

12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 1 (siehe Bild D.1)
Aluminiumprofil mit thermischer Trennung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 1 9k Zellen\D 1.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

- Raumbez.: Room 0
  - α= 25 W/(m²K) Rs=0.0400 m²K/W : Außenraum
- Raumbez.: Room 1
  - α= 7.69 W/(m²K) Rs=0.1300 m²K/W : Innenraum
  - α= 5 W/(m²K) Rs=0.2000 m²K/W : Innenraum mit Rsi = 0,20 m²K/W

Wärmequellen : keine

Baustoffe :

- λ= 160 W/(m K) : Aluminium
- λ= 0.035 W/(m K) : Dämmblock
- λ= 0.25 W/(m K) : EPDM
- λ= 0.174 W/(m K) : L1
- λ= 0.086 W/(m K) : L10
- λ= 0.127 W/(m K) : L12
- λ= 0.031 W/(m K) : L13
- λ= 0.115 W/(m K) : L2
- λ= 0.107 W/(m K) : L3
- λ= 0.125 W/(m K) : L4
- λ= 0.115 W/(m K) : L5
- λ= 0.071 W/(m K) : L6
- λ= 0.113 W/(m K) : L7
- λ= 0.0321 W/(m K) : L8
- λ= 0.094 W/(m K) : L9
- λ= 0.3 W/(m K) : Polyamid

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> Room 1 @ BackLeft: (0, 0, 0) x (0, 53, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Aluminium	160.0000	2.0000			0.0000	
L1	0.1740	49.0000			0.2816	
Aluminium	160.0000	2.0000			0.0000	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**2.2140**	**[W/m²K]**	

Room 0 <-> Room 1 @ BackRight: (300, 10, 0) x (300, 38, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Dämmblock	0.0350	28.0000			0.8000	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**1.0309**	**[W/m²K]**	

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 1 (siehe Bild D.1)
Aluminiumprofil mit thermischer Trennung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_1 9k Zellen\D_1.antherm

Anzahl der bilanzierten Zellen: 8640

Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,550893
Room 1	0,550893	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-2.48690e-014	0,550893	-4.51431e-014
Room 1	2.48690e-014	0,550893	4.51431e-014

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 1 (siehe Bild D.1)
Aluminiumprofil mit thermischer Trennung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_1 9k Zellen\D_1.antherm

Anzahl der bilanzierten Zellen: 8640 (Knotenzahl = 104919)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^{*}_{Rsi}
Room 0	-10,00	-8,81	-5,98	100.00 %	
Room 1	20,00	7,27	15,98	43.65 %	0,58

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,960439	0,424288
g(Room 1)	0,039561	0,575712

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^{*}_{Rsi}
Room 0	130,2500	10,0000		-8.81	
Room 1	7,2500	53,0000		7.27	0,58

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 1 (siehe Bild D.1)
Aluminiumprofil mit thermischer Trennung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_1 18k Zellen\D_1.antherm

Anzahl der bilanzierten Zellen: 16465

Thermische Leitwerte [W / K]

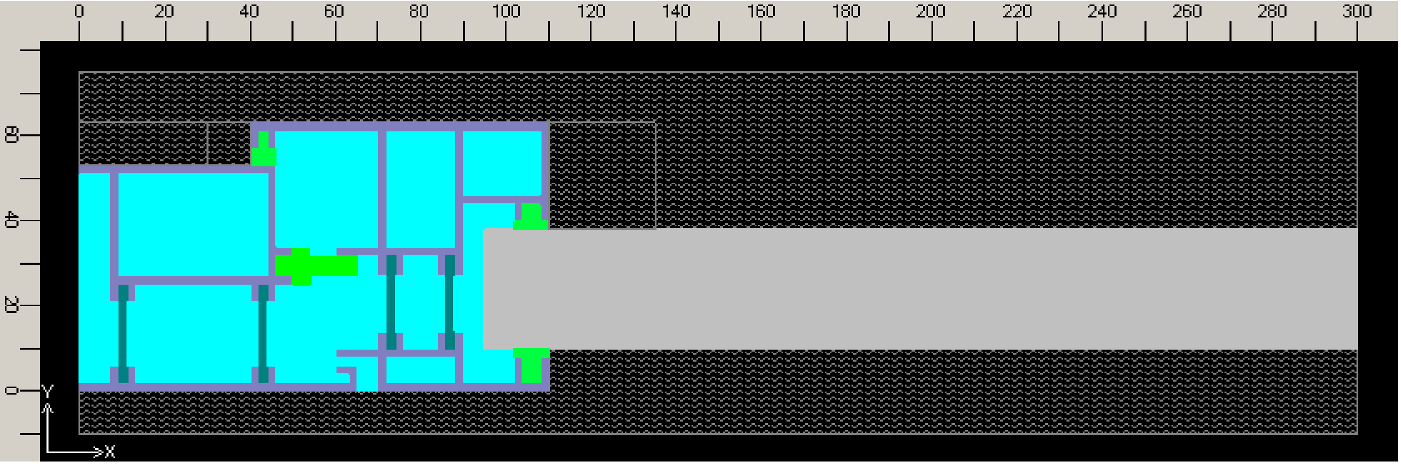
Raum\Raum	Room 0	Room 1
Room 0		0,551208
Room 1	0,551208	

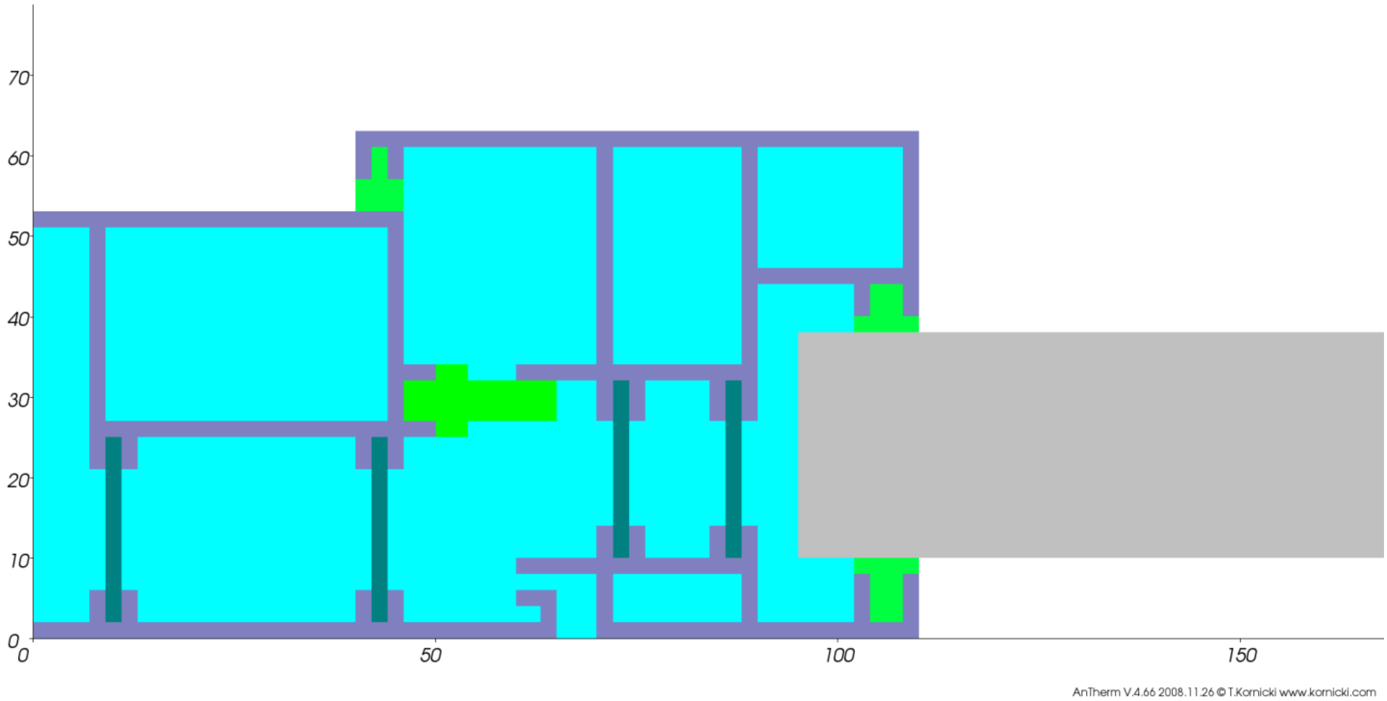
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-2.62046e-012	0,551208	-4.75403e-012
Room 1	2.62046e-012	0,551208	4.75403e-012

Prüfreferenzfall 1

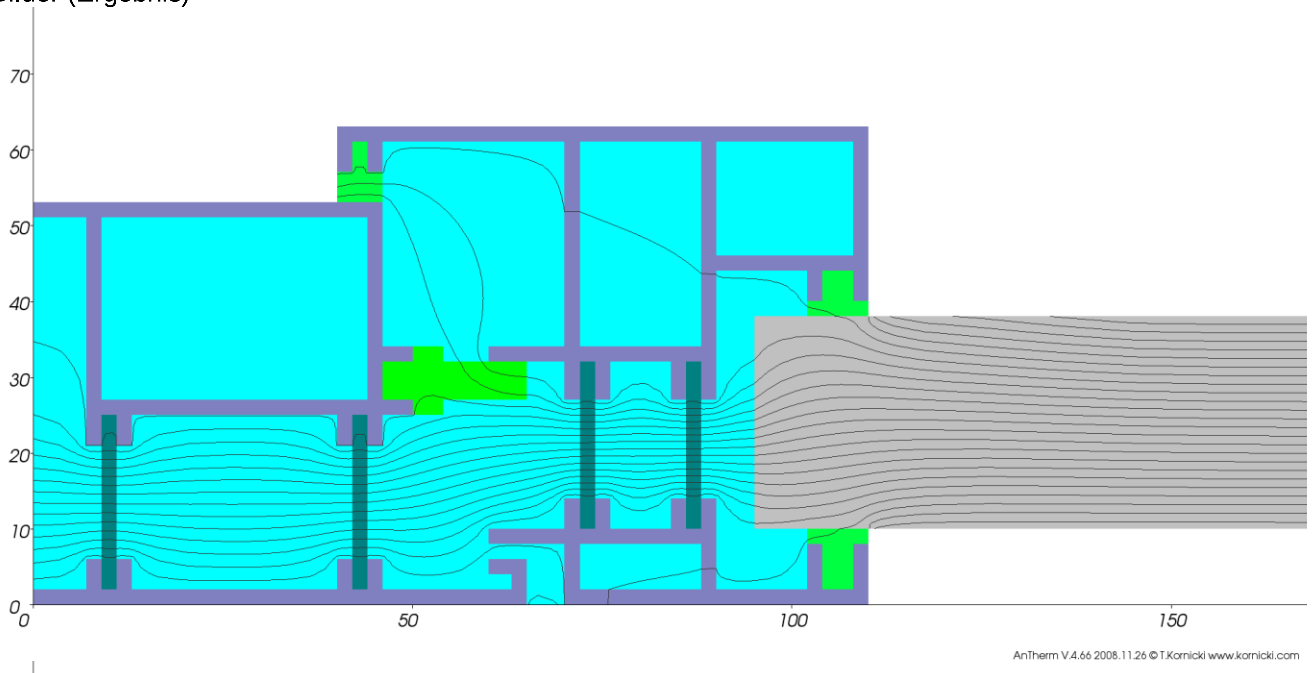
Bilder (Eingabe)

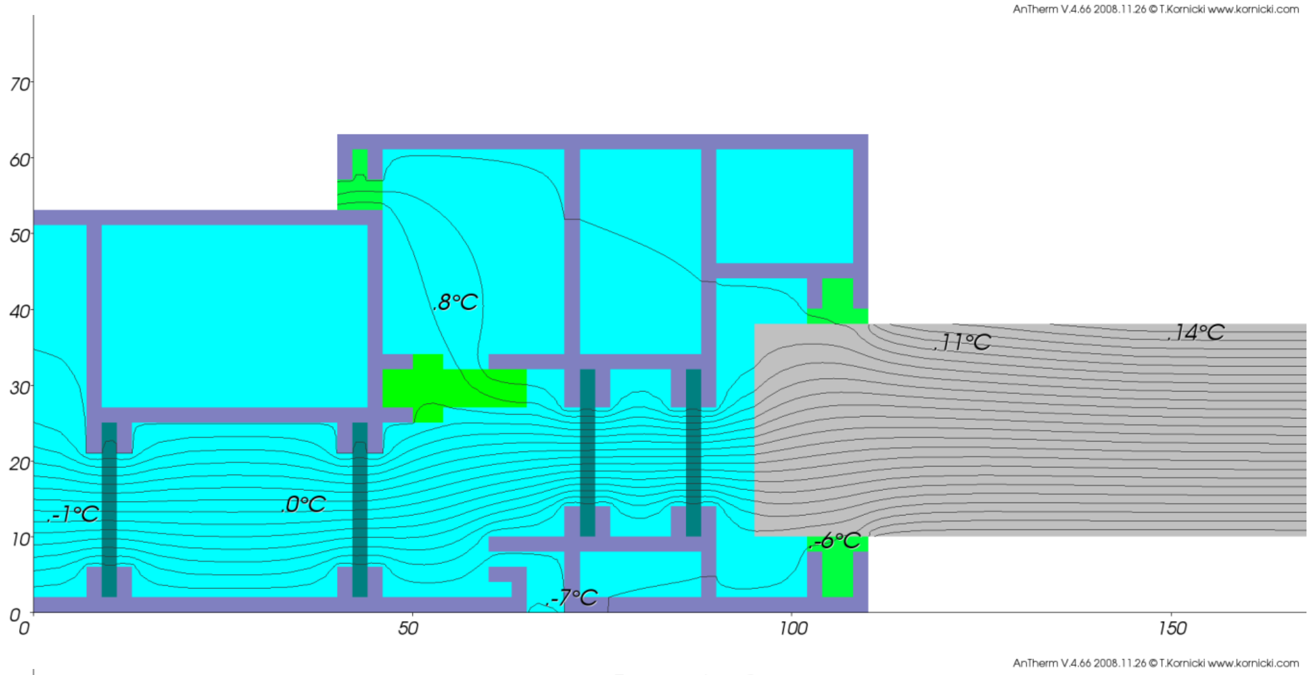


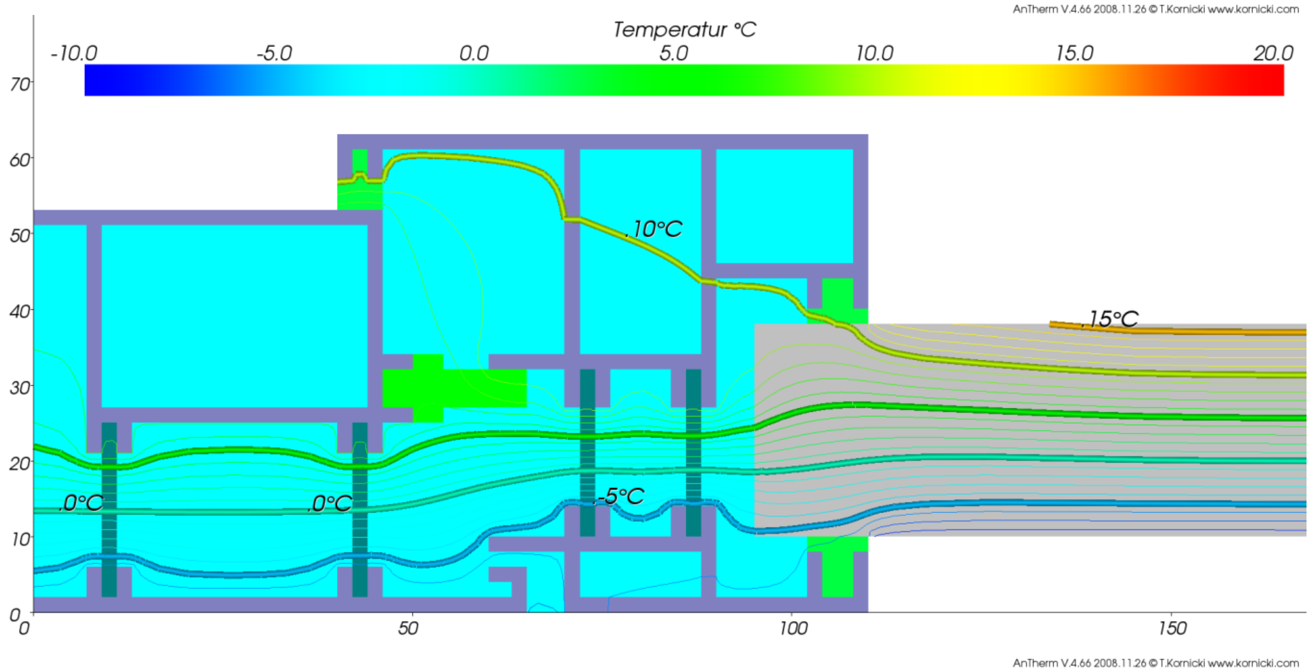


Prüfreferenzfall 1

Bilder (Ergebnis)







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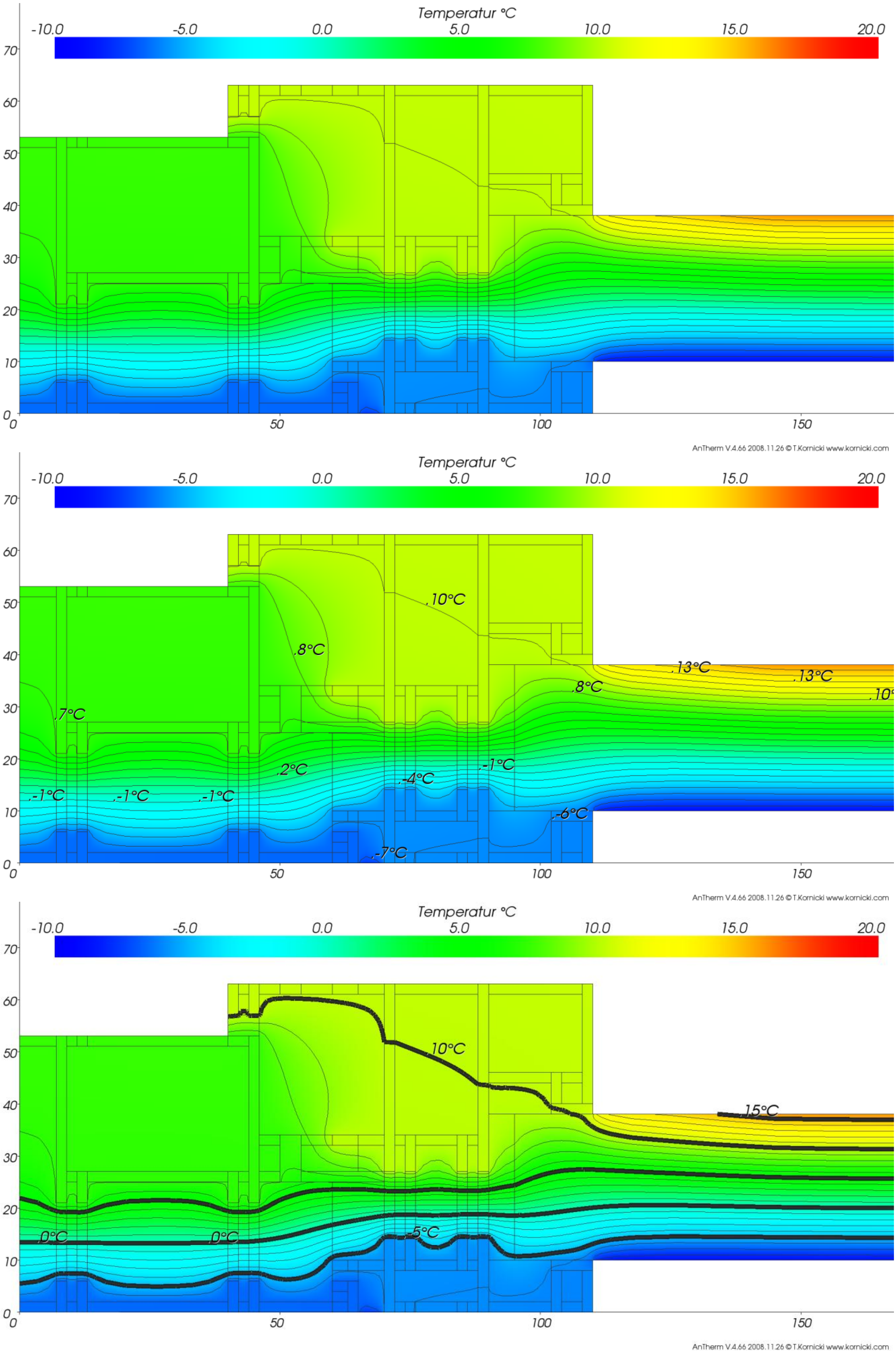

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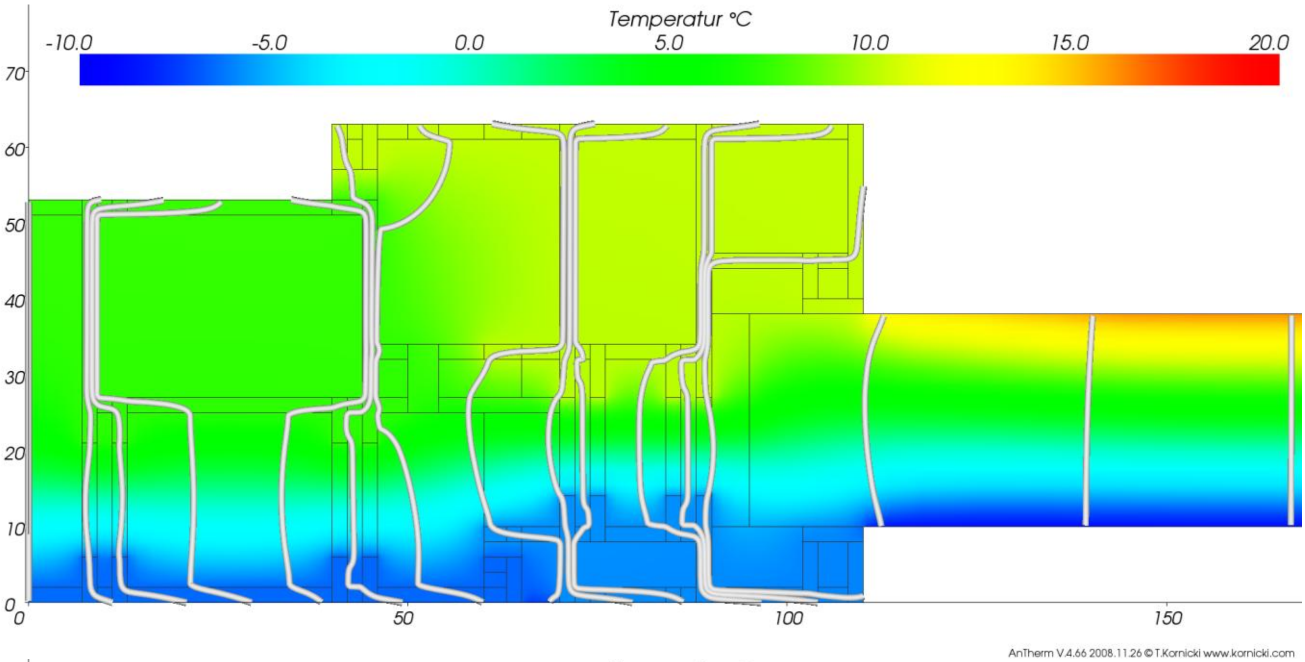

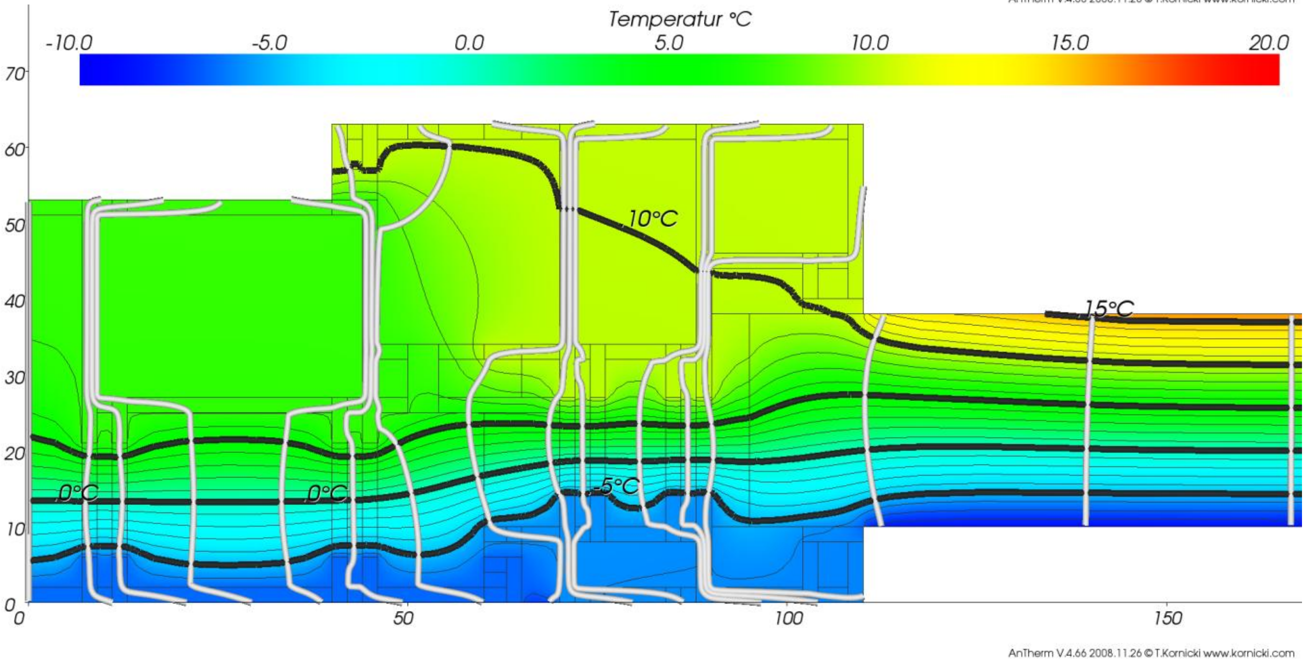

Quellkode der Projektdatei D_1.antherm


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Prüfreferenzfall 2

Validierungsberechnung (Unterleitungsraster 12.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 24.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_2.antherm

T.Kornicki, Dienstleistungen in EDV und IT
A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 2 (siehe Bild D.2)
Aluminium-Holz-Profil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 2 12k Zellen\D 2.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, 71, 0) x (300, 130, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" α = 7.692308
    2. Raumzelle - (0, -20, 0) x (300, 71, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
    3. Baustoffzelle - (0, 0, 0) x (110, 119, 1000) Bez.: "Holz" λ = 0.13
    4. Raumzelle - (0, 100, 0) x (47, 130, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" α = 7.692308
    5. Baustoffzelle - (76, 0, 0) x (110, 59, 1000) Bez.: "Aluminium" λ = 160
    6. Baustoffzelle - (0, 0, 0) x (76, 8, 1000) Bez.: "Aluminium" λ = 160
    7. Raumzelle - (90, 0, 0) x (110, 28, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
    8. Baustoffzelle - (47, 100, 0) x (59, 103, 1000) Bez.: "EPDM" λ = 0.25
    9. Baustoffzelle - (95, 77, 0) x (110, 103, 1000) Bez.: "EPDM" λ = 0.25
    10. Baustoffzelle - (95, 80, 0) x (110, 100, 1000) Bez.: "Dämmblock" λ = 0.035
    11. Baustoffzelle - (110, 42, 0) x (300, 100, 1000) Bez.: "Dämmblock" λ = 0.035
    12. Baustoffzelle - (59, 65, 0) x (63, 103, 1000) Bez.: "L6" λ = 0.1715
    13. Baustoffzelle - (59, 26, 0) x (76, 65, 1000) Bez.: "L6" λ = 0.1715
    14. Baustoffzelle - (76, 59, 0) x (110, 65, 1000) Bez.: "L6" λ = 0.1715
    15. Baustoffzelle - (76, 26, 0) x (90, 28, 1000) Bez.: "L6" λ = 0.1715
    16. Baustoffzelle - (0, 2, 0) x (76, 8, 1000) Bez.: "L1" λ = 0.0493
    17. Baustoffzelle - (78, 2, 0) x (88, 24, 1000) Bez.: "L2" λ = 0.091
    18. Baustoffzelle - (78, 30, 0) x (95, 57, 1000) Bez.: "L3" λ = 0.106
    19. Baustoffzelle - (95, 30, 0) x (108, 40, 1000) Bez.: "L3" λ = 0.106
    20. Baustoffzelle - (97, 42, 0) x (108, 57, 1000) Bez.: "L5" λ = 0.0668
    21. Baustoffzelle - (108, 42, 0) x (110, 50, 1000) Bez.: "L5" λ = 0.0668
    22. Baustoffzelle - (90, 77, 0) x (95, 103, 1000) Bez.: "L4" λ = 0.1009
    23. Raumzelle - (28, 100, 0) x (47, 130, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5
    24. Raumzelle - (110, 100, 0) x (129, 130, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5

Räume :

Raum 0
Raum 1

Wärmequellen :

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 2 (siehe Bild D.2)
Aluminium-Holz-Profil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 2 12k Zellen\D 2.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Raum 0

α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Raum 1

α= 7.692308 W/(m²K) Rs= 0.1300 m²K/W : Innenraum

α= 5 W/(m²K) Rs= 0.2000 m²K/W : Innenraum mit Rsi = 0,20 m²K/W

Wärmequellen : keine

Baustoffe :

λ= 160 W/(m K) : Aluminium
λ= 0.035 W/(m K) : Dämmblock
λ= 0.25 W/(m K) : EPDM
λ= 0.13 W/(m K) : Holz
λ= 0.0493 W/(m K) : L1
λ= 0.091 W/(m K) : L2
λ= 0.106 W/(m K) : L3
λ= 0.1009 W/(m K) : L4
λ= 0.0668 W/(m K) : L5
λ= 0.1715 W/(m K) : L6

Schichtaufbauten und U-Wert Berechnungen

Raum 0 <-> Raum 1 @ BackLeft: (0, 0, 0) x (0, 100, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Aluminium	160.0000	2.0000			0.0000	
L1	0.0493	6.0000			0.1217	
Holz	0.1300	92.0000			0.7077	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**1.0006**	**[W/m²K]**	

Raum 0 <-> Raum 1 @ BackRight: (300, 42, 0) x (300, 100, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Dämmblock	0.0350	58.0000			1.6571	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**0.5473**	**[W/m²K]**	

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 2 (siehe Bild D.2)
Aluminium-Holz-Profil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_2 12k Zellen\D_2.antherm

Anzahl der bilanzierten Zellen: 12104

Thermische Leitwerte [W / K]

Raum\Raum	Raum 0	Raum 1
Raum 0		0,263884
Raum 1	0,263884	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	3.30274e-009	0,263884	1.25159e-008
Raum 1	-3.30274e-009	0,263884	-1.25159e-008

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 2 (siehe Bild D.2)
Aluminium-Holz-Profil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_2 12k Zellen\D_2.antherm

Anzahl der bilanzierten Zellen: 12104 (Knotenzahl = 146751)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Raum 0	-10,00	-9,57	-7,63	100.00 %	
Raum 1	20,00	12,25	17,87	60.98 %	0,74

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Raum 0	Raum 1
g(Raum 0)	0,985804	0,258366
g(Raum 1)	0,014196	0,741634

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Raum 0	119,4750	42,0000		-9.57	
Raum 1	45,9000	100,0000		12.25	0,74

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A-1230 Wien, Othellogasse 1/RH 8/2
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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 2 (siehe Bild D.2)
Aluminium-Holz-Profil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_2 24k Zellen\D_2.antherm

Anzahl der bilanzierten Zellen: 26077

Thermische Leitwerte [W / K]

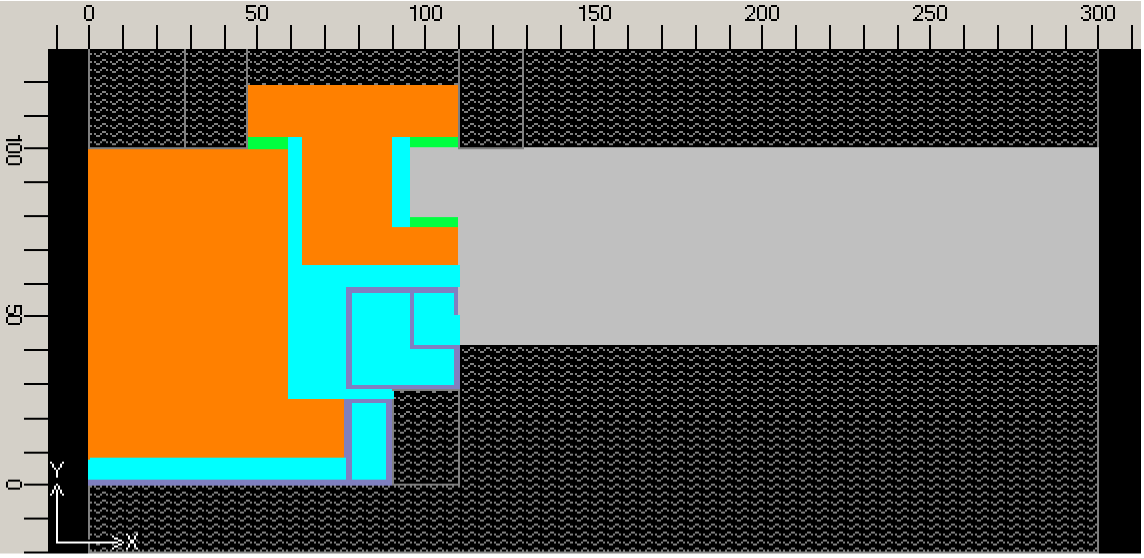
Raum\Raum	Raum 0	Raum 1
Raum 0		0,264033
Raum 1	0,264033	

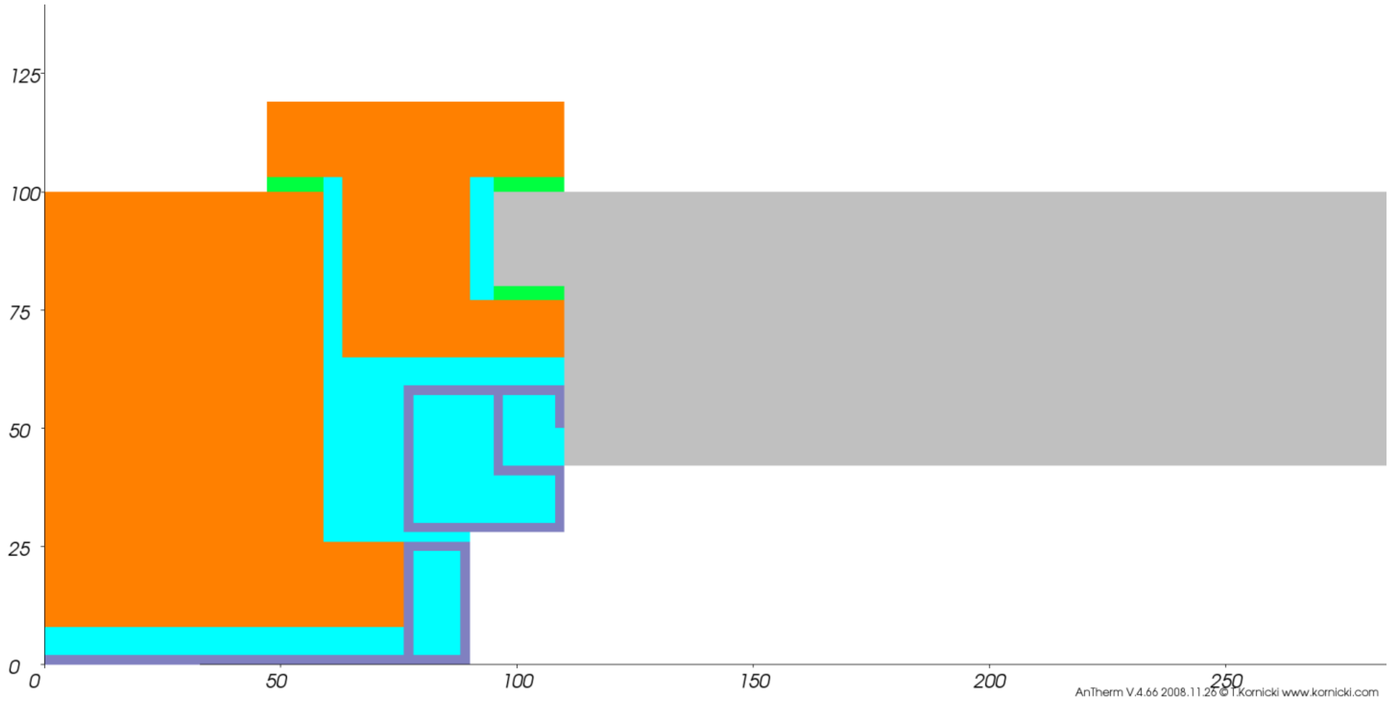
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	4.91404e-009	0,264033	1.86115e-008
Raum 1	-4.91404e-009	0,264033	-1.86115e-008

Prüfreferenzfall 2

Bilder (Eingabe)





Prüfreferenzfall 2

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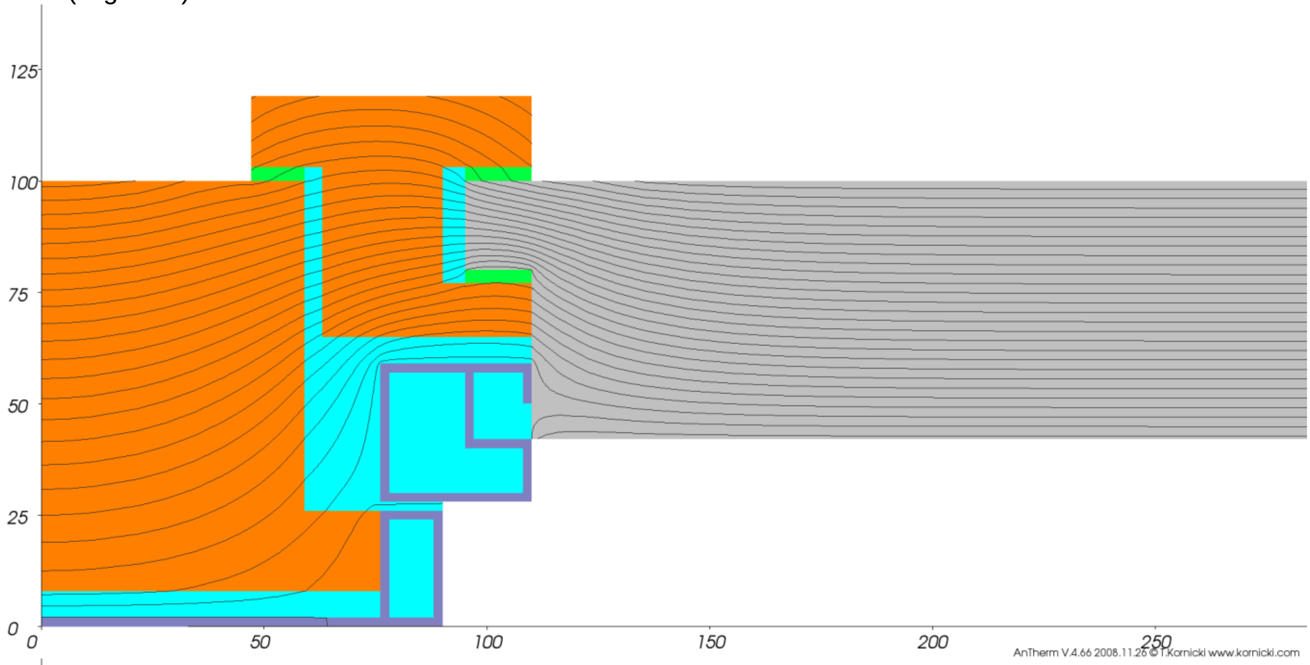

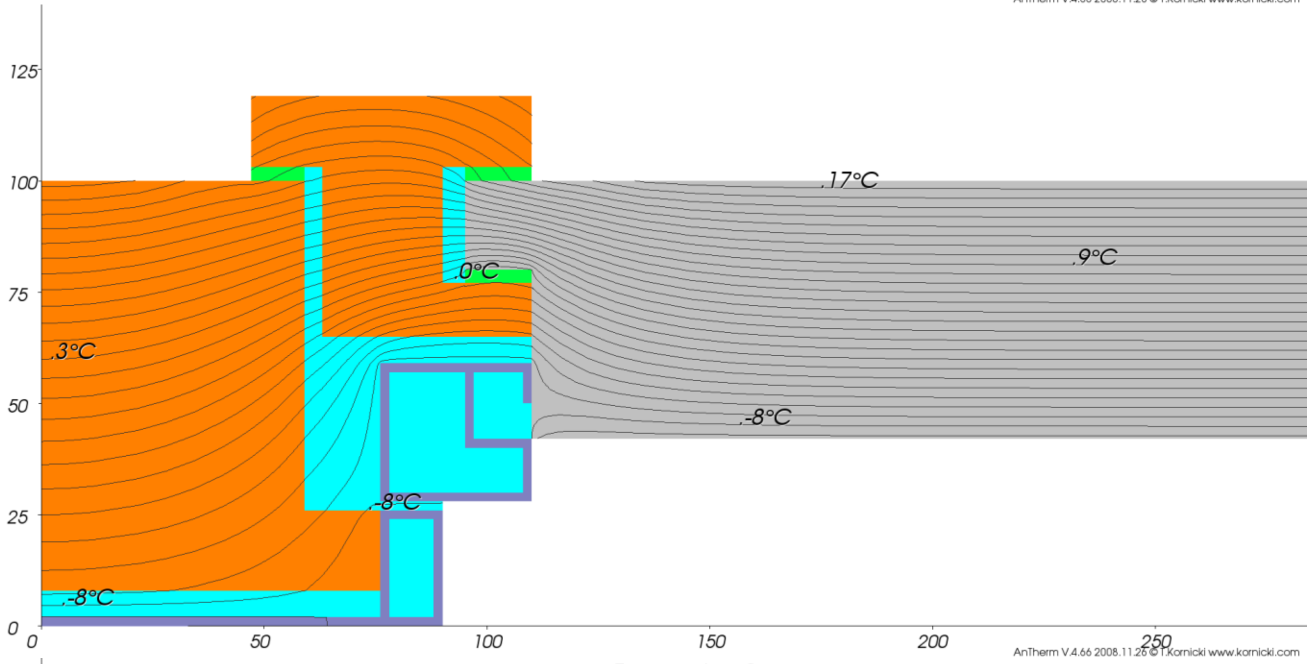

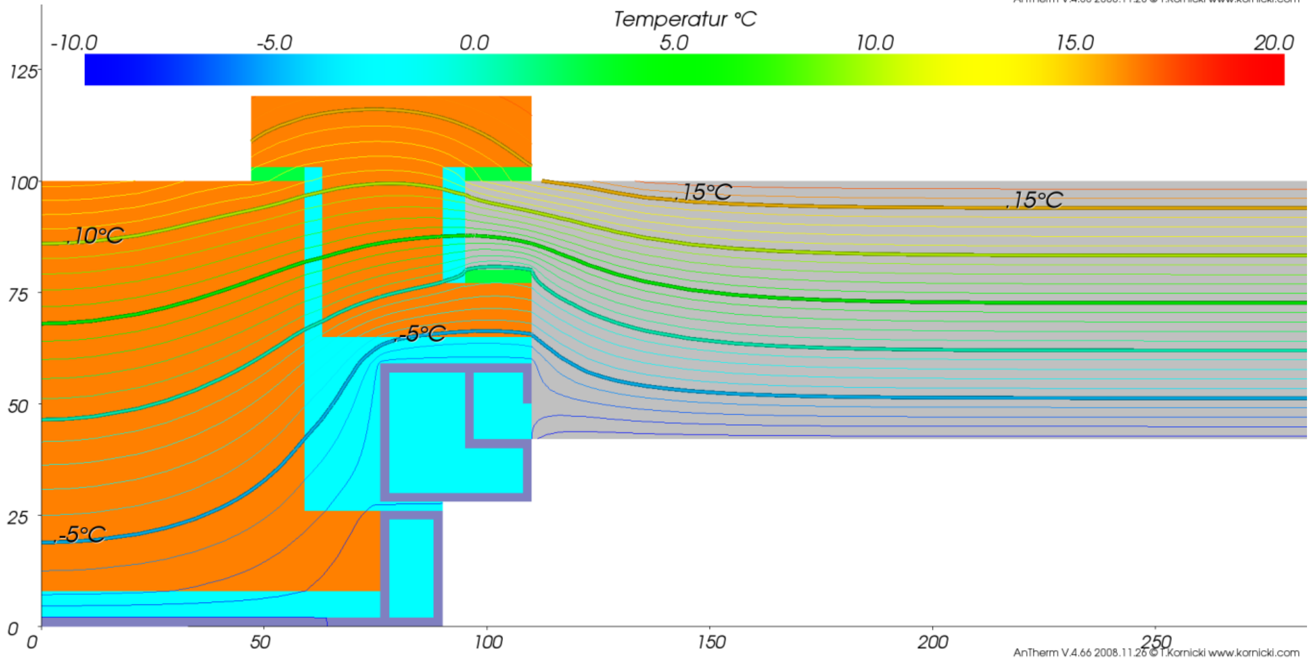

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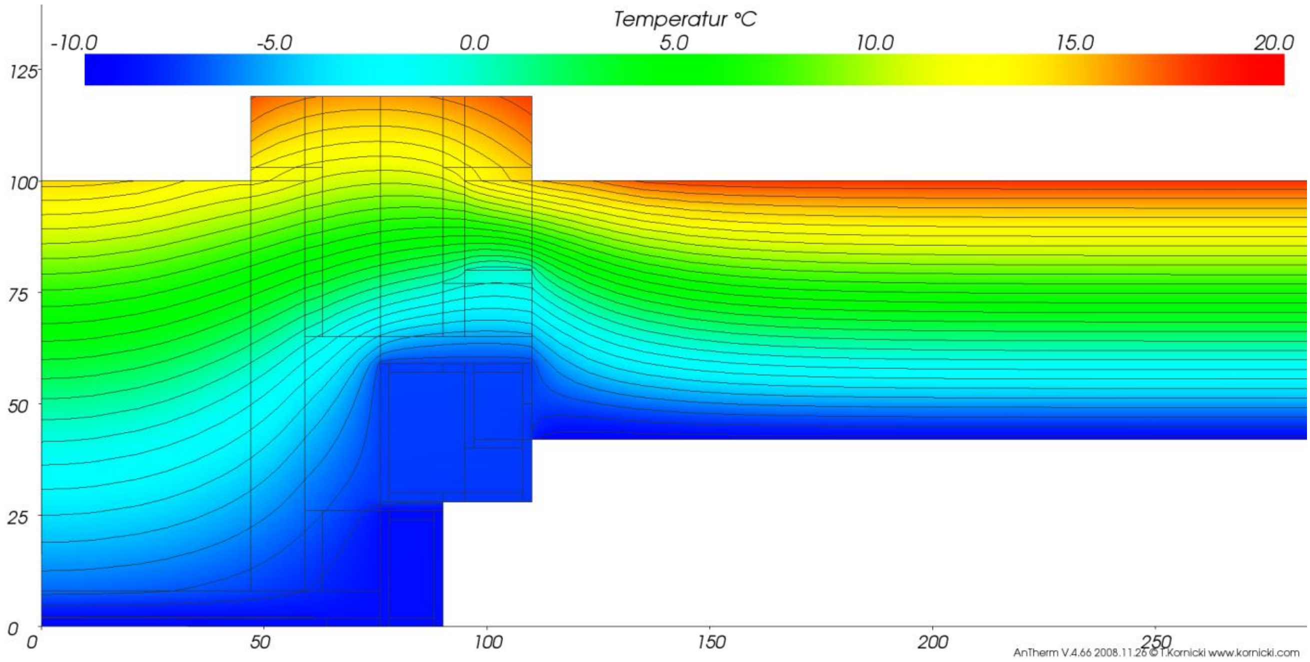

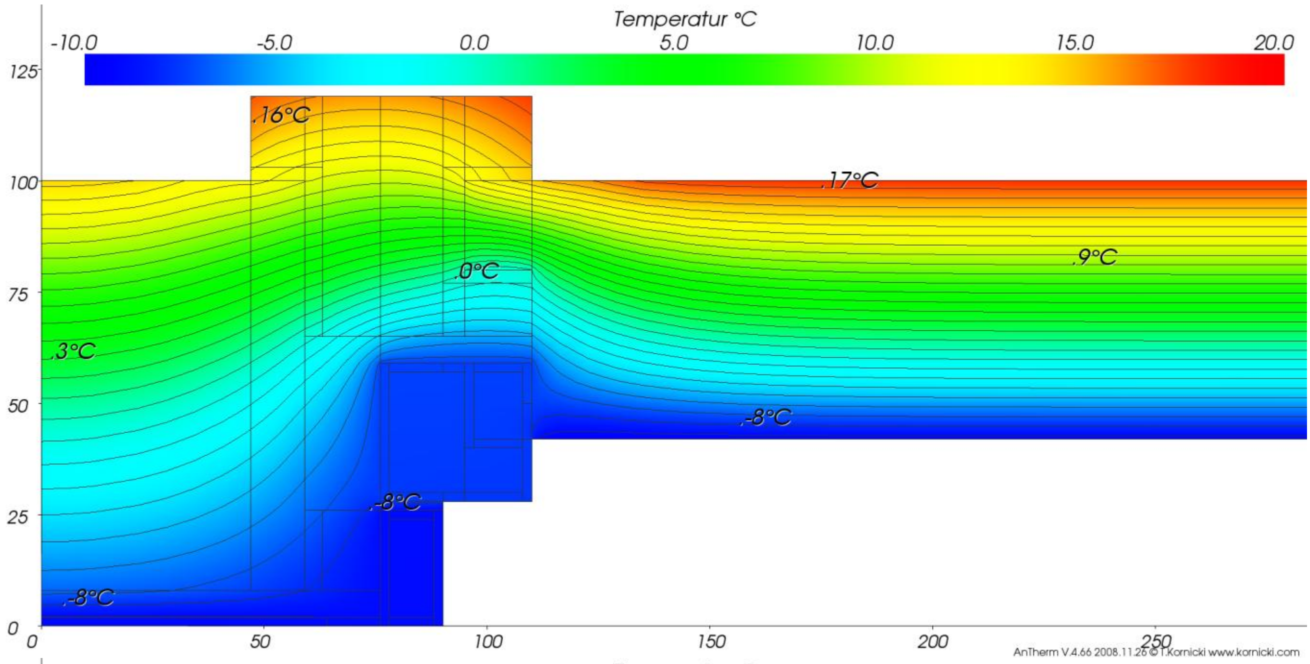

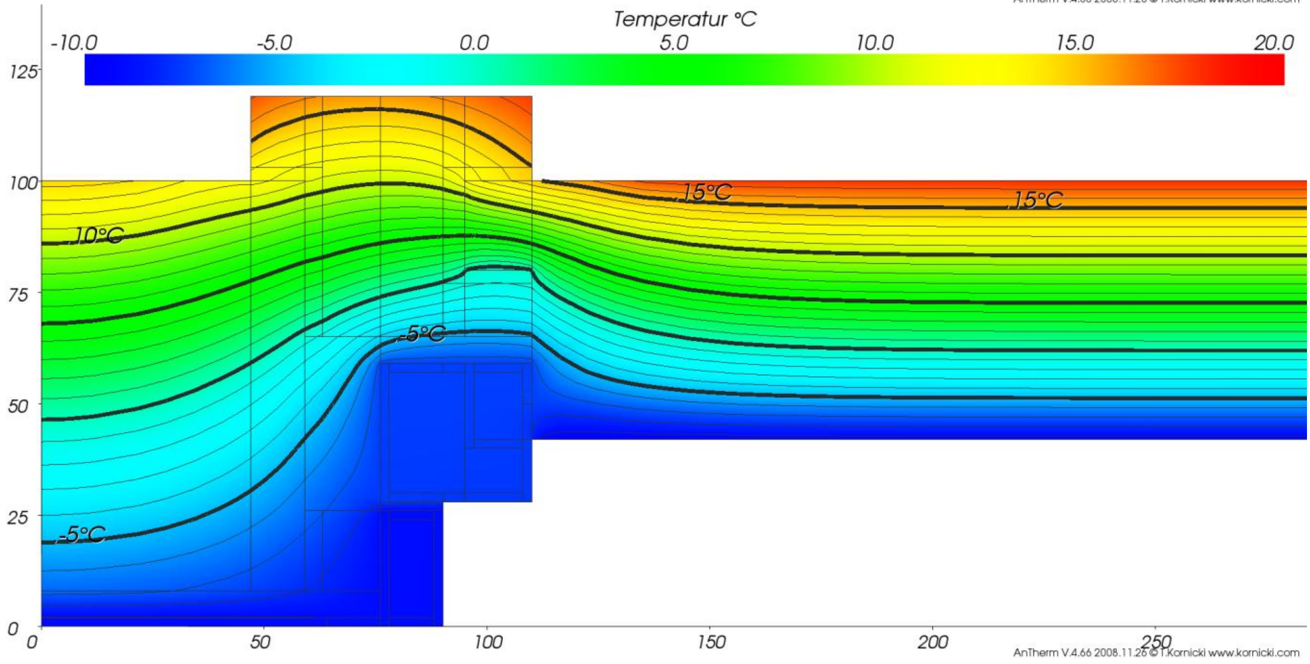

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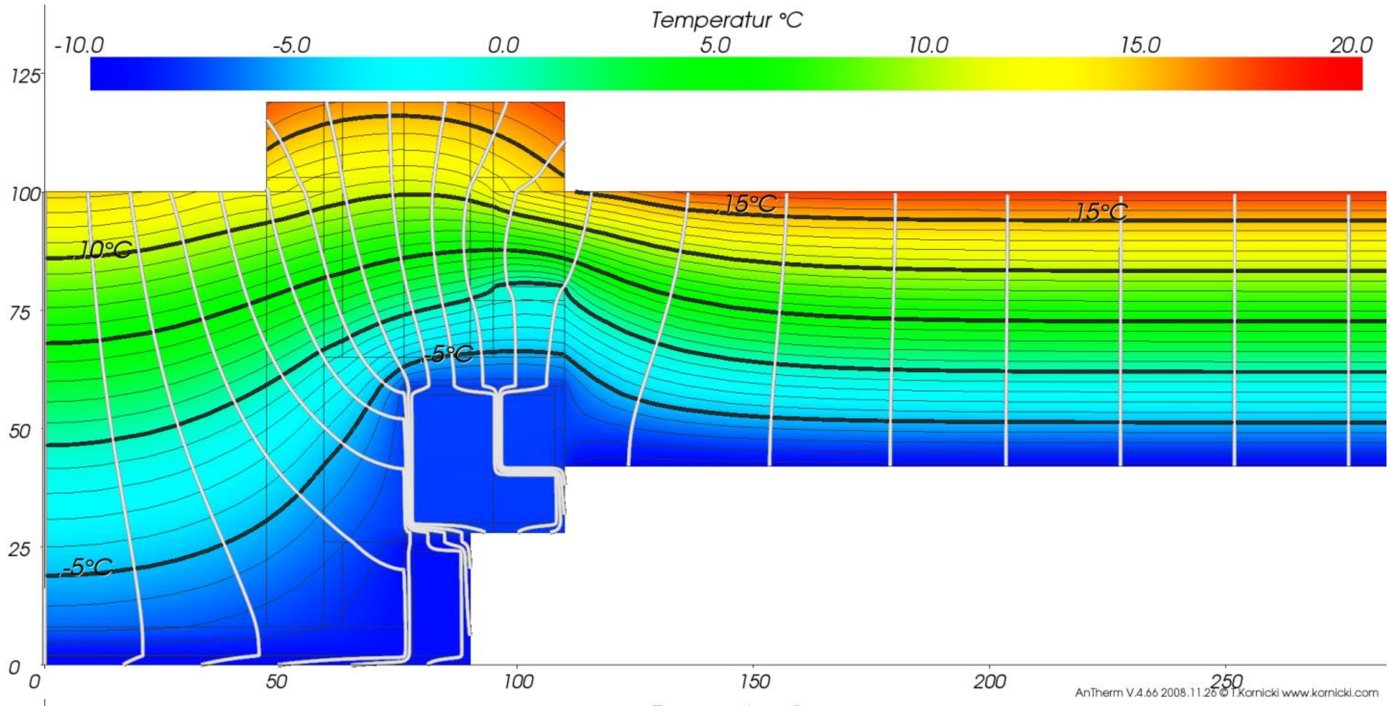

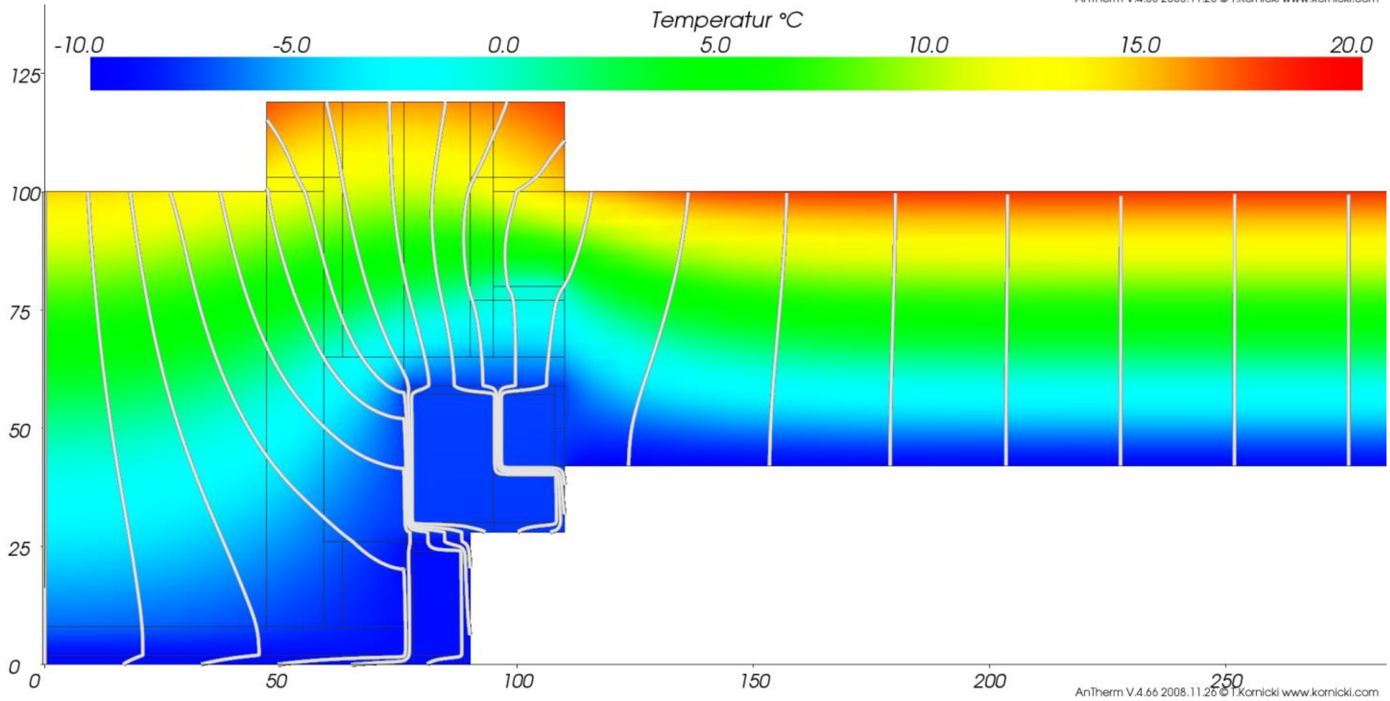

Quellkode der Projektdatei D_2.antherm


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Prüfreferenzfall 3

Validierungsberechnung (Unterleitungsraster 6.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 12.000 Zellen = Gleichungen)
   a. Leitwerte

Quellkode der Projektdatei D_3.antherm

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 3 (siehe Bild D.3)
PVC-Profil mit Stahlverstärkung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_3 6k Zellen\D_3.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

1. Raumzelle - (0, -10, 0) x (300, 44, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
2. Raumzelle - (0, 44, 0) x (300, 93, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" α = 7.692308
3. Baustoffzelle - (0, 0, 0) x (110, 83, 1000) Bez.: "PVC" λ = 0.17
4. Raumzelle - (0, 66, 0) x (28, 83, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" α = 7.692308
5. Raumzelle - (68, 0, 0) x (110, 11, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
6. Baustoffzelle - (95, 30, 0) x (300, 58, 1000) Bez.: "Dämmblock" λ = 0.035
7. Baustoffzelle - (0, 3, 0) x (8, 63, 1000) Bez.: "L1" λ = 0.2097
8. Baustoffzelle - (11, 52, 0) x (33, 63, 1000) Bez.: "L2" λ = 0.0625
9. Baustoffzelle - (11, 10, 0) x (33, 49, 1000) Bez.: "L3" λ = 0.1651
10. Baustoffzelle - (12, 11, 0) x (14, 48, 1000) Bez.: "Stahl" λ = 50
11. Baustoffzelle - (14, 46, 0) x (31, 48, 1000) Bez.: "Stahl" λ = 50
12. Baustoffzelle - (14, 11, 0) x (31, 13, 1000) Bez.: "Stahl" λ = 50
13. Baustoffzelle - (31, 72, 0) x (46, 80, 1000) Bez.: "L6" λ = 0.052
14. Baustoffzelle - (36, 52, 0) x (62, 69, 1000) Bez.: "L7" λ = 0.09
15. Baustoffzelle - (36, 49, 0) x (46, 52, 1000) Bez.: "L7" λ = 0.09
16. Baustoffzelle - (28, 66, 0) x (36, 69, 1000) Bez.: "EPDM" λ = 0.25
17. Baustoffzelle - (36, 10, 0) x (62, 38, 1000) Bez.: "L8" λ = 0.16
18. Baustoffzelle - (36, 40, 0) x (42, 46, 1000) Bez.: "EPDM" λ = 0.25
19. Baustoffzelle - (40, 38, 0) x (42, 40, 1000) Bez.: "EPDM" λ = 0.25
20. Baustoffzelle - (40, 46, 0) x (50, 49, 1000) Bez.: "EPDM" λ = 0.25
21. Baustoffzelle - (42, 38, 0) x (62, 46, 1000) Bez.: "L8" λ = 0.16
22. Baustoffzelle - (50, 46, 0) x (62, 49, 1000) Bez.: "L8" λ = 0.16
23. Baustoffzelle - (11, 3, 0) x (65, 7, 1000) Bez.: "L18" λ = 0.0412
24. Baustoffzelle - (48, 72, 0) x (65, 80, 1000) Bez.: "L9" λ = 0.14
25. Baustoffzelle - (65, 27, 0) x (82, 80, 1000) Bez.: "L9" λ = 0.14
26. Baustoffzelle - (50, 77, 0) x (81, 79, 1000) Bez.: "Stahl" λ = 50
27. Baustoffzelle - (79, 28, 0) x (81, 77, 1000) Bez.: "Stahl" λ = 50
28. Baustoffzelle - (66, 28, 0) x (79, 30, 1000) Bez.: "Stahl" λ = 50
29. Baustoffzelle - (66, 30, 0) x (68, 46, 1000) Bez.: "Stahl" λ = 50
30. Baustoffzelle - (85, 66, 0) x (107, 80, 1000) Bez.: "L15" λ = 0.0707
31. Baustoffzelle - (85, 27, 0) x (95, 63, 1000) Bez.: "L16" λ = 0.1311
32. Baustoffzelle - (95, 58, 0) x (110, 63, 1000) Bez.: "EPDM" λ = 0.25
33. Baustoffzelle - (95, 27, 0) x (110, 30, 1000) Bez.: "EPDM" λ = 0.25
34. Baustoffzelle - (65, 14, 0) x (82, 24, 1000) Bez.: "L14" λ = 0.058
35. Baustoffzelle - (85, 14, 0) x (107, 24, 1000) Bez.: "L17" λ = 0.0596
36. Baustoffzelle - (62, 10, 0) x (68, 11, 1000) Bez.: "EPDM" λ = 0.25
37. Raumzelle - (11, 66, 0) x (28, 83, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5
38. Raumzelle - (110, 58, 0) x (135, 83, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5

Räume :

Raum 0
Raum 1

Wärmequellen :

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 3 (siehe Bild D.3)
PVC-Profil mit Stahlverstärkung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_3 6k Zellen\D_3.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Raum 0
- α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Raum 1
- α= 7.692308 W/(m²K) Rs= 0.1300 m²K/W : Innenraum
- α= 5 W/(m²K) Rs= 0.2000 m²K/W : Innenraum mit Rsi = 0,20 m²K/W

Wärmequellen : keine

Baustoffe :
- λ= 0.035 W/(m K) : Dämmblock
- λ= 0.25 W/(m K) : EPDM
- λ= 0.2097 W/(m K) : L1
- λ= 0.058 W/(m K) : L14
- λ= 0.0707 W/(m K) : L15
- λ= 0.1311 W/(m K) : L16
- λ= 0.0596 W/(m K) : L17
- λ= 0.0412 W/(m K) : L18
- λ= 0.0625 W/(m K) : L2
- λ= 0.1651 W/(m K) : L3
- λ= 0.052 W/(m K) : L6
- λ= 0.09 W/(m K) : L7
- λ= 0.16 W/(m K) : L8
- λ= 0.14 W/(m K) : L9
- λ= 0.17 W/(m K) : PVC
- λ= 50 W/(m K) : Stahl

Schichtaufbauten und U-Wert Berechnungen

Raum 0 <-> Raum 1 @ BackLeft: (0, 0, 0) x (0, 66, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
PVC	0.1700	3.0000			0.0176	
L1	0.2097	60.0000			0.2861	
PVC	0.1700	3.0000			0.0176	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**2.0349**	**[W/m²K]**	

Raum 0 <-> Raum 1 @ BackRight: (300, 30, 0) x (300, 58, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Dämmblock	0.0350	28.0000			0.8000	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**1.0309**	**[W/m²K]**	

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 3 (siehe Bild D.3)
PVC-Profil mit Stahlverstärkung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_3 6k Zellen\D_3.antherm

Anzahl der bilanzierten Zellen: 5764

Thermische Leitwerte [W / K]

Raum\Raum	Raum 0	Raum 1
Raum 0		0,426995
Raum 1	0,426995	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	6.01463e-013	0,426995	1.40860e-012
Raum 1	-6.01408e-013	0,426995	-1.40847e-012

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 3 (siehe Bild D.3)
PVC-Profil mit Stahlverstärkung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_3 6k Zellen\D_3.antherm

Anzahl der bilanzierten Zellen: 5764 (Knotenzahl = 70299)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Raum 0	-10,00	-9,56	-6,22	100.00 %	
Raum 1	20,00	10,01	17,39	52.55 %	0,67

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Raum 0	Raum 1
g(Raum 0)	0,985307	0,333045
g(Raum 1)	0,014693	0,666955

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Raum 0	110,0000	11,0000		-9.56	
Raum 1	1,5000	66,0000		10.01	0,67

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 3 (siehe Bild D.3)
PVC-Profil mit Stahlverstärkung und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_3 12k Zellen\D_3.antherm

Anzahl der bilanzierten Zellen: 12428

Thermische Leitwerte [W / K]

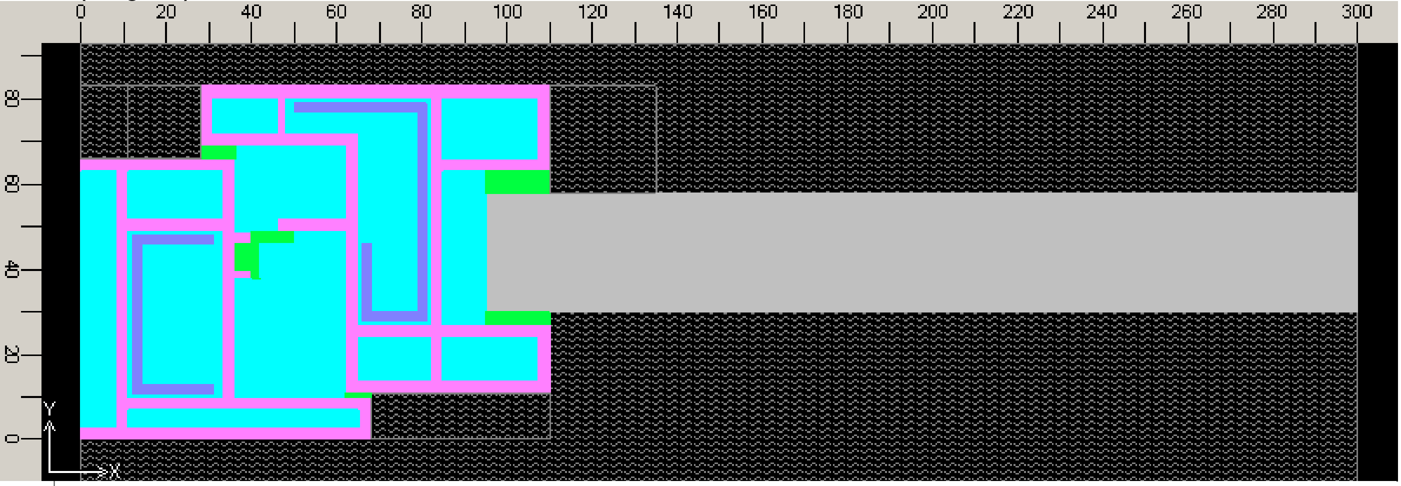
Raum\Raum	Raum 0	Raum 1
Raum 0		0,427495
Raum 1	0,427495	

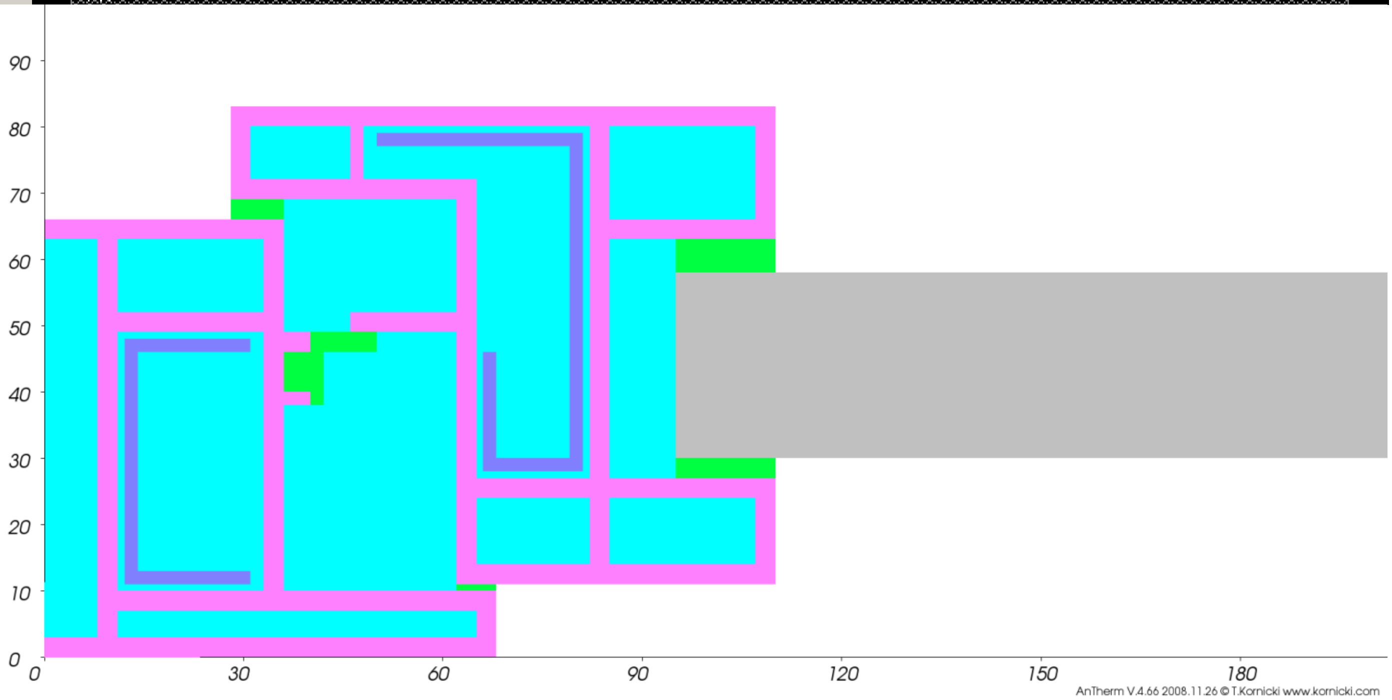
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	4.87277e-013	0,427495	1.13984e-012
Raum 1	-4.87332e-013	0,427495	-1.13997e-012

Prüfreferenzfall 3

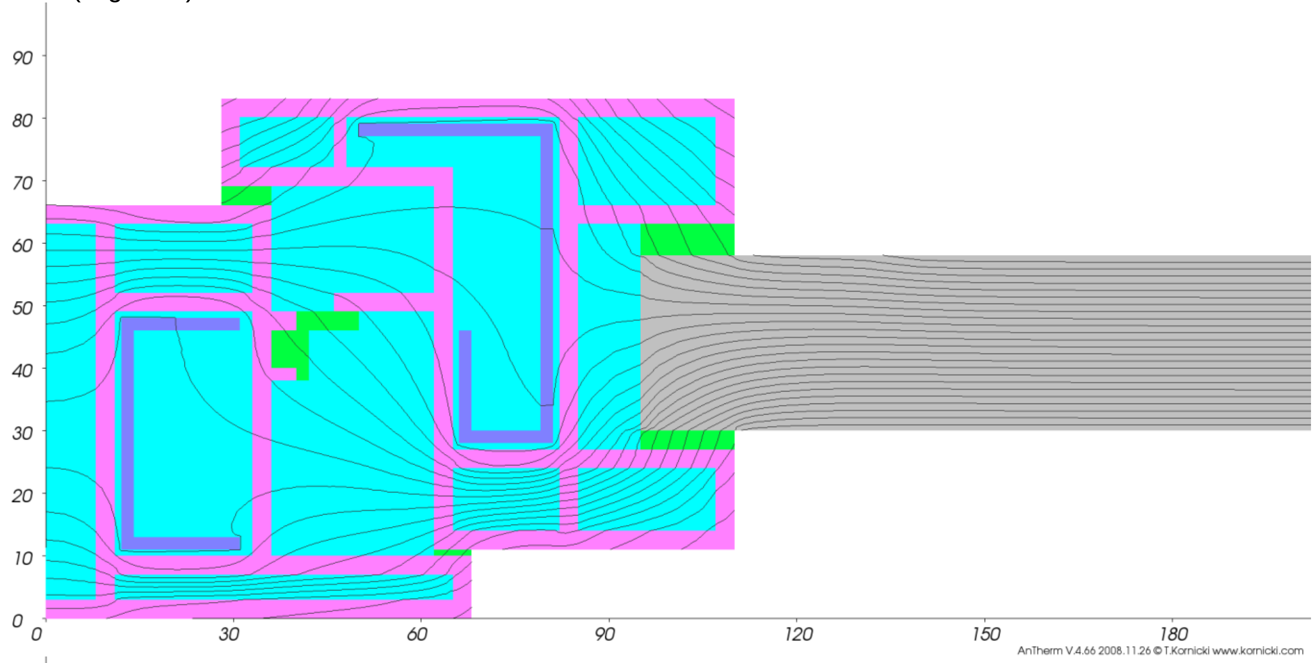
Bilder (Eingabe)

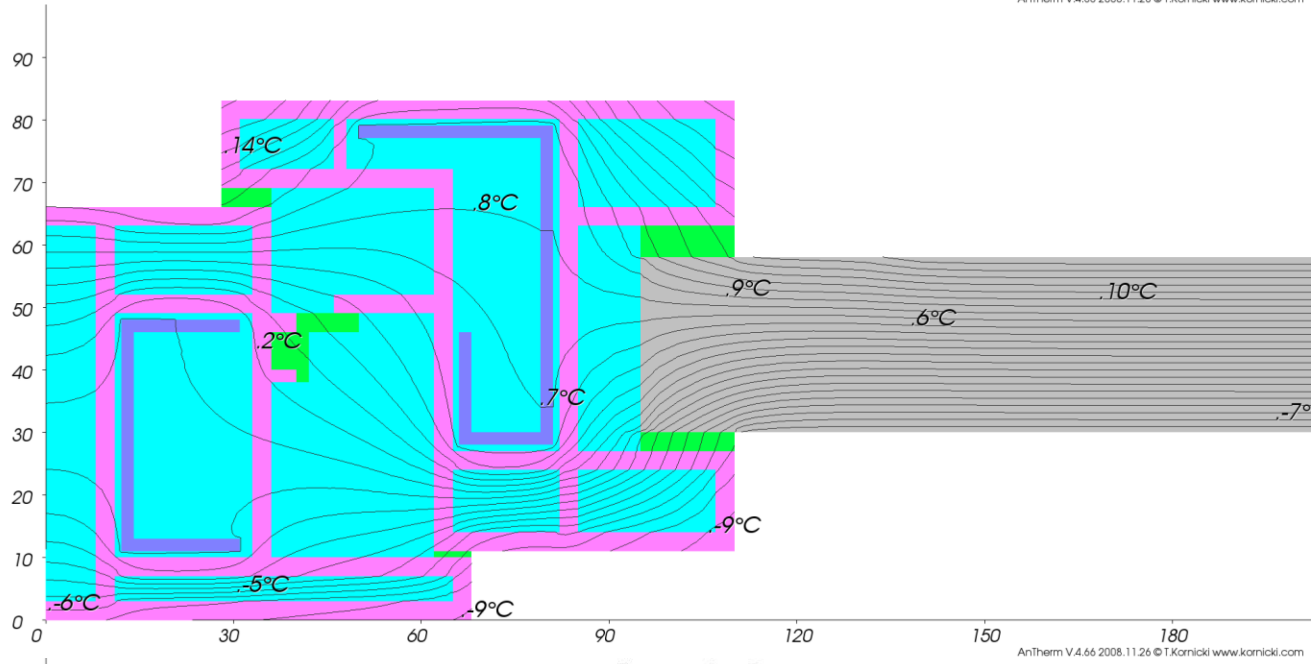


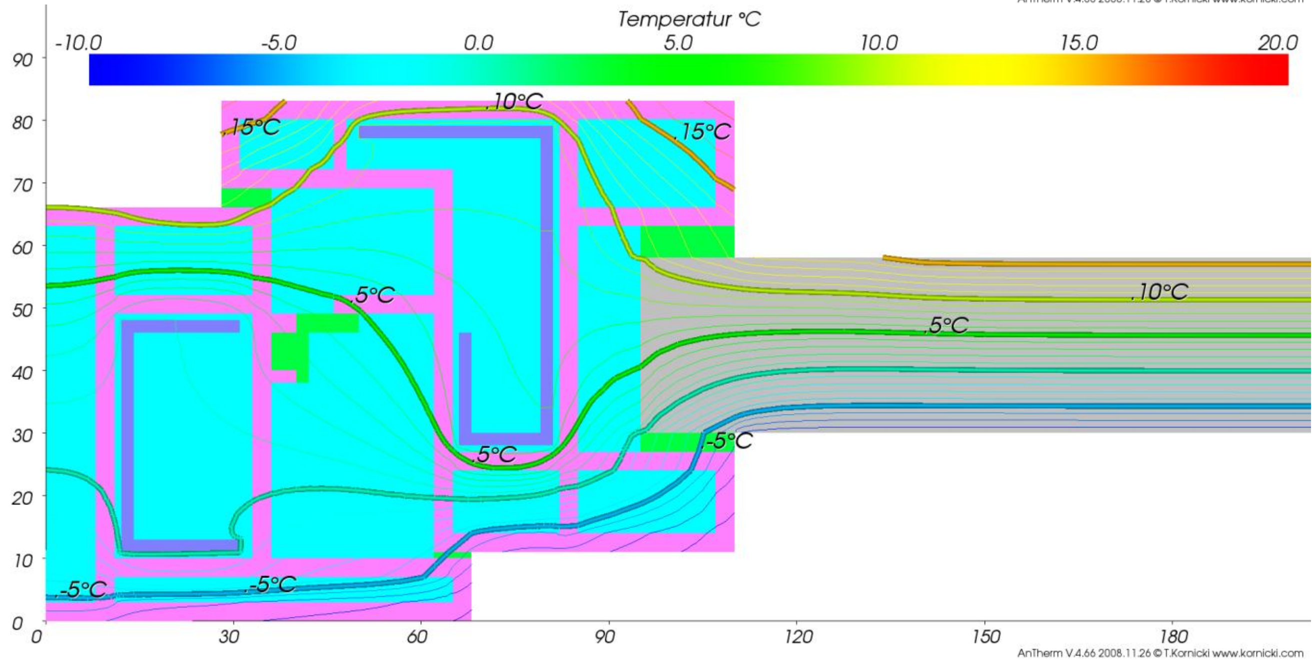


Prüfreferenzfall 3

Bilder (Ergebnis)







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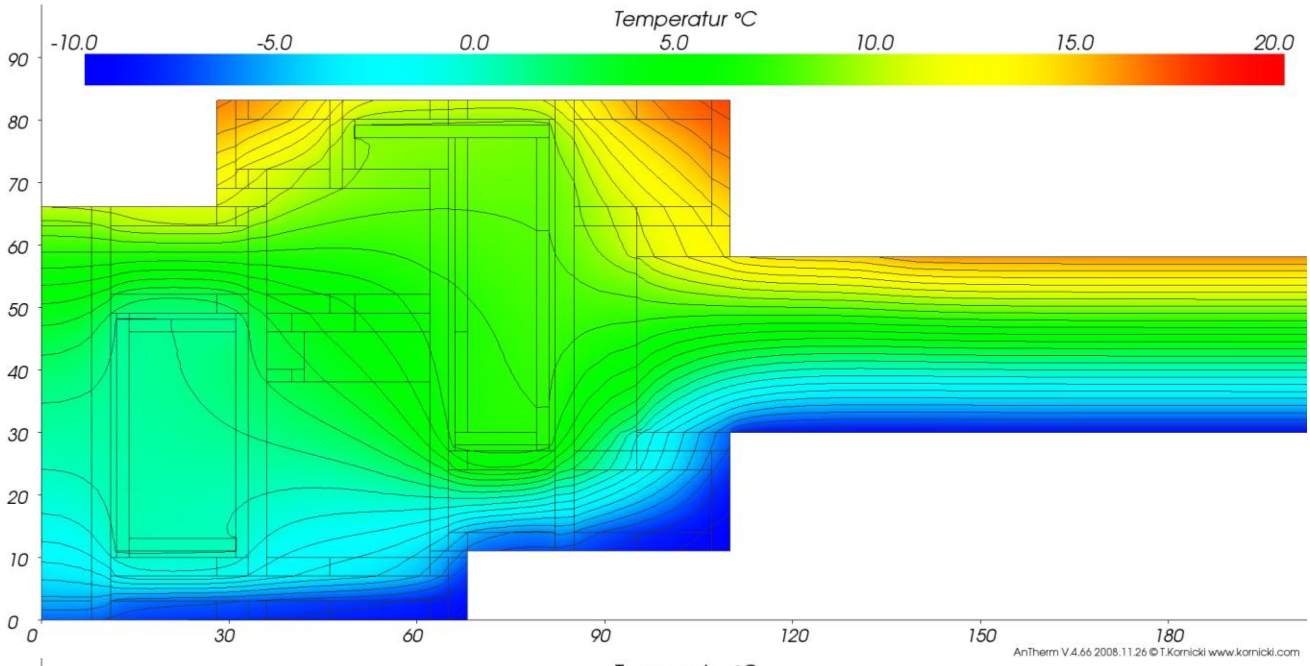

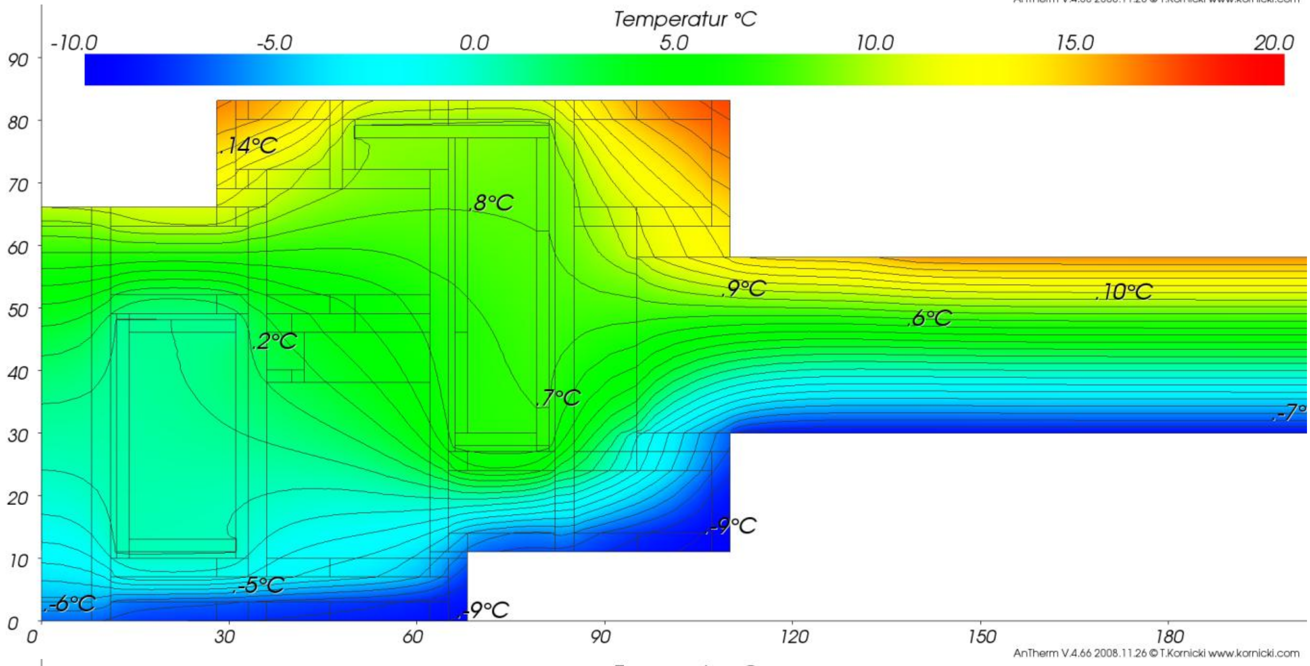

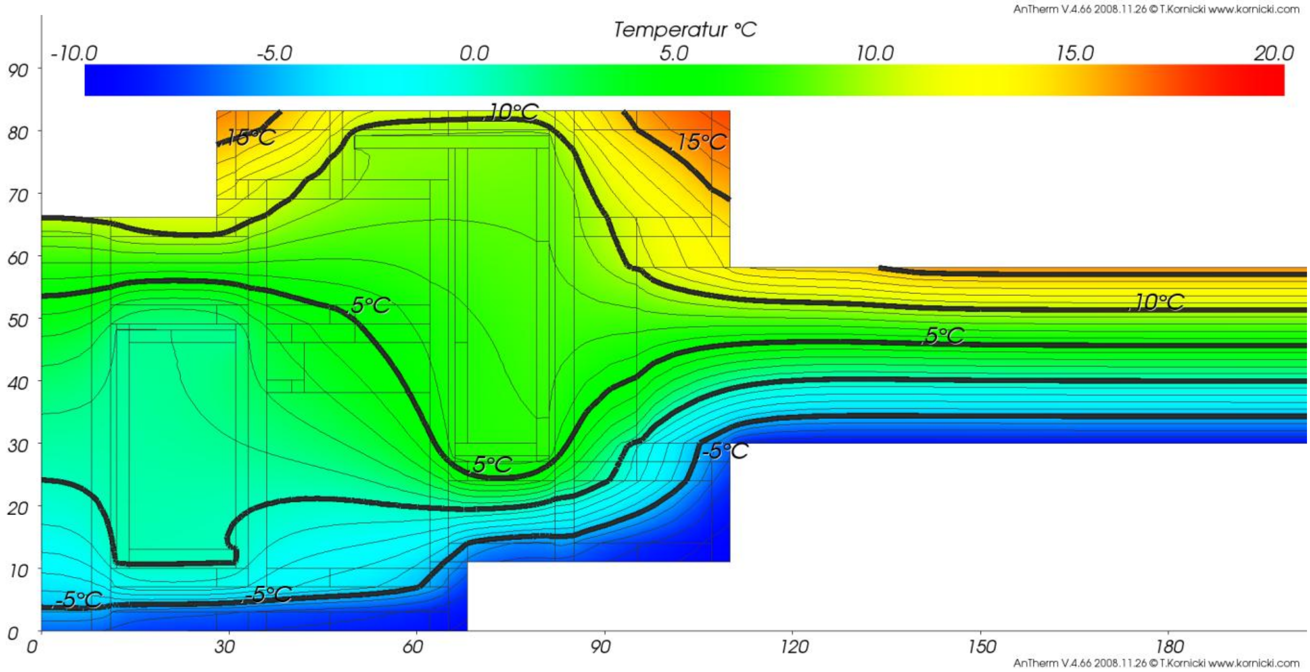

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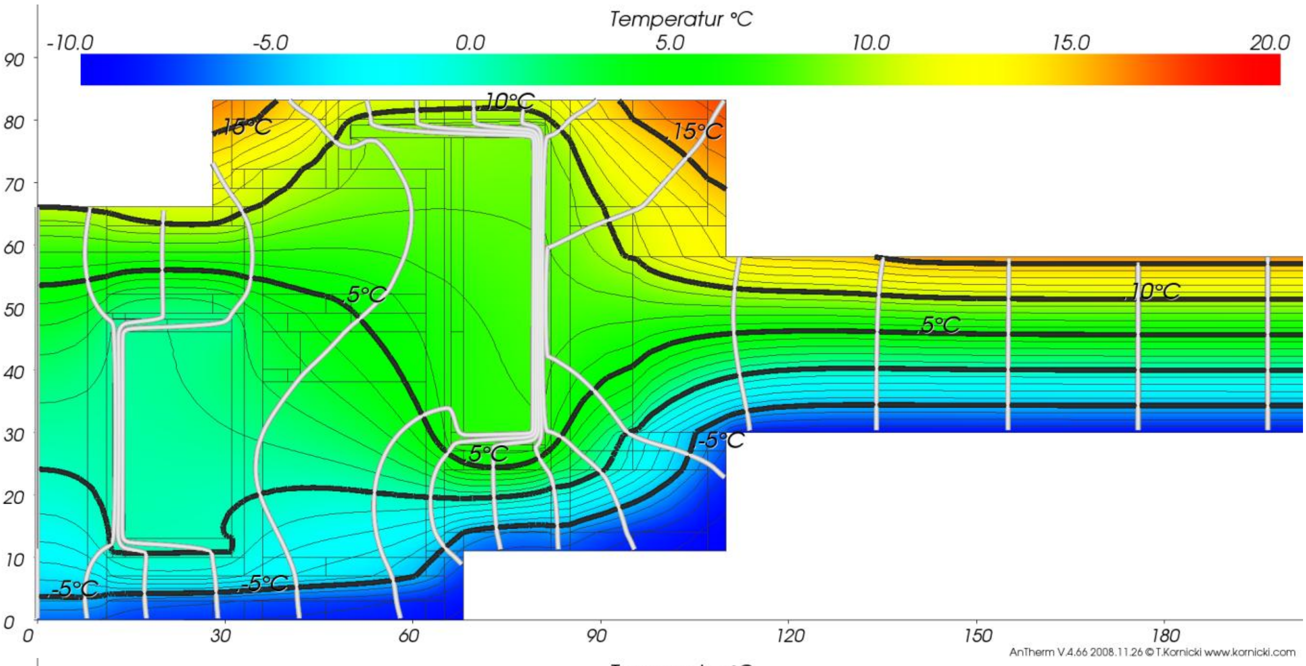

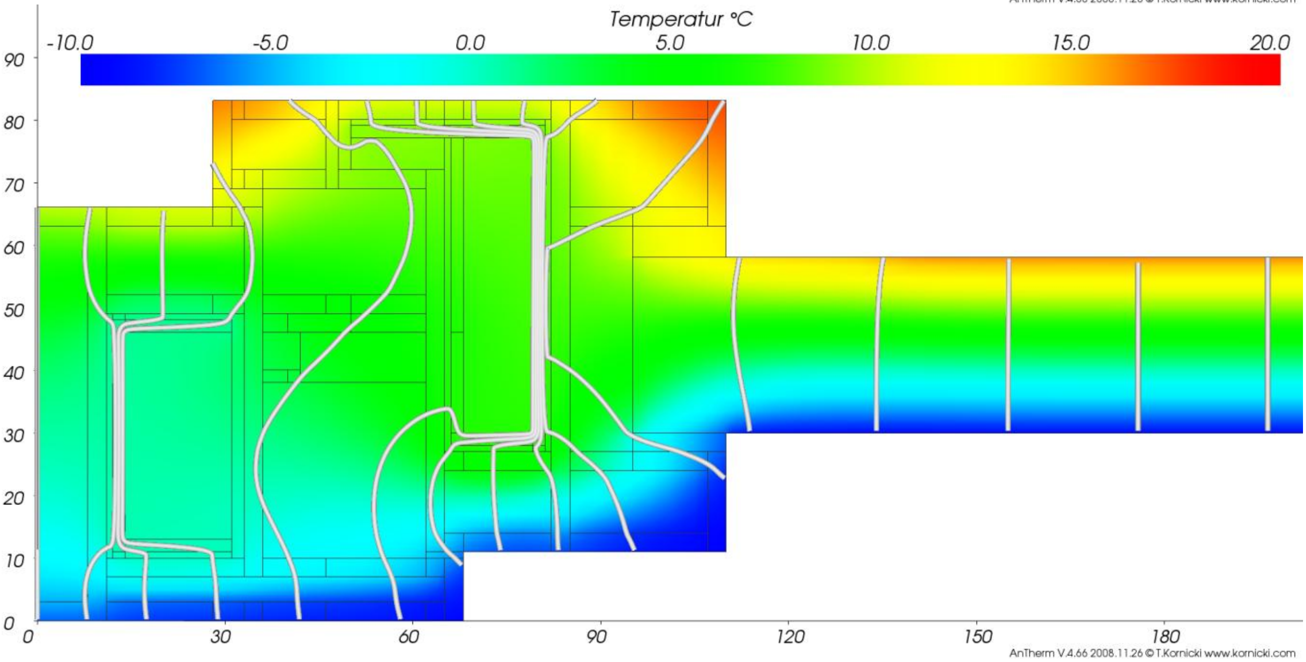

Quellkode der Projektdatei D_3.antherm


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Prüfreferenzfall 4

Validierungsberechnung (Unterleitungsraster 3.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 6.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_4.antherm

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 4 (siehe Bild D.4)
Holzprofil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 4 3k Zellen\D 4.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elementе :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, -10, 0) x (300, 32, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
    2. Raumzelle - (0, 32, 0) x (300, 93, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" α = 7.692308
    3. Baustoffzelle - (0, 0, 0) x (110, 83, 1000) Bez.: "Holz" λ = 0.13
    4. Baustoffzelle - (26, 66, 0) x (42, 69, 1000) Bez.: "EPDM" λ = 0.25
    5. Baustoffzelle - (42, 15, 0) x (48, 69, 1000) Bez.: "L1" λ = 0.205
    6. Baustoffzelle - (48, 15, 0) x (63, 18, 1000) Bez.: "EPDM" λ = 0.25
    7. Baustoffzelle - (63, 0, 0) x (68, 18, 1000) Bez.: "L2" λ = 0.1428
    8. Baustoffzelle - (90, 15, 0) x (95, 49, 1000) Bez.: "L3" λ = 0.1303
    9. Baustoffzelle - (95, 46, 0) x (110, 49, 1000) Bez.: "EPDM" λ = 0.25
    10. Baustoffzelle - (95, 15, 0) x (110, 18, 1000) Bez.: "EPDM" λ = 0.25
    11. Raumzelle - (9, 66, 0) x (26, 83, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5
    12. Baustoffzelle - (95, 18, 0) x (300, 46, 1000) Bez.: "Dämmblock" λ = 0.035
    13. Raumzelle - (110, 46, 0) x (140, 83, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5

Räume :

Raum 0
Raum 1

Wärmequellen :

T.Kornicki, Dienstleistungen in EDV und IT
A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
email: tkornicki@chello.at

12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 4 (siehe Bild D.4)
Holzprofil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 4 3k Zellen\D 4.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Raum 0
α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Raum 1
α= 7.692308 W/(m²K) Rs= 0.1300 m²K/W : Innenraum
α= 5 W/(m²K) Rs= 0.2000 m²K/W : Innenraum mit 0,20 m²K/W

Wärmequellen : keine

Baustoffe :

λ= 0.035 W/(m K) : Dämmblock
λ= 0.25 W/(m K) : EPDM
λ= 0.13 W/(m K) : Holz
λ= 0.205 W/(m K) : L1
λ= 0.1428 W/(m K) : L2
λ= 0.1303 W/(m K) : L3

Schichtaufbauten und U-Wert Berechnungen

Raum 0 <-> Raum 1 @ BackLeft: (0, 0, 0) x (0, 83, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Holz	0.1300	83.0000			0.6385	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**1.2369**	**[W/m²K]**	

Raum 0 <-> Raum 1 @ BackRight: (300, 18, 0) x (300, 46, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Dämmblock	0.0350	28.0000			0.8000	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**1.0309**	**[W/m²K]**	

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 4 (siehe Bild D.4)
Holzprofil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_4 3k Zellen\D_4.antherm

Anzahl der bilanzierten Zellen: 3258

Thermische Leitwerte [W / K]

Raum\Raum	Raum 0	Raum 1
Raum 0		0,345813
Raum 1	0,345813	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	-1.39888e-013	0,345813	-4.04519e-013
Raum 1	1.39944e-013	0,345813	4.04680e-013

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 4 (siehe Bild D.4)
Holzprofil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_4 3k Zellen\D_4.antherm

Anzahl der bilanzierten Zellen: 3258 (Knotenzahl = 40107)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Raum 0	-10,00	-9,69	-8,06	100.00 %	
Raum 1	20,00	12,58	18,11	62.33 %	0,75

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Raum 0	Raum 1
g(Raum 0)	0,989735	0,247190
g(Raum 1)	0,010265	0,752810

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Raum 0	110,0000	0,0000		-9.69	
Raum 1	20,6719	66,0000		12.58	0,75

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Prüfreferenzfall 4 (siehe Bild D.4)
Holzprofil und Füllung (Dämmstoff); Profilhöhe: 110 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_4 6k Zellen\D_4.antherm

Anzahl der bilanzierten Zellen: 6262

Thermische Leitwerte [W / K]

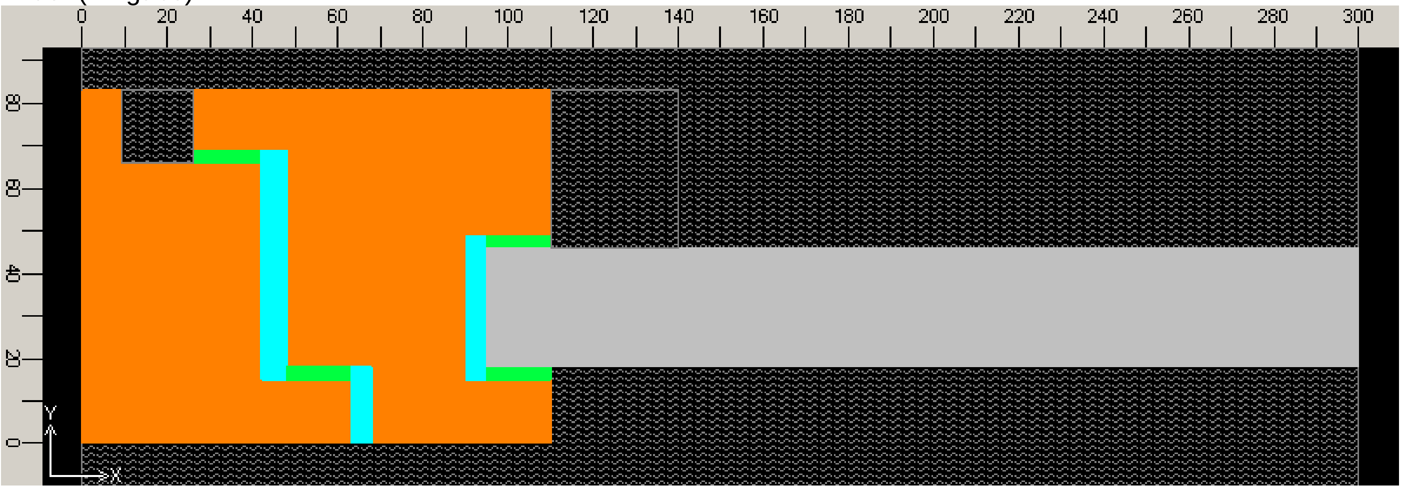
Raum\Raum	Raum 0	Raum 1
Raum 0		0,345872
Raum 1	0,345872	

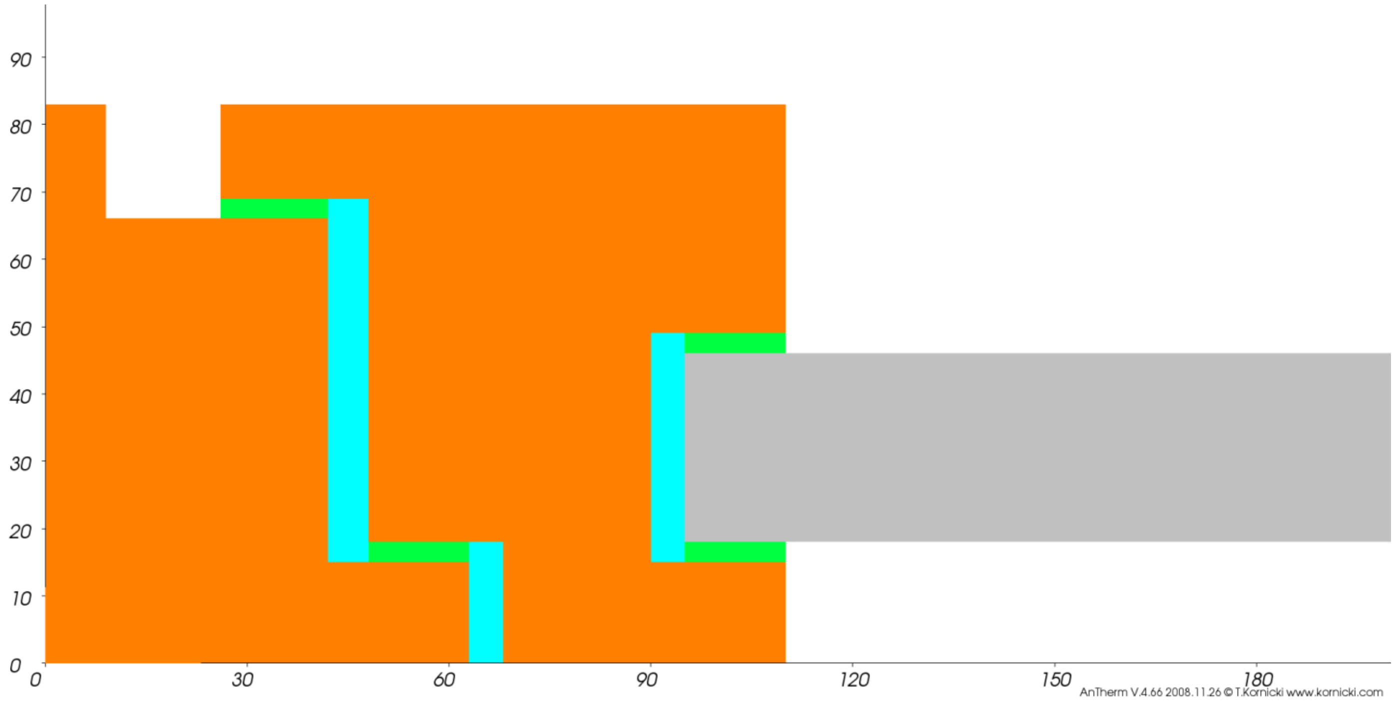
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	6.69698e-012	0,345872	1.93626e-011
Raum 1	-6.69703e-012	0,345872	-1.93627e-011

Prüfreferenzfall 4

Bilder (Eingabe)





Prüfreferenzfall 4

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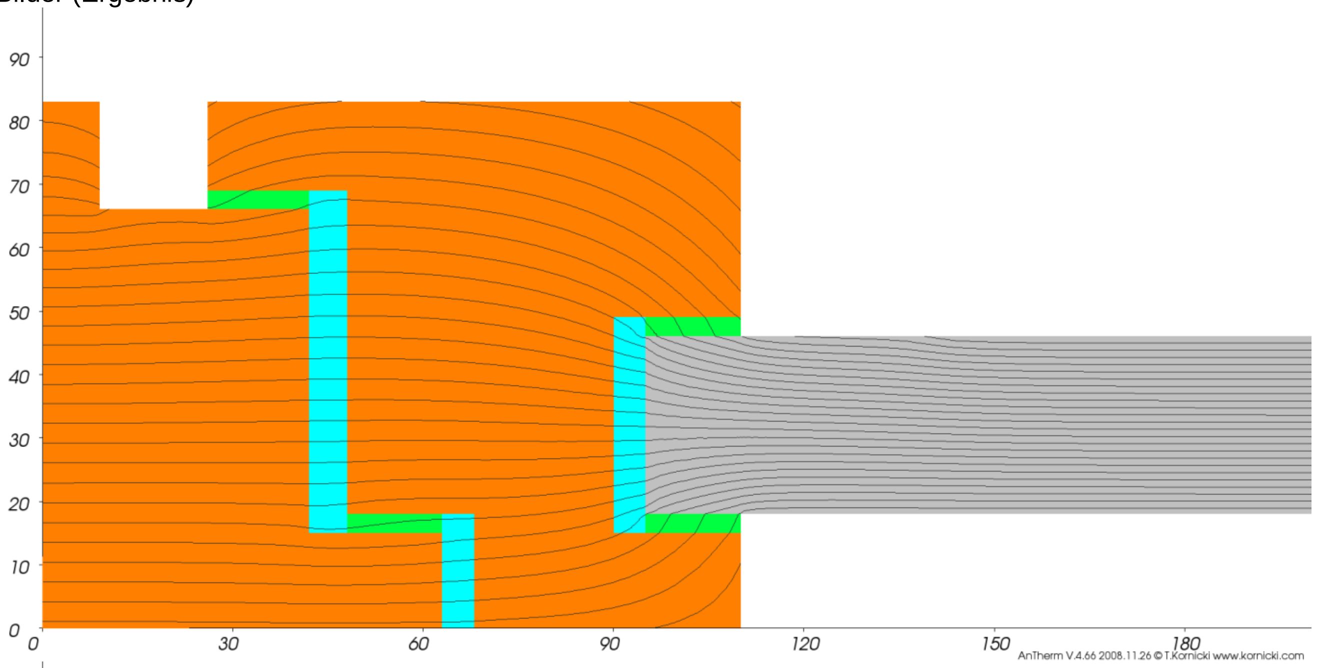

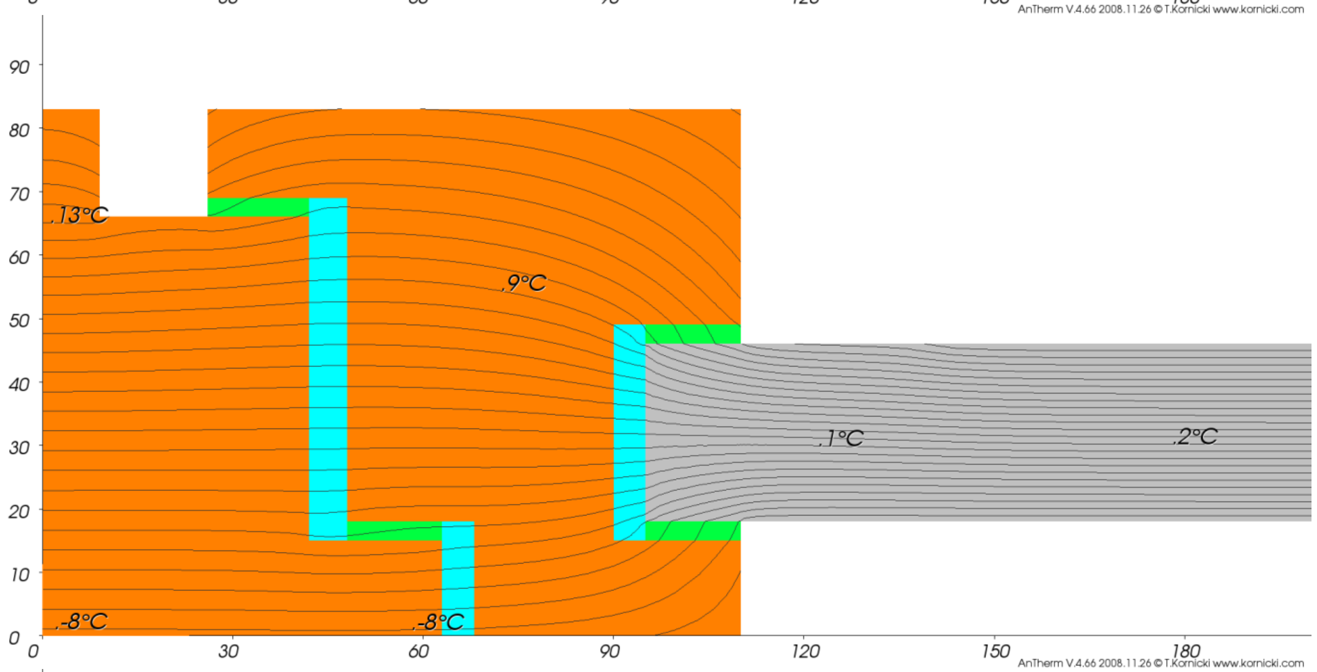

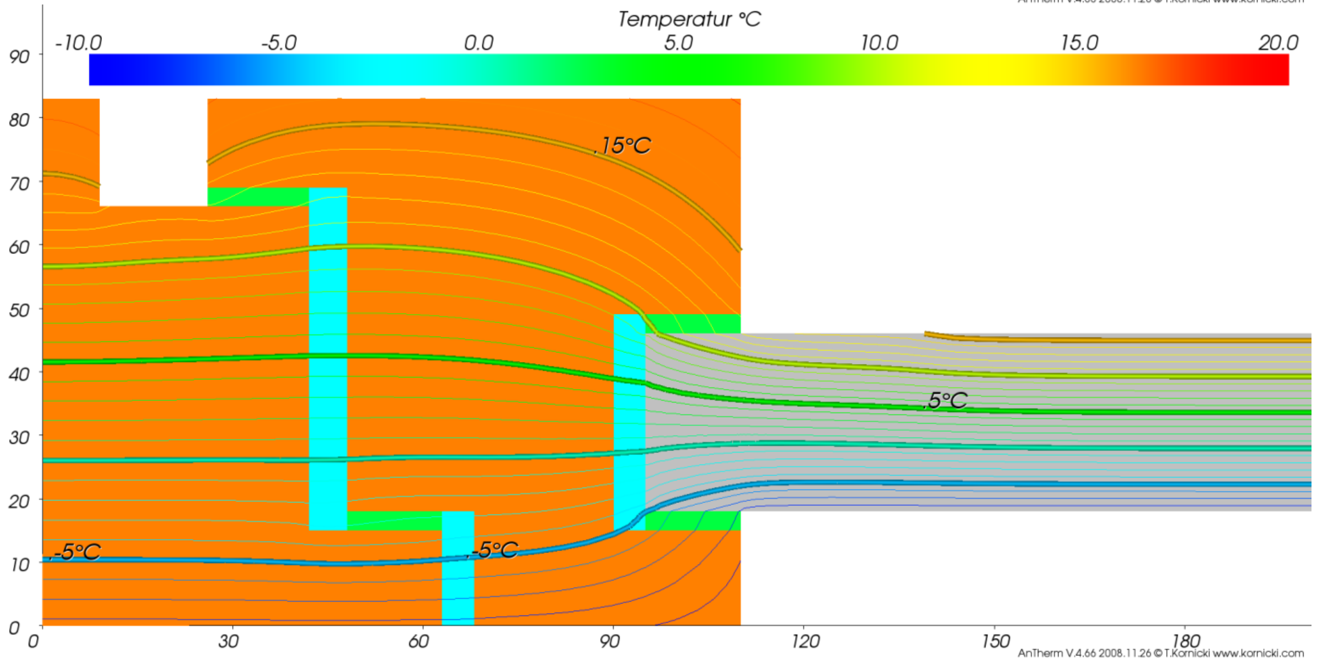

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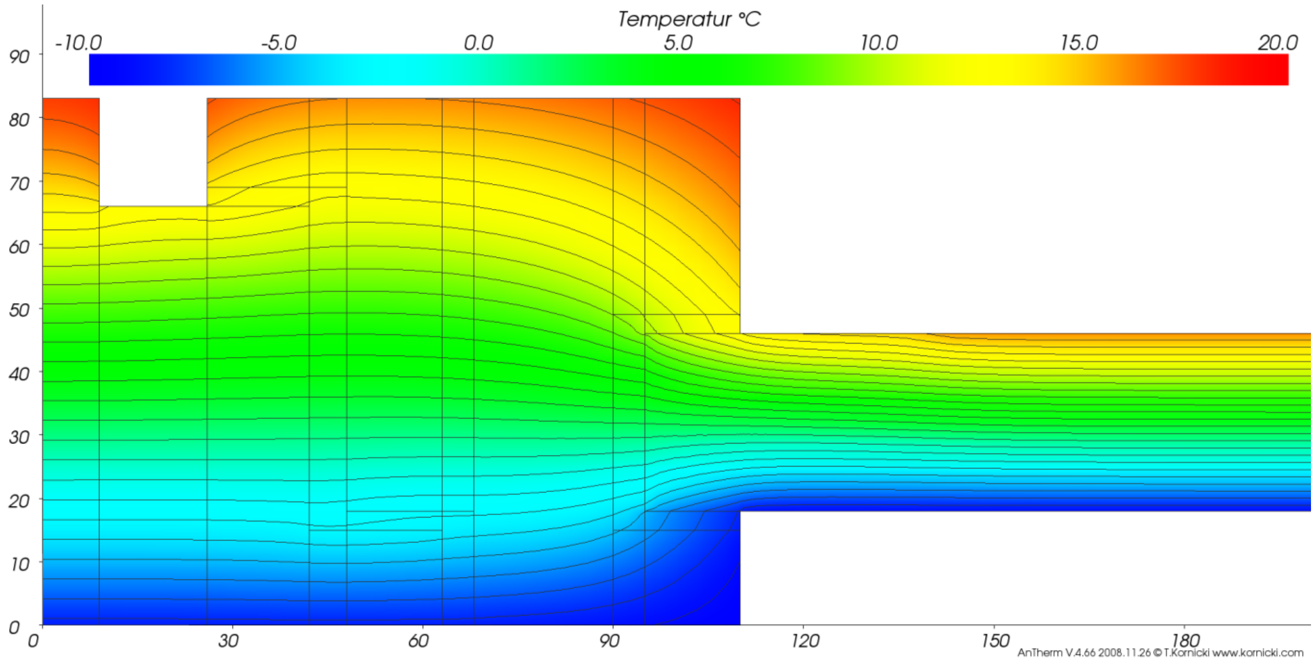

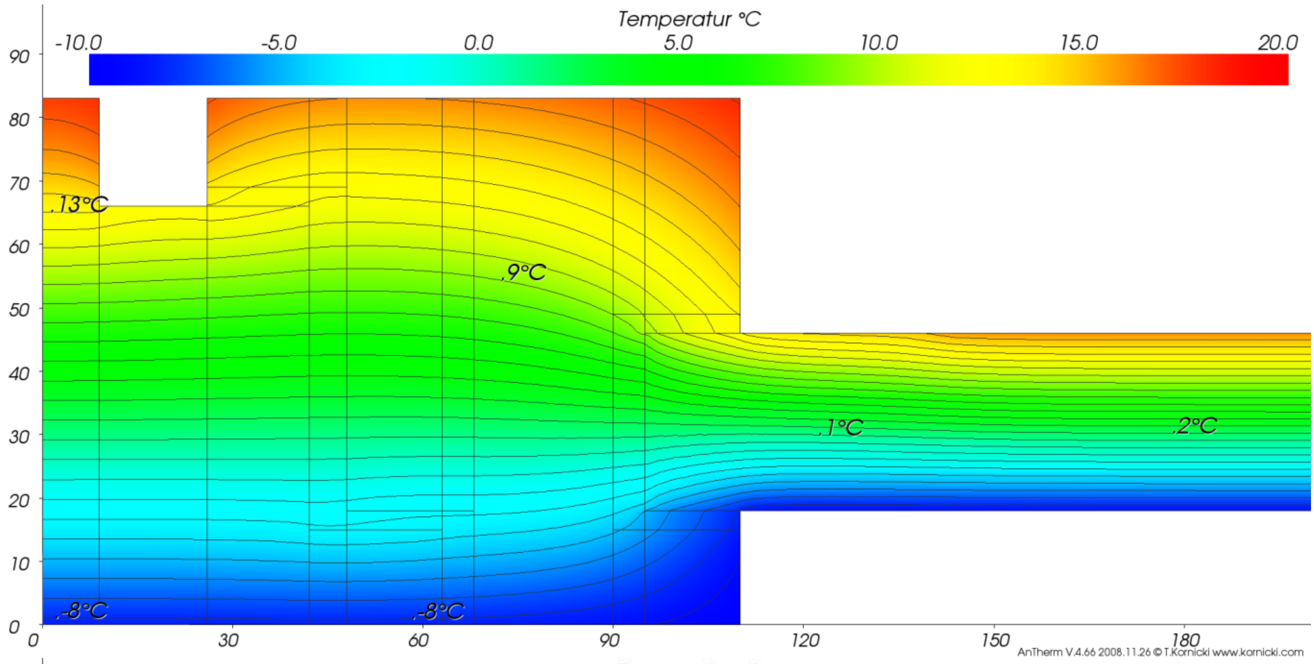

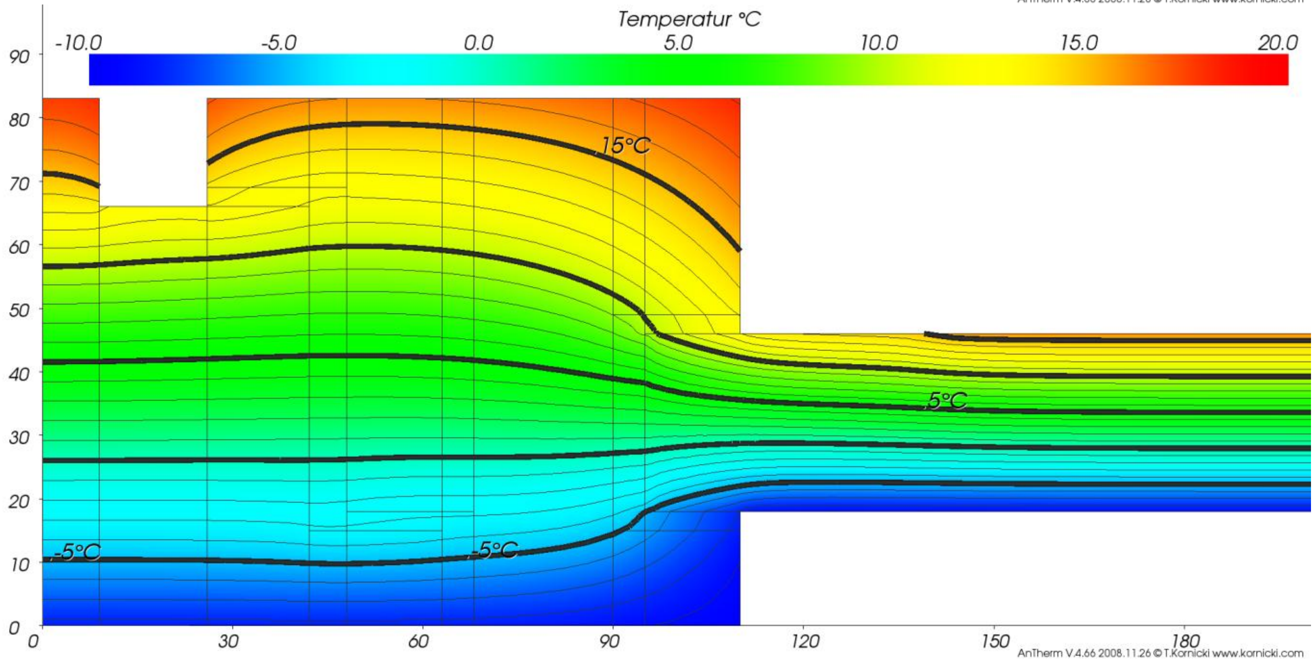

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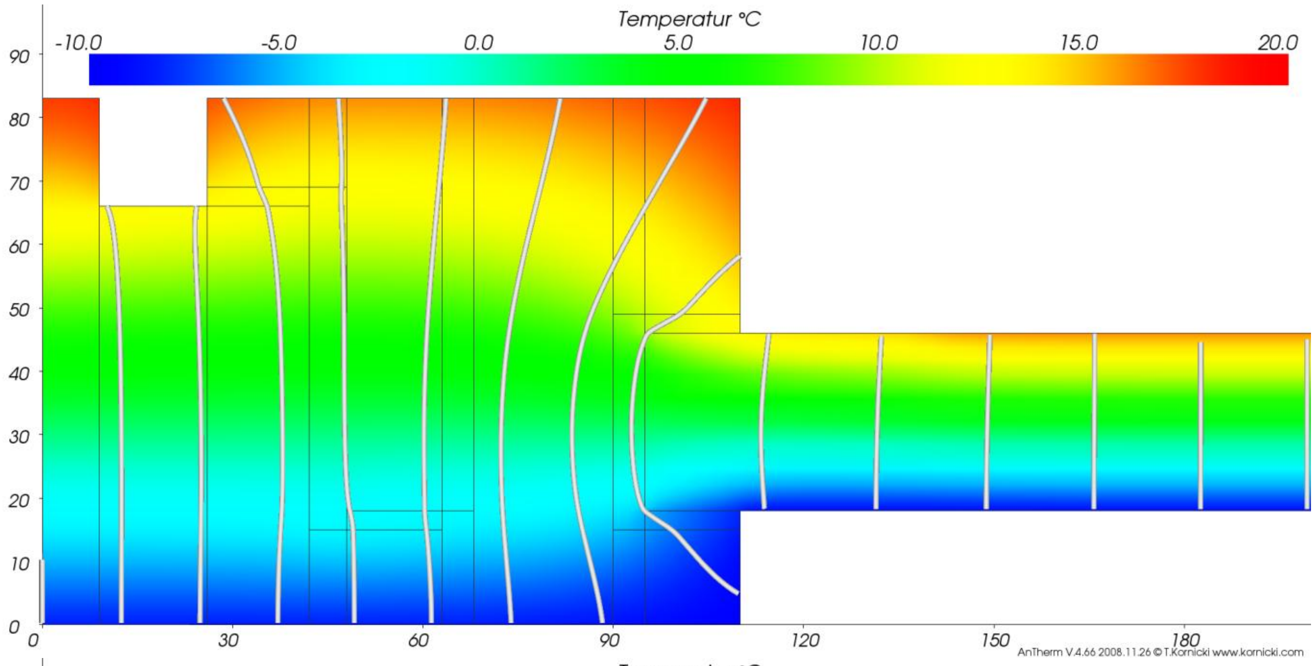

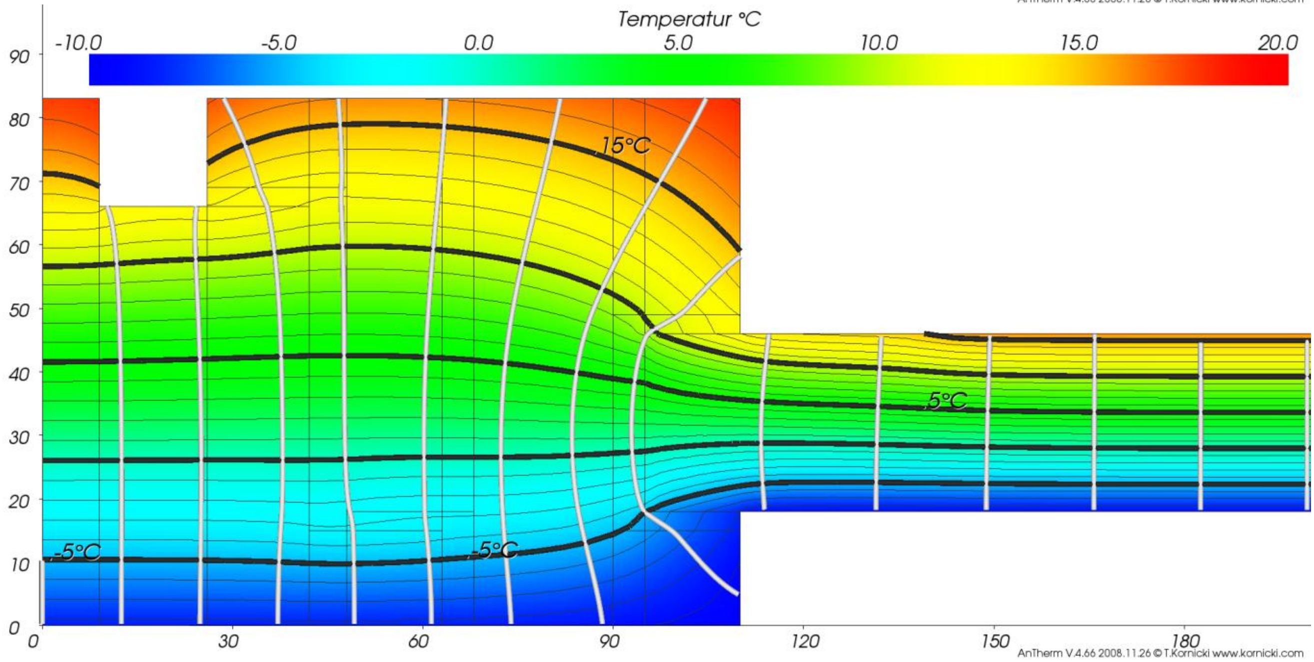

Quellkode der Projektdatei D_4.antherm


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Prüfreferenzfall 5

Validierungsberechnung (Unterleitungsraster 3.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 6.000 Zellen = Gleichungen)
    b. Leitwerte

Quellkode der Projektdatei D_5.antherm

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 5 (siehe Bild D.5)
Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_5 3k Zellen\D_5.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

1. Raumzelle - (19, 96, 0) x (298, 161, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.692308
2. Raumzelle - (19, 16, 0) x (298, 96, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.692308
3. Raumzelle - (0, 16, 0) x (19, 96, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
4. Raumzelle - (0, -19, 0) x (298, 16, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
5. Baustoffzelle - (19, 0, 0) x (108, 145, 1000) Bez.: "Holz" λ = 0.13
6. Raumzelle - (59, 96, 0) x (108, 145, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.692308
7. Raumzelle - (93, 89, 0) x (108, 96, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.692308
8. Raumzelle - (19, 0, 0) x (30, 14, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
9. Baustoffzelle - (0, 88, 0) x (19, 96, 1000) Bez.: "Aluminium" λ = 160
10. Baustoffzelle - (12, 77, 0) x (19, 88, 1000) Bez.: "Aluminium" λ = 160
11. Baustoffzelle - (10, 14, 0) x (19, 77, 1000) Bez.: "Aluminium" λ = 160
12. Baustoffzelle - (10, 14, 0) x (30, 15, 1000) Bez.: "Aluminium" λ = 160
13. Baustoffzelle - (30, 0, 0) x (56, 15, 1000) Bez.: "Aluminium" λ = 160
14. Baustoffzelle - (56, 0, 0) x (71, 1, 1000) Bez.: "Aluminium" λ = 160
15. Baustoffzelle - (71, 0, 0) x (84, 15, 1000) Bez.: "Aluminium" λ = 160
16. Baustoffzelle - (84, 6, 0) x (90, 15, 1000) Bez.: "Aluminium" λ = 160
17. Raumzelle - (84, 0, 0) x (108, 6, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
18. Baustoffzelle - (0, 89, 0) x (19, 96, 1000) Bez.: "L1" λ = 0.071
19. Baustoffzelle - (13, 15, 0) x (19, 96, 1000) Bez.: "L1" λ = 0.12$_{1\,5}$
20. Baustoffzelle - (11, 15, 0) x (13, 40, 1000) Bez.: "L1" λ = 0.071
21. Baustoffzelle - (11, 40, 0) x (12, 77, 1000) Bez.: "L2" λ = 0.029
22. Baustoffzelle - (30, 11, 0) x (36, 14, 1000) Bez.: "L3" λ = 0.308
23. Baustoffzelle - (31, 1, 0) x (36, 11, 1000) Bez.: "L3" λ = 0.308
24. Baustoffzelle - (36, 1, 0) x (37, 6, 1000) Bez.: "L3" λ = 0.308
25. Baustoffzelle - (37, 1, 0) x (56, 15, 1000) Bez.: "L3" λ = 0.308
26. Baustoffzelle - (51, 15, 0) x (56, 63, 1000) Bez.: "L3" λ = 0.308
27. Baustoffzelle - (71, 6, 0) x (73, 15, 1000) Bez.: "L5" λ = 0.046
28. Baustoffzelle - (71, 1, 0) x (83, 6, 1000) Bez.: "L4" λ = 0.122
29. Baustoffzelle - (74, 6, 0) x (83, 14, 1000) Bez.: "L4" λ = 0.122
30. Baustoffzelle - (83, 11, 0) x (89, 14, 1000) Bez.: "L4" λ = 0.122
31. Baustoffzelle - (84, 6, 0) x (89, 11, 1000) Bez.: "L4" λ = 0.122
32. Baustoffzelle - (90, 6, 0) x (108, 35, 1000) Bez.: "Aluminium" λ = 160
33. Baustoffzelle - (90, 7, 0) x (95, 35, 1000) Bez.: "L6" λ = 0.108
34. Baustoffzelle - (59, 66, 0) x (62, 88, 1000) Bez.: "L7" λ = 0.074
35. Baustoffzelle - (59, 89, 0) x (62, 96, 1000) Bez.: "L8" λ = 0.086
36. Baustoffzelle - (51, 63, 0) x (71, 66, 1000) Bez.: "EPDM" λ = 0.25
37. Baustoffzelle - (62, 57, 0) x (65, 63, 1000) Bez.: "EPDM" λ = 0.25
38. Baustoffzelle - (59, 88, 0) x (71, 89, 1000) Bez.: "Aluminium" λ = 160
39. Baustoffzelle - (95, 9, 0) x (298, 33, 1000) Bez.: "Dämmblock" λ = 0.035
40. Baustoffzelle - (95, 7, 0) x (108, 9, 1000) Bez.: "EPDM" λ = 0.25
41. Baustoffzelle - (95, 33, 0) x (108, 35, 1000) Bez.: "EPDM" λ = 0.25
42. Raumzelle - (59, 96, 0) x (89, 145, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5
43. Raumzelle - (93, 89, 0) x (100, 96, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5
44. Raumzelle - (108, 33, 0) x (164, 89, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5

Räume :

Room 0
Room 1

Wärmequellen :

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 5 (siehe Bild D.5)
Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 5 3k Zellen\D 5.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Room 0
- α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Room 1
- α= 7.692308 W/(m²K) Rs= 0.1300 m²K/W : Innenraum
- α= 5 W/(m²K) Rs= 0.2000 m²K/W : Innenraum mit Rsi = 0,20 m²K/W

Wärmequellen : keine

Baustoffe :
- λ= 160 W/(m K) : Aluminium
- λ= 0.035 W/(m K) : Dämmblock
- λ= 0.25 W/(m K) : EPDM
- λ= 0.13 W/(m K) : Holz
- λ= 0.071 W/(m K) : L1
- λ= 0.1215 W/(m K) : L1
- λ= 0.029 W/(m K) : L2
- λ= 0.308 W/(m K) : L3
- λ= 0.122 W/(m K) : L4
- λ= 0.046 W/(m K) : L5
- λ= 0.108 W/(m K) : L6
- λ= 0.074 W/(m K) : L7
- λ= 0.086 W/(m K) : L8

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> @ BackLeft: (0, 88, 0) x (0, 153, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Aluminium	160.0000	1.0000			0.0000	
L1	0.0710	7.0000			0.0986	
NONAME			0.0000		0.0000	
			U-Wert:	**7.2151**	**[W/m²K]**	

Room 0 <-> Room 1 @ BackRight: (298, 9, 0) x (298, 33, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Dämmblock	0.0350	24.0000			0.6857	
Room 1/Innenraum			0.1300	7.6923	0.1300	Room 1
			U-Wert:	**1.1686**	**[W/m²K]**	

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 5 (siehe Bild D.5)
Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_5 3k Zellen\D_5.antherm

Anzahl der bilanzierten Zellen: 3093

Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,403673
Room 1	0,403673	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-1.14153e-012	0,403673	-2.82786e-012
Room 1	1.14148e-012	0,403673	2.82772e-012

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 5 (siehe Bild D.5)
Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_5 3k Zellen\D_5.antherm

Anzahl der bilanzierten Zellen: 3093 (Knotenzahl = 37995)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Room 0	-10,00	-9,29	-7,89	100.00 %	
Room 1	20,00	8,56	18,39	47.65 %	0,62

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,976336	0,381461
g(Room 1)	0,023664	0,618539

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Room 0	30,0000	11,5000		-9.29	
Room 1	108,0000	33,5000		8.56	0,62

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 5 (siehe Bild D.5)
Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_5 6k Zellen\D_5.antherm

Anzahl der bilanzierten Zellen: 5440

Thermische Leitwerte [W / K]

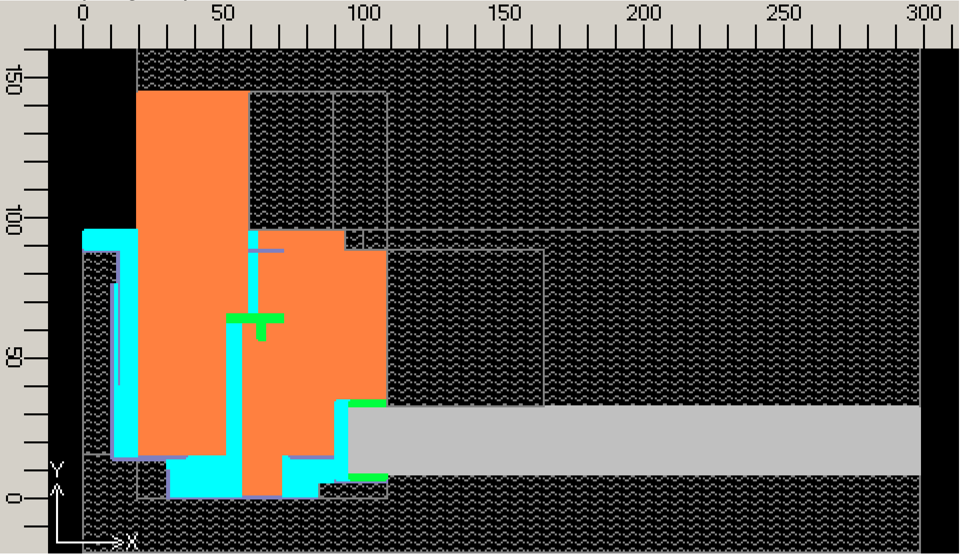
Raum\Raum	Room 0	Room 1
Room 0		0,404031
Room 1	0,404031	

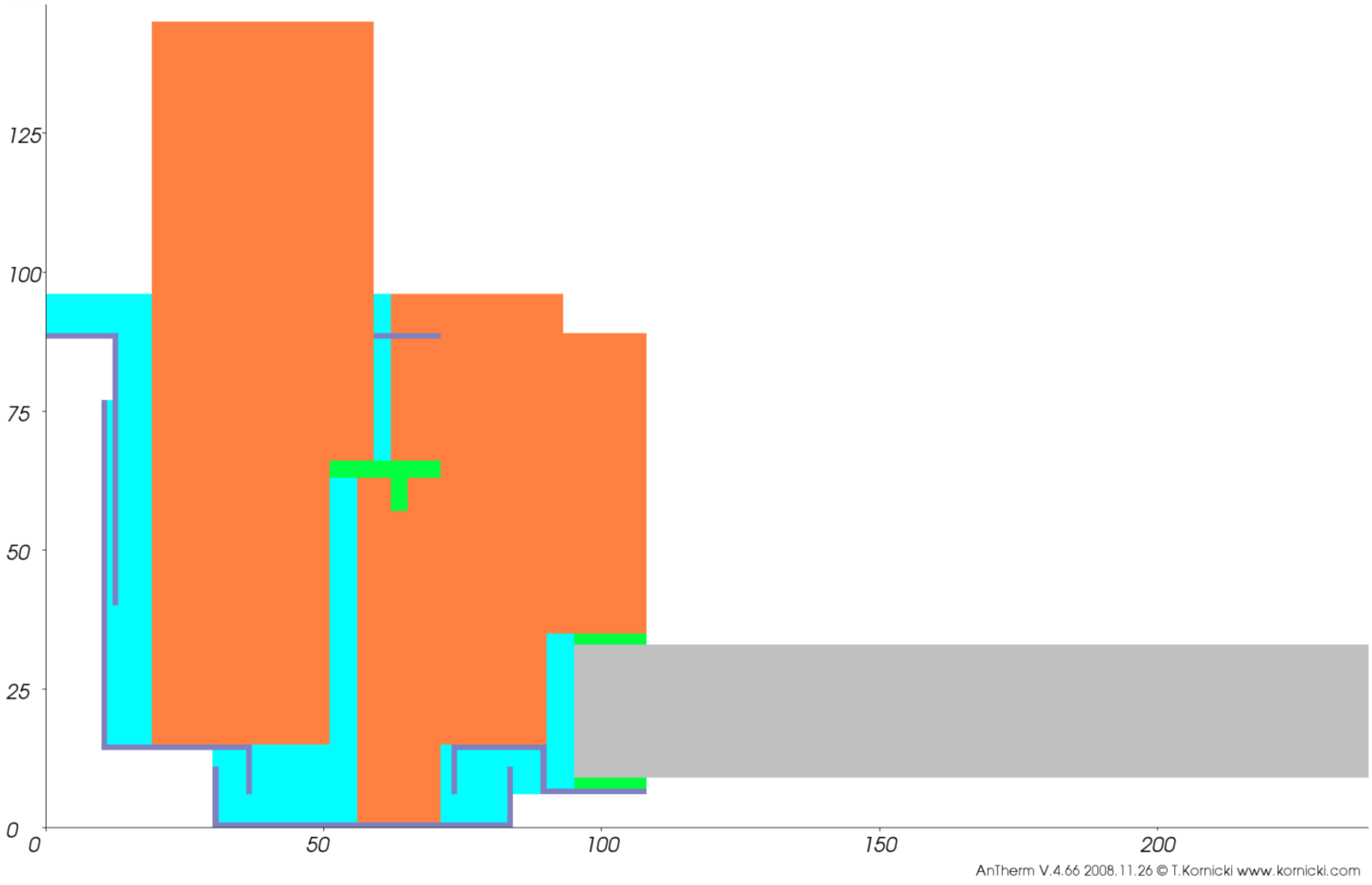
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	8.46551e-012	0,404031	2.09526e-011
Room 1	-8.46562e-012	0,404031	-2.09529e-011

Prüfreferenzfall 5

Bilder (Eingabe)





Prüfreferenzfall 5

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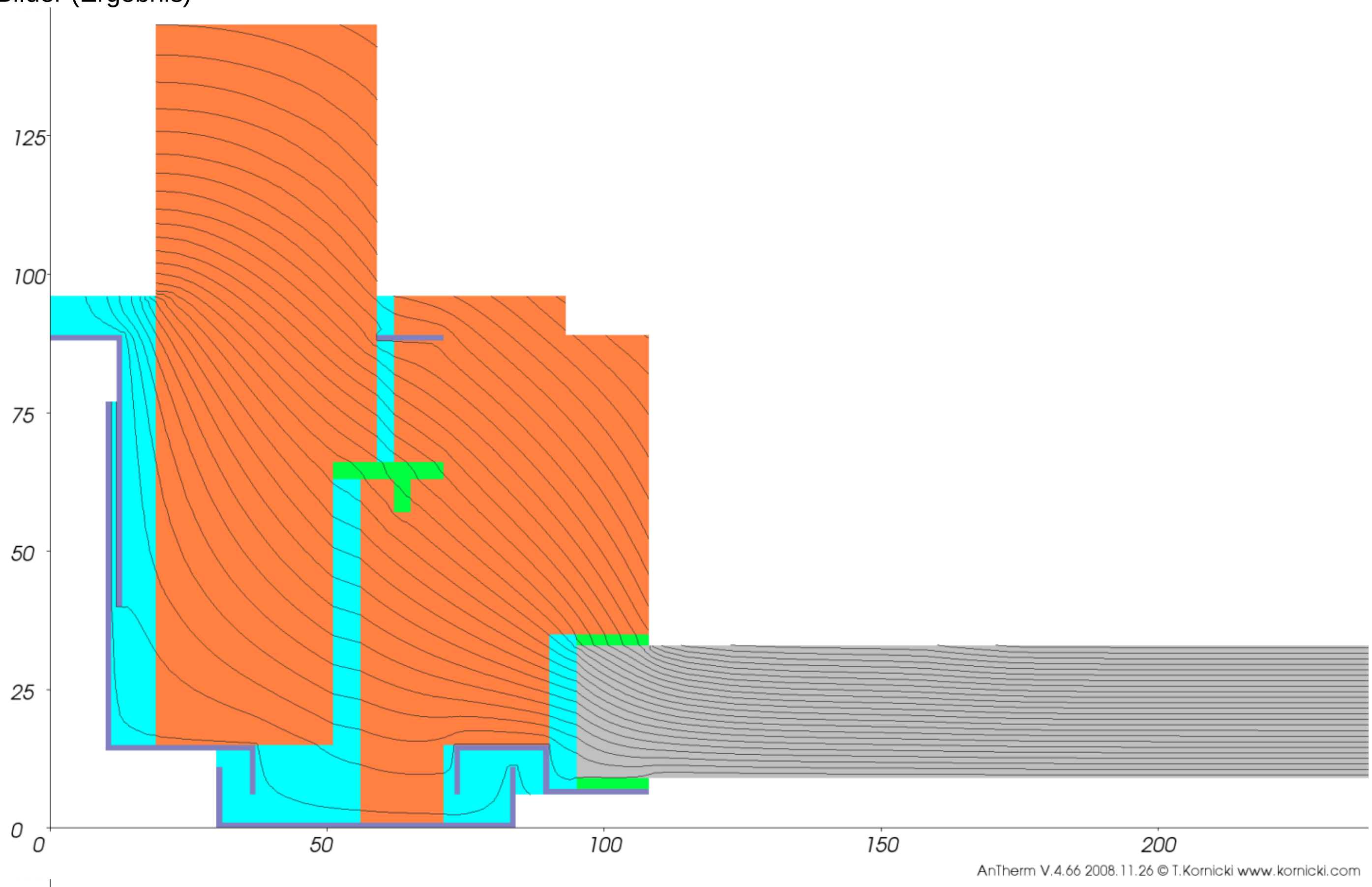

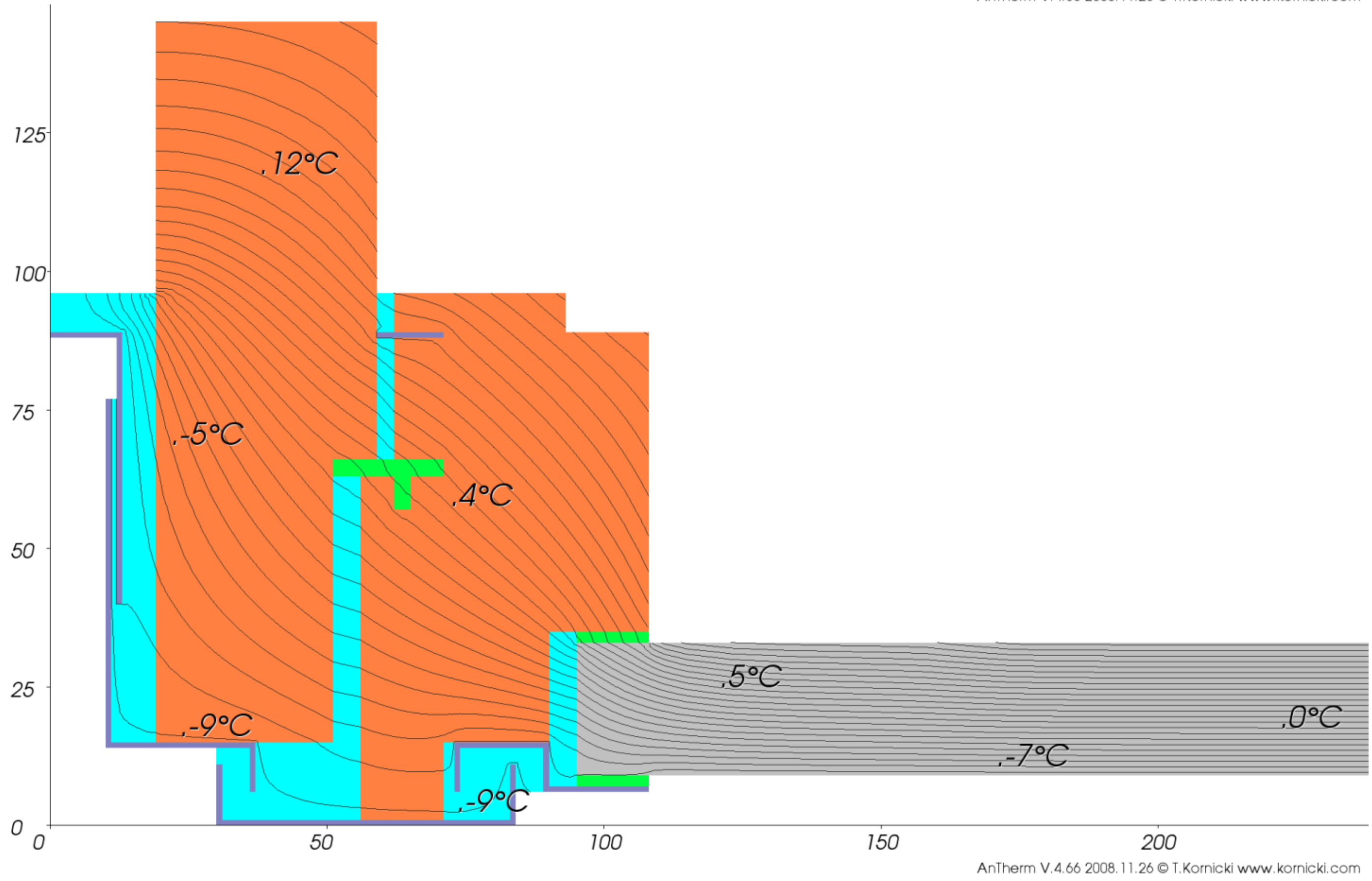

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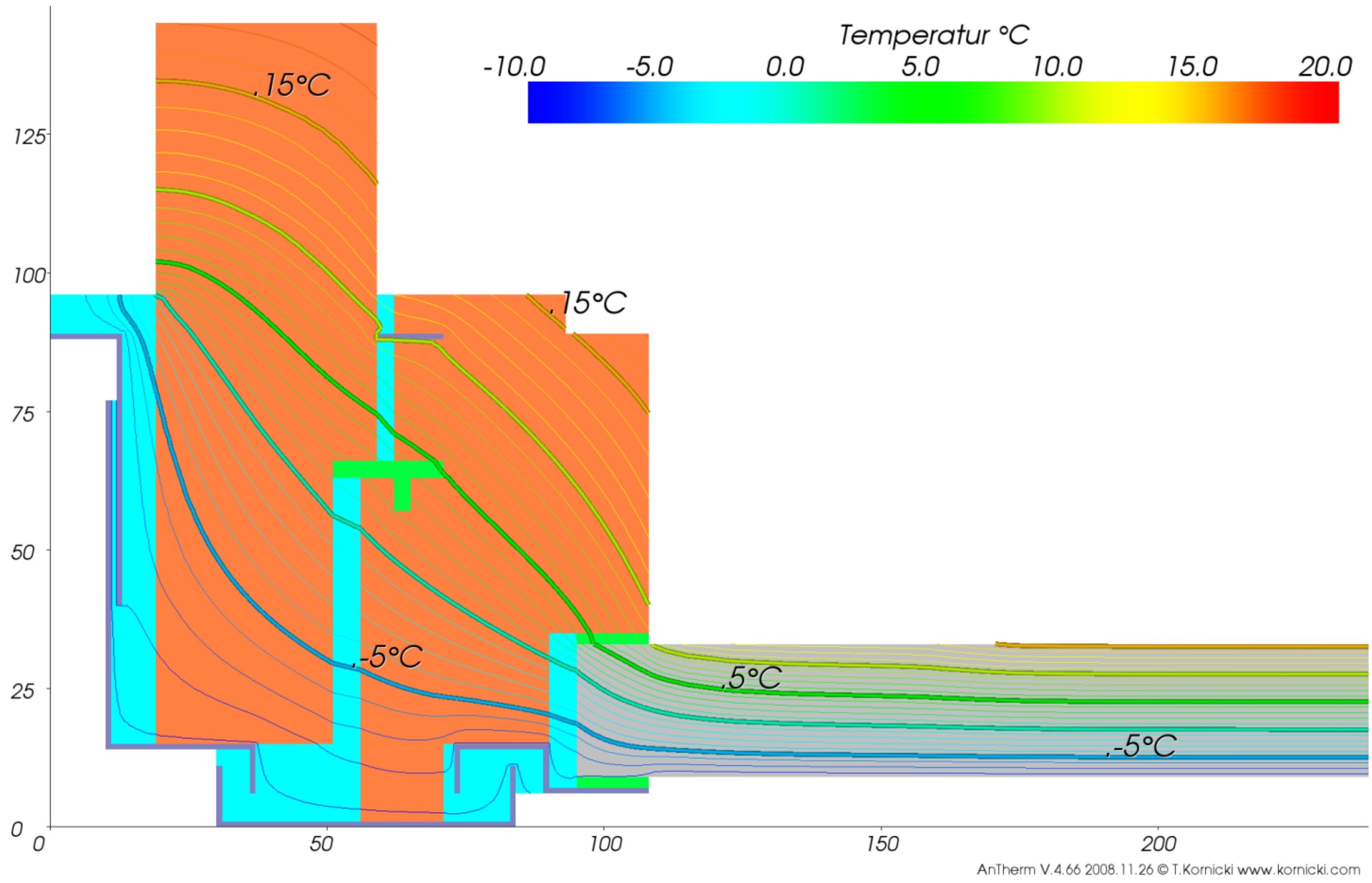

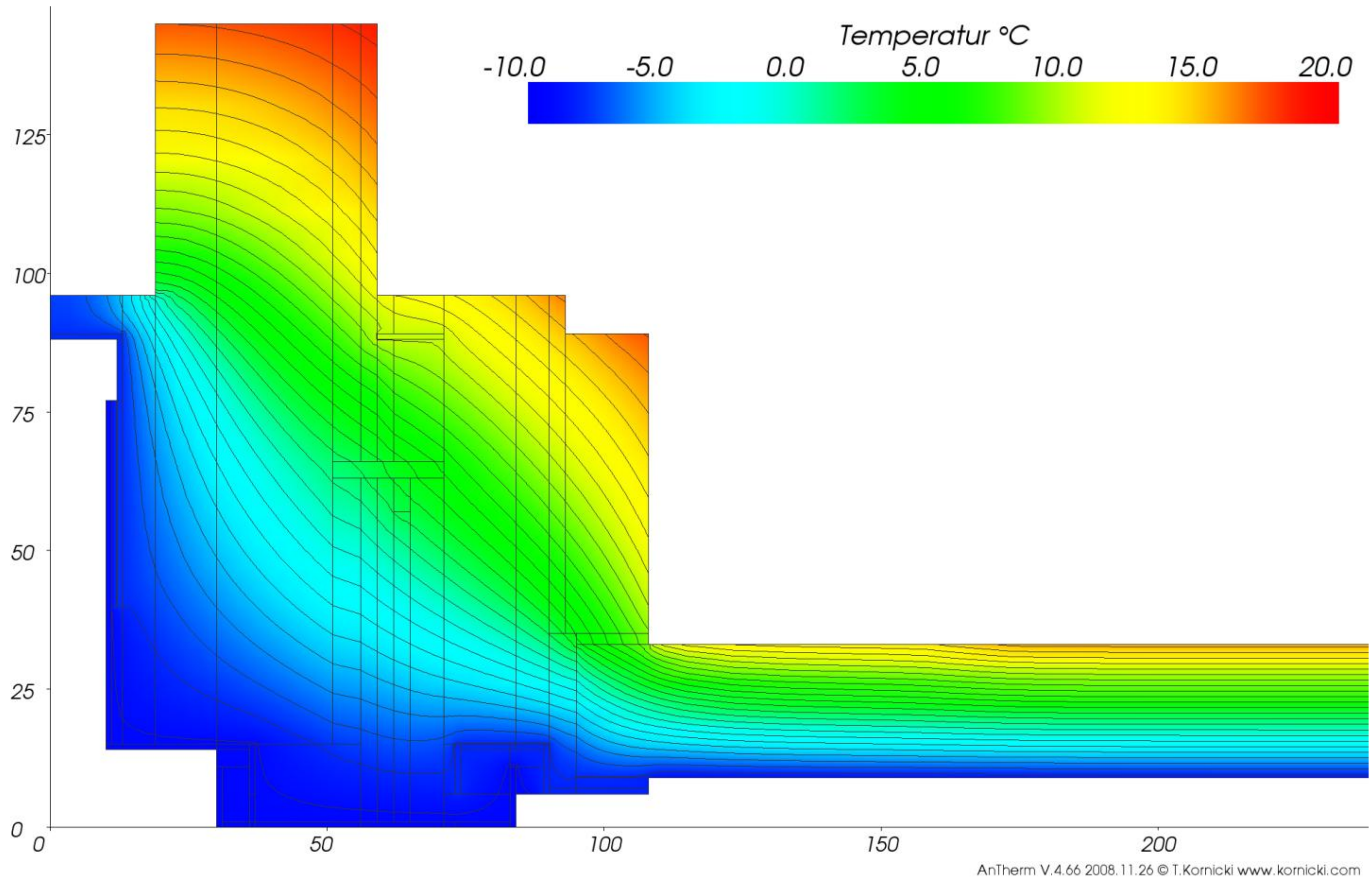

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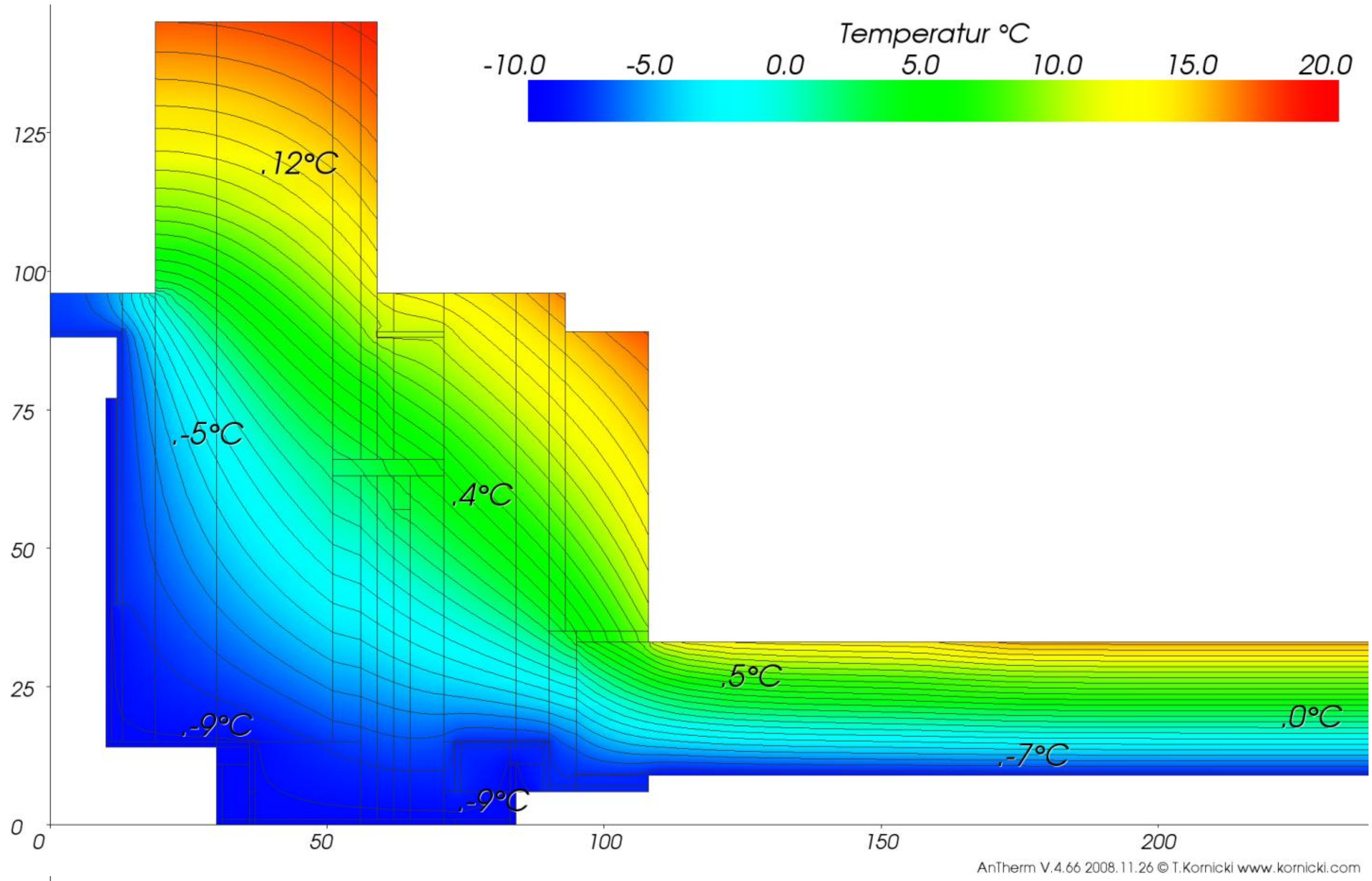

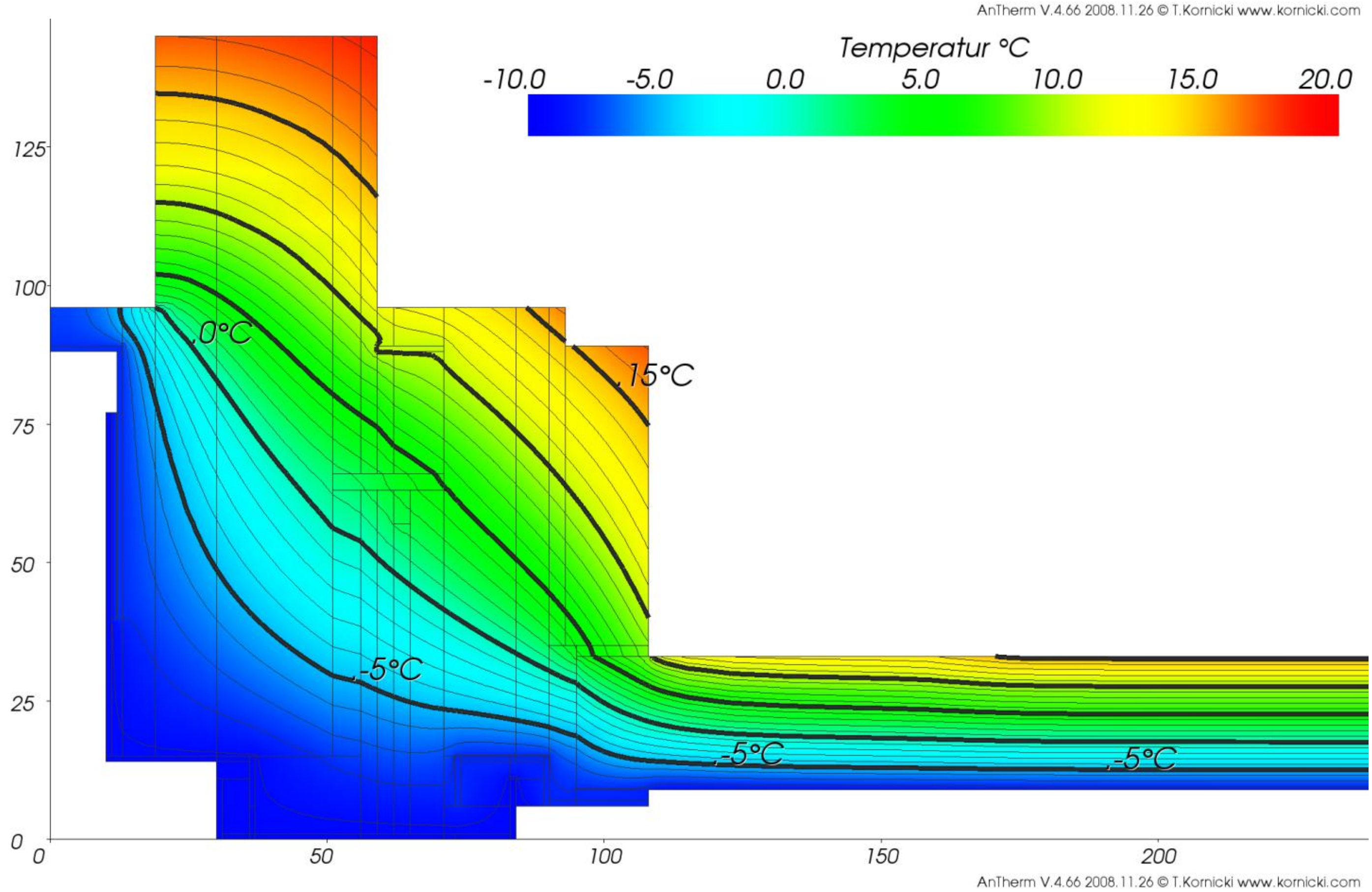

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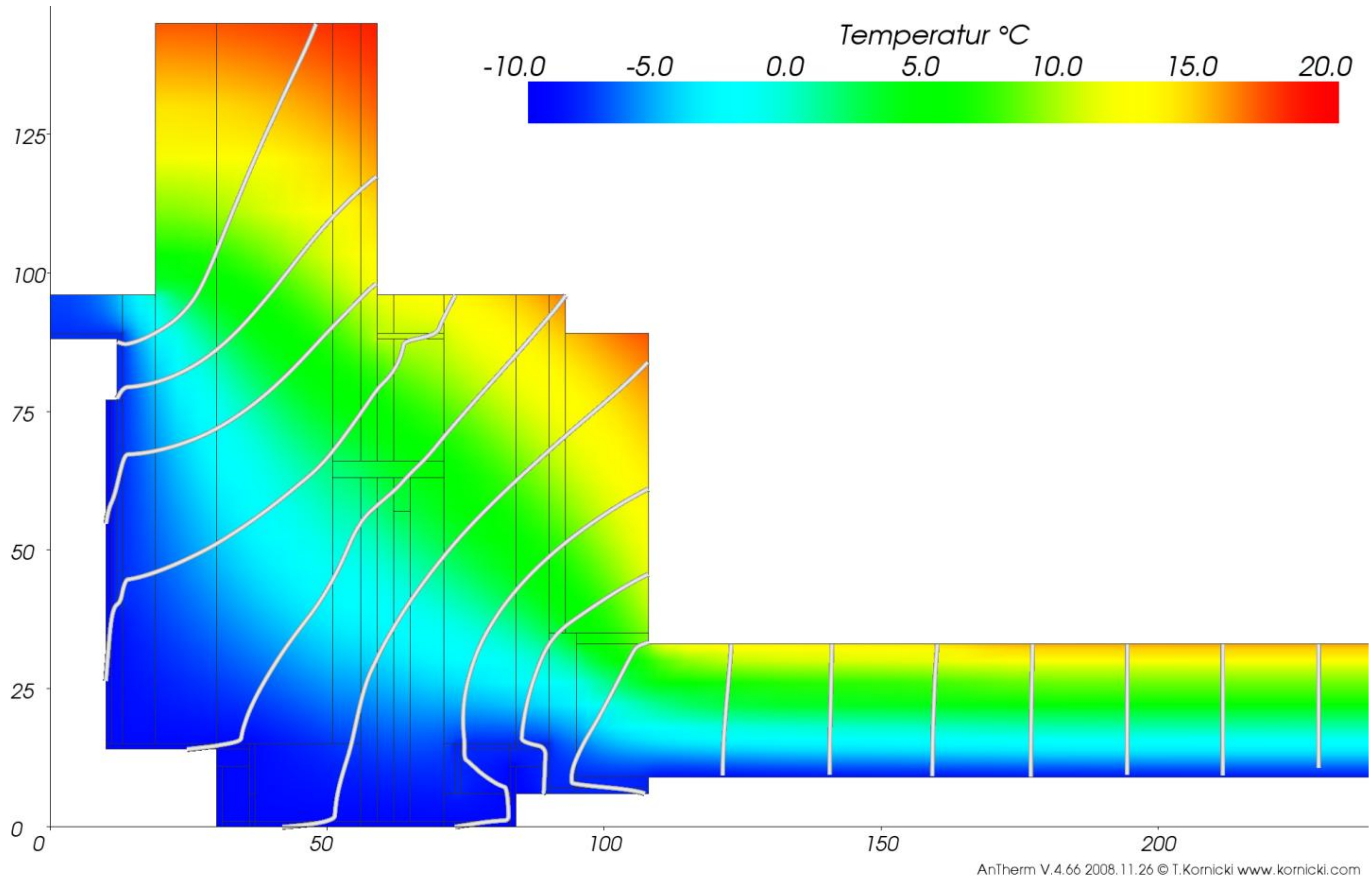

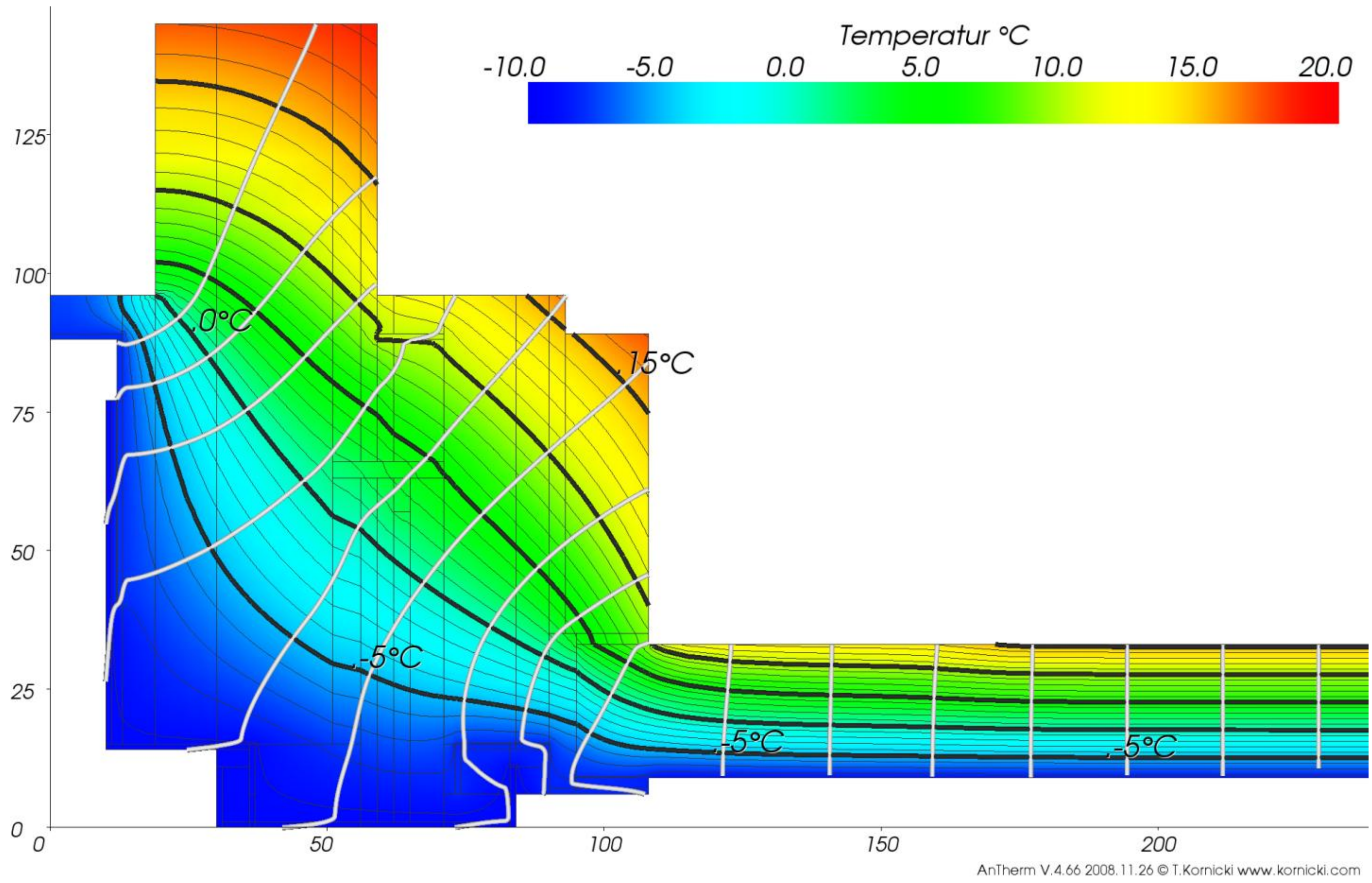

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          <Name>Innenraum mit Rsi = 0,20 m²K/W</Name>
          <Alfa>5</Alfa>
        </ElementSurface>
        <Appearance />
        <ElementRoom>
          <Name>Room 1</Name>
        </ElementRoom>
      </ObservedElement3D>
    </Elements>
  </ObservedLayer>
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</Model>
<Description>
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 <string>Prüfreferenzfall 5 (siehe Bild D.5)</string>
 <string>Dachfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 89 mm</string>
 <string>stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008</string>
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 <MinStep>1</MinStep>
 <MaxStep>10</MaxStep>
</FineGridParameters>
<SolverParameters>
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  <OmegaDelta>1E-12</OmegaDelta>
  <OmegaMaxNoOfIterations>2500</OmegaMaxNoOfIterations>
 </OmegaOptimizer>
 <IterationControl>
  <Delta>1E-12</Delta>
  <Version>20080813</Version>
 </IterationControl>
 <OmegaControl />
 <Instationary />
</SolverParameters>
<TemplateBoundaryConditionValues>
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  <Name>Room 0</Name>
  <Value>-10</Value>
  <RelHumidityPercent>80</RelHumidityPercent>
 </BoundaryCondition>
 <BoundaryCondition xsi:type="Space">
  <Name>Room 1</Name>
  <Value>20</Value>
  <RelHumidityPercent>53</RelHumidityPercent>
 </BoundaryCondition>
</TemplateBoundaryConditionValues>
</Project>
```

Prüfreferenzfall 6

Validierungsberechnung (Unterleitungsraster 14.000 Zellen = Gleichungen)

6. Eingabedetails
7. Bauteilliste
8. Leitwerte
9. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

10. (Unterleitungsraster 28.000 Zellen = Gleichungen)
    c. Leitwerte

Quellkode der Projektdatei D_6.antherm

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 14k Zellen\D_6.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, 60, 0) x (285, 100, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.692308$
    2. Raumzelle - (0, -20, 0) x (285, 60, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    3. Baustoffzelle - (0, 0, 0) x (95, 85, 1000) Bez.: "Aluminium" $\lambda = 160$
    4. Raumzelle - (27, 2, 0) x (43, 38, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    5. Raumzelle - (41, 38, 0) x (43, 40, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    6. Raumzelle - (27, 38, 0) x (33, 40, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    7. Raumzelle - (43, 0, 0) x (95, 48, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    8. Raumzelle - (43, 81, 0) x (95, 85, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.692308$
    9. Baustoffzelle - (0, 56, 0) x (13, 83, 1000) Bez.: "L1" $\lambda = 0.265$
    10. Baustoffzelle - (0, 42, 0) x (3, 56, 1000) Bez.: "L1" $\lambda = 0.265$
    11. Baustoffzelle - (3, 46, 0) x (5, 52, 1000) Bez.: "L1" $\lambda = 0.265$
    12. Baustoffzelle - (15, 64, 0) x (31, 83, 1000) Bez.: "L2" $\lambda = 0.149$
    13. Baustoffzelle - (27, 50, 0) x (62, 77, 1000) Bez.: "L2" $\lambda = 0.149$
    14. Baustoffzelle - (43, 77, 0) x (62, 79, 1000) Bez.: "L2" $\lambda = 0.149$
    15. Baustoffzelle - (62, 73, 0) x (73, 79, 1000) Bez.: "L2" $\lambda = 0.149$
    16. Baustoffzelle - (62, 50, 0) x (73, 56, 1000) Bez.: "L2" $\lambda = 0.149$
    17. Baustoffzelle - (62, 62, 0) x (64, 67, 1000) Bez.: "L2" $\lambda = 0.149$
    18. Baustoffzelle - (27, 40, 0) x (43, 46, 1000) Bez.: "Polyamid" $\lambda = 0.25$
    19. Raumzelle - (27, 40, 0) x (31, 42, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    20. Baustoffzelle - (27, 44, 0) x (31, 50, 1000) Bez.: "L2" $\lambda = 0.149$
    21. Baustoffzelle - (41, 81, 0) x (43, 83, 1000) Bez.: "L3" $\lambda = 0.031$
    22. Baustoffzelle - (31, 81, 0) x (33, 83, 1000) Bez.: "L3" $\lambda = 0.031$
    23. Baustoffzelle - (41, 46, 0) x (43, 48, 1000) Bez.: "L3" $\lambda = 0.031$
    24. Baustoffzelle - (31, 46, 0) x (33, 48, 1000) Bez.: "L3" $\lambda = 0.031$
    25. Baustoffzelle - (33, 79, 0) x (41, 83, 1000) Bez.: "Polyester" $\lambda = 0.14$
    26. Baustoffzelle - (33, 38, 0) x (41, 42, 1000) Bez.: "Polyester" $\lambda = 0.14$
    27. Baustoffzelle - (33, 44, 0) x (41, 48, 1000) Bez.: "Polyester" $\lambda = 0.14$
    28. Baustoffzelle - (24, 50, 0) x (27, 58, 1000) Bez.: "Polyamid" $\lambda = 0.25$
    29. Baustoffzelle - (22, 25, 0) x (27, 50, 1000) Bez.: "Polyamid" $\lambda = 0.25$
    30. Baustoffzelle - (22, 17, 0) x (24, 25, 1000) Bez.: "Polyamid" $\lambda = 0.25$
    31. Baustoffzelle - (15, 48, 0) x (22, 62, 1000) Bez.: "L4" $\lambda = 0.139$
    32. Baustoffzelle - (13, 46, 0) x (15, 52, 1000) Bez.: "L4" $\lambda = 0.139$
    33. Baustoffzelle - (15, 46, 0) x (24, 48, 1000) Bez.: "L4" $\lambda = 0.139$
    34. Baustoffzelle - (15, 42, 0) x (24, 46, 1000) Bez.: "L4" $\lambda = 0.139$
    35. Baustoffzelle - (19, 28, 0) x (24, 42, 1000) Bez.: "L4" $\lambda = 0.139$
    36. Baustoffzelle - (5, 44, 0) x (13, 54, 1000) Bez.: "Polyurethan" $\lambda = 0.25$
    37. Baustoffzelle - (64, 58, 0) x (73, 71, 1000) Bez.: "Polyurethan" $\lambda = 0.25$
    38. Baustoffzelle - (73, 62, 0) x (75, 67, 1000) Bez.: "L5" $\lambda = 0.075$
    39. Baustoffzelle - (75, 50, 0) x (77, 79, 1000) Bez.: "L5" $\lambda = 0.075$
    40. Baustoffzelle - (77, 50, 0) x (95, 79, 1000) Bez.: "EPDM" $\lambda = 0.25$
    41. Baustoffzelle - (80, 52, 0) x (285, 77, 1000) Bez.: "Dämmblock" $\lambda = 0.035$
    42. Baustoffzelle - (0, 2, 0) x (5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    43. Baustoffzelle - (5, 2, 0) x (5.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    44. Baustoffzelle - (5.5, 4.5, 0) x (6, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    45. Baustoffzelle - (6, 7, 0) x (6.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    46. Baustoffzelle - (6.5, 9.5, 0) x (7, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    47. Baustoffzelle - (7, 12, 0) x (7.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    48. Baustoffzelle - (7.5, 14.5, 0) x (8, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    49. Baustoffzelle - (8, 17, 0) x (8.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    50. Baustoffzelle - (8.5, 19.5, 0) x (9, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    51. Baustoffzelle - (9, 22, 0) x (9.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    52. Baustoffzelle - (9.5, 24.5, 0) x (10, 42, 1000) Bez.: "L1" $\lambda = 0.265$
    53. Baustoffzelle - (10, 27, 0) x (10.5, 42, 1000) Bez.: "L1" $\lambda = 0.265$

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 14k Zellen\D_6.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

54. Baustoffzelle - (10.5, 29.5, 0) x (11, 42, 1000) Bez.: "L1" λ = 0.265
55. Baustoffzelle - (11, 32, 0) x (11.5, 42, 1000) Bez.: "L1" λ = 0.265
56. Baustoffzelle - (11.5, 34.5, 0) x (12, 42, 1000) Bez.: "L1" λ = 0.265
57. Baustoffzelle - (12, 37, 0) x (12.5, 42, 1000) Bez.: "L1" λ = 0.265
58. Baustoffzelle - (12.5, 39.5, 0) x (13, 42, 1000) Bez.: "L1" λ = 0.265
59. Baustoffzelle - (15, 17, 0) x (19, 42, 1000) Bez.: "L4" λ = 0.139
60. Baustoffzelle - (14.5, 17, 0) x (15, 39.5, 1000) Bez.: "L4" λ = 0.139
61. Baustoffzelle - (14, 17, 0) x (14.5, 37, 1000) Bez.: "L4" λ = 0.139
62. Baustoffzelle - (13.5, 17, 0) x (14, 34.5, 1000) Bez.: "L4" λ = 0.139
63. Baustoffzelle - (13, 17, 0) x (13.5, 32, 1000) Bez.: "L4" λ = 0.139
64. Baustoffzelle - (12.5, 17, 0) x (13, 29.5, 1000) Bez.: "L4" λ = 0.139
65. Baustoffzelle - (12, 17, 0) x (12.5, 27, 1000) Bez.: "L4" λ = 0.139
66. Baustoffzelle - (11.5, 17, 0) x (12, 24.5, 1000) Bez.: "L4" λ = 0.139
67. Baustoffzelle - (11, 17, 0) x (11.5, 22, 1000) Bez.: "L4" λ = 0.139
68. Baustoffzelle - (10.5, 17, 0) x (11, 19.5, 1000) Bez.: "L4" λ = 0.139
69. Raumzelle - (7.7, 0, 0) x (21.7, 1.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
70. Raumzelle - (8, 1.5, 0) x (22, 3, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
71. Raumzelle - (8.2, 3, 0) x (22.2, 4.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
72. Raumzelle - (8.5, 4.5, 0) x (22.5, 6, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
73. Raumzelle - (8.7, 6, 0) x (22.7, 7.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
74. Raumzelle - (9.2, 9, 0) x (23.2, 10.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
75. Raumzelle - (9.5, 10.5, 0) x (23.5, 12, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
76. Raumzelle - (9.7, 12, 0) x (23.7, 13.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
77. Raumzelle - (10, 13.5, 0) x (24, 15, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
78. Raumzelle - (9, 7.5, 0) x (23, 9, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
79. Raumzelle - (24, 2, 0) x (27, 3.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
80. Raumzelle - (24.2, 3.5, 0) x (27, 5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
81. Raumzelle - (24.7, 5, 0) x (27, 6.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
82. Raumzelle - (25, 6.5, 0) x (27, 8, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
83. Raumzelle - (25.2, 8, 0) x (27, 9.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
84. Raumzelle - (25.7, 11, 0) x (27, 12.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
85. Raumzelle - (26, 12.5, 0) x (27, 14, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
86. Raumzelle - (26.2, 14, 0) x (27, 15.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
87. Raumzelle - (26.5, 15.5, 0) x (27, 17, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
88. Raumzelle - (26.7, 17, 0) x (27, 18.5, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
89. Raumzelle - (25.5, 9.5, 0) x (27, 11, 1000) Raumbez.: "Raum 0" Oberfl.Bez.: "Außenraum" α = 25
90. Raumzelle - (43, 81, 0) x (47, 85, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5
91. Raumzelle - (95, 77, 0) x (99, 81, 1000) Raumbez.: "Raum 1" Oberfl.Bez.: "Innenraum mit Rsi = 0,20 m²K/W" α = 5

Räume :
  Raum 0
  Raum 1

Wärmequellen :

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 14k Zellen\D_6.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Raum 0

α= 25 W/(m²K) Rs=0.0400 m²K/W : Außenraum

Raumbez.: Raum 1

α= 7.692308 W/(m²K) Rs=0.1300 m²K/W : Innenraum

α= 5 W/(m²K) Rs=0.2000 m²K/W : Innenraum mit Rsi = 0,20 m²K/W

Wärmequellen : keine

Baustoffe :

λ= 160 W/(m K) : Aluminium
λ= 0.035 W/(m K) : Dämmblock
λ= 0.25 W/(m K) : EPDM
λ= 0.265 W/(m K) : L1
λ= 0.149 W/(m K) : L2
λ= 0.031 W/(m K) : L3
λ= 0.139 W/(m K) : L4
λ= 0.075 W/(m K) : L5
λ= 0.25 W/(m K) : Polyamid
λ= 0.14 W/(m K) : Polyester
λ= 0.25 W/(m K) : Polyurethan

Schichtaufbauten und U-Wert Berechnungen

Raum 0 <-> Raum 1 @ BackLeft: (0, 0, 0) x (0, 85, 0)

	λ	d	Rs	α	R	
Baustoff / Oberfläche	[W/mK]	[mm]	[m²K/W]	[W/m²K]	[m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Aluminium	160.0000	2.0000			0.0000	
L1	0.2650	81.0000			0.3057	
Aluminium	160.0000	2.0000			0.0000	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**2.1022**	**[W/m²K]**	

Raum 0 <-> Raum 1 @ BackRight: (285, 52, 0) x (285, 77, 0)

	λ	d	Rs	α	R	
Baustoff / Oberfläche	[W/mK]	[mm]	[m²K/W]	[W/m²K]	[m²K/W]	Raum
Raum 0/Außenraum			0.0400	25.0000	0.0400	Raum 0
Dämmblock	0.0350	25.0000			0.7143	
Raum 1/Innenraum			0.1300	7.6923	0.1300	Raum 1
			U-Wert:	**1.1309**	**[W/m²K]**	

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 14k Zellen\D_6.antherm

Anzahl der bilanzierten Zellen: 13755

Thermische Leitwerte [W / K]

Raum\Raum	Raum 0	Raum 1
Raum 0		0,653091
Raum 1	0,653091	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	5.25247e-013	0,653091	8.04247e-013
Raum 1	-5.25247e-013	0,653091	-8.04247e-013

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 14k Zellen\D_6.antherm

Anzahl der bilanzierten Zellen: 13755 (Knotenzahl = 167649)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Raum 0	-10,00	-9,13	-5,48	100.00 %	
Raum 1	20,00	1,77	15,59	29.69 %	0,39

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Raum 0	Raum 1
g(Raum 0)	0,971100	0,607675
g(Raum 1)	0,028900	0,392325

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Raum 0	41,0000	38,0000		-9.13	
Raum 1	13,2500	85,0000		1.77	0,39

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12/10/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 6 (siehe Bild D.6)
Gleitfensterrahmen und Füllung (Dämmstoff); Profilhöhe: 95 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_6 28k Zellen\D_6.antherm

Anzahl der bilanzierten Zellen: 28890

Thermische Leitwerte [W / K]

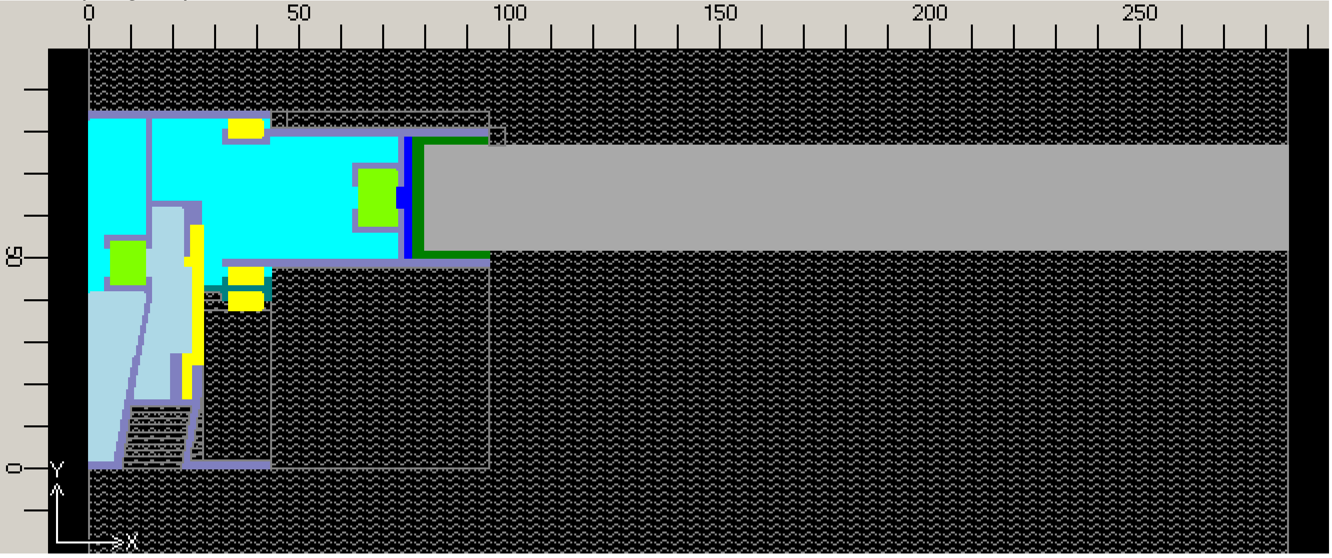
Raum\Raum	Raum 0	Raum 1
Raum 0		0,653954
Raum 1	0,653954	

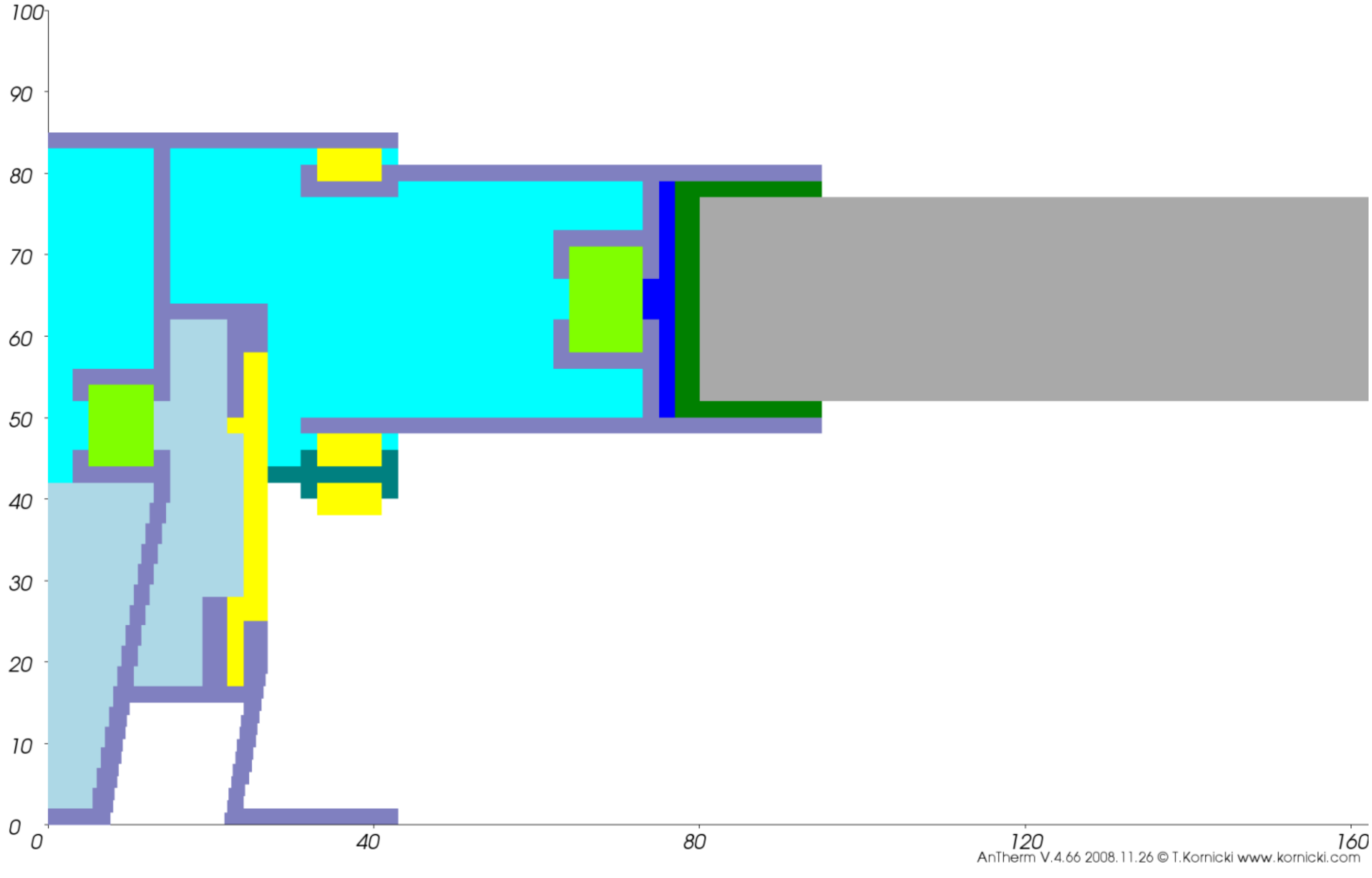
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Raum 0	1.30397e-009	0,653954	1.99398e-009
Raum 1	-1.30397e-009	0,653954	-1.99398e-009

Prüfreferenzfall 6

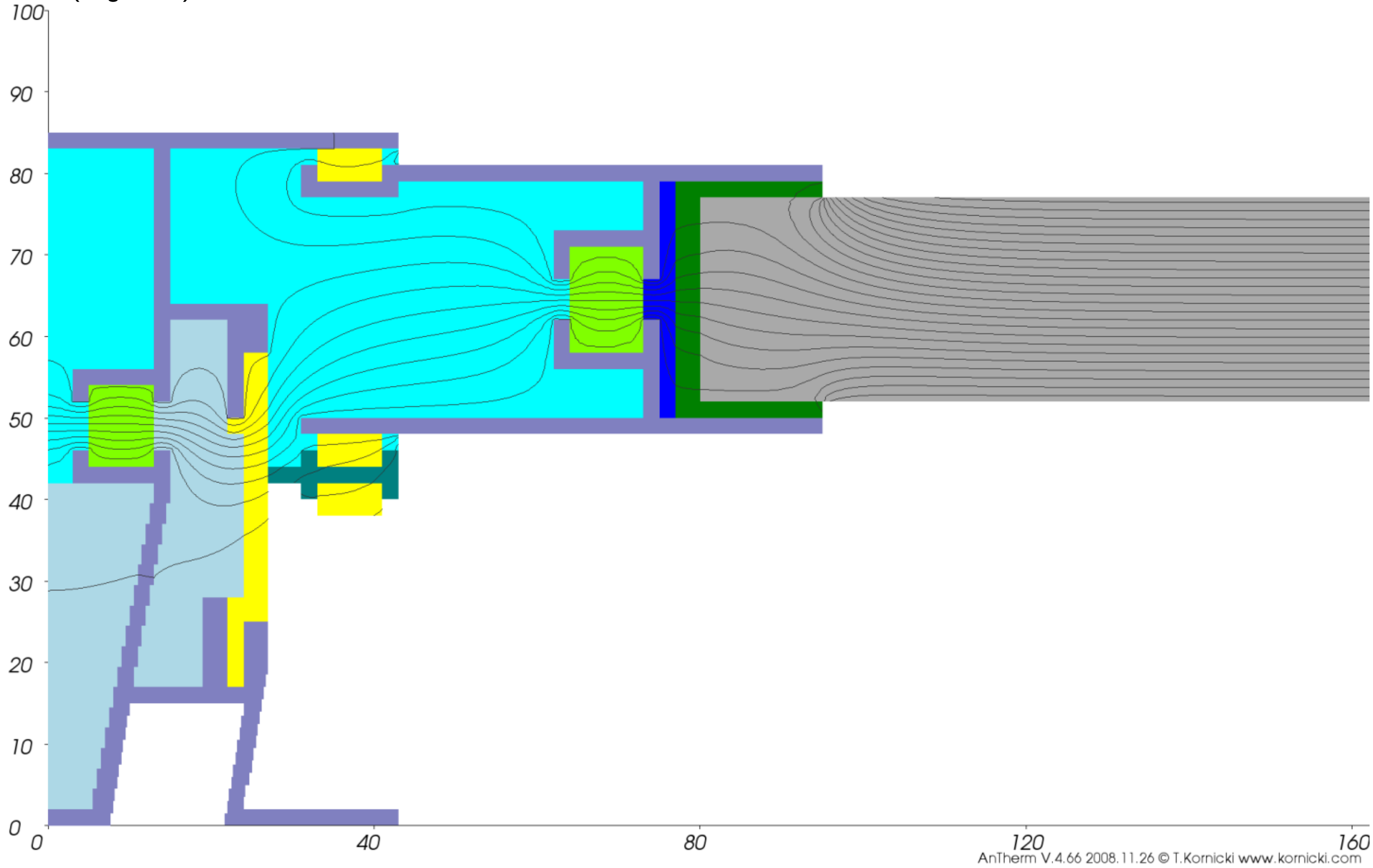
Bilder (Eingabe)

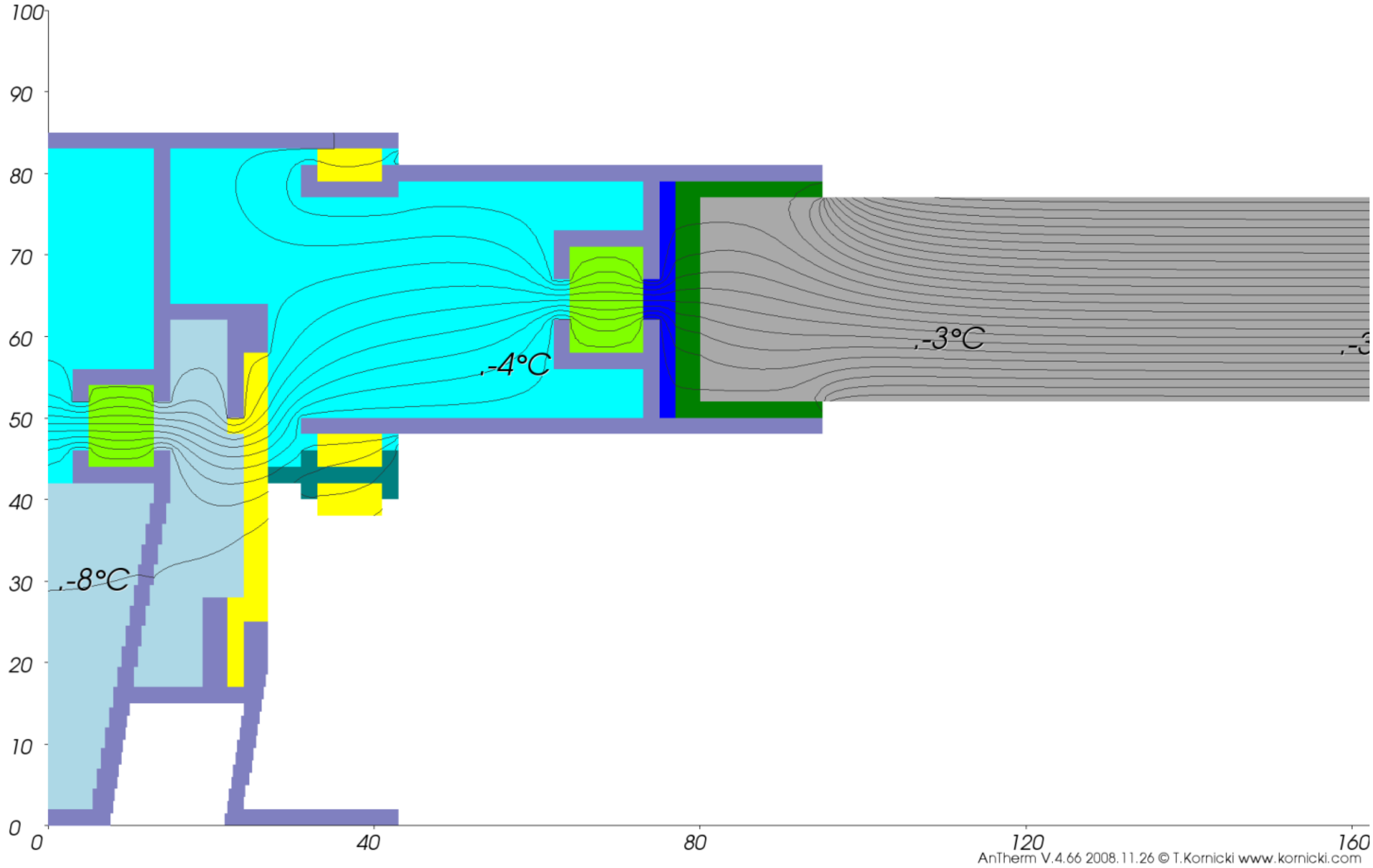




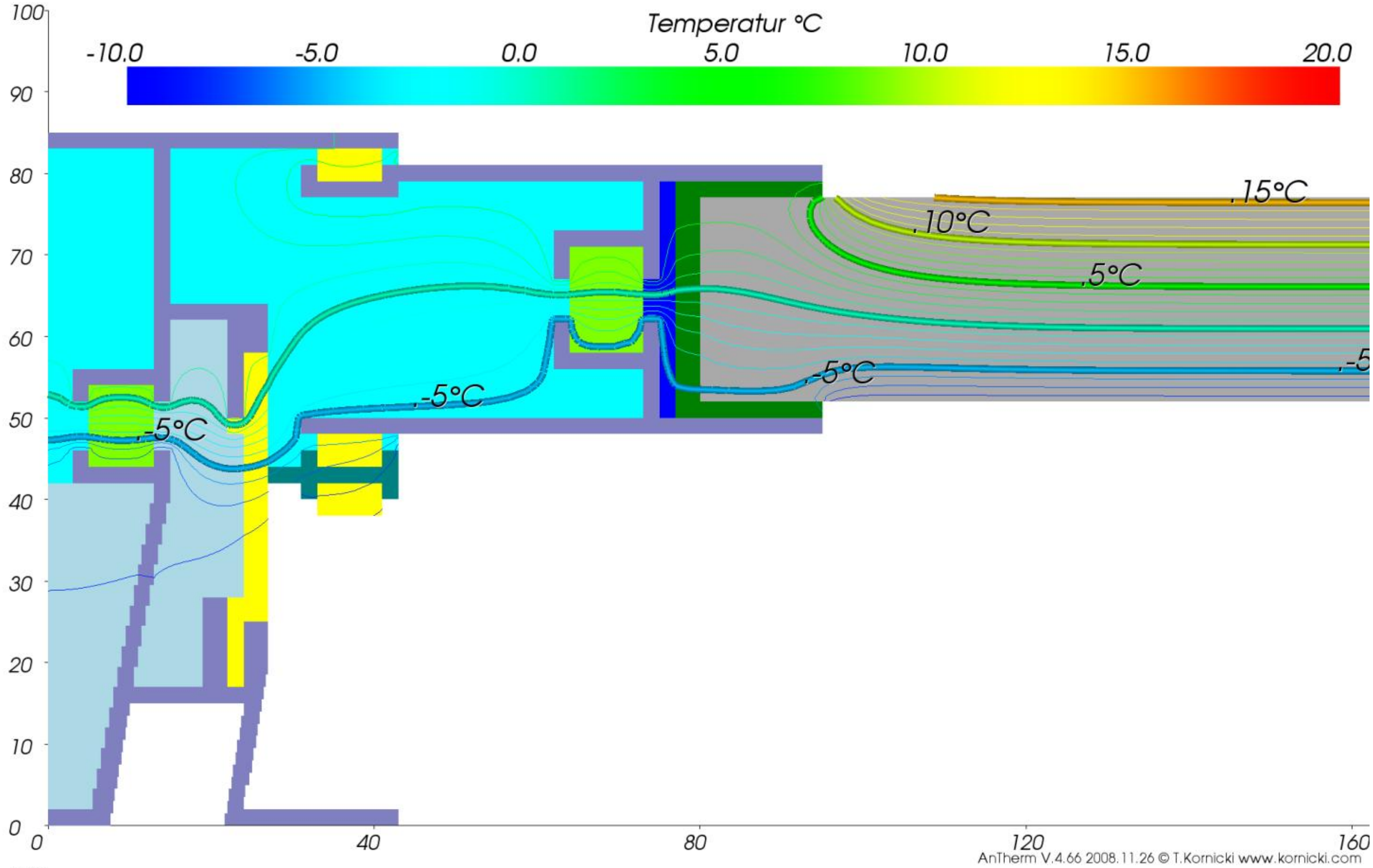
Prüfreferenzfall 6

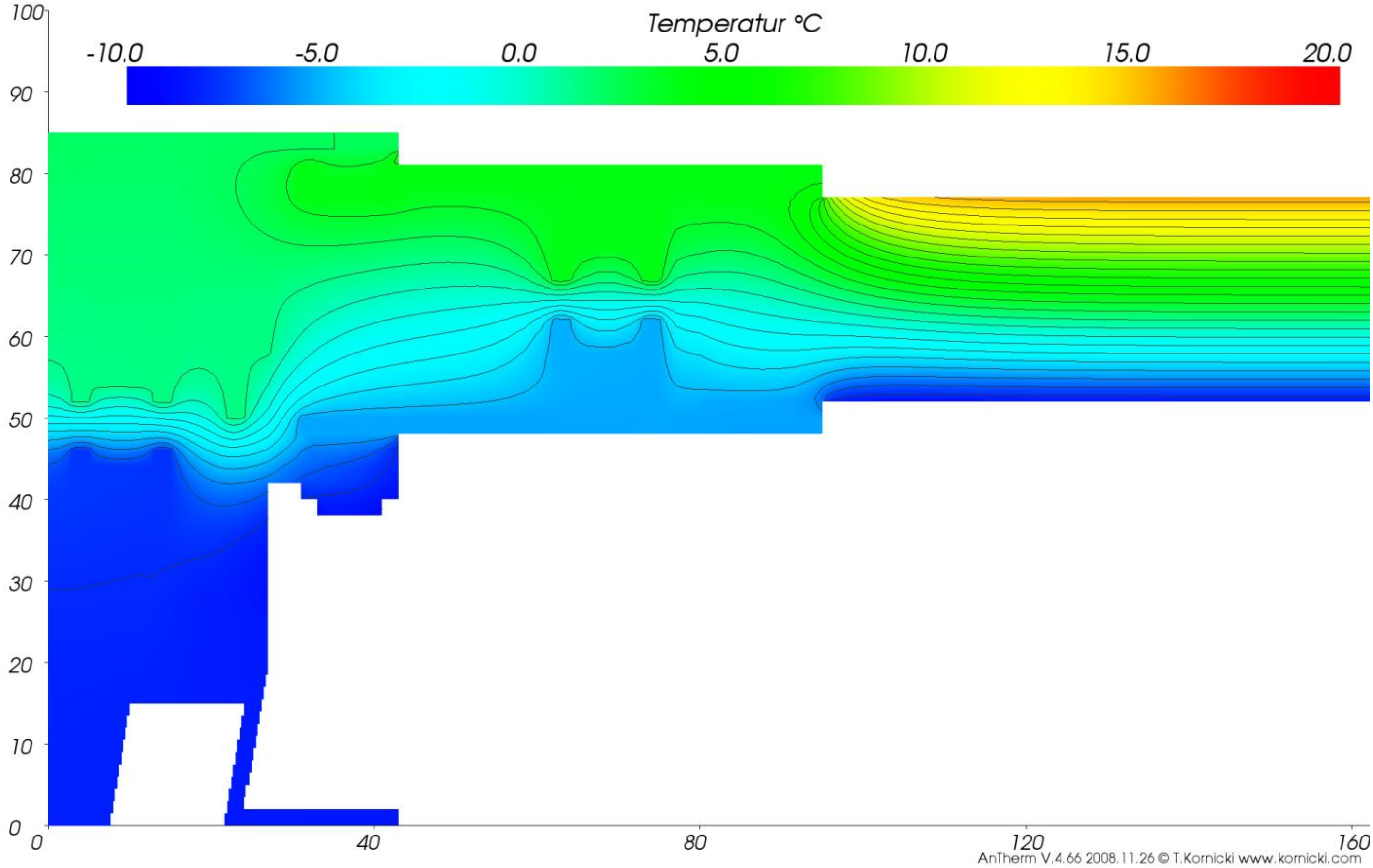
Bilder (Ergebnis)





Prüfreferenzfall 6





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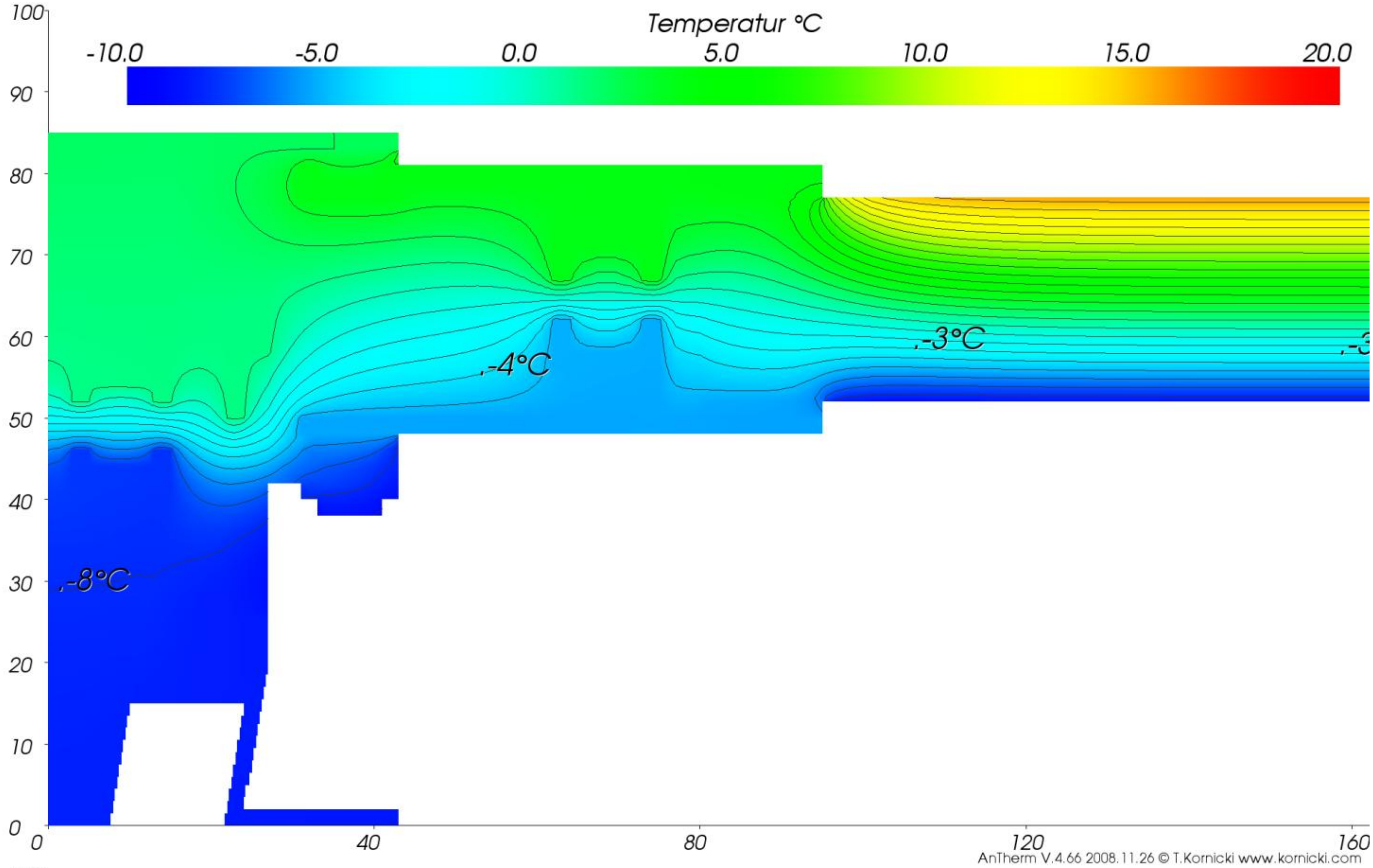

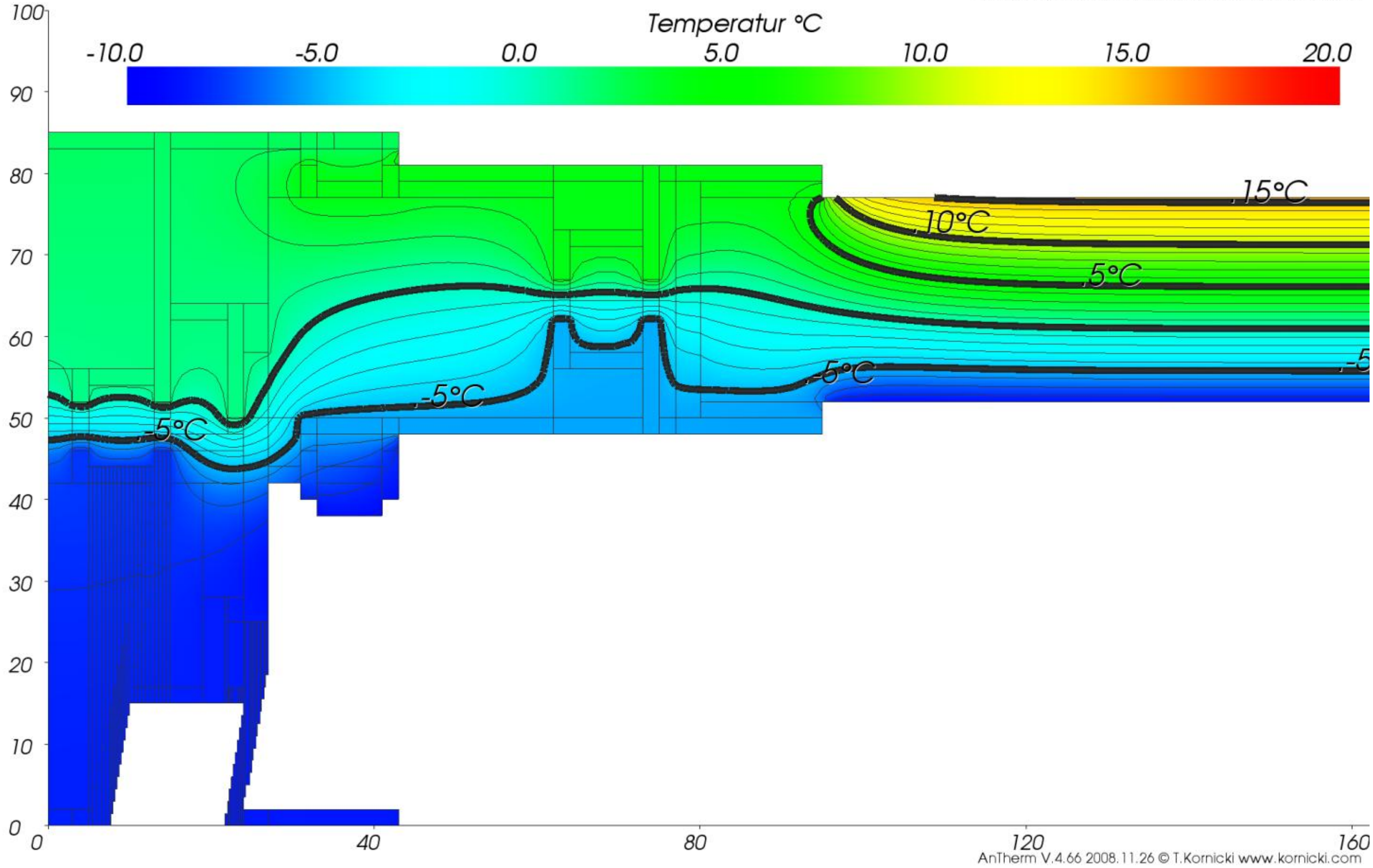

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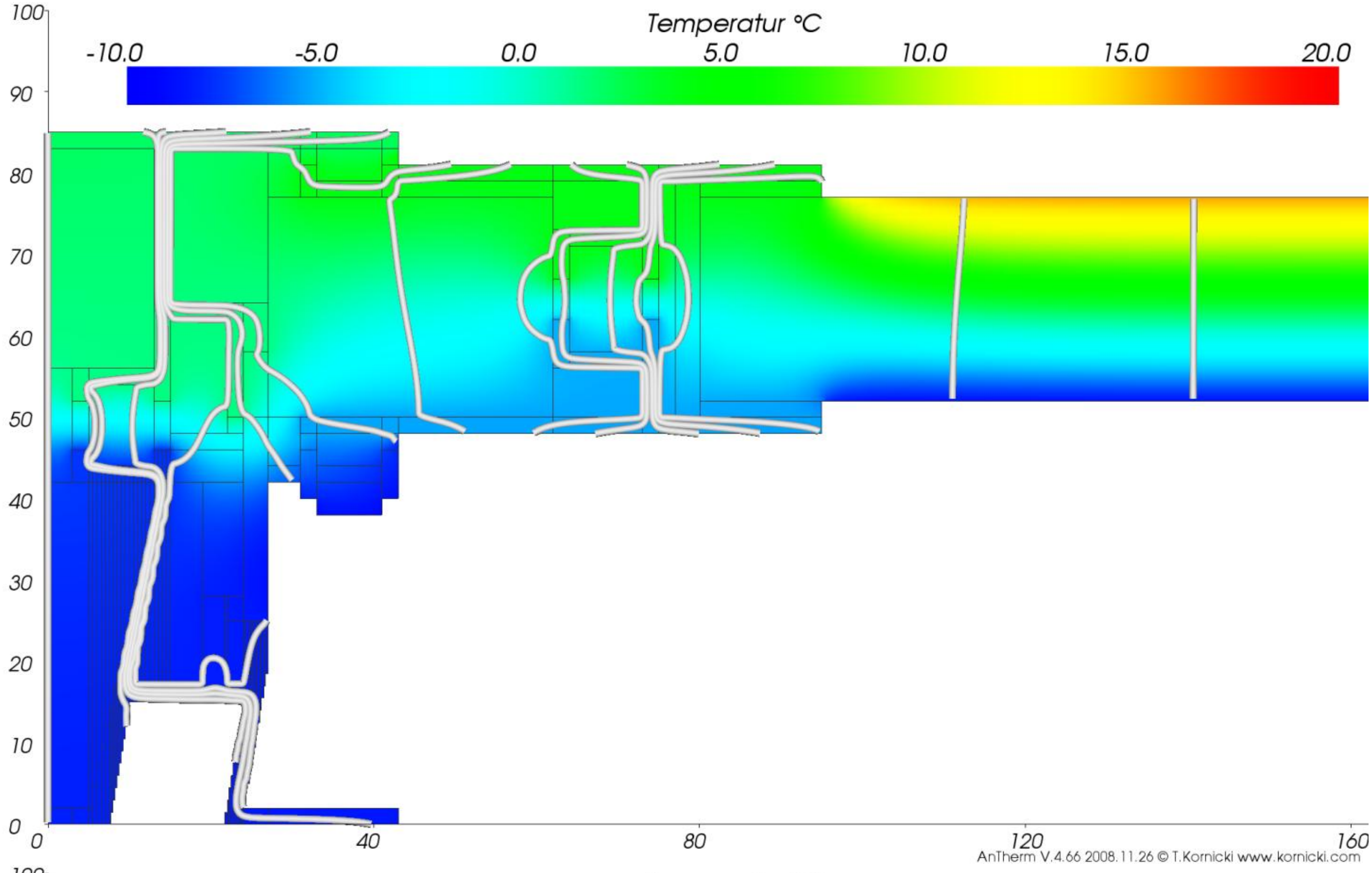

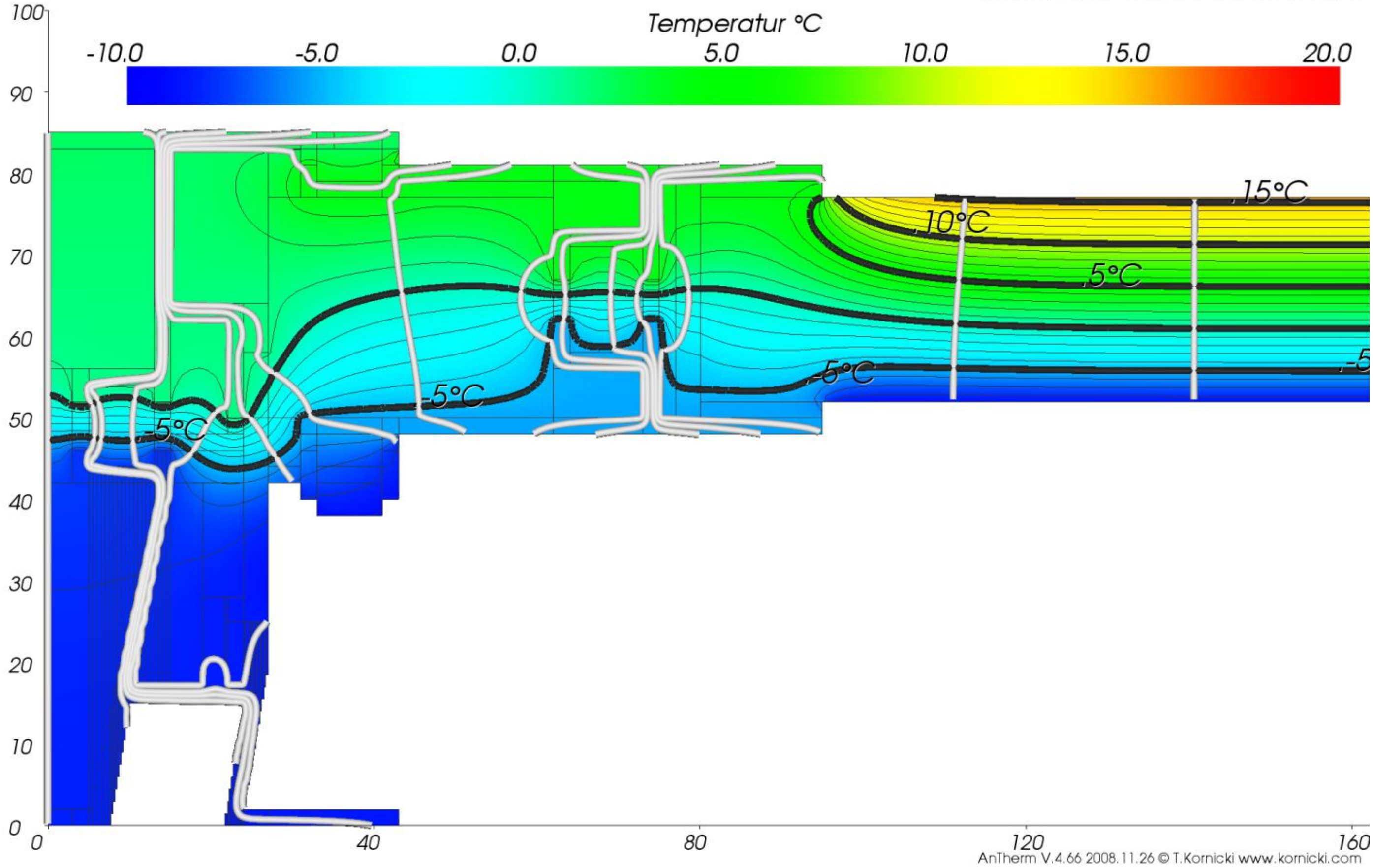

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Prüfreferenzfall 7

Validierungsberechnung (Unterleitungsraster 8.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 16.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_7.antherm

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_7 8k Zellen\D_7.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, -20, 0) x (238, 44, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    2. Raumzelle - (0, 44, 0) x (238, 120, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.69$
    3. Baustoffzelle - (0, 0, 0) x (48, 99, 1000) Bez.: "PVC" $\lambda = 0.17$
    4. Raumzelle - (31, 87, 0) x (48, 99, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" $\alpha = 7.69$
    5. Raumzelle - (31, 0, 0) x (32, 1.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    6. Raumzelle - (32, 0, 0) x (33, 3.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    7. Raumzelle - (33, 0, 0) x (34, 5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    8. Raumzelle - (34, 0, 0) x (35, 7, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    9. Raumzelle - (35, 0, 0) x (36, 8.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    10. Raumzelle - (36, 0, 0) x (37, 10.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    11. Raumzelle - (37, 0, 0) x (38, 12, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    12. Raumzelle - (38, 0, 0) x (39, 14, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    13. Raumzelle - (39, 0, 0) x (40, 15.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    14. Raumzelle - (40, 0, 0) x (41, 17.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    15. Raumzelle - (41, 0, 0) x (42, 19, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    16. Raumzelle - (42, 0, 0) x (43, 21, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    17. Raumzelle - (43, 0, 0) x (44, 22.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    18. Raumzelle - (44, 0, 0) x (45, 24.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    19. Raumzelle - (45, 0, 0) x (46, 26, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    20. Raumzelle - (46, 0, 0) x (47, 27.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    21. Raumzelle - (47, 0, 0) x (48, 29, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" $\alpha = 25$
    22. Baustoffzelle - (28, 27.5, 0) x (44, 29, 1000) Bez.: "L7" $\lambda = 0.121$
    23. Baustoffzelle - (28, 26, 0) x (43, 27.5, 1000) Bez.: "L7" $\lambda = 0.121$
    24. Baustoffzelle - (28, 24.5, 0) x (42, 26, 1000) Bez.: "L7" $\lambda = 0.121$
    25. Baustoffzelle - (28, 22.5, 0) x (41, 24.5, 1000) Bez.: "L7" $\lambda = 0.121$
    26. Baustoffzelle - (28, 21, 0) x (40, 22.5, 1000) Bez.: "L7" $\lambda = 0.121$
    27. Baustoffzelle - (28, 19, 0) x (39, 21, 1000) Bez.: "L7" $\lambda = 0.121$
    28. Baustoffzelle - (28, 17.5, 0) x (38, 19, 1000) Bez.: "L7" $\lambda = 0.121$
    29. Baustoffzelle - (28, 15.5, 0) x (37, 17.5, 1000) Bez.: "L7" $\lambda = 0.121$
    30. Baustoffzelle - (28, 14, 0) x (36, 15.5, 1000) Bez.: "L7" $\lambda = 0.121$
    31. Baustoffzelle - (28, 12, 0) x (35, 14, 1000) Bez.: "L7" $\lambda = 0.121$
    32. Baustoffzelle - (28, 10.5, 0) x (34, 12, 1000) Bez.: "L7" $\lambda = 0.121$
    33. Baustoffzelle - (28, 8.5, 0) x (33, 10.5, 1000) Bez.: "L7" $\lambda = 0.121$
    34. Baustoffzelle - (28, 7, 0) x (32, 8.5, 1000) Bez.: "L7" $\lambda = 0.121$
    35. Baustoffzelle - (28, 5, 0) x (31, 7, 1000) Bez.: "L7" $\lambda = 0.121$
    36. Baustoffzelle - (28, 3.5, 0) x (30, 5, 1000) Bez.: "L7" $\lambda = 0.121$
    37. Baustoffzelle - (28, 3, 0) x (29, 3.5, 1000) Bez.: "L7" $\lambda = 0.121$
    38. Baustoffzelle - (11, 8, 0) x (12, 11, 1000) Bez.: "L7" $\lambda = 0.121$
    39. Baustoffzelle - (12, 8, 0) x (13, 13.5, 1000) Bez.: "L7" $\lambda = 0.121$
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    41. Baustoffzelle - (14, 8, 0) x (15, 19, 1000) Bez.: "L7" $\lambda = 0.121$
    42. Baustoffzelle - (15, 8, 0) x (16, 21.5, 1000) Bez.: "L7" $\lambda = 0.121$
    43. Baustoffzelle - (16, 8, 0) x (17, 24, 1000) Bez.: "L7" $\lambda = 0.121$
    44. Baustoffzelle - (17, 8, 0) x (18, 27, 1000) Bez.: "L7" $\lambda = 0.121$
    45. Baustoffzelle - (18, 8, 0) x (19, 29.5, 1000) Bez.: "L7" $\lambda = 0.121$
    46. Baustoffzelle - (19, 8, 0) x (20, 32, 1000) Bez.: "L7" $\lambda = 0.121$
    47. Baustoffzelle - (20, 8, 0) x (21, 35, 1000) Bez.: "L7" $\lambda = 0.121$
    48. Baustoffzelle - (9, 3, 0) x (28, 8, 1000) Bez.: "L7" $\lambda = 0.121$
    49. Baustoffzelle - (21, 8, 0) x (28, 40, 1000) Bez.: "L7" $\lambda = 0.121$
    50. Baustoffzelle - (3, 0, 0) x (6, 8, 1000) Bez.: "L8" $\lambda = 0.09$
    51. Baustoffzelle - (3, 11, 0) x (9, 46, 1000) Bez.: "L4" $\lambda = 0.124$
    52. Baustoffzelle - (9, 13.5, 0) x (10, 46, 1000) Bez.: "L4" $\lambda = 0.124$
    53. Baustoffzelle - (10, 16, 0) x (11, 46, 1000) Bez.: "L4" $\lambda = 0.124$

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_7 8k Zellen\D_7.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

54. Baustoffzelle - (11, 19, 0) x (12, 46, 1000) Bez.: "L4" λ = 0.124
55. Baustoffzelle - (12, 21.5, 0) x (13, 46, 1000) Bez.: "L4" λ = 0.124
56. Baustoffzelle - (13, 24, 0) x (14, 46, 1000) Bez.: "L4" λ = 0.124
57. Baustoffzelle - (14, 27, 0) x (15, 46, 1000) Bez.: "L4" λ = 0.124
58. Baustoffzelle - (15, 29.5, 0) x (16, 46, 1000) Bez.: "L4" λ = 0.124
59. Baustoffzelle - (16, 32, 0) x (17, 46, 1000) Bez.: "L4" λ = 0.124
60. Baustoffzelle - (17, 35, 0) x (18, 46, 1000) Bez.: "L4" λ = 0.124
61. Baustoffzelle - (3, 49, 0) x (28, 62, 1000) Bez.: "L3" λ = 0.079
62. Baustoffzelle - (21, 43, 0) x (28, 49, 1000) Bez.: "L3" λ = 0.079
63. Baustoffzelle - (31, 32, 0) x (36, 62, 1000) Bez.: "L6" λ = 0.115
64. Baustoffzelle - (3, 65, 0) x (15, 96, 1000) Bez.: "L1" λ = 0.118
65. Baustoffzelle - (15, 80, 0) x (28, 96, 1000) Bez.: "L1" λ = 0.118
66. Baustoffzelle - (18, 68, 0) x (28, 77, 1000) Bez.: "L2" λ = 0.045
67. Baustoffzelle - (33, 65, 0) x (45, 84, 1000) Bez.: "L5" λ = 0.088
68. Baustoffzelle - (21, 68, 0) x (28, 74, 1000) Bez.: "PVC" λ = 0.17
69. Baustoffzelle - (36, 32, 0) x (48, 62, 1000) Bez.: "EPDM" λ = 0.25
70. Baustoffzelle - (36, 35, 0) x (238, 59, 1000) Bez.: "Dämmblock" λ = 0.035
71. Raumzelle - (31, 87, 0) x (43, 99, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5
72. Raumzelle - (48, 59, 0) x (76, 87, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5

Räume :
- Room 0
- Room 1

Wärmequellen :

T.Kornicki, Dienstleistungen in EDV und IT
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email: tkornicki@chello.at

12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2 2008\D 7 8k Zellen\D 7.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :
- Raumbez.: Room 0
  - α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum
- Raumbez.: Room 1
  - α= 7.69 W/(m²K) Rs= 0.1300 m²K/W : Innenraum
  - α= 5 W/(m²K) Rs= 0.2000 m²K/W : Innenraum mit 0,20 m²K/W

Wärmequellen : keine

Baustoffe :
- λ= 0.035 W/(m K) : Dämmblock
- λ= 0.25 W/(m K) : EPDM
- λ= 0.118 W/(m K) : L1
- λ= 0.045 W/(m K) : L2
- λ= 0.079 W/(m K) : L3
- λ= 0.124 W/(m K) : L4
- λ= 0.088 W/(m K) : L5
- λ= 0.115 W/(m K) : L6
- λ= 0.121 W/(m K) : L7
- λ= 0.09 W/(m K) : L8
- λ= 0.17 W/(m K) : PVC

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> Room 1 @ BackLeft: (0, 0, 0) x (0, 99, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
PVC	0.1700	99.0000			0.5824	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**1.3291**	**[W/m²K]**	

Room 0 <-> Room 1 @ BackRight: (238, 35, 0) x (238, 59, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Dämmblock	0.0350	24.0000			0.6857	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**1.1686**	**[W/m²K]**	

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_7 8k Zellen\D_7.antherm

Anzahl der bilanzierten Zellen: 8037

Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,284397
Room 1	0,284397	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	1.86684e-013	0,284397	6.56420e-013
Room 1	-1.86573e-013	0,284397	-6.56030e-013

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Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_7 8k Zellen\D_7.antherm

Anzahl der bilanzierten Zellen: 8037 (Knotenzahl = 97875)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Room 0	-10,00	-9,64	-7,80	100.00 %	
Room 1	20,00	12,37	17,71	61.46 %	0,75

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,988140	0,254360
g(Room 1)	0,011860	0,745640

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Room 0	31,0000	0,0000		-9.64	
Room 1	48,0000	59,0000		12.37	0,75

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 7 (siehe Bild D.7)
Festverglasung und Füllung (Dämmstoff); Profilhöhe: 48 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_7 16k Zellen\D_7.antherm

Anzahl der bilanzierten Zellen: 14675

Thermische Leitwerte [W / K]

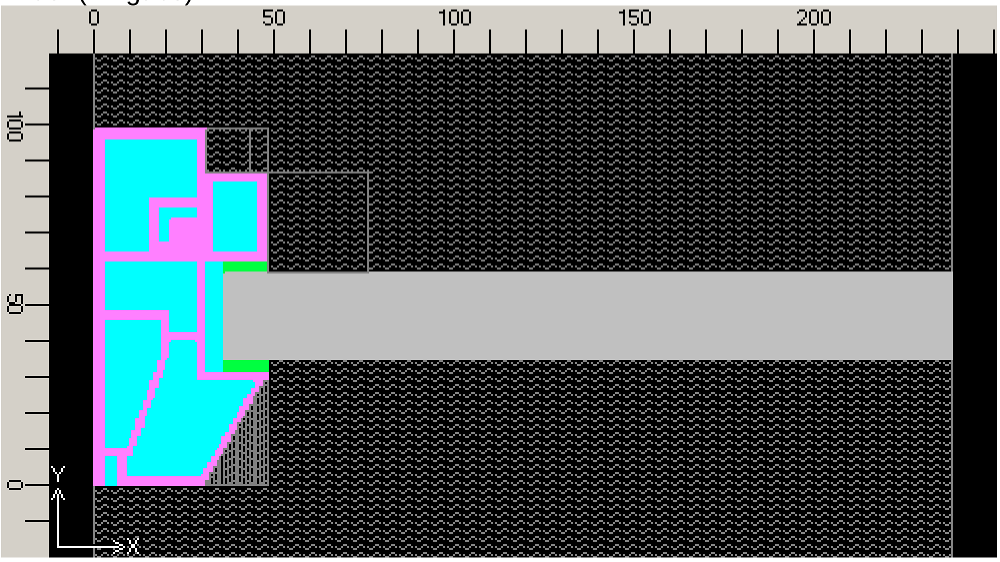
Raum\Raum	Room 0	Room 1
Room 0		0,284476
Room 1	0,284476	

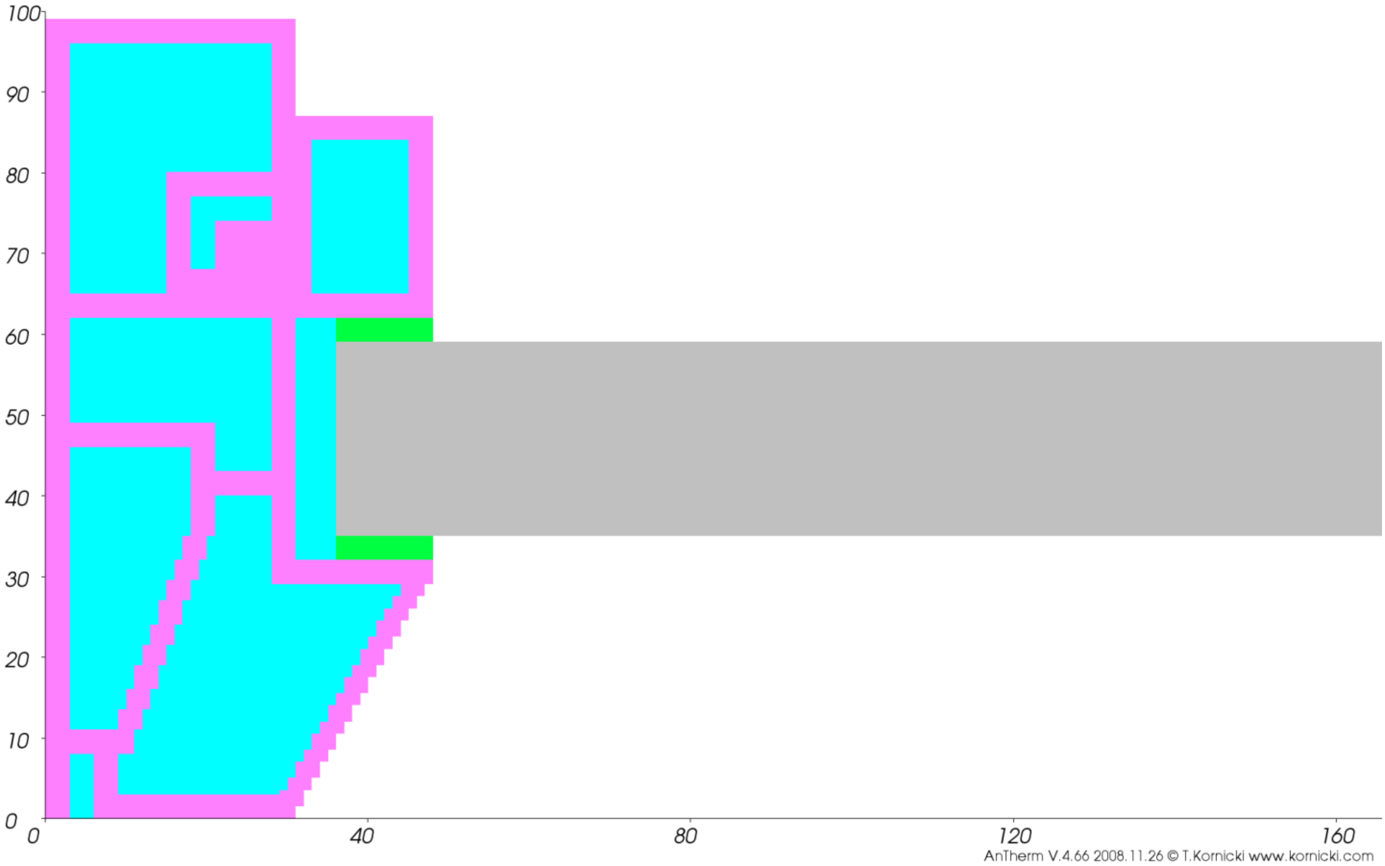
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-4.97125e-012	0,284476	-1.74751e-011
Room 1	4.97119e-012	0,284476	1.74749e-011

Prüfreferenzfall 7

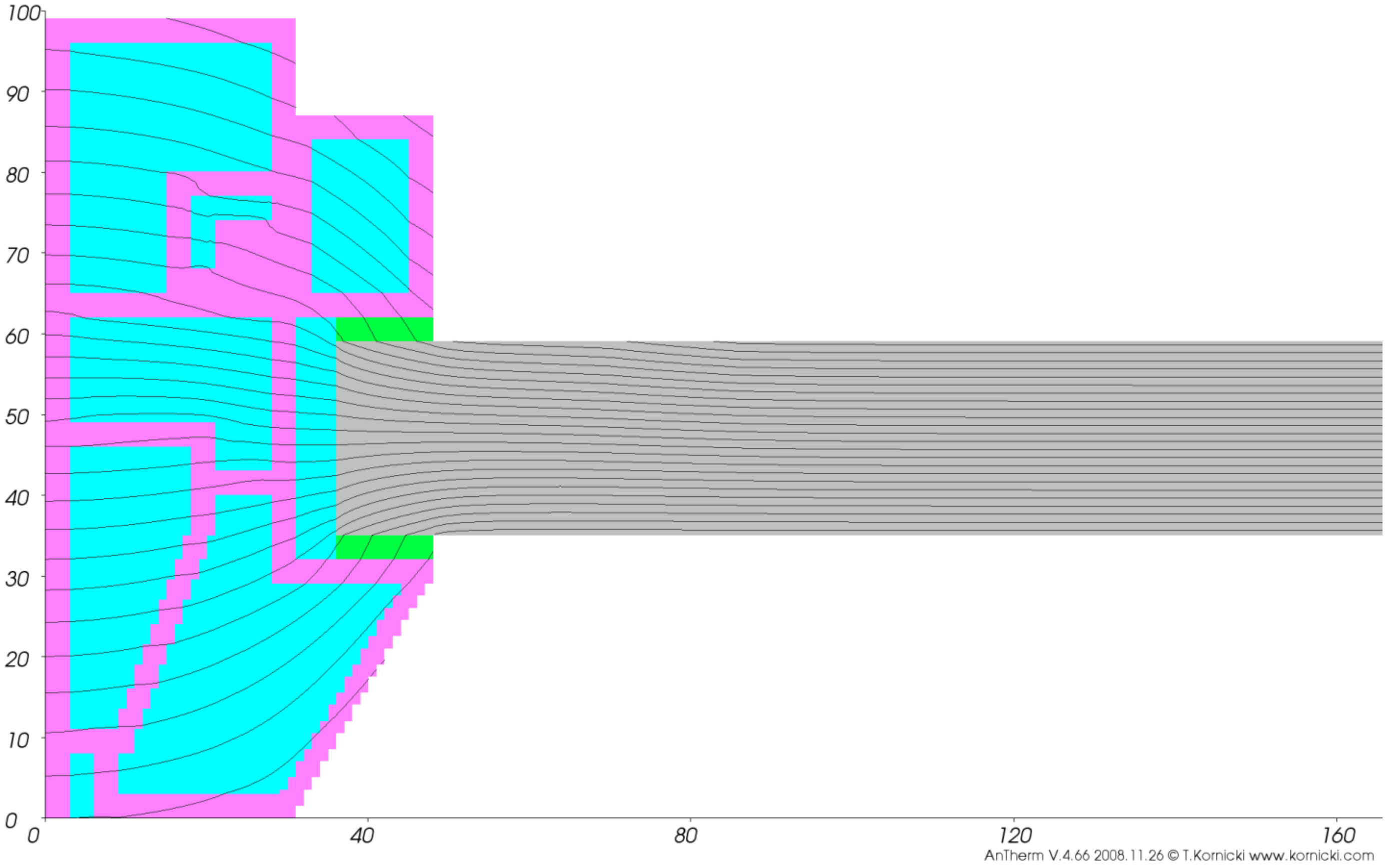
Bilder (Eingabe)

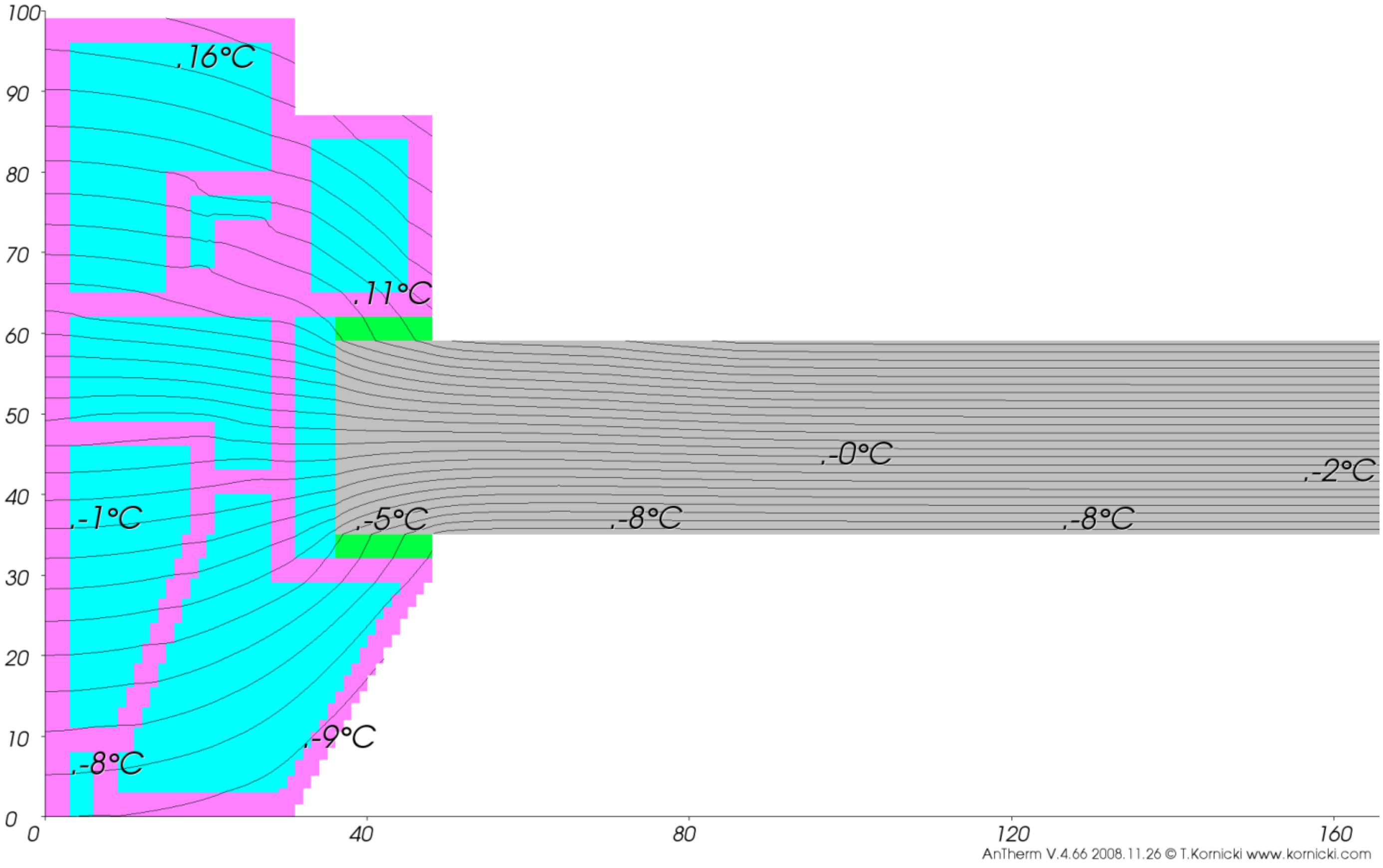




Prüfreferenzfall 7

Bilder (Ergebnis)





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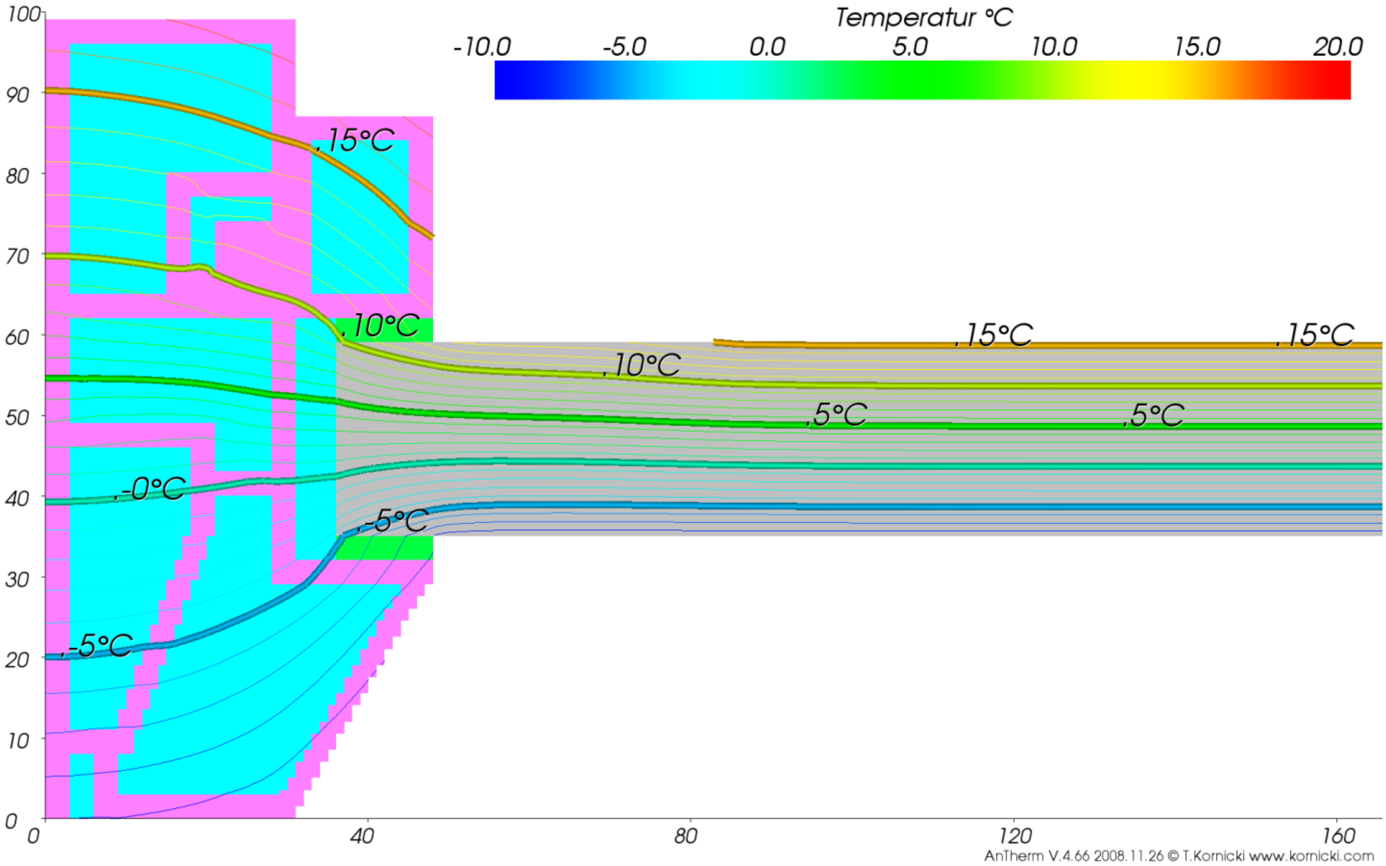

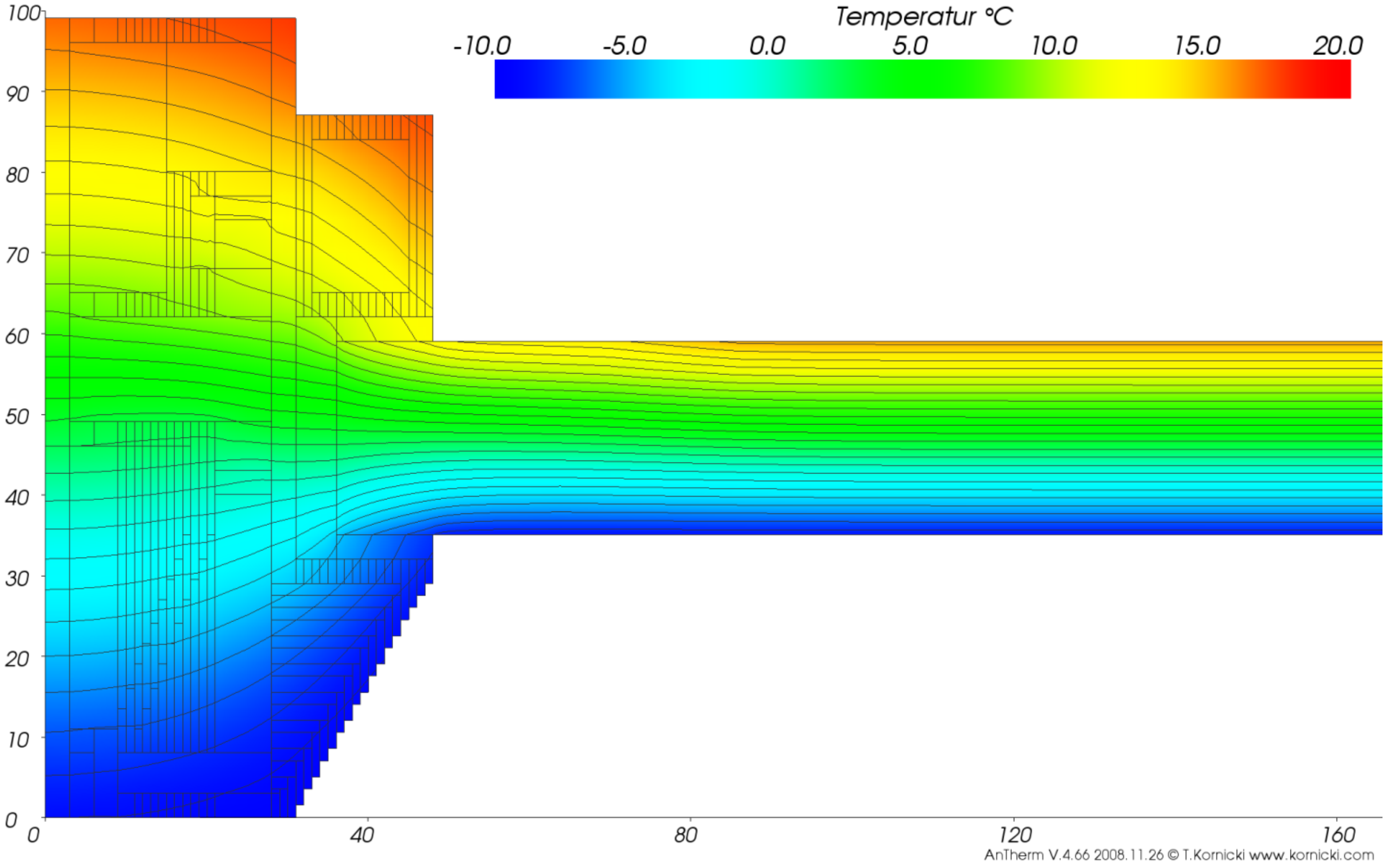

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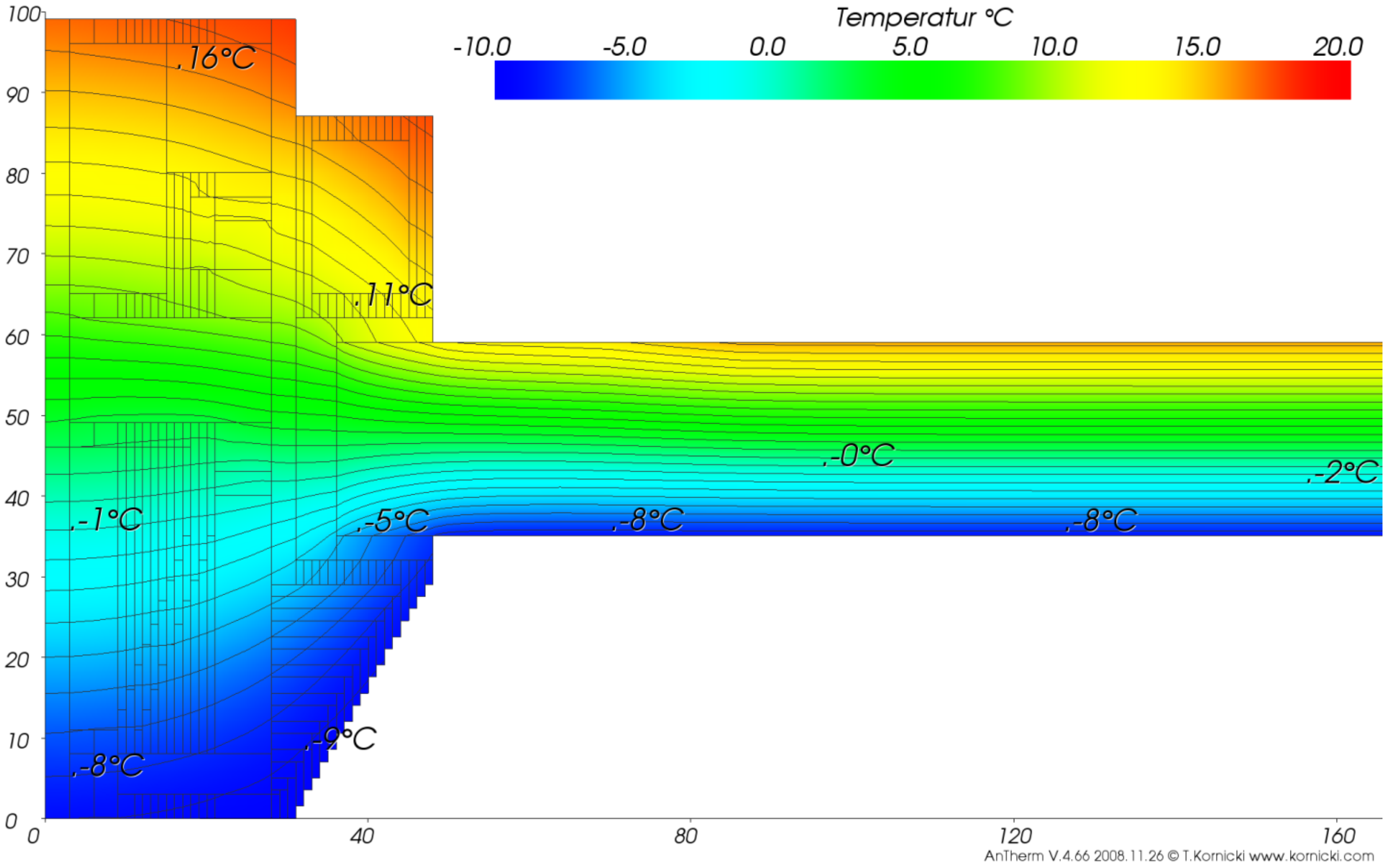

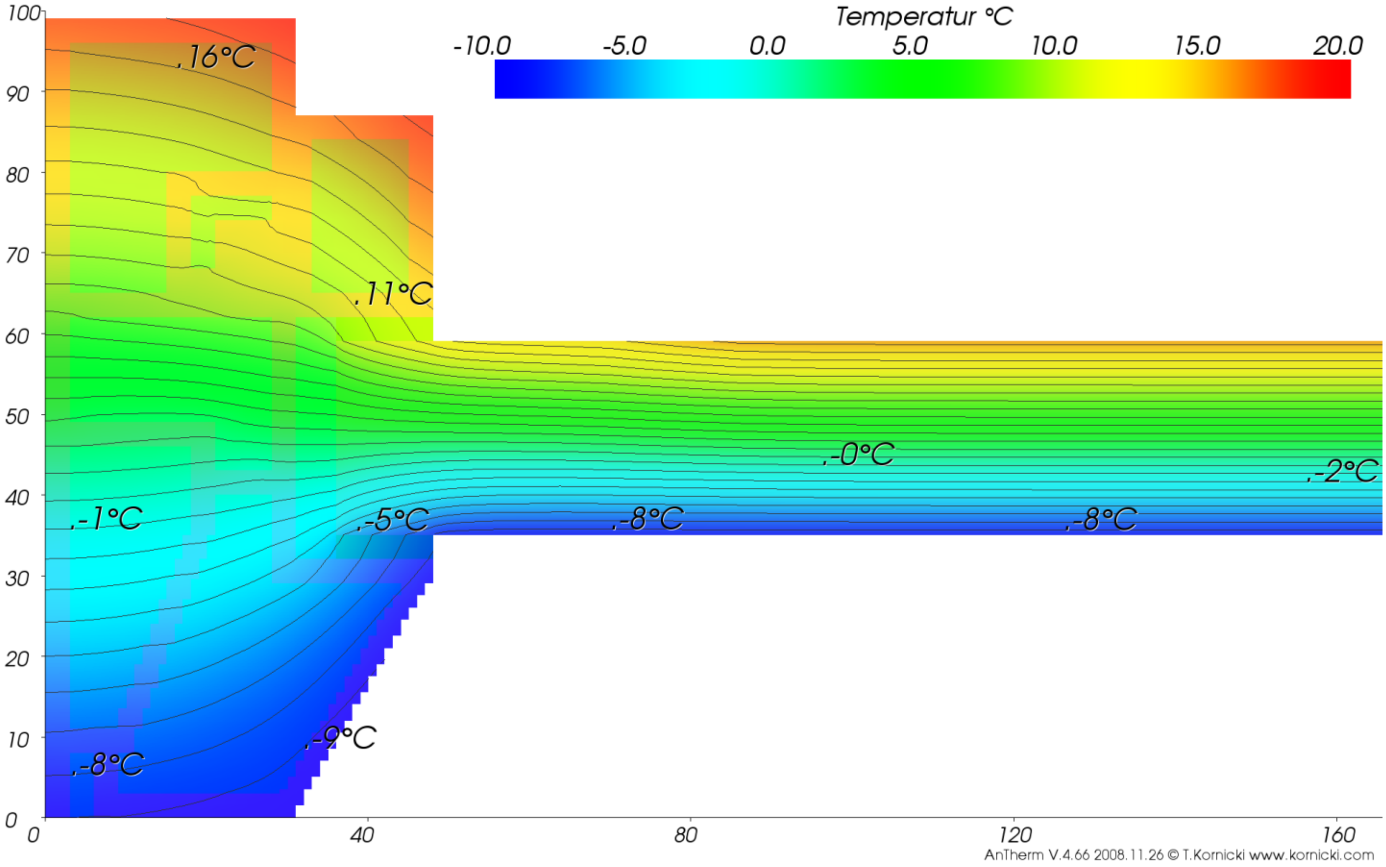

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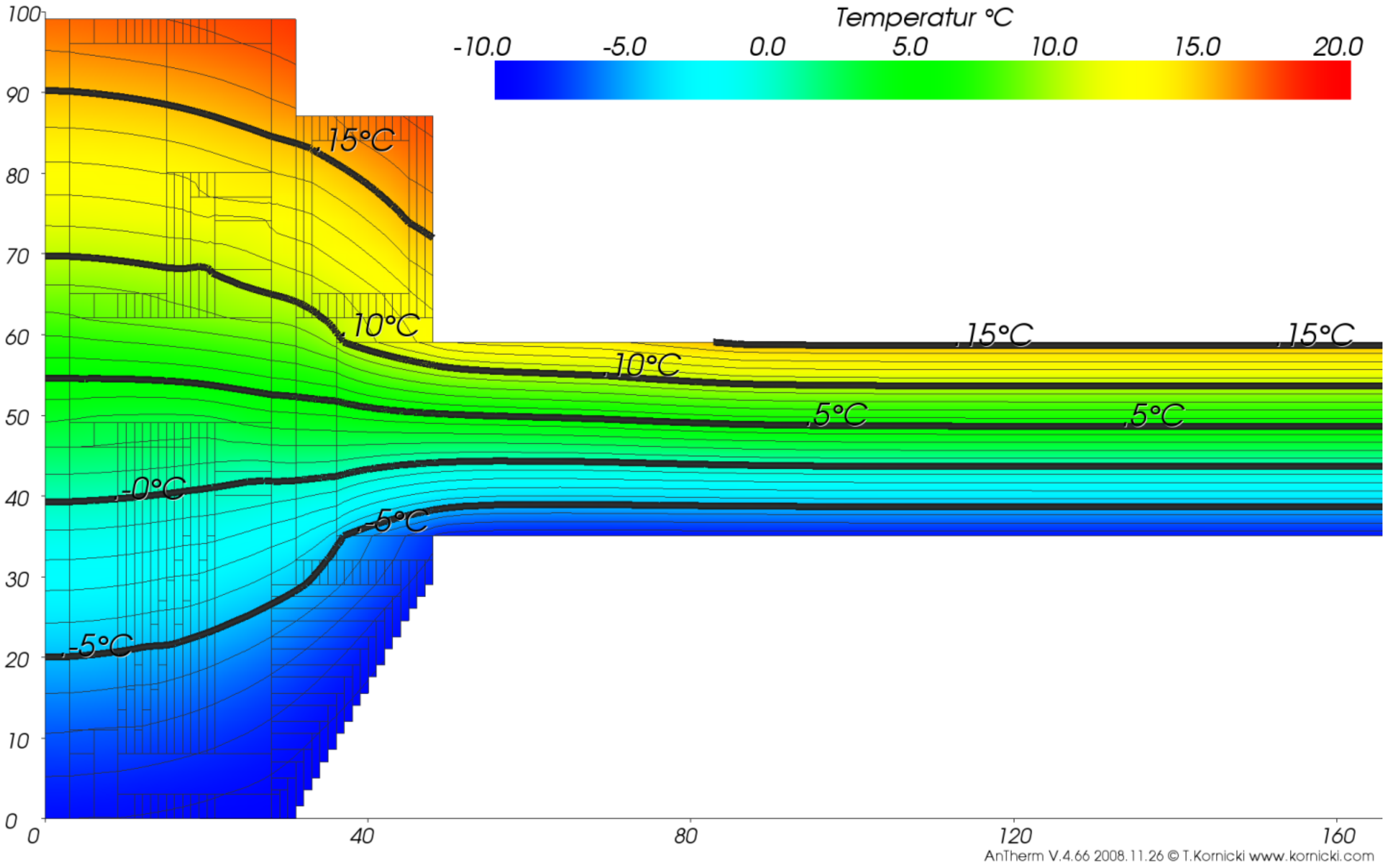

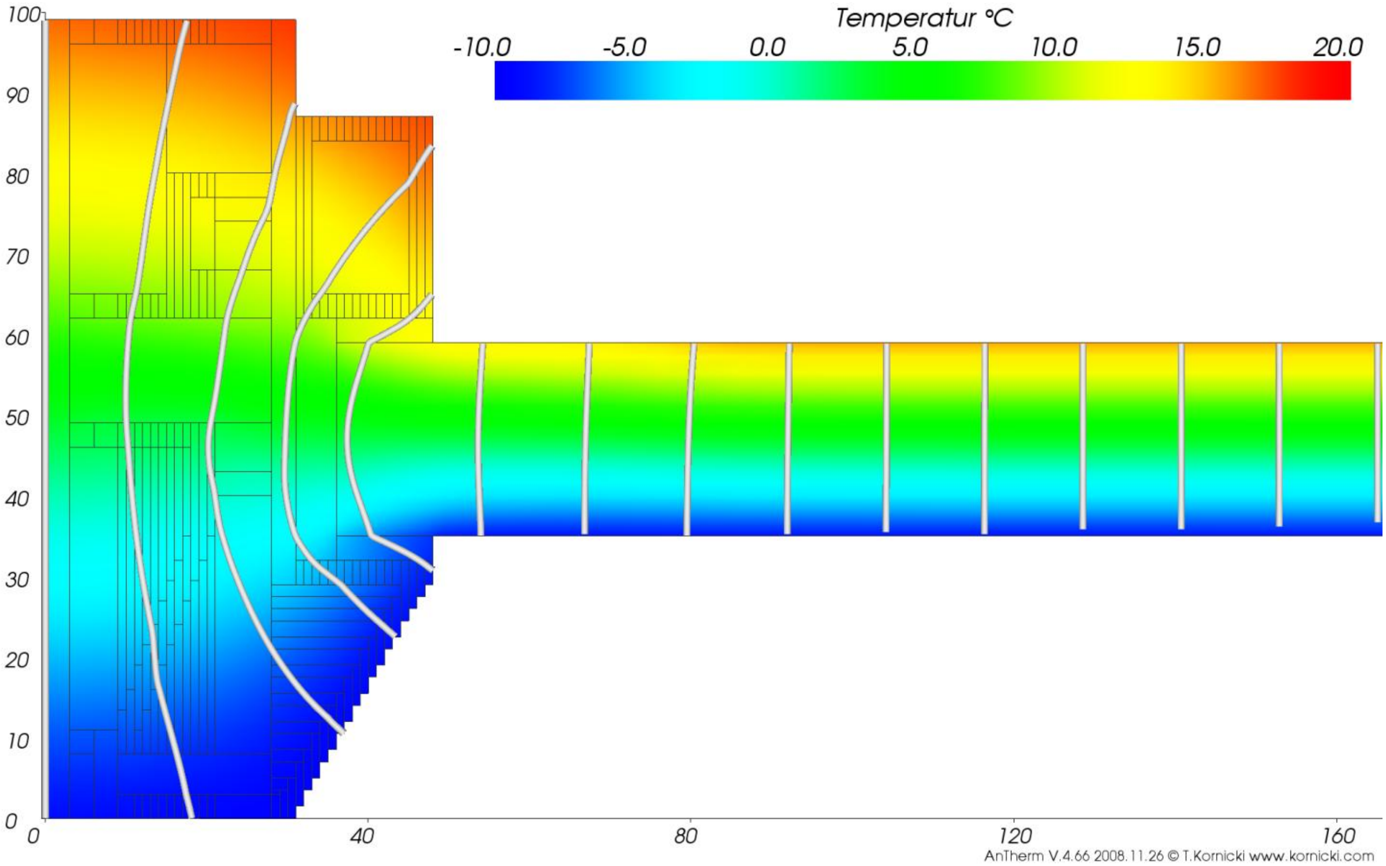

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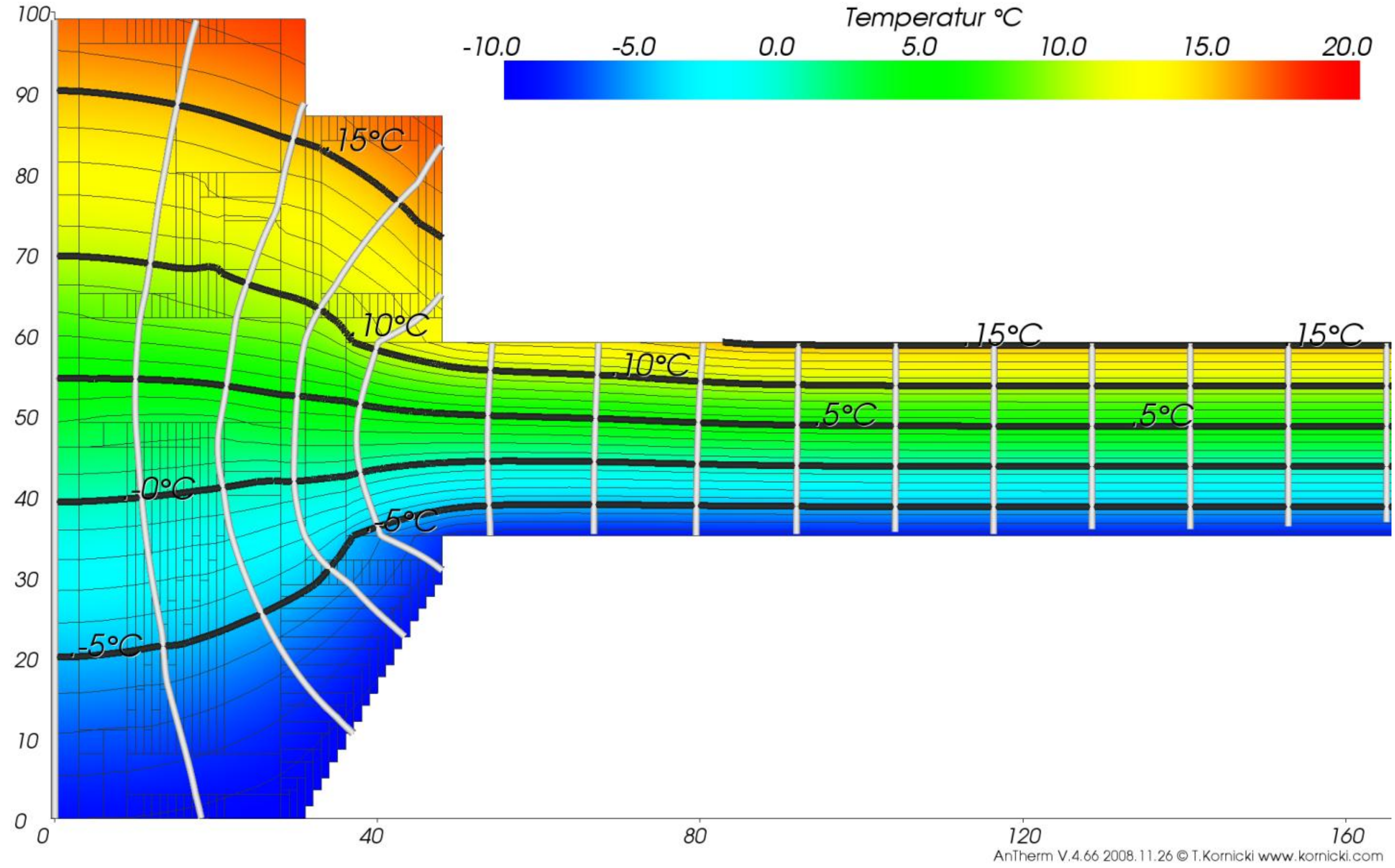

Quellkode der Projektdatei D_7.antherm


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Prüfreferenzfall 8

Validierungsberechnung (Unterleitungsraster 7.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 14.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_8.antherm

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 8 (siehe Bild D.8)
Rollladenkasten; Breite: 198 mm; Bezugshöhe: 177 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_8 7k Zellen\D_8.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (-10, -10, 0) x (70, 187, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
    2. Raumzelle - (70, -10, 0) x (208, 187, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.69
    3. Baustoffzelle - (0, 0, 0) x (198, 177, 1000) Bez.: "PVC" λ = 0.17
    4. Löschzelle - (0, 177, 0) x (198, 187, 1000)
    5. Löschzelle - (40, -10, 0) x (100, 0, 1000)
    6. Baustoffzelle - (10, 10, 0) x (151, 167, 1000) Bez.: "L1" λ = 1.248
    7. Baustoffzelle - (88, 10, 0) x (188, 25, 1000) Bez.: "Dämmblock" λ = 0.035
    8. Baustoffzelle - (151, 25, 0) x (188, 167, 1000) Bez.: "Dämmblock" λ = 0.035
    9. Baustoffzelle - (1, 1, 0) x (9, 9, 1000) Bez.: "L4" λ = 0.049
    10. Baustoffzelle - (1, 10, 0) x (9, 25, 1000) Bez.: "L3" λ = 0.052
    11. Baustoffzelle - (1, 26, 0) x (9, 46, 1000) Bez.: "L2" λ = 0.053
    12. Baustoffzelle - (1, 47, 0) x (9, 67, 1000) Bez.: "L2" λ = 0.053
    13. Baustoffzelle - (1, 68, 0) x (9, 88, 1000) Bez.: "L2" λ = 0.053
    14. Baustoffzelle - (1, 89, 0) x (9, 109, 1000) Bez.: "L2" λ = 0.053
    15. Baustoffzelle - (1, 110, 0) x (9, 130, 1000) Bez.: "L2" λ = 0.053
    16. Baustoffzelle - (1, 131, 0) x (9, 151, 1000) Bez.: "L2" λ = 0.053
    17. Baustoffzelle - (1, 152, 0) x (9, 167, 1000) Bez.: "L3" λ = 0.052
    18. Baustoffzelle - (1, 168, 0) x (9, 176, 1000) Bez.: "L4" λ = 0.049
    19. Baustoffzelle - (10, 168, 0) x (25, 176, 1000) Bez.: "L5" λ = 0.064
    20. Baustoffzelle - (26, 168, 0) x (46, 176, 1000) Bez.: "L6" λ = 0.082
    21. Baustoffzelle - (47, 168, 0) x (67, 176, 1000) Bez.: "L6" λ = 0.082
    22. Baustoffzelle - (68, 168, 0) x (88, 176, 1000) Bez.: "L6" λ = 0.082
    23. Baustoffzelle - (89, 168, 0) x (109, 176, 1000) Bez.: "L6" λ = 0.082
    24. Baustoffzelle - (110, 168, 0) x (130, 176, 1000) Bez.: "L6" λ = 0.082
    25. Baustoffzelle - (131, 168, 0) x (151, 176, 1000) Bez.: "L6" λ = 0.082
    26. Baustoffzelle - (152, 168, 0) x (172, 176, 1000) Bez.: "L6" λ = 0.082
    27. Baustoffzelle - (173, 168, 0) x (188, 176, 1000) Bez.: "L5" λ = 0.064
    28. Baustoffzelle - (189, 168, 0) x (197, 176, 1000) Bez.: "L4" λ = 0.049
    29. Baustoffzelle - (189, 152, 0) x (197, 167, 1000) Bez.: "L3" λ = 0.052
    30. Baustoffzelle - (189, 131, 0) x (197, 151, 1000) Bez.: "L2" λ = 0.053
    31. Baustoffzelle - (189, 110, 0) x (197, 130, 1000) Bez.: "L2" λ = 0.053
    32. Baustoffzelle - (189, 89, 0) x (197, 109, 1000) Bez.: "L2" λ = 0.053
    33. Baustoffzelle - (189, 68, 0) x (197, 88, 1000) Bez.: "L2" λ = 0.053
    34. Baustoffzelle - (189, 47, 0) x (197, 67, 1000) Bez.: "L2" λ = 0.053
    35. Baustoffzelle - (189, 26, 0) x (197, 46, 1000) Bez.: "L2" λ = 0.053
    36. Baustoffzelle - (189, 10, 0) x (197, 25, 1000) Bez.: "L3" λ = 0.052
    37. Baustoffzelle - (189, 1, 0) x (197, 9, 1000) Bez.: "L4" λ = 0.049
    38. Baustoffzelle - (173, 1, 0) x (188, 9, 1000) Bez.: "L5" λ = 0.064
    39. Baustoffzelle - (152, 1, 0) x (172, 9, 1000) Bez.: "L6" λ = 0.082
    40. Baustoffzelle - (131, 1, 0) x (151, 9, 1000) Bez.: "L6" λ = 0.082
    41. Baustoffzelle - (110, 1, 0) x (130, 9, 1000) Bez.: "L6" λ = 0.082
    42. Baustoffzelle - (89, 1, 0) x (109, 9, 1000) Bez.: "L6" λ = 0.082
    43. Baustoffzelle - (68, 1, 0) x (88, 9, 1000) Bez.: "L6" λ = 0.082
    44. Baustoffzelle - (47, 1, 0) x (67, 9, 1000) Bez.: "L6" λ = 0.082
    45. Baustoffzelle - (26, 1, 0) x (46, 9, 1000) Bez.: "L6" λ = 0.082
    46. Baustoffzelle - (10, 0, 0) x (25, 10, 1000) Bez.: "L1" λ = 1.248

Räume :

Room 0
Room 1

Wärmequellen :

T.Kornicki, Dienstleistungen in EDV und IT
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Tel./Fax. +43-1-6157099
email: tkornicki@chello.at

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 8 (siehe Bild D.8)
Rollladenkasten; Breite: 198 mm; Bezugshöhe: 177 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_8 7k Zellen\D_8.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Room 0
α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Room 1
α= 7.69 W/(m²K) Rs= 0.1300 m²K/W : Innenraum

Wärmequellen : keine

Baustoffe :

λ= 0.035 W/(m K) : Dämmblock
λ= 1.248 W/(m K) : L1
λ= 0.053 W/(m K) : L2
λ= 0.052 W/(m K) : L3
λ= 0.049 W/(m K) : L4
λ= 0.064 W/(m K) : L5
λ= 0.082 W/(m K) : L6
λ= 0.17 W/(m K) : PVC

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> Room 1 @ BottomBack: (0, 0, 0) x (198, 0, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
PVC	0.1700	10.0000			0.0588	
L1	1.2480	15.0000			0.0120	
PVC	0.1700	173.0000			1.0176	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**0.7946**	**[W/m²K]**	

Room 0 <-> Room 1 @ TopBack: (0, 177, 0) x (198, 177, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
PVC	0.1700	198.0000			1.1647	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**0.7492**	**[W/m²K]**	

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 8 (siehe Bild D.8)
Rollladenkasten; Breite: 198 mm; Bezugshöhe: 177 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_8 7k Zellen\D_8.antherm

Anzahl der bilanzierten Zellen: 6720

Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,182912
Room 1	0,182912	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-6.42675e-012	0,182912	-3.51358e-011
Room 1	6.42683e-012	0,182912	3.51363e-011

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 8 (siehe Bild D.8)
Rollladenkasten; Breite: 198 mm; Bezugshöhe: 177 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_8 7k Zellen\D_8.antherm

Anzahl der bilanzierten Zellen: 6720 (Knotenzahl = 81639)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Room 0	-10,00	-9,75	-7,52	100.00 %	
Room 1	20,00	7,62	19,59	44.69 %	0,59

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,991699	0,412817
g(Room 1)	0,008301	0,587183

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Room 0	0,0000	0,0000		-9.75	
Room 1	100,0000	0,0000		7.62	0,59

T.Kornicki, Dienstleistungen in EDV und IT
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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 8 (siehe Bild D.8)
Rollladenkasten; Breite: 198 mm; Bezugshöhe: 177 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_8 14k Zellen\D_8.antherm

Anzahl der bilanzierten Zellen: 14874

Thermische Leitwerte [W / K]

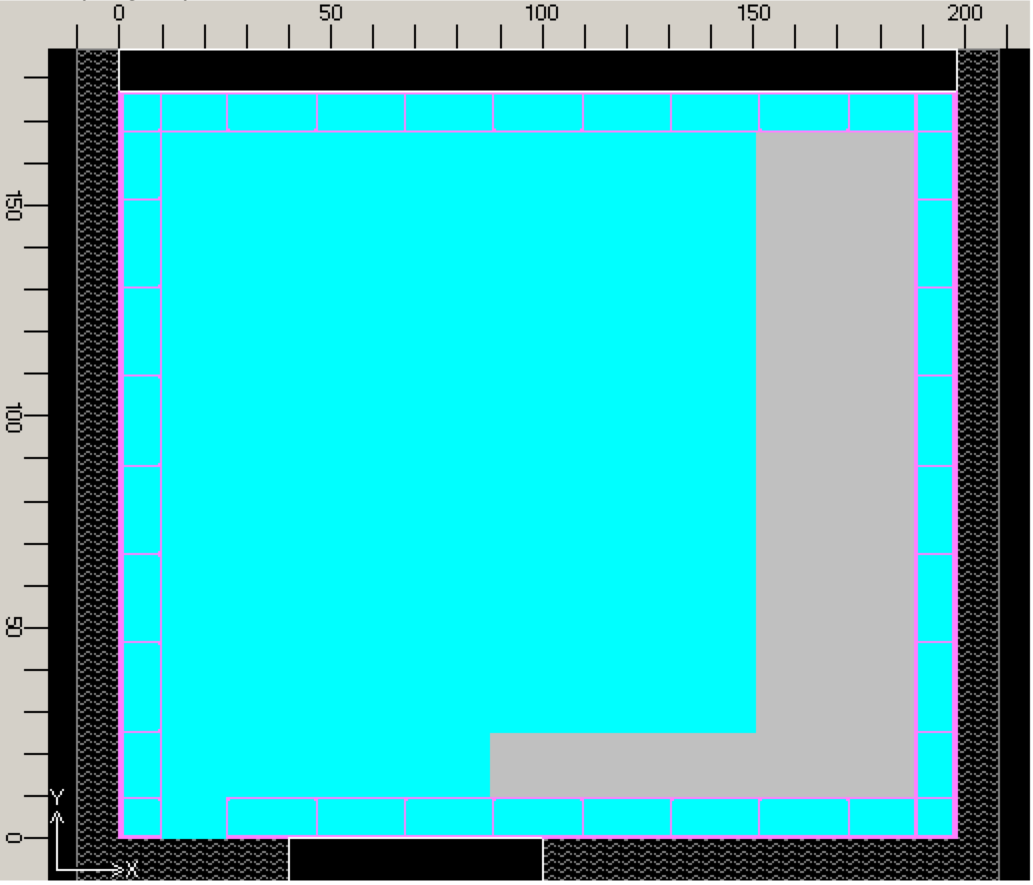
Raum\Raum	Room 0	Room 1
Room 0		0,183235
Room 1	0,183235	

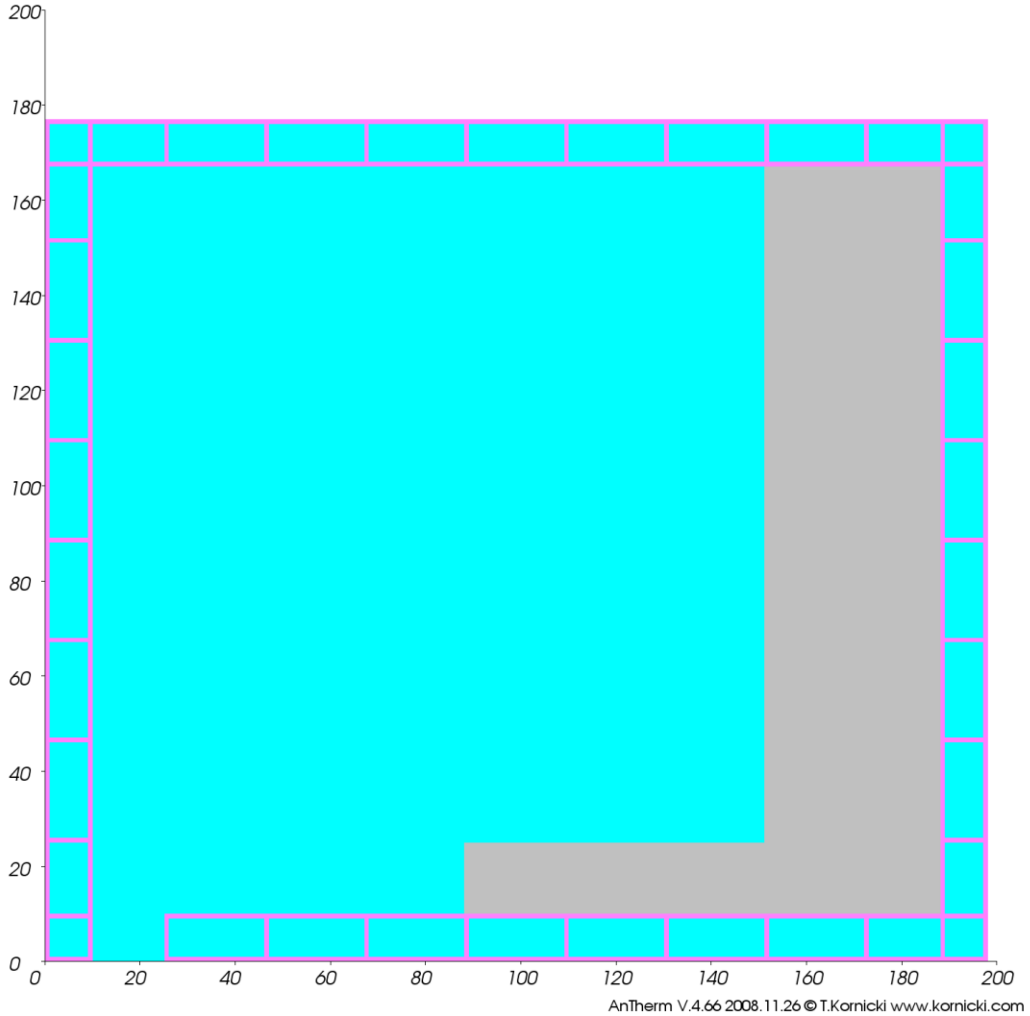
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	1.59704e-011	0,183235	8.71583e-011
Room 1	-1.59704e-011	0,183235	-8.71583e-011

Prüfreferenzfall 8

Bilder (Eingabe)





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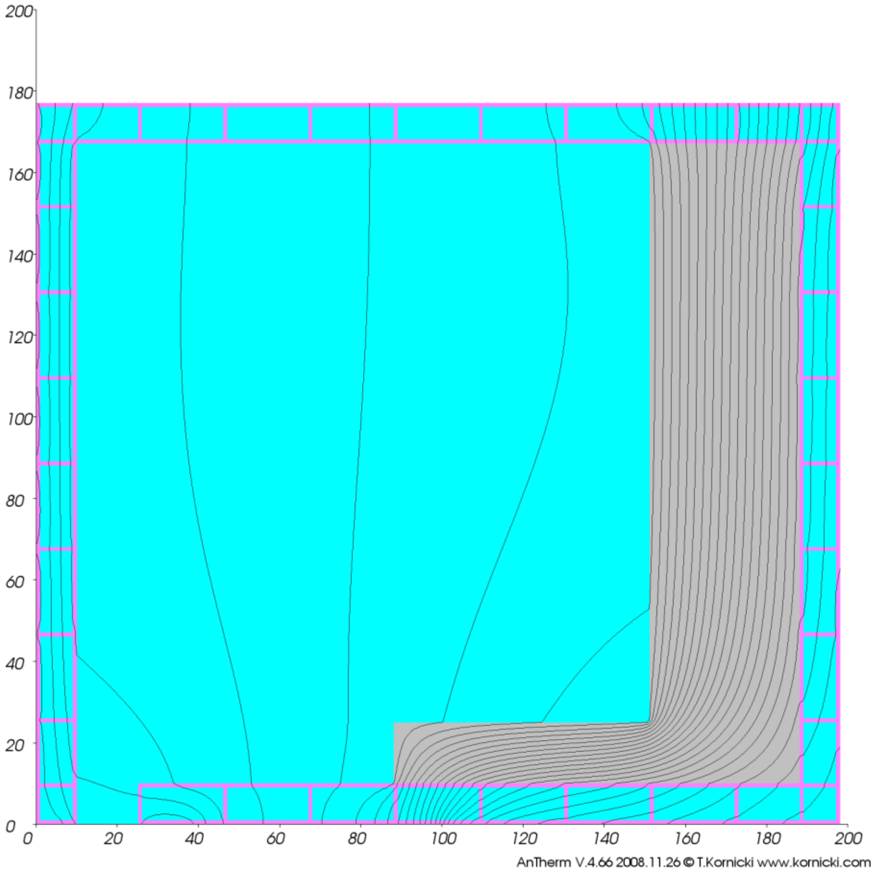

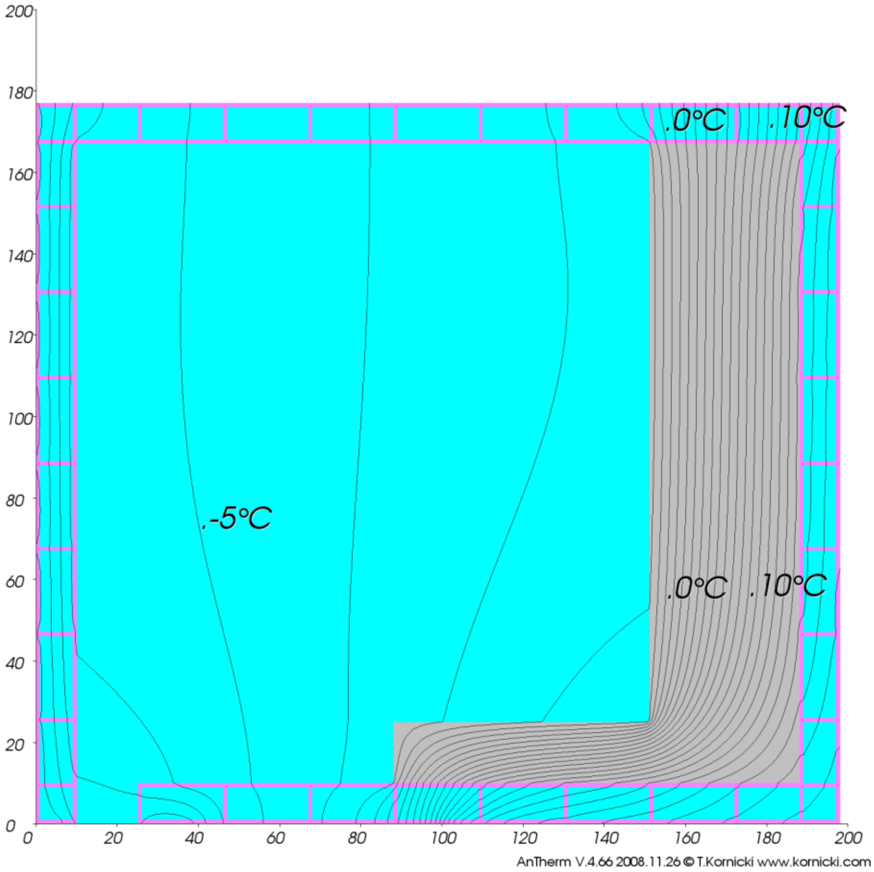

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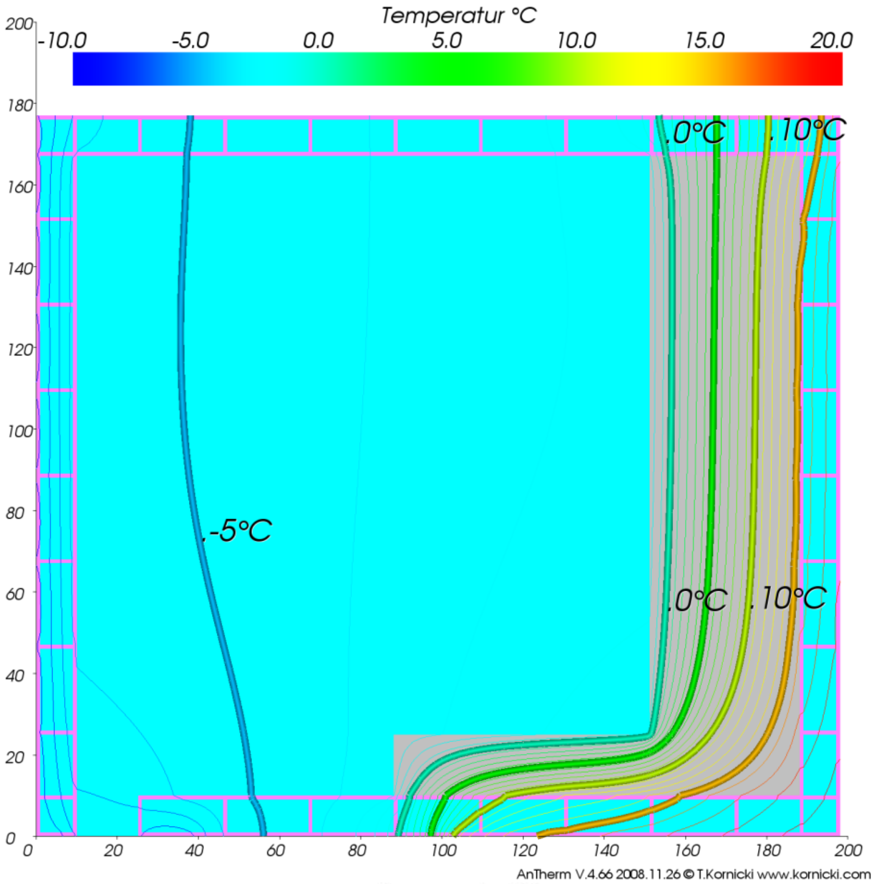

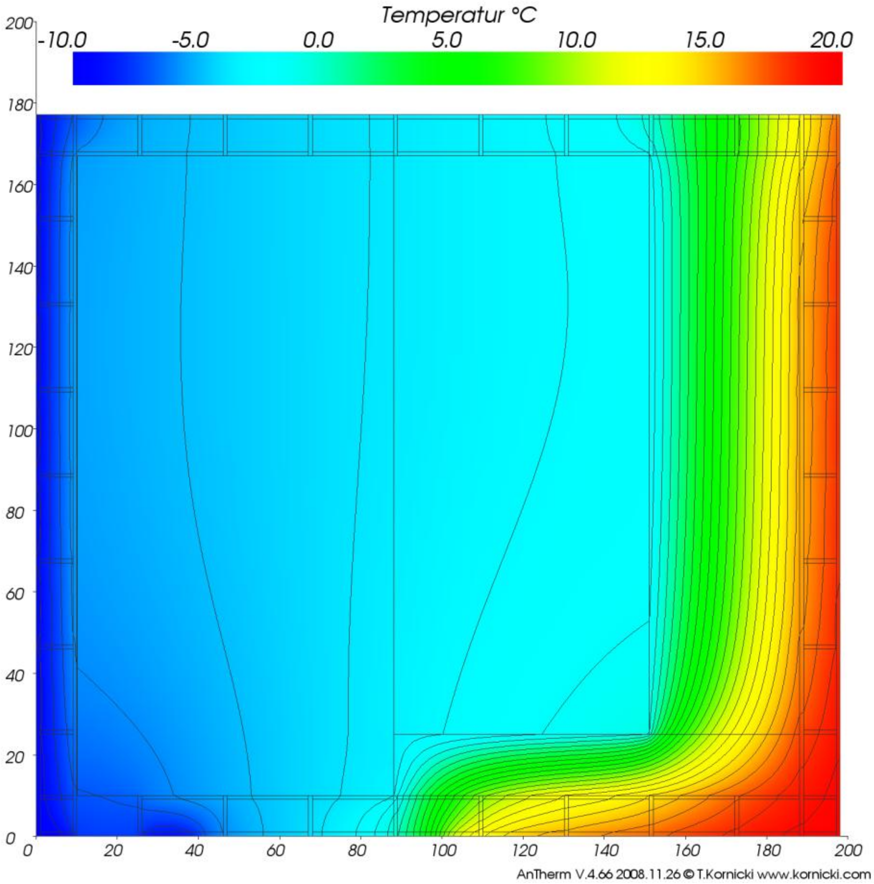

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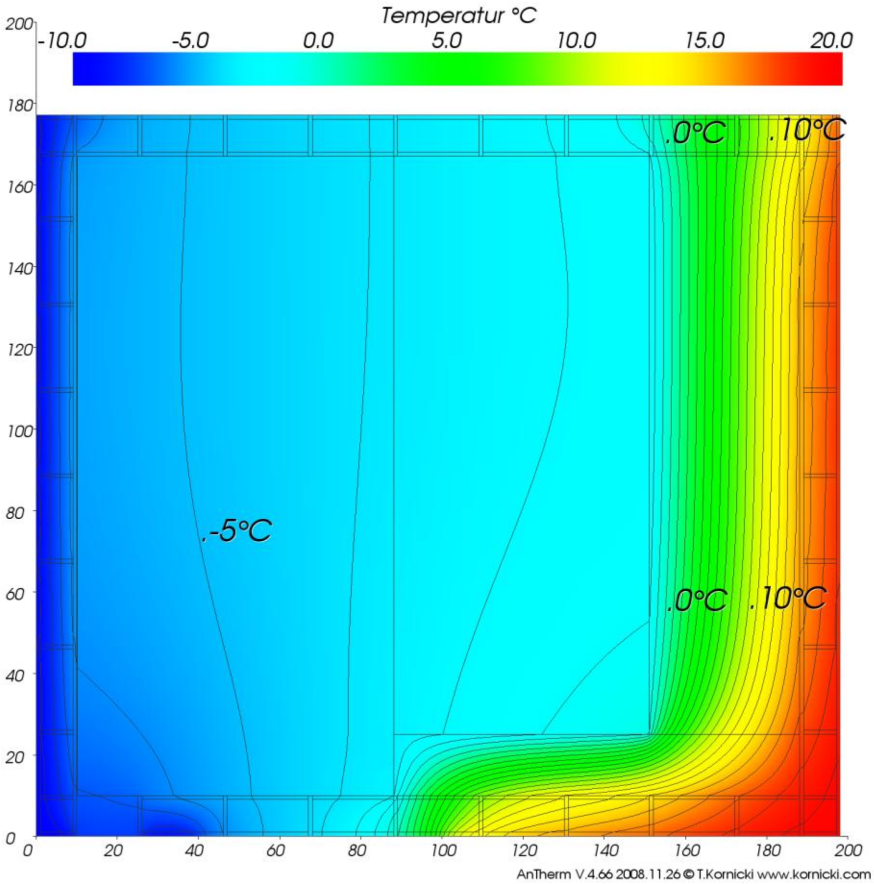
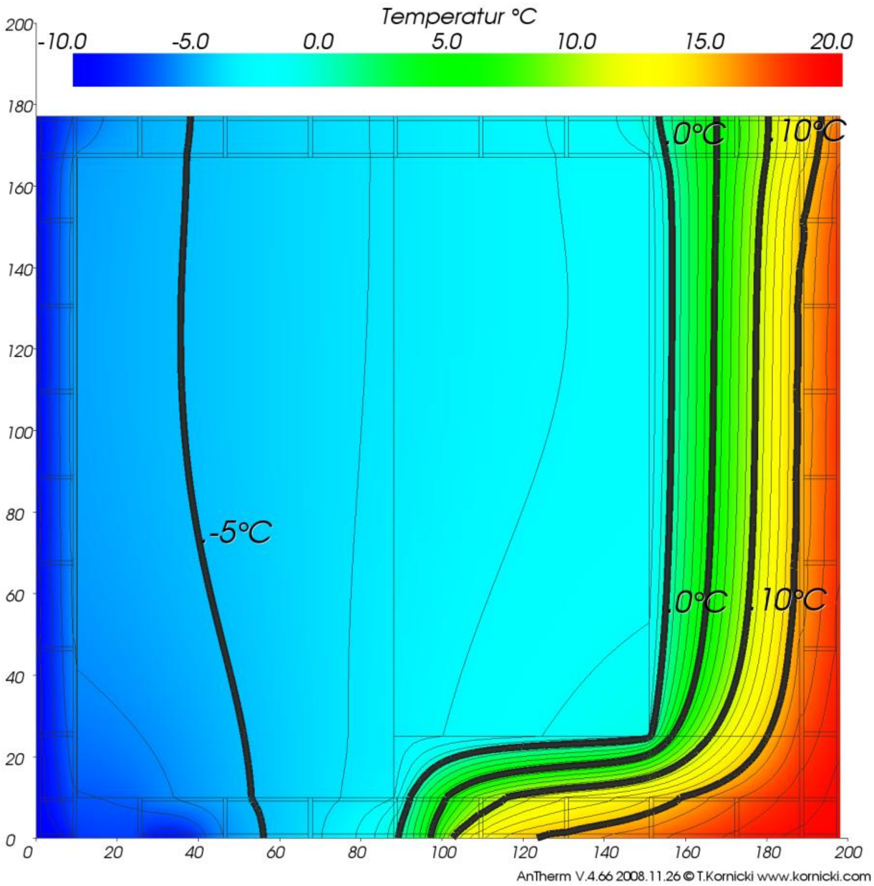
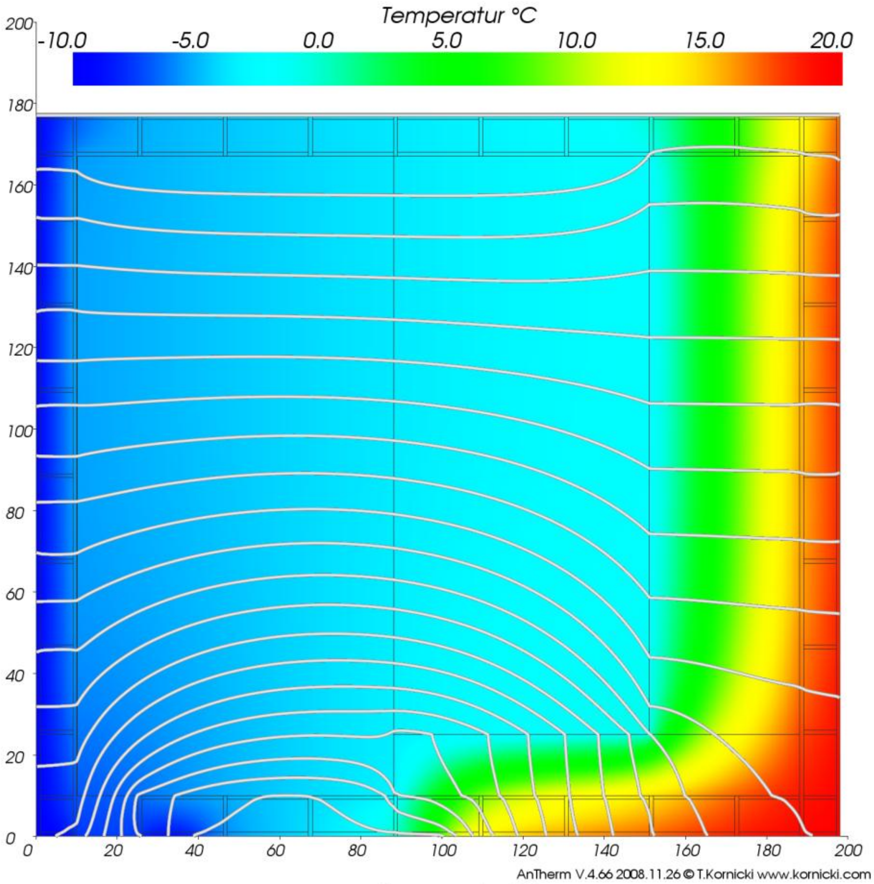
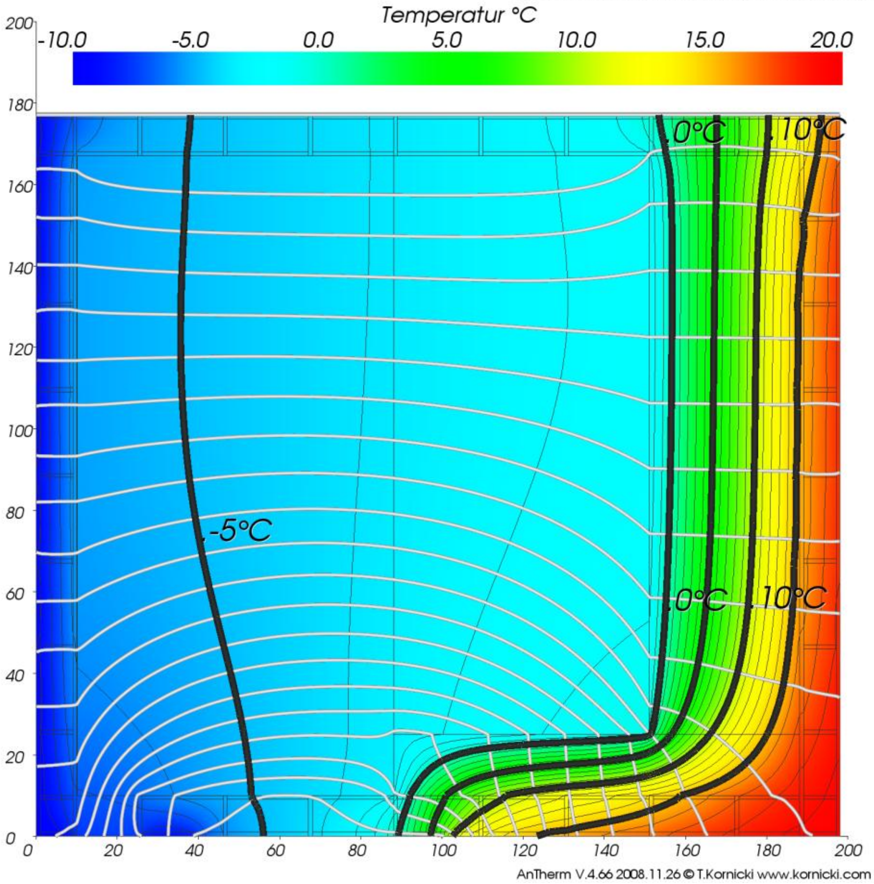




Prüfreferenzfall 8





Quellkode der Projektdatei D_8.antherm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Prüfreferenzfall 9

Validierungsberechnung (Unterleitungsraster 637 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 1204 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_9.antherm

T.Kornicki, Dienstleistungen in EDV und IT
A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
email: tkornicki@chello.at

12/13/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 9 (siehe Bild D.9)
PVC-Rollladenpanzerglied; Bezugshöhe: 57 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_9 637 Zellen\D_9.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elemente :

1. Schicht - Bez.: "BG#0" Dicke= 1000

    1. Raumzelle - (0, 3.5, 0) x (57, 17, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.69
    2. Raumzelle - (0, -10, 0) x (57, 3.5, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
    3. Baustoffzelle - (0, 0, 0) x (57, 7, 1000) Bez.: "PVC" λ = 0.17
    4. Baustoffzelle - (0.5, 1, 0) x (12.5, 6, 1000) Bez.: "L1" λ = 0.043
    5. Baustoffzelle - (13.5, 1, 0) x (25.5, 6, 1000) Bez.: "L1" λ = 0.043
    6. Baustoffzelle - (44.5, 1, 0) x (56.5, 6, 1000) Bez.: "L1" λ = 0.043
    7. Baustoffzelle - (31.5, 1, 0) x (43.5, 6, 1000) Bez.: "L1" λ = 0.043
    8. Baustoffzelle - (27.5, 3, 0) x (28.5, 6, 1000) Bez.: "L2" λ = 0.032
    9. Baustoffzelle - (28.5, 5, 0) x (29.5, 6, 1000) Bez.: "L3" λ = 0.028
    10. Baustoffzelle - (29.5, 1, 0) x (30.5, 6, 1000) Bez.: "L4" λ = 0.037
    11. Baustoffzelle - (27.5, 1, 0) x (29.5, 2, 1000) Bez.: "L5" λ = 0.028

Räume :

Room 0
Room 1

Wärmequellen :

T.Kornicki, Dienstleistungen in EDV und IT
A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
email: tkornicki@chello.at

12/13/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 9 (siehe Bild D.9)
PVC-Rollladenpanzerglied; Bezugshöhe: 57 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_9 637 Zellen\D_9.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Room 0
α= 25 W/(m²K) Rs= 0.0400 m²K/W : Außenraum

Raumbez.: Room 1
α= 7.69 W/(m²K) Rs= 0.1300 m²K/W : Innenraum

Wärmequellen : keine

Baustoffe :

λ= 0.043 W/(m K) : L1
λ= 0.032 W/(m K) : L2
λ= 0.028 W/(m K) : L3
λ= 0.037 W/(m K) : L4
λ= 0.028 W/(m K) : L5
λ= 0.17 W/(m K) : PVC

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> Room 1 @ BackLeft: (0, 0, 0) x (0, 7, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
PVC	0.1700	7.0000			0.0412	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**4.7345**	**[W/m²K]**	

Room 0 <-> Room 1 @ BackRight: (57, 0, 0) x (57, 7, 0)

Baustoff / Oberfläche	λ [W/mK]	d [mm]	Rs [m²K/W]	α [W/m²K]	R [m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
PVC	0.1700	7.0000			0.0412	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**4.7345**	**[W/m²K]**	

T.Kornicki, Dienstleistungen in EDV und IT
A-1230 Wien, Othellogasse 1/RH 8/2
Tel./Fax. +43-1-6157099
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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 9 (siehe Bild D.9)
PVC-Rollladenpanzerglied; Bezugshöhe: 57 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_9 637 Zellen\D_9.antherm

Anzahl der bilanzierten Zellen: 637

Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,207262
Room 1	0,207262	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	1.00076e-012	0,207262	4.82846e-012
Room 1	-1.00076e-012	0,207262	-4.82846e-012

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12/13/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 9 (siehe Bild D.9)
PVC-Rollladenpanzerglied; Bezugshöhe: 57 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_9 637 Zellen\D_9.antherm

Anzahl der bilanzierten Zellen: 637 (Knotenzahl = 8019)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^{*}_{Rsi}
Room 0	-10,00	-5,97	-4,57	100.00 %	
Room 1	20,00	4,19	6,36	35.25 %	0,47

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,865614	0,527007
g(Room 1)	0,134386	0,472993

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^{*}_{Rsi}
Room 0	36,2500	0,0000		-5.97	
Room 1	26,5000	7,0000		4.19	0,47

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12/13/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 9 (siehe Bild D.9)
PVC-Rollladenpanzerglied; Bezugshöhe: 57 mm
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_9 1204 Zellen\D_9.antherm

Anzahl der bilanzierten Zellen: 1204

Thermische Leitwerte [W / K]

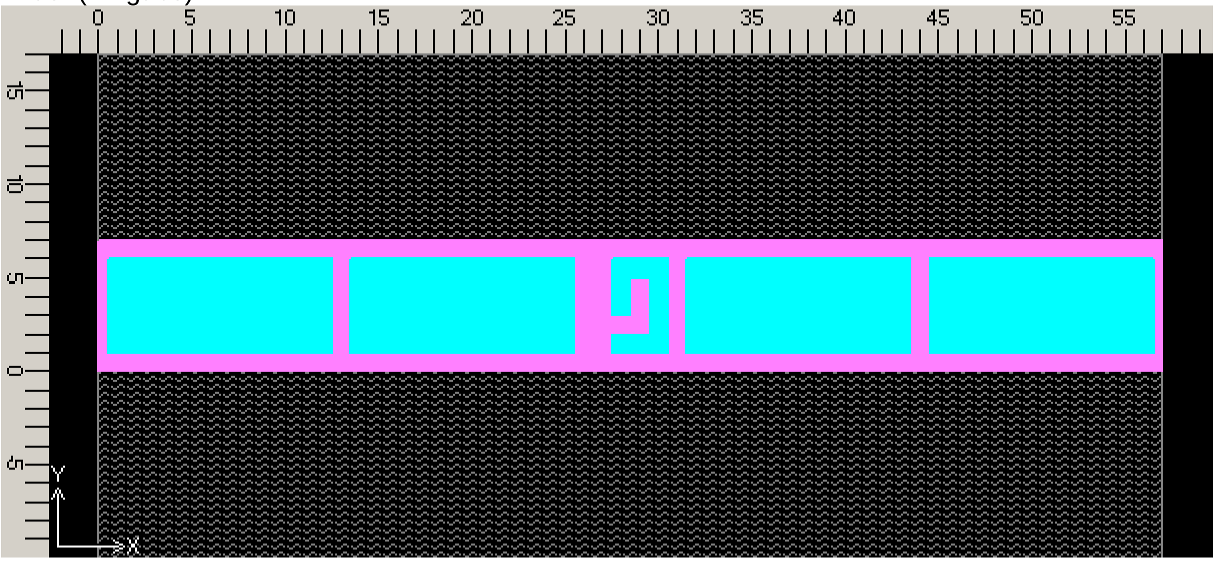
Raum\Raum	Room 0	Room 1
Room 0		0,207338
Room 1	0,207338	

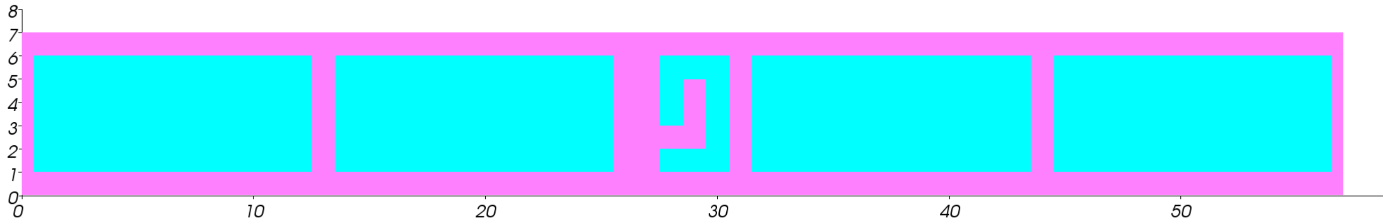
Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	-1.02526e-012	0,207338	-4.94489e-012
Room 1	1.02526e-012	0,207338	4.94489e-012

Prüfreferenzfall 9

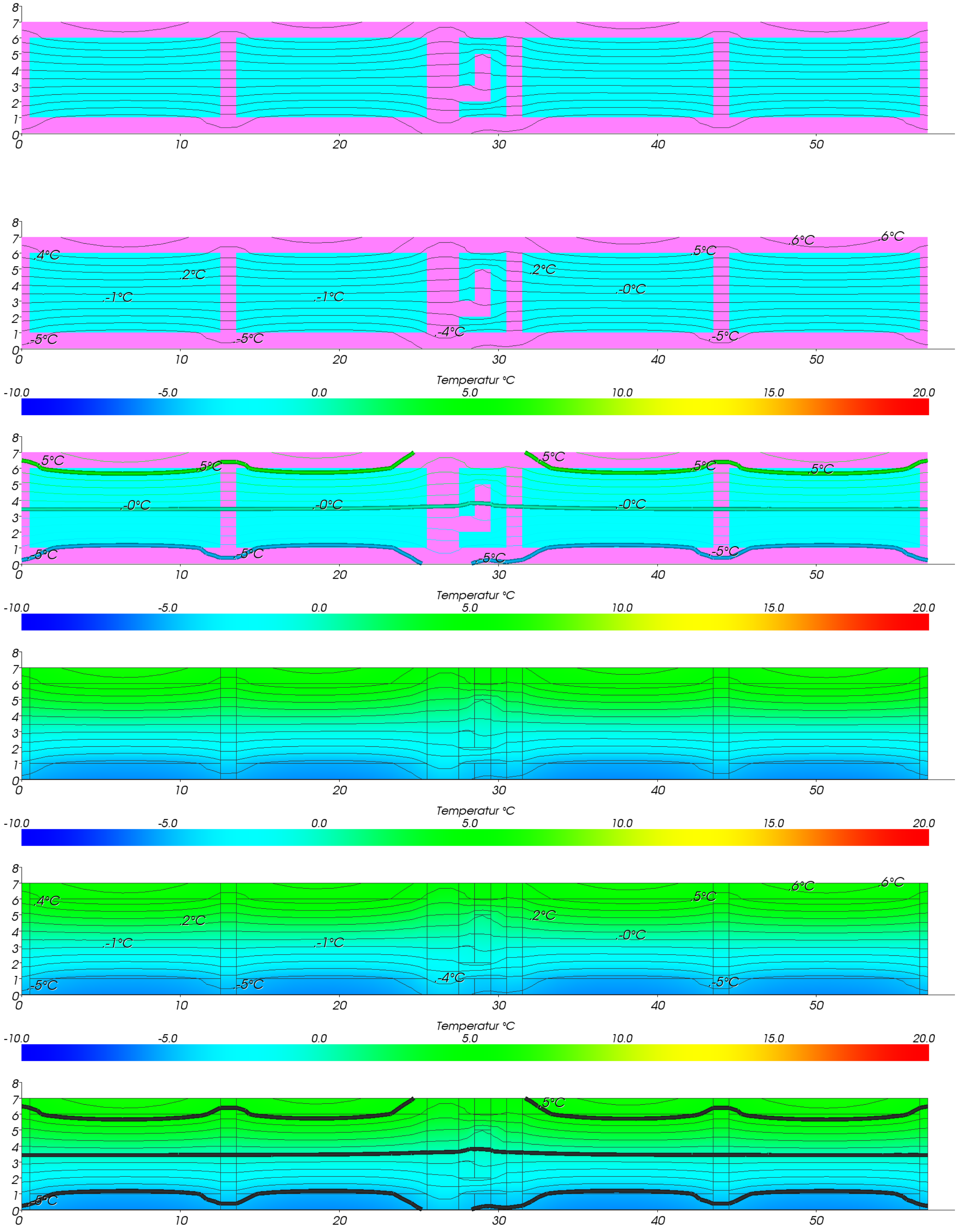
Bilder (Eingabe)



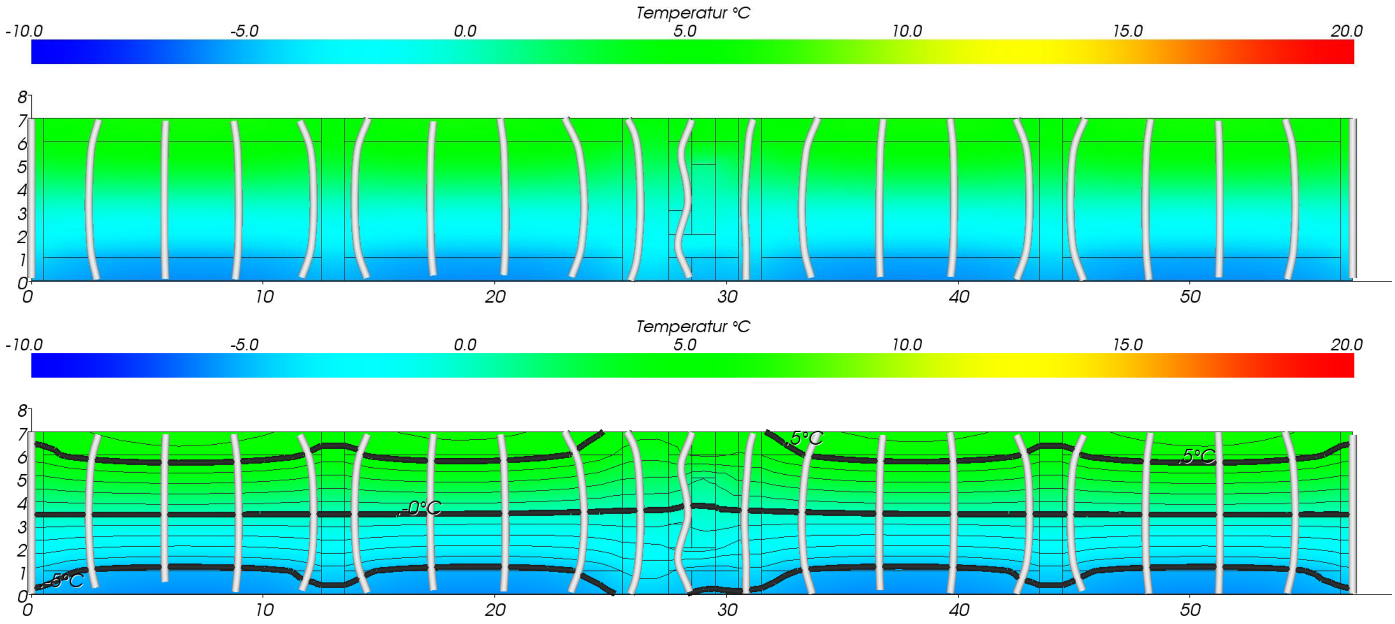


Prüfreferenzfall 9

Bilder (Ergebnis)



Prüfreferenzfall 9



Quellkode der Projektdatei D_9.antherm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Prüfreferenzfall 10

Validierungsberechnung (Unterleitungsraster 5.000 Zellen = Gleichungen)

1. Eingabedetails
2. Bauteilliste
3. Leitwerte
4. Ergebnis

Prüfung der ausreichenden Zahl der Unterteilungen:

5. (Unterleitungsraster 10.000 Zellen = Gleichungen)
    a. Leitwerte

Quellkode der Projektdatei D_10.antherm

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 10 (siehe Bild D.10)
Holzprofil mit Verglasung (mit Dämmblock siehe D.4)
Profilh.: 110 mm; Verglasung Ug = 1,3 W/(m²K), 4-20-4, Alu-Abstandsh.
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_10 5k Zellen\D_10.antherm

Detailangaben zu der Bauteilkonstruktionseingabe

Elementе :

1. Schicht - Bez.: "BG#0" Dicke= 1000

   1. Raumzelle - (0, -10, 0) x (300, 32, 1000) Raumbez.: "Room 0" Oberfl.Bez.: "Außenraum" α = 25
   2. Raumzelle - (0, 32, 0) x (300, 93, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.69
   3. Baustoffzelle - (0, 0, 0) x (110, 83, 1000) Bez.: "Holz" λ = 0.13
   4. Raumzelle - (0, 66, 0) x (26, 83, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum" α = 7.69
   5. Baustoffzelle - (26, 66, 0) x (42, 69, 1000) Bez.: "EPDM" λ = 0.25
   6. Baustoffzelle - (42, 15, 0) x (48, 69, 1000) Bez.: "L1" λ = 0.205
   7. Baustoffzelle - (48, 15, 0) x (63, 18, 1000) Bez.: "EPDM" λ = 0.25
   8. Baustoffzelle - (63, 0, 0) x (68, 18, 1000) Bez.: "L2" λ = 0.142
   9. Baustoffzelle - (90, 15, 0) x (95, 49, 1000) Bez.: "L3" λ = 0.13
   10. Baustoffzelle - (95, 46, 0) x (110, 49, 1000) Bez.: "EPDM" λ = 0.25
   11. Baustoffzelle - (95, 15, 0) x (110, 18, 1000) Bez.: "EPDM" λ = 0.25
   12. Raumzelle - (9, 66, 0) x (26, 83, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5
   13. Baustoffzelle - (95, 18, 0) x (300, 46, 1000) Bez.: "Glas" λ = 1
   14. Raumzelle - (110, 46, 0) x (140, 83, 1000) Raumbez.: "Room 1" Oberfl.Bez.: "Innenraum mit 0,20 m²K/W" α = 5
   15. Baustoffzelle - (95, 22, 0) x (300, 42, 1000) Bez.: "SZR" λ = 0.034
   16. Baustoffzelle - (95, 22, 0) x (108, 42, 1000) Bez.: "Polysulfid" λ = 0.4
   17. Baustoffzelle - (98, 22.5, 0) x (108, 41.5, 1000) Bez.: "Aluminium" λ = 160
   18. Baustoffzelle - (98.5, 23, 0) x (107.5, 41, 1000) Bez.: "Silica-Gel" λ = 0.13

Räume :

Room 0
Room 1

Wärmequellen :

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12/11/2008
AnTherm (Code WALTER)
Version 4.66 2008.11.26

Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 10 (siehe Bild D.10)
Holzprofil mit Verglasung (mit Dämmblock siehe D.4)
Profilh.: 110 mm; Verglasung Ug = 1,3 W/(m²K), 4-20-4, Alu-Abstandsh.
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_10 5k Zellen\D_10.antherm

Angaben zur Modellierung der Bauteilkonstruktion

Räume :

Raumbez.: Room 0
α= 25 W/(m²K) Rs=0.0400 m²K/W : Außenraum
Raumbez.: Room 1
α= 7.69 W/(m²K) Rs=0.1300 m²K/W : Innenraum
α= 5 W/(m²K) Rs=0.2000 m²K/W : Innenraum mit 0,20 m²K/W

Wärmequellen : keine

Baustoffe :

λ= 160 W/(m K) : Aluminium
λ= 0.25 W/(m K) : EPDM
λ= 1 W/(m K) : Glas
λ= 0.13 W/(m K) : Holz
λ= 0.205 W/(m K) : L1
λ= 0.142 W/(m K) : L2
λ= 0.13 W/(m K) : L3
λ= 0.4 W/(m K) : Polysulfid
λ= 0.13 W/(m K) : Silica-Gel
λ= 0.034 W/(m K) : SZR

Schichtaufbauten und U-Wert Berechnungen

Room 0 <-> Room 1 @ BackLeft: (0, 0, 0) x (0, 66, 0)

	λ	d	Rs	α	R	
Baustoff / Oberfläche	[W/mK]	[mm]	[m²K/W]	[W/m²K]	[m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Holz	0.1300	66.0000			0.5077	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**1.4755**	**[W/m²K]**	

Room 0 <-> Room 1 @ BackRight: (300, 18, 0) x (300, 46, 0)

	λ	d	Rs	α	R	
Baustoff / Oberfläche	[W/mK]	[mm]	[m²K/W]	[W/m²K]	[m²K/W]	Raum
Room 0/Außenraum			0.0400	25.0000	0.0400	Room 0
Glas	1.0000	4.0000			0.0040	
SZR	0.0340	20.0000			0.5882	
Glas	1.0000	4.0000			0.0040	
Room 1/Innenraum			0.1300	7.6900	0.1300	Room 1
			U-Wert:	**1.3050**	**[W/m²K]**	

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 10 (siehe Bild D.10)
Holzprofil mit Verglasung (mit Dämmblock siehe D.4)
Profilh.: 110 mm; Verglasung Ug = 1,3 W/(m²K), 4-20-4, Alu-Abstandsh.
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_10 5k Zellen\D_10.antherm

Anzahl der bilanzierten Zellen: 5211

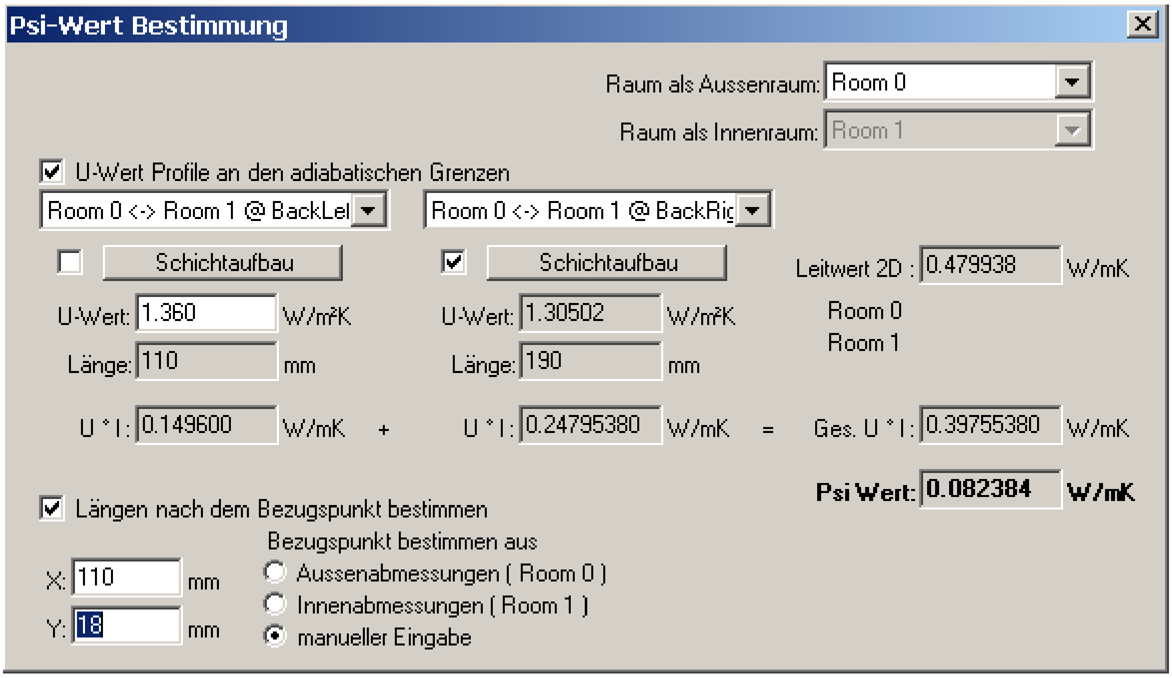
Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,479938
Room 1	0,479938	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	4.25877e-010	0,479938	8.87358e-010
Room 1	-4.25877e-010	0,479938	-8.87358e-010

Prüfreferenzfall 10



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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 10 (siehe Bild D.10)
Holzprofil mit Verglasung (mit Dämmblock siehe D.4)
Profilh.: 110 mm; Verglasung Ug = 1,3 W/(m²K), 4-20-4, Alu-Abstandsh.
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_10 5k Zellen\D_10.antherm

Anzahl der bilanzierten Zellen: 5211 (Knotenzahl = 63543)

Randbedingungen und resultierende Oberflächentemperaturen / Grenzfeuchten

	Raumtemperatur [°C]	min. Temperatur [°C]	max. Temperatur [°C]	Grenzfeuchte [%]	f^*_{Rsi}
Room 0	-10,00	-9,33	-3,26	100.00 %	
Room 1	20,00	3,47	17,07	33.50 %	0,45

Gewichte für den kältesten Oberflächenpunkt eines jeden Raumes

	Room 0	Room 1
g(Room 0)	0,977728	0,551100
g(Room 1)	0,022272	0,448900

Koordinaten (x,y,z) des kältesten Oberflächenpunktes eines jeden Raumes

	x	y	z	Temp.[°C]	f^*_{Rsi}
Room 0	110,0000	0,0000		-9.33	
Room 1	110,0000	46,0000		3.47	0,45

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Validierung Programmpaket AnTherm gemäß EN ISO 10077-2:2003, Anhang D
Prüfreferenzfall 10 (siehe Bild D.10)
Holzprofil mit Verglasung (mit Dämmblock siehe D.4)
Profilh.: 110 mm; Verglasung Ug = 1,3 W/(m²K), 4-20-4, Alu-Abstandsh.
stationäre 2D-Berechnung: K. Krec/T.Kornicki, Dezember 2008

Datei: D:\Entw\Walter\Validation\10077-2_2008\D_10 10k Zellen\D_10.antherm

Anzahl der bilanzierten Zellen: 11335

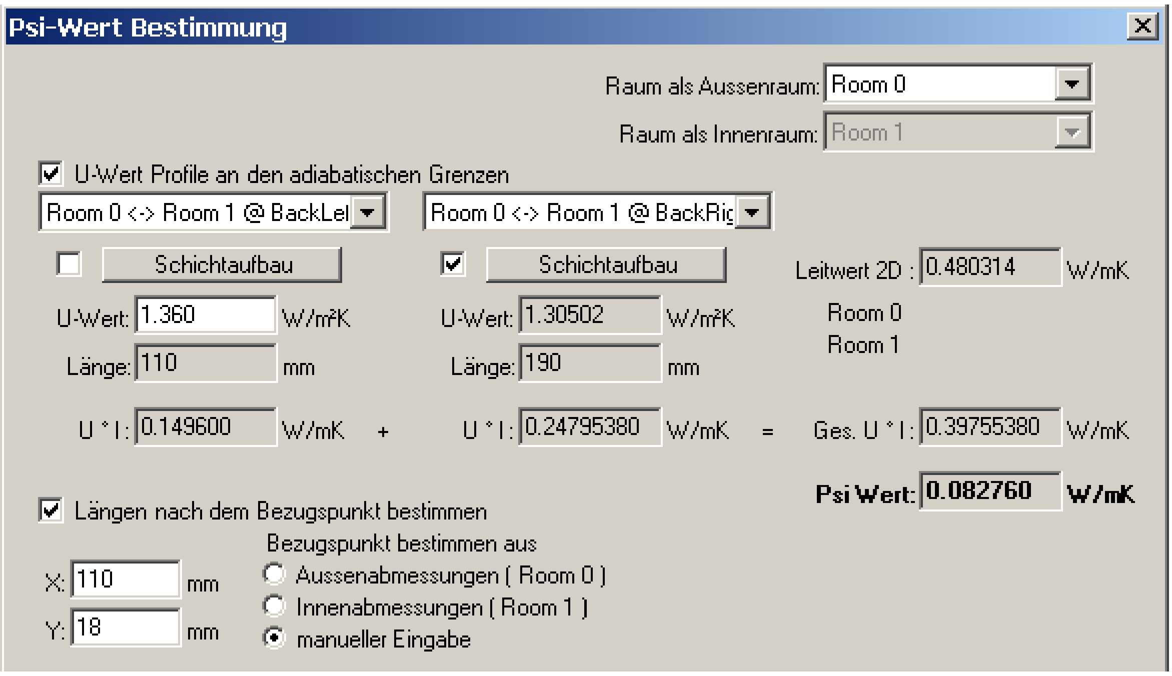
Thermische Leitwerte [W / K]

Raum\Raum	Room 0	Room 1
Room 0		0,480314
Room 1	0,480314	

Genauigkeitsangaben

	Schließfehler [W / K]	Leitwert Summe [W / K]	Leitwertbezogener Schließfehler
Room 0	5.59359e-010	0,480314	1.16457e-009
Room 1	-5.59359e-010	0,480314	-1.16457e-009

Prüfreferenzfall 10



Prüfreferenzfall 10

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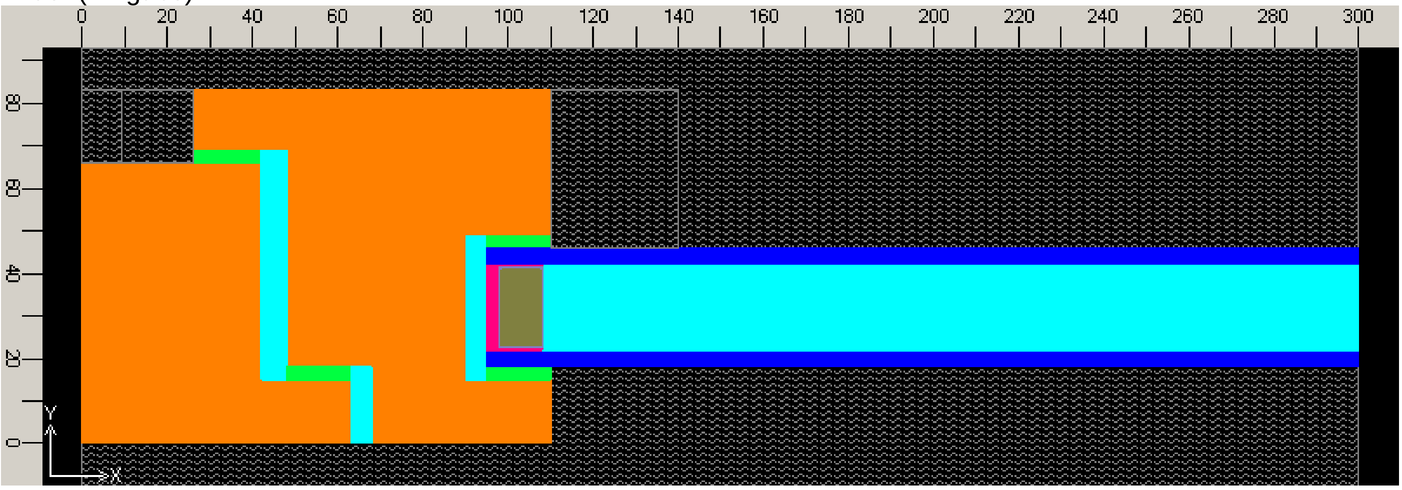

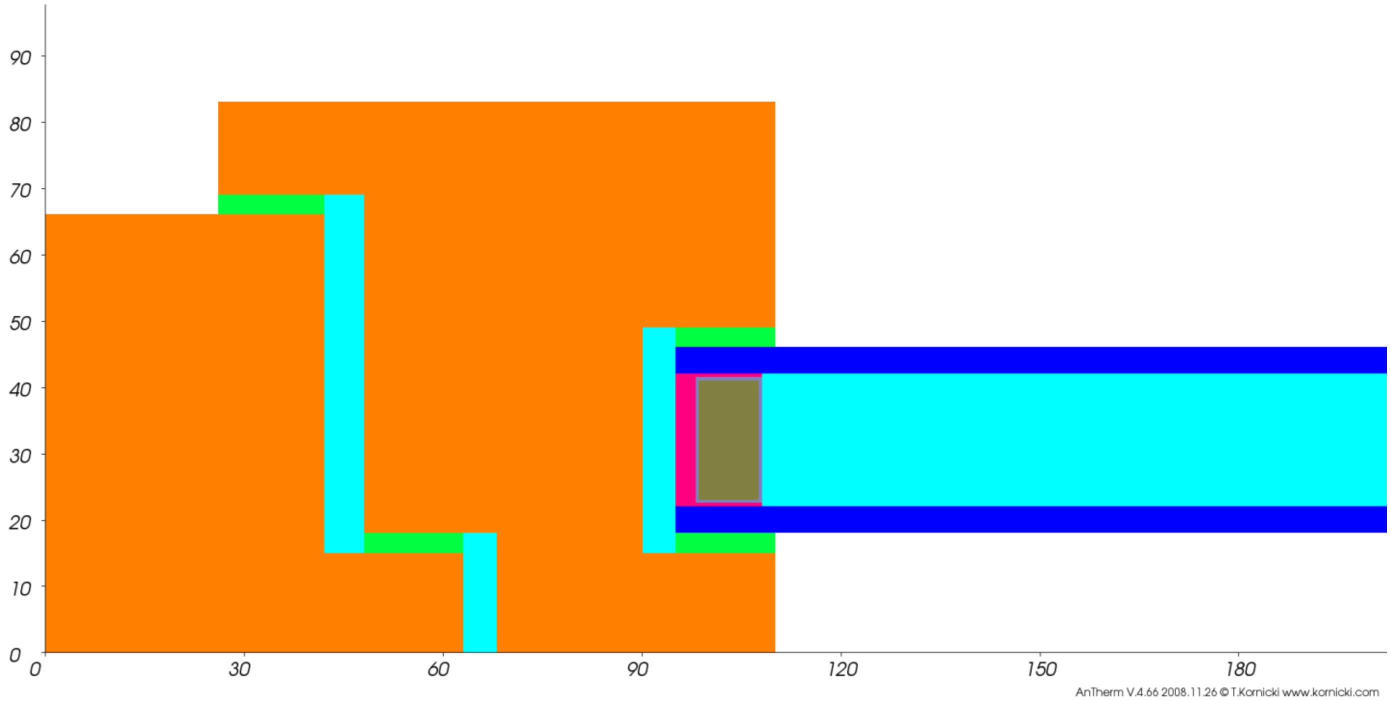

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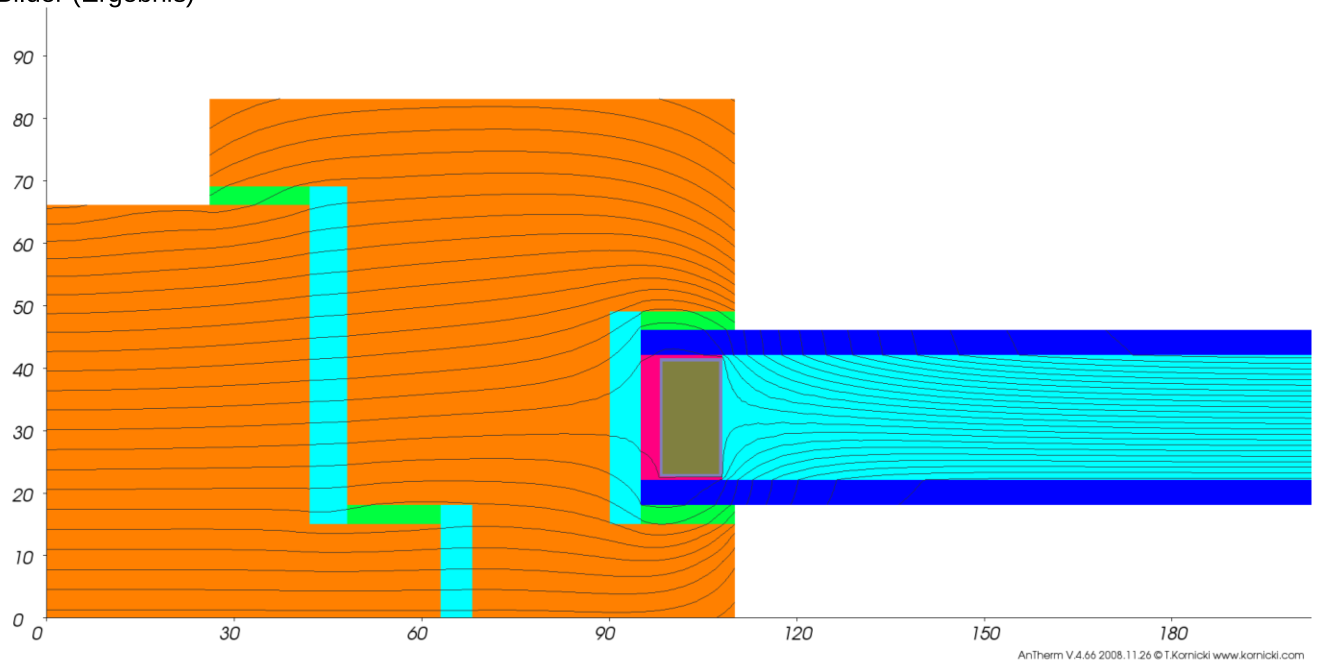

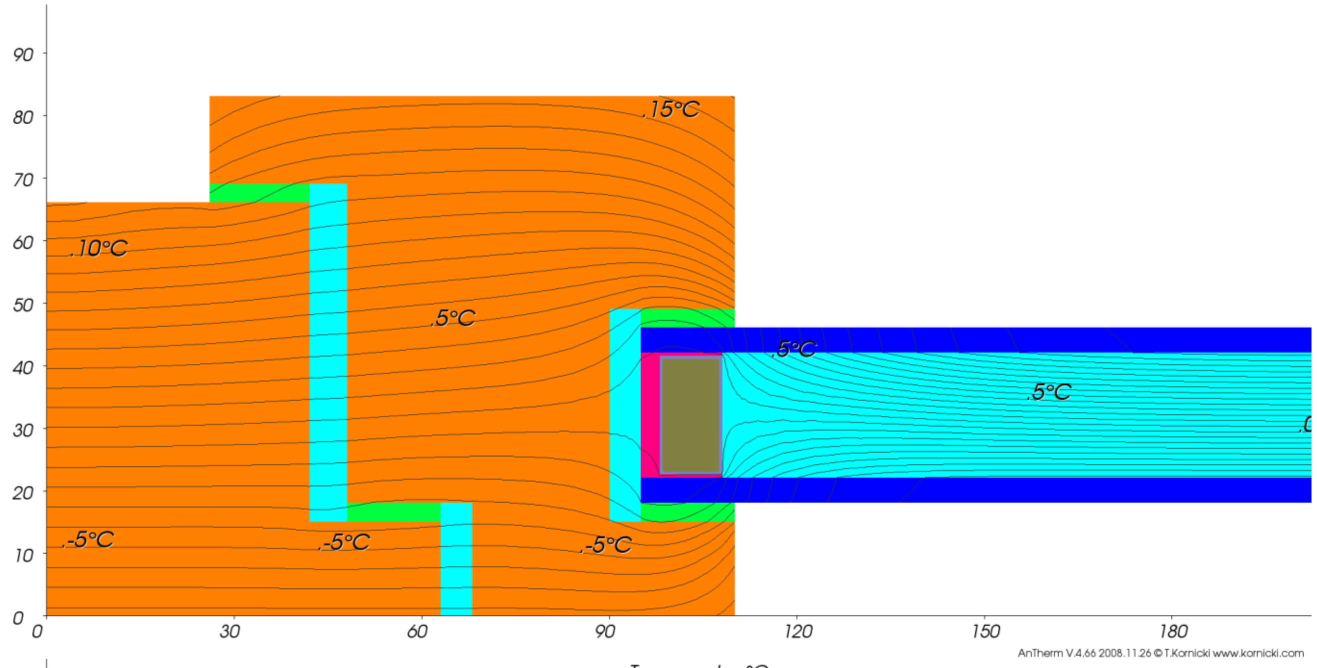

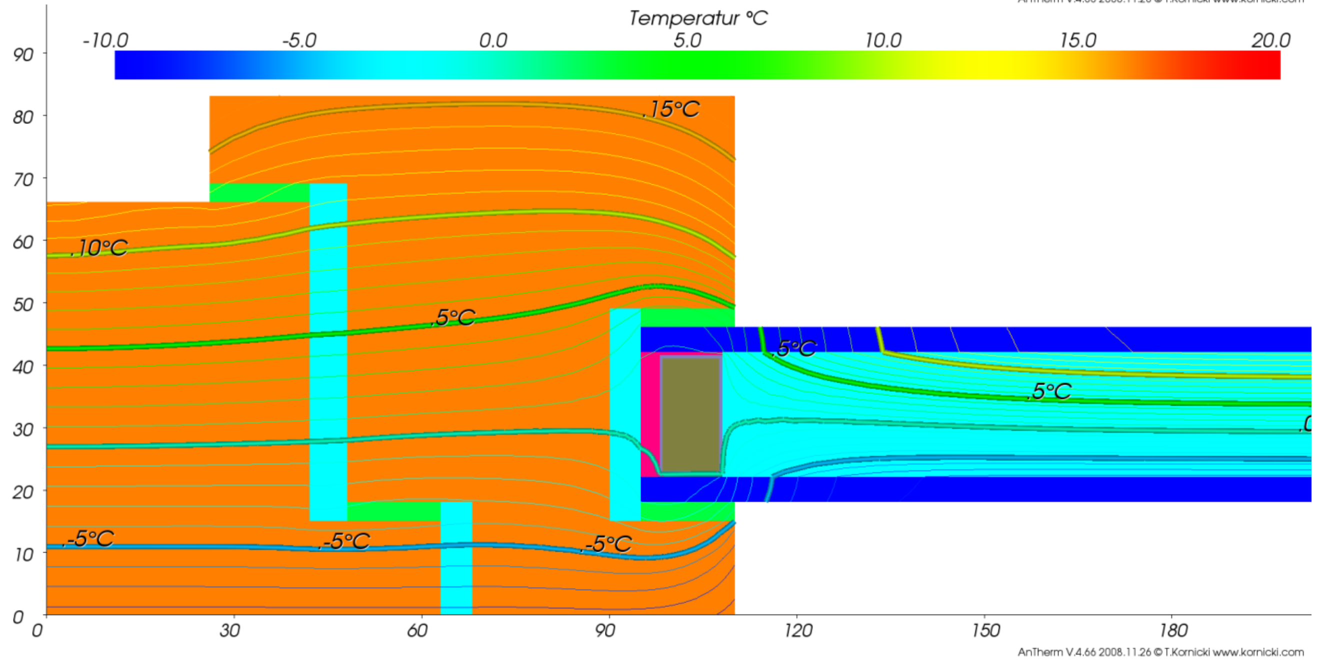

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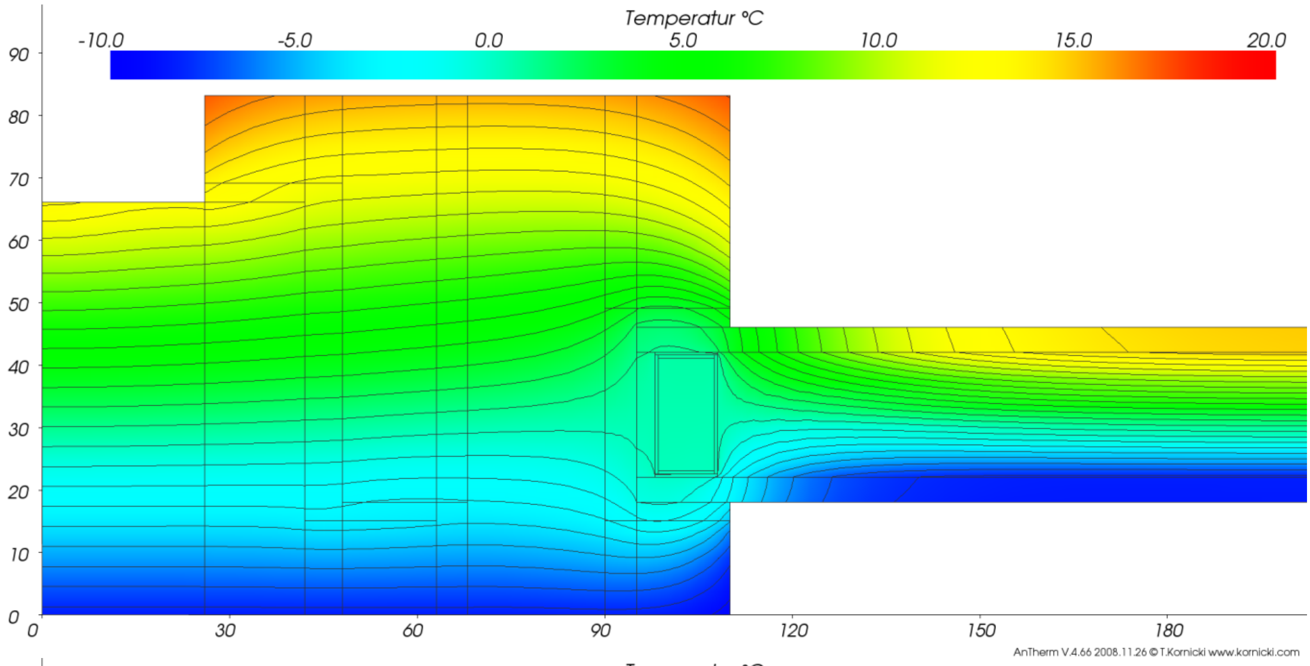

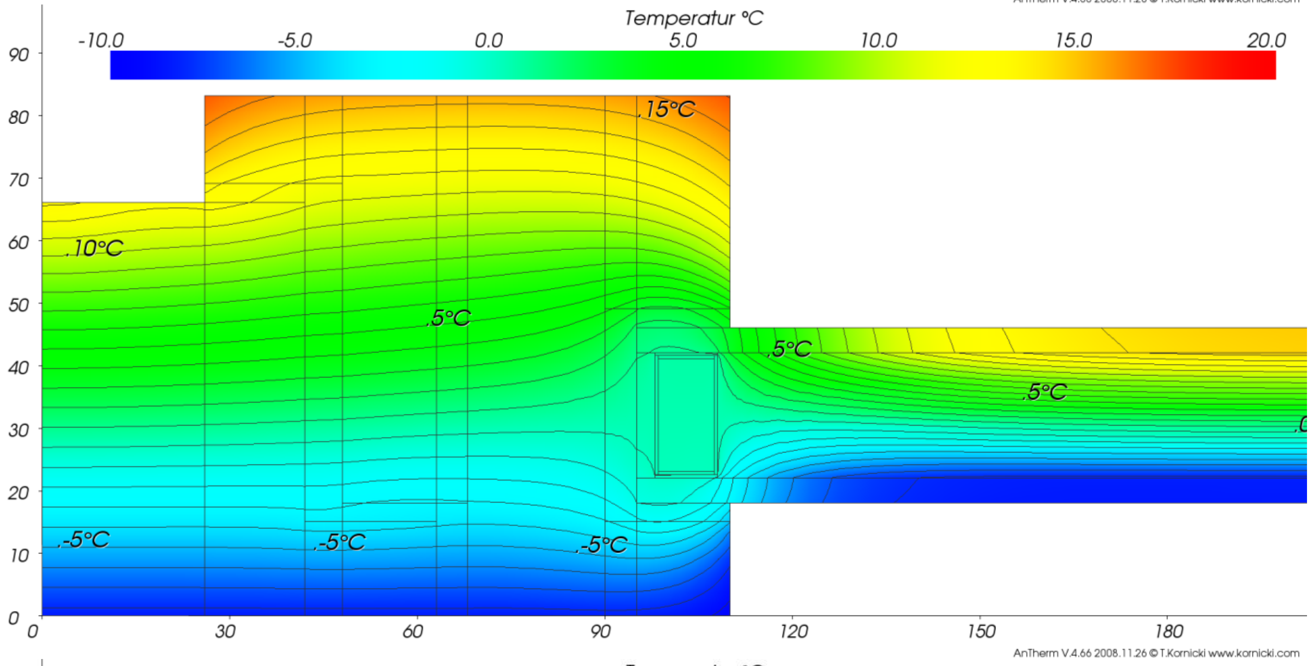

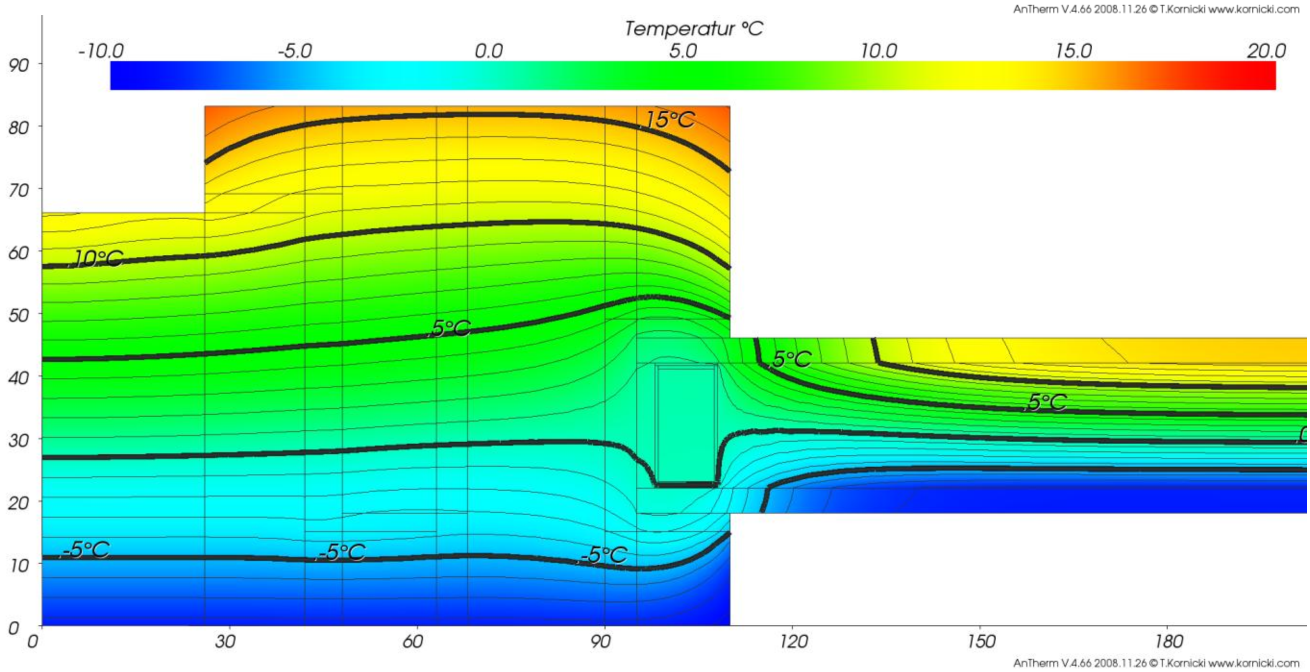

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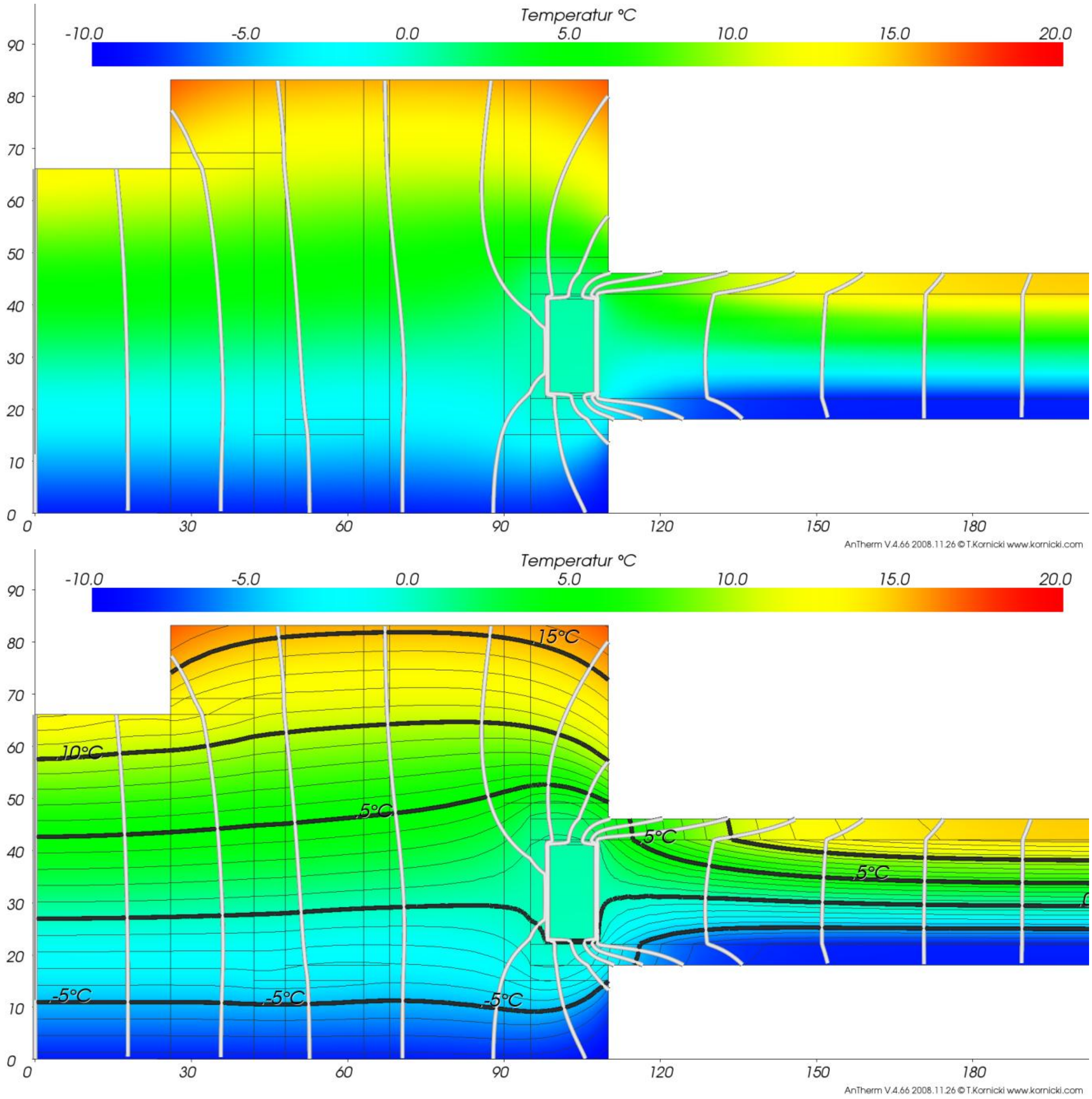

Quellkode der Projektdatei D_10.antherm


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Weitere Hinweise

http://www.kornicki.com/antherm
http://www.kornicki.de/antherm
http://www.kornicki.at/antherm
http://waermebruecken.kornicki.at