

EnergyPlus Exercise Ground Heat Transfer 1

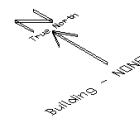
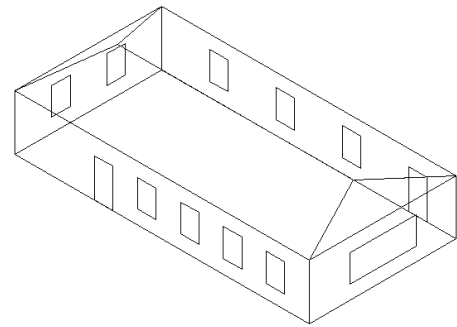
Ground Heat Transfer using the Slab Preprocessor

Last revised November 2012 for EnergyPlus v7.2.0.006

General Description

Overview

- Rectangular single story building
- Doors in east and west walls
- Windows in all walls
- Single zone (8m x 15m x 3m high) plus attic
- Lightweight constructionConcrete slab in grade floorPackaged DX cooling with gas heat



Instructions

Exercise Ground Heat Transfer 1A – Use Ground Temperatures from the Slab Preprocessor

Objective: Establish baseline results, then run the Slab preprocessor and use the resulting ground temperatures.

1. Run ExerciseGroundHT1 with USA_IL_Chicago-OHare.Intl.AP.725300_TMY3 weather data. This input file uses the default ground temperatures of 18C for all months.
2. In the Table (html) output file, find the monthly average zone temperatures for Occupied Zone.
3. Return to EP-Launch and open ExerciseGroundHT1.idf in IDF Editor.
4. Save as to ExerciseGroundHT1A.idf
5. In the Building object, change the building name to "Exercise Ground Heat Transfer 1A".
Note: This helps in identifying HTML output files, because the building name is shown at the top and is also part of the window title.
6. In IDF Editor, locate the "GroundHeatTransfer:*" objects.
7. Create a new GroundHeatTransfer:Control object, give it a name, and set "Run Slab Preprocessor" to Yes.

8. Create a new GroundHeatTransfer:Slab:Materials object:

2,	!- NMAT: Number of materials
0.158,	!- ALBEDO: Surface Albedo: No Snow
0.379,	!- ALBEDO: Surface Albedo: Snow
0.9,	!- EPSLW: Surface Emissivity: No Snow
0.9,	!- EPSLW: Surface Emissivity: Snow
0.75,	!- Z0: Surface Roughness: No Snow
0.03,	!- Z0: Surface Roughness: Snow
6.13,	!- HIN: Indoor HConv: Downward Flow {W/m2-K}
9.26;	!- HIN: Indoor HConv: Upward {W/m2-K}
9. Create a new GroundHeatTransfer:Slab:MatlProps object:

2300,	!- RHO: Slab Material density {kg/m3}
1200,	!- RHO: Soil Density {kg/m3}
653,	!- CP: Slab CP {J/kg-K}
1200,	!- CP: Soil CP {J/kg-K}
0.93,	!- TCON: Slab k {W/m-K}
1;	!- TCON: Soil k {W/m-K}
10. Create a new GroundHeatTransfer:Slab:BoundConds object:

TRUE,	!- EVTR: Is surface evapotranspiration modeled
TRUE,	!- FIXBC: is the lower boundary at a fixed temperature
,	!- TDEEPin, {C}
FALSE,	!- USRHflag: Is the ground surface h specified by the user?
; USERH: User specified ground surface heat transfer coeff	
11. Create a new GroundHeatTransfer:Slab:BldgProps object:

10,	!- IYRS: Number of years to iterate
0,	!- Shape: Slab shape
2,	!- HBLDG: Building height {m}

for TIN1: January Indoor Average temperature set point {C} thru
 TIN12: December Indoor Average temperature set point {C} use the monthly
 indoor temperatures output from the first run above.

0,	!- TINamp: Daily Indoor sine wave variation amplitude {C}
0.1;	!- ConvTol: Convergence Tolerance
12. Create a new GroundHeatTransfer:Slab:Insulation object:

0.,	!- RINS: R value of under slab insulation {m2-K/W}
0.,	!- DINS: Width of strip of under slab insulation {m}
0.,	!- RVINS: R value of vertical insulation {m2-K/W}
0.2,	!- ZVINS: Depth of vertical insulation {m}
0;	!- IVINS: Flag: Is there vertical insulation

13. Create a new GroundHeatTransfer:Slab:EquivalentSlab object:
 - 2.6, !- APRatio: The area to perimeter ratio for this slab {m}
 - 0.15, !- SLABDEPTH: Thickness of slab on grade {m}
 - 15., !- CLEARANCE: Distance from edge of slab to domain edge {m}
 - 15.; !- ZCLEARANCE: Depth of region below slab {m}
14. Locate the BuildingSurface:Detailed object named "Foundation Floor Core Section" and change the outside boundary condition to "GroundSlabPreprocessorCore".
15. Locate the BuildingSurface:Detailed object named "Foundation Floor Perimeter Section" and change the outside boundary condition to "GroundSlabPreprocessorPerimeter".
16. Run ExerciseGroundHT1A and compare results with ExerciseGroundHT1.

List of New Objects

This is a listing of new objects added or modified in this Exercise.
Try not to look at this section until you have completed the Exercise.

Exercise Ground Heat Transfer 1A

New Objects:

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GroundHeatTransfer:Control,
  Ground Heat Transfer Exercise,  !- Name
  No,                               !- Run Basement Preprocessor
  Yes;                              !- Run Slab Preprocessor

GroundHeatTransfer:Slab:Materials,
  2,                               !- NMAT: Number of materials
  0.158,                           !- ALBEDO: Surface Albedo: No Snow
  0.379,                           !- ALBEDO: Surface Albedo: Snow
  0.9,                              !- EPSLW: Surface Emissivity: No Snow
  0.9,                              !- EPSLW: Surface Emissivity: Snow
  0.75,                            !- Z0: Surface Roughness: No Snow
  0.03,                            !- Z0: Surface Roughness: Snow
  6.13,                            !- HIN: Indoor HConv: Downward Flow {W/m2-K}
  9.26;                            !- HIN: Indoor HConv: Upward {W/m2-K}

GroundHeatTransfer:Slab:MatlProps,
  2300,                            !- RHO: Slab Material density {kg/m3}
  1200,                            !- RHO: Soil Density {kg/m3}
  650,                              !- CP: Slab CP {J/kg-K}
  1200,                            !- CP: Soil CP {J/kg-K}
  0.93,                            !- TCON: Slab k {W/m-K}
  1;                                !- TCON: Soil k {W/m-K}

GroundHeatTransfer:Slab:BoundConds,
  TRUE,                            !- EVTR: Is surface evapotranspiration modeled
  TRUE,                            !- FIXBC: is the lower boundary at a fixed temperature
  ,                                 !- TDEEPin {C}
  FALSE;                           !- USRHflag: Is the ground surface h specified by the user?

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GroundHeatTransfer:Slab:BldgProps,
  10,                !- IYRS: Number of years to iterate
  0,                 !- Shape: Slab shape
  1,                 !- HBLDG: Building height {m}
  20.11,             !- TIN1: January Indoor Average temperature set point {C}
  20.18,             !- TIN2: February Indoor Average temperature set point {C}
  20.6,              !- TIN3: March Indoor Average temperature set point {C}
  21.36,             !- TIN4: April Indoor Average temperature set point {C}
  22.32,             !- TIN5: May Indoor Average temperature set point {C}
  23.1,              !- TIN6: June Indoor Average temperature set point {C}
  23.31,             !- TIN7: July Indoor Average temperature set point {C}
  23.04,             !- TIN8: August Indoor Average temperature set point {C}
  22.46,             !- TIN9: September Indoor Average temperature set point {C}
  21.24,             !- TIN10: October Indoor Average temperature set point {C}
  20.54,             !- TIN11: November Indoor Average temperature set point {C}
  20.1,              !- TIN12: December Indoor Average temperature set point {C}
  0,                 !- TINamp: Daily Indoor sine wave variation amplitude {C}
  0.1;               !- ConvTol: Convergence Tolerance

GroundHeatTransfer:Slab:Insulation,
  0,                 !- RINS: R value of under slab insulation {m2-K/W}
  0,                 !- DINS: Width of strip of under slab insulation {m}
  0,                 !- RVINS: R value of vertical insulation {m2-K/W}
  0.2,              !- ZVINS: Depth of vertical insulation {m}
  0;                 !- IVINS: Flag: Is there vertical insulation

GroundHeatTransfer:Slab:EquivalentSlab,
  2.6,              !- APRatio: The area to perimeter ratio for this slab {m}
  0.15,             !- SLABDEPTH: Thickness of slab on grade {m}
  15,               !- CLEARANCE: Distance from edge of slab to domain edge {m}
  15;               !- ZCLEARANCE: Distance from bottom of slab to domain bottom {m}

Modified Objects:
BuildingSurface:Detailed,
  Foundation Floor Perimeter Section, !- Name
  Floor,                             !- Surface Type
  BotFloorConstruction,               !- Construction Name
  Occupied Zone,                      !- Zone Name
  GroundSlabPreprocessorCore,         !- Outside Boundary Condition
. . .

BuildingSurface:Detailed,
  Foundation Floor Core Section, !- Name
  Floor,                             !- Surface Type
  BotFloorConstruction,               !- Construction Name
  Occupied Zone,                      !- Zone Name
  GroundSlabPreprocessorPerimeter,    !- Outside Boundary Condition
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