TESS Ground Coupling Model Comparison

Topic	Type 49 (Standard TRNSYS)	Type 1244 (Tess Ground Coupling Library)	Type 1255 (Tess Ground Coupling Library)	Type 1267 (TESS Individual Components for Sale)
Intent	Slab-on grade heat transfer from Type 56 buildings	Slab-on-grade, basement, crawlspace, and buried zone heat transfer from Type 56 buildings	Intended to model slab-on-grade and slab-in-grade construction for non-Type 56 buildings	Intended to model most on-grade, and sub-surface heat transfer for Type 56 buildings, non-Type buildings, storage tanks etc.
Data file creation	TESS Plug-In to Google SketchUp	Typically created by hand using a spreadsheet. The top surface (X-Y plane) noding can be performed by the TESS Plug-in to Google SketchUp which maps the nodes to the surfaces and then pulled into the spreadsheet. For each soil node in the z-direction (depth), the user must specify the full X-Y map.	TESS Plug-In to Google SketchUp	Typically created by hand using a spreadsheet. The top surface (X-Y plane) noding can be performed by the TESS Plug-in to Google SketchUp which maps the nodes to the surfaces and then pulled into the spreadsheet. For each soil node in the z-direction (depth), the user must specify the full X-Y map.
Example File	.\TESS Models\ SampleCatalogData\ Type49\ Example_Type49.dat	.\TESS Models\ SampleCatalogData\ Type1244\ Example_Type1244.dat	.\TESS Models\ SampleCatalogData\ Type1255\ Example_Type1255.dat	.\TESS Models\ SampleCatalogData\ Type1267\ Example_Type1267.dat
Wall/floor materials	Specified within Type 56 building model	Specified within Type 56 building model	Floor slab is assumed to be uniform across all thermal zones (thickness, materials, etc.)	Walls/floors/insulation can be specified within Type 56 or specified within this model.
Slab edge heat transfer	Not accounted for	Not accounted for in slab-on-grade or slab-in-grade constructions. Subsurface walls and floors have edge effects.	Slab edge heat transfer calculated to both the ambient air and to the soil.	Accounted for in the model (both to air and to soil or other materials).

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Insulation	Can be added to the Type 56 walls. Model allows for skirt insulation to the depth of the footer (not between zones). Insulation in model is mass-less and infinitesimally thin.	Can be added to the Type 56 walls. No additional insulation allowed.	The user can specify top surface or bottom surface insulation on each slab. The user can also specify skirt (slab edge) insulation. This skirt insulation, assumed to start at the top edge of the slab, can stop partway down the slab edge, stop at the bottom edge of the slab, or continue down beneath the slab. All insulation is assumed to be infinitesimally thin. Skirt insulation is not located between thermal zones – only between the zone and the soil/ambient.	The user can specify insulation R-values on the faces of any of the materials defined in the model, can specify the insulation as it's own material (density, conductivity, specific heat) in the model, or have the insulation be a part of Type 56 building surface.
Footer material	Not accounted for	Not accounted for	Not accounted for	Can be accounted for in the model.
Soil layers	1	1	1	Multiple allowed.
Soil surface	Uniform and horizontal	Uniform and horizontal	Uniform and horizontal	Completely user-defined.
Far-field heat transfer	Conductive or adiabatic and can be set for the X and Y directions independently	Conductive or adiabatic and can be set for all four directions independently	Conductive or adiabatic and can be set for all four directions independently	Adiabatic. Users should specify a far-field distance sufficiently far away from the heat transfer.

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Far-field temperatures	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Two options: 1 - Surface temperature of set by the Kusuda correlation with far-field soil temperatures driven by 1-dimensional conduction from the surface 2-Surface temperature of the far-field is set by an energy balance considering convection, conduction to the soil, incident solar radiation and long-wave radiation exchange with the sky. Far-field soil temperatures are then set by 1-dimensional conduction from the calculated surface temperature.	Two options: 1 - Surface temperature of set by the Kusuda correlation with far-field soil temperatures driven by 1-dimensional conduction from the surface 2-Surface temperature of the far-field is set by an energy balance considering convection, conduction to the soil, incident solar radiation and long-wave radiation exchange with the sky. Far-field soil temperatures are then set by 1-dimensional conduction from the calculated surface temperature.	N/A
Deep earth heat transfer	Conductive or adiabatic	Conductive or adiabatic	Conductive or adiabatic	Conductive, but the user can specify bottom-surface insulation on the lowest soil material.
Deep earth temperature	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Provided by the user as a parameter.

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Near-field surface temperatures	Set by Kusuda correlation as a function of soil properties, time of year and depth. Building does not impact the surface temperatures.	Two options: 1 - Surface temperatures set by the Kusuda correlation. In this case the presence of the building does not influence the surface temperatures, just the sub-surface temperatures. 2 - Surface temperatures are calculated with a surface energy balance considering convection, conduction to the soil, incident solar radiation and long-wave radiation exchange with the sky (building presence impacts soil temperatures).	Two options: 1 - Surface temperatures set by the Kusuda correlation. In this case the presence of the building does not influence the surface temperatures, just the sub-surface temperatures. 2 - Surface temperatures are calculated with a surface energy balance considering convection, conduction to the soil, incident solar radiation and long-wave radiation exchange with the sky (building presence impacts soil temperatures).	Two options: 1 - Surface temperatures set by the user as inputs to the model. In this case the presence of the building does not influence the surface temperatures, just the sub-surface temperatures. 2 - Surface temperatures are calculated with a surface energy balance considering convection, conduction to the soil, incident solar radiation and long-wave radiation exchange with the sky (building presence impacts soil temperatures).
Zone/soil heat transfer calculation	Heat flows from Type 56 slabs are passed in as inputs. Average slab/soil boundary temperatures passed back to Type 56 model.	Heat flows from Type 56 slabs/walls are passed in as inputs. Average slab/soil boundary temperatures passed back to Type 56 model.	Slab surface temperatures are calculated from a surface energy balance.	Two options: 1 - Heat flows from Type 56 slabs/walls are passed in as inputs. Average slab/soil boundary temperatures passed back to Type 56 model. 2 – Material/air boundary temperatures are calculated from a surface energy balance.

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Initial sub-surface temperatures	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Set by Kusuda correlation as a function of soil properties, time of year and depth.	Initial slab temperatures set by the user. Initial soil temperature profile set by Kusuda correlation as a function of soil properties, time of year and depth.	Initial (and uniform) material temperatures are set by the user.
Radiant floors	Piping network can be specified within the Type 56 building model.	Piping network can be specified within the Type 56 building model.	Cannot be studied with this model.	Pipes can be specified throughout any of the material layers.
Sub-surface heat transfer calculation method.	3-dimensional conduction using finite difference approach.	3-dimensional conduction using finite difference approach.	3-dimensional conduction using finite difference approach.	3-dimensional conduction using finite difference approach.