

非定常熱湿気同時移動解析プログラム WUFI®(ヴーフィ)のご紹介

開発

Fraunhofer 建築物理研究所

建材データベース

財団法人 建材試験センター

技術指導

お茶の水女子大学 田中辰明名誉教授

販売

有限会社イーアイ (EI, Ltd.)



Since 1874





計算条件

住宅の省エネルギー基準の解説（財団法人 建築環境・省エネルギー機構）の
非定常計算による防露措置の判断方法により解析

以下解析条件、判断基準概略

室内条件：温度 $T = 7.0 \cos\left(\frac{2\pi(day - 212)}{365}\right) + 20.0$ 、 相対湿度70%一定

ここでday：1月1日を起点とした延べ日数（日）

温度：7月31日に最大値27 、 最小値13 を示すサインカーブ、湿度：70%RH一定）

外気条件：拡張アメダス気象データ1995年版標準年、神奈川県海老名市、千葉県千葉市

計算開始日、解析間隔、期間：7月1日から1時間ごと3年

日射吸収率：0.9、方位：北面、

材料の初期条件：温度26 、 湿度80%RH

判断基準基準：最寒季（1～2月）における外装材表面を除く、全ての計算ポイントの容積基準含水率の期間平均値が0.15（m³/m³）以下（木質系の材料については質量含水率で0.28（kg/kg）以下）であること。

非定常計算における通気層の分類と換気回数の設定：

外 壁	通気層厚さ9mm以上	通気層厚さ9mm以上 (通気経路上に障害物がある場合*)
屋 根		通気層厚さ9mm以上
換気回数	30回/h	15回/h

*「通気経路上に障害物がある場合」とは、防火上の通気役物を意味する

構造を決定する

建材種類、厚みと位置、温湿度のモニタ位置を指定する

- ・ 建材をデータベースから選択、物性値の直接入力が可能

The screenshot displays the WUFI Pro 5.1 software interface. The main window is titled 'Project/Case: K's Project_Yokohama'. The 'Assembly/Monitor Positions' tab is active, showing a cross-section of a wall assembly. The assembly consists of several layers: a yellow exterior layer (0.02 m), a cyan layer (0.001 m), a pink layer (0.05 m), an orange layer (0.0125 m), a yellow interior layer (0.14 m), a cyan layer (0.001 m), and a white interior layer (0.03 m). The total thickness is 0.29 m. The total thermal performance is R-Value: 6.8 m²K/W and U-Value: 0.144 W/m²K. The interface includes a project tree on the left, a toolbar at the top, and various configuration options on the right, such as 'Material Data', 'Sources, Sinks', 'New Layer', 'Duplicate', and 'Delete'. The 'Assign from' section offers 'Material Database' and 'Example Cases' options. The 'Grid' section has 'Automatic Grid' checked, with options for 'Coarse', 'Medium', and 'Fine'.

● 建物特性を決定する

建物の方位、傾き、建物の種類および高さを指定する

Orientation **方位**

South

Inclination **傾き**

Inclination [°] 90

Building Height/Rain Absorption Coefficient **建物種類および高さ**

R1 [-] 0

R2 [s/m] 0.07

Note:
Rain Load =
 $Rain * (R1 + R2 * Wind Velocity)$

Short Building, height up to 10 m

WUFI Pro 5.1 online help

Orientation/Inclination/Height

Orientation: South

Inclination: 90

Building Height/Driving Rain Coefficients

R1 [-] 0

R2 [s/m] 0.07

Note:
Rain Load =
 $Rain * (R1 + R2 * Wind Velocity)$

Short Building, height up to 10 m

屋外表面および室内表面の熱湿気特性を入力する

The screenshot shows the WUFI Pro 5.1 software interface. The main window displays the 'Project/Case: zairai_sheet/Sapporo_Vario' settings. The interface is divided into several sections for defining surface properties:

- Exterior Surface (Left Side):** This section is labeled '外気側' (Exterior Side) and '表面熱伝達抵抗' (Surface Thermal Resistance). It includes:
 - Heat Resistance [m^2K/W]: 0.043 (User Defined)
 - Options: wind dependent, includes long-wave radiation parts
 - Sd-Value [m]: — (No coating)
 - Short-Wave Radiation Absorptivity [-]: 0.9 (User Defined)
 - Long-Wave Radiation Emissivity [-]: 0.9 (with a 'Details >>' button)
 - Rain Water Absorption Factor [-]: 0.7 (According to inclination and construction type)
- Interior Surface (Right Side):** This section is labeled '室内側' (Interior Side) and '表面熱伝達抵抗' (Surface Thermal Resistance). It includes:
 - Heat Resistance [m^2K/W]: 0.11 (User Defined)
 - Sd-Value [m]: — (No coating)

Additional annotations in orange text are present:

- '放射の吸収と放散' (Absorption and emission of radiation) is placed near the radiation properties.
- '雨のあたりかた' (Rainwater absorption) is placed near the Rain Water Absorption Factor.
- 'SD値: 湿気の通しにくさ' (SD value: difficulty of moisture passage) is placed near the Sd-Value field in both exterior and interior sections.

● 初期値を設定する

分析開始時の建材の温度、含水率を設定する

- ・ある相対湿度における含水率（データベース搭載）、建築時の典型的な含水率（データベース搭載）、ファイルの読み込みが可能

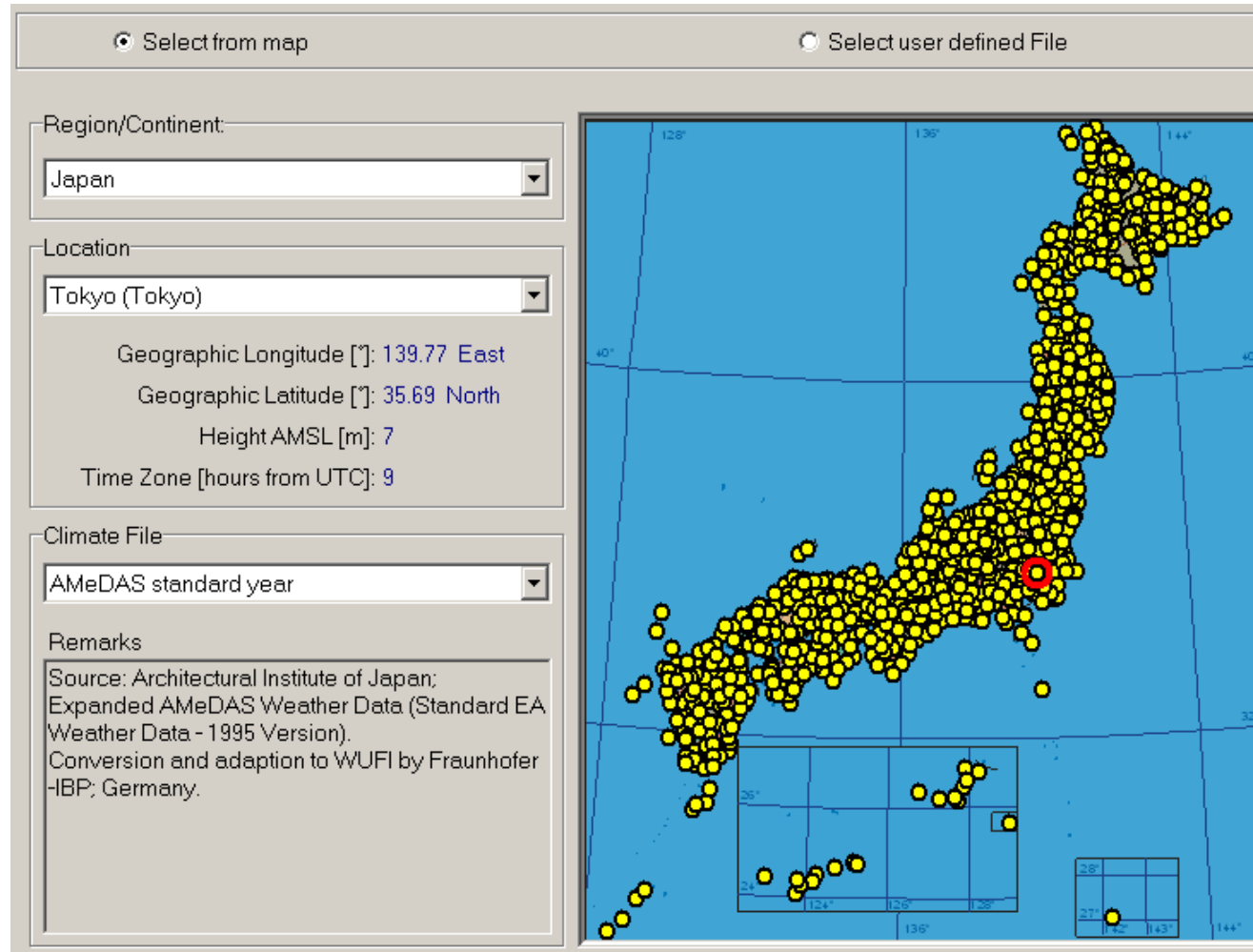
The screenshot shows the WUFI Pro 5.1 software interface. The main window is titled "Project/Case: K's Project_Yokohama/PF_pe". The "Initial Conditions" tab is selected. The interface is divided into several sections:

- Initial Moisture in Component:** Radio buttons for "Constant Across Component" (selected), "In each Layer", and "Read from File".
- Initial Temperature in Component:** Radio buttons for "Constant Across Component" (selected), "Read from File", and "Read from File".
- Initial Relative Humidity [-]:** Input field with value "0,8".
- Initial Temperature in Component [degC]:** Input field with value "26".
- Initial Water Content in Different Layers:** A table with columns: No., Material Layer, Thickn. [m], and Water Content [kg/m³].

Large orange text labels "湿気条件" (Moisture Condition) and "温度条件" (Temperature Condition) are overlaid on the respective sections of the interface.

No.	Material Layer	Thickn. [m]	Water Content [kg/m ³]
1	Mineral Plaster (stucco)	0,02	45,0
2	Air Layer 20 mm; without additional moisture capacity	0,02	0,01
3	weather resistive barrier (sd=0,2m)	0,001	0,0
4	PF (phenolic foam)_feu.abh.ramuda	0,05	1,2
5	Plywood Board	0,0125	75,0
6	Fibre Glass	0,14	0,0

- 対象地域の気象データ（最大842箇所）を選択する
- ・ 測定ファイル、設定ファイルの読み込みが可能



室内温湿度の設定

室内温湿度条件を設定する ・サインカーブ、規格、ファイル読込が可能

The screenshot shows the WUFI Pro 5.1 software interface. The main window title is "WUFI Pro 5.1 C:\My Document\WUFI-IBPフォルダ\20110411WUFIセミナー\110411_Seminar計算フォルダ\0411Seminar 計算済Simulation\K's passivehouse Project". The menu bar includes "Project", "Inputs", "Run", "Outputs", "Options", "Database", and "Result Analysis".

The left sidebar shows a project tree with three cases. "Case: 2 PF_pe (Act. Case)" is selected. Under "Climate", "Outdoor (Left Side)" and "Indoor (Right Side)" are checked.

The main panel shows the "Project/Case: K's Project_Yokohama/PF_pe" settings. The "Outdoor Climate (Left Side)" and "Indoor Climate (Right Side)" tabs are visible. The "ASHRAE 160" standard is selected. The "WTA Guideline 6-2-01/E" is selected, and "User Defined Sine Curve Parameter" is chosen from the dropdown.

The "Temperature / Relative Humidity" section is active. The "Temperature" sub-section has the following table:

Adjustments	
Mean Value [degC]	20
Amplitude [degC]	7
Day of Maximum	2010/07/31

The "Relative Humidity" sub-section has the following table:

Adjustments	
Mean Value [%]	70

Two graphs are shown: "Temperature" and "Relative Humidity". The Temperature graph shows a sine wave with a peak of approximately 27°C in July and a minimum of approximately 13°C in January. The Relative Humidity graph shows a constant horizontal line at 70%.