

1. Purpose

This policy defines the minimum standards, test evidence, validation requirements, and review conditions under which NSAI Agrément will accept hygrothermal modelling as part of a technical assessment or certification submission.

The policy ensures that modelling input data, calibration procedures, and interpretation of results meet the level of rigour necessary for decision-making on systems where moisture performance is safety-critical.

Rationale:

Studies in Ireland, including large-scale hygrothermal research referenced in published reports, have demonstrated that accurate hygrothermal modelling is dependent on calibration against real-world measured data and the use of material-specific, laboratory-tested hygrothermal properties. Accordingly, NSAI Agrément will only accept hygrothermal modelling in accordance with this policy. The requirements of this policy represent NSAI's current approach to the assessment of hygrothermal modelling and may be updated as industry knowledge, research findings, modelling methodologies and standards evolve.

2. Scope

This policy applies to:

- All Agrément certification applications (new, revision and periodic review)

3. Definitions

- Hygrothermal Modelling – Numerical simulation of coupled heat and moisture transfer in building assemblies based on material properties, climatic data, and boundary conditions.
- Model Calibration – Validation and adjustment of modelling outputs to demonstrate alignment between predicted and measured performance. Irish studies indicate that calibration is essential for reliable predictions.
- Material-Specific Properties – Laboratory-tested hygrothermal characteristics of materials used as modelling inputs. These properties are critical to achieving accurate modelling results.

- Boundary Conditions – Environmental inputs used in the model, including climate data, wind-driven rain exposure, temperature, and humidity.
- Moisture Storage (Sorption) Curve – The relationship between a material's moisture content and relative humidity, describing the amount of moisture absorbed or released under varying conditions.
- Liquid Transport Coefficient (D_w) – A measure of the rate at which water is transported through a material by capillary action, determined through laboratory testing.
- Wind-Driven Rain Exposure Class – Classification of the severity of rain exposure at a site. This should be consistent with the climatic data and exposure assumptions used in the modelling.
- Uncalibrated Modelling – Modelling undertaken without validation against measured data and/or relying on unverified material properties, assumptions, or inputs.

4.0 Acceptance Criteria

4.1 Acceptance Criteria

To be accepted by NSAI Agrément as supporting evidence for certification, hygrothermal modelling must meet all of the following conditions:

4.2.1 Material Input Requirements

Modelling must use material-specific, laboratory-tested values for all key hygrothermal properties, including:

- Density
- Specific heat capacity
- Dry and moisture-dependent thermal conductivity
- Vapour diffusion resistance factor (μ)
- Sorption curves (moisture storage)
- Liquid transport coefficient (D_w)

Generic, estimated, or software-default values will not be accepted unless they can be shown to correlate with the material.

4.2.2 Calibration Requirements

Modelling must include documented calibration demonstrating alignment between predicted and measured behaviour. Acceptable calibration evidence includes:

- In-situ moisture content measurements,
- Wall-scale or laboratory hygrothermal testing,
- Measured temperature/RH profiles,
- Comparison with available Irish empirical datasets.

NSAI will normally require calibration evidence as part of any hygrothermal modelling submission.

Uncalibrated modelling will not normally be accepted as supporting evidence for Agrément Certification.

4.2.3 Environmental Inputs and Boundary Conditions

The modelling must use:

- Irish climate files appropriate to the project location,
- Exposure-class-appropriate wind-driven rain intensities,
- Representative internal humidity classes,
- Validated future-climate datasets only after baseline calibration is demonstrated.

The use of non-representative climate data may result in rejection of the modelling submission or a requirement for additional justification and evidence.

4.2.4 Modelling Workflow Requirements

The modelling submission must follow a structured approach that includes:

- Material-scale testing (to generate all required inputs)
- Wall-scale or controlled testing (to verify behaviour)
- Calibrated modelling (using validated Irish climate data)
- Extended modelling (future climate, sensitivity analysis) only if calibrated results are provided
- Where any stage is omitted, the applicant shall provide technical justification acceptable to NSAI. Failure to provide adequate justification may result in the modelling submission not being accepted.

5.0 Documentation Requirements

A complete modelling submission must include:

- Full set of material test certificates,
- Complete model input files,

- Boundary condition documentation,
- Calibration evidence,
- Sensitivity analysis (required where uncertain inputs exist),
- Incomplete documentation may result in the modelling submission not being accepted until the required information has been provided.

6.0 Limitations and Non-Acceptance Conditions

NSAI will not normally accept modelling where:

- default or estimated parameters are used without suitable justification;
- no calibration evidence is provided;
- boundary conditions do not reflect the relevant Irish exposure conditions; or
- the assembly being modelled does not match the assembly being certified.

8.0 Review

This policy is subject to periodic review and may be revised by NSAI from time to time to ensure its continued suitability and effectiveness.