

Hutton + Rostron

Environmental Investigations Limited

Southleigh Park House; Mansion House, Coach House and Stables: Preliminary condensation risk assessment

Site note A7 for 15 December 2020 and 05 January 2021 Job no.
152.09

CONTENTS

- 1 Introduction
- 2 Staff on site and contacts
- 3 Observations and *Recommendations*
- 4 H+R work on site
- 5 Proposed action by H+R
- 6 Information required by H+R
- 7 Administrative requirements

Attachments

- A Commentary on calculation results
- B Computer modelling of condensation risk – calculation results
- C Photographs

Distribution:

Steve Coull – Director, FSL Group

Prepared by: Andy Wade BSc (Hons), MSc (An. Chem.), MSc (Hist. Build. Cons.), MRSC	Technical review by: Andy Wade BSc (Hons), MSc (An. Chem.), MSc (Hist. Build. Cons.), MRSC	Administration by: Jennifer Potter BA(Hons)
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1 INTRODUCTION

1.1 AUTHORITY AND REFERENCES

Hutton + Rostron Environmental Investigations Limited carried out site visits to Southleigh Park on 15 December 2020 and 05 January 2021 in accordance with instructions from Steve Coull of FSL Group by email, on 10 November 2020 at 13:09. Drawings were provided by the client. For the purpose of orientation in this report, the principal façade of the Mansion House was taken as facing south

1.2 AIM

The aim of this survey was to identify potential risk of condensation, of and conditions associated with potential surface mould growth during and after refurbishment associated with the existing window and wall structures, and make recommendations for cost effective remedial works to manage intermittent surface condensation and prevent problems of damp and decay during refurbishment and on occupancy

1.3 LIMITATIONS

This survey was confined to the accessible structures. Structures were not examined in detail except as described in this report, and no liability can be accepted for defects that may exist in other parts of the building. We have not inspected any parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect or in the event that such part of the property is not free from defect it will not contaminate and/or affect any other part of the property. The recommendations in this report are included to advise and inform the design team appointed by the client. The contents of this report do not imply the adoption of the role of Principal Designer by H+R for the purposes of the Construction Design and Management (CDM) Regulations 2015

2 STAFF ON SITE AND CONTACTS

2.1 H+R STAFF ON SITE

Andy Wade

2.2 PERSONNEL CONTACTED

Site Staff

3 OBSERVATIONS AND RECOMMENDATIONS (MANSION HOUSE, COCAH HOUSE AND STABLES)

3.1 CONDENSATION RISK ANALYSIS

3.1.1 Data Collection

Structures were assessed visually in numerous locations to determine the construction types listed below (Section 3.1.5). As far as was practical, each elevation of the structure was investigated at each floor level and examples of all window reveals were inspected to establish representative constructions for assessment. Thermography and a digital thermo-hygrometer were not used due to the open nature of the structure leading to equilibrated readings internally and externally. Observations were limited to access provided, with no special provisions available for detailed measurements. The water penetration and condensation risk analysis is informed by the assessment of façade integrity undertaken in H+R's site notes A6, B3 and C3 (damp) and site notes A8, B5 and C5 (external masonry)

3.1.2 Facades

Generally, elevations were primarily knapped flint with localised areas of solid brick and/or what appeared to be a cementitious render. Window reveals to the exterior were also a mixture of brickwork or flint around the window frames. These construction profiles were seen across all elevations of all three buildings investigated. Internal walls were a mixture of plaster applied directly onto the internal faces of the brickwork, as well plasterboard drylining. The plaster to some walls had been removed exposing the brickwork behind. The minimum wall thickness found was a brick and a half thick. This was considered a sufficient thickness to provide good capacity for harmless moisture storage under adverse conditions considering the building's location

Dimensions of varying wall profiles are shown in section 3.1.5 below

See H+R site notes A8, B5 and C5 for recommendations pertaining to façade condition

3.1.3 Windows and door frames

Window fenestrations were commented on in H+R site note A9

See H+R site note A9 for recommendations pertaining to windows

3.1.4 Environmental conditions

Environmental conditions of the interior and exterior were not assessed at the time of inspection with digital thermo hygrometer, due to the unoccupied state of the building and the ongoing refurbishment works being undertaken at the time of survey leaving the buildings wholly unrepresentative of conditions following completion

A strategy of partial opening of windows to provide cross-ventilation should be continued during refurbishment to minimise the risk of surface mould growth prior to the commissioning of any new ventilation system(s). Windows should be left secured in a partially-open position where practical; either cracked open only or fixed open with wire stopping to prevent entry of feral pigeons, and flues should be capped with ventilated caps or rain cowls to promote ventilation while minimising ingress of rain

3.1.5 Representative construction elements

Several different profiles were identified on inspection, across all accessible floors and all orientations of all three buildings. Representative constructions listed below were

assessed to cover a range of elements with focus on those considered most vulnerable to condensation or surface mould growth. Construction is listed from exterior to interior:

- 1 'Solid brick wall with external render': 25 mm cement lime plaster, 360 mm solid brick, 20 mm hard lime plaster, emulsion paint (sd value corresponding to Class 1 according to BS EN 1062-1)
- 2 'Solid brick wall without external render': 360 mm solid brick, 20 mm hard lime plaster, emulsion paint (sd value corresponding to Class 1 according to BS EN 1062-1)
- 3 'Flint wall with rubble infill': 360 mm flint/infill (high mortar proportion, flint brick and shingle), 20 mm hard lime plaster, emulsion paint (sd value corresponding to Class 1 according to BS EN 1062-1)
- 4 'Solid brick wall with external render and generic internal dry lining': 25 mm cement lime plaster, 360 mm solid brick, 25 mm air gap, 12.5 mm gypsum plasterboard (sd value corresponding to Class 1 according to BS EN 1062-1)
- 5 'Solid brick wall without external render and generic internal dry lining': 360 mm solid brick, 25 mm air gap, 12.5 mm gypsum plasterboard (sd value corresponding to Class 1 according to BS EN 1062-1)
- 6 'Hard plastered reveal': 160mm brick, 20 mm hard lime plaster, emulsion paint (Class 1 according to BS EN 1062-1)
- 7 'Timber panel reveal': 160mm brick, 5mm air gap, 30mm softwood timber, gloss paint
- 8 'Timber window frame': white gloss paint, 150mm softwood (solid timber, weight boxes discounted as worst-case), gloss paint

3.2 COMPUTER MODELLING

3.2.1 Assessment methodology

Site measurements were used as the basis for hygrothermal modelling of condensation and surface mould growth risk, using software developed by the Fraunhofer Institute of Building Physics, called Wärme Und Feuchte Instationär (WUFI Pro 6.4, release 6.4.1.2298.DB.27.0.5.0). See Appendix A for more information on the software and the relevant calculation standard - BS EN 15026

3.2.2 Wall assessment criteria

- 1 Surface: Superficial mould growth risk is the main determinant of risk associated with internal surfaces. A threshold of 80 per cent mean monthly surface humidity is applied to manage risk according to BS 5250 (4.2) and BS EN 13788 (5.1). Building Regulations Approved Document Part F includes extra thresholds for duration of moving averages at a range of relative humidity values (e.g., 85 per cent moving average equilibrium surface RH should not be surpassed for longer than 1 week). Mould growth isopleths generated by WUFI are also assessed as a simple graphical representation of risk, with a more refined method available for at-risk surfaces with a dedicated mould assessment tool which accounts for the nature of the surface
- 2 Interstitial: Interstitial condensation accumulation is the principal determinant of risk if internally insulating walls; condensation accumulation and prolonged excessive humidity may be a risk to embedded timber elements; potentially raising their moisture content above the threshold for decay. Interstitial condensation was only assessed in voids behind dry-lining, paneling and at timber boarded window reveals

(Constructions 3, 4, 5 and 7 above)

3.2.3 Windows and door frames

Mould growth is rarely a problem on low thermal inertia elements, such as windows and frames. As such they are usually assessed against 100 per cent relative humidity and resulting potential for condensation accumulation and run-off affecting adjacent finishes. Results for window frame elements should be taken as indicative only, as structures with low thermal inertia are more accurately assessed with critical temperature factor calculations according to BS EN ISO 13788:2012 based on finite element calculations to BS EN ISO 10211:2017 or by calculation according to BS EN ISO 10077-2:2012. They are however, a useful indicator of the principal factors governing risk. Certain fenestration elements in traditional buildings can be subject to mould growth such as directly plastered reveals. Risk is highly dependent on decorative finish as well as solar gain, convection currents, and UV exposure; none of which the one- dimensional calculation accounts for, being intended for assessing opaque elements only. North orientation is assessed as the worst-case orientation for surface condensation on low thermal inertia elements

3.2.4 Environmental conditions

The internal humidity and temperature profile was calculated according to vapour pressure excess defined for low occupancy dwellings in BS 5250, and external conditions according to BS EN 15026 to represent conditions during occupancy. H+R assume that no air conditioning or other plant was to be installed to modify internal relative humidity (RH per cent), significant periods of vacancy were also discounted. More details of assumed internal conditions can be found in the calculation overview in Appendix A

3.2.5 Results and commentary

- 1 External walls: No theoretical surface mould growth or condensation risk, resulting in a net annual accumulation of moisture, was identified that might affect any of the retained wall structures as found during the survey, provided that adequate provision for natural and mechanical extract ventilation and for space heating to normal 'comfort' levels is made on refurbishment and maintained on occupancy, and internal humidity levels as defined in Appendix A of AD Part F of the building regulations for buildings for residential use are maintained. The results are project specific and their implications should not be applied to other projects or to the risk of condensation within and on walls at Victoria Avenue for which insulation may be proposed. Strong variation according to orientation would be likely
- 2 Window frames and reveals: Intermittent condensation was not predicted by the calculation for timber window frames or sashes and was considered of negligible risk even in extreme conditions given the mitigating factors acting on windows which the one-dimensional modelling is unable to replicate (see Section 3.2.3 above)

3.3 FURTHER OBSERVATIONS AND RECOMMENDATIONS

3.3.1 Single glazing

Intermittent condensation on single glazed window panes should be anticipated during refurbishment and on occupancy under certain conditions such as during extensive wet works in late autumn or winter or with intensive occupancy of heated rooms. Under some circumstances, condensation may form droplets and drain down window frames and glazing, collecting on the internal sill. Sustained accumulation and run-off of condensation resulting in damage to joinery and adjacent finishes can be avoided with adequate ventilation during works and on occupancy. Intermittent condensation on non-absorbent

surfaces such as gloss painted timber elements is rarely associated with mould growth. Intermittent condensation absorption by adjacent absorbent wall finishes may result in discolouration

Consideration should be given to improving the thermal resistance of glazing by replacement with slimline double glazing in the original sashes, ensuring new insulated glazing units are compliant with BS EN 1279 parts 2 & 3, such as Safeguard Glazing Supplies

If re-glazing is not planned, the window panes should be secured with a self-coloured or highly flexible sealant compound, to reduce the risk of damage to applied decorative finishes that may be subject to intermittent surface condensation. In this case, reference to the likelihood of intermittent surface accumulations of condensation moisture on glazing and glazing bars should be made in the tenant leases and/or Landlord's Operation and Maintenance documentation, and provision for space heating should be included under the window structures by, for example, fitting additional radiators in these locations

3.3.2 Secondary glazing

Secondary glazing could be considered as an alternative to the above, However, intermittent condensation and surface mould growth is possible between secondary and original glazing and the means of mitigating this may not be compatible with the exposure level on site; with potential clouding of the secondary glazing from wind-blown salt deposits. Directly applied plaster reveals between primary and secondary glazing are considered especially vulnerable to mould growth on the plaster between the panes. Intermittent condensation on non-absorbent surfaces such as gloss painted timber elements is rarely associated with mould growth

If proposed, secondary glazing should be well sealed to reduce the transfer of warm moist air into the void between panes, and draught stripping of the original sashes should be avoided. This may allow wind driven rain and spray to enter the void, given the level of exposure. Plastered reveals should not be included between original sashes and secondary glazing with openable sashes. They should be replaced in the design to match the majority of existing windows with timber cover strips isolated from the masonry on plastic shims to provide an easy to clean surface

3.3.3 Mould growth risk on cold spots

Internal surface temperature differentials should be minimised as far as possible. Thermal efficiency improvements to walls can be associated with relatively increased rate of heat loss through poorly insulated junctions leading to surface temperature differentials in localised areas. These thermal bridges may be associated with heightened surface mould growth risk

Junctions at openings of insulated walls or where structural thermal bridges are inevitable require careful design to minimise the severity of thermal bridging relative to surface mould growth risk, especially in high humidity environments such as bathrooms and kitchens. Thin layers of insulation should be considered where practical for encapsulation of structural steels alongside fire-proofing measures. Consideration should be given to adjusting floor finish specification over solid sections of ground floors in contact with original walls to allow the insertion of a perimeter insulation strip to mitigate thermal bridging at the wall floor junction. If necessary, designs can be assessed with temperature factor calculations according to BS 13788 based on finite element calculations according to BS 10211

3.3.4 Common areas

If the provision for space heating is reduced in common areas, it may not be adequate for the control of moisture and condensation. Warm moisture laden air from occupied areas

may tend to migrate to less well heated and ventilated areas, increasing the risk of condensation on thermal bridges in these areas. Paint delamination in the front entrance lobby may have resulted from this

Ventilation should be included in common areas and increased in proportion to any significant reduction in space heating provision

3.3.5 Chimney flue ventilation

A number of internal fireplaces may have been blocked up previously, but passive stack ventilation up any unblocked flues would make a significant contribution to ventilation of the property

Through-ventilation of all redundant flues not intended for re-use should be provided. Vents should be provided at flue heads by fitting ventilated caps. Opportunities for re-directing low level ventilation by means of inclusion of air bricks in floor voids or basement could be explored in the interest of energy efficiency. Where flues are blocked, the consequent reduction in ventilation to internal spaces should be compensated for by the ventilation strategy, see section 3.4 below

3.3.6 Cold voids

Condensation on cold spots such as any embedded soil stacks or pipes within service risers is a risk. Potential for condensation on these elements is likely to increase given the increased moisture generation associated with the proposed usage but unlikely to occur during refurbishment given the absence of an acute thermal gradient from inside to outside

All voids should be provided with adequate through-ventilation to allow moisture laden air to dissipate and prevent condensation conditions. Internal finishes should be isolated from potentially cold service pipes

3.3.7 Suspended timber floor voids

High external ground levels and obstructions may have resulted in inadequate cross-ventilation of sub-floor voids resulting with exacerbation of decay conditions from increased water penetration

Any suspended floor voids should be provided with adequate cross-ventilation to allow moisture laden air to dissipate and prevent condensation conditions

3.3.8 Wall insulation

Internal wall insulation can be associated with heightened risk of interstitial condensation with potential implications for structural integrity and health of occupants. If internal wall insulation is proposed for external walls of occupied spaces, it will reduce the drying potential of the absorbent fair faced brick walls to the internal environment, and may contribute to decay conditions for embedded timbers with potential implications for structural integrity of timber floors and health of occupants. Planning considerations are likely to preclude its installation in significant areas of the building

Further condensation risk analysis is recommended if wall insulation is proposed once design and M&E requirements are known, to assess interstitial condensation risk and the associated risk to vulnerable embedded timbers

3.4 VENTILATION

H+R assume that refurbishment works will include a review of the current provisions for ventilation to meet requirements set out in Approved Document Part F of the building Regulations. Failure to adequately discharge warm moisture laden air direct to the exterior from the points of generation on occupancy or to provide adequate cross and through ventilation by fresh external air will increase the risk of both intermittent surface condensation affecting the retained glazing, window surrounds and other vulnerable parts of the structure, and hidden interstitial condensation associated with thermal wall linings or risers

All risk associated with condensation are reduced by effective ventilation and heating. The provision for ventilation on occupancy should be reviewed to ensure the effective discharge of warm moisture laden air to the exterior direct from the points of generation, such as over cooker hobs and from utility rooms and bathrooms, generally to comply with or surpass Approved Document F of the current Building Regulations. Occupants should be advised to maintain adequate levels of through and cross ventilation with fresh external air for the control of moisture and condensation on occupancy

4 H+R WORK ON SITE

- 4.1** H+R inspected representative structures on all floor levels to all buildings to establish construction
- 4.2** H+R took photographic images for record and illustration purposes

5 PROPOSED ACTION BY H+R

- 5.1** H+R will review proposed refurbishment details as these become available, if instructed, with further condensation risk calculations undertaken where required
- 5.2** H+R will return to site to inspect sample details when instructed
- 5.3** H+R will liaise with conservation and historic building authorities, if instructed, so as to ensure the cost-effective conservation of original fabric

6 INFORMATION REQUIRED BY H+R

- 6.1** H+R require copies of up-to-date project programmes, as these become available
- 6.2** H+R require copies of up-to-date lists of project personnel and contact lists as these become available
- 6.3** H+R require copies of proposed remedial details for comment as these become available

7 ADMINISTRATION REQUIREMENTS

- 7.1** H+R require formal instructions for further investigations and consultancy on this project
- 7.2** H+R require confirmation of distribution of digital and printed copies of reports and site notes

Attachment A

DYNAMIC CONDENSATION RISK ASSESSMENT TO BS EN 15026

A.1 SCOPE

Calculations of moisture transfer through the wall structures and frame elements were undertaken with the aim of assessing potential condensation accumulation and the risk of internal surface mould growth

A.2 KEY TO WUFI CALCULATION SUMMARIES

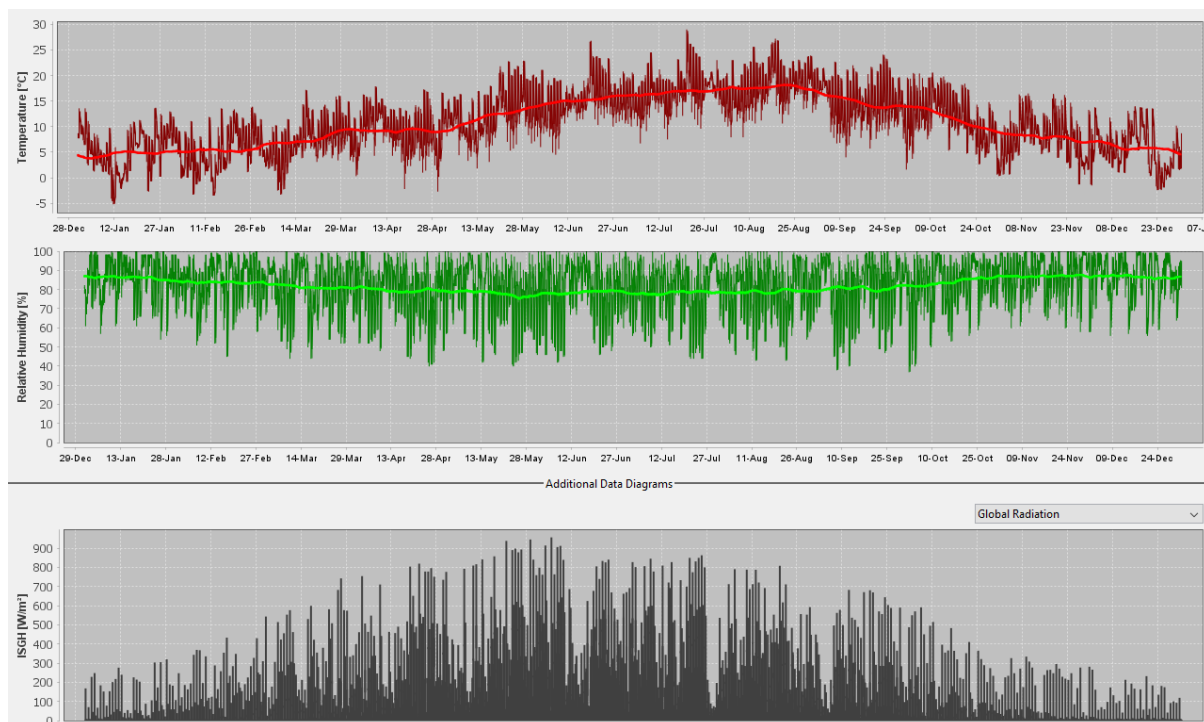
Page 1: Project Details (included for Case 1)

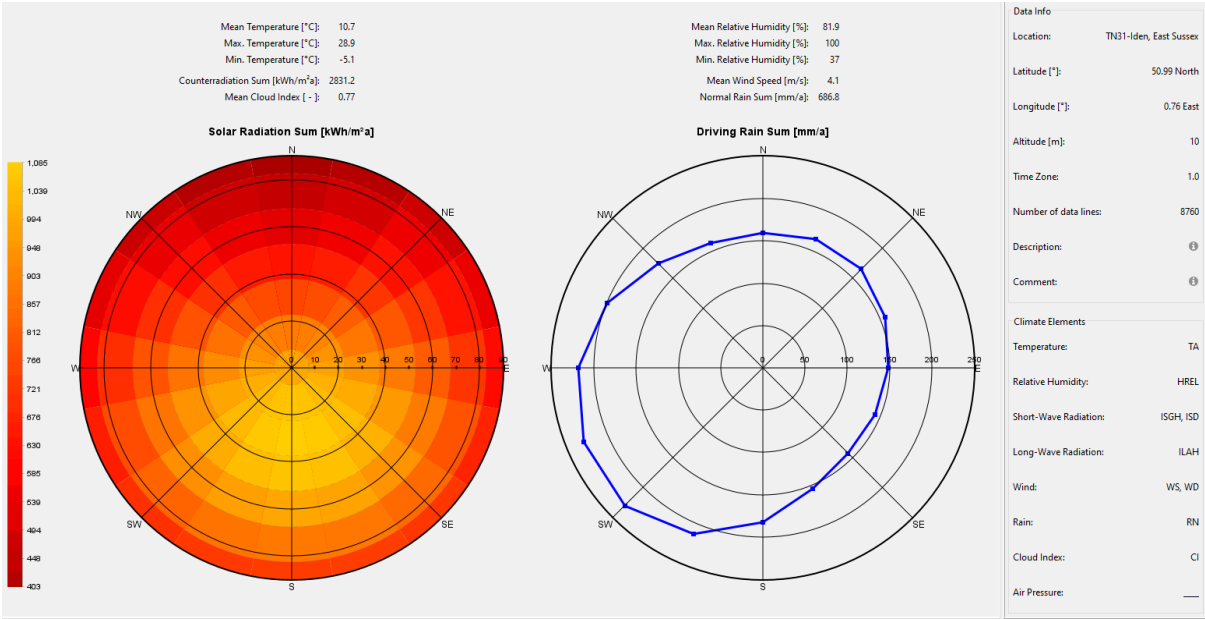
Page 1/2: Build-up of the assessed construction element as per Site Note 1 with exterior to interior left to right, and position of the monitors (for RH analysis)

Page 2/3: Simulation Parameters

External Boundary Conditions:

A climate file of hourly data generated by Meteonorm 7 from data measured at weather stations close to the location is used. Data from more than one station ensures all required weather variables are included. The climate file is averaged from two decades of weather data

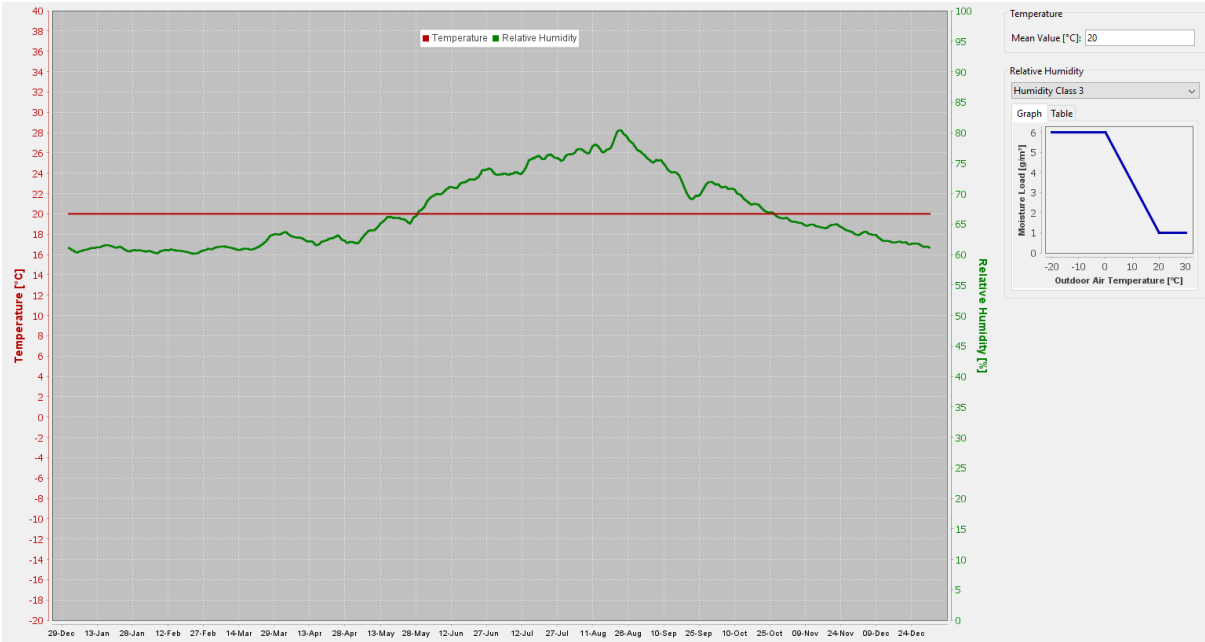




Calculations were run for various elevations to assess all risk factors from low drying potential associated with north elevation to greater exposure associated with the south and west elevations
Assessment of internal surface mould growth on reveals is undertaken with North orientation as worst-case regardless of context

“Internal” Boundary Conditions:

The humidity profile is derived from the hourly external climate file according to BS EN 13788 – Class 3 (building of unknown occupancy) which corresponds with the moisture profile for dwellings of low occupancy as defined by BS 5250



Surface transfer coefficients:

Internal surface S_d (vapour resistance of surface layer) according to two coats of acrylic emulsion of Class 1 according to BS EN 1062-1 for plastered wall sections, and increased for window frames with gloss paint finishes. Rain splash away/absorption is set for a building <10m tall, wall orientation is as per site where known, short wave absorptivity of the component determined by surface colour of the brick, and long wave radiation incident on the wall according to “weathered concrete” at the wall base

Page 3/4: Moisture sources – additional sources of moisture beyond absorption of liquid by the external surface and vapour diffusion through the wall. Predominantly air leakage (introduction of humid air to interstitial space) or water penetration depending on context. Driven rain penetration is not included for components of limited extent such as window frames

- Driven rain penetration to reflect faulty pointing or other source of water penetration from wind driven rain. The fraction of penetration water can be adjusted according to site conditions (state of repair of pointing, render cracking, flashing detailing, window sill seals, and absorption capacity of the surface finish). 1% is taken as representative of basic construction defects according to research contributing to ASHRAE 160P and is considered overly conservative for masonry walls in fair repair
- Air infiltration from the internal environment to the void behind panelling derived from $3\text{m}^3/\text{m}^2\text{h}$ @50 Pa airtightness of the whole envelope.

Page 4/5: Numerical results of simulation - Moisture must not accumulate over time. The calculations use initial conditions that reflect the probability of built in moisture during construction. Water condensing in the building component must be able to dry out again. This gives a simple indication of risk, but should be confirmed with further analysis of Moisture Content or Relative Humidity/temperature or dew point/temperature at any critical interfaces (interfaces of materials of significantly differing liquid transfer coefficients or vapour diffusion resistance) which do not apply where only internal surface humidity is of concern

Page 5/6: Graph of Relative Humidity against time across the calculation period at interface of concern. Peaks at 100% RH, indicate incidence of condensation and sustained peaks indicate condensation accumulation. Sustained peaks above 80% on absorbent internal finishes (painted window and door frames generally non-absorbent) indicate a risk of mould growth and warrant further investigation of mould growth isopleths. None of these conditions is predicted for the wall build ups assessed

A.3 BACKGROUND TO WUFI

WUFI analysis is not absolute proof of the suitability of the assessed system. Calculation results should be taken as indicative due to the limited accuracy of input data such as wind driven rain and material properties. Dynamic condensation risk analysis is not a definitive method of evaluating moisture risk, it is based on imperfect algorithms that give an estimate of the system performance in context. However, it is a more comprehensive method of analysis than industry standard steady state calculations according to BS EN 13788, and gives a more accurate picture of the performance of a building component and an indication of the risk (or not) associated with it

WUFI (BS EN 15026) in comparison with steady state vapour diffusion calculations (BS EN 13788)

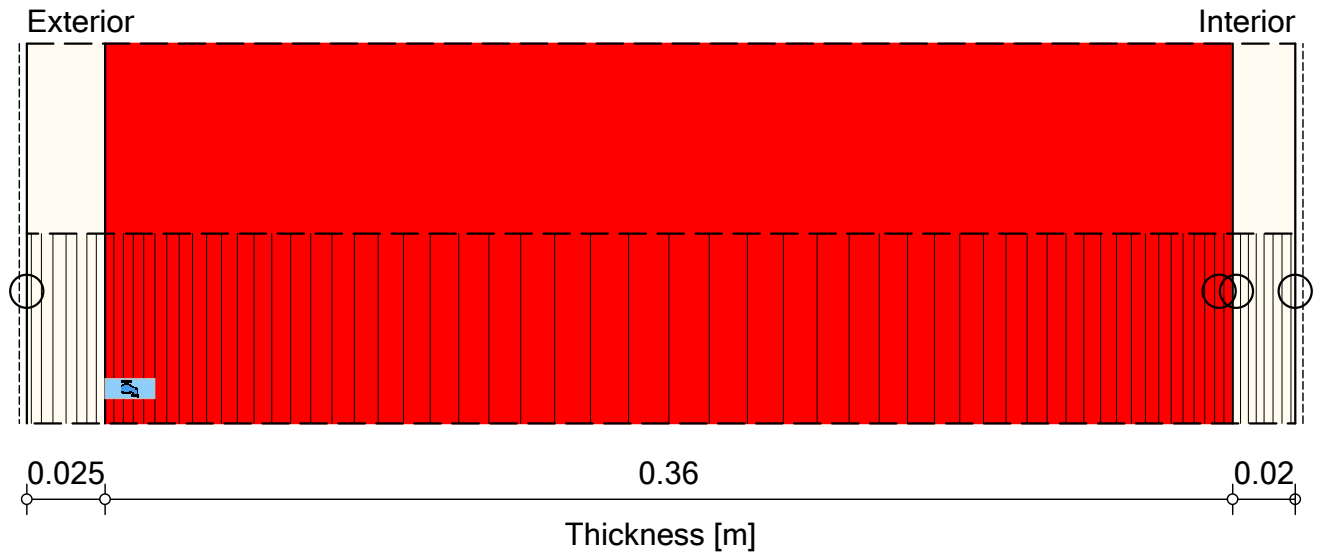
- **BS EN 13788:2002** calculates vapour diffusion only, under monthly averaged steady state conditions, so cannot account for transient conditions. Other important methods of moisture transfer, such as surface diffusion, and capillary action are not accounted for, so movement of liquid moisture is unaccounted for; hygroscopicity of materials is overlooked; and moisture absorbed as a result of construction or driving rain is ignored. Drying potential from sunshine is ignored.
- **BS EN 15026:2007** Dynamic calculation method that accounts for all methods of moisture transfer and allows for the inclusion of air change and moisture sources within the build up to reflect imperfect installation and/or extreme service conditions. Calculations are based on hourly data from climate files that include all relevant environmental conditions according to orientation and location, as well as internal temperature and relative humidity. Currently only supported by a limited number of usable software applications (WUFI and DELPHIN)

As is recognised in BS 5250:2011, Code of practice for Condensation Control in Buildings (section D.3.1), there are serious deficiencies in the BS EN 13788 calculation for interstitial condensation risk, which is almost universally applied to building envelopes: “It assumes one-dimensional, steady state conditions and does not consider air movements within or through the construction and makes no allowance for the moisture in the materials or rainwater absorbed during construction. Consequently, while it is useful for comparing the performance of different structures, it does not provide an accurate prediction of moisture conditions within the structure under service conditions”

Attachment B

Component Assembly

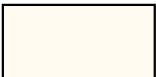
Case: Solid brick wall with external render



○ - Monitor positions

☀️/💧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 12:49:09
Computing Time	2 min,10 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

Time Integral of fluxes

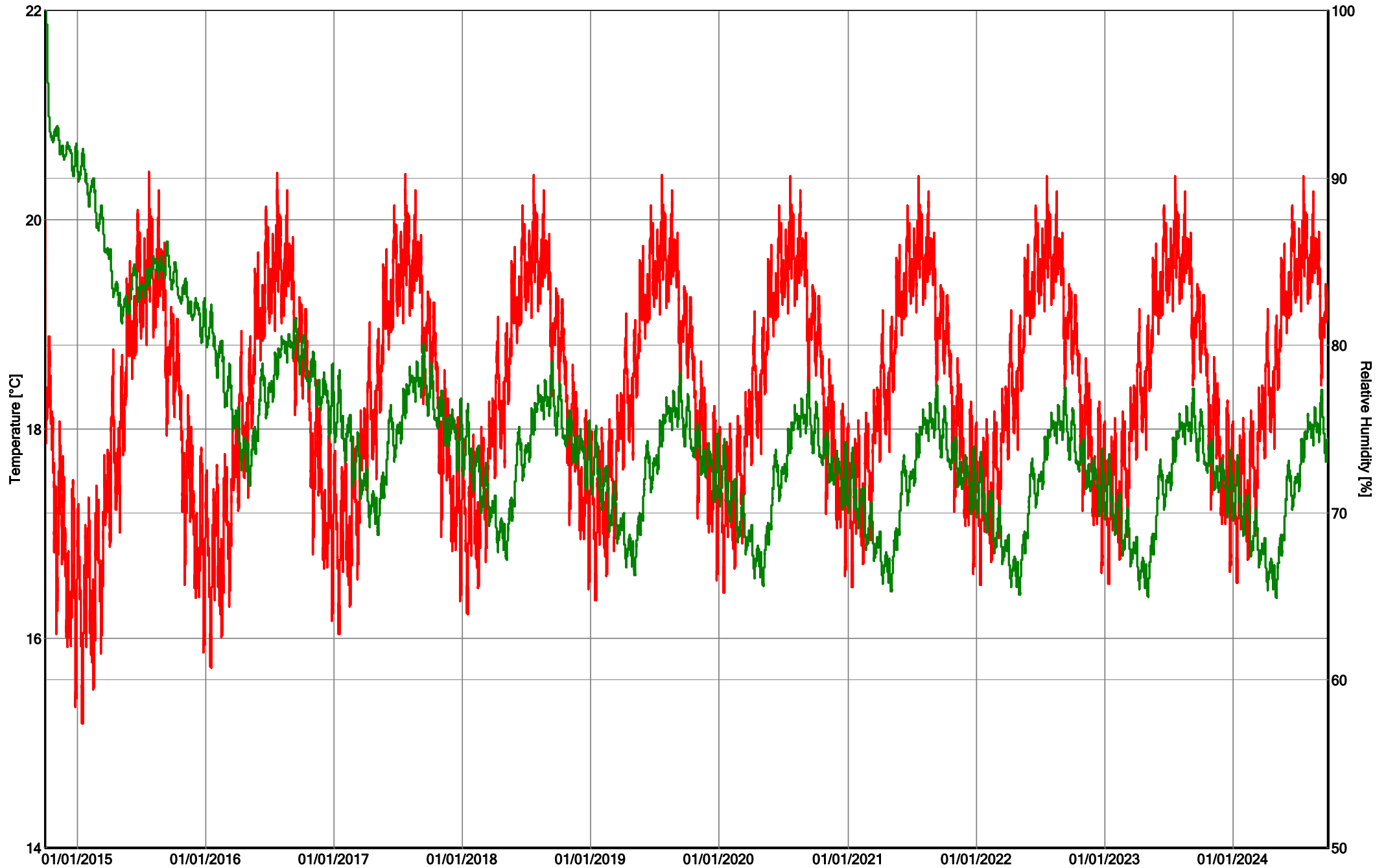
Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

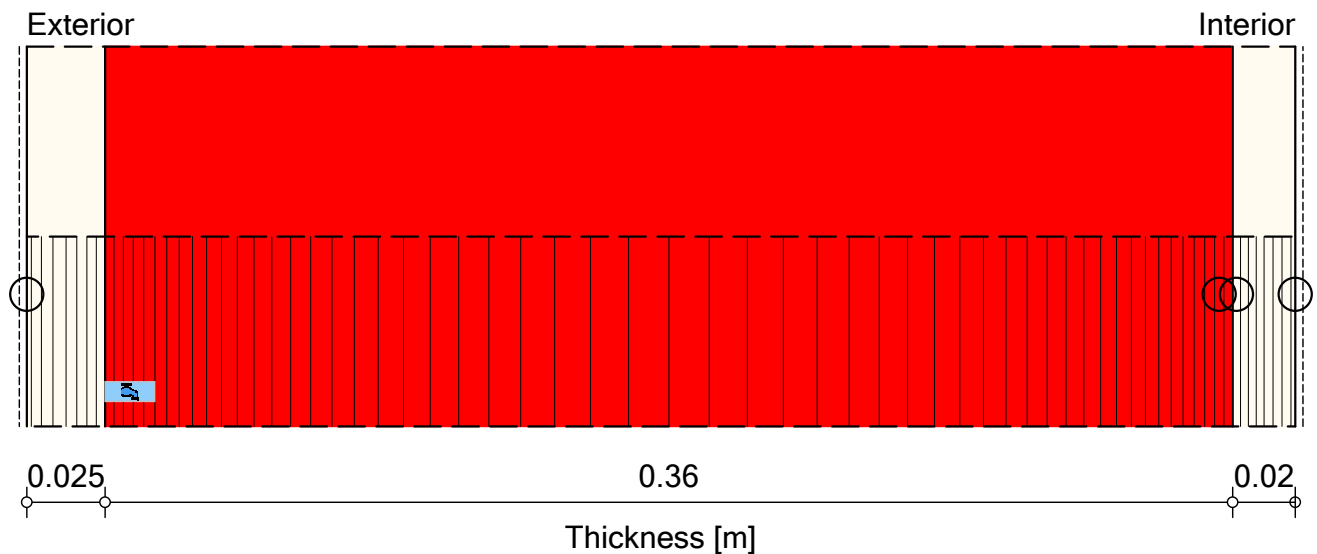
Interior Surface

Temperature Relative Humidity



Component Assembly

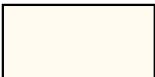
Case: Solid brick wall without external render



○ - Monitor positions

💡/🔧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 13:06:05
Computing Time	2 min,15 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

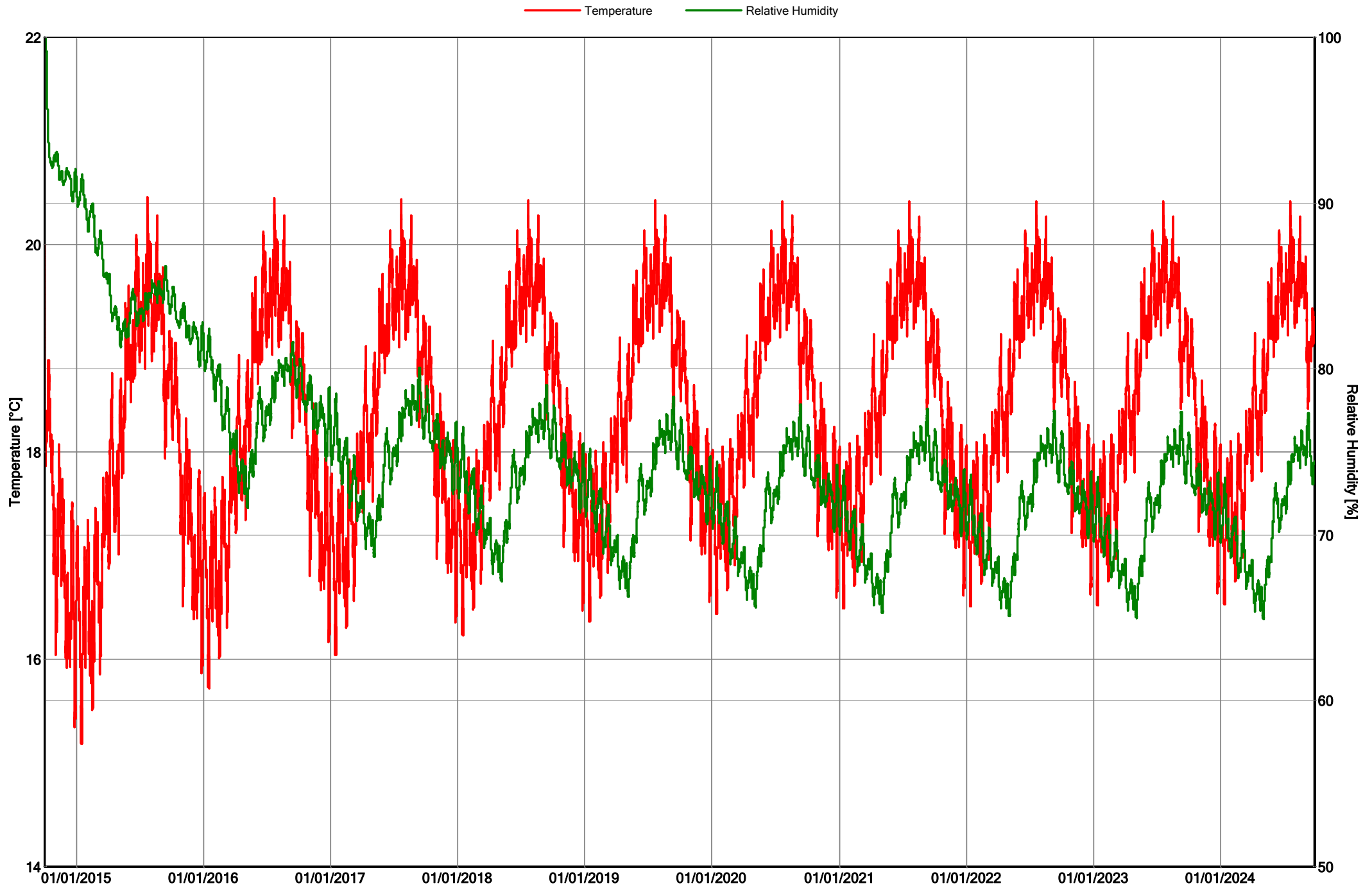
Time Integral of fluxes

Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

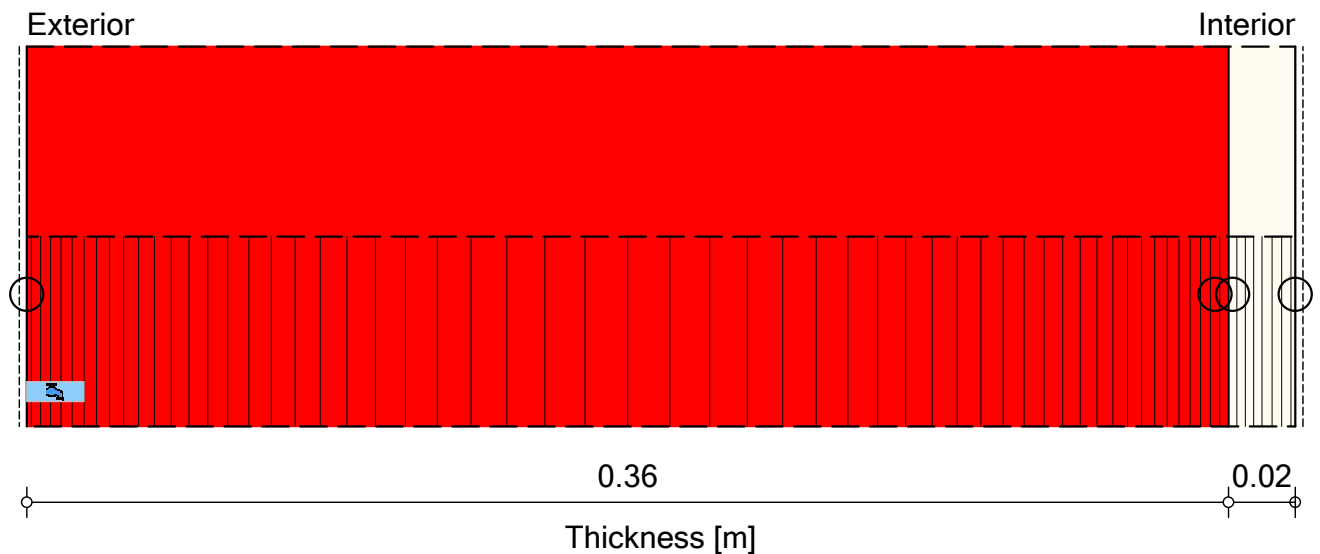
Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

Interior Surface



Component Assembly

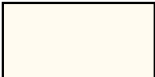
Case: Flint wall with rubble infill



○ - Monitor positions

💡/🔧 - Heat/Moisture source/sink positions

Materials:

	- Mortar (historical): Lime + Cocciopesto (crushed bricks)	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.38 m

R-Value: 0.63 (m² K)/W

U-Value: 1.233 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Mortar (historical): Lime + Cocciopesto (crushed bricks)

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	328.96
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 13:26:49
Computing Time	2 min,49 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-7.79 -13.31
Integral of fluxes, right side (kr,dr)	[kg/m ²]	19.35 1.24
Balance 1	[kg/m ²]	-37.32
Balance 2	[kg/m ²]	-36.95

Water Content [kg/m³]

	Start	End	Min.	Max.
Total Water Content	40.2	2.54	2.36	40.2

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Mortar (historical): Lime + Cocciopest	100.00	4.73	4.37	105.48
Cement Lime Plaster (stucco, A-value)	210.00	41.76	37.59	210.00

Time Integral of fluxes

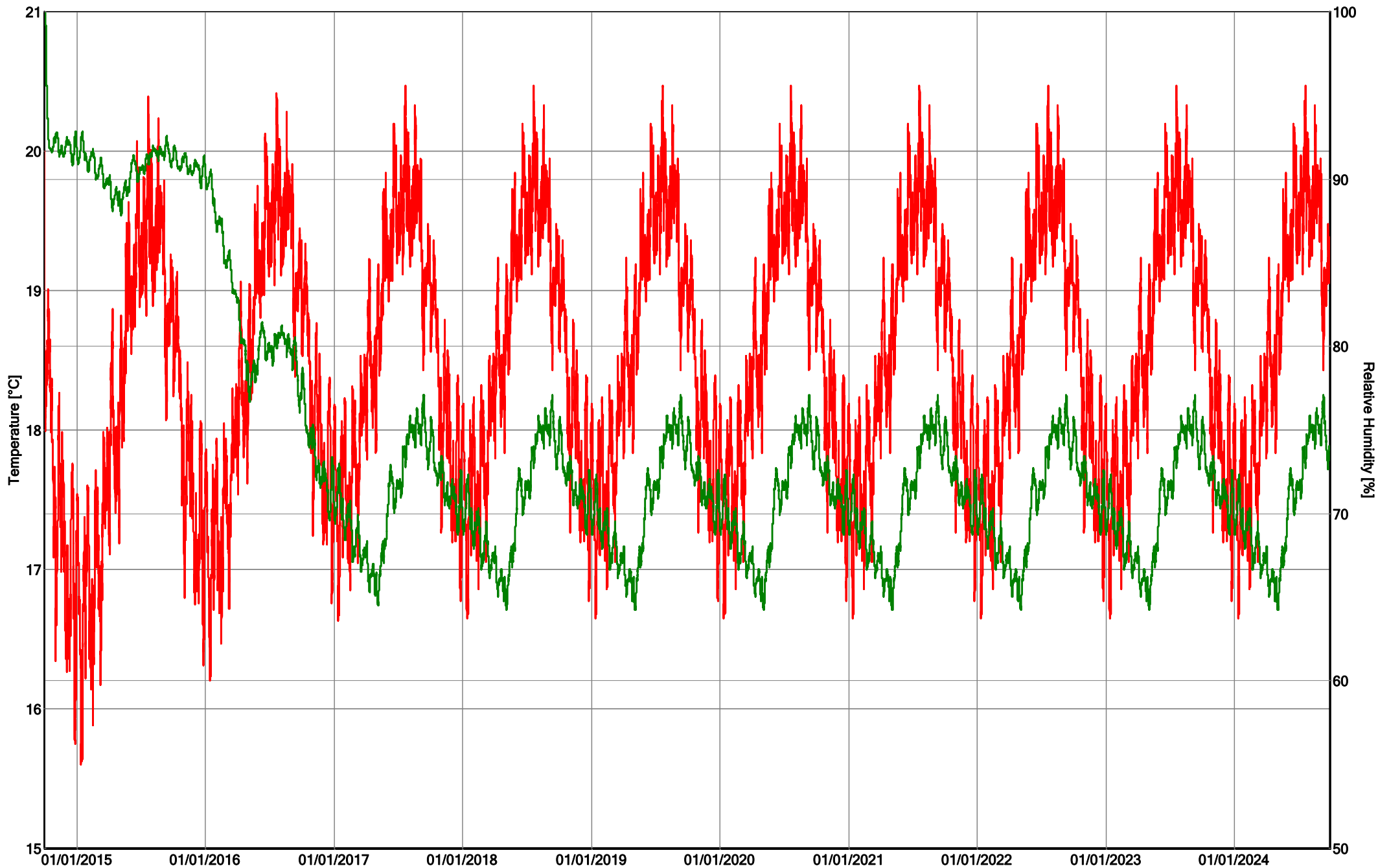
Heat Flux, left side	[MJ/m ²]	-1237.57
Heat Flux, right side	[MJ/m ²]	-3748.45
Moisture Fluxes, left side	[kg/m ²]	-21.59
Moisture Fluxes, right side	[kg/m ²]	20.81

Hygrothermal Sources

Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

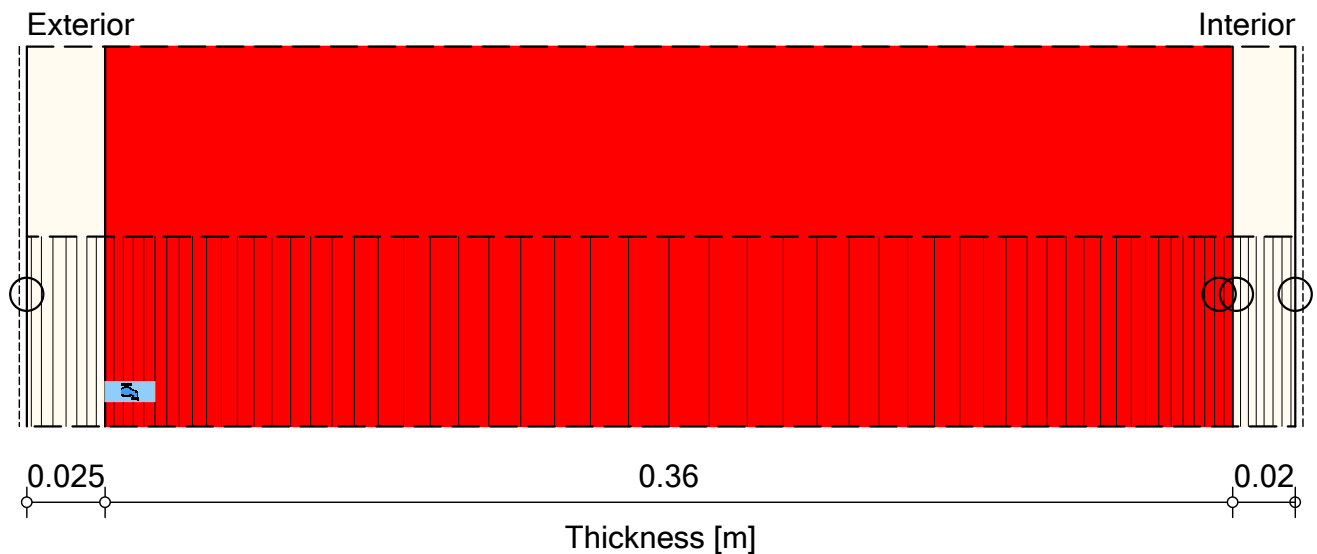
Interior Surface

Temperature Relative Humidity



Component Assembly

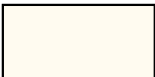
Case: Solid brick wall with external render and internal dry lining



○ - Monitor positions

💡/🔧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 13:10:28
Computing Time	2 min,37 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

Time Integral of fluxes

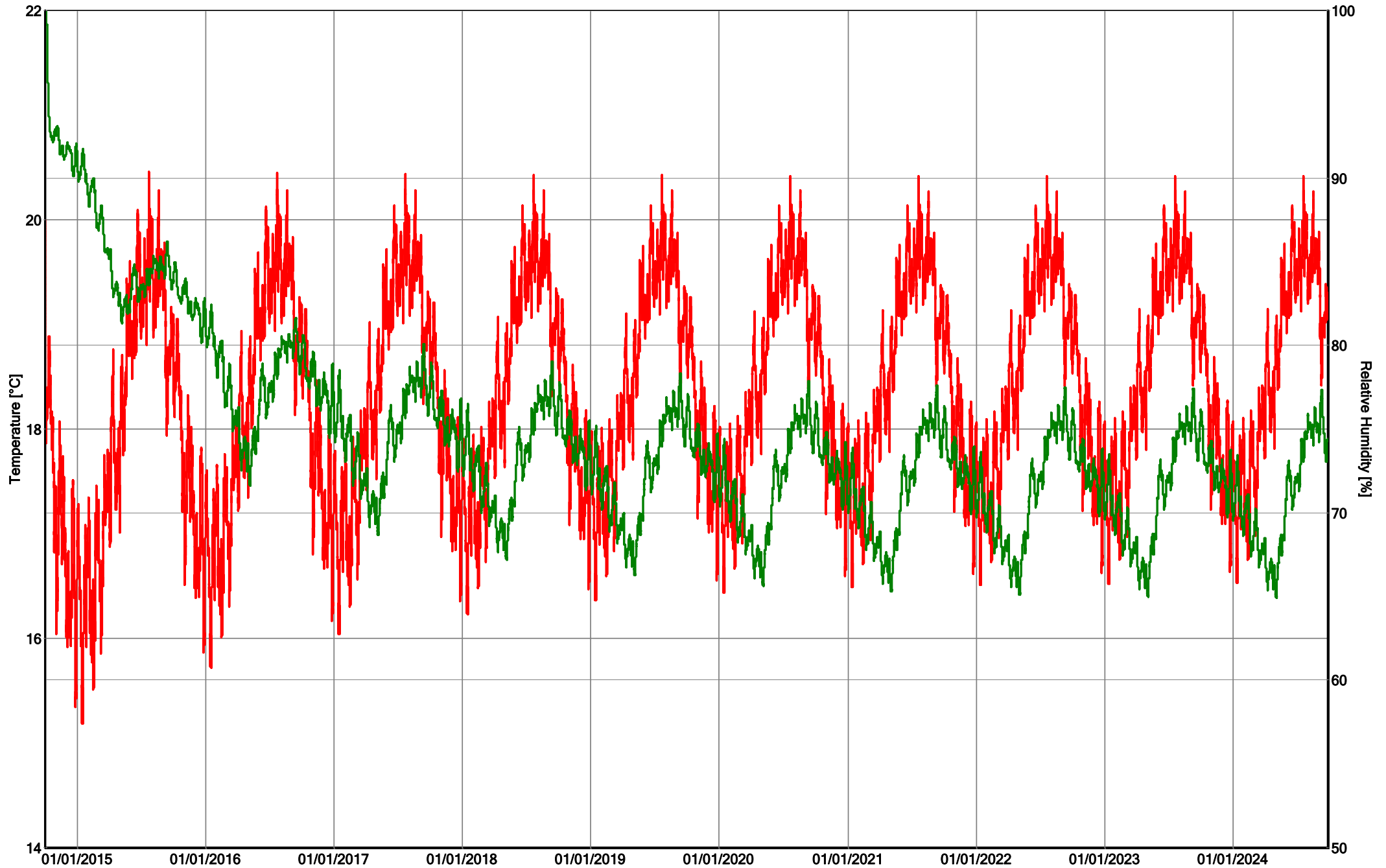
Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

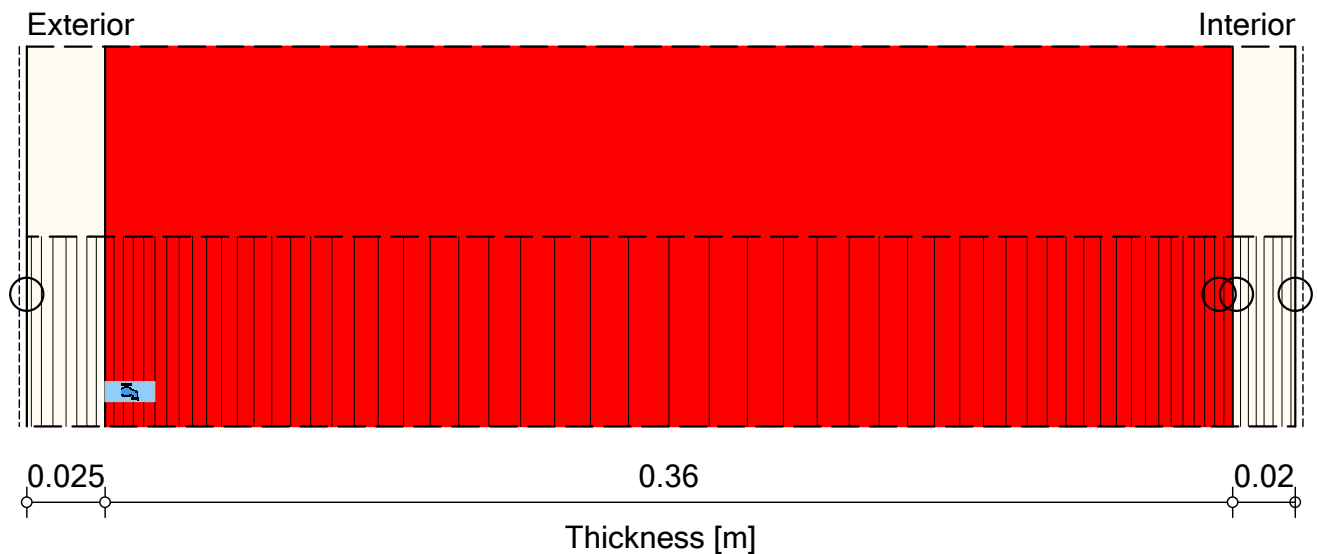
Interior Surface

Temperature Relative Humidity



Component Assembly

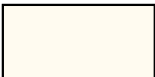
Case: Solid brick wall without external render and internal dry lining



○ - Monitor positions

💡/💧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 13:14:17
Computing Time	2 min,43 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

Time Integral of fluxes

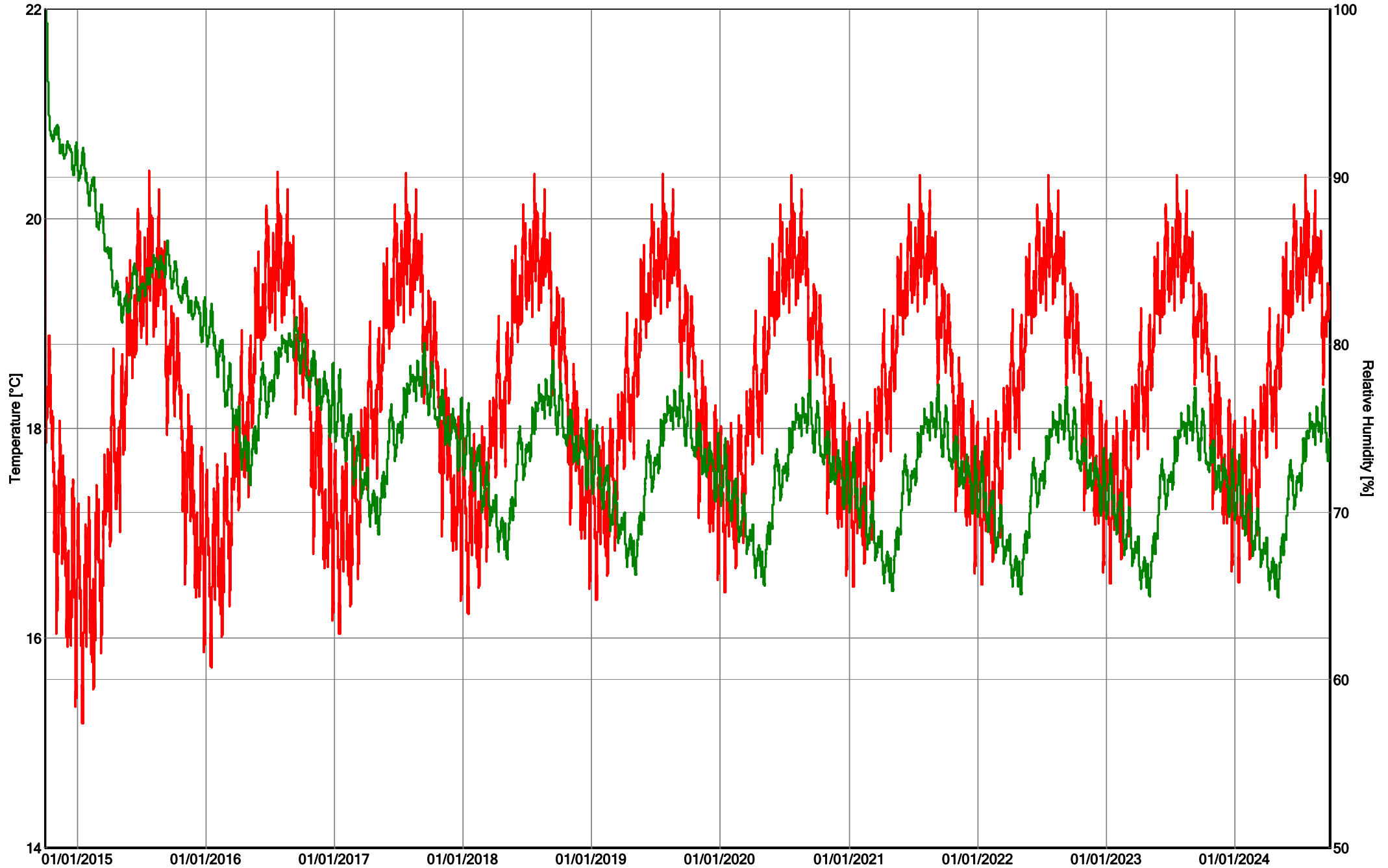
Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

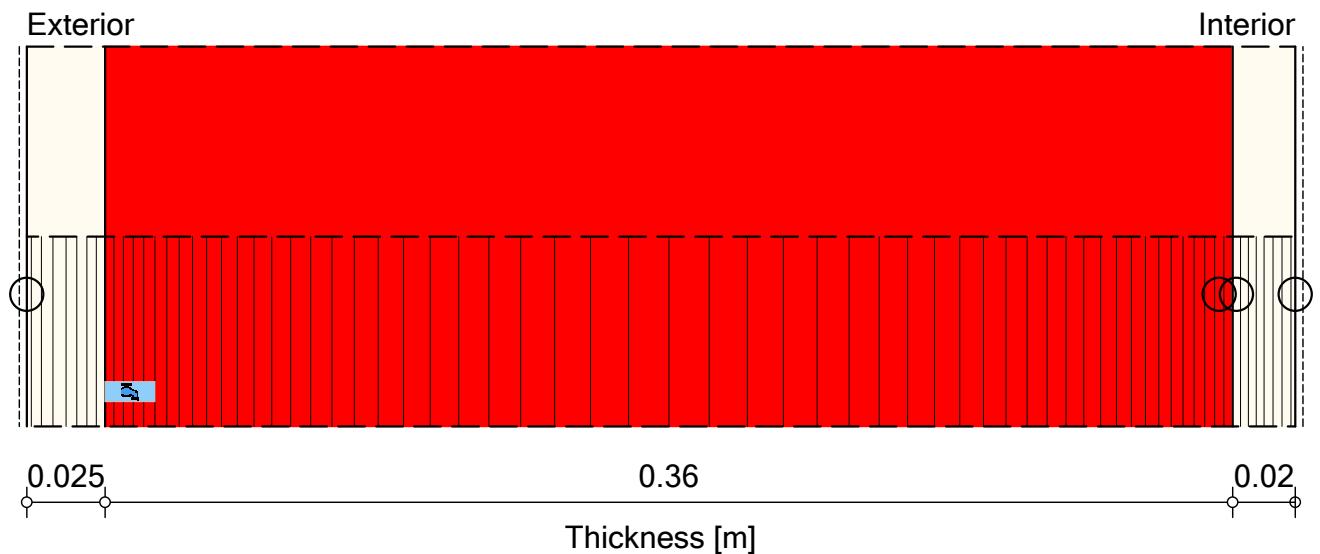
Interior Surface

Temperature Relative Humidity



Component Assembly

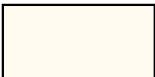
Case: Hard plastered reveal



○ - Monitor positions

💡/💧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 12:53:48
Computing Time	2 min,11 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

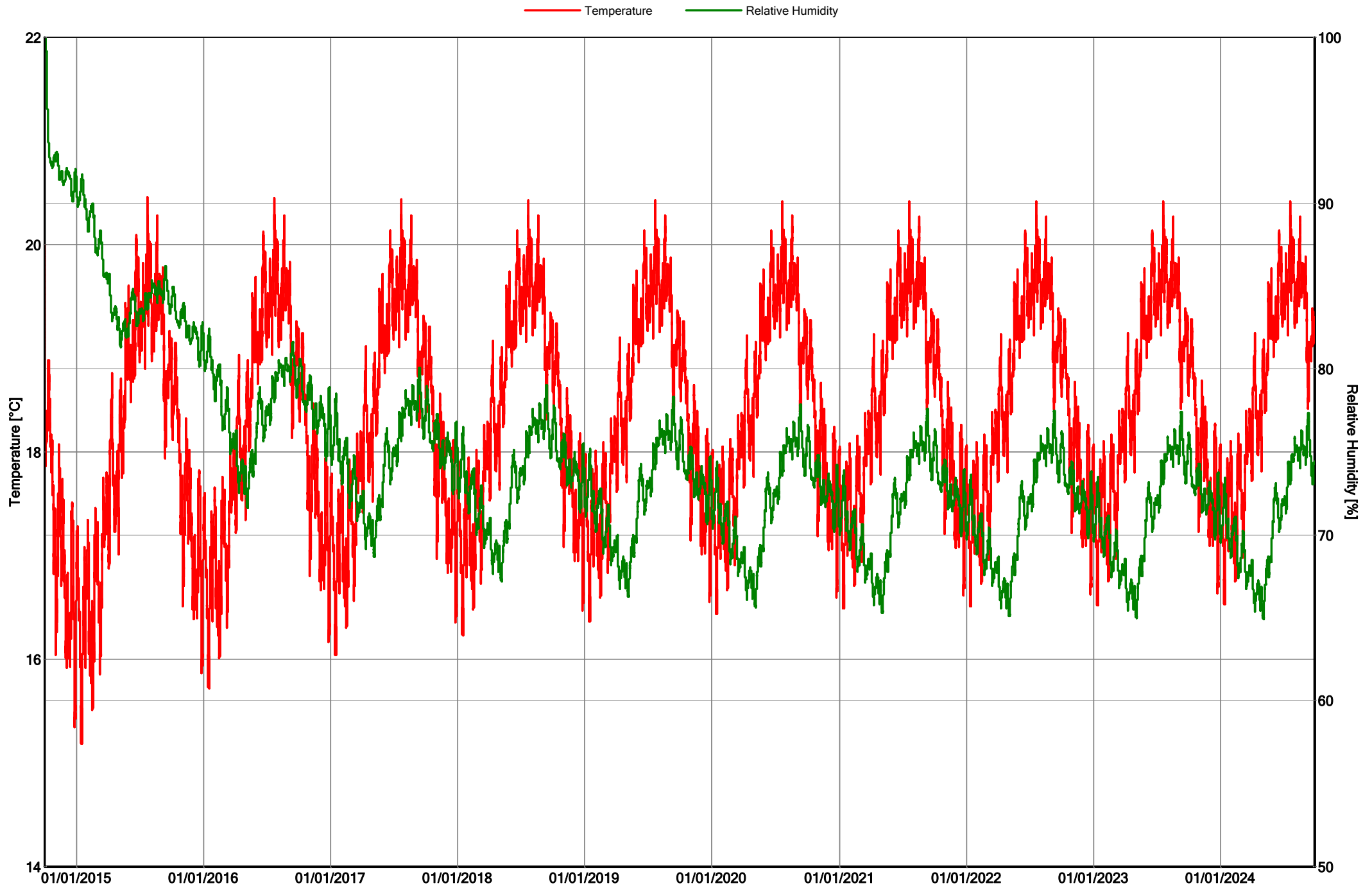
Time Integral of fluxes

Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

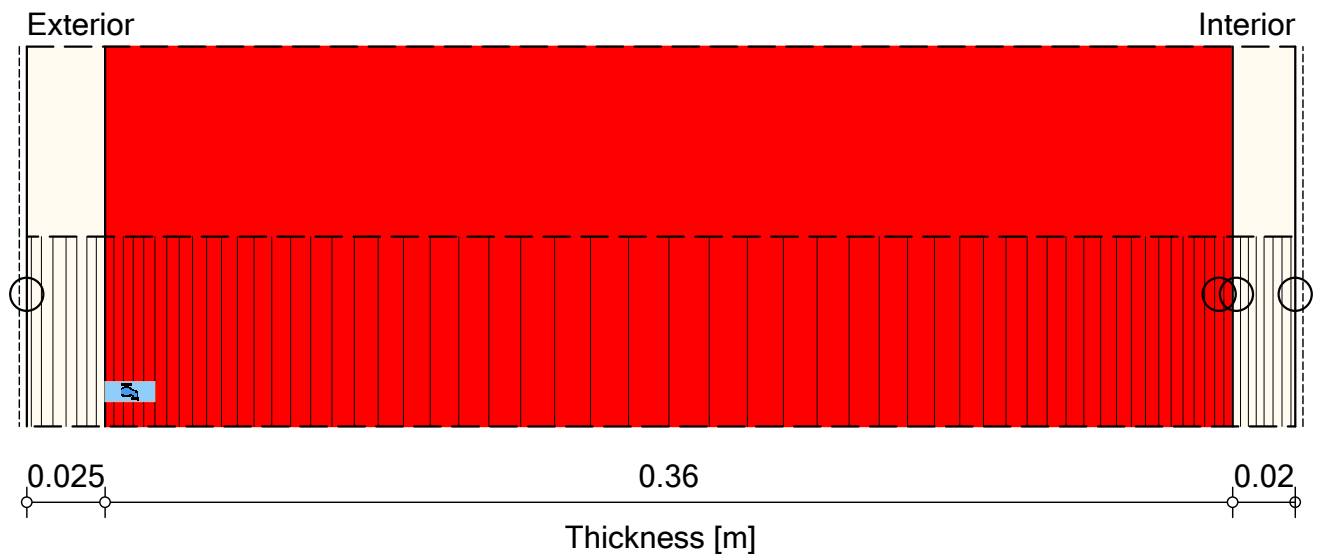
Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

Interior Surface



Component Assembly

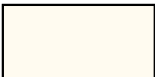
Case: Timber panelled reveal - representative worst case



○ - Monitor positions

💡/📉 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 12:56:58
Computing Time	2 min,39 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

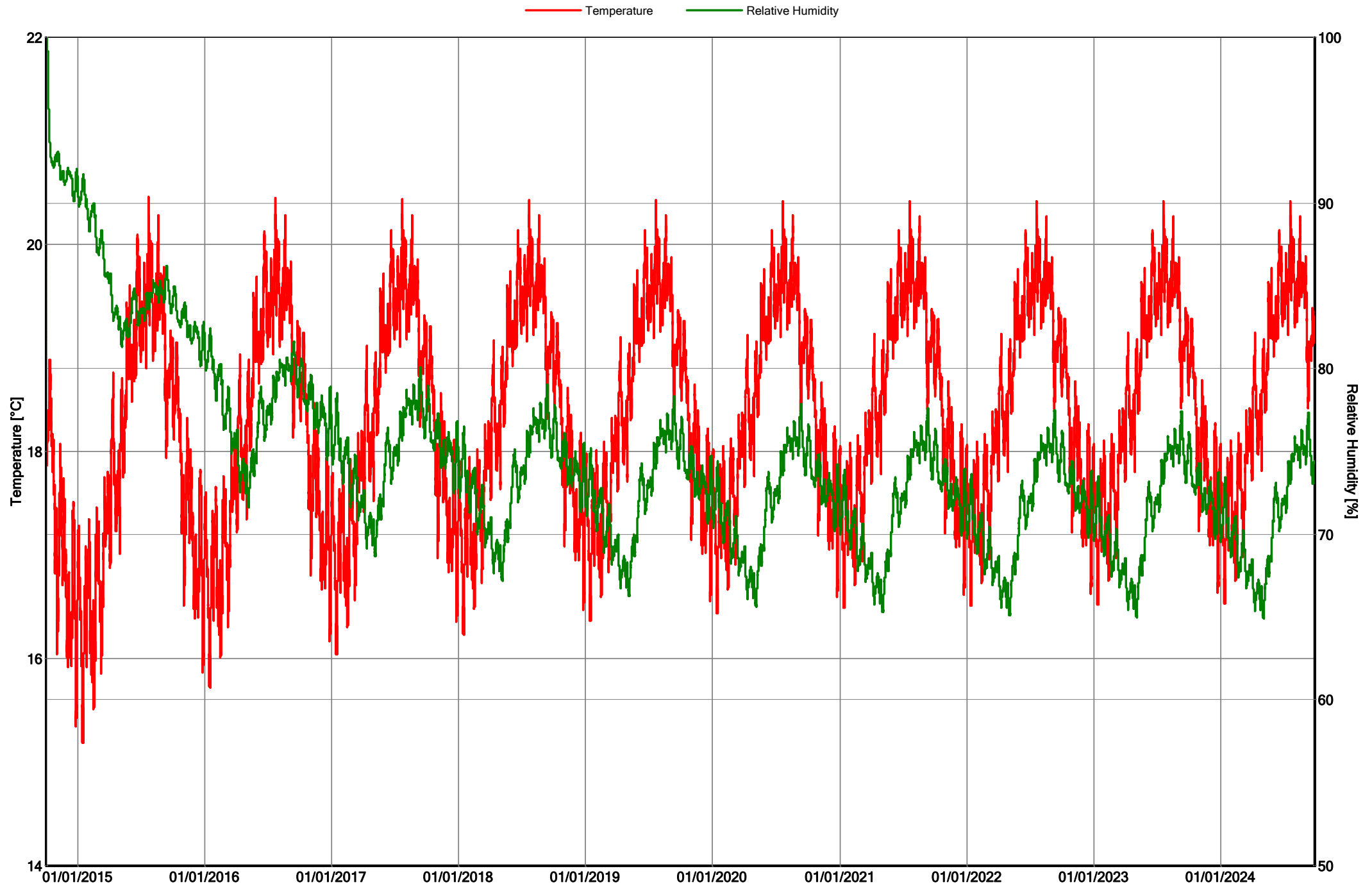
Time Integral of fluxes

Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

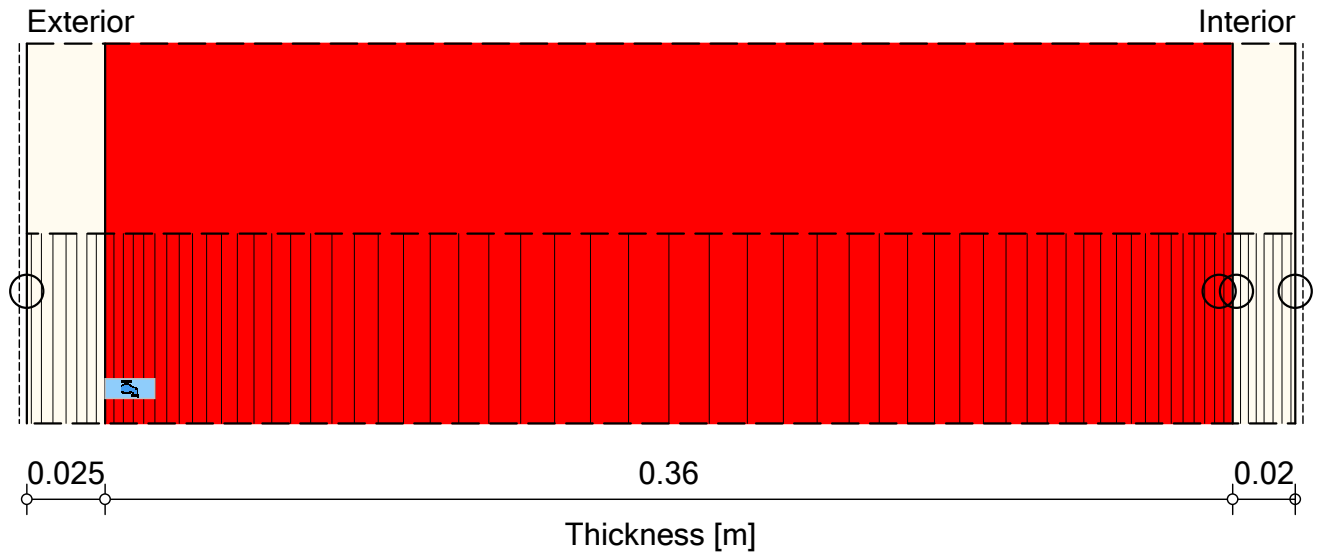
Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

Interior Surface



Component Assembly

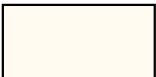
Case: Timber window frame



○ - Monitor positions

🔦/💧 - Heat/Moisture source/sink positions

Materials:

	- Cement Lime Plaster (stucco, A-value: 1.0 kg/m ² h ^{0.5})	0.025 m
	- Solid Brick Masonry	0.36 m
	- Cement Lime Plaster (stucco, A-value: 2.0 kg/m ² h ^{0.5})	0.02 m

sd-Value Ext. [m]: 0.3

sd-Value Int. [m]: 0.14

Total Thickness: 0.405 m

R-Value: 0.57 (m² K)/W

U-Value: 1.322 W/(m² K)

Boundary Conditions

Exterior (Left Side)

Location: SO32_-_Hants-hour.wac
 Temperature Shift: 0.0 °C
 Orientation / Inclination: North / 90 °

Interior (Right Side)

Indoor Climate: EN 13788
 Humidity Class 3; Temperature: 20 °C

Surface Transfer Coefficients

Exterior (Left Side)

Name	Description	Unit	Value
Heat Resistance - includes long-wave radiation	External Wall	[(m ² K)/W]	0.0588 yes
sd-Value	Acrylic facade paint	[m]	0.3
Short-Wave Radiation Absorptivity	Limestone, bright	[-]	0.4
Long-Wave Radiation Emissivity	Limestone, bright	[-]	0.9
Adhering Fraction of Rain	No absorption	[-]	----
Explicit Radiation Balance			yes
Terrestrial Short-Wave Reflectivity		[-]	0.2
Terrestrial Long-Wave Emissivity		[-]	0.90
Terrestrial Long-Wave Reflectivity		[-]	0.10
Cloud Index		[-]	0.66

Interior (Right Side)

Name	Description	Unit	Value
Heat Resistance	External Wall	[(m ² K)/W]	0.125
sd-Value		[m]	0.14

Sources, Sinks

Solid Brick Masonry

Name	Type		
1% Driven rain	<i>Moisture Source; Fraction of Rain Load</i>		
	Start Depth in Layer	[m]	0.00
	End Depth in Layer	[m]	0.015
	Cut-Off at Free Water Saturation	[kg/m ³]	190
	User-Defined	[%]	1

Results from Last Calculation

Status of Calculation

Calculation: Time and Date	31/01/2021 13:02:36
Computing Time	2 min,26 sec.
Begin / End of calculation	01/10/2014 / 01/10/2024
No. of Convergence Failures	0

Check for numerical quality

Integral of fluxes, left side (kl,dl)	[kg/m ²]	-13.9 -10.47
Integral of fluxes, right side (kr,dr)	[kg/m ²]	12.15 5.87
Balance 1	[kg/m ²]	-37.65
Balance 2	[kg/m ²]	-37.65

Water Content [kg/m²]

	Start	End	Min.	Max.
Total Water Content	45.45	7.33	7.2	45.45

Water Content [kg/m³]

Layer/Material	Start	End	Min.	Max.
Cement Lime Plaster (stucco, A-value)	210.00	44.26	41.08	210.00
Solid Brick Masonry	100.00	14.95	14.78	112.63
Cement Lime Plaster (stucco, A-value)	210.00	42.06	38.07	210.00

Time Integral of fluxes

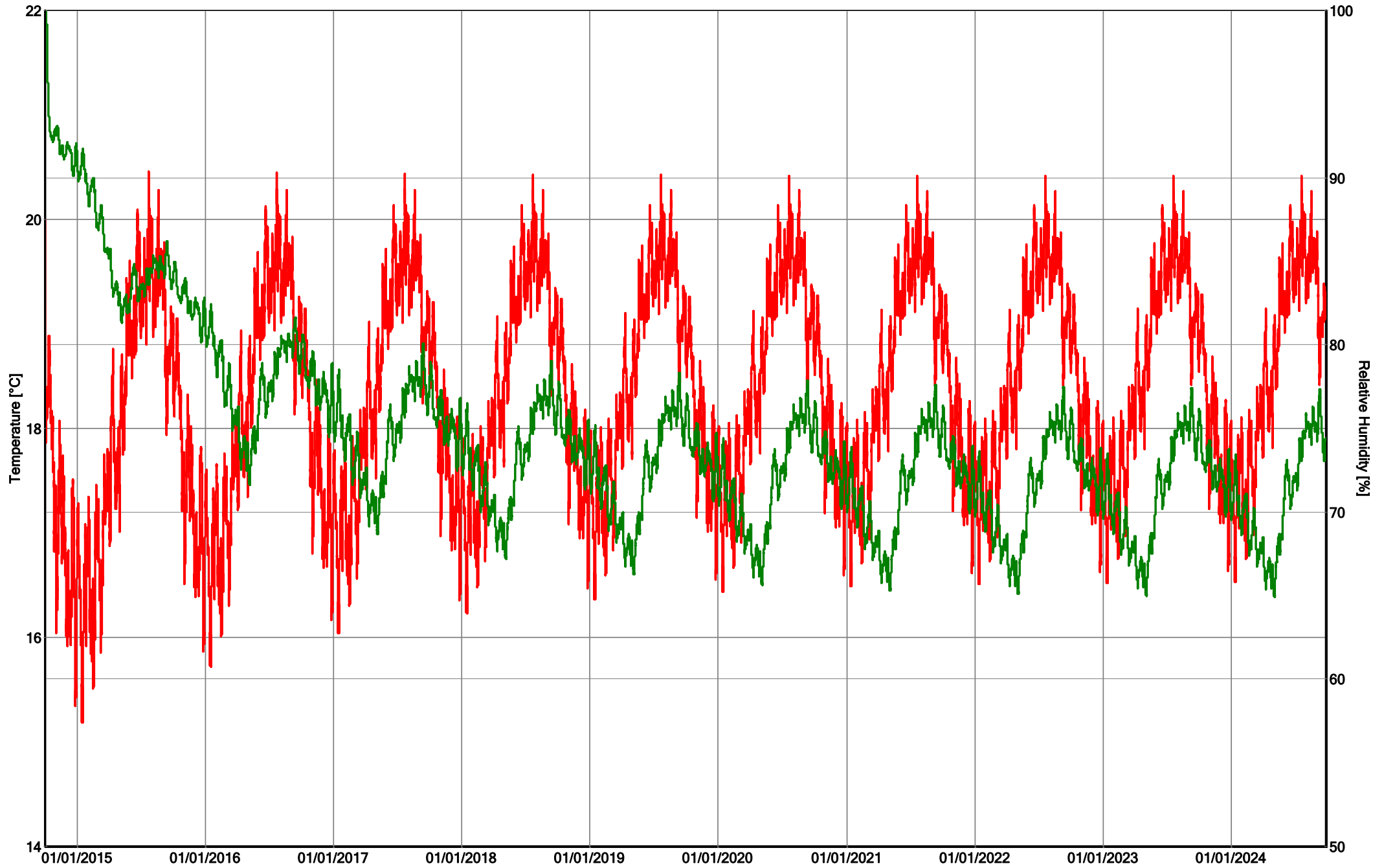
Heat Flux, left side	[MJ/m ²]	-1481.06
Heat Flux, right side	[MJ/m ²]	-4123.42
Moisture Fluxes, left side	[kg/m ²]	-24.6
Moisture Fluxes, right side	[kg/m ²]	18.26

Hygrothermal Sources

Heat Sources	[MJ/m ²]	0.0
Moisture Sources	[kg/m ²]	4.742
Unreleased Moisture Sources (due to cut-off)	[kg/m ²]	0.0
1% Driven rain (Moisture Source)	[kg/m ²]	4.742

Interior Surface

Temperature Relative Humidity



Attachment C



Fig 1 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 2 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Southleigh Park House

Photographs

15 December 2020 and 05 January 2021

Not to scale

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Fig 3 :

View of the wall/reveal width across a window opening



Fig 4 :

View of the wall/reveal width across a window opening



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Fig 5 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 6 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 7 :

View of the wall/reveal width across a window opening



Fig 8 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 9 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar. Note also the presence of a cementitious render at this location



Fig 10 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 11 :

View of the internal wall construction



Fig 12 :

View of the wall/reveal width across a window opening



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Fig 13 :

View of the wall/reveal width across a window opening



Fig 14 :

View of the wall/reveal width across a window opening



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Fig 15 :

View of window openings used to establish the construction type of the building



Fig 16 :

View of the wall/reveal width across a window opening



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Fig 17 :

View of the render and brickwork



Fig 18 :

View of window openings used to establish the construction type of the building



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Fig 19 :

View of the internal wall construction



Fig 20 :

View of window openings used to establish the construction type of the building



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Fig 21 :

View of the wall/reveal width across a window opening



Fig 22 :

View of window openings used to establish the construction type of the building



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Fig 23 :

View of the wall/reveal width across a window opening



Fig 24 :

View of the wall/reveal width across a window opening



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Fig 25 :

View of window openings used to establish the construction type of the building



Fig 26 :

View of the wall/reveal width across a window opening



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Fig 27 :

View of window openings used to establish the construction type of the building



Fig 28 :

View of window openings used to establish the construction type of the building



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Fig 29 :

View of the wall/reveal width across a window opening



Fig 30 :

View of window openings used to establish the construction type of the building



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Fig 31 :

View of the wall/reveal width across a window opening



Fig 32 :

View of window openings used to establish the construction type of the building



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Fig 33 :

View of the wall/reveal width across a window opening



Fig 34 :

View of window openings used to establish the construction type of the building



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Fig 35 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 36 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 37 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 38 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 39 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 40 :

View of window openings used to establish the construction type of the building



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Fig 41 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar. The previously external wall had been incorporated into the interior and rendered in this location



Fig 42 :

View of the plaster thickness



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Fig 43 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 44 :

View of window openings used to establish the construction type of the building



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Fig 45 :

View of the wall/reveal width across
a window opening



Fig 46 :

View of the wall/reveal width across
a window opening



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Fig 47 :

View of window openings used to establish the construction type of the building



Fig 48 :

View of the wall/reveal width across a window opening



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Fig 49 :

View of window openings used to establish the construction type of the building



Fig 50 :

View of the wall/reveal width across a window opening



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Fig 51 :

View of the wall/reveal width across a window opening



Fig 52 :

View of window openings used to establish the construction type of the building



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Fig 53 :

View of the wall/reveal width across a window opening



Fig 54 :

View of the internal wall construction



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Fig 55 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 56 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 57 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



Fig 58 :

General view of façades. The exterior faces were found to be knapped flint bedded on a lime-based mortar



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Fig 59 :

View of the external wall construction



Fig 60 :

View of window openings used to establish the construction type of the building



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Fig 61 :

View of the wall/reveal width across a window opening



Fig 62 :

View of window openings used to establish the construction type of the building



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Fig 63 :

View of window openings used to establish the construction type of the building



Fig 64 :

View of the wall/reveal width across a window opening



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Fig 65 :

View of window openings used to establish the construction type of the building



Fig 66 :

View of the wall/reveal width across a window opening



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Fig 67 :

View of the internal wall construction



Fig 68 :

View of the wall/reveal width across a window opening



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Fig 69 :

View of the wall/reveal width across
a window opening



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