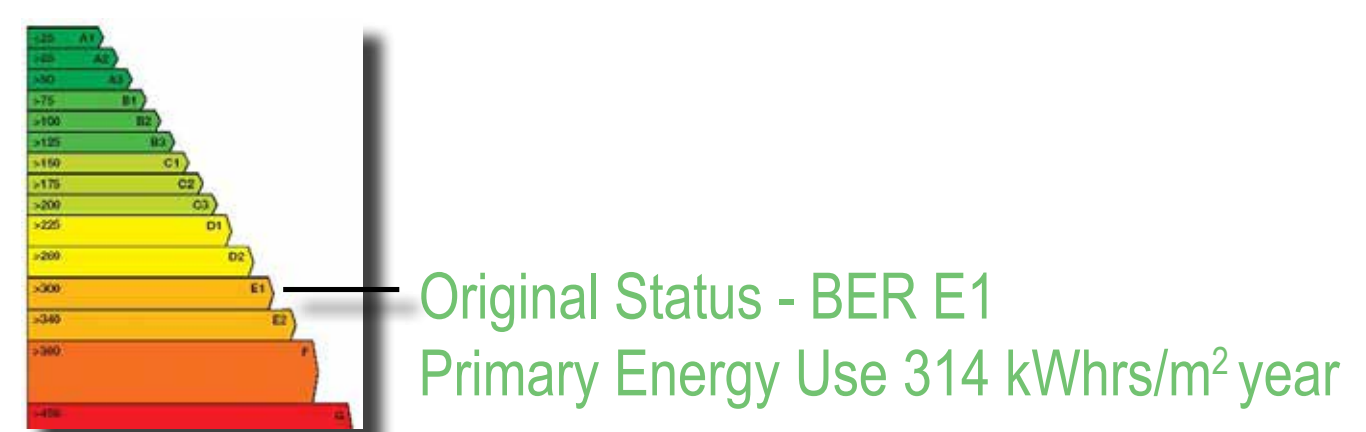


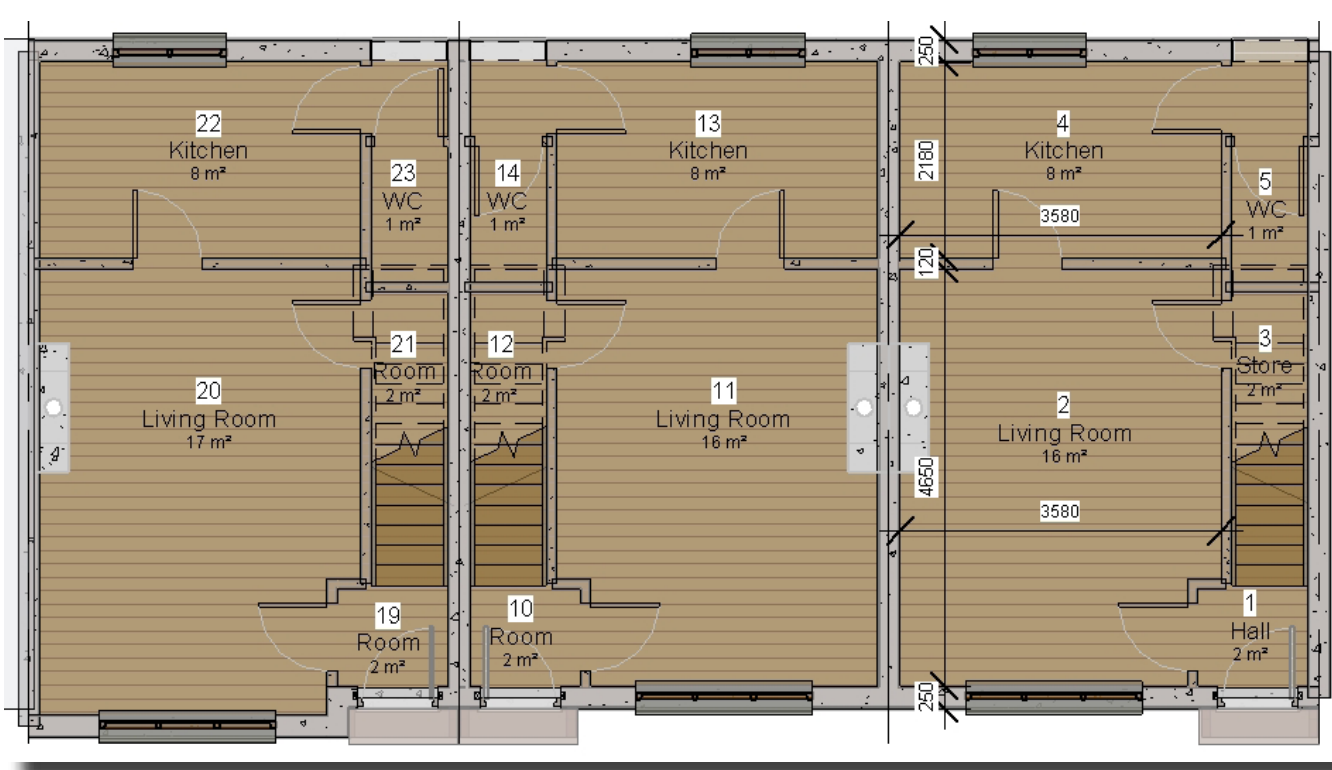
Analysis of retrofit possibilities, problems and solutions - 6 houses, Crumlin (Target A2 BER Rating)

Ground Zero...The Starting Point:

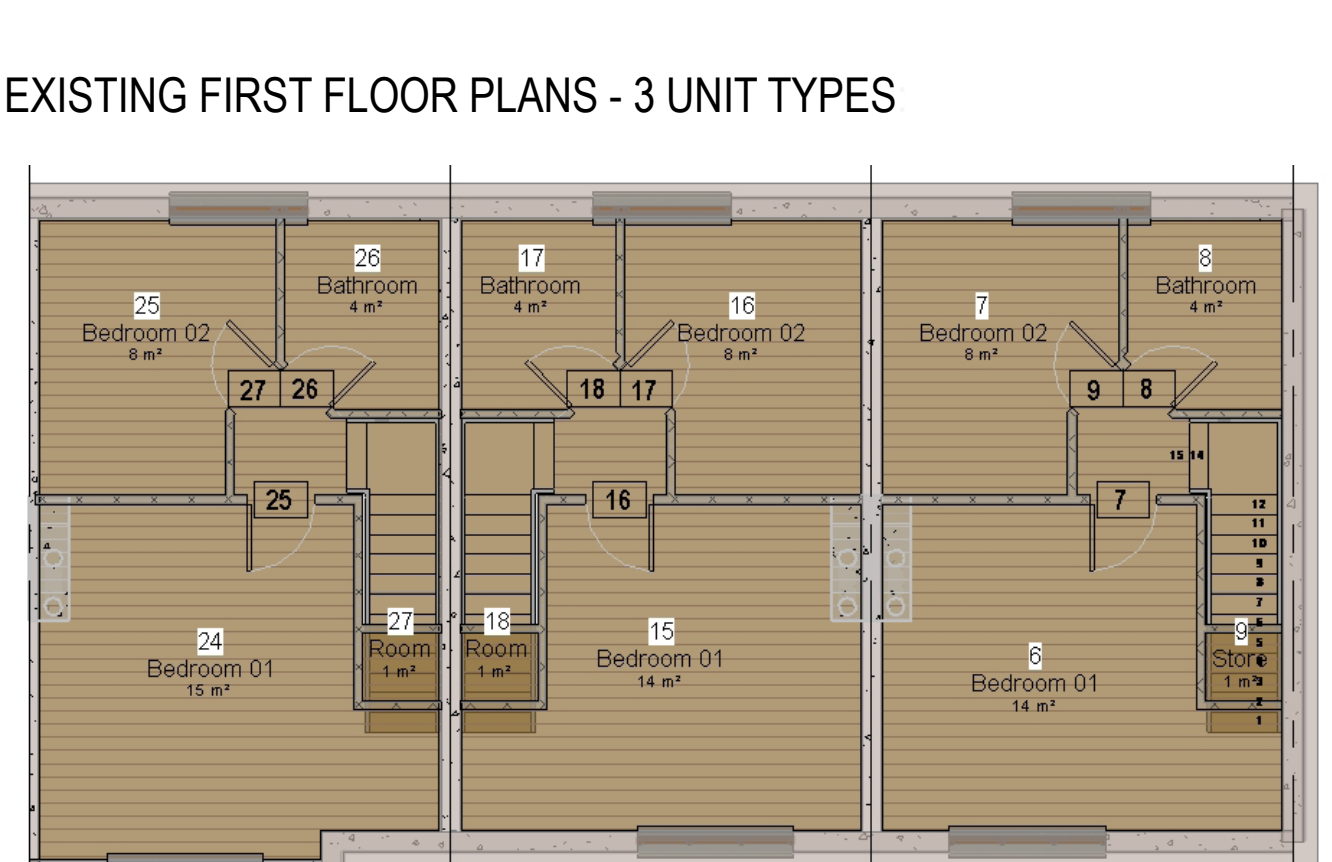


Detail Ref	Location	Construction Type	U-value
1	External Wall Front and Rear	18mm pebbledash - 1 W/mK 235mm Mass Concrete - 1.55W/mK 18mm plaster interior - 0.8 W/mK	2.47W/mK
2	Internal Wall between units	18mm plaster external - 0.8 W/mK 100mm Mass Concrete - 1.55W/mK 18mm plaster internal - 0.8 W/mK	1.37W/mK
3	External Wall Kitchen Exposed to Path	18mm plaster external - 0.8 W/mK 100mm Mass Concrete - 1.55W/mK 18mm plaster internal - 0.8 W/mK	1.38W/mK
4	Internal Wall from Unit to semi-exposed WC	2.5mm plaster skin - 0.43W/mK 12.5mm plasterboard - 0.25 W/mK 50mm EPS Insulation - 0.03 W/mK 12.5mm plasterboard - 0.25 W/mK 2.5mm plaster skin - 0.43W/mK	0.88W/mK
5	Ground Floor House	22mm Floorboards - 0.13 W/mK 75mm Concrete Subfloor - 1.15 W/mK	0.63W/mK
6	First Floor Exposed Spare Part	22mm Floorboards - 0.13 W/mK - 0.13 W/mK 12.5mm plasterboard - 0.25 W/mK 175mm x 44 SW joists @ 400c/c 12.5mm plasterboard - 0.25 W/mK 2.5mm plaster skin - 0.43W/mK	1.44W/mK
7	First Floor to Semi exposed space/WC	22mm Floorboards - 0.13 W/mK - 0.13 W/mK 12.5mm plasterboard - 0.25 W/mK 175mm x 44 SW joists @ 400c/c 12.5mm plasterboard - 0.25 W/mK 2.5mm plaster skin - 0.43W/mK	0.86W/mK
8	Ceiling to semi-exposed attic	100mm x 48mm SW Rafter - 0.13W/mK 100mm Insulation - 0.03W/mK 12.5mm plasterboard - 0.25 W/mK 2.5mm plaster skin - 0.43W/mK	0.41W/mK
9	Sloped roof of eaves	22mm Concrete roof tiles 22mm x 50mm SW battens @ 300 centres 100mm x 48mm SW Rafter - 0.13W/mK 18mm insulation 12.5mm plasterboard - 0.25 W/mK 2.5mm plaster skin - 0.43W/mK	0.91W/mK

EXISTING GROUND FLOOR PLANS - 3 UNIT TYPES:



EXISTING FIRST FLOOR PLANS - 3 UNIT TYPES:

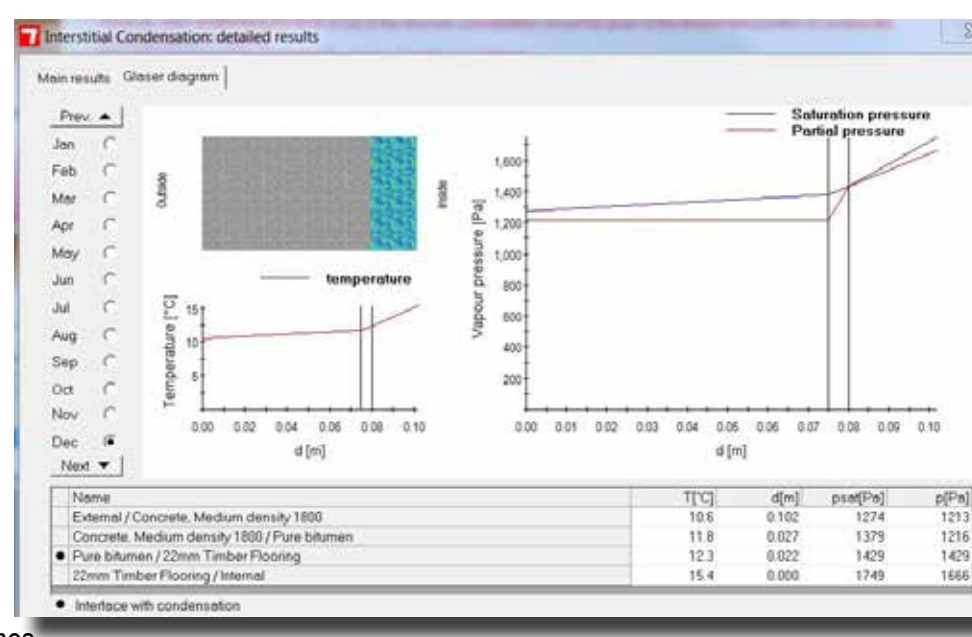


Baseline Analysis:

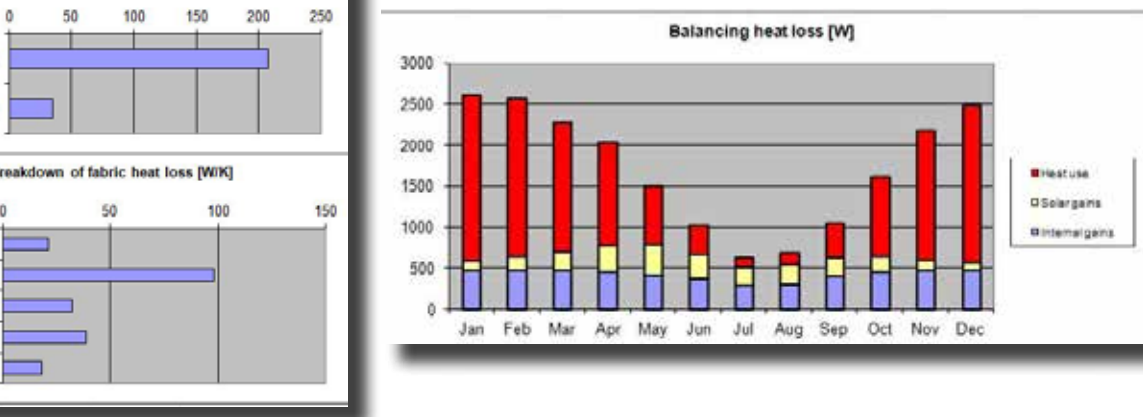
- Constructed late 1930's, cast in-situ wall concrete construction.
- Kitchen House layout, 2 up 2 down, small format houses.
- Front and rear gardens, South West to the front, North East rear facing.
- Practical design in varying forms throughout the Dublin area - opportunity of large scale upgrade.
- BER of 3 house types ranging from E1 to F.

Blower Door Test Result: Q50 of 4.65 m3/hour/m2

Condensation risk evident: floors, ceilings.



Fabric heat loss is nearly 4 times the rate of heat loss through ventilation.



Original gas boiler is 91% efficient, but Primary Circuit and Distribution losses are considerable.

Annual Primary Energy Use is 314 kWh/m²/year

Annual fuel cost calculated at per annum €1,347.00

Cast-in-situ concrete chimney

Concrete tiles on tiling battens on 100x44 rafters, no sarking felt

100mm Ceiling joists with Plasterboard and skim finish, no insulation to attic

Timber floorboards on 175x44 joists, plasterboard and skim ceiling below



Double glazed PVC windows

Timber flooring on bitumen layer on 75mm coke concrete floor - no insulation or DPM

215mm cast-in-situ concrete walls, 18mm wet plaster to interior, 18mm pebbledash to exterior - no insulation

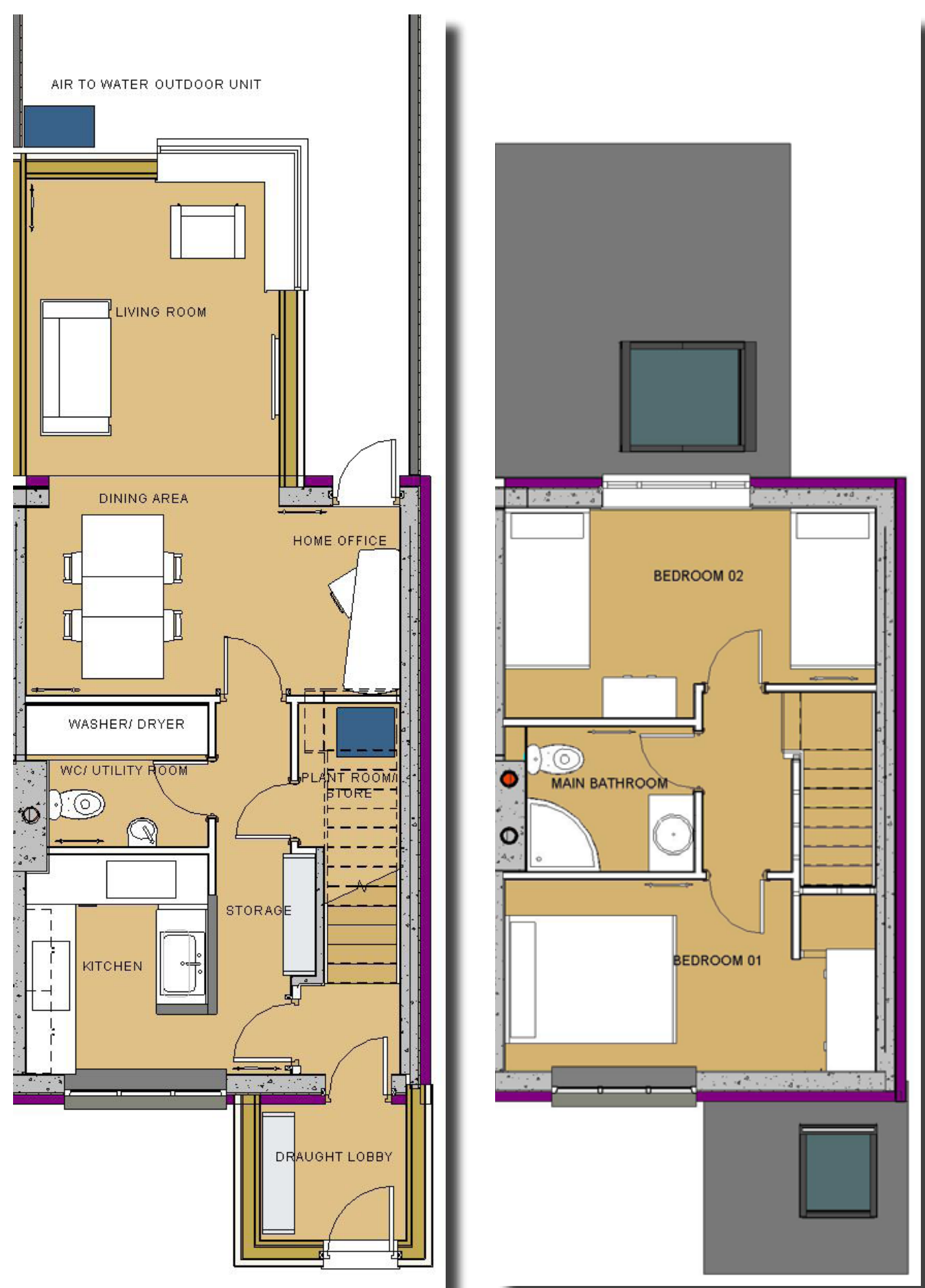


Assessment Made:

- Current house layout and restricted gross floor area is not suitable to ensure a sustainable future for this house type for the next 50 years, as requirements have changed.
- Lack of insulation throughout is resulting in substantial heat loss and over-reliance on Primary Energy sources.
- It is apparent from analysis carried out that there is a very high risk of both surface humidity and condensation build-up within these structures owing to the both the nature of their construction, and the lack of controlled ventilation. This moisture build-up may result in the degradation of materials such as timbers, possibly resulting in wet rot. It will also give rise to the potential for the growth of mould and mildew both on wall and ceiling surfaces where it is clearly visible, as well as in concealed spaces such as within ceilings.
- The concrete structure affords a relatively high level of air tightness, but the lack of controlled ventilation and high permeability of materials elsewhere within the structure means that there is the opportunity for much of this condensation to evaporate there not manifesting as a problem currently. However in addressing the heat loss situation in the properties with added insulation and reduced air permeability, these problems will come to the fore unless addressed.
- Linear thermal bridging is a considerable issue owing to original detailing, some easier to deal with than others. The cast-in-situ concrete chimney stack is a particular



Initial Measures...Not there yet, but might this be enough?



PROPOSED GROUND FLOOR PLAN: PROPOSED FIRST FLOOR PLAN:

CEILING TO ATTIC:

300mm Isover Metac Mineral Wool between and above existing ceiling joists on original 12.5mm plasterboard ceiling with 2.5mm skim finish, layer of Intello Plus membrane fitted directly to underside of original ceiling and taped to perimeter wet plaster walls with Tescon tape with new 12.5mm plasterboard ceiling with 2.5mm skim finish to underside.

U-Value: 0.09 W/mK

ROOF TO EXTENSIONS:

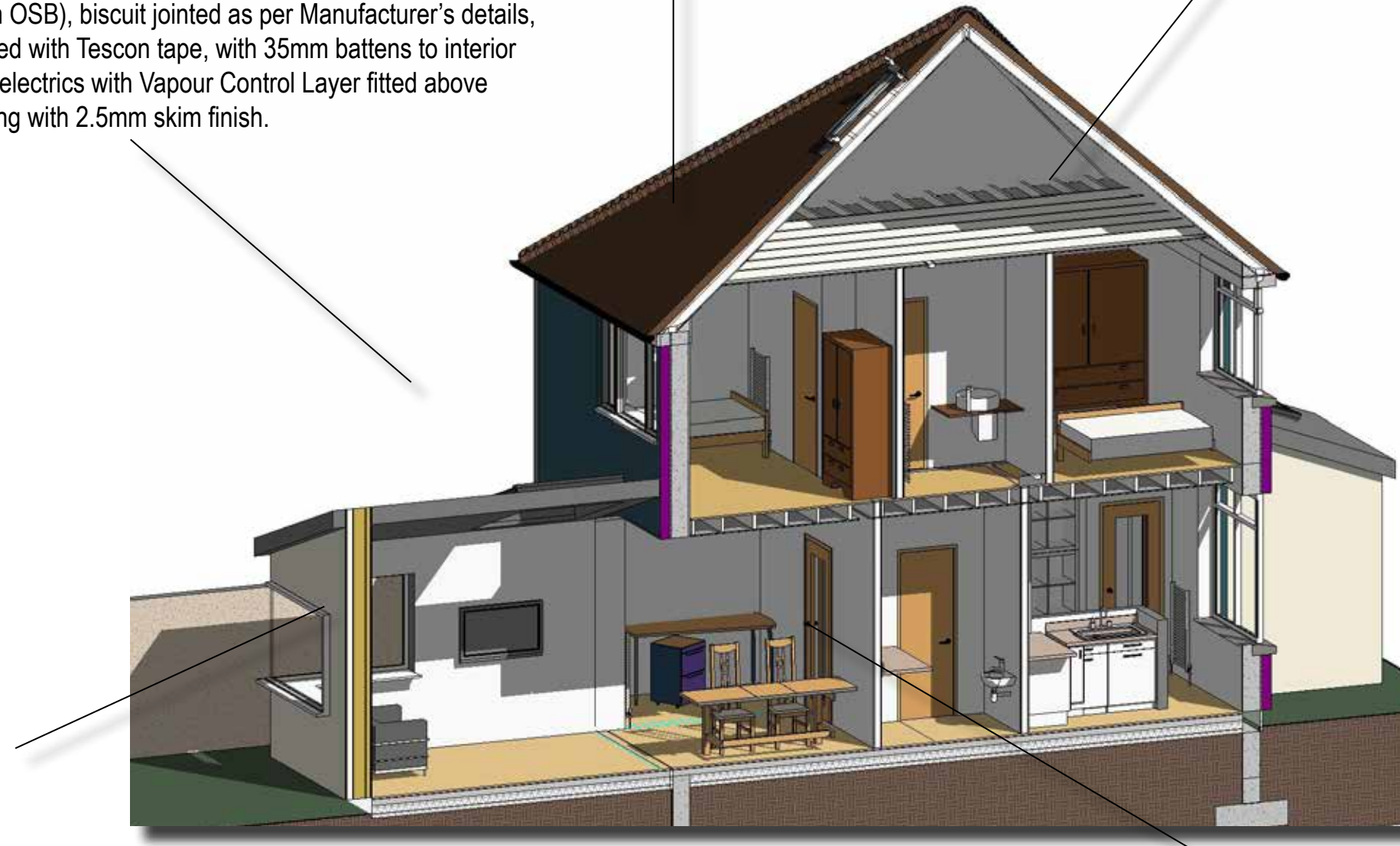
3mm Zinc roof finish on 8.5mm Perno sec 'Hairy Chest' membrane on Ampatop Protecta layer on 172mm Kingspan TEK panel (comprising 15mm OSB on H2 Insulation on 15mm OSB), biscuit jointed as per Manufacturer's details, all joints in TEK panels taped with Tescon tape, with 50mm battens to interior to provide service void for electrics with Vapour Control Layer fitted above 12.5mm plaster board ceiling with 2.5mm skim finish.

U-Value: 0.12 W/mK

WALLS TO EXTENSIONS:

10mm Aquapanel on 55mm vertical battens providing ventilation space with insect mesh on 172mm Kingspan TEK panel (comprising 15mm OSB on H2 Insulation on 15mm OSB), biscuit jointed as per Manufacturer's details, with 50mm Kingspan K17 drying insulation incorporating Vapour Control Layer with 12.5mm plasterboard and 2.5mm plaster skim finish directly fitted to interior. Joints to all TEK panels to be taped with Tescon tape.

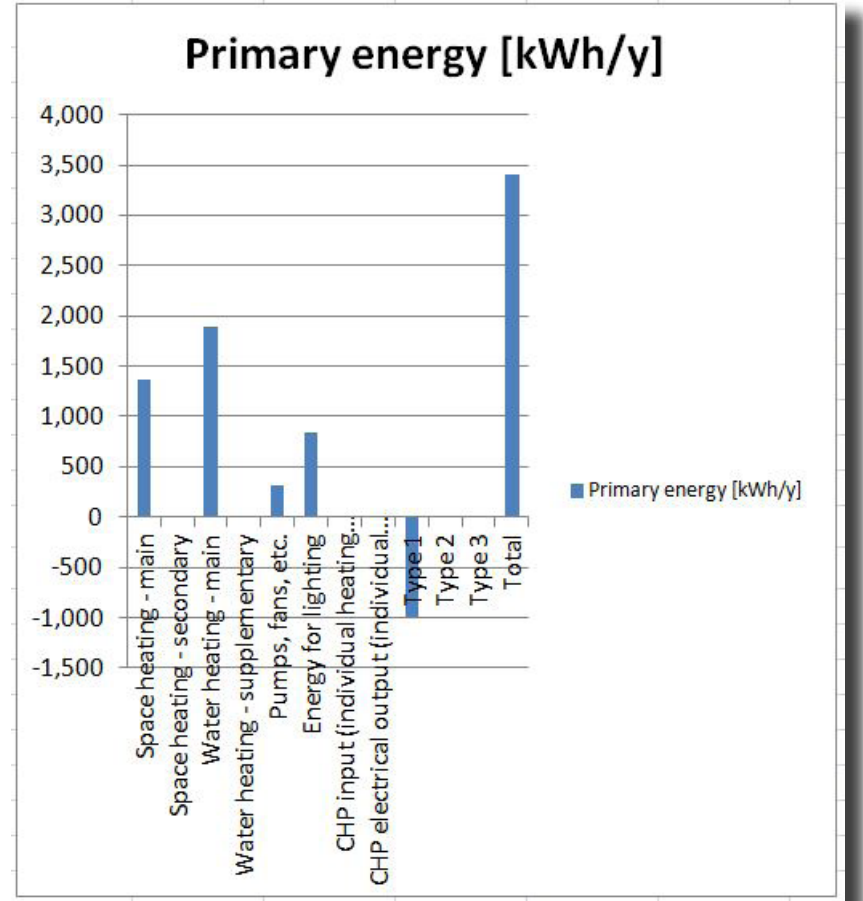
U-Value: 0.14W/mK



FLOOR:

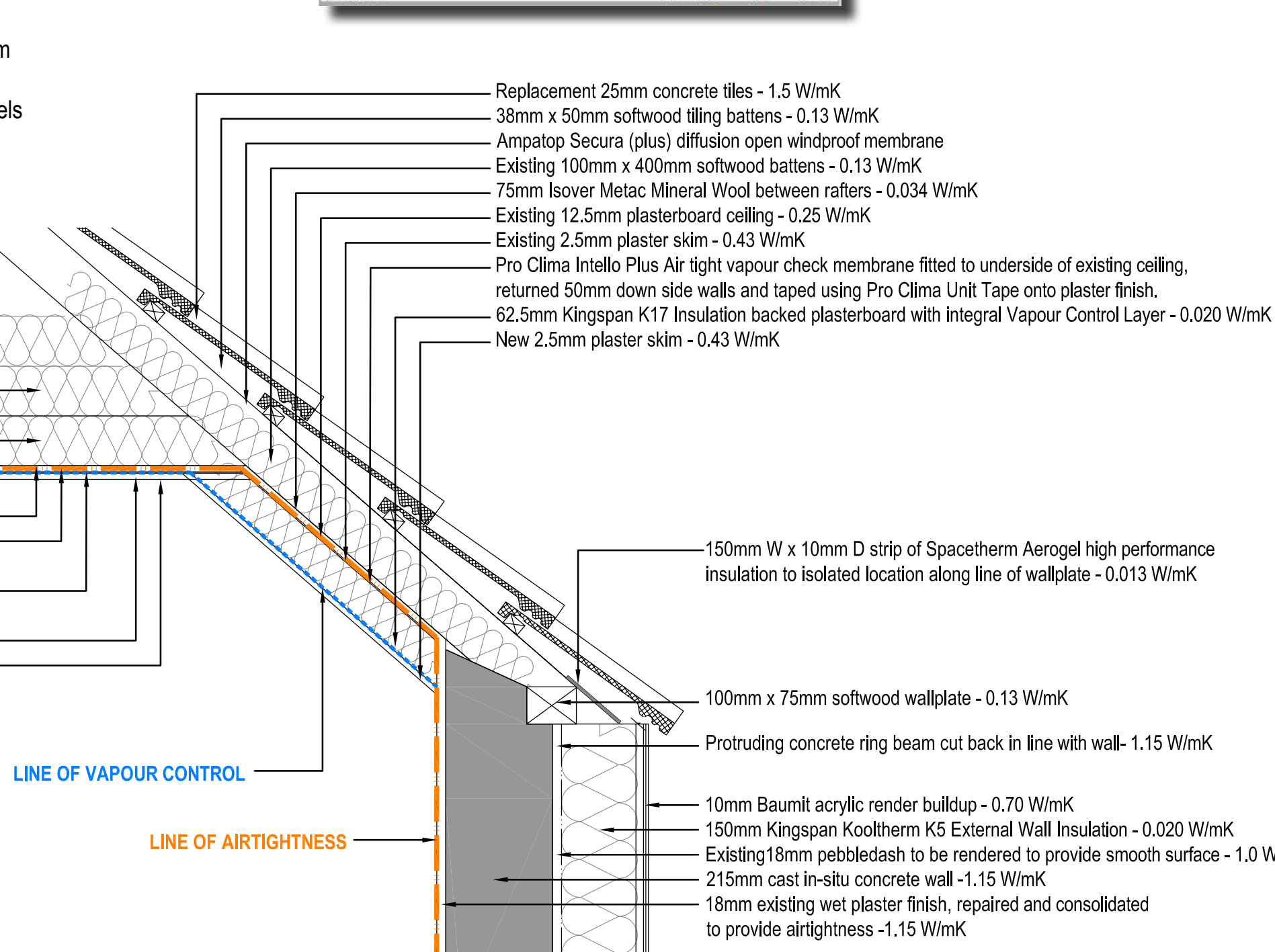
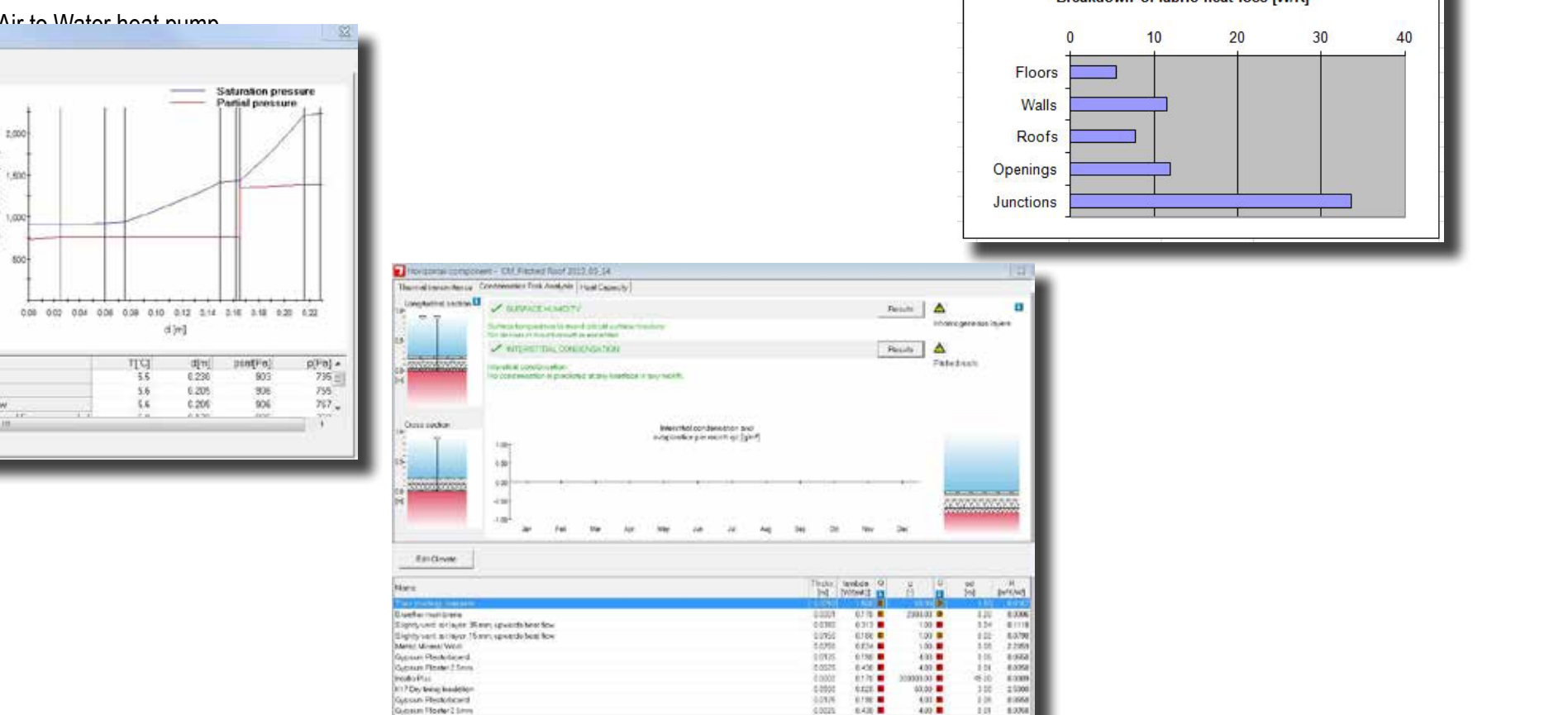
65mm polished concrete screed on 50mm Kingspan K3 insulation on 150mm concrete raft on DPM/ Radon barrier on 250mm Kingspan K3 insulation on well compacted hardcore. 50mm insulation to perimeter of screed, TEK panels taped to full perimeter of concrete raft with Tescon tape.

U-Value: 0.05 W/mK



Initial Measures:

- Increase in floor area to 78m² - full compliance with DOE Guidelines. Small single storey extensions front and rear constructed using 172mm SIPS panels with additional insulation to interior for walls and roofs.
- Redesign of internal layout to provide larger open plan living space to rear of house, including a space for a home office.
- Replace existing ground floor slab throughout with polished concrete Passive Slab, including insulated foundations.
- Repurposing of chimney structure within house for vertical service riser (SVP, Extract, MAE). If existing concrete structure is to remain in place, new insulated pressed metal housing terminal to be fitted to chimney above roof line.
- 150mm EPS External Wall Insulation with Baunit render to be fitted to existing concrete walls, existing pebble dash to be plastered to provide light fit. Existing concrete details at ring beam, window sills and canopy to door to be out back in line with wall.
- Consolidate airtight layer.
- Replace windows with high performance triple glazed units.
- Demand controlled ventilation system - no heat recovery initially.



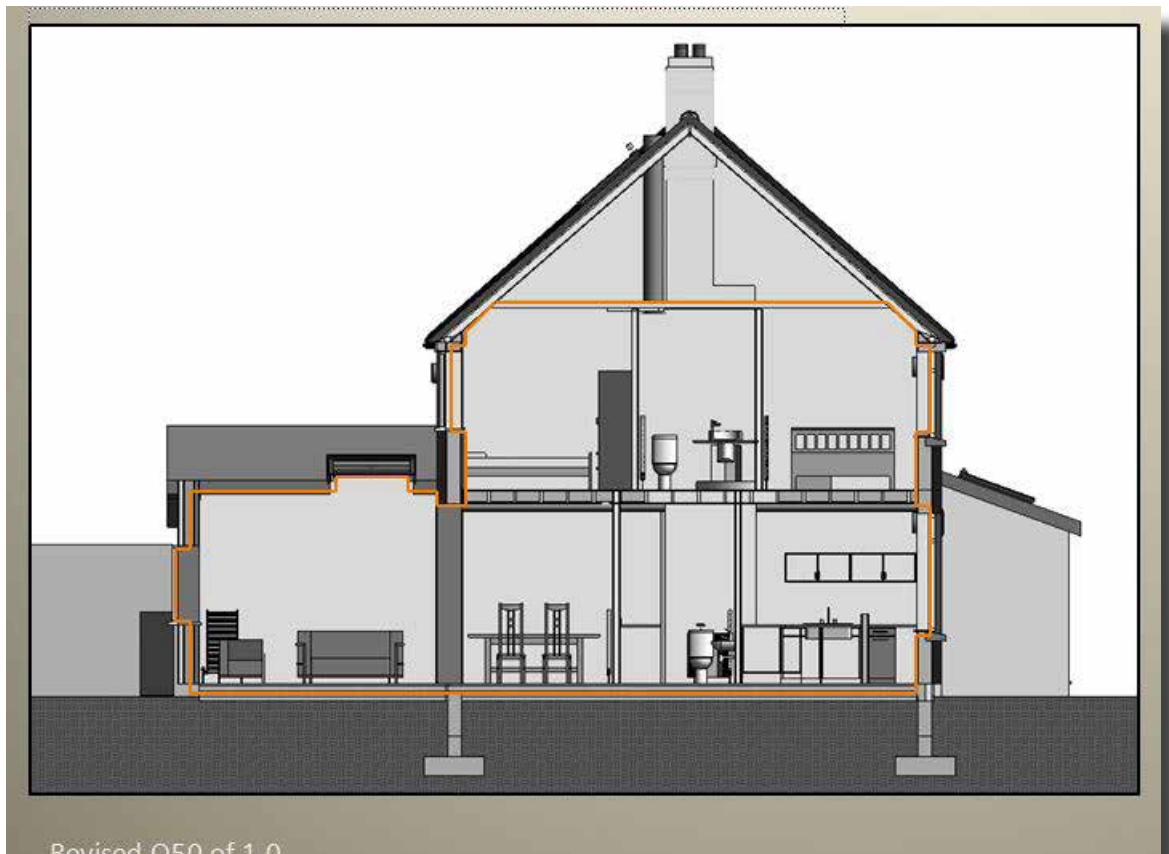
DETAIL 04: Retrofit detail to existing pitched roof Scale 1:10

A2...What it took to get there?



AIR TIGHTNESS (Orange):

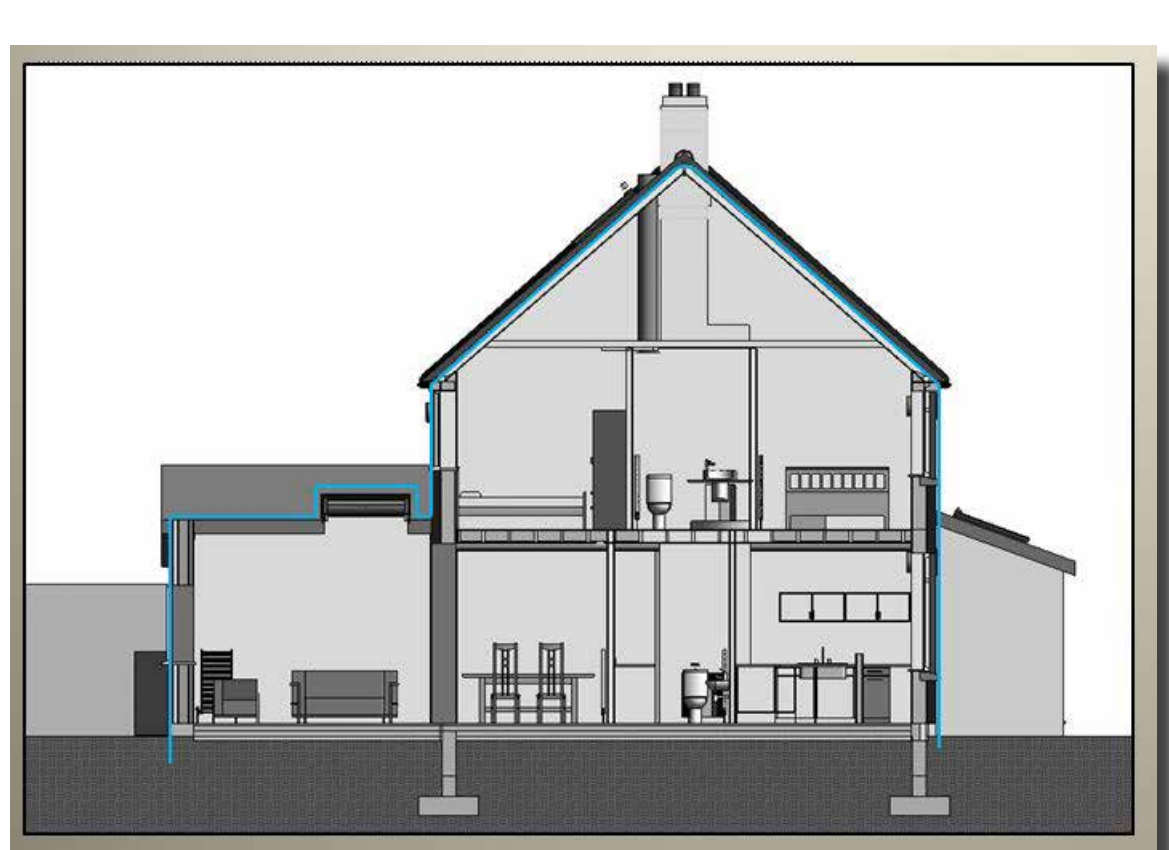
- Consolidate existing plaster finish to inside face of concrete walls.
- Joints to SIPS panels provide air tightness to extension walls.
- Airtight membrane fitted to underside of existing first floor ceiling and taped to walls.
- Airtight tapes to joints of extension roofs, battened for services void.
- Airtight tape to perimeter of all new doors, windows and openings in perimeter walls.
- M&E services restricted to party walls and internal partitions only.
- Revised Q50 air tightness target of 1.0 to be achieved or bettered.



AIR TIGHTNESS DIAGRAM:

WIND TIGHTNESS (Blue):

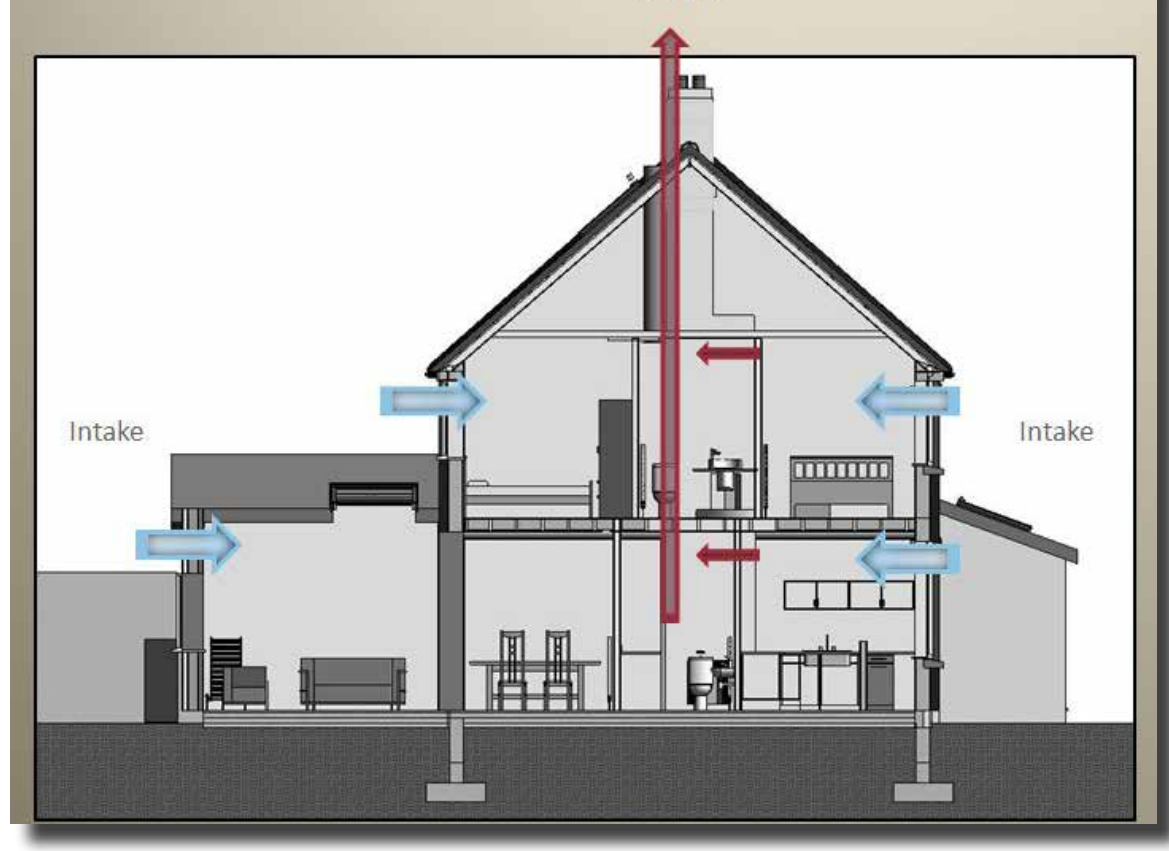
- Diffusion-open wind proof membrane fitted to underside of new roofs, eg. Ampatop Protecta.
- Anrylic finish to EW seals original house structure.
- Diffusion-open wind proof membrane fitted to outer face of SIPS panels to extensions eg. Ampatop Protecta.



WIND TIGHTNESS DIAGRAM:

VENTILATION:

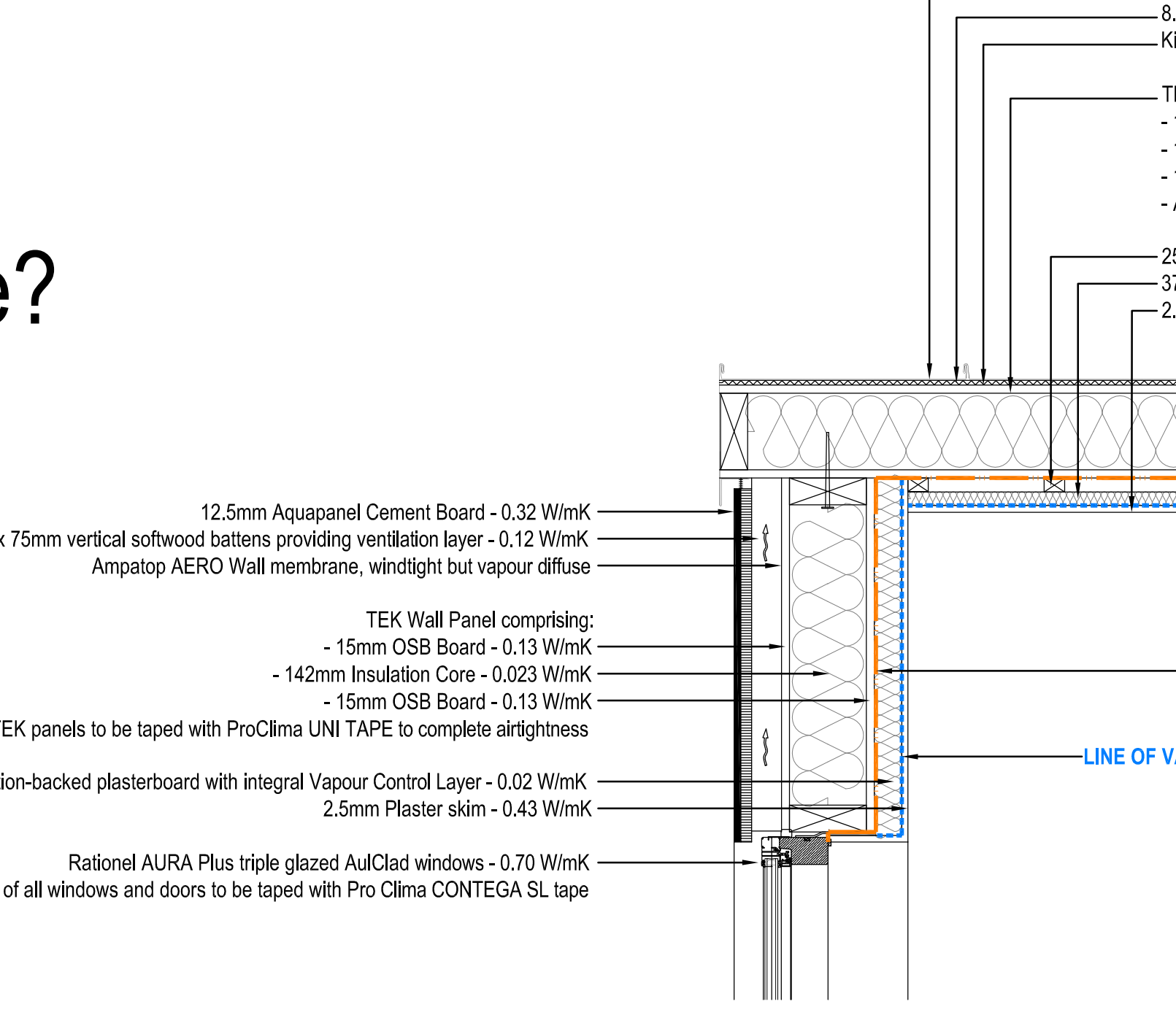
- Bathrooms stacked above one another, adjacent to Kitchen.
- Outdoor unit located to extreme rear to minimise any noise disturbance.
- Factory insulated cylinder located in store under stairs.
- 2No. 260W Solar PV panels fitted to front roof to offset electricity requirements.
- Single source fuel (Electricity) allows for simplified energy monitoring by occupants, and allows for integration with solar PV.



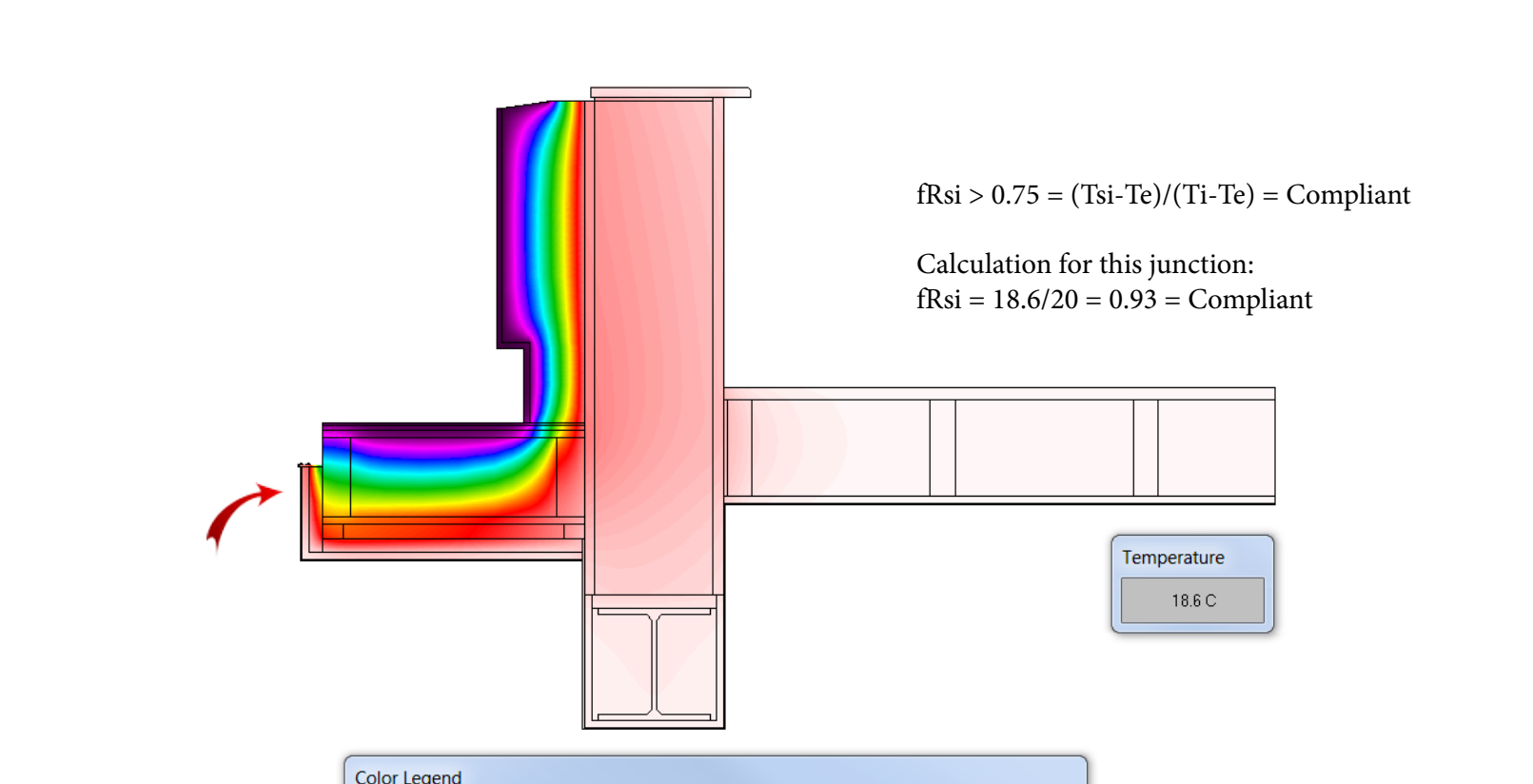
VENTILATION DIAGRAM:

RENEWABLES:

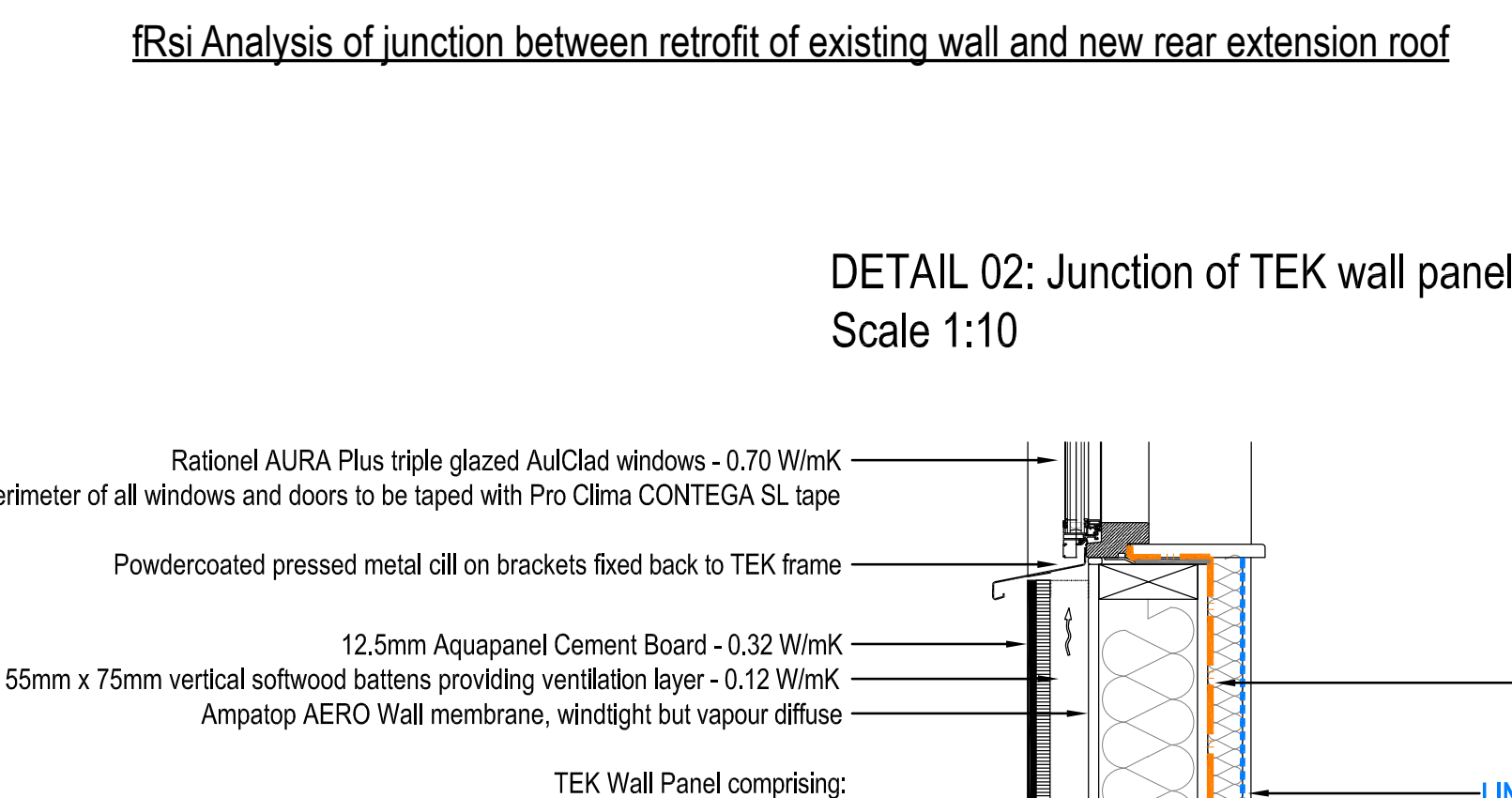
- Therma Airc R407D Air to Water Heat Pump to replace gas boiler.
- Outdoor unit located to extreme rear to minimise any noise disturbance.
- Factory insulated cylinder located in store under stairs.
- 2No. 260W Solar PV panels fitted to front roof to offset electricity requirements.
- Single source fuel (Electricity) allows for simplified energy monitoring by occupants, and allows for integration with solar PV.



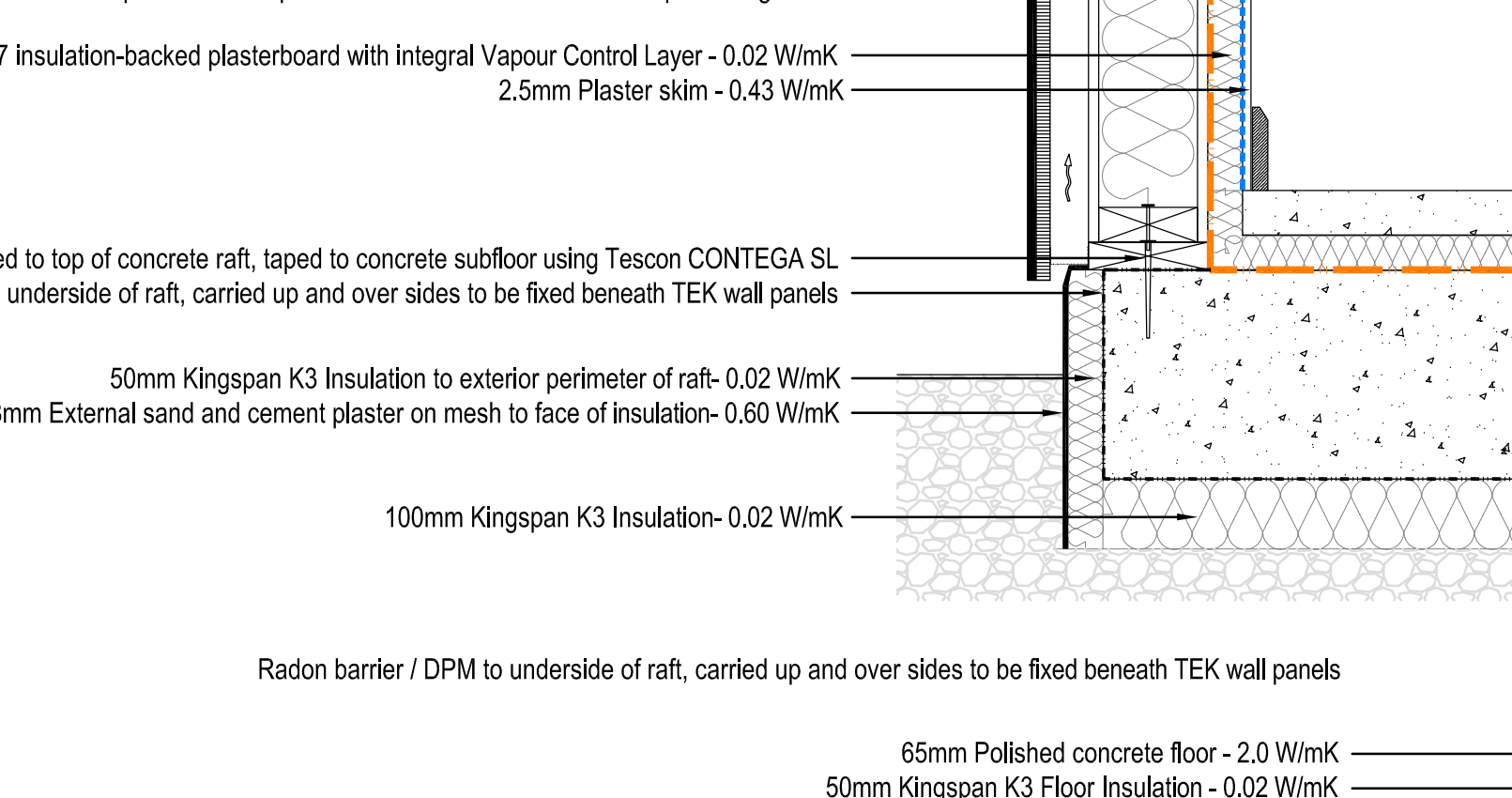
DETAIL 01: Junction of TEK roof to TEK wall panels - New Extensions Scale 1:10



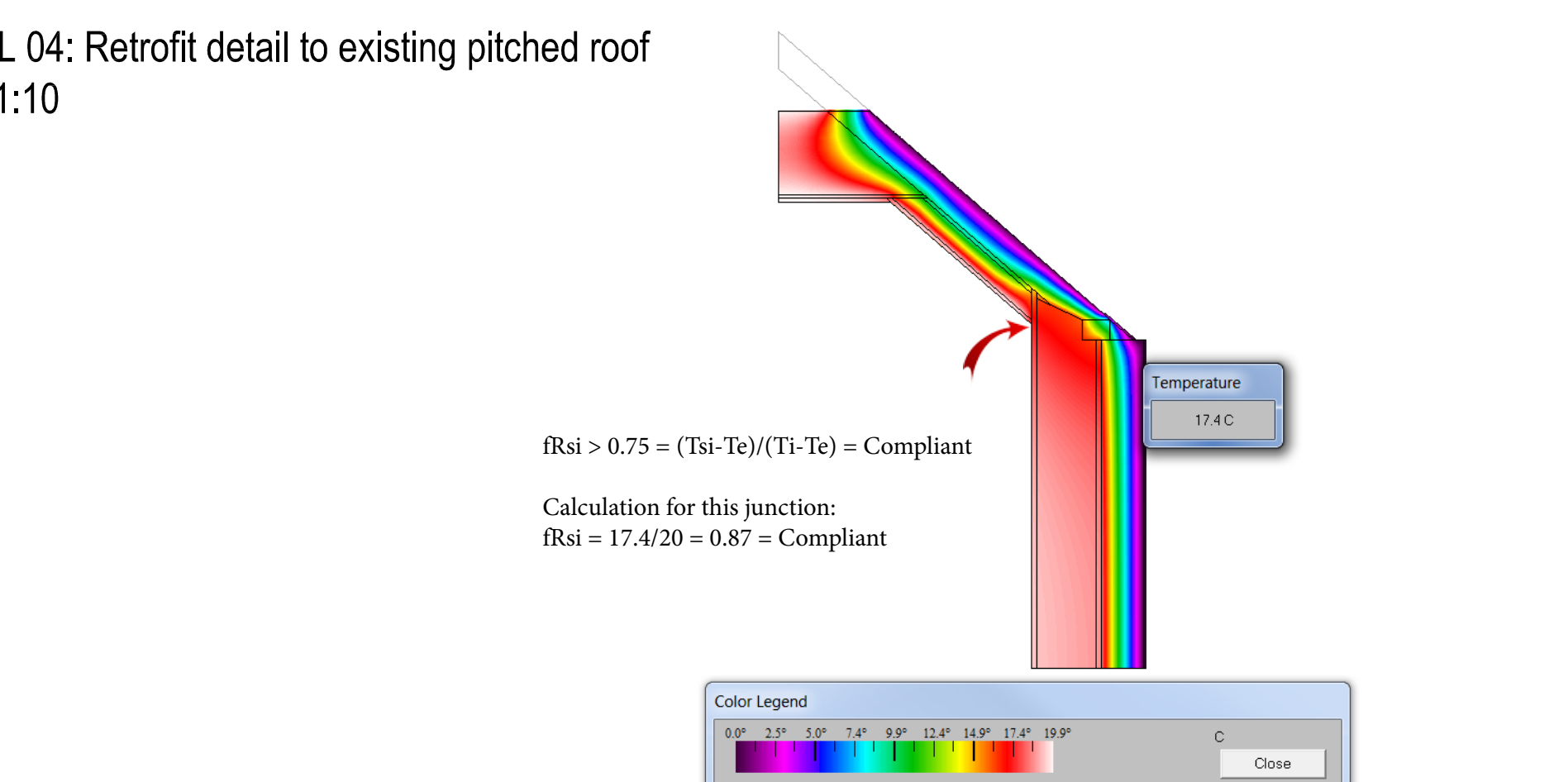
fRsi Analysis of junction between retrofit of existing wall and new rear extension roof



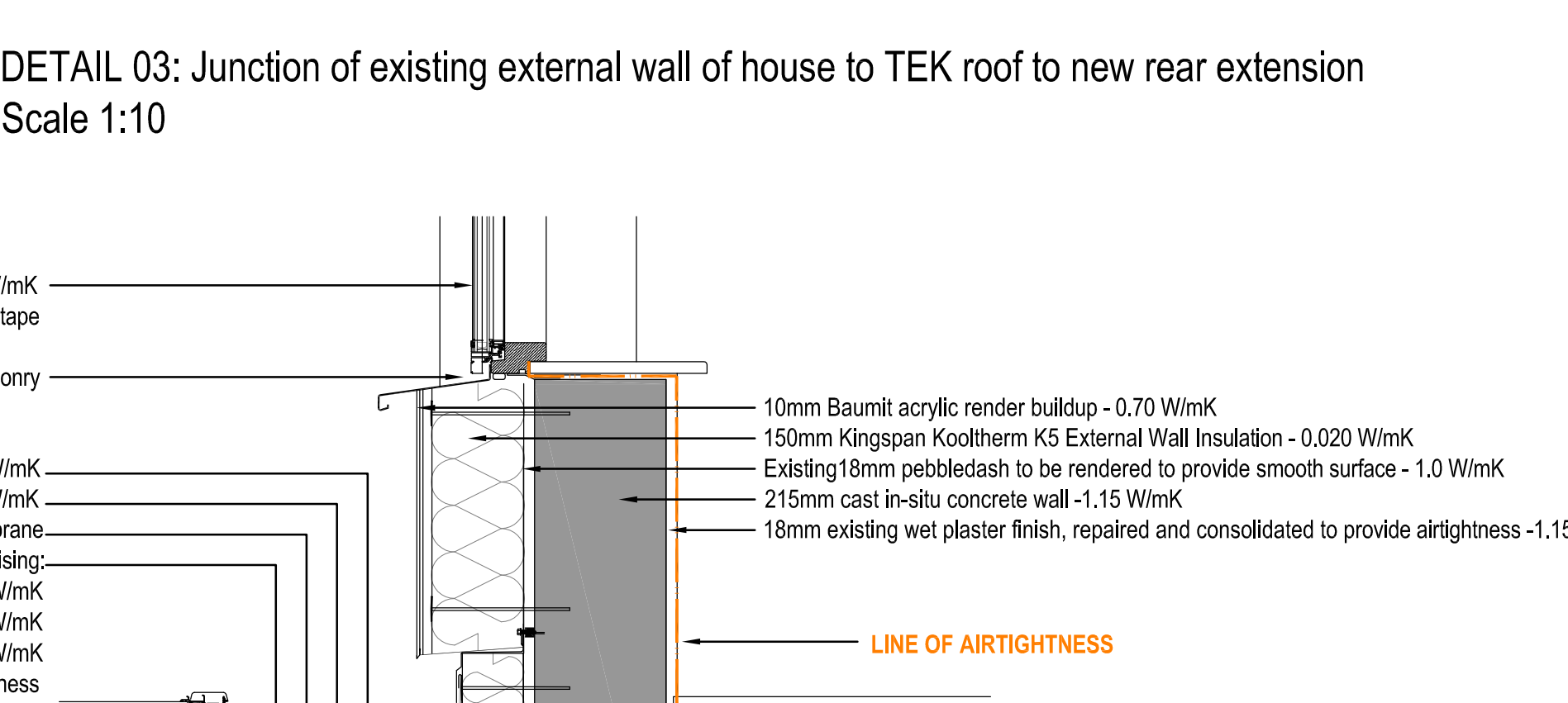
DETAIL 02: Junction of TEK wall panels to new floor- New Extensions Scale 1:10



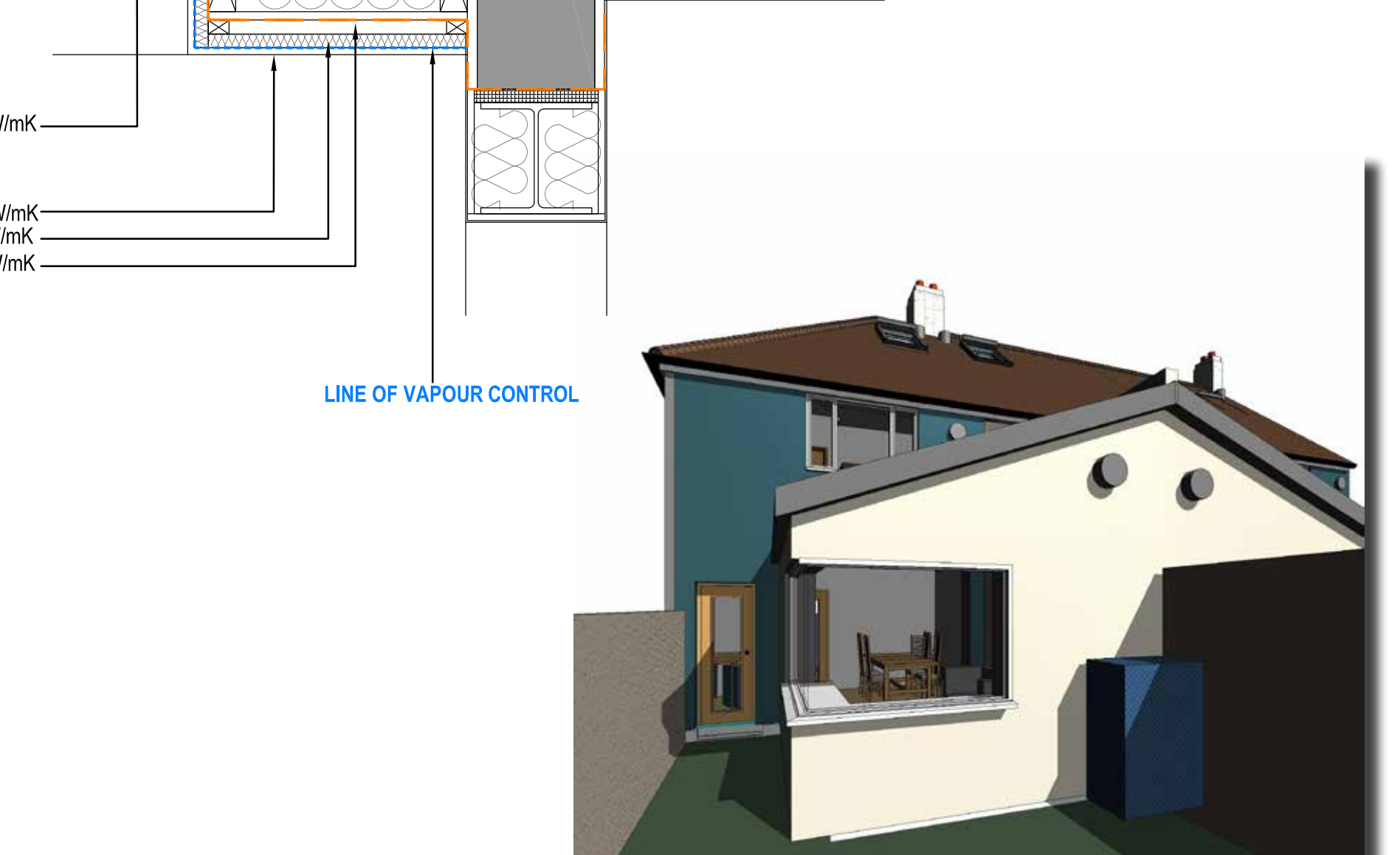
DETAIL 03: Junction of existing external wall of house to TEK roof to new rear extension Scale 1:10



fRsi Analysis of junction between retrofit of existing eaves detail to original house



DETAIL 03: Junction of existing external wall of house to TEK roof to new rear extension Scale 1:10



DETAIL 03: Junction of existing external wall of house to TEK roof to new rear extension Scale 1:10

COMPLIANCE ANALYSIS - DEPARTMENT OF ENVIRONMENT HERITAGE AND LOCAL GOVERNMENT

Best Practice Guidelines for Quality Housing for Sustainable Communities