Building Low Carbon Timber Frame Homes
STA – what we do

TRADE BODY for - Timber Frame – SIPS- CLT- Glulam – Engineered wood products

(see www.structural timber.co.uk for more information)
This presentation is all about

Timber Frame – Understanding Design Detail Principles
To deliver: Low Carbon Homes
What are the aims of this presentation?

Support
- The delivery of Zero Carbon Homes
- The deliver current *Part L Regs* - *FEE*
- Encourage good practice construction by project team understanding.
BUILDING IN TIMBER FRAME

Timber Frame –
- Low embodied energy material
- Renewable resource
- Design versatile and flexible
Structural Timber Solutions
The basic - Open timber frame panels
Solutions IN TIMBER FRAME

The Wall

- External wall
  - **A)** Stud width options
  - **B)** Breather paper options
  - **C)** Insulation options - between studs:
    - “Wool” types
    - Rigid foam
    - Multi foils
  - **D)** Service zones
  - **E)** Additional internal over-lay board, or laminate plasterboard
Back ground - Solutions IN TIMBER FRAME

STA Advice notes

Structural timber solutions: Thermal performance

Part 1 - Fabric first approach to thermal performance
Background - energy efficiency is more than U values

**FEE influenced by:**

- Building fabric U-values
- Thermal bridging
- Air permeability
- Thermal mass
- External heat gain (solar)
- Internal heat gain
Key Issues to consider – for improved performance

- Better detailing
- Good quality workmanship
- Sequencing of works

Recognition and understanding

KEY ISSUES:
1. Thermal Performance
2. Thermal Bridging
3. Thermal Bypass
4. Airtightness
5. Sequencing
Thermal Performance

The U-value - All materials in the building element are taken into account.

Thermal Mass Plus - Minus.

Heat loss through a wall. Increased levels of insulation will reduce the rate of heat loss.
**Key Issue ② Thermal Bridging**

**Thermal bridges** – points in the envelope where heat loss is greatest.

**Impossible to avoid** all thermal bridging, but can be minimised.

**Increased Bridging** caused by poor workmanship,
Key Issue 3: Thermal Bypass

Thermal bypass - movement of unheated air through spaces in the building fabric = heat loss.

Air tight layer – follow insulation

The thermal bypass can occur when the airtightness barrier does not follow the insulation.
Airtightness

**Air leakage** = loss of internal heated air = fuel use.

**Airtightness barrier** – the building envelope component which provides an airtight seal.

Air leakage / not ventilation - Controll ventilation by a natural or mechanical means.

Air leakage can occur around badly fitting components such as window frames.
Key issue: Sequencing

Out-of-sequence work
- Prevent other work stages damaging previous work that has already been done.
- Cause defective airtightness and thermal performance of the building envelope.

Key stage inspections
- Early co-ordination is important.

A services installation through the wall results in a difficult-to-seal air leakage path.
Common Issues  Good practice principles

**Thermal Performance**

- Analyse details at design stage.
- Additional insulation to fill voids.
- Avoid displacing insulation within studs.
- Timber fraction included in calculations.

**WALL JUNCTION:**
EXTERNAL WALL – UPPER FLOOR
**Thermal Bridging**

- Account for thermal in calculations
- Continuous insulation layer.
- Thermally efficient cladding support.
- Check bridging at large structural elements
Thermal Bypass

- Check no voids between heated spaces and the line of insulation.
- Airtightness barrier follows the inside line of the insulation layer.
- Seal floor voids from vertical cavities.
- Full fill insulation in party walls if possible.
- Seal cavities to prevent air movement
Airtightness

- Continuous airtightness barrier.
- Service void to the inside the face of the frame.
- Avoid interstitial condensation.
- Adhesive tapes, or bonded to substrate.
Sequencing

- Co-ordinate the airtightness line.
- Anticipate service penetrations - gaps are sealed.
- Pressure testing at different stages of construction.
Diagrammatic Example: Ground Floor – external

**GROUND FLOOR 01:**
EXTERNAL WALL - GROUND FLOOR

- Thermal insulation to be continuous. Additional insulation to inner leaf reduces thermal bridge at junction of timber frame and masonry.

- Maintain continuity of airtightness barrier at floor/wall junction with lapped and sealed joints.

- Airtightness barrier should coincide with insulation to avoid thermal bypass.

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Thermal Bypass

Sequencing

Airtightness
Diagrammatic Example: Ground Floor – party wall

GROUND FLOOR 02:

INTERNAL LOADBEARING WALL - GROUND FLOOR

Full fill insulation to party wall cavity to avoid thermal bypass.

Maintain continuity of airtightness barrier at floor/wall junction with lapped and sealed joints.

Seal base of party wall cavity before floor and walls are installed, to prevent thermal bypass.
Diagrammatic Example: Window Cill

**WINDOW 01: WINDOW CILL**

- Additional seals between airtightness barrier and window frame to maintain airtightness.

- Insulation below frame and internal cill to minimise thermal bridging.

- Window aligned in wall to maintain thermal continuity.

- Insulated cavity closer instead of timber to reduce the extent of thermal bridging.
**Diagrammatic Example: Window jamb**

**WINDOW 03: WINDOW JAMB**

- Additional seals between airtightness barrier and window frame to maintain airtightness.
- Insulation between frame and wall to minimise thermal bridging.
- Window aligned in wall to maintain thermal continuity.
- Insulated cavity closer instead of timber to reduce the extent of thermal bridging.
Common Issues: Warm Roofs

ROOF 01:
EAVES – WARM ROOF

- Thermal insulation to be continuous. Additional insulation within eaves construction.

- Airtightness barrier should be adjacent to insulation to avoid thermal bypass.

- Airtightness barrier to be continuous with sealed laps between wall and roof construction.
**Common Issues: Cold Roofs**

**ROOF 04:**
**EAVES – COLD ROOF**

- Thermal insulation to be continuous. Additional insulation within eaves construction.

- Airtightness barrier should be adjacent to insulation to avoid thermal bypass.

- Airtightness barrier to be continuous with sealed laps between wall and roof construction.
WALL JUNCTION 01:
EXTERNAL WALL – UPPER FLOOR

- Thermal insulation to be continuous. Additional insulation within floor construction at junction with wall.
- Airtightness barrier to be continuous at junction. Joints to be lapped and sealed. Careful choice of membrane at junction.
- Co-ordinate airtightness barrier with installation of floor.

WALL JUNCTION 03:
INTERNAL WALL/EXTERNAL WALL DETAIL

- Maintain airtightness where internal studwork meets the external wall. If airtightness is being provided by membrane this is best installed before internal studwork.
- Where insulation reduces in depth ensure that it is installed correctly and cut to match space available.
Summary

Fabric Energy Efficiency in Timber Frame

Key Issues

Common Issues

KEY ISSUES:
1. Thermal Performance
2. Thermal Bridging
3. Thermal Bypass
4. Airtightness
5. Sequencing
Further Information

- **Structural Timber Association** [www.structuraltimber.co.uk](http://www.structuraltimber.co.uk)
- **Fabric First** [www.fabricfirst.co.uk](http://www.fabricfirst.co.uk)
- **Zero Carbon Hub** [www.zerocarbonhub.org](http://www.zerocarbonhub.org)
- **National House-Building Council** [www.nhbc.co.uk](http://www.nhbc.co.uk)

**Building Low Carbon Homes (Guide)**
[http://www.structuraltimber.co.uk](http://www.structuraltimber.co.uk) download-documents

**Fabric Energy Efficiency for Zero Carbon Homes (Guide)**
[www.zerocarbonhub.org/resources](http://www.zerocarbonhub.org/resources)