

# STA Advice Note 14

## Robustness of CLT Structures



No. 14 - Part 2, March 2017

## Part 2 - Key principles for CLT wall to foundation interfaces

### The purpose of advice note 14

This series of STA advice notes provides good practice design principles to reduce errors and to provide installation guidance to deliver durable, robust panelised CLT buildings. Refer to Advice Note 14, Part 1 for the introduction and general key principles.

Part 2 provides good practice guidance and concept details on the interface of CLT wall panels and foundation support for heated buildings such as dwellings, hotels, school buildings and offices.

### Introduction

CLT is manufactured using quality controlled softwood material which has no natural defence against decay caused by sustained high levels of moisture; typically above the design threshold of 20% moisture content. Correctly designed CLT structures will not be subjected to high moisture, but incorrect installation may create conditions for moisture to become trapped. It is essential that the design team, installation team and follow on trades understand the building materials being adopted. This series of advice notes provides good practice design principles to reduce installation mistakes and includes guidance on installation to deliver durable, robust CLT buildings. The advice note is set out in five parts for ease of reference and application by the building team involved in a project.

The four key design principles are:

- CLT is not positioned on the external envelope cold side, i.e. insulation is on the outside face
- Breathable walls to allow internal moisture to defuse
- Warm roofs to be appropriately designed to avoid moisture traps in service; consult specific warm roof design guidance
- Avoid water traps during installation and in service where leaks can occur.

The three key installation principles are:

- The installers understand and have knowledge of timber as a construction material
- Poor workmanship and interference by follow on trades can occur if not checked (supervision of the works is part of the durability risk mitigation process; for which the STA have provided a check list for site works contained in Part 4)
- Temporary protection of CLT end grain that can be subjected to exposure to wetting during construction.

## Acknowledgements

Written by STA Technical with support and review from TRADA and the sponsors' steering group.  
Endorsed by LABC Warranty and Premier Guarantee.



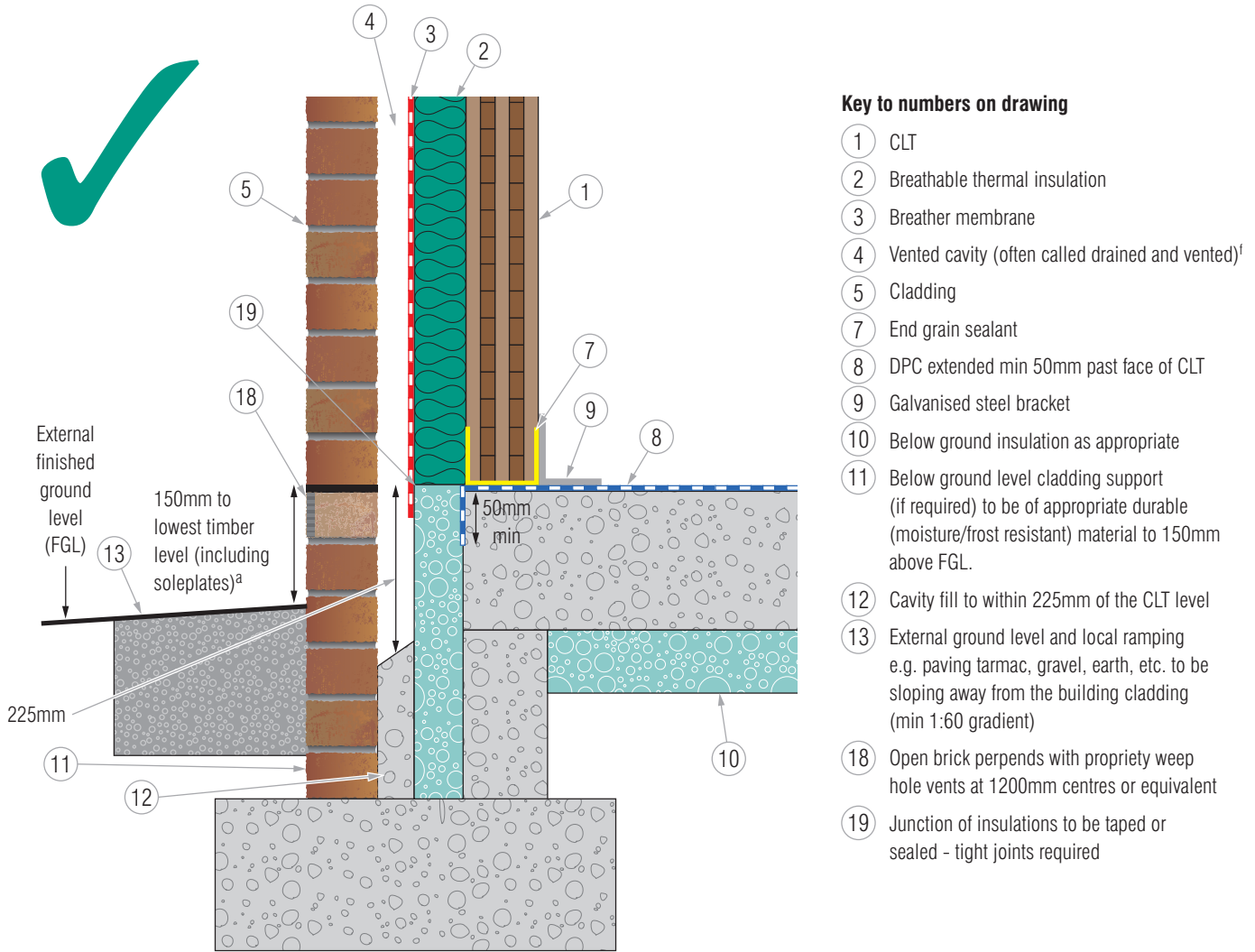
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# Principles of CLT foundation level / slab support level

Objective of details presented: to provide diagrammatic principles on good practices for CLT construction at foundation level. A concrete substructure should be provided to support the CLT wall panel assembly. All timber and CLT components as a standard should be located on a suitable damp proof course membrane (DPC) located at a minimum of 150mm above finished ground level unless a solution using an active drainage system is provided to reduce the distance.



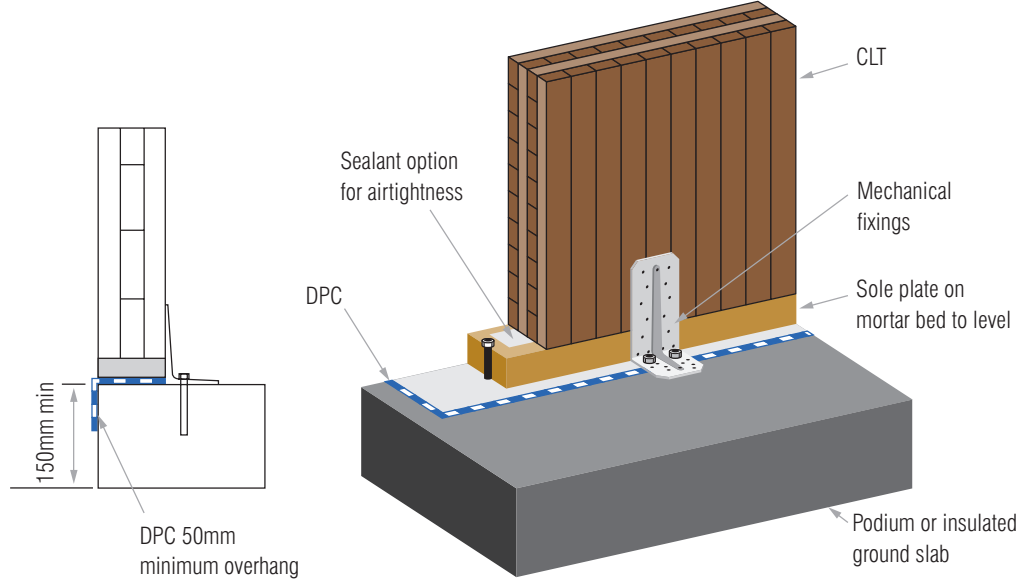
**Fig 2.1 Recommended external wall detail (typical CLT wall to substructure interface)**

- NOTES:**
- a A reduction of the 150mm may be permissible where adequate perimeter drainage and splash protection can be ensured at the base of the wall panels in accordance with Warranty Provider details. This will be a design-driven detail and will require specific detailing on a project by project basis to ensure that the cladding and external ground cover does not create a splash back to cause moisture build up. Good practice accepts a minimum 75mm, provided there is not a high water table and the cavity is not subjected to standing water. In addition, a drainage layer next to the cladding is to be detailed.
  - b The minimum cavity width should be in accordance with third party warranty provider guidelines and should extend to at least 150mm below DPC and open brick perpend provided to prevent water build up in the cavity and to provide cavity ventilation in accordance with third party warranty provider or other guidance details.
  - c This guidance does not cover gas membrane details and a specialist should be consulted to ensure appropriate details do not trap moisture in the frame.
  - d Protection to be provided where ledges are formed on the concrete support structure and can form a moisture trap.
  - e Concrete upstands engineered for the loads can be used to ensure the timber is more than 150mm above external ground level.
  - f Vented or ventilated cavities according to the design requirements and technical standards (Scotland) and Building Regulations (England and Wales).



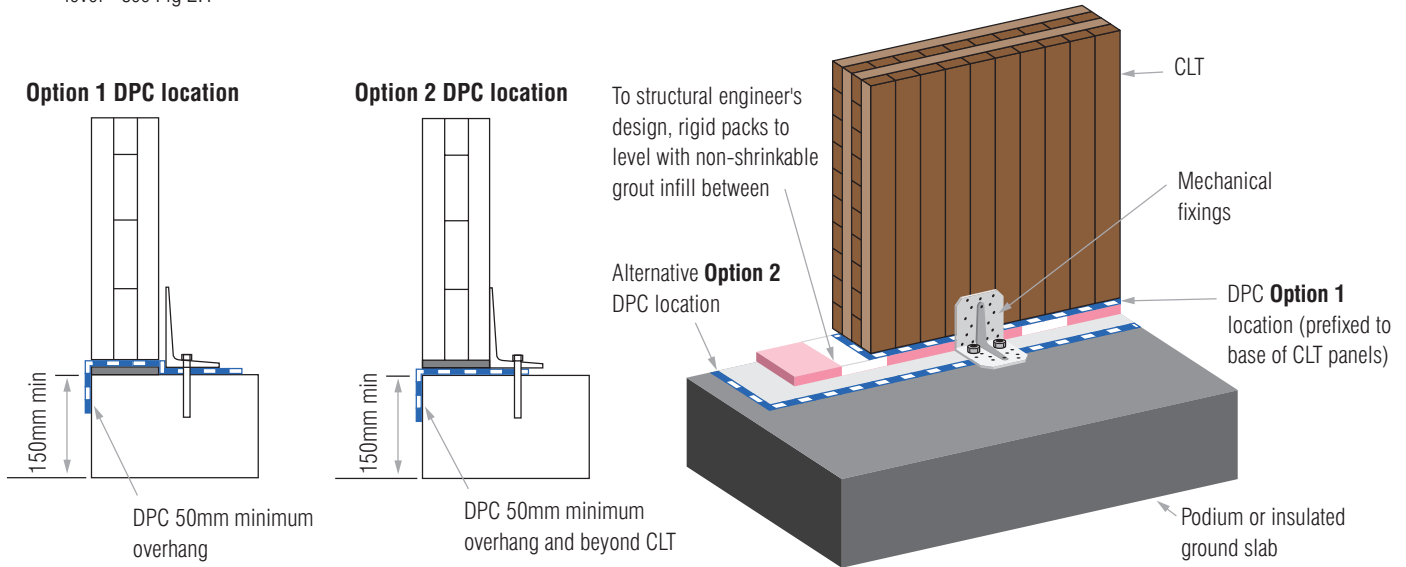
# CLT connectivity to a concrete slab

CLT walls should be either located on a pressure-treated timber soleplate (Fig 2.2) or, more typically, levelled on to the support slab using non-degradable packers with non-shrinkable grout used to fill the gap between the packers to give full bearing to the panels (Fig 2.3).



**Fig 2.2 CLT wall panel located on soleplate**

**NOTE:** Soleplates only suitable for low rise construction to avoid compression to grain. All timber components are to be a minimum of 150mm above external ground level - see Fig 2.1



**Fig 2.3 CLT wall panel with non-degradable packing to level with non-shrinkable grout infill (or directly onto DPC where no levelling required)**

**NOTE:** All timber components are to be a minimum of 150mm above external ground level - see Fig 2.1

## Key principles

- Where a grout bedding material is used, the DPC can be placed directly onto the slab (e.g. liquid applied or membrane type DPCs) or pre-fixed to the base of the CLT panels. It is recommended that the DPC should extend a minimum of 50mm inboard of the CLT panel and should not be lapped up the CLT panel to prevent a water trap. Grout shall not bridge the DPC.
- In either case the CLT wall panel is to have a timber end grain sealant applied to the bottom section as a temporary barrier against moisture uptake from any wet grout - see the STA check list for approved end grain sealant details.



## CLT foundation level / slab support level

### Do's and don'ts

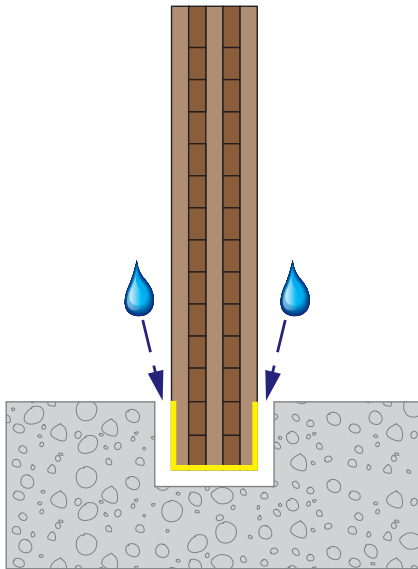


Fig 2.4 Incorrect location of CLT wall in recess

**DO NOT DO!**

Do not install CLT in to recesses or pockets in slabs.

Results in water traps during construction and increased risk in service.

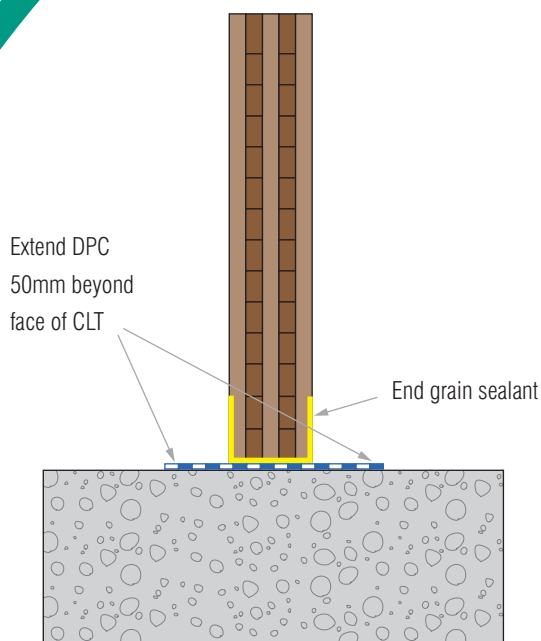
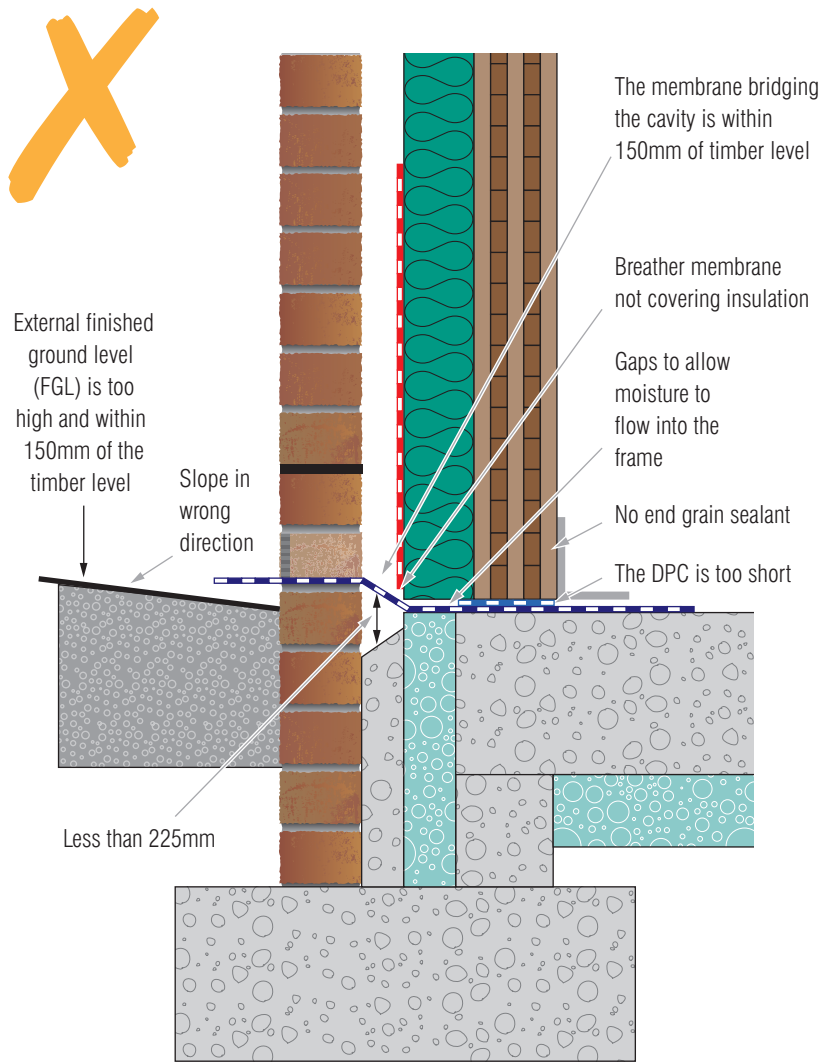


Fig 2.5 Correct location of CLT wall

Keep CLT above structural slab level.

**NOTES:**

- The DPC should extend a minimum of 50mm past the CLT panel and should not be lapped up the CLT panel as this may cause a moisture trap.
- Where finished floor level is added after the frame has been made weathertight, the CLT shall be checked for moisture content of less than 16% before the flooring is installed.
- In plant room/boiler rooms, the drainage of surface water to be considered in the concrete/screeded floor.



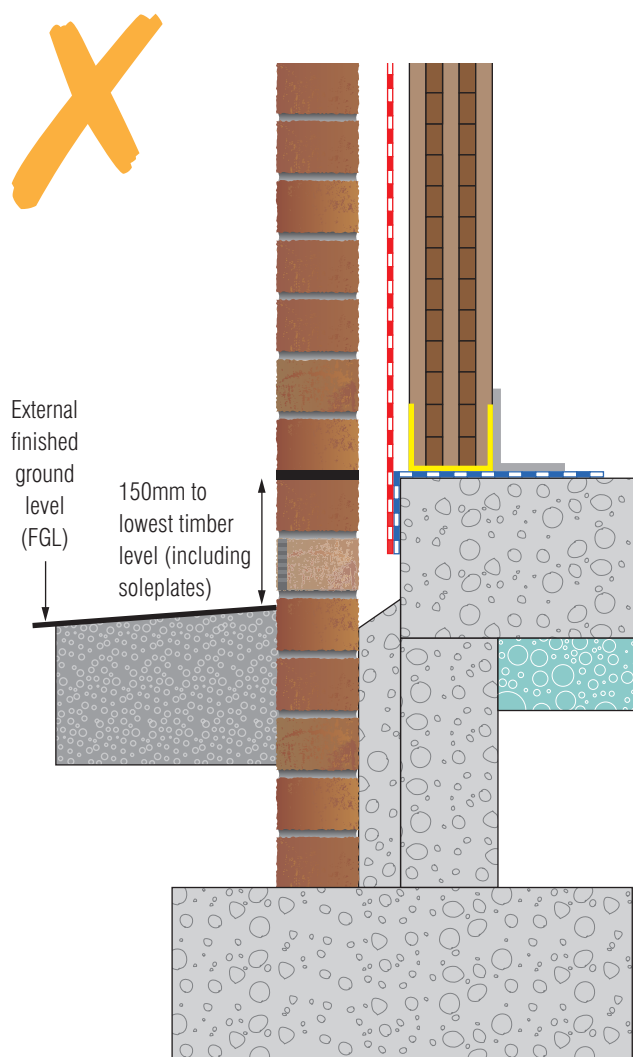
**Fig 2.6 Unacceptable external wall details - CLT not 150mm above external ground level**

**NOTE:**  
 For good practice, see threshold door detail Fig 2.9 for localised ramp detail.

**!** **DO NOT DO!**

Lowest timber level located below 150mm above FGL resulting in potential route for external moisture below CLT wall panels.

Refer to **Fig 2.1** for correct detailing.



**Fig 2.7 External wall detail - uninsulated, exposed CLT in the cavity**

**NOTE:**

*This application of CLT is out of the scope of this guidance. It requires specific assessment as noted in Part 1.*



**DO NOT DO!**

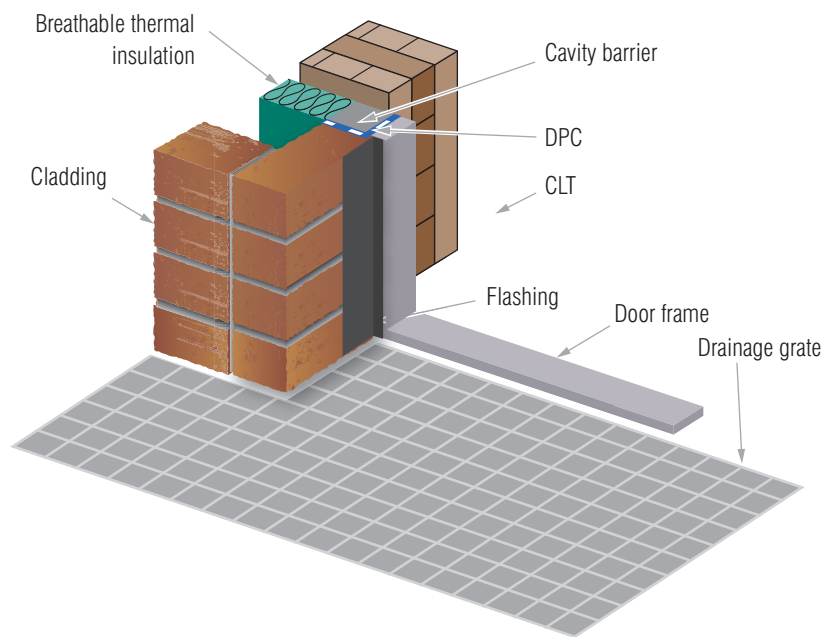
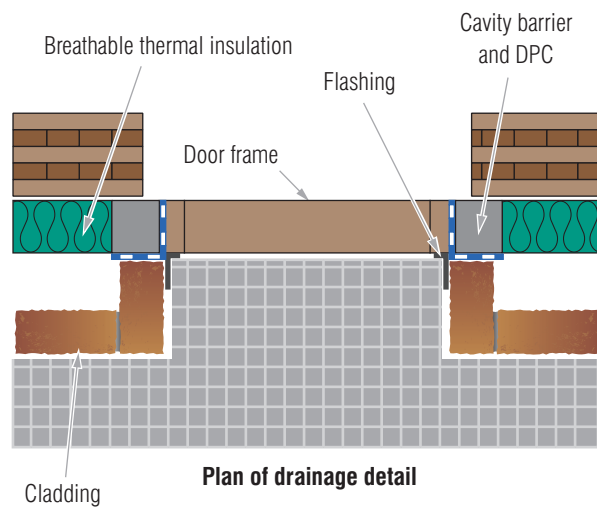
Where there is no insulation on the cold side of the CLT the timber structure is in Service Class 2 and specific condensation risk calculations are required to check that condensation will not form on the face of the CLT.

Refer to **Fig 2.1** for correct detailing.

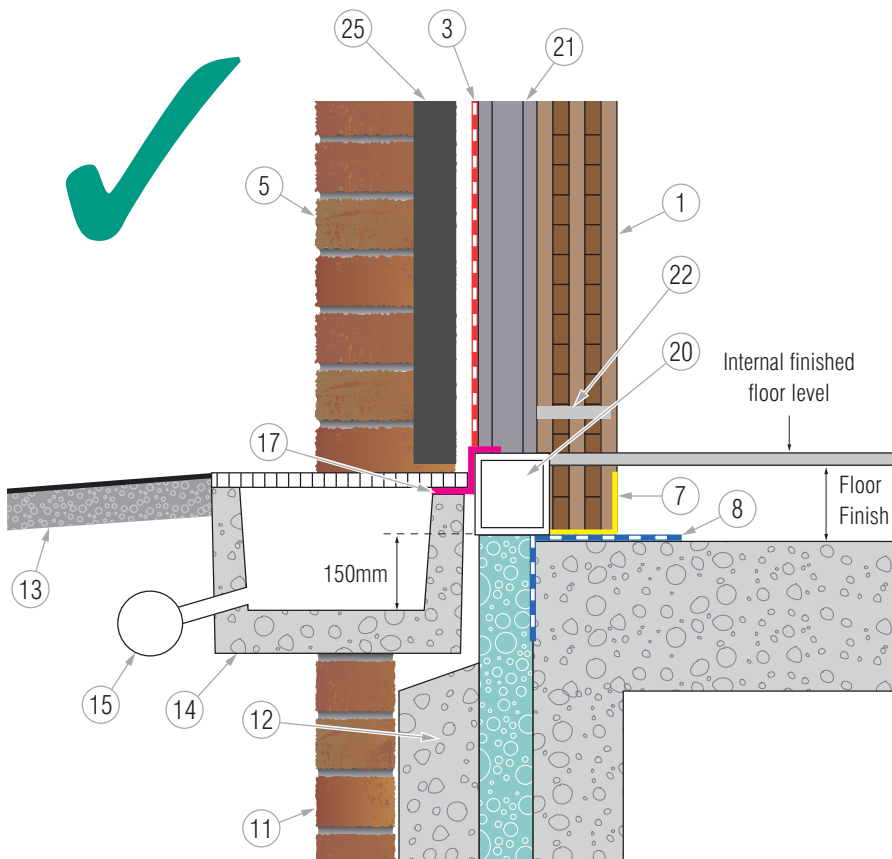


## Detailing at level thresholds

Accessible thresholds, or full height glazing details should be designed to ensure that the CLT wall unit is not in direct contact with the external water bar and is sealed around the jambs. The external ramping detail to achieve level threshold is to ensure that there is no direct link from outside to the CLT. See Fig 2.9a and 2.9b. Detailing around the entrance door is critical in preventing the ingress of water. The landing should be designed with a gradient of at least 1:60 away from the threshold to ensure water run-off and an adjacent drainage slot or channel provided to protect the entrance.



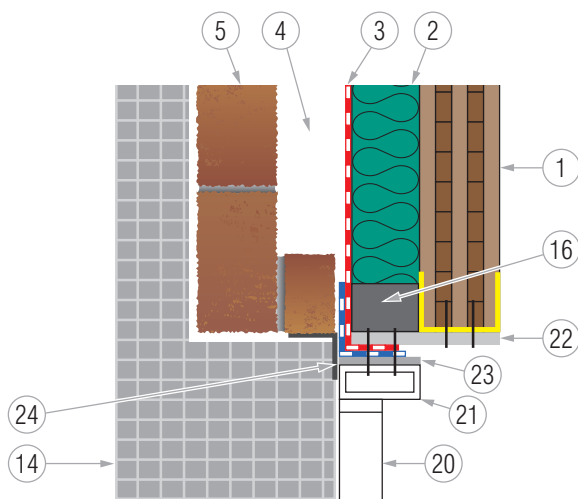
**Fig 2.8 External drainage detail around CLT external walling and level door threshold - see Fig 2.9a and 2.9b.**



**Fig 2.9A External wall section - level threshold detail concept**

**Key to numbers on drawing**

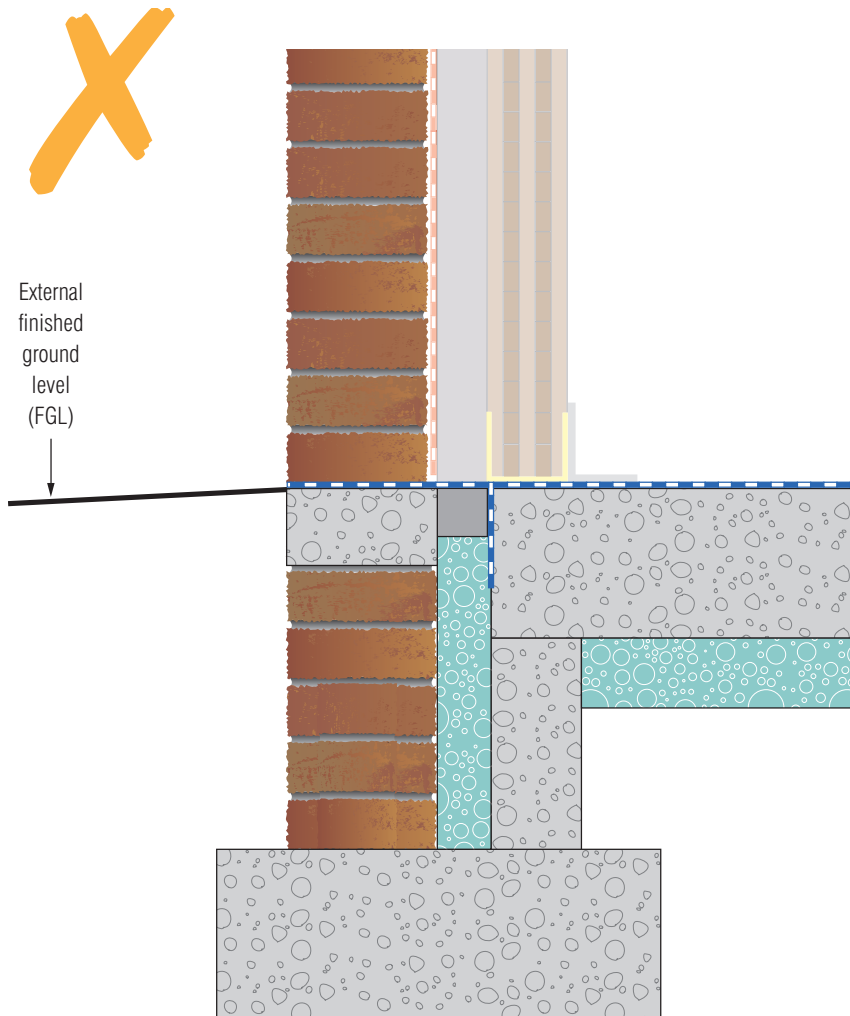
- ② Breathable thermal insulation
- ③ Breather membrane
- ④ Vented cavity (often called drained and vented)
- ⑤ Cladding
- ⑦ End grain sealant
- ⑧ DPC extended min 50mm past face of CLT
- ⑪ Below ground level cladding support (if required) to be of appropriate durable (moisture/frost resistant) material to 150mm above FGL.
- ⑫ Cavity fill to within 225mm of the CLT level
- ⑬ External ground level and local ramping e.g. paving tarmac, gravel, earth, etc. to be sloping away from the building cladding (1:60 gradient)
- ⑭ Drainage channel/grate and outlet to catch water from door way area depth of channel to be at least 150mm lowest level of timber element
- ⑮ Water flow from drainage channel away from building and into free draining ground/material.
- ⑯ Cavity barrier with DPC across cavity face and into reveal to be behind the window frame by at least 50mm
- ⑰ Door/window frame cill
- ⑳ Thermal break at door threshold/frame
- ㉑ Door/window frame reveal
- ㉒ Door reveal support bracket
- ㉓ Reveal foam packing between window frame and cavity barrier.
- ㉔ Reveal closer flashing to protect the gap between the frame and the cladding as appropriate



**Fig 2.9B External wall section - plan view on opening reveal**

**NOTE:** End grain sealant is also to be applied to the CLT reveals at the openings. Refer to Fig 11 and Part 3 of this Advice Note for details





**!** **DO NOT DO!**

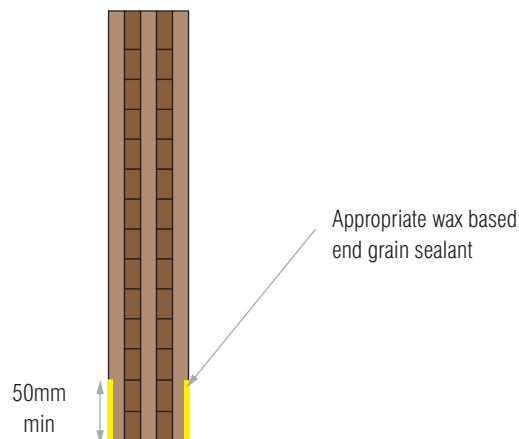
No drainage to protect CLT at reveal and from local ramping at door threshold giving a potential route for external moisture below CLT wall panels.

Refer to **Fig 2.9A** and **2.9B** for correct detailing.

**Fig 2.10 Unacceptable level threshold detail. Do not do!**

## Requirements for end grain sealant

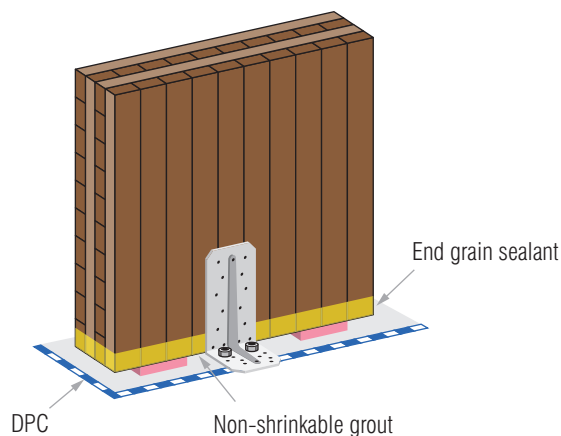
Apply end grain sealant to the CLT panels in accordance with the project-specific details. Refer to NSTS Section 9.1 & 9.2 and Advice Note 14, Part 3 - Good practice details.



**Fig 2.11 End grain sealant.**



## Requirements for metalwork



**Fig 2.12 Standard fixing bracket to CLT (for option 1 in Fig 2.3)**

### Checklist of requirements

In service, brackets to CLT panels presented in this guidance will be located in Service Class 1 (dry) locations to EN1995-1-1. Although dry environments, the brackets and fixings should, for good practice, be:

1. Provided with an appropriate corrosion resistance which is typically electro galvanised plating or hot dip galvanising. Examples are zinc coating weight of Z275 according to EN 10346.
2. Proprietary metal brackets should have a European Technical Approval based on ETAG-15.
3. Bolts, screws and nails installed to engineer's specification. CE marked fixings to be used, or specific project engineered brackets adopted; in each case coordinate with the foundation slab engineer for suitability.



## References

1. **National Structural Timber Specification (NSTS) v1 (2015)**
2. **BS EN ISO 10346:2015**  
Continuously hot-dip coated steel flat products. Technical delivery conditions
3. **STA Advice Note 4, Part 1 - Foundations**  
Recommended construction tolerances for foundations within timber structures
4. **STA Advice Note 4, Part 2 - Soleplates**  
Recommended construction tolerances for the soleplates of timber structures
5. **STA Advice Note 4, Part 3 - Timber walls**  
Recommended construction tolerances for timber walls within timber structures

### Steering Group

Sincere thanks for the time and contribution given to this project by members of the CLT steering group.

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**Robin Lancashire - TRADA**

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