AKS Ward

CONSTRUCTION CONSULTANTS

Structural Design Guide

For

Domestic Scale External Walls Built Using Tradical® Hemcrete® and Timber Frame

Prepared in conjunction with

Lime Technology Ltd

limetechnology
Sustainable building innovation

hemcrete
Tradical® Better-than-zero carbon

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Revision	Amendments	Prepared By	Checked	Date
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1.0 INTRODUCTION

1.1 This design guide has been prepared to assist timber frame house designers with the design of housing using Tradical® Hemcrete® in the external walls and in compliance with the LABC requirements.

1.2 It is assumed that the designer is experienced in the design of timber frame housing to current British Standards and Building Regulations. This guide therefore only covers the differences in design from standard timber framing to external walls when using Tradical® Hemcrete®.

1.3 The designer remains responsible for the design of the timber framing and must satisfy themselves that this guide is applicable to their particular design.

1.4 Tradical® Hemcrete® can be used for buildings other than housing and for buildings greater than three stories but these are outside the scope of this guide. Should any project not be covered by this generic guidance then please contact AKS Ward or Lime Technology to discuss the project further. AKS Ward can offer a full engineering package to Tradical® Hemcrete® projects where required. Please contact Oliver Fyson (Tel: 01865 240071) to discuss fees and services available.

2.0 LIMITATIONS

2.1 This guide is applicable to designs that meet the following criteria:

2.1.1 Construction in accordance with the details set out in the LABC New Home Warranty, A Guide to Tradical® Hemcrete®.

2.1.2 Construction in accordance with the standard details presented in the Tradical® Hemcrete® section of www.limetechnology.co.uk.

2.1.3 Racking resistance provided in up to three storey housing by either 9mm Multi-Pro XS board sheathing or Tradical® Hemcrete® alone.

3.0 DESIGN GUIDANCE

3.1 Axial compression

Tradical® Hemcrete® will provide restraint to the timber studs against buckling in the line of the wall. Other than this the stud is designed to BS 5268 as for traditional timber framed construction. Horizontal noggins between the studs are not required to reduce the stud effective length due to its continuous restraint by the Tradical® Hemcrete®.

Restraint from the Tradical® Hemcrete® cannot be assumed across the wall.

3.2 Lateral Bending from Wind Load

Tradical® Hemcrete® will contribute to the lateral load capacity of the wall panel under wind loading. The structural properties of Tradical® Hemcrete® such as flexural strength are not fully established yet. A conservative approach for the design of Tradical® Hemcrete® needs to be adopted at this stage. Work carried out to date shows that Tradical® Hemcrete® will resist a wind load of at least 0.15kN/m² in panels 2.4m high. Further research is being carried out which is expected to conclude that higher lateral loads can be resisted. Revised loads will be included in an update of this design guide following the completion of the research.

The remainder of the wind load above 0.15kN/m^2 is to be taken by the timber studs.

3.3 Racking for Wind

For a conventional timber frame design it is usual to provide studs on the inside face of the wall and sheath these externally to resist racking. For Tradical® Hemcrete® walls the sheathing is on the inside face of the studs and acts as permanent shuttering. There are other benefits of the board such as only skim plastering being required and it providing a good substrate for internal fixtures. The recommended 9mm Multi-Pro XS board has been tested for racking resistance in conjunction with timber studs only (no Tradical® Hemcrete®) and has shown satisfactory results.

Testing of Tradical® Hemcrete® alone to resist racking has also been undertaken and has shown satisfactory results so Tradical® Hemcrete® alone is adequate to resist normal racking loads without any contribution from an

inner board. On this basis it would be possible to omit the inner boarding altogether and cast the Tradical® Hemcrete® against a temporary shutter. Temporary/ permanent bracing may be required to keep the structure braced until the Tradical® Hemcrete® sets. A separate internal finish would then be needed.

3.4 Window and Door Openings

Cripple studs will be needed to be designed to carry the concentration of wind and vertical loads at the reveal of window and door openings in the usual manner. Lateral restraint to the cripple studs cannot be assumed at openings as the Tradical® Hemcrete® is on one side only.

3.5 Shrinkage of Tradical® Hemcrete and Timber Frame

Tradical® Hemcrete® shrinks around the same amount as timber in the direction of the grain but only around 10% of the shrinkage across the grain. This means that there is little differential shrinkage between the timber studs and the Tradical® Hemcrete®, but differential shrinkage of around 5mm can occur at the floor zone if solid softwood floor joists are used; which could lead to cracking in the finishes. It is therefore a requirement that engineered floor joists are used at this location to limit the effects of shrinkage.

4.0 CONCLUSION

4.1 Pioneering a new material into the mass market requires a balance between conservatism to ensure the approach is accepted by the regulators and stretching the boundaries to establish a place in the market. Engineering judgement suggests that in a Tradical® Hemcrete® timber stud wall the Tradical® Hemcrete® will make a major contribution to the structural capacity resisting both vertical and horizontal loads. The above proposals represent a conservative approach with the Tradical® Hemcrete® taking around a quarter of the lateral load. This will be updated when further data is available.

4.2 Application of the above approach for walls with the limitations described will normally allow 38 x 89 C16 studs at 600mm centres to be used. This size is at present considered to be the minimum recommended.

4.3 Further testing is being carried out to confirm the full structural characteristics of Tradical® Hemcrete® so that further economy can be made and the full potential of Tradical® Hemcrete® realised. This design guide will be updated at intervals and the design process will continue to evolve as new data becomes available.

4.4 Should any project not be covered by this generic guidance then please contact AKS Ward or Lime Technology to discuss the project further. AKS Ward can offer a full engineering package to Tradical® Hemcrete® projects where required. Please contact Oliver Fyson to discuss fees and services available.

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