George Street, St. Albans, UK

a case study in the repair of historic timber structures
Using bonded-in pultruded plates
St. Albans – George Street

18-19 George Street, St. Albans Herfordshire     Timber Frame jettied property, c.1600
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50 x 1.7 x 800 carbon fibre plates grouted into 12mm slot cut into new and existing timber using Rotafix slow set adhesive

New timber, size to suit existing timber to be spliced

Approx 60

Loose tenon

Approx 200

Section A-A

Plan on B-B
50 wide x 1.7 thick x 800 long CFRP
CB10TSS

Elevation

Section AA'

230
190
Check splice using Carbon Fibre Plates CFRP (First Floor Joists)
Existing timber size: 190mm high x 230mm wide
Timber type: English mature oak, probable grade THA
Bending stress: in the absence of precise information assume 7.5N/mm²

\[ Z \text{ of section} = \frac{230 \times 190^2}{6} = 1383 \times 10^3 \text{ mm}^3 \]

Therefore Mr of section \( = 1383 \times 10^3 \times 7.5 \times 10^{-6} \)
\( = 10.37 \text{ KnM} \)

Bond area = 400 x 50 x 2 = 40,000 mm²/plate/stress zone
Critical stress in bond between plate and timber which using Rotafix CB10T SS is 6N/mm² allow fact of safety = 2.0

\[ \text{Therefore Mr} = \frac{40,000 \times 6 \times 85 \times 10^{-6}}{2} \]
\( = 10.2 \text{KnM} \)

Therefore Mr of splice equates to Mr of timber
Therefore OK.
Procedure for repair to first floor joists

1. Existing floor joists to be adequately propped.
2. Carefully cut back end of floor joists to sound timber, approximately 500mm from face of supporting beam.
3. Prepare and install new oak tenon into existing mortice in existing beam.
4. Prepare and install new section of joist, cutting slot in end suit new tenon.
5. Cut 12mm slot in top of new and existing timbers to receive two carbon fibre plates 50mm x 1.7mm x 800mm.
6. Partially fill slot with Rotafix slow set adhesive and install two carbon fibre plates, topping up slot with adhesive.
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Rotafix® slot-making jig
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View of jig and Rotafix modified chainsaw equipment
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Cutting 12.7mm wide x 60mm deep slot in the timber extension

Compression zone

Tension zone
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Underside view of existing joists before removing the decayed ends
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Typical un-connected decayed end
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Ends cut and slots prepared
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Cut joists supported by Acrow props
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Making out the position of the slots for the remaining sections of the joist using the extension sections as a template.
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Cutting the slots with the Rotafix jig and Rotafix modified chainsaw
Dry fitting the CFRP prior to adhesive installation
NB green peel ply is removed before bonding
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Injecting adhesive
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Pushing the CFRP into the adhesive
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View of top of finished joists
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New joist ends fixed in place before contouring
Thank you for your attention

We would welcome your comments and suggestions.