### Project characteristics

<table>
<thead>
<tr>
<th>Year of construction</th>
<th>Space Heating</th>
<th>28kWh/(m²a)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>U Value External Walls</th>
<th>Thermal improvement to existing external solid wall constructions are limited by dew point calculations and thus the primary performance has been achieved at 0.302 to 0.348 W/(m²K)</th>
<th>Treated Floor Area</th>
<th>125m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New external wall construction 0.14 W/(m²K)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U Value Flat Roof</th>
<th>New construction 0.119W/(m²K)</th>
<th>Air Pressure test @ 50 Pa</th>
<th>0.43ac/hr</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>U Value Pitched Roof</th>
<th>Existing cottage renovation 0.134w/9m²K</th>
<th>Primary Energy Renewable</th>
<th>119kWh/(m²a)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>U Value Windows</th>
<th>0.86W/(m²K)</th>
<th>Primary Energy Non renewable</th>
<th>122kWh/(m²a)</th>
</tr>
</thead>
</table>

### Project Description

The Barge: circa 1810 solid wall brick cottage, south facing to a walled garden within the City of Ripon, adjacent to the Canal Basin.

The cottage was a two storey two up two down and had a 1970’s extension to the west which included family bathroom, stairwell and mono-ridge sitting room. It was in very poor condition with considerable damp, mould growth, draughts and poor thermal value.

The property has undergone a deep retrofit taking it back to a carcass of external walls and roof rafters, before restoring it to achieve Passivhaus EnerPhit by components with a target Heating demand

### Project Participants

<table>
<thead>
<tr>
<th>Architect; Certified Passivhaus Designer &amp; Self Builder</th>
<th>Claire Jamieson</th>
<th>Phi Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certifier</td>
<td>Kym Mead</td>
<td>Mead Consulting</td>
</tr>
<tr>
<td>Heating and Domestic hot water</td>
<td>Nick Roberts</td>
<td>NCR Heating and Plumbing</td>
</tr>
</tbody>
</table>
South elevation

- Projecting zinc feature surround to WG09 to form New west end extension south elevation in zinc on brick plinth
- Existing stone openings for main cottage altered as need of cottage to suit boundary
- Existing profiled steel lintel replaced with new zinc lintel

North elevation

- New extended monopitch roof to north side of west wing extension
- New extended monopitch roof to north side of west wing extension
- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.

West elevation adjoining party wall

- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.
- New extended monopitch roof to north side of west wing extension

East elevation adjoining garden room and party walls

- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.
- New extended monopitch roof to north side of west wing extension

Elevations

- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.
- New extended monopitch roof to north side of west wing extension

South elevation

- Projecting zinc feature surround to WG09 to form New west end extension south elevation in zinc on brick plinth
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West elevation adjoining party wall

- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.
- New extended monopitch roof to north side of west wing extension

East elevation adjoining garden room and party walls

- Existing entrance recess to be clad in zinc from canopy up to and around W1 16.
- New extended monopitch roof to north side of west wing extension

Elevations
Surface Areas and Assemblies
Ground Floor Plan

New West Wing  Existing cottage

First Floor & mezzanine Plan

Existing boundary walls in Footpath - overall depth and construction indicative only.

Existing boundary walls to Foundry House - overall depth and construction indicative only.

Existing chimney breast removed completely.

Existing chimney breast removed to allow for nominal corridor width of 900mm.

Existing plasterboard in corridor to be removed.

Existing chimney breast and first floor walls removed.

All existing stone walls removed and replaced.

Manifold and Gas Hob removed.

All existing stone walls removed.

New stud partitions with acoustic Rockwool fill.

Ceiling void above corridor to span between house north to south,
on window below.

 Void

Existing window below.

Temporary frame to open interior existing brick to view the Full width of

Measurements of the new mezzanine frame to be measured on site.

This drawing shall not be reproduced without express written permission from Shaw & Jagger Architects Ltd.

This drawing shall not be scaled to ascertain any dimensions.

Any discrepancies are to be reported to the Shaw & Jagger Architects Ltd.

All dimensions and levels are to be checked on site.

Title overlay drawings and ownership boundaries are produced using figured dimensions only.
Exterior wall construction - water vapour permeable approach

Original cottage

Solid walls stripped back to bare brick and cobble, with all layers of plasterboard, plaster, paint and wall paper removed.

Chimney breasts removed and complete internal face given a lime levelling coat

Airtightness primarily achieved through a lime slurry wash.

Internal insulation with Pavadentro

Lime plaster finish and Beeck mineral paint emulsion

External mortar joints ground out and repointed with lime mortar to ensure water vapour permeable construction throughout.

New west wing

Low lambda concrete block and cavity construction with full fill insulation

External zinc ventilated rain screen

Internal lime plaster finish and Beeck mineral paint emulsion

Perimeter ground external insulation with Foamit for thermal and moisture control
Ground and first floors

Ground floors

Foamit compacted as thermal hardcore with internal perimeter Styrofoam insulation
DPM laid over, taped at seams, to receive 100mm poured concrete
Internal studwork thermally broken from slab with fixing through Compacfoam spacers
Insulation laid over concrete ready to receive underfloor heating and screed

First floors

Hung as a raft, thermally broken from the existing solid wall constructions by Compacfoam spacers set through airtight lime slurry with Orcon airtightness sealant
Windows

Windows and doors

Ideal Combi Futura+

Windows set back 100mm from external facades and fixed with brakcets back to ply reveals.

Internal thermal envelope completed with Pavadentro and Spacetherm blanket

Siga airtight tapes close airtight layer to lime slurry.

Compriand infill to tolerance gaps on external faces

g values vary according to orientation 0.51 to 0.53

Ug value ranges from 0.52 - 0.57W(m2K)

Class 4 air permeability

In addition :-

MVHR kitchen extract brought in from plant room to avoid riser

A

Roof Truss

Intake and extract

MVHR

New Front door DG01 installed within existing stone opening, with adjustments

New primed skirting boards with moulding to match door architraves and

made to ensure continuation of thermal envelope.

Air flow to rear of WBP to be continous, from the top capping to the

Fall to be achieved with fillets to top side of joists.

Grp flat roof laid to nominal fall to drain surface water to rainwater

22mm OSB laid over 100mm Kingspan TR26, laid over 22mm

outlet, proprietory fitting laid within GRP build up.

Zinc fascia to mirror detail at the east end garden room.

Air flow to rear of WBP to be continous, from the top capping to the

Integrity of wall structure on removal of all existing windows to be considered.

Should no suitable lintols be in place:- Install concrete 100mm wide litnol to

terminate at the kitchen sink.

All windows to be dressed with zinc external cills on raked wbp base boards, to

a minimum of two days.Any severly damaged bricks to be replaced in the

edges. Stone cleaned and

brushed off when semi dry befoe end of each day and covered with hessian for

covered within stone threshold

Sunken step

All external elevations of original buildings to have mortar joints raked out

as indicated.

Airtight tape applied to complete window perimeter and sealed back to u/side of

window cill to WG01, an internal swing

allows for a clear opening to

an internal swing

The map of the ventilation route and perforated sheets to be cut as

mounted within the return side of the cupboards where they

received the floor and wall units and the fully tiled splashback.

Exsiting stone structural

receive the floor and wall units and the fully tiled splashback.

blocks to be used to avoid cold bridge.

All windows to be dressed with zinc external cills on raked wbp base boards, to

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All external elevations of original buildings to have mortar joints raked out

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The map of the ventilation route and perforated sheets to be cut as

mounted within the return side of the cupboards where they

receive the floor and wall units and the fully tiled splashback.

Exsiting stone structural


Roof construction

Original cottage

- Original rafters retained and made true
- Warm roof construction created using insulation overlay
- Roofing membrane taped at all seams and back to gables and eaves
- Additional insulation laid as infill between existing rafters, prior to fitting of internal airtight membrane

New west wing

- New flat roof formed as a warm roof with GRP top coat to provide surface for south facing PV array
**Services**

**Heating nd DHW**

Ground floor under wet system underfloor heating  
First floor nominal radiator sizes and towel radiators  
Oso hot water cylinder  
All supported by new Ideal gas boiler

**MVHR**

Paul Novus 300  
91.2% hHR,eff  
0.24 specific efficiency
Air Leakage Certificate

In accordance with BS EN 13829, ATTMA TSL1 (2016) & TSL4 (2018)

Building Tested: The Barge
5 Canal Road, HG4 1QN

Test Date: 18th December 2018

Test Engineer: Paul Jennings, Aldas

Certificate No: P3731-C01

This is to certify that the above-named dwelling has been tested for air leakage in accordance with the BS EN 13829:2001 methodology and the requirements of ATTMA as specified in TSL1 (2016) & TSL4 (2018). The additional requirements of the Passivhaus Institute when Passivhaus Certification is required were also met. The average Leakage Characteristics of the dwelling were recorded as follows:

- Airflow @ 50 Pa: 123.1 m³/hr
- Air Permeability @ 50 Pa: 0.36 m³/(hr.m²)
- Air Change Rate @ 50 Pa: 0.43 AC/hr

Data consistency, r² (requirement, r² > 0.98): 0.995
Slope, n (requirement, 0.5 < n < 1.0): 0.78
Intercept, Cenv: 5.85 m³/(hr.Pa)

Test Parameters

Envelope, A: 346 m²
Volume, V: 287.8 m³

Env. Calc. prepared by: Paul Jennings, Aldas & Claire Jamieson, PHI Architecture

Initial Offset Pressure: -1.40 Pa
Final Offset Pressure: -0.07 Pa
Initial Inside Temperature: 13.8°C
Final Inside Temperature: 13.6°C
Average Outside Temperature: 9.8°C
Barometric Pressure: 102.5 kPa

This certificate should be read in conjunction with the full airtightness test report P3731-02 and associated test method statement.

Signed: Paul Jennings

Position: Air Leakage Specialist

Deviations from TSL1 & TSL4 methodology: None

The design of the above-mentioned building meets the criteria defined by the Passivhaus Institute for modernization to the 'EnerPHit Classic' standard:

Building quality: 75/100

The associated certification booklet contains more characteristic values for this building.
### Verification data & additional information

#### Special features, factors

Integration of 18th Century cottage solid wall renovation with new build Pigmento green zinc extension within considerable party wall constraints accommodating 8 different external wall types and two different roof types.

Water vapour permeable renovation to restore original building fabric.

Walled garden with almost entirely south facing aspect enabling excellent solar gains.

4KW array installed on southerly orientation flat roof.

#### Construction costs

Cost per square metre < £2,000

Overall withheld.

#### Energy consumption

Currently monitored by Carlos Jimenenz Bescos, Nottingham University.

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### Specific building characteristics with reference to the treated floor area

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Treated floor area</th>
<th>Criteria</th>
<th>Alternative criteria</th>
<th>Fulfilled?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space heating</td>
<td>28</td>
<td>≤</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Space cooling</td>
<td>18</td>
<td>≤</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Frequency of overheating</td>
<td>3</td>
<td>≤ 10</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Frequency excessively high humidity</td>
<td>0</td>
<td>≤ 20</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Air tightness</td>
<td>0.4</td>
<td>≤ 1.0</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Non-renewable Primary Energy (P/E)</td>
<td>122</td>
<td>≤ 156.739144</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Primary Energy</td>
<td>119</td>
<td>≤</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Renewable (PER)</td>
<td>28</td>
<td>≤</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>