This summary describes work commissioned by Rykneld Homes. The survey was carried out by Michael Dyson Associates Limited over the period 6th September to 10th November 2011.

Date: 18 11 2011

Executive Summary

The present inspection of Trusteel non traditional properties seeks to establish the structural condition of the properties and recommends appropriate repairs to maintain 30 year assured life structural integrity.

Trusteel properties are of steel frame construction clad externally with brick but are not a designated defective property type within the meaning of the 1985 Housing Act (Housing Defects Legislation).

The survey covers one property in every pair or half-pair of properties owned by North East Derbyshire District Council.

The structural condition of properties in the present survey was derived from a visual survey of external elevations and intrusive inspection of steel frame elements of a representative sample of 136 Nr properties.

The survey has confirmed that corrosion of stanchion bases is widespread across the Trusteel properties inspected, but is largely confound to the immediate area above ground floor level where mortar and builders debris has trapped moisture.

Elsewhere, stanchions, horizontal and diagonal bracing, internal roof and first floor structures are largely in sound corrosion free condition at present with original paint treatments intact, where observed. Steel angle lintel edges have however corroded where these are exposed to the elements.

The external brickwork cladding has been repointed in areas at some properties on a somewhat ad hoc basis. Step cracking is also evident at many properties. Mortar has been found to be weathered and soft, particularly at properties at the Clay Cross site. The brickwork cladding is likely to be porous and water ingress into the cavity will accelerate corrosion of stanchion bases if left unchecked.

Ties restraining the brick cladding are deficient in number and where observed were found to be corroded. Brickwork claddings may therefore be at risk of detachment in high winds.

Fire stop party divide walls within roof spaces are generally inadequate, with gaps observed to the underside of roof coverings and holes within the walls observed at the majority of inspected properties. Ventilation to roof spaces and levels of loft insulation are also deficient at many properties.

The recommended repairs to achieve a further 30 years assured life include a combination of remedial repairs and overcladding the external envelope of the properties.

The survey, by including every Trusteel block structure has enabled an order of priority in which recommended repairs should be undertaken to be established.

1. Introduction

Michael Dyson Associates Limited was appointed by Rykneld Homes to undertake a Survey Appraisal of its stock of Trusteel non-traditional houses by means of a visual and intrusive survey.

The term “non-traditional” generally refers to prefabricated building systems, frames and construction methods that are significantly different from those used for more traditional masonry construction.

The Trusteel properties are of prefabricated steel frame construction, clad externally with brick and lined internally with plasterboard and wood wool slabs. The Trusteel properties are not a designated defective property type within the meaning of the 1985 Housing Defects Act., however the non traditional construction and the potential for corrosion and structural deterioration of these properties can lead to difficulties in obtaining mortgages for residents wishing to exercise their right to buy.

Information provided by Rykneld Homes at the outset indicated that the stock of Trusteel non-traditional properties included a total of 213 Nr houses at three different sites, with a similar number of privately owned properties as follows:

Location	Rykneld Homes	Privately Owned	Total
Clay Cross	149	137	286
Wingerworth	60	64	124
Grassmoor	4	2	6
Totals	**213**	**203**	**416**

The survey included a detailed invasive assessment of 136 Nr Trusteel properties selected by Rykneld Homes at the outset of the survey. Only the properties owned by North East Derbyshire District Council are included within the survey, although it is understood that a summary of the results will be made available to private owners and North East Derbyshire District Council would encourage owners to undertake the recommended repairs and reinstatement works to the Trusteel properties. The cost of any such surveys repairs and reinstatements will be the responsibility of each private owner.

The objectives of the structural investigation include:

- Assess (by visual and invasive investigation) the existing condition of the structures.
- Establish repair works required at each structure and order in which repairs should be implemented.

2. Survey Methodology

A detailed investigation of the 136 Nr properties selected for survey by Rykneld Homes was carried out including:-

- Examination of general condition of the external fabric, particularly those parts of the envelope likely to deteriorate to the point of requiring repair or replacement during the next 30 years.

- Visual inspection of the internal aspects of the dwellings and examine the structure in the roof space.
- Inspection of present condition and adequacy of party fire stop wall within the roof space.
- Establish the construction of the first floor (void properties only).
- Removal of small areas of masonry from external walls to enable inspection of the lower sections of the steel frame, particularly at the corners of the property.

3. Results of Survey

3.1 Construction Details

Typical Trusteel House Front Elevation

Typical Trusteel House Rear Elevation

3.2 Stock Distribution

The address list provided by Rykneld Homes Limited included a total of 213 Nr North East Derbyshire District Council owned Trusteel properties located at 3 Nr sites at Clay Cross, Grassmoor and Wingerworth, Chesterfield.

The properties are believed to have been built in the period 1946-1966 and are all of semi-detached 2-storey houses with a 3-bedroomed layout.

In addition to the North East Derbyshire District Council owned Trusteel properties there are a large number of privately-owned Trusteel properties distributed across the 3 Nr sites.

3.3 General Property Condition and Repairs History

Information provided by Rykneld Homes indicated that the properties are in generally original structural condition and have not benefited from any significant programme of improvements other than routine repairs and maintenance and replacement of doors and windows.

The findings of the survey showed that whilst there was relatively little evidence of deterioration of external brick cladding and few significant structural defects were noted internally, the invasive investigation of external walls identified varying levels of corrosion of steel stanchion bases, both from property to property and from elevation to elevation at individual properties. Stanchions and bracing were observed to exhibit

slight surface corrosion and deterioration of the original red oxide paint treatment, which had advanced in many instances to include loss of section immediately above base level.

The external brick skin was noted be attached to stanchions by wire half triangle type cleats. These were found to be generally insufficient in number by present standards, and suffering from a degree of corrosion.

Inspection of roof spaces highlighted significant gaps to party wall fire stops at a number of properties.

The report recommends as a minimum a combination of repairs and maintenance to ensure continued affective weather tightness, adequate levels of heating and ventilation to ensure that the steel frame structures are kept warm and dry, with low internal humidity levels, debris in cavity bases is removed and any corrosion of steel stanchions and exposed lintel edges is treated appropriately, that fixity of external brick cladding is improved, and that all party wall fire stops are made adequate. In order to improve levels of thermal performance a system of external wall insulation and render overcladding was recommended.

Given the extent of corrosion observed at the base level of stanchions at properties included in the previous survey, it was recommended that the repairs be implemented as soon as practicable and within the next 3 years of the repairs programme.

3.4 Present Condition

A total of 136 Nr Trusteel properties were investigated in detail as part of the survey, including 92 Nr properties from the Clay Cross site, 3 Nr Properties from the Grassmoor site and 41 Nr properties from the Wingerworth site. The surveyed properties represent a high percentage of the stock of Trusteel properties owned by North East Derbyshire District Council.

External Visual Inspection

The visual inspections of accessible external elevations of the Trusteel properties selected for survey identified relatively little deterioration of the external brick cladding or of defects to roof finishes. The steel frame structural elements are however hidden from direct observation. Corrosion of lightweight lattice steel stanchions can be considerable before the effects manifest as cracking of brick claddings. Significant loss of structural integrity can occur before deterioration becomes evident.

All properties have gable ended roofs. A mixture of original Rosemary type plain tiles and concrete interlocking roof tiles were observed at the Clay Cross site. Replacement concrete interlocking roof tiles were observed at the all the properties surveyed at the Grassmoor and Wingerworth sites.

Structurally, roof tiles appear to be in reasonable condition generally with only minor undulations in the roof line and areas of repaired, loose and missing ridge and hip tiles observed. Repointing of chimneys has also been undertaken on an ad hoc basis with areas of weathered mortar observed at the Clay Cross and Wingerworth sites and at a single property at the Grassmoor site.

Damage to gutters and down pipes was observed at 10 Nr properties at Clay Cross and 8 Nr properties at the Wingerworth site. Leaking rainwater goods and overflows may allow water to ingress the cavity and accelerate corrosion if left unchecked.

Flaking paint to timber soffits and fascias was observed at 73 Nr properties at Clay Cross, 2 Nr properties at Grassmoor and 28 Nr properties at Wingerworth.

Generally only minor areas of deterioration and defects of a non-structural nature to external elevations were observed at individual properties.

Large areas of the cladding brickwork have been repointed, typically up to first floor window sill level at some of the properties surveyed at the Wingerworth and Clay Cross sites. Mortar joints in brickwork at the Grassmoor properties are more weathered with fewer areas of patch pointing observed at this site.

Horizontal and step cracking of face brickwork was observed at a single property at Clay Cross and at 2 Nr properties (5%) at Wingerworth. Previous areas of cracking may however have been made good during the repointing of areas of brickwork at the Clay Cross and Wingerworth sites. Such cracking is typically associated with ground movement settlement, rather than the steel frame nature of the Trusteel construction.

Cracking can allow water ingress into the cavity with subsequent corrosion of the steel frame elements if left unchecked. The brick cladding is devoid of weep holes at slab level or at lintels above openings, therefore water finding its way into the cavity will not easily drain and will be trapped by accumulated debris and mortar droppings observed within the cavity at base level.

Shaling of areas of face brickwork was observed at 8 Nr properties at Clay Cross and 8 Nr properties at Wingerworth, while shaling was observed at a single property at Grassmoor. The properties at Wingerworth have had an element of repointing previously.

Masons openings are spanned by steel angle lintels which were observed to be mostly in generally fair structural condition with surface corrosion of exposed edges and minor cracking at end bearings observed on an ad hoc basis. Cracking of brickwork at lintel bearings was observed at a single property at Clay Cross and 2 Nr properties at Wingerworth.

Sagging over large window openings was perceived to be more noticeable at the Wingerworth site, where extensive repointing over windows has also been undertaken in the past. Cracking of brickwork over windows and at lintel bearings was however evident at 7 Nr properties and 1 Nr property respectively at the Clay Cross site. Cracking of brickwork over window and at lintel bearings was also evident at 5 Nr properties and 2 Nr properties respectively at the Wingerworth site, while no evidence of cracking was observed to the 3 Nr properties surveyed at Grassmoor.

Lintels at some windows appear to have been replaced at a number of properties as there is evidence of replacement and repacking of bricks at end bearings, with off cuts of bricks and clay tiles inserted and evident at many properties. Lintels appear to have been replaced on an ad hoc, responsive repairs basis at each house rather than as a programme of replacement across the sites.

Most concrete door canopies and the projecting concrete door lintels at properties surveyed were found to be in generally sound condition at present, but cracking was observed to the door canopies at 3 Nr properties across the 3 Nr sites,

Areas of bridged damp proof courses and areas of foliage growth to elevations were observed at a number of the properties surveyed, particularly at the Clay Cross site. Bridging by gardens, flowerbeds or raised paths and patios could lead to damp penetration and deterioration of steel stanchions and ideally a continuous 150mm to ground level should be maintained around the perimeter of all properties. .

3.4.1 Internal Visual Inspection

The internal visual inspection of the Trusteel properties identified few significant structural defects at present.

Lattice section steel rafters, vertical ties and ceiling joists within the roof structures were observed to be generally in sound structural condition with only minor surface corrosion to red oxide painted surfaces observed. The vertical bracing was also observed to be in similar sound condition to all properties.

As previously noted the properties at Clay Cross have a mixture of Rosemary type plain tile coverings and repaired concrete interlocking roof tiles. Tiles back pointed were observed at 39 Nr properties at Clay Cross, while all properties at Grassmoor and Wingerworth have sarking felt beneath the tile roof covering. Back pointing and timber battens were noted to be generally sound at the properties at Clay Cross.

Where present, sarking felt was found to be in a generally satisfactory condition at the majority of inspected properties, although minor tears were noted at 25 Nr properties at the Clay Cross site, 1 Nr property at Grassmoor and 24 Nr properties inspected at Wingerworth.

Water staining of rendered brick chimneys was observed at 32 Nr properties at Clay Cross, 1 Nr property at Grassmoor and 16 Nr properties at Wingerworth. Staining appears to be historic as daylight was not observed at flashings at affected properties.

Levels of roof insulation were observed to be variable, particularly at the Clay Cross site where levels were observed from as little as 50mm to a high of 300mm. Generally levels of loft insulation are in the region of 100mm to 300mm typically. Loft insulation at the Grassmoor site was generally observed to be at a depth of 150mm to 200mm, which is less than the recommended Building Regulations requirement at present. Levels of loft insulation at the Wingerworth site were also observed to be variable with as little as 100mm to a high of 300mm.

The original 50mm or so of insulation quilting has been supplemented by additional layers of fibreglass and Rockwool type insulation and also blown cellulose type insulation added on a somewhat ad hoc basis at the properties surveyed. Levels of insulation can therefore be expected to vary significantly at both the North East Derbyshire District Council owned and privately owned properties across the estates.

Ventilation of roofs appears to be provided by specific ventilation tiles added to roof coverings at some the properties inspected at Wingerworth.

The roofs of properties surveyed at Clay Cross are a mixture of original Rosemary tiles and replacement concrete interlocking tiles as noted above. Replacement roof coverings appear to have more discreet vent tiles installed than those at the Wingerworth site. Ventilation is also originally provided at eaves level, although the presence of additional layers of loft insulation may have reduced the effectiveness of such ventilation provision.

Elsewhere internally, significant cracking to walls and ceilings was not observed, with only minor cracking at ceiling boards generally.

Inspection of first floor voids was undertaken at 5 Nr void properties across the 3 Nr sites. The findings confirmed these to be of pressed steel types as is typical of Trusteel construction.

Joists where inspected are in structurally sound condition, with no observed corrosion of steel lattice joists or decay, insect or fungal attack present to timber battens and floor coverings.

Evidence of condensation and black mould staining, including areas of peeling wallpaper coverings was observed at 18 Nr properties inspected at the Clay Cross site during the survey. Similar mould growths was observed at 6 Nr properties inspected at Wingerworth. No evidence of condensation and mould staining was observed at the 3 Nr properties at Grassmoor.

3.4.2 Inspection of Party Fire Stop Walls

Party walls within roof spaces at the Clay Cross site were noted to be of blockwork at 62 Nr properties with the remainder of inspected properties having brick party walls. All 3 Nr properties at the Grassmoor site were noted to be of brickwork construction, while 39 properties at Wingerworth were also noted to have block party walls with the remainder having brick party walls.

Significant gaps to the undersides of roof coverings or at ridge level were observed at 53 Nr properties at Clay Cross, 36 Nr properties at Wingerworth and a single property at Grassmoor . Gaps will allow the spread of flame and smoke in the event of a fire and should be made good. The party walls within the roof space at Clay Cross were all observed to be a mixture of blockwork and brickwork construction, while the properties at Grassmoor have brick party walls and all properties at Wingerworth have blockwork party walls with air bricks clay ventilation bricks built into the party walls on an ad hoc basis, which means they are ineffective as fire stop walls at present.

3.4.3 Invasive Investigation of External Walls

Invasive inspection of the steel framed structure within the external walls was undertaken by removal of areas of brick cladding above damp proof course level at corners and mid elevations with typically a minimum of 4 Nr break outs and inspection of between 4 Nr and 6 Nr lattice stanchions undertaken at each property.

The external walls have a total thickness of 330mm and comprise of an external leaf of 100mm brick, a cavity of 180mm and an inner leaf of 50mm Woodwool slabs with a plastered finish. Woodwool slabs are generally just nailed to the gaps between the flanges of the stanchions, however timber framing to brace the inner leaf Woodwool was also observed in some instances.

There is a bitumen felt type damp proof course in the external brick skin. Mortar droppings and more general builders debris, including plasterboard and Woodwool off cuts, bricks, ceramic tiles and grass ands straw materials used to build birds nests etc, were observed at the base of the cavity at nearly all of the properties inspected at all 3 Nr sites. Stanchion bases in particular are often embedded in a layer of accumulated mortar, which appears to have led to corrosion of the steel immediately above slab level at the properties surveyed.

The mortar used in the construction of the external walls was found to be variable in strength with areas of relatively soft mortar common, particularly at the properties surveyed at Clay Cross. Bricks were easily removed during the survey and shaling, weathering and erosion of the mortar was noted at the many of the properties inspected.

The lattice steel stanchions where inspected were found to be in sound structural condition generally at present with red oxide paint treatment intact and only minor surface corrosion noted, except in the area immediately above slab level where severe corrosion and loss of steel section on an ad hoc basis was observed at the properties surveyed. Horizontal and diagonal bracing was in similar sound condition at slab level and elsewhere up the height of the elevations as observed from the areas of brick removal.

The bases of stanchions are further protected in areas by a coating of bitumen paint and the faces against the external brickwork were observed to have the typical sticky grease impregnated canvas “Denso” tape to act as damp proof membrane. Significantly perhaps, the Denso tape was generally deteriorated or stopped short of the area immediately above slab level, where corrosion was generally observed.

The extent of observed corrosion varied from property to property and from elevation to elevation at many of the properties surveyed. The corrosion of stanchions at base level may be expected to be influenced by such factors as the degree of debris and mortar within the cavity and the orientation of the stanchions in relation to the prevailing weather, as water ingress and trapped moisture will play a large part in determining the extent of corrosion which has so far occurred at each property.

Stanchions and bracing exhibited slight surface corrosion and deterioration of original red oxide paint treatment, which has advanced in many instances to include loss of section immediately above base level.

The external brick skin is attached to the stanchions with a mixture of wire half triangle type cleats and a 1mm flat plate which either hook over the edge of the front flange in the case of the wire cleat, or clip onto it by means of a slot in the case of the flat plate, and are embedded into the mortar beds. Both the cleats and the plates were noted to be generally insufficient in number by present standards, although by the nature of the Trusteel form of construction, cleats or plates are arranged in vertical stacks rather than staggered.

Horizontal spacing of cleats and plates was noted to be typically as few as a single observed cleat/plate up the height of each inspected stanchion, although it is possible that mortar debris is obscuring them from view elsewhere up the height of the stanchions. Embedment of ties into the external brick skin was noted to be satisfactory at 50mm to 65mm typically where inspected, however corrosion was observed and may be attributed to the porous and soft nature of mortar at these properties. Continued corrosion of ties can therefore be anticipated.

4. Recommendations

4.1 Structural Repairs

The structural investigation of the Trusteel properties shows them to be in generally poor structural condition. There is significant corrosion of the bases of steel stanchions and other inherent structural defects. These include inadequacy in terms of the number and frequency of wall ties, due to which external brick claddings may be at risk of detachment by high winds, presence of significant amounts of builder’s debris in cavities, which can contribute to retention of moisture and resultant corrosion of the stanchion bases, and gaps to the party wall in the roof space, making it ineffective as a fire stop.

4.2 Prioritisation of Repairs

Following the survey some properties have been classified as urgent for four main areas of potential defect or deterioration, namely;

- Corrosion to stanchion bases
- Wall ties visible (adequacy of number and spacing)
- Debris within the cavity
- Gaps to party wall fire stop within the roof space

Whilst there is no distinct pattern in any of the above areas from one site to another, it is often the case that the majority of properties on the same street are of similar condition. Where an area of potential defect is highlighted as urgent, it is considered that this property should be given priority within the programme for this aspect of the works where practical. It is considered that works to address both the issue of inadequacy of wall ties and that of debris within cavities may be left until the intended programme of works, commencing in 2013.

It is understood that works to improve party wall fire stops are to be undertaken prior to this. Those properties identified as urgent for adequacy of party wall fire stop should certainly be included within any programme of improvements to this element taking place prior to 2013. A total of 65 Nr properties have been classified as urgent in this area.

A total of 33 Nr properties have been classified as urgent for corrosion of stanchion bases, where it has been identified that there is severe corrosion to 4 Nr or more inspected stanchions, or there is loss of section of 50% or more to any of the inspected stanchions. Works to address this should be implemented prior to 2013. It is recommended that commencement of these repairs should not be later than June 2012. Those properties affected are;

- Nrs 5, 9 & 18 Ashbourne Avenue, Clay Cross
- Nr 24 Brook Street, Clay Cross
- Nrs 17 & 18 Cromford Road, Clay Cross
- Nr 7 Derwent Place, Clay Cross
- Nr 90 Meadow Road, Clay Cross
- Nrs 7, 29, 69, 112 & 146 North Street, Clay Cross
- Nr 45 Rock Crescent, Clay Cross
- Nr 10 Frederick Street, Grassmoor
- Nrs 1, 12, 14, 22, 26, 33, 45, 49, 60 & 99 Adlington Avenue, Wingerworth
- Nrs 33, 47, 58, 61, 64, 65 & 69 Greenway, Wingerworth
- Nr 7 Mill Crescent, Wingerworth

It would be prudent to include the adjoining properties in any pairs wholly-owned by North East Derbyshire District Council. This would equate to an additional 8 Nr properties.

4.3 Thermal Improvements and Assured Life

The remedial works described, whilst ensuring the continued life of the steel frame structure in the short term, do nothing to improve the poor thermal performance of the Trusteel properties. The installation of cavity wall insulation may lead to problems of interstitial condensation forming on lattice stanchions in this form of construction and we would not recommend this approach. Ideally improvements in thermal performance would be better achieved by the application of an external wall insulation and render overcladding system. Such overcladding would also have the additional benefit of providing additional weatherproofing to the structure, enabling the remedial works described above to achieve the required 30 years assured life solution.