Portlethen Academy

Cavity Wall Tie Inspection

October 2016
CONTROL SHEET

CLIENT: Aberdeenshire Council

PROJECT TITLE: Cavity Wall tie inspection at Portlethen Academy

REPORT TITLE: Cavity Wall tie inspection at Portlethen Academy

PROJECT REFERENCE: 114941

Issue and Approval Schedule:

<table>
<thead>
<tr>
<th>ISSUE 1</th>
<th>Name</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared by</td>
<td></td>
<td></td>
<td>Oct 16</td>
</tr>
<tr>
<td>Reviewed by</td>
<td></td>
<td></td>
<td>Oct 16</td>
</tr>
<tr>
<td>Approved by</td>
<td></td>
<td></td>
<td>Nov 16</td>
</tr>
</tbody>
</table>

Revision Record:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Status</th>
<th>Description</th>
<th>By</th>
<th>Chk</th>
<th>App</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Introduction

Fairhurst were instructed by Aberdeenshire Council to undertake an inspection of the existing wall cavity and wall ties within the external wall at Portlethen Academy. An intrusive survey was carried out on the 10th – 12th of Oct 2016. Works involved removing localised pockets of block work outer leaf at roof eaves at 6 locations around the building. Please refer to Fig 1. Location plan for exploratory survey works.

Fig 1. Site location plan for exploratory survey works.
General Building Description

Portlethen Academy is located off Bruntland Rd. The building comprises a 2 and 3 storey braced steel frame with the teaching wings generally 3 storey except for the wing on the North Elevation which is only 2 storey. Games halls are steel frame building and integrate into the overall building scheme. The Internal upper floors are composite metal decking or pre-cast.

The internal walls are block work and the external envelope wall are constructed with render block masonry and cream brick work and block inner leaf.

Roof construction is a light weight system consisting of steel purlins supporting insulated panel roofing system. Roof cladding system wrap around the building eaves which is consistent detail around the building perimeter.

Summary of drawing information supplied

Prior to undertaking survey works we were supplied with the following drawings:

- Ramsay & Chalmers Masonry wall tie detail drawing (dwg No. B2658/339)
- Holmes Partnership block works 203x203UC details (dwg No. 1858 AA(2) 105 -109)

Inspection Procedure

Inspection of the cavity and ties were carried out at 6 locations around the exterior elevation of the building perimeter using a MEWP platform lift.

Inspection focused on the following key items:

1. Inner masonry leaf head restraint detail.
2. How the outer leaf was restrained at eaves levels.
3. Location of walls ties.
4. Wall ties embedment depths.
Site Observation and Results

Location 1 eaves on North elevation (over main entrance):

Based on inspection wall construction at this location is 100mm outer rendered block, 100mm wide cavity and 140mm inner leaf.

Generally the wall ties are spaced at 225mm c/c vertically at the column locations, 450mm c/c vertically and 900mm c/c horizontally between inner and outer leaf.

No head restraint ties for between block inner leaf and steel work.

No wall ties between steel work and masonry out leaf for the 1st four courses.

Wall ties starts 330mm down from U/S of beam and 225mm centres vertically.

Existing ties are 250mm long with an embedment depth of 80mm into outer leaf and 70mm into internal leaf.

4 outer leaf courses of block work with no ties back to internal structure.
Location 2 eaves on North elevation:

Based on inspection wall construction at this location is 100mm outer rendered block, 125mm wide cavity and 140mm inner leaf.

Generally the walls ties are spaced at 450mm c/c vertically and 900mm c/c vertically between inner and outer leaf. With the 1\textsuperscript{st} tie starting 330mm below the internal steel beam.

**Picture 1: location of exploratory opening**

![Exploratory opening image]

- 3.5 outer leaf courses of block work with no ties back to internal structure.
- 1\textsuperscript{st} wall tie approximately 330mm from U/S of steel.

**Picture 2: Typical wall tie embedment detail**

![Wall tie embedment detail image]

Existing ties are 300mm long with an embedment depth of 70mm into outer leaf and 105mm into internal leaf.
Picture 3: Junction between steel beam and masonry wall

No internal masonry head restraint ties.
Location 3 eaves on South West elevation:

Based on inspection wall construction at this location is 100mm outer rendered block, 140mm wide cavity and 140mm inner leaf.

Generally the wall ties are spaced 450mm c/c vertically and 900mm c/c horizontally between inner and outer leaf. With the 1st tie being 225mm below the internal steel beam and 3 outer leaf courses above the tie.

**Picture 1: Junction between steel beam and masonry wall**
Location 4 eaves on South East elevation:

Based on inspection wall construction at this location is 100mm outer rendered block, 140mm wide cavity and 140mm inner leaf.

Generally the wall ties are general spaced at 450mm c/c vertically and 900mm c/c horizontally between inner and outer leaf.

**Picture 1: location of exploratory opening**
Picture 2: Junction between steel beam and masonry wall

No internal masonry head restraint ties.

Picture 3: Picture of internal cavity
Location 5 eaves on East elevation:

Based on inspection wall construction at this location is 100mm outer rendered block, 170mm wide cavity and 140mm inner leaf.

Generally the wall ties are spaced at 450mm c/c vertically and 900mm c/c horizontally between inner and outer leaf. With the 1st tie being 330mm below the internal steel beam with 3.5 outer leaf courses above the tie.

Picture 1: location of exploratory opening
Existing ties are 300mm long with an embedment depth of 50mm into outer leaf and 80mm into internal leaf. No internal masonry head restraint ties. 1st wall tie approximately 330mm from U/S of steel with 3.5 outer leaf courses of block work with no ties back to internal structure.
Location 6 eaves on East elevation:

Based on inspection wall construction at this location is 100mm outer rendered block, 100mm wide cavity and 140mm inner leaf.

Generally the wall ties are spaced at 450mm c/c vertically and 900mm c/c horizontally between inner and outer leaf. With the 1st tie being 225mm below the internal steel beam with 3 outer leaf courses above the tie.

Picture 1: Location of exploratory
Existing ties are 275mm long with an embedment depth of 75mm into outer leaf and 60mm into internal leaf.

No internal masonry head restraint ties.

1st wall tie approximately 225mm below U/S of steel with 3 outer leaf courses of block work with no ties back to internal structure.
Picture: Masonry cracking between steel works within plant room on East elevation
**Conclusions/Concerns**

1. Where wall ties have been encountered the depth of embedment is adequate.

2. There are no head restraint ties to the inner leaf in all locations where we investigated.

3. Table below summarising the locations of upper most ties relative to the U/S of internal steel beams and distance to top of outer leaf.

<table>
<thead>
<tr>
<th>Locations</th>
<th>Distance from U/S of steel</th>
<th>Height from tie to top of outer leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>330mm</td>
<td>900mm</td>
</tr>
<tr>
<td>2.</td>
<td>330mm</td>
<td>790mm</td>
</tr>
<tr>
<td>3.</td>
<td>225mm</td>
<td>550mm</td>
</tr>
<tr>
<td>4.</td>
<td>900mm</td>
<td>1350mm</td>
</tr>
<tr>
<td>5.</td>
<td>330mm</td>
<td>790mm</td>
</tr>
<tr>
<td>6.</td>
<td>440mm</td>
<td>900mm</td>
</tr>
</tbody>
</table>

It appears the top outer leaf is not tied back to existing structure and would propose a combination of the following remedial works to help restrain the block outer leaf (please see detail 1 below):

- Installation of a pressed metal flashing fixed to roof structure to restrain head of wall.
- Stainless steel self-tapping fixing to tie out leaf back to steel work.

**Details 1: Proposed remedial detail at gutter locations**
**Internal head restraint detail**

At locations invested where no head restraint ties were found, we will require verification that all wall panels were designed as unrestrained and have sufficient capacity to resist required wind loads including local effects.

**Remedial wall ties at survey location 4 (areas above plant room)**

At this location wall ties were found to be 900mm below the u/s of steel beam therefore we would recommend that Helifix Dryfix or equivalent remedial wall ties are installed for the first 3 courses of block work form under side of beam (please see picture below showing extent of works)

**Picture: Remedial wall ties at survey location 4**
Remedial Masonry cracking between steel works within internal plant room on East elevation

Stainless steel strap to be installed vertically