



GADSDEN CONSULTING

STRUCTURAL INSPECTION REPORT

LOCATION: QUARRY HOUSE, CASTLE VIEW, MILLOM,
CUMBRIA. LA18 5AQ

CLIENT: SARAH LUPTON

JOB No: 24263



Rev	Description	Issued By	Reviewed By	Date
00	First Issue	MG	RG	08/07/2024

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1. Introduction

Gadsden Consulting were appointed by Sarah Lupton to undertake a structural inspection of Quarry House, Castle View, Millom, Cumbria LA18 5AQ.

Quarry House is a detached dwelling situated in a primarily residential area of Millom, Cumbria and dates to 1897. As suggested by its name it is on a large plot containing a former working quarry. The property itself comprises two reception rooms and a kitchen at ground-floor, along with three bedrooms, a family bathroom, at first-floor level.

The property is generally of traditional construction with stone walls (the two sides and rear elevations have subsequently been rendered in wet dash), a mixture of timber suspended and solid ground floors, timber first floor and a purlin and rafter roof finished in slate.

Photo 1 - Front Elevation



We understand that you are in the process of purchasing the property and a valuation survey recommended a structural engineer be employed due to concerns over cracking noted. We have not seen a copy of the surveyors report or comments.

Our inspection was based on one visual, non-intrusive inspection. We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are therefore unable to report that any such part of the property is free from defect. Where applicable, visible damage has been classified in accordance with *BRE Digest 251: Assessment of Damage in Low-Rise Buildings*, Table 1 overleaf. Within the body of the report this classification appears in brackets at the end of statements.

Descriptions of the property are worded as if you are viewing the property from the front. An inspection of the property was undertaken on Wednesday 3rd July 2024.

Table 1 - Classification of Visible Damage to Walls with Particular Reference to Ease of Repair of Plaster & Brickwork or Masonry (Crack width is one factor in assessing category of damage and should not be used on its own as a direct measure of it)

Category of Damage	Description of Typical Damage <i>(Ease of repair in italic type)</i>
0	Hairline cracks of less than about 0.1 mm which are classed as negligible. <i>No action required.</i>
1	Fine cracks which can <i>be treated easily using normal decoration</i> . Damage generally restricted to internal wall finishes; cracks rarely visible in external brickwork. Typical crack widths up to 1 mm.
2	<i>Cracks easily filled. Recurrent cracks can be masked by suitable linings.</i> Cracks not necessarily visible externally; some external repointing may be required to ensure weather-tightness. Doors and windows may stick slightly and require easing and adjusting. Typical crack widths up to 5 mm.
3	<i>Cracks which require some opening up and can be patched by a mason. Repointing of external brickwork and possibly a small amount of brickwork to be replaced.</i> Doors and windows sticking. Service pipes may fracture. Weather-tightness often impaired. Typical crack widths are 5 to 15 mm, or several of, say, 3 mm.
4	Extensive damage which <i>requires breaking-out and replacing sections of walls, especially over doors and windows</i> . Windows and door frames distorted, floor sloping noticeably*. Walls leaning or bulging noticeably*, some loss of bearing in beams. Service pipes disrupted. Typical crack widths are 15 to 25 mm, but also depends on number of cracks.
5	Structural damage which requires <i>a major repair job, involving partial or complete rebuilding</i> . Beams lose bearing, walls lean badly and require shoring. Windows broken with distortion. Danger of instability. Typical crack widths are greater than 25mm but depends on number of cracks.

2. Internal Inspection

2.1 Entrance Porch/Main Hall

- A vertical crack extends from approximately 1200mm above the floor, running up to the coving, across the door head, and then descending to roughly the same height on the opposite side. This crack measures approximately 4-5mm in thickness. (Category 2)
- Additionally, there are hairline cracks in the coving and ceiling generally. (Category 0)
- The solid floor in the main hall exhibits some undulation, sloping downward from the door entrance toward the staircase.

Photo 2 - Cracking Around Front Door



Photo 3 – Cracking Around Front Door



2.2 Right Reception Room

- The room has been previously opened up, with a beam installed toward the rear.

- The front half features a suspended timber floor with joists spanning from left to right.
- The floor exhibits undulation, sloping downward toward the front, rising in the middle, and then descending where it meets the concrete floor at the rear.
- The solid floor at the rear feels relatively level.
- Internally, the front corners appear to be in good condition.
- However, at the rear left junction with the hall wall, there is a severe crack extending from floor to ceiling. At its worst, the gap opens to approximately 10mm. (Category 3)
- On the right-hand side, diagonal cracking emanates from the rear wall and intersects with vertical cracking at the junction with the rear wall. (Category 1/2)
- Sporadic hairline cracking is visible on the right-hand side elevation. (Category 0)
- Finally, there is minor movement around the coving at ceiling level. (Category 0)

Photo 4 - Right Reception - Vertical Cracking to Rear Left



Photo 5 - Right Reception - Cracking to Rear Right



2.3 Front Left Reception Room

- No structural comments.

2.4 Kitchen

- The floor exhibits undulation.
- To the right-hand side of the backdoor, there is a vertical crack running from the ceiling down to floor level. This crack extends into the plaster, measuring 7-8mm in thickness. There is very little tie between the internal and external walls. (Category 3)
- In the understairs cupboard, there is a severe vertical crack, measuring up to 10mm wide mirroring the crack noted above. There is a similar crack in the wall separating the cupboard with the right reception. There is also a gap to the landing above. (Category 3)

Photo 6 - Cracking in Cupboard

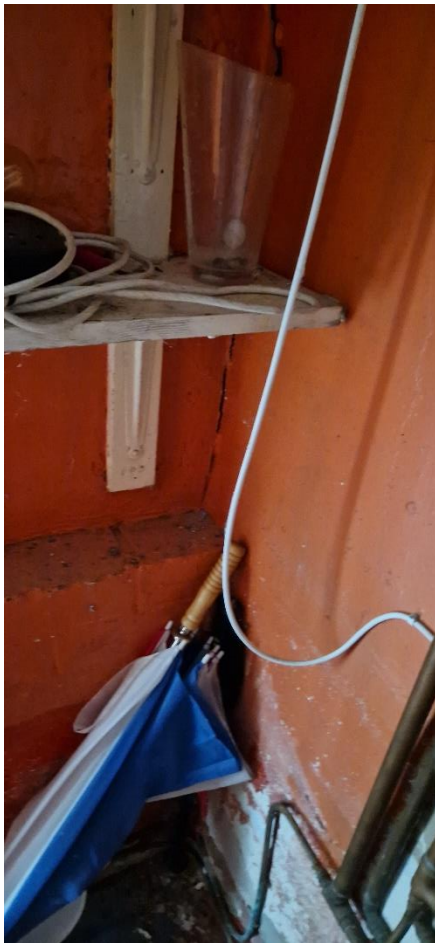


Photo 7 - Cracking in Cupboard



2.5 Stair & First Floor Hall

- The vertical cracking noted in the cupboard below continues up both sides of the hall. At their worst they are upto 25mm wide. (Category 4)
- At the first-floor level, solid walls flank either side of the staircase running front to back. All other walls at first floor level are stud.
- Floor joists run front to back at first floor level.

Photo 8 - Hall - Vertical Crack to Right Side at Rear



Photo 9 - Hall - Vertical Crack to Left Side at Rear



2.6 Front Left Bedroom

- Vertical fine crack at the junction between the front wall and the wall to the adjacent bedroom. (Category 1)

2.7 Front Right Bedroom

- Minor undulation in the floor present.
- Vertical crack at the junction of the right-side external wall and internal stud wall separating this bedroom with the rear right bedroom. (Category 1)

2.8 Rear Right Bedroom

- Vertical crack at the junction of the side and rear external walls running floor to ceiling. (Category 2)
- Severe vertical crack to the left side of the room at the intersection between hall wall and rear. Like what was observed on the hall side. (Category 2)

2.9 Main Bathroom

- No structural comments.

2.10 Roof

- Two intermediate queen post trusses roughly positioned at thirds supporting two rows of side purlins and a ridge. In turn these support the rafters. All section sizes appear to be of good proportions and where observed the timber appears to be in good condition. We would however point out that several slates were missing, and water ingress is likely to have occurred which could have damaged some timber.

Photo 10 - Roof



3. External Inspection

3.1 Front Elevation

- There has been some lateral movement around first floor centrally both horizontally and vertically.

3.2 Left Side Elevation

- Fairly significant belly starting from about 1m high up to just above first floor level.
- The elevation has been rendered historically. It hasn't cracked suggesting movement isn't ongoing.

3.3 Rear Elevation

- There are cracks around wall penetrations. These appear due to corrosion and rust. (Category 1)
- On the right-hand side of the kitchen window, there are hairline cracks present. (Category 0/1)
- Moving centrally on the elevation, behind the downspout and bathroom outlet, there is sporadic cracking. These previously filled cracks have not reopened. (Category 0/1)
- Above the right-hand side of the French doors, there are sporadic cracks in the render. These have been filled with mastic and haven't reopened. (Category 0/1)

Photo 11 - Rear Elevation - Sporadic Cracking



- Severe lateral movement is evident, particularly in the central area.
- Whilst the roof is generally straight and true with no real undulation, the chimney seems to be leaning inwards.

3.4 Right Side Elevation

- Some minor lateral movement present again centrally both horizontally and vertically.

4. Discussion & Recommendations

Quarry House needs substantial renovations and modernisation to bring it up to modern, habitable standards. This includes all new kitchen and bathrooms but also bringing the property upto standard in terms of insulation and energy efficiency to ensure its long-term viability. This will likely require the property to be stripped back to brick/stone.

Structurally, the four main potential failure mechanisms are settlement, lateral movement, constructional defects and perishment to the fabric.

All buildings undergo a degree of settlement during their lifetime and usually the majority of this will occur at an early stage. In this instance there has been some undulation in the floors generally but there is no suggestion that this is current or ongoing. We suggest the renovation works should include taking out all ground floors and installing new insulated concrete floors. First floors where there is minor undulation can be repaired as necessary.

Despite the thick stone walls and internal masonry walls (all at ground floor and spine walls at first floor) the property has suffered from lateral movement on all elevations. The movement to the front elevation is at this stage relatively minor and the render coat applied to the gable elevations appears to have slowed this process down. However, the rear elevation has suffered to a much greater degree. The cracking observed internally at the junction of internal and external walls is significant with as much as 25mm cracking observed. We recommend that a large section of the rear elevation be demolished and rebuilt.

The other three elevations can be retained but we recommend proprietary helical bar repairs (see Appendix A) to ensure the inner and outer leaves of stone are adequately tied together (Helifix RF-10 or similar), the front wall and internal walls are adequately tied together (Helifix RD-RW05 or similar), and the external walls are secured back to the floor joists at first floor level (Helifix RD-RB07 / RD-RB11 or similar). A tie at roof level may also be required.

There has obviously been perishment to the building fabric and this would all require renewal as part of the renovation works including ensuring the roof is watertight. We would recommend that the roof have a breathable membrane installed to ensure a long-term watertight roof structure. All timbers being retained should be inspected by a timber specialist and treated as required.

Finally, the chimney breast appears to be leaning onwards and this should either be removed or rebuilt from roof level up.

The minor cracking noticed elsewhere we do not believe is serious or in need of structural repair. Cracking occurs in all properties, and these are a result of a lack of maintenance, mixture of stress and thermal differences.

5. Conclusions

Quarry House is an old property that has suffered generally from a lack of ongoing maintenance resulting in the need for it to be completely overhauled to secure its long-term future as a dwelling.

Structural works are required as outlined in section 4 which include demolition and rebuilding of some walls and tying of walls, roofs, and floors. The cost of these structural works we estimate to be in the region of £45,000. We recommend that you get these items priced independently by a reputable building contractor.

It is our professional opinion that subject to the works highlighted being completed, this property will be in a reasonable structural condition.

Appendix A – Helical Bar Repair Details

Restraining a Bowed Solid or Stone Wall from inside using DryFix into Joist Ends

METHOD STATEMENT

1. Using a lightweight rotary hammer drill or 3-jaw chuck type percussion drill, drill vertically staggered pilot holes (normally 6mm) either side of the joist at an angle between 30° - 45° and into the masonry.
2. Insert the DryFix power driver attachment into an SDS rotary hammer drill and place the DryFix into the support tool.
3. Drive the DryFix through the joist into the masonry to the required depth ensuring the tie is left flush with the face of the joist.

N.B. Ensure that the area of wall, into which the DryFix ties are driven, is sound. Stabilise if necessary.

RECOMMENDED TOOLING

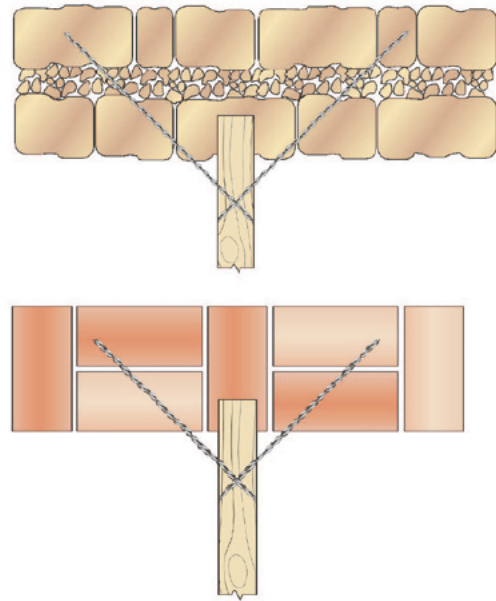
- **For drilling**
Either a 650/700w SDS rotary hammer or percussion drill
- **For installation of DryFix**
DryFix Power Driver Attachment

GENERAL NOTES

If your application differs from this repair detail or you require specific advice on your particular project or Helifix products, call our Technical Sales Team on **020 8735 5222**.

Our Technical Department can provide you with a full support service including:

- Advice, assistance and recommendations on all structural repair matters
- Devising and preparing complete repair proposals for specific situations
- An insurance-backed warranty via our Approved Installers scheme



Specification Notes

The following criteria are to be used unless specified otherwise:

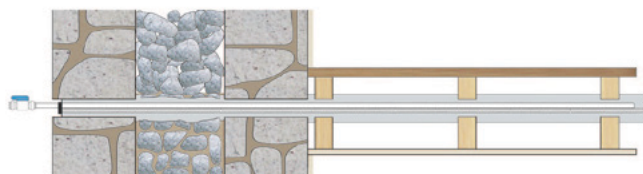
- A. DryFix ties are generally installed at an angle of 45°, with two fixings per joist.
- B. The far leaf penetration can only be accurately determined through site testing. However, as a guide we would recommend a penetration depth within the outer leaf of 65-70mm in stonework, 25-30mm in concrete, 65-70mm in a 3N concrete block or stock brick & 90mm penetration in a lightweight block. DryFix ties are suitable for most building materials including cob, clay lump, hollow block, terracotta or timber.

The above specification notes are for general guidance only and Helifix reserves the right to amend details/notes as necessary.

Restraining Rubble-Filled Stone Walls using SockFix into Joist Sides

METHOD STATEMENT

1. Mark the positions for the holes on the outer face of the wall.
2. Core drill the hole, to the specified diameter, through the wall and through the first three floor joists. Retain the entry hole core where possible.
3. Set up the pressure pot and compressor for installation.
4. Flush the pressure pot and associated components with fresh water.
5. Prime the injection tube with water. Wet each SockFix prior to installation by flushing with fresh water.
6. Mix the SockFix Grout using a power mixer until a smooth fluid consistency is achieved, then pour through a sieve into the pressure pot container.
7. Insert SockFix in the hole, ensuring that the sock is evenly distributed along the full length. Do not twist or force as it is pushed into the hole (any tears in the sock will lead to premature grout leakage).
8. SockFix assemblies over 1000mm in length should be flushed with water again once inserted.
9. Connect SockFix valve with the pressure pot.
10. Inflate the SockFix sleeve with SockFix Grout from the pressure pot at a maximum of 3 bar pressure.
11. Maintain the pressure until the sock is fully inflated in the drilled hole and between the floor joists and all the grout milk has been expelled.
12. Close the shut off valve and disconnect from the pressure pot.
13. Once the grouted anchor has cured sufficiently to resist any residual pressure, cut off the end of the grout tube below the surface of the masonry.
14. Make good the entry hole, using the retained core where possible.



RECOMMENDED TOOLING

- **For Drilling**
Rotary Percussion / Wet Diamond / Dry Diamond
- **For Mixing Grout**
3 jaw-chuck drill with mixing paddle or powered grout mixer. Large catering sieve
- **For Inflating**
Large 20 ltr pressure pot max working pressure 110 PSI

Specification Notes

The following criteria are to be used unless specified otherwise:

- A. Diameter of clearance hole to be determined on site depending on the substrate and the diameter of SockFix to be used.
- B. Clearance holes should be drilled through the upper half of the floor joists.
- C. Length of tie to be calculated carefully to allow recess of 25mm below the surface of the wall and extension 100-150mm past the far joist.

The above specification notes are for general guidance only and Helifix reserves the right to amend details/notes as necessary.

SockFix Grout Mixing Instructions

Each 20kg bag requires 5.5litres of clean cold water:

1. Place 4.5 litres of clean cold water into a clean mixing container. While mixing, slowly add approximately $\frac{3}{4}$ of a bag of Helifix SockFix Grout.
2. Continue mixing until all the above grout has been mixed.
3. Add a further 1 litre of clean cold water (to make up the required 5.5 litres in total).
4. Add the remaining grout while continuing to mix.
5. Continue to mix for a minimum of 5 minutes ensuring all the dry grout from the side of the container is removed and mixed.
6. Leave to stand for 4 minutes.
7. Pour into pressure pot through sieve.
8. If possible, continue to agitate grout in pressure pot in-between installations.

This repair is to be undertaken by a Helifix Approved Installer only.



GENERAL NOTES

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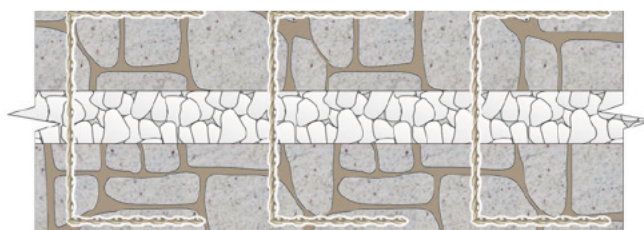
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Repair of Delaminated or Separating Masonry in a Rubble- Filled Wall using HeliBars

METHOD STATEMENT

1. Mark the positions for the holes on the outer face of the wall.
2. Drill 12mm clearance holes through the wall in a staggered pattern.
3. Using a twin-bladed, diamond-tipped wall chaser and vacuum attachment, cut 350mm long slots into the horizontal mortar joints to one side of the holes, to the specified depth and at the required vertical spacing. Ensure that **NO** mortar is left attached to the exposed stone surfaces in order to provide a good masonry/grout bond. This operation may require the use of hand tools to remove the mortar due to the random nature of the stone.
4. Repeat step 3 on the other side of the wall ensuring the slots are opposite those already cut.
5. Clean out ALL mortar from the slots and dust from the slots and holes and thoroughly flush with water. Where the substrate is very porous or flushing with water is inappropriate, use HeliPrimer WB. Ensure the holes are damp or primed prior to commencing step 9.
6. Mix HeliBond cementitious grout using a power mixer and load into the Helifix Pointing Gun CS.
7. Fit an appropriate mortar nozzle.
8. Insert the HeliBar through the hole, making sure that it is long enough for a minimum of 300mm to be bent at right angles and bedded into the slots on both the inner and outer faces of the wall.
9. Inject a large bead of HeliBond grout, approx. 15mm deep, into the back of the slot on the outer face and tool firmly into the slot.
10. Bend the HeliBar to the required angle and push firmly into the grout to obtain good coverage.



11. Inject a second smaller bead of HeliBond grout over the exposed HeliBar and iron it into the slot using a finger trowel. Inject additional HeliBond grout as necessary, leaving 10-15mm for new pointing.
12. Point up the remaining slot with a suitable matching mortar and make good the crack using an appropriate Helifix bonding agent depending on the width of the crack.
13. Repeat steps 9 to 12 on the inner wall.
14. Clean tools with clean, fresh water.

N.B. Pointing may be carried out as soon as is convenient after the HeliBond has started to gel.

RECOMMENDED TOOLING

- **For cutting slots up to 40mm deep**
Twin bladed cutter with vacuum attachment
- **For drilling**
SDS rotary hammer drill 650/700W
- **For mixing HeliBond**
3-jaw-chuck drill with mixing paddle
- **For insertion of the CemTies**
Helifix Pointing Gun Kit HD with pinning nozzle
- **For smoothing pointing**
Standard finger trowel

Specification Notes

The following criteria are to be used unless specified otherwise:

- A.** Depth of slot into the masonry to be 35-40mm + the thickness of any render.
- B.** Height of slot to be equal to full mortar joint height, with a minimum of 8mm. For thin mortar joint specifications refer to the Helifix Technical Dept.
- C.** Bars to be installed at 450mm vertical x 450mm horizontal centres in a staggered pattern.
- D.** In hot conditions ensure the masonry is well wetted or primed to prevent premature curing of the HeliBond due to rapid de-watering. Ideally additional wetting of the holes and slots should be carried out just prior to inserting the CemTies and HeliBar.
- E.** Do not use HeliBond when the air temperature is +4°C and falling or apply over ice. In all instances the holes and slots must be thoroughly damp or primed with HeliPrimer WB prior to injection of the HeliBond grout.

The above specification notes are for general guidance only and Helifix reserves the right to amend details/notes as necessary.

GENERAL NOTES

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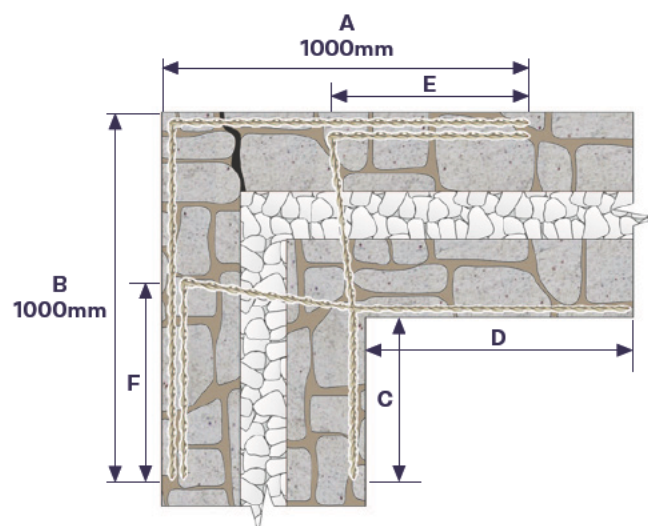
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Reconnecting a Cracked Corner in a Rubble-Filled Wall using HeliBars

METHOD STATEMENT

1. Using a twin-bladed, diamond-tipped wall chaser and vacuum attachment, cut slots into the horizontal mortar joints on the outer face at positions A & B and on the internal face at positions C & D, to the specified depth and at the required vertical spacing. **NOTE:** Internal slots must be vertically staggered with external slots.
2. Ensure that **NO** mortar is left attached to the exposed stone surfaces in order to provide a good masonry/grout bond. This operation may require the use of hand tools to remove the mortar due to the random nature of the stone.
3. At the end of the slot on the internal wall closest to the corner, drill a 12mm hole through the wall into the same height mortar joint on the outer face.
4. Repeat steps 1 & 2 to the mortar joints E & F on the outer face to which the holes have been drilled.
5. Remove **ALL** dust and mortar from the slots and thoroughly flush with water. Where the substrate is very porous or flushing with water is inappropriate, use HeliPrimer WB. Ensure the slot is damp or primed prior to commencing step 8.
6. Mix HeliBond cementitious grout using a power mixer and load into the Helifix Pointing Gun CS.
7. Fit an appropriate mortar nozzle.
8. Insert HeliBars into all four slots. Where relevant, feed the HeliBar through the hole to allow sufficient length to be bent at 90° and be bedded into slots E and F.
9. Inject a bead of HeliBond grout, approx. 15mm deep, into the back of the slot.
10. Bend the HeliBar to the required angle and push firmly into the grout to obtain good coverage.
11. Inject a second bead of HeliBond grout over the exposed HeliBar and iron it into the slot using a finger trowel. Inject additional HeliBond grout as necessary, leaving 10-15mm for new pointing.



12. Point up the remaining slot with a suitable matching mortar and make good the crack using an appropriate Helifix bonding agent depending on the width of the crack.
13. Clean tools with clean, fresh water.

N.B. Pointing may be carried out as soon as is convenient after the HeliBond has started to gel.

RECOMMENDED TOOLING

- **For cutting slots up to 40mm deep**
Twin bladed cutter with vacuum attachment
- **For drilling**
SDS rotary hammer drill 650/700W
- **For mixing HeliBond**
3-jaw-chuck drill with mixing paddle
- **For injection of HeliBond into slots**
Helifix Pointing Gun CS with mortar nozzle
- **For smoothing pointing**
Standard finger trowel

Specification Notes

The following criteria are to be used unless specified otherwise:

- A.** Depth of slot into the masonry to be 35-40mm + the thickness of any render.
- B.** Height of slot to be equal to full mortar joint height, with a minimum of 8mm. For thin mortar joint specifications refer to the Helifix Technical Dept.
- C.** Internal HeliBars to be drilled through adjoining wall, bent and returned in external bed joints to a minimum of 1000mm beyond crack or apex of corner. External bars to extend a minimum of 1000mm beyond crack or apex of corner.
- D.** All 3 HeliBars to be installed at every 450mm vertical centre.
- E.** In hot conditions ensure the masonry is well wetted or primed to prevent premature drying of the HeliBond due to rapid de-watering. Ideally additional wetting of the slot, or priming with HeliPrimer WB, should be carried out just prior to injecting the HeliBond grout.
- F.** Do not use HeliBond when the air temperature is +4°C and falling or apply over ice. In all instances the slot must be thoroughly damp or primed prior to injection of the HeliBond grout.

The above specification notes are for general guidance only and Helifix reserves the right to amend details/notes as necessary.

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Reconnecting a Cracked Internal/Party Wall to an External Stone Wall using CemTies

METHOD STATEMENT

1. Mark positions for holes on the outer face of the wall.
2. Drill a 16mm clearance hole through the outer wall and to the required depth.
3. Clean out ALL dust from the hole and thoroughly flush with water. Where the substrate is very porous or flushing with water is inappropriate, use HeliPrimer WB. Ensure the hole is damp or primed prior to commencing step 8.
4. Attach the required length of CemTie pinning nozzle to the gun.
5. Mix HeliBond cementitious grout using a power mixer and load into the Helifix Pointing Gun HD.
6. Pump grout to fill the nozzle.
7. Wind the CemTie into the nozzle and ensure that it is fully covered in grout.
8. Insert the nozzle to the bottom of the drilled hole and pump the grout until the CemTie is fully embedded.
9. Make good all holes at the surface with matching mortar and stone dust. The crack within the wall should be weather-proofed using an appropriate Helifix bonding agent e.g. HeliBond or CrackBond, depending on the width of the crack and the surface made good or left ready for any decoration.
10. Clean tools with clean, fresh water.

N.B. If diamond core drilling is used, the internal surface of the hole must be roughened to ensure a good bond.



RECOMMENDED TOOLING

- **For drilling**
SDS rotary hammer drill 650/700W
or diamond core drill
- **For mixing HeliBond**
3-jaw-chuck drill with mixing paddle
- **For insertion of the CemTies**
Helifix Pointing Gun HD with pinning nozzle

Specification Notes

The following criteria are to be used unless specified otherwise:

- A. CemTies are to be installed at a vertical spacing of 450mm.
- B. CemTies are to extend at least 500mm past the crack.
- C. Depth of hole to be CemTie length +25mm.

Continued...

- D.** CemTies are to be installed within the centre third of the wall.
- E.** Ensure the CemTies are installed into solid stone and not the mortar joints or loose rubble within the wall.
- F.** In hot conditions ensure the masonry is well wetted or primed to prevent premature curing of the HeliBond due to rapid de-watering. Ideally additional wetting of the hole should be carried out just prior to inserting the CemTie.
- G.** Do not use HeliBond when the air temperature is +4°C and falling or apply over ice. In all instances the hole must be thoroughly damp or primed with HeliPrimer WB prior to injection of the HeliBond grout.

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