

M3 – Footway Paving

Concrete Paving / Artificial Stone	1	Amendments:
Special Requirements	2	
Natural Stone	3	
Special Requirements	4	
Natural Stone Finishes	5	
Historic Paving	6	
Specification for Repairs	7	
Corner Details	8	
Inspection Cover Details	9	
Edges	10	

Concrete Paving/Artificial Stone

The types of paving flags used in Edinburgh include precast concrete units and various styles of artificial stone. The layout and pointing of concrete paving is very important to achieve a good quality, long lasting finish.

Where to lay concrete paving

Extensive new areas of paving across retail, service sector and residential street types.



The City of Edinburgh Council

Design considerations

- Larger slabs help maintain a smooth surface.
- Maximum dimensions 900 x 600 x 65mm.
- Minimum recommended paving dimensions for footways: 300x 450 x 65mm. Smaller module paving such as block paving should generally be avoided for footways. Continuous footway crossing points should utilise fibre reinforced paving flags.
- There are some situations where smaller unit flags are beneficial (e.g. for continuous footway treatments and pub frontages etc.). Otherwise they should generally be used sparingly as edging details or small areas of demarcation.
- Paving flags should be laid in a staggered bond arrangement to strengthen the stability of the paving course.
- Loading should be considered when designing joints, edging and sub-structure.
- Where vehicular overrun is likely, strengthened footways should be used to protect the paving, or measures should be taken to stop overrun, e.g. bollards or increased kerb height.
- Do not use chamfered edge paving. This will help to avoid trip hazards.
- Careful detailing is needed for the interface with inspection covers

Large flags in a neutral colour help to reduce visual clutter and create an even surface for pedestrians.



© Paving Expert, 2017

Small pavers increase clutter and can create an uneven surface for walking on.



GoogleMaps, Hawthornbank Lane 2016

Relevant Factsheets:

Corner Details (M3)

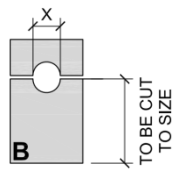
Inspection Cover Details (M3)

Special Requirements

Joint detail

- Joints shall be filled to refusal with semi dry mortar, coloured to approval, and key pointed
- Joints between flags to be 5-10mm (\pm 1mm)
- Excess mortar and sand should be thoroughly cleaned from flags
- Flags which are laid against curving edges and kerbs shall be cut to fit the radius, with joints not exceeding 7mm
- The use of mortar to infill gaps will not be permitted. Flags must abut all surfaces, utility features and other street furniture with these joints not exceeding 7mm
- Posts shall pass through core drilled flags to ensure good fitting

Post Detail: X = 60mm – 230mm



Marshal, 2017



Flag cutting: curves

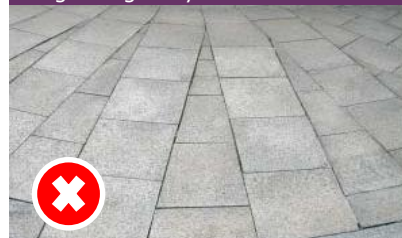
- On circular/curving areas flags to be radially cut on both edges to suit the proposed radius
- Flags to be cut using a 2:1 maximum ratio in plan to the following tapering changes: width varying, length 600mm with a 300mm taper, length 900mm with a 450mm taper.
- Tapering sections of flags must be kept to a minimum, avoiding slivers of paving

Advised Tapering Style



Rock Unique, 2017

Tapering only some sections of flags irregularly is not advised.



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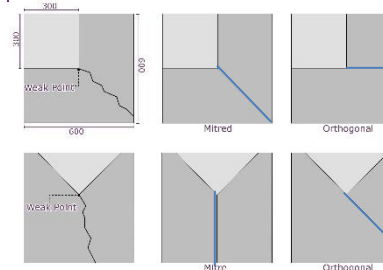
Relevant Factsheets:

Corner Details (M3)

Flag cutting: notches

- When notching >25% of a flag's area, either mitre or orthogonally cut to best match surrounding paving design, or ensure cut flag is sufficiently bedded on concrete to avoid fracture;

Flag Weakness & Notching Styles



Atkins, 2017

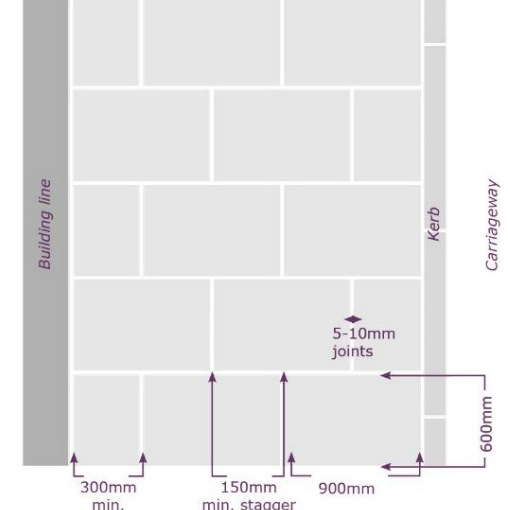
- Generally, mitred and diagonal cuts should be avoided/minimised;
- Residual slab lengths of less than 150mm should be avoided.

Laying detail

- Completed panels to be protected from the elements for no less than three days
- Flags are not to be laid if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer

Paving patterns

Paving units laid in a regular transverse stretcher bond at 90 degrees to the kerb.



Atkins, 2017

British standards

Precast concrete flags shall be:

- hydraulically pressed, complying with BS EN 1339:2003
- laid in accordance with BS 7533-4:2006
- designed in accordance with BS 7533-12:2006

Inspection Cover Details (M3)

Natural Stone

Common natural stone pavers in Edinburgh are Sandstone, Caithness, and Granite. In general natural stone is extremely durable but can deteriorate if the wrong type is specified for the conditions and usage.

Where to lay natural paving

- Suitable for areas of civic importance or conservation areas.
- Commonly used in new retail developments.
- Sandstone paving should be used within the New Town for historic continuity.
- Caithness, granite and whinstone kerbing are appropriate materials for use within the old town.
- See table: 'Recommended footway materials for street types' Factsheet for further detail.

Design considerations:

- Small module paving (i.e. less than 450-600mm) should generally be avoided for footways. Larger unit paving (300x450mm) should be the smallest unit used.
- Loading should be considered when designing joints, edges and structure.
- Where vehicular overrun is likely, the height of kerbs should be increased to protect the paving.
- Specify hard trimmed edges.
- Surrounding context will determine the paving finish.
- Careful detailing needed for interface with inspection covers (see relevant factsheet)
- If laid in an approved course, it should never have 4 corners meeting and joints should have a minimum spacing of 3m.
- In some cases laying in a random paving pattern may be appropriate.

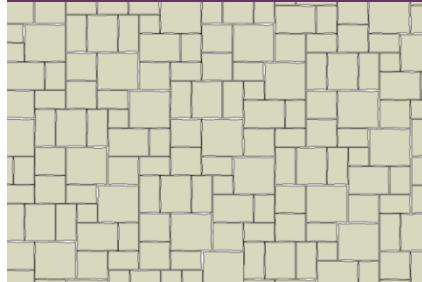
Relevant Factsheets:

Corner Details (M3)

Inspection Cover Details (M3)

Recommended footway materials for street types (M1)

Random Layout Paving Pattern



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Natural stone type considerations:

The characteristics of the stone, especially compressive strength and water absorption, must first be established before specifications are finalised.

British standards

All natural stone paving to

- comply with BS EN 1341:2001
- laid in accordance with BS 7533-4:2006
- designed in accordance with BS 7533-12:2006

Sandstone paving: High St Edinburgh



The City of Edinburgh Council

Granite Setts: George Street, Edinburgh



Edinburgh World Heritage, 2004

Caithness Stone flags: Royal Mile, Edinburgh



External Works

Special Requirements

Road Construction Consent (RCC) – maintenance issues

The City of Edinburgh Council request that an additional 1 - 5% of natural stone materials be ordered for maintenance purposes. This percentage will depend on the size of the proposed development and will be negotiated at the road construction consent stage.

The delivery of these materials will be made to the Council at the end of the development. The materials will be delivered to a Council depot and will be fully palletised. A goods return slip will be obtained from the RCC inspector with 7 days notice being given, to enable the operators of the depot to prepare for the delivery. The costs to pallet and deliver the materials will be at the developer's expense with no costs attributed to the Council.

Joint detail

- Joints shall be filled to refusal with semi dry mortar, coloured to approval and key pointed
- Joints to be 5-10mm (\pm 1mm)
- Excess mortar and sand should be thoroughly cleaned from flags
- Flags which are laid against curving edges and kerbs shall be cut to fit the radius, with joints not exceeding 7mm
- The use of mortar to infill gaps will not be permitted. Flags must abut all surfaces, utility features and other street furniture with joints not exceeding 7mm
- Posts to pass through core drilled pavers to ensure good fitting

Flag cutting

- On circular/curving areas flags to be radially cut on both edges to suit the proposed radius
- Flags to be cut using a 2:1 maximum ratio in plan to the following tapering changes: width varying, length 600mm with a 300mm taper, length 900mm with a 450mm taper.
- Tapering sections of flags must be kept to a minimum, avoiding slivers of paving
- When notching >25% of a flag's area, either mitre or orthogonally cut to best match surrounding paving design or ensure cut flag is sufficiently bedded on concrete to avoid fracture
- Generally, mitred and diagonal cuts to be avoided/minimised
- Residual slab lengths of less than 150mm should be avoided

Laying detail

- Completed panels to be protected from the elements for not less than three days;
- Flags are not to be laid if the temperature is below 3°C on a falling thermometer or below 1°C on a rising thermometer.

Bollards in paving integration, installation is good however bollards may not be appropriate at this location



The City of Edinburgh Council

Relevant Factsheets:

Corner Details (M3)

Inspection Cover Details (M3)

Minimising Street Clutter (P7)

Natural Stone Finishes

	Finish Type	Advantages	Disadvantages
	Cropped	<ul style="list-style-type: none"> • Good slip resistance 	<ul style="list-style-type: none"> • Uncomfortable to walk on
	Fair Picked	<ul style="list-style-type: none"> • Smooth surface 	<ul style="list-style-type: none"> • Can wear down to polish
	Bush Hammered	<ul style="list-style-type: none"> • Good skid/slip resistance 	<ul style="list-style-type: none"> • Difficult to clean
	Flame Textured	<ul style="list-style-type: none"> • Good for pedestrian use • Easy to clean 	<ul style="list-style-type: none"> • Discolours some stones
	Polished	<ul style="list-style-type: none"> • Contemporary aesthetic 	<ul style="list-style-type: none"> • Poor slip resistance
	Sawn	<ul style="list-style-type: none"> • Best long-term skid/slip resistance • Good for pedestrian use • Easy to clean 	
	Chiselled	<ul style="list-style-type: none"> • Good slip resistance 	

Natural stone finishes with poor slip resistance should not be used for new or replacement outdoor paving.

Historic Paving

The majority of the original paving in Edinburgh is natural sandstone flags or features and whinstone honouring.

Protecting historic paving

In order to protect remaining areas of natural stone paving they need to be clearly identified to everyone involved in commissioning, specifying and authorizing before undertaking works.

There should be a presumption in favour of retaining and repairing areas of historic paving.

Materials for repairs

The closest currently-available match for Hailes/Central Belt sandstone is Scout Moor sandstone produced in Lancashire. Before specifying sandstone the consistency of the product should be confirmed with samples.

In some situations it may be suitable to make small scale repairs using stockpiled original sandstone slabs. These resources are scarce and their use should be agreed with Planning.

Repair of surviving historic stone paving will be required using appropriate traditional materials and detailing. Where new natural stone paving work is proposed it should respect the existing palette of traditional materials and where possible be based on site-specific research into the original materials, dimensions, tooling, bedding and other details.

Relevant Factsheets:

Footway Materials and Surfacing (M1)

Principles for undertaking repairs

- Repairs should match the original as closely as possible in terms of type, size, colour, density and tooling.
- Repairs to paving must be undertaken in accordance with the specification below. Note that **the use of Portland cement should be avoided.**
- Depending on the context, where fragmentary or very small areas (<5M2) of historic paving survive, it may be appropriate to consolidate them into larger groupings with CEC approval.
- Where individual paving stones are broken and need to be replaced, the replacement material should match the original.

For further details on repair principles and specifications see: "Paving the Way" (2008).

Note that this is not a public document and will only be released at the discretion of the City of Edinburgh Council upon request.

Charlotte Square Sandstone Paving



The City of Edinburgh Council "Paving the Way"
Image: N. Haynes

Setted Streets (M6)

Natural Stone (M3)

Specification for Repairs

When undertaking work to original paving, one must get specialist advice from a suitable qualified architect/ stone consultant and from lime mortar specialists.

Method of working

- Compile a pre-work photographic record and submit to the Council's Conservation team
- Number all existing flags to be lifted with chalk/biodegradable spray.
- Prepare a drawing of existing paving layout and mark with numbers (to prevent unnecessary cutting when relaying)
- Lift all paving flags and lay aside under a protective cover until required
- Retain and lay aside kerb stones as required
- Kerbs with badly broken or chipped ends to be trimmed square
- Stones less than 400mm long to be discarded

- Lay kerbs to radius and levels on a normal concrete base with lime mortar bedding
- Second hand sandstone (using a matching stone type) to be used to replace excessively damaged flags, as directed
- Prepare base for slabs and lay according to the pointing and concrete specifications below
- Point joints in kerbs and flags with mortar noted below
- Ensure all work is covered / protected from frost, sun, wind or rain during the initial setting time

Bedding and sub-base under stone paving

Stone slabs should be laid onto a suitable engineer designed concrete slab.

Stone slabs can be laid on a bed of mortar 25-30mm (earth damp) about 7 days after the concrete is placed, depending upon the weather conditions, consisting of 2 parts Hourdex to 5 parts well graded, sharp sand such as Gowrie Concrete Sand.

Mixing of the Hourdex and sharp sand should be kept to a minimum of 1 hour board time before placing.

Hourdex is relatively fast setting and if the work is laid in bays of concrete a day joint should be formed. Curing would be as for any concrete – regularly lightly watered for the first couple of days then intermittently for at least a week.

The area should be protected from traffic for the first 28 days. Foot traffic should be acceptable after 48 hours.

The sub base should be free-draining, clean, screened 50-75mm stone, well compacted (150mm) with a geo-textile membrane to prevent rapid loss of water from the concrete.

Pointing to flags and kerbs

To be 1:2 lime / sand. Lime to be St Astier NHL5 or similar. Sand to be well graded sharp quarried concrete sand.

Corner Details

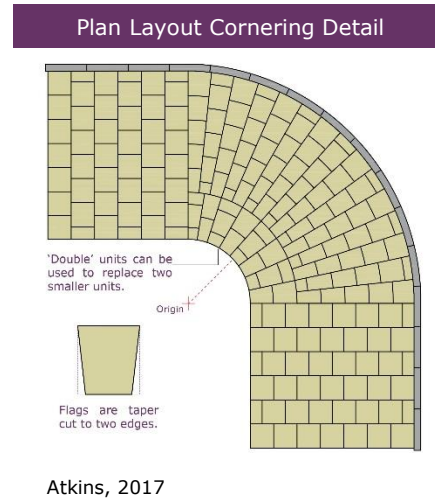
Natural stone footway Paved corner detail

When using natural stone on corner details (radius <10m and a rotation of 45 degrees or more), use fan radius layouts (also known as 'splayed radius' and 'spoked radius').

Continue the laying pattern with staggered or random joints to match adjacent paving.

Pavers to have a double taper with two cut edges. No unit to breach the 2:1 maximum plan ratio, with double pieces used to replace two single pieces if plan sizes are too small.

Where the origin of the radius is paved, a single "Cap Stone" should be used, to avoid small tapering flagstones. When the radius is >90°, two or more cap stones may be used.

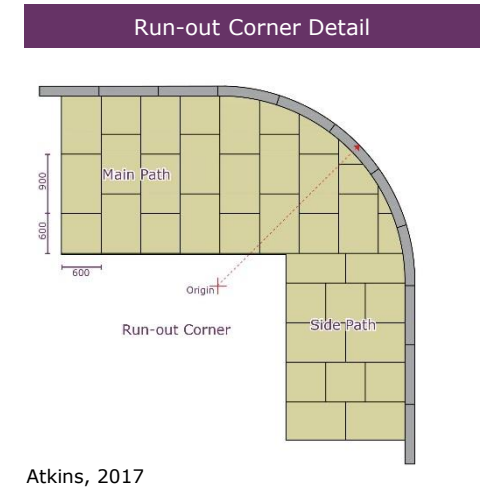


Concrete paving/ artificial stone Paved corner detail

For concrete/artificial stone footways, a run-out corner detail should be used as the junction of two flagged pavements. The main path should be "run out" to intercept the kerb line and cut to suit, while the subsidiary path should be cut to abut the rear edge of the main path.

If it is not apparent which of the two paths is the main footway, follow this hierarchy:

- The main path will be:
- the path that runs alongside the major carriageway, or
 - the path that carries most pedestrian traffic, or
 - the path that is wider.

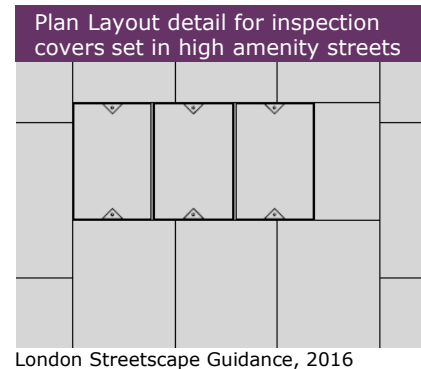


Relevant Factsheets:
Natural Stone (M3)

Concrete Paving/Artificial Stone (M3)

Inspection Cover details

- Recessed inspection covers should be provided on high amenity value streets
- Agreement must be obtained from the owner of that manhole cover, chamber cover or surface box before changing it to any other design.
- Inspection covers should not be used unless agreement is gained from the owner prior to changing it.
- All covers must also have the owners mark on it. E.G. SW, SGN BT etc to identify who it belongs to. Off the shelf items may not be acceptable.
- Replace any obsolete service covers
- Covers to be laid flush with ground material
- Covers and frames to be of a suitable strength rating in accordance with BS EN124
- Flags arranged around manholes to have joints not exceeding 7mm
- When notching 25% of a flag's area, either mitre or orthogonally cut to best match surrounding paving design, or ensure cut flag is sufficiently bedded on concrete to avoid fracture (see image right-centre).



Relevant Factsheets:
Natural Stone (M3)

Concrete Paving /Artificial Stone (M3)

Edges

Detailing of edges, insertions and level changes within paving should be resolved before construction.

Design teams must consider how a scheme terminates, where edges are located and how to best tie-in with adjoining street materials.

All flexibly laid footways, and asphalt, must have a suitably robust edge restraint detail to prevent the footway moving or crumbling at the edges.

Pavement failure due to insufficient edge structure



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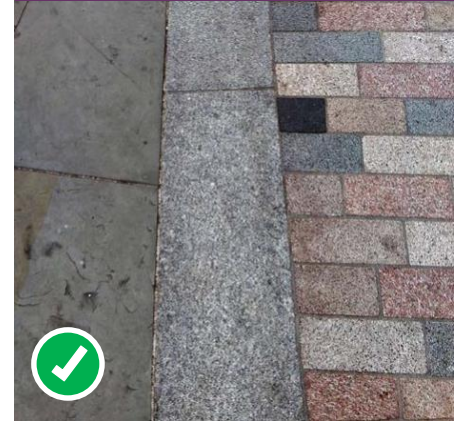
Edge treatments should:

- Be detailed to provide a smooth transition between new and old materials, with appropriate edge restraints as required, ensuring alignment resilience.
- Where possible, materials should terminate at a point which responds to the surrounding built character, for example, where a building frontage ends, or is aligned to a prominent feature such as a wall or street tree.
- Aim to avoid making a transition across an inspection cover as this will require additional work in cutting surface materials and result in the creation of small fragments of paving.
- Be free at edges (i.e. Not restrained by fixed features such as buildings, kerbs etc.). The edge must be capable of withstanding the lateral pressures exerted by the pavement and its traffic.
- Be designed in collaboration with drainage details as appropriate.

Edges for concrete paving, artificial stone and asphalt footways can utilise 50mm x 150mm hydraulically pressed flat top concrete edging (set flush) to BS EN 1340:2003, installed on a 200mm x 100mm ST4 concrete foundation, haunched on both sides.

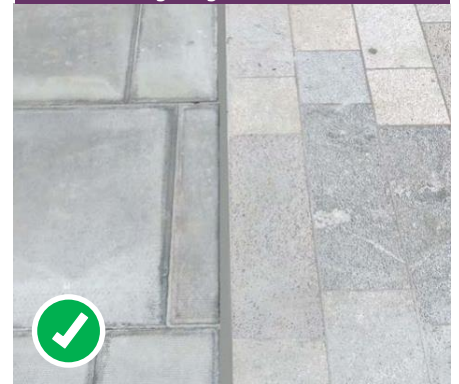
Edges for natural stone footways should be sympathetic to the adjoining paving materials, i.e. natural stone flush kerbs or a soldier course of setts as appropriate.

Yorkstone transitioning to granite setts with a flush granite kerb acting as a border



London Streetscape Guidance, 2016

900x600mm concrete slabs transitioning to granite



London Streetscape Guidance, 2016

Image References

Concrete Paving/Artificial Stone

Transverse stretcher bond using rectangular flags: The City of Edinburgh Council

Large Flag: Paving expert [ONLINE]. Available at: http://www.pavingexpert.com/flag_patterns_01.htm

Small Pavers: Google Maps (2016) [ONLINE]. Available at: <https://goo.gl/hXzScx>

Special Requirements

Post detail: Marshalls [ONLINE]. Available at:

<http://www.marshalls.co.uk/commercial/paving/products/bollard-surround-unit-webfa044020>

Advised Tapering Style: Rock Unique [ONLINE]. Available at: <http://www.rock-unique.com/natural-stone-for-exterior-use/patio-slabs/beige-sawn-sandblasted-sandstone-paving.html>

Tapering only some sections of flags...: [ONLINE]. Available at: Available at:

http://www.pavingexpert.com/cut_in06.htm

Flag weakness and notching styles: Atkins (2017)

Paving units laid in regular...: Atkins (2016)

Natural Stone

Random layout paving: [ONLINE]. Available at: http://www.pavingexpert.com/flag_patterns_01.htm

Sandstone paving, Edinburgh: The City of Edinburgh Council

Granite Setts, George Street: Setts and the City, Edinburgh World Heritage (2004)

Caithness Stone Flags, Royal Mile: [ONLINE]. Available at:

<http://www.externalworkindex.co.uk/entry/41012/A-and-D-Sutherland/Caithness-Flagstone-paving-for-external-applications/>

Special Requirements

Bollards in paving integration: The City of Edinburgh Council

Historic Paving

Image: The City of Edinburgh Council – “Paving the Way” (2008)

Corner Details

Plan Layout Cornering Detail: Atkins (2017)

Advised Cornering In-Situ: The City of Edinburgh Council

Run Out Corner Detail: Atkins (2017)

Porphyry flagstone run-out corner: Atkins (2017)

Inspection Cover Details

Plan layout detail diagonal inspection covers – avoid small cuts of stone...: London Streetscape Guidance (2016)

Plan layout detail for inspection covers set in high amenity streets: London Streetscape Guidance (2016)

Continue paving orientation and pattern: London Streetscape Guidance (2016)

Notching around inspection cover: [ONLINE]. Available at: http://www.pavingexpert.com/cut_in04.htm

Avoid 'framing' manhole features (left): Road Construction Guidelines for Development, CEC, Chapter 4

Design out small paving cuts and used recessed paved covers where applicable: Atkins (2016)

Where associated with tactile paving...: London Streetscape Guidance (2016)

Avoid framing manhole features (Right): Road Construction Guidelines for Development, CEC, Chapter 4

Edges

Pavement failure due to insufficient edge structure: [ONLINE]. Available at: <http://www.pavingexpert.com/blocks04.htm>

900x600mm concrete slabs transitioning to granite: London Streetscape Guidance (2016)

Yorkstone transitioning to granite setts with a flush granite kerb acting as a border: London Streetscape Guidance (2016)

Index

Subject	Page	Subject	Page
Concrete paving/artificial stone			
British standards	M3.2		
Corner details	M3.8		
Design considerations	M3.1		
Flag cutting	M3.2		
Joint detail	M3.2		
Laying detail	M3.2		
Paving patterns	M3.2		
Edges	M3.10		
Historic paving			
Protection	M3.6		
Repairs	M3.6-7		
Inspection cover details	M3.9		
Natural stone			
British standards	M3.4		
Corner details	M3.8		
Design considerations	M3.3		
Flag cutting	M3.4		
Finishes	M3.5		
Joint detail	M3.4		
Laying detail	M3.4		