

THICK STONE SUPPORT/RESTRAINT

HALFEN Support Brackets HK4 / HMA

Introduction

Traditional construction of natural stone facades has involved the use of stone blocks typically exceeding 50 mm in thickness and course sizes of 215, 440 mm or more. The stones are set free standing so require a load bearing capacity. This method of construction does not require the individual support of each stone, however, restraint at two points on each stone is needed and support at each floor level is usually required once the height of the panel has exceeded 3.7 m.

Types of HALFEN Support

For maximum flexibility HALFEN HK4 or HMA backlegs are coupled with the support angle. The support angle can be designed either as a traditional 15 degree upturned corbel bracket or a 90 degree shelf

angle with restraint dowels. The shelf angle can be supplied in long lengths, generally 1.5 m long, or as individual brackets.

Bracket angle systems are an economical way of providing support in larger cavities with the additional benefit of reduced thermal bridging and providing a positive drip to avoid water ingress.

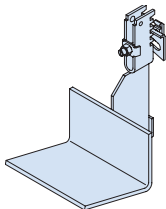
Traditional folded corbel brackets can also be designed and manufactured where smaller cavities preclude the use of a bracketed angle system or where cold bridging is not an issue. The corbel brackets are provided with either a horizontal slot for lateral adjustment or a welded serrated patch for vertical adjustment.

Both systems can be used in conjunction with HALFEN cast-in channel for maximum adjustability or may be post-fixed with drilled bolts or HALFEN HCB Concrete Screws.

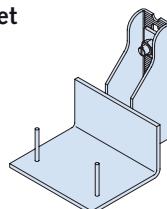
For corbel brackets with a horizontal slot HALFEN recommend the use of a vertically cast HALFEN toothed channel to provide adjustment in all directions. For corbel brackets with a serrated patch HALFEN recommend the use of a horizontally cast HALFEN channel for all round adjustment.

When fixing to a steel frame HALFEN recommend the use of a bracketed angle system or corbel brackets with a vertical serrated patch used in conjunction with horizontal slots in the steelwork.

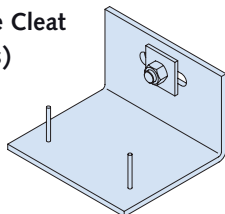
HK4 Bracket



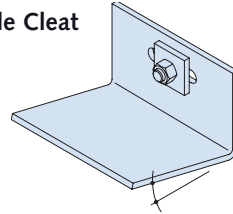
HMA Bracket



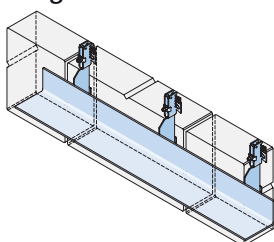
Folded Angle Cleat (with dowels)



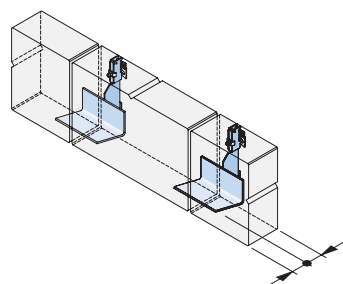
Folded Angle Cleat



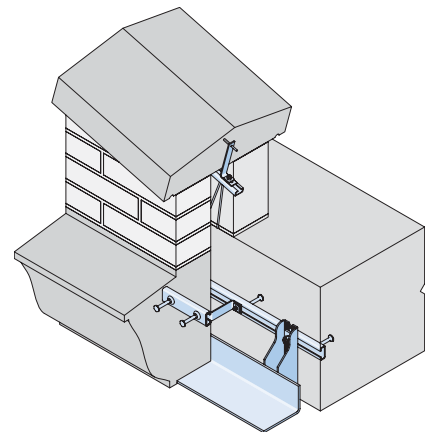
Continuous Angle Typically over Openings



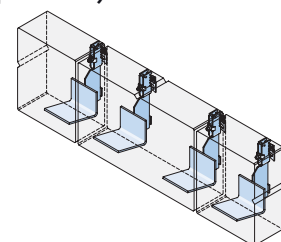
Shared Bracket Cleats



Typical Coping Detail with HMA Support



Individual Bracket Cleats (2 per stone)



THICK STONE SUPPORT

Restraint Ties HTS, HKT, HKZ, UHA

Types of Restraint Tie

In most situations stone requires restraint against lateral loading which may be due to either wind load or overturning loads typically associated with cornices and other projecting features.

HALFEN manufacture a comprehensive range of restraint fixings suitable for all applications covering a wide range of allowable loads.

Design considerations

Any restraint which is not also load bearing should allow vertical movement to ensure that the mass is fully transferred to the support structure. The use of vertical HALFEN channel provides greater adjustment than available in slotted cramps and ensures effective differential movement at restraints. HALFEN produce a range of cast-in channels that are suitable for concrete substrates and a range of surface fixed channels which may also be fixed to steelwork or blockwork. For location and frequency of restraints guidance should be sought from the relevant standards, for example BS8298.

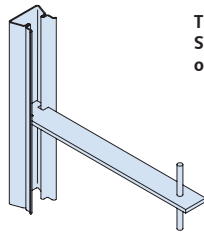


HALFEN stone anchors allowing easy installation of the coping stones.

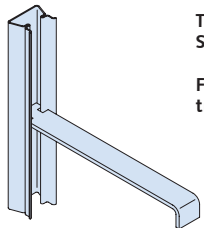
Where necessary HALFEN can design and manufacture unique solutions to meet particular restraint criteria.

HTS - Lightweight systems

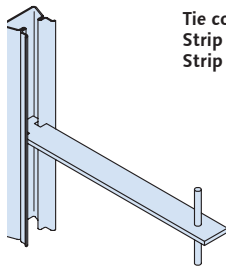
HTS BR channel ties and HTS FR slotted frame cramps are available with restraint dowels or bent to locate into a groove in the stone. HALFEN UHA grout-in anchors may also be suitable for this application.



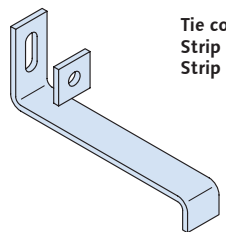
Tie code HTS BR 9D
Strip size 19 x 3 mm
one or two way dowel



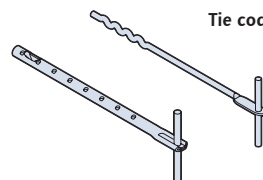
Tie code HTS BR 5
Strip size 19 x 3 mm
Fix using SEB · 8
trough plate washer



Tie code HTS FR 9D
Strip size 19 x 3 mm
Strip size 30 x 3 or 4 mm



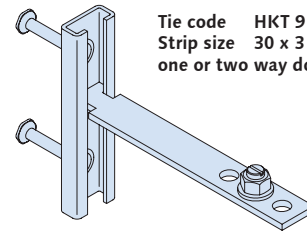
Tie code HTS FR 5
Strip size 19 x 3 mm
Strip size 30 x 3 or 4 mm



Tie code UHA

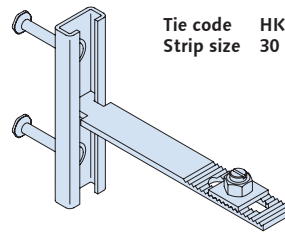
HKT - Medium duty systems

HKT systems use 38/17 cast-in channel with keyed head ties. Ties can be resin fixed to the stone. Typically used to restrain projecting stone features.



Tie code HKT 9 (pre-drilled)
Strip size 30 x 3 or 4 mm
one or two way dowel

- Tie bolted to precast unit, using Cast-in channel and T-head bolt or site drilled resin anchor.

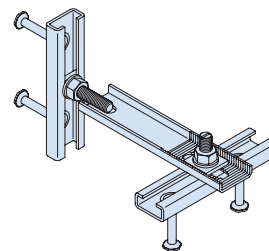


Tie code HKT Z toothed tie
Strip size 30 x 4 or 6 mm

- Tie bolted to precast unit, using Cast-in channel and T-head bolt or site drilled resin anchor.

HKZ GU - Heavy duty systems

HKZ GU - Heavy Duty Systems. HKZ GU Systems are designed to meet high load requirements.



- Tie fixed to vertical channel
- Channel cast-in to precast unit typically 40/25 or 49/30
- Channel cast-in to floor slab of structure
- Tie fixed to horizontal channel using T head bolt

All restraint ties and associated components are manufactured from stainless steel grade 304. Grade 316 stainless steel is also available to order.