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Care, Maintenance & Repair of Concrete Roof and Cladding Tiles

A Guide to the Care, Maintenance and Repair
of
concrete tiles used for pitched roofs and walls

**BS 5534 & BS 8000-6
&
HSE - HSG 33 & INDG 284**

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Introduction

This guide was produced jointly by the Concrete Tile Manufacturer's Association and the National Federation of Roofing Contractors, and contains guidance to enable designers, contractors and building owners to identify specific maintenance and repair items that can affect roofs and walls clad with concrete tiles and to implement appropriate design and maintenance measures.

It is acknowledged that all roofs require some level of maintenance during their lifetime, even if it merely involves the removal of wind-blown debris from valleys and gutters.

Sometimes access to a roof is required in order to maintain other building elements e.g windows and chimneys. Consequential damage to the roof or wall cladding can also compromise the integrity of the roof covering, leading to water ingress and loss of safety of the roof element.

Before commencing to replace the roof covering or carry out any structural alterations to the roof, the designer or installer should refer to the current Building Regulations⁽¹⁾ and their requirements.

When correctly installed in accordance with the recommendations of BS 5534⁽²⁾ and BS 8000 – 6⁽³⁾, a completed roof or wall clad with concrete tiles should give trouble-free performance for the guaranteed life of the product without the need for extensive maintenance or repair.

To achieve the full benefits of a roof or wall clad with concrete tiles, there are a number of standard procedures which should be drawn to the attention of the building owner or maintenance operative, when occupying the completed building.

Both roof and wall claddings should be treated as fragile and basic precautions should be taken to avoid access to the roof by window cleaners, chimney sweeps, aerial installers etc, without the correct use of crawling boards, roof ladders or access platforms. Failure to use adequate access equipment can damage the tiles and fixings and may be in contravention of Health and Safety Regulations.

Maintenance

The main objective of regular maintenance involves carrying out regular visual inspections of the roof, usually twice a year, in the Spring and Autumn.

Any leaves and debris should be removed from valleys and gutters and any moss or lichen growths that restrict the flow of water off the roof slope (See section on Mosses and Lichens).

Check the function of any roof space ventilation components and clear any grilles or apertures to ensure adequate air flow into the roof void.

Access Equipment

The Work at Height Regulations^(12.10) require dutyholders to ensure that all work at height is properly planned and organised and those involved in work at height are competent and that the risks from working at height are assessed and appropriate work equipment is selected and used.

The risks from fragile surfaces should be properly assessed and controlled and any equipment used for work at height should be properly inspected and maintained prior to undertaking the work..

Ladders

Ladders should always be secured if possible, and be primarily used for access and only used to do light work of short duration, and then only if it is safe to do so. It is generally safer to use a tower scaffold or MEWP, even for short-term work. Heavy work activity carrying heavy loads should never be carried out from a ladder. When using a ladder ensure that the person on the ladder always has three points of contact, i.e. two legs and a hand.

Ladders can be used for the purposes of inspection of the roof from the eaves or simple maintenance, and should not be rested against the gutter. The top of the ladder should be made secure to the structure using an appropriate clamp or rope and should extend to project not less than 1.07m above the eaves and be fitted with a wall stand off stay to clear the gutter. All ladders should comply with the relevant standards; BS 2037⁽⁴⁾ aluminium; BS 1129⁽⁵⁾ timber.

Where access to the roof slope is required, proprietary roof ladders should be used in conjunction with appropriate working platforms (see below).

Care should be exercised when working near metal or open valleys so as not to damage the side coverings. GRP prefabricated valley trough units are vulnerable to breakage and should not be eased or levered or used for foot traffic.

All roofs clad with concrete tiles and slates should be treated as fragile, and extra care must be taken if it is necessary to traffic them. Suitable packing material should always be provided between roof ladders and the actual covering material to prevent breakage, e.g. foam rubber.

It is not advisable to traffic roofs clad with proprietary lightweight resin bonded tiles or slates, which may require special protection against damage. It is recommended that the manufacturer is consulted for guidance before gaining access to a roof clad with such products.

Safety Hooks

Safety hooks are proprietary devices which are fixed directly to the roof or building structure and to which safety ropes or harnesses are attached by roofing or maintenance

contractors. Such products are subject to Health & Safety legislation and should comply with BS EN 517 ⁽⁶⁾

Roof Walkways

Proprietary devices which are fixed to the roof structure or as part of the concrete tile product may be used for access in order to stand or walk during inspection, maintenance or repairs to elements or parts of the building structure which penetrate the roof covering. These devices may be required by Health & Safety legislation and should comply with BS EN 516 ⁽⁷⁾.

Working Platform

Where small areas of roofs are to be accessed for repair or maintenance, a working platform or mobile access platform may be required at eaves level. Mobile access platforms are only permitted in these circumstances. All mobile elevated work platforms (MEWP) should be constructed to the requirements of BS 7981 ⁽⁸⁾ (power operated) or BS 1139-3 ⁽⁹⁾ and BS 1139-5 ⁽¹⁰⁾ (mobile working towers). The use of a mobile elevated work platforms (MEWP), ladders or towers to access the roof requires special considerations.

Scaffold

If roofs are to be extensively repaired or re-roofed, a working platform in the form of an independent tied scaffold conforming to BS EN 12811-1 ⁽¹¹⁾ should be constructed. A suitable guard rail or barrier must be provided at the edges of the roof (eaves, verges) where scaffold is not provided, and should be constructed in accordance with this Standard.

Ensure that all roof inspections and roofing works are carried out by competent persons in accordance with Health and Safety Regulations ⁽¹²⁾.

REPAIRS

All repairs, re-covering and maintenance of tiled roofs and walls should conform to :

- a) Current Building & Health & Safety Regulations ^(1&12)
- b) British Standards - BS 5534 ⁽²⁾ and BS 8000 - 6 ⁽³⁾

Depending on the size of the repair or area of roof to be inspected, access to the roof can either be temporary or permanent.

Broken or defective tiles should be replaced with a sound matching unit and not covered over superficially with any other material or coating. If extensive repairs are required, sectional or complete recovering should be considered. Proprietary surface coatings applied to weatherproof the complete roof externally or internally, are not recommended.

Ridge and Hip Fittings should be replaced individually and re-fixed using recommended materials/fixings where required (see BS 5534 ⁽²⁾, BS 8000-6 ⁽³⁾ and manufacturer's literature).

REPAIR PROCEDURES

Underlay

Repair any tears, holes or cuts in the underlay by cutting a slit above the hole and placing a sizeable piece of material large enough to fit under and lap onto the underlay around the hole by at least 150mm. Secure under the battens or fix to the adjacent rafters using felt nails.

Battens

Defective battens should be replaced for a minimum of two rafter spacings to ensure adequate fixing. Always cut back to the centre of the rafter and nail the end. Never allow battens to be unsupported. Ensure replacement battens are fully graded and comply with the requirements of BS 5534⁽²⁾

Plain Tiles

A damaged tile can be removed by raising up the neighbouring tiles with a timber wedge, and sliding the tile out with the nibs clearing the top of the batten. Any nails should be removed and disposed of safely.

The replacement tile can be inserted back into position using the same technique in reverse. A dab of mastic can be placed on the underside, to prevent movement. Some manufacturers may also provide proprietary fixings for replacement tiles.

Interlocking Tiles

A damaged tile can be removed by first easing it up slightly, so that the tile can be slid out with the nibs clearing the top of the batten. Timber wedges and a flat trowel will facilitate this procedure. If the damaged tile is nailed, then the neighbouring tiles should be lifted to expose the nail(s), which should be extracted carefully and disposed of safely. The replacement tile can be inserted using the same procedure in reverse.

Isolated replacement tiles which require fixing should be secured to adjacent tiles (mechanically fixed with either nails or clips) by the use of an epoxy resin adhesive applied to the interlock/overlock and headlap area. Care should be taken to ensure that the anti-capillary bars are not bridged and interlocks are kept clear to allow water drainage.

The tile manufacturer should be contacted to check the suitability of any selected adhesive for its intended use.

A less aesthetic solution is to drill the left hand bottom corner of the replacement tile in a position which aligns with the nail hole of the tile below. A suitable stainless steel drive screw with sealing washer can be used to secure the tail of the tile to the batten.

If all the damaged tiles are clipped, it may be necessary to strip back the roof to the nearest verge or valley/hip in order to re-clip the replacement tiles.

Fittings

Ridge and Hip tiles can be replaced individually and re-bedded and fixed with new mortar and/or mechanically fixed where required. Ensure the correct mix is used (typically 3 : 1 sand/cement) complying with BS 5534⁽²⁾ and that all fittings are pre-wetted prior to laying. Mechanically fix all ridge/hip tiles for a distance of 900mm from the face of rigid masonry supports (gables), abutments or separating walls using manufacturer's recommended fixings. When re-fixing existing ridge and hip tiles, ensure that all tile surfaces are clean and old mortar is fully removed. If this cannot be achieved, then new matching replacement ridge or hip tiles should be obtained.

Valley tile replacement may necessitate stripping out adjacent tiles in order to replace existing valley tiles or trough valley units. Ensure any replacement tiles adjacent to the valley are re-fixed by clips and/or nails or re-bedded in mortar in accordance with BS 8000-6⁽³⁾.

Ridge, Hip, Valley and Verge components can also be re-fixed using 'Dry Fix' Systems, which avoid the use of mortar and provide mechanical fixing. Details of proprietary dry fix systems are available from the tile manufacturer.

ROOF TILE SECURITY

Tile 'chatter' in high winds is an unavoidable phenomenon associated with most roofing tiles. The sound, which can be heard within the building, is caused by the tails of the tiles or slates being lifted and then dropped by the wind forces.

Unfortunately the problem is often highlighted in roof designs where there is living accommodation in the roof space. Forms of roof construction can amplify the sound created by the movement of the tiles/slates where the ceiling is fixed directly to the rafters.

Single lap tiles can be particularly prone to chatter in high winds because the tails of the tiles are more vulnerable. These tiles only overlap each other by, for example, 75mm, leaving the remaining surface exposed. The use of tile clips may help to minimise the affect of chatter, although it should be remembered that clips are principally designed to prevent the tiles from being dislodged in high winds and are not intended as a cure for tile chatter.

Double lapped tiles and slates are less prone to chattering in high winds because they overlap each other by over half their length, although movement can still sometimes occur, particularly if the nails have not been driven home sufficiently.

Sometimes the problem is restricted to a small area of roof. Natural or artificial features nearby, or a roof feature such as a chimney or dormer windows, can affect wind speed or create turbulence causing uplift in a particular roof area. If such a localised area can be identified then it may be possible to secure the tails just in these areas using clips (for single-lap tiles).

The use of a suitable epoxy resin adhesive can also be considered, although care should be taken to ensure that the surfaces to be bonded are suitably prepared to ensure a firm surface adhesion. Adhesive should not block interlocks and anti-capillary channels etc and compromise the tiles' ability to shed water.

In extreme circumstances it may be necessary to drill through the tail of the tile and then fix into the batten of the course below using stainless steel screws or ring shank nails and sealing washers. If this course of action is proposed, then specific advice should be obtained from the manufacturer.

MAINTENANCE ITEMS

Efflorescence

Efflorescence is a general term used in the construction industry, to describe the white deposits found on building materials such as concrete roof tiles, paving blocks, clay bricks, calcium silicate bricks, mortar, concrete etc.

The term efflorescence covers a number of different phenomena and different forms of efflorescence can occur on concrete products as a result. With concrete roof tiles, subtly different reaction mechanisms at various stages of the production process and lifespan of the products can give rise to the formation of calcium carbonate, which appears on the surface of the tiles as a white 'bloom'.

Efflorescence as found on concrete roof tiles is often categorised as 'lime bloom', which is a deposit apparent either in the form of white patches or as a more general lightening in colour. When the latter effect is seen, it is often misinterpreted as a fading or 'washing out' of the colour of the concrete.

Efflorescence forms more readily when the concrete tile becomes wet and dries slowly and therefore there are more occurrences during the winter. It is also generally only likely to occur in the early life of concrete roof tiles and materials installed for a year or more without experiencing lime bloom, are unlikely to be affected in the future.

Perhaps the most important factor for the specifier, builder and property owner is that the natural weathering process gradually removes efflorescence on concrete tiles. This natural removal restores the original colour of the product and in no way affects the product's impermeability, or continuing strength growth with age.

Efflorescence may sound like a complicated chemical phenomenon, but in reality, it is merely a superficial characteristic feature of quality concrete roofing products.

MOSSES & LICHENS ON CONCRETE TILED ROOFS

The principal cause of the growth of mosses and lichens on tiled roofs is due to their rough surface that filters dirt out of rainwater. Decaying matter in the form of dead leaves which fall on to the roof, also tend to lodge on the surface. Spores and seeds of

mosses and lichens are also blown on to the roof, or get carried there by the feet of birds, and sooner or later take root in the dirt and begin to grow. Inevitably, the surface of some concrete tiles that have a sanded or granule facing, are the first to attract moss growth.

Moss tends to flourish on roofs where trees are nearby and where there are shady, damp conditions. Steeper pitched roofs are less likely to support moss and lichen growth as they shed water more quickly than low-pitched roofs. By contrast, north facing slopes that remain damp longer may attract the growth of mosses and lichens.

The primary effect of moss on a roof is that it holds water. Thus, the flow of water into gutters is slowed down and the water is held on the roof in contact with the tiling for a longer time.

If the mosses and lichens affect the drainage of water down valleys, abutment gutters and the interlocking drainage channels of the roof tiles, they should be carefully removed.

In normal circumstances, the growths are not deleterious to concrete and in some circumstances can impart a mellow and pleasing appearance. In circumstances where they are considered undesirable, there are several methods of removal.

Methods of Removal

Spraying with a Toxic Wash

This is perhaps the least expensive, but very great care has to be taken. Any spray that is toxic to moss can also be dangerous to garden plants in the vicinity of the roof and perhaps to the plants in adjoining gardens. There is also the possibility of ill effects to animals and birds.

Toxic washes take a few days to be fully effective and should preferably be applied during a spell of dry weather, since rain may wash them off before they have had time to act. The action is hastened if thick growths are removed and the wash is well brushed in.

Normally, one treatment is sufficient to kill the growths but sometimes repeat applications are necessary. The dead growths will eventually weather off and disappear. If rapid removal of the dead growths is required this can be achieved by a low pressure jet of water, taking care not to spray against the tile laps. This is a job best suited to experienced and qualified labour using a proprietary toxic chemical. On no account should a high pressure water jet be used to clean off moss and lichen growths from concrete tiles. This will result in erosion of the surface thereby reducing the potential lifespan of the roof tile.

Some toxic washes leave a residue that discourages subsequent growth, but even under favourable circumstances the residual effect is unlikely to last for more than two or three years.

A wide range of toxic washes is available, but care must be taken with regard to Health & Safety and Environmental Regulations ^(12&13). A useful summary of some of these materials and their effectiveness can be found in BRE Digest 139 ⁽¹⁴⁾.

Copper Wire

A more permanent answer to the problem of maintaining a clear roof can be obtained by trailing copper wires across the roof surface. These can be fixed at intervals up the roof slope, directly below the front edge of the tiles, so that with every shower of rain, the copper slowly oxidises in the atmosphere and provides the roof with a wash of copper salts which prevents renewed growth. Please contact the Copper Development Association for further details Tel: 01442 275705; Fax: 01442 275716 E Mail: helpline@copperdev.co.uk; Web: www.copperinfo.co.uk

Scraping

This is not recommended as it can result in broken or damaged tiles and unsightly scrape marks on the surface of the tiles, however carefully the work is carried out. Inevitably the process will have to be repeated in the future as the mosses and lichens return.

Generally, moss and lichen growths are not unsightly, and sometimes give a weathered appearance to the roof, but they should be removed if they affect the discharge of rainwater from the roof.

TOP TEN MAINTENANCE CHECKS

- Look for signs of any cracked or broken tiles caused by possible impact or wind damage. Check the security of all vertically tiled surfaces, particularly beneath window openings, where ladders may have damaged flashings and tiles.
- Inspect inside the loft space for signs of dampness, which may be caused by a cracked or broken tile or defective valley gutter. Check the roof underlay for any holes which might allow moisture to penetrate to the roof structure and ceiling. Check for moisture on the back surface of the underlay that may be due to condensation (see BS 5250¹⁵).
- Inspect G.R.P and metal valleys for deterioration and any damage to raking cut tiles and bedding mortar.
- Examine top edge and abutment metal flashings for damage and re-fix /re-dress or replace as appropriate.
- Check all vent pipes and other protrusions through the tiled roof covering to ensure that lead collars and flashings are correctly fitted and sealed.
- Check bedding mortar for cracks caused by roof settlement or shrinkage. Re-bed or replace ridge or hip fittings and mechanically fix if required.
- Clear all eaves / back gutters of leaves and other debris and check free flow of water to rainwater outlets.
- Cut back overhanging trees or foliage that may impair roof drainage or cause damage to the roof covering during a storm. Check the security of all aerials and roof accessories.
- Clear all ventilation grilles and terminals of dust and debris that may block the ventilation path.
- Clear mosses and lichens that affect the free flow of water from the roof.
- When clearing debris from lead gutters, valleys and flashings, use a plastic tool to avoid damaging the lead sheet.

REFERENCES

- | | | |
|-------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
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| 1.1. | The Building Regulations (Scotland) | The Building (Scotland) Regulations 2004 Technical Handbook Section 1 : Structure |
| 1.2. | The Building Regulations (Northern Ireland) | The Building Regulations (Northern Ireland) 2000. D Structure |
| 2. | BS 5534: 2003 | Code of practice for slating and tiling (including shingles) : Design |
| 3. | BS 8000-6 : 1990 | Workmanship on building sites – Part 6. Code of practice for slating and tiling of roofs and claddings |
| 4. | BS 2037 :1994 | Specification for portable aluminium ladders, steps, trestles and lightweight stagings |
| 5. | BS 1129 :1990 | Specification for timber ladders, steps, trestles and lightweight stagings |
| 6. | BS EN 517 : 2006 | Prefabricated accessories for roofing. Roof safety hooks |
| 7. | BS EN 516 : 2006 | Prefabricated accessories for roofing. Installations for roof access, walkways, treads and steps |
| 8. | BS 7981 : 2002 | Specification for mobile elevating work platforms |
| 9. | BS 1139-3 : 1994 | Specification for prefabricated mobile access and working towers |
| 10. | BS 1139-5 : 1990 | Specification for materials, dimensions, design loads, safety requirements for service and working scaffolds made of prefabricated elements |
| 11. | BS EN 12811-1:2003 | Temporary works equipment –scaffolds. Performance requirements and general design. |
| 12. | Health & Safety Regulations | |
| 12.1. | | The Health & Safety at Work Act 1974 |
| 12.2. | | Construction (Design & Management) (Amendment) Regulations 2007 |
| 12.3. | | COSHH Regulations 2005 |
| 12.4. | | Construction (Head Protection) Regulations 1989 |
| 12.5. | | Health & Safety in Roof Work HSG 33 2004 |
| 12.6. | | The Management of Health & Safety at Work Regulations 1999 |
| 12.7. | | Working on roofs INDG 284 HSE 2004 |
| 12.8. | | Workplace (Health, Safety & Welfare) Regulations 1992 |
| 12.9. | | Lifting operations and lifting equipment regulations 1998 |
| 12.10 | | Work at Height Regulations 2005 |
| 12.11 | Guidance Document | INDG 401 – Work at Height Guidance 2005 |
| 12.12 | Guidance Document | INDG 402 – Safe use of ladders and stepladders 2005 |
| 12.13 | Guidance Document | CIS10 – Tower Scaffolds 2005 |
| 12.14 | Guidance Document | CIS49 – General Access and Scaffolds 2004 |
| 13. | Environmental Regulations | |
| 13.1 | | Environmental Protection Act 1990 |
| 13.2 | | Public Health Act 1961 |
| 13.3 | | RoHS (Restriction of Hazardous Substances) Regulations 2004 |
| 14. | BRE Digest 139 | Control of lichens, moulds and similar growths |
| 15. | BS 5250 : 2002 (Amnd No.1 12/05) | Control of condensation in buildings |

IMPORTANT NOTE

These guidance notes consider some aspects of the work required to maintain and repair roofs and claddings using concrete roof tiles and accessories. The CTMA & NFRC do not accept liability for any of the recommendations contained in this document. Further guidance should be sought from the manufacturer of the product concerned and it remains the designer & builders' responsibility, to ensure that all aspects of the remedial work comply with relevant regulations and codes of practice.

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