

ROOF TILE ASSOCIATION GUIDANCE

A DEVELOPER AND CONTRACTOR GUIDE TO ACHIEVING THE BEST VISUAL EFFECT WITH ROOF TILES MANUFACTURED FROM CONCRETE AND CLAY

Achieving the best visual effect from concrete and clay roof tiles requires cooperation across the supply chain. This guidance document sets out best practice from ordering and inspection through to site handling, installation and sign off, to ensure the best possible roof for home owners.

The document also discusses the issues that can influence the appearance of the roof tiles when installed; some of these are inherent in the manufacturing process, others can be caused during transport and installation while others are natural and intrinsic to concrete and fired clay materials.



ORDERING

Ordering roof tiles correctly is the first important step in achieving the best visual effect on the finished roof. Roof tile manufacturers supply products via various routes to market including direct to a developer's site, or via distributors/merchants and contractors.

It is recommended that when placing the order that the following information is supplied for all plots to be roofed on the order:

- Housebuilder Name (If Relevant)
- Site Name
- Plot Number (If Relevant)
- Tile Type and Colour
- Tile Quantity

For new housing developers this recommendation should be included within the trade specification document of the housing developer so that roofing contractors engaged in site work for developers know the information that has to be supplied to the tile manufacturer when placing product orders.

For more guidance refer to the current version of BS 8000-6: Workmanship on construction sites – Part 6, Code of practice for slating and tiling of roofs and walls.

ON-SITE ROOF TILE STOCK MANAGEMENT

Before roof tiling commences, shipments of tiles and fittings to be used should be checked against the initial order to ensure they are correct for each plot to be roofed.

Any discrepancies or defective materials should be reported to the Site Agent (of the housing developer) or person responsible for the project as appropriate.

It is not best practice to use tiles and fittings from different shipments or batches on the same roof/plot, as different shipments will often have different concrete maturity (if concrete roof tiles) or be from kiln firings from different time periods (if clay roof tiles) as well as different climate exposure.

To avoid stock allocation errors on site it is recommended that different shipments or batches of roof tiles and fittings are kept apart to avoid the possibility of mixing of tiles and fittings from different shipments. This guidance relates mainly to large format concrete and clay roof tiles, however due to

the natural variation in colours of handmade, sand faced, and naturally coloured clay plain roof tiles, mixing in from different batches may be permissible with these types of tiles.

It is important that the correct shipment or batch for each plot is used to ensure colour consistency on the roof particularly for concrete roof tiles and especially for variegated tile colours.

For more guidance refer to the current version of BS 8000-6: Workmanship on construction sites – Part 6, Code of practice for slating and tiling of roofs and walls.

INSPECTION

When concrete or clay roof tiles and fittings are received on site and Proof of Delivery documents are signed, it is important and recommended that a visual inspection is carried out by the contractor or developer as part of the delivery handover process.

This brief inspection should include comparing the tile and fitting colour from each pallet within each shipment to ensure colour consistency and reporting immediately any major variances.

MIXING ROOF TILES

It is a requirement of all roof tile manufacturers, and clay brick manufacturers too, that products are mixed from different pallets, normally a minimum of three. Good mixing when laying a roof minimises the visual effect of any slight colour variations within the production batch, or between different production batches in the shipment.

Adequate provision for mixing roof tiles from three pallets should be made available on site by the developer such as scaffold loading bays, loading areas etc



Figure 1. Example of poor concrete roof tile mixing



Figure 2. Example of poor clay roof tile mixing

ACCEPTANCE

It is recommended that before the scaffold is dropped for each plot that the Site Agent for the Housing Developer or other responsible person visually inspects the roof with the roofing contractor and ensures there are no obvious colour variation issues that would result in a problem for the housing developer in selling the house or apartment block, or for the building owner.

Ideally this visual inspection for colour consistency should occur when the roof tiles are dry.

It is acknowledged that efflorescence issues can manifest themselves some weeks after the scaffold is dropped depending on the weather. Further guidance on efflorescence can be found later in the document.

ROOF TILE APPEARANCE COMPLAINT HANDLING

Whilst roof tile manufacturers do not guarantee tile colour or appearance, the aesthetics of a roof can be as important as the performance. The aim in these instances is to be as supportive as possible, however the tile manufacturer cannot always be held solely responsible for the final appearance of the roof due to many factors being outside the tile manufacturer's control.

The most important note to take from this guidance document is to raise concerns through the contractual supply chain and report through to the roof tile manufacturer as soon as possible. A manufacturer can conduct an investigation much more efficiently if brought to their attention early on in the installation process, whilst scaffolding is still erected and contractors are on site. Once the scaffolding is dropped and the roof is complete, the investigation of and implementation of any possible solution becomes significantly more complex.

Complaints will be investigated much more efficiently and quickly if appropriate information can be provided to the roof tile manufacturer in advance. This can include but is not limited to: tile profile, tile colour, site address, location of purchase, involved parties (contractors, merchants, developers etc.) and batch date. Photographs demonstrating the particular concerns together with production batch date is vital to a roof tile manufacturer, particularly when investigating colour variation complaints. The batch date is sometimes printed onto the roof tile depending on manufacturer but is almost always shown on the label of the packaging. Manufacturers often find the packaging has been thrown away by the time a complaint is raised. It is good practice to keep the label or take a picture for your records for as long a period as possible after the roof is complete.

Quick customer checklist: To improve the efficiency of complaint handling

- Keep roof tile production batch date information of roof tiles used for as long as possible.
- Provide manufacturers with all of the site information they ask for as soon as possible.
- Raise colour variation complaints as soon as possible and preferably before the roof is complete and scaffolding has been dropped.
- Take time during installation to take a step back and look at the tiles, preferably from ground level and during dry weather, as colour variation can be harder to spot when working up close and/or in wet weather.
- Mix roof tiles from three pallets on the roof as much as possible in line with manufacturer's recommendations.

EXAMPLES OF AESTHETIC ISSUES WITH ROOF TILES MANUFACTURED FROM CONCRETE AND CLAY

CONCRETE

This section highlights common surface appearance characteristics with concrete roof tiles and explanations for these. Many of these are acknowledged and permitted within British Standards for concrete roof tiles. As this document will highlight, raw material, manufacturing process, logistics and the natural environment can all have an impact on the colour or appearance of a roof tile at various stages throughout its lifecycle. It is for these reasons that manufacturers are unable to guarantee colour or appearance in general, as it is extremely difficult to produce as well as maintain in service an exact colour match for roof tiles due to various factors many of which are outside of the manufacturer's control.

Variation in raw materials

Supply of raw materials can sometimes make an impact on the final appearance of pigmented concrete manufactured goods giving rise to some variation from batch to batch. Roof tiles can be identified with batch codes or dates to ensure not mixing old and new stock. It is advisable to check materials at the outset and before installation to ensure a reasonable colour match exists and where a discrepancy is suspected to raise that through the supplier at the earliest opportunity. Similar advice is common to other coloured products such as carpets, wallpaper, bathroom tiles or dyed fabrics for example.

Variegated colour roof tiles

Variegated colour tiles are designed to be random and should be mixed on the roof to avoid distinct patches of shade banding.

Scuffing

Scuffing is where the surface of the tile is abraded, scratched, blemished or marked, often leaving white marks which are most visible on dark coloured tiles. This is purely an aesthetic issue and does not impact on the technical performance of the tiles. Quality systems in place at factories ensure the tiles go out in the best possible condition. Once they leave the factory they are subject to transit, storage and handling. We as manufacturers ensure to the best of our ability that our products are packaged sufficiently, but from the moment the products leave our factories, we lose control over this. The more the tiles are transported, lifted and moved around a stock yard or site compound, unpacked and repacked, the more susceptible they become to issues like scuffing.

Light scuffing will weather away with time and you can install tiles with this level of scuffing, safe in the knowledge that it will weather away reasonably quickly depending on the time of year. However, it is possible that the scuffing is heavy enough to remove paint from the surface of painted tiles. If the paint has been scratched off the surface weathering will over time fade the colour of the rest of the tile to better blend the scuff marks in, but the scuff marks will remain.

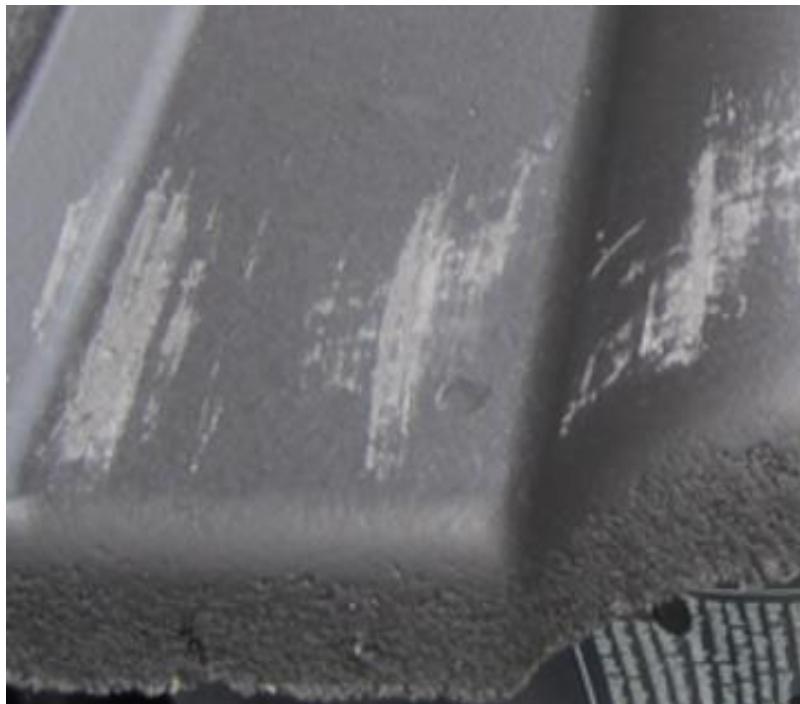


Figure 3. Typical example of scuffing of the surface of a concrete roof tile

Roof tiles with poor paint finish

Poorly painted tiles are a much rarer but occasional occurrence. All manufacturers have extensive quality measures in place, but on occasion, for various reasons, tiles can make their way to packaging without an adequate paint covering. It is extremely rare that an entire pallet will be poorly painted and so the odd tile should easily be identifiable when loading the roof and we advise these are set aside and queried with the supplier.

Efflorescence

Concrete products and mortar consist of sand, gravel, cement and water. Efflorescence is a naturally occurring phenomenon caused by water in the form of rain, condensation (on the reverse side of the roof tiles) or dew penetrating into the pores of concrete and then carrying calcium hydroxide, which is formed during the hydration process of the cement, to the outer surface of the roof tile. The water then evaporates, leaving a white film, bloom or streaking on the surface.



Figure 4. Example of concrete roof tiles exhibiting efflorescence bloom



Figure 5. Example of concrete roof tiles exhibiting efflorescence streaking

Efflorescence can also occur in mortar used for bedding common details such as ridge and hip tiles, where rainwater carries these chemicals from the ridge down the roof and it deposits on a roof tile. Once deposited on the surface of the product, the calcium hydroxide then reacts with carbon dioxide in the atmosphere and becomes an insoluble calcium carbonate.



Figure 6. Example of mortar from hip tiles causing efflorescence

Efflorescence disappears naturally over time. Rainwater is slightly acidic, therefore long-term weathering will eventually remove efflorescence, but it is difficult to accurately predict how long this will take. It is important to remember efflorescence will not interfere with the functionality or durability of the tile. Efflorescence does not impact upon a product's performance and is purely aesthetic in nature. The short-term visual impact of any efflorescence that may occur can be mitigated by the effective mixing of tiles on the roof from different pallets.

Manufacturers recommend a period of weathering to allow efflorescence to be removed naturally, restoring the roof tiles to a more uniform appearance over time. Please see examples in photographs included of the effect of natural weathering exposure on efflorescence.



Figure 7. Example of concrete roof tiles exhibiting efflorescence (on left) and then after 18 months of natural weathering



Figure 8. Example of concrete roof tiles exhibiting efflorescence (on left) and then after 3 years of natural weathering



Figure 9. Example of concrete roof tiles exhibiting efflorescence (on left) and then after 4 years of natural weathering

CLAY

Clay is a natural material made up largely of inorganic clay minerals (kaolinite, illite, montmorillonite etc.) and quartz (sand), along with smaller quantities of other components such as iron oxides, carbonates, pyrite, organic material etc. Clay is found in large quantities right across the UK laid down many millions of years ago. There are many different seams of clay (Etruria Marl, Lower Oxford, Weald, London) to name a few. Each has its own mineralogy and chemical composition and subsequently fires differently, offering a range of colours post firing. Manufacturers will often blend two or more different clays to help achieve different tile colours, tensile strength and frost resistance. Small changes in the mineralogy across clay seams or the blend, along with position of the product in the kiln can have an impact on the fired colour of the finished product. After every firing slight colour shifts occur, these will over a period of time result in tiles that are either darker or lighter than a burn from say 3 months previously. To overcome this tile manufacturers always recommend mixing of tiles from a minimum of 3 pallets at all times. This will help to blend tonal shade variation found within the individual firings, and to even out size variations due to different shrinkage rates that occur during the firing process. Failure to mix tiles will not affect their performance, but aesthetics may be compromised.



Figure 10. Example of natural colour variation in fired clay roof tiles

Clay roof tiles and fittings (ridge, hip and valley tiles) may require sorting on site to achieve the desired appearance. Clay fittings are commonly manufactured and fired separately from the roof tiles which may lead to slight colour variations.

The British Standard, BS EN 1304 covering product specification for clay roofing tiles and fittings acknowledges that variations are inherent in the ceramic fabrication process and these will affect both geometric characteristics such as length, width, camber and twist, and appearance characteristics such as colour and texture. As such, it should be recognised that variations in geometry and appearance do not constitute a fault with clay tiles and fittings.

OTHER COMMON CAUSES OF COLOUR VARIATION ON A ROOF

Lead and other metal flashings

Roof tile and/or masonry cutting debris

Biological growth

Bird guano

For advice on these topics contact the roof tile manufacturer.