CARADON STONE .

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Caradon Stone Technical Guidance – Lantoom Walling Stone

Technical Update - February 2024

Introduction

Thank you for considering or indeed purchasing Lantoom rustic stone from Caradon Stone. This document has been produced to assist you in getting the most from this product.

This stone has been quarried and used in Cornwall and Devon for around 100 years and now we want our stone to be part of your story, as you create the landmark buildings of the future.

Caradon Stone has produced the below technical guidance to assist building designers using its quarried Lantoom stone. This specification has been produced to act as a design age so that the use of natural stone can be properly considered and incorporated appropriately at an early stage.

Caradon Stone are not construction designers and consequently cannot give comprehensive advice regarding the suitability of a particular stone or of a particular design or mortar at a particular site location. You should take your own professional advice in that regard because the performance of a stone wall using natural stone involves many factors outside of our knowledge or control.

If you do have any questions of a technical nature, please do get in contact with us using the details listed above. Whilst we cannot provide construction advice we may be able to assist in directing you to professional consultants who have the relevant expertise required to provide such professional advise.

Certificate of Conformity

The appendix of this document contains our latest Declaration of Performance Certificate, which stone producers are legally required to produce as a key part of the Construction Products Regulations.

This document contains important testing data for the stone we supply, and may be of assistance at the design stage when looking to incorporate stone into a design.

It is important to note that this document is not a declaration that the stone will work with a particular design or is appropriate for any particular use; indeed it wouldn’t be possible to make sure a declaration because the performance of any building material is contingent upon many factors.

It is the duty of the designer to determine the performance requirements of a building material in the context of its design, function, location and other environmental factors and then select and specify suitable building materials appropriate to the design. This should take into account a range of factors including the local building tradition, the physical and chemical properties of the stone and the properties of any materials with which it is to be combined. It is the duty of the builder to follow the design and to employ appropriate building practices along with construction quality control procedures to ensure the design objectives are met. Therefore the testing data must be assessed and used by a professional in conjunction with knowledge of the site conditions and other materials intended for use in the design.

The Importance of Design

In general, natural stone use in construction has been iterated and developed over hundreds of years within a local context; locations such as Cornwall have their own vernacular construction to suit the environment, including smaller windows, limewash coatings and slate hangings on exposed walls. Contemporary designs often break with these traditions and can result in additional strain being placed on the building materials involved.

- Site and design specific criteria – Every site and plot should be individually assessed and its design take its individual circumstances into account. Standard designs should be positively verified to be suitable for construction in any particular location.
- Designs must take weather exposure to wind driven rain into account. This is especially important in the Very Severe Exposure environments of Cornwall and Devon. Even in these areas, the most exposed coastal or hilly locations may have exposure far greater than the minimum level required to be categorised as Very Severe. Examples include appropriate capping details to shed water away from the wall.
- Design details must take into account the characteristics of stone. For instance, the moisture absorption of Lantoom is higher than more impermeable stones such as granite.
- Lantoom stone is a rubble walling material and designers must take into account its differences with other materials such as brick, which is generally coursed.
- Movement joints should be designed to take into account the characteristics of the site and the stone including thermal and moisture related movement.

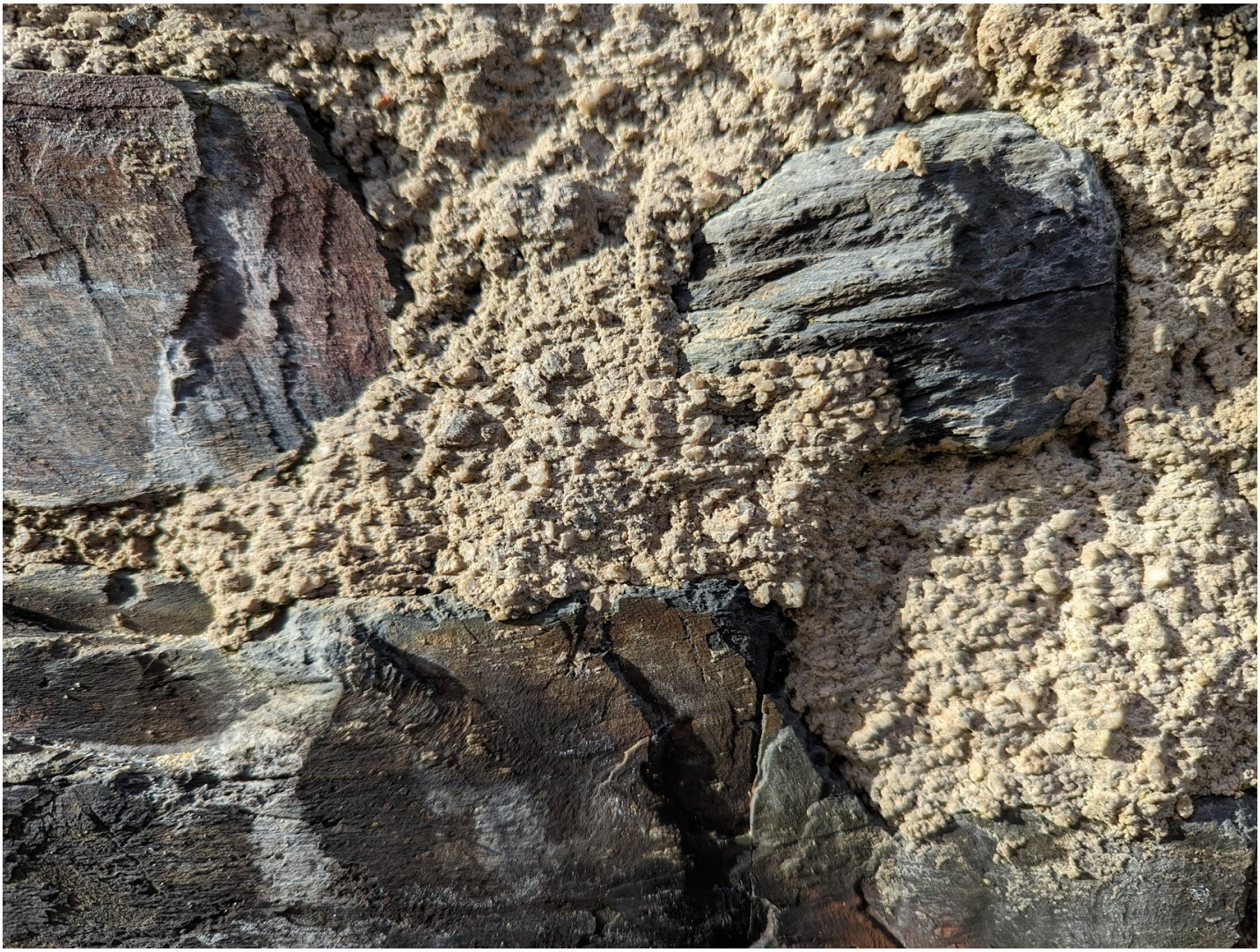
Mortar Composition

Pre-mixed mortars should not be used with Lantoom Quarry stone.

In use they have proven to have properties that are incompatible with Lantoom Quarry stone resulting in premature deterioration of the mortar and consequential damage to the wall structure. Mortar shrinking, cracking, de-bonding from the stone and mortar becoming weakened has led to damage to the stone units over time.

Mortars should be designed and specified as part of an integrated approach to the building and wall design. The following factors must be positively taken into account

- Mortar Classification – All of Cornwall and most of Devon is categorised as a Very Severe Exposure Zone. The mortar should comply with building regulation and warranty provider standards in regard to the level of exposure of the site. This means that in most cases a Designation (ii) mortar will be appropriate.
- Lime – Lime improves the flexibility of mortar joints and improves bonding between the mortar and stone. Lime should be used.
- Sand – The sand content of a mortar plays an important role in creating an interlock in the material. It should be well graded (sharp and not well rounded, such as a marine sand) and the maximum particle size should be approximately 1/3 of the width of the mortar joint. e.g. For a 15mm joint thickness, the maximum sand particle size should be 5mm. Angular aggregate particles are preferred for some types of masonry work as they provide better interlock and ultimately strength, and also tend to provide better elasticity properties
- Good site practice – Mortars should be mixed in accordance with good site practice to ensure they are made in accordance with the mortar design requirements and be adequately mixed.
- Air entrainment and other plasticisers – These must be used with care to avoid excessive air entrainment.



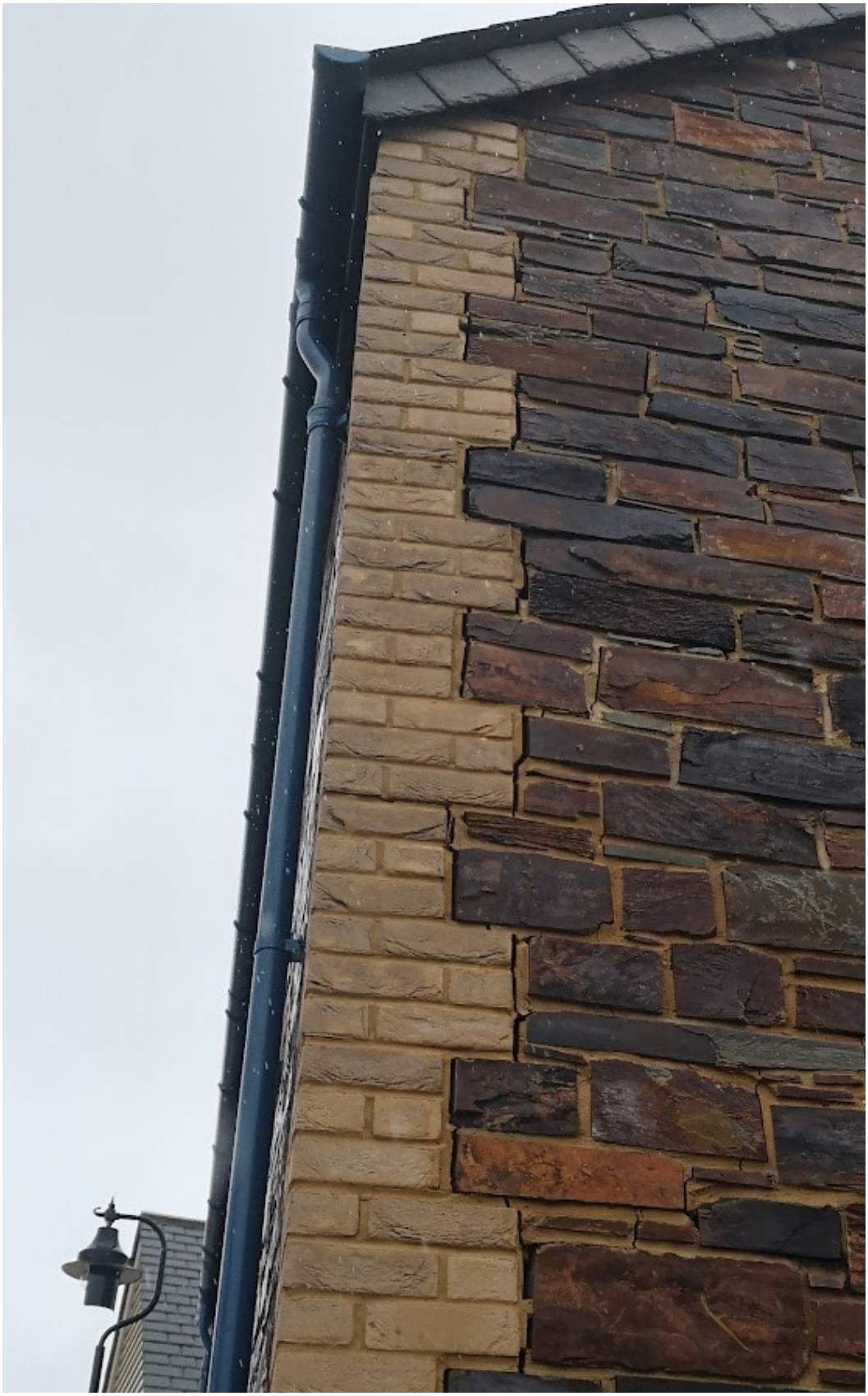
Example photo showing a very durable lime mortar with well graded, course aggregate size.

Mortar joints

- Mortar joints must be either flush or bucket handle.
- Recessed joints must not be used.
- Joints should be pressed to ensure adequate mortar compaction. Where brushing is used, brushing should not be relied upon to provide adequate compaction.
- Most advice recommends joint widths of a maximum 15mm

This reduces the potential for water penetration of the wall and subsequent damage due to moisture. Recessed jointing increases the exposed surface area of the wall, exposes stone to greater weathering, encourages water penetration and reduces the rate of wall drying.

If cracking in the mortar is noticed, this should be investigated immediately and made good. Such cracks are sometimes presented in a “step” pattern, which can be a sign of lateral forces acting on the wall. As the cracking follows the path of least resistance along the areas where different materials meet, this generally will lead to stone and mortar separating from one another. The outcome of this can be further moisture ingress into the wall, as wind driven rain finds it easy to get into the cracks, and stone units becoming loose, which in the wrong circumstances can lead to material loss from the wall. An adequate concentration of lime in the mortar mix helps improve flexibility to cope with movement.



Example of stone and brick functioning adequately but serious mortar cracking between them suggests underlying movement or issues with the mortar mix. These cracks will likely lead to further damage over time, including to the stone units. Note the very fine sandy mortar that has been used.

Good site practice

- Recognised good site practice must be used. The Quality Triangle means that if time and/or cost are compromised, construction quality will fall.
- Stones should be tapped and examined prior to use to ensure defects are identified before being built into a wall. Particular care should be taken for stone to be used as quoins or around openings as these will be at greater exposure. Stones that may be fit for use as infill, where the whole stone unit will be locked into the wall, may not be fit for use as a quoin stone that will have two edges exposed. Historically, granite or brick quoins have been used for this reason for rustic stones of this type and should be considered as a more durable alternative in some locations.
- Stones should be washed with clean water to remove mud and dust immediately prior to use to help develop a good bond between the mortar and the stone.
- Stones should only be laid on their natural bed. Stones that have been laid to a vertical bedding plane are colloquially known as a “shiner”. This is poor practice as stones should only be laid on their natural bed. Installing stones in this way exposes these bedding planes and can lead to quicker weathering,
- “Gone off” mortars must be discarded and should not be “re-worked” by the additional of water or other additives.
- Stone and mortar wall construction must be adequately managed, supervised and inspected.
- Wall ties must be suitable for the prevailing conditions and be suitably anchored within mortar joints. Designers should consider the need for additional wall ties at the corners of walls.
- Natural stone is at its strongest when unquarried or built into a wall system. During transport and storage it can be vulnerable to the affects of weather. Natural stone like that from Lantoom Quarry should not be stored out in the open for any length or time, to prevent driving rain, temperature differentials and frost cycling from causing damage. Consider covering the stone when it arrives on site if it is not immediately due to be used, especially in the Winter months.

Use of stone for the construction of the outer leaf of a cavity wall

- Stone used for the outer leaf of a cavity should be 150mm bed depth where no dense concrete backing block or Surecav is used in the wall construction.
- 100mm bed depth Lantoom Quarry stone should only be used for the outer leaf of a cavity wall in conjunction with a dense concrete backing block or Surecav.
- Non-traditional construction types, such as timber or steel frame, have not been assessed for use with Lantoom stone and may require additional investigation due to the potential for differential movement between the outer and inner leaf of the wall.
- The above requirements are applicable to house wall construction. For dry stone or retaining garden walls the requirements may be very different and generally far less onerous.

Alternative stone choices

If it is deemed that Lantoom Stone, or any other type of stone you may be considering, is not appropriate for your design then we would be delighted to discuss alternatives with you. These include our premium Caradon Granite stone, which is an especially durable Cornish granite suitable for a variety of uses.

Maintenance & Aftercare

The stone will not require cleaning to safeguard its durability; cleaning is purely a cosmetic requirement.

The effects of algae growth and bird fouling can be limited with a regular cleaning regime using water with a soft bristled brush. For the removal of this, and more ingrained contamination call the Lithofin Technical Line for specific guidance on cleaning this type of surface.

Minerals in both the stone and mortar may leech out and cause staining. This can be due to minerals such as copper sulphate in the sand, or lime in the mortar, but also manganese compounds which occur naturally and sporadically within the Lantoom mineral and other rustic slates of similar geology. When exposed to air, they oxidise and can cause a black discolouration.

Such staining, especially if running down onto masonry elements such as lintels, can be viewed as unattractive, but are wholly cosmetic and can be removed by mechanical action and appropriate proprietary cleaning products, such as those offered by Lithofin. It can otherwise be considered a form of maturation of the natural stone which will eventually settle over time, contributing to the uniqueness of the stone.

Cleaning and surface repair of a larger façade should be carried out in accordance with BS 8221-1 and BS 8221-2 and the Stone Federation guide to Best Practice on the Cleaning of Internal and External Masonry Surfaces guidance by suitably qualified operatives on a cycle depending on the building design, the local climate and orientation of the facades, and the levels of atmospheric deposits deemed acceptable by the client.

Pressure washing should never be used as this has the potential to exploit any gaps in stone and mortar much like wind driven rain, and to also damage the stone and mortar directly by force.

Some clients have chosen to limewash or otherwise paint Lantoom Stone as part of an on-going maintenance solution. This practice has been a part of local vernacular architecture for hundreds of years, especially in coastal locations, and has not been demonstrated to have any ill effect on Lantoom stone if the wall in question is allowed to breathe. Care must therefore be taken in selecting an appropriate lime or paint that will work with and not against the design of the overall wall construction.

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APPENDIX

Declaration of Performance – Lantoom Stone

20141

EN 771-6:2011

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Category II, Natural Stone Masonry Unit	
Dimensions: lengh NPD, width NPD, height NPD	
Dimensional Tolerance: NPD	
Category:	Rubble
Configuration:	NPD
Compressive Strength: mean	39 N/mm^2
Compressive Strength After Freeze Thaw (56 cycles)	NPD
Apparent Density	2450 kg/m^3
Shear Bond Strength:	0.15N/mm^2
Flexural Bond Strength:	NPD
Reaction to Fire:	Euroclass A1
Water Absorption by capillarity	9.5 $g/m^2s^{0.5}$
	2.8 %
Open Porosity	9.9%
Water Vapour Permeability Factor	250 (Dry)
	200 (Wet)
Thermal Conductivity:	2.30 W/mK
Specific Heat Capacity	1000 J/kgK
Petrographic Denomination:	Slate / Mudstone
Dangerous Substances:	None