Heidelberg Materials

Natural Hydraulic Lime NHL 3,5

Technical data sheet

Natural Hydraulic Lime NHL 3,5 moderately hydraulic lime is produced to meet the requirements for mortar, render and plaster for conservation, restoration and new build construction. It conforms to the requirements of BS EN 459-1 type NHL Natural Hydraulic Lime strength class 3,5.

This NHL is suitable for use in lime:-sand mortars for stone, tile, brick and block laying, external rendering and internal plastering. It provides options for the whole range of climatic conditions encountered in the UK. NHL is particularly useful in designing mortars and renders to complement the strength of natural stone and soft brick construction. NHL3,5 is used for the production of quality architectural finishes and can be pigmented to supplement sand colours and provide matches for restoration work.

Applications

Natural Hydraulic Lime as a constituent of lime-sand mortars can be used for a wide range of applications for jointing mortars, bedding tiles, renders and plasters. Using suitable sharp sand the mortar will have excellent workability and good water retention when applied to most bricks, blocks and surfaces to be bedded, rendered or plastered. The lower strength of natural hydraulic lime mortar compared with Portland cement based mortars allows mixes to be produced which complement the lower strengths of many natural stone and soft brick applications whilst improving plasticity and retaining a high level of cohesion with low shrinkage.

Natural Hydraulic Lime mortars have excellent resistance to sulfates in either ground waters or in masonry. NHL 3,5 mortars of lime:sand ratios of 1: 2.5 and 1: 2 have good resistance to freezing and thawing actions.

General guide to mortar selection by building application

Building element	Hydraulic Lime Mortar Designation (HLM)
Internal walls Externals walls Facing solid construction	HLM 0.5 HLM 0.5 – 2.5 HLM 1.0 – 2.5
Walls close to/below ground Parapets, sills, lintels and cornices Copings and capping's	HLM 2.5 – 3.5 HLM 2.5 – 3.5 HLM 2.5 – 5.0
Chimneys	HLM 3.5 – 5.0
Earth retaining walls	HLM 3.5 – 5.0

Please note: Selection of mortar should take into account any structural requirements and the properties of the masonry units. The mortar designation (see following table for individual mixes) is for average exposure conditions. Selection must take account of any special local environmental conditions such as prevailing wind, frequency of frosts, location (coastal, hill-side, protected), etc.

General guide to selection by hydraulic lime mortar designation (HLM)

HLM designation	NHL3,5 (lime:sand) by volume	Compressive strength (MPa @ 91 days)
HLM 5.0 HLM 3.5	1:1 1:1 ½	5.0 3.5
HLM 2.5 HLM 1.0	1:2 1:3	2.5 1.0

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Quality

Natural Hydraulic Lime is produced from materials in the South of France. The Quality Control is backed by extensive central Research and Development facilities. This ensures a high degree of consistency in performance and colour. NHL is not a formulated lime.

Strength

Very high strength is not normally required of NHL building mortars. An unnecessarily strong mortar will concentrate the effects of any differential movement between the mortar and the masonry and cracks may appear which could reduce the durability and increase the risk of penetration by rain. A weaker mortar will accommodate some differential movement between the mortar and the masonry and if cracking does appear it will generally be distributed as hairline cracks in joints, thus preserving the integrity of the stone, bricks or blocks themselves. In general mortar should be weaker than the masonry it is used with. The use of natural hydraulic lime mortar imparts special properties to mortar such as low shrinkage combined with elasticity and allows cracks to heal autogenously by continuing carbonation.

Mortar mix design

Natural hydraulic lime mortars gain strength by a combination of hydraulic action and carbonation. It is essential to consider the mix proportions of mortars with care. The following mix proportions provide a guide from which a mix can be selected to suit the construction and local environmental conditions. Other factors, such as the type of brick or stone, or the sand being used will affect the final mix selection.

It is strongly recommended that trial mixes are carried out prior to commencement of work to ensure that the mix design and material combinations meet the requirements of the specification and method of use.

Renders

Choice of suitable mixes for renders follows a similar process to that for masonry mortars. In this case the properties of the substrate must be considered. The choice of sand will also be affected by the kind of finish required with finer sands being necessary for some smooth decorative renders and plasters. The overall mix durability in relation to exposure details will be similar to that for masonry mortar.

General guide to mortar for renders by substrate type

Substrate	Base coat Hanson NHL3,5 (lime:sand) by volume	Finish coat Hanson NHL3,5 (lime:sand) by volume
Weak or porous e.g. soft brick	1:2	1:2½
Medium	1:2½	1:2½
Impervious e.g. dense brick	1:2½	1:2½
Plasterwork	1:2	1:3 finish on a 1:2½ second coat

* Each successive coat should be weaker and/or less thick moving away from the substrate. This can be achieved by mix proportions, NHL strength class and/or thickness of coat.

Standard mixes per 25kg bag of NHL 3,5

Composition by volume	Sand content (15 litre buckets/bag of lime)	Water addition approx (litres)*	Yield (m3/bag)	Hanson NHL content (kg/m3)
1:2	6	14	0.09	275
1:2 ½	7	18	0.10	245
1.3	9	20	0.12	205

* Water addition to mortar will depend on the moisture content of sand, quantities in table assume a moisture content of 7%.

Please note: For the purpose of gauging sand a heavy-duty 15 litre bucket should be used. Sand should be clean, sharp and free of foreign or harmful materials. When mix proportions are by volume care should be taken if the sand is either dry or excessively wet to allow for bulking. Backgrounds should be damp before application of render and the work should be kept damp for at least 24 hours after application.

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Mixing

It is essential that the lime is uniformly dispersed and that any fine agglomerations are broken down. The time of mixing will be controlled by the efficiency of the mixer. Roller-pan mixers and screed mixers have the most efficient action but simple tilting drum cement mortar mixers can be used if a longer mixing time is allowed. If the job is sufficiently large use a mixer with a capacity for a full bag of lime.
The following sequence will be suitable for a tilting-drum mixer. When mixing wear protective goggles and water-proof gloves.
Introduce half of the sand and add all of the lime, mix well for 2 to 5 minutes until a uniform colour is achieved.
Stop the mixer and isolate the drive. Scrape down any material adhering to the back. Add the remaining sand and mix again for 2 to 5 minutes to get uniform dispersion.
Continue mixing adding water slowly over at least 10 minutes and giving plenty of time for water to be fully incorporated. The mortar should be more like a dough than a slurry and the less water added to achieve this, the better the mortar performance will be.
The longer the final mixing time the more workable (fatter) the mortar will be. Workability will be improved by allowing mixed mortar to stand for 15 minutes before re-mixing for a further 5 minutes. (In hot weather do not over-mix as water will be lost through evaporation).

Admixtures

Admixtures may be used with natural hydraulic lime mortars, subject to any limitations imposed by the job specification. In particular the use of air-entraining admixture in mortars and renders exposed to severe frost can be beneficial. It is recommended that trial mixes are produced to establish optimum dosage consistent with the required strength.

Additions

Addition of pozzolanic materials can improve the hydraulic activity and performance in some applications of natural hydraulic lime mortars. Materials such as traditionally used crushed brick, BS EN 450 Fly Ash, ground granulated blastfurnace slag or metakaolin may be used to increase the mortar strength designation. Addition of Hanson Hydrated Lime or Hanson Lime Putty will improve the mix's plastic properties but reduce the mortar strength designation. It is recommended that trial mixes be produced to establish the optimum properties for a particular application.

Health and safety

Please refer to Materials Safety Datasheet for full information.

Please note: Reference to a Technical Standard number in this leaflet is deemed to include the latest published edition and/or any published amendments issued after the standard's publication, unless a date of issue is quoted in which case reference is to the provisions stated in that edition.