



*the Sign of Quality*

## Admixture Technical Sheet – ATS 7

### *Retarded, ready-to-use Mortars*

#### 1 Function

Retarded Ready-to-use Mortars are based on a combination of a mortar plasticiser (air entraining/plasticising admixture) and a mortar retarder. This combination is adjusted to give extended retention of consistence, typically for 36 hours. However, when the mortar is placed between absorbent masonry units, setting is accelerated and the mortar sets normally.

These properties facilitate the provision of mortar to building sites by readymix suppliers and offer the following primary benefits:

- Quality Assured control of mix proportions
- Consistent and stable air content
- Consistence (workability) retention (for up to 72 hours.)
- Increased productivity
- Eliminates the need for mixers and storage of materials on site

The restrictions on the use of retarded ready-to-use mortars for non-absorbent masonry and rendering, detailed in clauses 4.6 and 4.7, should be noted.

#### 2. Standards

This class of admixture is covered by the requirements of BS EN 934 Part 3: Admixtures for masonry mortar – Definitions requirements, conformity, marking and labelling.

All CAA manufacturers CE mark their products to show they conform to this standard.

#### 3 Materials

The principal chemicals are:

<u>a) Mortar plasticisers</u>	<u>b) Mortar retarders</u>
Synthetic surfactants	Salts of hydroxycarboxylic acids
Neutralised wood resins	Natural carbohydrates
Air stabilisers	

#### 4 Mechanisms

Mortar plasticisers act by forming very stable microscopic air bubbles within the mortar matrix. Typically 14 - 20% volume of air is entrained which acts as a workability aid thereby reducing the amount of water required in the mortar to achieve a given workability and aiding retention of consistence.

Mortar retarders act in a similar manner to concrete retarders, slowing down the rate of hydration of the cement. The amount of retarder added controls the time when setting of the bulk mortar starts but the air entrainer has the most significant effect on the retention of consistence.

In retarded ready to use mortars, the suction caused by the masonry unit when it is bedded on the placed mortar, removes most of the mortar retarder together with the excess water. Hydration and stiffening of the mortar then continue normally.

## **5 Use**

### **5.1 Dosage**

The dosage of both admixture components is significantly affected by the sand source being used and also by the inclusion of lime. Building sands may contain significant levels of very fine silt or clay that can increase the dose as can the inclusion of lime, especially if it is lime putty.

The dosage of the mortar plasticiser is normally adjusted to give 18 to 20% air and this air needs to be retained over the full retardation period or consistency loss will occur. The loss of as little as 2% of this air can significantly lower consistence.

The retarder dose depends on the period of consistency retention required. Consistency should remain almost constant for the required time, which can typically be between 8 and 48 hours. There will then be a further period of typically 30 to 50% of the 'retained consistency time' over which the consistency steadily falls and setting starts.

### **5.2 Cement Type**

Retarded Ready-to-use Mortars normally use CEM I in combination with ground granulated blastfurnace slag (ggbs) or limestone filler . The use of other binders and of colour pigments may effect air and hence consistence retention. This needs to be assessed before use.

### **5.3 Supply**

Retarded Ready-to-use Mortars are delivered to site by readymix truck or other specialised vehicle and are normally dispensed into quarter metre tubs for storage until required. These tubs should be covered with polythene sheeting to protect the mortar from evaporation, dilution with rain or contamination from site debris.

### **5.4 Temperature**

As with all cementitious materials retarded ready-to-use mortars must be protected from frost and freezing temperatures, especially while in the storage tubs.

### **5.5 Overdosing**

Overdosing of the mortar plasticiser may increase the entrained air which will give higher workability and a longer working life but lower compressive strength.

Overdosing the retarder can give a greatly extended setting time and the possibility of unset mortar in the finished joints.

### **5.6 Masonry Units**

Retarded ready-to-use mortars will remain workable in the bulk site container for the intended working life. However, when placed between absorbent masonry units, sufficient water and retarder are sucked out to initiate setting within a few hours and the mortar will be set hard even when any remaining mortar in the bulk container is still useable.

If the Masonry units are dense and non-absorbent, water/admixture are not removed. The mortar beds remain fluid and setting may not be initiated for several days. In this situation the wall is 'floating on the mortar beds and is relatively unstable.

In this situation it is unwise to supply mortar with a working life of more than 1 day (usually 8 hours)

### **5.7 Rendering**

Rendering onto non-absorbent masonry may suffer similar problems with set as that detailed in 4.6 above.

In addition, water, drawn to the surface and evaporating will leave a concentration of retarder, which may prevent setting. For these reasons, retarded ready-to-use mortars should never be supplied for rendering applications with a working life in excess of 1 day (usually 8 hours). It is also essential that the render surface is well cured as soon as possible after application to prevent evaporation and desiccation of the surface.

## **6 Effects on properties of mortar**

### **6.1 Strength**

The compressive strength of a mortar is reduced by the inclusion of mortar plasticising admixtures but the reduction in water content will offset some of the strength loss. BS EN 934-3 requires the mortar plasticiser to give a test mortar with an air content of 14 - 20% at a minimum water reduction of 8%, and that the 28 day compressive strength is at least 70% of a control mortar without air entrainment.

### **6.2 Consistence and Working Life**

Working life is a measure of the 'useable life of the mortar' when it can still be used for laying bricks, prior to it eventually setting. This was determined by either Flow Table or Dropping Ball Consistence tests given in BS 4551, and whilst superseded is still a common method of acceptance test. On site the typical range of results for useable mortar is 130 - 85% flow or 11.5 - 8.5 mm dropping ball consistence. It should be noted that there is no established relationship between flow and consistence. BS EN 1015 measures consistency by way of a plunger penetration and a typical value at 28 hours would be within 15mm of the initial value.

### **6.3 Setting Time**

The setting of mortar is measured by its resistance to penetration as described in BS EN 934 -3 and gives limits as acceptance tests for mortar plasticisers and mortar retarders respectively. The retarder side of the system controls the setting time of the mortar, the plasticiser having no affect on setting time. The setting time requirement in BS EN934 -3 is 24 hours after the end of a 28 hour 'Working Life' requirement.

### **6.4 Air entrainment**

The mortar plasticiser is responsible for giving the correct level of entrained air in the mortar with little effect coming from the retarder side of the system. It is recognised that a small loss of air in a mortar will significantly affect the working life of the mortar, BS EN 934 -3 gives acceptance levels for the amount of air entrained by the mortar plasticiser after standard mixing. It then gives limits for the amount of air lost after 1 hour standing and the change in air content after extended mixing and after 28 hours standing.

### **6.5 Bleeding**

The use of a retarded ready to use mortar admixture system will reduce the bleed relative to a mortar that has not been plasticised. However, over a 36 hour Working Life some bleed can occur if harsh sands are employed.

### **6.6 Durability**

Unlike much site batched mortar, the use of a retarded ready-to-use mortar admixture system ensures that the mortar is produced under controlled conditions of weigh batching and recording of all constituents. This ensures that the mortar complies with the specified grade.

The stable air void system it introduces will enhance the durability of the mortar particularly in resisting freeze thaw cycling.

## **7 Health and Safety of Admixtures**

Most admixtures are non hazardous and pose no abnormal health and safety risk but as with all forms of chemical it is essential that the material safety data sheets are read and understood before use. Risk assessments should be conducted to ensure all users are provided with a safe means of use and relevant PPE.

## **8 Other information**

Other CAA information sheets are available including Environmental Product Declarations, use of admixtures in drinking water applications, sustainability, storage and dispensing. These are available at [www.admixtures.org.uk](http://www.admixtures.org.uk) under the 'Publications' tab.