

# EMACO<sup>®</sup> S55

**Premixed, Shrinkage compensated,  
Rheoplastic Grout**

## Description

EMACO S55 is a ready-to-use product in powder form to be mixed with water in order to obtain a rheoplastic, flowable and non-segregating, grout which does not shrink, both in the plastic and in the hardened state, is impermeable and durable and provides high strength and high bond to steel and concrete. EMACO S55 does not contain metallic aggregate and is chloride free.

## Preparation of the grout

For a correct mixing of EMACO S55 grout, the following procedure is advisable:

- Check that the quantity of EMACO S55 at disposal be sufficient for the machinery to be grouted, taking into consideration that 1950 kg of EMACO S55 are needed to obtain 1 m<sup>3</sup> of grout.
- Make sure all grouting materials (mixer, wheelbarrows, pails, trowels, etc.) are within reach.
- Check the preliminary steps concerning the preparation of concrete foundation, machine and forms, following the recommendations given in the section "Directions for Precision Grouting", have been fully taken.
- Open the bags of EMACO S55 necessary for the grouting a short time before mixing is started. Pour the minimum amount of mixing water indicated in Table 1 into the mixer chosen according to the most suitable consistency for type of job to be made. Start the mixer and add EMACO S55 fast and continuously.
- Mix the blend 3 to 4 minutes after all EMACO S55 has been added, until the grout is well mixed and without lumps.

- Add water, if necessary (within the amounts indicated in Table 1), until required consistency is achieved and mix again 2 to 3 minutes. The water content may slightly vary with respect to the one indicated in Table 1, depending on ambient temperature and relative humidity, In

## The influence of temperature

EMACO S55 can be easily used when ambient temperature during pouring operations is between +5 and +50°C. However, if ambient temperature is very low (+5 to +10°C), strengths develop more slowly. When high early strength is required, the following precautions are advised:

- a. store the bags of EMACO S55 in ambient protected against cold weather;
- b. use hot mixing water (+30 to +50°C)
- c. start pouring in the morning;
- d. use watertight coverings to protect the pours of EMACO S55 against cold weather. If temperature is below 0°C, contact one of our technical representatives before starting pours.

If ambient temperature is very high (> 35° C), slump loss is the only problem. Generally speaking, at temperatures between + 15 and +25°C, EMACO S55 keeps flowable more than 1 hour. At higher temperatures, the duration of workability lowers progressively. If slump loss is excessive with regard to the intended use, the following precautions are recommended:

- a. store the bags of EMACO S55 in a cool place;
- b. use cold or iced mixing water;
- c. prepare the grout at coolest time of day. In hot weather, special measures must be taken during curing operations: after keeping the surface moist at least throughout the first 2 days, a film of MACKURE

## Water requirements to produce EMACO S55 grout

Type of work	Suggested consistency	Flow ASTM* C-109	Flow Cone CRD C-611	Litres of water	
				min	max
Grouting structural columns and reinforced concrete structures	Plastic	90	--	3.5	4.0
Grouting machinery	Fluid	170	--	4.5	5.0
**	Superfluid	--	> 55	5.0	5.5

\* Test method was modified to only 5 drops

\*\* The superfluid consistency must be used only when the distances hot and dry climates, slightly higher amounts of water may be needed, the contrary in cold and humid climates.

C curing compound must be applied to the grouted surface exposed to air, as soon as the surface has been finished (see point 9).

### Directions for precision grouting

The following recommendations and suggestions are based on field practice in the use of EMACO S55 grout for precision grouting of machinery. These suggestions may be followed, modified or rejected by the engineer, owner or contractor since they, and not we, are responsible for planning and executing procedures appropriate to the specific installation. Numbered items refer to corresponding numbers in the figure.

### Preparation of Foundation and Machine Being Grouted

1. Before setting the machine, remove defective concrete and laitance, by using a chisel or a scarifier in order to make foundation surface rough but level. Clean both surface and bolt holes of oil, grease and dust.
2. Carefully clean both bolts and underside of the bedplate of oil, grease and dust or any other material that may interfere with the hydration of cement. Check that air-relief holes have been made on the bedplate. Set, align and level the machine, making sure the final place will not be modified during following steps. If shims are to be removed (see point 11) after grouting operation is over, apply a thin coat of grease to them for an easier removal.
3. After machine is set and aligned, saturate foundation concrete with water for at least 6 hours before pouring grout. Remove excess water from foundation with air hose or raps and from bolt holes with rags or with a siphon.

### Forms

4. Forms must be built of strong material, watertight, to prevent water to be drawn out of the grout, and securely anchored and shored to withstand the pressure of the grout when it is placed and levelled. On the side where grout is to be poured allow 150 mm clearance between the side of the form where EMACO S55 is poured and the bedplate of the machine. On other sides, allow at least 50 mm clearance between form and bedplate, and 50-100 mm for the head of grout. When extensive bedplates (20-30 mm) are to be grouted, adequate forms are required to allow higher heads of grout (up to 1.5 meters) on the side of the pour. Other special techniques of filling the space to be grouted may be used, such as pumps, funnels or standpipes. Moreover, when extensive bedplates have to be grouted, and in order to make the grout flow easily, it may be useful: a) move the head of grout forward with respect to the initial position, providing adequate forms and necessary working space; b) mix a slightly more flowable grout (with approximately 5-10% 12

more water), in order to lubricate the concrete foundation, then mix grout at normal flowability.

5. Caulk forms to prevent leakage and loss of head. Either expanded polystyrene, EMACO S55 grout itself at a stiff consistency, or other suitable materials may be used.

### Placement of the Grout

After EMACO S55 has been mixed with water following the suggestions of the section "Preparation of the Grout", the placing operation may be started as follows.

6. Observing if the surface of water in a vessel on the bedplate of the machine being grouted, vibrates, check that vibration from machines operating nearby is not transmitted to the foundation of the machine being grouted. If this occurs, these machines must be shut down at least until the grout has set and hardening has started (at least 10 to 12 hours at +20°C). As a matter of fact, vibration might jeopardize the grout-bedplate bond.
7. The mortar shall be poured continuously. Do not vibrate the grout beneath the bedplate. It should usually be poured from one side only, to avoid air entrapment. Avoid pouring the mortar from two opposite sides. Entrapped air should be relieved through air-relief holes previously made on the bedplate (see point 2). If the flow of mortar is hindered by particularly intricate underside of bedplate, air-relief holes are specially important.
8. Make sure the grout completely fills the space between bedplate and machine. For this purpose flexible steel strapping may be moved back and forth under the bedplate of the machine.

### Finishing Treatments of Grouting Operation

9. All unconfined edges must be protected immediately against water loss by evaporation, for at least 24 hours. This can be obtained either by water curing, moist coverings, or by the spray application of the curing compound MACKURE C (see directions for use on the technical sheet of the product). In absence of curing, especially in hot and dry weather, surface crazings or microcracks on unconfined edges may occur, whose consequence is merely aesthetical. In fact, this case does not cause any shrinkage—detachment of grout—beneath the bedplate.
10. If unconfined edges of grout must be removed or differently shaped, this may be achieved using a trowel or a hammer, after the grout has set and hardening has started, in order that forms may be removed.
11. Temporary levelling shims may be removed after two days, only provided they have been greased as described at point 2. Actually, greased as described at point 2. Actually, using EMACO S55 grout, it is not necessary to remove shims, unless such is recommended by the machine manufacturer.
12. After the machine has been put into operation, it is good maintenance practice to check that screws and

bolts are tight. Use a torquewrench to tighten nuts uniformly and to the recommended tension.

### Packaging and storage

EMACO S55 is packaged in 30 kg moisture resistant bags. 1000 kg bags are also available on request. Store in a sheltered and dry place. Do not use the product if bag is damaged.

### Recommended applications

EMACO S55 is designed for precision grouting operations of light or heavy machines, even if subject to repetitive thermal movement, such as:

- Gas or steam turbines
- Generators
- Compressors
- Paper mill machines
- End and horizontal lathes
- Milling machines
- Planers
- Presses
- Hot or cold rolling mills
- Drawbenches
- Boring machines
- Balancing machines
- Diesel engines
- Cranes
- Pumps
- Material handling equipments
- Crushers
- Marble cutting machines

### Properties

#### Workability

Tests were made meeting ASTM C-109 or Corps of Engineers CRD C-611, by mixing EMACO S55 with 15% and 20% of water. Adding 15% of water, a fluid non-shrink grout is obtained with a flow of at least 130% at the flow table. Adding 18% of water, a superfluid shrinkage compensated grout with an efflux time of at least 25-35 sec. is achieved.

#### Bleeding Water

No bleeding water is observed (ASTM C-232).

#### Expansion

Tests were made following both ASTM standard C-878, on the use of expansive cements and Corps of Engineers standard for grout. Tests made as prescribed by ASTM standard C-878 show an expansion value of about 0.05%. Tests in conformity with Corps of Engineers show an expansion value of 0.3% that is lower than the maximum value (0.4%) fixed by the same standards. Moreover, EMACO S55 expansion occurs both in the plastic and in the early hardened state. However, the expansion action of

EMACO S55 exhausts mainly during the first 12 hours of curing.

#### Strength

Fig. 1 shows compressive strength of cubic specimens (100 mm) and flexural strength of 40 x 40 x 160-mm specimens.

#### Modulus of Elasticity

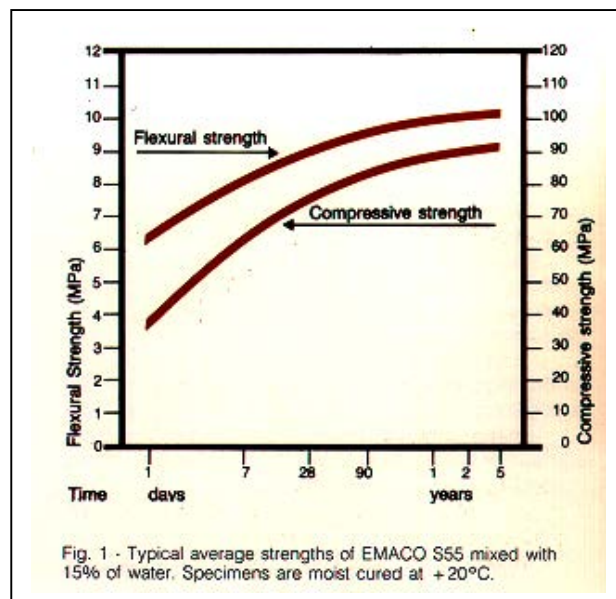
The static modulus of elasticity, measured by applying a load corresponding to 1/3 of the strength, is approximately 25,000 MPa at 7 days and 30,000 MPa at 28 days.

#### Fatigue Resistance

Some 100-mm cubic specimens, produced with EMACO S55 and cured for a month, underwent fatigue tests of 2,000,000 pulsing stresses ranging between 20 and 50 MPa at a frequency of 500 cycles/min. Tested specimens were undamaged and their compressive strength was higher than that of similar specimens that were not subjected to fatigue tests.

#### Bond to Concrete

After a 28-day curing period, the EMACO-concrete bond was determined (about 6.5 MPa) by the load applied to cause the disjunction from the contact surface.



#### Bond to Steel

The bond of EMACO to steel, calculated by applying loads to the bars undergoing pull-out tests and by the grout-steel contact surface, is 3 MPa at 7 days and 4 MPa at 28 days for plain bars; 20 MPa at 7 days and 30 MPa at 28 days for deformed bars.

#### Capillary Pores and Permeability

Even under a pressure of 20 atm, water does not penetrate EMACO specimens, the permeability factor being calculated to be therefore lower than  $1.10^{-12}$  cm/sec.

#### **Resistance to Chemical Attack**

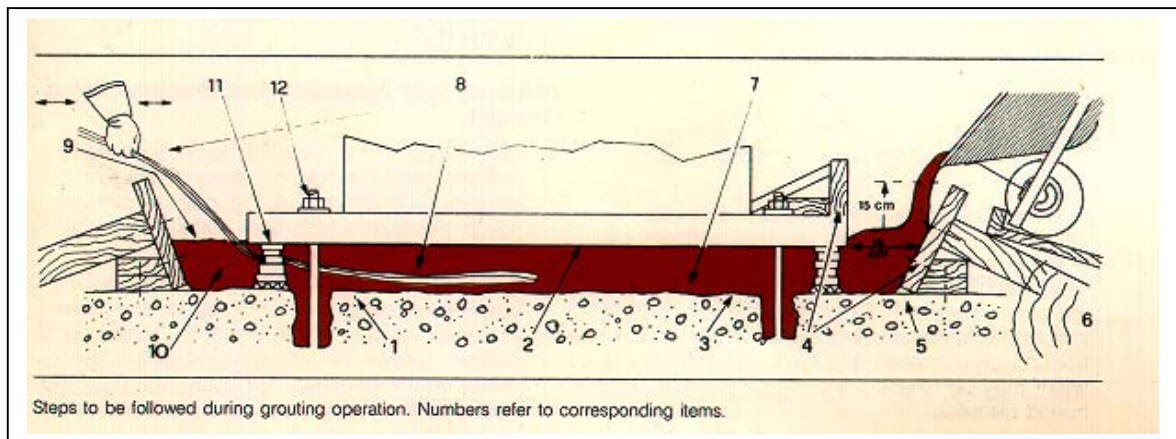
Thanks to its watertightness, EMACO grout is absolutely protected against environmental aggressive agents.

#### **Resistance to High Temperature**

EMACO grouts can withstand high temperature (+400°C) for very long periods without deteriorating substantially.

#### **Resistance to Low Temperature**

After 300 freezing and thawing cycles, the modulus of elasticity decreases only 5%. This indicates that EMACO highly resists the disrupting action of frost.



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From 16/12/1992 MAC spa operates under the Quality System in compliance with European Standard UNI-EN ISO 9001

#### **MAC spa**

##### **Modern Advanced Concrete**

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The technical advice on how to use our products, either written or verbally given, are based on the present state of our best scientific and practical knowledge, and no guarantee and/or implicit or explicit responsibility are assumed on final results of works executed by the use of our products.

The owner, his representative, or the contractor is responsible for checking the suitability of our products as to the intended use and aims.

For further information, please consult your local MAC representative.

Supersedes all prior issues on this product.

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