RESTAUROMIX

Mortar for the protection and repair of concrete structures

Class R1/R2/R3/R4 repair mortars partner guide. *(only for internal use do not divulgate in this form)*

Smart guide writted by Personal Factory Lab team

www.hackthemat.com, www.personalfactory.eu

“What is” a protection and repair mortar

- It is a mortar necessary to restore and/or to replace defective concrete and to protect reinforcement, necessary to extend the service life of a concrete structure exhibiting deterioration.

- It can be fluid or thixotropic depending on the purpose of the application.

- It can be used as anchoring systems, to anchor reinforcement and to fill cavities in order to ensure a continuity between steel and concrete elements; as reinforcement protection system applied on unprotected reinforcement to provide corrosion protection; as injection systems which when injected into a concrete structures restore the integrity and durability; as not structural repair systems which when applied on a concrete surface restore the geometric or aesthetic aspect; as structural repair systems used to replace defective concrete and to restore structural integrity and durability; as surface protection system used to improve the durability of concrete to the chemical and physical attack.

“Why” concrete damage and deterioration

PERSONAL FACTORY

Mechanical Attack

- Impact
- Overloading
- Vibration
- Earthquake

Physical Attack

- Freeze/thaw action
- Thermal movement
- Shrinkage

Chemical Attack

- Aggressive chemical exposure
- Salt crystal expansion
- Sulphate attack

Chemical Attack due to reinforcement corrosion

- Carbonation: $CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$
- Corrosion contaminante due to chlorides

Important characteristics

Compressive Strength

It is the most common performance measure and it is measured by breaking cubical mortar specimen (40mm x 40 mm) in a compression testing machine. It represents the failure load divided by the cross section area resisting the load and it is reported in MPa in the SI units. In Personal Factory repair mortars, the minimum compressive strength is more than 25MPa.

Important characteristics

Bond Strength

It measures the force necessary to separate the mortar from the substrate when a perpendicular tensile force is applied. It is measured with Pull-off adhesion tester and it is reported in MPa. In a Personal Factory repair mortar has to be at least 1MPa.

Important characteristics

Restrained shrinkage/expansion

It is the ability of a repair system, when bonded onto a substrate, to accommodate stressed due to volume change. It is very important because the cracks on the surface of mortar are due to this phenomenon. Personal Factory repair mortars do not have cracks when applied on a substrate or on a defective concrete until 10 mm of thickness.

Important characteristics

Bond strength after termal cycles.

It measures the property of a repair mortar, when bonded onto a substate, to accommodate cyclic changes in temperature. They are very aggressive cycles because simulate very well the long term durability effects. Personal factory mortars are tested and resist to three different termal conditions (50 cycles -15°C/20°C where 20°C are under water; 30 cycles 60°C/water spay every 15 minutes where the temperature of the water is12°C; 30 cycles of 21°C/-25°C/55°C). Visual damages is not present on Personal Factory repair mortars and a bond strength more than 0,8 MPa is evaluated.

Important characteristics

Compression strength after thermal cycles.

It simulates the long lasting resistance of a repair mortar. Personal factory mortars do not have reduction of compression strength after three different thermal conditions (50 cycles -15°C/20°C where 20°C are under water; 30 cycles 60° C/water spay every 15 minutes where the temperature of the water is12°C; 30 cycles of 21°C/-25°C/55°C).

Important characteristics

Capillary absorption

It measures the ability of a repair mortar to absorb water without application of hydrostatic pressure. In Personal Factory repair mortars the absorbing power (measured on half prismatic sample 160mm x 40mm x 40 mm) is no more than 5g in 24 hours.

Important characteristics

Carbonation

Important characteristics

Chloride ion content

It is an important parameter that has to be measured because chlorides accelerate the corrosion process and can cause structural problems. High concentration of chlorides (0,2-0,4%) in concrete can break down the passive oxide protective layer on the steel surface. In Personal Factory repair mortars chlorides concentrations is less than 0,1%.

Important characteristics

Sulfate attack

It is due to penetration of sulphate in solution into the concrete from outside. Sulphate ions in ground water and sea water may cause alteration of cement paste with formation of ettringite, by provoking expansion and cracking, or with formation of thaumasite, by provoking disintegration of concrete. Personal Factory mortars are designed to avoid the penetration of the sulphate.

Important characteristics

Stiffening time

It is the time beyond which the workability of a mortar is lost. In a Personal Factory repair mortar this time has to be at least 20 min.

Important characteristics

Workability

It measures the thixotropic or flowing power of a repair mortar. The first one is an important feature if mortar it is used as surface repair of deteriorated concrete structures on both vertical and horizontal surface. Flow characteristic is very important when mortars have to flow through narrow gaps and around areas of congested reinforcement without bleeding or segregation. In Personal Factory thixotropic mortars the value of workability is less than 150 mm.

Important characteristics

Fast setting

It is the feature of mortars used for projects that have to be completed quickly. This is necessary for rapid restoration and fast repairs of damage corners. Personal Factory rapid mortars have an initial setting time no more than 30 minutes and drying up no more than 60 minutes.

ISO classification and rules

- ✓ CC: mortars based on a hydraulic binder that may include additives to give specific properties
- ✓ PCC: Hydraulic mortars modified by the addition of polymer additives
  - ✓ Non Structural: R1 Compressive strength ≥ 10 MPa
    Adhesive bond ≥ 0,8 MPa
    R2 Compressive strength ≥ 15 MPa
    Adhesive bond ≥ 0,8 MPa
  - ✓ Structural: R3 Compressive strength ≥ 25 MPa
    Adhesive bond ≥ 1,5 MPa
    R4 Compressive strength ≥ 45 MPa
    Adhesive bond ≥ 2,0 MPa

Ex. RESTAUROMIX TX 60 is a CC R4: a hydraulic mortar modified with additives with high performance for structural uses.

Made for real world

PERSONAL FACTORY

Always freshly made product.

We developed the micro-production system to be near to the final user of the material. This because mineral binder based product have all the time the problem of expiry. ISO/ASTM/JTS/BS/SS norms allow to have a term of expiry of 12 months in paper/plastic/paper bag. But depending on certain conditions, after only 3 months it may happen that you lose parts of mechanical resistances.

	Good conditions	Humidity conditions	Hot and humid conditions
1 month – reduction	-	-	5%
3 months - reduction	10%	15%	20%
6 monts - reduction	25%	30%	40%
12 months - reduction	35%	40%	50%

Made for real world

PERSONAL FACTORY

Local standard conditions

We developed the micro-production system to be local worldwide. The reason is that different climates need to have different “standard testing conditions”.

UNI/ISO/ASTM/JTS/BS/SS uses 20 or 25°C as standard conditions.

But depending on conditions you can find in the world, it is better to have standard conditions that change from 12 to 30°C. Our products have been developed to pass the norms in both kinds of conditions: world standard and local standard.

RESTAUROMIX TX RASO 10 (CC R2)

- ✓ Entry level repair mortar with thixotropic effect
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 50%

Filler <0,063 mm: 18,5%

Portland Cement 42,5 R : 26%

Applications: Non-structural repairs and smoothing on vertical and horizontal concrete elements.

Special features

- ✓ Low cement
- ✓ Good thixotropic effect
- ✓ No restrained shrinkage
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.
- ✓ Applicable in one coat from 3mm to 30 mm thickness

RESTAUROMIX TX RASO 20 (PCC R2)

- ✓ Repair mortar with very good thixotropic effect, universal markets
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 50%

Filler <0,063 mm: 18,5%

Portland Cement 42,5 R : 26%

Applications: Non-structural repairs and smoothing on vertical and horizontal concrete elements.

Special features

- ✓ Low cement
- ✓ Good thixotropic effect
- ✓ No restrained shrinkage
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.
- ✓ Applicable in one coat from 3mm to 30 mm thickness

RESTAUROMIX TX RASO 50 (PCC R2)

PERSONAL FACTORY

- ✓ High level repair mortar with very good adhesion to substrate and resistant to temperature change.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 50%

Filler <0,063 mm: 18,5%

Portland Cement 42,5 R : 20%

Application: Light structural repairs, restoration of corners and superficial

Special features

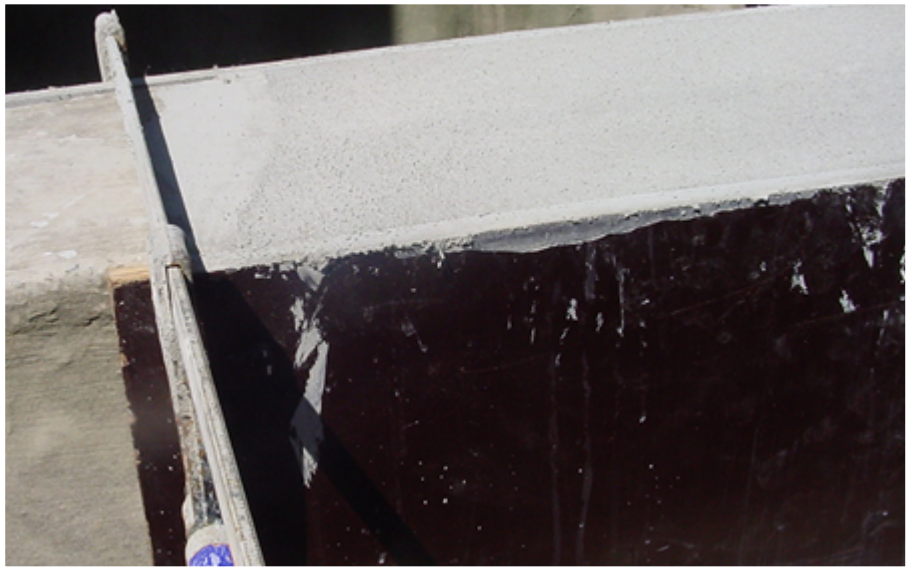
- ✓ High level
- ✓ Good thixotropic effect
- ✓ Good adhesion bond
- ✓ No restrained shrinkage
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.
- ✓ Applicable in one coat from 3mm to 40 mm

RESTAUROMIX TX 40 (CC R3)

PERSONAL FACTORY

✓ Entry level, thixotropic repair mortar with medium compression resistant, It complies with the EU norms

✓ Formulations



0,1-0,5 mm dry sand: 24,5%

0,5-1,5 mm dry sand: 31,5%

Filler <0,063 mm: 9%

Portland Cement 42,5 R : 31,5%

Applications: repair of concrete beams, concrete columns and structural element, reconstruction of concrete covering reinforcement bars.

Special features

RESTAUROMIX TX 60 (CC R4)

- ✓ High quality, repair mortar with high compression resistant and resistant to sulphate attack
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 23%

0,5-1,5 mm dry sand: 31%

Filler <0,063 mm: 8,5%

Portland Cement 42,5 R : 31,5%

Applications: Repair of degraded concrete structures or reinforced concrete structures in sulphate environment.

Special features

- ✓ Resistant to sulphate attack

RESTAUROMIX TX 40 QUICK (CC R3)

PERSONAL FACTORY

- ✓ Universal repair mortar with fast setting, drying up and medium compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 23%

0,5-1,5 mm dry sand: 32%

Filler <0,063 mm: 9%

Portland Cement 42,5 R : 31%

Applications: Fast repair of concrete beams, concrete columns and structural element, reconstruction of

Special features

RESTAUROMIX TX 60 QUICK (CC R4)

PERSONAL FACTORY

- ✓ High level repair mortar with fast setting, drying up and high compression resistant
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 21,5%

0,5-1,5 mm dry sand: 29%

Filler <0,063 mm: 8%

Portland Cement 42,5 R : 34%

Applications: Fast Repair of degraded concrete structures or reinforced concrete structures.

SPECIAL FEATURES

PERSONAL FACTORY

- ✓ Resistant to solphate attack

RESTAUROMIX TX 40 COLOR (CC-R3)

PERSONAL FACTORY

- ✓ Colored repair mortar with medium compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 21%

0,5-1,5 mm dry sand: 30,5%

Filler <0,063 mm: 8%

Portland Cement 42,5 R : 36%

Applications: Repair of concrete beams, concrete columns and structural element, reconstruction of

Special features

RESTAUROMIX FL 40 (CC R4)

PERSONAL FACTORY

- ✓ Entry level fluid repair mortar with medium compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 24%

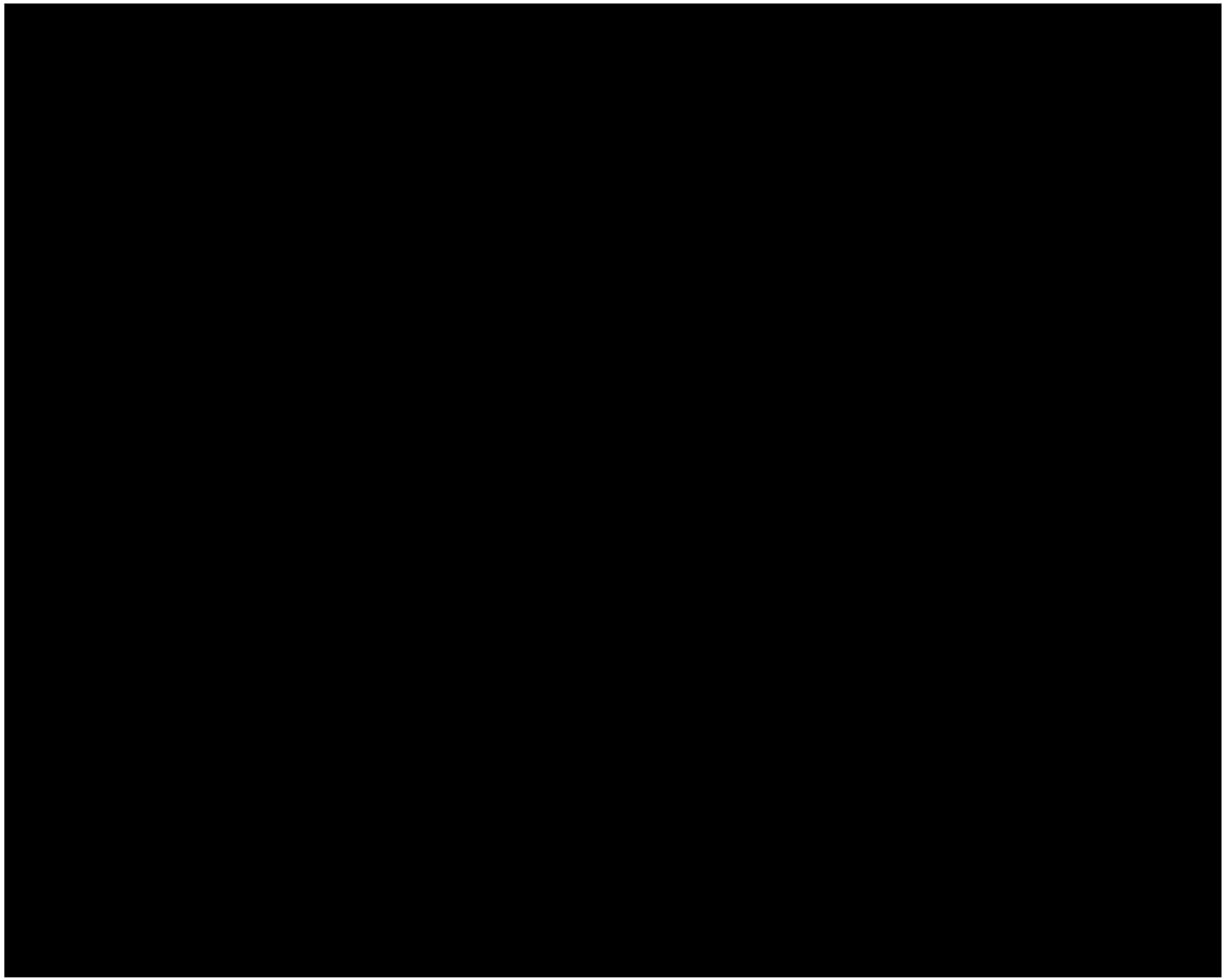
0,5-1,5 mm dry sand: 33%

Filler <0,063 mm: 9%

Portland Cement 42,5 R : 32%

Applications: Repair of concrete structures where complicated shapes require the use of a flowing

Special features



RESTAUROMIX FL 40 QUICK (CC R4)

PERSONAL FACTORY

- ✓ Entry level fluid repair mortar with fast setting, drying up and medium compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 23%

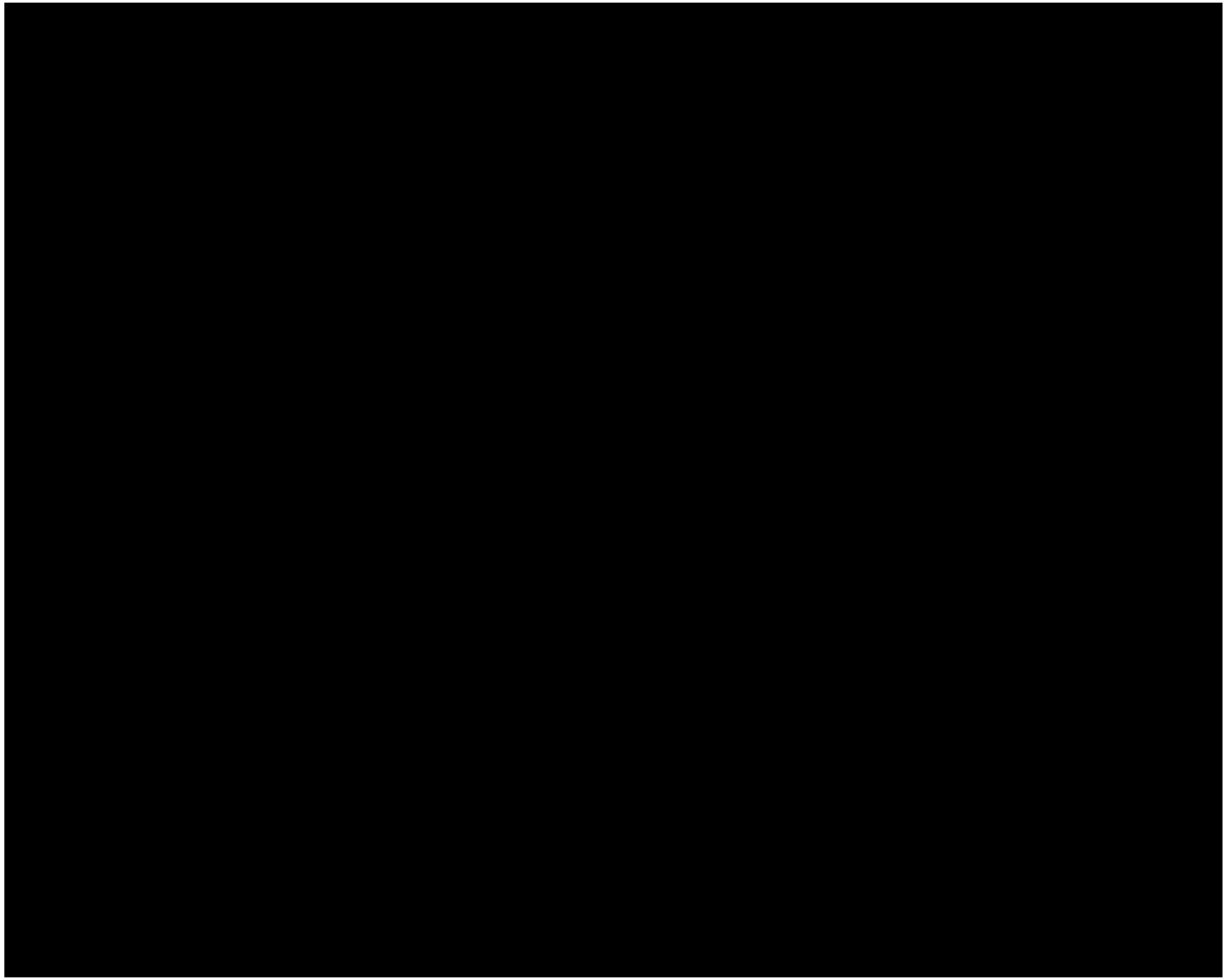
0,5-1,5 mm dry sand: 32%

Filler <0,063 mm: 8,5%

Portland Cement 42,5 R : 32%

Applications: Fast repair of concrete structures where complicated shapes require the use of a flowing

Special features



RESTAUROMIX FL 60 (CC-R4)

PERSONAL FACTORY

- ✓ High level fluid repair mortar with high compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 23%

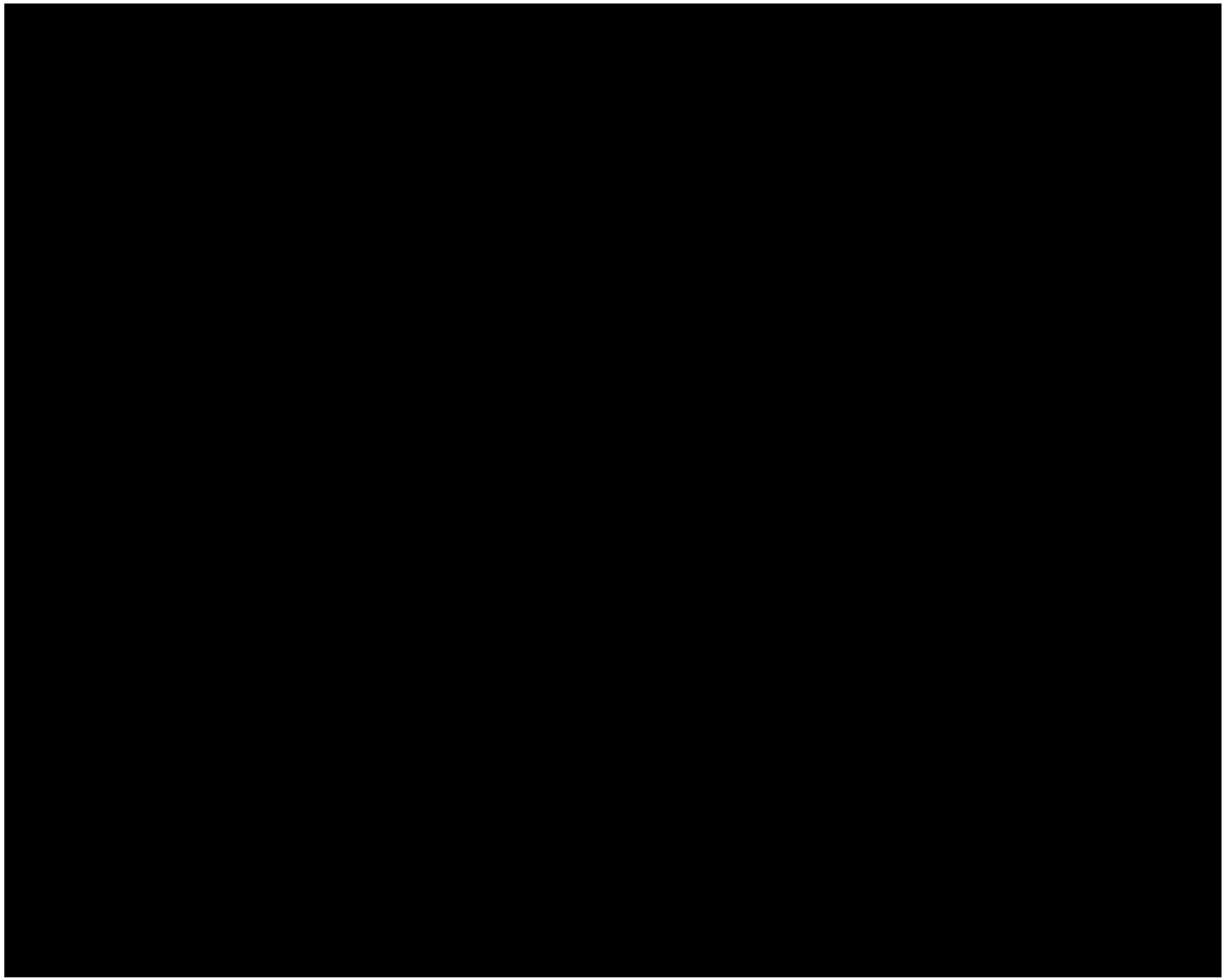
0,5-1,5 mm dry sand: 21%

Filler <0,063 mm: 8,5%

Portland Cement 42,5 R : 32%

Applications: Repair of deteriorated concrete structures included prestressed beams, concrete floors (industrial, road, and airport) and increase of sections of structural

Special features



RESTAUROMIX FL 60 QUICK (CC-R4)

PERSONAL FACTORY

✓ High level fluid repair mortar with fast setting, drying up and high compression resistant.

✓ It complies with the EU norms

✓ Formulations

0,1-0,5 mm dry sand: 21,5%

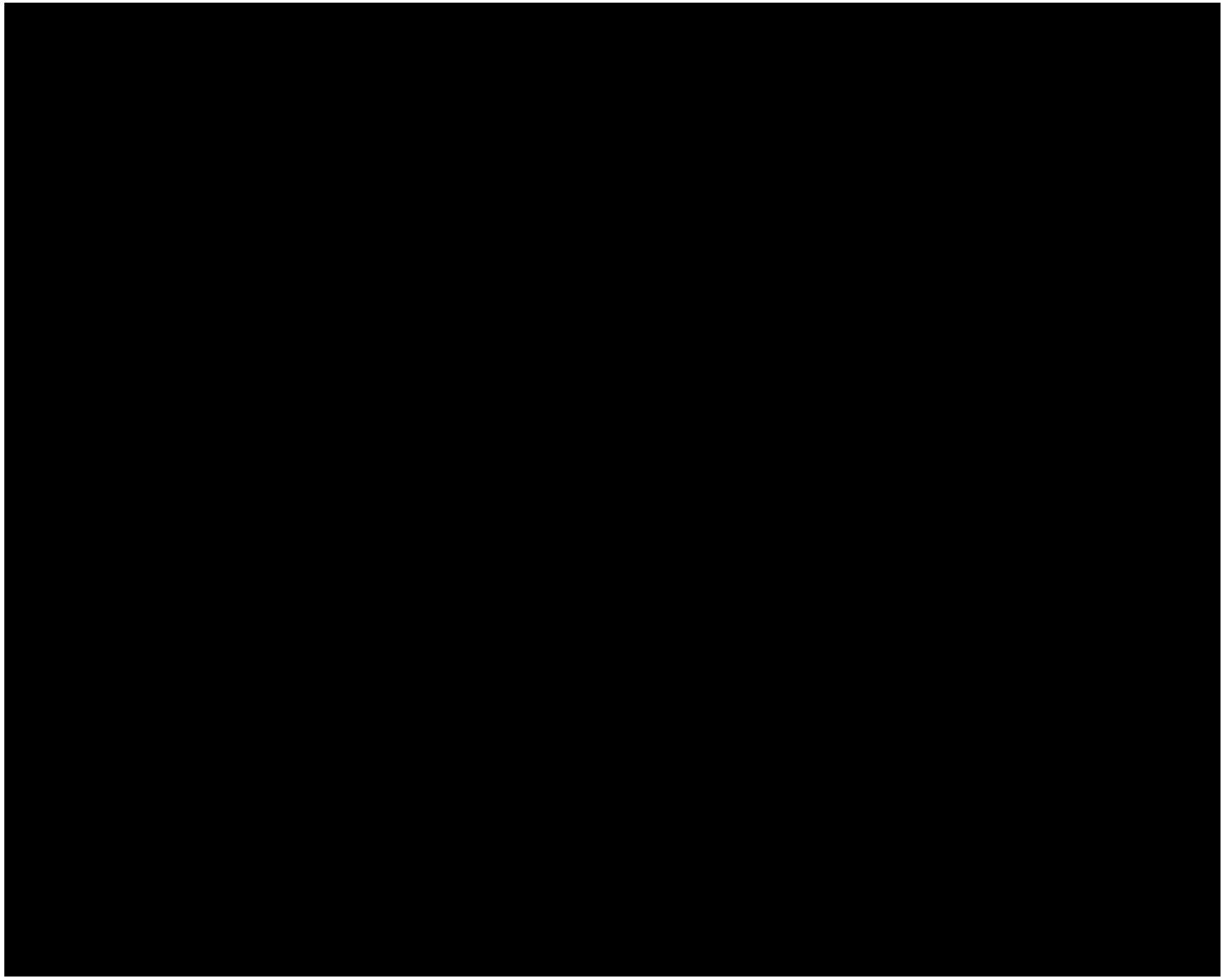
0,5-1,5 mm dry sand: 30%

Filler <0,063 mm: 8 %

Portland Cement 42,5 R : 34%

Applications: Fast repair of deteriorated concrete structures and increase of sections of structural

Special features



RESTAUROMIX
FL 40 COLOR (CC-R3)

PERSONAL FACTORY

- ✓ Colored repair mortar with medium compression resistant.
- ✓ It complies with the EU norms
- ✓ Formulations

0,1-0,5 mm dry sand: 22%

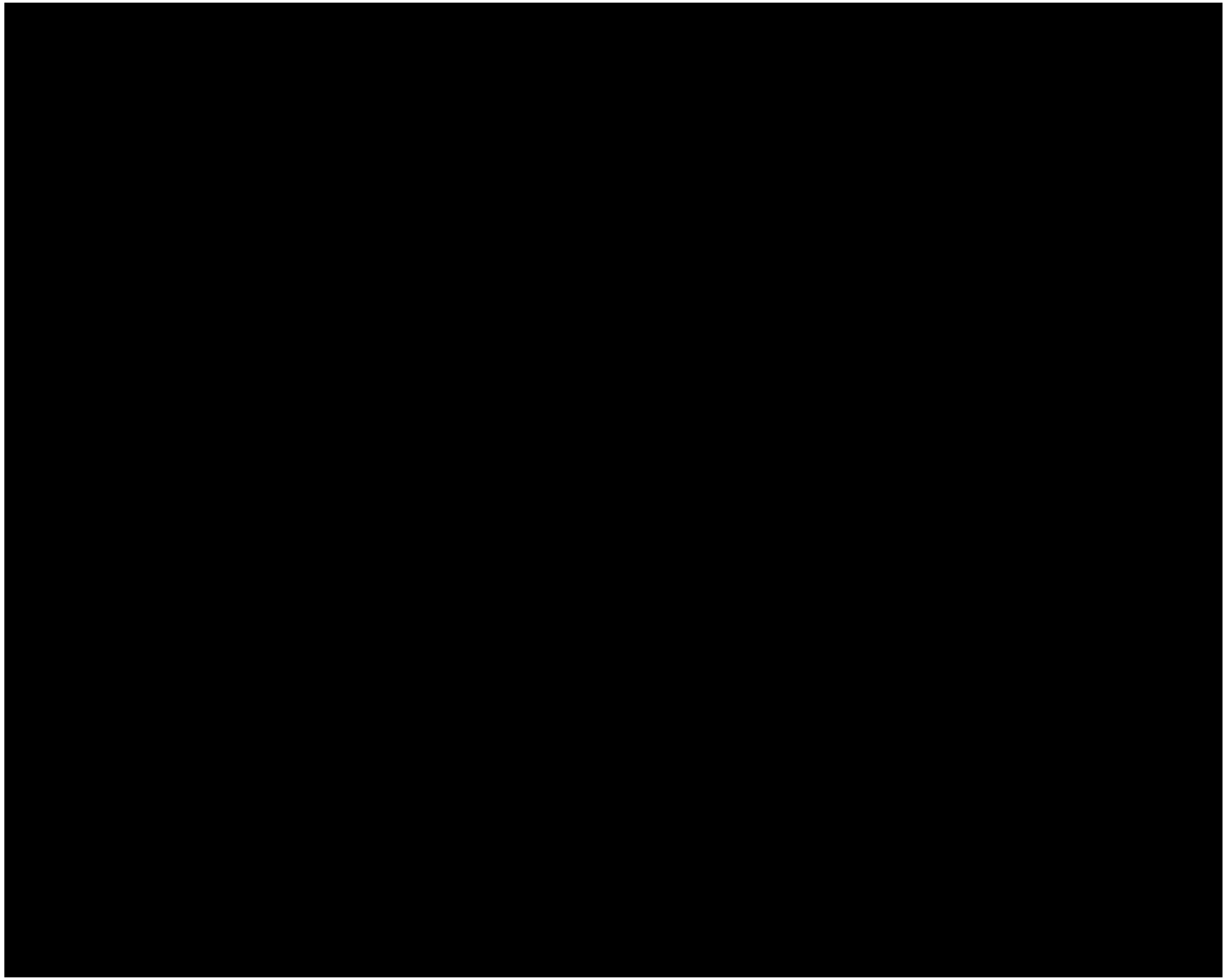
0,5-1,5 mm dry sand: 30%

Filler <0,063 mm: 8%

Portland Cement 42,5 R : 36%

Applications: Fast repair of concrete structures where complicated shapes require the use of a

Special features



ECOFIBAR 100 MPa

PERSONAL FACTORY

- ✓ Very High level mortar, Self-compacting with very high performance.
- ✓ The only mortar that has more than 105 MPa
- ✓ It goes over the limits of EU standard
- ✓ Formulations

0,1-0,5 mm dry sand: 49%

Portland Cement 52,5 R : 40%

Applications: It is especially suited for slabs which are very sturdy and durable and for the repair of degraded concrete in parts of structures where very high resistance is required.

Special features

- ✓ Very high compression strength > 100 MPa
- ✓ Very high bending strength of thin layer
- ✓ Self compacting effect
- ✓ Drop effect
- ✓ No absorption under water pressure
- ✓ Comply with UNI/EN standard

RESTAUROMIX ECOCALIX M15

PERSONAL FACTORY

- ✓ Very High level mortar, based hydraulic lime.
- ✓ It complies with the EU standard UNI EN 998-2
- ✓ Formulations

0,1-0,5 mm dry sand: 21,9%

0,5-1,5 mm dry sand: 40%

Filler <0,063 mm: 8,1 %

Hydraulic Lime: 28%

Portland Cement 42,5 R : 5%

Applications: Consolidation of masonry structures, reinforced plasters.

Special features

- ✓ High mechanical performances
- ✓ Breathability
- ✓ Restrained shrinkage
- ✓ Ideal to repair historic buildings
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.

RESTAUROMIX ECOCALIX JOINT W

PERSONAL FACTORY

- ✓ Very High level mortar, based hydraulic lime.
- ✓ It complies with the EU standard UNI EN 998-2
- ✓ Formulations

0,1-0,5 mm dry sand: 21,9%

0,5-1,5 mm dry sand: 40%

Filler <0,063 mm: 8,1 %

Hydraulic Lime: 28%

Portland Cement 42,5 R : 5%

Applications: Consolidation of masonry structures, reinforced plasters.

Special features

- ✓ High mechanical performances
- ✓ Breathability
- ✓ Restrained shrinkage
- ✓ Ideal to repair historic buildings
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.

RESTAUROMIX RAPIDSTICK

PERSONAL FACTORY

- ✓ Entry level mortar to repair and smoothing concrete elements.
- ✓ It complies with the EU standard
- ✓ Formulations

0,1-0,5 mm dry sand: 21,9%

0,5-1,5 mm dry sand: 40%

Filler <0,063 mm: 8,1 %

Hydraulic Lime: 28%

Portland Cement 42,5 R : 5%

Applications: Consolidation of masonry structures, reinforced plasters.

Special features

- ✓ High mechanical performances
- ✓ Breathability
- ✓ Restrained shrinkage
- ✓ Ideal to repair historic buildings
- ✓ Comply with UNI/EN standard
- ✓ With Origami production system, it is always fresh.