BS 40 M6 MuCis® mono

LE CE — CAPITOLATO AUTOSTRADE PER L'ITALIA — SPEA

SPECIAL COMPOUND FOR RHEOPLASTIC AND ANTI-CORROSION SUPERCONCRETE WITH VERY HIGH DURABILITY

LE type: "expansive binder which allows the production of extremely fluid concrete or grouts, with no bleeding, low water/ cement ratio, characterized by high mechanical strength" corresponding to the class LE of the SPECIFICATIONS FOR ITALIAN HIGHWAYS for which can be obtained the CE class.

CE type: " rheoplastic concrete with volumetric stability, having Rck ≥ 50 MPa, consistency S4-S5, with no bleeding and high pumping ability, obtained using as special binder an expansive cement type LE in place of normal cement, and mixing it with water and aggregates "corresponding to the Class CE of ITALIAN HIGHWAYS SPECIFICATIONS

Description

BS 40 M6 MuCis® is a pre-mixed powder based on Portland cement, and special additives, which forms, after mixing with water and well selected aggregates in proper granulometric distribution, special durable concretes with exceptionally high mechanical resistances, resistance against chemical aggression, and excellent protection against the corrosion of the reinforcement steel. The product is shrinkage compensated and can have rheoplastic or self-levelling consistency.

Advantages and characteristics

- Practically zero permeability against water (5 bars x 3 days according to EN 12390-8 = < 6 mm), and chloride containing water, and very good permeability to water vapour.
- Optimal durability against aggressive chemicals, more particularly Chlorides, Nitrates and Sulphates.
- Anti-corrosion protection of the steel reinforcement by the corrosion inhibitor MuCis® , multiple contact and migrating corrosion inhibitor, not only in direct contact but also by migration through the concrete porosity to reach and protect the rebars at distance.
- Excellent resistance against frost/thaw cycling, also in presence of de-icing salts..
- Carbonation barrier : after more than 10 years the carbon dioxide has penetrated only 1 mm
- No bleeding, compensation of hygrometric shrinkage.
- Very strong adhesion to concrete, and to the anchoring and reinforcement steel.
- Exceptional mechanical resistance.

Fileds of use

For all the concrete applications in formwork or in confined areas, to achieve a high quality concrete with exceptional durability, even in severe aggressive ambient conditions.

Method of use

Depends on the final use and the available aggregates. In general, we advise dosage levels of 300 to 550 kg/m³ in order to obtain concrete and micro-concrete with the above described characteristics.
The product allows, with very low water/cement ratios, to produce concretes with very good workability and easy placing properties.
The lower the amount of water used, the better the impermeability of the micro-concrete.
In the case the poured concrete will be in contact with other already existing conglomeration substrates, it is advisable first to saturate them with water some hours before, and to remove the excess water immediately prior to the application of BS 40 M6 MuCis®. Immediately after the curing, apply by roller the Curing Compound UR19, which will prevent the formation of cracks in the plastic phase .
After the surface is hardened (in 1-3 hours), especially in dry conditions, apply a wet clothes saturated with water or poly-ethylene . When temperatures are very low, protect the fresh application by poly-styrene insulation plates.

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Packaging: 20 Kg bag

Remarks Information according to 2003/53/CE
Storage : The product can be kept for at least 12 months if stored in dry and protected conditions, in the original packaging, between +5°C and + 35°C.
Do not use the content of opened bags in case of powder agglomeration.

Technical characteristic (typical values dosage 400 Kg/cu.m.)

• Compressive strength	N/mm^2	40 (1 d.)
	N/mm^2	80 (28 d.)
• Flexural strength	N/mm^2	5 (1 d.)
	N/mm^2	12 (28 d.)
• Modulus of elasticity	N/mm^2	30.000 (28 d.)
• Adhesion to concrete	N/mm^2	3 (28 d.)
• Pull-out rebars	N/mm^2	> 20 (28 d.)
• Carbonation in time	8 years mm	0,1
	18 years mm	0,2
	25 years mm	0,5
• Resist. to CO_2 penetration	µ	11.000
• Water vapour permeability coefficient	µ	55
• ① Res. FROST/THAW	gr/m^2	40
• ② Permeab. to CHLORIDES	Coulomb	300
• Type mortar		Concrete-micro-concrete
• N. components		Mono
• Advised layer thickness	mm	40÷500
• Application		In formwork, pouring
• Curing : wet		YES
• Curing : protected		SE
• Typical application		VHDRS-VHDRC-MuCis
• Setting time		Normal
• hardening		Accelerated
• Shrinkage compensation		YES++
• Consumption	Kg/m^3	300-550

① Freeze and thaw resistance in the presence of salt. SIA 162 11/91 (< 600 gr/sm=very high freeze and thaw resistance)
② Chlorides permeability. FH WA RD/81 (100÷1000 COULOMB = very low chlorides permeability)
③ UNI 8148 restrained expansion :
≥ 0,04 % (7 d.)
0,045% ÷ 0,055% (28 d.)

SE Depending on the applicative conditions (rain, sun, hot temperatures, humidity)

VHDRS — Very High Durability Repair & Prevention Systems

VHDRC — Very High Durability Reinforced Concretes

MuCIS® Multiple Corrosion Inhibiting Synergies

AED Very High Deformation Energy

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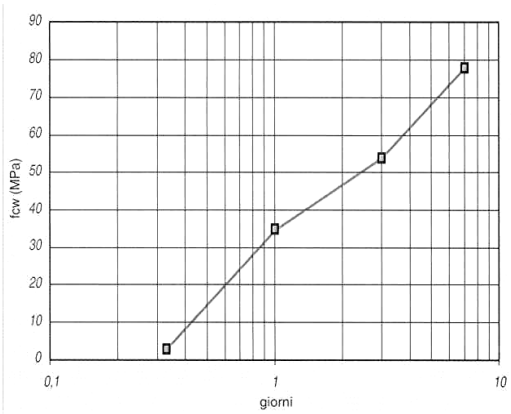
Some indicative results of BS-40 M6 MuCis® as improved micro-concrete or concrete.

Micro-concrete

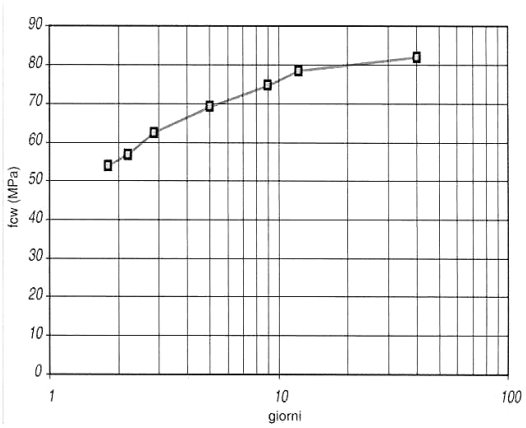
Composition:

BS 40 M6 MuCis® RIVER AGGREGATE 0,1-8 mm (DRIED) WATER	Kg 540 Kg 1.720 Kg 190 (ratio WATER/ BS 40 M6 MuCis® = 0,35) Kg 2.450 per m^3
Slump Abrams CONE	10 cm
Restrained expansion according to UNI8148	≥ 0,3‰ at 24 hour

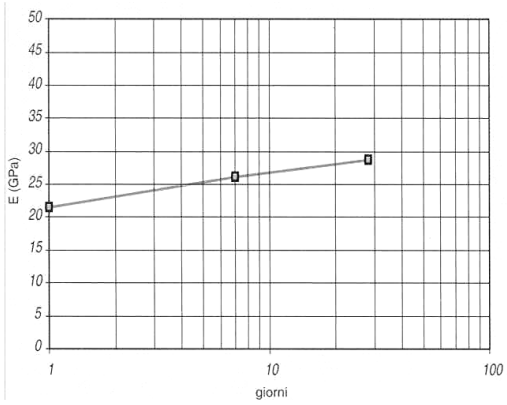
Compressive strength on prism of 4/4/16 cm
MICRO-CONCRETE OF BS-40 M6 MuCis®



Compressive strength on samples of 12/12/12 cm
MICRO-CONCRETE OF BS-40 M6 MuCis®



Elasticity modulus in time on samples of 4/4/16 cm
MICRO-CONCRETE OF BS-40 M6 MuCis®



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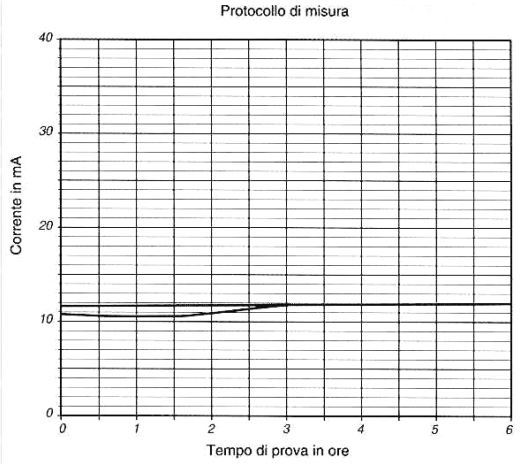
PERMEABILITY TO CHLORIDES OF CONCRETE

(Rapid method according FHWA/RD-81)

MICRO-CONCRETE OF BS-40 M6 MuCis®

Interpretation of results			
	high	permeability	> 4000 Coulomb
	moderate		2000/4000 C
	low		1000/2000 C
X	***very low**		100/1000 C
	Negligible		< 100 C
Measured: $C = {}_0\int^t A \cdot dt = 248$ (Coulomb)			

* Requested for motorway borders



Test of frost/thaw cycling in presence of salt

MICRO-CONCRETE OF BS 40 M6 MuCis®

Sample No.	Scaling in g after			Total scaling in g	Total surface (m^2)	Specific scaling (g/m^2) Δm_{30}
	10 cycles	20 cycles	30 cycles			
2943-1	0	0	0	0.05	0.0108	5
2943-2	0	0	0.05			

(surface of the specimen : internal part polystyrene)

Criteria of validation : $\Delta m_{30} \leq 600$ g/m² = high resistance to frost/thaw action

$\Delta m_{30} \leq 3.800$ g/m² = low resistance to frost/thaw action

At the atmosphere of 100 years in order that the carbonation happens at the depth of 1,5 mm

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ACCELERATED CARBONATATION TEST PERFORMED ON MICRO-CONCRETE OF PRISMA OF BS-40 M6 MuCis®

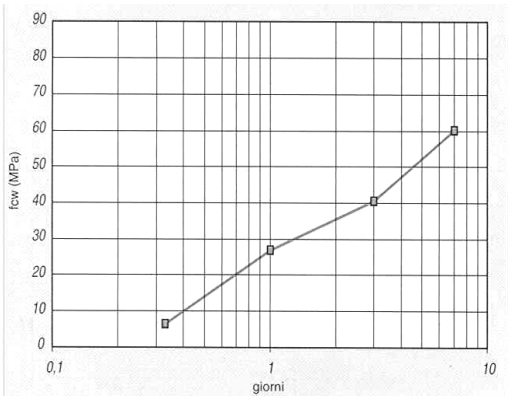
Samples of 10x10x8 cm are stored in climate area with 20°C, 65 % relative humidity, and a concentration of 90% CO_2.
After 4,9 and 25 days of storage in this atmosphere, each sample is cut in two parts and subjected to the phenolphthalein test.
The un-carbonated concrete becomes a red/violet colour, while on carbonated surfaces, no colour appears.
Interpretation of results :

4 days of conservation as described correspond to about 30 years of service.
9 days of conservation as described correspond to about 70 years of service
25 days of conservation as described correspond to about 180 years of service

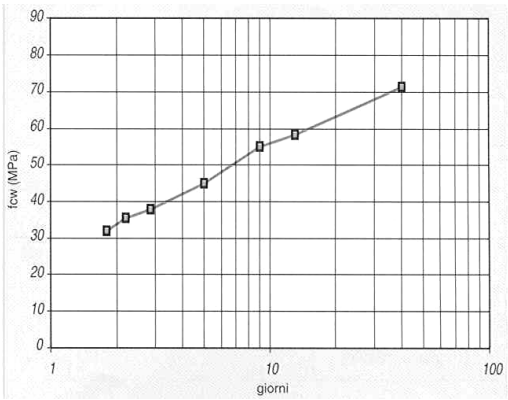
CONCRETE BASED ON BS-40 M6 MuCis®

Composition :	
BS-40 M6 MuCis®	Kg 400
RIVER AGGREGATE 0,1-15 mm (DRIED)	Kg 1.946
WATER	Kg 160
	Ratio water /MuCis® BS-40 M6 = 0,4
	Kg 2.506 per m^3
Slump Abrams cone	cm 14
Restrained expansion according to UNI8148	≥ 0,3‰ at 24 hour

Compressive strength on prism of 4/4/16 cm
CONCRETE OF BS-40 M6 MuCis®



Compressive strength on samples of 12/12/12 cm
CONCRETE OF BS-40 M6 MuCis®



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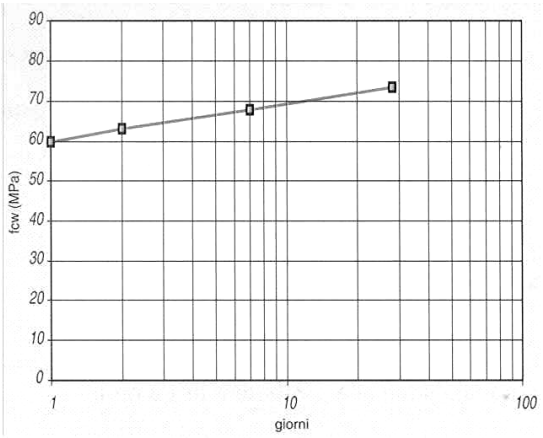
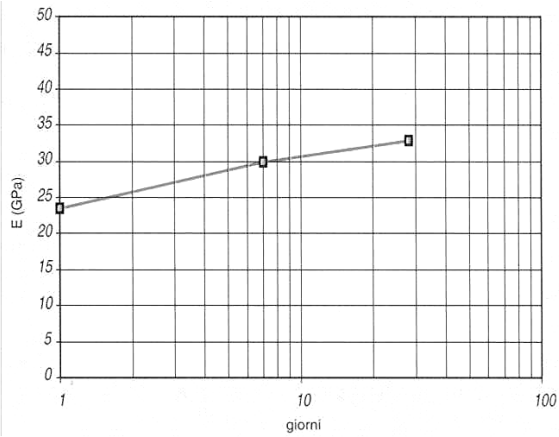
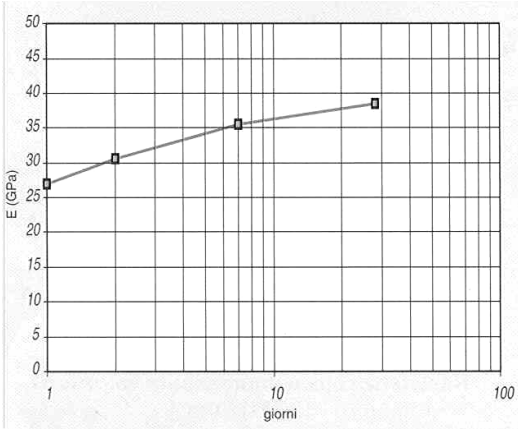
Compressive strength on prism of 15/15/15 cm
CONCRETE OF BS-40 M6 MuCis®



Elasticity modulus in time on samples of 4/4/16 cm
CONCRETE OF BS-40 M6 MuCis®



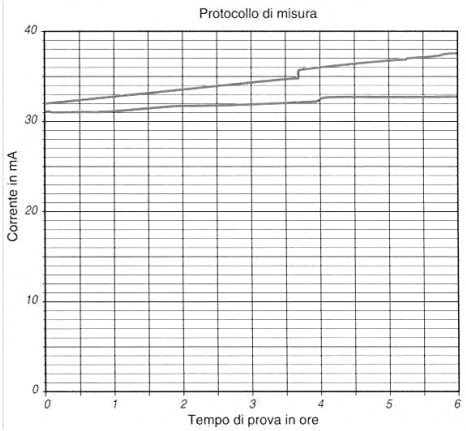
Elasticity modulus in time on samples of 12/12/36 cm
CONCRETE OF BS-40 M6 MuCis®



PERMEABILITY TO CHLORIDES OF CONCRETE
(Rapid method according FHWA/RD-81)
CONCRETE OF BS-40 M6 MuCis®

Interpretation of results			
	high	permeability	> 4000 Coulomb
	moderate		2000/4000 C
	low		1000/2000 C
x	***very low**		100/1000 C
	Negligible		< 100 C
Measured: $C = \int_0^t A \cdot dt = 720$ (Coulomb)			

* Requested for motorway borders



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Test of frost/thaw cycling in presence of salt
MICROCONCRETE OF BS 40 M6 MuCis®

sample No.	Scaling in g after			Total scaling in g	Total surface (m^2)	Specific scaling in (g/m^2) Δm_{30}
	10 cycles	20 cycles	30 cycles			
2944-1	0.05	0.05	0.43	0.81	0.0108	75
2944-2	0.07	0.07	0.38			

(surface of the specimen : internal part polystyrene)
Criteria of validation : $\Delta m_{30} \leq 600$ g/m^2 = high resistance to frost/thaw action
$\Delta m_{30} \leq 3.800$ g/m^2 = low resistance to frost/thaw action

ACCELERATED CARBONATATION TEST PERFORMED ON MICRO-CONCRETE OF PRISMA OF BS-40 M6 MuCis®

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Interpretation of results :

4 days of conservation as described correspond to approx 30 years of service.
9 days of conservation as described correspond to approx 70 years of service
25 days of conservation as described correspond to approx 180 years of service

The results obtained with the concrete of BS-40 M6 MuCis® indicate as average value, a carbonation depth of 2,5 mm after 100 years of exposure to the atmosphere.

Safety indications Read carefully the safety indications on the packaging, or consult the relevant safety datasheet of this product.

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