STRUCTURAL CALCULATIONS
FOR

JEA KENNEDY GENERATING STATION
MCC BUILDING REINFORCEMENT

JACKSONVILLE, FLORIDA

SEPTEMBER 11, 2015

CLIENT: **Premier Florida Industrial Services, Inc.**
4916 W. Linebaugh Ave., Suite 103
Tampa, FL 33624

BY: ***B2 Engineering, PA***
301 Birdwood Avenue
Haddonfield, NJ 08033

B2 Engineering **Project No. 2015-2017**

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9/16/2015

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No 75010
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PROFESSIONAL ENGINEER

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B2

Client	Premier Corrosion Protectin Services, Inc	Sheet	2 of 4
Project	JEA Kenedy MCC Building	Job no.	2015-2017
Engineer	PCB	Date	September, 11, 2012
Reviewed by	ELB	Date	September, 11, 2012

OBJECTIVE:

THE MCC BUILDING AT KENNEDY GENERATING STATION IS A 12INCH THICK CMU BLOCK STRUCTURE SUPPORTED ON AN ELEVATED CONCRETE SLAB THAT IN TURN IS SUPPORTED BY CONCRETE PIERS. JEA STAFF OBSERVED CRACKING IN THE CMU WALL AND REQUESTED B2 ENGINEERING TO REVIEW THE STRUCTURE.

WE WERE PROVIDED WITH AN ARCHITECTURAL SET OF DRAWING DATED 7/23/1999. THESE PLANS REFER TO STRUCTURAL DRAWINGS, BUT THE STRUCTURAL DRAWINGS WERE NOT SUPPLIED.

OUR FIELD REVIEW OBSERVED THAT THE WEST ELEVATION (THE SHORT SIDE WITH A SINGLE DOUBLE DOOR) WAS OBSERVED TO HAVE NUMEROUS LADDER CRACKS WITH A LIMITED NUMBER OF THE CRACKS EXTENDING THROUGH THE BLOCK FACE. THE NORTH ELEVATION WAS ALSO OBSERVED TO HAVE NUMEROUS LADDER CRACKS WITH ONLY A FEW OF THE CRACKS EXTENDING THROUGH THE BLOCK FACE. THE OTHER TWO FACES WERE OBSERVED TO HAVE MINIMAL CRACKS. LADDER CRACKING IS NORMALLY ASSOCIATED WITH MOVEMENT. THE MOST COMMON SOURCE OF MOVEMENT IS FOUNDATION SETTLEMENT. THE FOUNDATION FOR THE MCC BUILDING WAS OBSERVED TO BE QUITE ROBUST AND WE DID NOT SEE ANY DISTRESS IN THE ELEVATED CONCRETE SLAB OR ANY SIGN OF SETTLEMENT.

IT WAS REPORTED THAT WHEN THE ADJACENT EQUIPMENT IS OPERATING THE VIBRATION IN THE BUILDING IS NOTICEABLE. WHILE THIS EQUIPMENT WAS NOT OPERATING AT THE TIME OF THE VISIT, IT IS VERY PROBABLE THAT THIS TYPE OF VIBRATION COULD CAUSE THE OBSERVED CRACKING. STRUCTURAL DESIGN FOR VIBRATION CAN BE QUITE RIGOROUS AND REQUIRES EXTENSIVE DATA AS TO THE AMPLITUDE AND FREQUENCY OF THE VIBRATIONS. THEREFORE IT WAS DETERMINED WITH THE JEA STAFF TO PROVIDE AN EMPIRICAL DESIGN THAT WOULD PROVIDE A CONFINING FORCE ON THE STRUCTURE TO MINIMIZE THE DIFFERENTIAL MOVEMENT CAUSED BY THE VIBRATION. IT WAS DECIDED TO PROVIDE A RESTRAINING CONFINEMENT EQUIVALENT TO A #4 R EINFORCING BAR AT 8 IN SPACING.

Client	Premier Corrosion Protectin Services, Inc	Sheet	2 of 4
Project	JEA Kenedy MCC Building	Job no.	2015-2017
Engineer	PCB	Date	September, 11, 2012
Reviewed by	ELB	Date	September, 11, 2012

OBJECTIVE:

PROVIDE GFRP REINFORCING TO STRENGTHEN THE 12" CMU WALLS OF THE MCC BUILDING. PROVIDE A MINIMUM CONFINEMENT WRAP EQUIVALENT TO #4 BAR AT 8" SPACING

DESIGN METHOD:

DESIGN SHALL BE IN ACCORDANCE WITH AMERICAN CONCRETE INSTITUTE (ACI) ACI-440 .

DESIGN DATA:

f'c = 2,000 psi (ASSUMED)

f'm = 1500 ksi (ASSUMED)

REINFORCING STEEL Fy = 60 ksi (ASSUMED)

CONCLUSION:

PROVIDE EXTERNALLY BONDED CFRP AS INDICATED ON DRAWING FRP-1 TO FRP-3

Client Premier Corrosion Protectin Services, Inc | Sheet 3 of 4

Project JEA Kenedy MCC Building | Job no. 2015-2017

Engineer PCB | Date September, 11, 2012

Reviewed by ELB | Date September, 11, 2012

ANALYSIS AND DESIGN:

MAXIMUM TENSION FORCE IN EXISTING REBAR (1) NO. 4 BARS:

$T = \phi F_y A$

$\phi = 0.90$

F_y= 60 KSI

A = 0.20 sq. in

T = (0.9)(60 KSI)(0.20 sq. in) = 10.8 KIPS

USE MAPEWRAP G UNI-AS WITH MAPEWRAP 21 EPOXY (SEE ATTACHMENT A FOR PROPERTIES) TO PROVIDE EQUIVALENT CAPACITY.

TRY 8" WIDE SHEET: $T = (\phi)(\psi_f)(\psi_e)(\text{WIDTH})(T_f)(f_{fu})$

$\phi = 0.90$

$\psi_f = 0.95$

$\psi_e = 0.90$

T_f =.0517 IN

WIDTH = 8 IN

$f_{fu} = (C_E)(f_{fu}^*)$

C_E = 0.90 (FOR EXTERIOR EXPOSURE)

F_{FU}^* = 43KSI

F_{FU} = (0.90)(43 KSI) = 38.7 KSI

T = (0.90)(0.95)(.95)(8 IN)(0.0517 IN)(38.7 KSI) = 13.0 K per 8 INCHES > 10.8 kip

∴ SUPPLY CONTINUOUS WRAP OF MAPEWRAP G UNI AX

APPENDIX A

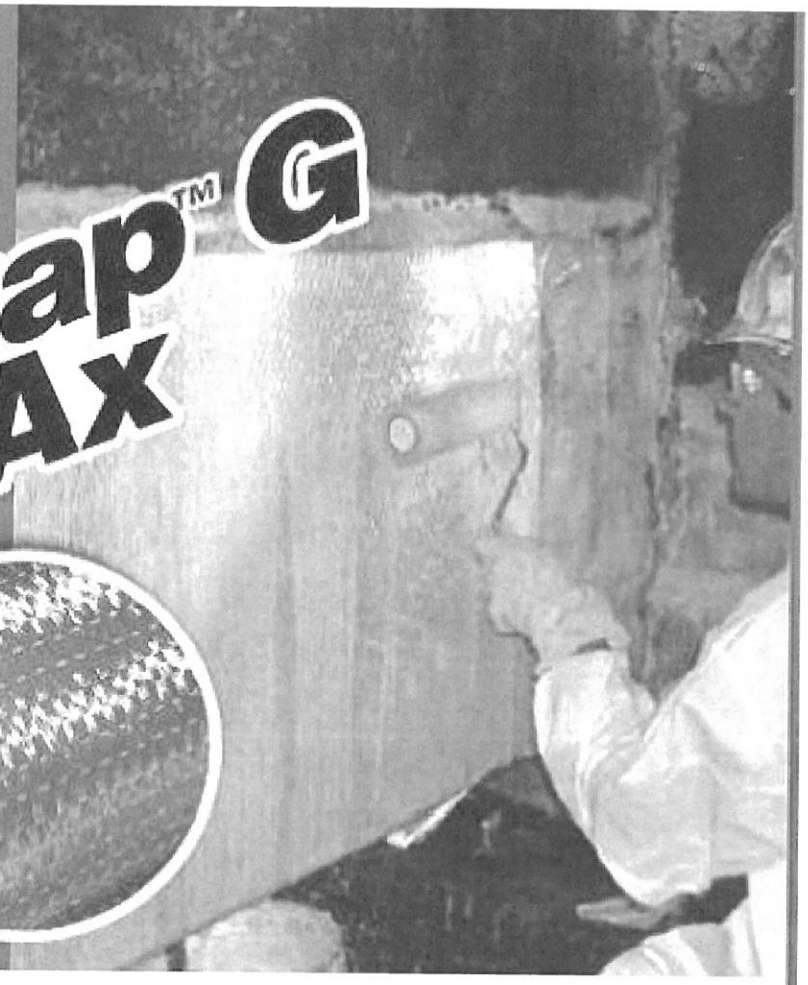
MATERIAL PROPERTIES

B2 Engineering, PA. 301 Birdwood Avenue, Haddonfield, New Jersey 08033
Phone: (856) 816-7122 Fax: (215) 827-5117 E-Mail: ed@b2eng.com

Version: April 29, 2013

MAPEI

MapeWrap™ G Uni-Ax



High-Strength, Uni-Directional E-Glass Fiber Fabric

DESCRIPTION

MapeWrap G Uni-Ax is a high-strength, uni-directional E-glass fiber fabric that, when used with the *MapeWrap* family of two-component epoxy adhesives, forms an externally bonded fiber-reinforced polymer (FRP) reinforcement system engineered to increase the strength of structural elements. When applied to the surface of structural members in buildings, parking garages, bridges, marine piles and other structures, *MapeWrap G Uni-Ax* improves the seismic performance of concrete columns, masonry and concrete walls, and concrete beam-column connections.

FEATURES AND BENEFITS

- High strength-to-weight ratio
- Use for confinement, shear or flexural strengthening
- Non-corrosive
- Low aesthetic impact (easy to conceal)
- Installs quickly, with no special machinery or equipment
- Flexible; will conform to shape of complex surfaces that need repair
- Economical
- Can be used on concrete, masonry, wood and steel substrates

WHERE TO USE

- Restores structural integrity to damaged or deteriorated concrete surfaces caused by fire, impact or aging
- Improves seismic strength of masonry and concrete shear walls, column-beam connections and concrete columns
- Increases ductility and load-bearing capacity of concrete beams, slabs, columns and walls due to design defects, change of use, and increased service loads in buildings, parking garages and bridges
- Seismic strengthening and restoration of vaulted elements and arches found in historical buildings, tunnels and highway structures
- Use for vertical and horizontal installations, and for interior and exterior applications

LIMITATIONS

- Application temperature of the epoxy adhesive being used should be between 41°F and 86°F (5°C and 30°C). Contact MAPEI's Technical Services Department for installation recommendations when ambient temperatures fall above or below this temperature range.
- Design calculations and project review should be carried out by an independent licensed engineer with carbon-fiber-reinforced polymer (CFRP) and/or glass-fiber-reinforced polymer (GFRP) design experience, and in accordance with all state, provincial and federal building codes. Additional design examples/guidelines are available upon request from MAPEI's Technical Services Department.

SUITABLE SUBSTRATES

- Use for interior/exterior applications on 28-day-old cured concrete, masonry, wood and steel.

Consult MAPEI's Technical Services Department for installation recommendations regarding substrates and conditions not listed

MapeWrap G Uni-Ax

SURFACE PREPARATION

- Concrete surfaces must be fully cured, clean, sound, and dry and free of cavities or protrusions.
- Remove all fins and sharp protrusions, and detail element as illustrated on the engineering documents.
- Remove all bond-inhibiting materials – including dust, laitance, oils, impregnations, coatings, form release agents or any surface contaminants – before installation.
- Defects in the concrete substrate must be repaired and any surface cracks greater than 10 mils (0,3 mm) must be sealed with MAPEI's epoxy injection products, such as *Planibond® AE* and/or *Planibond CR 60*.
- Clean all exposed reinforcement in accordance with the Steel Structures Painting Council (SSPC) and coat with *Planibond 3C* or *Mapefer™ 1K*.
- Mechanically prepare the substrate to provide a proper surface profile, as determined by the engineer. The surface profile typically should be a minimum International Concrete Repair Institute (ICRI) concrete surface profile (CSP) of #3 to #5. In all cases, it is the responsibility of the engineer to assess and specify the appropriate anchor profile required to ensure system performance.
- Test the prepared surface, as directed by the engineer. Adhesive strength to concrete should meet a minimum tensile strength of 200 psi (1,38 MPa) and exhibit failure within concrete substrate. Random pull-off testing (per ACI 503R) should be completed after the appropriate surface preparation has been achieved.

MIXING

Note: Choose all appropriate safety equipment before use. Refer to (Material) Safety Data Sheet for more information.

1. Refer to individual MAPEI Technical Data Sheets (TDSs) for the appropriate epoxies to be used with *MapeWrap G Uni-Ax*.
2. Do not dilute or modify epoxies.

PRODUCT APPLICATION

MapeWrap G Uni-Ax can be installed using the "dry" or "wet" layup method.

Common to both dry and wet layups

1. The installer and owner should read and follow all recommended personal protection equipment (PPE) procedures while preparing and installing *MapeWrap G Uni-Ax* and its adhesives.
2. When the product is applied in a closed environment, provide good ventilation. For further information, carefully read the (M)SDS of each of the products used.
3. Cut *MapeWrap G Uni-Ax* to the desired length.
4. Prime the surface that needs to be reinforced with a brush or roller and an even coat of *MapeWrap Primer 1* at a rate of 150 to 190 sq. ft. per U.S. gal. (3,67 to 4,65 m² per L). Very porous substrates may require a second coat after the first coat has been completely absorbed.
5. On concrete surfaces sealed with *MapeWrap Primer 1* but requiring smoothing/leveling, apply a layer (average thickness of 1/32" [1 mm] and maximum thickness of 1/6" [4 mm]) of *MapeWrap 11* or *MapeWrap 12* using a notched trowel, while the primer is still wet or tacky. Use a flat trowel to smooth the surface and remove any imperfections. For higher thickness, use *Planitop® X* or *Planitop XS*.
6. When wrapping columns, *MapeWrap G Uni-Ax* must be overlapped by 8" (20 cm) with the same fabric.

Dry layup

1. Spread an even first coat of *MapeWrap 31* with a brush or short-nap roller at a thickness of 20 mils (0,5 mm) and rate of 40 to 45 sq. ft. per U.S. gal. (0,98 to 1,10 m² per L), while *MapeWrap 11* or *MapeWrap 12* is still wet or tacky.
2. Immediately place *MapeWrap G Uni-Ax* over the still-tacky or -wet *MapeWrap 31*, using a gloved hand (refer to the (M)SDS for proper personal protection equipment [PPE]) to thoroughly flatten out the fabric, and then use a hard plastic roller to smooth out any wrinkles or air pockets. The roller should be run only in the direction of the primary fibers in the fabric.
3. Use a rubber roller to push the epoxy through the fibers on both sides of the fabric, and then apply a second coat of *MapeWrap 31* over the exposed surface to completely encapsulate the fabric. Use an aluminum worm screw roller to completely eliminate any remaining air bubbles formed during the application.
4. Broadcast sand to rejection onto the wet surface of *MapeWrap 31* and cover with a protective coating, such as *Mapelastic™* flexible, cementitious waterproofing mortar, or *Mapecoat™ AF* flexible acrylic paint, to provide an effective barrier against ultraviolet (UV) rays, particularly in direct sunlight.

Wet layup

1. *MapeWrap G Uni-Ax* should be impregnated with *MapeWrap 21* using an automated, mechanically driven saturation device. This is a simple machine fitted with a bucket and a series of rollers that automatically saturates the fabric and allows any excess saturant to drip from the fabric easily and safely.
2. As an alternative, *MapeWrap G Uni-Ax* can be plunged into a plastic trough filled with 1/3 of the total volume with *MapeWrap 21*. Remove the fabric from the trough, let it drip and press it between gloved hands until the excess resin is completely removed. Take precaution not to wring the fabric and damage the E-glass fibers.
3. Once *MapeWrap G Uni-Ax* is saturated, apply it over the still wet *MapeWrap 11* or *MapeWrap 12* that covers *MapeWrap Primer 1*, or over *MapeWrap Primer 1* alone if a fast-setting mortar was used. Use a gloved hand (refer

MapeWrap G Uni-Ax

Product Performance Properties

Laboratory Tests	Results
Fiber material	High-strength E-glass
Color	White
Primary fiber direction	0° (uni-directional)
Shelf life	Unlimited in proper storage conditions; store in a dry place with no exposure to direct sunlight
Weight	26.5 U.S. oz. per sq. yd. (900 g per m²)

Dry Fiber Properties

Property	Typical Test Value
Base	High-strength, uni-directional E-glass fiber fabric
Ultimate tensile strength	371,297 psi (2,56 GPa)
Tensile modulus	11,704 psi (80,7 MPa)
Elongation at break	3%
Nominal thickness (t_f):	0.0139" per ply (0,353 mm per ply)

Cured Laminate Properties with *MapeWrap 21*

Properties	Average Value	Design Value[1]	ASTM Test Method
Tensile strength*	69,000 psi (476 MPa)	43,000 psi (297 MPa)	D3039
Tensile modulus*	3,292,000 psi (22 703 MPa)	3,292,000 psi (22 703 MPa)	D3039
Elongation at break*	2.1%	1.4%	D3039
Ply thickness (inch/mm)*	0.0517 (1,313)	0.0517 (1,313)	-

Cured Laminate Properties with *MapeWrap 31*

Properties	Average Value	Design Value[1]	ASTM Test Method
Tensile strength*	54,000 psi (372 MPa)	42,000 psi (290 MPa)	D3039
Tensile modulus*	2,586,000 psi (17 834 MPa)	2,586,000 psi (17 834 MPa)	D3039
Elongation at break*	2.1%	1.8%	D3039
Ply thickness (inch/mm)*	0.0701 (1,780)	0.0701 (1,780)	-

** 24 sample coupons per test series according to ACI 440. Testing is in accordance with ASTM D3039.*

[1] Average value minus 3 standard deviations

Packaging

Product Code	Size
7303450	164-ft. (50,0-m) roll at 23.6" (60 cm) wide
Made to order	164-ft. (50,0-m) roll at 11.8" (30 cm) wide

MAPEI

to the (M)SDS for proper PPE) to thoroughly flatten out the fabric, and then use a hard plastic roller to smooth out any wrinkles or air pockets. The roller should be run only in the direction of the primary fibers in the fabric.

4. Pass over the impregnated fabric with a worm screw roller in order to completely eliminate any air bubbles formed during application of the fabric.
5. Broadcast sand to rejection onto the wet surface of *MapeWrap 21* covering *MapeWrap G Uni-Ax* and cover with a protective coating, such as *Mapelastic* flexible, cementitious waterproofing mortar, or *Mapecoat AF* flexible acrylic paint, to provide an effective barrier against UV rays, particularly in direct sunlight.

CLEANUP

Due to the high bond strength of *MapeWrap 11*, *MapeWrap 12*, *MapeWrap 21* and *MapeWrap 31* on metal, tools should be cleaned with approved solvents (ethyl alcohol, toluene, etc.) before the product dries. Cured materials can only be removed mechanically. Dispose of in accordance with local disposal regulations.

Refer to the (M)SDS for specific data related to VOCs, health and safety, and handling of product.

STATEMENT OF RESPONSIBILITY

Before using, user shall determine the suitability of the product for its intended use and user alone assumes all risks and liability whatsoever in connection therewith. **ANY CLAIM SHALL BE DEEMED WAIVED UNLESS MADE IN WRITING TO US WITHIN FIFTEEN (15) DAYS FROM DATE IT WAS, OR REASONABLY SHOULD HAVE BEEN, DISCOVERED.**

We proudly support the following industry organizations:

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1-800-361-9309 (Canada)

Customer Service
1-800-42-MAPEI (1-800-426-2734)

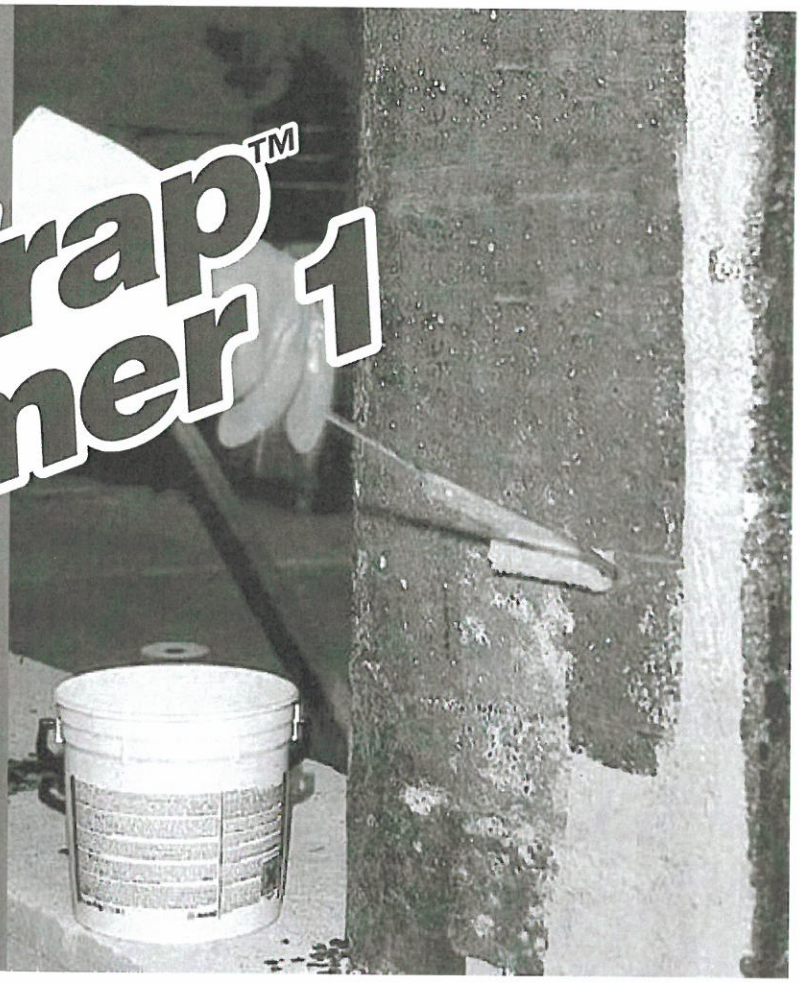
Services in Mexico
01-800-MX MAPEI (01-800-696-2734)

Edition Date: April 25, 2013
PR 6467 MKT 6725

Version: Oct. 1, 2014

MAPEI®

MapeWrap™ Primer 1



Low-Viscosity, 100%-Solids Epoxy Resin Primer for the *MapeWrap* Composite System

DESCRIPTION

MapeWrap Primer 1 is a 100%-solids, moisture-tolerant, low-viscosity, two-component epoxy resin that is used as a seal coat for consolidating and priming concrete substrates. After mixing, *MapeWrap Primer 1* becomes a low-viscosity resin that is able to penetrate a cementitious pore structure and provide a high bond for the other components of the *MapeWrap* composite system on horizontal, vertical and overhead surfaces.

FEATURES AND BENEFITS

- Solvent-free and VOC-compliant
- Moisture-tolerant and can be applied on damp surfaces
- Excellent adhesion to concrete, masonry, wood and steel surfaces
- 100%-solids epoxy
- Developed specifically for the *MapeWrap* composite system
- 90-minute working time at 73°F (23°C)

INDUSTRY STANDARDS AND APPROVALS

LEED Points Contribution	LEED Points
MR Credit 5, Regional Materials*	Up to 2 points
IEQ Credit 4.2, Low-Emitting Materials – Paints & Coatings	1 point

** Using this product may help contribute to LEED certification of projects in the categories shown above. Points are awarded based on contributions of all project materials.*

WHERE TO USE

- Use on interior/exterior, horizontal, vertical and overhead surfaces.
- Use on concrete, masonry, wood and steel.
- Use as the first component in the *MapeWrap* composite system installation.
- Use to promote excellent adhesion for the *MapeWrap* composite system.

LIMITATIONS

- Apply *MapeWrap Primer 1* when the ambient temperature is between 50°F and 86°F (10°C and 30°C).
- Do not thin *MapeWrap Primer 1* with solvents.
- Contact MAPEI's Technical Services Department for applications below 50°F (10°C) and above 86° F (30°C).

SUITABLE SUBSTRATES

- Use on properly prepared, structurally sound, fully cured concrete substrates (at least 28 days old), as well as masonry, steel and wood.

Consult MAPEI's Technical Services Department for installation recommendations regarding substrates and conditions not listed.

SURFACE PREPARATION

1. Ensure that all substrates are fully cured, structurally sound, stable, clean and free of dust, oil, grease, paint, tar, wax, sealers, curing compounds, form release agents, primers, laitance, loose particles, and any foreign substance or debris that could reduce or impair adhesion.

MapeWrap™ Primer 1

2. All sharp edges that may be found on rectangular beams and columns must be ground smooth and flush, with a bending radius (bullnose) of not less than 3/4" (19 mm) on all corners.
3. Mechanically prepare the substrate to provide a proper surface profile, as determined by the engineer. The surface profile typically should be a minimum of International Concrete Repair Institute (ICRI) concrete surface profile (CSP) #3 to CSP #5. In all cases, it is the responsibility of the engineer to assess and specify the surface profile required to ensure system performance.
4. Uneven surfaces should be leveled with a fast-setting cementitious repair mortar such as MAPEI's *Planitop® X* or *Planitop XS*. Allow cementitious repair mortars to cure 24 hours before installation of *MapeWrap Primer 1* and fabric. Alternately, an epoxy putty such as MAPEI's *MapeWrap 11* or *MapeWrap 12* can be used for smoothing/leveling. Apply a 1/16" (1,5-mm) layer of *MapeWrap 11* or *MapeWrap 12* using a notched trowel while the primer is still wet or tacky (about 2 to 6 hours after installation). Use a flat trowel to smooth the surface and remove any imperfections. If an epoxy putty is used, it should be fresh or tacky when the fabric is applied.
5. Seal any surface cracks with MAPEI's epoxy injection products, such as *Planibond®* AE and/or *Planibond CR 50*.
6. Clean all exposed reinforcement in accordance with The Society for Protective Coatings (SSPC) and coat with *Planibond 3C* or *Mapefer™ 1K*.
7. The pull-off strength of the concrete should meet a minimum tensile strength of 200 psi (1,38 MPa) and exhibit failure within the concrete substrate. Random pull-off testing (per ACI 503R) should be completed after the appropriate surface preparation has been achieved.

MIXING

Note: Choose all appropriate safety equipment before use. Refer to the Safety Data Sheet for more information.

1. Combine the two components together that make up *MapeWrap Primer 1* by pouring Part B into Part A.
2. Mix with a low-speed mixer (at 400 to 600 rpm) and a standard Jiffy paint-mixing paddle for about 3 minutes, until the mixture has a smooth, homogenous consistency. Part A and Part B components are pre-proportioned (mix ratio: 3 parts by weight of Part A and 1 part by weight of Part B) and should be mixed as full units. Partial mixing of Part A and Part B is prohibited.

PRODUCT APPLICATION

1. Prime the surface that needs to be reinforced with a brush or 3/8" (10-mm) nap roller and an even coat of *MapeWrap Primer 1* at a rate of 150 to 190 sq. ft. per U.S. gal. (3,67 to 4,65 m^2 per L). Very porous substrates may require a second coat after the first coat has been completely absorbed. Once prepared, *MapeWrap Primer 1* has a working time of 90 minutes at 73°F (23°C).
2. No special precautions need to be taken at temperatures between 50°F and 86°F (10°C and 30°C). Apply the product in the lower end of its temperature range and do not expose the material to direct sunlight.
3. If applications are performed outdoors at temperatures below 50°F (10°C), heat the substrate to 50°F (10°C) for 24 hours before applying *MapeWrap Primer 1*. Protect from frost for 24 hours.
4. When applying the products in a closed environment, provide good ventilation. For further information, carefully read the SDS of each product.

CLEANUP

- Due to the high bond strength of *MapeWrap Primer 1* on metal, clean tools with approved solvents (ethyl alcohol, toluene, etc.) before the product dries. Cured material can only be removed mechanically. Dispose of cured material in accordance with local disposal regulations.

MapeWrap Primer 1

Product Performance Properties*

Laboratory Tests	Results
Consistency (mixed)	Liquid
Color (mixed)	Transparent yellow
Specific gravity (g per cm^3)	1,1
Mix ratio (by weight)	Part A : Part B = 3 : 1
VOCs	< 50 g per L
Set times At 50°F (10°C) At 73°F (23°C) At 86°F (30°C)	 5 to 6 hours 3 to 4 hours 2 to 3 hours
Complete curing	7 days
Adhesion to concrete at 7 days and 73°F (23°C)	> 435 psi (> 3 MPa)
Tensile strength at 7 days (ASTM D638)	4,394 psi (30,3 MPa)
Tensile elongation at 7 days (ASTM D638)	2.28%
Compressive strength at 7 days (ASTM C579)	12,015 psi (82,9 MPa)

** Based on testing of cured samples per ASTM D638 at 72°F (22°C) and 40% relative humidity*

Shelf Life and Application Properties

Shelf life	2 years in original, unopened container in a covered area
Store at	50°F to 86°F (10°C to 30°C). Protect from freezing in shipment and storage.
Working time At 50°F (10°C) At 73°F (23°C) At 86°F (30°C)	 120 minutes 90 minutes 60 minutes

Packaging

Kit (Parts A and B), 1 U.S. gal. (3,79 L)

Approximate Coverage

1 U.S. gal. (3,79 L)	150 to 190 sq. ft. per U.S. gal. (3,67 to 4,65 m^2 per L)

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Refer to the SDS for specific data related to VOCs, health and safety, and handling of product.

STATEMENT OF RESPONSIBILITY

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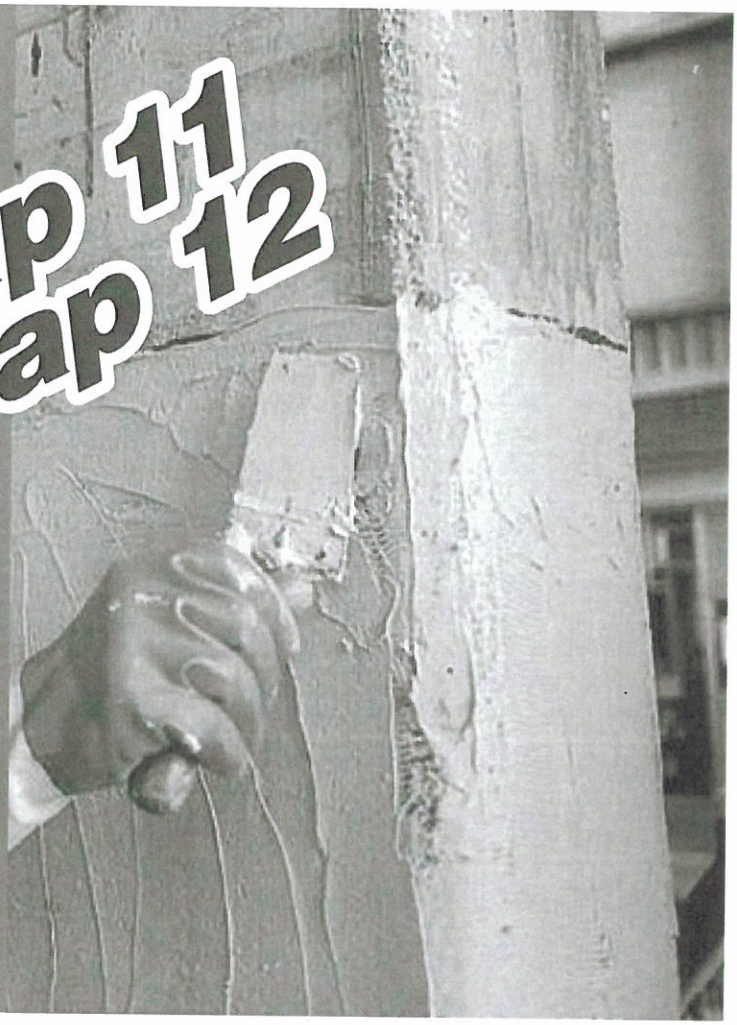
Edition Date: September 9, 2014
PR: 7087 MKT: 14-0526

For the most current BEST-BACKED℠ product data and warranty information, visit www.mapei.com.

MAPEI

MapeWrap 11
MapeWrap 12

Thixotropic epoxy putties for levelling concrete surfaces



WHERE TO USE
Levelling concrete, reinforced concrete or masonry surfaces before applying **Mapewrap** fabrics.

TECHNICAL CHARACTERISTICS
Mapewrap 11 and **Mapewrap 12** are two-component epoxy resin based products with selected fine graded aggregates and special additives developed in the MAPEI research laboratories.

After mixing **Mapewrap 11** Part A or **Mapewrap 12** Part A with their relative hardener (Part B), they become a thixotropic paste, easy to apply both on vertical surfaces and on soffits.

The two products differ from each other only for the workability time. **Mapewrap 11** is suitable for applications at temperatures between +5°C and +23°C, while **Mapewrap 12** is recommended in hot climates (T > 23°C).

Mapewrap 11 and **Mapewrap 12** harden without shrinkage, becoming extremely adhesive and mechanically strong.

RECOMMENDATIONS
- **Mapewrap 11** and **Mapewrap 12** must not be used on wet surfaces.
- **Mapewrap 11** and **Mapewrap 12** must not be used on dirty or crumbly surfaces.

APPLICATION PROCEDURE
Preparing the substrate
Treat the substrate with **Mapewrap Primer 1** before applying **Mapewrap 11** or **Mapewrap 12**.

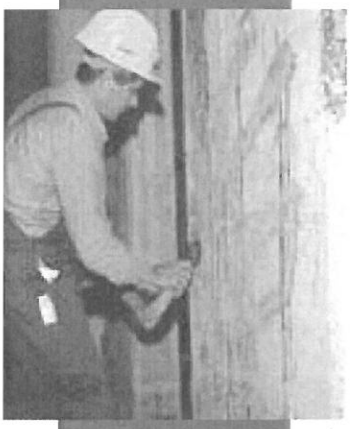
Preparing the mixes
The two components Part A and Part B, of **Mapewrap 11** and **Mapewrap 12** must be mixed together. Pour Part B (white) into Part A (grey) and mix with a slow speed drill fitted with a stirrer until the resin is completely homogeneous (completely grey). The products come already pre-dosed therefore do not use partial quantities to avoid the risk of accidental ratio errors that could prevent **Mapewrap 11** and **Mapewrap 12** from hardening fully or partially.

Applying the mixes
Mapewrap 11 and **Mapewrap 12** can be applied on concrete, stone, brick or metal with a flat trowel after the substrate has been primed with **Mapewrap Primer 1**.

In order to obtain good levelling, it is recommended to let the product penetrate well into particularly uneven areas.

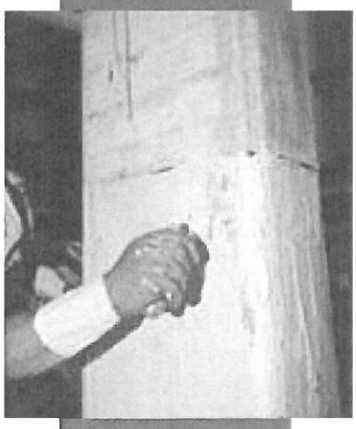
Apply, with a notched trowel, approximately a 1 mm layer of **Mapewrap 11** or **Mapewrap 12**, depending on the temperature, over the still fresh **Mapewrap Primer 1**. Use a flat trowel to completely level even

MapeWrap 11, MapeWrap 12



Preparing the substrate

Applying a coat of Mapewrap Primer 1



Levelling with Mapewrap 11 or Mapewrap 12

TECHNICAL DATA (typical values)

IDENTIFICATION DATA OF MAPEWRAP 11 AND MAPEWRAP 12

	Part A	Part B
Consistency:	thick paste	thick paste
Colour:	grey	white
Specific gravity (g/cm³):	1.6	1.5
Brookfield viscosity (mPa·s):	800 (F shaft - rev. 5)	300 (D shaft - rev. 2.5)
Storage:	24 months in original sealed packaging at temperatures between +10°C and +30°C	
Hazard classification according to EC 99/45:	irritant Before using the product, consult the "Safety instructions" paragraph and the information described on the packaging and safety data sheet.	corrosive
Customs class:	3907 30 00	

APPLICATION DATA

	Mapewrap 11	Mapewrap 12
Mix ratio:	Part A : Part B = 3 : 1	
Mix consistency:	thixotropic paste	
Colour of mix:	grey	
Specific gravity of the mix (g/cm³):	1.55	
Brookfield viscosity (mPa·s):	500 (3 shaft - rev. 5)	
Workability **– at +10°C:** **– at +23°C:** **– at +30°C:**	 60' 40' 20'	 150' 60' 35'
Setting time **– at +10°C:** **– at +23°C:** **– at +30°C:**	 7-8 h 3 h - 3 h 30' 1 h 30' - 2 h	 14-16 h 4-5 h 2 h 30' - 3 h
Application temperature:	from +5°C to +30°C	from +10°C to +30°C
Complete curing:	7 days	
Adhesion to concrete (N/mm²):	>3 (after 7 days at +23°C - concrete failure)	
Tensile strength (ASTM D 638) (N/mm²):	30	
Tensile elongation (ASTM D 638) (%):	1	
Compressive strength (ASTM C 579) (N/mm²):	70	
Flexural strength (ISO 178) (N/mm²):	40	
Modulus of elasticity under compression (ASTM C 579) (N/mm²):	8000	
Modulus of elasticity in flexion (ISO 178) (N/mm²):	4000	

the most uneven parts of the surface. Use the same product to fill and round the corners in order to create a profile with a bending radius not less than 2 cm.

Mapewrap 11 or **Mapewrap 12** must be applied within their pot-life, therefore timing is vital in order to use the whole pack within the given time.

The **Mapewrap** fabrics must be applied over the still fresh **Mapewrap 11** or **Mapewrap 12**.

Precautions to be observed before application

No special precautions need to be taken at temperatures between +5°C and +30°C. In hot weather do not expose the material to direct sunlight. Levelling should be carried out during the cooler hours.

SAFETY INSTRUCTIONS FOR THE PREPARATION AND APPLICATION

Mapewrap 11 and **Mapewrap 12** Parts A are irritant in direct contact with the eyes and skin. Parts B contain a strongly caustic and harmful substance when inhaled and swallowed. After repeated and prolonged contact, sensitivity of the skin could be caused. Use protective gloves and avoid all contact with the skin. In case of contact, wash with plenty of water and soap. If there should be any sensitivity of the skin, consult a doctor. If in contact with the eyes, wash with plenty of running water and consult a doctor. Use in ventilated areas and avoid inhaling the fumes, especially when mixing the two components.

Cleaning

Due to the strong adhesion of **Mapewrap 11** and **Mapewrap 12** also onto metal, it is recommended to wash the working tools with solvents (ethyl alcohol, toluol, etc.) before the product dries.

CONSUMPTION

1.55 kg/m² per mm of thickness.

PACKAGING

2 kg units (Part A = 1.5 kg, Part B = 0.5 kg).

6 kg units (Part A = 4.5 kg, Part B = 1.5 kg).

STORAGE

The product must be stored in original sealed packaging at temperatures not below +5°C.

FOR PROFESSIONALS.

WARNING

N.B. - Although the technical details and recommendations contained in this product report correspond to the best of our knowledge and experience, all the above information must, in every case, be taken as merely indicative and subject to confirmation after long-term practical applications: for this reason, anyone who intends to use the product must ensure beforehand that it is suitable for the envisaged application: in every case, the user alone is fully responsible for any consequences deriving from the use of the product.

All relevant references of the product are available upon request

MapeWrap 11
MapeWrap 12

MAPEI®

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MAPEI®

MapeWrap™ 21

Low-Viscosity, 100%-Solids Epoxy Resin for Impregnation of *MapeWrap* Fabrics

DESCRIPTION

MapeWrap 21 is a 100%-solids, moisture-tolerant, low-viscosity epoxy resin for impregnating *MapeWrap* composite system fabrics by a wet layup method immediately before they are placed. *MapeWrap 21* may be applied by an automated saturation device or manually to provide complete encapsulation of both carbon and glass fiber fabrics. When applied on concrete and masonry surfaces, the resulting cured laminate provides strengthening to these structural elements.

FEATURES AND BENEFITS

- Low-viscosity epoxy resin for complete encapsulation of all *MapeWrap* fabrics
- Remains workable for 40 minutes at 73°F (23°C)
- High mechanical strength
- Moisture-tolerant
- Solvent-free and VOC-compliant
- Developed specifically for the *MapeWrap* composite system

INDUSTRY STANDARDS AND APPROVALS

LEED Points Contribution	LEED Points
MR Credit 5, Regional Materials*	Up to 2 points
IEQ Credit 4.2, Low-Emitting Materials – Paints & Coatings	1 point

** Using this product may help contribute to LEED certification of projects in the categories shown above. Points are awarded based on contributions of all project materials.*

WHERE TO USE

- Use for saturation of all *MapeWrap* fabrics before placement.
- Use on interior/exterior horizontal, vertical and overhead surfaces.
- Use when additional structural strengthening is required on concrete, masonry, steel and wood elements.
- Use for the repair of large surface areas.

LIMITATIONS

- Do not thin *MapeWrap 21* with solvents.
- Apply *MapeWrap 21* when the substrate and ambient temperature are between 50°F and 86°F (10°C and 30°C). Contact MAPEI's Technical Services Department for applications below and above this range.
- Do not use *MapeWrap 21* if its mixed components have begun to harden before application.

SUITABLE SUBSTRATES

- Use on properly prepared, structurally sound, fully cured concrete substrates (at least 28 days old), as well as masonry, steel and wood.

Consult MAPEI's Technical Services Department for installation recommendations regarding substrates and conditions not listed.

SURFACE PREPARATION

1. Ensure that all substrates are fully cured, structurally sound, stable, clean and free of dust, oil, grease, paint, tar, wax, sealers, curing compounds, form release agents, primers, laitance, loose particles, and any foreign substance or debris that could reduce or impair adhesion.

MapeWrap™ 21

2. All sharp edges that may be found on rectangular beams and columns must be ground smooth and flush, with a bending radius (bullnose) of not less than 3/4" (19 mm) on all corners.

3. Mechanically prepare the substrate to provide a proper surface profile, as determined by the engineer. The surface profile typically should be a minimum of ICRI CSP #3 to CSP #5. In all cases, it is the responsibility of the engineer to assess and specify the appropriate surface profile required to ensure system performance.

4a. Leveling with a fast-setting mortar: Uneven surfaces should be leveled/smoothed. A fast-setting cementitious repair mortar such as MAPEI's *Planitop® X* or *Planitop XS* can be used. Apply a 1/16" (1,5-mm) layer of the repair mortar using a notched trowel. Use a flat trowel to smooth the surface and remove any imperfections. Allow the repair mortar to cure for 24 hours before a *MapeWrap* fabric is applied.

4b. Leveling with an epoxy putty: As an alternative method for the required leveling/smoothing of uneven surfaces, an epoxy putty such as MAPEI's *MapeWrap 11* or *MapeWrap 12* can be used. First, prime the surface that needs reinforcement with a brush or 3/8" (10-mm) nap roller and an even coat of *MapeWrap Primer 1* at a rate of 150 to 190 sq. ft. per U.S. gal. (3,67 to 4,65 m^2 per L). Very porous substrates may require a second coat after the first coat has been completely absorbed. Once prepared, *MapeWrap Primer 1* has a working time of 90 minutes at 73°F (23°C). While the primer is still wet or tacky (about 2 to 6 hours after installation), apply a 1/16" (1,5-mm) layer of *MapeWrap 11* or *MapeWrap 12* using a notched trowel. Use a flat trowel to smooth the surface and remove any imperfections. The epoxy putty should be fresh or tacky when a *MapeWrap* fabric is applied.

5. Seal any surface cracks with MAPEI's epoxy injection products, such as *Planibond® AE* and/or *Planibond CR 50*.

6. Clean all exposed reinforcement in accordance with the Steel Structures Painting Council (SSPC) and coat with *Planibond 3C* or *Mapefer™ 1K*.

7. The pull-off strength of the concrete should meet a minimum tensile strength of 200 psi (1,4 MPa) and exhibit failure within the concrete substrate. Random pull-off testing (per ACI 503R) should be completed after the appropriate surface preparation has been achieved.

8. If a fast-setting mortar was used for leveling: *MapeWrap Primer 1* should now be applied. Prime the surface that needs to be reinforced with a brush or 3/8" (10-mm) nap roller and an even coat of *MapeWrap Primer 1* at a rate of 150 to 190 sq. ft. per U.S. gal. (3,67 to 4,65 m^2 per L). Very porous substrates may require a second coat after the first coat has been completely absorbed. Once prepared, *MapeWrap Primer 1* has a working time of 90 minutes at 73°F (23°C). *MapeWrap Primer 1* should be dry/cured when a *MapeWrap* fabric is applied.

MIXING

Note: Choose all appropriate safety equipment before use. Refer to the Safety Data Sheet for more information.

1. Combine the two components together that make up *MapeWrap 21* by pouring Part B into Part A.

2. Mix with a low-speed mixer (at 400 to 600 rpm) and a standard Jiffy paint-mixing paddle for about 3 minutes, until the mixture has a smooth, homogenous consistency.

3. Part A and Part B components are pre-proportioned (mix ratio: 4 parts by weight of Part A and 1 part by weight of Part B) and should be mixed as full units. Partial mixing of Part A and Part B is prohibited.

PRODUCT APPLICATION

1a. Automated saturation: Cut the *MapeWrap* fabric to the desired length and begin the impregnation process with an automated, mechanically driven saturation device and *MapeWrap 21*. This is a simple machine fitted with a bucket and a series of rollers that automatically saturates the fabric and allows any excess saturant to drip from the fabric easily and safely. This system is particularly effective on large surface areas and ensures even distribution of resin over every part of the fabric.

1b. Trough saturation: As an alternative, after the *MapeWrap* fabric is cut to length, it can be plunged into a plastic trough filled with 1/3 of the total volume of the mixed *MapeWrap 21*. Remove the fabric from the trough, let it drip, and press it between gloved hands until the excess resin is completely removed. Take precaution to not wring the fabric and damage the carbon fibers.

2. Once saturated, the *MapeWrap* fabric should be applied over the still tacky *MapeWrap 11* or *MapeWrap 12* or over the dry/cured *MapeWrap Primer 1* (depending on the leveling method). Use your gloved hand (refer to the SDS for proper Personal Protection Equipment [PPE]) to thoroughly flatten out the fabric. Then, use a hard plastic roller to smooth out any wrinkles or air pockets. The roller should be run only in the direction of the primary fibers in the fabric.

3. Apply a second coat of *MapeWrap 21* by brush or 3/8" (10-mm) roller. Press several times with a hard plastic or aluminum worm screw roller to allow the resin to completely penetrate the fibers of the fabric.

4. Pass over the impregnated fabric with a hard plastic roller in order to completely eliminate any air bubbles formed during application of the fabric.

5. When applying the products in a closed environment, provide good ventilation. For further information, carefully read the SDS of each product.

Product Performance Properties*

Laboratory Tests	Results
Consistency (mixed)	Liquid
Color (mixed)	Transparent yellow
Specific gravity (g per cm^3)	1,1
Mix ratio (by weight)	Part A : Part B = 4 : 1
VOCs	< 50 g per L
Set times	
– At 50°F (10°C)	90 minutes
– At 73°F (23°C)	50 minutes
– At 86°F (30°C)	30 minutes
Complete curing	7 days
Adhesion to concrete at 7 days and 73°F (23°C)	> 435 psi (> 3 MPa)
Tensile strength (ASTM D638) at 7 days	5,600 psi (38,6 MPa)
Tensile elongation (ASTM D638) at 7 days	3.6%
Compressive strength (ASTM C579) at 7 days	12,659 psi (87,3 MPa)
Flexural strength (ISO 178)	7,975 psi (55 MPa)
Modulus of elasticity under compression (ASTM C579)	290,000 psi (2,000 MPa)
Modulus of elasticity in flexion (ISO 178)	362,500 psi (2,500 MPa)

** Based on testing of cured samples per ASTM D638 at 72°F (22°C) and 40% relative humidity*

Shelf Life and Application Properties

Shelf life	2 years in original, unopened container in a covered area
Storage conditions	50°F to 86°F (10°C to 30°C). Protect from freezing in shipment and storage.
Working times	
– At 50°F (10°C)	60 minutes
– At 73°F (23°C)	40 minutes
– At 86°F (30°C)	20 minutes

Packaging

Size
Kit (Parts A and B), 1 U.S. gal. (3,79 L)

Approximate Coverage for a 2-coat application

When used with	Amount of fabric that can be applied
MapeWrap C Uni-Ax 300	34 to 37 sq. ft. per U.S. gal. (0,83 to 0,91 m^2 per L)
MapeWrap C Uni-Ax 600	23 to 25 sq. ft. per U.S. gal. (0,56 to 0,61 m^2 per L)
MapeWrap C Bi-Ax 230	34 to 37 sq. ft. per U.S. gal. (0,83 to 0,91 m^2 per L)
MapeWrap G Uni-Ax 900	56 to 64 sq. ft. per U.S. gal. (1,37 to 1,57 m^2 per L)

MapeWrap™ 21

CLEANUP

- Due to the high bond strength of *MapeWrap 21* on metal, clean tools with approved solvents (ethyl alcohol, toluene, etc.) before the product dries. Cured material can only be removed mechanically. Dispose of cured material in accordance with local disposal regulations.

Refer to the SDS for specific data related to VOCs, health and safety, and handling of product.

STATEMENT OF RESPONSIBILITY

Before using, user shall determine the suitability of the product for its intended use and user alone assumes all risks and liability whatsoever in connection therewith. **ANY CLAIM SHALL BE DEEMED WAIVED UNLESS MADE IN WRITING TO US WITHIN FIFTEEN (15) DAYS FROM DATE IT WAS, OR REASONABLY SHOULD HAVE BEEN, DISCOVERED.**

We proudly support the following industry organizations:

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For the most current BEST-BACKED℠ product data and warranty information, visit www.mapei.com.