

**Resin Mortar with Carbon Fiber
for Anti-Corrosion**

**Mighty Coat
CF-CP**

(JP 2 0 4 0 0 9 4)

Standard Construction Manual

Mighty Chemical Co., Ltd.

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1. Kinds of Mighty Coat CF-CP

1.1 What is Mighty Coat CF-CP?

Mighty Coat CF-CP is an advanced inorganic anti-corrosion coating which changes red rust to stable black rust as a result of its high alkaline nature. As an inorganic material, Mighty Coat CF-CP has a very long life because it is not susceptible to ultraviolet rays. The Shimonoseki Fishing Park pier is an outstanding example of Mighty Coat CF-CP's durability and long life.

Shimonoseki Pier was constructed in 1984 by the City of Shimonoseki. Since its construction, no major repair has been required. Even now, rust is still minimal and major repair work is required. This is evidence of Mighty Coat CF-CP's long term weather resistance, and heavy duty anti-corrosion nature.



Shimonoseki Pier

Easy to use and with a beautiful finish, Mighty Coat CF-CP offers the following products for trouble-free application. Use these products to achieve the highest performance

Product Name	Detail Component	Packaging	Net Weight
Mighty Coat CF-CP Emulsion	Co-Polymer of Acrylic Acid Ester	Plastics Container	7Kg x2

Mighty Coat CF-CP Compound	Carbon Fiber Contained Compound	Plastics Bag	16K gx2
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1.2 Storing of Emulsion and Compound

Mighty Coat CF-CP Emulsion is liquid emulsified with a polymer solution in water. For this reason, the emulsion should be stored in a cool, dry place and should not be exposed to direct sunlight, high altitudes, extreme temperatures or freezing conditions. It should be used within 6 months from the date of production.

Mighty Coat CF-CP Compound is a mixture of white cement and other materials. This should be stored in a cool, dry place to avoid the solidification. It should not be stored directly on the ground to avoid moisture adsorption.

1.3 Packaging and General Characteristics of Mighty Coat CF-CP

Appearance:	Used with the powder and liquid at the fields
Packaging:	1 set of Mighty Coat CF-CP is 46Kg in total. (2 packages each of 16Kg compound and 2 packages each of 7Kg emulsion liquid)
Color tone:	Gray-white (Same to white cement)
Sheen:	Matte
Bulk Density:	1.8 to 1.9 after drying
Drying Time:	20 minutes to 2 hours depending by weather (do not touch during this time)
Coating Amount:	500g per square meter for one coating
Flash Point:	Nonflammable, no igniting and not explosive
Hazardous:	Passed the specifications of JWVA
Organic Solvent:	Not used

1.4 Composition of Mighty Coat CF-CP

Mighty Coat CF-CP is composed of the following materials based on a 1:2.3 mixture of the Emulsion to Compound.

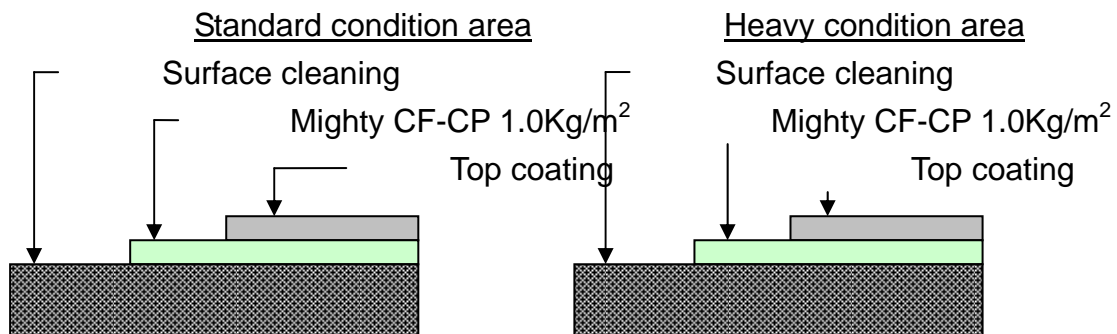
Compound Powder:	
White cement	25 wt%
Natural silica sand	38 wt%
Carbon Fiber	2 wt%
Other	5 wt%
Emulsion Liquid:	
Water	22%
Co-polymer of Acrylic Acid-Ester	8 wt%
Other	
<hr/>	
Total	100 wt%

Please make note that there may be some minor variation from time to time of the above composition, which is the standard composition.

2. Construction Procedure of Mighty Coat CF-CP

2.1 Standard Anti-Corrosion procedure with Mighty Coat CF-CP

Standard Mighty Coat CF-CP anti-corrosion coating procedure is explained utilizing the spray coating method. For anti-corrosion painting with Mighty Coat CF-CP, there is two kinds of procedures can be employed, depending on whether there are standard corrosion conditions or much heavier corrosion conditions such as those caused by locations near salt water.



For standard conditions

1. Surface cleaning operation
 - a) Clean to the guidelines of level 3 or 4, table below
 - b) Complete de-oiling
2. Mighty Coat CF-CP coating

Necessary quantities of Mighty Coat CF-CP (including 25% loss)

Emulsion: 380g/m²

Compound: 870 g/m²

Operation

Spray up two layers separately of Mighty Coat CF-CP

1,250 g/m² including spraying loss

After drying, top coat with top coating paint

For heavy condition area

1. Surface cleaning operation
 - a) Clean to the guidelines of level 3, table below
 - b) Complete de-oiling

2. Mighty Coat CF-CP coating

Necessary quantities of Mighty Coat CF-CP (including 25% loss)

Emulsion: 570g/m²

Compound: 1,310 g/m²

Operation

Spray up to three layers separately of Mighty Coat CF-CP in total

1,880 g/m² including spraying loss

After drying, top coat with top coating paint

The above procedures are standard practices; more detail will be provided in Section 3, Construction Procedure for Mighty Coat CF-CP.

2.2 Cleaning Level of Construction Surface

For coating steel surface

- (1) The third level cleaning requires using sander disc tool, steel brush etc.
- (2) Flaking rust should be scraped out completely.
- (3) New construction, it is only necessary to clean the surface powder rust.
- (4) For new construction, a small amount of coating oil will be on the surface which will need to be removed completely.
- (5) Specific surface conditions and cleaning methods are as follows:

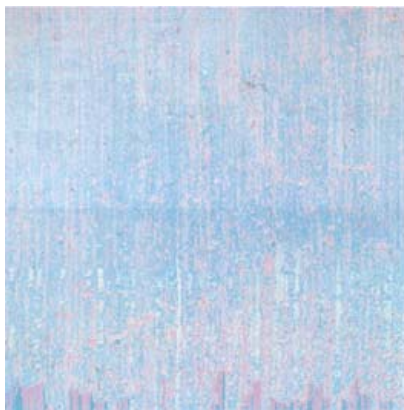
Level	How to clean up	Procedure
1	Remove all rust and paint completely to create clean steel surface.	Sandblast method
2	Remove all rust and paint completely to expose the steel surface; concave pitting, rust or paint membranes will remained.	Clean up with electric disc-sander and wire wheel
3	Remove all rust and deteriorated paint completely; however active paint membrane cannot be removed.	Clean up with electric disc-sander and wire wheel
4	Remove powder materials and extraneous materials, but active layer cannot be removed.	Clean up with electric disc-sander and wire wheel



Level 1 cleaning surface



Level 2 cleaning surface



Level 3 cleaning surface



Level 4 cleaning surface

For coating concrete and mortar surfaces

- (1) Unstable concrete and brittle concrete layers should be removed
- (2) Laitance concrete, remover, cutting oil must be completely removed, and rust flakes on the steel bar must be removed.
- (3) Cleaning the concrete surface and high pressure water cleaning procedure is recommended.

For coating other material's surface

- (1) Oily surfaces should be completely clean and devoid of oils.
- (2) If the surface is smooth, it should be roughed by sand paper and/or steel wire brush before applying coating.

2.3 Mixing Rate and Construction Procedure

Mixture ratio will depend on application tool as follows:

Application Tool	Mixing Rate (E : C)
Brush or roller brush coating	1 : 2.3
Spray coating	1 : 2.3
Trowel coating	1 : 3.0~3.5
Patching concrete pitting	1 : 3.0~3.5
Saturation	Emulsion only

Mixing rate is indicated by Wt% base.

E=Emulsion C=Compound

2.4 Mixing Procedure

Place the proper amount of Mighty Coat CF-CP Emulsion in the container after weighing and a small amount of the Mighty Compound per the required mixing rate. Mix with an electrical hand mixer until it is thoroughly blended and add remaining Compound. Continue to mix with an electrical hand mixer until it is thoroughly blended. The total mixed amount should be less than half the volume of the container to avoid spattering during mixing.

3. Construction Procedure for Mighty Coat CF-CP

3.1 General Procedure for Mighty Coat CF-CP Application

To maximize the anti-corrosion properties of Mighty Coat CF-CP, it is important to follow the procedures and coat with Mighty Coat CF-CP only after the surface is thoroughly cleaned and directly onto the surface of the steel itself. It is acceptable to coat over the black rust layer if good contact with the steel surface can be made. In some cases, a zinc-rich paint is applied or zinc is plated on the steel surface prior to applying Mighty Coat CF-CP. It is acceptable to coat Mighty Coat CF-CP to that surface. However, if there is an undercoat of an organic paint, Mighty Coat CF-CP should be used only after that paint is removed completely with solvent.

If Mighty Coat CF-CP is applied on the surface of an old steel structure, the cleaning procedure will be especially important. All loose layers of old paint or rust must be completely removed. If the loose layers remain and Mighty Coat CF-CP applied on top, it will not saturate the surface and the area will corroded quickly because it will not be properly protected with Mighty Coat CF-CP.

The remaining powder like red rust will be no problem to coat on the surface and first layer of Mighty Coat CF-CP will be mixed with powder like red rust to form pinky color layer. It will be white color after second layer coating.

For the second layer coating, confirmation of drying of first layer is important procedure. Drying of first layer will be confirmed by finger touching and confirmed not to layer damaging by touching. After confirmation of first layer drying, second layer coating should be applied. The third layer is coating after same procedure of the confirmation. Drying time is dependent on weather conditions, especially moisture and sunlight. Normal drying time is approximately 30 minutes to 2 hours.

If the remaining Mighty Coat CF-CP becomes hard and/or viscous by drying in the mixing container, additional emulsion can be mixed in. Water should never be added to lower the viscosity as this will weaken the anti-corrosion properties. Use emulsion only.

3.2 Brush Coating Procedure

Brush coating can be utilized for small areas or complex surfaces such as trussed structures.

Considerations when choosing to coat by brush:

- a) Small loss rate (about less than 15%)
- b) Able to coat to the edges and underside of structure
- c) Requires simple tools
- d) Painting speed is comparatively slow

Brush coating procedure:

- a) Mixed the compound and emulsion with above 1:2.3 mixing procedure
- b) Ratio should be 1:2.3 of emulsion to compound
- c) Split the mixed Mighty Coat CF-CP into small containers
- d) Used a 50 to 75mm wide and about 50mm long brush
- e) Bristles should be firm
- f) First coat should be dry to touch before applying second coat
- g) Second coat should be dry to touch before applying third coat
- h) If a roller brush is used, select a shorter nap roller for application

3.3 Spray Coating Procedure

This is the standard application method for Mighty Coat CF-CP. Select a mortar spray gun applying Mighty Coat CF-CP. This method is ideal for small areas or complex structures. However for narrow spaces or structures, this method causes greater loss of Mighty Coat CF-CP and is less economical.

Considerations when choosing to coat by spray gun:

- a) Very beautiful finish
- b) Faster coating speed than with a brush
- c) Comparably higher loss of material (about 25%)

Spray coating procedure using mortar spray gun:

- a) Mixed the compound and emulsion with above 1:2.3 mixing procedure
- b) Distribute the mixed Mighty Coat CF-CP into spray containers
- c) Use a mortar spray gun with a 3.2mm to 4.5mm diameter nozzle, using compressed air
- d) Distance of air nozzle from the Mighty Coat CF-CP discharge nozzle should be set around 5mm
- e) Compressed air pressure should be approximately 6 atm
- f) Spraying distance to the surface from gun nozzle should be approximately 50cm
- g) First coat should be dry to touch before applying second coat
- h) Second coat should be dry to touch before applying third coat

3.4 Coating Procedure for Complex Surfaces

In some cases, Mighty Coat CF-CP will have to be applied on complex shaped surfaces such as structural edges, or bolt heads and nuts etc. The detailed procedure is available on request; however the general procedure is as follows.

- a) The ratio of Emulsion to Compound of Mighty Coat CF-CP should 1:3. This mixture is applied liberally to the edge of structure by hand or brush
- b) The thickness of the layer should be about 1.0 to 1.5mm
- c) First coat should be completely dry before applying second coat
- d) If it is difficult to develop sufficient thickness, multiple coats can be applied, after each prior coat is completely dry
- e) The thicker layers will often take longer to dry than with standard application
- f) When sufficient coating is achieved, proceed with standard application using either a brush or spray gun

3.5 Trowel Coating Procedure

Although it is possible to apply Mighty Coat CF-CP with a trowel, it is not a common practice. This method can be used for building floors, walls and ceilings. When applying Mighty Coat CF-CP with a trowel, the first layer should be mixed at a ratio of 1:2.3, emulsion to compound. After the first layer is completely dry, a second layer should be applied. The ratio for the emulsion to compound for the second layer should be 1:3.0. The detailed procedure is available on request; however the general procedure is as follows:

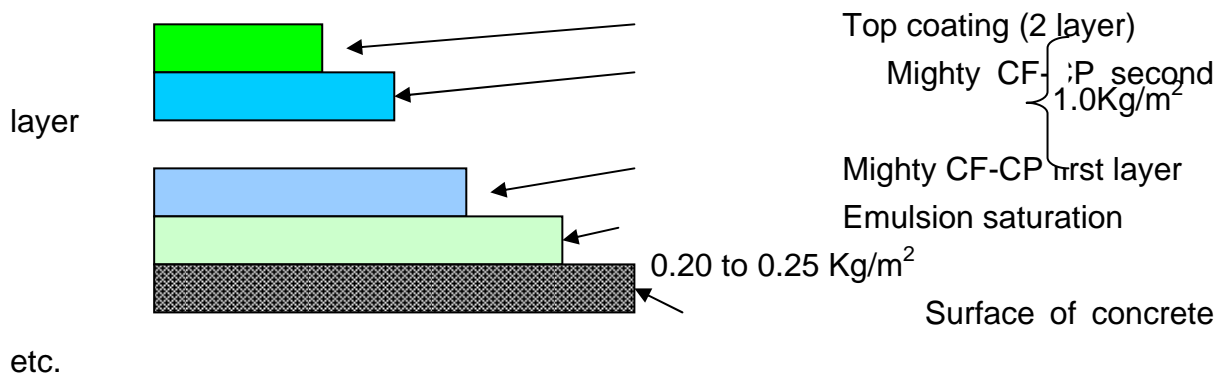
- a) Clean the surface thoroughly
- b) Emulsion to Compound ratio should be 1.0:2.3 for first layer
- c) Confirm drying at half-point by touch
- d) Emulsion to Compound ratio should be 1:3 for the second layer
- e) Never coat more than 5mm thickness

3.6 Saturation Procedure on the Concrete Surface

At times, Mighty Coat CF-CP may be used for surface improvement of inorganic board or concrete. In the case of ALC and Calcium Silicate Board, the saturation procedure is as follows:

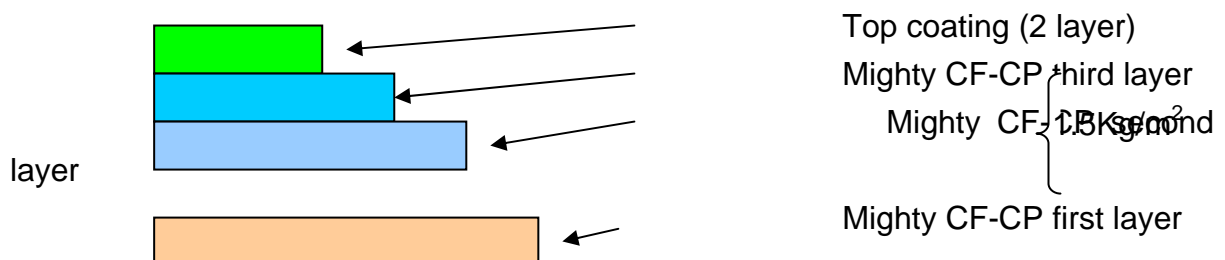
- a) Clean the surface thoroughly and removing any deteriorated material with pressure wash
- b) Dry the surface for more than 6 hours
- c) Clean the surface again
- d) Apply Mighty Coat CF-CP only on the surface.
- e) The amount of emulsion coating is 0.20 to 0.25kg per square meter.
- f) Check after 6 hours to confirm that Mighty Coat CF-CP has adhered to the surface
- g) Proceed with standard application using either a brush or spray gun

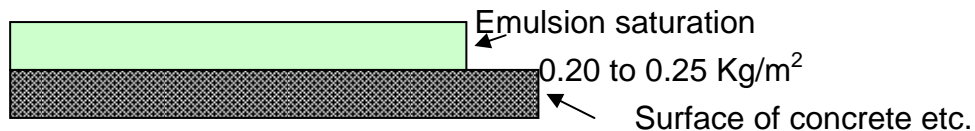
For 1.0Kg/m² coating of Mighty CF-CP (For concrete, corrugated board etc.)



- 1) Loss is not included
- 2) When saturation is not possible, emulsion layer is not required

For 1.5Kg/m² coating of Mighty CF-CP (For concrete, corrugated board etc.)





- 1) Loss is not included
- 2) When saturation is not possible, emulsion layer is not required

3.7 Top Surface Coating Procedure

Mighty Coat CF-CP is a cement mortar type anti-corrosion coating material and is composed mainly of white cement and silica sand. For this reason, after applying to steel surfaces, some small pores may remain. This will allow red rust to occur within several years. To cover the pores and to protect from res rust, a top coating with organic paint is recommended. Normal paint may be used as top coating, if color matching is required. The recommended paint materials are:

- a) Inorganic top coating without thinner.
- b) Acrylic lacquer paint
- c) Urethane paint
- d) Epoxy paint
- e) Chlorinated rubber coating
- f) Fluorine resin paint

The top coating should be painted after Mighty Coat CF-CP is completely dry and hardened. The hardening time is normally 2 to 3 days after coating Mighty Coat CF-CP. Two coats of top coat are normally applied. Directions for application and use of top coat should be provided by the manufacturer.

4. Additional Consideration of Mighty Coat CF-CP Application

4.1 Standard Coating Quantity of Mighty Coat CF-CP

Mighty Coat CF-CP is an inorganic anti-corrosion material containing silica sand and white cement. The particle cement and silica sand coating is rough, and makes measurement of thickness difficult to assess accurately. For this reason the thickness of the layer is not controlled and measured; the volume of coating applied is the gauge used for control and measurement.

The coating loss is different for each painting procedure, and coating amount calculations for use includes loss

Anti-corrosion grade	Coating amount (including loss)		
	Procedure	Loss%	Amount
Standard corrosion severity area 1.0Kg/m ² grade	Brush or Roll brush coating	15 %	1.15Kg/m ²
	Spray coating	25 %	1.25Kg/m ²
Very severe corrosion area 1.5Kg/m ² grade	Brush or Roll brush coating	15 %	1.73Kg/m ²
	Spray coating	25 %	1.88Kg/m ²

4.2 Drying Procedure for Mighty Coat CF-CP

Dryness of Mighty Coat CF-CP is confirmed by touch. It is important that each layer is dry before applying the subsequent layer. Drying time depends on the season, weather conditions, and humidity. Generally, dry time is:

Standard drying time for one layer (500g/m²)

Summer 30 to 40 min.

Winter 1 to 2 hours

On rainy days, dry time will be significantly longer.

4.2.1 Application Limits of Mighty Coat CF-CP

Mighty Coat CF-CP is inorganic mortar composed with cement like powder

and emulsion liquid. The compound and emulsion are mixed to use. Application of Mighty Coat CF-CP has several limitations:

- a) During rain, painting outside is prohibited without proper curing for rain
- b) If it is expected to rain after applying Mighty Coat CF-CP, coated surfaces must be covered with proper materials
- c) During extreme high heat, it is prohibited to expose painted surface because of rapid vaporization of water in the emulsion. Coated surfaces must be covered with proper materials
- d) Using the coating for very small materials is difficult to clean. It is also difficult to apply the coating evenly on the convex, concave or edge areas.

4.3 Temperature Consideration during the Application

Mighty Coat CF-CP is a mixture of water emulsion and compound powder. Exposing it to extreme high and low temperatures will cause problems. It will freeze when exposed to temperatures below 0°C and become difficult to work with when temperatures drop near 0°C. The temperature must be above 5° C for application; otherwise the following problems can occur:

- a) Dry time will be very long.
- b) The emulsion will decompose and not adhere to the surface
- c) Below 5° C and with windy conditions, freezing will be accelerated.

4.4 Usable time span for Mighty Coat CF-CP

Usable time span for Mighty Coat CF-CP is as follows.

Summer: About 4 hours

Winter: About 6 hours

Within this timeframe, vaporization of water in the emulsion will break down the micelle of dispersed material in the emulsion. As a result, viscosity of mixed Mighty Coat CF-CP will increase and become difficult to apply. In this case, additional emulsion can be added; however this can only be done once. Adding water to control the viscosity prohibited.

4.5 Maintenance Procedure for Tools and Emergency Medical Care

Mighty Coat CF-CP is a water emulsion mixture; the following for tools is recommended:

- a) At interruption or completion of painting, tools used should be washed with water as soon as possible
- b) Do not treat the tools with oil based solvent

Mighty Coat CF-CP is a highly alkaline mixture.

- a) Protective gloves and goggles must be worn at all times when working with Mighty Coat CF-CP
- b) Wash skin with water immediately if Mighty Coat CF-CP comes into contact with skin
- c) If Mighty Coat CF-CP gets into eyes, see a doctor immediately
- d) In case of ingestion, contact poison control or emergency services immediately.

Mighty Coat CF-CP has the approval of JWWA (Japan Water Works Association for drinking water) after curing.