Section 07 92 13

Elastomeric Joint Sealants

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Multi-Purpose, Flexible Repair Composite.

1.2 RELATED SECTIONS

A. Section 07 92 13 – Elastomeric Joint Sealants

1.3 REFERENCES

A. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
B. ASTM D429 – Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates.
C. ASTM D413 – Standard Test Methods for Rubber Property – Adhesion to Flexible Substrate.
D. BS 903 Part A6 – Physical Testing of Rubber Part A6: Method of Determination of Compression Set at Ambient, Elevated or Low Temperatures.
E. ASTM D149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
F. ASTM D150 – Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation.
G. ASTM D257 – Standard Test Methods for DC Resistance or Conductance of Insulating Materials.
H. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
I. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
J. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
K. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Product characteristics and Safety Data Sheets.
2. Preparation Instructions and Recommendations.
3. Storage and Handling Requirements and Recommendations.
4. Installation Methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 25 years of experience manufacturing the product specified in this section.

1.6 REGULATORY REQUIREMENTS

A. Store products in manufacturer's original unopened packaging until ready for installation.

B. Store products in temperature within limits recommended by manufacturer.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature and humidity) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. This product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information For Use leaflet. Belzona ensures that all its products are carefully manufactured to ensure the highest quality possible and are tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Belzona Polymerics Ltd. Claro Road, Harrogate, HG1 4DS, UK Tel: +44 1423 567641. Fax: +44 1423 505967. Web: http://www.belzona.com
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

2.2 APPLICATION AND SCOPE

A. Two-component elastomeric repair composite for the repairing and rebuilding of rubber components. The versatile high-performance elastomer can be applied without the need for specialist tools and will bond strongly to a wide range of substrates including natural rubber, nitrile, neoprene, polyurethane, PVC, steel, copper, aluminum and concrete.

2.3 MATERIALS

A. Elastomeric Repair Composite.
    1. Belzona 2211: Two component, thixotropic, non-slumping material consisting of a base and solidifier.
        a. Volume Capacity: 51.8 in^3 (849 cm^3)/kg.
        28.5 in^3 (467 cm^3)/550g unit.
        b. Abrasion ASTM D4060:
            1. Wet (H18 wheels), 1 kg load, typical loss per 1,000 cycles: 180 mm^3 at 7 day cure at 68°F (20°C).
            2. Dry (H18 wheels), 1 kg load, typical loss per 1,000 cycles: 400 mm^3 at 7 day cure at 68°F (20°C).
        c. Adhesion ASTM D429:
            1. 90° Peel Adhesion:
            On Grit Blast Mild Steel, the adhesion values are the following:
                - Maximum Adhesion: 171 pli (3,053 kg/m)
                - Average Peel Adhesion: 159 pli (2,844 kg/m)
                - Failure Mode: Cohesive in Elastomer
            2. 180° Peel Adhesion:
            On EPDM (Shore A: 75), the adhesion values are the following:
                - Maximum Adhesion: 27 pli (488 kg/m)
                - Average Peel Adhesion: 10 pli (177 kg/m)
                - Failure Mode: Cohesive in Substrate

            On Nitrile (Shore A: 77), the adhesion values are the following:
                - Maximum Adhesion: 50 pli (897 kg/m)
                - Average Peel Adhesion: 20 pli (355 kg/m)
                - Failure Mode: Cohesive in Substrate

            On Neoprene (Shore A: 83), the adhesion values are the following:
                - Maximum Adhesion: 38 pli (671 kg/m)
                - Average Peel Adhesion: 13 pli (229 kg/m)
                - Failure Mode: Cohesive in Substrate

On Natural Rubber (Shore A: 51), the adhesion values are the following:

- Maximum Adhesion: 12 pli (214 kg/m)
- Average Peel Adhesion: 6 pli (108 kg/m)
- Failure Mode: Cohesive in Substrate

On Commercial Rubber (Natural/SBR) (Shore A: 72), the adhesion values are the following:

- Maximum Adhesion: 20 pli (359 kg/m)
- Average Peel Adhesion: 6 pli (108 kg/m)
- Failure Mode: Cohesive in Substrate

d. Compression Set BS 903 part A6:
   1. At 30 minutes recovery, the compression set value is 35%.
   2. At 6 hours recovery, the compression set value is 16%.

e. Electrical Properties:
   Dielectric Strength ASTM D149: 6.4 kV/mm when tested at 500 V/s.
   Dielectric Constant ASTM D150: 5.8 when tested at 1.0 V and 100 Hz.
   Dissipation Factor ASTM D150: 0.104 when tested at 1.0 V and 100 Hz.
   Surface Resistivity ASTM D257: 4.41×10^{11} Ω when tested at 500 V DC.
   Volume Resistivity ASTM D257: 8.08×10^{10} Ωcm when tested at 500 V DC.

f. Elongation and Tensile Properties ASTM D412 (Die C):
   1. Elongation:
      1000% at 24 hours cure at 68°F (20°C).
      1000% at 7 days cure at 68°F (20°C).
   2. Tensile Strength:
      900 psi (6.2 MPa) at 24 hours cure at 68°F (20°C).
      1,500 psi (10.34 MPa) at 7 days cure at 68°F (20°C).
   3. Tensile Modulus:
      53 psi (0.365 MPa) at 7 day cure at 68°F (20°C).

g. Expansion Joints ASTM C719:
   Material is qualified as a Class 25 sealant for +/- 25% movement.

h. Hardness ASTM D2240:
   For Shore A, typical hardness values are the following:
   1. 69 at 24 hours cure at 68°F (20°C).
   2. 73 at 7 days cure at 68°F (20°C).

i. Heat Resistance:
   Suitable for operation in the temperature range -40°F to 150°F (-40°C to 65°C).

j. Tear Strength ASTM D624:
   For Tear Strength, typical values are the following:
   1. 190 pli (3,392 kg/m) at 24 hours cure at 68°F (20°C).
   2. 230 pli (4,106 kg/m) at 7 days cure at 68°F (20°C).

Part 3 EXECUTION

3.1 EXAMINATION

A. Examine in accordance with manufacturer's instructions and recommendations.
B. New concrete should be cured for a minimum of 28 days or until moisture content is below 6% using a Protimeter.
C. Verify concrete is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per ASTM D4258.
D. Verify steel is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per SSPC-SP10.
E. Verify environmental temperature and relative humidity are within the manufacturer's recommendations.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
B. For steel substrates, remove all loose surface contamination and degrease with Belzona 9111 (Cleaner/Degreaser) or any other effective cleaner which does not leave a residue, e.g., methyl ethyl ketone (MEK). Steel substrates should be abrasive blasted to a surface cleanliness per SSPC-SP10 and a profile of 3 mils per ASTM D4417. Where blasting is not practical, thorough mechanical grinding may be considered, except for applications involving tensile loads, such as expansion joints, and all applications involving immersion and/or fluid flow.
C. For flexible surfaces, note that Belzona 9111 can draw processing oils and waxes to the surface of some rubbers, particularly new, which then impairs adhesion of Belzona 2211. Test for this on a small area. If, on rubbing with a rag moistened with Belzona 9111, a greasy film appears, the surface should not be degreased, but simply abraded. Undercut fine edges with a sharp knife and scuff the surface with a rotary wire brush or suitable roughing tool.
D. Brush away loose contamination and degrease again.

3.3 CONDITIONING

A. Apply in accordance with manufacturer's instructions and recommendations.
B. Immediately, after preparing the surface, apply a thin, even coat of Belzona 2911 (Elastomer QD Conditioner) or Belzona 2921 (Elastomer GP Conditioner) onto the surface. A brush should be used as a stipple to ensure a practical coverage rate of 13 sq.ft. (1.25 m^2) per unit, on steel and most metallic substrates. On well roughened rubber substrates this could be reduced by as much as 50%.
C. The Belzona Conditioner must be touch dry before overcoating with Belzona 2211. This will depend on the Belzona Conditioner selected, prevailing temperature, relative humidity and substrate.

3.4 APPLICATION

A. Apply in accordance with manufacturer's instructions and recommendations.
B. For first coat, apply Belzona 2211 directly on to the prepared surface with the plastic applicator or spatula provided. Press down firmly to remove entrapped air and to ensure maximum contact with the surface.
C. Contour the Belzona 2211 to the correct profile with the plastic applicator.

3.5 CLEANING

A. Mixing tools should be cleaned immediately after use with Belzona 9111 or any other effective solvent e.g., methyl ethyl ketone (MEK).
B. Application tools should be cleaned using a suitable solvent such as Belzona 9121, methyl ethyl ketone (MEK), acetone or cellulose thinners.

3.5 PROTECTION OF FINISHED WORK

A. Follow manufacturer's instructions and recommendations.

END OF SECTION

09 96 56

Section 09 96 53

Elastomeric Coatings

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Multi-Purpose, Flexible Repair Composite.

1.2 RELATED SECTIONS

A. Section 07 92 13 – Elastomeric Joint Sealants
B. Section 09 96 35 – Chemical-Resistant Coatings
C. Section 09 97 13 – Steel Coatings
D. Section 09 97 13.13 – Interior Steel Coatings
E. Section 09 97 13.24 – Exterior Steel Coatings
F. Section 09 97 23 – Concrete and Masonry Coatings

1.3 REFERENCES

A. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
B. ASTM D429 – Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates.
C. ASTM D413 – Standard Test Methods for Rubber Property – Adhesion to Flexible Substrate.
D. BS 903 Part A6 – Physical Testing of Rubber Part A6: Method of Determination of Compression Set at Ambient, Elevated or Low Temperatures.
E. ASTM D149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
F. ASTM D150 – Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation.
G. ASTM D257 – Standard Test Methods for DC Resistance or Conductance of Insulating Materials.
H. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
I. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
J. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
K. ASTM D624 – Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Product characteristics and Safety Data Sheets.
2. Preparation Instructions and Recommendations.
3. Storage and Handling Requirements and Recommendations.
4. Installation Methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 25 years of experience manufacturing the product specified in this section.

1.6 REGULATORY REQUIREMENTS

A. Store products in manufacturer's original unopened packaging until ready for installation.

B. Store products in temperature within limits recommended by manufacturer.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature and humidity) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. This product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information For Use leaflet. Belzona ensures that all its products are carefully manufactured to ensure the highest quality possible and are tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Belzona Polymerics Ltd. Claro Road, Harrogate, HG1 4DS, UK Tel: +44 1423 567641. Fax: +44 1423 505967. Web: http://www.belzona.com
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

2.2 APPLICATION AND SCOPE

A. Two-component elastomeric repair composite for the repairing and rebuilding of rubber components. The versatile high-performance elastomer can be applied without the need for specialist tools and will bond strongly to a wide range of substrates including natural rubber, nitrile, neoprene, polyurethane, PVC, steel, copper, aluminum and concrete.

2.3 MATERIALS

A. Elastomeric Repair Composite.
    1. Belzona 2221: Two component, fluid consistency material consisting of a base and solidifier.
        a. Volume Capacity: 53.8 in^3 (881 cm^3)/kg.
        40.3 in^3 (661 cm^3)/750g unit.
        b. Abrasion ASTM D4060:
            1. Wet (H18 wheels), 1 kg load, typical loss per 1,000 cycles: 88 mm^3 at 7 day cure at 68°F (20°C).
            2. Dry (H18 wheels), 1 kg load, typical loss per 1,000 cycles: 313 mm^3 at 7 day cure at 68°F (20°C).
        c. Adhesion ASTM D429:
            1. 90° Peel Adhesion:
            On Grit Blast Mild Steel, the adhesion values are the following:
                - Maximum Adhesion: 159 pli (2,839 kg/m)
                - Average Peel Adhesion: 133 pli (2,367 kg/m)
                - Failure Mode: Cohesive in Elastomer
            2. 180° Peel Adhesion:
            On EPDM (Shore A: 75), the adhesion values are the following:
                - Maximum Adhesion: 33 pli (584 kg/m)
                - Average Peel Adhesion: 9 pli (166 kg/m)
                - Failure Mode: Cohesive in Substrate

            On Nitrile (Shore A: 77), the adhesion values are the following:
                - Maximum Adhesion: 39 pli (697 kg/m)
                - Average Peel Adhesion: 18 pli (317 kg/m)
                - Failure Mode: Cohesive in Substrate

            On Neoprene (Shore A: 83), the adhesion values are the following:
                - Maximum Adhesion: 40 pli (723 kg/m)
                - Average Peel Adhesion: 15 pli (275 kg/m)
                - Failure Mode: Cohesive in Substrate

On Natural Rubber (Shore A: 51), the adhesion values are the following:

- Maximum Adhesion: 9 pli (163 kg/m)
- Average Peel Adhesion: 2 pli (40 kg/m)
- Failure Mode: Cohesive in Substrate

On Commercial Rubber (Natural/SBR) (Shore A: 72), the adhesion values are the following:

- Maximum Adhesion: 24 pli (431 kg/m)
- Average Peel Adhesion: 6 pli (116 kg/m)
- Failure Mode: Cohesive in Substrate

d. Compression Set BS 903 part A6:
   1. At 30 minutes recovery, the compression set value is 35%.
   2. At 6 hours recovery, the compression set value is 16%.

e. Electrical Properties:
   Dielectric Strength ASTM D149: 6.4 kV/mm when tested at 500 V/s.
   Dielectric Constant ASTM D150: 5.8 when tested at 1.0 V and 100 Hz.
   Dissipation Factor ASTM D150: 0.104 when tested at 1.0 V and 100 Hz.
   Surface Resistivity ASTM D257: 4.41×10^{11} Ω when tested at 500 V DC.
   Volume Resistivity ASTM D257: 8.08×10^{10} Ωcm when tested at 500 V DC.

f. Elongation and Tensile Properties ASTM D412 (Die C):
   1. Elongation:
      1000% at 24 hours cure at 68°F (20°C).
      1000% at 7 days cure at 68°F (20°C).
   2. Tensile Strength:
      900 psi (6.20 MPa) at 24 hours cure at 68°F (20°C).
      1,500 psi (10.34 MPa) at 7 days cure at 68°F (20°C).
   3. Tensile Modulus:
      55 psi (0.38 MPa) at 7 day cure at 68°F (20°C).

g. Expansion Joints ASTM C719:
   Material is qualified as a Class 25 sealant for +/- 25% movement.

h. Hardness ASTM D2240:
   For Shore A, typical hardness values are the following:
   1. 69 at 24 hours cure at 68°F (20°C).
   2. 73 at 7 days cure at 68°F (20°C).

i. Heat Resistance:
   Suitable for operation in the temperature range -40°F to 150°F (-40°C to 65°C).

j. Tear Strength ASTM D624:
   For Tear Strength, typical values are the following:
   1. 190 pli (3,392 kg/m) at 24 hours cure at 68°F (20°C).
   2. 230 pli (4,106 kg/m) at 7 days cure at 68°F (20°C).

Part 3 EXECUTION

3.1 EXAMINATION

A. Examine in accordance with manufacturer's instructions and recommendations.
B. New concrete should be cured for a minimum of 28 days or until moisture content is below 6% using a Protimeter.
C. Verify concrete is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per ASTM D4258.
D. Verify steel is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per SSPC-SP10.
E. Verify environmental temperature and relative humidity are within the manufacturer's recommendations.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
B. For steel substrates, remove all loose surface contamination and degrease with Belzona 9111 (Cleaner/Degreaser) or any other effective cleaner which does not leave a residue, e.g., methyl ethyl ketone (MEK). Use a flame to sweat out oil from deeply impregnated surfaces. Steel substrates should be abrasive blasted to a surface cleanliness per SSPC-SP10 and a profile of 3 mils per ASTM D4417. Where blasting is not practical, thorough mechanical grinding may be considered, except for applications involving tensile loads, such as expansion joints, and all applications involving immersion and/or fluid flow.
C. For flexible surfaces, note that Belzona 9111 can draw processing oils and waxes to the surface of some rubbers, particularly when new, which then impairs adhesion of Belzona 2221. Test for this on a small area. If, on rubbing with a rag moistened with Belzona 9111, a greasy film appears, the surface should not be degreased, but simply abraded. Undercut fine edges with a sharp knife and scuff the surface with a rotary wire brush or suitable roughing tool.
D. Brush away loose contamination and degrease again with Belzona 9111.

3.3 CONDITIONING

A. Apply in accordance with manufacturer's instructions and recommendations.
B. Immediately, after preparing the surface, apply a thin, even coat of Belzona 2911 (Elastomer QD Conditioner) or Belzona 2921 (Elastomer GP Conditioner) onto the surface. A brush should be used as a stipple to ensure a practical coverage rate of 13 sq.ft. (1.25 m^2) per unit, on steel and most metallic substrates. On well roughened rubber substrates this could be reduced by as much as 50%.
C. The Belzona Conditioner must be touch dry before overcoating with Belzona 2221. This will depend on the Belzona Conditioner selected, prevailing temperature, relative humidity and substrate. At 50% relative humidity, the touch dry state will be achieved after the times given opposite when applied to a steel surface. These times may be extended when applied to rubber substrates.

3.4 APPLICATION

A. Apply in accordance with manufacturer's instructions and recommendations.
B. For resurfacing, apply Belzona 2221 directly on to the prepared surface with a stiff bristle brush or the plastic applicator provided to give a coverage rate of approximately 18.9 sq.ft (1.76 m^2)/750g unit at 15 mils (375 μm) thickness.
C. For casting, brush a thin coat of Belzona 2221 onto the inside of the mold previously treated with Belzona 9411. Pour the remaining Belzona 2221 into the mold, avoiding air entrapment and then remove any occluded air by vibrating the mold.

3.5 CLEANING

A. Mixing tools should be cleaned immediately after use with Belzona 9111 or any other effective solvent e.g., methyl ethyl ketone (MEK).
B. Application tools should be cleaned using a suitable solvent such as Belzona 9121, methyl ethyl ketone (MEK), acetone or cellulose thinners.

3.5 PROTECTION OF FINISHED WORK

A. Follow manufacturer's instructions and recommendations.

END OF SECTION

09 96 56

Belzona 3921

FN10068 (GSC SURFACE CONDITIONER)

BELZONA®
Repair • Protect • Improve

INSTRUCTIONS FOR USE

1. TO ENSURE AN EFFECTIVE MOLECULAR WELD

a) **MANUALLY PREPARED STEELWORK**
All loose adherent and flaking rust should be removed by scraping and wire brushing, wherever possible with the aid of mechanical equipment, until a firm edge is obtained. Where the steel to be treated is contaminated by chemicals, it must first be thoroughly cleaned. In the case of water soluble materials, e.g. metal salts, this can be done by repeated washing by water jet. In the case of oils, grease or other solvent soluble contaminants, the steel should be washed repeatedly with **Belzona® 9111** or other suitable cleaner such as MEK, and must be allowed to completely evaporate prior to application of the **Belzona® 3921**.

b) **GRIT BLASTED STEELWORK**
Steel contaminated by chemicals should first be thoroughly cleaned using a high pressure water jet whilst steel contaminated by oil, grease etc. must first be thoroughly washed down with **Belzona® 9111** or other suitable cleaner such as MEK. Select an abrasive to give the necessary standard of cleanliness and a minimum depth of profile of 3 mils (75 microns). Use only an angular abrasive.

Blast clean the metal surface to achieve the following standard of cleanliness:
ISO 8501-1 Sa 2½ very thorough blast cleaning.
American Standard near white finish SSPC SP 10.
Swedish Standard Sa 2½ SIS 05 5900.

c) **GLASS, SLATE, LEAD, COPPER, ALUMINIUM and other NON-POROUS SURFACE EXCEPT PLEXIGLAS and other PLASTICS.**
Brush away loose contamination and degrease with a rag soaked in **Belzona® 9111** (cleaner/degreaser) or any other effective cleaner which does not leave a residue e.g. methyl ethyl ketone (MEK).

2. COMBINING THE REACTIVE COMPONENTS

Stir the contents of the Base container thoroughly to reincorporate any settlement. Shake the Solidifier container. Pour the contents over the Base in the mixing unit. Mix thoroughly together to achieve a uniform material free of any streakiness.

WORKING LIFE
Use mixed material within 48 hours, as after this time it will begin to solidify.

MIXING SMALL QUANTITIES
For mixing small quantities of **Belzona® 3921** use:
7 parts Base to 2 parts Solidifier by volume.

3. APPLYING BELZONA® 3921

FOR BEST RESULTS
Do not apply when:
i) Rain, snow, fog or mist is present.
ii) The temperature is below 41°F (5°C) or the relative humidity is above 80%.
iii) A combination of high relative humidity and low temperature occurs.
iv) Any of the above conditions is likely to occur within 45 minutes.

Brush the **Belzona® 3921** well into the surface, not exceeding the recommended coverage rate.

Clean brushes immediately after use with a suitable solvent such as **Belzona® 9121,** MEK, acetone or cellulose thinners.

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THINNING
Thinning may be necessary in warm, dry or windy conditions. **Belzona® 3921** may be thinned by adding 10% by volume of **Belzona® 9121**. Standard coverage rates apply, regardless of whether or not thinning takes place.

Substrate	Coverage rate
Iron / Steel	45sq.ft. (4.2 m²) / kg.
Galvanized Steel	54sq.ft. (5.0 m²) / kg.
Non-ferrous metals	60sq.ft. (5.6 m²) / kg.
Slate	38sq.ft. (3.5 m²) / kg.
Glass	60sq.ft. (5.6 m²) / kg.
Smooth painted surfaces	60sq.ft. (5.6 m²) / kg.
Synthetic polymer single ply roof sheeting*	60sq.ft. (5.6 m²) / kg.

* **Note**
Due to the wide range of single ply roofing sheets available, an adhesion trial is recommended to confirm suitability on specific surfaces.

Belzona® 3921 may be spray applied only to grit blasted steelwork.

A typical spray set-up for **Belzona® 3921** using a Pressure Feed spray gun is:-

DeVibliss JGA 502-1, No 54 air cap,
Atomizing pressure 2.75 - 3.5 bar.
Pot pressure 0.7 - 1.4 bar
with air supply 9.7 cu.ft./min (0.27 m³/min).

CLEANING
Clean all application equipment immediately after use with **Belzona® 9121**. It is not satisfactory to simply soak equipment in **Belzona® 9121** as **Belzona® 3921** continues to harden chemically even when immersed.

OVERCOATING
Belzona® 3921 may be overcoated after leaving for at least 4 hours (16 hours when overcoating with **Belzona® 3131**), but no longer than 48 hours. If left longer than 48 hours a further coat of **Belzona® 3921** should be applied and left for the previously recommended times.

HEALTH & SAFETY INFORMATION
Please read and make sure you understand the relevant Safety Data Sheets.

Belzona products are manufactured under an ISO 9001 Registered Quality Management System

BELZONA®
Repair • Protect • Improve

Section 03 63 00

Epoxy Grouting

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Multi-purpose repair composite for the resurfacing, rebuilding and protection of concrete and stonework.

1.2 RELATED SECTIONS

A. Section 03 60 00 – Grouting
B. Section 03 61 00 – Cementitious Grouting
C. Section 03 64 00 – Injection Grouting
D. Section 04 05 16 – Masonry Grouting
E. Section 04 05 16.16 – Chemical-Resistant Masonry Grouting

1.3 REFERENCES

A. ASTM D149 – Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.
B. ASTM D150 – Standard Test Methods for AC Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulation.
C. ASTM D257 – Standard Test Methods for DC Resistance or Conductance of Insulating Materials.
D. ASTM D1002 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal to Metal).
E. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
F. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
G. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
H. ASTM D648 – Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.
I. ASTM C157 – Standard Test Method for Length Change of Hardened Cement Mortar and Concrete.
J. BS 874 – Methods for Determining Thermal Insulating Properties with Definitions of Thermal Insulating Terms.
K. ASTM E228 – Standard Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer.

L. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness (for Belzona 4151).
M. ASTM D638 – Standard Test Method for Tensile Properties of Plastics (for Belzona 4151).
N. ISO 11357 – Differential Scanning Calorimetry (for Belzona 4151).
O. SSPC-SP10 – Near-White Blast Cleaning.
P. ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
    1. Product characteristics and Safety Data Sheets.
    2. Preparation Instructions and Recommendations.
    3. Storage and Handling Requirements and Recommendations.
    4. Installation Methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: 40+ years of experience manufacturing the product specified in this section.

1.6 REGULATORY REQUIREMENTS

A. Store products in manufacturer's original unopened packaging until ready for installation.
B. Store products in temperature within limits recommended by manufacturer.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature and humidity) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Belzona guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information. For Use leaflet. Belzona further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Belzona, Inc. 14300 NW 60th Avenue Miami Lakes, FL 33014 Tel: +1 305 594 4994. Fax: +1 305 599 1140. Web: http://www.belzona.com
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

2.2 APPLICATION AND SCOPE

A. Repair system composed of a two-component epoxy resin system combined with selected quartz particles used to repair and resurface concrete and stonework by impact, vibration, chemicals and environmental attack. Offers outstanding abrasion and chemical resistance.

2.3 MATERIALS

A. Aggregate.
    1. Belzona 4111: Selected Quartz Particles; Repair system for repairing and resurfacing concrete and stonework.
        a. Color: Light Beige or Quartz Grey.
        b. Coverage Rate: 12 ft^2 (1.1 m^2) applied at ¼ in (6 mm).
        c. Adhesion ASTM D1002: 2,700 psi (18.62 MPa).
        d. Adhesion ASTM D4541:
            1. Dry Concrete: 525 psi (3.62 MPa).
            2. Wet Concrete: 450 psi (3.10 MPa).
        e. Abrasion ASTM D4060:
            1. Wet (H10 wheels), 1 kg load, typical loss per 1,000 cycles: 820 mm^3.
            2. Dry (CS17 wheels), 1 kg load, typical loss per 1,000 cycles: 14 mm^3.
        f. Compressive Strength ASTM D695: 13,000 psi (89.63 MPa).
        g. Compressive Modulus ASTM D695: 1.16 x 10^5 psi (800 MPa).
        h. Electrical (Dielectric Strength) ASTM D149: 142.5 volts/mil (5,700 volts/mm).
        i. Electrical (Loss Tangent) ASTM D150: 0.038 at 1 MHz
        j. Electrical (Permittivity) ASTM D150: 4.25
        k. Electrical (Surface Resistivity) ASTM D257: 3.98 x 10^{14} ohms
        l. Electrical (Volume Resistivity) ASTM D257: 1.0 x 10^{13} ohm cms
        m. Flexural Strength ASTM D790: 5,500 psi (37.9 MPa).
        n. Flexural Strength (Polymeric Binder) ASTM D790: 13,000 psi (89.6 MPa).
        o. Flexural Modulus ASTM D790: 1.01 x 10^6 psi (6,964 MPa).
        p. Heat Resistance ASTM D648: 97°F (36°C).
        q. Shrinkage ASTM C157: No measurable shrinkage during cure.
        r. Thermal Conductivity BS 874: 1.9 W/M°K
        s. Thermal Expansion ASTM E228: 28.2 ppm/°C

B. Resin.

2. Belzona 4151: Two component clear amber resin system with excellent adhesion to masonry and metallic surfaces.
    a. Color: Amber.
    b. Coverage Rate: 205 ft^2 (19 m^2).
    c. Adhesion ASTM D1002: 2,700 psi (18.61 MPa).
    d. Adhesion ASTM D4541:
        1. Dry Concrete: 500 psi (3.45 MPa).
        2. Wet Concrete: 475 psi (3.27 MPa).
        3. Dry quarry tiles: 1,100 psi (7.58 MPa).
        4. Damp quarry tiles: 450 psi (3.10 MPa).
    e. Abrasion ASTM D4060:
        1. Wet (H10 wheels), 1 kg load, typical loss per 1,000 cycles: 427 mm^3.
        2. Dry (CS17 wheels), 1 kg load, typical loss per 1,000 cycles: 72 mm^3.
    f. Compressive Strength ASTM D695: 13,000 psi (89.63 MPa).
    g. Hardness (Shore D) ASTM D2240: 82.
    h. Flexural Strength ASTM D790: 13,000 psi (89.63 MPa).
    i. Heat Resistance ASTM D648: 106°F (41°C).
    j. Heat Resistance (Dry) ISO 11357: 320°F (160°C).
    k. Tensile Strength ASTM D638: 4,600 psi (31.71 MPa).
    l. Shrinkage ASTM C157: No measurable shrinkage during cure.

C. Conditioner.

3. Belzona 4911: Two component thixotropic resin system with excellent adhesion to masonry and metallic surfaces.
    a. Color: Pale White when mixed.
    b. Coverage Rate: 12 ft^2 (1.1 m^2) – 450 gm unit
       79 ft^2 (7.33 m^2) – 3 kg unit
    c. Adhesion ASTM D1002: 2,960 psi (208 kgs/cm^2).
    d. Adhesion ASTM D4541:
        1. Dry Concrete: 790 psi (55 kgs/cm^2).
        2. Damp Concrete: 590 psi (41 kgs/cm^2).
        3. Dry brick: 1,010 psi (71 kgs/cm^2).
        4. Damp brick: 1,110 psi (78 kgs/cm^2).
        5. Dry quarry tiles: 1,900 psi (134 kgs/cm^2).
        6. Damp quarry tiles: 1,510 psi (106 kgs/cm^2).
    e. Compressive Strength ASTM D695: 7,790 psi (548 kgs/cm^2) at 7 days cure at 77°F (25°C).
    f. Flexural Strength ASTM D790: 7,810 psi (549 kgs/cm^2) at 7 days cure at 77°F (25°C).

Part 3 EXECUTION

3.1 EXAMINATION

A. Examine in accordance with manufacturer's instructions and recommendations.
B. New concrete should be cured for a minimum of 28 days or until moisture content is below 6% using a Protimeter.
C. Verify concrete is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per ASTM D4258.
D. Verify steel is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per SSPC-SP10.
E. Verify environmental temperature and relative humidity are within the manufacturer's recommendations.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
B. Concrete substrates should be abraded per ASTM D4259 and cleaned per ASTM D4258.
C. Steel substrates should be abrasive blasted to a surface cleanliness per SSPC-SP10 and a profile of 3 mils per ASTM D4417.
D. If necessary, install masking tape to prevent contamination of adjacent substrates.

3.3 APPLICATION

A. Apply in accordance with manufacturer's instructions and recommendations.
B. Add the entire content of Belzona 4911 (Magma TX Conditioner) Solidifier to Belzona 4911 Base and stir thoroughly until completely mixed. Immediately brush all of this conditioner onto the surface to be treated with Belzona 4111, with a stiff bristled brush, not exceeding an area of 12 sq. ft. (1.1 m^2) per 450g unit.
C. Apply the mixed Belzona 4111 directly on to the conditioned surface with a trowel. Float or other suitable tool. Tamp down firmly to remove entrapped air, to compact it and to ensure maximum contact with the surface.
D. When applying Belzona 4111 to vertical surfaces, the normal maximum thickness obtainable without sagging is 0.25 ins (0.6 cms). On small areas thicknesses of 0.5 ins (1.2 cms) can be achieved without sagging and, if necessary, a piece of polyethylene can be pressed onto the surface of the Belzona 4111 to prevent sagging. The polyethylene can be removed when the Belzona 4111 has cured.
E. Belzona 4111 can be applied to damp surfaces but its adhesion will be approximately 75% of that obtained on a dry surface.

3.4 CLEANING

A. Mixing tools should be cleaned immediately after use with Belzona 9111 or any other effective solvent such as methyl ethyl ketone or acetone.
B. Brushes, injection guns, spray equipment and any other application tools should be cleaned using a suitable solvent such as Belzona 9121, methyl ethyl ketone, acetone or cellulose thinners.

3.5 PROTECTION OF FINISHED WORK

A. Follow manufacturer's instructions and recommendations.

END OF SECTION

03 63 00

Belzona 4131

FN10077 (MAGMA-SCREED)

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INSTRUCTIONS FOR USE

1. TO ENSURE AN EFFECTIVE MOLECULAR WELD

An effective damp proof membrane must be confirmed to avoid rising damp. Structural cracks in the floor must be chased out, terminated and proper provision made for subsequent movement by inclusion of expansion joints. Professional advice should be obtained if structural movement indicates that the floor is unsound.

Any surface to which **Belzona® 4131** is to be applied must be clean, firm and dry. Wash old concrete down with detergent to remove oil, grease and dust. Use clean water to wash away the detergent. Remove all paint, tar and any other coatings.

Allow new concrete to cure for a minimum of 28 days or until the moisture content is below 6% using a Protimeter.

Wire brush vertical upstands to remove loose surface material.

Horizontal concrete surfaces and new concrete will show the phenomenon of surface laitence and this must be removed by mechanical scarification. Wire brush vertical upstands to remove loose surface material.

Abrade metallic surfaces to remove loose rust and flaking paint and then roughen by blasting, grinding or other suitable means to achieve a rough bright metal surface.

In all instances vacuum up any loose dust produced by surface preparation techniques.

Treat any surfaces to which **Belzona® 4131** should not adhere with **Belzona® 9411** (Release Agent) and leave for 15 - 20 minutes to dry before proceeding; seal porous surfaces to be treated with **Belzona® 9411** first, with a suitable lacquer, e.g. shellac or cellulose enamel.

2. CONDITIONING

Add the entire contents of **Belzona® 4911** (Magma TX Conditioner) Solidifier to **Belzona® 4911** Base and stir thoroughly until completely mixed. Immediately brush all of this conditioner onto the surface to be treated with **Belzona® 4131,** with a stiff bristled brush, not exceeding an area of 12 sq.ft. (1.1 m²) per 450g unit.

NOTES:

1. For mixing small quantities of **Belzona® 4911** use: 2 Parts Base : 1 Part Solidifier by Volume

2. Conditioning and overcoating must be completed within the times shown below:

Ambient Temperature	Usable life after mixing	Minimum overcoating time	Maximum overcoating time*
41°F/ 5°C	230 mins	Application can commence as soon as conditioning has been completed.	6 hours
50°F/10°C	105 mins		6 hours
59°F/15°C	55 mins		6 hours
68°F/20°C	45 mins		6 hours
77°F/25°C	32 mins		6 hours

* If the maximum overcoating time for the **Belzona® 4911** is exceeded, then the cured surface should be abraded and fresh **Belzona® 4911** applied.

3. COMBINING THE REACTIVE COMPONENTS

Mixing may be carried out in the large bucket supplied but due to the bulk and stiffness of the mixed materials, it is essential that a mechanical mixer is used to ensure complete mixing.

Add approximately half the Base component and all of the Solidifier component to the mixing container and start the mixer.

Once initial incorporation has been achieved, slowly add the remainder of the Base material and mix together thoroughly for approximately 5 minutes, or until an even color and consistency are achieved. During this time periodically stop the mixer and withdraw the mixing paddle and scrape clean before continuing mixing.

NOTES:

1. WORKING LIFE

From the commencement of mixing, **Belzona® 4131** must be applied within the times shown below:

Temperature	50°F (10°C)	59°F (15°C)	68°F (20°C)	77°F (25°C)
Use all material within	2 hours	1 hour	45 mins	30 mins

2. VOLUME CAPACITY OF MIXED BELZONA® 4131

524 cu.ins. (8590 cm³.) per 20 kg pack.

3. COVERAGE RATE

The coverage rate of **Belzona® 4131** is 15 sq.ft. (1.4 m²) at the recommended thickness of 0.25 inch (6 mm).

Publication No. 01-22-13 USA

4. APPLYING BELZONA® 4131

Apply the mixed **Belzona® 4131** directly on to the conditioned surface, initially spreading to a general level using normal screeding techniques and then using a metal straight edge to achieve a uniform thickness prior to smoothing off using a steel float. Avoid overtrowelling as this may detract from the surface finish achieved.

ALTERNATIVE FINISHES
When a very smooth finish to the **Belzona® 4131** is required, a steel float, cleaned and wetted with **Belzona® 9111** should be used. Rougher surfaces, with increased non-slip properties, can be achieved by finishing with a wooden float or brush, working the surface in a circular motion to achieve the desired effect. Note that ease of cleaning and chemical resistance may be reduced by rough finishing.

NOTES:

1. VERTICAL SURFACES
When applying **Belzona® 4131** to vertical surfaces, the normal maximum thickness obtained without sagging is 0.125 in. (0.3 cm.). If application at a greater thickness is necessary, then a piece of polyethylene can be pressed on to the surface of the **Belzona® 4131** to prevent sagging. The polyethylene can be removed when the **Belzona® 4131** has cured.

2. APPLICATION LIMITS
Belzona® 4131 can be applied when the temperature is anywhere between 10°C (50°F) and 25°C (77°F). Below 10°C the material may be too stiff for easy mixing and application, and above 25°C the material may be somewhat “fluid” and will have a short usable life.

3. DAMP SURFACES
Belzona® 4131 can be applied to damp surfaces but its adhesion will be approximately 75% of that obtained on a dry surface.

4. APPLYING ADDITIONAL LAYERS OF BELZONA® 4131
Where this is required it should be done as soon as the first layer is firm enough to accept the second layer and within the maximum overcoating time of 6 hours.

After this time the surface of the **Belzona® 4131** must be abraded before further application.

In all cases the surface must be conditioned with **Belzona® 4911** (see Section 2) before applying further **Belzona® 4131.**

5. CLEANING
All mixing tools should be cleaned immediately after use with **Belzona® 9111** (Cleaner/Degreaser) or any other effective solvent e.g. MEK. Brushes and other application tools should be cleaned using a suitable solvent such as **Belzona® 9121,** MEK, acetone or cellulose thinners.

5. COMPLETION OF THE MOLECULAR REACTION

Allow **Belzona® 4131** to solidify for the following times before subjecting it to the conditions indicated:

Temperature	41°F (5°C)	59°F (15°C)	77°F (25°C)
Pedestrian traffic	16 hours	9 hours	6 hours
Full load bearing capability	5 days	3 days	1 day
Full chemical resistance	18 days	12 days	7 days

These figures are for **Belzona® 4131** at the recommended film thickness of 0.25 in. (6 mm.). They will be reduced for thicker sections and extended for thinner applications.

BELZONA® 4131 MUST NOT BE EXPOSED TO MOISTURE UNTIL FULL CURE HAS BEEN ACHIEVED OTHERWISE SURFACE WHITENING WILL OCCUR.

HEALTH & SAFETY INFORMATION
Please read and make sure you understand the relevant Safety Data Sheets.

ISO 9001:2008
US3429

Manufactured under an ISO 9000 Registered Quality Management System

PRODUCT SPECIFICATION SHEET
BELZONA 4511
FN10206

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GENERAL INFORMATION

Product Description:
A two-component, solvent free, fluid elastomeric sealant for vertical/horizontal building and expansion joints. Once combined, the base and solidifier form a flexible, elastomeric compound with low modulus.

Application Areas:
This material is designed for sealing building and expansion joints with up to ±12.5% movement. It is suitable for applications on:

- Vertical structures
- Adjacent walls
- Concrete bleachers and steps
- Concrete access ramps
- Concrete bases
- Doors, windows and other openings

APPLICATION INFORMATION

Working Life
The usable life will vary according to temperature. At 72°F (22°C), use all mixed material within 90 minutes.

Volume Capacity
204.8 in^3 (3354 cm^3) per 4.2 kg unit.

Cure Time
Will be reduced for thicker sections and extended for thinner applications. Allow to solidify for the times shown in the Belzona IFU before subjecting it to the conditions indicated.

Base Component

Appearance:	Viscous grey liquid
Density:	1.22 - 1.25 g/cm^3

Solidifier Component

Appearance:	Clear yellow liquid
Density:	1.00 - 1.02 g/cm^3

Mixing Properties

Mix by Weight (Base : Solidifier)	6.4 : 1
Mix by Volume (Base : Solidifier)	5.1 : 1

The above application information serves as introductory guide only. For full application details including the recommended application procedure/technique, refer to the Belzona IFU which is enclosed with each packaged product.

ADHESION

Peel Adhesion
The 90° peel adhesion when tested in accordance with ASTM D429 (modified) is typically:

Blasted Steel	45.1 pli (805.4 kg/m)*
Aluminum	51.2 pli (914.3 kg/m)*
Concrete	39.7 pli (708.8 kg/m)*
Belzona 4111	43.2 pli (771.5 kg/m)*

- *Cohesive failure in Belzona 4511*

ELONGATION & TENSILE PROPERTIES

Elongation
Tested in accordance with ASTM D412 (Die C) is typically 260%.

Tensile Strength
Tested in accordance with ASTM D412 (Die C) is typically in range 450-500 psi (31.6–37.7 kg/cm^2).

EXPANSION JOINT APPLICATIONS

Material is tested against a modified ASTM C-719 "Adhesion and Cohesion of Elastomeric Joint Sealant" and qualified as a Class 25, Type M, Grade N sealant (±12.5% movement).

CHEMICAL RESISTANCE

Once fully cured, the material will demonstrate excellent resistance to a broad range of chemicals.

SHELF LIFE

Separate base and solidifier components shall have a shelf life of 5 years from date of manufacture when stored in their original unopened containers between 32°F (0°C) and 86°F (30°C).

TEAR STRENGTH

Tear Strength
Tested in accordance with ASTM D624 is typically 77.5 pli (1384 kg/m).

HARDNESS

Shore A
Tested in accordance with ASTM D2240 is typically 63.

WARRANTY

This product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information For Use leaflet. Belzona ensures that all its products are carefully manufactured to ensure the highest quality possible and are tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

AVAILABILITY AND COST

Belzona 4511 is available from a network of Belzona Distributors throughout the world for prompt delivery to the application site. For information, consult the Belzona Distributor in your area.

HEALTH AND SAFETY

Prior to using this material, please consult the relevant Safety Data Sheets.

MANUFACTURER / SUPPLIER

Belzona Polymerics Ltd.
Claro Road Harrogate HG1
4DSUnited Kingdom

Belzona Inc
14300 NW 60th Ave,
Miami Lakes, FL, 33014USA

TECHNICAL SERVICE

Complete technical assistance is available and includes fully trained Technical Consultants, technical service personnel and fully staffed research, development and quality control laboratories.

Belzona products are manufactured under an ISO 9001 Registered Quality Management System

Belzona 4521

FN10196 (MAGMA-FLEX FLUID)

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INSTRUCTIONS FOR USE

1. TO ENSURE AN EFFECTIVE MOLECULAR WELD

Any surface to which **Belzona® 4521** is to be applied must be clean, firm and dry.

Surfaces less than 48 hours old created with **Belzona® 4111** or **Belzona® 4131** do not require conditioning. After this time the surfaces must be thoroughly abraded and conditioned.

Wash old concrete down with detergent to remove oil, grease and dust. Use clean water to wash away the detergent.

Remove all paint, tar and any other coatings.

Allow new concrete to cure for a minimum of 28 days or until the moisture content is below 6% using a Protimeter. Wire brush vertical upstands to remove loose surface material.

Horizontal concrete surfaces and new concrete will show the phenomenon of surface laitance and this must be removed by mechanical scarification.

Abrade metallic surfaces to remove loose rust and flaking paint and then roughen by blasting, grinding or other suitable means to achieve a rough bright metal surface. Vacuum up any loose dust produced by surface preparation techniques.

Insert backer rod to achieve correct joint configuration.

Treat any surface to which **Belzona® 4521** should not adhere with **Belzona® 9411** (Release Agent) and leave for 15 - 20 minutes to dry before proceeding; seal porous surfaces to be treated with **Belzona® 9411** first, with a suitable lacquer, e.g. shellac or cellulose enamel.

2. CONDITIONING

Add the entire contents of **Belzona® 4911** (Magma TX Conditioner) Solidifier to **Belzona® 4911** Base and stir thoroughly until completely mixed. Immediately brush all of this conditioner onto the surface to be treated with **Belzona® 4521**, with a stiff bristled brush, not exceeding an area of 12 sq.ft. (1.1 m²) per 450 gm unit.

NOTES:

1. For mixing small quantities of **Belzona® 4911** use:
   2 Parts Base : 1 Part Solidifier by Volume
2. Conditioning and overcoating must be completed within the following times:

Ambient Temperature	Usable life after mixing	Minimum overcoating time	Maximum overcoating time*
41°F/ 5°C	230 mins	Application can commence as soon as conditioning has been completed.	6 hours
50°F/10°C	105 mins		6 hours
59°F/15°C	55 mins		6 hours
68°F/20°C	45 mins		6 hours
77°F/25°C	32 mins		6 hours

* If the maximum overcoating time for the **Belzona® 4911** is exceeded, then the cured surface should be abraded and fresh **Belzona® 4911** applied.

3. COMBINING THE REACTIVE COMPONENTS

Shake well the Solidifier before use.

Transfer the entire contents of the Solidifier can into the Base container.

Mix together thoroughly for a minimum of 3 minutes to achieve an even consistency.

NOTES

1. WORKING LIFE

From the commencement of mixing, **Belzona® 4521** must be used within the times shown.

Temperature	50°F (10°C)	59°F (15°C)	68°F (20°C)	77°F (25°C)
Use all material within	12 hrs.	4 hrs.	2 hrs.	1½ hrs.

2. MIXING SMALL QUANTITIES

Whenever possible, complete units of **Belzona® 4521** should be mixed. Where small quantity mixes are required, mix
6 parts Base: 1 part Solidifier by Weight

It is important that these mixing ratios are accurately adhered to.

3. VOLUME CAPACITY OF MIXED BELZONA® 4521

196.8 cu.in. (3224 cm³) per 4 kg unit.

4. APPLYING THE BELZONA® 4521

FOR BEST RESULTS
Do not apply when:-
(i) The temperature is below 50°F(10°C) or the relative humidity is above 90%.
(ii) Rain, snow, fog or mist is present.
(iii) There is moisture on the surface or is likely to be deposited by subsequent condensation.
(iv) The working environment is likely to be contaminated by oil/grease from adjacent equipment or smoke from kerosene heaters or tobacco smoking.

Brush **Belzona® 4521** onto to the sides of the joint. Then, pour **Belzona® 4521** into the joint avoiding air entrapment. When the joint is filled, a suitable scraper should be used to remove any excess material.

CLEANING
Mixing tools should be cleaned immediately after use with **Belzona® 9111** or any other effective solvent e.g. MEK. Application tools should be cleaned using a suitable solvent such as **Belzona® 9121**, MEK, acetone or cellulose thinners.

5. COMPLETION OF THE MOLECULAR REACTION

Allow **Belzona® 4521** to solidify as below before subjecting it to the conditions indicated:

	Light loading	Full mechanical or thermal loading
50°F/10°C	24 hours	2 days
72°F/22°C	8 hours	1 days
86°F/30°C	4 hours	12 hours
104°F/40°C	2 hours	6 hours
122°F/50°C	1 hours	3 hours

These times are for a thickness of approximately 0.25 ins (0.6 cm); they will be reduced for thicker sections and extended for thinner sections.

6. OVERCOATING

Application of subsequent layers of **Belzona® 4521** can be carried out without need of any surface treatment other than removal of contamination in accordance with the below maximum overcoat times:

Temperature	Overcoat within
50°F (10°C)	72 hours
68°F (20°C)	48 hours
86°F (30°C)	48 hours

If the maximum overcoat time is exceeded or for overcoating aged or weathered **Belzona® 4521**, the surface should be cleaned and abraded before applying a thin layer of **Belzona® 2911**.

Belzona® 2911 must be touch dry before overcoating with **Belzona® 4521**. At 50% relative humidity, the touch dry state will be achieved after the times given below:

Temperature	Belzona 2911
50°F (10°C)	90 min
68°F (20°C)	45 min
86°F (30°C)	25 min
104°F (40°C)	20 min

NOTE:
If bonding to concrete or metallic substrates, **Belzona® 4911** should be used. If bonding over **Belzona® 4521** or rubbery substrates, **Belzona® 2911** should be used.

HEALTH & SAFETY INFORMATION
Please read and make sure you understand the relevant Safety Data Sheets.

Belzona products are manufactured under an ISO 9001 Registered Quality Management System

BELZONA®
Repair • Protect • Improve

Belzona 4911

FN10010 (MAGMA TX CONDITIONER)

Repair • Protect • Improve

INSTRUCTIONS FOR USE

1. TO ENSURE AN EFFECTIVE MOLECULAR WELD

Any surface to which **Belzona 4911** (Magma TX Conditioner) is to be applied must be clean, firm and dry.

Wash old concrete down with detergent to remove oil, grease and dust. Use clean water to wash away the detergent.

Remove all paint, tar and any other coatings.

Allow new concrete to cure for a minimum of 28 days or until the moisture content is below 6% using a Protimeter.

Wire brush vertical upstands to remove loose surface material.

Horizontal concrete surfaces and new concrete will show the phenomenon of surface laitance and this must be removed by mechanical scarification.

2. COMBINING THE REACTIVE COMPONENTS

Add the entire contents of **Belzona 4911** Solidifier to **Belzona 4911** Base and stir thoroughly until completely mixed. Immediately brush all of this conditioner onto the surface with a stiff bristled brush, not exceeding an area of 12 ft^2 (1.1 m^2) per 450g unit.

NOTES:

1. For mixing small quantities of **Belzona 4911** use:
2 parts Base : 1 part Solidifier by volume

2. Conditioning and overcoating must be completed within the following times:

Ambient Temperature	Usable life after mixing	Minimum overcoating time	Maximum overcoating time*
41°F/ 5°C	230 mins	Application can commence as soon as conditioning has been completed.	6 hours
50°F/10°C	105 mins		6 hours
59°F/15°C	55 mins		6 hours
68°F/20°C	45 mins		6 hours
77°F/25°C	32 mins		6 hours

* If the maximum overcoating time for the **Belzona 4911** is exceeded, then the cured surface should be abraded and fresh **Belzona 4911** applied.

3. CLEANING

Mixing tools should be cleaned immediately after use with **Belzona 9111** or any other effective solvent e.g. MEK. Brushes, and any other application tools should be cleaned using a suitable solvent such as **Belzona 9121**, MEK, acetone or cellulose thinners.

HEALTH & SAFETY INFORMATION

Please read and make sure you understand the relevant Safety Data Sheets.

ISO 9001:2008
US3429

Manufactured under an ISO 9000 Registered Quality Management System

Repair • Protect • Improve

Printed in the USA Publication No. 05-22-15-01

PRODUCT SPECIFICATION SHEET
BELZONA 5811
FN10100

GENERAL INFORMATION

Product Description:
A two component solvent free system applied by brush or spray for protection of metallic and non-metallic surfaces operating under immersion conditions in contact with aqueous solutions. Also used as a structural adhesive for bonding or for creation of irregular load bearing shims with good electrical insulation characteristics. For use in Original Equipment Manufacture or repair situations.

Application Areas:
When mixed and applied as detailed in the Belzona Instructions for Use (IFU), the system is ideally suited for application to the following:

- Cooling tower pans
- Submersible pumps
- Effluent tanks and channels
- Marine buoys
- Storage tanks
- Water Boxes
- Manholes
- Internal and external pipework
- Steel and concrete piling
- Water inlet screens
- Chemical containment areas
- Sludge digesters
- Buried pipework and structures

APPLICATION INFORMATION

Working Life
Will vary according to temperature. At 68°F (20°C) the usable life of mixed material is 2 hours.

Coverage Rate
The **Belzona 5811** should be applied in 2 coats to achieve a minimum thickness of 16 mil (400 micron).
The theoretical coverage rate at 16 mil (400 micron) is 27 sq.ft. (2.5m²)/litre.
Refer to the Instructions For Use for practical coverage rate guidelines.

Cure Time
Allow to solidify for the times shown in the Belzona IFU before subjecting it to the conditions indicated.

Base Component	
Appearance	Viscous liquid
Color	Beige or Grey
Density	1.67 - 1.71 g/cm³
Solidifier Component	
Appearance	Clear mobile liquid
Color	Dark brown
Density	1.00 - 1.04 g/cm³
Mixed Properties	
Mixing Ratio by Weight (Base : Solidifier)	5 : 1
Mixing Ratio by Volume (Base : Solidifier)	3 : 1
Mixed Density	1.46 - 1.50 g/cm³

The above application information serves as introductory guide only. For full application details including the recommended application procedure/technique, refer to the Belzona IFU which is enclosed with each packaged product.

PRODUCT SPECIFICATION SHEET
BELZONA 5811
FN10100

ADHESION

Tensile Shear
When tested in accordance with ASTM D1002, using metal substrates, grit blasted to a 3-4 mil (75-100 micron) profile, typical values will be:

Aluminum	2,300 psi (15.9MPa) 2,450 psi (16.9MPa)	28 days at 68°F (20°C) 4 hours at 212°F (100°C)
Brass	2,680 psi (18.5MPa) 2,750 psi (19.0MPa)	28 days at 68°F (20°C) 4 hours at 212°F (100°C)
Mild steel	3,370 psi (23.2MPa) 3,640 psi (25.1MPa)	28 days at 68°F (20°C) 4 hours at 212°F (100°C)
Copper	2,230 psi (15.4MPa) 2,650 psi (18.3MPa)	28 days at 68°F (20°C) 4 hours at 212°F (100°C)
Stainless steel	3,340 psi (23.0MPa) 3,330 psi (22.9MPa)	28 days at 68°F (20°C) 4 hours at 212°F (100°C)

Pull Off Adhesion
When tested in accordance with ASTM D 4541/ ISO 4624, the pull off strength from grit blasted steel will be typically:
Cure 28 days at 68°F (20°C) 4,450 psi (30.7MPa)

CHEMICAL RESISTANCE

The material will demonstrate excellent resistance to a broad range of chemicals. For a more detailed description of chemical resistance properties, refer to relevant Chemical Resistance chart.

COMPRESSIVE STRENGTH

Compressive yield strength
When tested in accordance with ASTM D695, typical values obtained will be:
28 days at 68°F (20°C) 5,500 psi (37.9MPa)
4 hours at 212°F (100°C) 5,700 psi (39.3MPa)

ELECTRICAL PROPERTIES

Dielectric Strength
When tested in accordance with ASTM D149, method A, with voltage rise of 2kV/s, typical value will be: 48.7 kV/mm

Dielectric Constant
When tested in accordance with ASTM D150 typical values obtained will be: 2.82

Surface Resistivity
When tested in accordance with ASTM D257 typical values obtained will be: 4402 Mohm

FLEXURAL PROPERTIES

Flexural Strength
When tested to ASTM D790 typical values obtained will be:
28 days at 68°F (20°C) 5,160 psi (35.6MPa)
4 hours at 212°F (100°C) 6,040 psi (41.6MPa)

Flexural Modulus
When tested to ASTM D790 typical values obtained will be:
Cure 28 days at 68°F (20°C) 3.4×10^5 psi (2344 MPa)

HARDNESS

Shore D
The Shore D hardness of the material when tested to ASTM D2240 is typically:
28 days at 68°F (20°C) 80
4 hours at 212°F (100°C) 81

Koenig Pendulum
When tested to ISO 1522 the Koenig damping time of the coating is typically:
28 days at 68°F (20°C) 64 seconds
4 hours at 212°F (100°C) 128 seconds

Barcol
When tested to ASTM D2583 the Barcol hardness will typically be:
28 days at 68°F (20°C) 75

HEAT RESISTANCE

Wet Heat Resistance
For many typical applications the material is suitable for continuous immersion in aqueous solutions up to 122°F (50°C). Please consult Belzona TKL for additional advice where immersed applications will operate close to 122°F (50°C).

Dry Heat Resistance
The indicated degradation temperature in air based on Differential Scanning Calorimetry (DSC) operated in accordance with ISO11357 is typically 356°F (180°C).
For many applications the product is suitable down to -40°F (-40°C).

IMMERSION RESISTANCE

Atlas Cell
When tested in accordance with NACE TM 0174 the coating will exhibit no rusting (ASTM D610 rating 10) or blistering (ASTM D714 rating 10) after 6 months immersion in de-ionized water at 104°F (40°C).

Seawater Immersion
When tested in accordance with ISO 2812-2, no blistering, rusting, cracking or delamination was observed after 6 months immersion in seawater at 104°F (40°C).

PRODUCT SPECIFICATION SHEET
BELZONA 5811
FN10100

IMPACT STRENGTH

The Izod impact strength (un-notched) of the material when tested in accordance with ASTM D256 is typically:

28 days at 68°F (20°C)	0.81 ft.lb./in (45 J/m)
4 hours at 212°F (100°C)	0.81 ft.lb./in (45 J/m)

SHELF LIFE

Separate base and solidifier components shall have a shelf life of at least 5 years when stored between 32°F (0°C) and 86°F (30°C).

TENSILE PROPERTIES

When determined in accordance with ASTM D638, typical values will be:

Tensile Strength (Maximum)	1750 psi (12.07 MPa) 2244 psi (15.48 MPa)	7 days at 68°F (20°C) 28 days at 68°F (20°C)
Tensile Strength (Yield)	522 psi (3.60 MPa) 998 psi (6.88 MPa)	7 days at 68°F (20°C) 28 days at 68°F (20°C)
Elongation	6.3 % 1.0 %	7 days at 68°F (20°C) 28 days at 68°F (20°C)
Young's Modulus	1.48 x 10^5 psi (1020 MPa) 3.14 x 10^5 psi (2167 MPa)	7 days at 68°F (20°C) 28 days at 68°F (20°C)

WARRANTY

Belzona guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information For Use leaflet. Belzona further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognised standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

AVAILABILITY AND COST

Belzona 5811 is available from a network of Belzona Distributors throughout the world for prompt delivery to the application site. For information, consult the Belzona Distributor in your area.

MANUFACTURER

Belzona Polymerics Ltd.
Claro Road, Harrogate,
HG1 4DS, UK

Belzona Inc.
2000N.W. 88th Court,
Miami, Florida, USA, 33172

HEALTH AND SAFETY

Prior to using this material, please consult the relevant Material Safety Data Sheets.

TECHNICAL SERVICE

Complete technical assistance is available and includes fully trained Technical Consultants, technical service personnel and fully staffed research, development and quality control laboratories.

Belzona products are manufactured under an ISO 9001 Registered Quality Management System

Section 09 96 56

Epoxy Coatings

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Protective Coating for Equipment Operating under Potable Water Immersion or where Potable Water Approval is required.

1.2 RELATED SECTIONS

A. Section 09 97 13 – Steel Coatings
B. Section 09 97 13.13 – Interior Steel Coatings
C. Section 09 97 13.24 – Exterior Steel Coatings
D. Section 09 97 23 – Concrete and Masonry Coatings
E. Section 09 97 26 – Cementitious Coatings
F. Section 09 97 26.13 – Interior Cementitious Coatings
G. Section 09 97 26.23 – Exterior Cementitious Coatings
H. Section 22 12 00 – Facility Potable-Water Storage Tanks
I. Section 40 23 23 – Potable Water Process Piping
J. Section 40 46 16 – Coatings and Wrappings for Process Corrosion Protection

1.3 REFERENCES

A. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
B. ASTM D1002 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal to Metal).
C. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
D. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
E. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
F. ASTM D2240 – Standard Test Method for Rubbery Property – Durometer Hardness.
G. ISO 1522 – Pendulum Damping Test.
H. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
I. ASTM D4258 – Standard Practice for Surface Cleaning Concrete for Coating.
J. ASTM D4259 – Standard Practice for Abrading Concrete.

K. SSPC-SP10 – Near-White Blast Cleaning.
L. ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
    1. Product characteristics and Safety Data Sheets.
    2. Preparation Instructions and Recommendations.
    3. Storage and Handling Requirements and Recommendations.
    4. Installation Methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: 8 years of experience manufacturing the product specified in this section and 30 years of experience manufacturing corrosion resistance products like the product specified in this section.

1.6 REGULATORY REQUIREMENTS

A. Store products in manufacturer's original unopened packaging until ready for installation.
B. Store products in temperature within limits recommended by manufacturer.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature and humidity) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Belzona guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information. For Use leaflet. Belzona further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Belzona, Inc. 14300 NW 60th Avenue Miami Lakes, FL 33014 Tel: +1 305 594 4994. Fax: +1 305 599 1140. Web: http://www.belzona.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

2.2 APPLICATION AND SCOPE

A. Provides excellent protection to metallic and non-metallic surfaces operating under immersion conditions in contact with water and aqueous solutions where potable water approval is required.

2.3 MATERIALS

A. Coating System.

1. Belzona 5812DW: Two component, solvent free coating system, applied by brush or spray, consisting of a base and liquid solidifier.
    a. Color: Blue or Light Grey.
    b. Coverage Rate: 27 ft^2 (2.5 m^2)/liter.
    c. Adhesion ASTM D1002:
        1. Aluminum: 1,940 psi (13.4 MPa) at 7 day cure at 72°F (22°C).
        2. Mild Steel: 3,130 psi (21.6 MPa) at 7 day cure at 72°F (22°C).
        3. Copper: 1,610 psi (11.1 MPa) at 7 day cure at 72°F (22°C).
        4. Stainless Steel: 2,840 psi (19.6 MPa) at 7 day cure at 72°F (22°C).
    d. Adhesion ASTM D4541:
        1. Dry Concrete: 610 psi (4.21 MPa)* at 2 day cure at 72°F (22°C).
        2. Wet Concrete: 455 psi (3.17 MPa)* at 2 day cure at 72°F (22°C).
        3. Grit Blasted Steel: ≥ 3,000 psi (20.7 MPa) at 7 day cure at 72°F (22°C).
        *Cohesive Failure of Substrate.
    e. Compressive ASTM D695: 7,310 psi (50.4 MPa) at 7 day cure at 72°F (22°C).
    f. Flexural Strength ASTM D790: 6,540 psi (45.1 MPa) at 7 day cure at 72°F (22°C).
    g. ASTM D4060:
        1. Dry (CS17 wheels), 1 kg load, typical loss per 1,000 cycles: 67 mm^3.
    h. Hardness (Shore D) ASTM D2240: 82 at 7 day cure at 72°F (22°C).
    i. Koenig Pendulum: 103 seconds at 7 day cure at 72°F (22°C).
    j. Atlas Cell: No rusting or blistering after 6 months immersion in de-ionized water at 104°F (40°C).
    k. Impact ASTM D256: 2.28 ft.lb/in^2 (4.8 KJ/m^2) at 7 day cure at 72°F (22°C).

Part 3 EXECUTION

3.1 EXAMINATION

A. Examine in accordance with manufacturer's instructions and recommendations.
B. New concrete should be cured for a minimum of 28 days or until moisture content is below 6% using a Protimeter.
C. Verify concrete is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per ASTM D4258.
D. Verify steel is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per SSPC-SP10.
E. Verify environmental temperature and relative humidity are within the manufacturer's recommendations.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
B. Concrete substrates should be abraded per ASTM D4259 and cleaned per ASTM D4258.
C. Steel substrates should be abrasive blasted to a surface cleanliness per SSPC-SP10 and a profile of 3 mils per ASTM D4417.
D. If necessary, install masking tape to prevent contamination of adjacent substrates.

3.3 APPLICATION

A. Apply in accordance with manufacturer's instructions and recommendations.
B. For first coat, apply product directly on to the prepared surface with a short, bristled brush or rubber squeegee.
C. Apply second coat after first coat, as per manufacturer's instructions and recommendations.
D. For spray applications, suitable areas may be coated by spray. Belzona 5812DW must be sprayed using heated airless equipment.

3.4 CLEANING

A. Mixing tools should be cleaned immediately after use with Belzona 9111 or any other effective solvent such as methyl ethyl ketone or acetone.
B. Brushes and any other application tools should be cleaned using a suitable solvent such as Belzona 9121, methyl ethyl ketone, acetone or cellulose thinners.

3.5 PROTECTION OF FINISHED WORK

A. Follow manufacturer's instructions and recommendations.

END OF SECTION

09 96 56

Section 09 96 56

Epoxy Coatings

Part 1 GENERAL

1.1 SECTION INCLUDES

A. Protective High Temperature Coating for Protecting Metallic and Non-Metallic Surfaces under Immersion at operating temperatures up to 203°F (95°C).

1.2 RELATED SECTIONS

A. Section 09 96 35 – Chemical-Resistant Coatings
B. Section 09 97 13 – Steel Coatings
C. Section 09 97 13.13 – Interior Steel Coatings
D. Section 09 97 13.24 – Exterior Steel Coatings
E. Section 09 97 23 – Concrete and Masonry Coatings
F. Section 09 97 26 – Cementitious Coatings
G. Section 09 97 26.13 – Interior Cementitious Coatings
H. Section 09 97 26.23 – Exterior Cementitious Coatings
I. Section 22 12 00 – Facility Potable-Water Storage Tanks
J. Section 40 23 23 – Potable Water Process Piping
K. Section 40 46 16 – Coatings and Wrappings for Process Corrosion Protection

1.3 REFERENCES

A. ASTM D4541 – Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
B. ASTM D1002 – Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal to Metal).
C. ASTM D1062 – Standard Test Method for Cleavage Strength of Metal-to-Metal Adhesive Bonds.
D. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
E. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
F. ASTM G8 – Method B – Standard Test Methods for Cathodic Disbonding of Coated Steel.
G. NACE TM0185 – Evaluation of Internal Plastic Coatings for Corrosion Control of Tubular Goods by Autoclave Testing.
H. ASTM D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
I. ASTM D2240 – Standard Test Method for Rubbery Property – Durometer Hardness.

J. ASTM D2583 – Standard Test Method for Indentation Hardness of Rigid Plastics by means of a Barcol Impressor.
K. ISO 1522 – Pendulum Damping Test.
L. NACE TM0174 – Procedure A – Laboratory Test Methods for the Evaluation of Protective Coatings and Lining Materials on Metallic Substrates in Immersion Service.
M. ASTM D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
N. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
O. ASTM D412 (Die C) – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
P. ASTM D4258 – Standard Practice for Surface Cleaning Concrete for Coating.
Q. ASTM D4259 – Standard Practice for Abrading Concrete.
R. SSPC-SP10 – Near-White Blast Cleaning.
S. ASTM D4417 – Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
    1. Product characteristics and Safety Data Sheets.
    2. Preparation Instructions and Recommendations.
    3. Storage and Handling Requirements and Recommendations.
    4. Installation Methods.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: 13 years of experience manufacturing the product specified in this section and 30 years of experience manufacturing erosion resistance products like the product specified in this section.

1.6 REGULATORY REQUIREMENTS

A. Store products in manufacturer's original unopened packaging until ready for installation.
B. Store products in temperature within limits recommended by manufacturer.

1.7 SITE CONDITIONS

A. Maintain environmental conditions (temperature and humidity) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Belzona guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Belzona Information. For Use leaflet. Belzona further guarantees that all its products are carefully manufactured to ensure the highest quality possible and tested strictly in accordance with universally recognized standards (ASTM, ANSI, BS, DIN, ISO etc.). Since Belzona has no control over the use of the product described herein, no warranty for any application can be given.

Part 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturer: Belzona, Inc. 14300 NW 60th Avenue Miami Lakes, FL 33014 Tel: +1 305 594 4994. Fax: +1 305 599 1140. Web: http://www.belzona.com
B. Substitutions: Not permitted.
C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 – Product Requirements.

2.2 APPLICATION AND SCOPE

A. Provides excellent protection to metallic and non-metallic surfaces operating under immersion in aqueous/hydrocarbons systems up to 203°F (95°C). Exhibits corrosion resistance at elevated temperatures and is resistant to a wide range of chemicals.

2.3 MATERIALS

A. Coating System.
    1. Belzona 5892: Cost effective, two component, solvent free, high temperature coating system consisting of a base and liquid solidifier.
        a. Color: Light Grey and White.
        b. Coverage Rate: 27 ft^2 (2.5 m^2)/liter.
        c. Adhesion ASTM D4541:
            1. Dry Concrete: 515 psi (3.6 MPa)* at 72°F (22°C) cure.
            2. Mild Steel: 4,264 psi (29.4 MPa) at 72°F (22°C) cure.
            *Cohesive Failure of Substrate.
        d. Cleavage Adhesion ASTM D1062:
            1. 1,750 pli (306 N/mm) at 72°F (22°C) cure and 72°F (22°C) test.
            2. 1,610 pli (282 N/mm) at 212°F (100°C) cure and 72°F (22°C) test.
            3. 1,340 pli (234 N/mm) at 212°F (100°C) cure and 212°F (100°C) test.
        e. Tensile Shear Adhesion ASTM D1002:
            1. 1,434 psi (9.9 MPa) at 72°F (22°C) cure.
            2. 2,362 psi (16.3 MPa) at 140°F (60°C) cure.
            3. 1,983 psi (13.7 MPa) at 212°F (100°C) cure.
        f. Abrasion ASTM D4060:
            1. Wet (H10 wheels), 1 kg load, typical loss per 1,000 cycles: 83.5 mm^3 at 212°F (100°C) cure.

2. Dry (CS17 wheels), 1 kg load, typical loss per 1,000 cycles: 20.95 mm^3 at 194°F (90°C) cure.

g. Compressive Strength ASTM D695:
   1. 8,900 psi (61.4 MPa) at 72°F (22°C) cure.
   2. 14,344 psi (98.9 MPa) at 212°F (100°C) post-cure.

h. Compressive Modulus ASTM D695:
   1. 2.0 x 10^5 psi (1.4 GPa) at 72°F (22°C) cure.
   2. 2.8 x 10^5 psi (1.9 GPa) at 212°F (100°C) post-cure.

i. Cathodic Disbondment ASTM G8 – Method B (impressed current system): 0.23 in (6.0 mm) at 72°F (22°C).

j. Explosive Decompression NACE TM0185: No blistering, cracking, delamination, holidays, rusting, discoloration or change in dry film thickness when tested under the following conditions:
   1. Test temperature: 158°F (70°C).
   2. Test pressure: 1,015 psi (70 bar).
   3. Gas Phase: 99% CH_4 / 1% CO_2.
   4. Hydrocarbon Phase: Crude Oil.
   5. Aqueous Phase: 35 g/L saltwater/
   6. Duration: 21 days.
   7. Decompression: Test pressure to 725 psi (50 bar) in 5 minutes and to 15 psi (1 bar) in 10 minutes.

k. Flexural Strength ASTM D790:
   1. 7,742 psi (49.2 MPa) at 24 hours cure at 72°F (22°C).
   2. 10.424 psi (71.9 MPa) at 1-hour post-cure at 212°F (100°C).

l. Flexural Modulus ASTM D790:
   1. 5.3 x 10^5 psi (3.6 GPa) at 24 hours cure at 72°F (22°C).
   2. 6.1 x 10^5 psi (4.2 GPa) at 1-hour post-cure at 212°F (100°C).

m. Hardness (Shore D) ASTM D2240:
   1. 87 at 24 hours cure at 72°F (22°C).
   2. 90 at 1 hour post-cure at 212°F (100°C).

n. Hardness (Barcol) ASTM D2583:
   1. 76 at 24 hours cure at 72°F (22°C).
   2. 86 at 1-hour post-cure at 212°F (100°C).

o. Koenig Pendulum ISO1522:
   1. 158 seconds at 24 hours cure at 72°F (22°C).
   2. 187 seconds at 1-hour post-cure at 212°F (100°C).

p. Atlas Cell: No rusting or blistering after 6 months immersion in de-ionized water at 203°F (95°C).

q. Impact (Izod Pendulum) ASTM D256:
   1. 1.09 ft.lb/in^2 (2.29 KJ/m^2) at 24 hours cure at 72°F (22°C).
   2. 2.58 ft.lb/in^2 (5.43 KJ/m^2) at 1-hour post-cure at 212°F (100°C).

r. Impact (Falling Weight) ASTM D2794:
   1. 13.8 in.lb (0.16 kg.m) at 24 hours cure at 72°F (22°C).
   2. 21.7 in.lb (0.25 kg.m) at 1-hour post-cure at 212°F (100°C).

s. Tensile Strength ASTM D412 (Die C):
   1. 3,063 psi (21.1 MPa) at 24 hours cure at 72°F (22°C).
   2. 6,133 psi (42.3 MPa) at 1-hour post-cure at 212°F (100°C).

t. Elongation ASTM D412 (Die C):
    1. 0.6% at 24 hours cure at 72°F (22°C).
    2. 1.9% at 1-hour post-cure at 212°F (100°C).
u. Young's Modulus ASTM D412 (Die C):
    1. 4.8×10^5 psi (3.3 GPa) at 24 hours cure at 72°F (22°C).
    2. 3.8×10^5 psi (2.6 GPa) at 1-hour post-cure at 212°F (100°C).

Part 3 EXECUTION

3.1 EXAMINATION

A. Examine in accordance with manufacturer's instructions and recommendations.
B. New concrete should be cured for a minimum of 28 days or until moisture content is below 6% using a Protimeter.
C. Verify concrete is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per ASTM D4258.
D. Verify steel is free of oil, grease, loose material and other foreign substances that would interfere with the adhesion to the substrate per SSPC-SP10.
E. Verify environmental temperature and relative humidity are within the manufacturer's recommendations.

3.2 PREPARATION

A. Prepare substrates in accordance with manufacturer's instructions and recommendations.
B. Concrete substrates should be abraded per ASTM D4259 and cleaned per ASTM D4258.
C. Steel substrates should be abrasive blasted to a surface cleanliness per SSPC-SP10 and a profile of 3 mils per ASTM D4417.
D. If necessary, install masking tape to prevent contamination of adjacent substrates.

3.3 APPLICATION

A. Apply in accordance with manufacturer's instructions and recommendations.
B. For first coat, apply product directly on to the prepared surface with a short, bristled brush or rubber squeegee.
C. Apply second coat after first coat, as per manufacturer's instructions and recommendations.
D. For spray applications, suitable areas may be coated by spray. Belzona 5892 must be sprayed using heated airless equipment.

3.4 CLEANING

A. Mixing tools should be cleaned immediately after use with Belzona 9111 or any other effective solvent such as methyl ethyl ketone or acetone.
B. Brushes and any other application tools should be cleaned using a suitable solvent such as Belzona 9121, methyl ethyl ketone, acetone or cellulose thinners.

3.5 PROTECTION OF FINISHED WORK

A. Follow manufacturer's instructions and recommendations.

END OF SECTION

09 96 56