BELZONA 1391 Product Specification Sheet

1. PRODUCT NAME

Belzona® 1391 (Ceramic HT)
Coating system for high temperature equipment handling water and aqueous solutions.

Also used as a high strength 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.

2. MANUFACTURER

Belzona Inc.
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Miami, Florida 33172

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

3. PRODUCT DESCRIPTION

A two component high temperature coating system designed to operate in immersion at operating temperatures up to 248°F (120°C) and suitable for steaming out up to 410°F (210°C).

Exhibits excellent erosion-corrosion resistance at elevated temperatures. Resistant to a broad range of aqueous solutions, hydrocarbons and process chemicals.

When mixed and applied as detailed in the Instructions for Use leaflet the system is ideally suited for application to:

- Condensate extraction pumps
- Condensate return tanks
- Evaporators
- Heat exchanger barrels
- Oil/gas and oil/water separators
- Autoclaves
- Scrubber units
- Calorifiers
- Distillation units

4. TECHNICAL DATA

Base Component

Appearance	Paste
Color	Gray
Density	2.48 - 2.68 g/cm³

Solidifier Component

Appearance	Liquid
Color	Blue or Violet
Density	0.99 - 1.03 g/cm³

Mixed Properties

Mixing Ratio by Weight (Base : Solidifier)	13 : 1
Mixing Ratio by Volume (Base : Solidifier)	5 : 1
Mixed Form	Liquid
Slump Resistance	nil at 50 mil (1.25 mm)
Mixed Density	2.24 - 2.41 g/cm³

• ***Shelf Life:***
Separate Base and Solidifier components will have a minimum shelf life of 3 years when stored in their original unopened containers between 32°F (0°C) and 86°F (30°C).

• ***Working Life:***
Will vary according to temperature. At 68°F (20°C) the usable life of mixed material is 35 minutes.

• ***Coverage Rate:***
At operating temperatures up to 212°F (100°C) the **Belzona® 1391** should be applied at a thickness of 24-30 mils (600-750 microns). To achieve the correct film thickness a practical coverage rate of 5.6 sq.ft. (0.52 m²) per kilogram unit should be obtained.

At operating temperatures between 212 and 248°F (100-120°C) the **Belzona® 1391** should be applied at a thickness of 32 - 40 mils (800 - 1000 microns) and to achieve this thickness a practical coverage rate of 4.2 sq.ft. (0.39 m²) per kilogram unit should be obtained.

• ***Volume Capacity:***
The volume capacity of mixed material is 26.1 cu.ins. (431 cm³) per kilogram.

• ***Cure Time:***
Allow the applied material to solidify for the times shown in the chart below before subjecting it to the conditions indicated. In certain instances it may be advantageous to post cure material prior to putting into service where chemical contact is involved. Refer to Belzona® for specific recommendations.

5. PHYSICAL / MECHANICAL PROPERTIES

Determined after either 7 days ambient cure at 68°F (20°C) or post cure at 212°F (100°C) unless otherwise stated.

• ***Abrasion Resistance:***
Taber
The sliding abrasion resistance of the material when tested in accordance with ASTM D4060 under wet conditions using the Taber Abraser fitted with H10 grinding wheels and 1 kg load is typically:

50 mm³ loss/1000 cycles	ambient cure
39 mm³ loss/1000 cycles	post cure

• ***Adhesion:***
Tensile Shear
When tested in accordance with ASTM D1002, using substrates which have been grit blasted to a 3-4 mil. profile, gives typical values of:

	Ambient cure	post cure
Mild steel	3,200 psi (22.06 MPa)	3,100 psi (21.37 MPa)
Stainless steel	2,800 psi (19.31 MPa)	2,700 psi (18.61 MPa)
Copper	2,200 psi (15.17 MPa)	2,300 psi (15.86 MPa)
Aluminum	1,600 psi (11.03 MPa)	1,800 psi (12.41MPa)

When tested on mild steel at 265°F (130°C) the tensile shear adhesion of the post cured material is typically 1750 psi (12.07 MPa).

Pull Off Adhesion
When tested in accordance with ASTM D4541/ ISO 4624, the pull off strength from grit blasted steel will be typically:

6030 psi (41.58 MPa)	ambient cure
4490 psi (30.96 MPa)	post cure

• ***Cathodic Disbondment:***
When tested in accordance with ASTM G42 at 194°F (90°C) the disbondment diameter is typically 0.24 inch (6 mm).

• ***Cavitation Resistance:***
The cavitation resistance of the product when tested to a modified version of ASTM G32 using stationary specimens at 20 KHz frequency and 50 microns amplitude, typical average volume loss is:

3.3 mm³/hr	ambient cure
2.0 mm³/hr	post cure

CURE TIMES

TEMPERATURE	50°F (10°C)	68°F (20°C)	77°F (25°C)	85°F (30°C)	105°F (40°C)
Movement or use involving no loading or immersion	8 hrs	5½ hrs	3½ hrs	2 hrs	1½ hrs
Machining and/or light loading	16 hrs	9 hrs	4½ hrs	3 hrs	2 hrs
Full mechanical loading or cold water immersion	7 days	4 days	2½ days	2 days	1½ days
Hot water immersion or chemical contact	14 days	7 days	4 days	3 days	2 days

• ***Chemical Resistance:***
The material will demonstrate excellent resistance to a broad range of chemicals. For more specific information refer to Product Data M514 or contact Belzona®.

• ***Compressive Modulus:***
When tested in accordance with ASTM D695, typical values obtained will be:
1.33 x 10^5 psi (917 x 10^3 MPa)

• ***Compressive Strength:***
When tested in accordance with ASTM D695, typical values obtained will be:
11,400 psi (78.6 MPa) ambient cure
14,400 psi (99.28 MPa) post cure

• ***Explosive Decompression:***
When tested to NACE TM 0185, using a seawater/hydrocarbon test fluid, the coating will exhibit no breakdown after a 21 day immersion period at 100°C and 100 bar pressure followed by decompression over 15 minutes.

• ***Flexural Modulus:***
When tested in accordance with ASTM D790, typical values obtained will be:
8.03 x 10^5 psi (5536 MPa)

• ***Flexural Strength:***
When tested to ASTM D790, typical value obtained will be 8,500 psi (58.6 MPa) under ambient or post cure conditions.

• ***Hardness:***
Shore
The Shore D hardness of the material when tested in accordance with ASTM D2240 is typically:
84 ambient cure
87 post cure

When tested at elevated temperatures the Shore D hardness of the post cured material is typically as follows:
212°F (100°C) - 87
284°F (140°C) - 85
356°F (180°C) - 82
392°F (200°C) - 78

Koenig Pendulum
When tested to ISO 1522 the Koenig damping time of the ambient cured coating will typically be 148 seconds.

Barcol
Tested to ASTM D2583 to Barcol hardness will be typically:
91 ambient cure
95 post cure

• ***Heat Distortion Temperature:***
Tested to ASTM D648 (264 psi fiber stress), typical values obtained will be:
118°F (48°C) ambient cure
253°F (123°C) post cure
293°F (145°C) when fully post cured for 7 days at 212°F(100°C)

• ***Heat Resistance:***
The material will resist water and hydrocarbons at temperatures up to 248°F (120°C). Above 212°F (100°C) a coating thickness of 32-40 mils (800-1000 microns) is recommended along with insulation of the outer surface of the coated item where practical. The material is thermally stable up to 392°F (200°C) under dry conditions.

Atlas Cell
When tested in accordance with NACE TM 0174 the coating will exhibit no blistering or rusting (ASTM D714 rating 10; ASTM D610 rating 10) after 6 months immersion in de-ionized water at 203°F (95°C). Please consult Belzona TKL for additional advice for applications operating between 212- 248°F (100-120°C).

• ***Impact Strength:***
Reverse notched Izod impact strength when tested in accordance with ASTM D256 is typically:
0.85 ft.lb./in (46 J/m) ambient cure
1.13 ft.lb./in (61 J/m) post cure

• ***Steam-out Resistance:***
Once fully cured the coating will exhibit no blistering, cracking or delamination after 96 hours exposure to pressurised steam at 410°F (210°C).

• ***Low Temperature Thermal Shock:***
Coated steel panels will exhibit no blistering, cracking or delamination after multiple cycles of rapid cooling from 212°F (100°C) to -76°F (-60°C).

• ***Thermal Cycling:***
When tested in accordance with section 9 of NACE TM0304 the coating passed after 252 cycles between +140°F and -22°F (+60°C and -30°C).

• ***Thick Film Cracking:***
When tested in accordance with Section 12 of NACE TM0104, the coating at three times recommended thickness, exhibited no cracking after 12 weeks immersion in seawater at 104°F (40°C).

6. SURFACE PREPARATION AND APPLICATION PROCEDURES
For proper technique, refer to the Belzona® Instructions For Use Leaflet which is enclosed with each packaged product.

Badly eroded surfaces may first be rebuilt, dependent on service temperature, with **Belzona® 1111** (Super Metal), **Belzona® 1311** (Ceramic R-Metal) or **Belzona® 1511** (Super HT-Metal) prior to application of **Belzona® 1391.**

7. AVAILABILITY AND COST
Belzona® 1391 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.

8. WARRANTY
Belzona® guarantees this product will meet the performance claims stated herein when material is stored and used as instructed in the Instructions 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, etc.). Since Belzona® has no control over the use of the product described herein, no warranty for any application can be given.

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

10. HEALTH AND SAFETY
Prior to using this material, please consult the relevant Material Safety Data Sheets.

11. APPROVALS/ ACCEPTANCES
U.K. WRAS
U.S.D.A.
NUCLEAR POWER INDUSTRY
(DBA Tested)

The technical data contained herein is based on the results of long term tests carried out in our laboratories and to the best of our knowledge is true and accurate on the date of publication. It is however subject to change without prior notice and the user should contact Belzona to verify the technical data is correct before specifying or ordering. No guarantee of accuracy is given or implied. We assume no responsibility for rates of coverage, performance or injury resulting from use. Liability, if any, is limited to the replacement of products. No other warranty or guarantee of any kind is made by Belzona, express or implied, whether statutory, by operation of law or otherwise, including merchantability or fitness for a particular purpose.

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