

ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

1 SCOPE

- This specification applies to single or two (or more) pack organic zinc-rich primers for application to iron and steel structures on which optimum surface preparation can be achieved.
- This document has been prepared in a manner compliant with the requirements of AS/NZS ISO/IEC 17065.
- APAS® is a trademark registered with IP Australia, owned by CSIRO, the Scheme Owner, and protected under applicable laws. Use of the trademark or the Certification Scheme is prohibited unless prior approval in writing is obtained from CSIRO via the APAS Secretariat.

2 BACKGROUND

- To obtain a broad overview of the Australian Paint Approval Scheme (APAS), refer to APAS document AP-D001.
- To obtain an overview of restricted ingredients in APAS certified products, refer to APAS document AP-D123.
- To obtain the current list of APAS participating manufacturers (and suppliers) and resellers, refer to APAS document AP-D152.
- To obtain an overview of how to participate in the APAS, refer to APAS document AP-D177.
- APAS approval to this specification may be gained by compliance with the requirements detailed in this specification and those in APAS document AP-D192.

3 DEFINITIONS AND ACRONYMS

3.1 Definitions

The definition of terms used in this document and in the Certification Scheme can be found in APAS Document AP-D001. In addition, the following definitions shall apply:

- Binder / Binding Agent:** any material that holds or draws other materials in a product together to form a cohesive whole that hardens chemically or mechanically.
- Extenders:** Pigment(s) with a low refractive index, added to a vehicle system to reduce cost, achieve durability, alter appearance, control rheology or influence other properties.
- Organic zinc-rich primer:** A surface coating product consisting of a dispersion of metallic zinc dust, flake nanoparticle or other form of this material, in an organic medium.
- Zinc:** A metal chemical element, bluish-white in colour. Zinc is used both to make other metallic alloys or used as a reinforcement and corrosion resistant pigment to aid in the protection of metals by galvanising or application of zinc-rich paints to iron and steel. Zinc may be in the form of dust, flake, nanoparticle or similar.
- Zinc-Rich Primer:** An anti-corrosive primer containing zinc in a concentration sufficient to produce electrical conductivity, either by itself or in conjunction with other materials in its formulation, in a dried film

enabling the zinc to corrode preferentially and sacrificially to the iron or steel substrate below, providing galvanic protection.

- Pigment:** A substance that can be natural or synthetic, inorganic or organic, that when dispersed in a liquid paint, can give colour and other properties, including opacity, hardness, durability, and corrosion resistance. The term is used to include extenders as well as white or coloured pigments.
- Primer:** An initial coating layer applied to an adequately prepared surface in a multi-layer system that provides adhesion and protection to the substrate.
- Thermoplastic:** Materials that can melt and become pliable at certain temperatures then reform when cooled, noting that this process is able to be repeated.
- Thermoset:** Materials that hardened permanently after one application of heat, pressure or chemical cross-linking.
- Vehicle:** The binding agent of a surface coating material including diluents.

3.2 Acronyms

The following acronyms appear in this document:

APAS	Australian Paint Approval Scheme
AS	Australian Standard
AS/NZS	Australian Standard / New Zealand Standard
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DFT	Dry Film Thickness
PDS	Product Data Sheet
SDS	Safety Data Sheet
TDS	Technical Data Sheet
WHS	Workplace Health and Safety

4 DESCRIPTION AND GUIDE FOR USERS

4.1 General Requirements

- This specification applies to single or two (or more) pack organic zinc-rich primers for application to iron and steel structures on which optimum surface preparation can be achieved.
- Zinc-rich primers have been widely used since the 1930's for corrosion protection of iron and steel structures. Organic zinc-rich coatings provide corrosion resistance in two ways: galvanic / cathodic protection against corrosion by the zinc acting in a sacrificial capacity when in direct contact with iron or steel, and as a physical barrier to corrosion.
- Films formed are typically hard and abrasive-resistant, but the degree of flexibility, impact resistance and other properties varies with the binder type and pigment to volume ratio. Compared to inorganic zinc-rich coatings, they are also less porous as the vehicle fills the pores created when zinc loaded.
- Binder types are typically, but not limited to, thermoplastic binders (chlorinated rubber, styrenes and vinyls) or thermoset binders (phenoxies, catalysed epoxies, epoxy esters and silicones). New advances in technology are constantly developing and

ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

products are not limited to these chemistry types as long as the performance requirements of the specification are met by the product under test.

- e) Best results are achieved with abrasive blast cleaned surfaces, however organic zinc-rich products are generally more surface tolerant if applied to inadequately prepared surfaces and are easier to topcoat than their inorganic comparative products. Organic zinc-rich coatings do tend to mud crack, dry spray less than inorganic products and are less likely to bubble when top coated.
- f) Organic zinc-rich primers are generally applied by spray application and can vary from 25 to 125 µm DFT. The typical application range is 50 to 85 µm DFT. These material types can also be applied by brush for small jobs but as zinc settles, must be adequately mixed prior to use.
- g) These primers are also used as repair and maintenance materials of damaged or weathered zinc-rich coatings (both organic and inorganic), galvanized surfaces or areas where it is difficult to use spray application. They can also be used as welding and pre-fabrication primers (protects the steel work until fabrication completed and final paint coat applied) and as a shop primer.
- h) Organic zinc-rich primers, when used as a maintenance paint to repair defects and damaged areas of inorganic zinc-rich coatings, offer better adhesion and less additional costs but are less resistant to abrasion, solvents and high temperatures when compared to an inorganic zinc-rich product.
- i) The manufacturer's product data sheet (PDS) or technical data sheet (TDS) should be consulted to confirm that the exposure conditions to which the coating system is to be exposed is within the capabilities of that system.

4.2 Sub-Classes

- a) This specification incorporates the following subclasses:
 - i. **2916/1:** Single-pack primer
 - ii. **2916/2:** Two (or more) - pack primer

4.3 Basis of this Specification

- a) Paints complying to both sub-classes of this specification are based on Type 1 (sub-class AP-S2916/1) and Type 2 (AP-S2916/2) of AS/NZS 3750.9 with the following modifications:
 - i. Storage Stability requirements increased from 6 to 12 months.
 - ii. Exterior durability requirement is increased from 48 to 72 months at three exposure sites.
 - iii. Inclusion of Accelerated Durability requirements for 2000 hours (interim) and 4000 hours (final).
- b) Products approved under sub-class AP-S2916/1 do not conform to any PRN of AS 2312.1 at this time.
- c) Products approved under sub-class AP-S2916/2 comply with Paint Reference Number (PRN) C02 of AS 2312.1. Systems using a primer that complies with this specification are referenced in Table 6.3 of AS 2312.1.

5 REFERENCED DOCUMENTS

- a) The following standards are referenced in this document:
 - i. **AS/NZS 1580** – Paints and related materials: Methods of test
 - ii. **AS 2312.1** – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Part 1: Paint Coatings
 - iii. **AS/NZS 3750.9** – Paints for steel structures – Organic zinc-rich primer
 - iv. **ASTM D5894-16** – Standard Practice for Cyclic Salt Fog/UV Exposure of Painted Metal, (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet)

These documents may be purchased through the Reference Standards Australia website:

<https://www.standards.org.au/>

- v. **The Poisons Standard June 2022:** Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) No. 36, Part 2: Control on Medicines and Poisons, Section Seven / Appendix I Paint or Tinters

This document is available from the Australian Government Federal Register of Legislation website at:

<https://www.legislation.gov.au/Details/F2022L00730>

- b) The following APAS documents are referenced in this document:
 - i. AP-D001 Rules Governing How APAS® Operates
 - ii. AP-D123 Restrictions on Ingredients in Product Formulations
 - iii. AP-D152 APAS® Participating Manufacturers and Resellers
 - iv. AP-D177 Rules Governing How Product Manufacturers participate in APAS®
 - v. AP-D181 Volatile Organic Compounds (VOC) Limits
 - vi. AP-D192 Rules Governing APAS® Product Certification Scheme

All APAS documents are available for download from the APAS website: <https://vs.csiro.au/apas/documents/>

6 COMPOSITIONAL REQUIREMENTS

6.1 Binder

- a) The binder composition is not restricted by this specification, however, is typically organic in nature, such as styrene or epoxy esters for sub-class AP-S2916/1 and epoxies for sub-class AP-S2916/2.

6.2 Volatiles

- a) The volatile portion shall typically comprise hydrocarbons.
- b) For VOC content restrictions, refer to APAS document AP-D181.



ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

6.3 Pigmentation

- a) The pigmentation shall be chosen to impart the properties detailed in clause 7, Table 1 below.

6.4 Colour

- a) The colour of organic zinc-rich primers are typical of the primary pigment used in its production (zinc) and as such, are usually only available in grey. The standard of decorative properties of these coatings is expected to be low.

7 PRODUCT APPROVAL REQUIREMENTS

7.1 General Requirements

- a) The product and its application for approval shall comply with the relevant requirements of APAS document AP-D192 and this specification during the life of the approval.

7.2 Technical Requirements

- a) The product shall comply with **all** the requirements of clause 8, Table 1 below.
- b) **CLASS II** certification **may** be granted provided that the following minimum conditions are met:
- All properties in clause 8, Table 1 (with the exception of Resistance to Weathering and Final Accelerated Weathering) have been tested for and shown to comply with stated requirements, **and**
 - Appropriate case histories of at least 4 years duration complying with APAS document AP-D192 Appendix B, are supplied.

7.3 Health and Safety Requirements

- a) The manufacturer's Safety Data Sheet (SDS) must be studied closely prior to using the product and complied with during use of the product.
- b) As products covered by this specification typically contain solvents, the product is considered flammable and should be stored away from all sources of heat or ignition.
- c) Containers should be resealed immediately after use and good ventilation provided during use to minimise the risk of fire or explosion and the long-term toxic effects of absorption of the vapour into the lungs.
- d) Care should be taken to avoid contact with the skin using protective clothing and barrier cream. All pumping equipment should be adequately earthed. It is anticipated that most of these products would be applied by operators in well ventilated spray booths or in the field by operators with adequate safety equipment.
- e) Care should be taken when opening up containers as zinc-rich products are susceptible to pressure build-up on moisture contamination.
- f) Single-pack zinc-rich products have the tendency to settle during storage so materials should be stored and handled appropriately to minimise the effects of settling.
- g) Products intended for sale in Australia shall comply with all the requirements of the SUSMP. Products

intended for sale in other countries shall comply with all local WHS and environmental requirements.

- h) The product shall comply with all requirements of clause 6.3 and 6.4 of APAS document AP-D192.



SPECIFICATION AP-S2916



ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

8 TABLE 1: PERFORMANCE PROPERTIES

TEST	AS/NZS 1580 METHOD	REQUIREMENTS
For EACH Component		
Preliminary Examination	103.1 211.2	Product shall be free from gel, coarse particles, skins and foreign matter and shall be readily re-incorporated. Report results.
Storage Stability	AS/NZS 3750.9, clause 2.4.3	A sample stored for 12 months at ambient temperature shall be readily incorporated to produce a uniform, lump-free mixture suitable for application. Report results.
VOC Content	APAS AP-D181	Refer to APAS document AP-D181 for method and limits. If the APAS specification is not listed on AP-D181, a declaration of VOC content is still required .
Wet Paint Tests		
General Requirements	AS/NZS 3750.9	Shall comply with all the requirements of the following sub-sections of Section 2: Material Requirements (clauses 2.2.1 Pigment Content and 2.6.5 Resistance to Weathering have been modified as per below): <ul style="list-style-type: none"> • 2.2 Pigment • 2.4 Liquid Paint • 2.5 Application Properties • 2.6 Applied Film All results shall be reported. NOTE: For one-pack products, the following clause shall not apply: 2.5.4 Pot-life assessment.
Pigment Content	AS/NZS 3750.9 clause 2.2.1	Total zinc content not less than 85 % by mass or greater than 94 % by mass. Report results. NOTE: Alternative pigment content levels will be considered on a case by case basis by the APAS EO as any new product innovations develop.
Thinning or Mixing Properties	208.1	Using 10 % of manufacturers recommended thinner, there shall be no signs of incompatibility. Report results.
Application of Aged Sample	205.2 or 205.4	A sample of the product which has been stored at routine conditions for 12 months , when mixed and sprayed according to manufacturer's instructions, shall produce a uniform finish typical of product type. Report results.
VOC Content	APAS AP-D181	Refer to APAS document AP-D181 for method and limits. If the APAS specification is not listed on AP-D181, a declaration of VOC content is still required .



SPECIFICATION AP-S2916



ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

TEST	AS/NZS 1580 METHOD	REQUIREMENTS										
Dry Film Tests												
Specular Gloss (60°)	602.2	To be recorded.										
Impact Resistance	406.1 Method A	A 2 Kg mass falling from 40 cm direct impact shall show no signs of film cracking or adhesive failure. Report results.										
Adhesion	408.2 Method B	Less than or equal to rating 1. Report results.										
Interim Accelerated Weathering	ASTM D5894 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<p>After 2000 hours the ratings shall be:</p> <table> <tr><td>Checking</td><td>≤ 0</td></tr> <tr><td>Cracking</td><td>≤ 0</td></tr> <tr><td>Blistering</td><td>≤ 0</td></tr> <tr><td>Flaking and Peeling</td><td>≤ 0</td></tr> <tr><td>Visible corrosion</td><td>≤ 0</td></tr> </table> <p>NOTE: A minimum of 2 test panels (one scribed and one un-scribed) must be prepared and tested for both the primer alone and the primer when used in conjunction with a multi-coat system (the system must be APAS approved products) so as to compare results for complete coating coverage with exposed areas of the panel.</p>	Checking	≤ 0	Cracking	≤ 0	Blistering	≤ 0	Flaking and Peeling	≤ 0	Visible corrosion	≤ 0
Checking	≤ 0											
Cracking	≤ 0											
Blistering	≤ 0											
Flaking and Peeling	≤ 0											
Visible corrosion	≤ 0											
Final Accelerated Weathering	ASTM D5894 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<p>After 4000 hours the ratings shall be:</p> <table> <tr><td>Checking</td><td>≤ 0</td></tr> <tr><td>Cracking</td><td>≤ 0</td></tr> <tr><td>Blistering</td><td>≤ 0</td></tr> <tr><td>Flaking and Peeling</td><td>≤ 0</td></tr> <tr><td>Visible corrosion</td><td>≤ 0</td></tr> </table> <p>NOTE: A minimum of 2 test panels (one scribed and one un-scribed) must be prepared and tested for both the primer alone and the primer when used in conjunction with a multi-coat system (the system must be APAS approved products) so as to compare results for complete coating coverage with exposed areas of the panel.</p>	Checking	≤ 0	Cracking	≤ 0	Blistering	≤ 0	Flaking and Peeling	≤ 0	Visible corrosion	≤ 0
Checking	≤ 0											
Cracking	≤ 0											
Blistering	≤ 0											
Flaking and Peeling	≤ 0											
Visible corrosion	≤ 0											
Resistance to Weathering	457.1 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<p>After 72 months exposure at all 3 atmospheric exposure sites (listed in APAS document AP-D192, clause 12), the ratings shall be:</p> <table> <tr><td>Checking</td><td>≤ 0</td></tr> <tr><td>Cracking</td><td>≤ 0</td></tr> <tr><td>Blistering</td><td>≤ 0</td></tr> <tr><td>Flaking and Peeling</td><td>≤ 0</td></tr> <tr><td>Visible corrosion</td><td>≤ 0</td></tr> </table> <p>NOTE: A minimum of 2 test panels (one scribed and one un-scribed) must be prepared and tested for both the primer alone and the primer when used in conjunction with a multi-coat system (the system must be APAS approved products) so as to compare results for complete coating coverage with exposed areas of the panel.</p>	Checking	≤ 0	Cracking	≤ 0	Blistering	≤ 0	Flaking and Peeling	≤ 0	Visible corrosion	≤ 0
Checking	≤ 0											
Cracking	≤ 0											
Blistering	≤ 0											
Flaking and Peeling	≤ 0											
Visible corrosion	≤ 0											



SPECIFICATION AP-S2916



ORGANIC ZINC-RICH PRIMER FOR THE LONG-TERM PROTECTION OF STEEL

APPENDIX A

Document History

Status: Current
Version: 11
Date Published: 15-06-2022

Document Version No.:	Date Published:	Summary of Changes:
11	15-06-2022	<ul style="list-style-type: none">• Full Technical review• Inclusion of clause 3 - Definitions and Acronyms• Updated SUSMP• Document brought in line with Australian Standard AS/NZS 3750.9• Name change from <i>Organic Zinc-Rich Coating for the Long-Term Protection of Steel</i> to <i>Organic Zinc-Rich Primer for the Long-Term Protection of Steel</i>• Standardising accelerated durability testing for interim and final testing results in line with material type (primer)• Removed <i>Resistance to Immersion - Salt and Fresh Water</i> test as is not relevant• General format changes
10	14-09-2021	<ul style="list-style-type: none">• General format changes• Updated background information in clause 2• Updated SUSMP information• Updated APAS website information
9	15-12-2020	<ul style="list-style-type: none">• Addition of Appendix A Document History and removal of the Editorial Note previously used in specification versions• Updated document to the current format• Updated internal and external document references• Defined aged sample requirement in clause 7, Table 1• Removal of Note 2 and inclusion of this information (Class II certification) into clause 6.2 b)• Inclusion of VOC Content requirement to Table 1 Performance Properties• Addition of "People + Product = Protection" to Footer
8	20-06-2007	<ul style="list-style-type: none">• Introduced sub-classes in 1.2• Clarified testing requirements to allow Interim approvals
7	17-11-2003	<ul style="list-style-type: none">• Deleted reference to GPC numbering and incorporated a general format update
6	11-05-2001	<ul style="list-style-type: none">• Incorporated the changes made to APAS document D192 and reflected in clauses 3 and 4• Initiated the second stage of the move to new specification numbering with prominence given to the new number (previously GPC-C-29/16)