HPL PE-Coated Steel Culverts - overview.

HPL is a polyethylene-coated galvanized steel with the same steel strength and galvanizing weight (G250, Z600) as used in the manufacture of our standard culverts. The reinforced PE layer provides considerable additional protection to the underlying Z600 galvanizing resulting in substantially increased lifespan of the culverts even in the most aggressive conditions.

Unlike other PE-coated steels, HPL has a reinforcement layer within the polymer that provides very high resistance to abrasion, harsh environmental conditions and localized surface damage. The coating is applied on both the internal and external surfaces of the culverts, as shown below:



The HPL materials are available in wall thicknesses of 1.6mm to 3.0mm in the 68 x 13mm and 125 x 25mm corrugation profiles specified in AS/NZS 2041.4. The culvert diameter range will remain the same – 300mm to 3,650mm on our standard mills, with the potential for >4,000mm on our mobile mills.

The Australian Standard for helically-formed corrugated steel culverts, AS/NZS 2041.4:2010, allows for the use of the polymer coated steel materials, as detailed in Section 2.2, and reproduced below.

2.2 MATERIALS

2.2.1 Base material

The base material consisting of the base metal and a protective coating shall be—

(a) galvanized steel strip complying with the requirements of AS 1397 for steel base grade G250 and galvanized to Z600;

(b) aluminium cladding aluminium substrate strip classification Alclad 3004-H34 (7072 cladding and 3004 core) in accordance with AS/NZS 1734 and ASTM B744;

(c) steel strip of grade G230 minimum with an aluminized (Type II) coating in accordance with ASTM A929; or

(d) galvanized steel strip of grade G230 minimum and galvanized to Z600 with a polymer coating in accordance with ASTM A742.

Ref. AS/NZS2041.4

HPL has been tested independently to ASTM A742 and meets the requirements 2.2.1 (d) above in full. The tests include the following:

- Adhesion
- Impact
- Thickness
- Holidays
- Abrasion Resistance
- Imperviousness
- Freeze-Thaw Resistance
- Weatherability
- Resistance to Microbial Attack

In reviewing the ASTM A742 standard, it is important to note the PE coating thickness specified in ASTM A 742 is 250 microns per side. This is due to the standard being based on the original Trenchcoat materials produced by Dow Chemicals, the only product available at the time. HPL materials are a minimum of 550 microns per side, including the reinforcement layer, which significantly increases its abrasion resistance and overall durability performance.

Product Specifications & Features:

- PE coating thickness: 550 microns (double the ASTM A742 standard).
- Corrosion and abrasion resistance levels.
- Service life expectancy (100 years in normal conditions).
- Available corrugation profiles: 68x13mm and 125x25mm.
- Available wall thicknesses: 2.0mm to 3.0mm.

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In addition to testing to the above ASTM standard, we have carried out extensive Taber abrasions tests comparing HPL materials to both standard Z600 galvanized steel and Trenchcoat PE-coated steel. By conducting directly comparable tests for the three materials, we were able to assess the benefits of against the known performance of Z600, together with comparisons to the Trenchcoat PE. The testing was carried out as follows:

Abrasion test overview:

- The Taber abrasion tests have been carried out in accordance with ASTM D4060 – 14.
- CS-17 abrading wheels have been used, as per the above standard.
- The abrading wheels are resurfaced every 500 cycles, as per the above standard.
- The abrading wheels are loaded with a 1,000-gram load.
- Three sample materials have been tested:
    - G250 Z600 galvanized steel.
    - Trenchcoat PE-coated steel; and,
    - HPL – PE-coated steel.
- In the case of the Z600 galvanized steel, testing continued until bare metal was reached.
- In the case of the Trenchcoat PE-coated steel, the testing continued until the galvanized steel surface was reached. This was also originally the intention for the HPL, but testing was halted at 80,000 cycles without the galvanized substrate being reached. Given that both the Trenchcoat and the HPL coated materials are galvanized to Z600 prior to the application of the PE coating, we can assume the lifespan of the underlying zinc coating will be the same across all samples.

The Z600 galvanized coating was removed after 8,000 cycles. The Trenchcoat PE-coated steel failed at 40,000 cycles. Testing on the HPL materials was stopped at 80,000 cycles without reaching the galvanized substrate. The samples were then water-cut and micro-measured to assess the degree of material loss, as detailed below:

Material	Original coating thickness - µm	Average coating thickness - µm	Total Cycles applied
HPL PE-coated Z600 steel	600, 630, 550, 610, 570	592	80,000
Z600 galvanized steel	30, 40, 30, 30, 30	32	8,000
Trenchcoat PE-coated Z600 steel	330, 350, 330, 340, 330	336	40,000

Material	Wear scar - µm	Average - µm
HPL PE-coated Z600 steel	300, 280, 280, 320, 300	296
Z600 galvanized steel	10, 0, 0, 10, 0	4
Trenchcoat PE-coated Z600 steel	30, 20, 30, 20, 20	24

We can see from the above results, the HPL materials wear at a rate approximately half that of the Trenchcoat materials. Given that the HPL coating thickness is also double that of Trenchcoat, the overall performance of HPL has the potential to be eight times superior.

Approvals and Certifications:

Our HPL culverts have been approved by the following organizations:

- **MRWA** - Main Roads Western Australia (including Panel Contract No. 0054/24).
- **TMR** – Transport and Main Roads, Queensland (various projects).
- **ARTC** – Australian Rail Track Authority (Type Approval ref. NESA-T157).

Key Applications:

- Mining projects (Rio Tinto, South32).
- Large-span drainage culverts and tunnels.
- Heavy-load underpasses and stockpile tunnels.

On-Site Support Services:

- Installation guidance and QA support.
- Inspection and maintenance programs.

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Culvert lifespan:

In terms of the expected lifespan of PE-coated steels, Section 3 of AS2041.1 details the estimated service life for PE-coated steel, against a range of pH and Resistivity values as shown in Table 3.7.2(E), copied below.

TABLE 3.7.2(E)

ESTIMATED MATERIAL SERVICE LIFE FOR POLYMER PRECOATED GALVANIZED STEEL

Estimated service life	Site environmental conditions	Maximum FHWA ID-85-15 (see Note 1) abrasion level
Minimum 100 y	$5.0 \le pH \le 9.0$ $r > 1500$ ohm-cm	Moderate (see Notes 1 and 2 of Table 3.4)
Minimum 75 y	$4.0 \le pH \le 9.0$ $r \ge 750$ ohm-cm	
Minimum 50 y	$3.0 \le pH \le 12.0$ $r \ge 250$ ohm-cm	

NOTES:
1 See Bibliography.
2 Polymer precoated material in accordance with ASTM A742.

Ref. AS/NZS2041.1

As noted above, the estimated service life detailed in the above table assumes the thickness of the coating to be a minimum of 250 µm as per ASTM A 742. Given the additional thickness of the HPL coating, together with the significant results of abrasion tests, it is reasonable to expect the HPL materials to last well in excess of the service life estimates detailed in Table 3.7.2 (E).

In conclusion, the HPL PE-coated steel materials represent a significant move forward in the production of helically-formed steel culverts, offering end-users and specifiers a significant choice where durability remains a concern.
The material will provide substantial durability performance in aggressive environments and in areas where high abrasion rates are a concern, whilst offering the same cost- effective benefits of traditional steel culverts.



HPL PE-coated steel - close up

Designed for durability and engineered for all conditions, **HPL PE-Coated Steel Culverts** represent the next generation of high-performance drainage solutions. With industry-leading abrasion resistance and a 100-year service life, HPL sets a new standard in sustainability and strength—ensuring long-term reliability across the harshest environments.

Setting new standards for Corrugated Steel Culverts







Roundel's HPL PE-coated steel culverts

offer significantly improved durability performance compared to traditional Z600 galvanized steel.

HPL is fully compliant with AS / NZS 2041.4, ASTM A742, and has been extensively tested locally to demonstrate a **100-year life**, with exceptional abrasion performance. It is available for internal and / or external surfaces depending on your requirements.

The coating's superior performance has been recognized by the Department of Transport and Main Roads (TMR) and was approved for culvert relines on the Toowoomba Second Range Crossing.

Over 4,500 tonnes of HPL PE-coated culverts are also being manufactured on-site by Roundel for Rio Tinto's Koodaideri Rail project in the Pilbara, WA.

Roundel welcomes your inquiries for HPL-coated culverts, traditional Z600 galvanized culverts and our wide range of B200 and B381 bolted, corrugated steel structures.

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Enquiries: James Rowland on (08) 9323 6542
Our Ref: 24/7569 D25#43025
Your Ref:

3rd February 2025

Email to: steve@roundel.com.au Stephen

Keeney
Operations Director
Roundel Civil Products Pty Ltd 1/9
Warman Street
NEERABUP WA 6031

Dear Stephen,

NOTICE OF ACCEPTANCE OF OFFER – PANEL CONTRACT FOR PROVISION OF MATERIALS RELATED TO ROAD CONSTRUCTION AND MAINTENANCE CONTRACT NO. 0054/24

In accordance with Clause 4.2 of the General Conditions, I am pleased to advise that your Offer is accepted and Roundel Civil Products Pty Ltd has been appointed as a Panel Member for the above Contract under the following work categories:

- Category E – Corrugated Metal Pipes.

The above acceptance, is in consideration of:

1. your Offer submitted on 27/11/2024; and,
2. Clarifications received on 17/12/2024 and on the 18/12/2024.

A full list of the initial Panel Members is as follows:

- Catwest Pty Ltd;
- CORPS Pavement Services Pty Ltd;
- Delnorth Pty Ltd;
- Fulton Hogan Industries Pty Ltd;
- Hosmar Pty Ltd (Total Asphalt);
- Keslake Group Pty Ltd (ATF Complete Road Services Trust);
- Malatesta Group Holdings Pty Ltd (Malatesta Road Paving And Hot Mix);
- MJB Industries Pty Ltd; and,
- Roundel Civil Products Pty Ltd.

Pursuant to Clause 4.18(d)(iv) of the General Conditions, you are reminded that there is no guarantee you will receive any Orders during the Term of the contract.

In accordance with Clause 4.18(c) of the General Conditions, you are reminded of the Contract Authority's right to add additional Panel Members to the Contract at any time during the Term.

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You are notified pursuant to Clause 33.2 of the General Conditions that James Rowland has, as from this day, been appointed as the Contract Authority's Representative under the Contract and has authority to exercise forthwith all functions of the Contract Authority with the exception of:

Terms and Conditions:

Form of Agreement	
Clause 34	Dispute Resolution; and
Clause 35	Termination.

James Rowland is contactable on (08) 9323 6542, James.Rowland@mainroads.wa.gov.au or PO Box 6202, East Perth WA 6892.

Details of the Customer(s) and Customer's Representative(s) will be detailed in any relevant Order issued.

You are requested to provide within 7 days of this letter the following information:

- Details of your Contractor's Representative inclusive of name, address, phone number and email address (refer Clause 33.3 of the General Conditions);
- Details of all locations where construction and maintenance products can be ordered from including address, contact person, phone number and email address; and,
- Copies of Insurance Certificates of Currency which meet the requirements detailed in Schedule 1, Head Agreement Details, items 7, 8, 9 and 10 of the Request.

The above information shall be provided in writing to contract54.24@mainroads.wa.gov.au.

As detailed in Schedule 1, Customer Contract Details, item 19 of the Request, Invoices relating to an Order must be sent via email to accountspayable@mainroads.wa.gov.au or via post to Invoice and Information Services Section, Main Roads Western Australia, P.O. Box 6202, EAST PERTH WA 6892. Invoices must quote Contract Number 0131/23, the Purchase Order Number and name of the Customer's Representative.

Should you have any questions regarding the above, please contact James Rowland on (08) 9323 6542.

Yours faithfully,



MIKE ANDREWS
GENERAL MANAGER NETWORK MANAGEMENT AND DELIVERY

CONTRACT SPECIFIC REQUIREMENTS

404.91 POLYETHYLENE COATED CURRUGATED STEEL PIPES

All Corrugated Steel Pipes shall be Polyethylene-coated.

Polyethylene-coated Corrugated Steel Pipes shall have an uncoated wall thickness of 3.0mm, and a 125mm x 25mm corrugation profile as specified in AS/NZS 2041.4.

The polyethylene coating shall be applied on both the internal and external surfaces of pipes.

The Polyethylene-coated Corrugated Steel Pipes shall meet AS/NZS 2041.4:2010 Clause 2.2 (d) galvanized steel strip of grade G230 minimum and galvanized to Z600 with a polymer coating in accordance with ASTM A742.

Polyethylene coating on both sides to be tested in accordance with ASTM A742/A 742M with a minimum overall coating thickness of 500 µm (microns) per side.

ASTM A742 testing to include:

Clause 9.1 – Adhesion Clause 9.2 – Impact
Clause 9.3 – Thickness of coating Clause 9.4 – Holidays
Clause 9.5 – Abrasion Resistance Clause 9.6 – Imperviousness
Clause 9.7 – Freeze-Thaw Resistance. Clause 9.8 – Weatherability

Taber abrasion tests carried out to ASTM D4060 – 14 using CS-17 abrading wheels loaded with 1,000-gram loads. Abrading wheels to be resurfaced every 500 cycles. Abrasion tests to continue until the underlying zinc coating is reached with total cycles recorded and average coating loss measured. Minimum cycles to zinc coating to be 60,000 cycles.

Add the following **Hold Point**

Proof of compliance with the requirements of Clause 404.91 shall be provided to the Superintendent for approval prior to the purchasing of the culverts.

See Book 8 for further information.

404.92 IN-SITU CONCRETE CLASS FOR END TREATMENTS

1. All formwork used to form and support the concrete shall conform to the requirements of AS 3610.

ARTC

NEW EQUIPMENT AND SYSTEM APPROVAL CERTIFICATE

Certificate No.	**NESA-T157**	**Version No. 1.0**
Approval date	12 October 2023	
Approved by	Head of Engineering Standards	
This certificate is issued to		
Supplier	Roundel Civil Products Pty Ltd	
In respect of		
Manufacturer	Roundel Civil Products Pty Ltd	
Product description	HPL PE-coated steel culverts	
Item identification	Roundel Civil HPL PE-coated steel culverts	
Application	Interstate Network Only	
Relevant Standards	AS 1379:2021; AS/NZS 2041.1:2011; AS/NZS 2041.2:2011; AS/NZS 2041.4:2010; ASTM A742; ARTC ETS-09-00.	

Conditions of Approval

Supplier:

1. A general condition of approval is that the supplier remains accredited to ISO 9001 specifically for these products and ARTC is advised on a 12 monthly basis that accreditation is current.
2. Any subsequent change to the design, materials or manufacturing process is not covered by this approval. The manufacturer should notify ARTC of any modification or changes in order to obtain a valid certificate.
3. Supplier to provide Certificate of Conformity to confirm supply is in accordance with relevant standards and this type approval.
4. The supplier shall provide guidelines for the transport, handling, storage, and installation of the product to ensure safety.

ARTC:

5. Consideration of nearby traffic shall be given during the design process to eliminate vehicle / livestock access. The culvert shall only be used at sites approved by asset management authority.
6. Site specific bush fire risk assessment as agreed by ARTC shall be conducted as part of the design process prior to purchasing.
7. The culvert should only be used as flood relief rather than drainage culverts in formed channels with frequent water flow. Only sites with less than 2 m/s abrasion velocity should be considered.
8. The project team shall develop construction specification for the pipes based on the Culvert Standard Installation Details prior to works commencing on site.
9. The culvert should be inspected by an ARTC project manager and/ or an assigned engineer by ARTC to ensure that the outside / inside coating was not damaged and sign off the inspection form prior to the backfill.
10. Extra care shall be given when inspecting the culvert to ensure

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the coating is not damaged. Excavators shall not be used.

11. Area Manager to report ongoing performance issues to the Manager Track & Civil Standards.

Note/Comments

Issue date	12/10/2023	**Expiry date**	N/A
Issued by		**ARTC Manager Track and Civil Standards**	

Supporting Documents:

- RDL-STD-CSP-01 - Culvert Standard Installation Details Rev 2
- Roundel HPL PE-coated steel materials - Overview, Material Specification and Project References 9-2-22
- CMP Final Risk Register