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Technical Report Astec Energy Star Heat Reflective Paint Systems

1. Compliance to AS/NZS 4859.1

Reflective paints fall within the scope of the Australian Standard AS/NZS 4859.1, as indicated by the following clauses.

AS /NZS 4859.1 Clause 1.1 states:

“This Standard specifies requirements for methods and tests for materials that are added to, or incorporated in, opaque envelopes of buildings to provide thermal insulation by moderating the flow of heat through these envelopes and building services.”

Astec Energy Star reflective paint is a *“material that [is] added to.... opaque envelopes of buildings to provide thermal insulation by moderating the flow of heat through these envelopes.....”*

AS /NZS 4859.1 Clause 1.1 lists materials that, although strictly complying with the above description, are excluded from the scope of the Standard.

Infra-red reflective coatings (such as Astec Energy Star) are not listed as excluded.

AS /NZS 4859.1 Clause 1.1 states:

“Materials that do not fall within the scope of one of the above Standards or Sections 5 to 9 of this Standard, need only comply with Sections 1 to 4 of this Standard”.

Astec Energy Star complies with *“....with Sections 1 to 4 of this Standard”*.

AS /NZS 4859.1 includes many references to “coatings”, including (but not limited to):

2.3.2 Classification

“(b) Formed in situ Materials such as paints and other coatings, sprayed fibres, and foamed in situ plastics.”

2.5 Solar Reflectance

“(a) Solar-reflective coatings that may receive direct or indirect solar radiation from the sky and that are intended to influence the thermal performance of the building due to reflection or absorption of this radiation.”

AS /NZS 4859.1 Clause C5 sets out guidance for the “thermal properties of surface coatings”, including the method of measurement.

Conclusion

Astec Energy Star is an insulation system complying with AS /NZS 4859.1.

2. Energy Star – safe, cost effective and thermally effective

- Infra-red reflective paint systems can be applied to existing roofs, in order to augment ineffective bulk insulation or to replace unsafe foil insulation. The relevant properties are set out in Appendix 2.
- Astec Energy Star is approved for guaranteed compliance with the BCA under the CodeMark system.
- Infra-red reflective paint systems can be applied to existing roofs, in order to augment ineffective bulk insulation.
- Infrared reflective paint systems can be applied to new or existing concrete walls to negate the need for conventional bulk insulation.

3. Performance Specifications

Appendix 1 sets out a generic performance specification, suitable for government contracts.



Rod Johnston
B Tech, M Eng Sc, MICD, CP Eng, NPER, MIE Aust, RPEQ
Director

Appendix 1

Sample Specification

Scope

This specification covers paint systems for external surfaces of roofs and walls.

Building Regulations and Standards

All materials and construction shall comply with the most recent version of:

- the relevant parts of the Building Code of Australia (BCA);
- the Standards referred to therein;
- other Standards nominated in this specification; and
- other relevant Regulations.

Relevant Standards

AS/NZS 2311 Guide to the painting of buildings

AS/NZS 2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

AS/NZS 2310 Glossary of paint and painting terms

AS /NZS 4859.1 Clause C5 sets out guidance for the “thermal properties of surface coatings”, including the method of measurement.

Paint Colours

The paint top-coats shall comply with the nominated colours or equivalent colours in an approved alternative brand of paint. The colour of sealers and undercoats shall be compatible with and not cause variation in the specified colours of top coats.

Energy Efficient Paints

Paints intended to assist in the energy provisions of the BCA, shall comply with the requirements of AS/NZS 2311 and the following. Where a paint or coating system is required to provide a particular level of solar absorptance, it shall be classified for compliance against the following criteria. Evidence of such compliance shall be provided by the manufacturer.

Relevant Building Code of Australia Clause	Volume 1 J1.3 (a)		Volume 1 Table J1.5a	Volume 2 Table 3.12.1.1a	
Applications	Roof		Walls	Roof	
Solar Absorption requirement	0.6	0.5	0.6	0.6	0.4

Environmental Specification

- Paints shall be less toxic and have lower concentrations of volatile organic compounds than commonly used alternatives. This criterion is deemed to be achieved, if the particular paint complies with requirements listed below.
- External paints shall have a maximum VOC (volatile organic content) content of wet paint of 16 grams per litre.
- Paints shall not have more than 5% by weight of total formulation of hydrocarbon solvents.
- Paints shall not include aromatic hydrocarbon solvents.
- Paints shall not include formaldehyde or release formaldehyde during use.
- Paints shall not include halogenated solvents.

- Paints shall not include mercury, arsenic or selenium or their compounds, pigments of lead, cadmium, chromium VI or antimony, except that impurities of the elements listed above which are contained in the raw materials and components and which do not exceed a combined total of 0.1% by weight of non-volatile content and which have individual element contents that do not exceed the limits specified.
- Paints shall not include more than the limits specified for any of the substances listed in the Toxic Substances Regulations, and with a cumulative total of not more than 0.5% by weight of these substances, based on the total formulations.
- Paints shall not include ethylene glycol as an integral part of the paint formulation.

Application

Painting shall comply with AS/NZS 2311. Surfaces shall be prepared and paint applied in accordance with the manufacturer's recommendations. Paint shall not be applied to surfaces that are moist, in conditions that will affect the quality of the work, such as extreme humidity or heat. Each coat shall be allowed to thoroughly dry and cure before subsequent coats are applied.

The substrate shall be checked by the painter and, if necessary, prepared to ensure that all joints have a smooth finish, cracks and holes are filled and the substrate is dry free of dust. In particular:

- Timber shall be prepared by filling nail holes, knots etc with wood filler, sanding and removing sharp edges.
- Concrete to be painted shall be checked to ensure it is free of holes, thoroughly cured and free from efflorescence.
- Masonry to be painted shall be checked to ensure it is free of holes, thoroughly cured and free from efflorescence.
- Metal and pre-treated metal shall be cleaned, free of rust, weld spatter, mill scale oils and other contaminants.

Appendix 2 Technical Opinion

As indicated by the CodeMark certification, Energy Star Coatings (listed below) produced by Astec Paints Australasia Pty Ltd comply with Building Code of Australia (BCA as follows):

1. Volume 1 – J1.3 (b) – Compliance as tabulated
2. Volume 2 – 3.12.1.2 (b)((i), 3.12.1.4 (b)(ii) – Compliance as tabulated

Building Code of Australia Clause	Roofs Volume 1 J1.3 (a) Walls Volume 1 Table J1.5a Roofs Volume 2 Table 3.12.1.1a	Roofs Volume 1 J1.3 (a)	Roofs Volume 2 Table 3.12.1.1a
Solar Absorptance Requirement	0.6	0.5	0.4
Complying Products			
Sportscoat	Yes	Yes	Yes
EC 100 Dirtguard White	Yes	Yes	Yes
Cool Pave White	Yes	Yes	Yes
DG IR Elastic White	Yes	Yes	Yes
ES Metal-Flex GLS/LS	Yes	Yes	Yes
Tile Guard SM White	Yes	Yes	Yes
Tile Guard White	Yes	Yes	Yes
DG IR Gloss White	Yes	Yes	Yes
GLS/LS White	Yes	Yes	Yes
Ceram - 4000 White	Yes	Yes	Yes
E100 T SM White	Yes	Yes	Yes
Broken White	Yes	Yes	Yes
C/B Smooth Cream	Yes	Yes	Yes
Light Cream	Yes	Yes	Yes
Neutral White	Yes	Yes	Yes
Armatex White	Yes	Yes	Yes
Sandalwood	Yes	Yes	Yes
Pale Biscuit	Yes	Yes	Yes
Off White	Yes	Yes	Yes
Light Latte	Yes	Yes	Yes
Mid Biscuit	Yes	Yes	Yes
Stone	Yes	Yes	Yes
C/B Merino	Yes	Yes	Yes
Gull Grey	Yes	Yes	Yes
Tuscany	Yes	Yes	Yes
C/B Birch Grey	Yes	Yes	Yes
Autumn	Yes	Yes	Yes
Pewter	Yes	Yes	Yes
Chino	Yes	Yes	Yes
Quarry	Yes	Yes	
Warm Clay	Yes	Yes	
Mocca	Yes	Yes	
C/B Saltbush	Yes	Yes	
C/B Beige	Yes	Yes	
French Green	Yes	Yes	
Clay Tone	Yes		
C/B Rivergum	Yes		
Terracotta	Yes		
C/B Mist Green	Yes		

C/B Slate Grey			
C/B Iron Bark			
Olive Green			
C/B Weathered Copper			
Red Oxide			
Regal Brown			
C/B Heritage Red			
Yallara Brown			
Blue Grass			
Nimbus			
Cobalt			
Charcoal			
Pioneer			
Botanic			
Mid Brunswick Green			
C/B Mountain Blue			
Carriage green			

1. Volume 1 JP1 when it's use is verified by methods JV1 or JV3
2. Volume 2 P2.6.1 when it's use is verified by methods V2.6.2.1 or V2.6.2.2

Solar Absorptance and Emissivity Values		
For use in verification by computer simulation to BCA Volume 1 JV3, or BCA Volume 2 V2.6.2.2		
Product	Solar Absorptance	Emissivity
Sportscoat	0.09	0.92
EC 100 Dirtguard White	0.10	0.91
Cool Pave White	0.10	0.87
DG IR Elastic White	0.11	0.91
ES Metal-Flex GLS/LS	0.11	0.90
Tile Guard SM White	0.11	0.88
Tile Guard White	0.11	0.91
DG IR Gloss White	0.11	0.89
GLS/LS White	0.13	0.88
Ceram - 4000 White	0.16	0.90
E100 T SM White	0.17	0.91
Broken White	0.19	0.89
C/B Smooth Cream	0.22	0.88
Light Cream	0.22	0.86
Neutral White	0.22	0.83
Armatex White	0.23	0.94
Sandalwood	0.23	0.87
Pale Biscuit	0.25	0.90
Off White	0.25	0.93
Light Latte	0.29	0.90
Mid Biscuit	0.31	0.90
Stone	0.31	0.90
C/B Merino	0.32	0.90
Gull Grey	0.32	0.89
Tuscany	0.34	0.90
C/B Birch Grey	0.38	0.86
Autumn	0.39	0.90
Pewter	0.39	0.90
Chino	0.39	0.90
Quarry	0.40	0.90
Warm Clay	0.41	0.83
Mocca	0.42	0.90
C/B Saltbush	0.44	0.90
C/B Beige	0.46	0.85

French Green	0.46	0.90
Clay Tone	0.53	0.90
C/B Rivergum	0.57	0.83
Terracotta	0.58	0.90
C/B Mist Green	0.58	0.87
C/B Slate Grey	0.60	0.85
C/B Iron Bark	0.60	0.92
Olive Green	0.61	0.90
C/B Weathered Copper	0.61	0.90
Red Oxide	0.61	0.85
Regal Brown	0.61	0.91
C/B Heritage Red	0.63	0.82
Yallara Brown	0.63	0.90
Blue Grass	0.64	0.90
Nimbus	0.65	0.90
Cobalt	0.66	0.90
Charcoal	0.68	0.88
Pioneer	0.71	0.90
Botanic	0.72	0.90
Mid Brunswick Green	0.74	0.87
C/B Mountain Blue	0.75	0.92
Carriage green	0.75	0.90

This opinion is subject to product installation being carried out by a competent Tradesman under the direction of a Builder, both of whom have ready access to all relevant technical information related to the required coating installation.

Appendix 3

Qualifications and Experience - Rod Johnston – Principal Consultant

This report is prepared by Rod Johnston, consulting engineer, builder and tradesman, with wide experience in the preparation of Australian Standards and Building Code of Australia.

- Master of Engineering Science (Structural & Foundation Engineering)
- Bachelor of Technology (Civil Engineering)
- Master of International and Community Development
- Qualified Building Supervisor (NSW 18087-S)
- Member, Institution of Engineers, Australia (MIE Aust)
- Chartered Professional Engineer (CP Eng)
- National Professional Engineers Register, Membership No 377019 (NPER)
- Registered Professional Engineer, Queensland (RPEQ)
- Association of Consulting Structural Engineers (ACSE)
- Association of Consulting Engineers, Australia (ACEA)

Rod Johnston represents the Association of Consulting Engineers Australia (ACEA) on the Building Codes Committee (BCC), the peak technical advisory committee to the Australian Building Codes Board, which prepares the Building Code of Australia (BCA). He therefore has an intimate knowledge of the BCA and its requirements

He has served on the following committees and working groups, assisting the Australia Building Codes Board to prepare amendments to the Building Code of Australia for energy saving.

- Technical Committee (Residential)
- Technical Committee (Commercial)
- Building Fabric (Housing) WGH 5 - Chairman
- Building Fabric (Commercial Buildings) WGC 2

Rod Johnston is has been an active member of many Standards Australia Technical Committees, including the preparation of the following standards:

AS/NZS 4959.1 Insulation
AS 2627.1 Thermal insulation of dwellings - Thermal insulation roofs and walls

- Chairman of Standards Australia Committee BD/26 for masonry units and test methods.
- Chairman of Standards Australia Committee BD/97 for residential masonry construction.