

## SECTION 685 - ANTI-GRAFFITI PROTECTION AND GRAFFITI REMOVAL

##This section cross-references Section 160 – is it included in the specification?:

### 685.01 GENERAL

This section specifies the requirements for the supply of materials, the application of anti-graffiti coating systems to various substrate surfaces, the removal of graffiti markings, graffiti removal maintenance requirements and relevant testing, associated with roadside furniture and structures including bridges, pedestrian underpasses, facings of reinforced soil structures, noise walls, barriers, retaining walls, traffic control boxes, and similar features.

The section is applicable to various substrate surfaces including normal concrete, lightweight concrete, glass fibre reinforced concrete, timber, acrylic plastic, painted steel, normal bricks, concrete blocks, besser blocks, cement render, sandstone, limestone and painted surfaces. Substrate surfaces other than concrete may require some variation of the usual treatment applicable to concrete surfaces. Manufacturers' recommendations shall be strictly adhered to for all substrate surfaces unless otherwise stated in this section.

### 685.02 STANDARDS

Australian Standards are referenced in an abbreviated form (e.g. AS 2700).

#### (a) Australian Standards

AS 1580.108.2	Dry Film Thickness-Paint Inspection Gauge
AS 1580.408.5	Adhesion-Pull-Off Test
AS 1580.602.3	Boller Test
AS 1627.1	Metal finishing, Preparation and pre-treatment of surfaces – Removal of oil, grease and related contamination
AS 1627.4	Metal finishing, Preparation and pre-treatment of surfaces – Abrasive blast cleaning of steel
AS 2311	Painting of Buildings
AS 2312	Guide to the Protection of Iron and Steel Against Exterior Atmospheric Corrosion
AS 2700	Colours Standards for General Purposes

#### (b) Additional Test Methods

ASTM D4263-83 (2005)	Moisture in Concrete by the Plastic Sheet Method
ASTM D4414-84 (1990)	Wet Film Thickness

### 685.03 DEFINITIONS

**Graffiti:** The unauthorised defacement of a surface by words, figures or obliteration.

**Substrate:** The material constituting the surface marked, e.g. concrete, timber.

**Graffiti Marking:** The defacement material, e.g. paint, felt-tip pen.

**Anti-Graffiti Coating:** A coating material which improves the graffiti resistance of many substrate surfaces. It facilitates the easy removal of graffiti by acting as an impermeable medium which stops the deep penetration of graffiti markings into the substrate pores and by preventing a firm attachment to the surface.

**Non-Sacrificial Anti-Graffiti Coating:** Longlife (permanent) coatings which can withstand several cycles of repeated defacement/cleaning processes.

**Sacrificial Anti-Graffiti Coatings:** Temporary coatings which are partially or totally removed from the substrate surface together with the graffiti during the cleaning process. Sacrificial coatings are then re-coated.

#### 685.04 MATERIALS

Anti-graffiti coatings, graffiti removal agents and decorative/anti-carbonation coatings shall be used in accordance with the manufacturer's recommendations, materials safety data sheets and as specified in this section.

The Contractor shall submit for review by the Superintendent not less than 14 days prior to the commencement of the anti-graffiti protection works, details of the anti-graffiti protection operations including information on the proposed anti-graffiti coatings, graffiti removers, decorative/anti-carbonation coatings, substrate preparation, method of application, equipment and operators, demonstrating compliance with the requirements of this specification.

Material details shall include information on the properties of the proposed products, documented evidence of previous performance and relevant test results, which shall not be more than twenty-four (24) months old.

**HP Anti-graffiti protection works shall not take place until the Contractor's proposed materials and procedures have been reviewed and accepted by the Superintendent.**

#### 685.05 SURFACE PREPARATION

The surface preparation shall be in accordance with the manufacturer's recommendations for the coating system to be applied and as specified in this section.

**All dust, dirt and other surface contaminants shall be removed by appropriate means and as approved by the Superintendent.** The surface shall then be washed with water such that grease and oil contaminants, including remnants of curing membranes, shall be removed from the surface by the use of appropriate solvents or detergents followed by the water washing in accordance with AS 1627.1.

Where an anti-graffiti coating system is specified, the substrate shall be free of all graffiti, graffiti shadows, paints, or any other surface contaminants which would be visible through the coating.

Where shadows of previously removed graffiti are likely to be clearly visible through a coating, a suitable anti-bleed stain sealer shall be applied prior to the application of any subsequent coatings. If the problem persists the Contractor shall advise the Superintendent accordingly.

Where required to promote adhesion of the coating system, some concrete and other substrate surfaces may be cleaned by whip blasting with a fine grade garnet or surface etched with an approved acid wash followed by a water wash in accordance with AS 1627.1. Any abrasive blast cleaning shall be carried out in accordance with AS 1627.4 and appropriate regulations imposed by the local government authority and the EPA.

#### 685.06 ANTI-GRAFFITI COATING SYSTEMS

(a) General

**The anti-graffiti coating system shall be non-sacrificial, clear or pigmented coating to a specified colour unless otherwise approved by the Superintendent.** The coating system shall be an acrylic-copolymer, acrylic-epoxy, polyurethane or polyurea type. All coats in the system shall be of the same brand and must be compatible with each other.

**The use of sacrificial anti-graffiti coatings shall be subject to the approval of the Superintendent.**

Substrate surfaces other than concrete may require variations of the usual treatment applied to concrete surfaces. Highly porous substrates may require a pore-filling primer coat prior to applying a final anti-graffiti finish. For relatively soft surfaces the primer and/or finish coat shall also offer surface binding and toughening effect. Manufacturers' recommendations shall be sought in all such cases.

(b) Performance Requirements

The coating system shall be non-yellowing and UV resistant for its guaranteed exposure life. The coating shall be impermeable to chlorides, water, carbon dioxide and acid rain but shall allow the transmission of water vapour.

The coating system shall carry a guaranteed outdoor exposure life of not less than ten years and a guaranteed 'Graffiti Removal' life of at least eight cycles of defacement and removal from the date of application.

Sacrificial anti-graffiti coatings if approved by the Superintendent shall carry a guaranteed outdoor exposure life of not less than five years from the date of application.

The Contractor shall provide evidence as to the compatibility of the proposed coating system to the nominated substrate. Such evidence shall include but not be limited to test certificates from a NATA accredited testing laboratory and history of previous performance.

Where a primer or undercoat is required as part of the anti-graffiti system, the primer or undercoat shall be a different colour to that of the final nominated colour and shall be in accordance with AS 2700.

The coating pigments shall be colourfast, and not subject to fading or discolouration.

The finished coating system shall have a minimum wet film thickness of 175  $\mu\text{m}$  and a minimum anti-graffiti coating dry film thickness of 100  $\mu\text{m}$ . Where an anti-graffiti coating is also used as an anti-carbonation coating its minimum dry film thickness shall be 150  $\mu\text{m}$  and shall also comply with the minimum performance criteria as stated in Clause 685.18(a)(iii) for anti-carbonation coating.

The applied coating system shall have an adhesion value of greater than 0.75 MPa to the substrate in accordance with AS 1580.408.5.

The applied coating system shall not have more than an "Oil" gloss (Boller) panel 70, to AS 1580.602.3.

For penetrating anti-graffiti coating systems applied to full saturation, the minimum amount of penetration into the substrate and minimum application rate shall be in accordance with the manufacturer's recommendations.

#### **685.07 METHOD OF APPLICATION**

The application of coating systems and removal of graffiti shall be carried out in accordance with the manufacturer's recommendations, current materials safety data sheets and as specified in this section.

The substrate shall not be coated until it is surface dry. Sufficient time shall elapse between coatings to allow the initial coat to dry and cure.

Coatings shall be smooth, uniform and without runs, beads, surface crazing and or imperfections.

If the coating is too thin, or shows evidence of having been applied under unfavourable conditions, or the workmanship is poor, or the specified requirements are not fulfilled, the surface shall be re-treated to the extent required by the Superintendent, at no additional cost to VicRoads.

Where the methods of application or removal are unacceptable to the Superintendent because of undesirable effects such as over spray, spatter or significant disruption to the public, alternative methods shall be used at the Contractor's expense.

If, in the opinion of the Superintendent, conditions become unsatisfactory, work shall not be continued, and newly coated surfaces shall be protected with approved shelters from rain or other damage.

**685.08 APPROPRIATE TIMINGS FOR APPLICATION OF ANTI-GRAFFITI COATINGS****(a) Newly Constructed Cast In-Situ Concrete/Non-Accelerated Cured Precast Concrete**

Anti-graffiti coating systems shall be applied no earlier than twenty eight (28) days after concrete has been placed or earlier if it can be established that the concrete moisture content is less than 10% (in accordance with test method ASTM D4263-83 (2005)), but not prior to fourteen (14) days after concrete has been placed, and provided the concrete surface is dry at the time of application.

**(b) Steam or Radiant Heat Cured Concrete**

Application of anti-graffiti coatings shall be carried out no earlier than fourteen (14) days after concrete has been placed.

**(c) Repaired Concrete**

Where concrete repairs have been completed with proprietary cementitious materials, the application of anti-graffiti coatings shall be carried out no earlier than fourteen (14) days after completion of repair.

Where normal concrete is used for repair, anti-graffiti coatings shall be applied no earlier than twenty eight (28) days after the completion of repair.

**685.09 ENVIRONMENTAL CONDITIONS****(a) General**

Coating systems shall not be applied under any of the following conditions:

- (i) windy conditions where over spray and/or spatter may be generated;
- (ii) when wind-borne debris is likely to contaminate the uncured surface of the freshly applied coating;
- (iii) when the ambient temperature exceeds 35°C or is below 10°C;
- (iv) when the relative humidity exceeds 85%;
- (v) when rain spatter, or run-off, including leakage through deck joints, contaminating the surface and adversely affecting the adhesion to the substrate may occur;
- (vi) when the substrate surface is wet or damp;
- (vii) the surface temperature of the substrate is less than 3°C above the dew point calculated in accordance with AS 2312 (Fig. 8.1) or exceeds 40°C.

**(b) Environmental Requirements**

The Contractor shall adhere to EPA and other Local, State and Federal Government requirements with respect to how waste generated during surface preparation, coating application, and clean up will be collected, segregated, handled, controlled and disposed of.

**(c) Disposal of Waste Materials**

Waste materials which may constitute a fire hazard shall be deposited in suitable containers and disposed of at designated disposal sites.

Liquid or other waste material shall not be disposed of through creeks or the stormwater drainage system.

## 685.10 COATING MATERIAL, HANDLING AND STORAGE

Materials shall remain in their original, sealed containers until time of use and shall be stored in strict accordance with the manufacturer's recommendations.

All material shall be brought to site in the original unopened cans clearly labelled with the appropriate marker's name, product type, reference number and batch number.

The Contractor shall provide, for each batch of coating material, a copy of the manufacturer's information as specified below:

- (a) manufacturer's name and address;
- (b) product reference;
- (c) batch number of identification;
- (d) quantity manufactured in the batch;
- (e) certificate of date of manufacture.

The Contractor shall maintain records showing which elements were treated with each coating batch. These records shall be handed over to the Superintendent on the Date of Practical Completion.

Materials stored beyond the manufacturer's recommended shelf life shall not be used. The material shall be used in the order of manufacture.

All coating materials to be used on the works shall be free from contamination, gelling, drying out, heavy skin formation and severe segregation of ingredients.

Coating materials which have exceeded the pot life recommended by the manufacturer shall not be used.

## 685.11 TESTING BEFORE AND AFTER APPLICATION OF COATING

The Contractor shall carry out testing in at least one 1 m<sup>2</sup> area in accordance with this clause. Testing shall be undertaken by a NATA accredited testing laboratory.

### (a) Testing before Application

At least one test shall be carried out before application of materials to ensure that:

- (i) surface moisture conditions of concrete and other substrates satisfy the manufacturer's recommendations;
- (ii) moisture content of concrete and other substrates is free of water back pressure to satisfy the manufacturer's recommendations in accordance with ASTM D4263-83 (2005);
- (iii) the environmental conditions, as specified elsewhere in this section, are satisfied.

### (b) Testing after Application

At least three tests shall be carried out after the application of materials to ensure that:

- (i) The bond strength to the substrate and between separate coats shall be tested using aluminium dollies with a minimum diameter of 50 mm in accordance with AS 1580.408.5 and shall be greater than 0.75 MPa.
- (ii) Wet and dry film thickness of the film forming top coat is as specified by the material manufacturer; however in any case the total dry film thickness shall not be less than 100 µm. The wet film thickness shall be checked in accordance with ASTM D4414-84 (1990). The dry film thickness shall be checked in accordance with AS 1580.108.2.

The dry film thickness of coatings may be measured using the coating remnants attached to the aluminium dollies from the adhesion testing provided the coating material remains intact and the correct frequency of testing is satisfied in accordance with the requirements of Clause 685.(11)(c).

- (iii) Measurements of dry film thickness shall satisfy the following conditions:
  - no more than 15% of measurements of dry film thickness shall be more than 10% under the specified thickness;
  - no more than 15% of the dry film thickness measurements taken in the 1 m<sup>2</sup> test area shall be less than the specified minimum.
- (iv) The amount of penetration of the anti-graffiti penetrant shall be checked in accordance with the manufacturer's recommendations.

(c) Location and Frequency of Testing

The above testing shall be undertaken in at least one 1 m<sup>2</sup> test area for every 50 m<sup>2</sup> on completion of the application of the final coat of the anti-graffiti/decorative coating.

## 685.12 INSPECTION AND TESTING

(a) General

The works shall be inspected by the Contractor at each stage of the coating operation as a minimum, i.e. after surface preparations, prior to each coat and after final top coat application and any touch-up coats that may be required.

For the purpose of surveillance and audits as specified in Clause 160.A7, the Contractor shall give the Superintendent five (5) days written notice of its intention to coat the concrete. The Contractor shall make available to the Superintendent all assistance and means of gaining access to the work at the Contractor's expense. The Superintendent shall determine the access requirements for surveillance of the work.

(b) Surface Preparation

The Contractor shall inspect the surface preparation and shall ensure and document that the following requirements have been satisfied:

- (i) that the degree of surface cleanliness is as specified;
- (ii) that the surface profile is specified;
- (iii) that immediately before painting, the prepared surface has had all loose dust and other foreign material removed;
- (iv) that the surface is not contaminated by any means after preparation and before painting.

(c) Materials

The Contractor shall inspect the materials and their preparation for use and shall ensure that the following requirements are met:

- (i) that the materials are the correct materials for the system which is to be applied;
- (ii) that the material containers are sound and not damaged in any way which may have caused or will cause the contents to deteriorate;
- (iii) that the material in the containers has not dried, gelled, formed a heavy skin or unduly settled;
- (iv) that the material is stirred, mixed, or thinned in accordance with the manufacturer's recommendations, multi-part materials mixed in the correct proportion, a reaction time for multi-part materials if specified by the material manufacturer shall be allowed and materials shall not be used once their pot life has expired;
- (v) that the application method is appropriate for the material.

The Contractor shall maintain a sample of not less than 1 litre from each batch as a reference sample for the shelf life of the product.

(d) Coating Condition after Application

The Contractor shall inspect each coat and the finished coating system and shall ensure that the following conditions are satisfied:

- (i) that the uniformity, colour, gloss, opacity and appearance are in accordance with the requirements of the specification;
- (ii) free of any defects that may impair the performance or appearance of the coating for the life of the coating.

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### 685.13 COATING REPAIRS

Should any of the works not comply with the provisions of this specification then the areas concerned shall be repaired to the satisfaction of the Superintendent. Such repair work may include removal of the coating, followed by surface preparation and application of a new coating. The procedure for any repair work shall be approved by the Superintendent. All repair works undertaken in accordance with this clause shall be performed at no extra cost to VicRoads.

For the purpose of this clause, unsatisfactory work shall include coating failure due to yellowing, loss of adhesion, colour change, penetration of graffiti into the coating, or loss of solvent resistance during the guarantee period.

### 685.14 REINSTATEMENT OF DAMAGED COATING

All areas of coatings damaged by the Contractor during its operation shall be made good to the satisfaction of the Superintendent.

### 685.15 TRIAL APPLICATION

**Unless otherwise approved by the Superintendent a trial application on a small test area of the actual substrate or a test panel made from the same substrate shall be conducted seven (7) days prior to the commencement of coating work.** The small test area or test panel shall be prepared and coated by the Contractor to satisfy the requirements of Clauses 685.05, 685.06, 685.07, 685.09, 685.11 and 685.12 and in accordance with the material manufacturer's recommendations.

If the coating trial application is deemed to be inadequate by the Superintendent a further coating application shall be made until the performance criteria of this specification are met.

In the event that the trial application is rejected, the Contractor shall remove and dispose of any work deemed as unacceptable by the Superintendent, submit a new proposal to rectify the deficiencies (including prequalification testing of any new materials/methods) and repeat the trial application as described above. Any delays caused through rejection shall not constitute justification for extension of time.

### 685.16 CONTRACTOR COMPETENCY

Application personnel and sub-contractors undertaking this work shall have a minimum of 5 years experience and a demonstrated competency for surface preparation and application of protective coatings.

The coatings application supervisor shall be trained and qualified on all aspects of application techniques and shall be present at all times during coating work. Application personnel shall be trained and skilled in the application procedures of the coating to be applied.

Documented evidence shall be available to demonstrate experience, qualification, skills and training of personnel and sub-contractors.

### 685.17 PROTECTION OF WORKS AND PROPERTY

The Contractor shall ensure that the coated works are protected from adverse conditions, dust and debris during the curing period of the coating system in accordance with the requirements of Clause 685.09.

If the anti-graffiti coating is air-sprayed onto a concrete surface, in close proximity of buildings, footpaths, roadways, pedestrians, or vehicles, no spray painting shall be carried out within ten (10) metres of the above items without approved protective measures or methods being used.

Proposals to overcome the above problem shall be submitted to the Superintendent, a minimum of two working days in advance of the proposed works. Protective measures may include the use of tarpaulins, hand brush, or roller applied painting.

**685.18 GRAFFITI REMOVAL AS PART OF A MAINTENANCE CONTRACT**

## (a) Graffiti Removal

## (i) General

Graffiti removal from existing coatings or untreated substrates shall be strictly in accordance with the manufacturer's recommendation and as specified in this section.

Typical graffiti removal methods shall include but not be limited to:

1. chemical cleaning;
2. steam cleaning;
3. hot or cold high pressure water cleaning with or without detergents;
4. wet and dry abrasive blast cleaning;
5. low-volatile solvent cleaning (non-toxic);
6. non-abrasive low-pressure water jet with granular sodium carbonate additives;
7. painting out of graffiti (where nominated).

The Contractor shall be responsible for ensuring the compatibility of the proposed cleaning method without injurious effect to any applied coatings, paint systems and uncoated substrates.

Damage to the substrate, substrate coating or anti-graffiti coatings caused by the Contractor shall be rectified at the Contractor's expense.

## (ii) Removal of Graffiti Markings

For anti-graffiti coated substrates the standard of graffiti removal shall be based on no residual graffiti markings being visible.

For uncoated substrates the complete removal may not be possible due to the absorbency of the substrate material. Under these circumstances, the Superintendent may allow some residual paint staining or shadowing to remain.

The graffiti message or configuration shall not be intelligible or clearly visible from close proximity in the case of a substrate close to pedestrians or from a distance of 10 metres in the case of proximity to a roadway.

All proposed cleaning methods shall be appropriate and safe for use in public areas and satisfy EPA requirements and the requirements of Section 160 of the specification.

## (iii) Painting Out of Graffiti

**Where painting out of graffiti is specified or approved by the Superintendent, at least two coats of an approved decorative/anticarbonation coating product (VicRoads grey or approved alternative colour to AS 2311) shall be applied in accordance with AS 2311 and the manufacturer's recommendations to achieve a uniform colour and texture.** Prior to overcoating, a suitable anti-bleed stain sealer shall be applied to prevent any subsequent bleed through of residual graffiti stain in the finish coat. If a uniform colour and texture is not achieved the Contractor shall take remedial measures at his own expense to produce the required surface finish. For painting out of graffiti the accepted standard of graffiti removal shall be no residual graffiti being visible.

Approved coatings shall satisfy the following minimum performance criteria:

1. Equivalent Air Layer Thickness (R) - 150 metres
2. Equivalent Thickness of Concrete (Sc) - 450 mm
3. Co<sup>2</sup> Diffusion Co-efficient (cm<sup>2</sup>/s) -  $2 \times 10^{-7}$
4. Water vapour equivalent air layer thickness of less than 4 metres
5. Dry film thickness of at least 150 µm (micron)
6. Water or acrylic based solvent free unless otherwise approved by the Superintendent.

Testing for items (1), (2), (3) and (4) shall be based on the Klopfer Criteria for anti-carbonation coatings and Ficks Law of Diffusion.



(b) Reports

The Contractor shall submit a report detailing its graffiti removal and application work undertaken on a monthly basis. The report shall contain a comprehensive time dated photographic display of all graffiti supported with written detail as to the correct location, description, area, treatment and removal of the graffiti.

The photographs shall be accurately labelled and presented in a suitable mounting system.

(c) Graffiti Removal Maintenance on a Site Specific Basis

The nominated VicRoads structures, parts of structures or roadside furniture shall be inspected and cleaned at a frequency nominated by the Superintendent, or where time periods have not been nominated, at a frequency of not less than twice per week. The inspection days will be Monday and Thursdays.

At the request of the Superintendent, the frequency of inspections may be increased to three times per week (Mondays, Wednesdays and Fridays). The additional inspection day shall be at VicRoads expense.

(d) Timings for Graffiti Removal

Graffiti shall be removed within 48 hours of the Contractor being aware of its presence either by inspection or notification by the Superintendent.

Graffiti that is of a sensitive nature (defined as including the following: racist, sexist, obscene or offensive) shall be removed within 24 hours.

#### **685.19 GRAFFITI REMOVAL AS PART OF A CONSTRUCTION CONTRACT**

The Contractor shall systematically inspect road and bridge construction works for graffiti at least on a monthly basis during the contract period, including immediately after weekends or public holidays, until the Date of Practical Completion. Particular attention shall be given to obvious graffiti targets such as bridges and other major structures with large surface area, sign structures and other roadside areas highly visible to the public.

Where an inspection discovers graffiti on completed works, or on those parts of the works that would normally be left for some time before completion, cleaning and removal shall be initiated and completed in accordance with the requirements of Clause 685.18.

#### **685.20 RECORDS OF GRAFFITI REMOVERS**

Further to the requirements of Clause 685.10 regarding anti-graffiti coating materials applied to the works, the Contractor shall also maintain records of all compatible chemical graffiti removers and other suitable cleaning methods as recommended by the materials manufacturer. These records shall be handed over to the Superintendent on the Date of Practical Completion.