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PAINTING OF SUBSTATION PLANT, EQUIPMENT AND STRUCTURES

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PURPOSE AND SCOPE

This document forms part of a suite of documents which define National Grid's functional and performance requirements for plant and equipment.

This specification defines the requirements for painting substation plant, equipment and structures. It includes materials, workmanship and testing. It does not specify protective coatings for Gas Insulated Switchgear and busbar systems.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

The majority of corrosion protection with coatings is carried out on existing plant, equipment and structures. Sound areas of old coating are either over-painted or after complete removal of the old coating an entire new coat is applied. It is National Grid's policy to use several paint systems which is dependant upon the condition of the equipment to be painted.

For the purpose of painting substation plant and structures a Modified Vinyl two coat system or a Modified Vinyl one coat system is to be used dependant upon the surface condition of the plant or structure. (See Appendix A pictorial standards).

Note! For brush and spray painting transformer main tanks, pipe work and coolers a Urethane Alkyd two coat system is to be used.

1.1 Access to Work

The Contractor shall not commence work on any structure without first obtaining the permission of the National Grid Engineer or his representative.

To enable painting of the equipment upper portions, arrangements will be made for the plant or equipment to be taken out of service for the necessary period of time. National Grid will take all reasonable steps to adhere to the outage programme, but operating factors and/or weather conditions may necessitate a departure from the programme envisaged at the commencement of the works.

Unless otherwise agreed, the upper portions of any plant or equipment shall be completed before proceeding with the lower portions.

The Contractor must also be prepared to work on the lower portion of any plant or equipment, if outages are not immediately available for work to proceed on plant or equipment upper portions.

The National Grid Engineer or representative shall have the right to vary these instructions should operational circumstances make it essential to do so.

1.2 Materials

Only manufacturers approved by National Grid shall be used for the supply of paint.

Within the normal constraints of good practise all paints should be formulated using lowest toxicity materials and where possible using high flash point solvents.

All paints must be suitable for application over a wide variety of substrates including weathered galvanising, rusty steel, aged paint or any combination of these.

Each coat of a multi-coat paint system must be compatible with all preceding coats and to avoid any dispute, should be supplied by the same manufacturer.

All materials must have a shelf life in excess of 12 months. No hard settlement will be acceptable.

All paints shall either be Modified Vinyl or Urethane Alkyd. The Vinyl type paint shall be suitable for hand brushing application and the Urethane Alkyd shall be suitable for both hand and spray application. They shall be compatible with the surface preparation techniques listed below and suitable for use on galvanised and mild steel plant and structures with varying degrees of degradation and/or corrosion.

1.2.1 Modified Vinyl Paint

The paint shall meet the parameters defined below. The paint must be suitable for application by hand brush to substation plant and structures.

a) Primer (Two coat Modified Vinyl System)

The primer coat shall be suitable for application over galvanised steel or mild steel in various stages of deterioration and must be suitable for all such surfaces after preparation by chipping, scraping and wire brushing. The paint shall be suitable for application by brush at temperatures of 5 - 30°C. Moisture displacement shall be adequate. Under a normal brushing action the paint should be capable of displacing moisture present in the form of uniformly dispersed droplets which have not coalesced from the substrate without detrimental effect on the dried film. The requirements and characteristics of the paint are shown in Table 1A.

b) Top Coat (Two coat Modified Vinyl System)

The top coat shall be suitable for application over the primer. It shall also be compatible with zinc coated and mild steel surface when two coats of this paint are used in accordance with the clients requirements. The paint shall be suitable for application by brush at temperatures of 5 - 30°C. Moisture displacement shall be adequate. Under a normal brushing action the paint should be capable of displacing moisture present in the form of uniformly dispersed droplets which have not coalesced from the substrate without detrimental effect on the dried film. The requirements and characteristics of this paint are shown in Table 1A.

c) One coat Modified Vinyl paint.

The paint shall be used over previously painted substrates either enamel gloss, Urethane Alkyd and Modified Vinyl paint systems or the primer component of the two coat Modified

Vinyl paint system. The prepared pre-painted surface must be sound as specified in sections 1.3.9, 1.3.10 and 1.3.11.

The paint shall be suitable for application by brush at temperatures of 5 - 30°C. Moisture displacement shall be adequate. Under a normal brushing action the paint should be capable of displacing moisture present in the form of uniformly dispersed droplets which have not coalesced from the substrate without detrimental effect on the dried film. The requirements and characteristics of this paint are shown in Table 1A.

1.2.2 Urethane Alkyd Paint

The paint shall meet the parameters detailed below. It must be suitable for application by hand brush or spray application to transformer main tanks, pipework and coolers.

a) Primer (Two coat Urethane Alkyd System)

The paint shall be used over galvanised steel, mild steel and enamel gloss in various stages of deterioration and must be suitable for all such surfaces after preparation by chipping, scraping and wire brushing. The paint shall be capable of application by hand brush or spray over the temperature ranges of 5 - 30°C. Moisture displacement shall be adequate. Under a normal brushing action the paint should be capable of displacing moisture present in the form of uniformly dispersed droplets which have not coalesced from the substrate without detrimental effect on the dried film. The requirements and characteristics of this paint are shown in Table 1B.

b) Top coat (Two coat Urethane Alkyd System)

The topcoat shall be suitable for application over the primer as part of the two coat system. The paint shall be capable of application by hand brush or spray over the temperature ranges of 5 - 30°C. Moisture displacement shall be adequate. Under a normal brushing action the paint shall be capable of displacing moisture present in the form of uniformly dispersed droplets which have not coalesced from the substrate without detrimental effect on the dried film. The requirements and characteristics of this paint are shown in table 1B.

			Vinyl Two Coat Paint		Vinyl Single Coat Paint
		Unit	Primer	Top Coat	Single Coat
Specific Gravity			1.44 - 1.46	1.55 - 1.58	1.55 - 1.65
Pigment Content	Min	%	45	50 ⁽¹⁾	50
Zinc Phosphate in Total Pigment		%	40 - 45	-	20 - 25
Volatile Content (VOC)	Max	%	39.5 ⁽²⁾	29 ⁽²⁾	30
Binder Content (Vinyl Co-Polymer)		%	15.5	21	16
Volume of Solids		%	37 +/- 1	47 +/- 1	50
Colour			Light Stone 361 BS381C 1996 Appx	Grey-Green BS4800 00A0597 Appx	Grey-Green BS4800 00A0597 Appx
Drying Time at 150⁽³⁾ µm wet film thickness @ 20°C	Surface	hr	< 4	< 4	< 4
	Hard	hr	< 16	< 16	< 16
Wet Edge Time @ 20°C		Min	10 - 15	10 - 15	10- 15
Film Thickness – dry	Min	µm	30	95	95
	Max	µm	60	200	200
	Nom	µm	40	125	120
	Total (primer + top coat)	µm	Min: 135 Max: 250 Nom: 165	N/A	
Film Thickness – wet	Min	µm	80	200	190
	Max	µm	160	425	400
	Nom	µm	110	265	240

Table 1A Paint Properties

- ¹ Iron Oxide to BS91/57463 type 2 grade 1 but with a thin flake content of > 70%
² Aromatic Hydrocarbons and other solvents
³ The drying time for top coat shall be measured at 300 µm

			Urethane Alkyd Two Coat Paint	
		Unit	Primer	Top Coat
Specific Gravity			1.30 - 1.40	1.55 - 1.58
Pigment Content	Min	%	45 – 50 W/W	55 – 60 W/W
Zinc Phosphate in Total Pigment		%	40 – 45 W/W	N/A
Volatile Content (VOC)	Max	%	35	25
Binder Content (Urethane Alkyd)		%	20 – 25 W/W	17 – 20 W/W
Volume of Solids		%	48 Min	48 - 52
Colour			08 C 35 – 08 E 51 Buff Yellow	Grey BS4800 00A09 Appx
Drying Time at 150 µm wet film thickness @ 20°C	Surface	hr	< 4	< 4
	Hard	hr	< 16	< 16
Wet Edge Time @ 20°C		Min	10 - 15	10 - 15
Typical Film Thickness – dry	Min	µm	50	75
	Max	µm	75	100
	Nom	µm	65	85
	Total (primer + top coat)	µm	Min: 125 Max: 175	Nom: 150
Typical Film Thickness – wet	Min	µm	105	150
	Max	µm	160	200
	Nom	µm	135	170

Table 1B Paint Properties

1.3 Workmanship

1.3.1 General

a) Surface Preparation and Cleaning

No plant, equipment or structure shall be disturbed or damaged in any way during the course of the cleaning process. It shall be the contractor's responsibility in this respect.

Any seriously corroded plant or equipment which is found to have cracks, deformities, missing bolts, nuts or locknuts shall be reported to the National Grid Engineer or representative before applying paint.

The degree and method of cleaning shall be to the National Grid Engineer or representative's approval, but this will in no way absolve the Contractor from their responsibility to ensure that the surfaces to be painted are adequately prepared and cleaned prior to painting.

b) Degreasing And Cleaning Prior To Painting

1.3.2 Degreasing

All oil, dirt etc. must be removed before painting can proceed, the following methods are to be used:-

a) White Spirit Solvent

With this method there can be a tendency to dilute the oil and grease contamination and also to spread it to clean surfaces. Surfaces are generally swabbed with the approved solvent and then wiped with a rag. If this method of degreasing is used, the procedure should be:-

- i) Wipe off heavy contamination with absorbent rag or paper.
- ii) Coat the surface fairly liberally with the solvent using a paintbrush to apply and rub well into the surface.
- iii) Wipe off excess with clean absorbent paper or rag.
- iv) Soak a *clean* cloth in solvent and swab surface.
- v) Dry off with another *clean* rag.

1.3.3 Before painting, all rust, scale and loose particles shall be entirely removed by means of wire brushes, scrapers, hammer and chisel or other mechanical means and any dirt, oil or grease or other surface contaminants removed to produce a clean surface. In all circumstances satisfactory preparation of the surfaces calls for 100% wire brushing. In saline or marine atmospheres, all traces of salt must also be removed. Rust removing or converting solutions shall not be used nor brought to Site.

1.3.4 The Contractor shall check the prepared surface and satisfy himself that all requirements have been met prior to inviting the National Grid Engineer or representative to inspect. A Certificate of Completion in respect of the preparation for each item of plant and equipment must be countersigned by the National Grid representative before painting proceeds and a copy retained for future records.

1.3.5 Further technical guidance on surface cleanliness can be found in National Grid Document TS 3.4.24 e.g. product and time period to allow for removal of Algae.