

A Guide

to the

Solvent

Emissions

Directive

S.E.D.



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Introduction

Under current VOC Legislation a user of industrial paint coatings can comply by using 'VOC Compliant Coatings' supplied by the paint manufacturer in line with the following limits:

<u>UK Compliant Coatings</u>	<u>Max VOC in gm/lt</u>
Etch/Wash Primers	780
Blast/Weldable Primers	780
Prefab Primers	780
Tie Coats and Sealers	780
General Primers/Undercoats	250
Top Coats	420

As a consequence much of the responsibility for compliance fell on the manufacturer, as they were required to provide VOC Compliant Coatings.

From 31st October 2005 new Solvent Emissions Legislation is being introduced which will have a serious impact on our industry.

Under this new legislation, known as 'The Solvent Emissions Directive' (SED), the responsibility for compliance falls very much with the end user of the paint coating because 'VOC Compliant Coatings' will no longer be an accepted means of compliance.

However there is still a lot that we as manufacturers can do to help our customers and this document is intended to give an overview of the SED, what it means to users of coatings and what they need to do to comply. Key milestone for mandatory compliance are given and a copy of the Guidance Note PG23(04), related to this Legislation can be found on the DEFRA Website at:

<http://www.defra.gov.uk/environment/airquality/lapc/pgnotes/default.htm>.

The New Legislation

The Solvent Emissions Directive (SED) takes effect immediately for new installations and from 31st October 2005 for most other installations. The limits required from October 2005 are further reduced from October 2007 and are given in the tables 1(a) to 1(c) below. It is important to note that 'new' or 'substantially changed' installations must comply with the 2007 levels now and are not allowed to use the lower 2005 limits.

The allowed limits are directly related to the total amount of solvent that is used on the installation and the reliance on compliance is moved entirely to the user not the paint manufacturer.:

Tables 1(a) - 1(c) - Summary of SED Criteria

1(a) For Very Small Installations - Less than 5 Tonnes Solvent/Year

<u>Action Deadline</u>	<u>Existing Facility Using <5 Tonnes Solvent/Annum</u>	<u>New/Substantially Changed Facility Using <5 Tonnes Solvent/Annum</u>
Immediate	No requirement	No requirement
October 2005	No requirement	No requirement
October 2007	No requirement	No requirement

1(b) Small Installations - Less than 5-15 Tonnes Solvent/Year

<u>Action Deadline</u>	<u>Existing Facility Using 5-15 Tonnes Solvent/Annum</u>	<u>New/Substantially Changed Facility Using 5-15 Tonnes Solvent/Annum</u>
Immediate	No requirements under SED but National Regulations apply - eg in UK current PG6/23 requires either: (a) Use of 'Compliant Coatings', or (b) Measured VOC emissions to be below a limit of 150mgC/m³	From 31-10-04, 2007 options and criteria come into force immediately a new process comes into operation, or a substantial change is made.
From 31 st October 2005 and up to 31 st October 2007	Monitor Emissions and Fugitive Emissions and apply National regulations e.g. in UK the VOC limit is <150mgC/m³ or Apply Solvent Reduction Scheme - solvent must be <47% of total paint weight (including thinners, cleaning solvent etc)	As above
From 31 st October 2007	Monitor Emissions and Fugitive Emissions - VOC must be <100mgC/m³ Under Solvent Reduction Scheme, solvent must be <37.5% of paint weight	As above

1(c) For Large Installations - Greater than 15 Tonnes Solvent/Year

<u>Action Deadline</u>	<u>Existing Facility Using >15 Tonnes Solvent/Annum</u>	<u>New/Substantially Changed Facility Using >15 Tonnes Solvent/Annum</u>
Immediate	No requirement under SED but National Regulations apply - e.g. in UK current PG6/23 requires either: (a) Use of 'Compliant Coatings' or (b) Measured VOC limits to be below a limit of 50mgC/m³	From 31-10-04, 2007 options and criteria come into force immediately a new process comes into operation, or a substantial change is made.
From 31 st October 2005 and up to 31 st October 2007	Monitor Emissions and Fugitive Emissions and apply National regulations e.g. in UK the VOC limit is <50mgC/m³ or Apply Solvent Reduction Scheme - solvent must be <36% of total paint weight.	As above
From 31 st October 2007	Monitor Emissions and Fugitive Emissions - VOC must be <50mgC/m³ Under solvent Reduction Scheme, solvent must be <27% of total paint weight	As above

How to Comply with S.E.D

Paint Users have two choices in how they approach compliance with S.E.D. They can monitor their emissions and keep below prescribed limits or adopt the Solvent Reduction Scheme which, we believe, most people will choose.

The Solvent Reduction Scheme involves reviewing and recording all solvent containing products purchased and used on site. It is a requirement that the percentage solvent content by weight is calculated and the amount used on site must be below the values set in the legislation. It is noted that total solvent must be recorded and includes all cleaning and thinning solvents. Any reclaimed solvent can be subtracted from the total used.

Summarised below are the alternatives that can be adopted in order to comply with the legislation with some positive and negative points that are felt relevant.

<u>Emission Monitoring</u>	<u>Solvent Reduction Scheme</u>
<ul style="list-style-type: none"> • Initial solvent management plan 	<ul style="list-style-type: none"> • Solvent management plan with continuous updating
<ul style="list-style-type: none"> • Sampling plan agreed with LA 	<ul style="list-style-type: none"> • Increased administrative burden
<ul style="list-style-type: none"> • Measurement of Carbon in exhaust gases 	<ul style="list-style-type: none"> • Records of all solvent inputs and outputs to be kept
<ul style="list-style-type: none"> • Repeat investigation required if high or borderline emissions 	<ul style="list-style-type: none"> • Inputs must include all thinning and cleaning solvent
<ul style="list-style-type: none"> • Work mainly outsourced • Costly • Abatement needed if non-compliant • Abatement expensive to install and operate • Not an option for uncontained processes 	<p>THEN</p> <ul style="list-style-type: none"> • Calculate solvent used in the process as percentage of total paint, and check that this is below the Target Emission Value quoted in PG6/23

The requirements of S.E.D. that were also stipulated in the old Compliant Coatings route are also still valid and must be complied with. Therefore as well as achieving the maximum solvent emissions the following must be achieved:

- High risk-phase solvents to be monitored and reduced.
- Total Particulate Emissions to be below 50 mg/m³
- Isocyanates (if used) must be below emission limit of 0.1 mg/m³

Target Emission Values

<u>Solvent Usage per Annum</u>	<u>Target Emission - Existing facilities by 31-10-05</u>	<u>TE - Existing facilities from 31-10-05, and New/Changed facilities from 31-10-04</u>
< 5 Tonnes	None	None
5 - 15 Tonnes	Total Mass of Solids x 0.9 ie <47gm VOC/100gm paint	Total Mass of Solids x 0.6 ie <37.5gm VOC/100gm paint
> 15 Tonnes	Total Mass of Solids x 0.56 ie <36gm VOC/100gm paint	Total Mass of Solids x 0.37 ie <27gm VOC/100gm paint

Choice of Specification

The choice of specification will actually have an impact on whether an installation is compliant, and the thickness of products used will potentially affect whether an applicator should use a system or not. It must be noted however that it is not the specification that is critical, it is the amounts of each product used. Therefore it is critical that customers keep a constant check on their solvent use on a monthly basis.

Set out in *Appendix 1* are examples of typical coating products with VOC content calculated as a percentage by weight. The table demonstrates how they impact on the paint user in trying to comply with S.E.D. The example formulations based on these figures demonstrate how critical a specification choice may be in helping a user comply - furthermore it also demonstrates how critical it is to control over application of products in order to comply.

Calculating Compliance

It is a requirement of the regulations that paint users keep records of their paint usage so that they can demonstrate compliance to S.E.D. We have tabulated the minimum required calculations.

(a) Product	(b) Quantity in Litres	(c) SG	d) VOC in gm/litre	(e) Paint Weight = (b) x (c)	(f) Weight of VOC = (b) x (d)
Paint					
Solvent					
Total				(g)	(h)
VOC as % of Paint = $(h) \times 100 \div (g)$					
<i>NB. This table may be simplified further if Paint Suppliers' published data is modified to include VOC in gm/kg at some time in the future</i>					

Calculated Vs Practical VOC

As a result of S.E.D. paint users now require the theoretical VOC of a product rather than that which is practically determined from the use of the coatings. Hence data sheets will now show that figure.

A guidance note and example data sheet are included as *Appendix 2* for further information.

Questions & Answers

Set out below are some summarised points which hopefully will answer any points not covered elsewhere in this document.

How does the SED differ from current VOC legislation?

- There will no longer be 'compliant coatings' as such. The painting process at any installation will be assessed and deemed to be compliant or not, depending upon the amount of carbon in the exhaust from the process, or from a calculation of the mass balance of paint solids weight to solvent weight used in that installation over a 12 month period.
- The responsibility for VOC compliance effectively shifts from the paint manufacturer to produce VOC compliant products, to the end user to manage his overall solvent use based on their product mix of paints and solvents used over that period. Alternatively the user must monitor fugitive emissions from their plant and keep within limits of carbon weight per cubic metre of exhaust air.
- All solvents, whether from those contained in the paint itself, or solvents purchased separately for thinning and cleaning purposes, must be included in the calculation. Any solvents that are reclaimed and reused are exempt from the calculation.

Does the SED apply to my operation?

- SED will apply to any installation involved in the coating of metal or plastics articles, which uses more than 5 tonnes of total solvent per annum.
- 'Installation' is defined as ... "a stationary unit where one or more of the activities within the scope of SED are carried out, or any directly associated activities which could have an effect on emissions"...
- Effectively, permanent open air painting locations, such as dry docks, which didn't apply under the old EPA, but will come under scope for SED; however maintenance painting (ie a temporary painting site) will not.

Does the SED apply to my operation?.....cont'd/...

- There is, however separate EU legislation, Directive 2004/42, which will impose VOC limits and labelling requirements for site applied paints within buildings or worksites. (either new construction or maintenance). This will come into effect in 2007.

When will the SED come into force?

- For existing installations, interim limits come into force on 31/10/2005, with stricter limits enforced from 31/10/2007.
- New installations, or significantly altered installations will jump straight to the 2007 limits immediately.

What is an 'Existing Installation'?

- Any installation in operation and approved under the EPA :1990 before April 2001
- A 'new' or 'substantially changed' installation is defined as ..."one that has been set up or approved since that date, or one that was not previously approved under the EPA or has increased emissions by >25% for small users or >10% for all other users". These installations must immediately comply with the 2007 limits.

What are the routes to SED compliance?

- EITHER:
monitor fugitive emissions from the installation and keep levels of carbon per cubic metre of exhaust below prescribed limits.
- OR:
Operate a solvent management system which records quantity of all solvent used over a given 12 month period. This includes solvent from paint, plus any solvents purchased separately for thinning or cleaning purposes. The weight ratio of solid paint to total solvent must fall within prescribed limits.

Which route is most practical?

- Monitoring of carbon emissions can only be effectively performed on installations where all VOC emissions can be isolated to specified exhaust points where monitoring can be performed. The monitoring process involves sophisticated equipment and skilled operators, hence would normally require employing specialised outside companies to perform the task.
- For the majority of Leigh's customers, the solvent management route would be the most practical and cost effective route.

What are the limits for SED compliance?

- Any facility using < 5 tonnes of solvent per year will be exempt from SED
- **For existing facilities using 5 - 15 tonnes solvent per year**

From Oct 2005 to Oct 2007, proportion of solvent weight must be < 47% of total paint + solvent weight.

OR

Carbon emissions < 150mg Carbon / M³ exhaust air

From Oct 2007 onwards, proportion of solvent weight must be <37.5 % of total paint and solvent weight.

OR

Carbon emissions < 50 mg / M³ exhaust air.

- **For existing facilities using more than 15 tonnes solvent per year**

From Oct 2005 to Oct 2007, proportion of solvent weight must be < 36% of total paint + solvent weight.

OR

Carbon emissions < 50mg Carbon / M³ exhaust air

From Oct 2007 onwards, proportion of solvent weight must be < 27 % of total paint and solvent weight.

OR

Carbon emissions < 50 mg / M³ exhaust air.

Could a large installation be split up into lots of smaller areas, each using < 5 tonnes of solvent per year, thus going outside the scope of SED?

- NO !! The local authorities who will police the system are clearly instructed under the SED to be pragmatic and not allow for such bending of the rules.

Are there any other requirements under SED?

- All high risk phrase solvents to be monitored and reduced - This will not affect any of our standard products, none of which contain these solvents.
- Total particulate emissions to be < 50 mg / M³
- Isocyanate emissions to be < 0.1 mg / M³ (as per current regulations)

How will solvent levels be reported?

- Each installation must maintain records of their solvent management plan, which records total weights of paint and solvent used within a 12 month period, with a calculation of the total solvent content by weight.
- We will provide extra information on data sheets, plus product / VOC inventory to assist in the calculation.

How will data sheets differ under SED?

- In line with the rest of the industry, we currently quote practically determined solids volume on our data sheets. SED will require information on theoretical solids content calculated from the formulation, therefore the data sheets will include :
 - Practical solids volume
 - Calculated (theoretical) solids volume
 - Calculated (theoretical) solids weight

Why is the old practical solids volume usually higher than the theoretical value?

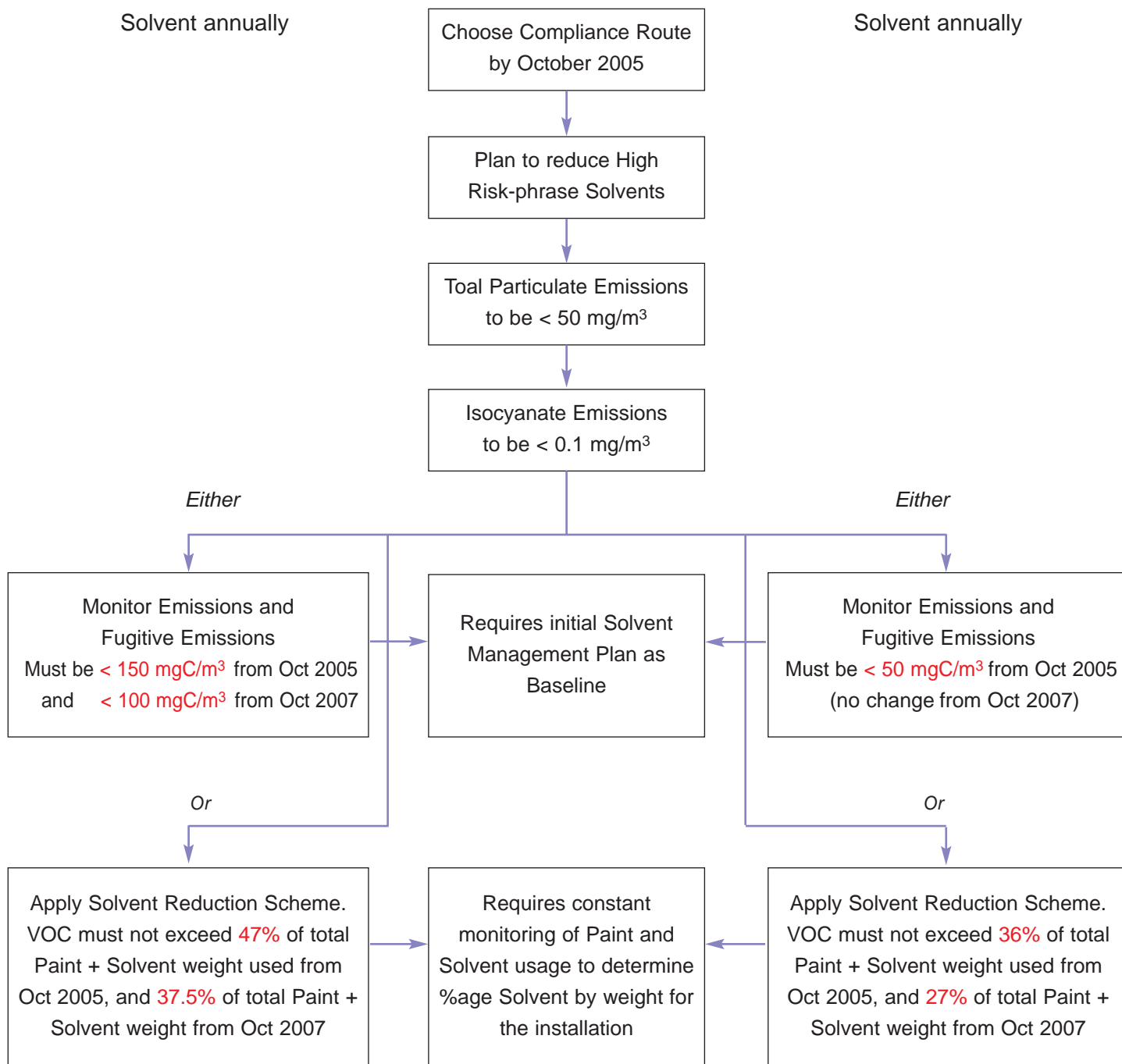
- With any paint, some solvent is always lost during the manufacturing process, and also there is a variable, but significant amount of solvent that is retained within the cured film and not released to atmosphere. This effectively means that the practical solids will almost always be a few percent higher than the calculated theoretical figure.

SED assumes that **all** the solvent in a paint is released at the point of application, hence we have to work off the calculated figures for the solvent management plans.

Flow Chart of Compliance

Small to Medium Installations
i.e. users of 5-15 Tonnes
Solvent annually

Large Installations
i.e. users of >15 Tonnes
Solvent annually



Notes

1. Solvent Management Plan must include ALL thinners and cleaning solvent used.
2. Recyled solvent is counted only once. Solvent still in-process can be subtracted from the calculation.
3. New or Substantially Changed Installations must comply immediatley with 2007 criteria.
'Substantial Change' is defined as an increase in solvent usage of 25% or more for a small to medium sized installation, and 10% or more for a large installation.

Appendix 1

Typical Solvent by Weight Calculations for Individual Protective Coatings

Product Type	Solids % by Vol	SG	VOC gm/ltr	VOC gm/kg	% VOC by weight	Compliance with SED Emissions					
						5 - 15 tonne users		> 15 tonne users			
						2005 - <47%	2007 - <37.5%	2005 - <36%	2007 - <27%		
QD Alkyd Primer	54	1.35	410	303	30.3	Y	Y	Y	Y		
QD Alkyd Finish	38	1.10	539	490	49.0	N	N	N	N		
Long-oil Alkyd Finish (slow drying)	47	1.15	401	349	34.9	Y	Y	Y	Y		
<hr/>											
Epoxy QD Prefab Primer	27	1.15	618	537	53.7	N	N	N	N		
Epoxy Blast Primer	29	1.2	594	495	49.5	N	N	N	N		
Zinc Silicate Prefab Primer	25	1.4	672	480	48.0	N	N	N	N		
<hr/>											
Epoxy Zinc Phosphate Primer	60	1.4	346	247	24.7	Y	Y	Y	Y		
Epoxy Zinc Rich Primer	62	2.6	330	127	12.7	Y	Y	Y	Y		
Epoxy Buildcoat	75	1.6	215	134	13.4	Y	Y	Y	Y		
<hr/>											
Polyurethane Finish	54	1.4	412	294	29.4	Y	Y	Y	Y		

Example Specifications

A. Quick-drying Alkyd System

- 1 coat QD Primer @ 75 microns dry film thickness (dft)
1 coat QD Alkyd Finish @ 50 microns dft
 - 10% thinner/cleaning solvent used in the process
 - Solvent content by weight of paint is **40.8%**
- >15 tonne solvent users can't use this system from 2005
- 5 - 15 tonne users are compliant at 2005, but not from 2007
- Changing the specification to 50+50 microns makes 2005 compliance difficult for all users

B. Epoxy/Polyurethane System

- 1 coat Epoxy Blast Primer @ 25 microns dft
1 or 2 coats Epoxy Primer/Buildcoat @ 200 microns total dft
1 coat Polyurethane Finish @ 60 microns dft
 - 10% thinner/cleaning solvent used in the process.
 - Solvent content by weight of paint is **25.6%**
- All users will comply with 2005 and 2007 requirements
- Blast Primer can still be used, but only in combination with low VOC buildcoats or topcoats
- Over application of Blast Primer can make the facility non-compliant - eg doubling its dft to 50 microns increases VOC to **28.6%** of paint weight.

Appendix 2



Conseil Européen de l'Industrie des Peintures, des Encres
d'Imprimerie et des Couleurs d'Art. Depuis 1951

Guidance Note

Calculated vs. Practical VOC for protective coatings

VOC figures currently quoted on paint manufacturers' Technical Data Sheets are generally based on a practical determination method (e.g. that described in UK EPA 1990 – PG6/23).

From 31st October 2005, VOC's will be based on data calculated from the paint formula. In many cases this will result in an increase in quoted VOC values.

Any such increase in published figures will be due to the fact that under the SED, the calculated VOC reflects **all** the solvent theoretically included in the paint formulation, whereas current practical data may exclude any solvent lost during paint manufacture as well as any solvent remaining in the applied coating when the determination is carried out.

It would not be unreasonable to expect a direct correlation between VOC and Solids Content by Volume of a paint coating, as in theory VOC represents the volatile and Solids by Volume the non-volatile components of the product.

In practice, however, this is not the case, as VOC is determined on the paint in its wet state, while Solids by Volume is usually determined on the dry film of the paint after application.

Solids by Volume therefore takes into account the film formation characteristics of the coating, which may involve chemical reaction, solvent or air entrapment and other factors which can influence the practical determination. Because of this, some coatings – such as zinc silicates – can produce significantly higher practical solids by volume figures than expected from their calculated VOC content.

In order to provide our customers with as much information as possible, it is proposed that Technical Data Sheets for Protective Coatings will be amended (in time for the implementation of new regulations on 31st October, 2005) to include:-

VOC determined practically in accordance with UK Regulations PG6/23, in gm/litre

VOC calculated from formulation, to satisfy EC Solvent Emissions Directive, in gm/litre

VOC content by weight from formulation, to satisfy EC SED, in gm/Kg

In addition some manufacturers' data sheets may express a VOC figure according to EPA test method 24. This again is a practical measurement and is a requirement for the North American market only. It is not connected to the SED.

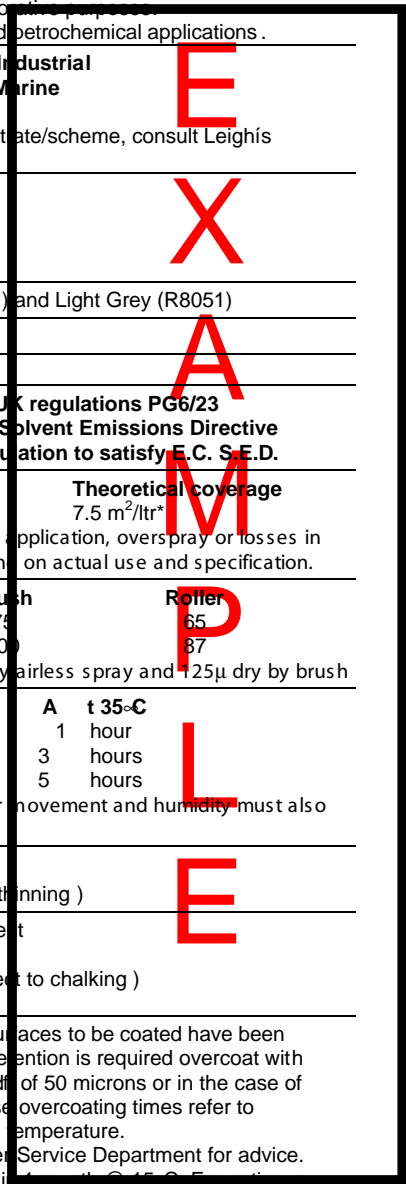


EPIGRIP C400V2

PRODUCT TECHNICAL DATA

EXAMPLE ONLY

FULL DESCRIPTION	: EPIGRIP C400V2 ZINC PHOSPHATE PRIMER/BUILD COAT		
MATERIAL TYPE	: A high build 2-pack epoxy zinc phosphate primer/buildcoat		
RECOMMENDED USE	: Anti-corrosive protection of carbon steel surfaces prepared by abrasive blast cleaning. : Can be applied at thicknesses between 75 and 200 microns dry to provide both primer and buildcoat in a single coat. A top coat is only required for decorative purposes. : For use in internal/external conditions, including offshore and petrochemical applications.		
ENDORSEMENTS	: 1998 COMPLIANT - 1990 EPA-PG6/23(97) Clause 20(d) - Industrial : 1998 COMPLIANT - 1990 EPA-PG6/23(97) Clause 20(e) - Marine : BS476 Part 7 - Surface Spread of Flame : BS6853 Appendix D - Smoke Emissions - for details of substrate/scheme, consult Leigh's Customer Service Department.		
RECOMMENDED APPLICATION METHODS	: Airless Spray (blast cleaned surfaces only) : Conventional Spray : Brush : Roller		
COLOUR AVAILABILITY	: Limited range including two MIO shades, Dark Grey (R8050) and Light Grey (R8051)		
FLASH POINT	: Base : 24°C Additive : 26°C		
% SOLIDS BY VOLUME	: 75 ± 3% (ASTM-D2697-91)		
V.O.C.	: 217gms/litre determined practically in accordance with UK regulations PG6/23 : 249gms/litre calculated from formulation to satisfy E.C. Solvent Emissions Directive : 164gms/kg VOC content by weight calculated from formulation to satisfy E.C. S.E.D.		
TYPICAL THICKNESS	Dry film thickness : 100 microns * This figure makes no allowance for surface profile, uneven application, overspray or losses in containers and equipment. Film thickness will vary depending on actual use and specification.	Wet film thickness : 133 microns	Theoretical coverage : 7.5 m ² /ltr*
PRACTICAL APPLICATION RATES- microns per coat	Airless Spray : Dry 100* : Wet 133	Conventional Spray : 100 : 133	Brush : 75 : 100 Roller : 65 : 87 * Maximum sag tolerance with overlap typically 300µm dry by airless spray and 125µ dry by brush
AVERAGE DRYING TIMES	At 15°C : To touch 2 hours : To recoat 6 hours : To handle 16 hours	At 23°C : 1 hour : 4 hours : 8 hours	At 35°C : 1 hour : 3 hours : 5 hours These figures are given as a guide only. Factors such as air movement and humidity must also be considered.
RECOMMENDED THINNER	: Leigh's Cleanser/Thinner No. 2 (for thinning) : Leigh's Cleanser/Thinner No. 9 or No. 13 (for cleaning and thinning)		
RESISTANCE TO	: Moisture - Excellent Aliphatic solvents - Excellent : Acid spillage - Moderate Abrasion - Excellent : Alkali spillage - Excellent Weather - Excellent (subject to chalking) : Petroleum solvents - Excellent		
RECOMMENDED TOPCOATS	: Indefinitely overcoatable with epoxy systems provided the surfaces to be coated have been suitably cleaned. Where a high degree of gloss and colour retention is required overcoat with Resistex C137, Resistex C237 within 7 days at a minimum dry film thickness of 50 microns or in the case of Resistex K651 or Leigh's C750 overcoat within 4 days. These overcoating times refer to achievement of optimum adhesion of 23°C and will vary with temperature. : For overcoating with alkyd systems consult Leigh's Customer Service Department for advice. : Overcoatable with Envirogard M770 Water Based finish within 1 month @ 15°C. For optimum intercoat adhesion, application of Envirogard M769 Water Based Tiecoat is recommended.		
POT LIFE	: 2Ω hours at 15°C 1Ω hours at 23°C 1 hour at 35°C		
PACKAGE	: A two component material supplied in separate containers to be mixed prior to use. Pack Size : 20 litre and 5 litre units when mixed. Mixing Ratio : 7 parts base to 1 part additive by volume. Weight : 1.60 kg/litre (may vary with shade). Shelf Life : Minimum 2 years.		



SURFACE PREPARATION:

Blast clean to Sa.2 Ω BS7079:Part A1:1989 (ISO 8501-1:1988). Average surface profile in the range 50-75 microns .

Ensure surfaces to be coated are clean, dry and free from all surface contamination.

Manually prepared surfaces should be prepared to a minimum standard of St3 BS7079:Part A1: 1989 at the time of coating.

Application to such surfaces should be by brush or roller where the mechanical action will aid adhesion.

APPLICATION EQUIPMENT:

Airless Spray For d.f.t. applications between 75-125 μ For d.f.t. applications between 125-300 μ

Nozzle Size : 0.33mm (13 thou) 0 .38mm (15 thou)

Fan Angle : 40 $^{\circ}$ 4 0 $^{\circ}$

Operating Pressure : 155kg/cm \leq (2200 psi) 155kg/cm \leq (2200 psi)

The airless spray details given above are intended as a guide only. Details such as fluid hose length and diameter, paint temperature and job shape and size all have an effect on the spray tip and operating pressure chosen. However, the operating pressure should be the lowest possible consistent with satisfactory atomisation. As conditions will vary from job to job, it is the applicators' responsibility to ensure that the equipment in use has been set up to give the best results. If in doubt Leigh's Customer Service Department should be consulted.

Conventional Spray

Nozzle Size : 1.27mm (50 thou)

Atomising Pressure : 2.8kg/cm \leq (40 psi)

Fluid Pressure : 0.4kg/cm \leq (6 psi)

The details of atomising pressure, fluid pressure and nozzle size are given as a guide. It may be found that slight variations of pressure will provide optimum atomisation in some circumstances according to the set up in use. Atomising air pressure depends on the air cap in use and the fluid pressure depends on the length of line and direction of feed i.e. horizontal or vertical.

For application by conventional spray, it may be necessary to thin the paint by the addition of up to 10% Leigh's Cleanser/Thinner No. 2. Where thinning has been carried out the wet film thickness must be adjusted accordingly.

N.B. Thinning will affect VOC compliance.

Brush and Roller

The material is suitable for brush and roller application. Application of more than one coat may be necessary to give equivalent dry film thickness to a single spray applied coat.

APPLICATION CONDITIONS AND OVERCOATING:

This material should preferably be applied at temperatures in excess of 10 $^{\circ}$ C. Relative humidity should not exceed 90% and in these conditions good ventilation is essential. Substrate temperature should be at least 3 $^{\circ}$ C above the dew point and always above 0 $^{\circ}$ C.

At application temperatures below 10 $^{\circ}$ C, drying and curing times will be significantly extended, and spraying characteristics may be impaired.

Application at ambient air temperatures below 5 $^{\circ}$ C is not recommended.

In order to achieve optimum water and chemical resistance, temperature needs to be maintained above 10 $^{\circ}$ C during curing.

If it is desired to overcoat outside the times stated on the data sheet, please seek advice of Leigh's Customer Service Department.

For full notes, see data sheet entitled 'Spreading Rates and Overcoating Times'.

ADDITIONAL NOTES:

Drying times, curing times and pot life should be considered as a guide only.

The curing reaction of epoxies commences immediately the two components are mixed, and since the reaction is dependent on temperature, the curing time and pot life will be approximately halved by a 10 $^{\circ}$ C increase in temperature and doubled by a 10 $^{\circ}$ C decrease in temperature.

Epoxy Coatings - Colour Stability:

Variable colour stability is a feature of epoxy materials which tend to yellow and darken with age whether used on internal or external areas. Therefore any areas touched-up and repaired with the same colour at a later date may be obvious due to this colour change.

When epoxy materials are exposed to ultra-violet light a surface chalking effect will develop. This phenomenon results in loss of gloss and a fine powder coating at the surface which may give rise to colour variation depending on the aspect of the steelwork. This effect in no way detracts from the performance of the system.

Epoxy Coatings - Tropical Use

Epoxy paints at the time of mixing should not exceed a temperature of 35 $^{\circ}$ C. At this temperature the pot life will be approximately halved. Use of these products outside of the pot life may result in inferior adhesion properties even if the materials appear fit for application. Thinning the mixed product will not alleviate this problem.

The maximum air and substrate temperature for application is 50 $^{\circ}$ C providing conditions allow satisfactory application and film formation. If the air and substrate temperatures exceed 50 $^{\circ}$ C and epoxy coatings are applied under these conditions, paint film defects such as dry spray, bubbling and pinholing etc. can occur within the coating.

Numerical values quoted for physical data may vary slightly from batch to batch.

HEALTH AND SAFETY:

Consult Product Health and Safety Data Sheet for information on safe handling and application of this product.

Any person or company using the product without first making further enquiries as to the suitability of the product for the intended purpose does so at their own risk, and W. & J. Leigh & Co. can accept no liability for the performance of the product, or for any loss or damage arising out of such use.

The information detailed in this Data Sheet is liable to modification from time to time in the light of experience and of normal product development, and before using, customers are advised to check with W. & J. Leigh & Co., quoting the reference number, to ensure that they possess the latest issue.