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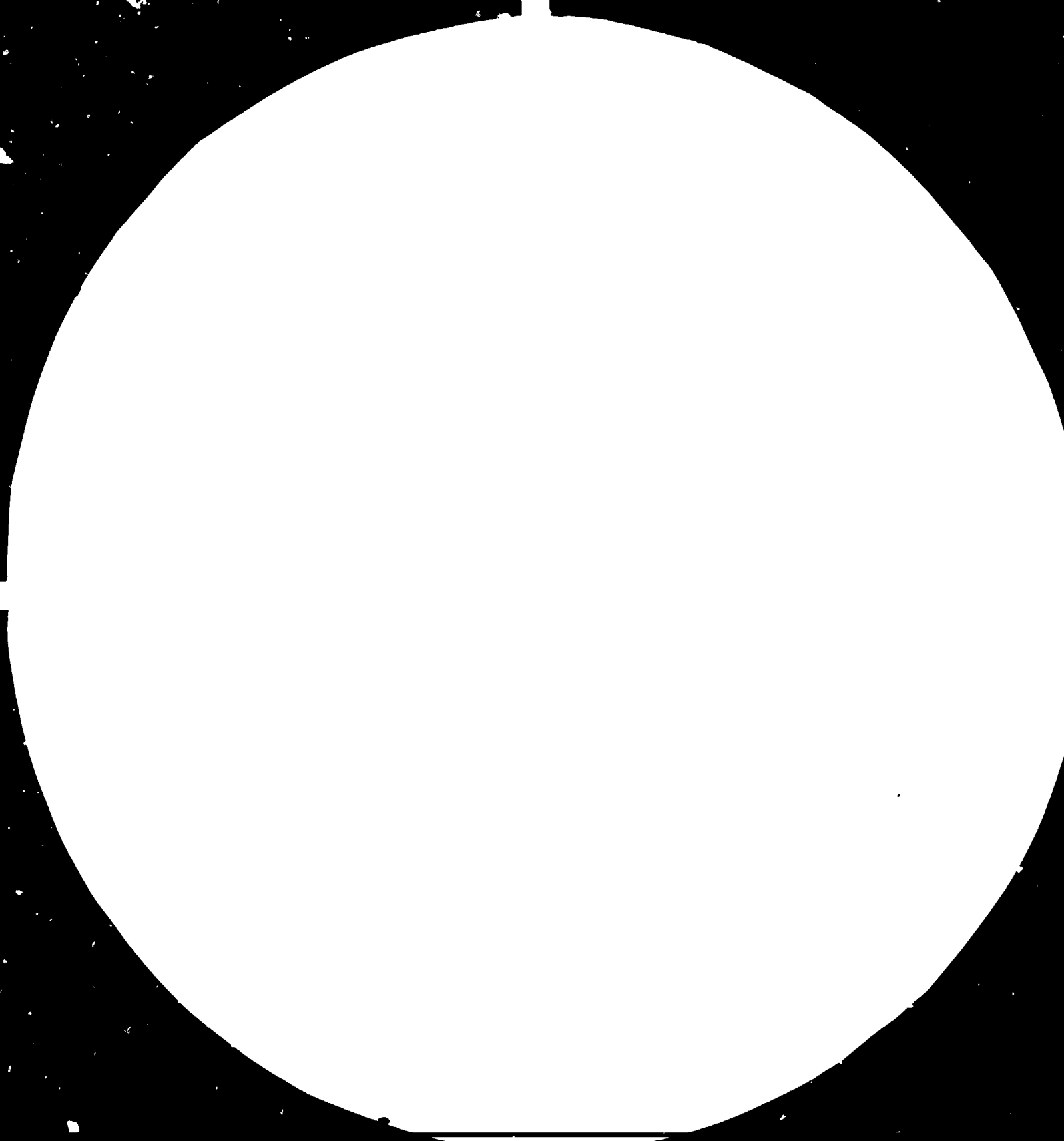

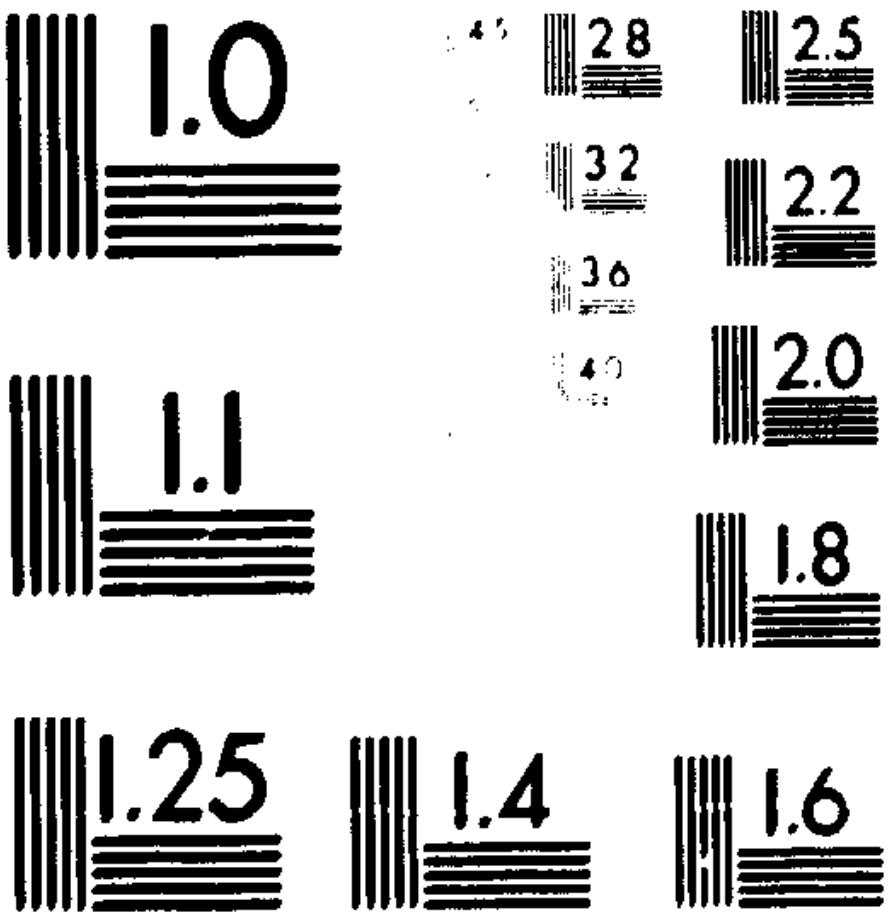

14619

Electro Gas Systems Ltd.

Electro Gas Systems Ltd.

14619

REPORT. EGS.100.U.N.

TO: U.N.I.D.O. Vienna International Centre.

Project No. DP/DRK/79/003 - Examination of Plaster Wall Sample from Republic of Korea.

Process Room to assess the most suitable "paint" in which to cover these walls.

INTRODUCTION.

The Pilot Plant Building at the Academy in the D.P.R.K. is generally wrongly constructed compared by modern methods used in Europe and the U.S.A. The method is to use a building shell and build a clean room complex within this shell. This allows a steel frame with plastic coated panels to be used to construct clean rooms and all services and "dirty" processes can be carried out in the service areas, i.e. between clean rooms and outer shell. The clean rooms do not come into contact with the outside conditions. This building problem was pointed out early in the project but too late to seriously correct it. However, it would appear that from resources available the present building was within the Academy's budget whereas a clean room complex by modern design would have been too expensive. The construction of the present building leaves all clean areas with plastered walls which from a dust aspect is very bad and as they cannot be replaced the only answer would be to seal them with a suitable "paint" such that the finished surface is dust free.

In a letter from R. Nuttall to U.N.I.D.O. - Pyongyang, 11th July, 1983, a basic requirement for the finished paint surface was listed and is as follows :

a) Flexible to allow for general building structure movement without cracking.

b) Reasonable abrasion resistant to avoid dust generation on rubbing against walls.

c) Definitely no "chalking", i.e. surface breakdown generating dust. Usually means that paint consists mainly of the plastic support medium with little inorganic powder filler. Breakdown can result if paint unsuitable by oxidation due to general moist atmosphere or exposure to light.

d) Some corrosion resistant properties would be necessary in case of accidental leaks or spillages of process chemicals usually acidic.

e) The surface should be a gloss finish and as non-porous as a plastic coating will allow.

It was also pointed out that a surface primer would have to be used if good adhesion was to be attained.

During the present investigation associated with this report it was noted that antistatic properties could also be introduced and this could be another benefit.

The following section discusses the various paints available from companies who specialised in this type of paint in the U.K. It should be appreciated that there are hundreds of paint manufacturers but those we approached had direct experience of building treatment and in some cases were suggested by clean room installation companies.

Estimate of Surface Areas Involved.

The area of walls to be treated would be :

a) All ground floor walls including changing rooms, corridors and clean rooms.

Corridors 5 metres high. Clean Rooms 3 metres high.

Estimated Area - 3000 sq. metres.

b) All walls on 1st. floor (not service void) in test assembly areas.

All 5 metres high.

Estimated Area - 3000 sq. metres.

c) All false ceilings and ceiling of 1st. floor rooms.

Estimated Area - 1000 sq. metres.

TOTAL AREA TO BE TREATED - 7000 SQ. METRES.

THE ABOVE ESTIMATES ARE MADE FROM BUILDING DRAWINGS AND MUST BE CHECKED BY U.N.I.D.O. ENGINEERS ON SITE.

The basement and service floor require sealing to a reasonable standard and it would seem a good domestic paint would suffice if concrete surfaces primed with suitable sealant. These should be available in D.P.R.K.

ASSESSMENT OF THE WALL FINISHES CONSIDERED.

The finishes are listed under the suppliers name and the various aspects considered. A white finish was selected in all cases for light and visual cleanliness.

1. Supplier. Liquid Plastics Limited,
P.O. Box 7.
London Road,
Preston. PR1 4AJ. England. Tel: 0772-59781.

Contact : Mrs. J.M. Brooke. Export Sales Manager.

British Company with large export market (see leaflet).

1. 1. Coating Recommended.

The material offered for clean room walls was "STERIDEX" which has had wide use in hospitals and food handling areas. However, there had been no use in semiconductor clean rooms as they were aware of. The plaster sample (A1) was treated with 1 coat of primer followed by 1 coat of Steridex. The materials were applied with a brush. Also the sample of vinyl coated paper (A2) which is intended to finish the wooden false ceilings the Academy have fitted was painted with the Steridex only.

1. 2. Results.

The finish is semi matt and textured in appearance although a more even finish would result from spraying on the paint. The lack of gloss does suggest it could hold "dirt" when applied to semiconductor standards. Also its anti-bacterial properties make its prime application for hospitals etc. Its main advantage would be in its application as it is non-toxic, water based, no fire hazard, long shelf life, so that transportation would be no problem. The paint is best applied by spraying techniques which gives a smoother finish and the equipment could be obtained from recommended spray equipment supplier in Hong Kong. Liquid Plastics Limited would be willing to offer an expert on site (Pyongyang) for 1 week to supervise the coating process.

1. 3. Cost.

The cost of the expert would be on application, but typically £2,500.00 - £3,000.00.

The cost of the coatings would be :

Primer : 25 litre/drum which covers 200 sq. metres. Cost: £90/Drum.

Steridex : 25 litre/drum which covers 90 sq. metres. Cost: £63/Drum.

A cost reduction may be offered by the manufacturers for the possible quantities envisaged, i.e. area 7,000 sq. metres.

Total cost 1 coat of primer : £3,150.00.
Plus 2 coats of Steridex : £9,800.00.

Total : £12,950.00.

Allow 2 coats of finish to assure full sealing.

2. Supplier. England, Hughes Bell & Company Limited,
Valley Works,
Monton Road,
Eccles,
Manchester M30 9HJ. Tel: C61.789.5191.

Contact : F.B. Windsor. British company with limited exports.

2. 1. Coating Recommended.

Several finishes were offered, namely :

(a) Huzeel Weatherprufe GH.

(b) Colorac FH Glassguard.

(c) Ceramite CQ Glassguard.

Following conversations with the technical people of England, Hughes Bell, it was suggested that the Ceramite CQ Glassguard could well be the most applicable for the project in question. The paint has a gloss finish and can either be sprayed or brushed.

2. 2. Results

The gloss finish is more ideal in that it can be more readily cleaned than the matt finishes and also the epoxy/polyurethane paint systems are well proven and have had limited use in clean room areas.
It would seem that the glass flakes used within the paint could not be "released" from the surface in the form of dust and from the samples B1 and B2 these appear as a gloss continuous surface.
The application of the paint would have certain hazards as indicated on their leaflets and also its low flash point could be a fire hazard.
This company was interested in offering technical support on site in Pyongyang for 1 week, if required.

2. 3. Cost.

Possible expert would cost £2,500 - £3,000 on application.

The cost of coatings would be :

Using System A :

(1) Ceramite 79/S Primer Sealer. 5 litre pack - covers 40 sq. metres.

(2) Ceramite 21 Intermediate Coat. 25 litre pack - covers 200 sq. metres.

(3) Ceramite CQ Glassguard. 25 litre pack - covers 200 sq. metres.

Some further cost reduction may be obtained - however, cost for 7,000 sq.metres, 1 coat each of above :

Ceramite 79/S	-	£7,474.00.
Ceramite 21	-	£4,688.00.
Ceramite C2	-	£5,664.00.
		£17,826.00.

3. Supplier.

H. Marcel Guest Limited,
Riverside Works,
Collyhurst Road,
Manchester M10 7RU. Tel: 061.205.5551.

Contact : Stephen Falder.

British Company with limited export market.

3. 1. Coating Recommended.

There were two finishes which were offered, i.e. Superthane and Standathane which could be suitable as a wall finish.
They also suggested Conguard which would be useful for floor sealing in the service areas of the complex. Comparing Standathane and Superthane it was recommended that Superthane would be preferred as this has some antistatic properties which have in fact led to some limited use in clean room areas within U.K. semiconductor device manufacturing companies. Again with Superthane a surface primer is required and again it has its own specific primer for cement render.
The plaster sample and wallpaper were not painted and samples are attached, C1 and C2.

3. 2. Results.

The finish of Superthane is gloss and tough for a plastic surface. It will wipe down if dust is present and also its antistatic properties should reduce the amount of dust settling. However, the paint is toxic as described on the data sheet and full instructions and care would have to be assured. Also it has a low flash point which could represent a fire hazard. In its application it would have to be applied using a brush.

3. 3. Cost.

Again the cost of the expert would be on application but typically £2,500 - £3,000 would be envisaged.

The cost of coatings would be :

Superthane primer (Concrete Sealer GP).

5 litre drum which covers 80 sq. metres. Cost - £11/5 litre pack.

Superthane finish.

200 litre drum with hardener 67 litre, total volume 267 litres,

which covers 3,000 sq. metres.

Cost £921 for 267 litres.

Some further cost reduction may be possible.

Area - 7,000 sq. metres.

Total Cost :	2 coats primer -	£2,020.00.
	2 coats Superthane -	£4,300.00.
		£6,320.00.

CONCLUSIONS.

The surface finishes have to be considered from the following aspects :

1) Suitability for the clean room standards which have to be achieved for silicon chip processing. Ideally the paint should have already been proven in similar situations. The standards involved have already been discussed in T.A.C. Reports.

2) Shelf life, i.e. will the paint survive the time and possible heat of the transportation from U.K. to D.P.R.K.

3) Hazards. These would be basically the flammability and toxicity of the paint during application and whether any hazard remains when the paint has dried out.

4) Cost and Delivery. All finishes are readily available and could be shipped within 4 weeks on receipt of order by the particular company involved.

From the points made in previous sections and brief discussions with engineers and staff from various clean room construction companies and also silicon device manufacturers, it was generally found that a gloss finish was preferred. In general paints as such were not used, already coated panels being favoured. However, in some cases, i.e. diffusion, deposition and cleaning processes requiring 1000 standard, support frames and

steel pillars were a part of the original building and which were within the clean room. These had been gloss painted and typically Standathane and Superthane had been used and the clean room standards had been maintained. However, the areas involved were relatively small. Unfortunately the Steridex and Ceramite have not, to the manufacturers knowledge, been used for clean rooms in the semiconductor fabrication areas but have been used in other clean areas (see leaflets). The most relevant information seems that Superthane is being considered by one of the large semiconductor manufacturers for clean room applications because of its antistatic properties which is particularly useful where MOS devices are fabricated. It would not be particularly relevant for the Bipolar TTL envisaged at the Academy. However, this additional property would be an asset. Hence on this count Superthane would appear to be the most promising.

Shelf Life.

All the paints considered in this report have sufficient shelf life to fit the requirements.

a) Steridex - shelf life and primer - 24 months.

b) Ceramite system and primer - 12 months.

c) Superthane and primer - 6 months.

Unfortunately the difficulties in applying the paints seem to be in reverse to their usefulness as a semiconductor clean room finish. The Superthane and Ceramite for safety would have to be brush applied and hence would take longer to apply and the finish could be uneven. However, it could be that any attempt to use a spray system in the Academy may be frought with problems due to their lack of experience. Hence brushing would seem to be the safest technical method. It would seem, therefore, that a decision has to be made as to whether the Koreans are capable of handling the more hazardous paints without inflicting any damage or injury and obtaining the better finish or alternatively using the paint which is safer to apply but having a finish which may be considered less ideal.

It would seem that epoxy based and/or polyurethane based paints in some form are satisfactory for the application and it may be possible to obtain similar coatings in Hong Kong or other country nearer D.P.R.K.

Electro Gas Systems Limited cannot directly recommend any of the products discussed as we have no direct experience. However, the leaflets enclosed together with the samples should be studied before any decision is made.

If required a visit to Vienna by one of the experts indicated may be useful to explain the technical aspects.

PO Box 7, London Road, Preston PR1 4AL Lancashire, ENGLAND
Telephone: 0772 37761 Telex: 67911 PIPE G Cables: Pipeline Preston

Manufacturers of waterproof and weatherproof membranes

JMB/jh

10 May 1984

Electro Gas Systems Ltd
2 Chapel St
Cheadle
Cheshire
SK8 1BR

14 MAY 1984

For the attention of Mr R N Wheeler

Dear Mr Wheeler

Further to our recent telephone conversation, I take pleasure in enclosing as agreed the samples you gave us of the two substrates to be used for the clean room in North Korea, both of which have been coated with Steridex, in order that your client may be able to evaluate the finish thereby obtained.

Steridex was applied direct to the wallpaper but best adhesion was obtained over the concrete, when a coat of our two-pack PU Primer was used under the Steridex.

I would also like to take this opportunity of confirming that Steridex is a system that is straight forward to apply using either brush or industrial spray equipment, and an example of a typical recommendation for the application of Steridex over PU Primer is enclosed for your reference.

Where a completely smooth finish is preferred then application by airless spray is suggested, and details on the type of spray equipment which is suitable are attached together with an example of the type of finish thereby obtained.

Whilst it is probable that you may already have copies of our reference list relating to Steridex, to be doubly sure you will find a set enclosed. On the lists I would refer you particularly to the applications in hospitals, in operating theatres, sterilisation chambers and sluice rooms, and you may also wish to pass the enclosed photograph of an application of Steridex to a mortuary in Preston, which I think you will agree, demonstrates the hygienic finish most satisfactorily.

/. . .

10 May 1984

Electro Gas Systems Ltd

If we can assist you further in any way, then I shall look forward to hearing from you.

Yours sincerely

J M Brooke (Mrs)
Export Sales Administration Manager

Encs

P.O. Box [illegible], [illegible] Road, Preston [illegible], Lancashire, ENGLAND
Telephone: [illegible] Telex: [illegible] Cables: Pipeline Preston

Manufacturers of waterproof and weatherproof membranes

JMB/ds 6 June 1984

Electro Gas Systems Limited
2 Chapel Street
Cheadle
Cheshire
SK8 1BR

For the attention of Mr Nuttal

Dear Mr Nuttal

Further to our telephone conversation on Monday, I have now had the opportunity of discussing with our Laboratory the question you raised concerning the effect of Steridex on the dust particle count in clean rooms.

As I suspected, it is unfortunately the case that whilst we have no doubt whatsoever that Steridex will make no contribution to the dust count, we do not have any official tests which we could quote to support this.

I know that time is rather short on this project now, but if our inability to produce an appropriate certificate is regarded as a major impediment, then please do let me know and I will see if there is anything at all that can be done within the time we have available to remedy this.

Yours sincerely

J M Brooke (Mrs)
Export Sales Administration Manager

(Registered Office No. [illegible] England)
Scottish Regional Office: [illegible] Crescent, Edinburgh [illegible]
[illegible] Preston PR1 4AR
Directors: [illegible]
[illegible]

Test Extracts, General Information and Method of Application

Description:

Steridex is a resin rich water based fungistatic protective finish. The material has very low toxicity and does not contain mercurials, arsenic, phenols or other metal complexes. Due to advanced technology the fungicidal controls will last the lifetime of the product.

Steridex is a one-product answer to hygiene problems, where ordinary paint provides just temporary decoration. Steridex will actively guard against mould growth throughout its long life — drastically reducing the danger of contamination and infection.

TEST DATA:

Resistance of Steridex Film to Bacterial and Fungal Contamination

Aim:
To determine the resistance of cured Steridex to contamination by a series of fungal and bacterial growths.

Method of test:

Part 1
Cured films of Steridex prepared by the method outlined in **Laboratory Report** RES/1076 were laid onto:

a) **Malt extract agar** dispensed into petridishes and pre-seeded with a spore suspension of the following fungi:—

Aspergillus niger, Penicillium notatum [illegible] pullulans and a species Cladosporium.

b) **Nutrient agar** dispensed into petridishes and pre-seeded with a suspension of the following bacteria:—

Pseudomonas fluorescens, Pseudomonas aeruginosa, Enterobacter aerogenes and Escherichia coli.

Method of test:

Part 2

Cured films of Steridex were laid onto the surface of unseeded Malt-agar and nutrient agar in petridishes. A further layer of each agar was then poured in turn over the surface of the Steridex films so that an overlying layer of some 3 mm of the agars was achieved. The surface of the agars was then seeded with the appropriate organisms.

The inoculated plates were incubated at 30°C for 14 days.

Results:

At the end of the incubation period it was observed that:—

a) no fungal or bacterial growth encroached onto the surface of the Steridex film.

b) fungal and bacterial growth occurred on the agars overlaying the Steridex film, indicating a low order of toxicity and the need to remove surface nutrients which might arise in service.

Dr. L. H. G. Morton
Senior Lecturer Microbiology
Preston Polytechnic

Summary of the conclusions reached in an independent investigation designed to determine the bactericidal and fungicidal properties of Steridex.

"The results obtained showed that (Steridex) is effective against a wide range of moulds and bacteria, including gram-positive, gram-negative, sporing and non-sporing micro-organisms . . . The effect is residual and is not inhibited by conditions of high relative humidity or the presence of large amounts of organic matter . . . The material is inhibitory to bacterial and mould spores as well as vegetable cells . . ."

"The use of this material would be suitable to prevent cross-contamination and fungicidal deterioration occurring on wall surfaces in food manufacturing plants, kitchens, and hospital walls and any structural surface in buildings where a high standard of hygiene is necessary." (Full test reports are available on request.)

Several experiments were carried out to determine the antimicrobial activity of Steridex based on those carried out by the consultants Messrs. Galloway and Barton-Wright (January 1968).

The bacteria were grown on plate-count agar at pH 7.0 and the moulds on wort agar pH 5.4.

Agar Diffusion Tests:

Strips of Steridex were painted onto the surface of agar plates which had been seeded with the bacteria or mould under test. The bacteria were grown on plate count agar incubated at 37° C for 24 hours and the moulds on wort agar at 22° C for 48 hours, after which time the width of the zones of inhibition were measured.
Test was repeated three times with each organism - mean values of the inhibition zones were determined.

Organism	Width of Inhibition zone (mm)			
	1	2	3	Mean
Pseudomonas Pyocyanea	0	4	1	1.7
Staphylococcus aureus	4	8	7	6.3
Streptococcus faecalis	9	12	9	10.0
Serratia marcescens	0	3	1	1.7
Escherichia coli	2	4	8	4.6
Bacillus subtilis	11	13	12	12.0
Bacillus megaterium	7	5	9	7.0
Aerobacter aerogenes	3	2	7	4.0

	Width of Inhibition Zone (mm)			
	1	2	3	Mean
Salmonella Typhimurium	0	0	0	0
Mucor spp.	9	11	4	8
Aspergillus sulphureus	8	11	12	10.3
Penicillium spp*		0	0	0
Cladosporum herbarum	15	21	12	16
Oidium lactis	17	20	24	20.3
Saccharomyces cerevisiae	14	19	23	18.7
Klockera spp	20	12	14	15.3

* There was no zone inhibition when the Steridex was placed onto plates seeded with Penicillium spp; but no growth of the mould occurred on the surface of Steridex.

Steridex was inhibitory in a varying degree to all the micro-organisms used in the investigation

Bactericidal Tests against Staphylococcus Aureus Method:

Four square centimetre pieces of Steridex were cut into fragments and added to 10 mls of nutrient broth which had previously been inoculated with a known number of cells of Staphylococcus Aureus. At hourly intervals for five hours the broth was sampled and suitable dilutions were made of the samples to estimate the number of viable bacteria remaining in the broth. The percentage kill of organisms due to the presence of the Steridex was calculated.
Results:

Time	Number of Viable Bacteria - 1 ml			
	A	%Kill	B	%Kill
Initial	1 150 000 000		3 400 000 000	
1 hour	100 000 000	91.3	835 000 000	75.5
2 hours	44 000 000	96.2	59 000 000	98.3
3 hours	1 000 000	99.1	2 000 000	99.42
4 hours	0	100.0	100 000	99.97
5 hours	0	100.0	0	100.0

Conclusion:

Steridex is bactericidal against Staphylococcus Aureus in a broth culture.

Test Report:

Extract of analysis conducted by PRESTON POLYTECHNIC, DEPARTMENT OF BIOLOGY, "To Assess the Dry and Pupa Killing Properties of Steridex".

AIM: To ascertain if the Steridex membrane in an applied situation has a lethal effect on pupae and adult flies which come in close environmental contact.

Conclusion:

Pupae in contact with Steridex membrane resulted in a generally very low hatch rate, and typically as in experiment No. 1 the pupae that emerged died on hatching. It is clear therefore that Steridex has a pronounced adverse effect on preventing the emergence of flies from the pupae stage.

This sample is composed of 100% Steridex.

Fire Retardancy:	BS 476 Part 5: Ignitability Gloss paint coated with one coat of LPL Sealer and two coats of Steridex. (Test carried out by Warrington Research Centre.) **Result** Class P not easily ignitable. BS 476 Part 6: Fire propagation. Gloss paint coated with two coats of Steridex. (Test carried out by Warrington Research Centre.) **Result** (I) 11.6p (I) 2.3
Water Vapour Permeability & Gas Sealing:	This test was carried out by R. H. Harry Stanger as an independent test and showed a mean water vapour permeability of 4.81 g/m² /day. Full details are available on Bulletin No. 3/S.
Chemical Resistance:	Standard 10% solutions of acids and alkalis, including Nitric Acid and Caustic Soda, failed to cause breakdown of the Steridex membrane. Full details are available on Bulletin No. 6/S.

Overseas Test Data:

Australia Department of Primary Industry Canberra ACT 2600.
"Steridex is permissible for use as a surface coating in non-product contact applications in registered fish export establishments."

Belgium Laboratorium voor Industriele Gistingen.
"Extensive tests showed that Steridex is fungicidal and bacteriologically active."

Canada Department of Agriculture, Canada.
"Steridex is proven to have ease of cleaning and durability."

Food Directorate, Bureau of Chemical Safety, Ottawa, Canada.
"Based on details submitted we see no reason to object to the use of Steridex to walls and ceilings in food processing plants."

Denmark Danish Technological Institute.
"Steridex is suitable for use in food environments and displays excellent adhesion and resistance to sunlight and abrasion."

France Institut d'Analyses et d'Essais du Centre – Ouest.
JS-PA274 test states Steridex free from toxicity and suitable for use in food factories and food preparation areas.

Germany Baden Wurttemberg Chemisch Technischen Prufamt 770 510Mg Pc.
The research and tests carried out show that Steridex is suitable as a coating for walls and ceilings in the food and drink industry. According to the specification for use and application it is not to be expected that food or drink would be disadvantageously influenced by the cured coating.

Holland Eyfopharmacy Reg. 7505 N.

U.S.A. Steridex complies with the exacting American USDA standards and is registered with the EPA (reg. no. 11325 – 1).

SURFACE PREPARATION

Priming:	(See application – observe all notes.) Use only LPL Primers and Sealers.
Unpainted Brick, Plaster, Cement, Asbestos Cement etc.:	After preparation use LPL Sealer. On new cement and concrete use LPL PU Primer. Coarse open wall blocks will need a cement grout to avoid high usage.
Painted Surfaces:	All loose, chalking paint must be removed. Sand gloss, alkyd, oil, epoxy etc. and apply Steridex direct. If sanding is not possible, clean and use LPL PU Primer. Treat sound emulsion painted surfaces with LPL Sealer. For polyurethane paints use LPL PU Primer. Ensure existing paints are fully adhered before priming. Test if necessary and remove if not well adhered.
Unpainted Metal Surfaces:	Remove all rust, abrade to bright metal and coat with LPL Solvent or Water Based Metal Primer. Use 2 coats of Primer on badly corroded metals. Galvanised and soft metals should be wire brushed followed by either LPL Water or Solvent Based Metal Primer. Degrease if necessary.
Wooden surfaces:	Use LPL PU Primer and consult the manufacturer if in doubt.
Bitumen or Tar Covered Surfaces:	Apply LPL Bitumen Primer (do not overbrush). To surfaces liable to Exudation use LPL Solvent Based Metal Primer.
Decorative Steridex:	Clean off all contamination and apply a coat of LPL PU Primer, followed by Steridex.
Cracked Areas:	[illegible]

Application:

1. Remove oil or grease with detergent and water and laitance from substrate by wire brushing. Remove loose material by either wire brushing or high pressure water lancing. Ensure all surfaces are clean and free from dampness. Treat mould with LPL Biocidal Wash. (For algae use bleach; see Biocidal Wash data sheet.)
2. Apply appropriate primer and leave to dry (2 - 18 hours).
3. Stir thoroughly and apply the first coat by brush or spray equipment. Apply in one direction only. Allow to cure thoroughly. If unsure test by rubbing a wet finger on the surface. If milkiness results then curing is not complete.
4. Apply the second coat at right angles to the first. Apply within 7 days of the first coat otherwise treat as "Overcoating Steridex".

To avoid uneven membrane thickness apply each coat in a slightly different colour.

Drying Times: Steridex 4 – 24 hours Sealer/Primer 2 – 18 hours Dependent on environmental conditions.

Coverage Rates:

Allow additional materials to obtain wet film thickness on irregular or porous surfaces and for site wastage.	Max. coverage per litre per coat to achieve wet film thickness		
Product:-	**Sq. metres**	**Sq. yards**	**Wet film thickness per coat in microns**
Steridex: 2 coats necessary each at per coat	3.6	4.4	250
LPL PU Primer	12	14	N/A
LPL Sealer	6	7	N/A
LPL Bitumen Primer	7.5	9	N/A
LPL Solvent Based Metal Primer	7.5	9	N/A
LPL Water Based Metal Primer	9	10.5	N/A

NOTE: The cured film thickness is essential to the long term durability and general effectiveness of the membrane. It is important that this film thickness is achieved.

Membrane Thickness: Laboratory tests indicate a dry thickness of 325 microns or 0.013" when laid at the finished coverage of 1.8m² litre or 2.2 square yards litre. Full details are available on Bulletin No. 1.

Container Sizes: Steridex is supplied in 25 and 10 litre containers.
Sealers and Primers are supplied in 25, 5 and 2½ litre containers.

Equipment: BRUSHES – a wide soft nylon brush gives best results and can be cleaned using water. Do not use sweeping brushes. Dried Steridex may be removed using petrol, cellulose thinners, xylene or toluene.
SPRAY EQUIPMENT – Most types of industrial spray equipment are suitable (pressure 2500-3000 p.s.i., tip size 19 - 29 thou.). Equipment should be cleaned by flushing through with water. Dried Steridex can be removed as above.
ROLLERS – Use for applying primers only, when surfaces are suitable, e.g. flat and of low absorbency.

Maintenance: Wash down periodically. If severely contaminated use scrubbers and scouring powder. Steam cleaning is permissible.

IMPORTANT NOTES: Do not apply near foodstuffs in unventilated conditions, always ensure adequate ventilation.
Do not thin or brush out like conventional paints.
Do not apply the products in damp or rainy weather or when the temperature is close to freezing.
Protect from frost and heat. Use nose/mouth mask when spraying.

Colours: Standard colours to B.S. 4800 as follows:
Light Blue B.S. 18E49, Cream B.S. 10C31, Light Grey B.S. 10A03, Light Green B.S. 14C31, Mushroom B.S. 08B17, Pale Lemon B.S. 10E49, Magnolia B.S. 08B15, LPL White and LPL Black.
Special colours can be made to order in minimum quantities.
The natural weathering process of the material may cause slight darkening of the colours. All colours are intermixable.

[illegible] information contained herein is correct to the best of our knowledge but it does not necessarily refer to the particular requirement [illegible] when further advice should be obtained.

P.O. Box [illegible] Road, Preston [illegible] Lancashire, ENGLAND
[illegible]

Technical Information

RECOMMENDATIONS FOR THE APPLICATION OF STERIDEX

to

NEW INTERNAL CEMENT OR PLASTER SURFACES

Section A - Preparation

1. Remove all loose and friable material by brushing with a stiff bristle brush or wire brush.
2. Remove Laitance (a dry powdery skin) from cement by vigorously wire brushing and dust off.
3. Coarse open walling blocks should be grouted or screeded with cement.
4. Any damaged areas should be raked out and repaired with similar material.
6. New cement and plaster should be left for as long as possible to thoroughly cure and should not be overcoated sooner than 7 days or when the moisture content is greater than 18%.

Section B - Treatment

1. Ensure that all surfaces to be coated are clean and dry as detailed above.
2. Mix Parts A and B of PU Primer by pouring Part B into Part A and stirring firmly until a uniform non streaky colour is achieved. Apply by brush or spray, a coat of PU Primer at a maximum spread rate of 12 sq m per litre on non absorbent surfaces and up to 7.5 sq m per litre on cementitious surfaces and allow to through dry. It is important to achieve a uniform coat of primer over the entire surface.
3. Do not overcoat PU Primer until the surface is dry and only very slightly tacky. Forced air will accelerate the curing process and this is essential in small confined spaces. Do not apply Steridex within 24 hours of the application of PU Primer.
4. Steridex will bridge small hairline cracks. Where cracks, gaps or joints liable to some movement are present, these require reinforcement with light duty Flexitape obtainable from Liquid Plastics Ltd. After priming as necessary, the tape should be laid and stippled flat with the aid of a loaded brush into a normal coat of Steridex with a generous overlap at either side of the crack and allow to dry.
5. Apply overall by brush or preferably spray equipment (see attached sheet for suitable machine). One coat of Steridex at a maximum spread rate of 3.6 sq m per litre and allow to through dry - from 4-24 hours according to atmospheric conditions. In confined spaces, forced air is essential to accelerate the cure.

6. Apply a second coat of Steridex as in paragraph 5 overleaf.

7. Never leave Steridex longer than 7 days between coats. After 7 days have elapsed a second coat of PU Primer will be required to reactivate the surface.

Special Note

All Steridex and PU Primer cans carry full instructions for use and these should be read in conjunction with the above recommendations. Copies are attached.

JMB/jh
25.10.83

RE-PRINTED OCTOBER 1983

L.P.L. MEMBRANE SYSTEMS

International Spraying Equipment Schedule and Trouble Shooting Guide
See individual leaflets for: - L.P.L. Twin Pack Materials (e.g. Flexcrete)
- Monolastex Textured Finish (Bulletin 79/MX.T)

NOTE: SPRAY MEMBRANES AS SUPPLIED. DO NOT THIN.

EQUIPMENT GUIDE TO CHART BELOW:

1a = Graco E.H. 433 G.T.
1b = Graco King 45:1
1c = Graco King 60:1
1d = Graco 733 G.H.
2 = Wagner Pneumatic Airless 66-265
3 = Aro 650-075

WHICH PUMP FOR WHICH MEMBRANE:

	DECADEX	FIRECHECK	ISOCLAD	STERIDEX	STEREPEL	SOLADEX
1a	X	X	X	X	X	
1b	X	X	X	X	X	X
1c	X	X	X	X	X	X
1d	X	X	X	X	X	X
2	X	X	X	X	X	X
3	X	X	X	X	X	
Water Based (W.B.) Solvent Based (S.B.)	W.B.	W.B.	W.B.	W.B.	W.B.	S.B.

* TIP SIZES AND ANGLES: In all cases the recommended tip sizes are:

21 THOU WITH 40°, 60° OR 80°FAN ANGLES. We recommend the REVERSIBLE CLEAN TIP ASSEMBLY BE USED WHEN AVAILABLE + THE SPECIAL TIP INSERT. NOTE: Tips can go up to 31 THOU, for higher throughput, if required.

* FLUID HOSE: ALL MATERIALS EXCEPT SOLADEX.

. In all cases use standard $\frac{3}{8}$" I.D. hose reduce to $\frac{1}{4}$" or standard whip line at end for ease of spraying.
FOR SOLADEX use $\frac{1}{2}$" I.D. (nylon lined) hose up to 125', greater than this add $\frac{3}{8}$" I.D. line up to a maximum of 175' in total.
. We recommend metal braded hose to minimise wear but plastic can be used.
. Always use manufacturers hose of suitably high pressure.

* NUMBER OF GUNS:

. On units listed 1a, 2 and 3 use 1 gun on runs greater than 30 FEET, on runs less than 30 FEET - 2 guns may be used if equipment is in good condition.
. On units listed 1b, 1c and 1d use 1 gun if lifting more than 25 FEET from ground. 2 guns may be used on long runs on the ground.

NOTE 1) It is possible on the large units (1b, 1c and 1d) to lift onto roofs with a $\frac{3}{4}$" I.D. material hose feeding a manifold and 2 guns may then be taken off - some experimentation may be necessary.

NOTE 2) Always use manufacturers recommended gun and tip - DO NOT EXCEED STATED MAXIMUM PRESSURE. OVER 3500 P.S.I. (246 kgs./sq. cm.) A SPECIAL GUN AND TIPS ARE REQUIRED, ENSURE THESE ARE SUPPLIED AND USED.

2/ .....

[illegible]:

- [illegible] pump filter of 30 MESH or coarser - if not available REMOVE fine filter as LPL materials are manufactured for airless spray application and fine filters will reduce material throughput - similarly remove in line filters from guns if fitted.

PUMP SEALS:

- a non-absorbent recommended seal such as TEFLON (ie. avoid leather). Including Teflon [illegible] on outlet taps.

CLEAN UP:

- ALL MEMBRANES EXCEPT SOLADEX - flush through with clean cold water. When leaving equipment fill with solvent to prevent rusting/sticking - purge before re-use.
- SOLADEX - flush through with solvent such as xylene, toluene or non-flammable such as 1,1,1 trichloroethane (e.g. ICI Genklene).

EQUIPMENT

- GRACO

a) FH. 433 G.T. - Electric unit with 230/110 volt single phase motor, operating pressure 2500/3000 p.s.i. (176/2 1 kgs./sq. cm.)

NOTE: Spracon offer an uprated 433 unit especially for airless spraying of LPL membranes. Also available are petrol and diesel powered units.

b) KING, 45:1 UNIT - Trolley mounted Pneumatic Unit, requires 40-90 p.s.i. (2.8-6.3 kgs./sq. cm.) compressed air supply to give operating pressure up to 4000 p.s.i. (281 kgs./sq. cm.) Compressed air throughput of at least 25 c.f.m. (0.7 cu. m./min.) is needed, this would deliver for example 2.25 litres of material per minute at 70 p.s.i. (4.9 kgs./sq. cm.) this equals 0.5 Imp. or 0.6 U.S. gallons per min. There is a petrol powered version of the 45:1 available as Part No. 226-961.

c) NOTE: Larger versions of the KING 45:1 are available e.g. 60:1 and may be used using similar settings as b) above (see note above re. high pressure guns and tips).

d) G.H. 733: Operating pressure up to 4000 p.s.i. - self contained petrol engine model.

- ARO CORPORATION

Type 650-075 pump - Requires compressed air to maintain 60 p.s.i. (4.2 kgs./sq. cm.) input pressure. Delivers at 44:1 compression ratio up to 9 litres per minute (2 imperial gallons or 2.5 U.S. gallons).

- WAGNER

Pneumatic Airless 66-265 - A 66:1 ratio piston operated pump powered by compressed air. Trolley mounted ideally fitted with a G40 or G50 high pressure gun. Delivers 765 ccs. per twin stroke. Maximum air inlet pressure = 8 bars (116 p.s.i. = 8.2 kgs./sq. cm.) Air consumption = 91.4 litres/second (194 c.f.m.) Maximum operating pressure is 6 bars (87 p.s.i.) which equates at 66:1 to 5742 p.s.i. - ENSURE HIGH PRESSURE GUNS AND HOSE ARE USED.

N.B. A similar unit designated 46-90 may also be used for water and solvent based membranes but the bigger unit is preferred for Soladex on long lifts or long runs.

USEFUL CONVERSION DATA

1 POUND PER SQUARE INCH = 0.0703 KILOGRAMS PER SQ. CENTIMETRE = 0.0689 BARS.

1 CUBIC FOOT = 0.028 CUBIC METRES.

1 IMPERIAL GALLON = 1.2 U.S. GALLONS = 4.55 LITRES.

3/ .....

[illegible]

GRACO

Australia - Bruce Nordin c/o Barrie Townsend, 10 Camelot Court, Carlingford. New South Wales 2118. Tel: 02-630-5828.
Canada - Graco Pumps Ltd., 3400 American Drive, Mississauga, Ontario. Tel: 416/677-0540.
Cyprus - See Spain.
England - Graco of England Ltd., Wednesfield Road, Wolverhampton, West Midlands. WV10 0DR Tel: 0902-51924.
France - Graco France S.A., 113 Rue des Solets, Silic 141, 94523 Runglis, Cedax. Tel: 33-1-68722 38.
Germany - Graco Germany GmbH., 4040 Neuss, Moselstrasse 19, Postfach 234. Tel: 8517859.
Greece - See Spain.
Hong Kong - Graco Hong Kong, 311-315 Caroline Mansion, 4 Yun Ping Road. Tel: 852-5-76-5411.
Italy - Peter Kruger, Via Brugnatelli 21, 00158 Rome. Tel: 4 50 56 64.
Japan - Gray Company of Japan Ltd., P.O. Box 25, 6-4, 2-Chrome Taishido, Setagaya-Ku, Toyko 154. Tel: (03) 413-2151/9.
Portugal - See Spain.
Scandinavia - Graco, Box 20117, 161 20 Bromma, Sweden. Tel: 46-8-29 85 00.
Spain - Enrique Abraham, Calle Urgel, 278, Barcelona 36. Tel: 321 04 77.
U.S.A. - Graco Inc. (Head Office) 60-11th Avenue N.E., P.O. Box 1441, Minneapolis. Tel: 612/378-6000.

THE ARO CORPORATION

Australia - Mr. Brian Attwood, 90 Ayers Avenue, Daw Park, South Australia 5041.
Austria - Herberts GmbH. & Co., Attemgasse 11, A-1222 Vienna.
Belgium - Aro S.A., Eurolaan 3, 2690 Temse.
Brazil - Ind. e. Comercio Aro do Brasil Ltda., Avenida Tiradentes 1525, 01102 Sao Paulo, S.P.
Denmark - G.A. Hansen, Symfonivej 10, Copenhagen.
Egypt - Habib Co., P.O. Box 498, Cairo.
Finland - Projecta Oy, Nuppulantie 41, 20310 Turku.
France - Aro SARL., 74 Rue Championnet, 75018 Paris.
Germany - Aro GmbH., Postfach 108, Breitschieder Weg. 24, 4030 Ratingen 4.
Greece - A. Romanos Co. Ltd., 'Neplex' Alexandras Av. 46, Athens 707.
Holland - See Belgium.
Hong Kong - Hansching Color + Chemical Co. Ltd., P.O. Box 576, Hunghum, Kowloon.
Italy - Kimatec Spa., Corso Garibaldi, 49, 20121 Milano.
Kuwait - Al-Sabah & Sabawi, P.O. Box 23909, Kuwait.
Malaysia - United Industrial Supplies (M.) Sbn. Bhd., P.O. Box 30, Shah Alam.
Norway - Haakon J. Smith, Lorenvangen 23, P.O. Box 55, Refstad, Oslo 5.
Portugal - Contimetra Inst. Ind. Lda., Rua Braamcamp 88 4° Dt°, Lisboa 1.
Spain - Cramix S.A., Traversia B. del Carmelo # 9 Bilbao.
Sweden - C.A. Clase A.B., Ruskvadersgaten 8, S-417 34 Goteborg.
Switzerland - Alowag, Amerbachstrasse 45, CH-4021, Basel.
Thailand - United Motor Works (Thai.) Ltd., P.O. Box 370, Bangkok.
U.K. - The Aro Corporation U.K. Ltd., East Moons Moat Industrial Estate, Alders Drive, Redditch, Worcs. B98 0RH
U.S.A. - The Aro Corporation, The Aro Centre, Bryan, Ohio 43506.

WAGNER

Argentina - Morwin S.A., Libertad 1136, Villa Ballester, Republica Argentina.
Australia - Wagner Spraytech Australia Pty. Ltd., P.O. Box 9, 556 Swan Street, Burnley, Victoria 3121.
Austria - [illegible] Peter [illegible], [illegible] 22, A-1092 Wien.
Bahrain - [illegible], P.O. Box 5182, Manama.
[illegible] - [illegible] S.A., [illegible] 59, B-1970 [illegible].
[illegible], Rua Arthur Prado 254, Sao Paulo.

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[illegible] - [illegible] Ltd., P.O. Box 2519, Stn. "T", Calgary, Alberta. T2H 4T[illegible]
[illegible] - [illegible] Ltd., P.O. Box 128[illegible], Nigeria.
Denmark - Wagner Spraytech Scandinavia A/S., Industriholmen 45, DK-2650 Hvidovre.
Ecuador - [illegible], P.O. Box 1099, Av. 6 de Diciembre 2368, Quito.
Egypt - [illegible] Arab Technocommercial Co., P.O. Box 786, Cairo.
Finland - Deriva Oy, Takkatie 7 C, SF- 00370 Helsinki 37.
France - J. Wagner - France SARL., B.P. 75, F-91122 Palaiseau, Cedex.
S.E.E., Société d'Expansion Europeenne, 3 Route de Choisy, F-60200 Compiègne.
Germany - J. Wagner GmbH., Postfach 2907, D-799 Friedrichshafen.
Greece - Anotides S.A., Syngrou Ave., Athens T.T. 403.
John Athanasiadis, 24 Aphrodite Street, Thessaloniki.
Grora Ltd., Achanon Str. 315, Athens.
Great Britain - Wagner Spraytech (U.K.) Ltd., Unit 3, Haslemere Way, Tramway Industrial Estate, Banbury, Oxfordshire. OX16 8TY
Powerspray Services, Unit 1, Industrial Estate Bracewell Ave., Poulton-le-Fylde, Lancashire.
Holland - Wagner Spraytech (Nederland) B.V., Zonnebaan 10, NL-3606 C.A. Maarssenbroek.
Hong Kong - Union Company, P O. Box 6958, 605 Tung Ying Bldg., 100 Nathan Road, Kowloon.
Hungary - General Impex, P.O. Box 168, H-1518 Budapest.
Iceland - Iselco S.F., P.O. Box 7074, Armula 32, IS-127 Reykjavik.
Indonesia - P.T. Reiss & Co. Indonesia, Speed Bldg. 1st Floor, Room 127, 18 Jl. Gajah Mada, P.O. Box 3407, Jakarta.
Ireland - Mark Marketing Ltd., 50 C. Robinhood Industrial Estate, Clondalkin, Co. Dublin.
Iran - M. Hossein Karbaschi Traders, P.O. Box 71, 129 Mantaghe 17, Tehran.
Italy - Wagner-Spraytech-Italia SRL., Viale Monza 75, I-20125 Milano.
Jordan - Jordan Sipes Paints Co. Ltd., P.O. Box 276, Amman.
Korea - International Marketing Inc., CPO. Box 3613, Seoul.
Kuwait - Mubarak Al-Ayar Est., P.O. Box 20716, Safat.
Malaysia - Autorex Far East Sdn. Bhd., P.O. Box S-70 Sentul, Kuala Lumpur.
Combat Enterprise, 32-A Jalan Tun Mohd, Fuad Dua, Taman Tun Dr. Ismail, Kuala Lumpur
Malta - Carmelo Gauci, 78 St. Ursola Street, Valletta.
Morocco - Alcayde S.A., 2 Rue de Marseille, B.P. 373, Rabat.
New Zealand - Wagner Spraytech (N.Z.) Ltd., 290 Wakefield St., P.O. Box 907, Wellington.
Norway - Carl F. Myklestad A/S., Nils Hansens Vei 20, N-Oslo 6.
Greiff Maskin A/S., Osterdalsgt.1, N-Oslo 6.
Lauritzen & Thommessen A/S., Hauger Skolevei 18, N-1351 Rud.
Philippines - Genco, 122 Timog Ave., P.O. Box 97, Quezon City.
Portugal - Atlas Copco de Portugal Lda., Apartado 14, P-2796 Linda-a-velha Codex.
Saudi Arabia - Al Naimi Trading & Contracting Est., P.O. Box 647, Al Khobar.
Singapore - Autorex Far East Pte. Ltd., Ghim Moh, P.O. Box 1008, Singapore 9127.
South Africa - Spraying Systems (Pty.) Ltd., P.O. Box 96, Isando 1600.
Spain - Wagner Spraytech Iberica S.A., Crta. N. II, KM 509, Molins de Rey, Barcelona.
Sweden - Sprayway Maskin A.B., Elektravägen 75, S-12612 Stockholm.
Verktygs Luna A.B., Göteborgsvägen 16, S-441 80 Alingsas 1.
Lindahl & Normark GmbH., Dreherstrasse 6, D-5630 Remscheid-Lüttringhausen.
Switzerland - J. Wagner A.G., Postfach 109, CH-9450 Altstätten.
Syria - Mr. Eng. Marwan Fattahi, P.O. Box 2721, Damascus.
Tahiti - Cida-Tahiti S.A., B.P. 154, Papeete.
Bernard Tracqui, B.P. 38, Papeete.
Taiwan - Sequence Co. Ltd., P.O. Box 24-297, Taipei, Taiwan, R.O.C.
Sunshine Industrial Corp., P.O. Box 1517, Taipei, Taiwan, R.O.C.
Everstar Trading Corp., Sunshine Bldg. 2nd Floor, 75 Chan An E. Rd., Sec. 1, P.O. Box 1033, Taipei, Taiwan, R.O.C.
Thailand - Thaimaex Co. Ltd., G.P.O. Box 344, Bangkok.
U.A.E. - [illegible] Trading Co., P.O. Box 1919, Sharjah.
National Trading & General Services Est., P.O. Box 3732, Abu Dhabi.
Uruguay - [illegible] S.R.L., Avenida Brasil 2679, Apartado 901, Montevideo.
U.S.A. - [illegible] Corp. P.O. Box 9[illegible]2, Minneapolis, [illegible]
[illegible] of America, P.O. Box [illegible], 4[illegible]0 [illegible] Road, Greenville, [illegible]

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[illegible] OF AIRLESS PUMPS AND GUNS

Condition	Cause	Remedy
1. Irregular operation or reduced fluid flow.	1. Worn tube packing nuts. 2. Worn inlet valve ball or seat. 3. Blocked fluid filter. 4. Gun malfunction. 5. Worn piston.	1. Replace. Ensure new packings are replaced in same order. 2. Replace ball or seat or remove obstruction. 3. Remove, strip and clean thoroughly. Ensure filter screen is clean (see notes on page 2). 4. Refer to spray gun guide. 5. Replace.
2. Pump will not prime or poor prime.	1. Air entrapment in fluid passages or line. 2. Fluid inlet valve stuck with dried material.	1. Purge by triggering gun. 2. Unseat with fingers and clean. To prevent further repeat of problem always smear with petroleum jelly i.e. Vaseline after cleaning.
3. Pressure on gauge but no pressure at gun.	1. Fluid line clogged. 2. Pump binding.	1. Thoroughly clean. 2. See pump binding below.
4. Pump binding.	1. Tube assembly blocked with dirt, paint skins or foreign matter. 2. Dried paint in tube assembly. 3. Using incompatible materials or solvents without very thorough cleaning between use. i.e. Following water based materials with solvent based and reduced materials.	1. Strain materials before use if in doubt. 2. Clean thoroughly. 3. Thoroughly flush and clean out unit when changing materials. See Cleaning Operation.
5. Unit stops while not spraying.	1. On air assisted motor units has the air supply ceased? 2. On oil hydraulic circuits if the unit is left running for long periods whilst not spraying during hot periods the oil will overheat and break the thermal cut-out. 3. Dirty air filter causing oil in hydraulic circuit to overheat because of lack of cooling air.	1. Check compressor or air supply. 2. Allow to cool. Press manual re-start button. Do not allow to over run if operating in hot conditions. 3. Check filter, clean or replace. Press manual re-start button.
6. Pump air motor freezing.	1. Too high a cycling rate causing ice formation.	1. Limit to a max. of 130 cycles per minute, less under conditions of high humidity and temperature by reducing air pressure or by reducing tip orifice size.

[illegible] - SAFETY FIRST

1. Before commencing to rectify the above conditions STOP, THINK, SWITCH OFF ELECTRICS OR AIR SUPPLY.
2. If the unit has partially operated the system may be under pressure. See operating instructions.

H. MARCEL GUEST LIMITED

WORKS & ACCOUNTS: RIVERSIDE WORKS - COLLYHURST ROAD - MANCHESTER M10 7RU
Telephone: 061 205 5551 (3 lines) Telegrams: 'Hermetical' Manchester

REGISTERED IN ENGLAND
REGISTRATION No. 258148
V.A.T. REG. No. 145 1584 71

QUOTATION
ACKNOWLEDGMENT OF ORDER

OUR REF SF/MLN DATE 17.7.84

RECEIVED
18 JUL 1984

Electro Gas Systems
2 Chapel Street
Cheadle
Cheshire SK8 1BR

Attention: Mr. Wheeler

Dear Mr. Wheeler

Further to our recent conversations, I have pleasure in quoting as follows:

1. Standathane - Mixing ratio 3 Base 1 Hardener

List price Base per litre	£4.97 litre
1 x 200 lt drum White Base	£3.23 litre - 35% discount
3 x 200 lt drum White Base	£2.90 litre - 35% + 10% discount
List price Hardener per litre	£6.85 litre
1 x 67 lt (sufficient for 200 lt Base)	£4.11 litre - 40% discount
1 x 200 lt (sufficient for 3 x 200 lt Base)	£3.70 litre - 40% + 10% discount

2. Superthane - Mixing ratio 7 Base 3 Hardener

List price Base per litre	£6.77
1 x 200 lt drum White Gloss	£4.40 - 35% discount
3 x 200 lt drum White Gloss	£3.96 litre - 35% + 10% discount
List price Hardener per litre	£9.48 litre
86 ltrs (sufficient for 200 lt Base)	£5.68 litre - 40% discount
258 ltrs (sufficient for 3 x 200 lt Base)	£5.11 litre - 40% + 10% discount

3. Conguard (Water Based Epoxy) Mixing ratio 4:1 Base 1 Hardener

List price per litre (Base + Hardener)	£5.41 litre
Less than 200 litres (Hardener	£3.79 litre - 30% discount
1 x 200 litres	£3.51 litre - 35% discount
3 x 200 litres	£3.16 litre - 35% + 10% discount

Yours sincerely

Stephen Folder
H MARCEL GUEST LIMITED

GENERAL CONDITIONS OF SALE

1. Application of Conditions: These Conditions together with the Company's [illegible] the whole contract between the Company and the Customer and supersede any contract form or set of conditions sent by the Customer to the Company. No subsequent variation shall bind either party unless it is in writing and signed by the party to be bound. Unless otherwise agreed in writing by the Company, all goods supplied by the Company are supplied only on these conditions and the giving by the Customer of any delivery instructions for the goods or the acceptance by the Customer of the delivery of the goods after receipt by the Customer of this document shall constitute unqualified acceptance by the Customer of these conditions.

2. Waiver: In the event of any waiver concession or latitude allowed by the Company [illegible] any of its rights under this contract or any delay by the Company in exercising any such rights, this shall not in any way prejudice or affect the rights of the Company afterwards to exercise its full rights in strict accordance with the terms of this contract.

3. Delivery: Delivery by the Company to the Customer shall be deemed to take place when the [illegible] to the Customer or when the customer collects them from the Company's premises and the title to the goods and [illegible] Clause [illegible] the risk of any loss of or damage to the goods shall thereupon [illegible] from the Company to the Customer.

4. Instalment deliveries: Where more than one consignment of goods is to be delivered by the Company to the Customer, each consignment shall be deemed to be a separate contract. Failure by the Company to deliver any consignment or delay in delivering any consignment shall not relieve the Customer from its obligation to accept and pay for subsequent consignments.

5. Prices: If between the date of this contract and the date of any delivery thereunder the Company's costs or expenses in respect of that delivery shall increase due to [illegible] foreseen by the Company as at the date of this contract, the Company shall be entitled to charge the Customer with the amount of that increase (the Company's decision as to the existence, cause, foreseeability and amount of such increase shall be final).

6. Payment and discount: Unless otherwise stated in a written quotation payment in respect of each consignment shall be made not later than the last day of the [illegible] in which such consignment is delivered by the Company. The Company shall be entitled to charge interest at the same rate as the [illegible] by National Westminster Bank Limited for the purpose of [illegible] charged by [illegible] to its customers, on any monies [illegible] for so long as such monies are unpaid.

7. Default by Customer: The Company may, without prejudice to any other rights [illegible] which it may have in such event, terminate this contract [illegible] cancel or suspend any one or more deliveries to be made under this contract or under any other contract or contracts made between the Company and the Customer in the event of non-payment of any sum due under this contract or any other such contract or any instalment thereof or of any breach [illegible] of any term of this contract on the part of the Customer. [illegible] Company under this or any other contract are payable without any [illegible] any sums [illegible] due by the Company to the Customer and the Customer may not bring any claim against the Company [illegible] in arrears in payment of the Company's invoices. In the event of cancellation the customer shall pay to the company all loss of any kind suffered by the company including loss of profit.

8. Responsibilities of the Company: The Company will be prepared to consider claims whether these are in respect of matters for which it is liable or not provided the claims are made within the times specified in Clause 9 hereof. The responsibility of the Company for the due performance of this contract shall however be limited as follows:

(1) Any description or specification of the goods shall be subject to reasonable commercial [illegible] and the Company does not warrant exact compliance.

(2) Save as aforesaid all conditions and warranties express and implied, as to [illegible] and otherwise as to the quality condition or fitness for purpose of the goods are hereby excluded.

(3) If the Company is unable to deliver any consignment by reason of any circumstances [illegible] delivery of a consignment is delayed for any reason whatsoever,

(a) The Company may suspend delivery for such period as it deems necessary [illegible] of the contract.

(b) the Company is not liable to the customer for non-delivery, [illegible] and the Customer is not entitled to [illegible] in respect thereof.

(c) the customer may not cancel the contract without the written consent of the company.

(d) the company's decision on the existence, nature and length of any reason for [illegible] delivery or delay in delivery shall be final.

(4) In any case where the Company has agreed to transport the goods to the Customer's premises the Company shall not be liable for any loss or damage [illegible] caused by the negligence of the Company or its servants or by any [illegible] employed by the Company. The burden of proving such negligence shall be on the customer.

(5) The liability of the Company under this contract shall in no case exceed the price [illegible] payable by the customer to the Company for the goods proved to be defective. The Company may, at its option discharge in full or part any liability to the customer by supplying goods in replacement. The Company shall not be liable to the customer for consequential or indirect loss of any kind, however arising, sustained by the customer as a result of any breach of whatsoever nature or non-observance of any term [illegible] the terms is fundamentally of this contract on the part of the Company even if occasioned by omission or negligence of the Company its servants or agents. Without prejudice to the generality of the foregoing the Company is not liable for any loss damage or injury other than any liability under these Conditions to replace any faulty goods or pay to the customer their value.

9. Time limits for claims: Claims in respect of partial loss or damage in transit must be endorsed on the carrier's [illegible] and in addition must be made in writing to the carrier and the company within three [illegible] of the arrival of goods at the Customer's premises. If the whole consignment is lost a claim in writing must be made to the carrier and the company within [illegible] of receipt by the customer of an invoice or of a notice that the goods have been despatched. In the absence of such claims the goods shall be [illegible] to have been delivered in accordance with the contract. All other claims against the company under this contract must be made in writing within thirty days of receipt of the goods by the customer or, in the case of defects which could not reasonably be discovered by careful inspection of the goods upon their arrival at the customer's premises, within thirty days of discovery of such defects by the customer or within three months of the delivery of the goods if such period be shorter. Any claims not made as aforesaid shall be deemed to have been waived by the customer and the company shall be under no liability in respect thereof.

10. Indemnities: The customer shall indemnify the company against all and any liabilities which the company may incur to third parties and against all claims which may be made by third parties [illegible] incurred by the Company in respect of such liabilities [illegible] the goods in any way whatsoever [illegible] goods is made to the customer's specification of any patents registered designs, trade marks or other rights belonging to third parties.

11. Patterns supplied by the Customer: Where [illegible] are supplied by the customer for use in supplying the goods sold or supplied by the company the company shall not be responsible for the loss of or the [illegible] ance of such patterns or for any damage which they may [illegible] while in the possession of the Company even if such loss [illegible] the necessity for repair or maintenance result from the act or neglect of the company its servants or agents.

12. Any samples or [illegible] supplied to the Customer shall be accepted by the Customer as such [illegible] only for the [illegible] of the Customer and as not in any way imposing any express or implied conditions or warranties as to quality description [illegible] and the Customer shall be deemed to have satisfied itself on all such matters prior to ordering the goods.

13. If the Customer shall make or offer to make any arrangement or composition with his creditors or commit any act of bankruptcy or if any distress or execution shall be levied upon the Customer's property or assets, or if any petition or receiving order in bankruptcy shall be presented or made against the Customer, or where the Customer is a Limited Company and any resolution or petition to wind it up shall be passed or presented, or if a Receiver of the Customer's undertaking, property or assets or any part thereof shall be appointed the Company shall have the right [illegible] with the Customer then subsisting and to cancel any outstanding deliveries and to stop any goods in transit; but without prejudice to the Company's right to any unpaid [illegible] and to any damages for any loss suffered in consequence thereof.

14. The Company shall not be responsible for and shall be indemnified by the Customer [illegible] any claims for any damage or injury to persons or property caused by, arising from or attributable, directly or indirectly to the use, handling or application of the goods, or the conditions [illegible] in which the goods are supplied and in particular the Customer shall [illegible] in such circumstances for any consequential damage or loss of profit whether arising in contract or tort or otherwise.

15. The Customer undertakes to ensure full compliance by his servants, employees [illegible] with any safety precautions [illegible] and relevant [illegible] concerning the safe handling of the goods [illegible] to ensure compliance with to prevent injury to the health and safety of any person or specifically given by the Company and the Customer undertakes to take all such other steps as having regard to the nature of the goods are necessary to preserve the health and safety of persons handling them or using them or (if such is the case) as are likely to have their health and safety adversely affected by the handling or use of the goods.

16. General: If any clause in these conditions [illegible] matter which is repugnant to any extent to any legislation governing this contract or to any matter in the Quotation such clause shall be treated as null and void to the extent that it is invalidated by such legislation but no further.

17. Proper law: This contract shall be deemed to be made in England and to be governed by and construed in accordance with English law.

18. Arbitration: All disputes from time to time arising out of or in connection with this contract including the [illegible] or construction thereof shall be referred to the arbitrament of a single Arbitrator to be appointed in default of agreement and at the written request of either party by the President for the time being of the Manchester Chamber of Commerce in accordance with the provisions of the Arbitration Act 1950 or any statutory modification or re-enactment thereof for the time being in force.

WORKS & ACCOUNTS: RIVERSIDE WORKS - COLLYHURST ROAD - MANCHESTER M10 7RU
Telephone: 061 205 5551 (3 Lines) · Telegrams: 'Hermetical' Manchester

REGISTERED IN ENGLAND
REGISTRATION No. [illegible]
V.A.T. REG. No. 145 1564 71

QUOTATION
ACKNOWLEDGMENT OF ORDER

OUR REF JMA/MBH

DATE 26 July 1984

Electro Gas Systems Ltd.,
2 Chapel Street,
CHEADLE,
Cheshire. SK8 1BR

For the attention of Mr. R. Whellan.

Dear Sir,

Thank you for your enquiry of 26th July, 1984, and in reply quote as follows:-

EPILIFE 2 PACK EPOXY

Standard Colours	per 4 ltr.	£20.95
Reds	per 4 ltr.	£24.49
Metallics	per 4 ltr.	£26.68

EPILIFE PRIMERS 2 PACK EPOXY

Red Oxide & Zinc Chromate	per 5 ltr.	£21.88
Zinc Phosphate	per 5 ltr.	£21.47
Epilife Thinners	per 5 ltr.	£06.00
Concrete Sealer	per 5 ltr.	£16.88

Yours faithfully,
H. MARCEL GUEST LTD.,

ALL LESS 35%.

J. Ansell

J. A. Ansell. (Mrs).

Encs.

MANUFACTURERS OF CELLULOSE LACQUERS, SYNTHETIC, [illegible] ... VARNISH

H.M.G. ADHESIVES
SPECIALISED POLYURETHANE - EPOXY - POLYESTER FINISHES

GENERAL CONDITIONS OF SALE

1. Application of Conditions: These Conditions together with the Company's [illegible] the whole contract between the Company and the Customer and supersede any contract form or set of conditions sent by the Customer [illegible]. No subsequent variation shall bind either party unless it is made in writing and signed by the party to be bound. Unless otherwise agreed in writing by the Company, all goods supplied by the Company are supplied only on these conditions and the giving by the Customer of any delivery instructions for the goods or the acceptance by the Customer of the delivery of the goods after receipt by the Customer of this document shall constitute unqualified acceptance by the Customer of these conditions.

2. Waiver: In the event of any waiver concession or latitude allowed by the Company or any of its rights under this contract or any delay by the Company in exercising any such rights, this shall not in any way prejudice or affect the right of the Company afterwards to exercise its full rights in strict accordance with the terms of this contract.

3. Delivery: Delivery by the Company to the Customer shall be deemed to take place when goods are consigned to the Customer or when the customer collects them from the Company's premises and the title to the goods and (subject to Clause 8 [illegible]) the risk of any loss of or damage to the goods shall thereupon pass from the Company to the Customer.

4. Instalment deliveries: Where more than one consignment of goods is to be delivered by the Company to the Customer, each consignment shall be deemed to be a separate contract. Failure by the Company to deliver any consignment or delay in delivering any consignment shall not relieve the Customer from its obligation to accept and pay for subsequent consignments.

5. Price: If between the date of this contract and the date of any delivery thereunder the Company's costs or expenses in respect of that delivery shall increase [illegible] not foreseen by the Company as at the date of this contract, the Company shall be entitled to charge the Customer with the amount of that increase (the Company's decision as to the existence, cause, foreseeability and amount of such increase shall be final).

6. Payment and discount: Unless otherwise stated in a written quotation payment in respect of each consignment shall be made not later than the last day of the calendar month following that in which such consignment is delivered by the Company. The Company shall be entitled to charge interest at the same rate as [illegible] Bank Limited [illegible] the purpose of [illegible] the rates charged by such Bank to its customers, on any monies owed to the Company and unpaid by a customer for so long as such monies are unpaid.

7. Default by Customer: The Company may, without prejudice to any other rights and remedies which it may have in such event, terminate this contract or at its option cancel or suspend any one or more deliveries to be made under this contract or under any other contract or contracts made between the Company and the customer in the event of non-payment of any sum due under this contract or any other such contract or any [illegible] thereof or of any breach or non-observance of any term of this contract on the part of the Customer. [illegible] due to the Company under this or any other contract are payable [illegible] any sums allegedly due by the Company to the Customer and the Customer may not bring [illegible] the Company [illegible] the Company's [illegible] the customer shall pay to the Company all loss of any kind suffered by the company, including loss of profit.

8. Responsibilities of the Company: The Company will be prepared to consider [illegible] in respect of matters for which it is liable or not provided such claims are made within the times specified in Clause 9 [illegible] of the Company for the due performance of [illegible] shall however be [illegible].

(1) Any [illegible] shall be subject to reasonable [illegible] and the Company does not warrant exact compliance.

(2) [illegible] all conditions and warranties express and implied, as [illegible] by statute and [illegible] the quality condition or fitness for purpose of the goods are hereby excluded.

(3) If the Company is unable to deliver any consignment by reason of any circumstances beyond its control or if delivery of a consignment is delayed for any reason whatsoever,

(a) The company may suspend delivery for such period as it deems necessary or may cancel the contract.

(b) the company is not liable to the customer for non-delivery, non-shipment or delay; and the customer is not entitled to damages in respect thereof.

(c) the customer may not cancel the contract without the written consent of the company.

(d) the company's decision on the existency cause and length of any reason for inability to deliver or delay in delivery shall be final.

(4) In any case where the Company has agreed to transport the goods to the Customer's premises the Company shall not be liable for any loss or damage in transit unless caused by the negligence of the Company or its servants or by any sub-contractor [illegible] by the Company. The burden of proving such negligence shall be on the customer.

(5) The liability of the Company under this contract shall in no case exceed the price paid or payable by the customer to the Company for the goods [illegible]. The Company [illegible] in full or part any [illegible] to the customer by supplying goods in replacement at. The Company shall not be liable to the customer for consequential or indirect loss of any kind, however arising, sustained by the customer as a result of any breach of whatsoever nature or non-observance of any term (whether or not the term is fundamental) of this contract on the part of the Company even if occasioned by omission or negligence of the Company its servants or agents. Without prejudice to the generality of the foregoing the Company is not liable for any loss damage or injury other than any liability under these Conditions to replace any faulty goods or pay to the customer their value.

9. Time limits for claims: Claims in respect of partial loss or damage in transit must be endorsed on the carrier's receipt and in addition must be made in writing to the carrier and the company within three days of the arrival of goods at the Customer's premises. If the whole consignment is lost a claim in writing must be made to the carrier and the company within seven days of receipt by the customer of an invoice or of a notice that the goods have been despatched. In the absence of such claims the goods shall be deemed to have been delivered in accordance with the contract. All other claims against the company under this contract must be made in writing within thirty days of receipt of the goods by the customer or, in the case of defects which could not reasonably be discovered by careful inspection of the goods upon their arrival at the customer's premises, within thirty days of discovery of such defects by the customer or within three months of the delivery of the goods if such period be shorter. Any claims not made as aforesaid shall be deemed to have been waived by the customer and the company shall be under no liability in respect thereof.

10. Indemnities: The customer shall indemnify the company against all and any liabilities which the company may incur to third parties and against all claims which may be made by third parties and the costs and expenses incurred by the Company in respect of such liabilities and claims in connection with the goods in any way whatsoever including infringement or alleged infringement by goods made to the customer's specification of any patents, registered designs, trade marks or other rights belonging to third parties.

11. Patterns supplied by the Customer: Where patterns are supplied by the customer for use in [illegible] the goods [illegible] by the company the company shall not be responsible for the loss of or the repair or maintenance of such patterns or for any damage which they may sustain while in the possession of the Company even if such loss or damage or the necessity for repair or maintenance results from the act or neglect of the company its servants or agents.

12. Any samples or shade cards supplied to the Customer shall be accepted by the Customer as supplied only for the information of the Customer and as not in any way importing any express or implied conditions or warranties as to quality description colour fitness or merchantable quality as the Customer shall be deemed to have satisfied itself on all such matters prior to ordering the goods.

13. If the Customer shall make or offer to make any arrangement or composition with his creditors or commit any act of bankruptcy, or if any distress of execution shall be levied upon the Customer's property or assets, or if any petition or receiving order in bankruptcy shall be presented or made against the Customer, or where the Customer is a Limited Company and any resolution or petition to wind it up shall be passed or presented, or if a Receiver of the Customer's undertaking, property or assets or any part thereof shall be appointed the Company shall have the right forthwith to terminate any contract with the Customer then subsisting and to cancel any outstanding delivery or deliveries and to stop any goods in transit; but without prejudice to the Company's right to any unpaid [illegible] goods delivered and to any damages for any loss suffered in consequence thereof.

14. The Company shall not be responsible for and shall be indemnified by the Customer against any claims for any damage or injury to persons or property caused by, arising from or attributable directly or indirectly to the [illegible] or application of the goods or the containers or packages in which the goods are supplied and in particular the Customer shall not be liable in such circumstances for any consequential damage or loss of profit whether arising in contract or tort or otherwise.

15. The Customer undertakes to ensure full compliance by his servants employees and agents with any safety precautions instructions and relevant legislation for and concerning the safe handling of the goods which it is appropriate for the Customer to ensure compliance with to prevent injury to the health and safety of any person or specifically given by the Company and the Customer undertakes to take all such other steps as, having regard to the nature of the goods, are necessary to preserve the health and safety of persons handling them or utilising them (if such is the case) as are likely to have their health and safety adversely affected by the handling or use of the goods.

16. General: If any clause in these conditions contains matter which is repugnant to any extent to any legislation governing this contract or to any matter in the Quotation such clause shall be treated as null and void to the extent that it is invalidated by such legislation but no further.

17. Proper law: This contract shall be deemed to be made in England and to be governed by and construed in accordance with English law.

18. Arbitration: All disputes from time to time arising out of or in connection with this contract including the subject matter or construction thereof shall be referred to the arbitrament of a single Arbitrator to be appointed in default of agreement and at the written request of either party by The President for the time being of the Manchester Chamber of Commerce in accordance with the provisions of the Arbitration Act 19[illegible] or any statutory modification or re-enactment thereof for the time being in force.

RIVERSIDE WORKS - COLLYHURST ROAD - MANCHESTER M10 7RU Telephone: 061-205 5551

REGISTERED IN ENGLAND
REGISTRATION No. 251148
V.A.T. REG. No. 145 1584 71

OUR REF/DEPT. KC/MRR TECH. SERVICE

YOUR REF

DATE 24th July, 1984.

Electro Gas Systems
2 Chapel Street,
Cheadle,
Cheshire,
2K8 1BR.

25 JUL 1984

For the attention of Mr. Whellan

Dear Mr. Whellan,

With reference to our telephone conversation of today, 24th July 1984. We have pleasure in forwarding to you, all our relevant Health & Safety data on the two products in question i.e. Standathane and Superthane. These products would be the same in all Health & Safety factors so should be treated in the same way regarding application.

We would see no problems in respect of the isocyanate factor when these products are either brushed or roller coated. If however, they are to be sprayed; the necessary Health & Safety requirements are listed in our leaflet JD/11/77 ISOCYANATES CODE OF PRACTICE.

It would be essential that adequate ventilation conditions are observed both during and for a period after application, in order to remove all solvent vapours. It may therefore require air moving equipment at point of application to facilitate these requirements.

The solvents utilised in the Standathane and Superthane are an aromatic hydrocarbon blended with a propylene glycol ether ester. This latter solvent we have chosen to use, is the latest "SAFE" alternative to the previously used ethylene glycol ether solvent. Enclosed Health & Safety Data on these solvents.

Flashpoints on mixed systems: Standathane and Superthane will be $22^{\circ}C - 32^{\circ}C$.

Shipments of the paint products would require good packaging and provided no damage is incurred to the containers the shelf life of the products should exceed six months. The products would require reasonable shipment and storage conditions prior to use on site.

Cont/d.....

Electro Gas Systems 24.7.84.

We would mention that the SUPERTHANE SYSTEM is being used by Howarth Air Filtration for use on air filtration units used in hospital operating rooms and intensive care units, this therefore may help your clients decide on a system for the Clean Room installation.

We trust this information is of help to you and assure you of our best attention at all times.

Yours faithfully,
H. Marcel Guest Limited.

K. Carney
Technical Service Manager

Enclosures.

H.M.G. PAINTS

WORKS & ACCOUNTS: RIVERSIDE WORKS, COLLYHURST ROAD, MANCHESTER, M10 7RU

Telephone: 061-205 5551 (3 lines) Telegrams: 'Hermetical' Manchester

INFORMATION

SUPERTHANE

"SUPERTHANE" is a two-pack Polyurethane coating giving a performance previously unobtainable with surface coatings, offering new standards in:

WEATHER RESISTANCE
GLOSS RETENTION
COLOUR RETENTION
SOLVENT RESISTANCE
DOES NOT RETAIN DIRT
ABRASION RESISTANCE
WIDE RANGE OF CHEMICAL RESISTANCE

"SUPERTHANE" ...ers the highest possible quality finishes for use on ferrous and non-ferrous metals, wood, various plastics, concrete, asbestos, etc.

Standard finishing procedure is as follows:

Ferrous Metals:

1. Blasting — Light ferrous metals, fully clean and degrease.
2. Prime — Polykote Primer or Epi-Life Primer, overcoat not greater than 24 hours.
3. Finishing coats — Applied at no greater than 24-hour intervals.

Non-Ferrous:

1. Fully cleaned.
2. Two-pack Etch Primer.
3. Prime as ferrous metals.
4. Finishing coats.

Concrete/Asbestos:

1. Rough surface.
2. Prime with Protathane.
3. Overcoat with Polykote Primer within 24 hours.
4. Apply finishing coats no greater than 24-hour intervals.

Wood:

1. Prime with Protathane — overcoat within 24 hours.
2. Polyurethane Undercoat (for wood).
3. Apply finishing coats no greater than 24 hours.

Force drying can be used if preceded by a flash-off period of 10–15 minutes, e.g., 90 minutes at 80°C, 30 minutes at 120°C., above this yellowing may occur.

Overcoating must take place immediately the article has cooled if forced drying is used.

"SUPERTHANE" is a fairly slow drying system, being dust free in 2–4 hours, firm dry in 24 hours. Fully cured in 5 days at 20°C.

It can be subject to normal exposure to the atmosphere after reaching the firm dry stage, i.e., 24 hours after the application of the final coat, but must be allowed at least 5 days to cure if it is to be subjected to chemical or harsh abrasive conditions.

NOTES

"SUPERTHANE" finds application where the best possible finishes are required e.g. Ship Superstructures, Bridges, Aircraft, High-Quality Structural Steelwork, Food Storage Warehouses, Abattoirs, Hospitals, all structures in chemical or abrasive environments, Railway Rolling Stock, Road Tankers, High-Quality Commercial Vehicles, Building Facings, protection of bright metal surfaces with Clear Superthane.

"SUPERTHANE" is finding increased usage in refinishing in all the previously mentioned fields, it being found in many cases all that is necessary, sound previously painted panels, surfaces, is to flat down and apply either Polyurethane Undercoat or HMG Oil-Sound Filler and then apply the finishing coats in the normal recommended manner.

"SUPERTHANE" is, as stated, a two-pack material with a shelf life of 6–12 months when left in the original container, and a pot life of 6–12 hours after mixing.

All equipment must be fully cleaned with special cleaning solvent immediately after use.

SD/TV/28/12/78
UPDATED KC/TV/14/4/80

FOOTNOTE:
The information given in this leaflet is given in good faith, but customers should carry out their own trials to determine the suiability of the product for a particular application.

Viscosity (Base Lacquer) as supplied: 80 to 90 seconds (No. 4 BS Flow Cup)

Flash Point (Base Lacquer): 22 to 33°C (72 to 92°F)

Flash Point (Hardener-Ordinary): 22 to 33°C (72 to 92°F)

Flash Point (Hardener-Rapid): 5°C (23°F)

PROPERTIES

The outstanding characteristics of "STANDATHANE" are really remarkable mechanical properties such as hardness, flexibility and toughness, scratch and abrasion resistance. Combined with these features are excellent resistance to corrosion and also to water and aqueous solutions of many acids and alkalis. Resistance to heat of "STANDATHANE" is also very good up to about 250°C (482°F) and although discoloration may be expected on prolonged exposure at that temperature, the film does not fail. Furthermore, whilst "STANDATHANE" is not completely non-flammable in cured films, at the same time it does not assist the spread of flame.

The proportion of hardener (this is a chemical cross-linking agent) is very important and has been carefully worked out to give extreme hardness and flexibility together with high degree of resistance to chemicals and corrosion. Thus it follows that when the two parts - Base Lacquer and Hardener - are blended in readiness for application, the instructions regarding mixing should be followed without variation, incomplete mixing-in of the hardener for instance could lead to uneven cure throughout the film. Likewise, it must be emphasised that, for optimum performance with "STANDATHANE" the recommendations regarding pretreatment and priming, especially with metals, should be followed closely.

APPLICATION

All surfaces should be thoroughly cleaned in the first place. Old paint should be completely removed. Metal surfaces in particular should be completely free of moisture, oil, scale, rust and dirt. Cleaning may be done by shotblasting, alkali bath or TCE vapour degreasing, as appropriate.

When using "STANDATHANE" on metals, full performance, especially in respect of corrosion resistance, can only be obtained by using the correct anti-corrosive primer. Priming on iron and steel is best done with one coat of either "POLYCOTE" Zinc Phosphate Primer or "EPI-LITE" Zinc Rich Primer. (The latter is preferred for heavy-duty industrial environment).

In the case of non-ferrous metals (aluminium, brass, copper, galvanised iron) one coat of HMG Two-Pack Etch Primer is required directly after cleaning followed by one coat of "POLYKOTE" Zinc Chromate Primer and then two coats of "STANDATHANE" finish.

PRE-TREATMENT & PRIMERS

"STANDATHANE" finishes are suitable for application by brush or spray. For brushing, the lacquer should be used as supplied, without the addition of thinner. Spray application requires the addition of HMG Polyurethane Thinner after thorough mixing of the two components. Thinning should be carefully done and the consistency should be checked: this should be 20 to 25 seconds in No. 4 BS Flow Cup. Too high a viscosity leads to difficulties with bubbling and pinholing, too low a viscosity gives rise to poor film build and lack of opacity.

Drying times that may be expected with "STANDATHANE" are 30 to 45 minutes to the touch-dry stage and about six to eight hours to become tack free. Full cure and ultimate hardness and resistance is reached in five to seven days. Overcoating should be done when the film is tack free but, in any event, not longer than 24 hours interval. If a long drying interval between coats is unavoidable, it becomes necessary to flat down the prior coat with fine paper to assist inter-coat adhesion. "STANDATHANE" Rapid Hardener may be used in place of Ordinary Hardener to cut the initial setting-off time but the later hardening and full cure is the same as with "STANDATHANE" Ordinary Hardener.

Since "STANDATHANE" compositions cure by chemical reaction, the cured polyurethane becomes solvent resistant and difficult to remove. Hence it is necessary to clean all spray and mixing equipment directly after use. "STANDATHANE" Two-Pack Polyurethane Thinner is a suitable cleaning mixture.

Finally, moisture in polyurethane is to be avoided at all costs. So when using "STANDATHANE" all equipment must be carefully dried and brushes, spray guns and air lines must be clean and free from traces of water and oil.

PACKAGING & COLOUR RANGE

"STANDATHANE" pigmented finishes are available in the full range of BS4800 Standard Colours. Special shades can also be matched by arrangement.

"STANDATHANE" clear and pigmented finishes are supplied in two parts, packed separately. Part A - Base Lacquer is packed in lever-lid tins of 1, 2 and 4 litre capacity, containing sufficient Base Lacquer to give those actual quantities when mixed with Part B - Hardener, prior to application

WORKS & ACCOUNTS: IRVINSIDE WORKS, COLLYHURST ROAD, MANCHESTER, M10 7RU
Telephone: [illegible] (3 lines) Telegrams: [illegible] Manchester

INFORMATION

PRODUCT

CONGUARD FLOOR COATINGS

Auto Refinishing and Coach Enamels

Industrial Cellulose Lacquers

Industrial (non cellulose) O.A.D. Finishes

Stoving [illegible]
Conventional
Acrylic
Epoxy

[illegible]

[illegible] and Enamels

Coach [illegible]

Decorative Paints

[illegible]

[illegible]

Primers and Fillers — Acid Washes
Etch Primers (1 and 2 pack)

[illegible]

Advantages of using CONGUARD system:

No unpleasant effects of organic solvents (fire hazard, smell)

Normal tap water is the only diluent

Application on humid surfaces is possible

Because of the absence of organic solvents, many sensitive materials can act as a substrate

FLOOR COATINGS:

Especially when the applicator is faced with problems such as humid substrate or a prohibition to use inflammable solvents CONGUARD based coatings is the solution.

Its resistance to chemicals and its mechanical properties facilitates the use for garages, parkings, warehouses, supermarkets etc.

WATER TREATMENT PLANTS:

Concrete basins used in domestic waste water treatment plants and water purification installations can be protected against erosion and corrosion by using the CONGUARD system.

FOOD INDUSTRY:

In food industry, breweries, slaughter-houses, dairies etc, the coating of walls and floors with solvent based paints is often a problem because of the smell and taste retention of solvents. CONGUARD based paints are practically odourless and its resistancy makes its application very interesting

AGRICULTURAL INDUSTRY:

Farmers are often facing protection problems in stables, grass silos etc; the CONGUARD system can often solve these problems satisfactorily.

PROPERTIES:

Pot Life @ 20°c - 1½ - 2 hours
Dust free time (20°c/65% rh) - 3 hours
Hard dry time (20°c/65% rh) - 24 - 26 hrs
Fully cured (20°c/65% rh) - 5 days
Flash Point 110°c.
Coverage rate per litre - app 3 - 4 sq. metres giving approx. 40 microns dry film thickness.

Thinning: If easier brushing is required use approx 100 ml water per litre of mixed CONGUARD.

WARNING:
Water must only be added to the mixed A + B components.

EQUIPMENT CLEANING:

Use warm soapy water

HEALTH & SAFETY

The system is a skin irritant on prolonged or repeated contact and may cause sensitisation. Because of the ready dispersibility of this system in water, it is important to avoid contact with the eyes and skin, protective clothing including goggles or face shield and gloves should be worn.

H.M.G. PAINTS

H. MARDER & CO. LTD.

WORKS & ACCOUNTS: RIVERSIDE WORKS, COLLYHURST ROAD, MANCHESTER, M10 7RU
Telephone: 061-205 5551 (3 lines) Telegrams: "Hermetical" Manchester

INFORMATION

PRODUCT CONCRETE & G.P. SEALER

Auto Refinishing and Coach Enamels

Industrial Cellulose Lacquers

Industrial (non-cellulose) O.A.D. Finishes

Stoving Enamels —
Conventional
Acrylic
Epoxy

Chlorinated Rubber Paints

Brushing Varnishes and Enamels.

Coach Enamels

Decorative Paints

Polyurethanes —
One-pack "POLY K"
One pack "ROTATHANE"
Two-pack "STANDATHANE"
Two-pack "SUPERTHANE"

Air-curing two-pack Acrylic Enamel "ACRYTHANE"

Pretreatments and Primers —
Acid Mordants
Etch Primers (1 and 2 pack)

Anti-corrosives —
Conventional Alkyd
Epoxy
Zinc Rich
Etc., etc.

GENERAL

Moisture cured "CONCRETE & G.P. SEALER is a low viscosity but high solids material developed for use in sealing concrete, asbestos, wood, brickwork, plaster etc.
It can be applied over quite damp surfaces and although it is of a clear lacquer type appearance, it is in essence a "primer coat" offering excellent chemical/solvent/water/petrol/fat and abrasion; it may be overcoated with a wide variety of high performance topcoats.

TECHNICAL DATA

Coverage Rate:
600-800 square feet per 5 litres per coat.
80 sq m.

Viscosity:
Approximately 40 secs B.4 Ford Cup @ 25°c.

Flash Point:
Between 22-33°c

Thinners:
None required - use as supplied.

Cleaning:
H.M.G. Gun Cleaners can be used for cleaning of equipment.

Temperature Resistance:
Up to 200°c

Shelf Life:
12 months in original sealed containers.

USEAGE

Common usage of CONCRETE & G.P. SEALER is in applications over new concrete or bare concrete floors - the floor must be clean although extensive preparation such as scarifying is not necessary.
Application is by brush or roller, the low initial viscosity of the CONCRETE & G.P. SEALER providing maximum wetting effect for thorough penetration and binding of the surface to which it is applied.

cont/d...

Usage cont....

Enough coats are applied to give a "light glaze" to the surface of the concrete. CONCRETE & G.P. SEALER provides excellent resistance against the passage of water and is often used as a "liquid damp course"; also to prevent the passage of water and salts through walls and ceilings etc.

HEALTH & SAFETY

Open the container with care, avoid contact with skin, eyes and clothing. In the interests of protecting our environment, please empty the container and dispose of safely.

Air fed breathing apparatus MUST be worn if spraying this material. Before use see JD 11/77.

H.M.G. PAINTS

H. MARCH GEES LTD.

WORKS & ACCOUNTS: RIVERSIDE WORKS, COLLYHURST ROAD, MANCHESTER, M10 7RU

Telephone: 061-205 5551 (3 lines) Telegrams: 'Hermetical' Manchester

INFORMATION

PRODUCT — ISOCYANATES CODE OF PRACTICE

Auto Refinishing and Coach Enamels

Industrial Cellulose Lacquers

Industrial (non-cellulose) O.A.D. Finishes

Stoving Enamels —
Conventional
Acrylic
Epoxy

Chlorinated Rubber Paints

Brushing Varnishes and Enamels

Coach Enamels

Decorative Paints

Polyurethane —
One-pack "POLY K"
One-pack "PROTATHANE"
Two-pack "STANDATHANE"
Two-pack "SUPERTHANE"

Air-curing two-pack Acrylic Enamel "ACRYTHANE"

Pretreatment and Primers —
Acid Mordants
Etch Primers (1 or 2 pack)

Air-curing
Conversion Coating
Epoxy
Zinc Rich
Etc., etc.

Technical Data Note JD/11/77

PRECAUTIONS IN THE HANDLING AND SPRAYING OF POLYURETHANE PAINT PRODUCTS CONTAINING ISOCYANATES

This Note refers to paints in which an organic isocyanate has been used as a constituent, or is added as part of a two-pack system. The special properties of such paints depend upon the reaction between this isocyanate and a substance providing hydroxyl groups or other reactive hydrogen atoms. In some cases, the substance may be water vapour in the atmosphere.

As with all paints, precautions have to be taken when spraying them, but there are hazards peculiar to these polyurethane paints arising from the use of the isocyanates. Unless proper precautions are taken, there is a potential hazard from the isocyanates because they are respiratory sensitisers. A sensitised person will react to very low concentrations of isocyanates. Symptoms of chest tightness or wheezing may occur, but there is rapid recovery when exposure ceases.

Observation of the following recommendations, together with good standard of industrial hygiene will enable paint products containing isocyanates to be used without risks to health.

1. SELECTION

Persons with a history of asthma should not be engaged in any process which involves the use of isocyanates. Firms engaged in spraying products containing isocyanates are advised to have spray operators medically examined before employing them in this work. Persons showing adverse symptoms should obtain medical advice immediately.

2. PLANT DESIGN

2.1. SPRAY OPERATIONS involving products containing isocyanates should be carried out preferably in suitable spray booths or enclosures under effective exhaust ventilation so that the spray-mist cannot enter the spray operator's breathing zone or escape into the general workroom atmosphere outside the spray booth.

2.2. The exhaust ventilation should be designed so that spray-mist is conducted away to a safe place.

2.3. Air-flow velocities should be sufficient to disperse spray-mists and vapours effectively. Normally an air-flow velocity of 1 metre per second may be considered sufficient.

3. PERSONAL PROTECTION

3.1. When operators, whether spraying or not, have to work inside the spray booth, they should wear compressed airline breathing apparatus — BS 4667: Part 3: 1974 — or other air-fed equipment which provides equivalent protection both during the spraying process and until such time as the spray-mist has cleared.

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3.2. The design of equipment used to supply compressed air to the breathing apparatus should conform to BS 4275: 1974. In particular, care should be taken to ensure that the supply of air to the compressor is drawn from an uncontaminated source and that an efficient oil/water and fume filter is fitted to provide respirable air. Where operators are required to work within the booth an alarm system should be fitted to warn the user of the apparatus whenever the air pressure falls to the minimum safe working level.

3.3. Persons entering the spray booths or enclosures for short periods (less than 15 minutes) when spraying is taking place may be protected from inhaling the spray-mist by wearing suitable respirators to BS 2091: 1969 with type CC canisters. Care should be taken to ensure that filters are changed when necessary.

3.4. Airline breathing apparatus is not essential during short periods of spraying polyurethane paint products on small test panels in quality-control booths. However, an inward air velocity at the face of the booth of not less than 1 metre per second should be provided and a canister respirator to BS 2901 should be worn.

3.5. Persons engaged in handling and mixing these products should wear protective clothing to avoid skin and eye contact. In the event of splashes on the skin or in the eye, wash the affected part with copious amounts of water.

4. SPILLAGE

Accidental spillages should be absorbed on to sand or earth or other inert material. Waste materials collected in this way should be disposed of in accordance with the Deposit of Poisonous Waste Act, 1972.

DO NOT ALLOW the materials to enter any drains.

5. FIRE

Most of the products covered by this Note are subject to the requirements of the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations, 1972, and must be handled and stored accordingly. In the event of fire, fight with foam and take suitable precautions against inhaling combustion products.

BIBLIOGRAPHY

BS 4275 : 1974 - - Recommendations for the selection, use and maintenance of respiratory protective equipment.

BS 2091 : 1969 — Respirators for protection against harmful dust, gases and scheduled agricultural chemicals.

BS 4667 : Part 3 : 1974 — Fresh-air hose and compressed-air line breathing apparatus.
Obtainable from regional sales offices of BSI; orders by post should be addressed to: BSI Sales Department, 101 Pentonville Road, London, N1 9ND.

Deposit of Poisonous Waste Act, 1972 — Highly Flammable Liquids and Liquefied Petroleum Gases Regulations, 1972. SI 1972, No. 917.
Obtainable from HMSO.

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Guidance Note EH 16
from the
Health and Safety
Executive

Isocyanates: toxic hazards and precautions

Environmental Hygiene EH 16 (revised March 1984)

These Guidance Notes are published under five subject headings: Medical, Environmental Hygiene, Chemical Safety, Plant and Machinery and General.

INTRODUCTION

1 Isocyanates are basic constituents used in the production of polyurethanes. Polyurethanes can be used in the form of flexible and rigid foams, in the manufacture of synthetic rubbers, in the production of paints and varnishes, and for many other purposes.

2 This Guidance Note deals with the possible health hazards arising from the use of isocyanates and from certain processes where isocyanates may be liberated during processes involving polyurethanes. The fire risks associated with the storage and use of polyurethane foam are not dealt with. Health and Safety Executive (HSE) guidance on the fire risks and their control is given in the booklet HS(G)1 *Safe use and storage of flexible polyurethane foam in industry* and in the Guidance Note GS3 *Fire risk in the storage and industrial use of cellular plastics.*

CHEMISTRY

3 An isocyanate may be represented by the general formula R–N=C=O. It reacts with the hydroxyl group of an alcohol to form a urethane thus:

$$R{-}NCO + R'OH \rightarrow R{-}NHCOOR'$$

In the production of a polyurethane resin the reaction is generally between a di-isocyanate and a polymeric hydroxyl compound such as a polyether or polyester resin. The reaction (exothermic) then becomes:

$$OCN{-}R{-}NCO + 2\ HOR'OH \rightarrow HO{-}R'COONH{-}R{-}NHCOOR'{-}OH \rightarrow \text{further reactions.}$$

Catalysts such as tertiary aliphatic amines and organo-tin derivatives are normally added to initiate the reaction.

4 Details of the more commonly encountered isocyanate compounds are given in para 26.

TOXIC EFFECTS

5 In sufficiently high concentrations, isocyanates have a primary irritant effect on the respiratory tract, causing dry throat and coughing. Asthmatic attacks may result and may occur immediately on exposure or some hours later. Some workers may become sensitised and may exhibit asthmatic symptoms when subsequently exposed to atmospheric concentrations well below the Control Limit. There is evidence that susceptible persons who are repeatedly exposed to isocyanates may suffer impairment of ventilatory function even in the absence of complaint and may even develop interstitial pulmonary fibrosis. In cases of severe overexposure, delayed pulmonary oedema can develop which in rare instances may prove fatal.

6 Isocyanate splashed in the eyes may cause severe chemical conjunctivitis. Isocyanates are usually mild skin irritants and may cause dermatitis. Sensitisation of the skin may occur, but this is rare.

CONTROL LIMIT

7 The Control Limit for the exposure of persons at work to all isocyanate compounds is expressed in terms of the airborne concentration of free isocyanate (–NCO) groups and is as follows:

0.02 mg (–NCO) m^{-3}, 8 hour time weighted average, and
0.07 mg (–NCO) m^{-3}, 10 minute time weighted average.

The Control Limit came into effect on 1 February 1983.

8 The Control Limit was adopted by the Health and Safety Commission (HSC) after detailed consideration of the available scientific medical and technical evidence by the HSC's Advisory Committee on Toxic Substances. All exposure to isocyanates should be kept as low as is reasonably practicable and the Control Limit should not normally be exceeded. In circumstances where other control measures cannot provide adequate protection the use of suitable respiratory protection may be necessary. The section of this Note which gives details of the specific processes which can give rise to an isocyanate hazard (paras 35–74) includes reference to the circumstances where the use of suitable respiratory protection may be necessary.

DETERMINATION OF ENVIRONMENTAL LEVELS

9 A recommended method for the measurement of total isocyanates has been published as MDHS 25 in the series 'Methods for the determination of hazardous substances'. For some species of isocyanates, and in some circumstances of use, methods of measurement other than that described in MDHS 25 may be used. The advice of a competent industrial hygienist as to the suitability of alternative methods should be sought. Where reliance is placed on alternative methods then it should be possible to show that the results obtained are reliable and consistent with those obtained using the recommended method.

10 To ensure that control measures are effective, it is essential that periodic air samples at working positions are taken – for example, toluene di-isocyanate (TDI) is not normally detectable by odour until the concentration reaches 5 to 10 times the Control Limit. Exposure should preferably be monitored by means of personal sampling techniques. If extensive reliance is placed on static sampling, it will be necessary to show that the results obtained can be used to give a reliable estimation of personal exposure.

11 Direct reading instruments are obtainable which respond to airborne concentrations of some isocyanate compounds. Care should be taken in interpreting the readings from such instruments where exposure to mixed isocyanates, isocyanate aerosols or isocyanate dusts occurs. Some direct reading instruments do not respond to all free isocyanates and may underestimate exposures.

MAINTENANCE OF CONTROL MEASURES

12 Where local exhaust ventilation systems or other methods of engineering control are used to reduce the exposure of employees to isocyanates it is essential that the control measures are properly maintained. Regular monitoring of air extraction velocities can be used to detect any fall-off in extraction efficiency so that remedial action can be taken before employees are exposed to excessive levels of isocyanates.

13 Where it is necessary for employees to use respiratory protective equipment and protective clothing it is essential that the equipment is properly maintained. Respiratory protective equipment should be inspected regularly and maintained in accordance with the manufacturer's recommendations. Similarly, protective clothing should be regularly checked and repaired or replaced as necessary. Care should be taken when dealing with contaminated protective clothing (see para 15).

MEDICAL SUPERVISION OF WORKERS

14 Medical supervision of workers who may be exposed to isocyanates is recommended and should include pre-employment and routine medical examinations, re-examination on return to work following a sickness absence and instruction in the first-aid treatment of accidental exposures and contamination. Further information is given in the Guidance Note MS8, *Isocyanates: medical surveillance* and detailed advice may be obtained from HSE's Employment Medical Advisory Service (EMAS).

FIRST AID

15 Splashes of isocyanate on a worker's skin or clothes should receive prompt attention as indicated:

(a) *eyes* – wash out with copious amounts of clean water;

(b) *skin* – wash with soap and water;

(c) *clothing* – remove all contaminated clothing, wash the skin, preferably under a shower with soap and water, then decontaminate and launder the contaminated clothing.

16 Following any cases of gross personal exposure or contamination prompt medical attention should be sought.

RECORDS

17 Records detailing the results of (a) the environmental monitoring (para 9–11), (b) the tests of engineering control measure (para 12) and (c) the inspections of respiratory protective equipment (para 13) should be kept and made available to employees or their representatives on request. The records should include details of the measures taken to correct any defects found by the inspection, tests and monitoring.

18 The results of medical examinations (para 14) should be recorded and made available to employees or their representatives in a form which does not enable the results for specific individuals to be identified.

INSTRUCTION AND TRAINING

19 All employees whose work may involve exposure to isocyanates should be fully and carefully instructed as to the nature of the hazards and the precautions to be observed. Particular attention should be paid to ensuring that employees understand the circumstances in which protective clothing and respiratory protective equipment should be worn. All employees who may have to use respiratory protective equipment should be specifically trained in the use of the equipment supplied and have the limitations of use explained to them. This is particularly important in circumstances where occasional use of canister respirators may occur (see para 22).

PROTECTIVE CLOTHING AND RESPIRATORY PROTECTIVE EQUIPMENT

20 As indicated in para 8 there are some situations where it is not feasible to control isocyanate exposure to levels below the Control Limit by the use of engineering control measures. In such circumstances, some of which are described in paras 35–74, the control measures should be used to reduce exposure levels as far as possible and the employees should be provided with (and use) suitable protective clothing and adequate and suitable respiratory protective equipment.

21 In this context 'suitable protective clothing' should be taken as including impermeable gloves (PVC or synthetic rubber), impermeable aprons or overalls and rubber boots, together with suitable eye protection where appropriate.

22 Respiratory protective equipment should always be adequate in terms of the protection it affords and suitable for the circumstances of use. Such equipment for use when exposed to isocyanates would usually mean a properly designed and fitted full facepiece self-contained or compressed air-line breathing apparatus. In some circumstances half-mask compressed air-line breathing apparatus may be acceptable. Where isocyanates are present in the working atmosphere as vapours only, and if there is no risk of oxygen deficiency, full facepiece canister respirators complying with BS 2091:1969 *Specification for respirators for protection against harmful dusts, gases and scheduled agricultural chemicals,* and fitted with type CC canisters, may be acceptable. Though such respirators are designed to provide adequate protection from vapour concentrations of up to 400 times the Control Limit it is unlikely that such extreme conditions will be encountered in practice, provided that all practicable process and engineering control measures to reduce exposure have been taken. It is essential that the facepiece of such a respirator is a correct fit and that the canister is changed in accordance with the maker's instructions. Air supplied respiratory protective equipment is preferable to the use of respirators when spraying isocyanate paints, lacquers, adhesives etc., due to the possibility of a gradual build up of sticky deposits at canister air intake apertures and in the facepiece inhalation/exhalation valves.

23 It is advisable to provide and use impermeable gloves, aprons and boots where there is a significant risk of skin contamination or spillage of isocyanates even in circumstances where the Control Limit is not likely to be exceeded.

STATUTORY REQUIREMENTS

24 No specific regulations dealing with the use of isocyanates have been made under the Factories Act 1961 or the Health and Safety at Work etc Act 1974. Sections 4 and 63 of the Factories Act require ventilation of workrooms and measures to be taken to protect employed persons against inhalation of injurious dust or fume. There are general duties under Section 2 of the Health and Safety at Work Act relating to the provision of a safe and healthy work environment and the provision of information and training of employees. Section 6 of the same Act relates to the duties of suppliers of substances for use at work.

25 Di-isocyanate works are scheduled works under the Alkali, etc Works Regulations Act 1906, as extended by the Alkali, etc Works Orders 1966 and 1971.

TYPES OF ISOCYANATE COMPOUNDS

26 The most commonly used isocyanate compounds in industry are:

(a) *toluene di-isocyanate (TDI)*
TDI is generally a colourless to pale yellow liquid consisting of a mixture of 2,4 and 2,6 isomers in the proportion of 65 : 35 : or 80 : 20. The former mixture freezes at 8.5°C (47°F) and the latter at 14°C (57°F). It is one of the most volatile di-isocyanates (vapour pressure 0.025 mm Hg at 25°C) in commercial use and is used mainly in the manufacture of flexible polyurethane foams. In view of its relatively high vapour pressure TDI should not be used where it is practicable to use one of the following di-isocyanates which has a lower vapour pressure.

(b) *diphenyl methane di-isocyanate or methylene bisphenyl di-isocyanate (MDI)*
Undistilled commercial (polymeric) grades of MDI are usually dark brown viscous liquids, but MDI may also be found in pure (monomeric) form as a white to pale yellow solid (flakes). Recent developments have produced liquid grades of modified monomeric MDI which although having a high monomer MDI content are still liquid at room temperature. The undistilled liquid form will only solidify below 10°C. The modified grades of pure MDI may solidify below about 15°C and a warm storage area may be necessary. MDI has a very low vapour pressure at room temperature (approx. 0.00009 mm Hg at 25°C). Vapour concentrations in excess of the Control Limit may be produced, however, when MDI is heated to temperatures above 40°C. The most important uses of MDI are in the manufacture of rigid foams, footwear, adhesives, elastomers, microcellular elastomers and seating quality flexible foams. MDI is sometimes called polymethylene polyphenyl isocyanate or PAPI.

polyisocyanates (isocyanate pre-polymers)
Toluene di-isocyanate (TDI), hexamethylene di-isocyanate (HDI) and some other isocyanate monomers can be reacted with substances containing hydroxyl groups, for example a trihydric alcohol, to yield a high

molecular weight triisocyanate with a vapour pressure very much lower than the parent monomer. There are also methods in existence by which monomers can be converted to other types of polyisocyanates such as biurets and isocyanurates. Such polyisocyanates or prepolymers are used extensively in the manufacture of surface coatings, adhesives etc. They are usually solids but are supplied commercially as solutions in non-reactive solvents such as ethyl acetate, cellosolve acetate, xylene, etc. Residual monomer in the solid prepolymer is usually less than 0.5%.

Other isocyanates

27 There are several other isocyanates which at present have only limited applications as monomers. These include:

(a) *1,5-naphthalene di-isocyanate (NDI)*, which is a white powder. It has a very low vapour pressure at normal temperature (0.003 mm Hg at 25°C) but may give rise to a toxic dust hazard. It is used in the production of elastomers;

(b) *hexamethylene di-isocyanate (HDI)*, which is a liquid with a vapour pressure similar to that of TDI (0.05 mm Hg at 25°C);

(c) *isophorone di-isocyanate (IPDI)*, which is a colourless liquid with a low vapour pressure (0.003 mm Hg at 20°C);

(d) *trimethyl-hexamethylene di-isocyanate (TMDI)*, which is a colourless liquid with a low vapour pressure (0.007 mm Hg at 20°C rising to 0.015 mm Hg at 50°C).

STORAGE AND HANDLING OF ISOCYANATES

28 All isocyanates should be stored and handled in ways which minimise the risks of spillage and the generation of vapours or airborne dust into the general atmosphere.

29 When considering the suitability of storage facilities account must be taken of the difficulties which may result from keeping TDI and certain grades of MDI at temperatures which are so low that crystallisation occurs. The provision of a warmed storage area may be advantageous.

30 Where isocyanates in drums have crystallised in cold weather they should be allowed to attain room temperature in a ventilated store inside the workplace. The use of warm water baths or steam chests to thaw out such drums is hazardous and, in general, the application of direct heat to supplier's drum (using electro-thermal heating blankets, for example) is not considered advisable without adequate safeguards to prevent overheating and means to extract isocyanate vapour from the drum to outside atmosphere, via a moisture-trap if necessary. The heating of individual drums should be carried out within an exhausted enclosure and not in the open workroom.

31 The handling of isocyanates in open vessels should be avoided so far as is practicable. For example, liquid isocyanate preparations should be transferred to vessels by pumps or by vacuum techniques. Methods of dip-leg transfer by means of air pressure applied to a supplier's drum are not acceptable as isocyanate vapour may escape. Fully enclosed systems of handling should be used wherever practicable.

32 Mixing, weighing and dispensing operations should, where practicable, be conducted under local exhaust ventilation or in suitable booth enclosures provided with effective exhaust ventilation, especially if heating or spraying is involved, or dust is generated from solid isocyanates.

33 Spillages should be cleared up immediately and adequate supplies of a suitable decontaminant liquid should be readily available for this purpose. One such decontaminant fluid has the following composition (by volume): water (45 parts) industrial methylated spirits or isopropyl alcohol (50 parts) 0.880 concentrated ammonia solution (5 parts). The Highly Flammable Liquids and Liquified Petroleum Gases Regulations 1972 may apply to such mixtures and suitable precautions should be taken as required.

34 Empty isocyanate drums should be decontaminated before disposal by filling them with 5% sodium carbonate solution and leaving them to stand for at least 24 hours with the bungs removed to allow carbon dioxide to escape. The use of the alcohol/ammonia solution is not recommended for routine drum decontamination because of its rapid and vigorous action. Care should be taken to avoid the inhalation of the isocyanate vapour displaced from the drum during filling with the sodium carbonate solution. Where quantities in excess of approximately 5 kg remain in the drum, advice on disposal should be sought from the supplier.

SPECIFIC PROCESSES: TOXIC HAZARDS AND PRECAUTIONS

35 In this section brief details of the hazards and precautions in the following processes are given:

(a) manufacture, flame bonding and hot wire cutting of flexible foam, together with the use of flexible foam to produce moulded articles and reconstituted foam;

(b) spray application and *in situ* production of rigid foam insulation, the use of rigid foam to fill car body cavities, to produce moulded articles, to package articles and to provide bouyancy aids in boats;

(c) production of polyurethane rubbers and elastomers;

(d) use of surface coatings containing isocyanates;

(e) use of printing inks containing isocyanates;

(f) use of adhesives containing isocyanates;

(g) 'cold cure process' for making foundry cores;

(h) soldering of wires varnished with polyurethane.

36 There are many other processes involving isocyanates. Usually the precautions relating to one of the processes listed will be applicable but in case of doubt HSE's local Area Office should be contacted for advice.

Flexible foam

Manufacture of foam block

37 The usual method of manufacture of flexible foam block, using TDI, is the one-shot process. This consists of the direct reaction between the di-isocyanate and a polyhydroxylic compound (polyol) in the presence of an activator system containing a mixture of water, a catalyst, a stabiliser (to regulate the structure of the foam) and organo-metallic compounds to produce rapid gel strength. The water may sometimes be incorporated in the polyol. The function of the activator is to assist the foaming by the evolution of carbon dioxide and its action is normally supplemented by the incorporation of volatile fluorocarbons.

38 The process is generally carried out in a plant consisting essentially of a metering system, a mixing head (commonly known as the foaming head) and a curing tunnel. The TDI, polyol and other components are accurately metered and pumped individually to the mixing head which deposits the mixture on to a paper-lined conveyor. Carbon dioxide, fluorocarbon vapour and TDI fume are evolved as the foam expands and sets. The block formed moves along the curing tunnel which is under exhaust extraction and sometimes incorporates infra-red radiant heating panels. The paper is stripped off and the continuous block cut into standard lengths (often known as 'loaves') which are transferred to a curing warehouse. The loaves are later cut into convenient sizes for various uses, such as in the upholstery and bedding trades.

39 In addition to achieving good general ventilation of workrooms, precautions must be taken to prevent the escape of free isocyanate vapour into the working atmosphere as follows:

(a) bulk storage tanks should be bunded whether situated inside factories or outside in the open air (which is preferable). When sited inside, the tanks should vent to external atmosphere.* If drums of isocyanate are used they should be connected directly to the foam dispensing equipment by permanent rigid pipes and the isocyanate discharged by pump or by other suitable means referred to earlier;

(b) all pumps used for TDI transfer purposes should be well maintained and free from leaks. As an additional precaution, such transfer pumps may be immersed in a non-reacting fluid, e.g. liquid paraffin or phthalate ester. For large installations, main transfer pumps should be 'twinned' to facilitate regular planned maintenance;

(c) a very high standard of enclosure and exhaust ventilation should be provided at the working openings of continuous foam block curing tunnels particularly at the positions where the side and bottom support papers are stripped from the foam block.

40 If entry into a curing tunnel is necessary suitable respiratory protective equipment, as described in para 22, must be used unless all traces of isocyanate vapour have been removed and steps have been taken to prevent their re-entry. For occasional jobs of limited duration a full facepiece canister respirator may be acceptable — see para 22.

41 Sampling from the mixing head for quality control or other purposes should be carried out in such a way as to prevent persons employed from being exposed to isocyanate vapour. If other precautions are impracticable, suitable respiratory protective equipment should be used.

Flame bonding of flexible foam

42 In this process textiles are bonded together by means of a continuous thin sheet of polyurethane foam passed rapidly over a gas-fired strip burner and fed, with the fabrics to be bonded, between water-cooled pressurising rollers. This process is known as 'flame bonding', and depends upon the partial breakdown of the foam structure which gives rise to free isocyanate groups. Effective local exhaust ventilation is required (particularly above the strip burners) to prevent toxic vapours containing free isocyanates from entering the working atmosphere.

Hot-wire cutting of flexible foam

43 The cutting of polyurethane foam by means of a hot wire can cause the breakdown of the urethane linkeages. The concentration of free isocyanate in the fume evolved will depend upon the temperature of the cutting wire and upon the period of contact of the wire with the foam. Temperatures between 300°C and 400°C have been found to cause evolution of free isocyanate.

Manufacture of moulded articles

44 Flexible foam is widely used in the production of shaped articles such as car seats and cushions. The dispensing process is essentially the same as that used to produce foam blocks but the mixing head incorporates an 'on off' device which enables the correct quantity of liquid foam mixture to be delivered into each mould as it travels past the head on a conveyor. The moulds are then closed and pass through a curing tunnel under exhaust extraction.

* Advice on the siting and installation of bulk storage facilities is available from UK suppliers of TDI.

45 In a plant of the type, the main health hazard is at the moulding point. Isocyanate vapour may escape from the mould itself before it is closed and there may be an additional hazard created by the possibility of overrun of the mix at the mixing head. Adequate enclosure and local exhaust ventilation is therefore required at the moulding point and any sampling, cleaning or blowing through of the head should be done within the enclosure. Occasionally isocyanate vapour may be evolved at the mould opening position, and further enclosure under local exhaust ventilation may be required at this point.

Re-constituted foam

46 Off-cuts of flexible foam are chopped into small pieces mixed with TDI and polyol and then compressed into large blocks. The plant consists of a mixing chamber into which chopped foam and a measured quantity of TDI and polyol are fed. After a period of thorough mixing the bottom of the mixing chamber is opened and the mixture falls into large containers. It is then compressed into blocks.

47 The main hazard to health in this process arises from insufficient enclosure of the area into which the mixture falls from the mixing chamber. This area should preferably be completely enclosed on three sides leaving only one side open for the containers to be wheeled out. Exhaust ventilation should be applied to provide an adequate inward flow of air across the open end. The containers should remain in the enclosure long enough to ensure that no isocyanate vapour is evolved when the container is moved out of the enclosure; the period will vary on different plants but can be determined by sampling the atmosphere above the foam after removal from the enclosure. On some plants it has been found necessary to improve the enclosure and ventilation at the point where the TDI is introduced into the mixing chamber.

Rigid foam

Insulation

48 Rigid MDI-based polyurethane foam is frequently used for insulation purposes in the manufacture of freight containers and for the thermal insulation of hot water storage cylinders, tanks, pipes etc. (Less frequently, TDI-based foams have been used for this purpose, and may occasionally still be encountered.) In the case of hot-water storage cylinders the liquid foam mix is usually applied by spraying in a booth or special spray room provided with a high standard of exhaust ventilation. The operators need to wear suitable protective clothing and suitable respiratory protective equipment which should not be removed until it is known that the atmosphere is free from isocyanate vapour or aerosols. In the case of pipe spraying, the mix is sometimes applied to the rotating pipe length by an operator standing outside the enclosure, when an effective inward air velocity across the open working face is essential. Unless air sampling has shown that the isocyanate vapour and aerosols are adequately controlled, the operator should wear suitable respiratory protective equipment.

49 Rigid foams are used extensively for insulation in the manufacture of refrigerators, cold store vehicles, etc. This process consists of injecting the polyurethane mix into the cavity between the inner and outer walls. The foam forms *in situ* and the air escaping from the breather hole generally contains some free isocyanate vapour. The amount evolved is not usually high enough to constitute a significant health hazard provided that the operator stands well away from the breather hole.

50 The plant used to produce rigid foam is sometimes portable or at least mobile and can consist of two pressurised containers connected to a dispensing gun, or can simply be a single canister similar to a large aerosol. The foam may be applied by injection or in the form of a spray. In the two container system the MDI is usually pumped mechanically into the reservoir tank, in which case exhaust ventilation is unnecessary provided that there is good general ventilation and the temperature of the MDI is below 25°C. Where the MDI tank is filled manually it is advisable to do this under a hood with exhaust ventilation. Occasionally the mix used for insulation purposes contains some TDI in which case the appropriate precautions should be taken.

51 Where the mixing/dispensing head needs to be purged occasionally, either by solvent or by compressed air (or by both in succession), the purged stream should be directed into a suitable waste container which is either maintained under effective inward airflow or contained within an extracted enclosure, so that aerosols bearing isocyanate materials are not released into the workroom.

52 When MDI is used in confined spaces such as in ships, or when large units are insulated by spraying, suitable protective clothing and suitable respiratory protective equipment must be used. Where Section 30 of the Factories Act, 1961, applies to such work, approved breathing apparatus must be worn, and respirators are not permissible.

Moulded articles

53 Diphenyl methane di-isocyanate (MDI) is also used to make rigid polyurethane articles in moulds and the plant employed is similar to that used for making flexible foam articles. MDI has a lower vapour pressure than TDI and such high standards of exhaust ventilation and enclosure are not usually necessary. In some processes, however, the MDI is heated and the same precautions as are necessary with TDI should be taken. The precautions outlined in para 51 should be taken when purging the mixing/dispensing head.

Foam filling of car body cavities

54 Certain body cavities in some motor vehicles are filled with polyurethane foam. In premises where this process is carried out on a regular basis a ventilated enclosure should be provided and the operator should, where necessary, wear full protective clothing including suitable respiratory protective equipment. Motor vehicle repairers may occasionally need to replace the foam

Polyurethane rubbers

62 Polyurethane rubbers may be hard or soft. The hard rubbers are generally made from NDI after reacting with polyesters followed by a cross-linking agent such as glycol. Precautions should be taken against the dust hazard when handling solid MDI or NDI, although the latter is often supplied in dust free pellet form and pure MDI may be granular or fused, in which case the dust hazard is negligible. The main toxic hazard is that of vapour when heat is applied although in the case of NDI sublimation might take place. Fused MDI is unlikely to present a dust inhalation hazard but may present a vapour hazard when heated above its melting point e.g. during melting out of drums.

63 The soft rubbers used extensively in the manufacture of printing rollers are generally made from TDI. The tubular moulds are usually filled in the vertical position with the hot fluid elastomer mix delivered via a flexible pipeline into the open upper end. All the usual precautions should be taken, including enclosure, the provision of local exhaust ventilation at the mouldfilling points and the venting of curing ovens to outside atmosphere.

Surface coatings

64 Most polyurethane paints and lacquers are no more hazardous than other paints when applied by brush, roller or dipping at normal room temperature, as they usually contain less than 0.5% of free voltaile isocyanate monomer. Even such low concentrations may produce an adverse reaction in people who have been sensitised. The amount of free isocyanate present depends upon the type of paint and the material from which it is manufactured. The materials in general use are:

(a) *polyurethane oils*, in which the isocyanate is combined with an unsaturated drying oil which dries by atmospheric oxidation, often promoted by catalysts. These contain no free isocyanate;

(b) *blocked isocyanate coatings*, in which the isocyanate has been reacted with a phenol or ketoxime. When the blocked isocyanate is heated, the original isocyanate is liberated and reacts with a polyol present in the formulation to give a very hard polyurethane film. Phenolic vapours together with traces of the parent isocyanate are driven off with solvent vapours. The insulating polyurethane varnish applied to certain types of electrical conductor wire is applied by such a process;

(c) *one-pack or two-pack polyurethane surface coatings*, which are sometimes acrylic resin systems. The one-pack system, which has a long shelf life, is an adduct of resin with polyisocyanate dissolved in a moisture-free solvent. When applied to a surface the film cures and hardens as moisture in the air reacts with the isocyanate groups in the resin. The two pack system consists of a polyisocyanate (frequently derived from an aliphatic isocyanate monomer) and a polyol as separate components. Once the two components are mixed the shelf life is very limited.

65 In common with most other forms of coatings, the application of polyurethane paints and lacquers in confined spaces can be hazardous even when they are applied by brush or roller. The advice given in paras 66-68 is not, in general, applicable to the use of polyurethane surface coatings in confined spaces. Advice on the precautions necessary when carrying out such work is given in the Guidance Note GS5, *Entry into confined spaces*. The particular hazards of isocyanates should be borne in mind when applying the advice given in the Guidance Note.

66 Because of the low concentrations present, the isocyanates in polyurethane paints do not themselves give rise to a vapour hazardous to non-sensitised individuals when the paints are applied by brush or roller at room temperature. However, when such paints are applied by spray (as in car refinishing) the aerosol mist droplets produced are mainly in the respirable size range and precautions are necessary to avoid an inhalation hazard. Even if spraying is carried out in an enclosure under exhaust ventilation, adequate and suitable respiratory protective equipment will be needed if employees need to work inside the enclosure. Steps must be taken to ensure that persons nearby, who may be unconnected with the spraying operation, are not affected by any spray droplets or vapour. If curing is accelerated by means of a heated oven, some isocyanate vapour may be evolved and the oven should be under negative pressure and vented to outside atmosphere.

67 Any exhaust ventilation system used must discharge to a safe place in the open air where fume and spray will not be drawn back into the workroom or affect persons in adjoining premises. Large installations or those in difficult situations may require some form of scrubbing equipment to prevent emission of isocyanates.

68 For occasional jobs of limited duration, where an operator may need to carry out minor touch-up work or needs to enter a spray area for quality control inspection purposes etc, it is accepted that a full facepiece canister respirator as described in para 22 may be worn provided that the canister is changed after successive periods totalling 15 minutes spraying, or otherwise in accordance with the makers' instructions. The use of a canister respirator is very much a second choice in comparison with the superior protection afforded by a suitable self-contained or compressed air-line breathing apparatus. Firm controls must be exercised so as to ensure that the conditions attached to the use of canister respirators are fully observed. Facepiece exhalation valves should be regularly checked for free movement and proper seating to ensure that their function has not been impaired by spray deposits.

69 Operators engaged in mixing or applying containing isocyanates should wear suitable protective clothing, including gloves and eye protection, to prevent skin or eye contact.

FURTHER INFORMATION

Information on the use of isocyanates is available from the following organisations:

The International Isocyanates Institute
c/o Imperial Chemical Industries
Blakely
Manchester 9

The British Rubber Manufacturers Association
90, Tottenham Court Road,
London W1

The Paint Manufacturers Association
Alembic House,
93 Albert Embankment,
London SE1

This Guidance Note is produced by the Health and Safety Executive. Further advice on this or any other publication produced by the Executive is obtainable from the general enquiry point, St Hugh's House, Stanley Precinct, Bootle, Merseyside L20 3QY, or from area offices of HSE. Advice on technical matters can be obtained from the organisations listed above or HSE area offices.

HEALTH AND SAFETY

PROPYLENE GLYCOL ETHER ESTER SOLVENT

Nature of Hazards:

Inflammable liquid of relatively low toxicity, slightly irritating to eyes and skin.

Personal Protection required when handling:

Ensure adequate ventilation.
Employ goggles and rubber gloves.

Emergency Action:

(i) Spillage - minor: flush away with water.
- major: absorb in sand or earth and dispose of by controlled incineration.

(ii) Fire: Fight with water spray, dry agent or alcohol resistant foam.

(iii) First Aid:

Inhalation:	Remove to fresh air and seek medical aid.
Ingestion:	Seek medical aid. Do not induce vomiting.
Skin contact:	Remove soaked clothing and wash skin with soap and water.
Eye contact:	Flush thoroughly with water. Seek medical aid.

Toxicity:

Inhalation: TLV = 100 ppm.

Ingestion: LD50 = 6.6g/kg.

Storage:

Mild steel is satisfactory. PME should be stored away from all sources of ignition. Earth all metal vessels when storing or transferring PME and avoid static discharge.

H. MARCEL GUEST LTD.

RIVERSIDE WORKS · COLLYHURST ROAD · MANCHESTER M10 7RU *Telephone: 061-205 5551*

REGISTERED IN ENGLAND
REGISTRATION No. 251148
V.A.T. REG. No. 145 1584 71

OUR REF/DEPT. YOUR REF DATE

HEALTH AND SAFETY AT WORK ACT, 1974

For the attention of the Managing Director and to all concerned:

Dear Sir,

We supply a very wide range of industrial surface coatings with varying properties. Section 6(4) (a) of the Health and Safety at Work Act 1974 requires that we ensure, so far as is reasonably practicable, that our paints and other surface coatings, for use at work, are safe and without risk to health when properly used. Equally, the Act places a duty upon employers to ensure, so far as is reasonably practicable, the health at work of their employees.

Attention must be given to industrial hygiene, extraction of vapours, fire precautions and personnel should be kept informed of any handling requirements.

Particular attention should be paid to cautionary notices on our containers.

References should also be made to the publications listed in the appendix.

We would therefore draw your attention to the following recommendations for the safe use and storage of our products.

1. Fire Risk

An indication of the flammability of the product is given on the label. Where the Flash Point is indicated on the container in the form of "Flash Point Range" the material should be stored and used in accordance with the appropriate regulations (ref. 1 & 2).

2. Toxicity

2.1 Inhalation of fumes or dusts from paints should always be avoided by the use of ventilation or extraction. (ref. 4, 5, 6, 7 & 9).

(a) Products should be used in a well ventilated area.

(b) In confined spaces forced ventilation or fresh air masks should be used.

(c) A face mask should be worn when spraying or sanding.

2.2 Skin contact

Some substances used in paint may cause irritation after repeated or prolonged contact with the skin and in susceptible cases there is a risk of dermatitis.

(a) Operatives with a history of skin sensitivity should not be employed in processes where skin contact can occur.

(b) Prolonged or repeated contact with the skin should be avoided.

(c) Barrier cream should be supplied and used.

(d) Gloves should be worn (Ref. 4, 5, 8 & 11).

2.3 Ingestion

The ingestion of paint should always be avoided.

(a) Food should not be brought into or consumed in the work area where coatings are stored or used.

(b) Thorough washing of hands and face is essential before the consumption of food and drink after using paint.

(c) If paint should accidentally be swallowed, seek medical attention immediately.

2.4 Eye Protection

Steps should be taken to prevent material entering the eyes.

(a) Goggles should be worn whenever possible.

(b) If the eyes become contaminated they should be irrigated with water and immediate medical attention sought. (Ref. 3, 4, 5 & 7).

3. Good Housekeeping

Safety and Health is intimately connected with the maintenance of a high standard of procedure.

(a) Suitable clean protective clothing should be provided when necessary and appropriate, and kept reasonably clean.

(b) Spillages should be cleared up without delay.

(c) Waste products and empty tins should not be allowed to accumulate in the workroom and should be disposed of in a satisfactory manner.

(d) Due to the risk of spontaneous combustion, saturated cleaning materials should be disposed of immediately or kept in closed bins until they can be disposed of satisfactorily. (Ref. 10).

Your safety is our concern and if you are in any doubt about any of our products or should you require any further information, please do not hesitate to contact us.

H. MARCEL GUEST LTD.

RIVERSIDE WORKS - COLLYHURST ROAD - MANCHESTER M10 7RU

Telephone : 061 205 5551

APPENDIX

1. The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972.
2. The Petroleum (Consolidation) Act 1928, The Petroleum (Inflammable Liquids) Order 1971.
3. The Protection of Eyes Regulations 1974.
4. Safety at Work. Directory and Hand Book, published by British Safety Council.
5. Reference Book of Protective Equipment, published by The Industrial Safety Manufacturers Association.
6. Application of Powder Coatings by Electrostatic Spray, published by the Paint-makers Association of Great Britain.
7. Dust and Fumes in Factory Atmospheres, Health and Safety at Work Series Booklet No. 8.
8. Industrial Dermatitis - Precautionary Measures. Health & Safety at Work Series Booklet No. 13.
9. Threshold Limit Values - Technical Data Notes No. 2 issued by the Department of Employment.
10. Deposit of Poisonous Waste Act 1972.
11. Statutory Instruments No. 1530 Factories - The Construction (General Provisions) Regulations 1961.

FBW/VS

24 July 1984

Glassguard Surface Coatings
ENGLAND HUGHES BELL & CO LTD
Valley Works
Monton Road
Eccles
Manchester M30 9HJ
Tel 061-789 5191
Telex UZEBELL 669335 G

Electrogas Systems Limited
2 Chapel Street
Cheadle
Cheshire

For the attention of Mr Wheeler

Dear Sir

RE: N KOREA PROJECT

We refer to our recent telcon regarding coatings for the above project. Based on your request for prices related to the four potential systems supplied, herewith details of costs/packaging - based on prices operating from 1 September 1984 and having a 60 day validity (copy of price list included).

1. Cement Render White Face

System A

Ceramite 79/S Primer Sealer Clear	- 1 Coat - 5 Litres
Ceramite 21 Intermediate Coat	- 1 Coat - 5 & 25 Litres
Ceramite CQ Glassguard	- 1 Coat - 5 & 25 Litres

System B

Colorac FH Primer Sealer	- 1 Coat - 5 & 25 Litres
Colorac Glassguard Finish	- 2 Coats 5 & 25 Litres

2. Treated Wallpaper

System A

Colorac Glassguard Finish	- 2 Coats 5 & 25 Litres

System B

Huzeel Primer Sealer Clear DR8	- 1 Coat - 5 & 25 Litres
Huzeel Plastic Coating	- 2 Coats 5 & 25 Litres

/Cont...

Please find enclosed a copy of our price list with the above mentioned products highlighted. Please do not hesitate to contact us if you have any further queries.

Yours sincerely

P B WINDSOR
Technical Service Manager

CERAMITE CQ
GLASSGUARD

CQGG/7/82

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HU
Telephone: 061 789 5191
Telex: 669336

This special two pack finish which contains patented, self-leafing, heat hardened, borosilicate glass flakes, possesses the best properties of both epoxide and polyurethane finishes. In the field of chemical resistance, it combines and improves on the extremely high chemical resistance properties of epoxies and the excellent water resistance of polyurethanes. The basic role for Ceramite CQ Glassguard is one of chemical resistance combined with the availability in a range of colours and excellent brushability when used for interior applications.

TYPE

Two pack Epoxy Polyurethane modified with patented, self-leafing heat hardened, borosilicate glass flakes.

PROPERTIES

Mixing Ratio:	5 parts Base to 1 part Hardener by volume
Volume Solids:	33%
Working Life:	(after mixing with Hardener) 12 hours at 10°C (50°F)
Drying Time:	Touch Dry: 1 hour
	Hard Dry: 8/12 hours
	Recoatable: 16 hours (minimum) 7 days (maximum)
Coverage Rate:	Brush/Roller: (approx) 40 square metres per 5 litres
	Spray: (approx) 50 square metres per 5 litres
Dry Film Thickness:	Brush/Roller: (approx) 40 microns
	Spray: (approx) 30 microns
Flash Point:	Typical 24°C (75°F)
Minimum Curing Temperature:	5°C (40°F)

APPLICATION

For overcoating correctly prepared, cured and suitably Ceramite primed and intermediate coated substrates.
Intermediate coat alternatives: Ceramite 21/Ceramite Polyurethane Intermediate Coat/Ceramite 24/Ceramite 71/2
NB Aged Ceramite CQ Glassguard is subject to special recommendation ie use of a Ceramite tie-coat (CL37/V286).
Stir two components well before use.

Brush:	No thinning required. Do not overbrush.
Spray:	Conventional: Add 1 litre DS 63 to 5 litres mixed Ceramite CQ/CG.
	Airless: No thinning necessary.
Roller:	No thinning necessary. Use solvent resistant roller.
Thinners:	Ceramite Polyurethane Thinners, DS 63
Equipment Cleaner:	DS 78
Colour:	Black, White and BS 4800 : 1981 range
Availability:	In 5 litre containers (hardener packed separately).
Storage Life:	12 months in original sealed containers at moderate temperature (10°C - 50°F)

HEALTH & SAFETY

1) Maintain adequate ventilation during application and drying.
2) Wear fresh air/positive pressure type mask during spray application.
3) If splashes enter eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5191
Telex: 669336

CERAMITE 21

2/83

This two pack Epoxy coating possessing good chemical resistance has been marketed for more than 15 years. Recommendations for use are as an intermediate coat for Glassguard two pack finishes or as a two coat system. It should always be used over the relevant Ceramite Primer.

TYPE

Two pack Epoxy Polyamide based combined with selective pigmentation.

PROPERTIES

Mixing Ratio:	2 parts base to 1 part hardener by volume.
Working Life:	(after mixing with hardener) 24 hours at 10°C (50°F).
Drying Time:	Touch dry: 1 hour Hard dry: 6/8 hours Recoatable: 16 hours (minimum) 7 days (maximum)
Coverage Rate:	Brush/Roller: approximately 40 square metres per 5 litres Spray: approximately 50 square metres per 5 litres
Dry Film Thickness:	Brush/Roller: 50 microns Spray: 40 microns
Flash Point:	Typical 18°C (65°F)
Minimum Curing Temperature:	8°C (45°F)

APPLICATION

For overcoating correctly prepared, cured and suitably Ceramite primed substrates.

Brush:	No thinning required. Stir two components well before use. Apply with 3" minimum brush. Brush small areas. Do not overbrush.
Roller:	No thinning required. Use solvent resistant roller.
Conventional Spray:	(Air assisted): add 1 litre DS 27 Thinners to 5 litres mixed Ceramite.
Airless Spray:	Should not require thinning.
Thinners/ Equipment Cleaner:	DS 27
Availability:	Available in 5 litre and 25 litre containers (hardener packed separately).
Colour:	Black, White, Aluminium plus range to BS 4800 : 1981.
Storage Life:	12 months in original sealed containers at moderate temperature (10°C - 50°F).

HEALTH & SAFETY

1) Maintain adequate ventilation during application and drying.
2) Wear mask during spray application.
3) If splashes enter eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

Recommendations/information given in this data sheet are/is offered in good faith, but no warranty is implied or expressed.

SOCIALIST FEDERAL REPUBLIC OF YUGOSLAVIA

SOCIALIST REPUBLIC OF SERBIA

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UNIVERSITY OF BELGRADE

D I P L O M A

OF THE UNIVERSITY DEGREE

OBTAINED AT THE FACULTY OF MEDICINE

The Chancellor of the University of Belgrade and the Dean of the Faculty of Medicine putting their signatures and the seal of the University certify that

N E S T O R O V I Ć M. L J U B O M I R

born on the 12th of October, 194[illegible]. at Obrenovac; enrolled the Faculty in the school year 1967/68 and by the 28th of November, 1972. has successfully passed all examinations prescribed to obtain this [illegible] Diploma of the Faculty of Medicine with the average grade [illegible],33.

This Diploma has been issued as a confirmation of the University Degree and professional title of MEDICAL DOCTOR, giving to the bearer all rights provided by the law.

At Belgrade, 2nd of March, 19[illegible]3.

No.12508/72

Dean of the Faculty of Medicine

[illegible] (sgn.)

(seal)

Vice-Chancellor of the University

[illegible] (sgn.)

CERAMITE 79/S
EPOXY FLOORING
PRIMER SEALER

79/S/PS/2/82

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5191
Telex: 669336

A specially formulated 2 pack solventless penetrative primer sealer for application to substrates such as concrete, prior to the application of Ceramite 79/S Epoxy Flooring composition. This sealer can also be applied to dense substrates ie Ceramic tiles.

TYPE Two pack solventless Epoxy Polyamine.

PROPERTIES

Mixing Ratio:	2 parts Base to 1 part Hardener by volume.
Working Life:	(after mixing with Hardener) - 30 minutes at 15°C (59°F).
Drying Time:	Hard dry: 24 hours Recoatable: 24 hours (minimum)
Coverage Rate:	Brush: approx 6 square metres per litre.
Dry Film Thickness:	Theoretical: 50 microns Practical: Depends on porosity of substrate
Flash Point:	Typical - above 55°C (130°F).
Minimum Curing Temperature:	10°C (50°F)
Surface Preparation:	All surfaces should be free from contamination ie oil, grease, dust, laitance, loose particles etc. Maximum moisture content should not exceed 2 on the Protimeter Moisture Meter 0-10 scale.

APPLICATION No thinning required. Stir two components well before use.

Brush:	Method preferred - use vigorous strokes.
Equipment Cleaner:	DS 78
Colour:	Clear
Availability:	Available in 5 litre containers (hardener packed separately).
Storage Life:	12 months in original sealed containers at moderate temperature 10°C (50°F).

HEALTH & SAFETY

1) Maintain adequate ventilation during application and drying.
2) If splashes enter eyes, wash with plenty of water and seek medical advice.
3) Remove splashes from the skin with a recognised hand cleaner.
4) Potentially dermatitic. Use gloves and/or barrier cream.
5) At the end of the working life of this material, an exotherm may develop. At this stage move unused material to a safe, very well ventilated area.

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5191
Telex: 669336

COLORAC FH GLASSGUARD

FHGG/7/92

This highly durable, unmodified chlorinated rubber based coating is further enhanced by the inclusion of patented self-leafing, heat hardened, borosilicate glass flakes. It has excellent abrasion resistance combined with good wide range inorganic chemical resistance properties. Colorac FH Glassguard has been designed as the semi gloss finishing coat for the Colorac Glassguard system and is available in a range of colours.

TYPE:

Plasticised, pigmented, one pack chlorinated rubber polymer containing patented, self-leafing, heat hardened, borosilicate glass flakes.

PROPERTIES:

Drying Time:	Touch dry:	30 minutes
	Hard dry :	2-4 hours
	Recoatable:	Brush - 16 hours Spray - 4 hours
Coverage Rate:	Brush/Roller:	35/40 square metres per 5 litres
	Spray:	45/50 square metres per 5 litres
Dry Film Thickness:	Brush/Roller:	approx 50 microns
	Spray:	approx 30 microns
Flash Point:	Typical 24°C (75°F)	

SYSTEMS:

Surface Preparation: Should be applied over correctly prepared, primed and intermediate coated surfaces as a finishing coat.

APPLICATION: Stir well before use.

Brush:	Thinning not required: do not overbrush: use largest brush.
Roller:	Thinning not required. Standard recommendations for smooth surface is mohair type.
Conventional Spray:	Gravity/Pressure Feed: add 1.5 litres DS 17 thinners per 5 litres.
Airless Spray:	Standard Grade unsuitable - special grade available.
Thinners:	DS 17
Equipment Cleaner:	DS 78
Colour:	White, black and BS 4800 : 1981 colour range.
Availability:	Available in 5 and 25 litre containers.
Storage Life:	12 months in original sealed containers at moderate temperature (10°C - 50°F).

HEALTH & SAFETY:

1) Maintain adequate ventilation during application and drying.
2) Wear mask during spray application.
3) If splashes enter eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

England, Hughes, Hall & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5191
Telex: 669336

COLORAC FH GLASSGUARD

EHGS/7/82

This highly durable, unmodified chlorinated rubber based coating is further enhanced by the inclusion of patented self-leafing, heat hardened, borosilicate glass flakes. It has excellent abrasion resistance combined with good wide range inorganic chemical resistance properties. Colorac FH Glassguard has been designed as the semi gloss finishing coat for the Colorac Glassguard system and is available in a range of colours.

TYPE:

Plasticised, pigmented, one pack chlorinated rubber polymer containing patented, self-leafing, heat hardened, borosilicate glass flakes.

PROPERTIES:

Drying Time:	Touch dry:	30 minutes
	Hard dry :	2-4 hours
	Recoatable:	Brush - 16 hours Spray - 4 hours
Coverage Rate:	Brush/Roller:	35/40 square metres per 5 litres
	Spray:	45/50 square metres per 5 litres
Dry Film Thickness:	Brush/Roller:	approx 50 microns
	Spray:	approx 30 microns
Flash Point:	Typical 24°C (75°F)	

SYSTEMS:

Surface Preparation: Should be applied over correctly prepared, primed and intermediate coated surfaces as a finishing coat.

APPLICATION: Stir well before use.

Brush:	Thinning not required: do not overbrush: use largest brush.
Roller:	Thinning not required. Standard recommendations for smooth surface is mohair type.
Conventional Spray:	Gravity/Pressure Feed: add 1.5 litres DS 17 thinners per 5 litres.
Airless Spray:	Standard Grade unsuitable - special grade available.
Thinners:	DS 17
Equipment Cleaner:	DS 78
Colour:	White, black and BS 4800 : 1981 colour range.
Availability:	Available in 5 and 25 litre containers.
Storage Life:	12 months in original sealed containers at moderate temperature (10°C - 50°F).

HEALTH & SAFETY:

1) Maintain adequate ventilation during application and drying.
2) Wear mask during spray application.
3) If splashes enter eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

COLORAC FB
PRIMER SEALER

FH/PS/8/82

England, Hughes, Bell & Co. Ltd.
Valley Works, Manton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5151
Telex: 669335

This single pack, highly penetrative sealer has been specially formulated for application to porous substrates which include asbestos cement, concrete, plaster, wood etc. It is designed for subsequent overcoating with the various Colorac chlorinated rubber based systems.

TYPE: Low viscosity pigmented solution of a plasticised chlorinated rubber polymer.

PROPERTIES:

Drying Time:	Touch dry :	30 minutes
	Hard dry :	1 hour
	Recoatable:	4 hours
Coverage Rate:	Brush/Roller:	(depending on porosity) approx 24 square metres per 5 litres
	Spray:	(depending on porosity) approx 30 square metres per 5 litres
Dry Film Thickness:	Brush/Roller:	25 microns (aproximately)
	Spray:	20 microns
Flash Point:	Typical 24°C (75°F)	

SYSTEM:

Surface Preparations: All surfaces should be free from contamination, ie oil, grease, dust, laitance (concrete) loose particles etc. Maximum moisture content should not be in excess of 2 on Protimeter Moisture Meter 0-10 scale.

APPLICATION: Stir well before use. No thinning required.

Brush/Roller: Brush application preferred method. Vigorous application (multi-directional strokes recommended).

Conventional Spray: Pressure/suction/gravity feed. Minimum 60 lbs per square inch atomising pressure.

Airless Spray: Recommendations vary with equipment type.
Typical data is: Gun Pressure: 1500 lbs per square inch
Tip Size: 11-15 thou

Colour: Standard material: white

Availability: Available in 5 litre and 25 litre containers.

Thinners/
Equipment Cleaner: DS 17

Storage Life: 12 months in original sealed containers at moderate temperature (10°C - 50°F).

HEALTH & SAFETY:

1) Maintain adequate ventilation during application and drying.
2) Wear mask during spray application.
3) If splashes enter the eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HJ
Telephone: 061 789 5191
Telex: 669336

HUZEEL WEATHAPRUFE GH

W/GH/6/82

Based on an isobutyl rubber, this material is a water based coating which provides an easily applied, long-life, resilient and waterproof treatment for new roofing and is excellent for the renovation and decoration of old roofs. It is thixotropic in nature and does not drip.

It gives a better choice of colours than most other roofing treatment. It can be brushed or sprayed on to most roofing materials, including asbestos cement, metal and foamed concrete blocks also wood wool slabs, when used as ceiling and wall partitions. It is not suitable for application over some bituminous surfaces.

TYPE — Isobutyl rubber emulsion.

PROPERTIES

Drying Time:	Touch dry : 1 hour Hard dry : 3 hours Recoatable : 4 hours
Dry Film Thickness:	75 microns
Flash Point:	Not applicable as it is water based.
Minimum Temperature:	5°C (40°F)
Surface Preparation:	All surfaces to be free from contamination. Apply two coats of Huzeel Weathaprufe GH over suitable primer.
Asbestos Cement, Concrete, GRC, Wood Wool Slabs etc	Apply one coat over Huzeel Plastic Primer.
Metallic Substrates:	Apply over Colorac Zinc Phosphate Primer. We also recommend the use of Ceramite Etch Primer initially.

APPLICATION

Brush or Soft Broom/ Lambswool Roller/ Bottom Outlet Pressure Pot System Spray:	10 square metres per 5 litres.
Thinners/ Equipment Cleaner:	All coatings ready for use. Clean equipment with cold water plus detergent.
Availability:	Available in 5 litre containers and 25 litre plastic buckets.
Colour:	Available in a limited range from BS 4800 : 1981.
Storage Life:	12 months in original sealed containers at moderate temperature (10°C - 50°F) PROTECT FROM FROST.

HEALTH & SAFETY

Waterborne materials are non hazardous with safe working practice.

HUZEEL PLASTIC COATING
PRIMER FOR
ASBESTOS/CONCRETE - DRB/0R94.

HPC/P/DRB/6/83

England, Hughes, Bell & Co. Ltd.
Valley Works, Monton Road
Eccles, Manchester M30 9HU
Telephone: 061 789 5191
Telex: 669336

This specially formulated water borne sealer is designed to promote adhesion and satisfy absorbtion levels when the Huzeel Plastic Coating system is applied to AC, concrete and similar substrates.

TYPE	Water borne Polymer based on a vinyl acetate/chloride ethylene grafted terpolymer.
Mixing Ratio:	Single pack.
Working Life:	Single pack.
Drying Time:	Touch dry - 10 minutes
(AC) 15°C	Hard dry - 30 minutes
	Recoatable - 8 hours (minimum) 16 hours (optimum)
Coverage Rate:	Approx 5 square metres/litre/new AC.
Dry Film Thickness:	Approx 30 microns but dependant on porosity.
Flash Point:	Not applicable - water borne system.
Minimum Temperature of Application:	5°C - do not apply on frost.
Maximum Temperature of Application:	40°C
Surface Preparation:	Remove all surface contamination. Can be applied to substrates damp with clean water but subject to subsequent drying conditions. Do not apply to visibly wet surfaces.
APPLICATION	Stir before use.
Brush/Roller:	Optimum method.
Thinners:	(if required for special substrates) - cold water.
Equipment Cleaner:	Cold water/detergent.
Colour:	Translucent solution - clear film.
Availability:	5L and 25L plastic containers.
Storage Life:	6 months in original sealed containers when stored at moderate temperatures.

HEALTH & SAFETY

1) Contains small amount of ammonia.
2) Being water borne this product is generally non-hazardous if material is used/applied with reference to good painting practices.
3) If splashes enter eyes, wash with plenty of water and seek medical advice.
4) Remove splashes from the skin with a recognised hand cleaner.

Recommendations/information given in this data sheet are/is offered in good faith, but no warranty is implied or expressed.

GROUP 1

1 September 1984

Computer Code	Product Code	Description	Pack Size	Quantity 0 - 500	501 - 750	751 - 1000	
85535	E A 35	Huzeel Roofing Compound	5L	5.70	5.53	5.25	
			25L	23.93	23.21	22.03	
85542	E A 42	Huzeel Roofing Compound	5L	5.87	5.70	5.42	
			25L	24.82	24.10	22.87	
	E A 47	Huzeel Mastic	5Kgs	5.70			
85601	E B 1	Huzeel Bituminous Solution	5L	9.23	8.95	8.49	
			25L	41.49	40.26	38.19	
			205L	300.25			
85901	E E 1	Huzeel Silver Roofing Compound	5L	12.64	12.30	11.63	
			25L	58.54	56.81	53.90	
85343	D R 43	Degreasing Solution	5L	8.95	8.67	8.23	PLUS DUTY
			25L	40.26			PLUS DUTY
Solvents/Cleaners/Thinners							
85408	D S 8		5L/25L	8.89/40.26	8.66	8.16	
85413	D S 13		5L/25L	9.89/46.58	9.62	9.10	
85417	D S 17		5L/25L	10.17/46.80	9.89	9.40	PLUS DUTY
			205L	378.74			(.1716/L)
85420	D S 20	For Ceramite GC	5L/25L	6.59/28.96	6.43	6.09	PLUS DUTY
85427	D S 27	For Ceramite 21, 62	5L/25L	10.96/50.48	10.68	10.06	(.1716/L)
85441	D S 41		5L/25L	11.07/51.22	10.79	10.17	
85463	D S 63	For Ceramite AI, CQ, MC	5L/25L	11.35/52.61	11.01	10.46	
85452	D S 52	For Ceramite Etch Primer	5L/25L	11.52/53.39	11.18	10.63	
	D S 78	General Purpose Brush Cleaner -	5L/25L	11.35/52.61	11.01	10.46	
		not to be used as thinners	205L	424.64			
		Fungicidal Wash	5L	3.08	3.01	2.82	
	D S 94		5L	11.60	11.26	10.68	

Collecting and Paying

Minimum order is £50 - if stock available
Normal minimum consignment value £100
Carriage charged extra on consignments below £250
All prices subject to VAT
Prices negotiable for quantities in excess of 1000 L/K

GROUP 2

1 September 1984

Computer Code	Product Code	Description	Pack Size	Quantity 0 - 250	251 - 500	501 - 750	751 - 1000
88275	A D		5L	14.31	13.92	13.20	12.30
88263	N C		5L	20.18	19.57	18.56	17.39
		Cerakryl Standard Finish	5L	17.05	16.55	15.71	14.65
		Solv Acrylic	25L	80.80	78.39	74.36	69.50
		Cerakryl High Build	5L	17.39	16.88	15.99	14.98
		Solv Thixotropic	25L	82.30	79.84	75.71	70.78
85337	DR/34/35	Cerafil MP)			PRICES		
85360	DR/59/60	Cerafil ML)			AVAILABLE		
85344		Ceramite Flexible Epoxy 2)			ON REQUEST		
86104		Colorac FH Standard Intermediate	5L	21.41	20.80	19.68	18.45
		Coat	25L	102.21	99.13	94.05	87.90
86130		Colorac Zinc Phosphate Primer	5L	22.25	21.58	20.46	19.12
86149		Colorac Primer Sealer	5L	19.14	18.56	17.61	16.50
86810		Colorac FZ Intermediate Coat HB	5L	20.74	20.13	19.12	17.84
86701		Colorac Glassguard Finish	5L	21.02	20.41	19.34	18.11
87001		Cerakryl 5	5L	22.48	21.81	20.69	19.34
		Huzeel Plastic Coating GH	5L	14.70	14.26	13.53	12.63
			25L	71.79	69.67	66.09	61.73
		Vinoplast FV Intermediate	5L	18.84			
		Vinoplast FV Glassguard	5L	20.80			

1 September 1984

Computer Code	Description	Pack Size	Quantity 0 - 124	125 - 250	251 - 500	501 - 750	751 - 1000
84502	Ceramite Standard & Intermediate Coat	5L	24.32	23.59	22.37	20.91	19.46
84415	Ceramite 24 High Build	5L	28.72	27.85	26.45	24.72	22.97
83360	Ceramite 'S' Adhesive	5L	45.23	43.89	41.60	38.91	36.17
84110	Ceramite Self-Levelling Concrete Filler	5L	22.87	22.20	21.02	19.68	18.28
87701	Ceramite MM	2Kgs	8.49	8.27	7.82	7.32	6.83
		7.5L	36.79	35.67	33.88	31.65	29.41
Glassguard Finishes							
	Ceramite 21 Glassguard	5L	26.79	26.00	24.65	23.04	21.41
	Ceramite CQ Glassguard	5L	32.37	31.43	29.80	27.85	25.88
	Ceramite AI Glassguard	5L	39.42	38.24	36.29	33.88	31.53
	Ceramite GC Glassguard	5L	21.69	21.02	19.96	18.67	17.34
	Ceramite 71 Glassguard	5L	51.16	49.65	47.08	44.01	40.93
	Ceramite 62 Glassguard/Spraying	5L	30.64	29.75	28.18	26.33	24.49
	Ceramite 62 Glassguard/Brushing	2.5L	15.71	15.27	14.48	13.53	12.58
		5L	29.91	29.02	27.51	25.71	23.93
	Ceramite 62 Glassguard/Trowelling	1K	4.53	4.42	4.19	3.92	3.63
84148	Ceramite 79S Glassguard	5L/7.5Kg	48.48	47.02	44.61	41.71	38.80
84168	Ceramite C541 Glassguard	5L	50.26	48.75	46.24	43.22	40.21
	Ceramite 75 Glassguard	5L	51.27	49.76	47.19	44.11	41.03
Ceramite Primers							
84315	Ceramite Primer Sealer	5L	24.99	24.27	22.97	21.47	20.01
84314	Ceramite Special Primer Sealer V286	5L	27.68	26.84	25.49	23.81	22.14
84337	Ceramite Red Oxide Zinc Phos Primer	5L	26.89	26.11	24.77	23.14	21.53
		25L	117.86	114.35	108.47	101.37	94.27
84805	Ceramite Blast/Holding Primer	5L	22.97	22.31	21.14	19.79	18.40
		25L	100.47	97.45	92.42	86.44	80.40
84148	Ceramite 79/S	5L	44.01	42.71	40.48	37.85	35.23
S C	Ceramite Etch Primer	10L	23.59	22.87	21.68	20.27	18.85
83152	Ceramite Metal Primer AV2	5L	17.05	16.55	15.71	14.65	13.64
		25L	74.53	72.29			

ELECTRO GAS SYSTEMS LTD.

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