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Elcometer plays a key role in Eastlink Freeway Project

Paul Jenkins, Phillro Industries Australia, reports on Melbourne's newest freeway project.

The new Eastlink Freeway currently under construction will link Melbourne's eastern and south-eastern suburbs between the existing Eastern Freeway at Donvale and the Frankston Freeway on Mornington Peninsula.

The Deep Creek Approach to the tunnel

At the Mullum Mullum Creek section there will be 1.6km of twin road tunnels below the creek and the Mullum Mullum Valley. The project is planned for completion by late 2008.

Key elements of the project include:

- A total of 45km of freeway
- 39km of tollway
- 3 lanes in both directions comprising 33km
- 2 lanes in each direction comprising 6km
- Twin 3-lane section in the 1.6km tunnel
- 2 railway crossings
- 86 bridges
- 6km of toll free feeder roads
- Tunnel works for the twin 3-lane section
- 2 bypasses

Thiess John Holland, the Project Construction Managers must ensure that the specifications for coatings on all aspects of the construction project are met at all times. A range of Elcometer products are being used by Action Blasting & Protective Coatings Contractors including Surface Comparators, Elcometer 319 Dewpoint Meters, Wet Film Combs and Elcometer 456 Coating Thickness Gauges.

Construction of the Mullum Mullum Tunnel

According to contractors at the site, the Elcometer products they use allow them to easily and quickly measure the surfaces during and after surface preparation, check and control the wet film thickness during application and also check the dry film thickness prior to steel structures being delivered and installed.

On a project of this scale it is vital that the coatings applied last for the specified time and do not fail prematurely as the cost implications of repair work are huge. Elcometer Instruments are playing a key role in this part of the project in assuring that the protective coatings used will adhere correctly to the structural steels and meet the specifications required for the project.

Phillro Industries, as the Australian Principal Distributor for Elcometer have been able to provide local technical support and service to ensure the correct instruments are used and are maintained in good working order.

Vintage Elcometer

Graham Duk, BAMR South Africa, tells us about his latest sale.

In 1982, BAMR, Elcometer's South African distributor purchased an Elcometer Ferrite Detector for a customer.

Elcometer Ferrite Detector

At the time, the customer decided not to take the product and it has been stored on a shelf in BAMR's storeroom waiting for the right enquiry.

Now, as the internet is becoming more popular in South Africa, one query that came in through BAMR's website for this very instrument.

Graham said "I was amazed when we received a request through our website for the Elcometer Ferrite Detector. It has been sitting on shelf for 24 years and it still works perfectly. This shows the benefit of high quality products and a good, easy to use and find, website!"

For more information on BAMR visit www.bamr.co.za

Elcometer E-Award winners

Every year, the Elcometer E-Award is presented to those distributors and the Elcometer office, which have performed exceptionally well over the past financial year. The winners for 2005/2006 are:

Largest Annual Sales Growth (Value)
Winner: Samwon Instruments Trading, South Korea
Runner-up: NDT Equipment, Russia

Largest Annual Sales Growth (Percentage)
Winner: Komal Scientific Co, India
Runner-up: Asistencia Post Venta, Chile

Elcometer Office
Winner: Elcometer Instruments Ltd (UK Sales Dept.)
Runner-up: Elcometer Inc, USA

product of the month

Elcometer 223 Digital Surface Profile Gauge

The Elcometer 223 is a battery operated Digital Surface Profile Gauge, which measures the peak-to-valley height of a blast cleaned surface.

The Elcometer 223 is able to switch between imperial and metric readings and there is the added benefit of an RS232 output. This allows direct transfer of readings to a PC, datalogger or printer to provide a permanent record of results.

For further information on the Elcometer 223 Digital Surface Profile Gauge or any of our other surface profile products, please visit our website www.elcometer.com or contact BAMR at sales@bamr.co.za.

coatings on site

Anti corrosion

The effectiveness of a protective coating is very clear in this example of an old water pipe on a jetty in Scotland. The straight pipes have lost any coating they may have had, yet the elbow is still protected from corrosion by a different type of coating.

If this pipe were to carry water again, the joints would fail first because the nuts holding the flanges together have almost disappeared. The wall thickness of the pipe looks normal, but the rust must be removed from the surface before this can be determined.

Today, better coatings applied according to tight specifications, protect such pipes and Elcometer gauges help to ensure they are applied correctly.

Airbus A380

The Airbus A380 from Airbus S.A.S is the largest passenger plane in the world. Superseding the Boeing 747, the A380 is a double-deck, four-engine airliner seating up to 555 passengers in standard three-class configuration (first, business and economy class) and has been appropriately nicknamed 'Superjumbo'.

The A380 is manufactured in sections across Europe with final assembly taking place in Toulouse, France. The Broughton facility in North Wales, UK, is responsible for the manufacture and assembly of the wing components. A wingspan of almost 80m makes these the largest wings ever built at Broughton.

Testing the coating on a wing with the Elcometer 355 Top Coating Thickness Gauge

There have been many engineering challenges throughout the design and initial manufacture, such as considering the 4m wing flex on take off and how to manufacture the huge aluminium sheets for the outer skin of the wing. But Airbus Broughton knew that when it came to checking the coating thickness on their components they would use their tried and tested Elcometer gauges.

Using a combination of the Elcometer 355 Top and Elcometer 456 coating thickness gauges, the engineers at Broughton can be certain that the applied coatings meet the specification and pass the stringent quality testing before export to France for final assembly.

coatings in the lab

Screen quality

Markus Biess, Elcometer GmbH, reports on the use of Elcometer gauges in the screen-printing process.

Schildmann GmbH are a leading screen manufacturer for the screen printing industry supplying many companies, including manufacturers of white goods and CD/DVDs. Each screen they produce must comply with their stringent standards and quality assurance criteria.

Ultra-violet light hardening the light sensitive emulsion

The construction of a screen is a fine nylon or polyester mesh stretched over a wooden or metal frame. A light sensitive emulsion is applied to the mesh, blocking the holes. After the desired pattern is transferred, ultra-violet light hardens the emulsion, thus creating the stencil.

During the print process, if the emulsion is too thin, less ink will be transferred and the print will have rough edges and reduced sharpness. Ink spots may appear where they should not. If the emulsion is too thick, some of the mesh may remain blocked, preventing ink going through, leaving spaces or gaps in the printed design.

Schildmann have used the Elcometer 345 for many years to accurately control this process. They have now progressed to the Elcometer 456 Ferrous gauge to continue the accurate measurements.

Calibrated to a steel plate placed underneath the nylon or polyester mesh, the gauge first measures the thickness of the mesh then the mesh with emulsion. Subtracting, for example 39µm of mesh, from a total reading of 42µm, gives the emulsion thickness as 3µm. This value must agree with the particular specification of the various screens.

Emulsion thickness confirmed, the mesh is ready for framing

Schildmann GmbH retain their reputation as quality manufactures of screens for screen printing due to their attention to detail and quality procedures, using the reliable and accurate Elcometer coating thickness gauges.

THE ELCOMETER 456 FOR SILKSCREENS

1. Switch on – press the probe against the steel block or press the [e] key.
2. Calibrate – Probe on to 250µm foil for one second and lift up, adjust display to foil value. Probe on metal block, lift and set to zero.
3. Mesh – Place screen over the steel block and measure the thickness of the **mesh** (M).
4. Emulsion – Place screen over the steel block & measure the thickness of the **mesh** (M) **and emulsion** (E).
5. Calculate – (M+E) – (M) = emulsion thickness.

On a coarse mesh, use a 250 microns foil under the probe to smooth out the variation. Set the Offset to subtract 250 from each reading automatically.

Coatings on concrete - part 2

Continued from last month's issue of elconews e-zine, we discuss more methods of testing in the field.

COATING THICKNESS & COVERMETERS

The measurement of coatings on concrete substrates can be carried out non-destructively by using specialist ultrasonic gauges. However, they must be calibrated against a destructive test due to the uncertainty associated with the ultrasonic method, caused by differences in the response of different coating materials. Alternatively, metal coupons coated at the same time as the concrete can be used to monitor coating thickness using electronic thickness gauges, for example the Elcometer 456, which is familiar in the steel protection field for measuring paint.

Covermeters are widely used for the detection, location and sizing of reinforcement bars as part of an inspection routine. They are also useful of as a quality assurance tool. For example, if a cage of rebars moved during the pouring process, a check at this early stage would help reduce the cost of remedial action. The measurement of the concrete cover with an Elcometer 331 on both sides of the column will show different thicknesses and confirm the cage has moved.

The Elcometer 331 Concrete Covermeter

COATING ADHESION

The pull-off adhesion test determines if the fracture strength of the bond between coating layers and the concrete substrate is stronger than the concrete itself. The principle is that a test piece or 'dolly', 50mm diameter, glued to the surface of the coating is pulled gradually until the coating or the substrate fails and the dolly is pulled off.

Elcometer 106/6 Adhesion Tester

There are two pull systems available. The mechanical system, as used in the Elcometer 106/6, generates the increasing force by a hand-held wrench compressing a spring assembly. In the pneumatic system, such as the Elcometer 1920 PAT, the force is provided by air pressure in a piston.

COATING POROSITY

To locate flaws in insulating coatings, the high-voltage spark test can be used up to a thickness of at least 7mm. As the moisture normally present in concrete allows an electrical current to flow, this method of detecting pinholes and other coating defects can be applied to concrete structures too.

IN CONCLUSION

The surveying of concrete structures, immediately after construction or during the life of the structure, needs to be simple, portable and provide unambiguous results. The test equipment also needs to be reliable and rugged for use in the hostile conditions experienced on construction sites. Elcometer's range of concrete testing equipment has been specifically designed for these conditions.

Reflection standards

Last month in elconews e-zine, we reported on reflectance values for coatings for petroleum storage above ground. Tanks must have a reflectance value of 70% of incident radiation in order to comply with European Directives.

To assist in the manufacture and maintenance of the tanks, standard shade lists have been produced.

The lists of standard shades below meets the standard Section 53 – Standard Shades conforming to EPA PG1/13 (96) with a luminosity of 70% or greater. The Y values listed are from a spectrophotometer and are a numeric system in order to ensure accuracy in colour selection.

RAL Shades

RAL Shade Number	Colour Name	'Y' Value (D65 – 10°)
RAL 1013	Pearl White	73.76
RAL 1015	Light Ivory	71.09
RAL 1016	Sulphur Yellow	77.49
RAL 1018	Zinc Yellow	72.28
RAL 9001	Cream White	78.66
RAL 9003	Signal White	84.95
RAL 9010	Pure White	87.92
RAL 9016	Traffic White	87.29

BS4800 Shades

BS Shade Number	Colour Name	'Y' Value (D65 – 10°)
00E55	White	90.57
04B15	Rosepetal	75.17
04E49	Pastel Pink	80.01
08B15	Magnolia	81.97
08C31	Honeysuckle	77.87
10B15	Almond White	84.43
10C31	Buttermilk	78.56
10C33	Pollen	70.21
10E49	Pale Yellow	75.88
10E50	Primrose	71.60
12B15	Seafoam	78.08
14C31	Iceberg	77.11
18C31	Moonlight	79.00
18E49	Crystal	73.28
22B15	Swansdown	76.12

Even when a recommended colour is used for petroleum storage tanks, the reflectance can be checked from time to time by using the Elcometer 6013 Novo-Shade Reflectometer. This measures the shade irrespective of colour and will identify any darkening of the surface.

RAL colour charts are available as the Elcometer 6210 series.

Construction update

The roof is on and the walls are growing. To follow the progress of the new extension at Elcometer's production facility in Manchester, visit:
elcometer.com/uk_extension

Clean & rough surfaces – Part 2

There are various techniques to determine how clean or rough a surface is before a coating is applied.

CLEANLINESS

The first book defining the cleanliness of the surface was provided by the Standards Institute of Sweden. It described four pieces of steel as they were progressively cleaned and became known in the business as "The Swedish Standard". Today, it is officially ISO 8501-1. Two original photographs showing abrasive blast cleaning were then supplemented by a third, showing a more practical, commercial level of cleanliness in between them. This was the famous Sa2½ (not 2.5 as often written). Elcometer continue to reject requests for an email, fax or photocopy of it because the point of having a carefully printed picture in a book is to protect the standard from progressive corruption.

Pictures and text describe the levels of cleanliness of steel

The Swedish Standard was based on silica sand abrasive. Because using this sand is not allowed in the UK, the British version of the Swedish Standard added extra photographs showing how different abrasives affect the colour of a perfectly clean Sa3 surface. This two-in-one standard has the number BS 7079:Part A1.

The American SSPC standard developed from the Swedish Standard in to SSPC-VIS1 and describes levels of cleanliness after using metallic and non-metallic abrasives in slightly different terms.

DUSTY SURFACE

Between blasting and painting, there is time for the clean surface to become covered in dust. A quick test with the Elcometer 142 Tape Dust Test will show if it needs more cleaning. The amount of dust collected by the adhesive tape is compared to a scale in accordance with ISO 8502-3. If the dust were left, the applied coating might not wet it or the metal surface, leading to poor adhesion and early detachment.

Very importantly, **none** of the above standards mention any link between cleanliness and roughness.

SO HOW ROUGH IS IT?

Because the amplitude of the surface at any point is a random variation, a number of readings must be taken. How these readings are combined depends on the parameter required for the job, which could be the average peak-to-valley height or its maximum, or even something else.


Elcometer 123, 223 Profile Gauges

Surface Profile Gauges such as the Elcometer 123 and 223 stand on the highest peaks. Their sharp point goes into the valleys but not always to the bottom. This **range** of readings can be seen easily on the analogue Elcometer 123 because they are mostly within a certain segment of the scale. At the start of blast cleaning, two black tabs can be positioned to show where. At the end of the blasting, the readings should be similar or something in the process will have changed. Finding the **maximum** value for an inspection report is easier with the digital Elcometer 223; the user simply remembers the largest of say 20 readings.

If other roughness parameters are specified for the job, they can determine by a meter with a very small stylus. This measures the fluctuation in 5 short lines on the surface, one after the other. The Elcometer 7060 Surftest Roughness Tester then calculates Ra (average roughness), Rz (average of 5 maximum peak to valley heights) and Rt (from the highest peak to the lowest valley). These parameters are not interchangeable, nor can they be translated or converted. Be sure you know which one is required before measuring.

A relatively new parameter for blast-cleaned surfaces is Peak Density, Pc, measured with a stylus gauge such as the Elcometer 7060. This represents the number of peaks and valleys in a given line and measures how effective grit-type abrasives are at roughening the surface. Having many short peaks can be better for adhesion and long-term protection from corrosion than fewer peaks with the same peak to valley height.

Because the blast-cleaning environment is quite hostile to nice instruments, a simpler system of comparators is often used instead.

COMPARATORS

Nickel replicas of blast-cleaned surfaces that can be looked at and touched provide a practical method of assessing the roughness of a blast-cleaned surface. They are used according to ASTM D 4417 Method A. The Elcometer 127 has five examples of shot, grit and sand blasting together with an illuminated magnifier. The comparator for ISO 8503-1, Elcometer 125, has four samples providing the boundaries of 'fine', 'medium' and 'coarse'. Anything rougher than segment 4 is classed as 'extra coarse'. A third comparator is the Elcometer 129 Rugotest, which is still quoted in some European job specifications and has a range of grit and shot blasted surfaces side by side.

The surface profile after blasting can be recorded in special plastic foam and kept as a record. After the replica in Elcometer 122 Testex tape *(right)* is measured, it can be re-measured years later. This could be useful evidence to have should a dispute arise after the job is completed.

NEXT ISSUE: We will look at the chemical tests on the surface before it is coated.