

AUSTRALIAN STAINLESS

SPECIALISING IN STAINLESS STEEL AND ITS APPLICATIONS

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ASSDA

STAINLESS VISION AT EPPING - CHATSWOOD RAIL TUNNEL



The construction of the Epping to Chatswood rail line in Sydney is the largest publicly funded infrastructure project underway in New South Wales. The project, managed by the Transport Infrastructure Development Corporation, will increase the capacity of the CityRail network and provide direct rail access for the first time to the growing North Ryde/Macquarie Park area. Due to be completed in 2008, the 12.5 kilometre underground passenger line will include four new underground stations at Epping, Macquarie University, Macquarie Park and North Ryde.



Photography: Josh Hill Photography

Following a tender process, Contractors AW Edwards appointed ASSDA Accredited Fabricator Townsend Group to design, engineer, manufacture and install, for all four stations, a cavern lining/ceiling system, louvre and glass smoke baffles - forming part of the ventilation system. Additionally, they designed, manufactured and installed vitreous enamel panels to public areas, general composite panel cladding to services buildings, 316 stainless steel cladding for lifts and escalators and 304 patterned stainless steel for ceiling features, station facilities cladding, services risers and column cladding.

For the cladding components, Townsend purpose designed and engineered all fixings in 316 stainless steel to meet the high performance requirements of the project. The system also incorporated 304 patterned stainless steel wall and ceiling panels for which Townsend developed a fabrication technique which optimised both the aesthetics and strength of the panel. Overall, the project used some 160 tonnes of stainless steel.

Townsend Group had up to 100 people working on the project at the one time, spread across the 4 rail stations and at their warehouse and manufacturing facility in Sydney. They began their involvement in the project in September 2005, and are expected to complete the contract by April 2007.



Photography: Josh Hill Photography

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445M2: A NEW GENERATION STAINLESS STEEL



THIS ARTICLE IS THE THIRD IN A SERIES SHOWCASING THE USES OF 445M2 STAINLESS STEEL

The Applied Science Building at the University of NSW is a landmark in the Eastern Suburbs of Sydney. This world-class multi-storey complex of research laboratories and lecture theatres has recently been extended and upgraded, including the air conditioning and fume extraction systems.

The new air conditioning and ventilation systems were placed on the roof. Management at the University were concerned that the upgrade would be a major disruption and not one they wished to endure more than once in a generation. They needed materials to be long-lasting and require minimal maintenance.

As contractors on the project, Croydon Industries chose a new generation marine grade stainless steel. 445M2 was selected for the ducts on the roof, which are exposed to a marine atmosphere created by surf at Maroubra Beach just a few kilometres away.

Brian Clark at Croydon Industries says, "This was the first time we used 445M2, and we were a bit apprehensive - but it gave us no problems. It formed very easily, producing clean lines and well shaped panels with no flaws.

"The stream diffuser sheet of perforated metal was a dream to make.



"The punching ran cool, the sheet came out flat, with very little burr and at a lower cost than the familiar 316. We're glad we opted to use 445M2, it's been a win-win for all."

CONTACT

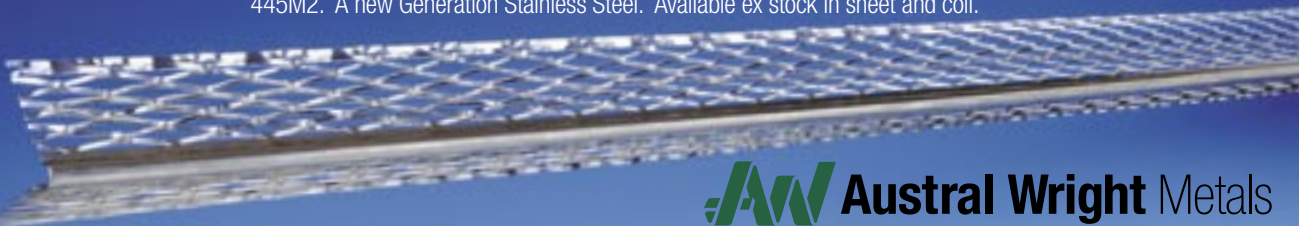
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TECHNICAL ARTICLE: SMOOTH AND CORROSION RESISTANT SURFACES FROM THE MILL



THIS ARTICLE IS THE FINAL IN A SERIES ON COMMON FINISHES. PREVIOUS ARTICLES IN THIS SERIES DEALT WITH THE WORKHORSE NO 4 (2J/2K) (AS36, WINTER 2006) AND THE MILL FINISHES 2R (BA), 2B AND 2D (AS38, SUMMER 2006). THIS ARTICLE LOOKS AT MIRROR, PROFILED AND COLOURED SURFACES.

Mirror polished surfaces, as the name implies, have a bright reflective surface which give a mirror like image. They are the most labour intensive mechanically finished surface with an obvious impact on cost and time of production. As flat product, mirror finishes are produced by post mill abrasive polishing of either hot rolled or cold rolled sheet or strip.

Although mirror finishes are only defined in standards for flat products, it is also possible to generate a mirror polish on surfaces where there is sufficient access for the grinders and polishing mops. The exception to this is materials with large or variable microstructures such as some castings or heavily cold worked items or welds. In these cases, it may not be possible to obtain a mirror surface with a clear image or a uniform lustre.

Mirror polished surfaces are produced by grinding with successively finer abrasives where the next grit size is not selected until all the scratches produced in the previous stage have been removed. The surface is then buffed with "mops" (which may be soft or hard) and sticks compounded with binders and rouge of whose particle size depends on the required finish. The buffing stage does not remove much material and, if there are scratches from earlier grinding stages, they will show up as rounded furrows. Contamination with a larger grit



particle will give isolated, but very unsightly, scratches.

A mirror finish is the only one that will produce a clear image of its surroundings. Finishes such as the cold rolled BA or an electropolished 2B or even a No 4 finish with a very low Ra that is then electropolished, will be brilliant and reflective but they will not form a sharp reflected image.

Specifications

Both ASTM A480 and EN10088-2 include mirror finish specifications called No 8 and 2P respectively. Mirror finish is described as a non-directional finish which is reflective and has good image clarity. The surface will be essentially free from grit lines due to the initial grinding stages but there will be visual differences between surfaces produced by different suppliers to these specifications.

For mirror finishes, requiring that the surface has a specific surface roughness (Ra) is not very useful. Gloss measurements are a useful technique on flat surfaces especially if both diffuse and specular reflection are measured. Not surprisingly, diffuse reflectance is always higher. If a higher level of confidence is required for critical applications, then agreement on comparison with a finished sample in agreed conditions is recommended. It is the most reliable method of detecting random scratches.

Applications and limitations

Mirror finish is most widely used for plates in presses, on the interior surface of moulds and also for small mirrors, reflectors and architectural panels.

The two primary limitations are:

- the most commonly used grades (304 and 316) are quite soft so that any cleaning process must avoid scratching the surface with residual dust or applied cleaning compounds, and
- large flat areas of mirror polish throw scratches, grease or dirt markings into sharp contrast.

The first limitation is overcome by careful cleaning protocols using adequate water rinsing. The effect of random marks and scratches is reduced if the surface is corrugated at the macro level described below when using surfaces that are texturised (single sided deformation) or embossed/rigidised (through thickness deformation). However, while mirror sheet may be profiled, it is more common to apply profiling treatments to cold rolled sheet.



This decorative 2M finish was pressed into mirror polished sheet and while reflective, does not emphasise defects such as scratches, fingerprints and stains.

ASSDA STAINLESS STEEL TECHNICAL HOTLINE

Contact ASSDA on 07 3220 0722 or visit www.assda.asn.au

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Profiled or patterned surfaces

EN10088-2 uses categories 1M and 2M for sheet material that has been patterned on one side only. The 1M group applies to hot rolled base materials while the much more common 2M applies to cold rolled base materials, usually with a 2B, 2D or 2R (BA) finish. In corrosive environments it is essential to orient the pattern to allow free drainage.



The Petronas Towers - a building with large side facets, clad with hyClad cambric patterned surfaces



The door cladding provides strength as well as a bright appearance. Another example of strengthening is when a rigidised pattern is used for outdoor bench seating.

Through thickness deformation

EN10088-2 lists 2W for cold rolled sheet that has been cold rolled into a through thickness corrugated pattern. The cold work strengthens the sheet and may permit the use of thinner sheet. The rigidity also helps control oil-canning, i.e. local buckling caused by thermal expansion during fixing or temperature changes during the year or day. The surfaces are often described as embossed or rigidised.



These patterns are stiffer than simple sheet and, while the patterns are decorative, they are also less susceptible to grease marks, dirt and scratching.

Coloured stainless steel

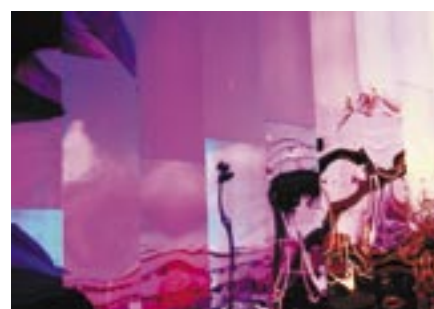
Stainless steel can be painted provided that the surface is scrupulously clean and has sufficient profile to mechanically anchor the paint. Using a stainless steel base metal offers the advantage that, even if the coating is damaged, any rusting is superficial and will not lead to long term structural failure as has occurred when protective coatings fail on steel or aluminium structures.

However, painted organic coatings are a clumsy means of colouring stainless steel. If it is simply to be blackened, then the molten sodium dichromate process or a hot sulphuric acid treatment or even an electrodeposited and baked organic coating could offer greater durability.

Other colours are offered by an electrochemical deposition process that deposits and hardens an enhanced oxide film on the stainless steel although usually only on 304. The colour depends on the thickness of the oxide and progresses from blue to gold to mauve and green with time of exposure.

The colour is similar to the interference colours in an oil slick or soap bubble with interference between the light reflected from the top of the oxide and base metal. In theory the colouring could be reproduced on any simple

shape but in practice, it is only available on sheets. The coated sheets may be deep drawn, formed, bent and fixed mechanically but welding destroys the coloured film. While the oxide film is harder and more resistant to scratching than the basic 304 substrate, it is still susceptible to mechanical damage and so is not suitable in areas subject to heavy traffic. Corrosion tests on blue coatings on 304 showed slightly improved resistance to atmospheric and acidic chloride exposure over the resistance of 304.



Mirror polished, coloured stainless steel adds concert mood at the Experience Music project in Seattle.

DID YOU KNOW?

If you are working on the design, specifications or plans for a new or existing project, ASSDA can assist you in finding fabricators who have directly relevant experiences.

Simply call the Technical Hotline with information about your project and your query will be syndicated to ASSDA's members who will contact you to discuss.

**ASSDA's Technical Hotline:
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STAIRWAY TO STAINLESS HEAVEN



Northern Stainless Director and Operations Manager Darren Colbert said a stairway to heaven for a Sunnybay home in Northern Territory meant minimal upkeep in a potentially corrosive environment.

“We wanted low maintenance because he (the home owner) is only 1km from the ocean,” Darren said. “He is well shielded from the sea but we still electropolished – to avoid tea staining.”

The staircase used 560 kilograms of grade 316 stainless steel supplied by Atlas Specialty Metals in Berrimah. Standing 4.5metres high and stretching out 3.5metres, the structure was built to complement the handrails around the pool area as well as the balustrades around the upper level of the dwelling.

A great deal of individual attention was given to the stair treads, using 3 millimetres of stainless steel which was laser cut and punched. Further laser cutting was used to provide aesthetic features under each step.

The two main stringers used 6-inch stainless steel pipes, which were electropolished to achieve their final look.

The end result was a spiralling stairwell from the pool area to the upper level of the home, which requires only minimal maintenance and looks simply gold!



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NICKEL MINE USES 400 TONNES OF STAINLESS STEEL



When ASSDA Accredited Fabricator Nepean Engineering was awarded the tender for the manufacture of the stirring mechanisms for 10 thickeners for the Goro Nickel Mine in New Caledonia, they had no idea of the enormity of the venture. But having now completed the two-year undertaking they reflect on what has been their biggest stainless steel project to date.

Although the nickel mine was a massive development, Nepean Group Owner and Managing Director David Fuller admits the initial stages of commencement were a little "stop-start".

"We won the tender 2 years before from GLV Australia Pty Ltd (Dorr-Oliver Elmco) but the project was cancelled," he says. "We then had to re-tender and were lucky enough to win it again."

Manufacturing finally commenced in August 2005 and was completed in March 2007.

David says the project resulted in 410 tonne of stainless steel product, including an additional 370 tonne of carbon steel. The contract export value was \$10 million. Varying grades were used including 338 tonnes of 316L, 65tonne of 904L and 7 tonne of AL6XN. The thicknesses ranged from 1.6mm up to 80mm.

Six of the thickeners were 70 metres in diameter and required the manufacture of 33 metre long raking arms. Because a highly corrosion resistant material was needed where the nickel extraction occurred, Nepean Engineering used 904L for its high nickel and chromium content. The thick sections required meant that 316L and 904L were used to avoid sensitisation and the subsequent risk of intergranular attack.

Super-austenitic grade AL6XN with 6% molybdenum and high nitrogen, offered better corrosion resistance and was used in one of the smaller thickeners which extracts cobalt. This material was imported from America.

When manufacturing commenced Nepean Engineering experienced quite a few

challenges as a large amount of material was non-standard size.

"316L angle was unavailable so all angles were pressed from flat plate," David says.

Pressing was performed across the grain. This required joining 2 x 8 metre sheets using sub arc welding so that the longer angles could run across the sheet. The sheets were then cut to fit the plasma cutter, which could handle 6 x 17 metres. Some of the angles were formed in Nepean's 1000 tonne press and others were subcontracted for specialist pressing.

Special dies were made for Nepean's press to allow larger angle radius. Furthermore, pipe unavailability due to wall thickness requirements meant up to 2 semi-circular half sections of pipe had to be pressed then sub arc welded together to achieve a die of the required length and diameter.



For quality purposes, all welding required procedures. Nepean Engineering created a procedures manual for approval by the client.

Contamination from processing and handling was an issue that required focus. Nepean Engineering built a new factory dedicated to stainless steel with inserts at work stations, on forklift tines and on cranes plus separation sheets on presses and rolls to avoid cross contamination. All welds were pickled after fabrication. However, it became evident that not all contamination had been removed with further contamination also occurring due to airborne grinding particles. In order to provide a clean surface with a uniform overall appearance, flap disc grinding and garnet blasting was performed which removed any contamination, excess flux, heat tint and oxides.

With such a large quantity of stainless steel on site and with varying grades and material thicknesses, clear identification was imperative. Traceability was adopted on all parts and processes of the project with the introduction of a colour coding system to identify the different grades of stainless steel.

Material heat numbers were stamped on all components. Maps and naming schedules were used so that each component had a part number and could be identified on a drawing. A spreadsheet was produced to advise the client of the heat number of the plate from which each part was cut. This then could be traced to a material certificate to provide the chemical and mechanical properties of that particular plate or item.

Weld traceability was also adopted on all parts of the project. Again maps and naming schedules were used so that all welds could be identified. Each welder was assigned an identification number, which was then traced against the weld number and placed on a spread sheet similar to the material traceability spreadsheet.

Other parameters traced were the type of wire used, wire batch numbers, flux type and batch and welding procedures.

Non destructive testing (NDT) was employed with dye penetrant and ultra sonic tests on the non-magnetic, austenitic stainless steel components and magnetic particle and ultrasonic on the carbon steel components.

David Fuller said "the job was a major challenge but one that Nepean Engineering rose to". "The experience we have acquired, along with the additional infrastructure built puts us in good stead for future projects of this magnitude."

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NEWCASTLE THE 2007 PACRIM DESTINATION



EXTEND YOUR STAY IN NEWCASTLE AFTER THIS YEAR'S CONFERENCE AND ENJOY ITS MANY OFFERINGS

Newcastle may not be a destination that typically springs to mind for a holiday but if sandy beaches, outdoor activities, golf, history, wine and culture are on your list of criteria, then extending your stay in the region after this year's PacRim Conference may be just what you're after.

Newcastle City reaches out to the sea on a Peninsula at the mouth of the Hunter River, making it the only Australian City with a CBD simultaneously on the beach and the harbour waterfront.

Newcastle is Australia's second oldest city – a title that brings with it a list of historical offerings. In addition to a myriad of gracious heritage buildings, the Convict Lumberyard is a site of national significance. With its rare evidence of a convict industrial workplace it is a glimpse into the harsh days of penal settlement. You can also navigate the underground tunnels at Fort Scratchley and marvel at the oldest working cannons in Australia, or flash back to the 1930s at the Ocean Baths with its rugged pool structure and Art Deco backdrop.

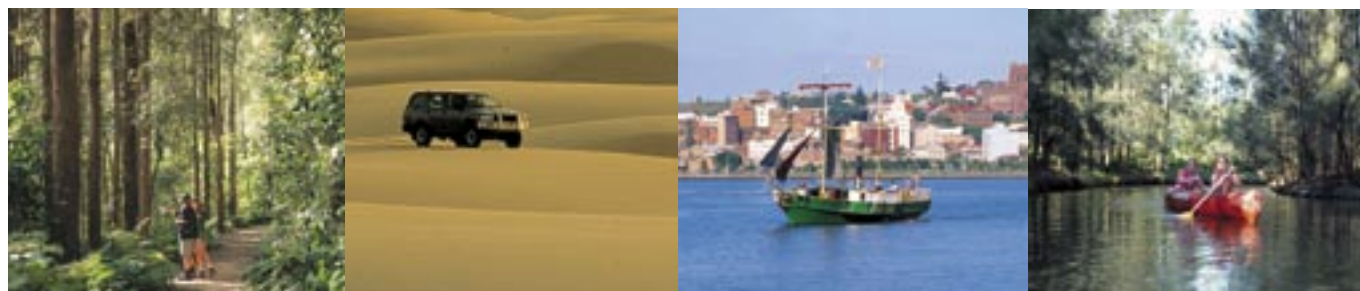
For those that desire sun and surf, Newcastle prides itself on its coastline. With numerous beaches to choose from, you are bound to find the perfect spot. Amongst those is Nobbys Beach, famous for its cleanliness and a popular spot for families.

Newcastle also has the biggest salt water lake (Lake Macquarie) in the southern hemisphere at its back door.

For the avid art lovers, you will be pleased to know that Newcastle has the highest number of artists per capita in Australia.

In the wider Newcastle region, you can extend your holiday to include a trip to the Hunter Valley, the Hunter Wetlands Centre or the Stockton Bight Sand Dune System - a 33 km moving desert coastal system. This is the largest sand dune mass in the Southern Hemisphere, which may be explored with your own 4WD (permit required) or by taking a guided tour via quad bike or 4WD.

Whatever it is you seek, Newcastle is a great holiday destination so bring your family to this year's conference and enjoy a well earned break!



Photography courtesy of Newcastle Tourism

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