

# AUSTRALIAN STAINLESS

SPECIALISING IN STAINLESS STEEL AND ITS APPLICATIONS

#50  
SUMMER  
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ASSDA



# CHIMPANZEE SANCTUARY WHERE STRENGTH MEETS STYLE



1. Non-climbable wall from paddock



2. Enclosure - blackened stainless steel mesh



3. Non-climbable wall - stainless cable net and panel supports



4. Chimpanzees enjoying their new home

Innovation in zoo enclosure design is a key feature of the recently completed \$7.5 million makeover of the Chimpanzee Sanctuary at Sydney's Taronga Zoo.

The project brief was to create a chimpanzee habitat akin to their native home that would encourage social interaction and allow the zoo's primate keepers to manage animal husbandry and the group's changing demographic. The enclosure's transparency and the ability to withstand the chimpanzee's remarkable strength and intelligence were essential.

ASSDA member Ronstan Tensile Architecture was contracted by the builder, the Lipman Group, to be the specialist contractor for the technical design and installation of a mesh enclosure and non-climbable wall. Ronstan's unique capability in tensile architecture and their technical expertise were a natural fit for this challenging project designed by Jackson Teece Architects.

The Sanctuary features the mesh separation paddock (similar to an aviary), at one end of the main exhibit. A non-climbable wall with a removable curtain, allows both spaces to function as one large paddock. This enables introductions of new chimpanzees into the compound and helps manage the apes' complex behaviour patterns.

Ronstan Tensile Architecture's General Manager, Rowan Murray, said the non-climbable wall structure was one of the most challenging design aspects.

"The architect's greatest challenge was to separate the chimpanzees physically, but still have them all in view in the paddock. We had to build a wall that was transparent, had openings of no more than 5mm to avoid chimpanzees putting their fingers in and climbing, and could withstand the strength of chimpanzees." Mr Murray said.

The structural complexity of the non-climbable wall required 3D modelling to analyse design configurations and ensure structural integrity. Test panels of the non-climbable wall were fabricated and assessed in the chimpanzees' temporary enclosure to determine which would offer the safest containment of the site and minimise visibility.

Mr Murray said the primary structure for the wall consists of a Ronstan supplied tensile cable net that supports semi-transparent perforated stainless steel panels.

"Most materials can be damaged, but the durability of stainless steel panels of certain perforation proved to be the right solution and important in the development of the overall design," he said.

"The non-climbable wall had been designed with wall panels clamped directly to the enclosure mesh face. In a collaborative effort, we changed this to an independent cable net structure to remove the risk of having the final wall shape differ from that modelled, and in doing so, avoided the risk of panel geometry differing from the complex 10 degree incline necessary for non-climbability. This also ensured uniform set out and fixing methods, more consistent panel shapes and allowed the panel geometry to drive the wall structure rather than this being determined by other elements."

ASSDA member, Locker Group, supplied the grade 304 stainless steel panels, which were perforated to 50%. A black painted finish was applied before installation.

With stringent performance characteristics to adhere to, including long-term corrosion resistance and aesthetics, Carl Stahl X-Tend stainless steel mesh was specified for the separation enclosure and the removable curtain within the non-climbable wall. The stainless steel mesh was blackened using an electrolytic process to increase transparency of the enclosure.

Trevor Williams, Lead Consultant of Jackson Teece and Project Architect for the development, said materials selection was critical in delivering the aesthetic appeal and longevity of the enclosure.

"We spoke with Ronstan Tensile Architecture for technical design advice in the early stages of the project. There were various other types of meshes that were a possibility but, being a dynamic structure, alternate materials were far too rigid and not as flexible as the Carl Stahl X-Tend stainless steel mesh. I don't think we could have achieved this outcome with any other mesh," Mr Williams said.

"The stainless steel will have a longer life in the aggressive south-facing coastal environment. The blackened mesh has a fantastic form and from an architectural point of view, has achieved an organic appearance."

Ronstan Tensile Architecture's contribution to the project, including the tensile mesh enclosure and non-climbable wall, cost about \$1.2 million and took 16 weeks to construct.

Mr Murray said the stainless steel demonstrates a great mix of strength and transparency, and the end tensile result is very forgiving.

"Achieving the architectural intent involved complex modelling and finite analysis of the mesh form to ensure the surrounding structures could be designed to support the enclosure loads. Ronstan is absolutely rapt with the state-of-the-art structure," he said.

The paddock was completely re-landscaped and the impressive exhibit also now features several climbing platforms at varying heights of up to 12 metres, and a 180 kilogram hammock for the chimpanzees to enjoy.

The 17 lucky Taronga Zoo chimpanzees moved in to their renovated home in late September 2011.

*Images 1, 2 and 3 courtesy of Ronstan Tensile Architecture.*

*Image 4 courtesy of Taronga Zoo.*

## QUANTITIES AND GRADES OF STAINLESS STEEL USED

### › Mesh enclosure

770m<sup>2</sup> of 3mm Ø x 60mm blackened stainless steel, grade 316 Carl Stahl X-Tend mesh.

### › Non-climbable wall facade

140m<sup>2</sup> of grade 304 stainless steel perforated to 50%, with a black painted finish.

### › Cables

1x19 construction 8mm, 12mm and 22mm diameter, grade 316 stainless steel cables. The stainless steel cable end fittings and components were polished and passivated prior to installation.

## HELICAL COIL GETS A U-NEEK BEND

Fabricating equipment for the chemical sector requires solid high quality materials and superior workmanship. In April 2011, ASSDA member and Accredited Fabricator U-Neek Bending Co Pty Ltd put the finishing touches on a radiant helical coil at their factory in Dandenong, Victoria.

The coil, designed as a heater for Titanium Tetrachloride (TiCl<sub>4</sub>) production, is 11.4 metres long with a diameter of 3.05 metres and required more than 7 tonnes of high grade Inconel Alloy.

U-Neek's Business Development Manager, John Lovell, said the client chose to have this material shipped from America.

"At around US\$1000 a metre, Inconel Alloy is a very expensive option but it has great heat transfer properties and is completely non-corrosive," Mr Lovell said.

The Western Australian client, who declined to be named, were looking for a fabricator that, in addition to having a proven record in metal bending, could work to their particular requirements for this critical process component.

"U-Neek weren't just competitive in pricing," said Greg, a project engineer with the client. "They succeeded with all the trial projects we sent them."

"To ensure total quality control, we provided a comprehensive report that detailed every step of the process, including the names of every person who worked on the individual stages," Mr Lovell said.

U-Neek Engineer Dale Theobald said the coil was manufactured to exacting tolerances using a range of Inconel Alloy materials.

"We used 150NB Schedule 40 seamless 600 for the pipes and flanges, 366-04 WPNCI-S for the elbows, B168-08 for the plate and 253MA for the high temperature pieces," he said.

Once completed, the coil then had to undergo a rigorous series of tests. The butt welds were verified with full radiography, the attachment welds were submitted to liquid penetrant inspection (LPI), and a full hydro exam was done on the coil itself.

"The coil was filled with distilled water to test its heating capabilities. Then the coil was pressurised with nitrogen, to a dew point of -12°, to remove all traces of water and moisture prior to transporting," Mr Lovell said.

The transport frame and mounting jigs were manufactured from mild steel. To ensure no cross contamination, Inconel

strips were fitted to the mounting points. The coil was lifted onto the back of a semi-trailer for final transportation to Perth, using U-Neek's 16 tonne travelling overhead cranes.

*Images courtesy of U-Neek Bending Co Pty Ltd.*



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