PRECISION INVESTMENT CASTINGS

HYCAST

Hycast Metals Pty Ltd

integrity reliability performance

AN OPEN INVITATION TO ALL DESIGN AND CONSTRUCTION PROFESSIONALS

HYCAST METALS PTY LTD FACTORY AT SMITHFIELD SYDNEY NSW AUSTRALIA

Dear Fellow Professionals,

Welcome to the dynamic world of Precision Investment Casting.

Hycast is at the forefront of technological innovation in architectural and structural glazing support systems.

At Hycast we have been busy designing, manufacturing and supplying custom made castings to a number of high profile engineered architectural projects.

Hycast is often selected to partner with world-leading façade engineers and other specialists. The reason is simple. Hycast is second to none when an innovative economic engineered solution is required.

Hycast offers superior engineering skills, state-of-the-art technology as well as on-time delivery.

I'd like to take this opportunity to introduce you to some recently-completed architectural projects which showcase Hycast expertise …

- Dubai Airport Terminal 3, United Arab Emirates
- 3 Pacific Place, Hong Kong
- Aurora Place, Sydney, Australia
- EDS Building, Adelaide, Australia
- 388 George Street, Sydney, Australia

I think you'd agree that Precision Investment Casting opens up a stunning repertoire of architectural design possibilities!

At Hycast we guarantee world-wide technical expertise and quality at its best.

Please contact us to discuss Precision Investment Casting for your next architectural project.

John F Kell
MIE Aust CPEng
Managing Director

HYCAST CORPORATE PLATFORM

VISION

Hycast is committed to consolidating its position as a world class supplier of engineered Precision Investment Castings suitable for architectural, industrial and commercial applications.

MISSION

With a strong 45 year track record well established, Hycast continues to develop as a leading Australian manufacturer dedicated to the production of quality professionally-engineered investment castings. The company will continue to meet client expectations in an understanding and innovative manner, by attracting, training and retaining high calibre technical personnel and staff. Through the ongoing improvement of management processes and service delivery systems, Hycast will sustain and expand its international profile and global market share.

PRODUCTION OBJECTIVES

Hycast focuses increasingly on the production of architectural investment castings used to support glazed assembly structures in commercial and industrial projects around the world.

From Shanghai to Sydney, from Dubai to Washington, Hycast products are now an integral aspect of leading architectural projects on every continent. Our company's success flows from uncompromising attention to all aspects of engineering, metallurgy and production issues.

Hycast offers flexibility in casting which reassures building owners, developers and architects that all Hycast metal products are manufactured to exacting specifications and are suited to the most demanding of design conditions.

Hycast employs personnel who bring with them a variety of sophisticated engineering and technical skills. Continual skills improvement and upgrading ensures that Hycast can always offer discerning clients a superlative skills base with guaranteed quality of manufacture.

Freestanding and integral architectural sculpture is another exciting aspect of investment casting which Hycast is always prepared to undertake. Hycast has the skills and creativity to bring art forms to life.

Why Hycast? Integrity, reliability and performance.

WORLD CLASS MANUFACTURING & QUALITY

Hycast works according to the following standards:

- Quality Management System AS/NZS/ISO 9001
- NATA accredited laboratory ISO/IEC 17025
- OH&S Management System AS/NZS 4801
- Environmental Management System AS/NZS/ISO 14001

Impression

Terminal 3 Runway View June 2006

Teardrop Windows June 2006

WHY HYCAST?

Hycast is a lot more than 'just another casting company'. Hycast offers the full range of technical skills necessary to ensure an architectural precision investment trade package is managed effectively from design through to installation.

ANOTHER HIGH PROFILE PROJECT - TERMINAL 3 DUBAI AIRPORT

Dubai International Airport Terminal 3 is a good working example of how Hycast likes to work on prestige architectural projects anywhere in the world.

Considered the premier and most busy airport in the Middle East, it is projected by the local Department of Civil Aviation that by 2010 over 30 million passengers per year will use Dubai International Airport.

Costing US$2.5 billion, Phase Two of the Dubai Airport expansion program includes Terminal 3. This work began construction in 2002 and was completed in 2006. Hycast was there every step of the way.

Hycast co-ordinated all of the engineering and metallurgical services required to produce the cast glazing support systems which secure the distinctive Dubai Terminal 3 teardrop windows.

A SUCCESSFUL FORMULA

The methodology adopted by Hycast to coordinate and complete the spider castings for the teardrop windows at Dubai Terminal 3 is as follows:

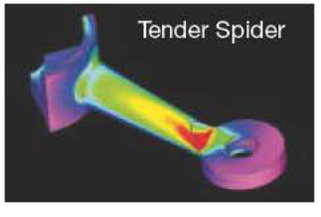
3D COMPUTER MODELLING

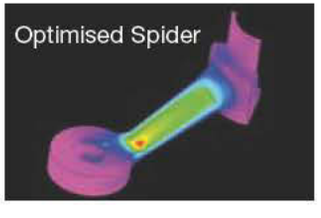
Typically, Hycast develops a 3D computer model of the proposed casting and its ancilliary components. Intended to verify the shape, 3D computer modelling enables architects and their clients to view and rotate the casting design.

FINITE ELEMENT ANALYSIS (FEA)

An FEA is a linear static finite element analysis of a casting used to demonstrate maximum developed stress when design loads are applied.

The cast teardrop window spiders used at Dubai T3 form the link between the glazing and catenary tensile support structure. An FEA assisted here to optimise the shape of the casting so that the casting grade ASTM A743 CF3M (equivalent to 316L) could be used.





CASTING SIMULATION

Forming a reliable casting with structural integrity in a timely manner at Dubai T3 required the design of a suitable metal feed system. Hycast adopted casting simulation technology to simulate and visualise the entire casting process. This included pouring, solidification and defect detection.

RAPID PROTOTYPING

Rapid prototyping is technology which facilitates fast production of a single casting. This enables architects to confirm shape, form and finish prior to commencement of tooling.

CASTING PROCESS

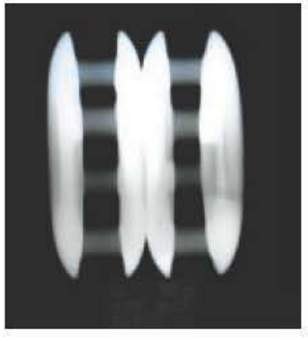
At Hycast, our casting process entails manufacturing of tooling, wax pattern and subsequent ceramic shell. The wax is then removed and fired in gas-fuelled furnaces at 1100°C to create the ceramic investment mould. The shells are filled with molten metal. The ceramic shell is then removed to allow for cleaning of the castings.

FINISHES

Casting finishes can vary from sand blasting to mirror polish. At Dubai T3, the finish chosen was a fine hairline mechanical polish.

NON-DESTRUCTIVE TESTING (NDT)

NDT involves radiographic testing and detects discontinuities or defects that may be present in castings. NDT also confirms the casting simulation phase.



DESTRUCTIVE TESTING

Destructive testing is used to determine the working and ultimate load capacities of a casting. The Dubai T3 spiders were tested in this manner.

HYCAST ARCHITECTURAL GLAZING SUPPORT SYSTEMS

PROJECT INFORMATION

Project: Three Pacific Place, Hong Kong

Area: 2760m²

Architects: Wong and Ouyang (HK) Ltd
Hugh Dutton Associates

Structural & Façade Engineers: Meinhardt Façade Technologies

Specialist Contractor: Josef Gartner GmbH

Three Pacific Place features an innovative podium glazing system. The support columns are set back from the façade, introducing interesting structural complexities.

There are 8 different cable nets and 75 different clamp, node and spider castings. Production quantities ranged from 1 item to 200. Time frame was 6 months for tooling, mock-up and production.

PROJECT INFORMATION

Project: Aurora Place, Sydney, Australia

Area: 625m²

Architects: Renzo Piano Building Workshop

Structural Engineers: Arup Façade Engineering

Specialist Contractor: Austress Freyssinet Pty Ltd

Aurora Place features cast football and hamburger shaped nodes which transfer high tension loads in a laced single catenary structure. Prodigious tension detailing delivers a world-first overhead CBD piazza canopy.

All cast elements were exhaustively engineered and analysed.

The nodes were made from high-strength Duplex CE3MN stainless steel.

Casting quality was paramount due to continuous high tensile forces.

PROJECT INFORMATION

Project: EDS Building, Adelaide, Australia

Area: 300m²

Architects: Hardy Milazzo

Structural Engineers: Cardno (NSW) Pty Ltd

On the EDS Building in Adelaide, 40 façade bracket castings were manufactured and supplied to site, on time. Each bracket was 1800mm high and weighed 80 kilograms. To support external glazing, each bracket required 2 four-legged, stainless steel spiders with a highly visible capped architectural profile. The structural design permitted tolerances of ±25mm in all directions.

The EDS Building is an excellent example of yet another successful collaboration between Hycast and firms of innovative architects and engineers.

PROJECT INFORMATION

Project: 388 George Street, Sydney, Australia

Area: 10,000m²

Architects: The Rice Daubney Group

Façade Consultants: Arup Façade Engineering

Specialist Contractor: Permasteelisa

At 388 George Street, Hycast supplied the most significant design element of this high-profile architectural curtain wall façade: 2,500 stainless steel truss frame castings.

Not simply an aesthetic design feature, the castings in conjunction with the aluminium mullions work as an innovative floor-to-floor truss system.

The Precision Investment Casting method ensures the cast elements feature qualities such as smoothness of finish, high structural strength and ease of erection.

Corrosion resistance is maximised by selection of a low-carbon CF3M alloy which minimises carbides in the alloy lattice.

HYCAST ARCHITECTURAL COMPONENT PRODUCTS

BALUSTRADE BRACKET


90° 2-LEGGED SPIDER


1-LEGGED SPIDER


180° 2-LEGGED SPIDER

SUPPORT BRACKET


CATENARY NODAL POINT


2-LEGGED FINNED BRACKET


CORNER GLAZING FITTING

HYCAST IS ABLE TO DESIGN AND MANUFACTURE ANY ARCHITECTURAL SHAPE REQUIRED FOR A GLAZED FAÇADE

Examples include:

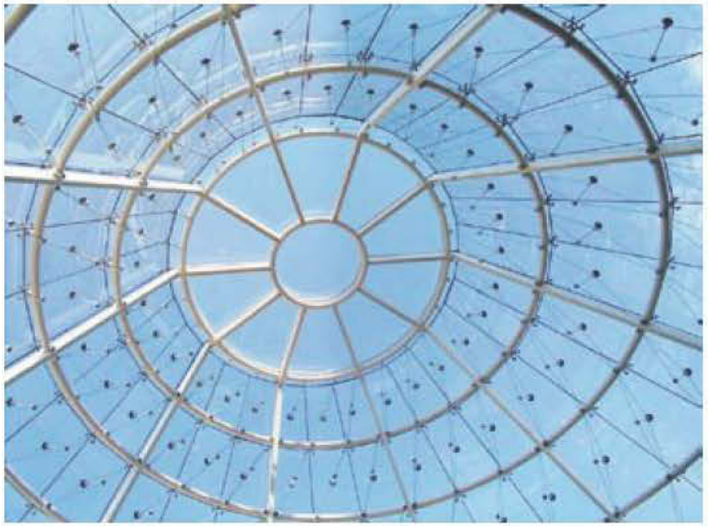
- Structural Connectors
- Glazing Fittings
- Nodes, Clamps & Spiders
- Façade Supports
- Specialised Truss Elements
- Custom Made Components
- Hollow Door Handles

HYCAST Hollow Door Handles
3 Pacific Place, Hong Kong

HYCAST BUSINESS CO-VENTURES AND CONSULTANCIES

HYCAST IS ALWAYS OPEN FOR BUSINESS... WHETHER IT BE TO ADVISE OR ASSIST

- Government Departments
- Institutional Proprietors
- Building Owners
- Architects
- Structural Engineers
- Façade Engineers
- Project Managers
- Construction Managers
- Façade Fabricators
- Glazing Companies
- Sub-Contractors



HYCAST/NUPRESS
Reserve Bank Of South Africa, Pretoria

HYCAST IS ALWAYS INTERESTED TO PARTNER, CONSULT OR CO-VENTURE... WORLD-WIDE

Here is a list of leading companies with whom Hycast has recently conducted business co-ventures and consultancies:

- CARDNO
- NUPRESS FACADES
- MEINHARDT
- PERMASTEELISA
- ARUP FAÇADE ENGINEERING
- GARTNER

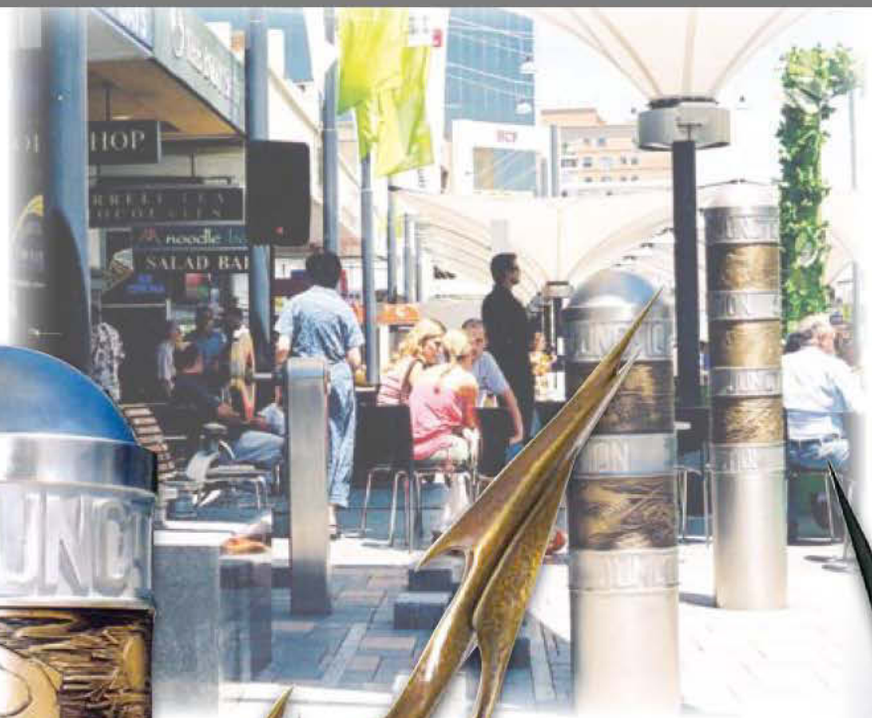
The outstanding results speak for themselves.

HYCAST/NUPRESS
Krung Thai Bank, Bangkok

HYCAST/CARDNO
3 Pacific Place, Hong Kong

HYCAST/NUPRESS
Four Seasons Hotel Group, Toronto

HYCAST SCULPTURAL CASTINGS



SCULPTURE OCCURS WHEN ART, ARCHITECTURE AND ENGINEERING MERGE

Hycast has the artistic vision and technical skill to transform inspired ideas in to sculpted reality. When the creative requirement is for either freestanding or integral architectural sculpture, Hycast is an originator offering design capabilities as well as flexibility, innovation and fine craftsmanship.

From maquette to monumental, from abstract to fine detail, from the lobby to the boardroom, Hycast offers master casting, foundry skills and a finished one-off sculpture.

Our sculpture sizes range from 100mm through to 12 metres.

At Hycast any casting can become a work of art!

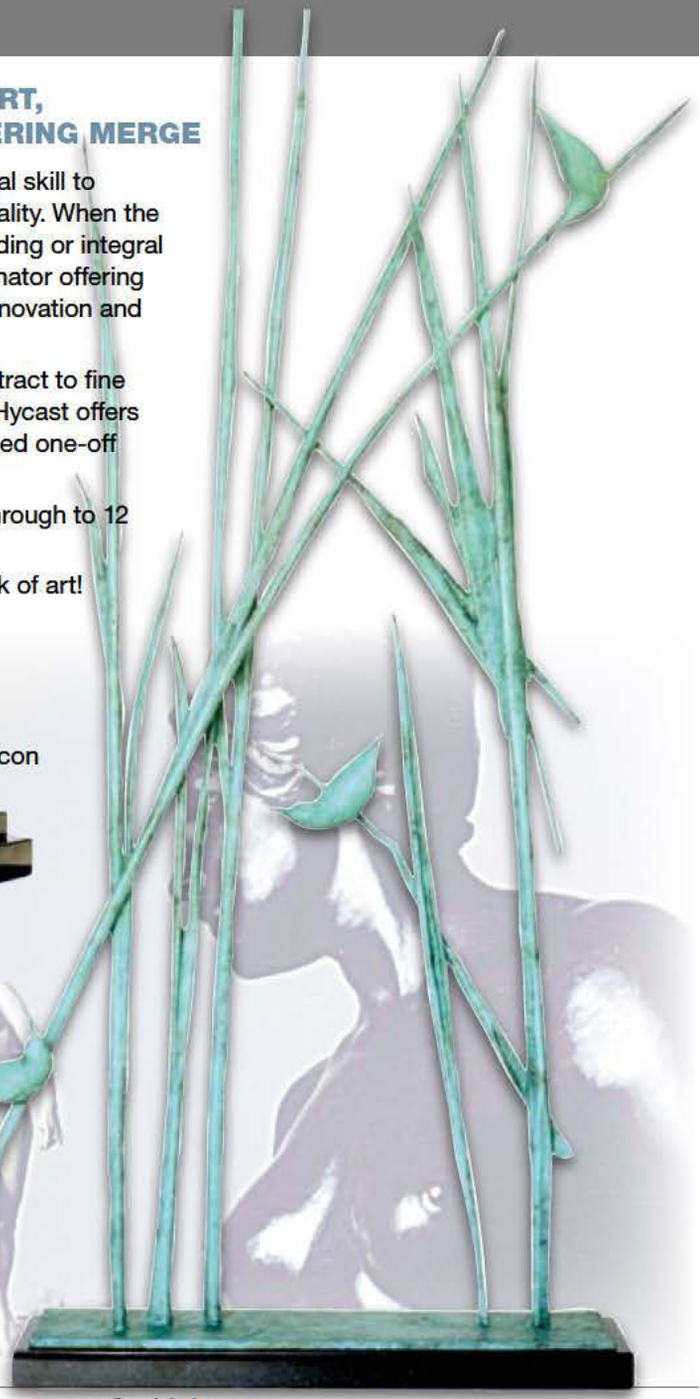
Bondi Story Totem

Fusion

Kingfisher

Falcon

Flight



Sunbirds

GENERAL SPECIFICATION
PRECISION INVESTMENT CASTING

Introduction

Investment or lost wax casting is to be used for all cast components. Any proposal to adopt other casting methods will only be acceptable if it can be demonstrated that the proposed method can meet aesthetic and technical requirements. The grade of alloy is dependant on the structural requirements for integrity and corrosion resistance.

Properties of metal alloys for architecural applications generally require high corrosion resistance or PRE (Pitting Resistance Equivalent), high elongation values and tensile properties to match load conditions. Casting grade CF3M, with low carbon, is generally considered as being the "minimum" grade suitable. Please refer to tables below. The wrought grade properties table is included as reference to stainless steel grades that are more commonly recognised.

1.0 Mechanical Properties of Typical Stainless Steel Cast Grades

Standard	Grade	Yield or 0.2% Proof Stress	Ultimate Tensile Stress	Elongation	PRE*
		MPa	MPa	%	
ASTM 743	CF8	205	485	35	18
ASTM 743	CF3M	205	485	30	24
ASTM 890	CD3MN	415	620	25	31
ASTM 890	CE3MN	515	690	18	39
ASTM 747	CB7CU-1	1035	1205	5	16

*Pitting Resistance Equivalent

2.0 Mechanical Properties of Equivalent Stainless Steel Wrought Grades

Standard	Grade	Yield or 0.2% Proof Stress	Ultimate Tensile Stress	Elongation	PRE*
		MPa	MPa	%	
ASTM 276	304	205	515	40	18
DIN	1.4401	205	510	40	23
ASTM 276	316L	170	485	40	23
ASTM 240	S32205	450	620	25	34
ASTM 240	S32750	550	795	15	38
ASTM 564	17-4PH	1170	1310	10	15

*Pitting Resistance Equivalent

3.0 Chemical Composition

The chemical composition shall comply with the relevant Standard.

4.0 Casting Tolerance

All casting dimensions are to be within the greater of ± 0.5% or 0.25mm. Reduced tolerances can be achieved by machining of the casting.

5.0 Surface Finish

There are four main surface finish categories:

CATEGORY	METHOD
Blast	Garnet Sand / SS Shot / Glass Bead
Electro Polish	Matt / Shine
Auto Mechanical Polish	Rumble
Manual Mechanical Polish	Buff / Satin / Fine Line / Mirror

There are variations to these methods such as Glass Bead Over Mechanical Polish which can be nominated.

6.0 Corrosion Resistance

In accordance with ASTM A380 the castings can be passivated to ensure they are not contaminated with iron oxides.

7.0 Specification

In accordance with the drawings, all precision investment castings are to be manufactured by Hycast Metals Pty Ltd.

HYCAST ARCHITECTURAL PROJECTS SPAN THE GLOBE

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