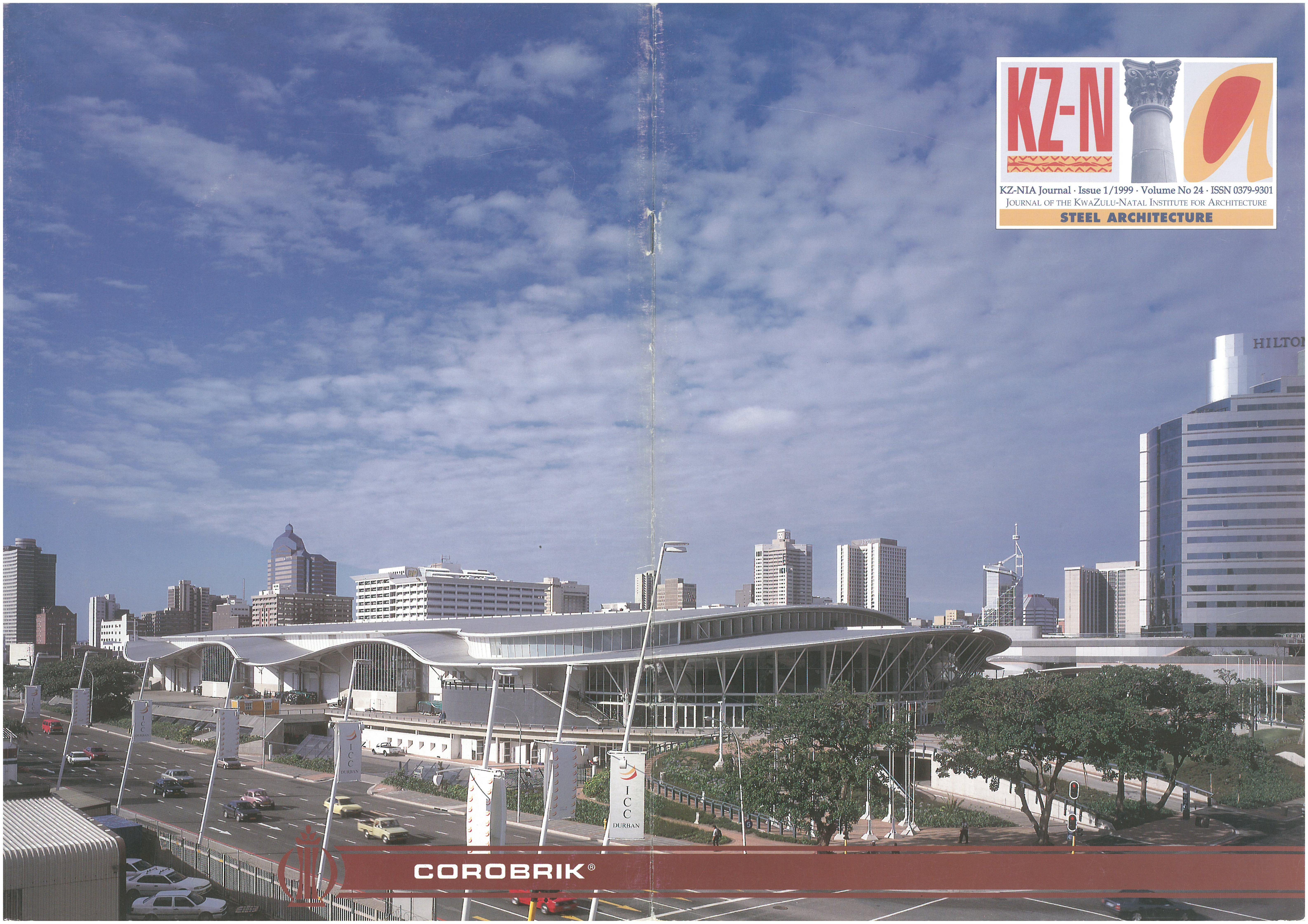

KZ-NIA

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STEEL ARCHITECTURE

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Obituaries

Lionel Reeves 1923-1998

Lionel Reeves was born in Johannesburg and obtained his degree from the University of the Witwatersrand in 1948. He joined the SA Air Force in 1942 and completed the war years as a navigator spending most of his time in North Africa and Italy.

After the war he joined Cowan & Ellis in Johannesburg and then Geoffrey le Sueur & Partners in Durban in 1951 and was Project Architect for Martin West Building for the Durban Corporation

In 1958 he moved to the then Paton Taylor & Partners and became a partner in 1966. He was involved in a whole range of Durban buildings during a distinguished career, among which Perm Corner, Daily News, SA Reserve Bank and NBS Kingsmead come to mind.

He served the Institute for many years as a representative on the Elevational Control Committees of Westville and Durban. Lionel retired from the practice in 1993 when he found more time for golf, painting and travelling. He is survived by Kay, Jonathan and Leslie.

Bill O'Beirne

Jack Simpson, 1911-1998

Of the more senior members of the architectural profession in KwaZulu-Natal, I doubt if there is a single one who did not know of Jack Simpson, and indeed there must be very few who did not experience his teaching, or his demonstrations of presentation techniques. Latterly Jack became widely known and admired as a painter, mainly of buildings; in the earlier part of his career he distinguished himself as a practitioner and teacher of architecture. These two overlapping phases cover a period of continuous, and incredibly prolific output of more than 60 years.

The bare facts of John Churchill Simpson's curriculum vitae, distinguished though they are, give a completely inadequate picture of the man. He was schooled at DHS, received an Emma Smith (Art) Scholarship in 1934, diplomated from the AA in 1937 and joined the practice of Geoffrey le Sueur in the following year. He became a partner in 1948, lectured part-time at Natal University College, as it was then known, and served as NPIA President during 1955-57 and ISAA President-in-Chief 1958-1959.

Throughout that timespan, Jack worked with a cheerful dedication and an unremitting diligence that I have rarely, if ever, seen equalled. As a fundamentally indolent person myself, I always envied Jack for his astonishing capacity for application. Wherever he happened to be – and he and his wife of 50 years, Kay, travelled often and extensively in Southern Africa and Europe – he was unceasingly sketching and painting. And yet, like many people blessed with that sort of continuous fount of energy, he managed to accomplish an enormous number of other things as well, from building domestic furniture and fittings, to writing, recording San paintings, illustrating books (eg. *Spanish Houses of Southern Africa* and *Palms for Gardens in Southern Africa* both by Hein Wicht), recording the trees of Durban, teaching young visitors to his studio, and constantly expanding his encyclopaedic knowledge of history. He was still busy with two major historical paintings – reconstructions of the dispositions of opposing forces at the Battle of Isandhlwana – up to the final fortnight of his life.

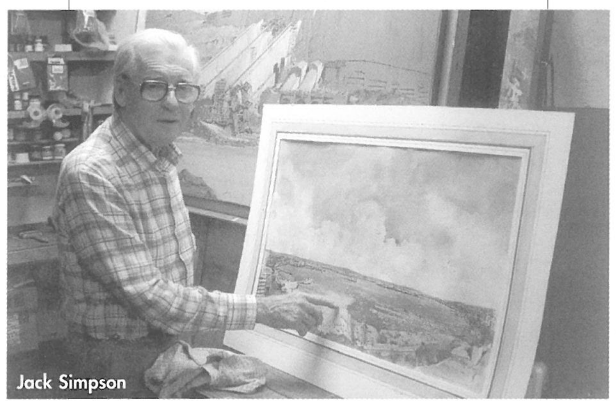
As an architect, he leaves a voluminous record: innumerable buildings of every type and scale, the bulk of them in Durban and its hinterland. It is not possible here to give a substantial catalogue of Jack's buildings, but a drastically curtailed selection would include: Customs House, Victoria Embankment; Dunlop House, Sydney Road; Methodist Church complex cnr Smith and Aliwal Streets; Eagle Buildings, Smith and West Streets; Trident Building Society, Field Street; Barcelona flats, Playfair Road; Denor House, cnr Smith and Field Streets; and the Magistrates Courts, Somtseu Road (this last being a planning nightmare under the apartheid regime, with a brief requiring circulation and access to courtrooms to be totally segregated).

I first knew Jack when, as a new lecturer at the Natal School of Architecture in the early 1950s, I shared the students' astonished fascination at his demonstrations of perspective presentation techniques. In those days, architectural renderings were done in watercolour on Imperial, and even Double Elephant (approximately A1 and A0) sheets of Whatmans paper, stretched tight as a drum. What took the average perspectivist four days or more, Jack would complete (amiably explaining all the while to his audience of thirty or so crowded round the board) between 09h00 and 16h00, including suitable breaks for drying the watercolour washes (no electric hairdryers!) which he occupied with demonstrations of dry-brush perspective drawings and rendering in India ink. Greek temples, Renaissance palaces, architectural details, all complete with tones and shadows, would grow magically on the page.

His interpretation of his subjects was generally highly literal and meticulously detailed, with conscious regard for their significance as records for posterity.

Jack was always an amiable, modest, gentle and yet remarkable man, a credit to his two professions, and to humanity.

Don Dyke-Wells
Emeritus Professor, University of Natal


Jack Simpson

Basil Adkin 1926-1999

An infectious smile is no more: Arthur Basil Adkin died suddenly on 30 March.

Basil joined the NPIA in 1949 and served on the committee for many years including a term as President, 1970-71. From 1966-81 he was in partnership with Roy Hardie and then also Dick Morton.

Together with Melville Poole and Clem Fridjhon, Basil was a Founder Trustee of the NPIA Foundation Fund, and a vigorous fund-raiser. In 1992 the bulk of the assets of this Fund were realised to purchase the premises at 160 Bulwer Road. Without the Foundation Fund, the KZ-NIA home would not have been possible.

Sylvia Grobler, Walter Peters

Letters

Beyond the Usual Borders

Sir: I have often meant to contact you as Editor to comment favourably on something in an issue of *KZ-NIA Journal*. This good intention is usually put aside and then lost in the distractions of architectural life.

The Issue 2/1997, for example, was one such! So if it is not too late, as they say, can I now say how much I appreciated the whole content (This was the issue including Maputaland, Issy Benjamin and Hans Hallen) and further, the frequent very real quality of this publication in general.

There are very few magazines which I keep for future re-reading, mostly *Architectural Review* issues, and those only average about three a year.

KZ-NIA Journal does nearly as well, the above issue being particularly special.

Rod Lloyd, Johannesburg

Guide to the Buildings and Places of Durban

Sir: *KZ-NIA Journal*, Issue 2/1998 has just arrived (22 December 1998) – like the most wonderful Christmas card from Durban.

What a beautiful issue! Maps, pictures, poetry – all beautiful. Lovely cover. Congratulations to all concerned.

My heart still lies in Durban. I am greatly moved. *Issy Benjamin, London*

Sir: I received the latest guide to the buildings and places of Durban. Filled me with nostalgia and a desire to have a few more copies if possible! *Hans Hallen, Sydney*

They're on their way to you. *Editor*

People

DIRECTOR: ARCHITECTURE

Jonathan Edkins has been appointed Director: Architecture in the Architectural Department of the City Engineer's Unit, which serves both the North and South Central Local Councils as well as the Metropolitan Council of Durban, with effect from 1 May.

DOCTOR OF ARCHITECTURE

The degree D Arch (*Honoris Causa*) was conferred upon **Prof Ronald Lewcock** by the University of Natal during the graduation ceremony of the Faculty of Community and Develoment Disciplines held in the Durban City Hall on Thursday, 22 April 1999.

COVER:
International Convention Centre, Durban
Photographer: Dennis Gilbert & VIEW

Steel Architecture

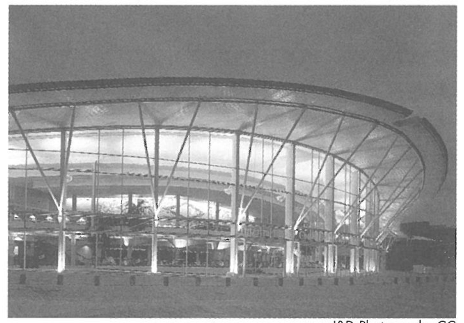
Editorial

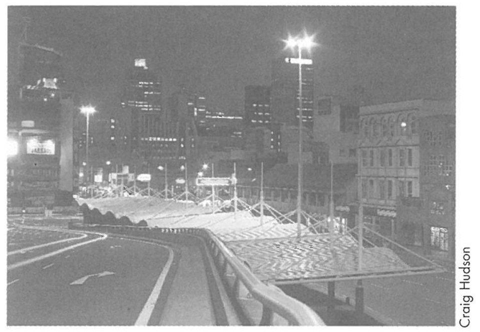
"Modern architecture is the architecture of freedom and steel is its backbone". So writes Christian Norberg-Schulz in his introduction to the book by Eggen, A & Sandaker, B *Steel, Structure, and Architecture* (NewYork: Whitney, 1995).

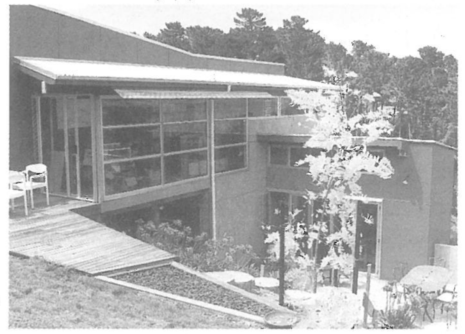
As a building material, steel appears first as linear units that are pieced together to form frames, trusses and space frames. These combinations fulfill two tasks: to provide space for particular social functions and to give form to a spatial character. Norberg-Schulz singles out Mies van der Rohe's ITT buildings with their clear articulation of primary and secondary steel elements as the models for emulation but reminds us too that Mies proffered no better example for young architects to study structurally dependent design than old wooden buildings.

In this issue we focus on recent architecture exemplified by the use of steel in Durban's ICC and combi-taxi ranks, and, as if following on from Mies's advice, we feature the timber house that Errol Haarhoff has built himself in his adopted city, Auckland.

Walter Peters, Editor


J&D Photography CC


Craig Hudson



WROUGHT IRON, CAST IRON & STEEL

Despite their common origin in iron ore, the three basic ferrous alloys differ substantially in their properties and suitability for building purposes. The differences arise primarily from the amount of carbon contained in each.

Wrought iron contains a miniscule amount of carbon, between .02% and .035%. It can be forged, hammered, and rolled, but not cast. Wrought iron can be crafted by the hands of skilled blacksmiths into beautiful grilles, gates and fences. It is notable for its tensile strength, making it perfect for tension rods and beams.

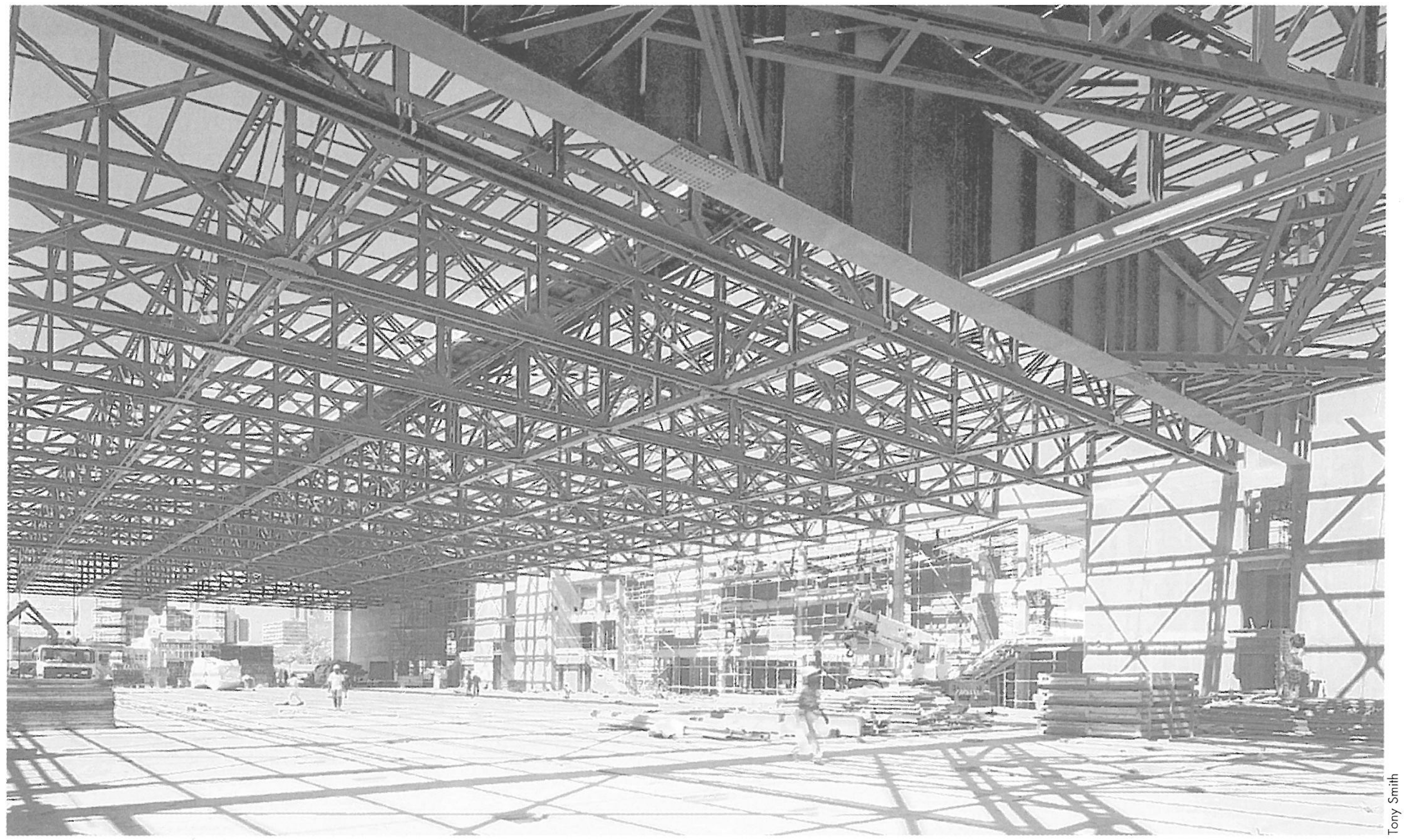
Cast iron has a high carbon content, ranging from 1.5 to as much as 4.5%, but averaging about 3%. The carbon increases the alloy's hardness, giving it great strength in compression and making it ideal for columns used to support heavy loads. On the other hand, the carbon makes cast iron rather brittle, so that it has little elasticity and is low in tensile strength.

Steel, with low but significant carbon content, usually less than 2%, has strength in both compression and tension. It can be rolled and extruded into a wide range of architectural forms. It can also be cast, but not with ease. Not until the later nineteenth century was steel available to builders in quantity and at a cost that would allow it to replace wrought iron. Inventions, such as Bessemer's converter in 1856, made possible greatly expanded production and brought steel into competition with wrought iron and to a lesser extent cast iron as an architectural medium

Source: Gayle, M&C *Cast-Iron Architecture in America*. New York: Norton, 1998.

Steel Architecture

ICC: Structural Frame



Brief

The brief called for a semi-basement for the parking of 700 vehicles; a main foyer and concourse; administrative facilities; a plenary hall with raked seating for 1800 delegates and an open, 10m high, unencumbered flat-floor hall space of 7 000sqm, sub-divisible acoustically into a variety of spaces for exhibition or meeting purposes; flexible break-out venues and a fully serviced kitchen.

Architectural Concept

A sub-divisible central hall space is terminated by a semi-circle on the north – prompted by the theatrical plenary seating arrangement – and truncated on the south for the possibility of future expansion. The entrance foyer on the north gives direct access to the plenary space and extends along the west as a concourse to provide access to the sub-divisible hall space and to the break-away venues opposite.

The central hall is roofed by a tall shed-roof and an undulating roof is wrapped over and around the disparate perimeter space-containers – a solution which organically acknowledges the varying scales around the external envelope of the building and meets with the climatic requirement of sheltering the glass facades from solar insolation.

Structure

The building structure is generally on an 8.4x7.8m module determined by the semi basement parking layout and this work is in reinforced concrete. The ground floor slab comprises a 350mm thick post-tensioned flat concrete slab designed for a loading of 5KPa and founded on 16m deep grout-injected auger piles. The transfer of grid systems occurs at the 10m eaves level by way of two reinforced concrete beams running the full length of the building. For the roof to the hall space, the internationally accepted service grid of 6x6m was applied to provide take-off points for various permutations of exhibitions, lighting, communications and electrical connections, besides carrying the sliding panels for subdividing spaces.

Structural steel lattice trusses with top chords profiled to form a constant-radius curved roof, 5m deep at midspan, were found to be the only structural system that could be successfully designed, fabricated and installed while remaining light, flexible and efficient.

Due to the semi-circular seating arrangement in the plenary space of the hall, a radial roof truss system was used here and over the foyer, supported off a 54m transverse steel plate girder. This layout integrates with the lifting points for the tiered seating banks, the lighting galleries, and the tracks for the movable walls.

Edited from texts supplied by John Ferendinos, Linda Ness and Rob Young

For an explanation of the design concept, readers are referred to *Architecture SA*, Jan/Feb 1995, and *World Architecture*, April 1999. *Editor*

International Convention Centre, Durban

Client *ICC Construction (Pty) Ltd*

Architects *Stauch Vorster Architects in association with Hallen Custers Smith and Johnson Murray Architects.*

Consulting Architect *Philip Cox of Cox, Richardson, Taylor & Partners, Sydney.*

Consulting Engineers *Young & Satharia (structural steel) in association with Lawrence & Boorsma.*

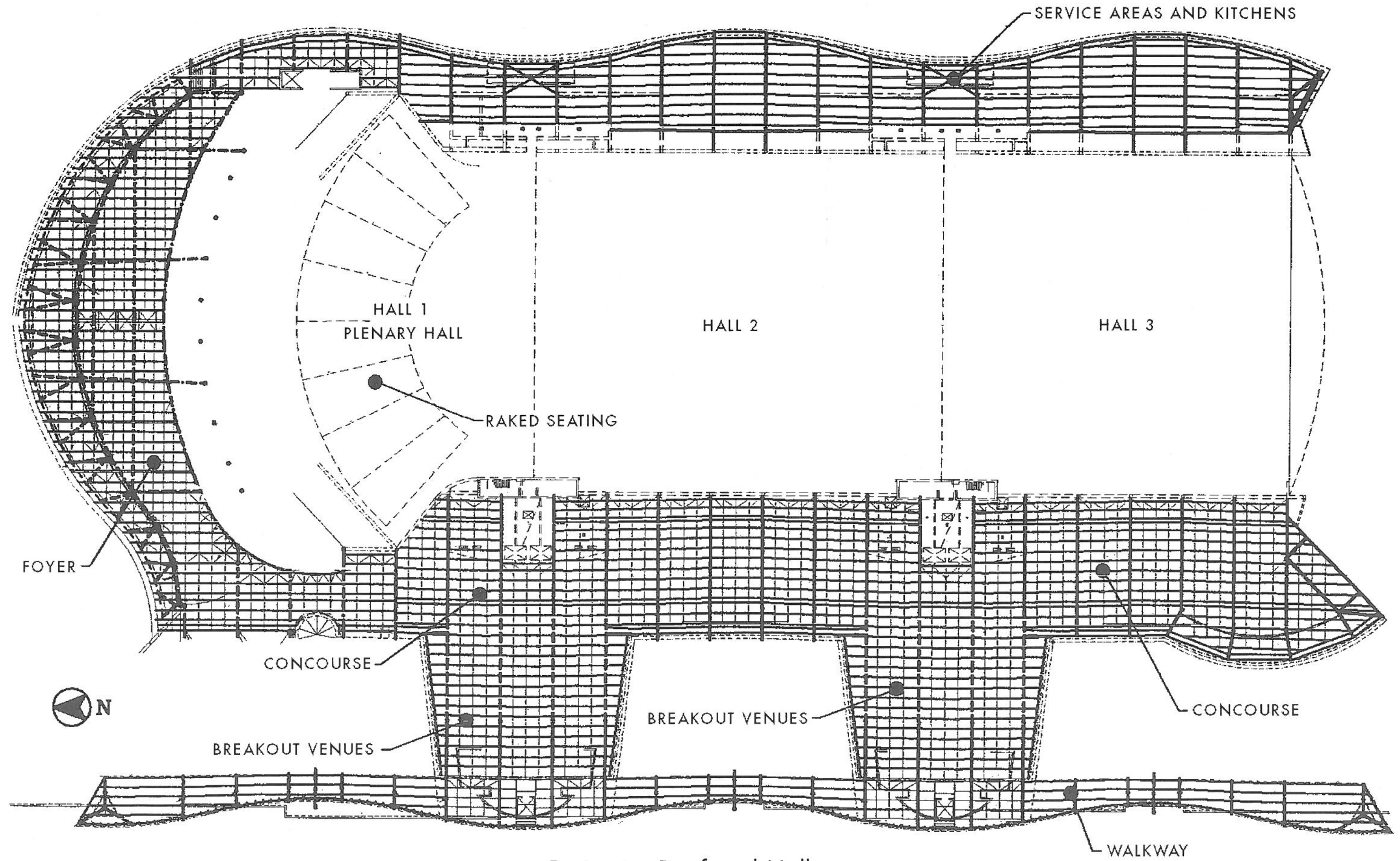
Construction *February 1994 — September 1997.*

Steel Fabricators *Girder Naco; Churchyard & Umpleby*

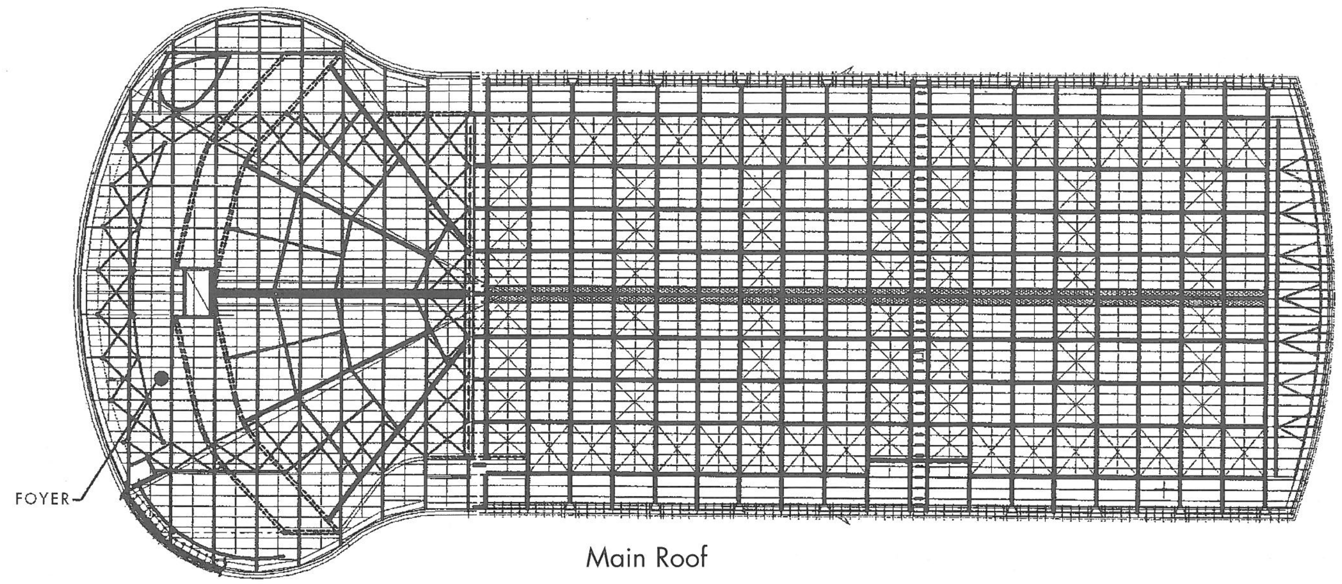
Material for the ICC contributions was prepared by Ed Howard; Brunton Nichols and Rob Young; Bharti Narshai and Andrew Murray; Cedric Richards and John Ferendinos; and Paul Sanders.

SPECIFICATION

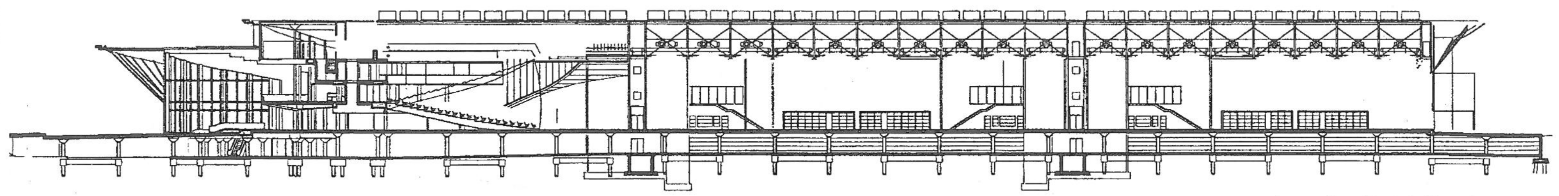
All steelwork was grit-blasted and primed with an inorganic zinc-based coating which provided the principal corrosion protection. Internally the base system was overcoated with modified acrylic emulsion paint and externally with an intermediate barrier coat of micaceous iron oxide followed by two coats of polyurethane enamel.



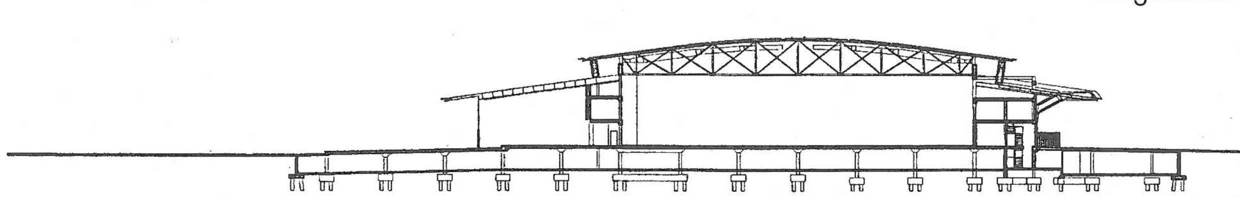
Perimeter Roof and Halls



Main Roof



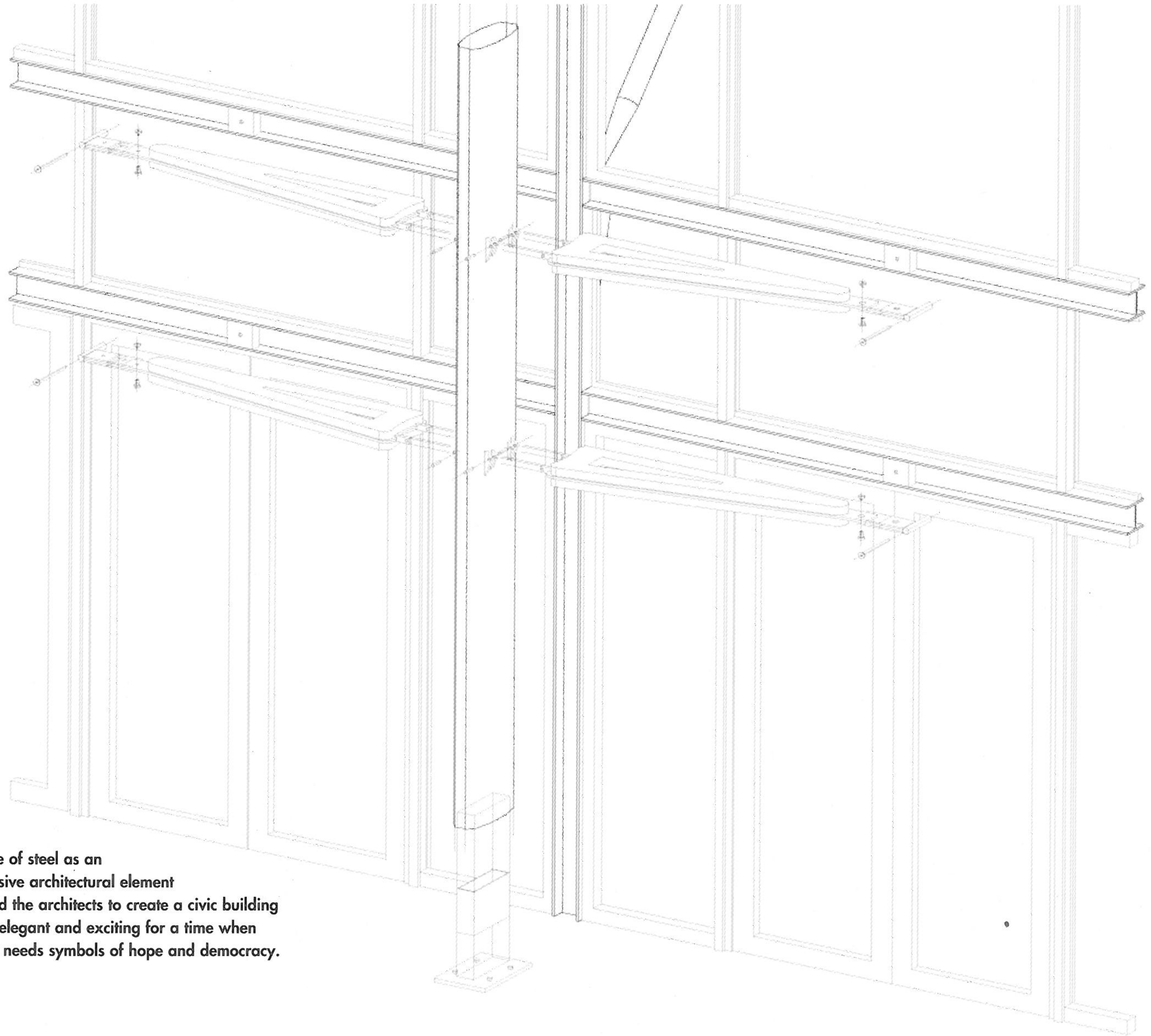
Longitudinal Section



Latitudinal Section

Steel Architecture

ICC Curtain Walling



The use of steel as an expressive architectural element enabled the architects to create a civic building that is elegant and exciting for a time when society needs symbols of hope and democracy.

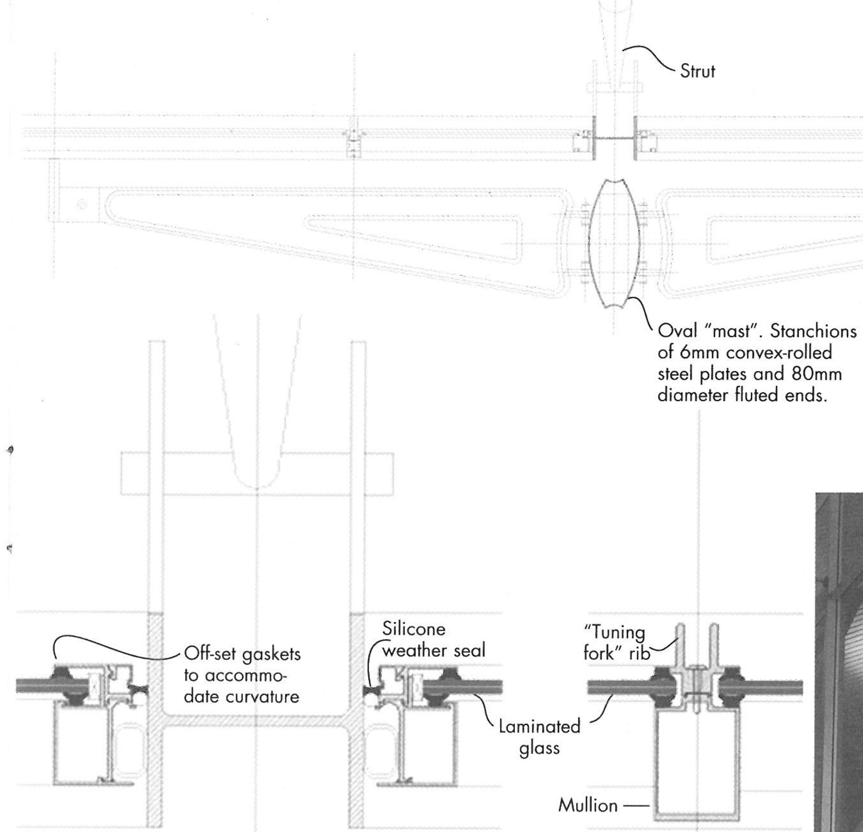
Urban Transparency

The oppressively high walls that surrounded Durban's Central Prison, were for years a brutal presence that stunted any possibility of development of the land between the CBD and the beachfront. The site, equidistant between Durban's major attractions and well served by vehicular arterials, presented an opportunity for a post-apartheid city to heal the urban fabric, and develop an international convention centre that would create a forum for discussion, debate, and the sharing of knowledge.

The concept of the building as both an integrator and generator of public movement was developed together with the belief that the activities and events within should be visible and arouse public curiosity and result in an ever increasing awareness and participation for the people of Durban with the building.

Thus the public face of the ICC was wrapped entirely in glass, full height and end to end, lightly supported on a nautically inspired steel structure and protected from the tropical African sunlight by the deep overhangs of the lightweight roof.

Craig Hudson



Angela Buckland

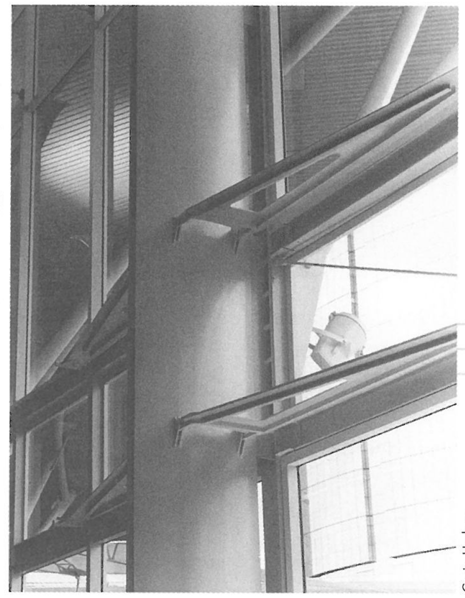
The fundamental design principle is the idea that the roof floats and sits lightly on a series of steel posts, which also support the transparent walling element.

Each post was designed as an oval mast with cantilever outrigger brackets inspired by the forms of yacht masts. The outriggers act to brace the curtain walling without having to use deep horizontal wind bracing beams. The substructure of the curtain walling is made up of "I" beams that create horizontal shadow lines and express the means of support.

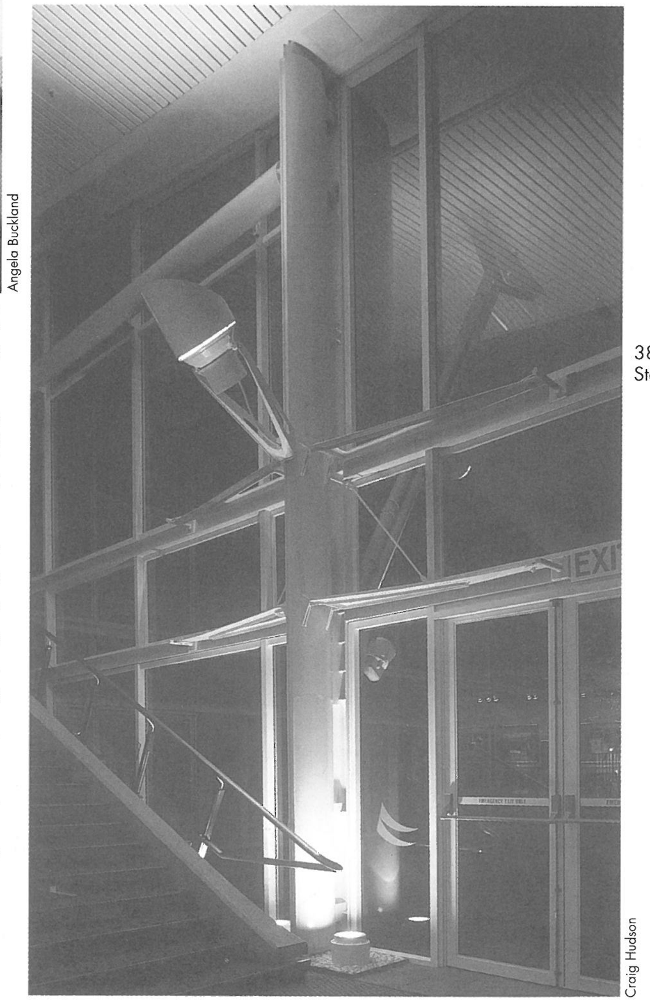
The glazed curtain walling is a combination of purpose-made mullions with exposed vertical ribs in conjunction with horizontal bands of flush glazing that emphasize the overall horizontality of the wall-plane.

Andrew Murray

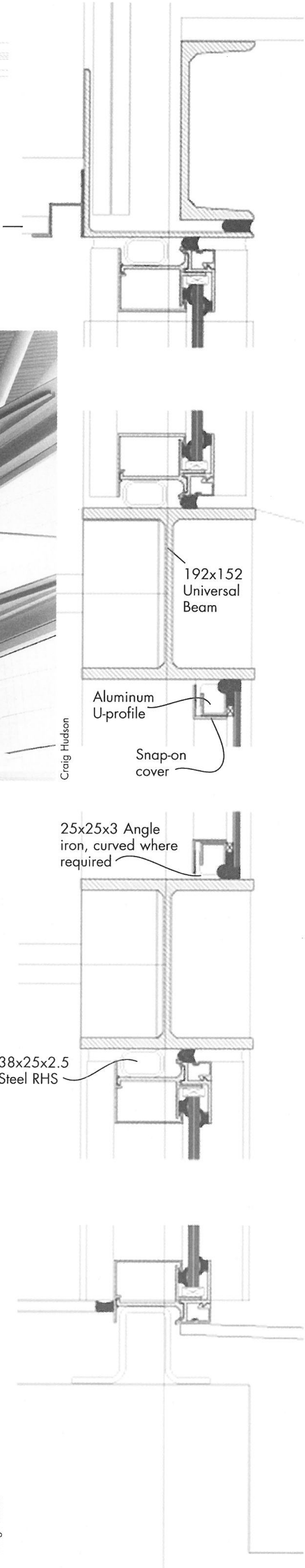
Due to the large and slender overhang of the roof over the curtain wall, a system of tubular raking struts was incorporated into the mullions, which when combined with the curve on plan, creates a complex geometric form.



Craig Hudson

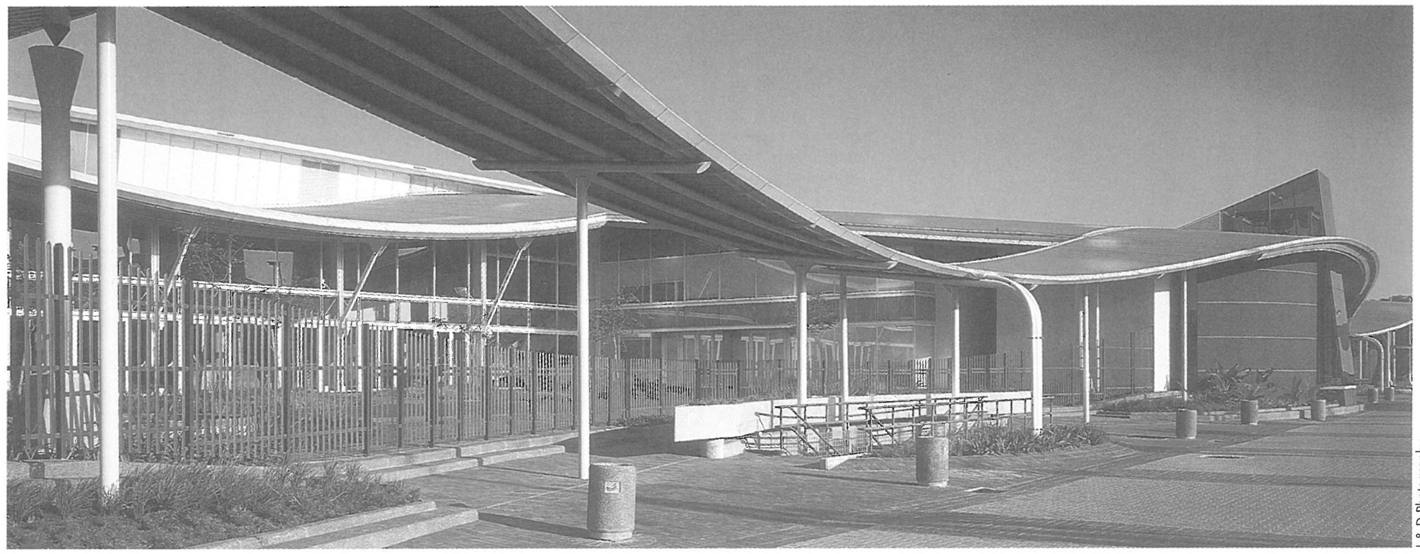


Craig Hudson



Steel Architecture

ICC Undulating Roof



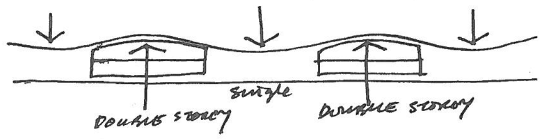
J & D Photography

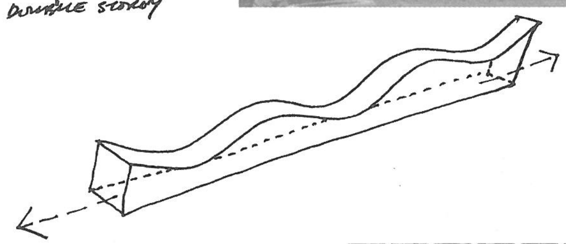
The undulating curves of the ICC Roof, with their reference to ocean swells that form Durban's surf have become an icon for a modern, outward-looking Durban.

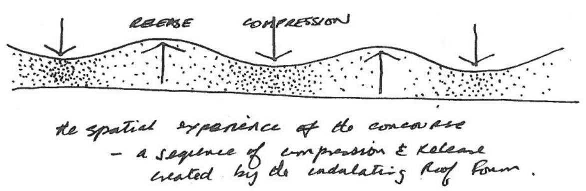
The iconographic quality of the roof form belies the simple and functional design solution that it is. The original concept, devised by Lance Smith, who lead the design process, was a wave form in cross-section. However, the large volume spatial requirements of the major conference and exhibition areas required a simple, long span, uncomplicated roof enclosure. The synthesis of the functional and the evocative resulted in the eventual solution that deals with the enclosure of the spaces of varying volumes. A single flowing roof form rises to acknowledge the double storey break-away venues and then dips over the single-level sections of the concourse to create a cyclical rhythm as an organic response to the design requirements.

Andrew Murray

Angela Buckland





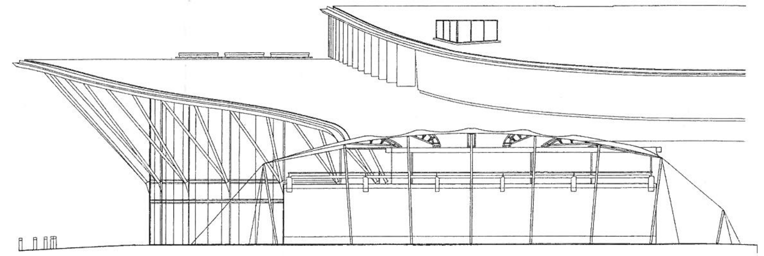


ABOVE LEFT TO RIGHT:
Concept sketches: Section; Axonometric; and Plan.
BELOW: West elevation

Steel Architecture

ICC Tensioned-Fabric Membrane Roof

Dennis Gilbert & VIEW



The brief called for a tensioned-fabric membrane cover to the first floor Coffee Shop terrace, which is partly curved in plan, and to control the rainwater run off.

The cover projects over the edge parapet of the terrace and it was necessary to design the rain water run-off so that a large part of the surface would drain to the inboard side where it could be collected in a gutter. This, of course, is a conflicting requirement when trying to maximise the sun shading by keeping the outboard edge as low as possible.

Membrane Structures

Tensioned membranes, as the names imply, carry load by tension – they have zero bending stiffness – and to provide stability (particularly under the action of varying wind loadings) it is a requirement that the membrane has bi-directional curvature i.e. is an anti-elastic surface. Bi-directional curvature is obtained, principally, by having alternating high and low points for attachment of the membrane.

In general, the higher the curvature (i.e. the smaller the radius of curvature) the "stiffer" is the membrane, and the lower the stress will be. To achieve small radii of curvature it is necessary to have substantial differences in the height of the attachment points.

The Adopted Form

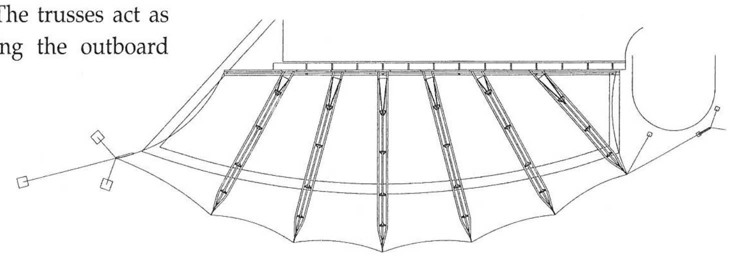
The supporting trusses are radial but not from a common centre – only one truss is orthogonal to the inboard edge support. Each truss has a different length and different curvature and is made up as triangular tubular lattices without the normal diagonal members, but relying on "Vierendeel" action of the welded connections for both lateral and vertical stiffness.

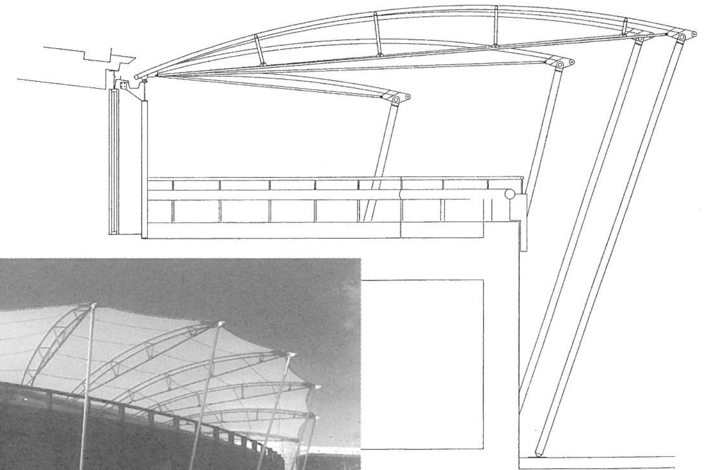
With all membranes, for each point of "pull" there must be a corresponding anchorage point or a compression member. The trusses act as compression members, taking the outboard end tension through to the opposing inboard where the fabric is anchored by lacing to a continuous tubular member which in turn is held in place by the inboard point end of the trusses.

The outboard end posts are pinned at both ends and carry only the vertical load component of the truss and membrane under the action of wind and uplift – the major load. The stays are anchored to the main concrete floor construction though drilled-in chemical anchors.

Ed Howard, Flexible Structures CC

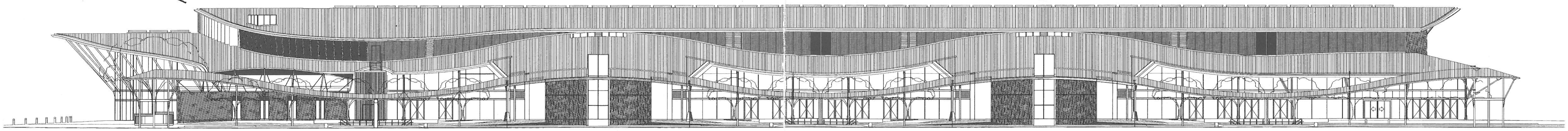
RIGHT: Plan
BELOW RIGHT: Section





Special shaped brackets welded in-situ to the existing main building frame and which double as gutter brackets carry all loads from the trusses back to the main structure.

Dennis Gilbert & VIEW



Steel Architecture

ICC Main Roof

The 6x6m grid formed integrally with the main roof trusses to the hall space met with the objectives of flexibility, multi-use and services integration.

The roof structure was designed to carry a one ton point load at each grid intersection for the suspending of exhibits and screens. But, the entire hall space is sub-divisible in many configurations by way of a wall system of panels 1.2m wide and 10m high (mass: 650 kg/m), hung from the trusses. For this reason, the midspan vertical deflection of trusses was restricted to 40mm – a stringent requirement for 55m free-spanning trusses – and, to so limit deflection, pre-cambered trusses were specified.

Each truss is designed as a double-chord unit with back-to-back steel channels forming the bottom and top chords. Fixed to the underside is a track guiding and supporting the movable acoustic walls which form the space dividers. To prevent noise attenuation, acoustical baffles were introduced to seal the roof space along all the subdivisions above the positions of the wall tracks.

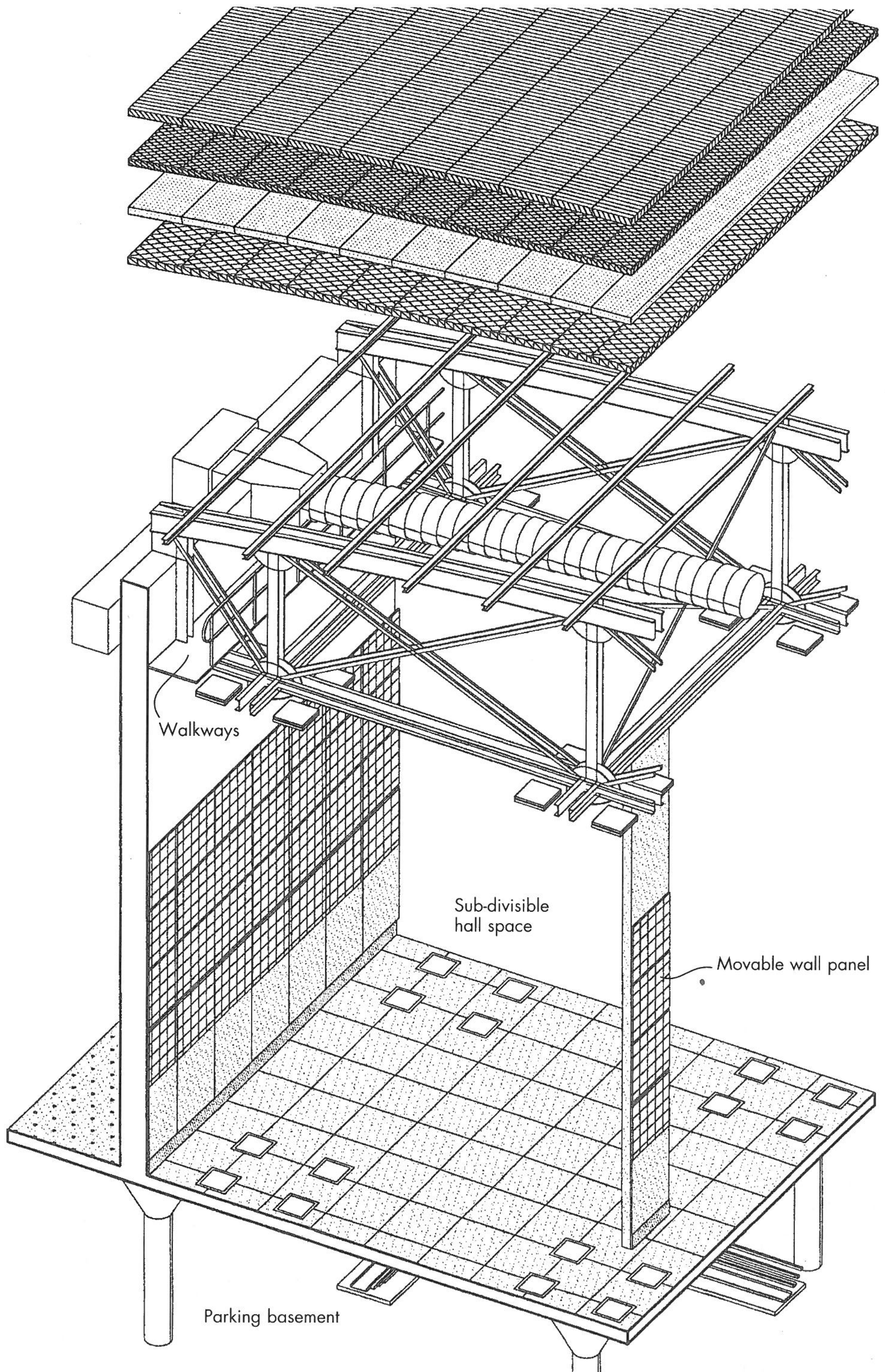
At each grid intersection point, both on the floor and on the truss, a cluster of service points is provided for exhibition or conferencing requirements. These include power, data and telephone services with general lighting at truss level and water supply and drainage at the floor.

Mechanically operated smoke extraction ventilators, air conditioning ducting, sprinklers, lighting, high level electrical, audio-visual reticulation and theatre staging and prop suspension infrastructures are accommodated within the truss space and accessed by a grid of walkways for use by technicians.

The air-conditioning supply ducting is introduced into the centre of each 6m grid at high level. Air is supplied from the main bulk supply services duct located horizontally on the outside of the eaves beam, designed as an oversail to the roof.

The outer roof consists of an acoustically insulated, panelised skin comprising 3 components: an aluminium profiled sheet, an acoustical and thermal inner sheet composite of gypsum board and fibreglass, and a grid of straining wires on the bottom flange of the purlins which support further acoustic material and cater for the absorption of various frequencies within the space below.

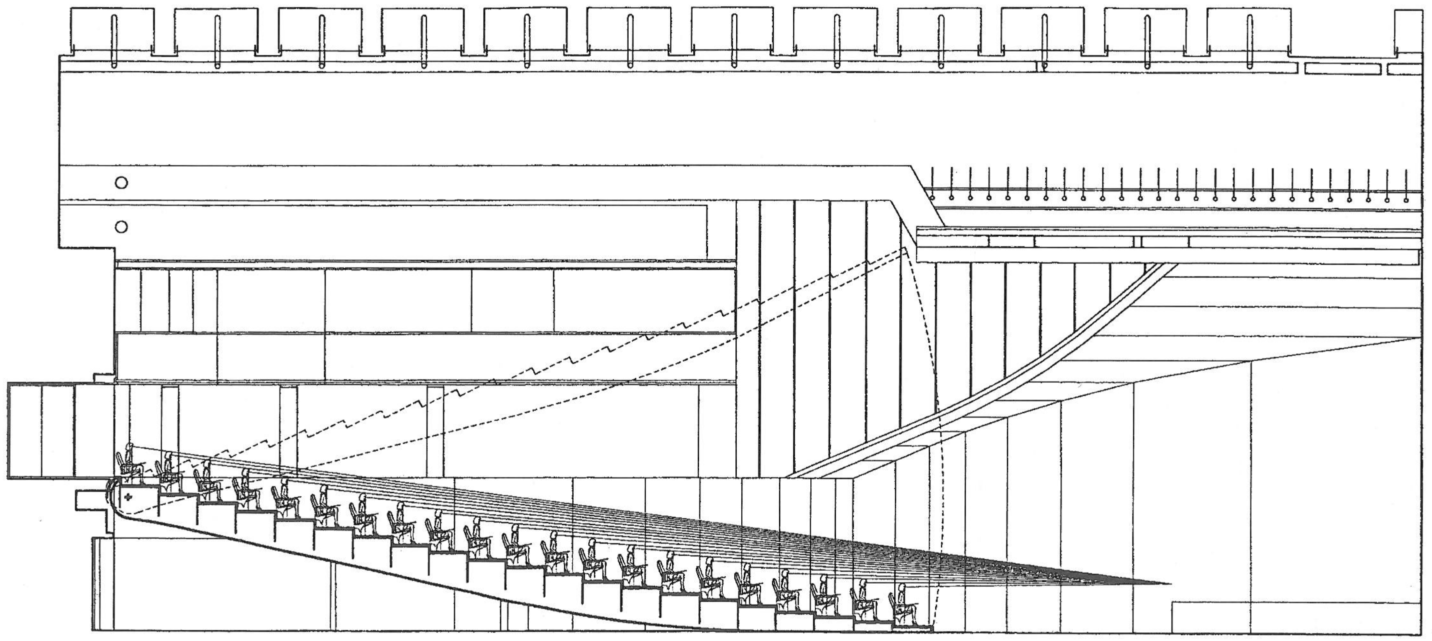
Cedric Richards



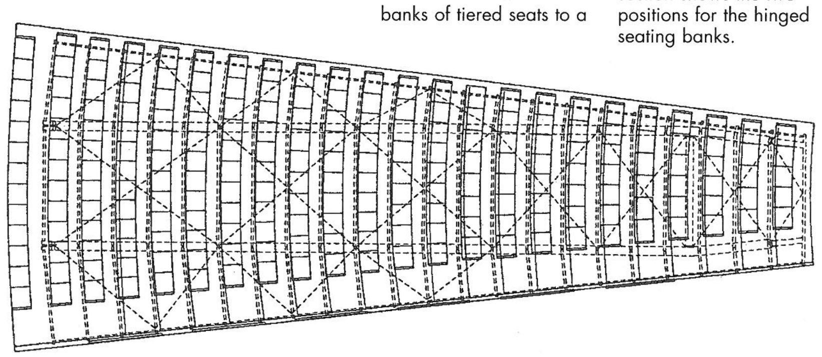
Dennis Gilbert & VIEW

Steel Architecture

ICC Seating Banks



The plenary hall space can be transformed from an auditorium with banks of tiered seats to a flat-floored area for exhibitions or banquets. The section shows the two positions for the hinged seating banks.

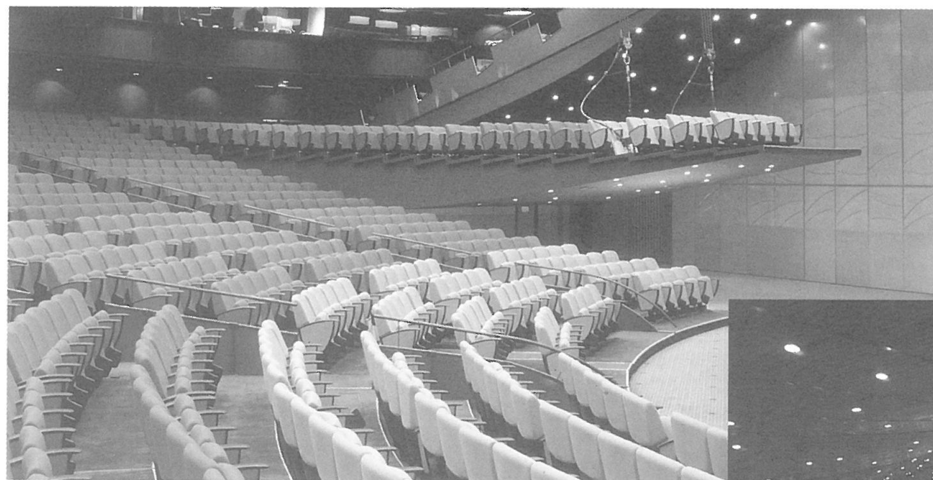


Plan of a seating bank

The convex-shaped and triple-volumed entrance foyer at the northern end of the ICC leads directly to the plenary portion of the sub-divisible hall space. The plan form is determined by the theatrical seating arrangement; and the optimal utilisation of space is achieved by the sub-division into two quadrantal spaces and by the accommodation of both raked and flat-floor seating possibilities.

The radial array of 8 individual tiered seating banks is designed in such a way as to allow full retraction of each of the 20ton segments. The heels are pivot-hinged with rotating spherical bearings at the circumference and the toes are hoisted up by way of a series of mechanical hoists travelling along crawl beams located within the roof space. Each tiered segment can then be secured within the roof space while providing a raking ceiling over the unencumbered floor below, deliberately profiled to perform the additional role of an open duct to guide the air conditioning to reach the space below (bottom).

Edited from texts by John Ferendinos and Rob Young



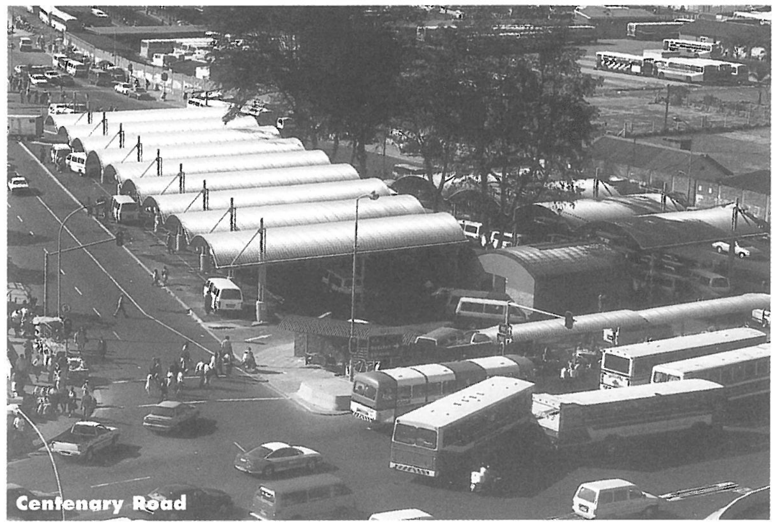
Dennis Gilbert & VIEW

"The emergence of the final solution of the ICC was one of those moments of combined input, one of those rare times when collaborative designs produce architectural solutions that transcend individual efforts and justify the faith that the city had placed in the appointed architects from the three Durban practices."
Andrew Murray

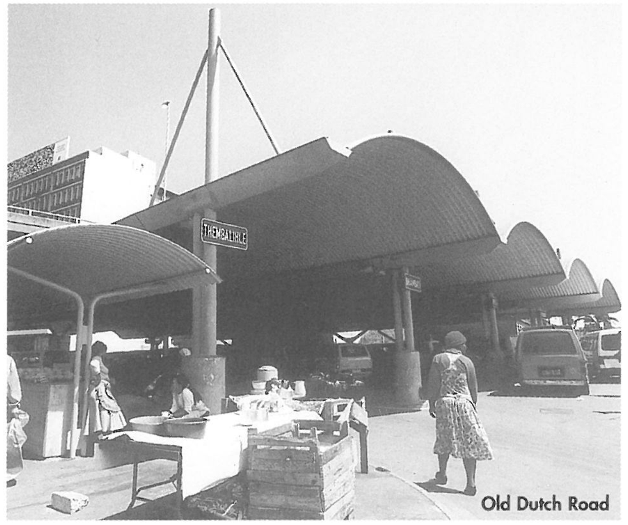
Dennis Gilbert & VIEW

Steel Architecture

Mini-Bus Ranks



Centenary Road



Old Dutch Road

In Durban, as in all major metropolitan areas in South Africa, a vast number of people make use of mini-bus taxis to commute to and from the city. As the mini-bus taxi industry has developed phenomenally over a relatively short period of time, facilities for taxis and commuters have been woefully inadequate.

The Traffic and Transportation Department of the Durban Central Local Council identified the necessity to develop and improve facilities at taxi ranks and in 1993 City Architectural Services was commissioned to prepare a design for the first such taxi rank.

The brief was to design a cost effective, lightweight structural system that could be used for various taxi ranks around the city. The system had to consist of a "kit of parts" which could be interchanged to suit varying site conditions and that would become synonymous with taxi ranks.

Design Considerations

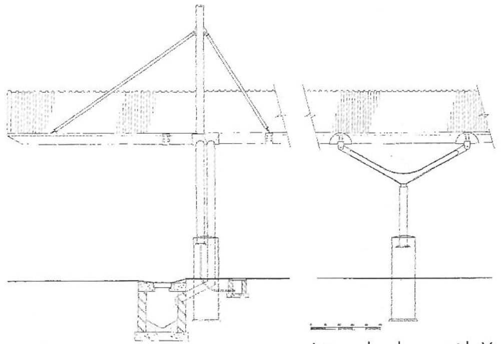
In order to retain the greatest level of flexibility, open space with minimal column intrusion was aimed at. This limitation and the lightweight roof, give the structure a necessary transparency, an advantage in the many tight, intensely utilised sites allocated to taxis. With relatively few components employed, all of which are visible, it was critical that the detailing of every element and junction be carefully considered.

The ranks are illuminated at night by mercury vapour fittings aimed at the underside of the vaults to provide non-blinding reflective light for safe operation.

Smaller canopy structures sympathetic to the main design are located adjacent to most of the ranks. These structures afford informal traders protection from the elements and a more structured trading space as well as acting as "baffles" to shield the commuters from wind-blown rain.

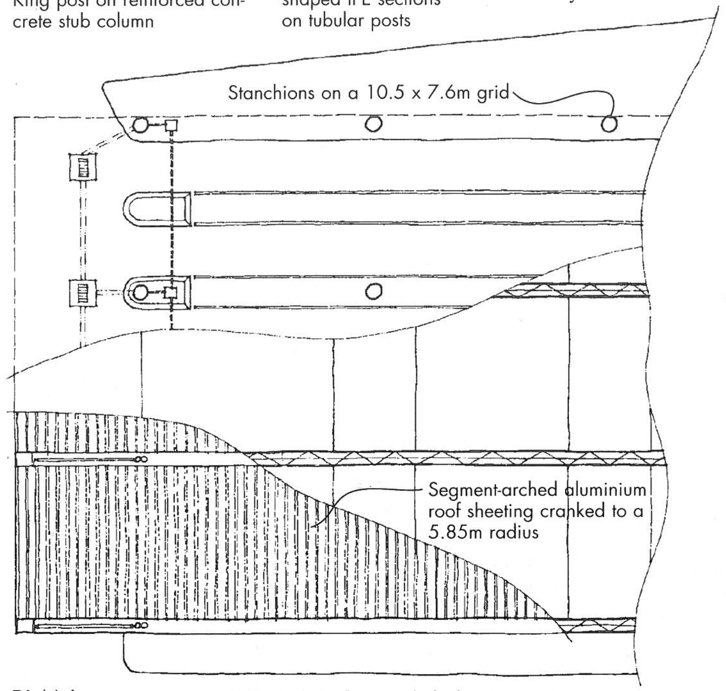
Gavin Adams

Architects *Architectural Services, City of Durban*
Project Architect *Gavin Adams*
Structural and Civil Engineers *De Leuw Cather; Vawda Thornton*
Cost Management *Architectural Services; Francis Williams-Jones Kgole*
Electrical Engineers *Electrical Services*
Photography *Ivor Migdoll Photography*
Contractors *W.H. Projects CC; Profour (Pty) Ltd. Armstrong Consultancy / Hi-Tec-Fab*

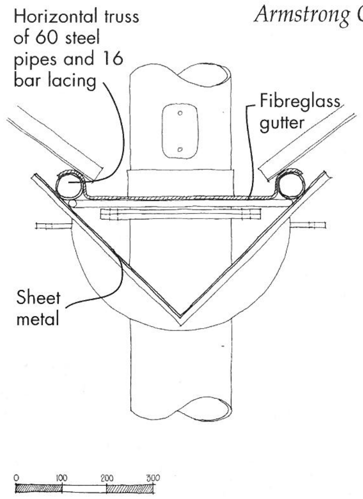


King post on reinforced concrete stub column

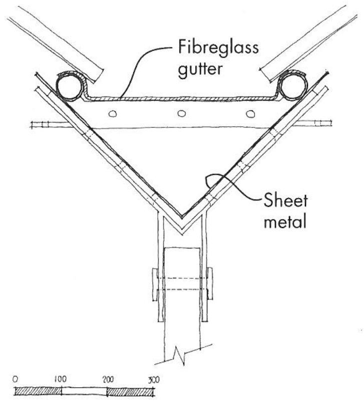
Internal column with Y-shaped IPE sections on tubular posts



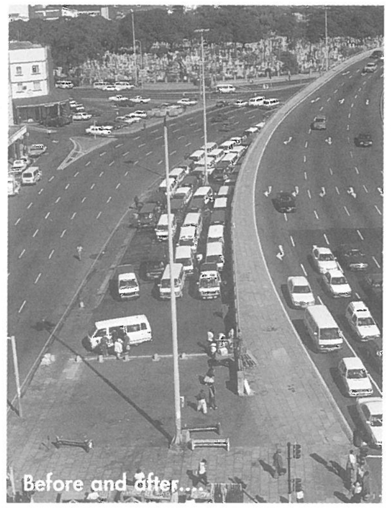
PLAN



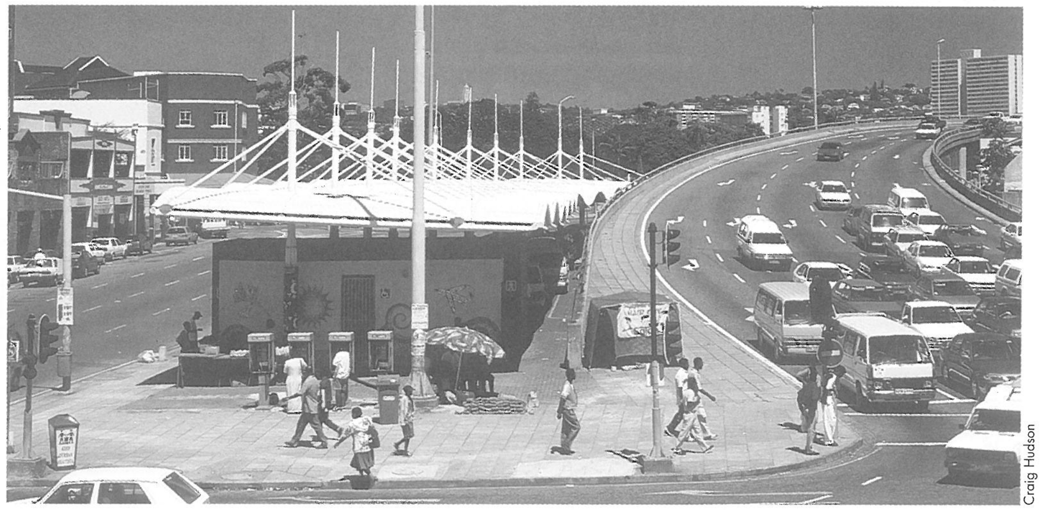
King post gutter section



Intermediate gutter section



Before and after



Craig Hudson

Pine Street Mini-Bus Taxi Ranks

This taxi rank provides a facility for taxi operators and commuters on a sliver of left-over land along one of the major entrances to the city. The narrow and curved nature of the site coupled with the need to house the maximum number of taxis necessitated a design solution that required a contained footprint.

The solution was a single row of columns spaced at 8m from which the undulating roof structure is suspended. Coupled to the functional aspects of the brief, was the requirement that the structure be designed aesthetically suitable to enhance the strategic location of the site and also provide a sense of place and be easily recognisable.

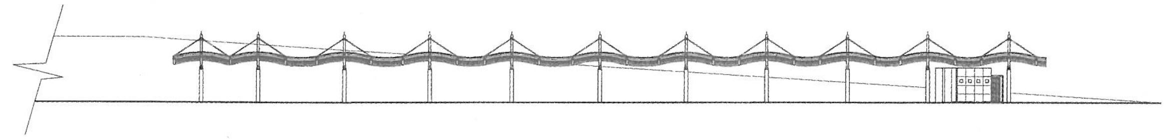
To this end steel was employed. This allowed for relatively long spans and cantilevers and produced a generally "light and bright" structure.

A mural was commissioned to adorn a prominent wall of the ablution structure, executed in glass mosaic tiles.

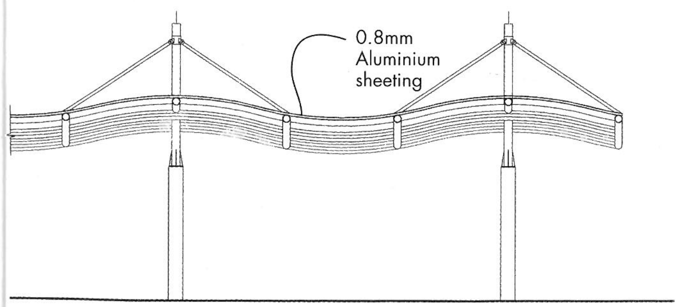
Ravi Jhupsee

Architects *Architectural Services, City of Durban*
Project Architect *Ravi Jhupsee*
Engineers *Sankar, Govender & Associates CC*
Mural Artist *Jane du Rand*

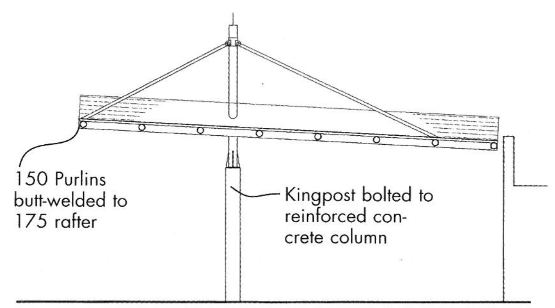
Craig Hudson



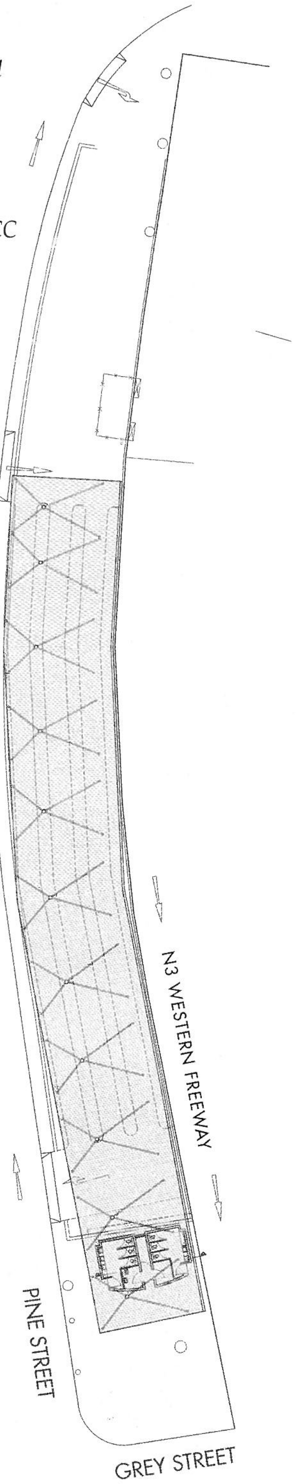
ELEVATION – Columns at 8m centres

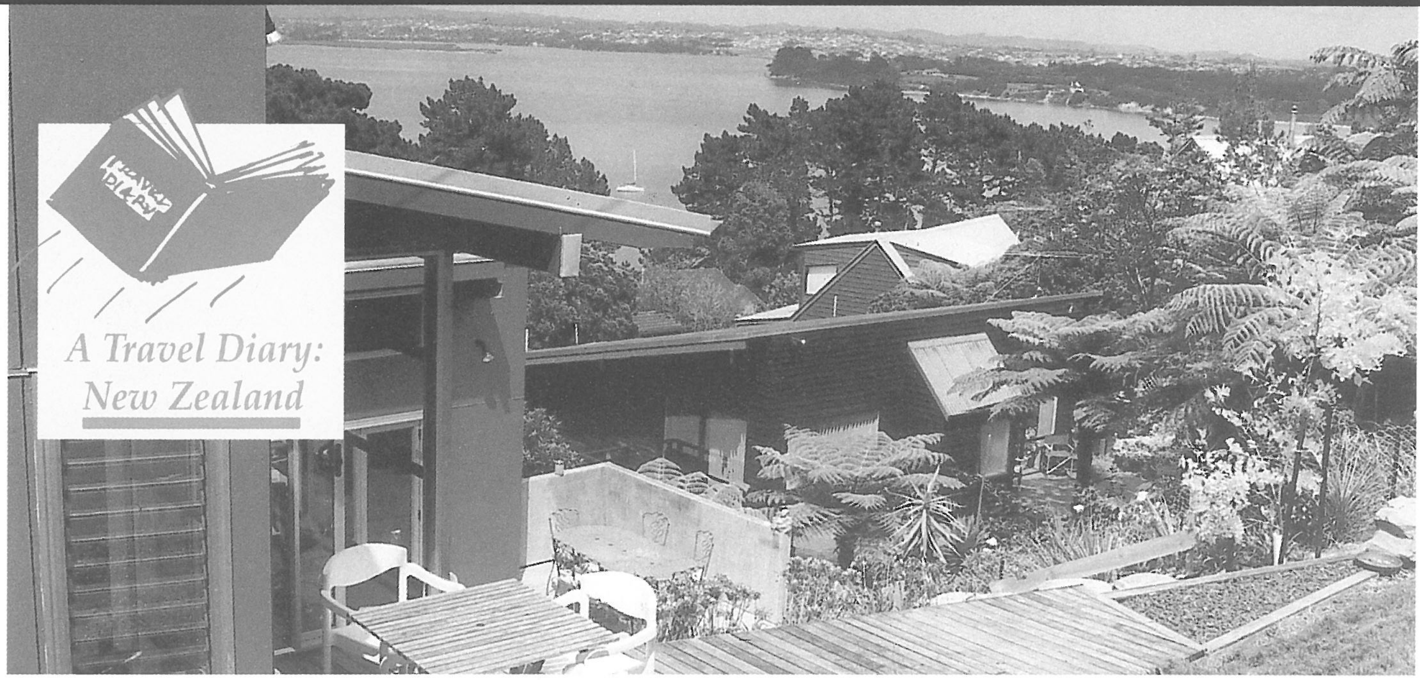


ELEVATION



SECTION

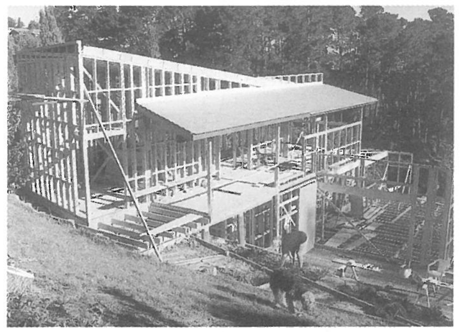


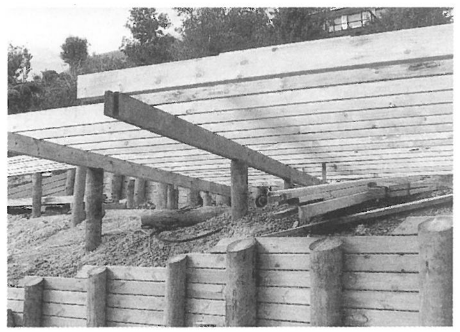


ON SHAKY GROUND: A NEW HOUSE IN NEW ZEALAND

Beyond the expected difficulties that go with designing and building one's own house, doing so in a new country creates additional challenges, not to mention anxieties. Surprisingly there are universal design principles that can be relied on (such as concerns for aspect and prospect), but in the case of New Zealand, there are unstable new beginnings to confront.

These Pacific islands are wedged between two tectonic plates, which produce frequent earthquakes and volcanic action. The last serious shaking destroyed the entire town of Napier in 1931, and the City of Auckland has its landscape peppered with craters and cones of over 40 volcanoes. Not surprisingly, building codes require designs to cope with these conditions. The solidity and rootedness of the African soil and landscape gives way to a sense of impermanence: to shaky ground.





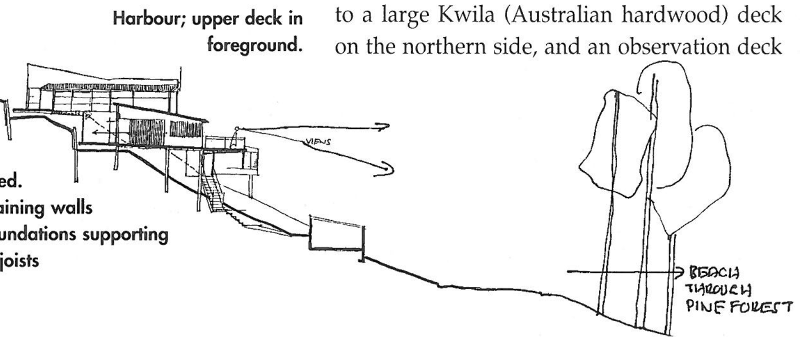
The second challenge, seemingly equally fragile and impermanent, is building in timber. Its use in New Zealand is partly related to the fact that designing for earthquakes using masonry construction in domestic buildings is uneconomical, and partly to the fact that forests (and hence timber) are a natural resource.

Site and Design

After living in New Zealand for five years, we took the step of building a new house. The site of 800sqm slopes steeply in a south-west direction to the waters of the Waitemata Harbour, in a northern suburb of Auckland. The geological examination of the site (a Council requirement) revealed instability in the form of a two metre layer of clay over a sedimentary sandstone bed, with the danger of slippage. This was overcome by constructing three timber retaining walls, also designed to hold the site together should it be shaken. Using 300mm diameter timber piles with their ends set into holes drilled into the sandstone at 800mm centres, the wall is formed from 150 x 50mm boards set against the back of the piles.

The design concept is a response to three notions: procession as an device of architectural space, the conditions of site, and a celebration of the lightness that can be achieved using timber construction. The idea of procession as an architectural device was inspired by memories of Delphi and the processional protocol that defines the spatial arrangements of the Marae (the traditional meeting houses of Maori in New Zealand). In the case of the house, it also produced a symbolic linkage between sea and land, with the beach and water being a starting point for a route that traverses the site to a lookout platform at the apex (rising 20 meters across the site itself.) This procession is concretised in the pathways, stairs, and decks that lead up to, through, and beyond, the house itself. Site conditions dictated that accommodation be orientated to deal with two contradictory realities: spectacular views of the waters of the Waitemata Harbour and the Waitakera Ranges beyond to the SW, and the need for northern exposure, to the sun. Maximising viewing opportunities placed the house two-thirds up the sloping site, with northern exposure being achieved in the detail design.

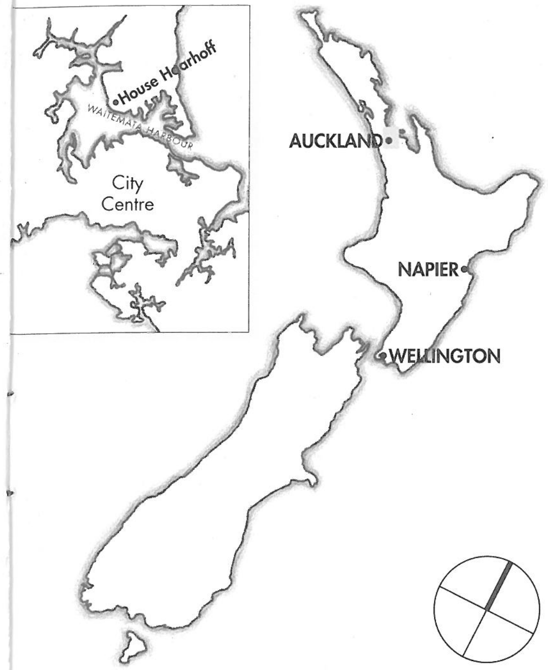
TOP: View over the Waitemata Harbour; upper deck in foreground.



LEFT: Timber wall framing being positioned. Below: Timber retaining walls and timber pile foundations supporting bearers and floor joists

Accommodation is dispersed over three levels in three 'timber boxes', on each side of a central gallery space through which the movement route passes. Each of the boxes is clad in either plywood (which is stained) or fibrecement sheeting (which is painted). The colours are reminders of Africa: ochre, deep grey, red and aubergine, which are used both externally and internally to unify surfaces.

The gallery on the first level begins as an entrance lobby leading to stairs that run up the two levels. The main bedroom wing is accessed by a glass bridge from the entrance hall, over a stone river that visually reinforces both the separation from the ground, and the bifurcation of the house by the gallery. The second level accommodates the living spaces: kitchen, dining and lounge, all of which open to a large Kwila (Australian hardwood) deck on the northern side, and an observation deck

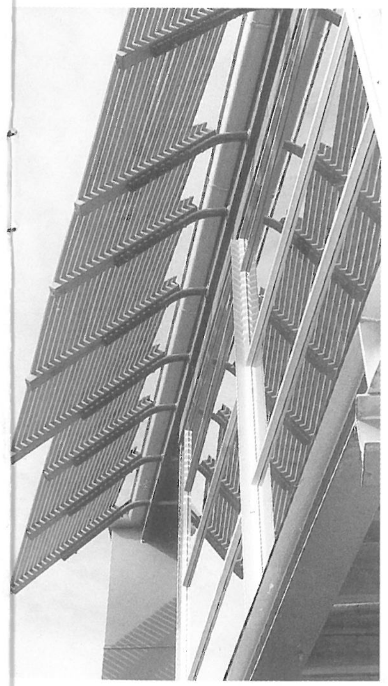


to the SW, cantilevering 8m above the sloping site (a place designated for watching the sun set while sipping wine). The third level contains bedrooms and a study, and the upper part of the gallery which houses a library. The gallery also opens to an upper deck, leading in turn to the lookout that terminates the route at the site apex.

Construction

The house is constructed entirely from timber. Apart from the three timber retaining walls already mentioned, the house itself is founded on 49 driven timber piles. Domestic construction in New Zealand is regulated by a building code which sets constructional criteria for both wind and earthquake loading of light timber construction (NZ Standard 3604).

The essential principle is that of creating shear walls (rather than posts and lintols) that provide structural bracing, held together by an array of metal fixing devices which deal with earthquake movement.

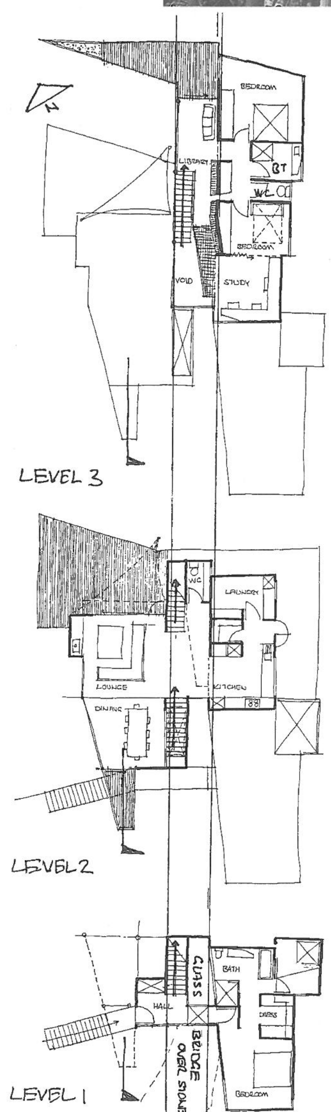


The quantity of shear walling needed for the particular conditions of site (earthquake zone, wind zone, prevailing wind direction, and so on) is established by the number of 'bracing units' to achieve the structural stability required by the code. Depending on wall length, height, and cladding systems, the bracing can be achieved using different constructional and fixing methods, with values given in "look-up" tables.

Building codes are not prescriptive, but set required performance criteria with regard to structural stability, safety, health, energy conservation and so on, and do not dictate how this should be achieved.

The three 'boxes' of accommodation are thus constructed from 100mm machine-graded, kiln-dried timber (*pinus radiate*) formed into stud and nog frames, clad internally with plaster board, and externally with either 16mm plywood or 7mm fibrecement sheeting. To achieve the large glazed wall openings to the main living areas and gallery, the code requirements could not be met, which necessitated an engineered-design solution, using steel portal frames.

The construction industry in New Zealand is highly systematised. Once the floor platform had been constructed over the foundation piles (on bearers, joists and particle boarding that form the floor surfaces), the timber frames (all prefabricated into wall-size units) were lifted into place using a 20m jib crane. A crane was also used to install steelwork, and lift heavy elements into position, such as plaster board. Aluminium joinery is also produced in pre-glazed form ready for site installation.



Landscaping

Landscaping remains a job yet to be completed. Preserved on the western side of the site is a small indigenous tree fern forest (*cyathea dealbata*). The concept is to extend this forest by extensive planting of indigenous trees and shrubs. The only exceptions are an exotic yellow leafed *robinia pseudoacacia* that marks the end of the upper processional vista, and an olive tree (*olea europaea*) that terminates this route at the apex of the site. The commencement of the access route at the bottom of the site will be marked by an *erythrina caffra* as another reminder of Africa.

Errol Haarhoff

Prof Haarhoff, former Head and Dean of Architecture at Natal, left South Africa to assume a Chair in Architecture at Auckland University in 1994. Having served a term as Head of Department, he now deputises. Editor

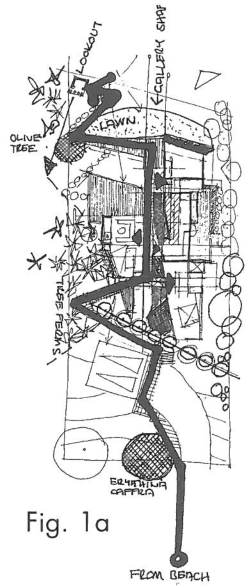


Fig. 1a

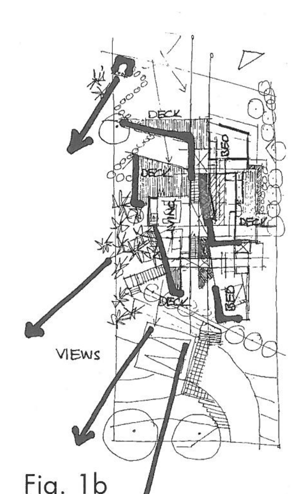


Fig. 1b

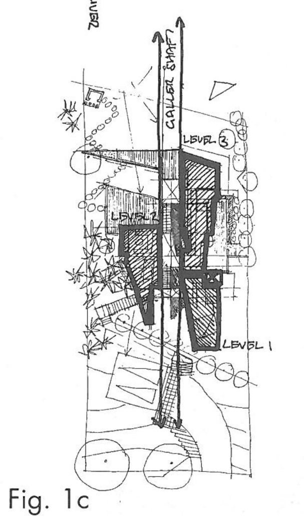


Fig. 1c

CLOCKWISE, TOP RIGHT:

The 'bedroom' box (level 1) with plywood cladding; behind is the glass entrance and bridge, and the cantilevered deck.

PLANS: Levels 1, 2 and 3.

CONCEPT:
Fig 1a: Procession as space organiser; Fig 1b: Response to site; Fig 1c: Three 'timber boxes'.

Steel and timber sun screen to library seating area glass wall.

New Zealand map and Auckland insert.