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From IB74 to US Patent 4438616: The (Re)Making of a Profession

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By the 1970s, when economics, management and scientific methods had gained currency, the personal service of an individual architect had become the corporate service of an architectural firm, while the practice of architecture had become less a profession and more and more a business. Furthermore, beginning in the 1970s, to counter the ravages of developers and package-dealers, architects and architectural firms also increasingly widened the range of services that they offered. Many began working with developers, while others became developers themselves, or ventured into the building industry. In addition to expanding their professional services, some also expanded their geographic scope and became global entrepreneurs. Although this narrative is well known, little scholarship exists that examines precisely how such changes occurred on the ground — at least in the case of Australia. This paper is a first step in addressing this dearth by examining the career and work of Edwin Codd (1939–), an Australian architect, educator, businessman, and global entrepreneur who saw it as his mission to transform the way in which architecture was taught, procured, and produced. Commencing in the late 1960s and extending to the early 2000s, Codd's career paralleled and propelled the aforementioned changes in the profession of architecture in Australia, from technologist-businessman-architect to global entrepreneur. The paper draws on interviews with Codd and his (former) collaborators, and on archival research and a literature review of contemporary periodicals. These primary sources have been complemented with a reading of secondary sources on the history of architecture in Australia following the 1960s.

Introduction

In 1971, John Maxwell Freeland, an Australian architectural historian, published *The Making of a Profession: A History of Growth and Work of the Architectural Institutes in Australia.* Commissioned by the Royal Australian Institute of Architects (RAIA), Freeland's book details the history of the architecture profession in the country from British settlement to 1970, which he summarises as follows:

> From the grudging hands of unwilling convicts Australia's building passed to opportunistic but unlettered craftsmen, thence to ambitious trades-contractor-architects and eventually to the smooth hands of the professional gentlemen. The gentleman-architect became the artist-architect, who in turn became, in response to bewildering imperatives in a rapidly changing word, the technologist-businessman-architect. And much of the colour and the fun and the adventure was squeezed out of architecture as it became a serious business. (Freeland 1971: 246–247)

Freeland's technologist-businessman-architect is a figure that by 1970 had appeared in many places across the globe. As economics, management, and scientific methods had gained currency, the personal service of an individual architect had become the corporate service of an architectural firm, while the practice of architecture had become less a profession and more and more a business. Furthermore, from the 1970s, to counter the ravages of developers and package-dealers, architects and architectural firms also increasingly widened the range of the services that they offered. Many began working with developers, while others became developers themselves or ventured into the building industry.[1] In addition to expanding their professional services, some also expanded their geographic scope and became global entrepreneurs.[2]

Although this narrative is well known today, little scholarship exists that examines precisely how such changes occurred on the ground.[3] Freeland's history of the architecture profession in Australia concludes in 1970, and while several publications have appeared that document the country's architecture after 1970, these focus predominantly on its aesthetics rather than its professional mechanics.[4] This article takes a step towards addressing this dearth by examining the career and work of Edwin Codd (b. 1939), an Australian architect, educator, businessman, and global entrepreneur who saw it as his mission to transform the way in which architecture was taught, procured, and produced (Hampson 2012). Commencing in the late 1960s and extending to the early 2000s, Codd's career paralleled and propelled the aforementioned changes in the profession of architecture in Australia, from the technologist-businessman-architect to the global entrepreneur. Accordingly, in following Codd's career, this article not only contributes

to the existing literature on the development of architectural practice (Freeland 1971; Kostof 1977; Saint 1983; Cuff 1991; Ellin 1999; Gosseye and Watson 2015), which focuses predominantly on the UK and the US; it also expands this scholarship by bringing into sharper view the period following the 1970s, when the figure of the 'architect as global entrepreneur' was popularised.

IB74: Architecture Beyond 'Isms'

The 1970s were a time of upheaval in Australia, both in political and in architectural terms. In 1972, Gough Whitlam led the Australian Labor Party to power for the first time in 23 years. During its short tenure, this government implemented extensive reforms, including the repeal of conscription laws, the withdrawal of all remaining Australian forces from the Vietnam War, the introduction of universal health insurance, and the abolishment of tertiary education fees (Kelly 1983). It was a swansong for the Australian welfare state. As other welfare states across the globe headed into decline, the Whitlam government set out to transform the country's education, health, and social welfare system and to implement urban improvements.

A change in architecture was also afoot. In *Australian Architecture Since 1960* (1986), the architectural historian Jennifer Taylor describes how by the end of the 1970s three directions had emerged in Australian architecture. Mainstream modernism, Taylor writes, was
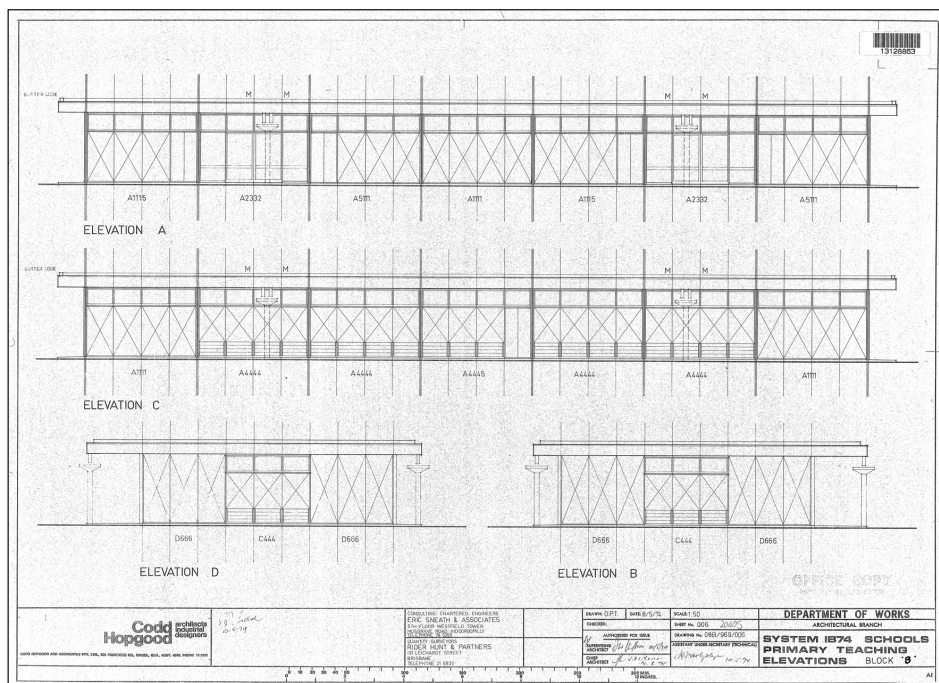
> represented in the work of [Harry] Seidler and [Robin] Gibson. ... Also there were the regional affinities of architects such as [John] Andrews and [Glenn] Murcutt. A third group consisted of those who came under the influence of contemporary overseas movements, particularly from America but also from Europe. (Taylor 1986: 192)

Architects such as Daryl Jackson fit this bill. 'The work of the last two groups', Taylor adds, 'in differing ways involved a critique of the content of orthodox modern architecture' (Taylor 1986: 192). Indeed, during the 1970s, a considerable conceptual distance appeared between Australia's modern masters and its proponents of postmodernism, resulting in an acrimonious atmosphere in the profession (Hogben 2008; Gosseye and Watson 2020). It would, however, be wrong to claim that this acrimonious atmosphere caused by the split between modernism and postmodernism was all-consuming. Feeling the pressure of developers, package dealers, and speculative builders, many architects were more concerned with the procurement and production of architecture than with what 'ism' might prevail. One of these was Codd, an architect whom Taylor would likely label a 'mainstream modernist', not only because of the formal language of his designs

but also because for Codd, architecture had a clear social mission. He firmly believed that carefully considered architectural design would be able to reduce building costs and thereby solve many of the world's problems, such as access to affordable housing (Codd 2019).

Like many of his contemporaries, Codd became very interested in system building in the early 1970s.[5] His interest was propelled by the federal budget that the Whitlam government presented in 1974, which proposed large increases in spending, especially in the education sector, for 'new and innovative building initiatives in schools throughout Australia'.[6] A substantial share of this budget went to Queensland, Australia's northeastern state, where Codd lived. Faced with the challenge of spending several millions of tax-payers' dollars within a 12-month period and having a suite of new school buildings ready for use by the end of the financial year, the Queensland Department of Public Works contacted Codd (Codd 2019). Codd, who had worked for the Queensland Public Works department during his university training and following his graduation, had in 1968 commenced private practice with Robert Hopgood as Codd Hopgood and Associates.[7] In 1974, the office received the commission from the Queensland Department of Public Works to design primary schools that could be rolled out across the state within the desired (one-year) timeframe. The result was the Industrialised Building 74 system, known as 'IB74', a model of system building that Codd and Hopgood designed, documented, and prototyped in only 13 weeks.[8]

The IB74 system offered a standardised solution for not only teaching rooms but also administration buildings, libraries, music facilities, and arts and crafts spaces. All buildings were constructed slab-on-ground and set out on a 1.2-metre module. Steel-framed trusses spanned the entire width of the buildings (10.8 metres in total) at 4.8-metre intervals, creating column-free interior spaces that could be laid out freely to suit their particular use (**Figure 1**). All buildings were given wide eaves, ranging from 1.2 to 2.4 metres (the latter commonly on the north side of the building), and subdivisions within the buildings were achieved with plywood sheeted panels, adapted to the specific function of each building type (**Figure 2**). In all of these, a dual system of floor coverings differentiated spaces. For instance, teaching areas and staff offices were carpeted, while 'activity' zones and storage rooms had vinyl flooring. Codd prescribed that the IB74 schools were to have primary colours which, like the structural organisation of the buildings proper, adhered to a predefined system: steel frames were blue, doors were red, downpipes were yellow. The downpipes were the most eye-catching element of what was otherwise a rather calculated and rational building system. They were (ostensibly) slightly over-dimensioned and had a distinctive sculptural form, with funnel-shaped collectors at the top that allowed children to see the water dropping

Figure 1: System IB74 schools, Plan, designed by Codd Hopgood and Associates, 1974. Queensland State Archives (Brisbane, Australia), series 1173, box number 802, item ID 595380.

Figure 2: System IB74 schools, Elevations, designed by Codd Hopgood and Associates, 1974. Queensland State Archives (Brisbane, Australia), series 1173, box number 802, item ID 595380.

down from the flat roof into the downpipe (**Figures 3, 4**). By October 1975, 58 IB74 buildings had been constructed in Queensland, a herculean achievement that cemented Codd's belief that industrialisation (through system building) was the way of the future for architectural design ('Building of the Month', 1977).[9]

QIT: Reforming Architectural Education

The ongoing political and professional changes in Australia also reverberated in the organisation of the country's architectural education. From the 1960s, architectural training in Australia, which had tended to become narrowly specialised in design with an almost exclusive emphasis on aesthetics, became more balanced. Practical and technical subjects of structures, construction, the various building sciences and services, and administration and economics were gradually given equal or even greater emphasis than design. Beginning in the 1970s, in an act of self-defence, architectural education in Australia broke out of the design strait-jacket completely and began to

Figure 3: State primary school Runcorn Heights, Queensland, Australia, designed by Codd Hopgood and Associates, 1974. Photograph by Richard Stringer, catalogue no. 2502-016c.

Figure 4: State primary school McDowall, Queensland, Australia, designed by Codd Hopgood and Associates, 1974. Photograph by Richard Stringer, catalogue no. 2522-008-c.

train students in such a way that they would be better equipped to work in new areas (Freeland 1971: 229). They were to be educated to become civic-minded businessmen, who not only could design well but were also good communicators and well informed about the latest developments in building technology. Codd was at the forefront of this educational evolution (or rather revolution) in Queensland.[10]

In the early 1970s, the RAIA accredited all architecture study programmes in the country to ensure an appropriate level of professional competence (Willis 2012; Orr 2015).[11] As part of this system of accreditation, Codd chaired an RAIA panel inspecting the school of architecture at the Queensland Institute of Technology (QIT) in Brisbane, the capital of Queensland. Following this inspection, the panel recommended that the existing course in architecture *not* be recognised unless major changes were made to the school's curriculum and its staffing. In response to this assessment, QIT advertised for a new head of school. When the successful applicant decided against taking up the position, Codd himself was offered the role. He accepted, and in 1972, at barely 33 years of age, he was appointed acting head of (what was then called) the Charles Fulton School of Architecture at QIT.[12]

In 1975, after serving three years as acting head, Codd became *the* head of the QIT School of the Built Environment (Hampson 2012), which was renamed at that time to reflect the far-reaching changes he had by then implemented. These included the establishment of new professional courses in not only architecture but also industrial design, urban and regional planning, landscape architecture, and building and quantity surveying, with new full-time staff recruited both nationally and internally. The course structure comprised a first year undertaken by all students, before streaming, according to the selected discipline, in the second and third years leading to a Bachelor in Applied Sciences (Built Environment). After obtaining this three-year bachelor's degree, two years of part-time graduate professional training ensued. This three-plus-two model became widely adopted in Australia by the end of the 1980s (Willis 2012: 34).

Following Codd's overhaul of the school, courses at QIT were structured in four study areas: Man/Environment, Problem Solving, Technology, and Communication. These study areas were meant to train students in understanding the context, in devising options based on an understanding of the materials and methods available, and in effectively communicating solutions. This new structure, Codd argues in an unpublished paper, 'The Journey to Professional and Academic Credibility' (EC collection), stood in sharp contrast to the previous structure of the school which, according to him, 'tended to indoctrinate the students in current practice … a little like an apprenticeship'. By contrast, Codd 'was more interested in educating future professionals than producing drawing office fodder'. Central to the success of the new courses was the creation of a state-of-the-art workshop as 'a place where students could experiment with different materials [to] understand their properties, and identify better ways of using resources'.

In 1979 Codd resigned as head of the School of the Built Environment at QIT. By then, he had taken on the role of president of the Queensland Chapter of the RAIA, a position that he held from 1978 to 1980 and successfully combined with running an architectural practice, as well as several other business ventures.

RAIA: Building the Architects Display Village

In November 1978, *Queensland Chapter News*, a periodical published by the Queensland Chapter of the RAIA, announced the appointment of Codd as its new president, with an article written by the man himself:

> I sought the Presidency for a number of reasons, most of which will become clear with the first policy statement of the new Council. There are a number of matters which I will be putting to Council for consideration and action. … The most important

matter I will want debated in the early session of Chapter Council is the amount of speculative work currently being undertaken by architects. I am not at all impressed by claims by various building organisations that they have spent $40,000–$50,000 putting in a tender on a particular facility when I am well aware that all the consultants involved [including architects] have done a great deal of work for very little return. ... The facts of the matter are that there will be no more work to go around. Our decision-making role and our agency role will be lost and we can only hope to get about one job in ten. A large commercial organisatin [sic] may be structured to sustain this kind of activity but I do not believe that professional organisations have adequate backing. If we make a reasonable stand at this stage with regard to adequate remuneration for work done, I believe it will be to the long term advantage of the profession and the building industry. ('New Faces', 1978)

In his role as president, Codd sought to strengthen the position of the businessman-architect and to expand and diversify the architect's professional practice. Codd had been experimenting with ways in which this could be achieved for some time before taking on the RAIA presidency, most notably when he became involved in Westlake, a suburb to the west of Brisbane that LJ Hooker, one of Australia's largest real estate groups, had begun developing in 1959. The then common trend for such developments was for master builders to set up display villages, also known as 'project building', which was an extension of the long tradition of speculative building that had existed in Australia since the 19th century (Garden 1992; Gimesy 1992). The essential difference between the speculative builder and the project builder was that while the former had the financial commitment of buying land and building houses that may or may not sell, the latter depended on sales generated by a single investment: the display house and its site (O'Callaghan and Pickett 2012).

Around 1977, the architect Noel Robinson, who was a few years Codd's junior, was commissioned by LJ Hooker to design the signage for Westlake, which was divided into several smaller sections, one of which was Middle Park. To Alan Voorhees, the LJ Hooker representative who was responsible for the development, Robinson suggested the set-up at Middle Park of an Architects Display Village. According to Robinson, Voorhees was 'attuned to the idea' and, as the plan required some commercial acuity, Robinson contacted Codd, whom he believed to have 'lots of entrepreneurialship' (Robinson 2019). During this meeting with Codd, the idea was hatched to brand the village an RAIA display village — Codd was an RAIA councillor at that time — and in July 1978, the duo published an article in the *Queensland Chapter News* bearing the title 'Who Wants to be a Builder?' The article announced that

a group of architects is currently negotiating with Hooker Centenary Estates to design and build a group of display houses at Centenary Estates under the auspices of the Royal Australian Institute of Architects. There are currently about eight architects involved but the Committee would be pleased to hear from others. ([Codd and Robinson] 1978: 6)

Although the hope was that 'the project will be substantially financed by the land vendor' and that 'most of the material suppliers would defer payment until after the display period, or when the house is sold', a substantial financial investment was required upfront ([Codd and Robinson] 1978: 6). This meant that in the end, only seven architects participated in the RAIA display village at Middle Park: Graham Burke, Edwin Codd & Partners, D.W. Hastie, Fergus Johnston, P.J. Locke, Noel Robinson, and Ken Walker & Associates ('Architect's Display Homes Open', 1979: 3).[13]

In March 1979, Codd placed a full-page advertisement in the *The Courier-Mail*, the local newspaper, touting the opening of 'Australia's first "architect designed and built" homes exhibition' (**Figure 5**). The crucial component of this announcement is the 'and built' part. Architect-designed display villages had existed in Australia since the mid 1950s, when a new style of project builder had appeared on the scene. Like their competitors, they offered small homes at competitive prices, but contrary to the products offered by their competitors, their homes *were* architect-designed.[14] Nevertheless, these display homes were *not* architect-built, which was the case in the architects' display village that Codd and Robinson established at Middle Park: the house designed by Noel Robinson was built by Noel Robinson Built Environments Pty. Ltd.; the one by Fergus Johnston was built by a company called 'Johnston Projects'; that by Edwin Codd & Partners was built by Harley Industries Pty. Ltd. (a company set up
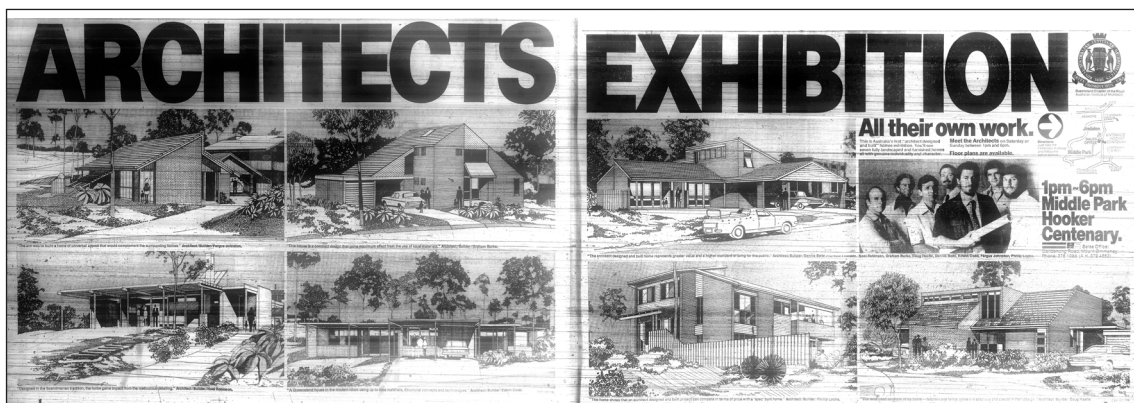

Figure 5: Advertisement in *The Courier-Mail* for the Architects Display Village. 'Architects Exhibition: All Their Own Work', *The Courier-Mail*, 24 March 1979, 14–15.

and owned by Codd and Hopgood); etc. This set-up irked the master builders. Codd was called to a meeting at the RAIA Chapter Council, where a delegation of master builders urged him to stop his building activities, stating (according to Codd): 'Architects design, and builders build!' In response to this exchange, Codd registered as a builder (Codd 2019).

For decades, the working relationship between architects and builders in Australia had been fragile and tense. In 1954, it was seriously put to the test when a group of architects, under the name of Architon, proposed to venture into the construction field, thus challenging their own professional code of ethics, issued by the RAIA in 1930, which prohibited architects from becoming engaged in real estate, building, or any other similar activity. From the 1950s, sympathy within the architectural profession grew for the sort of development that Architon foreshadowed, but change was slow (Freeland 1971: 181). Even though the RAIA set in place new schemes and regulations in the late 1950s, designed to protect their members in the rapidly evolving business world,[15] it was not until the late 1960s that the organisation reconsidered its code of professional conduct, allowing them to fully shed the guise of 'gentleman-architect' in favour of that of the 'businessman-architect'. Up until 1969, the RAIA's Code of Professional Conduct stipulated that

> a member should not be a director of any company or principal in a business carrying on business as builders, auctioneers of houses and estate agents … [and] a member should not carry on or act as principal, partner or manager of any firm carrying on any of the trades or businesses specified in [the previous] clause. (RAIA 1968)

What's more, it also stated that 'a member must not advertise or offer his professional services to any person or body corporate by means of circulars or otherwise, or make paid announcements in the press' (RAIA 1968). In Codd's words, 'You couldn't get your hands soiled by being involved in commercial activity. … you're [considered] a professional, like a doctor or a dentist. You couldn't … operate in the real world, you just were on the fringes and advised people what to do' (Codd 2019).

From the very start of his professional career, Codd opposed such rigid regulations and professional restrictions. His entrepreneurial mind-set was founded on the deep-seated belief that architects needed to be out there, 'in the real world', to have an impact, and to 'bring about desirable change' (Codd 2019). Fortunately for Codd, the times *were* changing. In 1969, the RAIA had set in place a new code of professional conduct. Contrary to the previous code, this new code was not negative or restrictive, but general and (rather) permissive. It said 'Thou shalt' instead of 'Thou shalt not',

12

and it banned nothing except ostentatious publicity. Instead of limiting an architect's field of work, it sought to lay down guidelines for professional behaviour based on responsibility to the public, clients, and colleagues in an unrestricted field of operation (Freeland 1971: 194).[16] The new code was designed to accommodate the new character of architectural practice and sought to encourage its further development. Codd welcomed these changes, and from the late 1970s and during the 1980s, he further expanded his design, building, and business empire, which he had originally established in the mid-1960s.

Patent 4438616: Perfecting the Technologist-Businessman-Architect Model

Codd had been challenging the RAIA's Code of Professional Conduct long before he engaged in the development of the Architects Display Village. Unlike the other architects involved, who saw it mostly as a way to promote their design acumen (Robinson 2019), Codd saw it as an opportunity to market one of his many business ventures: Harley Homes, which was a subsidiary of Harley Industries Pty. Ltd., a company that Codd and Hopgood had originally founded in 1964.[17]

Shortly after graduating from the University of Queensland (UQ) and while working for the Queensland Department of Public Works, Codd, together with Hopgood, began building a factory in Wacol, a Brisbane suburb about eight kilometres southwest of the CBD (Codd 2019). This factory was intended to house the production of Harley Furniture. Early on, Codd had become interested in furniture design, and for his master's thesis (in architecture), entitled 'Furniture and Space' (1964), he had developed a range of furniture, which he marketed under the brand name Harley Furniture (**Figure 6**). Over the following years, Codd and Hopgood rapidly expanded their Harley Industries business, and around the late 1960s, they began producing Harley Homes. Codd's own house in Duke Street, Taringa, Brisbane, which was constructed in 1964, was conceived as a prototype (**Figures 7, 8**). In 1968, the Melbourne-based architecture journal *Cross-Section* reported,

> In Taringa, Brisbane, this house is the prototype for four already built by Harley Industries, of welded steel frame, metal purlins, windows and door frames, with non-load bearing metal study [sic] partitions sheeted internally with plasterboard and externally with asbestos cement. E.T. Codd, archt. The aim of the company is to produce an economical industrialised construction system house, and they believe that other systems have been uneconomical because of (a) too large a factory over-head (b) double handling and storage of materials (c) complex and often expensive jointing methods.

DESK BB 4' 6" x 2' 6"   SIDE UNIT BT 4' 0" x 1' 6"   CHAIR SC AA4

BSM—A2

BMM—2

HARLEY INDUSTRIES ALSO MANUFACTURE AN EXTENSIVE RANGE OF OFFICE DESKS AND EQUIPMENT AS STANDARD ITEMS OR TO SPECIFIC SPECIFICATIONS

SCT 5

SC—AA2

HARLEY FURNITURE IS DESIGNED BY EDWIN CODD, B.Arch. (Hons.), A.R.A.I.A.

Figure 6: Page from a 1964 promotional brochure for Harley Furniture. Private collection Edwin Codd.

Figure 7: Codd Residence, Taringa (Brisbane), 1964. Photograph by Richard Stringer, catalogue no. 1030-002.

Figure 8: Codd Residence, Taringa (Brisbane), 1964. Photograph by Richard Stringer, catalogue no. 1030-006.

Inspired by international precedents, such as the Eames' case-study house at Pacific Palisades (Taylor 1968: 138), Codd's 'economical industrialised' Harley Homes were modular in construction (Lane 2019). They measured between 100 and 120 square metres and could be realised at a cost of 500 AUD per square metre.[18] Through the Architects Display Village, Codd hoped to promote this business venture.

According to David Lane, who was an architectural student working in the practice while Harley Homes were being produced, Codd wanted to change the business of architecture. Lane says that 'he wanted to modernise or refresh the stodgy appearance of architecture … the old boys' club', which relied on 'patrons [who would meet with architects at] the Brisbane Club, or the Queensland Club if you were in money' (Lane 2019). These were the places where the gentleman-architect was granted commissions and where working relationships were established. Codd, who was the son of a policeman and a teacher, and who spent most of his childhood moving around Queensland, depending on where his father was stationed,[19] was on the outside of such patronage, which to him seemed archaic and out of date. As a self-made man, he believed that not only the way in which architecture was produced needed to change, but also the way in which it was procured. Codd's approach to professional practice contributed to the evolution from the gentleman-architect to the technologist-businessman-architect.[20]

By the early 1980s, when at least a dozen Harley Homes had been built, the practice had been renamed Edwin Codd & Partners Pty. Ltd., with Codd the managing director.[21] This experience — the production of Harley Homes — taught Codd that to achieve a bigger impact, he needed to focus on building technology rather than on architectural production proper. In a recent interview, he stated:

> Registering design is useless. It's just to do with the image. You have to have inter-national patents. I realised that fairly early on … I wanted to exploit the technology … I wanted to change the world, but I wanted to make some money [doing so]. … You can manufacture a motor car and ship it cheaply all around the world … but a building you can't. So, you have to enable people in locations all over the world to utilise that technology based on the resources they've got available in their industries and so forth. And so, protecting the idea, I sold the use of the intellectual property, that was what I did. (Codd 2019)

Shortly after the completion of the Architects Display Village, and while building Harley Homes, Codd developed the most lucrative addition to his Harley empire yet: the Harley spaceframe, which he marketed under the brand Harley Systems.

By the late 1970s, spaceframes were well known and extensively used in the construction of large building complexes. Aware that the cost of spaceframes depended on the cost of the nodal connections of the members comprising the grid, Codd set out to devise a different jointing method that was simpler and more cost-effective. A 1979 commission for a new factory in Ipswich for Jordan & Co. Pty. Ltd. enabled him to test his spaceframe ideas (Taylor 1968: 138–140). In designing this complex, he realised that pre-finished roll-formed channels, placed back-to-back (at right angle) with webs adjacent, could form the upper and lower grids of a two-layer space frame (**Figures 9, 10**). If circular hollow sections used for the diagonal struts had their ends flattened, folded, and profiled, they could be slotted and bolted between the back-to-back webs. This continuous-chord-spaceframe substantially reduced building costs by avoiding expensive nodal connectors and by simplifying assembly, erection, and finishing — thereby also reducing the labour cost. Because Jordan & Co.'s factory was required sooner than Codd's spaceframe could be resolved, the showroom designed for the company the following year was its first use. Its potential was immediately realised
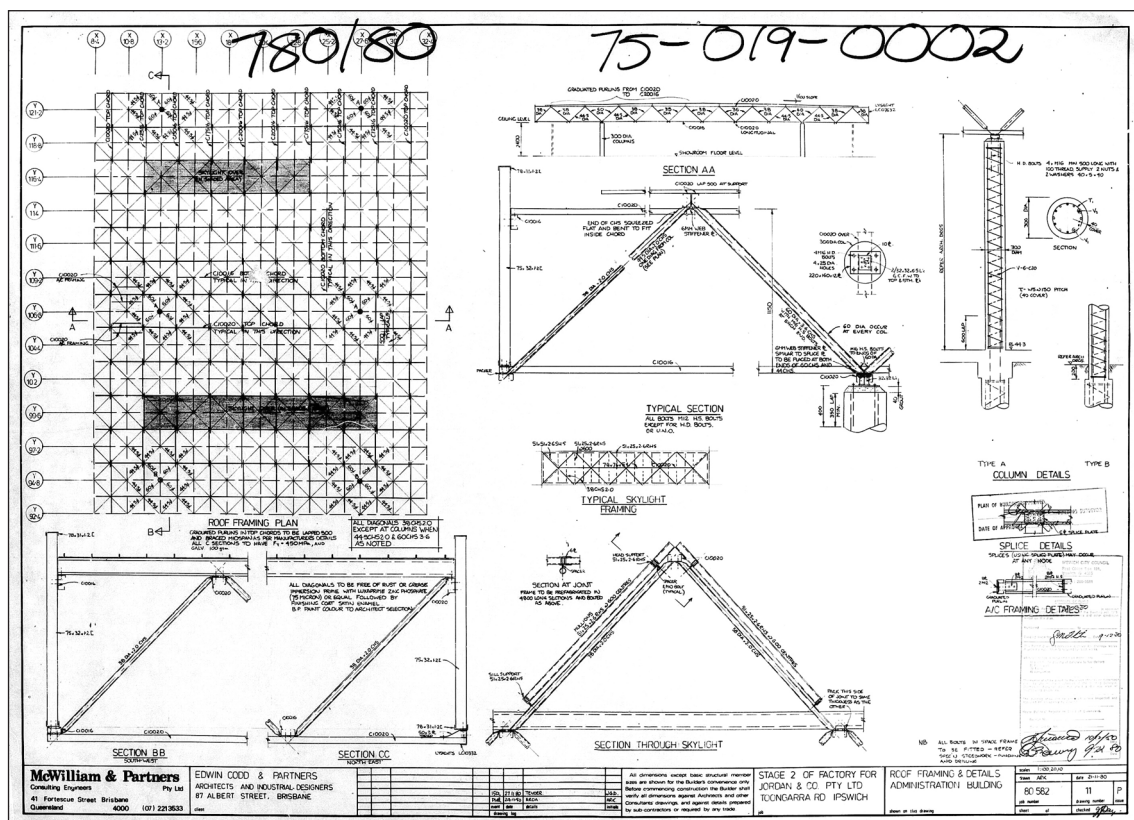

Figure 9: Jordan & Co. Showroom at Wulkuraka, Queensland, Australia, designed by Edwin Codd & Partners Pty. Ltd., 1980. Ipswich City Archives (Ipswich, Australia).

Figure 10: Jordan & Co. Showroom at Wulkuraka, Queensland, Australia, designed by Edwin Codd & Partners Pty. Ltd., 1980. Photograph by Richard Stringer, catalogue no. 4064-010.

and, on 11 July 1980, before the showroom was even finished,[22] Codd filed for the Australian patent.[23] His application was approved and published the following year, at which point Codd applied for the US patent which, upon approval, received the number 4438616 (**Figure 11**).[24]

In 1983, Codd received one of his first big projects that allowed him to demonstrate the advantages of the spaceframe that he had designed: the Mazda Distribution Centre in Brisbane. This single-volume shed, which was built on a former quarry at Mount Gravatt (a suburb situated in the southeast of the city), was simple in plan but sophisticated in detailing. The roof structure — a spaceframe — was supported by cantilever columns on a 19.2 metre grid, making the external walls non-loadbearing and thus creating complete flexibility for any future extension of the building. Since the external walls did not need to carry vertical loads, the cladding system was made up of mullions, hung from the spaceframe, to which horizontally arranged profiled steel panels were attached (**Figures 12, 13**). Made from readily available, off-the-shelf, standard cold-formed sections and tubes, the spaceframe was extremely economical to
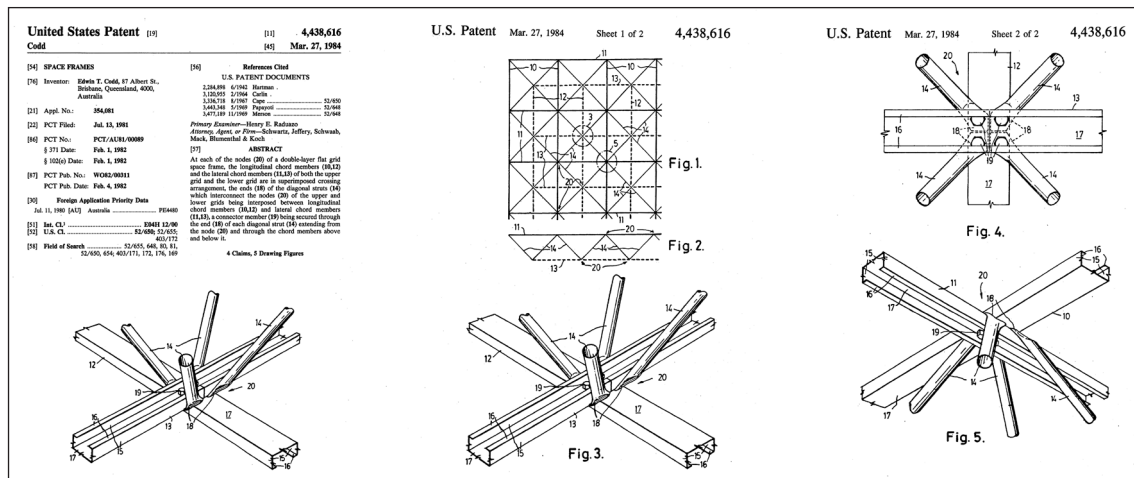
Figure 11: Edwin Codd, 'Space Frames', US Patent 4438616. United States Patent and Trademark Office, Department of Commerce, http://patft.uspto.gov/, consulted 29 March 2020.

Figure 12: Mazda Distribution Centre, Nathan, Queensland, Australia, Designed by Edwin Codd & Partners Pty. Ltd., 1983. Photograph by Richard Stringer, catalogue no. 4113-012-c.

Figure 13: Mazda Distribution Centre, Nathan, Queensland, Australia, Designed by Edwin Codd & Partners Pty. Ltd., 1983. Photograph by Richard Stringer, catalogue no. 4113-063-c.

produce and was erected in only a few days. Roof sections as large as 3,500 square metres were assembled on the ground and then lifted into position (Taylor 1986: 138–140). The Mazda Distribution Centre was met with acclaim. It received several professional accolades[25] and cemented Codd's business relationship with Great Western Australia (GWA), its client.

GWA: Becoming a Global Entrepreneur

As a new graduate commencing business in furniture manufacturing in the mid-1960s, the employment of a family friend, Barry Thornton, as accountant had long-term beneficial repercussions. While Codd's businesses developed in parallel with his architectural practice, Thornton's career also advanced, not least by his marrying into the Anderson family whose business coalesced as a conglomerate named Great Western Australia. GWA, which is today known as the Great Western Corporation, commenced business in 1934 in Toowoomba, a city 125 kilometres west of Brisbane. Over the following decades, the company established itself as a major corporate player

in Australia and beyond, managing significant assets comprising property holdings, shares in public and private companies, and investments in manufacturing, importing, and distribution businesses (Great Western Corporation n.d.). Thornton joined GWA in 1974, and in 1993, he was appointed chairman of the company (GWA Limited 1991; 'GWA Chairman Barry Thornton', 2010). Thornton was instrumental in granting Codd the commission for the Mazda Distribution Centre. Soon after this building was realised, Codd sold a half share in Harley Industries to GWA and moved his offices to GWA House, at 10 Market Street in Brisbane (Codd 2019).[26]

In the mid-1980s, with the backing of GWA, Codd ventured into the global market. It was an opportune time to do so. In 1983 Bob Hawke was elected as prime minister, and the Australian government began implementing a comprehensive programme of financial deregulation and reforms that transformed the country's economy and politics (National Museum Australia n.d.). Paul Keating, who was Hawke's treasurer, played a key role in integrating Australia into the global economy and changing its relationship with Asia, Europe, and the United States.

In 1984, Codd participated in the Hanover International Trade Fair in Germany. There, he marketed the Harley spaceframe as 'a cost-effective universal structural system applicable to most building types', with the Mazda Distribution Centre as the focus of his display.[27] At the time of the fair, Codd had already obtained the Australian and South African patents for the spaceframe innovation, with a notice of issue for America, Canada, and Europe, and the applications for other countries pending (**Figures 14, 15**).[28] Throughout the 1980s, five more spaceframe patents were applied for and approved, both in Australia and abroad, and Codd's 'Series 80 Connecting Joint', which was based on the 1980 patent, was succeeded by the 'Series 85 Connecting Joint' and the 'Series 90 Connecting Joint', based on his 1984 and 1988 patents respectively.[29] Series 85 was intended for flat plate application while Series 90 was intended to be used primarily for barrel vaulted or domed shapes. This joint was specifically designed to accommodate a variety of geometries necessary to construct single- or double-layer curved and compound curved spaceframe structures (**Figure 16**).

While applying for patents, Codd also travelled the globe to meet with the executives of building companies with an interest in acquiring the license for his spaceframe products. One of Harley Systems' first big licensees was Conder in 1989 (Codd 1991).[30] Codd said,

> I took myself overseas. We had a solicitor, Clarke & Carne and one of the partners [who was Codd's original solicitor] was Brent Ogilvie. He was … a really entrepreneurial type … We'd set up a meeting with Conder, who were the largest builder in

Figure 14: Harley Systems brochure for the 1984 Hanover Fair. Edwin Codd, private collection.

the UK ... Conder was a very old British establishment. I remember going there and people were still doing up their ties and putting their coats on ... I found the structure curious. When Brent and I met with the Board, people were calling the Chairman, 'Your Grace'. He was a Lord or something. For Brent and I this was too much. When I met him, I said: "Hello George, how are you?" And he said: "Eddie, I'm just fine." What that did was put us in the negotiating situation right up level with the boss of the whole operation, which was a very interesting outcome. Brent said: "look, we've got meetings set up all over Europe for this technology, perhaps Conder might be interested in accessing the European market?" And they sort of, they said, "well that'd be interesting." Without consulting me, Brent said: "a million pounds on the table now, and you've got Europe" ... And they said, "done". On the spot. They paid us a million pounds ... [and] we cancelled our European trip ... that was their market to develop. (Codd 2019)

Following the licensing of Harley Systems to Conder, the company applied the technology in several notable building structures in Europe and the UK, including the Eagle Centre Market in Derby, UK (1991), the Toll Booth Canopy at the Liefkenshoek

Figure 15: Harley Systems display at the 1984 Hanover Fair. Edwin Codd, private collection.

Tunnel in Antwertp, Belgium (ca. 1990), and extensive marshalling areas for the Channel Tunnel (Codd and White 1992; Chapman et al. 1992).

Codd also travelled to different parts of Asia to find licensees for his spaceframes. In Hong Kong, Harley Systems was licensed to Daido Steel Works & Engineering Ltd.; in India, to KND Engineering Technologies Ltd.; while in Malaysia, Angkasa Struktur (M) Sdn. Bhd. bought the right to use Codd's spaceframe system, which was applied in the Cheras Badminton Stadium in Kuala Lumpur in 1990. That same year, the license for a large part of the Middle East was sold to Zamil Steel Buildings Co. Ltd (Boral Acrow Limited n.d.). This company acquired the exclusive right to use Harley Spaceframe Systems in Saudi Arabia, Kuwait, Bahrain, Qatar, Oman, Yemen, the United Arab Emirates, and also Vietnam (Codd 2020). Two notable building structures that
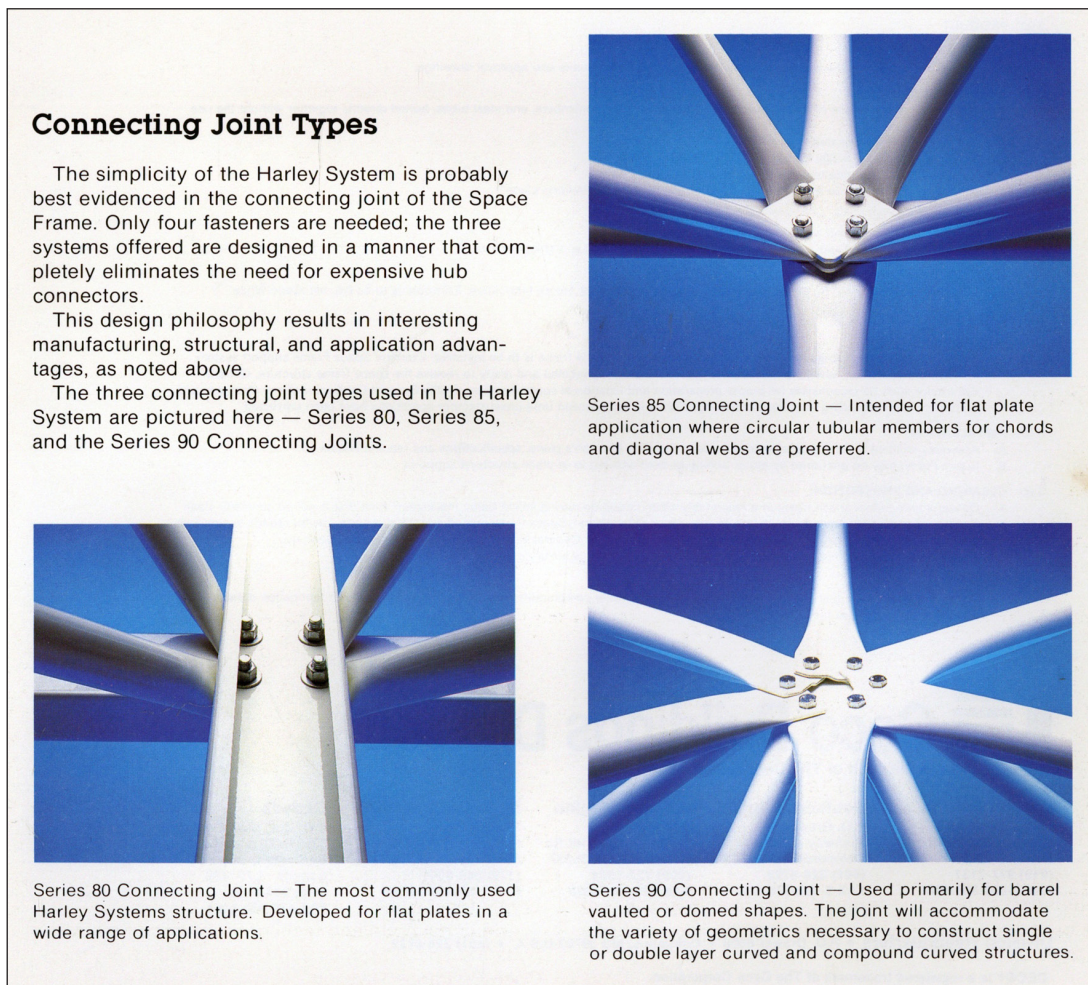
Figure 16: Different spaceframe joint types produced by Harley Systems. Harley Systems brochures, Edwin Codd, private collection.

followed, Toy Town (ca. 1991) and the Dammam International Shopping Complex (ca. 1991) in Dammam, Saudi Arabia, were (according to Harley Systems' promotional brochures) 'just the beginning ... [because] since acquiring the Harley license ... Zamil Steel has [already] signed supply contracts for in excess of 42,000 square metres of Harley Series 80 system' (Boral Acrow Limited n.d.) (**Figures 17, 18**). Another very active licensee elsewhere, on the other side of the world, was Grupo Corey in Mexico, which used the Harley Industries' spaceframe system to construct (amongst others) the International Airport of Mexico City (ca. 1991) (**Figure 19**), part of the Guadalajara International Airport (ca. 1991) (**Figure 20**), the distribution centre for General Motors in Acapulco (ca. 1991) (**Figure 21**), and the Hotel Continental Plaza in Veracruz (ca. 1991) (**Figure 22**).

Figure 17: Cover of the Conder Harley Europe promotional brochure. Edwin Codd, private collection.
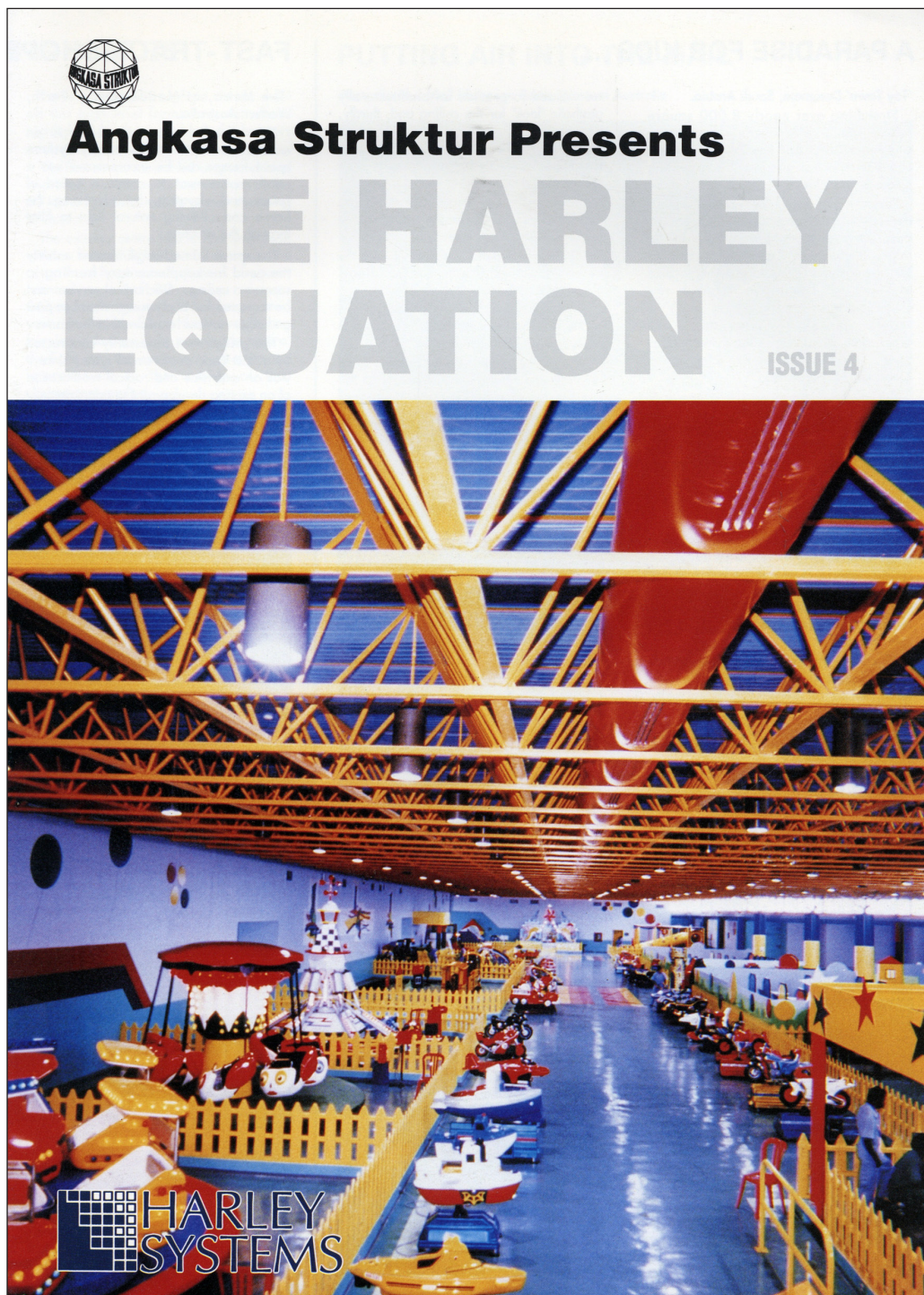
Figure 18: Promotional brochure produced for the Harley Systems licensee Angkasa Struktur. Depicted on the cover of this brochure is Toy Town (ca. 1991) in, Saudi Arabia, which was constructed using Harley Systems Series 80 Connecting Joint. Edwin Codd, private collection.

Figure 19: Harley spaceframe used in the International Airport of Mexico City. Edwin Codd, private collection.
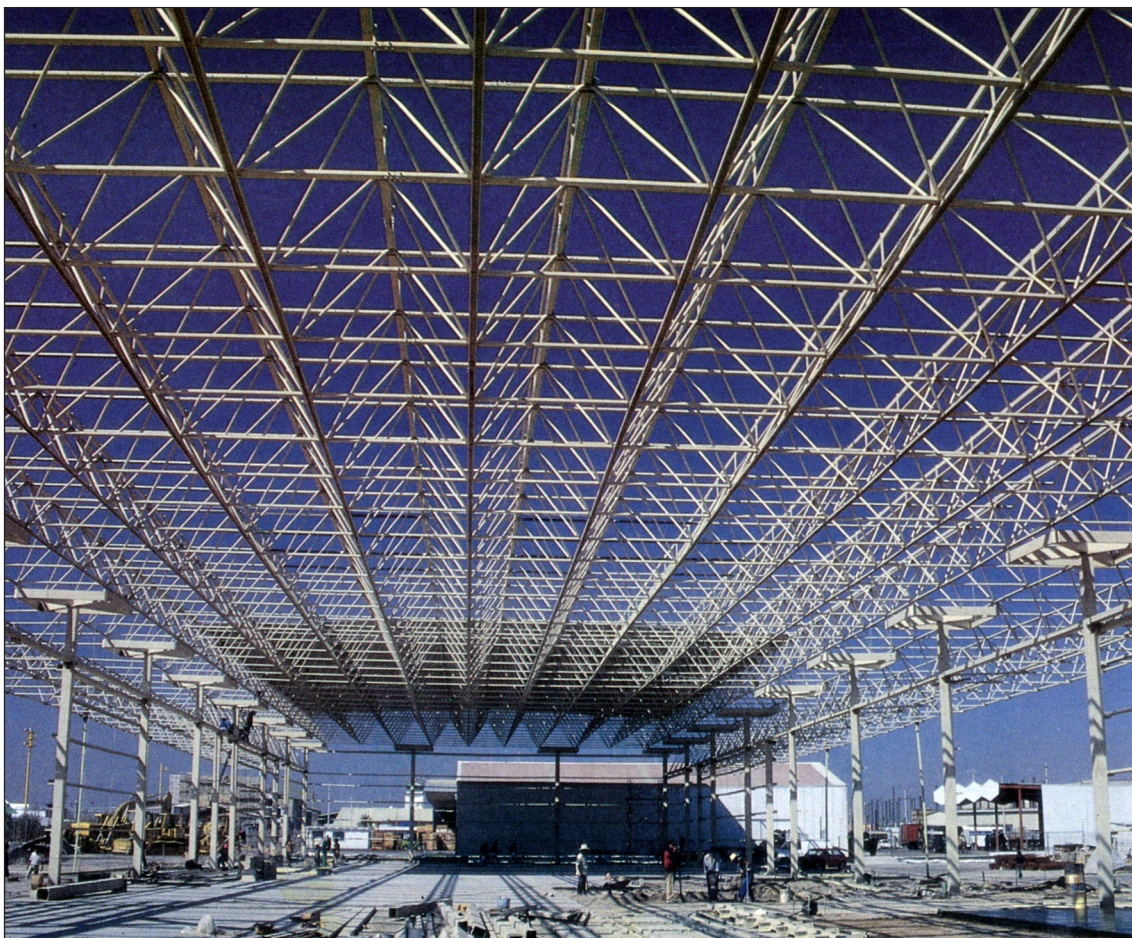
Figure 20: Harley spaceframe used in the tax precinct of the Guadalajara International Airport (Mexico). Edwin Codd, private collection.

Codd's affiliation with GWA facilitated this move into the global market. According to Codd, 'they had international banking [and] an office in Hong Kong [that] I could use … They [also] had American contacts' (Codd 2019). The importance for Harley Industries of getting a foothold in America is evident from Codd's account of one of his business trips to the Unites States for a meeting with a prospective licensee:

> We decided we'd fly into New York in the Concorde … to impress the hell out of them. There was economy class and business class, and first class, and then there was Concorde class. They wouldn't even let you walk on the plane carrying your overcoat; a page would walk ahead of you carrying your overcoat … So that — arriving in the Concorde — did impress the Americans (Codd 2019).

Figure 21: Harley spaceframe used in the distribution centre of General Motors in Acapulca, Mexico. Edwin Codd, private collection.
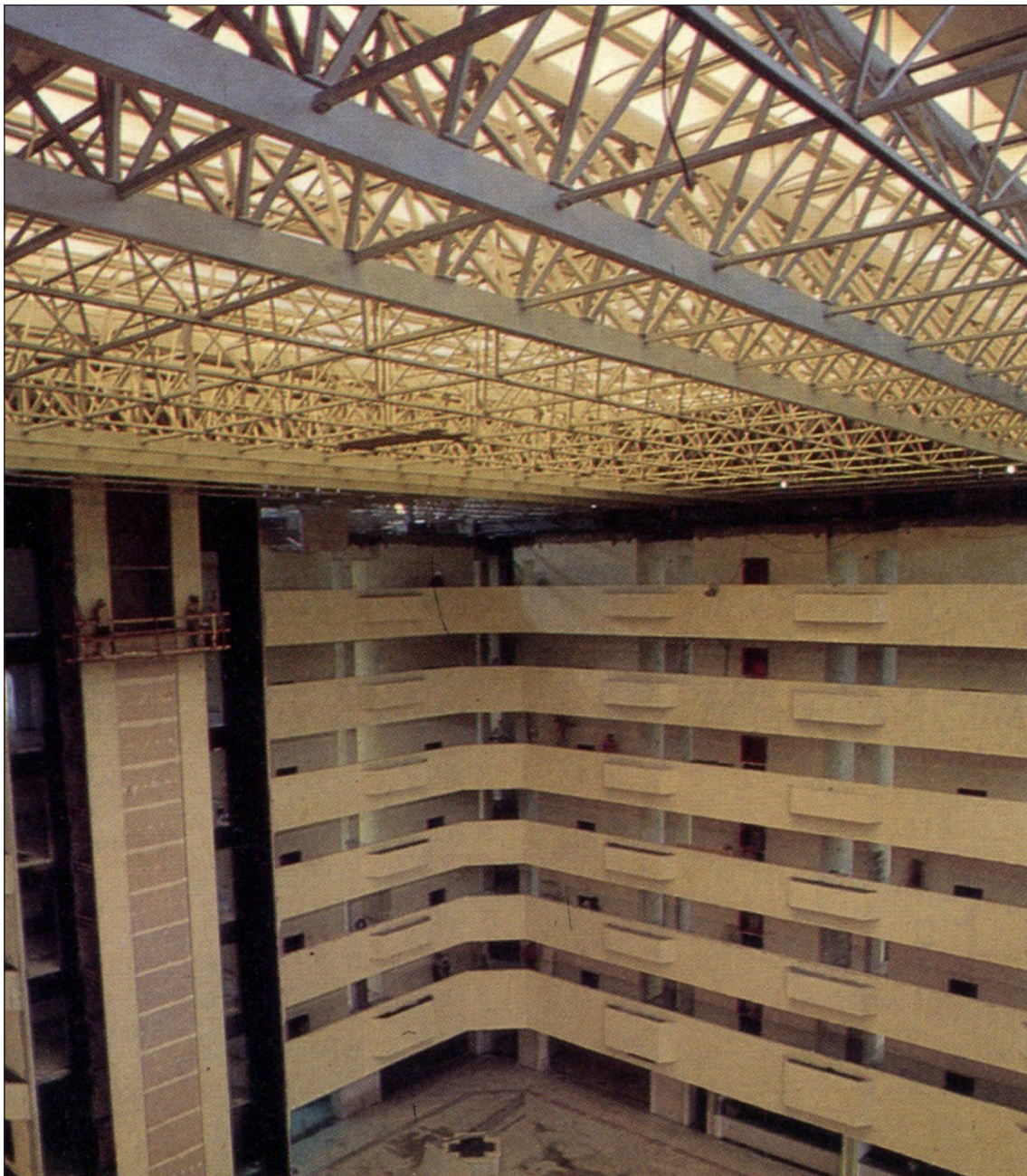
Figure 22: Harley spaceframe used in the Hotel Continental Plaza in Veracruz, Mexico. Edwin Codd, private collection.

In 1989 the Buildings Division of the Ceco Corporation (today known as Ceco Building Systems) obtained the exclusive rights to market the Harley spaceframe in the US and Canada ('Unique Space Frame', 1990). Originally established in 1947, by the 1980s Ceco had become a leader in the metal building industry, focused on highly customised and

architecturally inventive building commissions (Ceco Building Systems n.d.). Ceco viewed the purchase of the Harley spaceframe license as an investment in its future and wasted no time setting up a manufacturing facility in Columbus, Mississippi, for the newly acquired building system and obtaining the necessary certification that would enable its application in the US (Codd and McDonald 2020).[31] The Joe Cannon Baseball Stadium in Baltimore, Maryland, which was completed on 16 September 1990, marked the first application on American soil of the Harley spaceframe, and was rapidly followed by the Community Auction Resale Services (C.A.R.S.) centre in Norcross, Georgia, which opened on 13 October 1990. And yet, in spite of this promising start, the success of the Harley spaceframe in the US was short lived. In 1990, the US entered into a short recession, and Ceco merged with another building company, Robertson, which, following a business study, decided to relinquish the Harley spaceframe license (Codd and McDonald 2020; Robertson Building Systems n.d.).

In Australia 'the recession that Australia had to have'[32] was worse, especially in the building industry. Around 1993 Codd sold Harley Systems.[33] According to Codd, this was 'the right time' (Codd 2019). Beginning in the early 1990s, not only the US and Australia but much of the Western world experienced an economic downturn, which ended the real estate property boom of the early to mid-1980s. By the time the economy had recovered, in 1994, the spaceframe aesthetic had (largely) fallen from grace. Codd continued his architectural practice, first as Codd Partnerships Pty. Ltd. (1994–97), and from 1997, together with Andris Stenders, as Codd Stenders Pty., before retiring in the early 2000s (**Figure 23**).

Conclusion

In the latter half of the 20th century, the profession of architecture was remade. In Australia, as the socio-political landscape shifted from the Whitlam to the Keating era, not only architectural aesthetics but also architectural practice changed. In an attempt to respond to the exigencies that were imposed on the profession by the unyielding world of business, the institutions that structured it were reorganised and the regulations that governed it rethought. If by 1970, the technologist-businessman-architect had become a fixture on the architectural scene *down under*, by the late 1990s, several Australian architects had fashioned themselves as international architects,[34] and some even had become global entrepreneurs. One of these was Edwin Codd. Driven by a desire to change the way in which architecture was taught, procured, and produced, he started his own business empire in the 1960s, became head of the QIT school of architecture and president of the Queensland Chapter of the RAIA in the 1970s, and expanded his business empire globally throughout the 1980s and 1990s. As

Figure 23: Edwin Codd, holding a prototype of a Harley Systems Series 90 Connecting Joint, ca. mid-1990s. Edwin Codd, private collection.

one of the key actors propelling the reorganisation of architecture's institutions and the rethinking of its regulations in Australia, Codd's story is part of a larger history of the remaking of the profession in the last three decades of the 20th century, when the business of architecture gained an increasingly international character. This history is, as yet, to be studied in detail and told in its full complexity.

Notes

1. Architect John Portman was instrumental in legitimising the architect-as-developer in the US. This happened in the late 1960s (Ellin 1999: 253). Portman himself consciously cultivated this image. In 1976, for instance, he published a book entitled *The Architect as Developer* (Portman and Barnett 1976). Accordingly, Portman is prominently featured as an example of 'the architect as entrepreneur' in *The Image of the Architect* by Andrew Saint, who points out that in the UK, the proliferation of this new 'breed' of architect was opposed more vehemently than in the US (1983: 151–154).

2. Beginning in the mid-20th century, the practice of architecture became more global with the arrival of commercial jetliners and the subsequent revolution of air travel. Figures such as Constantinos Doxiades, Michel Écochard and Le Corbusier are frequently cited as trailblazing 'global experts'. However, these architects commonly worked for governments and supra-national agencies. They did not travel to set up global businesses, nor did their travels involve much financial risk-taking on their part. The global entrepreneur, one could argue, belongs to the generation of Rem Koolhaas, who in *S,M,L,XL*, in a diagram entitled 'OMA Travel Behavior', (in)famously described the number of kilometers travelled and nights spent in hotels by the office (Colomina 2011; Lagae and De Raedt 2013; O.M.A., Koolhaas and Mau 1995: 12–13).

3. This paper frequently cites the US and the UK as points of reference, given that in the period under investigation these two countries had a strong influence on Australia. If Australia was a new Britannia in the colonial era, during the 20th century its seaboard cities were wide open to the spread of ideas, technology, capital, and people from the New World.

4. A notable exception is Walker and Burns (2015).

5. The systems approach was popularised in architecture during the 1970s (Rabeneck 1976). One of the first conscious attempts to put this systems approach to work in architecture happened in 1961, when architect Ezra Ehrenkrantz developed the California School Construction Systems Development, SCSD (Educational Facilities Laboratories 1967).

6. Edwin Codd and Andris Stenders (2009), 'Expedited, cost effective and sustainable schools building systems', a promotional brochure in the Codd collection.

7. Beginning in 1975, Codd Hopgood and Associates became Codd Hopgood Farmer Pty. Ltd. (1975–1980).

8. As the promotional brochure by Codd and Stenders (2009) says, Codd and Hopgood also had to allow time for competitive bidding for the construction contract, which shortened their time for design, documentation, and prototyping. The contractor who won the bid was AV Jennings. A review of the IB74 building system that was published in 1977 in the *Queensland Chapter News* stated that 'a building can be completed in 6–8 weeks including ground work. Lock-up is achieved within 3 days of the slab being available' ('Building of the Month', 1977).

9. 'Specification for the supply and erection of 58 classroom blocks and buildings, industrialised building system, throughout Queensland', series 1173, box number 802, item ID 595380 (QSA).

10. A history of architectural education in Queensland prior to 1970 can be found in Van der Plaat and Wilson (2015).

11. In 1972, this task was taken over by the newly established Architects Accreditation Council of Australia (AACA).

12. From an unpublished, undated manuscript by Edwin Codd, 'The Journey to Professional and Academic Credibility for Courses in the Built Environment at the Queensland Institute of Technology', in the Codd collection.

13. Apart from Codd and Robinson, who both have entries in Goad and Willis's *Encyclopedia of Australian Architecture* (2012), most of the architects who participated in the RAIA display village are not well known in Australia today. Burke and Johnston went into development; the former focused predominantly on commercial development, the latter on housing development. Kenneth Ross (Ken) Walker graduated from the University of Queensland with a Diploma of Architecture several years prior to Codd. He was in long-term and well-regarded partnership (Buchanan & Walker) with a contemporary, Eric Murchison Buchanan. The partnership ended (probably as a result of a credit squeeze) in the mid 1970s, not long before the Architects Display Village. Looking for a new direction, he later practised alone. Philip John Locke and Douglas William (Doug) Hastie were younger and graduated from the Queensland Institute of Technology, Hastie while Codd was Head of the School. They registered as architects in 1972 and 1976 respectively. Doug Hastie later worked with Bligh Jessup Bretnall, one of the oldest architectural firms in Queensland (originally established in 1926), and its descendent practices.

14. The first known instance of an architect-designed project house (or display house) successfully reaching the marketplace occurred in Melbourne in 1955. This was the Peninsula, designed by the eminent Melbourne practice of Grounds, Romberg & Boyd for Contemporary Homes Pty. Ltd. (O'Callaghan and Picket 2012: 72). A 'display village' is a collection of different display houses (or project homes) built in close proximity to each other (hence the use of the term 'village') to allow prospect-

ive home-buyers to experience the living space and features of the home, and then order a copy of the particular display house that suits them to be built elsewhere in the development.

15 In 1958, the RAIA organised a professional indemnity insurance scheme to assist and protect its members. Around the same time, as the unyielding business world pressed harder, the council also considered the matter of architectural firms becoming limited liability companies. Such an arrangement existed nowhere else in the world, which meant that there were no precedents to serve as a guide. Both the insurance scheme and the approval of limited liability companies were important indicators of the changes in the profession (Freeland 1971: 183).

16 It is interesting to note that this adaptation of the Australian Code of Professional Conduct (to condone both development and advertising practices among architects) occurred almost a decade before the American Institute of Architects (AIA) changed its code of ethics, in 1978 (Ellin 1999: 252). According to Saint, in the UK, where the professional code of conduct was determined by the Architects' Registration Council of the United Kingdom (ARCUK), such changes were also met with opposition: 'Architects eager to take up the challenge of development, to advertise, to incorporate, to become directors and contractors, faced an opposition consisting of old-style professionals, salaried architects and small-scale principals, few of whom stood to gain from alterations in the rules of ARCUK or the RIBA'. Saint adds that '[a]t the time of writing [in the early 1980s] it appears that the battle to legitimize the entrepreneurial approach has been won' (Saint 1983: 147, 149).

17 From the early 1960s the number of Australian architectural firms operating as 'proprietary limited', or 'Pty. Ltd.' companies increased rapidly. Within such a business structure, the legal responsibility of the shareholder (the architect) for the company's debts or liabilities is limited to the number of shares they own. With Harley Industries, Codd and Hopgood were ahead of the curve. For a long time, senior members of the profession had opposed architectural firms operating as limited liability companies. However, as Harley Industries was not an architectural firm but (initially) a furniture manufacturing business, it likely flew under the radar (Codd interview, 28 January 2020).

18 These figures are based on information sourced from the 'Log Book of Experience in Architectural Practice' that David Lane kept as part of his internship at Codd Hopgood Farmer Pty. At that time, in order for graduates in architecture to register as architects in any state in Australia, or to obtain an Architects Accreditation Council of Australia (AACA) Certificate, they were required to have approved experience in architectural practice, the details of which were required to be recorded in an approved Log Book, issued by the AACA (Lane, private collection).

19 Until the age of ten, Codd grew up in Brisbane. After that he, with his family, moved around Queensland, as his father was stationed in different places: from Clifton on the Downs, to Tully, then to Ayr, then Charters Towers, and then back to down to Sandgate, and up again to Mount Isa (Codd interview, 26 July 2019).

20 Saint elegantly describes this transition in the UK by referencing two books on professional methodology, one published in the mid-1950s, the other in the early 1960s. He writes: 'Some sense of the distance which architects travelled in this period may be gained from comparing two books on professional methodology separated by only eight years. Maurice E. Taylor's *Private Architectural Practice* (1956) perpetuates the comfortable homilies of the inter-war profession: if you want to get jobs, join a club, play gold and make sure your office looks smart. Brunton, Baden Hellard and Boobyer's *Management Applied to Architectural Practice* (1964) has a drastically different tone'. The latter, Saint argues, zealously promotes a 'new style efficient architect' (Saint 1983: 145).

21 Codd's architectural practice (in its various incarnations) employed mostly architecture students. The architects who worked for Codd included Larry Knauer, David Lane, David McRae, Peter Pierce, Ian Robinson, Mark Ross, Geoff Street, and Greg Tunn, who documented the IB74 Schools. Apart from these architects and architecture students, Codd also had other staff working for Harley Industries in the Wacol factory. There was, for instance, a factory manager, called Barry Tooth, and an industrial designer.

22 The date for the showroom is November 1980, marked on the building plans for 'Stage 2 of Factory for Jordan & Co, Pty. Ltd. Toongarra Rd Ipswich', held in the Ipswich City Archives (Ipswich, Australia).

23 Application submitted to the Commissioner of Patents, Commonwealth of Australia, for a patent for an invention entitled 'Improvements in or Relating to Frame Constructions', Application number: 1981072821. The 'date received' stamp on this application is 11 July 1980. Australian Government, IP Australia, https://www.ipaustralia.gov.au/ [last accessed 29 March 2020].

24 This application was submitted to the United States Patent and Trademark Office on 13 July 1981. United States Patent and Trademark Office, An Agency of the Department of Commerce, http://patft.uspto.gov/ [last accessed 29 March 2020].

[25] RAIA Citation (1983), special merit in the BOMA Award (1983), Australian Steel Award (1983), The Industrial Design Council of Australia Good Design Award (1984).

[26] From 1983, Edwin Codd & Partners Pty. Ltd. is listed at 10 Market Street, Brisbane, in the Brisbane Telephone Directory, which is the same address as GWA. Prior to that, Codd's practice was listed at 36 Robertson Street (1982) and at 87 Albert Street (from 1974 to 1981).

[27] As seen on a photograph of the Harley Systems display at the 1984 Hanover Trade Fair (Codd, private collection).

[28] 'Harley Space Frame: An Economical and Versatile Structural System' (1984), a promotional brochure for the Hanover Fair in the Codd collection.

[29] These are the dates for the Australian patents. The dates at which he obtained patents for these innovations in other countries may differ. Application submitted to the Commissioner of Patents, Commonwealth of Australia, for a patent for an invention entitled 'Space Frames', Application number: 1984032185; Application submitted to the Commissioner of Patents, Commonwealth of Australia, for a patent for an invention entitled 'Space Frames', Application number: 1988027451. Australian Government, IP Australia, https://www.ipaustralia.gov.au/ [last accessed 29 March 2020].

[30] The very first licensee was Boral Acrow in New Zealand.

[31] Council of American Building Officials, National Evaluation Service Committee, Report No. NER-445, Harley Systems Series 80 Space Frame, issued 1 November 1990 (McDonald, private collection).

[32] As treasurer in 1990, Paul Keating famously described the 1990s recession as 'the recession we had to have'. He challenged Bob Hawke for the leadership of the Labor Party in 1991 and became prime minister of Australia.

[33] Harley Furniture had already closed shop in 1983. When Codd joined forces with GWA in 1983, GWA already owned Sebel Furniture, whose activities were based in Sydney. GWA wanted to centralise its furniture-making facilities there, and asked Codd to manage the whole furniture-making business from Sydney. When Codd declined, it was decided that Harley Furniture would close (Codd interview, 26 July 2019). The last time that Harley Systems Pty. Ltd., space frame manufacturers, is listed in the Brisbane Telephone Directory is 1993.

[34] Australia's best-known 'global architect' is probably John Andrews. Trained as an architect in Sydney, Andrews travelled overseas soon after graduation in 1956, winning commissions in Canada, where he established John Andrews Architects in Toronto in 1961. From there, Andrews also completed several projects in the United States — most notably Gund Hall for the Harvard University Graduate School of Design (1968). In the early 1970s, Andrews returned to Australia, where he established John Andrews International in 1972, which completed several high-profile projects, both in Australia and overseas. It would, however, be difficult to qualify Andrews as a 'global entrepreneur' in the way that Codd became a 'global entrepreneur', as his professional activities remained largely limited to architectural design. Andrew's work has been researched in great detail by Paul Walker and Philip Goad.

Competing Interests

The authors have no competing interests to declare.

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