Transport, Jim Kennan, in a ceremony at the Dandenong plant.

Z4 TRAM CONCEPT

Since it was expected that the M&MTB would very soon need to order more new trams, the Comeng team at Dandenong began looking at a revised version of the Z3 units in the early 1980s—these being dubbed by them as Z4s. A number of different concepts were considered, all of which were intended to be cheaper to manufacture, lower in mass, and more economical to operate. The structure was value-engineered so as reduce the number of components, the cab was intended to be a self-contained GRP module, and various other fittings and items of equipment reviewed and simplified. It was proposed to adopt the simple PCC bogie design—this being very much cheaper to manufacture compared to the Duewag units.[13] They were also considered to be better riding. The Z4 trams had no conductor's desks and therefore the seating capacity was potentially 66, and with a standing capacity of 84—an overall increase of 25 passengers compared to the Z3s.

By early 1982 the M&MTB was waiting on authorisation from the Victorian Government to order up to 100 new trams—presumably to the Z3 design. But in April 1982 there was an election in Victoria and the Cain Labor Government came into power—the new transport minister being Steve Crabb. New tram orders were therefore put on hold.

THE LONIE REPORT

Back in June 1979 the Victorian Government had initiated a comprehensive review of public transport in that state. Officially called the Victorian Transport Study, it became known as the Lonie Report (after its author Murray Lonie) and was published in September 1980. It called for drastic changes to all modes of public transport and how they were to be used. It recommended, among other things, the closure of many of Melbourne's suburban commuter lines. In the light of these threatened changes, Sydney-based engineer Dr John Gerofi (of Enersol Consulting Engineers) wrote to Steve Crabb shortly after the April 1982 election recommending that unprofitable suburban lines in Melbourne should not be closed. Gerofi recalled:

> I said that shutting down metropolitan suburban lines that did not have enough patronage was not a good idea. It would be better to convert those under-used railway lines to light rail—a technology that could provide a better service at a lower cost on the same lines.[14]

LOW-FLOOR TRAM PROPOSALS

Gerofi had come up with sketches of an articulated two-unit tram with drop-centre floors between the bogies (much along the lines of Melbourne's W-class trams)—which he presented to Crabb. When asked by Crabb to firm up his ideas Gerofi sought technical assistance from Comeng Granville's General Manager Phil Gutteridge. Gutteridge said:

> I spoke to Ellis Richardson and recommended that such assistance be extended to Gerofi as it would clearly aid Dandenong's negotiations with the Victorian Transport Minister.[15]

Coincident with these developments, Comeng Granville's John Dunn had been working on a number of low-floor tram concepts in early 1982. One of these was for a single-unit low-floor tram for the State Transport Authority (STA) in Adelaide. It was put forward as a 'new generation' of vehicles as a possible replacement of their City-to-Glenelg H-class units. Though keen to go further with the concept, the STA never pursued the proposal due to the lack of funds.

The background to this work was Dunn's involvement with Comeng engineer Ian Macfarlane who, in 1963, came up with an innovative low-floor rapid transit system called COMERT (the story is told in Volume 2, chapter 26). Although the proposal did not come to anything, some of the design principles of the cars had stuck in Dunn's mind. In fact Macfarlane reckoned he derived his idea from the 1896 Budapest low-floor Földalatti cars. Dunn was convinced that these principles could be applied to an entirely new low-floor tram design. At that time European and North American trams typically had floor levels in the range of 850–900 mm. Some were as high as 1,000 mm as they were used exclusively with high-level platforms or at least had folding steps for multi-level access. Dunn reckoned that if part of the car floor could be low, then trams operating in streets (such as in Adelaide and Melbourne) would be very much easier to access. By early 1982 these ideas had germinated into concepts that Engineering Manager Harry Anthony encouraged him to develop.

When Gerofi visited Comeng in May 1982 his and Dunn's proposals came together. Dunn said:

> My idea was to take John's concept further and create a two-unit vehicle with a then unheard-of low floor height at the doorways of just 300 mm. The intention was to put this forward to the M&MTB for possible introduction in Melbourne.

The concept of this low-floor tram was first presented at a Victorian Government Transport Seminar held in Melbourne in May 1982. Gerofi and Dunn both gave papers highlighting the advantages of this more modern approach to tram design—as well as other aspects of current

overseas tram operations. Although their ideas for the low floor were well received by many of the participants, the then Chairman of M&MTB, Dudley Snell, was highly sceptical. He asked at the public forum: 'If this idea by Mr Dunn and Mr Gerofi is supposed to be so good, then why hasn't anyone else thought of it?' But others had indeed thought of it *in principle*—many decades before. Perth had a Brill-built Hedley-Doyle 'stepless' tram that went into service in 1914. It was the same as those operating in New York. Brisbane had one too. And Milan then had trams with a 'low-floor' centre section.

Following the May seminar, Crabb authorised Gerofi and Comeng to work together to produce a concept design of an articulated low-floor tram suitable for Melbourne. Gerofi said of the seminar:

> I got the impression that the real aim of the minister was just to shake up the M&MTB and to get them come up with proposals of their own.[16]

Unfortunately, the low-floor concept was not taken seriously by the M&MTB, and so it was not pursued. Instead (as we will see), Comeng was asked to develop two prototype articulated trams with conventional high floors.

As it happened, in early 1984, a prototype tram with a low-floor went into service in Geneva, Switzerland—the first of its type in the world. It had a floor height at the doors of 480 mm with folding steps allowing relatively easy access from road level. Some of the equipment normally under the floor was housed inside the car (taking up passenger space) but the remainder was in the roof.

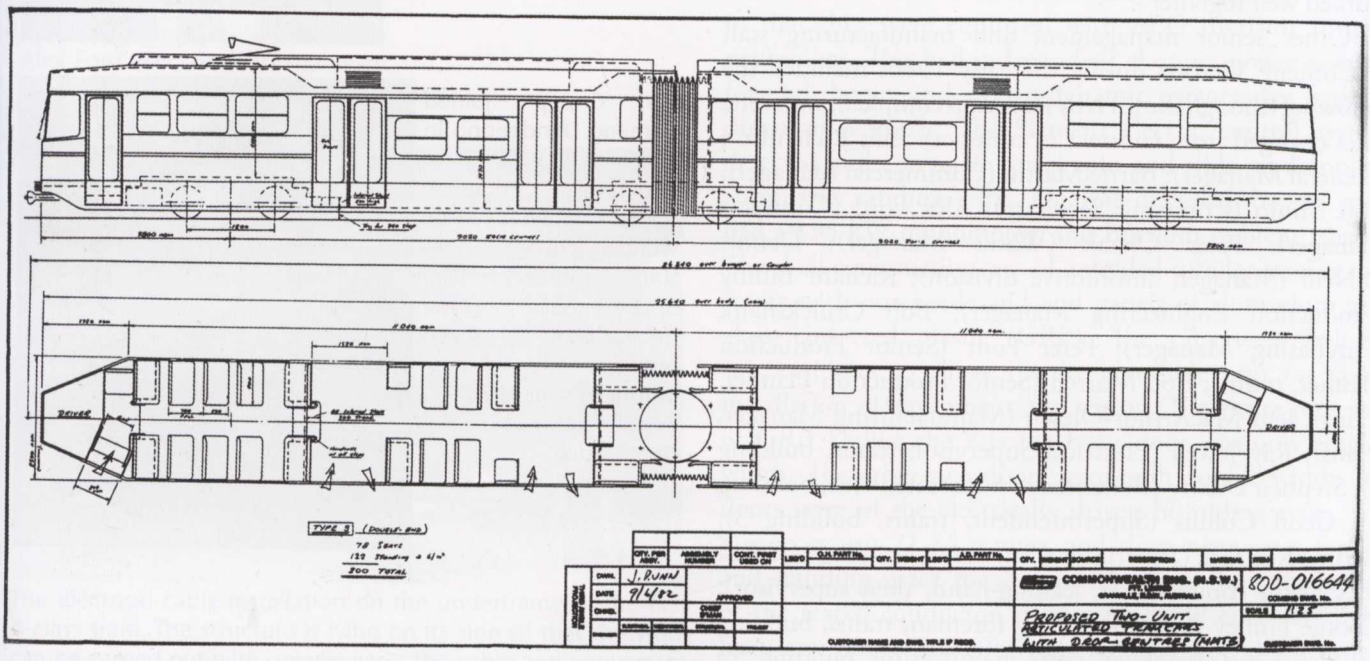
Had the M&MTB known about the Geneva tram then being developed by Vevey in Switzerland (and been more receptive to Comeng's idea) then an Australian-designed articulated low-floor tram might easily have been the first in the world to enter service. And it would have had a much lower floor at the entry doors than the Swiss prototype.

ORDERS FOR NEW TRAMS

It was some time before the new government gave their approval for additional trams to be ordered from Comeng once the tenders were in. It came as a variation to the Z3 contract—an extension that was secured by the company in late 1982. The order was for twenty-eight single-unit trams nominated A-class, and two, prototype, two-unit articulated trams nominated B-class. However, the new A-class trams differed from the previous Z3 type in that they had no conductor's seats, and the car ends were shorter and wider. They also had resized and relocated doors. The press reported that the A-class units were anticipated to cost approximately $430,000 ($1.3 million) each.

Comeng engineer David Foulkes recalled:

> We used to joke about it, because the new Transport Minister said Melbourne had had 'pointy' trams for some time and he wanted ones that were clearly different—ones that were 'ours'—this is, 'Labor' trams. He wanted them to have wider fronts, but did not seem to understand why they had to be narrow at the front to go around curves. If they were to be wider then they had to be shorter with less overhang. He wanted a modern tram with two large doors between the bogies.[17]



John Dunn's June 1982 general arrangement drawing of the proposed articulated low-floor tram for Melbourne. The 25.6 m long car seated 78 and had standing space for an additional 122. The floor height at the doors was just 300 mm. Most of the traction control equipment was housed in the roof. There were no equipment lockers inside the car taking up passenger space. All three bogies were of conventional design. The cars were pressure-ventilated.

The biggest hurdle was trying to house the same Z3 equipment on the underframe. The Z3s only had one set of double-width doors and stepwells each side between the bogies. But the new A-class had to have two sets of doors between the bogies each side—their respective stepwells therefore taking up much more underframe space. Foulkes said:

> The electrical blokes more or less had to shoe-horn all the existing electrical equipment on a Z3 tram onto the A-class. It was a real nightmare trying to get all the equipment boxes in on the underframe along with the cables.[18]

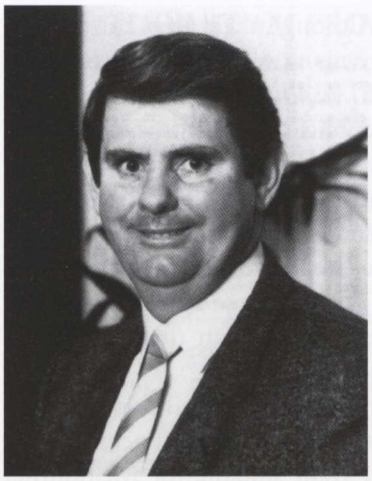
SENIOR STAFF AT DANDENONG

As Engineering Manager, Don Heumiller had general oversight of the design of the A-class trams. Under him, Max Russell looked after the concept design, with Gordon Jackson doing the interior. Overall supervision was by Paul Sparkes, an engineer taken on for the job by Heumiller in mid-1981. Another engineer hired by Heumiller was Ian Crump—who joined the company in April 1983.

> I was employed as a junior structural engineer. It came about because Don had RMIT doing some consulting work on the A-class tram. Don wanted to employ a graduate so I was recommended by one of my lecturers. Although Don interviewed and employed me, I was working for Paul Sparkes at the time.[19]

Nigel Nettleship was the engineer who looked after the electrical equipment design of these units. Crump recalled: 'In those days it was a small, compact design team, and we worked well together'.[20]

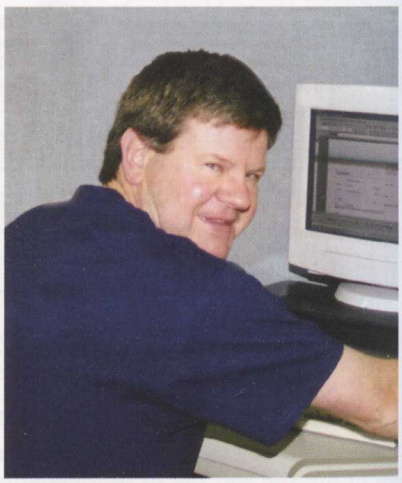
Other senior management and manufacturing staff at Comeng Victoria during the early 1980s included the following (though the list is by no means complete, and some roles changed from contract to contract): Ellis Richardson (General Manager); Barrie Martin (Commercial Manager); Rob Minio (Company Secretary); Alex Ford (Contracts Manager); Peter Olszak (Works Manager); Dennis O'Neill (Manager, automotive division); Richard Bunby (Production Engineering Manager); Bob Cruickshank (Purchasing Manager); Peter Font (Senior Production Planner, trams); Rod Murrell (Senior Production Planner, trains); Jens MacArthur-Olesen (Manufacturing Manager, trams); Ray Jewell (Electrical Supervisor, trams, building 4); Stephen Dainty (Boilermaker Superintendent, building 3); Geoff Collins (Superintendent, trains, building 3); George Rusiniak (Superintendent, trains, building 1); Mick McGuckin (Boilermaker, leading-hand, then supervisor); George Finney (Coach-building foreman, trams, building 4); Ken Gray (Foreman, parts manufacture, building 5); Ken Moresby-White (Foreman fitter, trains, building 3). Though not on staff, ex-Comeng Dandenong General Manager Don Smith was engaged as a consultant.



In February 1981 Comeng Dandenong's general manager Ellis Richardson employed Dennis O'Neill to manager the company's automotive division that produced chassis rails for buses and International trucks. Later that year Richardson gave him the added responsibility of managing the production and delivery of the Z3 trams. He moved to Comeng Granville in April 1983, becoming general manager of the two NSW plants later that year.

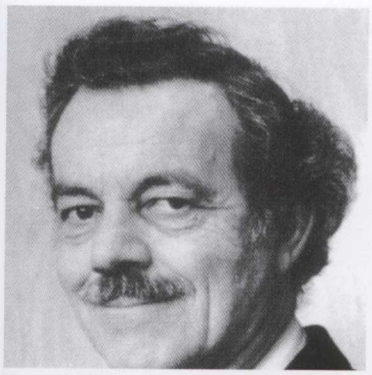
Don Heumiller collection

Paul Sparkes was employed by Don Heumiller as an electrical engineer at Dandenong in mid-1981 so as to take some of the electrical workload off Nigel Nettleship. Sparkes' first job was looking after the A-class trams as the design project leader. He stayed until early 1986—leaving for just over a year before returning in mid-1987 as design manager.

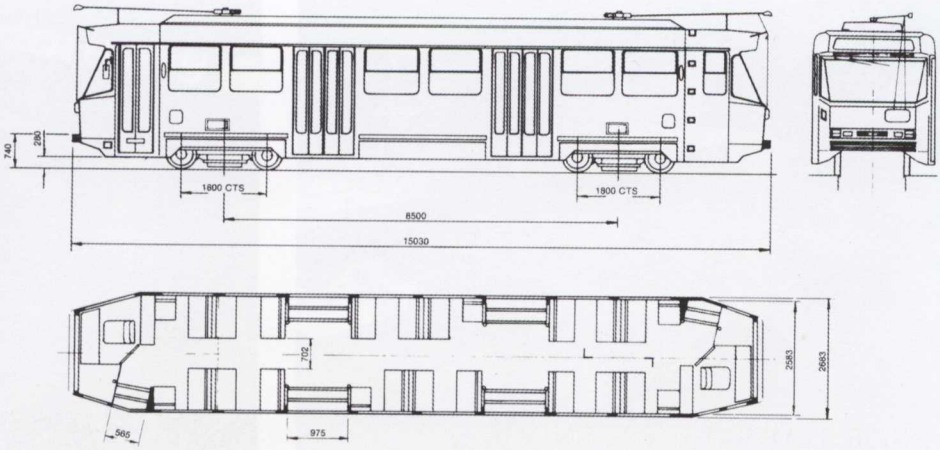


Ian Crump collection

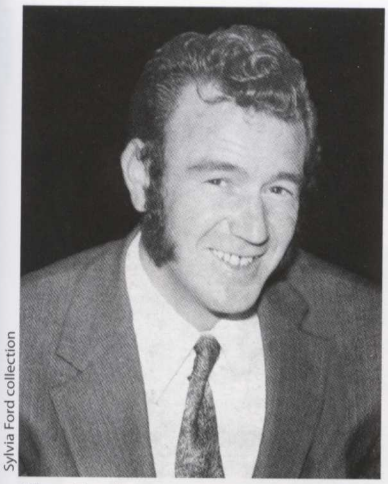
Ian Crump joined Comeng Dandenong in April 1983 as a junior structural engineer. One of his first jobs was working on the A-class trams, reporting to Paul Sparkes. He worked for Comeng for seven years, and then with the company's successors—ABB, Adtranz and Bombardier.



Don Smith had been General Manager at Comeng Dandenong up until 1976, and then of the Bassendean factory in 1976–77 for a year. He was engaged from time to time as a consultant at the Victorian plant during the early 1980s.



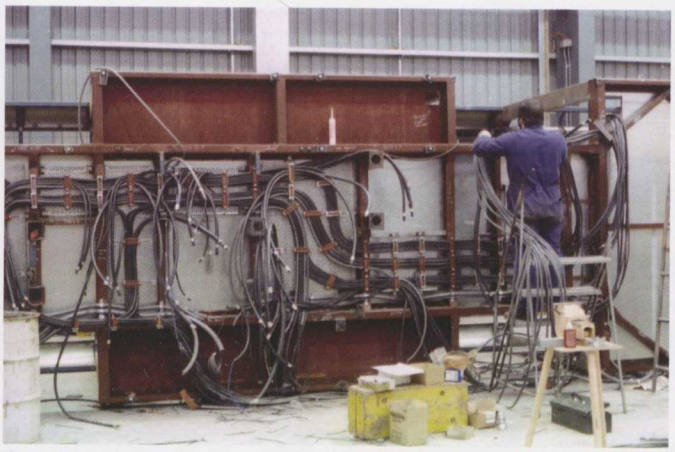
General arrangement drawing of the A-class trams designed and built by Comeng Dandenong for the Melbourne and Metropolitan Tramways Board (M&MTB). Although it was shorter than the Z3 trams, it had the same seating capacity of 42.



Sylvia Ford collection

Alex Ford was contracts manager at Comeng Dandenong.

The Dandenong tram purchasing/supply group. Left to right: Bob Cruickshank (Manager), Bridget Murphy, Jan Seymour, unknown, Lance Bastin, Dorothy Walklett and June McClusky.



David Foulkes collection

The electrical cable installation on the underframe of the first A-class tram. The structure is lying on its side so that the work can be carried out with greater ease. The cable and equipment installation work was carried out on all later units when their underframes were in the inverted stage. This photo clearly shows the intrusion into the underframe space of the four large stepwell cutouts.

The A-class trams were essentially the same as the Z3s in that they were equipped with AEG thyristor control equipment. This had independent chopper power systems for each bogie, and electro-dynamic regenerative braking down to 8 km/h. The Siemens electric control system detected and corrected wheel spin and slide, and applied automatic sanding. The Duewag-designed bogies each had a 195 kW monomotor, and Bochum resilient wheels. The shell construction was of a welded tubular-steel space-frame with outer side and end panels of aluminium and glass-reinforced plastic (GRP). The cabs were bolt-on subassemblies to allow a more accessible unit for faster installation of equipment and wiring. The entire roof was of GRP. Unlike the Z3s the front door was only single-width. The other two doors were both double-width. All doors were of the electrically driven bi-folding type. The tare mass was 21.54 tonnes, and there were seats for 42 and standing space for around 83. With the elimination of the seated conductor, passengers could enter or alight from any door. This effectively reduced stop dwell times, and the different arrangement was generally well received by the travelling public. The trams were fitted with power collection trolley poles similar to those on the Z3s, though these were later replaced with pantographs.

Bombardier

Apart from the first car (see the photo above) all the cables and much of the equipment were installed while the underframes were in the inverted stage.

The A-class trams under construction at Comeng Dandenong.

Bombardier

The A-class trams under construction at Comeng Dandenong.

Bombardier

The Comeng Dandenong workers at the handover ceremony of the first A-class tram to the Metropolitan Transit Authority (MTA) on 11 November 1983.

Bombardier

An electrician working on an A-class trams under construction at Comeng Dandenong.

NEW GENERAL MANAGER

In July 1983 Graeme Phipps moved to Melbourne (having been in Sydney at Comeng Granville—see chapter 18), and was appointed General Manager of the Dandenong plant by ANI's John Leard. After the publicity surrounding the ANI sackings at Granville under Phipps' direction, he needed to reassure the staff at Dandenong. Phipps said:

> The first thing I did was meet with the unions and their representatives. I told them that my impression was that the place was running well and that I did not have any problems. At that time Dandenong was extremely profitable. They were building the A-class trams, the two articulated B-class prototype trams, and finishing off the Z3 trams—all for Melbourne.[21]

Bombardier

11 November 1983: On the same day as the first A-class tram was handed over, the Victorian Minister of Transport Steve Crabb formally opened the $2.75 million ($7.5 million) extension to the Victorian plant, allowing the company's delivery rate of VR suburban trains to be doubled. Comeng (Victoria) General Manager Graeme Phipps (right) shaking hands with Crabb as the plaque celebrating the occasion was unveiled.

Bombardier

The Victorian Minister of Transport, Steve Crabb, in the cab of the first A-class tram.

On 1 July 1983—when the new trams were well under construction—the former M&MTB was renamed the Melbourne Transit Authority (MTA). Thus when the first A-class tram was handed over in a ceremony at Comeng on 11 November 1983 it appeared in the MTA's green and gold colour scheme. It had taken the Dandenong team just a year to do the redesign and produce the first unit.

The first A-class tram (number 231) was delivered to Preston on 12 December 1983 and entered service on 13 June 1984. Comeng received two extension orders in 1985 totalling a further forty-two similar tramcars but were nominated A2-class because they included a number of design improvements. For example, they were fitted with a stepless brake system, and all vehicles had pantographs instead of the traditional trolley poles. The engineering and redesign of the door gear was done by Ian Crump. He said:

> From the structural work I went into more mechanical engineering—supporting the ongoing engineering for both trams and the Melbourne EMUs. The first A-class had Duewag door operators, but they were not very successful and so it was decided that for the next extension order to revert to the Vapor door system. I was looking after that, getting all the integration design work done working with the American company.[22]

Melbourne Transit Authority (MTA)

Melbourne Tram Authority (MTA) A-class tram in service in East Melbourne.

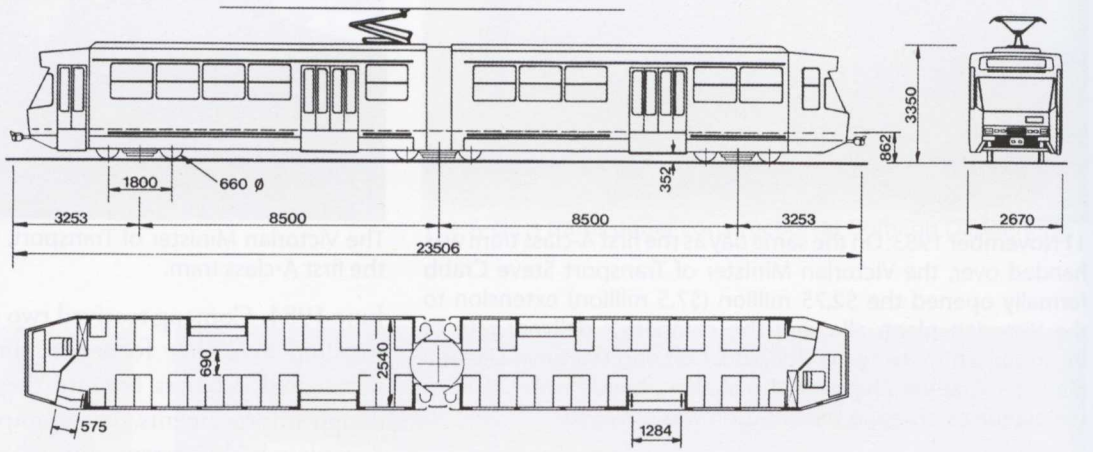
The first A2 unit was delivered to Preston workshops on 23 August 1985, and entered service on 8 February 1986. The production of the other units continued at Dandenong well into 1987. In September 1987 the last three A2 units were delivered to Kew Depot from Preston workshops ready to enter service.

PROTOTYPE ARTICULATED TRAMS

As noted above, Comeng received an order for two prototype articulated trams at the same time as the A-class units. The design and manufacture of the two types took place in parallel. The B-class articulated units had the same floor height as the A-class, as there was never any hint of interest by the M&MTB in the low-floor proposal that had been put forward by Gerofi and Dunn at the May 1982 seminar in Melbourne.

Although based on the A-class design, the articulated cars had a different internal layout, largely because of the need to reposition the double-width doors. The same team that designed the A-class units were also involved on these articulated cars. Engineer Ian Crump said:

> As a junior structural engineer I did all the finite element analysis of the prototype articulated tram for Melbourne. I worked on that for six months—doing the analysis and the strain gauge testing.[23]



General arrangement drawing of the prototype B-class articulated tram designed and built by Comeng Dandenong for the Metropolitan Transit Authority (MTA).

These two units were the first such vehicles of their type in Australia. They were unique in that they had power-operated dual-height steps at each doorway—the idea being that passengers could board or alight at street level, or from platforms at the same height as the car floor. The steps were arranged at either 337 mm from the road (with another intermediate step of 262 mm) or 862 mm for the high platforms. The idea for this arrangement was derived from the Duewag trams Ken Hall had seen in Hanover in Germany, which were among the first in the world to be fitted with dual-height steps. It was intended that some of Melbourne's heavy rail lines would be converted to light rail, and so these prototypes were to be the forerunner of future units that could operate on both old rail lines (with high platforms at station stops) as well as on the streets as traditional trams.

These were also the first of the 'modern' trams in Melbourne to have a compressor and be fitted with Knorr air brakes (instead of the troublesome hydraulic system on the Zs and As). Another innovation was the use of a pantograph instead of a trolley pole for the power collection from the 600 V dc overhead. The windows were all balanced half-drop units with tinted glass, and were all fitted with pull-down louvre blinds. The two outer powered bogies were the same as those under the A-class—each fitted with a 195 kW monomotor. The centre trailer bogie was fitted with the articulated joint that allowed the car to negotiate the sharp curves of Melbourne's system.

The 23.5 m long two-unit tram weighed 31.9 tonnes and could seat 76 and stand another 106. It had a top speed of 70 km/h.

Comeng Dandenong's General Manager Ellis Richardson said:

Don Heumiller collection

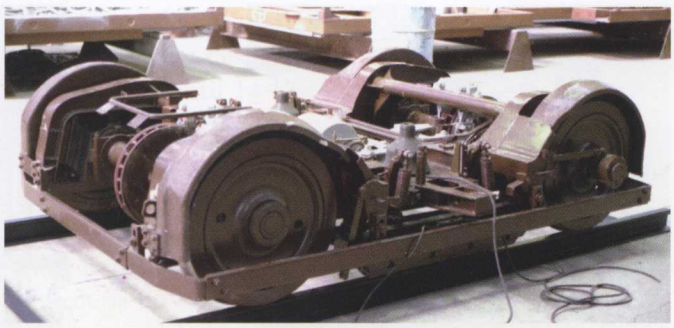
Comeng Dandenong's Engineering Manager Don Heumiller and a scale model of the proposed articulated tram for the MTA. (The model was built by David Foulkes.)

> The major issue I recall was that the bogie manufacturers were adamant they could not build an articulation for Melbourne's tight curves. I had a good relationship with Duewag at the time and we did a good deal of huffing and puffing and finally they came up with a design that would allow the artic for Melbourne.[24]

In April 1983 David Foulkes was sent to Germany to talk with Duewag about the dual-height steps and the articulated joint design. He recalled:

> The Melbourne system had sharp curves, and the cars had shorter bogie centres than those of a typical German tram. The result was that the articulated joint had to cope with a bigger angular deflection on our trams. I remember a draftsman who spent a lot of time mucking about redesigning the articulated joint—so that we had to change the shape and sill to allow everything to clear even though it was going through bigger angles.[25]

Peter Stute was involved in the structure relating to the articulation: 'I did work on B-class trams around the articulation'.[26]



Bombardier

The German-designed centre bogies for the prototypes had to be adapted to cope with Melbourne's sharp curves. This shows a unit before its bolster and slewing rings are fitted. The axle-mounted disc brakes are clearly seen.

Bombardier

The rear end of one the articulated trams showing the outriggers that support the body on the centre bogie's slewing ring.

David Foulkes collection

The bare shell of one half of a B-class articulated tram under construction at Comeng Dandenong in April 1983.

One of the prototype articulated B-class trams under construction at Comeng Dandenong.

Bombardier

The prototype articulated trams in various stages of construction at Comeng Dandenong.

Bombardier

One half of a B-class tram being fitted out.

Bombardier

Fitting the folding doors to the articulated tram

Bombardier

Inside the articulated tram showing the vehicle on a curve. This was taken prior to the installation of any stanchions, handholds or blinds.

Bombardier

Fitting out the interior of one of the articulated trams..

Bombardier

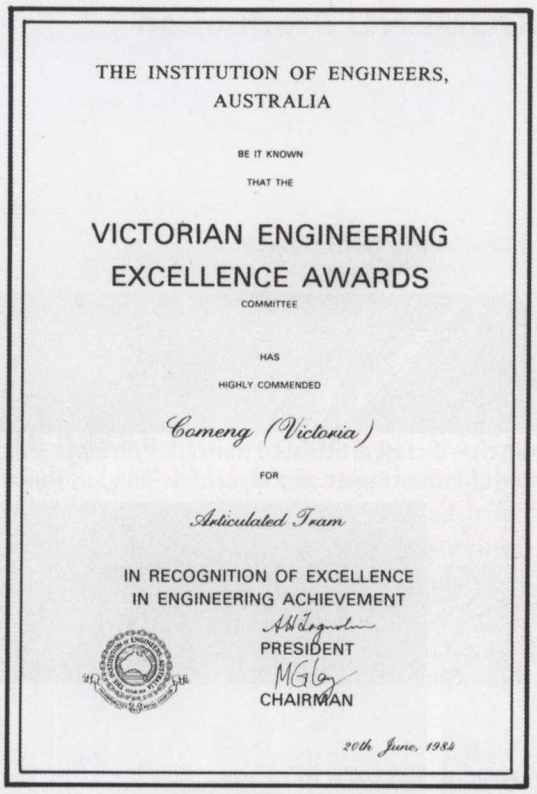
On 21 December 1983, the first of the articulated trams—2001—was handed over to the MTA in a ceremony at Comeng Dandenong.

Bombardier

Handover of 2001 on 21 December 1983: Left to right: Ellis Richardson (by then, Comeng Chief Executive), Don Heumiller (Comeng Dandenong Engineering Manager), John Grigg (MTA Chief Engineer), Steve Crabb (Victorian Transport Minister), and a gentleman from the Victorian Department for Transport.

Bombardier

Steve Crabb (left) and Don Heumiller in the cab of 2001 on the handover day, 21 December 1983.



THE INSTITUTION OF ENGINEERS, AUSTRALIA

BE IT KNOWN

THAT THE

VICTORIAN ENGINEERING EXCELLENCE AWARDS

COMMITTEE

HAS

HIGHLY COMMENDED

Comeng (Victoria)

FOR

Articulated Tram

IN RECOGNITION OF EXCELLENCE IN ENGINEERING ACHIEVEMENT

PRESIDENT

CHAIRMAN

20th June, 1984

The Institution of Engineers, Australia, Victorian Engineering Excellence Award for the Comeng articulated tram design: 20 June 1984.

IN-SERVICE PROBLEMS

The first B-class tram (numbered 2001) was handed over to the MTA in a ceremony at Comeng on 21 December 1983. One half was delivered to Preston on 8 February 1984, with the second half following the next day. The two halves were then married together and fitted out. The completed tram operated under its own power on the 17 April 1984. However, it was not until the end of the year before 2001 entered service due to a number of teething problems (as is often the case with a prototype design). And the second unit (2002) was not delivered until 14 December 1984 but did not enter service for a year. Ian Crump spoke of the problems:

> There were a lot of ride performance problems around the articulation. Because these two trams were only prototypes we had to find a trailer bogie to suit. Deuwag supplied two that were the same as those on the German contracts—but of course they were designed for German quality track, not Melbourne's! They virtually had no lateral suspension, and so we had a lot of lateral ride problems. In fact, when we got up around 60–70 km/h the whole centre of the car was shaking. So all the secondary suspension had to be redesigned.[27]

It also took a good deal of work to fine-tune the change from hydraulic to air braking.

However, the other big hiccup was the inconsistent functioning of the dual-height steps. These were troublesome from the outset and caused constant holdups. Eventually they were removed and standard fixed steps installed in their place. The platforms on the old railway lines (along which the articulated trams were to operate) were modified by the addition of low-level sections to match the height of the bottom step on the cars.

The two prototypes remained orphans and had a troublesome life. Peter Denison was production and customer support engineer and said: 'We did a lot of work on those trams later on'.[28] In particular there were braking problems with uneven wear on the pads between the three bogies—an issue that was eventually resolved. The MTA maintenance staff kept forgetting the two trams had air compressors, and so often failed to top up their oil. A compressor seized as a result, leaving the tram out of action for a prolonged period. Denison commented:

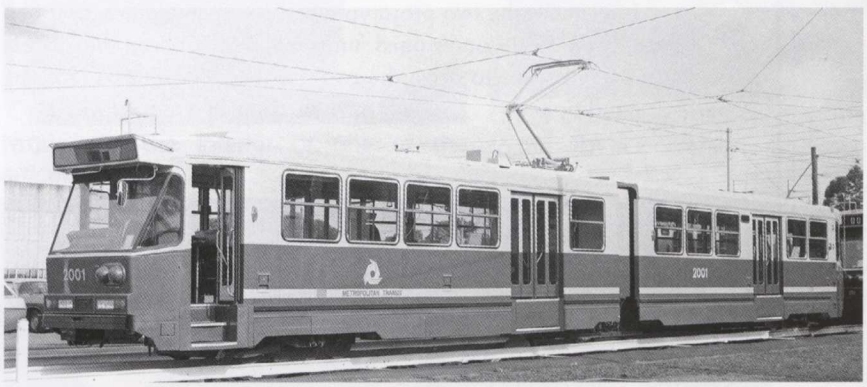
> In general, the two prototypes had a very low mileage. When the later air-conditioned units entered service, the drivers did not want to drive the two orphans as they were not air-conditioned.[29]

Bombardier

2001 at Comeng Dandenong.

Courtesy Cecily Belbin

Phil Belbin's painting showing the Metropolitan Transit Authority (MTA) prototype B-class articulated tram 2001 on a wet Melbourne evening shortly after entering revenue service. It is depicted at the corner of Power Street and Riversdale Road in Hawthorn—heading into the city.



Dale Budd

This shot of 2001 at Preston workshops taken in May 1984 shows the steps lowered at the front door, and folded up at the other doors.

John Beckhaus

Interior of the B1 articulated tram number 2001 in March 1985.

Rod Greenwood collection

Prototype articulated tram 2001 in Flinders Street, Melbourne during a trial run.

Bombardier

Articulated tram 2001 was introduced into service on the East Burwood line on 19 December 1984.

KNORR BRAKE FRANCHISE

As a result of the EMU bogie negotiations that Don Heumiller had with LHB he also negotiated with Knorr Bremse in Munich for the supply of bogie-mounted disc brakes and body-mounted air-supply equipment including wheel slip electronics for anti-slip on all axles.

Because the second batch of VR suburban trains and the two prototype B1 trams both had Knorr brake equipment, Ellis Richardson decided to take on the franchise of their equipment and a separate Comeng division was set up. Knorr had previously only supplied air compressors to QR and was not represented here. To promote the introduction of the Knorr brake equipment Heumiller was assigned to introduce their Dr Dieter Haseke to all the Railway systems and to car builders throughout Australia. The idea was for Comeng to distribute Knorr brake gear in Australia as a credible and significant competitor to Westinghouse and Davies & Metcalfe. Harold Delany was appointed Brake Equipment Manager and given the oversight of this new enterprise. However, the endeavour did not last long, as Delany related: 'ANI scuttled it. They pulled the plug on the arrangement and made me redundant in the process.'[30] Though divorced from Comeng by ANI, Knorr Bremse went on to establish its own local branch and became a dominant brake supplier in Australia.

Harold Delany collection

Harold Delany was engaged by Don Heumiller at Comeng Dandenong in 1980 as a senior project engineer on a yearly salary of $21,600 ($78,500), and a car allowance of $1,500 ($5,500). His initial role was that of addressing reliability issues on the Z3 trams. He was then involved in coordinating subcontractors and monitoring the reliability of the VR suburban trains. On the A-class trams he monitored their reliability—sorting out defects and recommending changes. He did the same on the B-class trams, and was also involved on the Tuen Mun light rail vehicles (see Volume 5, chapters 4 and 5). He had a number of titles over those years, including Project Support Manager, Customer Support Engineer, Testing and Commissioning Manager, and Brake Equipment Manager (when Comeng was representing Knorr in Australia). He was with the company until 1988, when he was made redundant by ANI.

VICTORIAN HIGH-SPEED TRAINS

During the early 1980s, the Victorian Government reinvigorated the country passenger rail service using a combination of initiatives including the introduction of new timetable featuring more services and faster schedules, refurbishing existing stock, and acquiring new locomotives and carriages. The new N-type fleet of 57 carriages that were built at Newport Workshops between 1981 and 1984 formed the core of the revamped business and were supported by the H-type cars converted by external contractors from Harris suburban cars. The N-car design was an update of the Z-type cars that had first entered service in 1957. However, it had been a long time since Newport workshops had built passenger cars and their workmanship left a good deal to be desired. Alan Reiher and others were highly critical of the quality of workmanship and fitout of the N cars, and an entirely new type of vehicle was then actively being sought. At that time, John Hearsch was VR's Group Manager, Country Passenger Services, and he takes up the story:

> In April 1982 Les Rolls [VR's one-time CME] and I went overseas and looked in detail at three options: the British Rail Mk3 cars which were then still coming into service, the SNCF Corail cars and the Spanish Talgo cars. Prior to our visit, Alan Reiher had thought the Talgo to be an elegant solution for Victoria. Whilst all three types had many features of interest to us, the Spanish low-level cars were totally incompatible with our high-level platforms and restrictive loading gauge below platform height. The French cars were too long, too wide and too high again for our loading gauge and could not be easily redesigned to fit. The closest fit to our requirements were the BR Mk3 cars which would have needed some adjustment to coupler heights, replacement of outward opening doors,

Rod Greenwood collection

Prototype articulated tram 2001 in Flinders Street, Melbourne during a trial run.

Bombardier

Articulated tram 2001 was introduced into service on the East Burwood line on 19 December 1984.

KNORR BRAKE FRANCHISE

As a result of the EMU bogie negotiations that Don Heumiller had with LHB he also negotiated with Knorr Bremse in Munich for the supply of bogie-mounted disc brakes and body-mounted air-supply equipment including wheel slip electronics for anti-slip on all axles.

Because the second batch of VR suburban trains and the two prototype B1 trams both had Knorr brake equipment, Ellis Richardson decided to take on the franchise of their equipment and a separate Comeng division was set up. Knorr had previously only supplied air compressors to QR and was not represented here. To promote the introduction of the Knorr brake equipment Heumiller was assigned to introduce their Dr Dieter Haseke to all the Railway systems and to car builders throughout Australia. The idea was for Comeng to distribute Knorr brake gear in Australia as a credible and significant competitor to Westinghouse and Davies & Metcalfe. Harold Delany was appointed Brake Equipment Manager and given the oversight of this new enterprise. However, the endeavour did not last long, as Delany related: 'ANI scuttled it. They pulled the plug on the arrangement and made me redundant in the process.'[30] Though divorced from Comeng by ANI, Knorr Bremse went on to establish its own local branch and became a dominant brake supplier in Australia.

Harold Delany collection

Harold Delany was engaged by Don Heumiller at Comeng Dandenong in 1980 as a senior project engineer on a yearly salary of $21,600 ($78,500), and a car allowance of $1,500 ($5,500). His initial role was that of addressing reliability issues on the Z3 trams. He was then involved in coordinating subcontractors and monitoring the reliability of the VR suburban trains. On the A-class trams he monitored their reliability—sorting out defects and recommending changes. He did the same on the B-class trams, and was also involved on the Tuen Mun light rail vehicles (see Volume 5, chapters 4 and 5). He had a number of titles over those years, including Project Support Manager, Customer Support Engineer, Testing and Commissioning Manager, and Brake Equipment Manager (when Comeng was representing Knorr in Australia). He was with the company until 1988, when he was made redundant by ANI.

VICTORIAN HIGH-SPEED TRAINS

During the early 1980s, the Victorian Government reinvigorated the country passenger rail service using a combination of initiatives including the introduction of new timetable featuring more services and faster schedules, refurbishing existing stock, and acquiring new locomotives and carriages. The new N-type fleet of 57 carriages that were built at Newport Workshops between 1981 and 1984 formed the core of the revamped business and were supported by the H-type cars converted by external contractors from Harris suburban cars. The N-car design was an update of the Z-type cars that had first entered service in 1957. However, it had been a long time since Newport workshops had built passenger cars and their workmanship left a good deal to be desired. Alan Reiher and others were highly critical of the quality of workmanship and fitout of the N cars, and an entirely new type of vehicle was then actively being sought. At that time, John Hearsch was VR's Group Manager, Country Passenger Services, and he takes up the story:

> In April 1982 Les Rolls [VR's one-time CME] and I went overseas and looked in detail at three options: the British Rail Mk3 cars which were then still coming into service, the SNCF Corail cars and the Spanish Talgo cars. Prior to our visit, Alan Reiher had thought the Talgo to be an elegant solution for Victoria. Whilst all three types had many features of interest to us, the Spanish low-level cars were totally incompatible with our high-level platforms and restrictive loading gauge below platform height. The French cars were too long, too wide and too high again for our loading gauge and could not be easily redesigned to fit. The closest fit to our requirements were the BR Mk3 cars which would have needed some adjustment to coupler heights, replacement of outward opening doors,