
7

By Design

Some¹ consider ‘civil engineer’ an oxymoron of the same calibre as ‘military intelligence’. No etymologist would consider an engineer to be ‘civil’ in the sense of politeness. A military engineer devised engines of war so, by default, a civil engineer made ‘engines’ for non-military, or civilian, uses.

Ask virtually any man in the street what an engineer does and, provided he doesn't respond, "He drives a train", he will almost certainly tell you he designs or constructs things. Designs Branch and Construction Branch were certainly considered the elite of the technical branches during the early days of the Commission and through to the last decade. As the emphasis of the Commission began to move from development to management, the demand for other skills increased. 'People people' were adjudged to be useful as well as technical people.² Even so, Designs Branch maintained its well-deserved reputation for technical competence and innovation as a number of Excellence Awards testify.

The first Annual Report of the Commissioner (1947–48) records the resignation from Designs Branch of NJ Butler and the failure to attract a replacement as Branch head. The position of Senior Designing Engineer remained vacant until 1951 when NJ Butler was again appointed to the position.³ He had spent the intervening period in Victoria where he had picked up dam experience enormously useful to the Commission.⁴

WATERY SAUCES



Norm Butler

Norman J Butler, a graduate of Melbourne University in 1927, worked with the Victorian State Rivers and Water Supply Commission before moving to Sydney to work on the Harbour Bridge design. In 1934, he moved to Brisbane to work on the Story Bridge with (Sir) James Holt and (Sir) John Kindler. With the rank of Lieutenant-Colonel, he served as Assistant Director, Engineering Services, Northern Command during the war. He then worked briefly on Somerset Dam design before joining the Irrigation and Water Supply Commission in 1945. Apart from a few years refresher on dam engineering on the Kiewa project in Victoria, he remained with the Commission until his retirement. His work laid the foundations of a lasting tradition of sound dam design in the Commission.⁵

He was the acknowledged character of Designs Branch. He had a fiery Irish temperament and would take no nonsense. His loud corridor cat-and-dog fights with Arch McIntyre (Senior Construction Engineer) were well known but were a 10-minute wonder and just as quickly blew over – until the next time.⁶

After Frank Learmonth became Chief Construction Engineer, Norm used to fight with **him**. Norm Butler yelled one day, “Just bloody telephone and motor car men that’s all you are. Construction people can use a car and phone but know nothing about engineering!”⁷ The term ‘TMC engineers’ had currency for a period. It should be recorded, however, that these tantrums were generally confined to his peers on the construction side and he was invariably polite and forbearing with his own staff, maintaining a professional but friendly attitude.⁸

One idiosyncrasy which earned him notoriety was his bell. He had a buzzer on his desk and a bell on the wall. Every member of the Branch was given a call sign and when Norm wanted one of them he would press the buzzer. The summonsed officer was expected to respond immediately. Alan Wickham, as deputy, may have had ‘dit’ as his call sign and third-in-charge had ‘da’ (recollections are remarkably hazy). Juniors had elaborate call signs like ‘da da dit dit da.’ At the first sound of the bell, all heads would look up and then gradually go down again as the owners realised they were not required on this occasion. The most junior had to stay alert to listen for all the ‘dits’ and ‘das’. If you were summonsed, you went to see Mr Butler – it certainly wasn’t Norm. He was very formal and although he called the staff by their Christian names, they wouldn’t have dared call him Norm.⁹ Even when he was second in charge of the Branch, Alan Wickham didn’t call him anything but ‘Mr Butler’.¹⁰ This was in stark contrast to Frank Learmonth who impressed Dave Coles at Tinaroo Dam by insisting that he was ‘Frank’.¹¹

BY DESIGN

One Christmas, Mal Robson finally got courage to fiddle with one of the bells and stuffed it full of paper. Norm pressed the button and realised he couldn't hear the bell and he stormed out of his office in a terribly agitated state.¹²

Norm Butler's great strength was in his highly developed sense of detail – so important for good design. A drawing taken in to him for approval was never treated lightly but always given a thorough check over and often returned for improvement. In a period of very rapid development of the State's water storages, many design procedures and materials were new or unfamiliar, and Norm himself became an expert, by meticulous research, in such things as epoxy coatings and other steel protective systems, rubber seals and aluminium bronze gate seats as well as the many types of dam and appurtenant works under design.

Not surprisingly, Norm was well remembered for his sayings, which often embodied pearls of wisdom. One of his favourite was "it came to me when I was shaving this morning" and many a curly problem was solved this way. This became a household saying on the Branch and brought home the importance of sleeping on a problem and keeping a few minutes free for clear thought in the morning. He was using the expression "Blind Freddy could see ..." long before any connection with a later Commissioner could be construed. Another favourite was "Wassay . . .?" used so often that it featured in a cartoon on his farewell card on retirement. It was not used through any hearing problem, but to gain thinking time while the question was repeated. Possibly the most important was his frequent reference to the 'golf stroke' – meaning the follow-through essential to check the impact of one detail, especially new or altered, on the rest of the design.¹³

There is no doubt that all who worked for Norm Butler remembered these lessons well and hopefully passed them on to successive generations. He ran a tight ship and certainly the staff respected him and took their work very seriously.¹⁴ This attitude lasted long past Norm's regime. People like Kev Devlin who served in the Branch on rotation years later observed that life was serious and earnest in contrast to more boisterous regional offices. Not that it was inappropriate for the design of major structures to be taken seriously.

In the immediate post-war years it was difficult to recruit experienced staff and only a few new graduates were as yet coming through from the universities. However, at the end of 1946 Alan Wickham, Bruce Moore and Nev Weller joined up after being interviewed by Norm Butler and being impressed by him and by the winds of change in the air. Eric Robinson (Robbie) was then 2IC to Norm Butler and design work was mainly on rock-filled timber crib weirs and concrete gravity weirs in a variety of river catchments including the Lockyer, Warrill, Balonne, Burnett and Walsh.¹⁵

WATERY SAUCES



Gorge Weir

Norm Rossi joined the Branch while Don Fraser was the senior man, Norm Butler having left. Norm Rossi's career aspirations always lay in design but he was 'borrowed' by Construction so frequently, Designs decided they could manage without him and the transfer became permanent. His first task was to design the coffer dam for the proposed Leichhardt Diversion which was part of the whole Burdekin scheme. The Co-Ordinator General's Department was designing the big Burdekin Dam, but the coffer dam became Gorge Weir and supported the scheme for the next 30 years.¹⁶

At the start of the new Commission, the concentration was on small weirs so that different Regions could share in the water resource development program.¹⁷ In the 1950s, however, the Atherton Tableland was selected for major development. Investigations had identified the Nullinga dam site on the Walsh River and the Tinaroo Falls site on the Barron River as the most favourable, with the former being preferred. Minister Tom Foley travelled with Commissioner Tom Lang to the Tableland to discuss the project with local interested parties. While the Minister was meeting a local Council, Tom Lang sat in the hotel poring over topographic maps newly available from National Mapping. He realised that it might be possible to divert water from the Barron (eastward flowing) over the Great Dividing Range to the Mitchell River catchment (westward flowing). The Minister was obviously impressed by this information as he announced at the public meeting that Tinaroo Falls was the chosen site.¹⁸ Designs were then completed for this site. The dam was a mass concrete gravity style structure and relatively straightforward in design.

After four years in Goondiwindi, Alan Wickham spent a year working in London and was fortunate to obtain a job with Sir Alexander Gibb & Partners, designing dams for North Scottish hydro schemes and spending some time at London University with Professor Skempton and Dr Bishop (the world experts in geotechnical analysis). He rejoined the Commission in 1954.

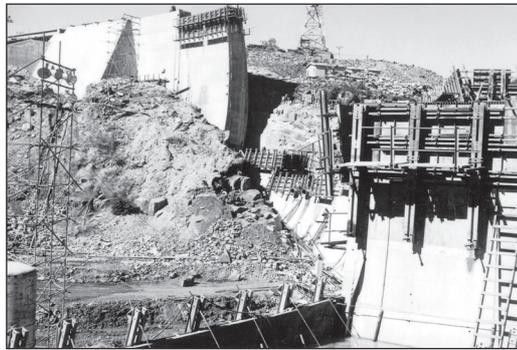


Tinaroo Falls Dam

BY DESIGN

Don Fraser – Alexander McDonald Fraser – was another prominent Branch member. According to Alan *he could look you straight in the eye and make you feel absolutely stupid because you didn't see the solution to the problem. He was a great intellect and it was obvious to everyone.* He also went to London and returned with a PhD and a DIC from Imperial College for work on soil mechanics. After serving in both Designs and Project Planning, he went to Queensland Institute of Technology as their first Director.¹⁹

After Tinaroo, attention was turned to a site on Reynolds Creek in the Fassifern Valley. This happened to be the electorate of AG Muller, a Minister in the recently elected Country–Liberal government. The site was a steep-sided narrow gorge in volcanic rocks, mainly fresh trachyte. The apocryphal story is that Fred Haigh went to an ANCOLD²⁰ meeting and in reporting on activities in Queensland described the site. “Then you’ll be constructing an arch dam,” his southern colleagues opined. “Of course,” said Fred and went home and told Designs Branch that was what they were doing. It was fortunate that preliminary designs for alternative types of dam had shown the arch to be the most economical.²¹



Moogerah Dam under construction 1960

Don Fraser and Alan Wickham were the principal designers of this most complex structure. It is a double curvature arch dam with an overhang at the crest of 9 metres. Such dams designed overseas (pre-computers) had used the Trial Load Method or a model test, but both were beyond the resources of the Commission. Several mathematical techniques were based on cylinder theory and the independent horizontal arch action concept. Despite a few anomalous results, the designers were quite confident until, not long after the commencement of its construction, Malpasset Dam in France failed.²² No one knew why for a long time, but the Commission took the precaution of having the Moogerah design checked by a European expert who came up with a minor modification to the abutment arrangement. The Vaiont Dam disaster in Italy also caused worries when a landslide occurred. The dam itself did not fail, but the contents were spilled by the landslide over the top of the dam causing a flood downstream. Commission designers also incorporated a cushion design that was used in Italy to smooth the arch.²³

As the 1960s came along, Norm Butler’s health deteriorated and staff became used to his quiet complaints about his ‘funnies’. He seldom got out to the job.²⁴ He

WATERY SAUCES

still, however, had bursts of energy. One day he went into the library, which came under his direction, and found the young librarian, Suzanne John, missing yet again. He almost exploded, but as there was no one to reprimand, he went back to his next-door office, collected a key and locked the library.²⁵

Norm Butler reached retiring age (65 in those days) in 1970 and retired after having received the organisation's thanks for a job well done. His farewell present was a reclining chair, but he didn't get to enjoy it for long as he died just two years after retirement. He had always intended to write his magnum opus but never did.²⁶

During Norm's incapacity, Alan Wickham had been required to accept an increasing burden, which he did without complaint or reward.²⁷ He did, however, gain the appointment as Chief Designing Engineer to succeed Norm Butler and later achieved the higher office he merited.

Prior to Norm's retirement, Mal Robson, a stalwart of the design office, chose to join a consultancy firm, much to the regret of the Commission. Unfortunately, Mal died young, a great loss to the profession. His nephew, Chris Robson, also became an engineer and is currently a General Manager in the Department.

Tinaroo Falls Dam was the first major storage in Queensland for irrigation purposes and provided the headworks for the then ambitious Mareeba–Dimbulah Scheme. By the time this dam was completed in 1958, a change in Government brought a change of policy favouring the development of dams to supplement natural flows and so stabilise and expand production on river-dependent irrigation farms. The first was Moogerah (arch dam, already mentioned), and this was closely followed by Borumba (rockfill, concrete face), Callide (zoned earth and rockfill), Leslie (mass concrete), Coolmunda (earthfill and foundation cut-off with large spillway gates) and Wuruma (mass concrete), all completed between 1958 and 1968. It seemed that projects were being approved as fast as Project Planning Branch could produce reports! Seven large dams in one decade, with a wide variety of types, meant a steep learning curve for the design staff under Norm Butler's leadership. An outsider's suggestion that Construction Branch simply provide 'as built' drawings was not considered an acceptable solution. By 1966, Alan Wickham was Senior Engineer and group leaders Keith Nutt, Pat McMahon and Lou Cavazza were all extremely busy with usually a couple of major and some minor projects in progress at the one time. Overtime was heavy at times in 1967 and 1968 to meet deadlines and, as time went on, outside consultants were briefed to assist.

The workload continued throughout the 1970s and 1980s with 24 major dams (mostly designed in house), being completed in a 30-year period. Government decisions to proceed with major irrigation schemes and the availability of

BY DESIGN

Commonwealth funding under the National Water Resources Programme made projects like Fairbairn Dam and the Emerald scheme feasible. More multi-purpose storages were developed as supplies to mining and power stations were provided by the Commission. Work was done for other authorities, notably Ross River Dam, Splyyard and Wivenhoe Dams. The Wivenhoe project in particular was a large and complex one involving several other authorities and required frequent meetings both externally and internally to co-ordinate the work.

Naturally, the best sites were developed first, but gradually it became necessary to reconsider less attractive sites that in years past had been rejected. Cheaper foundation and rock excavation made them more feasible and cost-effective than they had been, but the foundations had to be treated with more care. Foundation problems caused headaches. Coal seams in the abutments and clay seams in the foundations at Maroon required design modifications and a need to keep the full supply level artificially low to avoid the build-up of excessive water pressures in the foundations. Where possible, the problems were removed (at extra expense) or the designers had to find a way round them.²⁸

Ross River Dam was built with a very long embankment across a flood plain composed of alluvial sediments. Despite pre-design investigations of the alluvia by consultants, leakage following filling required extensive foundation treatment to drain water away without causing excessive pressure build-up. Brian Shannon and Russ McConnell experienced their share of headaches.²⁹

In the late 1970s, Alan Wickham presented a slide show of the Commission's foundation problems and solutions at an ANCOLD conference at New Zealand. *One of the Kiwis said, "It must be pretty terrible country" to which the Australian response was, "Not the same as NZ where you build on temporary landscapes". They call it ephemeral which they regard as better than temporary. The Kiwi conceded that "It wasn't as bad as shooting at moving targets – landslides and earthquakes." Queensland's problem is that there is such a mixture of very old and very recent rock formations often mixed together in the same area on the one site.*³⁰

As noted in the Moogerah design, the analyses were for many years done without the benefit of computers. Designers had to rely on slide rules, logarithms and hand-operated Facit calculating machines, which were time-consuming and tedious to say the least.³¹ Ian Pullar recalls

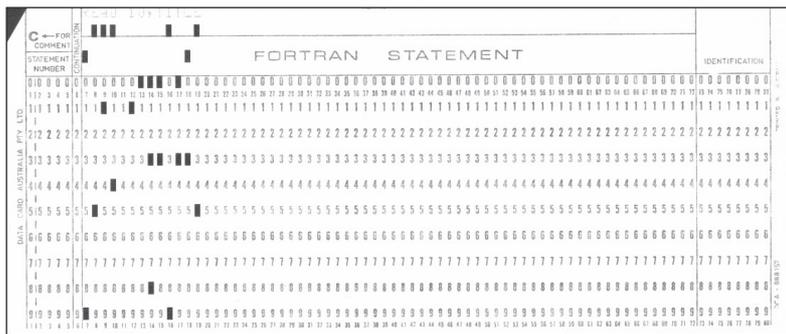


Leon 'Super Checker' Gachowicz and a Facit machine

WATERY SAUCES

undertaking slip circle analyses for Maroon Dam – each one would take days, even if no mistakes occurred. No wonder people were keen to devise short cuts. Kevin Mills – a brilliant young engineer who resigned to undertake a post-graduate research project on the flow of blood in veins and arteries, followed by further research in industry and academia – devised a simplified form of flood routing by the ‘Mills Method’. This was superseded, not only by the advent of the computer, but also by the change to the metric system which rendered the simple relationship between ‘cusec-days’ and acre feet obsolete.

As part of the analysis of homogeneous earthen embankments, designers used to model flow paths using an electrical analogue. Embankments would be drawn on electrically sensitive paper, and by attaching wires and passing current through the paper, the flow lines and equipotential lines could be plotted. It was always necessary to cut away the paper with a scalpel to the top flow line (phreatic line) very carefully – or start again. Draftsman John King was the expert technician who worked with many a young engineer in this tedious, but interesting, exercise.



Punch card

Fortunately, the advent of the computer was imminent. Alan Wickham was one of those who went to Sydney to investigate their possibilities and to be trained. Then the University of Queensland installed the PDP 10 (see Chapter 14), with the Commission as a sponsor and major customer.

Despite the joys of card decks with their inherent punched errors – and the problems if the deck was dropped – the computer ‘caught on’. Then WIZ came along – a slightly more sophisticated system than Fortran. Alan Wickham’s Sydney sorties had examined a program developed by the Snowy Mountains Hydro-Electric Authority for use on earthen embankments but when it was tried out on Callide cross-sections, the manual checks couldn’t be reconciled. So the designers abandoned that program and started their own. The design of Callide Dam in 1962-63 used a home-grown program for slip circle analysis using the simplified version of Bishop’s formula which took effective stresses into account but not all the complicated forces between slices.

BY DESIGN

That was the start of something big.³² Rod Jarvis undertook a Master's thesis using the newly introduced WIZ program, which was a real breakthrough.

One concrete gravity stability analysis could take three or four days to compute by hand. The computer reduced this to minutes (plus the time to prepare the data) and the personal computer reduced it to seconds.³³ The computer got rid of the computations and produced masses of tabular output. In due course, the computer was 'persuaded' to produce plots of results in digestible form.³⁴ The machine allowed a much larger range of cases to be analysed than manual methods could ever have allowed. This led to more economical designs in which more confidence could be placed.³⁵

The Government Computer Centre was the next thing and it had even more sophisticated ability than WIZ. Designers started using the Centre and 'the blokes' developed more sophisticated programs.³⁶ At least as the computer technology was coming in, designers understood the significance of the results because they had done the calculations themselves. The current computer literate generation is inclined to place absolute faith in the computer although it may be a case of 'garbage in-garbage out.'³⁷

Design was a male prerogative (not that that was different from the rest of the Commission). The first lady engineer in Designs was Esme Martens, who was something of a novelty.³⁸ At this time, women in the engineering faculty were extremely rare as well.

An event which affected the whole community, but perhaps design engineers most of all, was the change to S.I. (Système Internationale) metric units of measurement. In the early 1970s, it was necessary to participate in the various co-ordinating bodies set up by governments and to institute information and training arrangements within the Commission. It fell to the newly appointed Chief Design Engineer, Alan Wickham, to represent the Commission on outside bodies and to convene an inter-branch committee with Pat McMahon as Secretary. In 1972-73 information bulletins were issued to all offices with wordsmith Morrie Ochert as Editor. The change was greatly assisted by the existence of a Training Section headed by Training Officer, Jim Pashen who arranged seminars with efficiency. It says much for the quality of material published by the Metric Conversion Board, and for the resilience of the technical staff in general, that very few problems were experienced in the transition over some three years.³⁹ Morrie Ochert agrees; *I think we came through with flying colours to make such a vast change so smoothly*. Perhaps the streamlined introduction of decimal currency in 1966, which was accompanied by careful training, had been a good dress rehearsal.⁴⁰

WATERY SAUCES

Other forms of technology also arrived. In the early days, it was very difficult to keep in touch with the construction sites where others were attempting to bring the designs to reality. Long-distance travel was difficult and telecommunications were primitive. To make a phone call, you had to ring the public service switchboard (after having obtained permission) and place the call, which could come through much later. There was only one phone in the Branch with this facility for about twelve engineers (and no one else had any chance). It sat on Rod Jarvis's desk and had to compete with the Youth Hostels Association and the Adventurers Club for time. The first fax machine didn't arrive until about 1980.

These difficulties aside, the design of a dam is never really finished until construction is completed, particularly if difficult foundation conditions are encountered. Frequent site visits by designers are essential. For example, Senior Designing Engineer Alan Wickham made 14 trips to 10 sites in 1967.⁴¹

While inevitably there were some changes in personnel through the rotation scheme and other distractions, the core staff remained stable for decades. There were exceptions. Lou Cavazza applied for a year's leave without pay to visit his relatives in Italy. At the end of the year he didn't return, making it more difficult for others to get leave without pay for years to come. The brilliant Alan Kinder resigned to take up a post-graduate scholarship to Stuttgart. While there, he decided to 'get culture' by exploring the library at the American base. He also learned that professors realise that awarding post-graduate degrees results in the loss of their cheap research assistants.⁴²

Stalwarts such as Lee Rogers and Brian Shannon did their 'tour of duty' on construction before returning to the Branch. Errol Beitz left to join a firm of consultants but eventually returned to the fold. Keith Nutt and Bob Geddes remained. Keith was even appointed to a higher classification in Construction but was immediately seconded back to Designs and never left.

Keith Nutt was a remarkable man. He was a very good engineer and a top class designer and Alan Wickham's right-hand man for so long.⁴³ He was an excellent teacher. He would never say, "Go away and do that." He would say, "Let's just think about it. Let's look at some principles," and encourage you to come up with the solution.⁴⁴ He was an innovative designer. Dams have to incorporate outlet works for the release of water. This is customarily done through an inlet tower through which water can pass to pipes in the outlet conduit for controlled release through valves. Personnel access to the inlet tower is normally provided via a bridge, the length of which is determined by the slope of the upstream embankment. Aware of the considerable length (and hence high cost) of the bridge that would be required

BY DESIGN

at Maroon Dam, he designed inlet works without a tower or bridge. The inlet structure incorporated the novel concept of being pressurised, in the style of a diving bell, for service access to the upstream bulkhead.⁴⁵

Keith used to whistle Mozart and occasionally would nod off after lunch. Sometimes his eyes would just close and you'd think he was asleep, but he wasn't – only deep in thought.⁴⁶ Alan Wickham said that Keith only occasionally needed to consult him, but that when Keith came into his room, sat back and quietly posed a problem, then he knew he was in for a long and torrid think-tank session; but they invariably arrived at an agreed best solution – almost certainly the one Keith had in the back of his mind right from the start.⁴⁷ In private life, he put a tremendous amount of work into the boy scout movement and was an avid 'trailer sailor'. He built his own boat which he named *Nuttsbell*, being ambivalent about whether the second syllable commenced at or after the 's'.⁴⁸



Keith Nutt

In 1978, Alan Wickham was appointed to a Special Projects portfolio and Keith Nutt acted as Chief Designing Engineer. Bob Geddes, and many others, consider that Keith was the most brilliant designing engineer the Commission ever had, without a doubt.⁴⁹ There were some who thought that it was a waste for Keith's technical brilliance to be sacrificed to the administrative burden of the new office, but Keith rose to the occasion and handled it all splendidly. Designs Branch was tackling some major tasks at the time with some major technical problems to be solved, so Keith carried a substantial load. On 12 June 1979, Keith visited Splityard Creek Dam with Lee Rogers, who drove him home. He was in good spirits.

Even though Keith had had heart problems in his youth and had undergone surgery, he pursued his outdoor activities with gusto. Only two or three weeks before this visit, he had visited Lord Howe Island and climbed a mountain. But that night he died in his sleep of a heart attack, aged 47. The next day his appointment as Chief Engineer was to be confirmed by Cabinet. He was a great loss.⁵⁰

Alan Wickham commented on the aftermath. *One of the problems with Keith's sudden death was what to do with the Chief Engineer's job. We could only think of Pat (McMahon). He didn't really want it. The only alternative was to try and get someone from outside who had anything like the same sort of experience. He didn't think he was up to it because he was comparing himself with Keith and none of us were up to that. He didn't apply and he had his arm twisted to have the job. This*

WATERY SAUCES



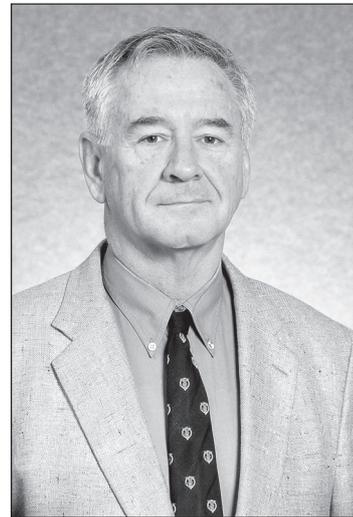
Ben Russo

*was typical of the guy. He had some construction experience which helped. He probably wasn't a top notch designer at a highly academic level but that didn't matter as he was a good organiser and got things done and had good technical back-up in the Branch.*⁵¹

Patrick Kevin McMahon graduated in Civil Engineering from the University of Queensland in 1951 and served in a variety of Branches. Among his more notable postings was that of Project Engineer at Borumba Dam. He was Senior Engineer Special Projects and had previously been designated Senior Engineer Wivenhoe Liaison when he was called upon to take over the reins of Designs, where he remained until he was promoted, in recognition of his ability, to Assistant Commissioner under Tom Fenwick in 1987. This led to the return of Lee Rogers to Designs, but now as Director (equivalent to Chief).

Richard Charles Lee Rogers attended the University of Queensland as a scholarship holder with IWSC and graduated with honours in Civil Engineering in 1963. After a few years in Designs, Lee went to Beardmore Dam and gained invaluable construction experience. He returned to Designs, where he served with distinction, gaining successive promotions. In 1980-82 he served as Secretary of ANCOLD. In 1985, he succeeded John Morse as Director of Planning Division, but returned to Design Division as Director in 1987. He moved to Water Resources and Resource Management before returning to the Regional Infrastructure Development group in 1995. Lee is a man of towering intellect with a very wide knowledge of the water industry. He has thus commonly found himself immersed in all manner of inter-departmental matters only peripherally related to the civil engineering design at which he excelled in his earlier career. Outside of work, he was a member of the lunch-time bridge club for nearly thirty years, is still a regular Thursday night tennis player and regularly attends symphony concerts and plays.

During this period the team continued to produce high-quality designs and to develop in-house skills. From time to time, experts were brought



Bob Geddes

BY DESIGN

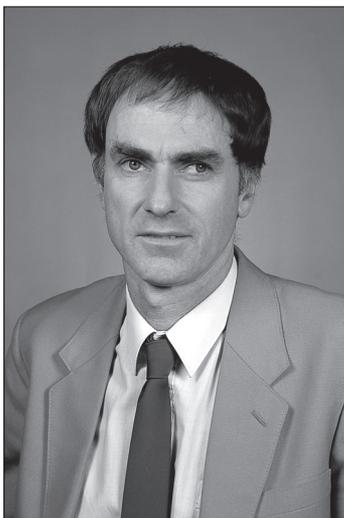
in from outside. The Snowy Mountains Hydro-Electric Authority had been called upon to assist with some particular problems such as the spillway design for Borumba Dam, the spillway gates at Beardmore or the foundations at Bjelke-Petersen Dam. Later, the Commission made use of an international consultant, J. Barry Cooke (obviously from USA), who used to fly round the world offering advice on a range of problems. He maintained this practice into old age.

The in-house team was developing its own expertise.⁵² Very fortunately, during the 1970s the Co-Ordinator General's Department decided to transfer the service delivery function to the line departments and the Commission scored Rosario 'Ben' Russo. Ben is a superb designer with no aspirations towards management. He has remained totally focused on design. In the early 1990s during one of the cyclical downturns in the sugar industry, he decided to take an early retirement package to bail out the family sugar farm. Fortunately, though, he didn't retire from engineering and he still continues to accept commissions from the Department and consulting firms so that his amazing abilities have not been lost.



Brian Shannon

There has been some criticism of the re-engagement of retired officers such as Ben instead of recruiting at a lower level. But as Bob Geddes points out, there is great difficulty in attracting even moderately experienced engineers to the group. The private sector is offering much higher salaries than the Department is able to offer for comparable experience.⁵³



John Potts

Following the 1991 reorganisation, Malcolm Pegg became General Manager and Brian Shannon Deputy General Manager of Development Division. Bob Geddes became the senior designing engineer. Bob is a quiet, unassuming chap with an enormous amount of experience who gets on with the job in a no-nonsense fashion. In other words, he is a solid old-fashioned designer. His skills, and those of others around him, were not tailored for the commercial world which was on its way. By the time John Potts became General Manager of Water Production

WATERY SAUCES

Division, commercialisation was being actively pursued as a goal and designers were being challenged to act in a more commercial way. It was no longer acceptable, said John, for designs to take as long as they would take and for items to cost what they would cost. The creation within Water Commercial of Engineering Services with Brian Shannon as General Manager provided another signal, reinforced by the advent of State Water Projects (which in turn became SunWater) and the introduction of a new breed of commercial staff.

A necessary adjunct to the design function was the laboratories at Rocklea and their subsidiaries on construction sites. The properties of engineering materials are an essential ingredient in the analysis of the structural competence of the creations. The advent of earth and rock fill dams and the upsurge in soil and rock mechanics in the 1960s led to the establishment of labs. Main Roads had had one for years for their work but theirs was basic compared to what the Commission needed for dam design. One was established at Rocklea and equipment was acquired. The tri-axial shear machine was purchased along with the pore pressure measurement equipment which was fabricated at Rocklea for installation at Callide. It was not quite a case of starting from scratch because of the help from SMHEA who had been through the hoops and gave guidance in the selection of the correct grade of nylon tubing and in the grouting up of 'quadratubes' – groups of four nylon tubes in a strong outer sheath.⁵⁴ Gerry Fitzgerald was recruited from NSW in 1963 to set up the laboratory and he and Ian McDonald from Main Roads were instrumental in setting up the first course at a technical level for technicians at Queensland Institute of Technology.⁵⁵



Daryl Brigden

The first Materials Engineer was Ron Peacock. The principal materials officer was Gerry Fitzgerald, who was in charge for many years. The current incumbent, Daryl Brigden, was a trainee at the outset, having joined at the age of 15 in January 1965, and he is still there, a constant through periods of great change.

Not only was there a central laboratory at Rocklea, each major dam site had its own field laboratory.⁵⁶ In the mid-1980s, at the peak of the construction programme, there were 29 people in the Rocklea laboratory and 72 elsewhere in the State. In 1999, there were 11 at Rocklea and two elsewhere.⁵⁷

When Ron Peacock elected to return to his native England, Michael Marley became materials engineer. Michael had post-graduate qualifications in soil mechanics and as a Confederation of British Industry scholarship holder had broadened his experience in the UK. In due course, Michael resigned to move

BY DESIGN

into the consultancy field, eventually becoming Principal in a geotechnical laboratory with Gerry Fitzgerald joining him after his early retirement from the Commission. Ross Stewart became Materials Engineer and continues to hold that position.

In the 1991 reorganisation, the geology section of Planning was amalgamated with the geotechnical section of Designs under the leadership of Geoff Eades, as previously discussed in Chapter 6.

The Materials Laboratory has always been concerned with all types of engineering materials. Obviously, soils and rocks have been a major consideration because of their tremendous variation, but concrete and geo-fabrics have also demanded research and evaluation. Coolmunda Dam employed a team of laboratory people carrying out tests on materials for two years. A dam of similar characteristics today would require somewhere between one-twentieth and one-fiftieth of the testing because of the expertise that has been developed over the years.⁵⁸ Today there is considerably more emphasis on visual assessment and testing materials at the boundaries of the weakest (or the strongest).

In the early days of the laboratory, there were only a limited number of Australian Standards. The Commission had two bibles, both from the US Bureau of Reclamation – the *Earth Manual* and the *Concrete Manual*. Gradually the staff developed their own expertise and the ‘bibles’ became less essential, but they had been excellent teachers with their well-written step-by-step approach.⁵⁹ Gerry Fitzgerald learned well and taught well.⁶⁰

At least in part, the development of expertise has been driven by commercial considerations. In about 1978, the laboratory commenced moving to a commercial operation. By 1983, it was a fully commercial operation, paying its own way. Whilst this instilled a real sense of commercial business in the staff and encouraged them to go out and look for work and be efficient, the hardest battle in the early days was to convince the major client – the Department – that they should pay commercial rates.⁶¹ “What!? Why should we pay?” was the frequent response.

The challenge, of course, is to find the local materials and design the dam to fit them, rather than the other way round. Whilst most Queensland dam sites are more suited to earth and rock fill (and the materials are often local and cheap), this philosophy has contributed greatly to the development of the Roller Compacted Concrete (RCC) dam for which the Commission has been at the forefront of technology. Malcolm Pegg discerned that Kroombit Dam was a natural for RCC⁶² which led to Daryl Brigden’s further development in the technology and eventually to a contract in Jordan.

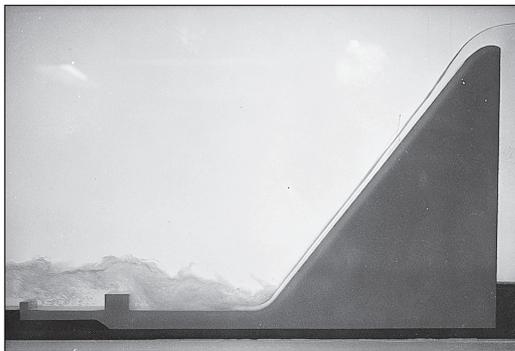
WATERY SAUCES

The laboratory and its staff⁶⁵ have been heavily involved in the National Association of Testing Authorities (NATA) programme. Not only is the laboratory NATA-registered, the staff have contributed to the setting of standards. Similarly, major contributions have been made by Ross Stewart and others to the Standards Association of Australia.

Unfortunately, there has been a significant downturn in the industry. Because of the price wars, there are many practitioners in private firms with no formal training whatsoever. The more reputable firms have recruited from the Commission and Main Roads and there has been virtually no intake of new trainees. There would scarcely be a practitioner under the age of 40.⁶⁴ This is essentially a return to the 1960s and Daryl Brigden has been involved with industry in attempting to set training courses for materials technicians.

Over the years there have been many attempts to improve and simplify the testing procedures, but they have not always been grasped with the enthusiasm they may have merited. Among these proposed tests were the Learmonth colour test – if it's red it's good core material⁶⁵; the Learmonth kick test – if it can withstand a good kick it's a good foundation⁶⁶; the golf ball test – the height of bounce of a dropped golf ball indicates the plasticity⁶⁷; and the Armstead piss test (named for Ken Armstead of NSW WC&IC) as a measure of dispersivity of clay.⁶⁸

The Commission established a Hydraulics Laboratory at Rocklea when the only other in the State was at the University of Queensland, and operated for many years testing models of structures, especially spillways, being designed. It has always



Model testing of spillway dissipation

been difficult to predict the flow of water over, around or beyond structures, particularly before computers made it possible to analyse complex mathematical equations. The alternative has been to construct scale models and to observe and measure water flow. The arrangement and dimensions of the structure can then be modified to produce satisfactory outcomes.

Laboratory staff⁶⁹ have built and operated models of weirs, dam spillways, fish passages and many other structures, but the constant figure is that of Technical Officer Malcolm Lawless.

Models have also been constructed in other locations including the Snowy Mountains laboratory at Cooma, the University of Queensland and the State Government laboratory at Deagon managed by the Environmental Protection Agency

BY DESIGN

(formerly by Harbours and Marine Department). SMEC was responsible for modelling Coolmunda, Callide and Clare.⁷⁰ The last of these was particularly interesting when Clare Weir failed (on the same day as IWSC became QWRC)⁷¹ through a fault that possibly could have been detected during SMEC's model testing.

While dams and other hydraulic structures are essentially the province of civil engineers, it is an extremely rare project that does not involve mechanical and electrical design. The Commission has therefore always had a Mechanical and Electrical section. AJ (Arch) Hilless was appointed Executive Engineer Mechanical in 1950–51⁷². He was promoted to Senior Engineer in 1952⁷³ (to succeed T J Munro) and remained at the top of the pile until 1959 when his name began to appear in every high rise building in Brisbane as the Chief Inspector of Lifts.⁷⁴

Among the technical staff who beavered away were Eric Kinghorn, Darryl Eckhardt, Cyril Bode, Jimmy Leadbeater and Morrie Ochert. Eileen Rossi (nee Rose), who served in the Branch as an 18-year-old recalls that Morrie seemed much older though he would have been in his early thirties. He used to give her lectures for her protection and take her to Jewish Festivals, concerts and the coast.⁷⁵ Morrie always considered that he had high-level technical, people and management skills and wasn't backward in telling people.⁷⁶

Cyril Bode was an electrical engineer and an ex-army man. He dressed immaculately, with tooth-brush moustache and shoes polished to the nth degree, and everything had to be done in sequence and order. Even in the field he had to have morning and afternoon tea at the right time. He'd bring out his little kit and it would be all laid out and he knew all the spots to stop.⁷⁷

Jimmy Leadbeater wasn't really content with where he was, although he had no intention of ever going anywhere else. If anybody like Bob Hitchcock stood on his toes, there would be a clash. Jimmy was always interested in what was going on around him, politically or socially (but not necessarily in the organisation) and was keen to talk about it. Morning tea would come along and you could count on it, out would come the chess board and for the whole 10 minutes, give or take a bit, he would find somebody to play chess with him – usually Barry Edgely – without talking.⁷⁸

John Myers was an inspector for a lot of manufactured plant. He was very straight, of the old school, and thoroughly trained in his native England. He had more experience than most people in industry and they had him on a pedestal. They would almost feel embarrassed if Mr Myers suggested they hadn't done something correctly.⁷⁹

WATERY SAUCES

The Senior Mechanical Engineer after Hilless was Bruce Milligan, an urbane, earnest man. Bruce will feature in the next chapter. Following his departure from the Commission, the position remained vacant for some time until Bob Hitchcock was promoted into the position in 1970. Bob had served on a number of dam sites including Borumba and Coolmunda, which was unusual for mechanical engineers who were usually confined to Head Office.⁸⁰



Spillway gates on Callide Dam

Up until this time, the work was mostly of a small nature – small pumping plants and even borehole pumps. If big items came up, like the gates on Beardmore Dam, they were usually referred to the Snowy Mountains Hydro-Electric Authority, whose staff were considered to be the experts.⁸¹ Gradually the scope of work grew, like the pump stations whose capacity increased from about 50 litres per second to 1,000 litres per second or more. The group got to tackle major spillway gates and gantry cranes and complex electrical systems – if Bob Hitchcock hadn't kept the job for himself!⁸²

As Branch Head, Bob was not very keen on purely administrative work. Morrie Ochert, who was his 2IC, was allocated such tasks almost by default – writing ministerial letters and managing staff. He and Bob never operated in a collaborative, technical style.⁸³ Some of the older hands in particular found Bob to be abrasive. He was quite happy to tell the Chief Construction Engineer where he was wrong, or if he thought the civil designers were off the mark, he had no hesitation in telling them.⁸⁴

Fortunately, Bob was usually happy to participate in initial Mechanical/Civil interface discussions and then leave the major discussions to the troops who had established a good rapport.⁸⁵

Gradually the older brigade retired and younger recruits joined the group.⁸⁶ Cliff McLeod arrived from outside industry in time to take over from Cyril Bode before he retired. Laurie Brace came from the Co-ordinator General's Department at the same time as Ben Russo. Laurie was technically very sound, an excellent teacher of young engineers and considered an *all-round super guy*.⁸⁷ He has always believed in thorough research, as illustrated by Frank Trimarchi. *I remember prior to his heart surgery, Laurie researched it all. Listening to him speak about it, I got the feeling that the specialist had better listen to him. In anything that he did he could speak fairly knowledgeably about what was happening and he shared this knowledge very well. Any time you asked Laurie a question, you'd walk away very satisfied,*

BY DESIGN

particularly with anything technical. He has won numerous Australian championships in beer-brewing and has a wide interest in music, literature and current affairs.⁸⁸

Laurie Brace was also a modest man, and when the Wivenhoe gates were being manufactured in Korea, he stood aside to let Frank Trimarchi accompany Bob Hitchcock. Frank recalls that *it was an interesting trip, but that there were difficulties of communication between the Koreans and Bob, whose colloquial expressions were not understood at all.*⁸⁹

In a Civil-dominated organisation, there was a definite career ceiling for Mechanical Engineers. In 1982, Bob Hitchcock decided to follow in the footsteps of a predecessor and became Chief Inspector of Lifts. Shortly after, John Hastie followed him and in due course succeeded him on Bob's retirement.

Both Laurie Brace and Cliff McLeod were applicants for Bob's vacancy. The decision period was protracted. Ian Rankin commented *the only time I've ever seen Laurie upset was when Cliff came through and got the job over him. I think it was the issue of the technocrat versus the more rounded bureaucrat. Cliff was competent in his engineering area of course, but he was also able to demonstrate management flair that Laurie had never bothered to pursue to any degree.*⁹⁰ As Branch Head, Cliff believed that M & E Branch was a poor relation in a basically Civil organisation, and his big disappointment was in being unable to achieve Chief Engineer status for his position.⁹¹



Ian Rankin

In due course, Laurie retired (but reappeared as a valued consultant). Cliff joined Malcolm Pegg in DPI before he, too, retired. Ian Rankin became Principal 'Mech and Elec' Engineer. Frank Trimarchi moved from the direct technical area entirely to pursue much broader areas of management in the water industry, firstly in Development Division and then in Regional Infrastructure Development.

The output of any design process is a set of working drawings. Thus the drafting section is an integral part of any design office and the quality of its output is crucial to the success of the entire enterprise. While design drafting has a certain amount in common with other types of drafting, a degree of specialisation is inevitable because of the degree of absolute detail. There is a fundamental difference between a general arrangement of an engineering structure and the exact arrangement of the reinforcing steel or the minute tolerances within a stuffing box.

WATERY SAUCES

Fortunately, the Commission has managed to recruit and train an endless procession of extremely competent exponents of the art of drafting. Billy Kearton has already been identified as a veritable artist, and while very few could achieve comparable pictorial standards, many others were able to meet the complex technical requirements.

At the time of the formation of the new Commission, Norrie Sutton was the senior draftsman. He was a quiet man who made no waves but got about his business in an efficient way. Norm White remembers him responding to the call of Norm Butler's bell without fuss. He retired on 30 June 1957 and was succeeded by Ted Taylor as Senior Draftsman.⁹²

Ted was a different kettle of fish who ruled his drafting section as an autocrat. He was never accused of unfairness, but he insisted on very high standards and was not above pointing out the shortcomings of his staff very publicly.⁹³

Mike Barry recalls *Ted used to have all these restrictions on draftsmen. You'd come in every day and get your current sheet of paper and your current sheet of tracing paper out of your drawer or whatever you're working on and you would put it on your desk and secure it with sticky tape. You would have to take it off that night or it would crinkle up. Ted was complaining one night about the use of sticky tape so he introduced a system where you had to record in the book the quantity of sticky tape you used. It really annoyed everybody so one day Bruce Burke got some sticky tape and wrote in the book 4 pieces and that was the end of the sticky tape ration.*⁹⁴

The junior cadet was the keeper of the store. If you wanted a new pen, you had to hand in the worn-out one,⁹⁵ but Ted was insistent that pencils be fully used, issuing holders to ensure that all but the last stub was fully used.⁹⁶ Special scales were locked in the cupboard and had to be signed in and out.⁹⁷

The junior cadet didn't always need technical skills. Among his duties was buying morning tea and lunch orders. The cadet also had to do the run to the Survey Office twice a day with blueprints or dyelines. Eric Davis recalls *getting into trouble because I didn't come back with these blueprints that he'd been waiting on, so when I went back (to the Survey Office) I said, "Hey! Where are those blueprints?" It was a Pommy bloke, and he said, "Son, you can only make blueprints when the sun's shining, and you tell your boss it's been raining for three bloody days." That's how primitive it was in those days.*⁹⁸ Norm White explains *they had a swivel glass case into which they'd put the tracing and sensitised paper, and they'd turn it to the sun and develop a print that way.*⁹⁹

Ted Taylor had a glass-fronted cupboard and one evening there was a little football training with Captain Alan Vizer organising some passing of the football. It was heading

BY DESIGN

for the cupboard when Alan stuck out his hand just in time.¹⁰⁰ Shellite was used to clean pencil marks off tracings and on another evening the bottle was spilled and Jim Ole accidentally dropped a match in it. Somebody grabbed a towel and smothered it just as Fred Haigh walked through. “Evening, boys,” he said. “You’re a bit exuberant tonight.” Nobody ever knew if he saw the flames.¹⁰¹

Draftsmen had a 4’x3’ table and a high stool with a parallel rule and set squares they supplied themselves. Then they moved to a tee square and later to a drafting machine with a parallel track. They were issued with an apron and always had a piece of linen hanging down to wipe the pens. They moved from knives to razor blades to scalpels.¹⁰² In due course, drafting tables and most of the equipment became obsolete as computer aided drafting took over. Until that happened, however, the draftsmen meticulously drew incredibly detailed drawings. From time to time there must have been considerable tension in the group when changes in drawings were called for. It was no easy matter in the days of drawing linen and manual drafting. The objective was always to keep reworks to a minimum and engineers who changed their minds were not strongly favoured in the popularity stakes.

Not that the draftsmen were allowed to talk directly to the engineers. Once Eric Davis asked Ted Taylor if he could discuss a problem with Mal Robson. *Ted said, “You go to college don’t you? Well you ought to be bloody able to work it out yourself.” A few minutes later Mal Robson came over to me and was talking to me when Ted Taylor came back. He waited until Mal went, and then he gave me one of the worst dressings-down I’ve ever had in my life, about being a dishonest, sneaky little bastard, going behind his back. The report that I got for that six months was the lowest of the low. Other blokes had taken on the reports, but you didn’t win, so for once in my life I kept my mouth shut. I found out later that Ted was mouthing off at the pub about dressing down a cadet one day, and Mal Robson put him straight. From then on, I was one of his best cadets. He never said “sorry”, never said a word to me.*¹⁰³

Eric also believed that *the drafting sections had some of the best quality control that was going around. Gun draftsmen had to subject themselves to real quality control. Every drawing ever produced was put before a Checking Draftsman, who went through it and cut it to shreds, with big crossed and coloured lines all over it, and told the draftsman to go and correct it. Then the boss draftsman went through it, and if he didn’t like something . . . then the engineer went through it and he mightn’t like something . . . so you learnt to accept other people’s ideas. It was your pride, as well. Not many other people around have to put up with that sort of thing, and if you tried to bung it onto some people today, all hell would break loose.*¹⁰⁴

WATERY SAUCES

Management style was to give the draftsman¹⁰⁵ the task without specifying it fully. According to Norm White, people these days are very much more informed. You just knew what you had in front of you, and never knew where it came from. There was no sense of ownership of a project. Eric Davis adds *we didn't even know we were part of a project in the very early days. I remember Fred Haigh coming to me when I was very young and I was doing some drawing and he said, "How are you going, Eric? What's that?" I told him what it was, and he said, "What project is that for?" I didn't have a clue.* This lack of knowledge is typified by the number of drawings in the Plan Room whose title describes the object drawn but does not specify the project, and are therefore useless!¹⁰⁶ Formal standard title blocks incorporating the project name were introduced in the 1950s.

As the new computer technology arrived, a deliberate decision was made to expend the limited training dollars on the production units rather than the supervisors. In no time flat the young men were years ahead of the older ones, who never managed to catch up.¹⁰⁷

Ted Taylor, who had been a sick man for years, died in 1968¹⁰⁸ and was succeeded as Supervising Draftsman by Roy MacArthur.¹⁰⁹ Roy was a very genial personality with excellent personal relationships with draftsmen and engineers. Not that there was any relaxation in standards, but Roy managed to achieve them by more cooperative approaches. His Senior Draftsman was Bob Dwyer, who was also obliging. By the time of Roy's retirement in 1987, Local Government had been incorporated into the Commission and Maurie de Hayr, who had been with Local Authority Services, became Supervising Draftsman for a short time before his retirement. He was succeeded in turn by Bob Dwyer. Bob's short period 'in the chair' was a reflection of the closeness of his age to his predecessors and in no way recognised his considerable technical and personal skills.

By 1988, there were five Divisional Draftsmen three of whom were more equal than others. The five were Construction, Designs, Irrigation, Planning and Water Resources.¹¹⁰

Following incorporation of the Commission into DPI, and with the retirement of long-serving supervising draftsmen Norm White, Bob Dwyer and Alan Vizer, the drafting staff were regrouped into two units. The group that serviced Development Division (Design and Construction) was under the management of Bob McDonald while Peter Taylor¹¹¹ had the responsibility for the other group. Bob McDonald elected to move on to a corporate role with strategic and financial planning leaving the Divisional Draftsman's position vacant. Mick Garvey and Mike Studley alternated in an acting capacity past the creation of Water Commercial and the end of this chapter in history.