

# THE HEALTH ENGINEER



THE JOURNAL OF  
N.Z. INSTITUTE OF HEALTH ESTATE AND  
ENGINEERING MANAGEMENT

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The Journal of the NZ Institute  
of  
Health Estate and Engineering Management

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Cover Photograph :- The old frontage of Wellington Hospital. This may be the only part preserved once the hospital has been rebuilt

The health and viability of any organisation depends on good communications. Our objective is to produce a good quality health engineering magazine. The magazine should inform readers, it should provide a forum for discussion, encourage interest in all aspects of the technical side of health facility management in its widest sense.



## ROYAL ADELAIDE HOSPITAL

Glen Reynolds is the Director, Engineering & Building Services at the Royal Adelaide Hospital.

The RAH is the major teaching and trauma hospital in Adelaide. There are three major hospitals and a plethora of smaller community and regional hospitals.

The state of South Australia was settled in 1836, and the Royal Adelaide Hospital has stood on its present site since 1840. None of the original buildings exist, and while there are buildings that date back to 1905 and the 1920's, the majority are tower blocks built around 1970. At its zenith, the RAH was a 1,000 bed hospital, but is now trading with 640 beds, 17 operating theatres, 140,000 square metres, 3,000 staff treat 60,000 inpatients p.a. (half are same day patients) and 350,000 inpatients p.a. with 200,000 occupied bed days and an average length of stay of 6.9 days. The Emergency department treats 50,000 patients p.a..

In addition to providing the engineering services to the Hospital, E&BS maintain the companion institution on site, this being the Institute of Medical and Veterinary Science. IMVS are the state's main pathology and research institution comprising 18,000 square meters of building floor area.

The RAH is also responsible for Hampstead Rehabilitation Centre (spinal injury unit, geriatric care and brain injury unit) and Glenside Hospital (the main psychiatric hospital) as well as a spread of community psychiatric units in our Eastern region mental health sector.

Engineering and Building Services have four areas of responsibility, these being :-

- Maintenance
- Projects
- Fire Safety
- Telecommunications

The overall budget of RAH is \$255 million.

The maintenance budget is \$1.9 million for labour (47 tradespersons) and \$2 million for goods and services (of which \$400,000 is for service contracts). This equates to 1.5% of the hospital budget being spent on maintenance of buildings and services.

Projects are specifically funded from capital works

allocations and varies year to year. Last year \$15 million of projects works were completed. Currently the Hospital is undergoing a \$120 million redevelopment staged over 5 years. Year two has just commenced.

Telecommunications has a budget of \$1.2 million, of which the Switchboard Operators labour costs \$320,000. The site is served by a NEC 7400 PABX that was installed in 1995 and further expanded in 1998 providing 4,000 extensions that include 650 patient bedside telephones that are accessed by use of prepaid phonecards. There is a growing demand for telemedicine services through the PABX.

Engineering & Building Services are responsible for the Utilities expenditure, comprising \$2.1 million p.a. for electricity, \$780,000 p.a. for gas and \$720,000 p.a. for water. The Hospital is the largest electricity consumer in the government and has recently become contestable in the new National Energy Market. The new structure has resulted in the power cost increasing by 40%.

The site has eleven chillers generating 13,350kW (3,800Ton) of cooling capacity and a central steam plant of three boilers each capable of 10,000kg/hr steam generation.

The E&BS Administration (comprising supervision, clerical officers and draftsmen) has a budget of \$700,000 p.a.

Engineering and Building Services are responsible for an asset base (including land, buildings and infrastructure services) valued at \$300 million replacement cost, or depreciated value of \$100 million. A condition rating exercise several years ago rated the assets at 38%. This means that 62% of the assets have exceeded the theoretical end of their life cycle! This indicates that the trend towards Total Asset Management is long overdue and critical for the efficient delivery of the services provided.

The New Zealand Institute of Health Estate & Engineering Management.

A Report on the 56th Annual Conference held at the James Cook Grand Chancellor Hotel November 8th and 9th 2001.

*“Engineering Value into Health”*

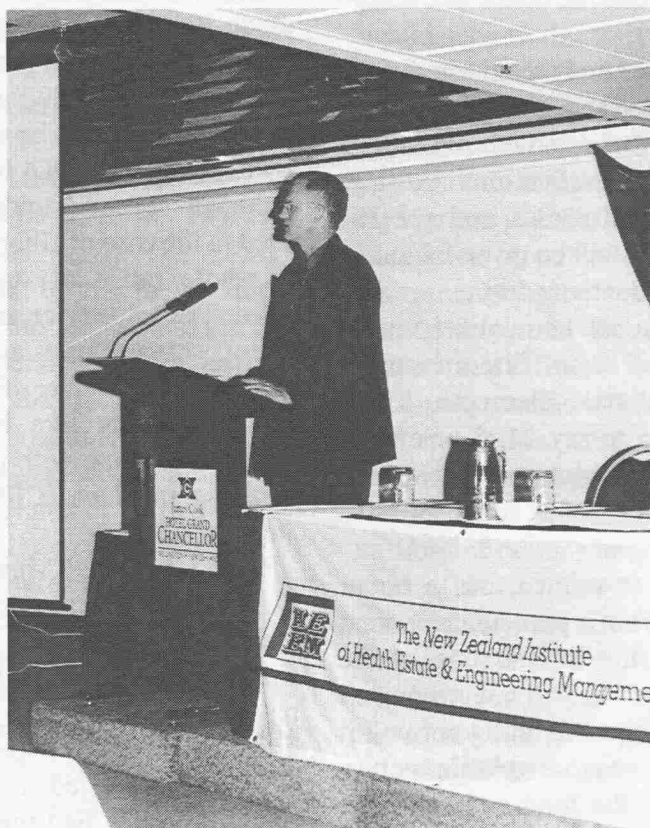
There were four businesses who were sponsors.

- Meridian Solutions
- Howard Wright Ltd.
- Programmed Maintenance Services Ltd
- AirPro Mechanical Ltd.

Among those present was Bruce Nosedo, President of the International Federation of Hospital Engineering.

It is always a very interesting time at ‘Registration’ meeting old friends as they come into register with much handshaking and hullo-ing but all too soon it is down to business, the Official Opening and straight into the first of the papers.

This honour fell to Richard Bullock from Capital Coast DHB whose paper was entitled “Minimum Facilities for Safe Anaesthetic Practice, Needs Versus Wants - A Project Managers Perspective”. Richard presented this with a series of projections from a laptop computer while leading us through his subject. Included in the printed version of his paper were copies of The Australian and New Zealand College of



Richard Bullock presenting his paper about Minimum Facilities for safe Anaesthetic Practice

Anaesthetists recommendations on “Minimum Facilities for Safe Anaesthetic Practice in Operating Suites” as well as a summary of what is available in the Procedures Clinic at Kenepuru

Hospital.

Following this, Alan Beuzenberg of Canterbury DHB outlined a course that he had organised for training tradesmen in the maintenance and management of medical gas systems based around HTM 2022.

AirPro Mechanical Ltd, a co-sponsor, then presented their views on operating theatre ventilation in their paper entitled “Solutions, Methodologies and Philosophies for Operating Theatre Ventilation.”

Glen Reynolds, from Adelaide, the Australian ANZEX delegate presented his paper on Total Asset Management, which is reproduced in this issue of the Health Engineer.

The morning session was completed by Andrew Paterson of Capital & Coast DHB whose paper explained his adventures with energy contracting in a very dynamic market where power supply companies sprang up, flowered for a short period and then died away, like a spring flower, being

overtaken by the next quick grower. With the low lake levels being experienced last year Andrew said it was economical to run the T.E.C. generators. This has possibly changed somewhat

with the wet summer weather filling the storage lakes to capacity.

After lunch Kieran Davis reported on his ANZEX trip to the conference of the Australian Institute of Hospital Engineering. He talked about many of the things that caught his interest.

Brian Robinson of Capital & Coast DHB demonstrated the human patient simulator that they have developed for surgeons to practice their Endoscopic Dexterity. The simulator was appropriately named Dexter.

Concluding the afternoon session Richard Chu of Meridian Solutions, a Co-Sponsor and a business unit of Meridian Energy offering Total Energy Partnership, Facility Management, Energy Performance Contracting and Energy Supply Contracts.

The first day of the conference concluded with the Institute AGM followed by the "Trades Night". This proved to be a relaxed and informative evening meeting firms that supply hospital equipment, systems and installations, discussing with their reps about the products on show. Meanwhile trays of food were brought round and there was an adequate supply of lubricant even for the thirstiest person. The evening ended with draws to find the recipients of bottles of wine which had been supplied by the firms involved. The Australians present appeared to take a disproportionate number of bottles.



The rather imposing entrance to the new Emergency Department at Wellington Hospital

The Friday morning session began with a site visit to Wellington Hospital to view the new Emergency Department. To obtain a comparison between the new and the recently vacated old department, we were firstly shown through the old department within the old Wellington Hospital main entrance on Riddiford Street. What a shambles of a place, at least it might have been tidier if it was currently occupied. Everything had been left just as the staff

had left it after its last day of use. There was even a partly eaten piece of bun on one shelf. It was then into the new building, built over the foundations of the old laundry. The treatment area consisted of a large open space with desks and benches in a central island, wide aisles and consulting / treatment rooms round the outside. Very impressive and the staff seem pleased with the much improved amenities. After that it was back on the bus, return to the James Cook for morning tea and the rest of the conference.

In the session leading up to lunch time we had papers from Dr. Peter Martin speaking about TB treatments and engineering controls, the Electricity Market from Dr. Philip Barnet and Nigel Caigon from Programmed Maintenance Services, a co-sponsor, speaking about their work systems.

After lunch we had Robert Tromop from E.E.C.A. speaking about the final draft of the National Energy Strategy, the Government's push to attempt to meet the requirements of the Kyoto Protocol. Bruce Moller and Kevin Fisher from Howard Wright, a co-sponsor, brought us up to date with the latest in hospital beds.

The final session of the conference commenced with Innovation in Contracting Options for Health Facility Design and Construction presented by Dean Riddell. Christopher Wolland of Capital & Coast DHB presented his paper about

rebuilding air handling systems. The final paper was a lighthearted look at the trials and tribulations involved in installing a Building Management System by Richard Whitehead of Capital & Coast DHB. (Reprinted in this issue)

The Annual Dinner, preceded by the Cocktail Hour was an enjoyable and relaxing occasion meeting old friends and former members such as Peter and Jane Duncan and Stuart Bridgman.



The Conference was a resounding success, well organised, unobtrusive service from the hotel staff, excellent food, and most importantly, well supported by Institute members.

Our thanks and congratulations must go Andrew Paterson and Max Christensen and all the other people involved in making the Conference a success.



Photo above :- A friendly group at the annual dinner Allison & Tony Blackler, Warren Crawley, Kevin Flower & partner Judie( obscured) and Paul McCartney and partner Pauline.



Photo above :- The ANZEC spirit was well to the fore by the end of dinner. Kieran Davis and Glen Reynolds both their respective Institutes' delegates.

## Biomed Forum Day

A number of service technicians involved in the maintenance and repair of Biomedical equipment attended the second day of the NZIHEEM Annual Conference in Wellington.

In an excellent turn out there were 13 DHB's represented with attendance also by servicing technicians from Fisher & Paykel.

The morning started with a lively update of the Technician Training initiative from Bill Shields, the Training and Workforce Development Officer from Waikato DHB and Trevor Crozier, Portfolio Manager, TOPNZ.

Both these gentlemen have been instrumental in initiating and driving this project and their presentation sparked some considered and informed debate during question time and indeed throughout the day as to the future direction of this technical qualification.

After morning tea there was a paper presented by Gillian Bohm on Credentiailling. Although not specific to our particular industry this was a thought provoking insight into benchmarking and the processes involved.

Tony Blackler and John Kelly of Standards NZ then rounded out the morning with an update of the standards process and current status of the safety triangle standards - AS/NZS 2500, 3551 and 3003.

After an excellent lunch and again interesting feedback as regards the mornings papers it was back to work with Trevor Nisbett from the Ministry of Health's Medsafe division presenting information on a proposal for Product Registration & Recall. Although there seemed to be a feeling that the time scale for this project was rather protracted there was general agreement that a co-ordinated and central approach to this issue was of benefit and the sooner it happened the better.

Tony Blackler followed this with a paper on the Application of ISO 9002 to a Clinical Engineering Dept. and I am sure that there was a number of those present, impressed, ( as I certainly was ) by the amount of work and effort that his dept. puts into their Quality Systems and Certification process.

Bruce Lill from Canterbury DHB provided an enlightening view into the success that can be achieved by getting on board early in a project. His discussion on the replacement of the dental unit at Canterbury Health clearly demonstrated not only the value in being proactive in our industry by achieving a favourable outcome but also the satisfaction and ownership which results in seeing a project through from inception to completion.

Peter Mandells carried on the theme of Service Innovation by describing an asset registration and database system which has recently been initiated at Waikato DHB. Peter was rather thrown in at the deep end at short notice but responded with a well thought out, even though it was impromptu, and interesting presentation - thank you, Peter.

After a short afternoon break we resumed for the final topic of the day. This was to be a think tank of current issues and problems being experienced by the service centres throughout New Zealand.

If there was one thing in common, it was that we all have the same issues and problems.

In a naive thought that we could actually address some of these in the time left, we listed them on the whiteboard. We quickly came to the conclusion we could have been there all week and not completed the task.

I have included them below for your reference in the hope that even if we do not progress them all, they may spark some lively debate at the next conference of the NZIHEEM in Auckland, November 7 and 8, 2002.

Encouraged by the turnout at this Biomed Forum we have taken the opportunity to build on this by inviting Biomed technicians to attend and participate at this 2 day joint conference. Book your tickets. Prepare your papers and come ready to discuss and debate in what, I am sure will be a stimulating and rewarding experience.

### Whiteboard Issues

1. Instrument calibration
2. Internal contamination of ventilators - removal of dust.

Continued on page...22

## ANZEX TOUR 2001

K.Davis NZIHEEM

For those of you that do not know what 'ANZEX' means, it is an annual event where a member from the respective New Zealand and Australian hospital engineering associations visit each other's country. They inspect a number of hospitals while on tour, extend their professional network, present a paper at the annual conference and get time to take in the local scenery.

I could handle that. I was a last minute 'fill in' for the role due to a cancellation, but what could be more simple?

Little was I to know.....this is a big event and shouldn't be undertaken lightly.

Firstly, I am sure the effort, planning and hospitality that the Australian Institute of Hospital Engineers were responsible for, in ensuing my visit was a success, was a 'practice run' for the Queens visit at CHOGM. I am still overawed by the level of generosity shown by Roy Aitken, Harry Cowen, Russell Phillips, Chris Ford and many others, but more on that later.

Secondly, this is a tremendous opportunity to personally benchmark operations against your own facility. I thought I had that one covered with being able to compare the eleven private hospitals that I oversee, plus the odd one or two public hospitals that I am familiar with.

However, there are a few aspects of 'hospital engineering' that are different in Australia, that warrant continuing comparison between the two countries. Therefore, the ANZEX tour programme is

something that members of NZIHEEM should strive for, for the betterment of their own facility.

DAY ONE Friday 5 October- (actually arrived in Sydney late on Thursday 4 October along with Simon and Ryan - two of my boys) Took taxi straight to the hotel on the North Shore that was booked by NSW branch. Great to be back in Australia, it's always so vibrant. Back to 'Day one' Was met by Russell Phillips who is Operations Manager at Westmead Hospital and President of the NSW IHEA branch. Russell took me on a tiki tour of downtown Sydney before dropping us off to do some sightseeing. Friday through Sunday, we were on 'holiday' before the official hospital itinerary started on Monday. Friday consisted of McDonald's, Darling Harbour, McDonalds, Circular Quay, McDonalds, Hyde Park, McDonalds again and getting lost on the way back to the hotel.



Kieran Davis speaking about his Australian trip to the conference.

DAY TWO Saturday - Russell met us again in the morning. He had decided the original booked hotel was not befitting the status of a hospital engineer. Who was I to argue? Russell has friends in all the right places and had booked us a suite at The Wentworth in Circular Quay. Russell went off to get in his Saturday morning of golf and we left the marble/granite/imported furniture environment and went off to McDonalds for breakfast. Tourist activities for the day were AMP tower, ferry out to Manly Sea world and looking around The Rocks and Botanical gardens. Switched to 'Hungry Jacks' (same as Burger King) for variety in diet.



DAY THREE Sunday - My wife Anne-Marie arrived after successfully managing to offload our two other boys, Samuel and Liam at grandparents in NZ. Daily calorie intake reduced by around 5,000. Started going out to restaurants

DAY FOUR Monday - Took the train out to Blacktown hospital (those of you at the 2000 IFHE conference may remember this one). My interest in this site visit (and others) was brands of equipment used (as often I source equipment ex Australia), standard and choice of materials used in building fit out and general layout of departments. Warren Sullivan, the hospital engineer, took me on a comprehensive tour of the hospital. The hospital itself has 8 operating rooms and 367 beds, is fully air conditioned and has full fresh air supply to O/Rs (stated at 39 changes/hr)

Other details are Atlas Copco units used for medical air (system designed by Hoslab Systems), PVR screw compressors for medical vacuum, 3,750 kW of cooling capacity via chilled water at 6 C leaving, 770 kVA of generating capacity (that has been used in anger on a number of occasions - NSW electrical storms!!) Aira hot water boilers, 2 x Fulton steam boilers (used for CSSD only), Algorix fire alarm system, 2 of 600 x 600 x 1.2 pass through Amsco/Steris sterilisers, all rooms Body protected with additional 30 mA protection per ward, all electric beds.

What could we learn from this newly constructed facility?

Warm water circulation system. This hospital does not have 'hundreds' of temperature limiting valves at point of use (costly to install, run and maintain). It uses an on site chlorinating system to ensure that legionella is not spread in the water that is circulated at 43 - 44 C. All hospitals please take note !!!

Alternative material choices for pipework. The hospital uses a combination of copper, stainless steel, PVC and plastic. Seeing as three of the hospitals within my portfolio have suffered from copper erosion and/or corrosion problems, it is pleasing to see alternative methods of piping utilised.

No flat roofs, low profile long run iron utilised. Why is it that we persist with flat roof membranes that are a disaster waiting to happen when we have x

times the annual rainfall of Australia I do not know.

What could this hospital learn from us?

Not a lot - this is a well-built and furnished modern hospital with a learned group of engineering staff. However in NZ I feel we excel at economising (we have to). O/R air volumes should be cut to the minimum that standards/risk management requires, plus recirculation of air should be considered. (Bearing in mind that summer temperatures are often 40 C).

How are we letting electric beds invade hospitals, mind you this is happening in NZ too. Where is the benefit/cost on this one? I perceive the push is coming from the OSH brigade to address 'bad backs' but where is the evidence to back this up.

Thank you for your time Warren, a very informative tour and a first class hospital.

The rest of the day was spent at the Blue Mountains doing the cable car etc tour around the Three Sisters. Spectacular.

DAY FIVE Tuesday - Took the train out to the Sydney Adventist Hospital where I met Ian Thompson, who some of you may remember from his visit to NZ in 1996. The Adventist is a not for profit private hospital that is unusual in that it has full acute facilities plus maternity, cancer treatment, cardiothoracic and other services. The hospital has 10 O/Rs, 314 beds (including 50 maternity, 41 bed day surgery unit, 12 in ICU and 8 in CCU). Certainly a large private facility in comparison to those in NZ.

The site is over 100 years old and is set on 100 acres of land. The main block was built in 1973 and is well due for refurbishment. In fact it is underway at present with Ian currently overseeing the refurbishment process ward by ward. Wards have predominantly 4 bed rooms. He presently manages a staffing level similar to what is the norm now in NZ hospitals of a similar size. In other words, it is probably an ongoing struggle to keep up with R&M demands.

Other details are 1500 kW of cooling capacity (Trane), one AHU per O/R with recirculated air (all O/R plant refurbished 5 years ago and in very good condition), BUSH vacuum pumps, a combination of both steam reticulation (2 x 300 HP boilers) and hot water for heating.

The age of the site has meant that a combination of new and old, plus central reticulation and local plant is used for heating and cooling. Ian is currently thinking about having an energy audit by external providers. Are there any takers for giving Ian a call to discuss the possibility of easy 'energy saving' wins. i.e. reducing any proportion of savings that will have to be paid to external sources upon a review.

One point that was not lost on me as a result of this visit, was that as Engineers or Facility Managers, we get caught up in thinking hospitals are only as good as their buildings/services etc. They aren't. The Adventist had dated furnishings and quite a bit of old plant. (Not unlike most NZ hospitals). However, this hospital has an excellent reputation and people choose to come to this hospital for treatment. In other words it is the staff that 'make' a hospital. Actually, this viewpoint is also borne out in the visitor surveys carried out at my own group of hospitals.

With the Adventist undergoing refurbishment, along with its highly regarded service, Ian has certainly got a hospital to be proud of. Thank you Ian for an excellent tour of the site and for looking after Ryan.

**DAY SIX Wednesday** - The itinerary for Wednesday was to travel to Newcastle to meet up with Harry Cowen, Manager Transport & Communications at The Hunter and en route visit John Bowdy at Base Hospital in Gosford. Here's where I hope that the itinerary that Harry spent many hours compiling was flexible. Anne-Marie had planned to visit Westmead Hospital to review Catherterisation Laboratory operations. (By the way, she had been sponsored to review 'Cath Labs' in Australia and was visiting hospitals along with me). So it was a chance to catch up with Russell again.

Russell took me on a very brief tour of his site. It is a large complex built in the mid seventies. Some figures that will help you gauge the size of this place are: 140,000 m<sup>2</sup> of floor space, 6.8 kilometres of windows, 2.5 million bricks and 135,000 tonnes of concrete.....but Russell doesn't like to brag.

The hospital has 900 beds and 21 O/Rs. Some of the O/Rs are full fresh air, some are re-circ and there are 8 laminar flow O/Rs. Russell also showed me the carpet that is used in the foyer and

corridor areas. It's 25 years old and is showing no signs of wear, mind you its 75-oz wool broadloom. I bet the staff keeps praying that it will finally wear out. One way out of this predicament is that Auckland airport is planning a new runway, perhaps.....

The Westmead has recently refurbished a ward for private patients, however its socio-economic catchment zone seems to be limiting the use of the ward. The Westmead is due for a \$187 million refurb shortly and will involve changes to layout to improve work practices. Col Erikson, Director of Facilities Development, Western Sydney Area Health Service will be responsible for this project. Some of you may remember Col from his visit to NZ as an ANZEX rep.

As yet, I had not viewed a facility that I could compare with one of Southern Cross' hospitals. Russell pointed out that there was such a beast right across the road. I bade farewell to Russell until the conference and headed for Westmead Private - there goes the itinerary!

Westmead private is a newly constructed facility comprising of 136 beds, 6 O/Rs (40% fresh air, 60% return air), ICU, Cath Lab, Maternity and Pharmacy. It also provides consulting rooms for the surgeons working in the facility.

The hospital engineer was away at the time of my visit, so I was taken around by the maintenance person. This hospital is very spacious and has a very high standard of fit out in the wardrooms and public areas. Unfortunately, with the current funding situation in NZ, a private facility of this measure built here, could not generate suitable returns on investment.

Rooms are predominately single bedroom and ensuite, with the usual hotel amenities. Plantroom areas also have a high standard of equipment (generously sized) and are housed in spacious plantrooms. This hospital also utilises a warm water disinfection unit that in this case uses UV for disinfection. (Edwards).

The latter part of Wednesday was spent looking around the Gosford Reptile Park. (Well worth a visit) and getting lost trying to locate the Molly Morgan Motel, the accommodation booked for the stay in Newcastle.

**DAY SEVEN Thursday** - Travelled to 'The Maitland



Hospital', a public hospital that has been in existence for over 160 years. Rob Campbell, Hospital Engineer, showed me around the site that has a variety of ages of buildings. The older hospital buildings are predominantly used for admin purposes and the emergency dept; radiology, main ward blocks and the operating and recovery suites are housed in a 5-year-old design/build facility. The newer areas have very pleasant furnishings as the brief was 'for the hospital to look as least institutional as possible'

However, Rob has had a few problems associated with the new facility, which unfortunately are not uncommon in a construction procurement process. The contract was design/build GMP, therefore the contractor was obviously looking to minimise costs associated with construction. With the hands off situation to hospital staff during the warranty period, shortcomings went unnoticed until the contractor risk period associated with design being fit for purpose was ended.

Rob has had to fit a hot well tank, condensate return from sterilisers, and steam reservoir as the steam generators were of insufficient capacity. - so much for GMP. The theatre air conditioning system design was also disappointing for a new installation. Hepas fitted in duct (plantroom) instead of installing terminal units, AHU's supplying more than one O/R and aspirating diffusers in the operating rooms instead of grilles or laminisators.

One pleasing feature of the construction was a large solar hot water system that fully caters for the sites hot water needs, in fact it often has to reject heat. Why not utilise the abundant Australian sunshine? This component of the project was funded by the Australian EECA equivalent.

Thanks for the site tour Rob, and a reminder to get your IHEA membership application in to Harry.

Thursday afternoon's activity was exploring the Myuna Bay Underground coal mine courtesy of Harry, (immediate past president of IHEA NSW branch) and his brother Jon (who works at the mine). Harry and Jon have a history of mining in their family (that goes back to their great, great grandfather ironstone mining in Yorkshire,

(England) and they were keen to demonstrate the engineering complexities and safety systems, that are an every day feature of mining in a site that produces 1.2 million tonnes/annum drawn from a depth of 1 km below Lake Macquarie.

For me, the whole afternoon was just amazing good fun but it did reinforce the fact that there are many facets of industry that fall under the umbrella of 'engineering', albeit this had to be at one extreme end of the continuum.

The continuous mining method employed at the site meant no let up in the activities that occur on the three levels (seams) and the many intersecting 'roads', complete with traffic lights give the impression of this being a busy underground city.

Thanks Harry and Jon, again an amazing visit - a very different working environment to what most people could imagine.

DAY EIGHT Friday - The main reason Harry booked me into the Molly Morgan was the siting of the Maitland Private hospital right next door. This hospital has been open less than 1 year, and was built after many years of canvassing from the local community for such a facility. It consists of 2 operating rooms, 60 beds and caters for usual elective surgery plus maternity care. It also has surgeon owned consulting rooms on site.

The facility is of a good build and furnishing standard and has a high standard of services equipment. However, it has been let down by theatre air conditioning design (hepas placed in duct and aspirating diffusers) and poor operating room suite layout and sizing. The 2-stage recovery area layout is good but due to throughput, only one area is used.

If this facility were placed in a competitive market e.g. Auckland the operating suite design and theatre to bed ratio would make this facility difficult to ever return a profit. It is fortunate that it has no competition in the immediate area.

DAY NINE Saturday - Spent the weekend looking around Newcastle beaches and suburbs. Took a boat tour out at Port Douglas to view the dolphins, (well worth a look), unfortunately did not have enough time to check out the world renowned Hunter region wine areas.

DAY TEN Sunday - Traveled back to Sydney for

the flight to Adelaide, venue of the 52nd National conference of IHEA.

DAY ELEVEN Monday - Sightseeing around Adelaide. (Consisted mainly of following Anne-Marie around clothes shops). I'm told it was a very worthwhile day.

DAY TWELVE Tuesday - Attended the IHEA national council meeting, chaired by Bill Geerlings. It was interesting to note that IHEA are dealing with many of the same issues that confront our association. e.g. membership growth and direction of the association. One area that IHEA seems to have made good gains on, is member participation on standards committees. This sort of involvement is good for raising the profile of the association, but apart from Tony and Bill's efforts here, we are sadly lacking in this area.

The conference welcome reception and dinner was held on Tuesday night. Simon and Ryan were made to feel as though they were esteemed guests by the generous welcome given by Roy Aitken to my family.

DAY THIRTEEN - FIFTEEN Wednesday to Friday - The IHEA annual conference was held in the Stamford Grand Hotel, right on the beach front at Genelg, just a short tram ride from the centre of Adelaide. Chris Ford, (Convenor) Mike Ellis and Glen Reynolds (2001 Anzex Rep) put together an excellent conference that featured first rate papers.

Dean Brown, Deputy Premier of South Australia and Minister for Human Services, undertook the official conference opening. He commented on expected trends in healthcare:

- spending on healthcare to increase as a proportion of GNP
- fall in hospital beds due to day stay trends expected to bottom out due to ageing population
- more flexibility and interaction expected between hospitals and aged care facilities
- increased amounts of funding made available for facilities improvements (however following speakers all talked about constraints and difficulties in maintaining existing assets)

Some papers of merit that hopefully find their way to members via The Australian Hospital Engineer were:

'Mapping the Future of Hospital Engineering' by Peter Jackson,

'Environmental Trends in Hospital Construction' by Dereck Exton,

Infection Control measures to be undertaken during construction by Kevin Moon

Energy Performance Contracting by Stephan Butt (voted best paper)

Of course many other papers had personal value to me in furthering my knowledge of hospital operations.

Harry, Russell and Roy were very gracious in not falling asleep during the presentation of my paper.....I noticed!

At the end of the conference, a workshop was held to ascertain the direction the organisation was headed, was in fact the correct one. All attendees had to agree on the goals for the association. The 'classroom setting', tight timeframe and the thorny task had everyone 'sweating'.

Luckily the association has the scholarly expertise of Jim Meldrum, who not only informed all participants they had got it hopelessly wrong, but that he had penned the correct answers to the 'test' and also had time to pop down to the local for a quick pint.

The site visit for the conference was to Flinders Private Hospital, a facility co-located on the Flinders Medical Centre grounds (public hospital). The facility is one year old, has 130 beds, 8 O/Rs, ICU, CCU, 2 cath labs, birthing and diagnostic facilities.

The building and plant is of a very high standard and cost the Ramsay group approximately \$A70 million to build. Eighteen months later the under-utilised facility was on sold to ACHA group (Adelaide Community Healthcare Alliance) for \$A45 million. It currently has 95% occupancy. No doubt this rather considerable change in business is due to the recent government subsidising of private healthcare.

Again the funding situation in NZ would mean that a private facility of this standard of build and fitout would be un-profitable to operate.

Social highlights of the conference were, the conference dinner at Hardy's Reynella Winery, the social outing on Saturday, (touring a few of Adelaide's vineyards) and an excellent BBQ put on by Chris and his wife Ali, to wrap up the week.



This paper was presented by Richard at the Conference and although we cannot get the full effect of the humour it is still worth publishing.

## Installing a Building Management System

Presented By Richard Whitehead Capital & Coast DHB

*This* paper provides a glimpse into the value a Building Management System can provide.

The story starts around 1993 when Crown Health Enterprises came into being. At that time Capital Coast Health Ltd. took over where the Wellington Hospital Board had once been. For many, things looked and worked just the same as they had for years before. But wait, there now seems to be money available to do work only dreamt of in the past. This new source of funds was called Capital Expenditure, to get hold of a wad of it a new set of paper work, the Capex request was formed. My boss at that time was Peter Duncan who many of you will know. He wanted to replace the old pneumatic control systems in most of the plant rooms with a new centrally monitored Building Management System.

The seed was sown, now all we had to do was decide what we wanted. Some previous jobs done by the old Board Head Office had used the new Honeywell Excel Plus B.M.S as the primary control systems. There were around 5 of these.

Originally installed as stand alone devices we had networked them and put in a Graphics Central monitoring station a year or so before. Honeywell seemed to be the way to go.

Next step was to decide exactly what we required in order to get quotes, one building alone had a total of 22 air handling units each with a heating loop, a cooling loop and a humidity control loop, these AHUs were distributed over 6 plant rooms and 3 floors of the 13 story building. Other buildings were not quite so daunting, a single VAV system in what is now the Grace Neill Block, a couple of air handlers at the top and bottom of Ward Support Block, a couple more in Link Block, oh yes better add a couple more in Oncology and a basement plant room. Phew the network alone is going to take a bit of thinking about as there is over a kilometre of cabling between the 2 most distant points.

After a few weeks of planning and thinking, a list of sensors and actuators and electro to pneumatic

converters, and pneumatic to electronic converters and controllers and control cabinets and wiring and labour costs and power supplies and a whole lot of other things, was completed. Quotes were obtained from Honeywell who by now had brought out the Excel 5000 range of control equipment.

Next the Capex forms, oops, I see we need quotes from 3 suppliers. But no we said, we want to use Honeywell to fit in with the Excel Pluses we already have. So off we go and get quotes from 2 competitor control companies. Now the paper work, anyone know what a net present value is or an internal rate of return? No, neither did we in those days being only simple engineers. Not to worry the accountants will work that bit out. So eventually the Capex was complete and presented. And it failed; reason being its rate of return was not good enough despite all of the benefits to be obtained. We now fast forward to August 1994 and the NZIHEEM conference, which that year was held at the Porirua Police College. This is where we will see the 'Engineering Value of the Health Conference'

At the trade exhibitions and at the GEC site visit was a gentleman by the name of Mike Robinson, Mike was with the Satchwell division of GEC and he was demonstrating a new range of B.M.S. controllers, the Satchwell IAC range. These were small distributed controllers which could be networked and centrally monitored and they were CHEAP, sorry not cheap, they were very good value for money. Mike and I got on very well together, him being a fellow pom and from not too far away from my home town either. I was soon provided with a demonstration disk for the PC and saw how flexible and easy it was to program the system.

New quotes were obtained, the value was amazing, I could install controllers in most of the Clinical Services Block for the same price as a competitors network interface card, the central monitoring and programming software came on a single floppy and cost less than 10% of the cost of the

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competitors software. A revised capex was completed and this time it worked, we had the go ahead to install our own Building Management System.

We had already decided to design, program and do most of the installation ourselves. This was intended to be an engineers system for engineers and

technicians to control, operate and modify as required. It was not going to require an expensive specialist from the XYZ control company to make any alterations as did the few existing programmable controllers.

An initial shopping list was given to Mike at GEC and whilst waiting for the goodies to arrive a start was made on the network. This was required to be a daisy chain type of network running the RS 485 protocol. With the large labyrinth of tunnels, plant rooms and buildings which had to be catered for it became a challenge to fit things into the 1000 metre segment length of the network. This was done by splitting the network into a primary segment known as the main LAN (local area network) which took in all of the basement plant rooms. In each of the basement plant rooms a local "touch screen" monitoring device was fitted, this device has the happy coincidence of providing sub LAN branch manager control functions at much less cost than a dedicated LAN branch manager. A sub LAN cable was now run up each building from the touch screen to the plant rooms within the building. Space for the new Satchwell controllers was gained by removing the old Honeywell Delta 2000 Data Gathering panels, a monitoring system which had apparently never really worked and had fallen into disuse some years previously. Luckily the data gathering panels were all in very close proximity to the existing pneumatic control equipment which made interfacing to the pneumatic actuators on heating and cooling valves that much easier.

Soon the control equipment arrived, sensors and electronic to pneumatic converters (and vice versa) were installed, wiring was completed back to the control cabinets and last, but most importantly our very own control program was written "on line" via the network. This was a simple heating, cooling and humidity system for the 4 wards near the top of the Clinical Services Block. Being a little nervous of "going live" with our new system we contained

ourselves for a week or two. We were content with using our new capabilities to monitor the performance of the existing pneumatic control systems.

Wow, what a lot of hunting going on, now its heating, now its not, now its cooling, no now its heating again, and that was just on one air handler. Another one seemed determined to cool as much as it could with the chilled water available no matter what the outside conditions. Whats going on here we wondered. Now it helps to know that since time immemorial the pneumatic controls had been "contracted out" to a well known controls company and they had been left to it. A check of the controls drawings showed that there should have been outside air temperature compensation on the air handling units but this we now found had been removed many years before as it would not work properly, we also found that the control set point of many of the loops was unachievable with the chilled water available.

So hesitantly we removed the pipes on the old RP907 controllers and replaced them with our new system and guess what? It works! A little tweak of the proportional band here and reset the integral action there and "voila" it works a treat.

Over the next few months our confidence grew with each new system we installed, not only were we controlling AHU loops, now we were running the variable air volume system in the Grace Neill Block. This is a system that measures the supply duct air pressure and then adjusts the pitch of the fan blades until the desired air pressure is achieved. The pressure in the system is constantly changing as supply air grills in all of the rooms of the building open and close in response to the desired set point of each room. We found that the pitch control mechanism of the fans used mechanical feedback via a Bowden cable to adjust desired pitch in response to a command to change signal. This too we found sadly lacking in both its response and its accuracy. A method of gauging the fan pitch without mechanical feed back was needed. How about using motor current feedback? And so it was done. Using transducers in conjunction with current transformers we then programmed a couple of analogue input ports to accept the 4 to 20 milli amp output signal from the transducers. Now we could see each motor current and use it as a variable in the control loop and for

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## POWER OUTAGE

In the Elizabeth Rothwell Building at Waikato Hospital, Hamilton.

From Bob Duncan.

On 18th October a short on the main switchboard in our 12 storey Elizabeth Rothwell Building cut mains power to the building and started the emergency generator which switched on to the same short on the board. This had the effect of slowing the generator down and dropping the low voltage breaker which allowed the generator to increase speed and switch back on to the fault, due to the length of cable the current being produced was not enough to blow the fuses protecting the board.

The generator was heard to be hunting and our Electrical Co-ordinator went to the generator room and shut the unit down.

At the same time the fire alarm in Elizabeth Rothwell sounded. On arrival at the building the alarm was a smoke detector in the switchboard room, closer inspection of the switch board showed major burning and shorting on the bus bars.

By the time the Brigade had given the All Clear it was now 1545 hrs. We were faced with a building which housed a Neonatal Intensive Care Unit, Delivery Suite, two paediatric wards, post natal and pre natal wards, outpatients and a rehabilitation ward, all without power, the switchboard also fed our main kitchen block.

A quick talk to the Operations Manager telling them it would be at least 5 hours before we could restore power and therefore we would have to evacuate the building. This was actioned and carried out over the next 3 hours with only the Rehabilitation ward on the 8th floor being left in

place with a temporary power supply from a portable generator.

Rapid discharge was put into place, both in the Elizabeth Rothwell Building and the main hospital allowing patient numbers to drop and freeing up beds for transfer of patients.

With three critical babies in our NICU, these had been assisted over the power outage by an UPS. These babies were transferred to our ICU and the rest of the 24 babies followed and set up in the Theatre Recovery area.

As the rest of the patients were transferred we set about to restore mains power to the building. Contacting a local hire firm to hire a generator and a switchboard manufacture to make temporary

repairs, we started the first steps to restoring power.

First was a temporary cable to the kitchen to allow the evening meal to be supplied to the rest of the hospital.

On the arrival of the generator, temporary power was set up in the switchboard room and another circuit run to the Rehab ward allowing some light in the corridors and supplying power to a water cooler. Bus bars were cut out of the board and cables

made up to make temporary repairs.

After the building had been cleared and all patients fed, we had to wait till 2140 hrs before the power was restored. It was not worth the disruption to return the patients that night. The next day patients were allowed to return although we took the opportunity to carryout some outstanding work in NICU.

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Our Elizabeth Rothwell Building was known up until recently as the Waikato Women's Hospital, the building is a 12 storey tower block which houses our Delivery Suite on the 2nd level, our Neonatal Intensive Care Unit level 3, Antinatal Ward level 4 Paediatric Wards levels 5&6, Post Natal wards and level 2 nursery level 7 Post Natal ward level 8, Fertility Clinic and Rehab Gym level 9, Outpatients Clinics level 10, Rehabilitation ward level 11 and Administration on level 12 and an Anti-Natal outpatients level 1.

The building stands on the North West corner of the Waikato Hospital campus. the first 3 levels are fully air-conditioned. Levels 1 and 2 have exterior access and level 4 has bridge access to the main corridor in the main hospital building.

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At this level of purity rouging (corrosion of stainless steel systems) can occur and Roger showed a photo of a badly rouged product where the client had used an inappropriate grade of stainless steel steam trap. Clean steam is probably the right compromise. Cost of ownership and maintenance is relatively low. It can be dedicated to the steriliser service and although stainless steel

would be required throughout it does not need the added cost of polishing the contact surfaces. There is full control of pressure and load as the steam is dedicated to the steriliser. Added to this the "as generated" steam quality, lower operating TDS level, etc are more closely controlled so any risk of carryover by higher TDS water, particulates etc associated with plant steam are minimised. +

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- 3. Service documentation
- 4. Agency change
- 5. Equipment acceptance → Compliance
- 6. Testing of Electrosurgical Accessories

- 7. Installation - compliance → Med Centres, Dentists
- 8. Resale of medical equipment
- 9. Compliance issues  
Mediation Resolution → rulings  
→ Commerce Dept
- 10. Standard Test labelling  
→ Liability  
→ Documentation

My thanks to all who attended and particularly to those who presented papers.

My thanks also to Tony Blackler for his enthusiasm and drive and without whom this Biomed Forum day would never have got off the ground, far less that it would be such a resounding success.

Indeed it was the positive feedback that we received about the Forum day that has encouraged us to commit to a 2 day joint conference in Auckland in Nov 2002.

See you there. Bill McDougal

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Overall, the conference ran extremely smoothly, just like one of Chris's Sunbeams.

first co-location ventures in Australia, being built alongside The Royal Melbourne.

SUNDAY - TUESDAY Flew to Melbourne for a few days of R&R before heading back to NZ, however couldn't resist a quick peek around Melbourne Private hospital. Mayne Health operate this facility and it is but one of their 60 private hospitals and medical centres nation-wide. It is also one of the

After writing this now (March), I am starting to reminisce about the good experiences I had during the ANZEX tour. It was an experience that I won't easily forget, mainly due to the generous hospitality shown by IHEA members to their 'Kiwi guests'. +

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Another planned shutdown early December allowed the switchboard to be rebuilt without any evacuation and with planned outages to allow temporary supplies from our generator.

Points from this incident :-

- 1. The switchboard had been built with the bus bars fitted on a common stud, the joints were built without the use of lock nuts or spring washers, therefore allowing the joints to loosen over the years.
- 2. The generator was allowed to start on a faulty switchboard.
- 3. Neonatal Intensive Care housed on a floor which required carrying incubators upstairs to reach

- 3. the connecting corridor to the main hospital
- 4. Emergency procedures worked well and all staff worked together for the good of the patients to move them without major incident and with little disruption to the planned work of the hospital.
- 5. The brigade did not receive an automatic signal when the smoke detector activated, this was due to an installation problem. The building has two fire panels due to its size, when the power failed, the battery backup only supplied one panel, leaving the second panel to activate the EWIS system, but not send a signal to the brigade. +



## Electromedical Standards

THREE SIGNIFICANT electromedical Standards are currently being revised. They are:

AS/NZS 2500 *Guide to the safe use of electricity in patient care.*

AS/NZS 3003 *Electrical installations—Patient treatment areas of hospitals and medical and dental practices*

AS/NZS 3551 *Technical management programs for medical devices*

There will be some transfer of content among the Standards, particularly the removal of patient area designation requirements from AS/NZS 3003 to AS/NZS 2500.

The requirements of NZECP12 will be incorporated into the Standards allowing the withdrawal of NZECP 12. A significant change in AS/NZS 3003 will be the deletion of 0.01 Ohm equipotential earthing requirements in cardiac protected areas and instead 0.1 Ohm will be required. As all three Standards are closely related they will be issued for public comment at the same time to enable reviewers to obtain a complete picture of proposed changes. The drafts are due to be available in the Dec. 2001/Jan.2002 time period.

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the first time in a great many years each of the 2 parallel supply fans were both running within an amp or two of each other.

We have achieved many many more things with our BMS, such as control and monitoring of the medical air, engineering air and vacuum compressors, monitoring of various medical gas alarms and central control of most of the external lighting around the campus. All air handlers now have outside air temperature compensation and some have solar compensation as well. We are about to undertake a chiller management program with inputs from electrical maximum kVa demand of the hospital, time of day electrical maximum demand, chilled water temperature and air handler plant demand. Once completed we expect to reduce costs by getting the control system to automatically chose the optimum chilling plant to use based on the above variables.

From our original vision the BMS has been expanded to take in control of the new Emergency Building and many more redeveloped areas at Wellington Hospital. Our central monitoring

station now has 2 main networks, 9 sub networks and 169 controllers with around 3000 connected input and output devices.

Most of the programming and installation has been done in house. The system is used on a daily basis by many trades staff to monitor and diagnose routine problems. We continue to 'tweak' it here and there if we have any new ideas for improvements.

Having a centrally monitored control system which you can monitor and program yourself puts you at the leading edge of control and energy saving opportunities.

We believe that at Capital Coast we have "Engineered Value into Health" with our Satchwell IAC Building Management System.

And what became of the pneumatic controls contract? **It was cancelled;** the first years savings just about paid for the whole of the first phase of the BMS installation.

Thank You.

**NZHEEM DIARY** some dates to remember :-

April 27th - South Island Regional Meeting at Greymouth

April / May - Northern North Island Regional Meeting ( postponed from March) T.B.A. refer to Bob Duncan.

November 7th&8th, Annual Conference, Carlton Hotel, Auckland

**NZIHEEM 58th Annual Conference**

*7th 8th November 2002 Carlton Hotel Auckland (the City of Sails)*

**'Sustainable Healthcare Support (A Holistic Approach)'**

**CALL FOR PAPERS**

For the first time in the history of the Institute, the annual conference will fully combine both the health support professions of Facilities and Biomedical Engineering. And appropriately, the theme for this landmark occasion will be 'Sustainable Healthcare Support (A Holistic Approach)'.

In these times, it is essential to address the concept of 'sustainability' if our role as a valuable support service to the healthcare industry is to foster and grow. To follow the practices of sustainable development of our services, a holistic approach should be undertaken that involves :-

- financial stability (in times of limited resources),
- environmental conservation (making existing supplies go further)
- social progress (through enhancement of our organisation's development)

Following these three pillars of sustainability should enable NZIHEEM to play a valuable part in the development of Healthcare provision in the years to come.

**We encourage all members, associates or any persons working in the Healthcare Support industry to present a paper.** This is your chance to have a say, on such topics as:

Asset management	Change management	Risk management
Standards	Training	Energy efficiency
Benchmarking	Product evaluation	Or any case studies

But don't limit yourself to the above, the conference theme gives great scope for lateral thinking on many Facilities and Biomedical topics. Papers can be of duration between 15 and 40 minutes.

**Please contact the President or any members of the Executive to discuss your ideas for a paper.**  
**Contact details on Page 1**

# From Roman Roads to Space Shuttles.

The following story was sent in by Stewart Dunlop who found it in a Resene Paint Company newsletter.

**At Resene we like to do things a little differently... after all, there's nothing quite like breaking the rules every now and then. Funny though, how often we stick to the old rules because it just seems too hard to change.**

**The next time you hear someone say, "Because we've always done it this way" think of this.....**

The US standard railway gauge (width between the two rails) is 4 feet 8.5 inches. That's an exceedingly odd number.

*Why was that gauge used?* Because that's the way they built them in England and the US railroads were built by English expatriates.

*Why did the English build them like that?* Because the first rail lines were built by the same people who built the pre-railroad tramways, and that's the gauge they used.

*Why did 'they' use that gauge then?* Because the people who built the tramway: used the same jigs and tools that they needed for building wagons which used that wheel spacing.

*Okay! Why did the wagons have that particular odd wheel spacing?* Well, if they tried to use any other spacing, the wagon wheels would break on some of the old, long distance roads in England because that's the spacing of the wheel ruts.

*So who built those old rutted roads?* The first long distance roads in Europe (and England) were built by Imperial Rome for their legions. The roads have been used ever since.

*And the ruts in the roads?* Roman war chariots first formed the initial ruts, which everyone else had to match for fear of destroying their wagon wheels. Since the chariots were made for (or by) Imperial Rome, they were all alike in the matter of wheel spacing. The United States standard railroad gauge of 4 feet, 8.5 inches derives from the original specification for an Imperial Roman war chariot.

Which goes to show that specifications and bureaucracies live forever.

So the next time you are handed a specification and wonder what horse's backside came up with it, you may be exactly right, because the Imperial Roman war chariots were made just wide enough to accommodate the back ends of two war horses. Thus, we have the answer to the original question.

There is an interesting extension to this wee story...

When we see a Space Shuttle sitting on its launch pad there are two big booster rockets attached to the sides of the main fuel tank. These are solid rocket boosters, or SRBs. The SRBs are made by Thiccol at their factory in Utah.

The engineers who designed the SRBs might have preferred to make them a bit fatter, but the SRBs had to be shipped by train from the factory to the launch site. The railroad line from the factory had to run through a tunnel in the mountains. The SRBs had to fit through that tunnel. The tunnel is slightly wider than the railroad track, and the railroad track is about as wide as two horses' behinds.

So, the major design feature of what is arguably the world's most advanced transportation system was determined over two thousand years ago by the width of a horse's backside.