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INSTITUTE OF HEALTHCARE ENGINEERING AUSTRALIA

HEALTHCARE FACILITIES

LEGIONELLA RISK MANAGEMENT – *State and Commonwealth Requirements*

PROTON BEAM THERAPY – *Implications for Hospital Design*

HIGH PROFILE BACKING FOR GS1 DRIVER – *Cutting Costs, Improving Efficiencies*

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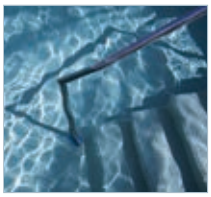

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IHEA MISSION STATEMENT
To support members and industry stakeholders to achieve best practice health engineering in sustainable public and private healthcare sectors.

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EDITORS MESSAGE

I am delighted to have been involved with compiling this new and exciting edition of the IHEA Journal. With the name change of the IHEA, from the Institute of Hospital Engineering Australia to the Institute of Healthcare Engineering Australia, comes a renewed focus to improve our representation and presence in the broader healthcare sector.

In the healthcare engineering sector there is always something exciting going on as technologies improve, standards and compliance moves to address new risks, learning from incidents and disasters helps us to prevent recurrence in the future. New treatments require modification to existing systems, and the ever increasing burden and expectations placed on the healthcare sector means we all have to be doing things more efficiently and effectively.

These interesting times are spread widely across the acute sector, residential aged care, research organisations, allied health services, primary health and regional and remote areas. These are the areas in which the Institute of Healthcare Engineering Australia facilitates the sharing of information, professional development, networking and engagement.

The intention of the name change, is to recognise that the strength of our membership and potential for the valued contribution of all stakeholders is well beyond the "traditional hospital engineer" – whatever that was or is.

"The Hospital Engineer" as the flagship publication of the IHEA has served our members and supporters well over many years and the new name and revised format is more like a partial refurbishment rather than a complete rebuild. The editorial committee, publishers and many responding readers all agree that the IHEA journal is of high quality, appropriately relevant and extremely informative.

We believe the new name will capture the attention of a wider audience, and once they have the publication in their hands (or on their screen or device… or whatever future technologies may provide), there may be an appreciation that some things never change. Namely, that well informed, technical specialists and highly regarded managers all contribute to the essential outcomes of our clients, patients and residents. Education and support is critical to the safety and sustainability of these assets, and the IHEA is here to help make that happen.

We thank all of our contributors over the years, and look forward to maintaining a relevant and beneficial relationship into the future under the headline banner of "Healthcare Facilities".

Whilst I have been part of the editorial committee for a number of years, this edition marks a significant change in the presentation of this publication, and we want to hear from you, our readers. A "Letters to the Editor" section will be included which you are invited to contribute to. "Letters" should be emailed to editor@ihea.org.au. As is the editors challenge, not all mail can or will be published or necessarily responded to in the public forum, but we welcome your feedback and contributions.

In recognition of the years of service and contributions of many long-serving IHEA members, we will also introduce a new section, "Reflections"– where we will seek reflective stories and anecdotes from those with a few runs on the board. Often stories that are part of our history will be of interest, like the ones shared by our longest serving member, Mr Charlie Shields at the National Conference in Adelaide, last year. Periodically under this heading we may dig into the archives of past journals and republish items of special interest.

We look forward to the ongoing support of our sponsors and partners. With this refreshed approach, comes a push into electronic publishing, where *"Healthcare Facilities"* will be shared widely in an online format. The assistance of our partners is essential to the quality of the network provided by the IHEA, so we will invite advertorial content, for which the IHEA gives no warranty or specific endorsement, but this forum may provide you with a new solution to an old problem.

Our cover image is of the newly completed Royal Adelaide Hospital an essential part of the healthcare facilities landscape in South Australia. It was announced this week that completion is imminent and it is expected that the facility will be open for business around mid-2017. Delegates at the IHEA National Conference were able to tour the site late last year and it was agreed that this project brings together some ground-breaking technology and innovation. All the more reason to ensure that the Healthcare Facilities experts are well informed to ensure delivery of services is in line with expectations. We congratulate the IHEA members who have been involved in this mammoth project and look forward to hearing more, as the quality, safety and sustainability benefits are realised into the future.

Regards
Darryl Pitcher

NATIONAL PRESIDENT'S MESSAGE

Welcome to the first Edition of Healthcare Facilities, your rebranded journal. This journal name change followed the change of our name from Institute of Hospital Engineering to Institute of Healthcare Engineering voted and accepted by members at the last Annual General Meeting. The Board endorsed this proposed change in name that will enable the Institute to engage with members right across Healthcare and will remove the perceived limitation to the "Hospital" sector.

The Board has maintained its commitment to address the business needs during the past period. We are undertaking a rebranding exercise over the next few months commencing with the Journal and the IHEA Website. We will update members as this process evolves.

FEBRUARY BOARD PROCEEDINGS AND SUMMARY OF KEY ACTIVITY

The National Board meet in Melbourne 9-10th February for 2 days. The first day held at the Royal Melbourne Hospital was a strategic planning day focussing and reviewing the 2016-108 IHEA Strategic Plan. The specific areas of focus were:-

- What we have achieved, what is still to be done
- Results of the IHEA Members survey
- Professional Development
- Website redevelopment
- Social Media plan
- Building on membership numbers
- Increase IHEA Journal circulation – Digital distribution

(The revised strategic plan has been uploaded onto the IHEA Website).

Our annual Business Plan was also reviewed in detail. Specifically the following items were discussed and progress updated:-

Increased Marketing

- Marketing and Communication Strategy developed (including social media) & Website to be reviewed and updated.

Membership

- A review of membership grades and increasing membership benefits is a work in progress with a special subcommittee appointed to undertake and report at our next board meeting

Professional Development

- Development of standardised Professional Development program for each state for consistency. Development of remote member engagement strategies for Professional Development.

Communication

- Streamlined monthly E-Bulletins to members

Our 2nd day consisted of Board Meeting and was held at The Pullman Albert Park, the venue for the 2017 National Conference.

- Financial and Risk Management report presented by Mal Allen with a good result year to date predominately from the successful National Conference.
- Brett Nickels presented the Standards report updating status of our representations on specific standards. Discussion was held over AS3811 Patient Monitoring System. It was agreed we will approach Standards Australia to offer IHEA assistance in coordinating a committee to review and possibly reinstate this standard.
- Peter Footner presented the membership report which highlighted a steady growth in new members.
- It was agreed that IHEA would join other associations and increase our exposure to "like minded" organisations and widen our reach for memberships.

  Australian Healthcare and Hospitals Associations (AHHA), Healthcare without Harm, Australian Private Hospitals Association, Australian College of Infection Prevention and Control, Australian Biomedical Association.
- The 2018 International Federation of Hospital Engineering (IFHE) congress, Brisbane was discussed and an update provided from the Professional Conference Organiser. We are well placed in our forward planning for this event. A partnering agreement has been forged with AHHA who are conducting their international conference at the same venue following the IFHE Congress. WE have agreed to support the efforts of each other's organisations to deliver successful conferences and leveraging marketing opportunities.
- S.A. Branch Conference Convener Peter Footner provided the Board with the final report on the successful 2016 National Conference. Feedback from delegates surveyed was extremely positive.
- State branch reports were tabled, these outlined the upcoming Professional Development Seminars being planned.
- ANZEX Delegate (2017). An Expression if interest has been circulated for members to nominate to represent the IHEA in New Zealand in November '17.

FACILITIES MANAGEMENT AUSTRALIA (FMA)

Members, the IHEA have approached the FMA as a services provider for a strategic alliance. Please let me reassure each of you that the Strategic Alliance proposed is:

1. Not a takeover or acquisition – but a partnering agreement by a like minded organisation
2. Expected to bring benefits to IHEA

We have asked FMA to undertake our membership administration. That is to include membership administration of records, regular invoicing, follow-up engagement of non-financial members, automatic electronic collection of funds and remittance to our bank account. The FMA have a customised electronic system for membership administration that we see as a benefit to our administration process. We anticipate having this in place shortly.

SUMMARY

In closing, there is lots of work ahead and the Board Directors are a very active and dedicated team striving for the betterment of all members. The recent member survey results highlighted areas where additional focus is required and the feedback has been reviewed and actioned. This has been included in our business & strategic planning moving forward and we are conscious of delivering and achieving our key performance targets.

Brett Petherbridge

IHEA National President

The National Board of Directors is as follows:-

Name	Position		Email
Brett Petherbridge	National President	Executive Committee	brett.petherbridge@act.gov.au
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Greg Truscott	Director – Asset Mark		Greg.Truscott@health.wa.gov.au
Michael McCambridge	Director (co-opted)		Michael.McCambridge@mh.org.au

WA BRANCH REPORT

Branch Meeting September 2016, Osborne Park Hospital

Osborne Park Hospital was the venue for the September branch meeting and host Fabien Edwards welcomed the attending 20 members.

Meeting sponsor Softlogic, represented by Nazar Jai, have been providing comprehensive and highly integrated software solutions for the Healthcare sector for the past 12 years. Nazar's unique value proposition is to develop, market, sell, implement and support world class software solutions in line with industry requirements.

Softlogic's presentation introduced a 'first' for the members, a 45 minute real-time 'on-line' international video and audio feed directly from their central London office. Special thanks to Mark who had an early start to his day in the UK for delivering an interesting talk on legionella and the appropriate conditions to contain and monitor the bacteria.

Branch Meeting October 2016, King Edward Memorial Hospital

Host, Philip Hawkins warmly welcomed the attending 18 members to the Professional Development (PD) session being conducted at King Edward Memorial Hospital.

The topic of the PD, was the High Voltage network increase from 6.6KV to 11KV, carried out by the local power provider Western Power for the suburb of which the Hospital is located.

Specialised High Voltage PPE.

Session 1 presented by Alex Foster of Fosters Services focussed on the regulations embedded within the Australian Standard document AS2067:2016, substations and high voltage installations exceeding 1 kV a.c. and the Guidelines for the safe management of High voltage (HV) installations.

The second professional development session was presented by Phillip Hawkins, highlighting the HV project upgrade planning, tender, procurement and logistic phases.

Fortunately for the King Edward Memorial Hospital, the capital outlay required for the HV upgrade was made available and funded by Western Power.

Also in October, long-standing member Don Kelly announced his retirement, following 20 years of service at Bethesda Hospital. Don started his career in the commercial maritime industry, eventually moving into the healthcare arena in WA. Don gained great respect from his colleagues and he also donated much of his time to numerous charitable causes over the years.

The WA branch wishes to congratulate Don on his retirement and service to the institute. Don and his wife now plan to travel Australia and spend time fishing (literally) for their supper.

Don Kelly – time to hang up the slide ruler.

Service Awards

Congratulations and recognition to the following WA members who have achieved their membership service certificates:

10 Years – Peter Klymiuk
20 Years – John Althuizen
30 Years – Colin Hartridge

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Peter Klymiuk being presented with his certificate by WA Branch President Greg Truscott.

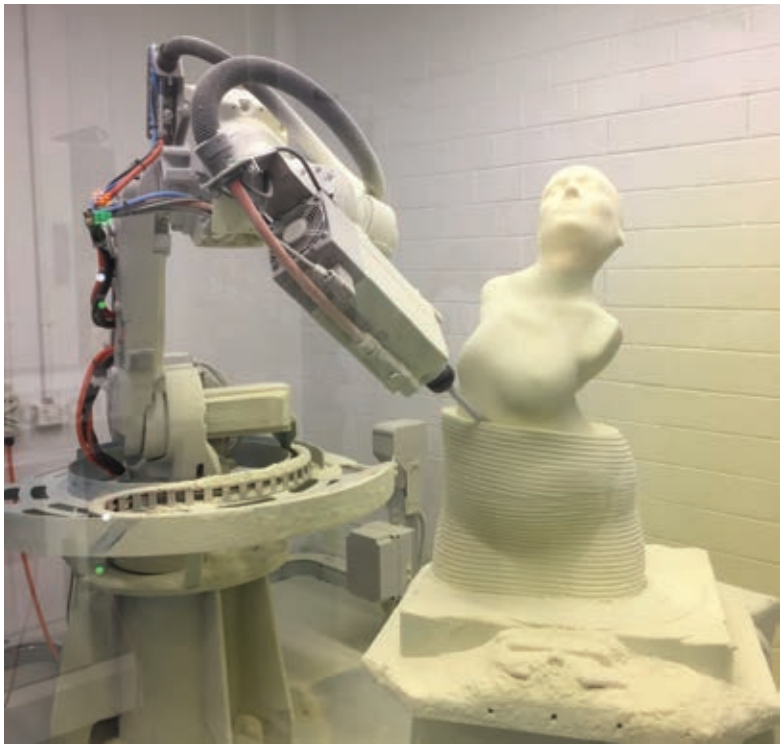
Branch Meeting November 2016, Royal Perth Hospital

Royal Perth Hospital hosted the November meeting, with Steve Dallas kindly welcoming all 32 members and guests.

Members were given the rare opportunity for a guided tour of the RPH Medical Engineering and Physics department. The department comprises of 4 divisions: Clinical Physics, Bioengineering, Scientific Computing, and Technical Services. Bioengineering was the focus of the tour, consisting of Centre for Implant Technology and Retrieval Analysis (CITRA) and Rehabilitation Technology Unit (RTU).

CITRA offers services for custom medical device design and manufacture, as well as analysing implants that have been retrieved from patients. The CITRA team utilise technologies such as 3D printing to deliver custom solutions to medical practitioners, including titanium cranioplasties, acetabular cages, orbital plates, and patient-specific surgical guides. Analysis of retrieved implants is aimed at determining wear, degradation, and failure mechanisms in order to better inform surgeons about the efficacy of the products. To date CITRA has analysed a collection of almost 10,000 implants over the last 40 years.

The Rehabilitation Technology Unit delivers a suite of services centred on rehabilitating patients. RTU utilises state of the art 3D scanning coupled with a 7-axis robotic carver to develop and create realistic models of the patients that can then be used to produce bespoke orthotics and prosthetics (such as spinal braces and ankle-foot orthoses) as well as custom contoured cushions. This technology was purchased 12 months ago at a cost of around AU$500,000. The unit also provides both manual and powered wheelchairs that are customised according to the patient's needs.

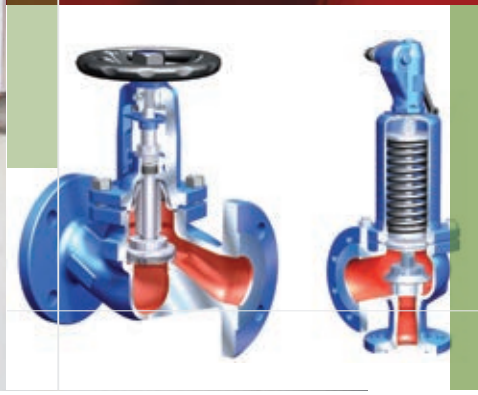


Scoliosis support mould in production with a robotic milling machine.

Selection of various femoral stems use in hip replacement surgery.

Hip replacement components usually comprise of an acetabular cup, including a metal shell with a plastic, metal, or ceramic liner to replace the acetabulum. The femoral stem is inserted inside the femur, and the femoral head (or ball) fits inside the acetabulum. Once the three components are aligned, more natural movement may be restored.

RPH wheelchair service bays.



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Storage available for over 120 wheelchairs.

Steve Dallas & David Babich.

The RTU provides state-wide services for maintaining and modifying wheelchairs to suit specific patient needs. The unit has over 120 wheelchairs available at any time ready to go or able to be altered in-house to suit any patient who requires one.

Bill Busby represented sponsor Pride Plumbing. Established in 1992, Pride Plumbing has grown to become one of WA's leading suppliers of both domestic and commercial plumbing and gas services. They are a family owned and operated business that is dedicated to achieving and maintaining the highest levels of customer service.

Annual Christmas Function, Best Brew Bar Perth CBD

End of year function: This IHEA hosted social function was attended by 52 members and their partners to celebrate another successful year for the WA Branch. We enjoyed perfect Perth weather on the venues open deck overlooking the street, with guests enjoying finger food, refreshments and each other's fellowship.

Jess Tercier & Debra Truscott.

End of Year function, on our private deck.

Branch Meeting February 2017, St John of God Hospital, Midland

Members had been looking forward to tour this new greenfield site incorporating 307 public beds, plus a 60 private bed hospital for some time. In 2010 the State Government decided a private entity would design, construct, operate and maintain the new hospital and St John of God Health Care was selected through an

expression of interest (EOI) for this DBOM process and delivered under a Public Private Partnership.

The facility, located next to the historic Railway Workshops precinct which opened in November 2015, had a construction cost of $360M. It has a comprehensive range of Clinical services including an Emergency Department.

Host Darryl Carter welcomed 28 members and guests and given he had only joined the IHEA last year, commenced telling us a little about himself and conducted an interesting and engaging tour of the key plant rooms and back of house utilities.

Greg Truscott

Branch President

Article Correction: The September 2016 edition of the journal listed the incorrect names of Chris Burden and Shane Listing in relation to their trade award photographs, apologies to both Chris and Shane for the error.

Due to a publishing anomaly, the articles which did not make the previous edition are included above.

SJoG Midland main foyer and reception.

VIC/TAS BRANCH REPORT

Professional Development Seminar Report

PD1 – Health Purchasing Victoria (HPV) and Water Quality (RO Systems)

Venue: Epworth Hospital Geelong

Date: Friday 17 February 2017

Attendees: 32: Regional 16 (4 Geelong); Melbourne 7; Corporate 3, Presenters & Sponsor 6.

Agenda:

10.00 am	Registration
10.15 am	Welcome
10.20 am	Introduction to Health Purchasing Victoria **David Clarke, Current Projects; Procurement;** Customer Engagement; Role of Engineers/Facility Managers in Future Projects
11.10 am	Presentation RO Systems **Merck Millipore, Rick Zolcinski, Lab Water Sales Specialist**
11.50 am	Special General Meeting
12.00 pm	Sponsor Presentation – Carbonetix
12.15 pm	Lunch
1.00 pm	Tour of Epworth, incorporating RO Plant
2.30 pm	Conclude
2.35 pm	COM meeting & National Conference planning

Summary:

Our first Professional Development Seminar for 2017 was held at the Epworth Hospital in Geelong and we offer a special thank you to Steve Ball and the Epworth Group for hosting the PD. The Auditorium venue was excellent for comfort and AV facilities and added to the value of the presentations.

Health Purchasing Victoria presentation by David Clarke outlined the role and function of HPV, their current projects, customer engagement strategy, and the role of Hospital Engineers in future contracts. He discussed the upcoming renewal of the Electricity Supply contract and the expected substantial increase in energy prices and the reasons for the recent substantial increase in gas prices. Dr Jefferson Hopewell outlined his role in pursuing sustainable procurement policies.

The HPV presentation used up its allocated time slot and then some, and the questions and discussions following was evidence of the interest in the session and information presented.

Rick Zolcinski of Merck, presented a technical presentation on Reverse Osmosis water systems and provided details on types and classification of pure water and using RO systems to produce, store and reticulate pure water.

A Vic/Tas Branch Special General Meeting was held to confirm nominations for a new committee of management and Executive. The nominations matched the number of vacancies so no election was required and the formalities were concluded promptly. The new CoM consists of Michael McCambridge (Branch President); Rod Woodford (Past President); Rod Cusack (Treasurer); Peter Crammond (Secretary); Committee members are

Mark Hooper, Sujee Parangoda, Steve Ball and Howard Bulmer. We thank all of our willing members who have accepted these roles and look forward to continuing to serve the Vic/Tas Branch in the coming year.

Our Sponsor for the day was Carbonetix and Rick Hudephol provided an introduction to the company and the strategies they use to provide solutions for their clients on a variety of sustainable projects. We thank Carbonetix for their contribution towards covering the cost of the PD seminar. We thank Zuki for doing an excellent job with catering.

After lunch we toured the Epworth Hospital building, with a detailed inspection and explanation of the RO plant and an overview of the various plant and equipment servicing the Hospital. Of particular note it was interesting to see the standby battery bank which can provide 2 hours electricity supply, in addition to the Emergency Generators.

Thanks to all the members for their attendance and involvement.

QLD BRANCH REPORT

February State Presidents Report

On behalf of the QLD Branch I would like to acknowledge the continued support of the QLD IHEA Branch Committee of Management, all Branch members, National Board and our many and varied sponsorship partners all of whom have contributed another successful year gone. Let me begin by wishing you all a very happy new year and I look forward to working with you in the months to come.

End of Year Professional Development Seminar

It was exciting to see a full house at our end of year Professional Development (PD) seminar; it was well attended and good to see trade staff representation from the Toowoomba Hospital. My congratulations and many thanks to the Staff and Management of the Pineapple Hotel for the provision of excellent meeting facilities and their continued support.

The PD seminar discussed changes within mechanical services and floor covering technologies. Paul Goodison and John Stilianos from Veolia provided us with an informative paper on Central Energy Plants, to the theme "Phase out and Introduction of Refrigerants – new and old" and shared with us Trane's latest generation of chillers.

Brett Nickels provides an update from the National Board to the QLD Branch.

QLD Branch meeting.

Dean Blackborough, Darren Hoffman, Wendy Davis and National Manager Mark Chate from Gerflor presented an excellent overview of their Health orientated portfolio of flooring products including wall protection, hand rail systems and the associated compliances and infection control mechanisms. Their new fire compliant wall sheeting is particularly exciting as it results in reduced damage to walls from trolleys thus reducing maintenance and is also easy to clean.

The networking function following the PD seminar was both a welcome interlude and enjoyable conclusion.

End of Year Function

We capped off the year with a small group of members and sponsors dinning out at popular South Bank venue, Ahmets Turkish Restaurant. Despite the heat and humidity I believe everyone had an enjoyable night – word to the wise if your ordering the Kings Banquet, bring a healthy appetite.

The Branch Committee of Management will be focusing on continued improvement with the engagement of our members and the provision of quarterly Professional Development (PD) seminars.

Its with regret that we have lost our Secretary, Jeff Turner from the Logan Hospital, he has accepted a position with the United Arab Emirates and will be leaving Australia very early February. A great opportunity for him and a big loss for us – on behalf of the team Jeff, our congratulations and good fortune with your endeavour's.

Toowoomba Country Meet

We started the year with our annual trip to Toowoomba. On 17th February 22 members of the Queensland Branch gathered for dinner at Encores Restaurant. This was in preparation for the Annual Country Meeting at Toowoomba. There was a lot of lively discussion as we dined on some exceptional food and met again for the first time in 2017.

The Following morning, Saturday we met for the half Yearly State Special Meeting at the Toowoomba Library, where the main topics for discussion were the PD program for the year and the mid-year conference, the dates will be added to the website. After coffee we were met by Chris Seth, Building Services Manager for Toowoomba regional Council, who took us for a guided tour behind the scenes of the new and very complex City Library. The building has high levels of automation and control, over 3000 control points, with an extensive amount of integration of various systems. The building uses air cooled chillers on a 4 pipe system for climate control and can be

Toowoomba City Library.

Queensland Branch members view the City Hall upgrade works.

QLD Members touring plant at Toowoomba City Library.

Exterior of the City Hall upgrade.

both heating and cooling at the same time. Only one area is humidity controlled, and this is a very sensitive historical collection. We were also accompanied by Barry Dever, the General Manager of Alpine Air Toowoomba, a local mechanical services contractor, that has a long term arrangement with Council for the provision of mechanical services support.

Our visit to the Library was followed by a visit to the nearby Town Hall. This is an historic building that is being returned to its 1930's art deco design, though not the original design. Andrew Civil, Western Regional Manager for Northbuild Construction was happy to show us through the site. The work involves the gutting of the old hall, restoration of a vaulted ceiling, lowering of the original timber floor, restoration of the proscenium arch replacement of various services, and installation of a new mezzanine that will contain meeting rooms.

Interior refurbishment of City Hall.

Interior refurbishment of City Hall.

The Toowoomba crew – Wally Freiling, Ross Gibbon, Alan Davis.

Specialist consultants for acoustics and heritage work have been engaged along with the normal array of building designers. The building is a cavity brick structure with a single brick external skin and a double brick internal skin all laid in lime mortar instead of the usual cement/lime mix this is posing a number of construction difficulties because despite the sealing healing nature of lime mortar it is quite weak and does not tolerate drilled fixings and vibration well.

On Saturday evening we gathered for the major social function at the Clifford Park racetrack for an evening of racing and dining. With about 27 present a great night was had by all. Wally Freyling managed to attend the night, but unfortunately his wife was not able to come this year. For those that don't know Wally, he was one of the founding members of the Qld Branch.

As usual Wally had some great stories to tell of past members and life in the hospitals years ago.

A few diehards made it to breakfast the next morning at the Engine Room Café, just opposite the Heritage Listed Railway Station. This building also had an interesting history having been a shop and a roller skating rink before becoming a fine café.

All in all an excellent weekend away was had by all.

Brett Nickels

On behalf of the QLD State President Scott Wells

Best dressed couple at the Toowoomba Races social outing, Richard MacAvoy (Ashburner Francis) and Linda Devitt.

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SA BRANCH REPORT

Branch Committee of Management

After something of a hiatus following the considerable work involved in preparing for and running the National Conference back in October, the SA Branch Committee of Management is again up and running, preparing for professional development and membership activities for 2017.

The current CoM membership and roles are as follows:

Position	Member
President	Peter Footner
Vice President	John Jenner
Treasurer	Peter Footner
Secretary	John Jenner
National Board Rep	Peter Footner
National Board Rep Proxy	John Jenner
Committee Member 1	Darryl Pitcher
Committee Member 2	Vince Russo
Committee Member 3	Tony Edmunds

From an administration viewpoint, the most significant development for the Branch has been the establishment of an informal relationship with like-minded professional membership organisations operating in South Australia. Though informal, it is expected that we can leverage our affiliation with these organisations to provide an even greater range of networking and professional development opportunity for our SA members.

The affiliated organisations involved in these arrangements are as follows:

AHSCA (Association of Hydraulic Services Consultants Australia Inc. (SA))

AMCA (Air Conditioning & Mechanical Contractors' Association)

CIBSE (The Chartered Institution of Building Services Engineers)

EESA (Electric Energy Society of Australia)

IES (Illuminating Engineering Society of Australia and New Zealand)

IFE (Institution of Fire Engineers Australia)

IHEA (Institute of Healthcare Engineering Australia)

IPEA (Institute of Plant Engineers of Australasia)

NFIA (National Fire Industry Association)

YEN-SA (CIBSE Young Engineer's Network)

Branch CoM representatives participate in monthly coordinating committee meetings to plan upcoming PD events across all the participating organisations.

Professional Development & Networking

Through our involvement with CIBSE and affiliated organisations, a full program of events has been mapped out for the rest of 2017. While not all events will be of interest or relevance to Institute of Healthcare Engineering Australia members, relevant seminars will be communicated to our members on a case-by-case basis. The relationship with these organisations should provide development benefits to our individual members and broader exposure to a wider group of engineering and facilities management operatives for our corporate members.

The CoM is continuing to develop a couple of PD events across the course of 2017 which will be of specific relevance and benefit to IHEA members. In particular, two seminars are currently being panned in relation to:

- Operating & Maintenance Manuals
- Indoor Air Quality & Healthy Buildings

Membership

As part of a national strategy to promote the renamed/rebranded IHEA, the SA Branch will be contacting potential and past members outlining recent developments across IHEA and encouraging them to join up, with the intention of attaining a critical mass of hospital and aged care facility/asset managers across the State.

Peter Footner

SA Branch President

NSW/ACT REPORT

February 2017

The NSW/ACT Branch COM is currently planning the state AGM with several venues and theme options being considered at present. Planning is also underway for the next professional development day which will be theme based rather than multi-faceted after some feedback received from members at the last event. The importance of these events within our industry cannot be overestimated as our November event has been favourably mentioned at executive level at NSW Ministry of Health regarding medical gas management.

Membership in the branch is starting to trend upwards which is a positive sign for the status and health of our organisation and we extend a warm welcome to all new members

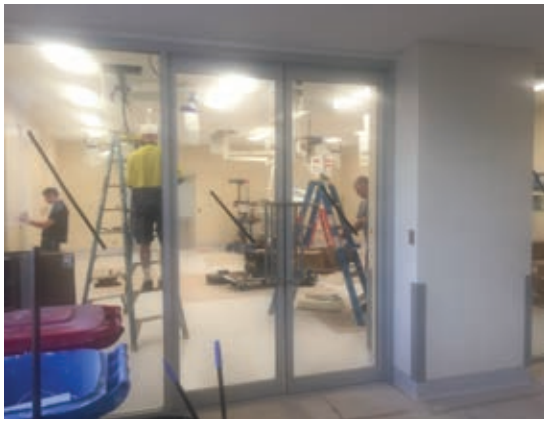
It is encouraging to note that two of our new members have had close involvement of an exciting new development at Sydney Local Health District. A world class robotic surgery teaching facility is nearing completion at Royal Prince Alfred Hospital.

When commissioned the facility will have two fully operational training theatres and will be one of the southern hemisphere's leading training centres in the exciting new field of robotic surgery

The facility is housed in a repurposed warehouse compound and has all building services and construction designed and project managed entirely by in house engineering services staff. The two IHEA members Chris Batch and Troy McIntyre have managed the design and installation of electrical and mechanical services in what is a highly technical installation.

Jon Gowdy

Director Engineering Services SLHD
MIHEA
NSW State President



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ARE CONDENSING BOILERS SUITABLE FOR RETROFIT OF AN 80°C/60°C CONVENTIONAL BOILER SYSTEM?

By Dr Paul Bannister

In previous articles we have considered the heating efficiency gains available through the use of condensing boiler technology and how these efficiencies are achieved. We have also looked at the way the lower temperature set points common to condensing boilers further enhances efficiency due to lower standing losses.

In this article, we'll be answering a question often encountered in the industry: whether condensing boilers offer a benefit in retrofit 80°C/60°C installations.

Typically, boilers are replaced like for like when replacing an existing boiler that has reached the end of its life. However, performance data shows that even though optimum performance of condensing boilers occurs at temperatures below 60°C, condensing boilers can still provide substantial energy efficiency benefits when retrofitted to a conventional 80°C flow/60°C return hot water system.

The major increases in efficiency are available in times when the heating load is less than the peak design value and can be achieved by varying the boiler operating temperatures from 80/60 at times of peak load to lower temperatures when heating loads are lower.

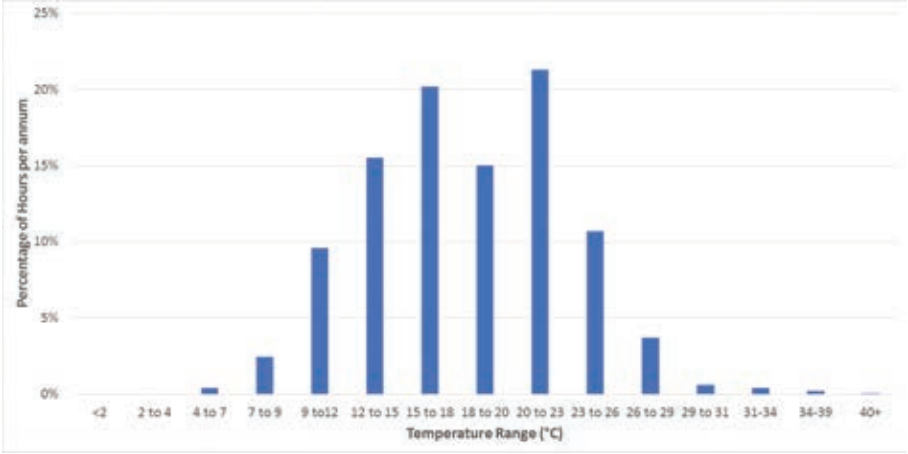


Figure 1. Sydney temperatures as a histogram. Other centres will be similar, but displaced up or down the scale dependent on climate.

This is quite simple to achieve using the on-board controls available on most condensing boilers, which permit the supply hot water temperature to be reset by an outside signal. The total efficiency gain achieved is almost as good as if the system was being run at low temperature all the time.

HEATING LOAD PROFILE

To understand how this is possible, it's necessary to look at the heating load profile. Figure 1 shows the annual temperatures for Sydney as a histogram.

Given normal design temperatures, the heating hot water system will be sized to be at 100% capacity in the 4-7°C temperature bracket. However, this comprises only 0.4% of the hours in the year. If we estimate that heating load decreases linearly from 100% in this temperature bracket to 0% by the time the temperature has

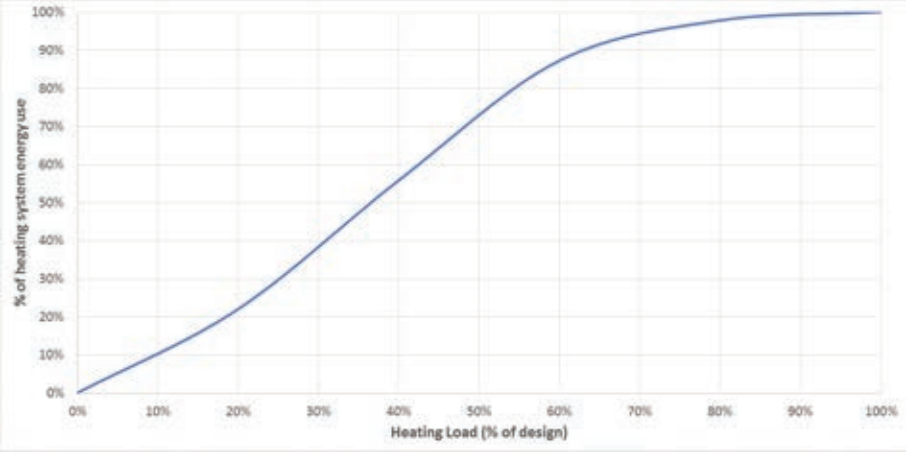


Figure 2. Heating hot water load profile.

reached 18°C, we can estimate the total energy consumption profile for the system, as shown in Figure 2.

It's pretty clear from this that the vast majority of the energy use occurs at less than 60% of design capacity. This is important, because it is only at the higher loads that the heating coils need the 80°C supply temperature they were originally designed for.

So it's possible to set the temperature control to adjust supply hot water temperature to reflect system needs, and provide hot water at 80°C at peak loads while maximising condensing boiler efficiency benefits at lower loads – which comprise the vast majority of the time.

EFFICIENCY BENEFITS

It's important to remember as a starting point that even in non-condensing conditions (such as 60°C return hot water temperature), a condensing boiler will still provide an efficiency benefit of around 5% relative to a conventional boiler. This is because the additional heat exchanger area of the condensing boiler improves efficiency even when no condensing occurs. However, once we drop the return water temperature below 55°C, the condensing efficiency benefits kick in and we start seeing combustion efficiency impacts of 10% and better – as well as reduced distribution pipework thermal losses.

The efficiency benefits are significant. If we compare an 80/60°C conventional boiler system to an equivalent condensing boiler system operating on a variable temperature schedule (80°C at 4-7°C reducing to 60°C by 15-18°C) and a condensing boiler operating at fixed temperature (60°C supply, 40°C return) using the heat energy profile in Figure 2, we get the results shown in Figure 4.

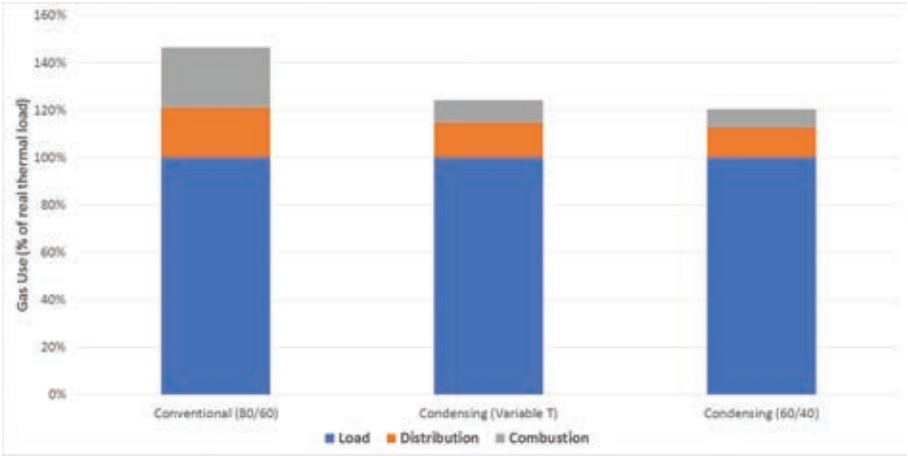
It can be seen that the variable temperature configuration achieves overall gas savings of 15% relative to the conventional boiler. This compares well with the fixed 60/40 condensing boiler, which achieves only marginally greater savings at 18%. The vast majority of the condensing boiler savings are retained in the variable temperature configuration.

CONCLUSION

Condensing boilers are an ideal retrofit for an existing 80°C flow/60°C return system. Modulation of the supply temperature, typically across the range 80°C-60°C across normal operating conditions, enables the system to serve the full system demands of the hot water system while still achieving the significant efficiency benefits of a condensing boiler system.

Written by Dr Paul Bannister, a thought leader and public speaker on energy and energy efficiency issues in Australia, for Automatic Heating Pty Ltd.

Figure 4. Full year efficiency for conventional, variable temperature condensing and fixed temperature boiler configurations based on the heat profile from Figure 2.



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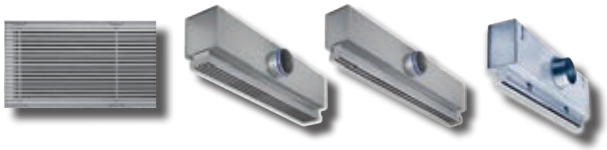

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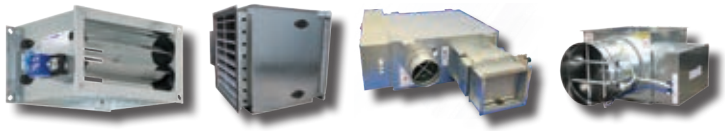

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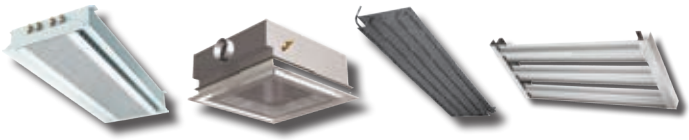

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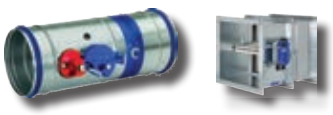

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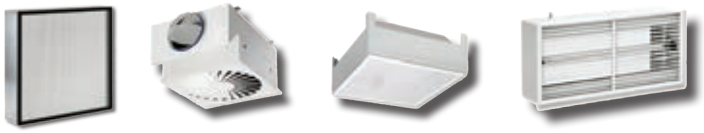

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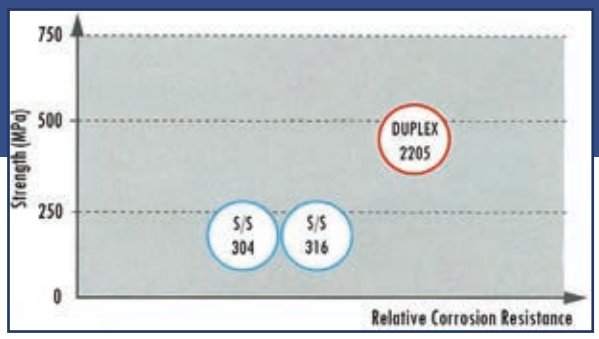
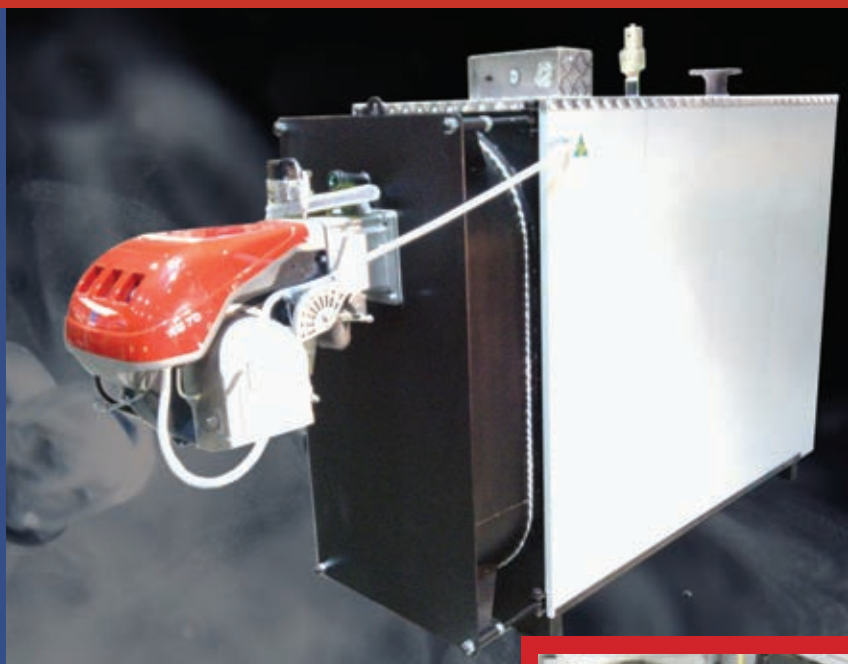


Strength and Relative Corrosion Resistance Duplex 2205 vs 304/316 Stainless Steel



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EFFECTIVE HEPA DESIGN AND OPERATION FOR HOSPITAL ENVIRONMENTS

By Airepure Australia 2017

HEPA air filters play a vital role in maintaining indoor air quality (IAQ) by reducing the fine airborne particles that can harbour bacteria and viruses – critical in many hospital settings, locations including but not limited to cancer wards (immune suppressed wards) and operating theatres. They also play a role in the containment of sub-micron particles from exhaust systems, where particles may be toxic or harbour airborne bacteria and viruses.

HEPA BASICS

HEPA filters are designed to capture small particles that can be measured to a quantifiable level. Ratings are usually based on a particle size of 0.3 micron airborne particles at an efficiency rate of 99.95% or greater.

HEPA air filters are classified according to their retention (efficiency) at the given MPPS (most penetrating particle size), typically 0.3 micron:

H13 with a total retention of >99.95%
H14 with an overall retention of >99.995%
U15 with overall retention of >99.9995% (very rarely used)
U16 with overall retention of >99.99995% (very rarely used)
U17 with overall retention of >99.999995%
(very rarely used)

The location or primary function of different hospital areas and departments determine the type of HEPA filters that will be used.

Supply Filtration

HEPA filters are typically used to supply clean air to a range of hospital areas. Terminal HEPA filters systems are generally preferred for supply air applications within hospitals, as the clean air is supplied directly to the room or space served.

Terminal HEPA filters in immune suppressed areas:

- Cancer wards
- Positive isolation rooms
- Burns rooms (low flow)

Terminal HEPA filters and Ultra Clean Ventilation systems (UCVs) in:

- Operating theatres
- Setup and recovery areas
- Sterile store stock areas

Terminal HEPA filters in clean spaces:

- Pharmacy
- Cytotoxic areas
- Research/laboratory areas
- Pathology areas
- Cyclotron/nuclear medicine areas

Exhaust Filtration

HEPA filters are also used to contain contaminates from being discharged to outside or other spaces within the hospital through exhaust HEPA filtration systems, which may be located within:

- Isolation rooms
- Cytotoxic areas,
- Research/laboratory
- Pathology areas
- Cyclotron/nuclear medicine areas

SEALING APPROACHES – MECHANICAL OR GEL-KNIFE EDGE

Mechanical sealing utilises gaskets of varying forms, mounted on the perimeter frame of the HEPA, which act as a sealing mechanism between the HEPA filter

and the housing mating surface. The surfaces must be smooth and flat, in some instances; considerable compressive pressure is required to ensure a good seal. Mechanical sealing is a proven method. It can however be quite time consuming to install and remove (especially if there are any mating surface issues).

As mentioned, flatness of the mating surfaces is critical to sealing, as any significant twisting or deformation along the surface length can result in gaps that the gasket is not capable of sealing. It is possible to over tighten, and twist and fracture the HEPA filter itself. Similarly, gaskets, when over compressed can either "cold flow" or deform permanently, resulting in gaps and thus air leaks.

The development of inert, soft gel polymer materials and reasonably priced, extrusion based HEPA frames, resulted in the development of gel-knife edge seal type HEPA filters. The gel is a soft, semi set material which is non-viscous and has the consistency of set jelly. The "knife edge" of the housing embeds into the soft gel sealing material within a channel around the HEPA Filter. This is considered a more mechanically forgiving and versatile sealing method, as this gel-knife edge seal will tolerate minor installation issues (such as uneven surfaces) and helps to limit the possibility of air bypass sometimes associated with gasket seal applications when they are disturbed.

In Australia, the use of gel seal HEPA filters has become the "default" choice over the last decade. Soft polyurethane gels may be used (for silicone sensitive applications); however, recent trends show the general chemical and environmental stability of Silicone gels are delivering the most popular solutions for HEPA applications.

Misguided attempts to retro-fit mechanical seal to gel-knife edge seal (or the reverse) to existing housings of one type are generally cost and time ineffective. If there is an application specific reason for using one particular sealing type, that needs to be determined on installation – or if change is needed, replace the entire housing and filter style.

HEPA MODULES AND HOUSINGS

Supply Applications

Inline/induct HEPA housings are typically used where clean air is required but it is not highly critical (i.e. grade D, with possible scope to achieve grade C). HEPA filters used in this supply application are typically large in size and have a high airflow capacity. This allows for fewer filters to be used to achieve the required airflow, and

often the final contaminant loaded pressure is high. What must be considered is that the duct between the inline HEPAs and the terminal may generate (or seep in particles), oxides of metals, mould etc., and these contaminants can enter the airstream after the filters – hence the popularity and effectiveness of terminal HEPA filters, which assure a supply of clean air direct to the room/area required.

In many cases the "disposable" HEPA filter that supplies air to a given room will be housed in a simple "fixed" HEPA module, and these units will be sized to achieve an effective airflow to the room at approved face velocity rates that deliver the specified values of IAQ. Generally these plenum boxes will have top air inlet spigots, and sometimes have options for inspection plates and damper adjustment units for air flow balancing. The fascia sections of these units are precision devices, to afford a flat, square mounting for the HEPA filter. Materials of construction are typically extruded aluminium facias with a sheet metal rear plenum with options for protective mesh covers which serve to diffuse air flow from the HEPA and protect the delicate HEPA filter from in house cleaning processes.

Disposable HEPA modules/filters are not recommended for any application requiring testing. If a filter fails, it cannot be repaired and must be replaced. This is expensive and time consuming ceiling works are required. The clean zone can be exposed to possible contaminated ceiling/service spaces.

There are filter modules similar to disposable units that have replaceable filters, and this is the minimum recommended selection.

Proprietary manufactured terminal HEPA housings are specially manufactured units of varying construction (subject to the requirements of the application) and typically manufactured from sheet metal and or extrusion, with a stainless or powder coated finish. There is a correlation between product quality, performance and service life – and that is where true value lies. Subject to manufacturer, customisation can be undertaken for specific applications, or finish requirements (i.e. non-magnetic materials for MRI room applications).

In more specific circumstances such as operating theatres, HEPA filters are often arranged in purpose built, multi-filter housings to promote superior laminar air flow control and simplified installation. Refinements such as accommodation of various pendants and lighting systems are further enhancements.

Exhaust Applications

Accessibility to the upstream air side of the HEPA filter for initial and annual testing by a NATA accredited testing agent is a vital consideration for all HEPA exhaust filtration applications. This is applicable for all scenarios – whether the HEPA filters are located in terminal housings or inline within the duct.

Terminally mounted HEPA containment housings allow contaminants to be contained within the affected area (i.e. isolation room or cytotoxic area). As the ductwork is protected by the HEPA filter, there is a reduced risk of a potential contagion or contaminant spreading in the ceiling service spaces. As space within hospitals is at a premium, there is often minimal space at the terminal to provide suitable levels of pre filtration to extend the life of the HEPA filter (unless this is factored in within the design stage). Alternatively, inline HEPA containment exhaust filtration Bag-In/Bag-Out (BIBO) systems are used. This type of system, being much more stringent usually includes bubble tight isolation dampers, decontamination/ fumigation ports, a remote scan arrangement for testing and BIBO arrangements for filter change out.

HEPA "LIFE" ASPECTS

To be operated in a cost effective manner, pre-filtration should be considered to protect and extend the life of the HEPA filters. HEPA filters require adequate protection from general dust, lint and contamination by inexpensive, disposable filters to stop premature loading and replacement. In general, the higher the rating of the pre-filters, the longer the protected HEPA will last.

On a supply side application, a typical filter arrangement may be as follows:

1. Pre-filter (G4 pleated filter) – to seize larger particles, such as dust, lint, etc.
2. Intermediate filter (F8 multi-pocket bag filter) – to intercept small to medium sized particles, such as some bacteria, mould, etc.
3. Final filter (HEPA filter) – to capture the fine, elusive particles at 0.3 microns, such as viruses.

Without the sacrificial pre-filters, the HEPA filters are likely to clog rapidly, resulting in a service life of months instead of three to five years.

When good practices are followed, useful, energy efficient, high performance particle filtration should be achieved for 3 to 4 years of operation of the HEPA filter. The upstream pre-filters will be changed at far more frequent intervals, of 3 to 9 months. The pre-filters

are "sacrificed" to capture small to large particles, and will generally be changed out to maintain energy efficiency and assure no particle "break-through" occurs due to overpressure that has affected the structural integrity of the pre filter.

The concept of "saving" money by infrequent pre-filter changes is a false economy. The cost of the increased energy consumed by an overly dirty pre-filter quickly outweighs the cost of replacing the relatively cheap pre-filter. Additionally the fan may not have the capacity to be able to move the required amount of air to or from the space if the pre-filter is excessively dirty.

Generally all these filters, (HEPA's included) will not look "dirty" when they are due to be changed. In general, when the filter is clearly discoloured, it is an indication that the filter has been in far too long and is consuming excessive energy.

The most effective way to monitor filters is to measure the pressure drop across them, either with a local magnehelic gauge or a gauge wired to the BMS. The rate in which the pressure drop across the filter increases can be used to provide an indication as to how quickly they will need to be replaced and when to order them. Other factors are involved in determining this, including the seasons, adjacent construction works, and HVAC plant loads. Suppliers are happy to help calculate an effective change out period when given an indication of the rate of pressure drop increase for a given system.

In areas where high levels of diesel fumes are present, very high humidity or high probability of mould activity, it is common to shorten the above change out periods significantly to assure high IAQ levels. Your HEPA tester can be a good person to speak to about the state of your HEPA filters, when regular NATA testing is done.

In new buildings, premature installation and or inadequate initial duct (and facility) cleaning may dramatically shorten filter life, as residues from the building process, plaster dust, building dust and concrete dust, put a massive initial load on filter systems. In older buildings, equipment failure upstream of the filters may load filters with chemical or physical residue that can instantly virtually destroy a filter set. So it is wise to keep in mind downstream filters when major repair works are done to in-duct equipment.

The initial balancing and setup of air flows done at building commissioning, will need to be reconsidered as the building ages (often during the annual filter testing), or with changing usages or other building changes. Subtle, "real world" effects as buildings age can lead to sub standard or excessive air flows, incorrect room pressure regimes, both of which partially defeat the original design intent of the HEPA filter and room.

ANNUAL NATA TESTING AND VALIDATION

The annual retest of HEPA filters by NATA accredited testing agents is necessary to validate performance. These independently certified Technicians will, during certification testing, expose the HEPA media and housing to a challenge agent. A regulated and calibrated amount of chemical "mist" is pumped into the downstream side of the filter, and the filter and housing are scanned for leakage. To perform testing, adequate access needs to be available to physically view and scan the HEPA face. Access to, or a connection point upstream of the filter is needed to introduce the challenge aerosol.

This routine maintenance and regular check-ups of HVAC components and HEPA filters enable early detection of faulty air control systems. It also helps maximise functionality and prolong service life.

FINAL THOUGHTS

HEPA filter systems perform a vital role in Hospital IAQ. They are very rugged, reliable and effective devices. The selection, care and maintenance of the important components follows very clear rules – and you should see years of reliable, high performance operations, if the above mentioned recommendations are followed.

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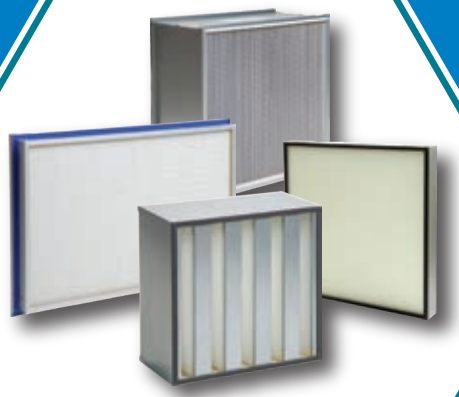

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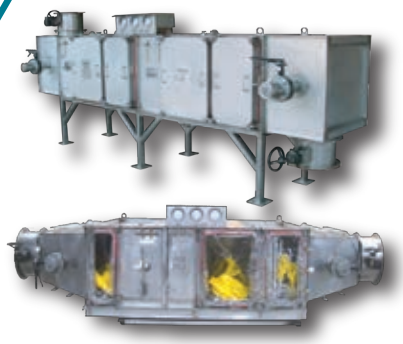

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MITIGATING RISK IN HEALTHCARE FACILITY CONSTRUCTION AND REFURBISHMENT PROJECTS

By Neil Thompson, Queensland University of Technology

INTRODUCTION

SME's, large public list entities and Government owned corporations alike are all exposed to financial and strategic risk through capital and operating cost escalation together with the social and environmental harm that results from the prevailing design & construct (D&C) procurement model for the built environment and associated utilities and transport infrastructure.

Examples of this risk can be quantified via use of the Global Reporting Initiative (GRI) protocol that monetises not only financial risk but also strategic risk via detailing the cost of associated social problems such as "sick" buildings and road rage together with environmental problems including water table pollution and petrochemical smog.

The D&C model has exacerbated the adverse and antagonistic relationships that plague all participants in the construction industry supply chain today resulting in increasing bankruptcies whilst at the same time it has exposed the developers and end-users of the built environment and associated infrastructure to increasing levels of economic, social and environmental risk.

In response to these issues, major building and infrastructure industry associations have partnered with universities and governments to fund research and testing of new development protocols that reduce not only financial risk but also strategic risk in terms of social and environmental outcomes from the construction and refurbishment of buildings and associated infrastructure.

BACKGROUND

The current dominance of the D&C procurement model for construction and refurbishment of the built environment and associated infrastructure has driven the deterioration of Australia's construction efficiency over the last few decades by at least 1% per annum as shown in Figure 1 when compared with the USA (Langston, 2014), which has adopted the Integrated Project Delivery (IPD) approach to help de-risk construction and refurbishment of buildings and infrastructure (IPD, 2007).

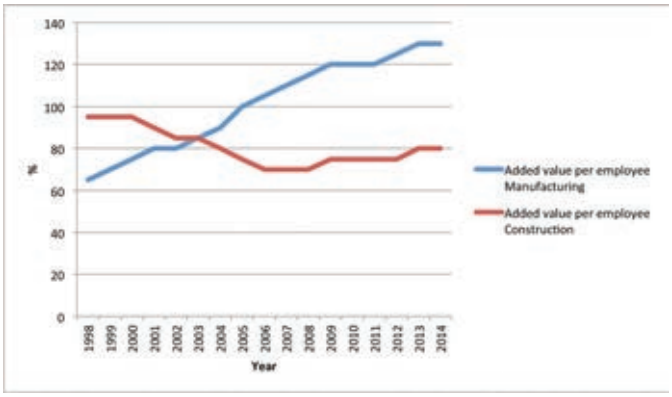

Figure 1 – Deterioration of Australia's construction efficiency compared to the USA.

At the same time, builder's variations to original design during the construction process typically occur when the cost of design changes are at their highest $/m2 rate as shown in line 2 of the MacLeamy cost curve in Figure 2 which exacerbates the capital cost risk of constructing and refurbishing buildings and infrastructure (AIA, 2007).

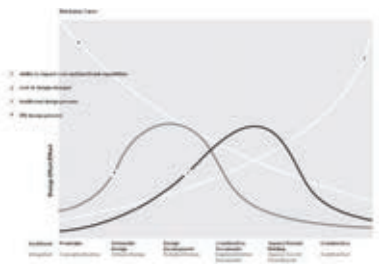

Figure 2 – Cost of design changes during construction.

In terms of ongoing operating costs for buildings and infrastructure, nearly half of the CEOs who participated in PWC's recent annual global CEO survey are concerned about financial risk associated with rising energy and transport fuel costs as shown in Figures 3 and 4 respectively (PWC, 2012). Energy – whether in the form of electricity, gas, oil or fuel – is connected

to a broad spectrum of other strategic business risk including climate change, natural resource constraints, food scarcity, water availability, political uncertainty and transport pollution.

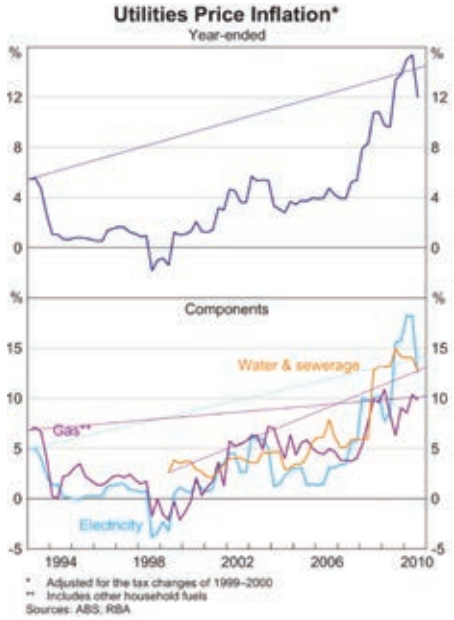

Figure 3 – Rising energy costs.

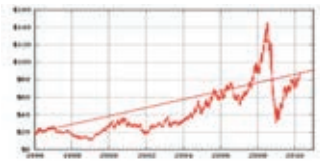

Figure 4 – Rising transport fuel costs.

Transportation is responsible for 70% of worldwide fuel consumption whilst buildings account for 75% of total electricity consumption (USDOE, 2016). Growing concern over energy for buildings and transport as a long-term business risk has prompted over 70% of companies to initiate sustainability programs to help improve business competitiveness and reduce environmental impact (MIT, 2012).

The D&C procurement model also provides for little in the way of design of preventative facilities management (FM) programs for buildings and associated infrastructure resulting in additional risk over the life cycle of facilities which tend towards overspend on reactive maintenance by a factor of 5:1 as shown in Figure 5 with an additional hidden cost of up to 20% additional expenditure on energy due to poor plant efficiency (IFMA, 2012).

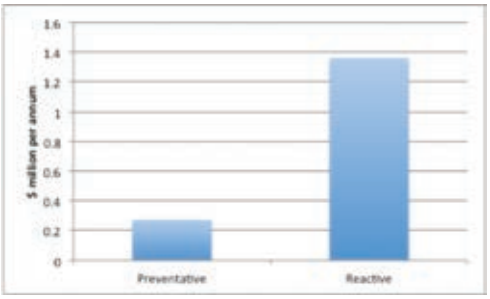

Figure 5 – Typical reactive versus preventative maintenance spend.

RESEARCH AND TESTING OF A NEW INTEGRATED DEVELOPMENT PROTOCOL

In response to current business concern over capital and strategic business risk associated with the D&C procurement model, together with rising energy costs for both stationary and motive applications, the Queensland University of Technology (QUT) partnered with the International Building Council (CIB) and the EU government to research and test a new integrated development protocol designed to de-risk construction and refurbishment of the built environment and associated infrastructure whilst "future proofing" facilities and fleet against rising energy costs.

This research commenced with a literature review of current best practice methods in the development of buildings and infrastructure that have been proven to reduce both capital and operating cost risks, whilst at the same time improving both environmental and social outcomes in accordance with the GRI imperative which resulted in development of the integrated sustainable design (ISD) development protocol as shown in Figure 6:

Figure 6 – Integrated Sustainable Design Protocol

The ISD protocol commences with passive building design which aims to maximise the thermal comfort levels of building occupants whilst minimising energy use and the need for electrical lighting and mechanical heating and cooling systems together with associated electrical infrastructure. It uses natural renewable energy resources such as solar and wind in order to provide cooling, heating, ventilation and lighting to building occupants (Chaturvedi, 2008). Research into the impact of best practice passive design using cross-ventilation has shown a reduction in energy usage of 50% when compared with "business as usual" per capita energy usage (Miller, 2007).

"Green urbanism" is another sustainable design concept that is used to combat future utilities cost growth through the move towards closed-loop, rather than linear utilities infrastructure metabolisms (Codoban & Kennedy, 2008). Examples such as integrated rainwater harvesting and storm-water management systems have provided capital cost savings of up to 50% and ongoing potable water operating cost reductions of up to 75% (Reidy, 2008).

Closed-loop design is also used to minimise waste outputs through their conversion back to useable inputs i.e. effluent to gas and grey water to non-potable water, thus reducing the volume of non-renewable inputs. The built environment acts as a "parasite" to harvest effluent to create energy for the building and fertiliser for growing micro-greens on roof areas and vertical facades to help feed the building inhabitants who generate more effluent (Timmeren & Sidler, 2007).

Use of Information and Communication Technology (ICT) based Building Information Modeling (BIM) tools within the next stage of the ISD development protocol improves construction productivity, bridges gaps in communication between stakeholders and encourages the implementation of new processes with a resultant reduction of up to 25% in design time and cost (Issa et al, 2007). Additional first capital and life cycle cost benefits have also been achieved through the use of virtual design technologies in this stage. These allow building designers to develop and test building solutions with confidence in building constructability and long term operational performance (Bailey & Brodkin, 2008). This Building Information Modelling (BIM) process allows project teams to quickly and accurately assess green building credentials for various material, equipment and systems selections (Barnes, 2009).

By using this BIM data in conjunction with additional transducers and advanced analytics incorporated into the building management system (BMS), facilities can also be moved from the traditional reactive and preventative maintenance modes to a "predictive" maintenance regime based on real time conditions of plant thus saving up to 20% on annual facilities management (FM) costs whilst normalising the predictive to reactive maintenance expenditures ratio to a best practice unity state (Hemmerdinger, 2010).

Additional initial construction cost reductions are offered through linking these BIM techniques to

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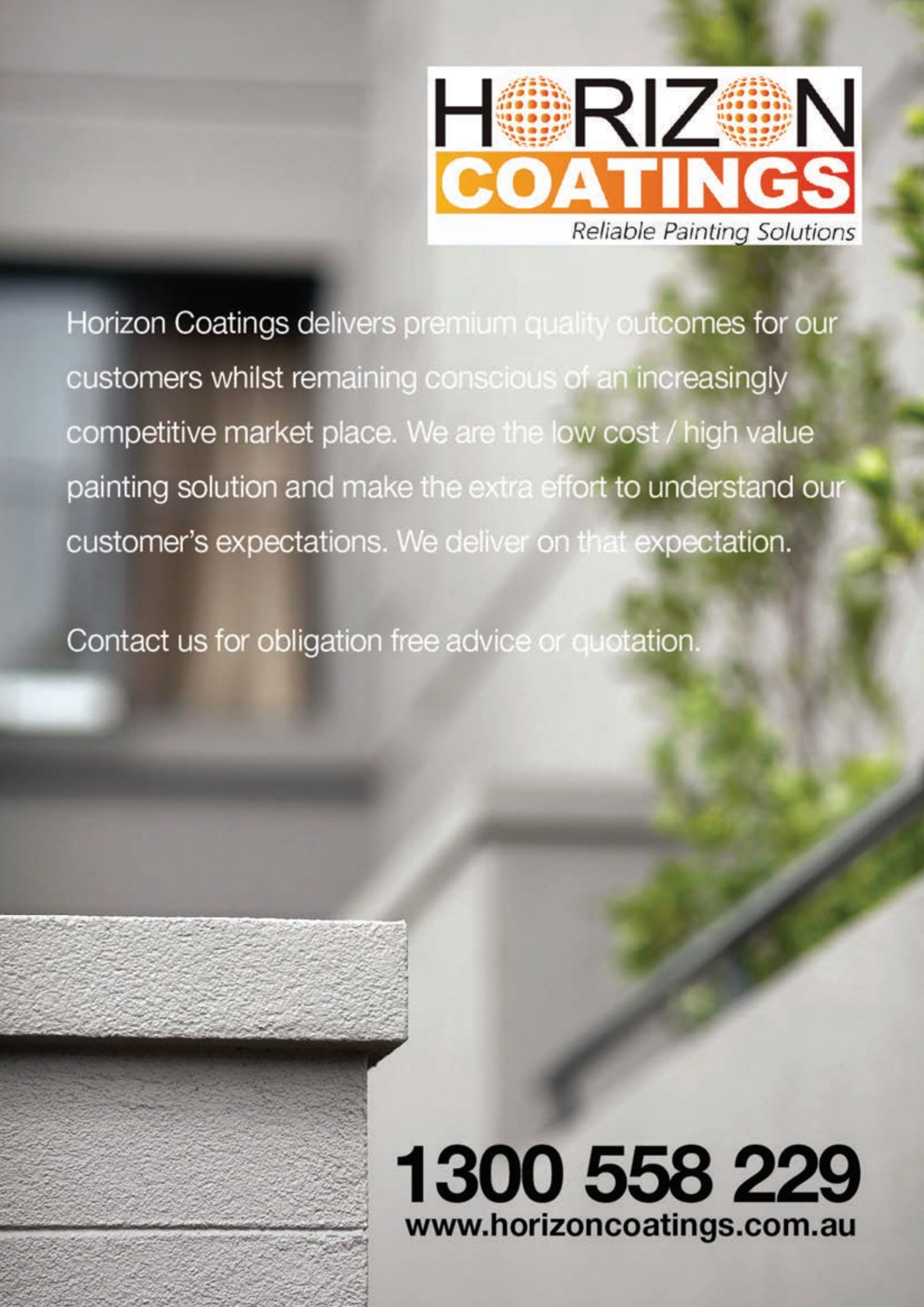
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building prefabrication. This involves constructing building structures and key sub-components in a controlled factory environment before transferring them to their final destination for assembly. The benefits of this off-site manufacturing (OSM) process include a reduction in embodied energy and material waste, together with reduced construction costs of up to 12%, through improved constructability and reduced costs for major sub-components such as heating, ventilation and air-conditioning (HVAC) systems (Blismas & Wakefield, 2009).

Increased use of closed-loop systems design has also provided the opportunity for greater use of the Design, Build, Operate and Maintain (DBOM) method of project delivery within the next stage of the ISD process whereby a single contract is let for the design, construction, operation and maintenance of discrete items of utility plant such as hot water systems, air conditioning systems and/or water harvesting/treatment plant in return for a defined user-pays fee over a fixed period (Dahl et al, 2005). At the same time, Government best practice regulation dictates that electricity, gas, water, waste and transport infrastructure network operators work with developers of new buildings and associated infrastructure to encourage greater use of closed-loop systems via provision of capital cost offset payments that effectively reduce first capital construction costs (DIT, 2011).

The next stage of the ISD protocol leverages best practice sustainable de/construction methods via use of locally recycled building materials for integration with new renewable building materials during the construction process together with re-use of de/construction materials recovered from the work site and/or expired DBOM contracts in accordance with world class zero waste protocols which have shown to reduce new construction costs by up to 10% and reduce environmental impact on the host community through decreased transport of new construction materials to the work site (Kuhlen, 2014). For example, large numbers of used EV/PHEV batteries are now entering the market via expired DBOM contracts hence they are being re-packaged and used in new construction projects as part of a combined solar power/battery UPS and electrical demand management system (Casey, 2014).

Use of integrated technologies across stationary and motive energy metrics within the next stage of the ISD development protocol also recognises the fact that total building energy efficiency should be measured across both stationary and motive power metrics (Weigel, 2014). New economic value is gained from large numbers of parked battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) assets in buildings via the vehicle-to-grid (V2G) concept whereby local electricity network operators can call on suitably enabled vehicles to facilitate access to the stored energy in the vehicle's traction battery in order to assist with short-term grid stability issues such as frequency and voltage control in return for incentive payments to the vehicle and/or building owner (Kempton et al, 2009). The "TracTile" integrated solar photovoltaic (PV) and solar hot water system is another example of integrated technology whereby the tile is used as the roofing material and when supplied on a DBOM contract has demonstrated potential for eliminating the first capital cost of roof cladding whilst providing up to an 80% reduction in ongoing electricity and hot water costs (IP Australia, 2010).

The next stage of the ISD development protocol uses utilities and transport demand aggregation methods to reduce costs and achieve improved social outcomes in terms of affordability and reduced environmental impact (Gilmour, 2009). Through leveraging bulk purchasing power, regional communities and building owners alike throughout Australia have been able to negotiate cost reductions of up to 20% for essential services such as communications and electricity (Tucker, 2004). This group procurement approach has also been used to tackle the growing problem of urban congestion. Carpooling represents one of many possible group procurement alternatives to single occupancy vehicle use for travel to work or school so as to help reduce this urban congestion problem and the resultant road rage incidents. Deployment of the TravelSmart project pilot in Brisbane, Australia has resulted in a 13% reduction in vehicle kilometres travelled (VKT) with a 22% increase in public transport usage, assisted in part by car pool connection to local public transport node car parks (SEQ 2031, 2010).

Another possible alternative to single occupancy vehicle use for travel to work or school is car sharing, which is an alternate system of car ownership, access and use. Private companies offer paid membership, which allows people to take and use a number of vehicles when and as needed. These self-service cars are available twenty four hours a day and are typically distributed over a wide urban area with the ability to access the car for a minimum of an hour or for extended periods (ThinkingTransport, 2010).

The final element of the ISD development protocol uses integrated project delivery (IPD) methods to facilitate formation of collaborative and productive

teams from all sections of the design, construction and facilities management supply chain (AIA, 2007). This integrated development approach also allows for community attitudes and local environmental conditions to be considered as part of the overall design optimisation process (Mani et al, 2005). By locking in the design using BIM technologies at the beginning of the project when the $/m2 cost of design changes is lowest, the IPD method ensures that the typical design variations initiated by builders during the construction phase are avoided.

At the same time, the IPD method changes the remuneration model for the design and construction team from a traditional capital cost based fee percentage, which typically restricts those team members that are most capable of developing capital and operating cost reduction strategies from applying their analytical technologies and experience, to an outcomes based remuneration model whereby the owner provides reward for effort in terms of reduction in both capital and operating costs for the project. Lean construction methods such as value stream mapping (VSM) and process mapping (PM) techniques are also used to support the IPD method by reducing design waste and delivering first capital cost savings of up to 18% (Goldstein, 2003).

RECENT APPLICATION IN INTERNATIONAL CONSTRUCTION AND REFURBISHMENT PROJECTS

Recent study of this integrated development protocol in the US construction industry has demonstrated how Toyota Motor Corporation has successfully applied these methods to the development of their new green office facilities in Torrance, California as shown in Figure 7. Significant reductions in project lead times and construction cost reduction of 17% together with 60% lower energy usage and 90% less potable water usage have been achieved (Lapinski, 2014).

Figure 7 – Toyota USA head office in Torrance, California.

Application of this integrated development protocol to the US National Renewable Energy Laboratory (NREL) Research Support Facility (RSF) in Golden, Colorado as shown in Figure 8 also demonstrated how it was possible to deliver a LEED Platinum rated facility at a cost of US$246/ft2 compared with equivalent peer rated buildings constructed using the conventional D&C process at a construction cost approaching US$500/ft2 as shown in Figure 9 (Pless & Torcellini, 2012).

Figure 8 – NREL RSF in Golden, Colorado.

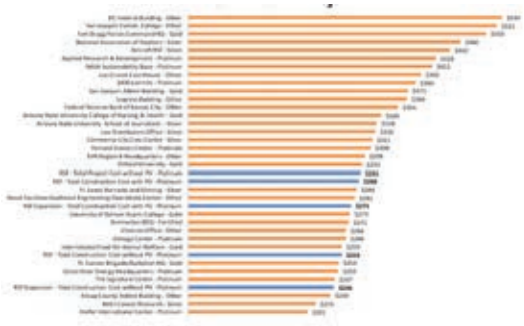

Figure 9 – Demonstrated cost savings from the integrated design process.

LOCAL HEALTH CARE FACILITY INTEGRATED DEVELOPMENT PROTOCOL CASE STUDIES

Quantitative data on the benefits of using this integrated development protocol in the construction and refurbishment of health care facilities throughout Australia is now becoming available through a number of case studies. For example, the new Sunshine Coast University Hospital located in Sippy Downs in Queensland as shown in Figure 10 used a mix of public private partnership (PPP) funding and long-term DBOM contracts for key items of utilities plant and associated facilities management services in order to provide significant reductions in first capital costs and ongoing operating expenses.

Figure 10 – Sunshine Coast University Hospital.

The project partners included Siemens, Lend Lease, Spotless and Capella Capital who formed an IPD consortium called "Exemplar Health" in order to leverage and integrate the expertise of each of the partners in energy systems, construction, facilities

management and finance respectively via the integrated development protocol so as to reduce financial and strategic risk for Queensland Health (Sunshine Coast University Hospital, 2016).

The South Australia Health and Medical Research Institute located in Adelaide, South Australia as shown in Figure 11 is another local example of application of the integrated development protocol.

Figure 11 – South Australia Health and Medical Research Institute.

Schneider Electric co-ordinated the design and delivery of this project in accordance with their "EcoStruxure" integrated systems architecture in partnership with Aurecon, Magelis, Andover, Pelco and Clipsal in order to deliver a new facility with a 24% reduction in projected capital expenditure and a 36% reduction in ongoing operating costs including facilities management activities via a transition to the predictive maintenance (PM) protocol (SAHMRI, 2016).

CONCLUSIONS

Disciplined application of the new integrated development protocol as synthesised from the recent research work undertaken jointly by QUT, the CIB and the EU government in recent construction and refurbishment projects has demonstrated an ability to effectively reduce financial risk through capital and operating cost escalation with encouraging results of up to 20% and 80% reduction as shown in Figures 12 and 13 respectively when compared with the business as usual D&C procurement model.

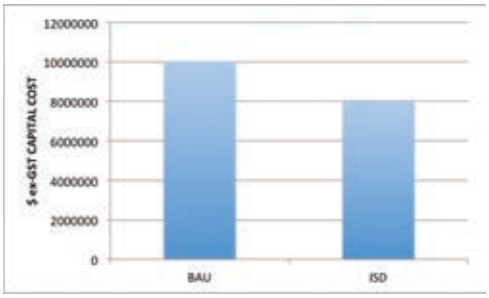

Figure 12 – CAPEX reduction potential.

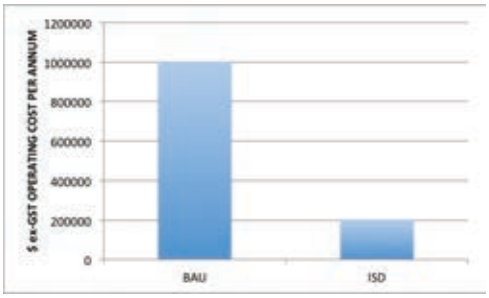

Figure 13 – OPEX reduction potential.

At the same time, use of associated DBOM contracts in accordance with the best practice PPP model has effectively "future-proofed" selected operating costs for new

developments by locking in rates for a fixed period thus reducing the risk of escalation over the contract period as shown in Figure 14.

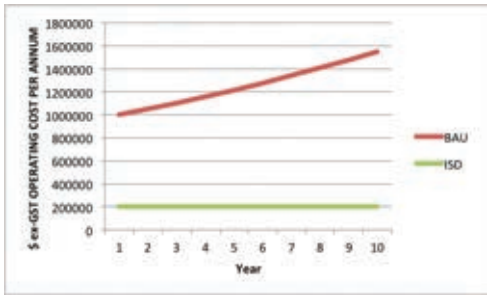

Figure 14 – Future proofed OPEX curve.

By using the BIM data from the integrated development process in conjunction with additional transducers and advanced analytics BMS, these facilities also operate on a PM basis using real time plant conditions thus normalising the predictive to reactive maintenance expenditures ratio to a best practice unity state as shown in Figure 15.

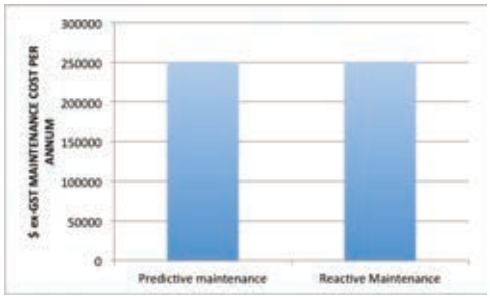

Figure 15 – Best practice PM to Reactive expenditure ratios.

Further research is currently being undertaken using the GRI protocol to measure improvements in social and environmental outcomes for these recent integrated design projects so as to further quantify the reductions in strategic risk that are achievable through use of this new development protocol in preference to the prevailing D&C model.

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Fast facts.

Baxx is an environmental pathogen and air-borne pollutant removal system.

The Baxx cold plasma technology kills Bacteria, Virus, Moulds & Fungus spores by disrupting the metabolism of their cell walls – no toxins, no chemicals, no radiation.

There are neither filters to replace nor consumables – no servicing and requiring only an occasional clean. Install it and let it do the work. Ceiling or wall mounted. 220v -240v.

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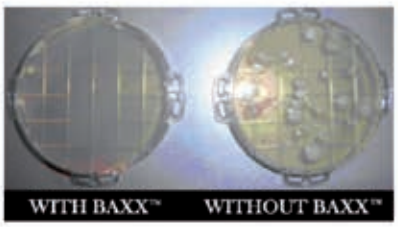
Unique cold plasma technology to create Hydroxyl Clusters which naturally kill all airborne pathogens. These groups also react with odour causing chemicals such as ammonia and methane gas to produce neutral compounds such as Co2, Nitrogen and Water. The harmless way to create a safer and cleaner environment.

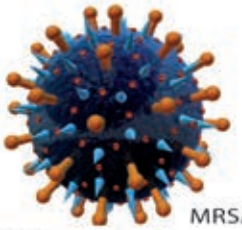
Protection for Guests and Staff

Hydroxyls are the single most important cleansing agent in our environment.
* 33% more effective at oxidizing pollutants than ozone.
* 2.5 times more germicidal and fungicidal than liquid chlorine
* Perfectly safe to breathe and use in occupied spaces

In a room of 28m2 at 27°C the Baxx reduced bacteria levels by 99.9% within 90 minutes, and viral traces were reduced by 88.96%. Ammonia levels reduced from 100% saturation down to zero in 30 minutes - without Baxx intervention the levels are 48%. Decomposition and ethylene gases are also effectively reduced/eliminated by Hydroxyls produced by Baxx.



TESTS INDICATE EFFECTIVE ELIMINATION OF THE FOLLOWING -



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LIVING AND WORKING IN PATHOGEN CLEAN AIR

Nature has its own method of cleaning air of odours, bacteria and virus besides simple dispersion. They are known as Hydroxyls or Hydroxyl Clusters and are found mostly at mountain top heights especially on sunny days.

Ozone is also nature's odour and pathogen killer, but is poisonous to all forms of life at the concentrations required to be effective, whilst Hydroxyls are completely safe at any concentration.

Nature has seen it fit to make our bodies immune to hydroxyls whilst leaving them extremely effective in killing single celled organisms such as bacteria, virus, mould and fungus spores.

Hydroxyls can be easily reproduced by today's technology from compact devices and is employed already in Hospitals (especially Hospital Kitchens), Food Manufacturing, Aged Care facilities, Veterinary Practices, Office blocks and a wide range of other applications to improve air quality and rid the air of airborne pathogens such as respiratory diseases and other bacteria that may contaminate and spread in food products.

Hydroxyls are also effective against a range of odours eliminating ammonia based odours in roughly half the time it takes by natural dispersion.

Hydroxyls are effective against Ethylene gas as well which is the gas given off by fruit and vegetables to promote ripening – bananas can be retarded from browning up to an extra four days by being stored in an area being controlled by a hydroxyl generator.

Waste and decomposition gases can also be reduced by the presence of hydroxyls. Hydroxyls have proven results in deodorising smoking smells.

Hydroxyls have been known of and researched for some 100 years since Louis Pasteur first discovered them whilst researching why people living at high altitudes in sunny conditions were generally healthier than people living at sea level.

Since then such organisations as the British Army have researched Hydroxyls as a method of combating germ warfare in the late 60's and all papers and studies have confirmed the benefits of using Hydroxyls, but until this century not been able to reproduce them by a compact means.

What is a hydroxyl? It's a water molecule (H^2O) missing one of its Hydrogen atoms and because it's in an unbalanced state, it seeks to replace its missing Hydrogen atom.

These hydroxyl (OH-) molecules are attracted to single celled organisms in the air and on surfaces, attach to them and forcibly rip a Hydrogen atom from the cell wall.

They are now H^2O again – harmless water molecules.

In the meantime, the cell wall of the organism has been ruptured and like a popped balloon, it dies.

This is a very simple mechanical action. Bacteria & virus cannot become immune to it. Further, the Hydroxyl is indiscriminate on what Bacteria & Virus it chooses attacking all equally.

Several companies have hydroxyl generators on the market – all but the Baxx requiring consumables or servicing or both.

By far the most successful method passes air through a small cold plasma field to produce hydroxyls which then are distributed throughout the space by a strong fan. They do not require any maintenance or consumables other than electricity, and so they can be mounted high on a wall or ceiling to gain maximum coverage across the space concerned.

They use the natural water molecules in the air all around us and do not require topping up or chemicals or any other medium to perform their function in generating Hydroxyls.

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LEGIONELLA RISK MANAGEMENT

A REVIEW OF THE STATE AND COMMONWEALTH REQUIREMENTS

By Sarah Bailey, QED Environmental Services

Recent outbreaks of legionellosis in Australia have been associated with the water distribution systems inside hospitals, as well as the better publicised source of the air conditioning cooling tower. As such, new guidelines have been released in late 2015 that apply to all health facilities in Australia, rather than the state or territory approach of existing *Legionella* control guidelines, and which specifically relate to the control of *Legionella* within the water distribution system. In addition to these guidelines, State and Territory guidelines and legislation still apply.

Individual state or territory guidelines still apply separately to the cooling tower systems, and a comparison of the state/territory guidelines for *Legionella* control show different controls, risk management and requirements are prescribed by each state and territory. This article will concentrate on bringing together some of the state and national guidelines to give an overview of the requirements of these guidelines, and the guidelines for overall risk management strategy for *Legionella spp*. for Australian healthcare premises.

It is quite difficult to find all of the relevant information on the applicable *Legionella* guidelines and legislation for Australia all in one place – this article attempts to do so, but does not guarantee to be a complete resource of all applicable legislation. The resources `Prensa update: National Summary of Cooling Tower Legislation, March 2011' and the `ABCB Plumbing Code Development Research report – Warm Water Systems 2015' have been invaluable in compiling this article. Both are freely available on line.

The most prescriptive legislation and guidelines for control of *Legionella spp*. in cooling towers is that from Victoria (see information under the state listing below), and for warm water systems, from Queensland (Guidelines for Managing Microbial Water Quality in Health Facilities 2013). For water systems, a Commonwealth wide set of Guidelines, the En Health `Guidelines for *Legionella* control in the operation and maintenance of water distribution systems in health and aged care facilities (2015)' exists, which apply Australia wide, and should be followed in addition to individual state legislation and guidelines.

Legionella are a group of naturally occurring bacteria, associated with water sources. Of the numerous species, *Legionella pneumophila* and *Legionella longbeachae* are the species that primarily cause disease in humans. 18 other species of *Legionella* have been documented to cause disease in humans, but control measures for *Legionella pneumophila* and for *Legionella longbeachae* will also control other potentially pathogenic species[1]. These bacteria are important as they colonise cooling towers and warm water systems of large buildings, and can cause significant outbreaks of disease. Along with their ability to cause outbreaks, the disease is often difficult to diagnose, hard to trace to the source; and also have a high mortality and morbidity rate in those persons who become ill. There is also a very high rate of ICU admission associated with the disease.

Infection with *Legionella pneumophila* causes two types of disease – Legionnaires disease, with a headache and flu like symptoms, with a cough, difficulty breathing, nausea, vomiting and diarrhoea. Confusion is often present; or, Pontiac fever, which is a much less serious disease and generally requires no

treatment. *Legionella longbeachae* has symptoms similar to legionnaire's disease.

Legionella longbeachae is the most common cause of Legionnaires disease in WA and SA, with *Legionella pneumophila* being slightly more common in the Eastern states. In WA, cases of *Legionella pneumophila* are often associated with foreign travel and are not generally acquired within the state.

Certain risk factors increase susceptibility to all types of disease – these include middle to advanced age, male, smoker, chronic heart or lung disease, diabetes, alcohol abuse, renal disease and other conditions that lead to an impaired immune system.

Transmission of *legionella* is never from person to person – it is always associated with a natural source. *Legionella pneumophila* is water borne, and transmitted via extremely small droplets deep into the lungs, and *Legionella longbeachae* is possibly transmitted by inhaled dust from potting mixes or mulches with travels into the lungs.

Documented sources of *Legionella* species include cooling tower systems, warm water supply systems, showers, misting systems, spas, decorative water features, fountains, humidifiers (especially if cleaned in tap water rather than sterile water), respiratory therapy equipment, ice machines, potting mix, mulch and compost, roadside puddles and commercial car wash systems. Dental equipment, water pumps and dental drills have also been implicated in some cases.

COMPOST PRECAUTIONS

Although often overlooked in the efforts to control *Legionella* in a hospital, the correct use of PPE by grounds staff is vital to avoid infection with *Legionella longbeachae*. A P2 mask and gloves should be worn when handling mulch and compost, and hands washed thoroughly after handling. Bags of compost should be wetted to avoid dust production, and used in a ventilated area.

WATER PRECAUTIONS

There is a risk of *Legionella* proliferation between the temperatures of 20C and 42C. This, along with stagnation, is the main risk in warm water systems within hospitals. In cooling towers, additional risks include nutrient growth, poor water quality, scale, sediment, location of the cooling tower, deficiencies of the system and the presence of free living amoeba that can engulf and protect the *legionella* bacteria from disinfectants. Temperatures of between 20C and 42C are easily reached and maintained in cooling towers in the Australian summers, and in uninsulated cold water supplies and warm water supplies.

Biofilm can be a particular issue in pipework and in cooling towers. This is a sticky 'slime' produced by bacterial cells, which sticks to surfaces and surrounds the bacteria. This protects them from the effects of disinfectants and can increase the amount of disinfectant that needs to be added to a system to ensure that it stays free of *legionella*. Biodispersants, as recommended for use in cooling towers in most states, can help disperse the biofilm layer and ensure that disinfectants can target the *legionella* bacteria. These can be added as a separate chemical with its' own dosing pump, or, some water treatment companies produce a combined disinfectant and biodispersant.

COOLING TOWERS

Cooling tower legislation and guidelines vary from state to state. The Victorian guidelines are the most prescriptive and the strictest. The Victorian government also produce a variety of assessment tools and very useful information on their website, which can be used by those in other states to assess and audit their cooling towers, and identify any potential problems that may arise in the future.

AS/ANZ 3666 is an Australia wide standard. It requires monthly inspection of the cooling towers for cleanliness, mechanical inspection and of the biocide and dosing systems. There should be no stagnation in the tower. The tower should be cleaned every six months, and measurements of the pH, total dissolved solids and temperature should be taken. Microbial testing is required monthly for HCC (Heterotrophic Colony Count, also referred to as HPC (Heterotrophic Plate Count) or TPC (Total Plate Count) in some documents), and six monthly testing for *Legionella spp*.

Victorian guidelines require a risk assessment to be prepared for all cooling towers, and for this to be audited annually. The Critical Risks' for cooling towers are assessed, and the operators of cooling towers in any state of territory would be advised to be aware of these factors in relation to their own cooling towers. The critical risks are shown in the following table and comprise:

- Stagnant Water
- Nutrient Growth
- Poor Water Quality
- Deficiencies in the Cooling Tower System
- Location and Access

Figure 1: Risk Evaluation Table.

Critical risk	Question
Stagnant water	Is the system (or part of the system) idle for more than a month?
	Where the system (or part of the system) is idle for more than a month, is a recirculating pump with a timer fitted to automatically circulate the water at regular intervals, to prevent it becoming stagnant?
	Are there 'dead legs'?
Nutrient growth	Are there factors in and around the site that may lead to environmental contamination and an increase in the level of nutrients in the cooling tower system?
	Is there a corrosion control program?
	Are any of the wetted surfaces exposed to sunlight?
	Is a biodispersant used?
Poor water quality	Has an automated biocide-dosing device been fitted?
	Is a comprehensive water treatment program in place?
Deficiencies in the cooling tower system	Is a modern, high efficiency drift eliminator fitted to all cooling towers in the system?
	Has a review of system design been conducted?
	Has a review of system operation and performance been conducted?
Location and access	Is the tower system located in or near an acute health or aged residential care facility?
	How many people come with close proximity to the tower within a day?

A comprehensive risk analysis leading to a risk classification from A-D (with A being the highest risk) is required, and a maintenance and testing schedule followed according to the risk classification of the tower.

Both Victoria and Queensland require the HCC to be tested monthly, and action taken at levels over 200,000cfu/ml – this differs from other states and territories, where action is required at over 100,000 cfu/ml. *Legionella* should be tested every three months and action taken at or over 10cfu/ml, as in other states. The system should be inspected monthly, and an annual review of the risk management plan should be undertaken. Towers must also be registered.

Figure 2: Risk classification.

Cooling Tower System Risk Classification

Critical Risk	Higher risk → Lower risk			
Stagnant Water	System is idle more than one month **and** Recirculating pump with timer not fitted **and** 'Dead legs' exist	System is idle more than one month **and** Recirculating pump with timer fitted **and** 'Dead legs' exist	**Any ONE of the following:** System is idle for more than one month **or** 'Dead legs' exist	System operates continuously **and** No 'dead legs'
Nutrient Growth	**Any THREE of the following:** Environmental contamination **and** No corrosion control program **and** Wetted surfaces not protected from sunlight **and** No biodispersant used	**Any TWO of the following:** Environmental contamination **or** No corrosion control program **or** Wetted surfaces not protected from sunlight **or** No biodispersant used	**Any ONE of the following:** Environmental contamination **or** No corrosion control program **or** Wetted surfaces not protected from sunlight **or** No biodispersant used	No significant environmental contamination **and** Corrosion control program exists **and** Wetted surfaces protected from sunlight **and** Biodispersant used
Poor Water Quality	No automated biocide dosing device installed **and** No comprehensive water treatment program in place	No automated biocide dosing device installed **and** Comprehensive water treatment program in place	Automated biocide dosing device installed **and** No comprehensive water treatment program in place	Automated biocide dosing device installed **and** Comprehensive water treatment program in place
Deficiencies in the Cooling Tower System	Modern, high efficiency drift eliminator not fitted **and** No review of system design **and** No review of system operation and performance	Modern, high efficiency drift eliminator not fitted	Modern, high efficiency drift eliminator fitted **and at least ONE of the following:** No review of system design **or** No review of system operation and performance	Modern, high efficiency drift eliminator fitted **and** System design reviewed **and** System operation and performance reviewed
Location and Access	System is located in an acute health or aged residential care facility **or** Very high numbers of people are potentially exposed	System is located near an acute health or aged residential care facility **or** High numbers of people are potentially exposed	System is not located near an acute health or aged residential care facility **and** Moderate numbers of people are potentially exposed	System is not located near an acute health or aged residential care facility **and** Low numbers of people are potentially exposed
Risk Classification	If your system matches **any** of the above responses, the Risk Classification for the system is **A**[1]	If your system matches **any** of the above responses and does not match **any** of the responses in Risk Classification A, the Risk Classification for the system is **B**	If your system matches **any** of the above responses and does not match **any** of the responses in Risk Classification A or B, the Risk Classification for the system is **C**	If your system matches **any** of the above responses and does not match **any** of the responses in Risk Classification A, B or C, the Risk Classification for the system is **D**
	Higher risk → Lower risk			

1 The only exception to this table is with regard to Category A systems which would fall into this category only because of the **number** of people who are potentially exposed to the cooling tower system. In this case, an exception is provided to classify these systems within Category B provided that the system meets the prerequisites described in Section 6.2.2.1.

Figure 3: Maintenance programmes.

Risk classification	Recommended operational program
A	A
B	B
C	C
D	D

Program A	Program B	Program C	Program D
Weekly inspection	Monthly inspection (2 weeks after service)	Monthly inspection (2 weeks after service)	Monthly service
Fortnightly service	Monthly service	Monthly service	
HCC and *Legionella* tested at a minimum of once each month	HCC and *Legionella* tested monthly	HCC tested monthly *Legionella* tested every 2 months	HCC tested monthly *Legionella* tested every 3 months
Six-monthly cleaning, or more frequently where environmental contamination (e.g. dust, soil, building works) is a problem			

HCC = heterotrophic colony count

Figure 4: Action to be taken from HCC levels.

Test result (cfu*/mL) (*Legionella*)	**Required control strategy**
Not detected (<10)	System under control. Maintain monitoring and treatment program.
Detected as <1,000	Immediate online disinfection (alternative or higher dose biocide than usual). Review control strategy. Re-test water within three to seven days of plant operation, and assess if further remedial action** is necessary.
Detected as ≥1,000	Immediate online decontamination (halogen based biocide). Review control strategy. Re-test water within three to seven days of plant operation, and assess if further remedial action** is necessary.

* cfu = colony forming units
** Adapted from Australian/New Zealand Standard, *AS/NZS 3666.3*. Refer to this standard for further information

Figure 5: Action to be taken from *Legionella* levels.

Test result (cfu*/mL) (*heterotrophic*)	**Required control strategy**
<100,000	System under control. Maintain monitoring and treatment program.
≥100,000 to <5,000,000	Immediate online disinfection (alternative or higher dose biocide than usual). Review control strategy. Re-test water within three to seven days of plant operation, and assess if further remedial action** is necessary.
≥5,000,000	Immediate online disinfection (alternative or higher dose biocide than usual). Review control strategy. Re-test water within three to seven days of plant operation, and assess if further remedial action** is necessary.

* cfu = colony forming units
** Adapted from Australian / New Zealand Standard, *AS/NZS 3666.3*; refer to this standard for further information.

The Western Australian guidelines require automated dosing systems to be installed, monthly inspection, 6 monthly cleaning and that the towers should have a risk assessment and management plan. HCC should be tested monthly and *Legionella* every three months. Action should be taken when HCC is at or above 100, 000 cfu/ml or *Legionella* levels are detected. The guidelines on the action to be taken are taken from AS/ANZ 3666.

Tasmania, New South Wales, South Australia and Australian Capital Territory all have very similar requirements. Towers must be registered, with annual inspection or certification. HCC should be carried out monthly and *Legionella* testing 3 monthly (or 6 monthly in Tasmania). Monthly inspection is required, and action taken if HCC levels are at or over 100,000cfu/ml and *Legionella* at or above 10 cfu/ml. In ACT, levels of HCC over 5,000,000cfu/ml are notifiable to the Health Department, as are levels of *Legionella* over 1000cfu/ml. In Tasmania, towers with HCC levels over 100,000cfu/ml or *Legionella* over 10cfu/ml are notifiable.

The Northern Territory has no specific *Legionella* legislation, but NT Worksafe refer to AS/ANZ 3666, as described above.

WARM WATER SYSTEMS

As stated in the ABCB Plumbing Code Development Research report on Warm Water, there are no specific requirements in The National Construction Code or The Plumbing Code of Australia for the installation or planning of Warm Water Systems, however, the Part B2 Heated Water Services requirements are relevant, among which the system should 'Safeguard people from illness, injury or loss'.

Individual project design for each installation should therefore be in accordance with the state/territory health authority jurisdiction.

The En Health Guidelines, released in 2015 are designed for use Australia wide, and sit over the top of each State/territories' own regulatory framework. The guidelines apply to all water systems except cooling towers in healthcare and aged care premises, regardless of if they are public or privately owned.

Examples of the water systems covered by the En Health Guidelines include, but are not limited to:

- Warm Water Systems
- Cold Water Systems
- Hot Water Systems
- Showers
- Eye Wash systems
- Emergency Showers
- Toilets
- Ice machines
- Filtered water
- Water Fountains

The En Health guidelines concentrate on pro-actively managing the risks associated with water systems, rather than responding to positive testing results.

The systems should be analysed for the layout of pipework (notoriously difficult in older, renovated and re-purposed buildings); components (TMVs, Heaters etc.); connected systems such as fire systems and fountains; outlets (showers, toilets, taps); Construction materials (plastic, copper); Temperatures achieved and maintained throughout the system, especially temperature stability; and the results of previous testing – for example has the system tested positive for *Legionella* previously. When testing, the quality of the water entering the building at the point closest to the scheme (or other) supply should always be tested for comparison.

The level of water quality that you are aiming for should also be known – are you looking to adhere to the ADWG 2011 (Australian Drinking Water Guidelines, 2011), or something stricter? What microbiological testing is required? Some examples of testing that may be required along with *Legionella* testing might be testing for HCC, Pseudomonas aeruginosa, which can cause serious infections in burns and other immunosuppressed patients, Escherichia coli/ coliforms, thermotolerant coliforms (indicators of faecal contamination) and amoebae. Stricter standards may be required for water supplied to areas such as Oncology, Neonates, Older people, Immunosuppressed patients, Respiratory patients or renal patients to give some examples.

Extra measures may be required in areas with at risk patients, which may include removal of aerators from taps, the removal of any mist generating devices and the installation of low aerosol producing showers or increased exhausts fitted to showers. Microfiltration or Ultra Violet sterilisation may be required to remove all bacteria from the water supply in especially sensitive areas. Water chillers and ice machines have been implicated in some outbreaks, and can have a build-up of biofilm in the internal parts. This can provide and ideal environment for HCC, *Legionella* and sometimes amoebae to grow.

Monitoring of water supplies takes two forms, operational monitoring and verification monitoring. The frequency of each type of testing should be determined with regard to the risk assessment of the system, the complexity of the system and the implications of an outbreak.

- Operational monitoring ensures that controls are effective, and allows results to be obtained immediately or very quickly. Examples include residual chlorine levels, temperature, pH and turbidity. These can be valuable indicators that a system may have problems.
- Verification monitoring detects general colonisation of the systems, and determines if the control strategies employed are effective. Results are not available immediately, and can be delayed up to ten days in the case of *Legionella* testing.

Any monitoring programme must comply with the State and Territory guidelines in place, as well as with En-Health guidelines. For example, more testing may be required under the strictest Australian guidelines – those in place in Queensland, than may be required by En Health guidelines.

Sampling methods must also be carefully chosen, as first flush samples detect colonisation of the taps and plumbing fittings, while samples taken after flushing the taps for a set amount of time may detect colonisation in the more distant pipework. AS/NZ 5661 contains advice on sampling techniques, as does the Queensland Health Department Guidelines for Managing Microbial Water Quality in Health Facilities 2013. The testing laboratory should also be consulted to ensure that the HCC testing for drinking water is carried out, as the testing usually done for HCC levels in cooling tower waters is

not sensitive enough for drinking water supplies.

The ADWG have no guidelines for HCC levels in drinking water, apart from stating that they should be `Low". The Queensland guidelines state that drinking water providers should inform a health facility if HCC levels are above 500cfu/ml. While HCC levels are not a reliable indicator that *Legionella* could be present, they are an indicator that a system may not be under control, and that there could be the potential for *Legionella* or other problematic bacteria to flourish.

While implementation of the En Health guidelines should go a long way to avoiding the presence of *Legionella* within the water systems of a hospital, there are actions to take if *Legionella* is discovered with a system. Examples of strategies to attempt to eradicate the colonisation include heat disinfection, where the temperature of the whole heated water system is raised to ≥70C for at least 5 minutes or ≥60C for at least 10 minutes, and all outlets flushed. Other strategies include chlorination or hyper-chlorination of the system, and different states/territories have different preferences for each strategy. Cleaning and replacement of fittings may also be required to help remove colonisation, and other exposure controls may be required.

The Queensland Guidelines for Managing Microbial Water Quality in Health Facilities 2013 have excellent flowcharts that are helpful in investigating and actioning any deviances from the required test results. The guidelines have two separate flowcharts of actions for high risk clinical locations and for lower risk clinical locations.

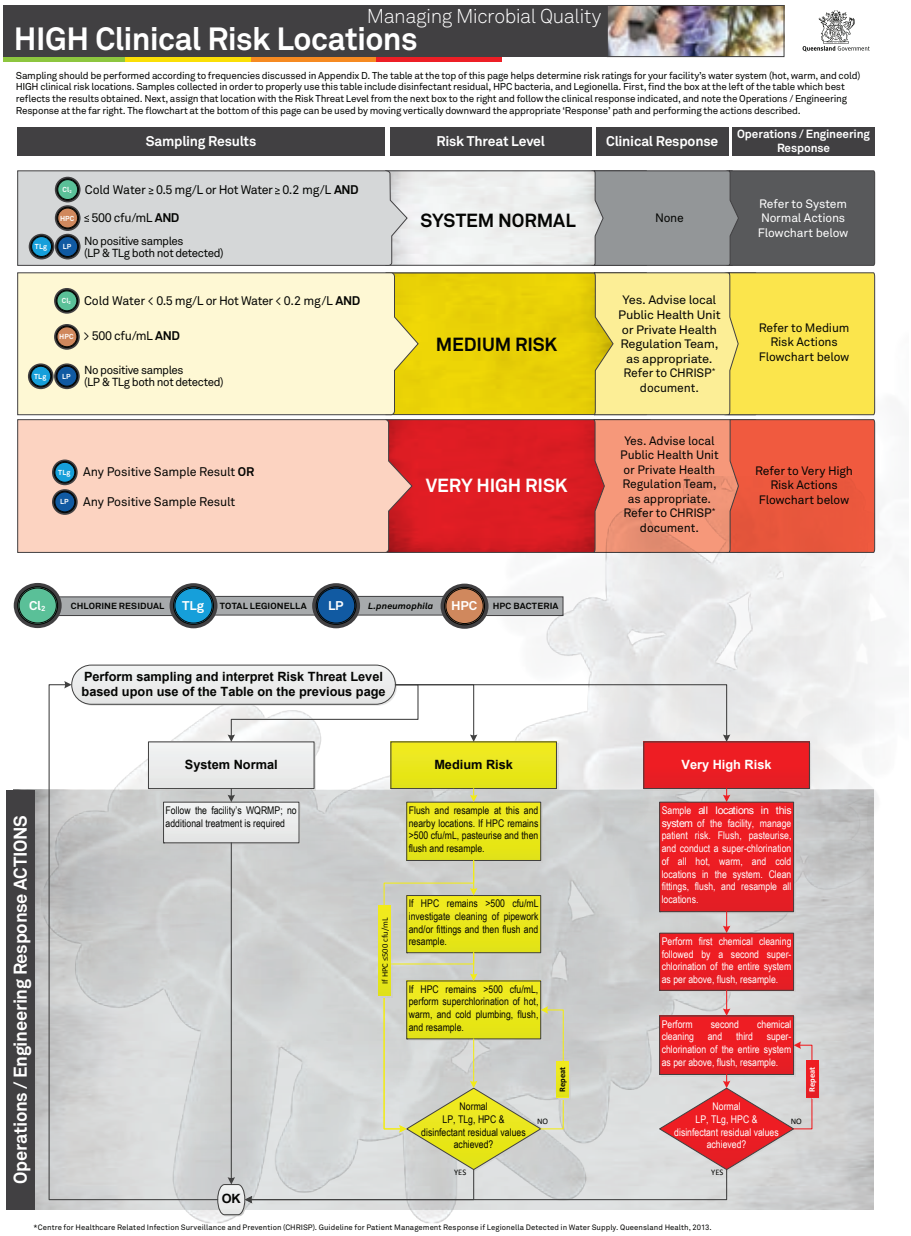

Figure 6: Actions to be taken with adverse results in a high risk clinical setting.

Individual State/Territory legislation varies in the requirements, but is overlain with the En-Health Guidelines.

While only South Australia, New South Wales, Australian Capital Territory and Tasmania state that a NATA (National Association of Testing Authorities) accredited laboratory should be used for testing water samples, it would be extremely unwise to use a non NATA accredited laboratory for any water testing from a health or aged care facility.

The following is a list of the legislation and guidelines relevant in each state for the control of *Legionella*. While every effort has been made to ensure this is a complete list, other guidelines and legislation may be relevant that has not been listed here.

AUSTRALIAN GUIDELINES, CODES OF PRACTICE & LEGISLATION

Warm water

- En Health 'Guidelines for *Legionella* control in the operation and maintenance of water distribution systems in health and aged care facilities (2015)
- Plumbing Code of Australia
- The National Construction Code

Cooling Towers

- AS/NZS 3666 (2011) Air Handling and water systems of buildings – microbial control

Water Sampling

- AS/NZS 5667.1:1998 (2016) Water quality – Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples

Australian Drinking Water Guidelines

- NHMRC Australian Drinking Water Guidelines (2011) updated February 2016, https://www.nhmrc.gov.au/guidelines-publications/eh52

USEFUL RESOURCES FOR ALL STATES & TERRITORIES

Warm water

- En Health 'Guidelines for *Legionella* control in the operation and maintenance of water distribution systems in health and aged care facilities (2015)
- Guidelines for Managing Microbial Water Quality in Health Facilities 2013 Queensland Health Department.
- CDC (Center for Disease Control, USA) Guide to Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings: A practical guide to implementing industry standards (2016) http://www.cdc.gov/*legionella*/downloads/toolkit.pdf

Cooling Towers

- A guide to developing risk management plans for cooling tower systems (Victoria) 2001 https://www2.health.vic.gov.au/public-health/water/*legionella*-risk-management-guidelines
- Guidelines for auditing risk management plans for cooling tower systems (Victoria)

AUSTRALIAN CAPITAL TERRITORY

- Planning and Development Act 2007
- Public Health Act 1997
- The Cooling Towers, Evaporative Condensers and Warm Water Storage Systems (Specialised Systems) Code of Practice 2005. (Public Health Act 1997)

Websites:

- Legislation – www.legislation.act.gov.au
- Plumbing – www.planning.act.gov.au
- Health – www.health.act.gov.au

NEW SOUTH WALES

- Microbial Sampling – Warm Water Systems Including Thermostatic Mixing Valves
- Notification of installed water cooling system or warm water system.
- NSW Code of Practice for the Control of Legionnaires' Disease 2004

NSW Health

- Part A – Approval specification for operational testing of thermostatic mixing valves for use in non-domestic buildings in New South Wales. And
- Part B – Approval specification for operational testing of warm water generating systems not incorporating thermostatic mixing valves for use in non-domestic buildings in New South Wales.
- Plumbing and Drainage Act 2011
- Plumbing and Drainage Regulation 2012
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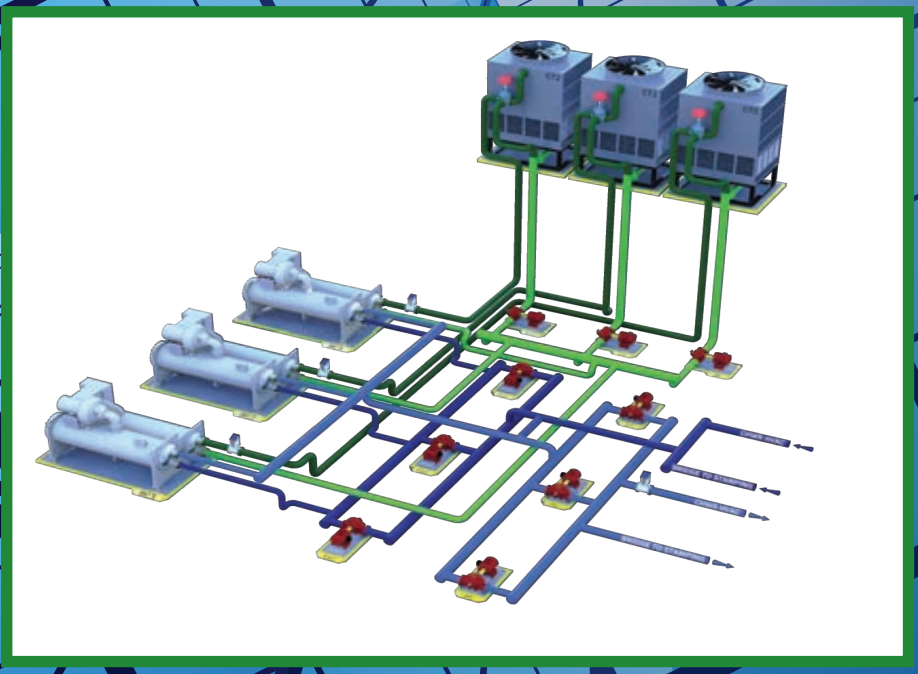

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PROTON BEAM THERAPY AND IMPLICATIONS FOR HOSPITAL DESIGN IN AUSTRALIA

By James Gungl

ABSTRACT

Proton Beam Therapy (PBT) is a cutting-edge radiation therapy technique which allows ionising radiation to be delivered in a precise and controlled manner for the treatment of cancer. The technology is a significant advancement over conventional X-ray based radiotherapy that is typically administered by LINAC machines. PBT uses protons to deliver the radiation treatment, which allows the peak radiation dosage to be directed at a tumour site and significantly reduce radiation damage to the surrounding healthy tissue.

Demand for PBT treatment is increasing worldwide, with over 70 PBT facilities now operational and a further 40 in construction. While Australia currently has no operational PBT facilities, feasibility and planning studies are currently being undertaken in a number of states and it appears likely that a PBT facility will be constructed within the next few years.

This article presents a discussion on the design challenges which may be faced by healthcare engineers in the development of an Australian PBT facility to accommodate this advanced medical technology.

WHAT IS PROTON BEAM THERAPY

Proton Beam Therapy (PBT) is a form of external beam radiation therapy which utilises ionising radiation to destroy cancer cells. External beam radiation therapy has traditionally been administered to patients via Linear Accelerator (LINAC) machines, which deliver high energy X-ray beams to damage the DNA of cancer cells, to kill them or limit their reproduction. The X-ray beam, while highly effective in destroying the cancer cells, also deposits energy along the path of beam travel meaning patients may also be subjected to radiation damage to healthy tissue in the path that the beam enters and exits the body. This entry and exit dosage limits the use of this treatment technique around sensitive areas of the body such as the brain, eye, and spinal cord.

The major advancement Proton Beam Therapy provides over traditional LINAC based radiotherapy is that the radiation dosage can be precisely controlled to administer the dosage more locally at the tumour site, and significantly reduce the exposure to the surrounding healthy tissue.

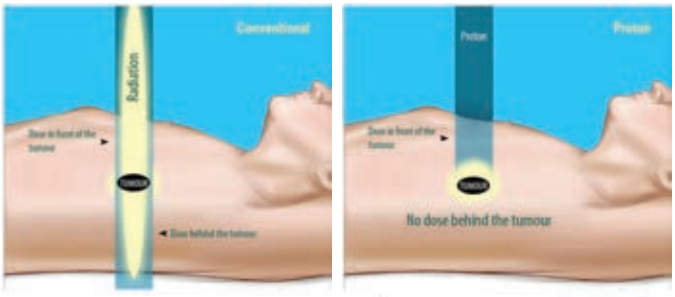

Figure 1 – Comparison of radiation dosage paths between PBT and conventional X-ray radiotherapy (source: http://www.proton-cancer-treatment.com/for-patients/advantages-of-proton-therapy/).

As evidenced by its name, PBT utilises protons to deliver the radiation dosage to the tumour site. The charged proton particles enter the body travelling at a very fast velocity, losing energy as they begin to travel through the body. The protons exhibit a phenomenon called a Bragg Peak, whereby the energy lost by the particle peaks significantly just before the particle comes to rest. During the administering of proton beam therapy, the radiation therapist can adjust the depth in which this peak occurs so that the maximum radiation dosage is precisely applied to the location of the tumour, with effectively no radiation dosage occurring behind the tumour site.

This controlled application of radiation dosage allows PBT to be utilised in areas of the body where traditional X-ray based radiation therapy would be unsuitable due to risk of significant side effects from radiation exposure, as indicated in Figure 2. Limiting

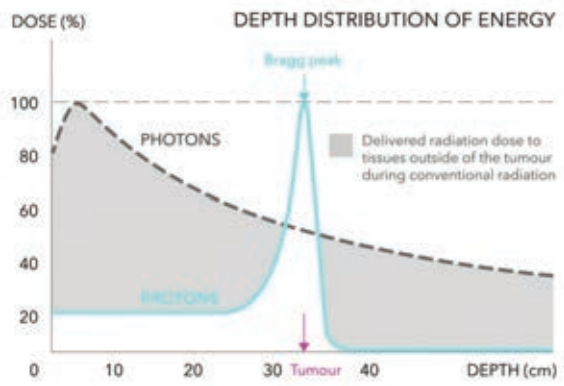

Figure 2 – Delivered radiation dosage for PBT and conventional X-ray/ photon radiotherapy (source: http://www.proton-cancer-treatment.com/proton-therapy/principles-of-proton-therapy).

radiation exposure to healthy tissue is also a major consideration for paediatric cancer treatment, to minimise long term radiation risks for developing children.

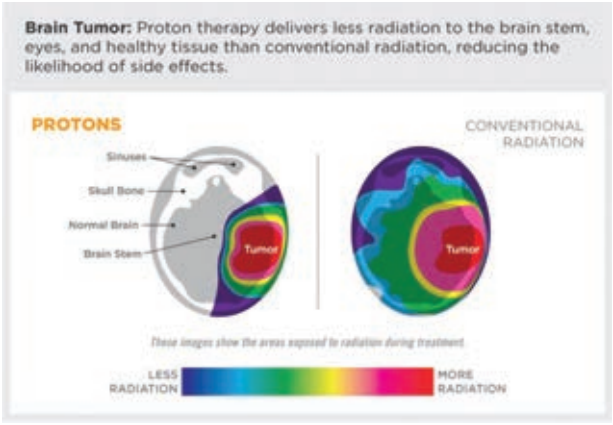

Figure 3 – Comparison of radiation exposure between PBT and conventional X-ray radiotherapy (source: http://www.provisionproton.com/about-proton-therapy/advantages-of-proton).

While there are clear advantages of PBT over traditional X-ray based radiation therapy options, the technology and infrastructure required to produce, distribute, and apply the protons beam for use in patient treatment is of a scale and complexity unlike any other medical equipment seen in today's modern hospitals.

HOW DOES PROTON BEAM THERAPY WORK

A patient receiving a PBT treatment will typically have very little appreciation to the scale and complexity of the supporting infrastructure behind the walls of the treatment room and back of house areas of the facility.

The PBT treatment generally occurs with a patient entering a treatment room and being positioned on a treatment couch, which is then precisely moved into position inside the treatment area.

Figure 4 – PBT Patient Treatment Room at the Children's Hospital of Philadelphia (source: http://www.newswise.com/articles/proton-therapy-carries-precise-potent-punch-against-children-s-cancers).

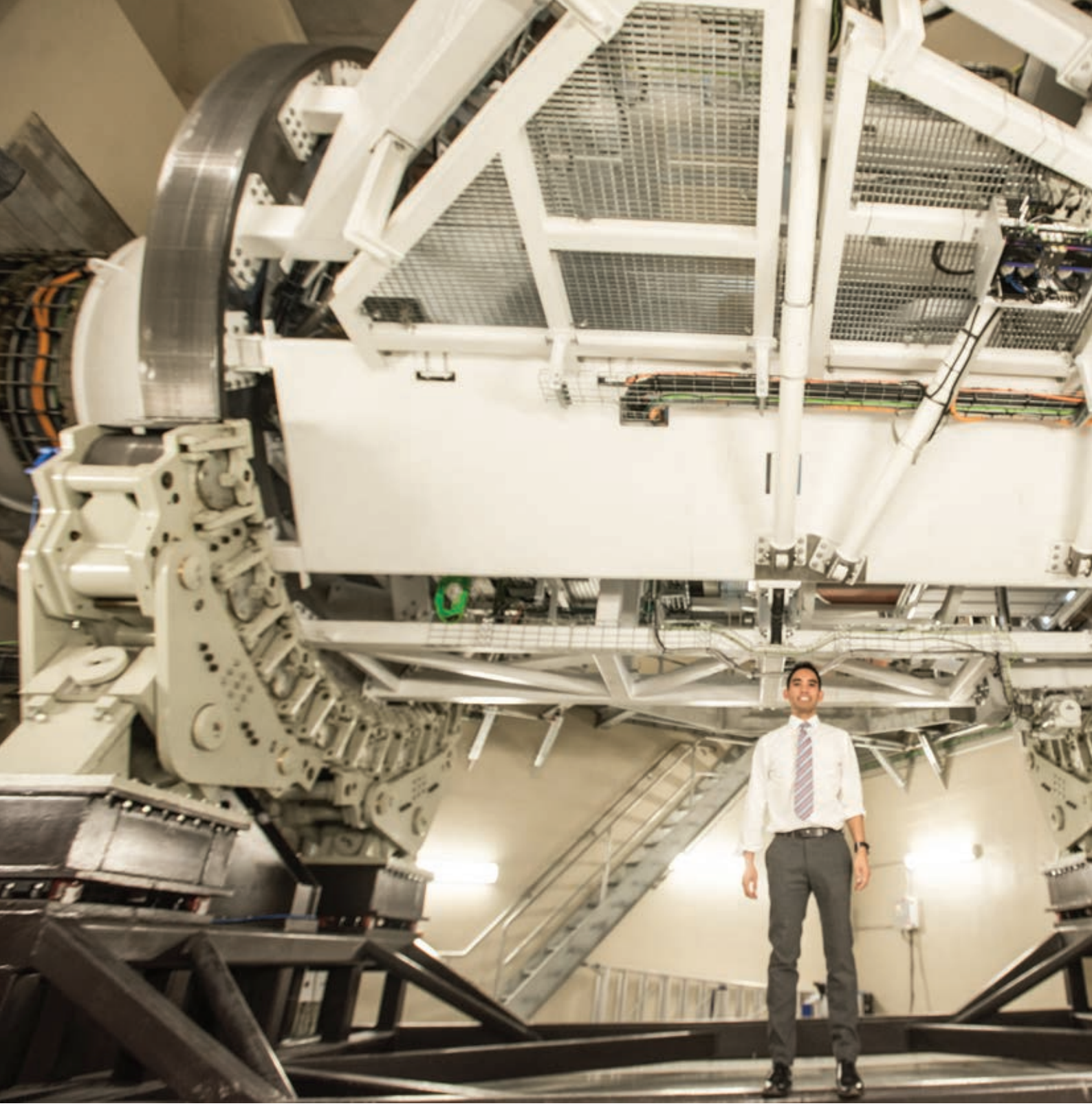

Figure 5 – PBT Gantry at the Texas Centre for Proton Therapy (source: http://www.texascenterforprotontherapy.com).

To direct the proton beam to the correct position to impact the tumour, most PBT facilities utilise a 360 degree rotating gantry to allow the delivery position of the beam to be adjusted to any point around the patient. The patient's view of the gantry is generally limited to the rotating element seen in white surrounding the patient couch in Figure 3 above. The physical structure of the gantry behind the treatment area is extremely large. Individual gantries for each treatment room can weigh up to around 200 tonnes each and require a three storey void to accommodate the structure.

The proton particles are generated by an ion injector which uses an electric field to separate hydrogen atoms into negatively charged electrons and positively charged protons. Protons are transported through a vacuum tube into a linear accelerator to accelerate the protons and significantly increase the proton's energy. The protons then enter a particle accelerator, such as synchrotron or cyclotron to further increase the energy of the protons by accelerating the particles to a speed of up to 200,000 km per second or around 70% of the speed of light.

Figure 6 – Mayo Clinic synchrotron and linear accelerator assembly (source: http://www.medgadget.com/2011/05/hitachi-proton-beam-therapy-coming-to-mayo-clinic.html).

The high velocity and high energy protons exit the particle accelerator and are transported via a vacuum tube through a beam transfer line at the rear of the gantry rooms. Large liquid cooled electromagnets along the beam line allow the protons to be directed to individual treatment gantries for delivery to each patient treatment room.

Figure 7 – Beam transfer line at Texas Centre for Proton Therapy (source: http://www.texascenterforprotontherapy.com).

The high velocity and energy of the protons is required to allow the radiation dosage to penetrate to required treatment depths within the body. The infrastructure required to generate particles in these conditions requires extremely advanced and high precision equipment, which is not only significant in footprint and energy usage, but is often orders of magnitude higher in capital cost than conventional X-ray based radiotherapy equipment.

Proton Beam Therapy has significant advantages over conventional radiotherapy; however the scale, complexity, and cost to implement these systems has meant that PBT is currently only available at a select number of specialist facilities worldwide. Demand for this treatment continues to grow, and with further advances in equipment technology to reduce the size and cost of the equipment the feasibility of providing these specialist facilities should also continue to increase.

OPERATIONAL PROTON BEAM THERAPY FACILITIES

Current estimates are that in excess of 100,000 patients have now been treated worldwide with Proton Beam Therapy.

As of February 2017, there are currently over 70 PBT facilities in operation worldwide, with the majority of these facilities located in North America, Japan and Europe. A further 40 facilities are in construction.

Australia has no operational PBT facilities, with the closest facilities in our region being located in China, Japan, and South Korea. At this time only a very select number

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Figure 8 – World distribution of operational PBT facilities (source: http://www.proton-cancer-treatment.com/proton-therapy/proton-therapy-around-the-world/).

of Australian patients have access to PBT treatment, having to travel overseas for treatment, funded by the Federal Government at a cost of around $200,000 per patient.

In recent years there has been significant interest in PBT technology from a number of organisations in Australia. Master planning and feasibility studies are currently being undertaken across sites in Victoria, Queensland, South Australia, and New South Wales, with these facilities at various stages of planning and development.

Proton Therapy Australia, a Sydney based company established in 2006, were one of the first groups to explore the implementation of PBT in Australia. In 2014 they signed an Alliance with The Mater Health Services to collocate a facility in Queensland, with an aim of having an operational facility within the next few years.

South Australia has also expressed an aspiration to provide the nation's first PBT facility, with plans to develop a second South Australian Health and Medical Research Institute (SAHMRI) for this purpose in the Health and Biomedical precinct adjacent the new Royal Adelaide Hospital facility. The facility is estimated to require investment of approximately $280M and is in the process of securing funding to undertake the project at present.

In late 2016, the Victorian government committed $50M to progress the planning for a PBT facility in Parkville, Melbourne, to be operated by the Peter MacCallum Cancer Centre. The Parkville location is particularly favourable due to its proximity to the recently completed Victorian Comprehensive Cancer Centre, as well as the Royal Children's Hospital.

It seems highly likely then, that within the next few years Australia will have its first operational Proton Therapy facility. In order to get to this point, there will be a number of planning and design challenges to be faced by local healthcare engineers to ensure any new facility can accommodate such an advanced and unique medical treatment system.

IMPLICATIONS FOR PBT FACILITY DESIGN IN AUSTRALIA

Design Planning

There is no 'one size fits all' when it comes to the architectural and building services planning for PBT facilities. There is significant variation between different equipment vendors for room sizes, locations, shielding requirements, and supporting building services infrastructure. The technology utilised by different manufacturers in their PBT systems varies too. Particle accelerators in some PBT system utilise a contained cyclotron and others favour a synchrotron arrangement; the two technologies having significantly different requirements for supporting power and cooling infrastructure. Most PBT facilities therefore require early engagement of a PBT vendor with the facility being specifically designed around the individual requirements of the chosen system.

Radiation Shielding

One of the most significant design challenges for the implementation of PBT is providing sufficient radiation shielding to limit the exposure of patients and staff to within safe levels. The radiation generated by the PBT equipment generally requires a specialist radiation physicist to be engaged as part of the design team to assist with the calculation of required shielding wall thicknesses and provide guidance on allowable room entry locations. PBT facilities are often located beneath ground level; however they still typically require concrete shielding walls between 2.5m to 3.5m thick to protect adjacent clinical areas from the PBT infrastructure. Construction implications of achieving wall thicknesses of this magnitude needs to be carefully considered by the structural engineer and construction team.

Structural Design Challenges

The constructability of forming thick shielding walls up to 3.5m is an important consideration for the structural engineer responsible for the design of the surrounding structure. Analysis of local concrete composition, particularly in regards to residual water content, may also be necessary for consideration in shielding calculations by the radiation physicist.

The precision required to transport the highly energised proton particles along the beam line requires the floor flatness and deformation of the

installation to be completed within an extremely fine tolerance. Any deviations long term can have significant implications to the accuracy and efficiency of the system.

Access to skilled local trades in forming the concrete structure and ensuring a quality finish within required tolerance levels has historically been a challenge for the construction of PBT facilities.

Figure 9 – Construction of gantry shielding walls at Maryland Proton Therapy Centre (source:http://www.schusterconstruction.com/projects/maryland_proton_treatment_center.html).

Coordination of services entering radiation shielded areas

Given the significant radiation containment challenges associated with PBT facilities, it is essential that all services which need to enter the gantry, beam line and particle accelerator areas need to be carefully coordinated and have entrance locations verified with the radiation physicist.

Typically services must enter treatment areas via the maze entry into the room, requiring a significant amount of ductwork, pipework, and cable trays in a highly congested and confined zone. If a particular service is missed, or cannot be coordinated in the allocated areas, it is typically not an option to core additional penetrations at a later date as any penetration through shielding walls will generally need to be pre-cast, configured in an arrangement eliminating a direct line of sight, and reviewed to be acceptable by the radiation shielding consultant.

Installation, Commissioning, and Plant Replacement

The equipment installation, testing, and commissioning process for the highly intricate PBT components can exceed 12 months. Programming of construction works and the separation of PBT areas from other areas of the facility being constructed requires careful planning. Plant replacement strategies also need to be developed early in the design to ensure large components such as a cyclotron which may weigh in excess of 100 tonnes can be removed and replaced from the facility if required. The significant shielding requirements and thick concrete bunker walls surrounding the PBT equipment constrain where replacement paths can be provided.

Figure 10 – Cyclotron lift at Skandionkliniken PBT facility in Sweden (source:http://www.cranestodaymagazine.com/news/heavy-lifting-install-cyclotron-in-sweden-290513/).

Power Quality and Quantity

The PBT equipment often requires dedicated substations, electrical infrastructure and distribution systems to support the energy intensive operation of the linear accelerator, particle accelerator, beam line electromagnets, and gantry actuators. The PBT equipment and supporting services infrastructure may require in excess of 3 MVA of supply capacity; with redundancy, standby power, and UPS infrastructure also key design considerations in the design of the distribution system. Power quality must also be maintained within a fine tolerance including long term voltage variations, imbalance between phases, frequency variations, and harmonics limits.

Process Cooling

The components of the PBT infrastructure generate considerable heat during the production and transport of the protons. Components including the linear accelerator and the electromagnets serving the beam line are water cooled and require dedicated process cooling loops to effectively dissipate the generated heat. Process cooling requirements for PBT equipment can be in excess of 1000 kWr in heat rejection capacity, with requirements varying between individual PBT equipment vendors and being dependent on the number of treatment

gantries. Key design considerations for these systems include ensuring water quality parameters such as conductivity are controlled and sufficient redundancy and monitoring capability is incorporated.

Air conditioning and ventilation

Temperature stability and uniformity of temperature distribution is an important design consideration for the air conditioning and ventilation systems given the precision of the PBT equipment. Humidity control must also be considered, particularly to limit any potential for the formation of condensation and to protect bare metal components from corrosion.

Industrial Gases

Industrial gas requirements vary between different PBT vendors, but may require instrument grade compressed air, nitrogen, oxygen, and hydrogen. The transport, storage, and handling of these gases must be carefully planned with the design team and facilities engineers, particularly in the case of hydrogen given its highly flammable nature.

CONCLUSION

With planning and feasibility studies well underway in Australia, it seems likely that an Australian PBT facility will be operational within the next few years. This advanced technology will require Australian healthcare engineers to implement facility design and building services infrastructure solutions unlike those seen in any of today's local hospital facilities.

PBT will be a new and exciting technological advancement when it arrives into the Australian market. Internationally though, there continues to be further rapid development in the field of particle therapy, with a focus on developing this technology to use even heavier particles such as carbon ions. By utilising heavier carbon ions considerably more energy can be deposited into a tumour, to significantly reduce the required number of treatment sessions. The energy, scale and cost associated with generating the carbon ions is magnitudes higher again than that of proton therapy, which has limited this technology to only a handful of specialised facilities around the world. The considerable research and development which is occurring in this field and the clinical benefits which have already been demonstrated will ensure that particle therapy systems will become increasingly relevant to Australian healthcare engineers developing hospital projects in the upcoming years.

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BUILDING ACT CHANGES AFFECTING HOSPITAL PROFESSIONALS & CONTRACTORS

By Derek Hendry, The Hendry Group

AUST – Hospital managers, engineers and contractors should be aware of recent significant changes to the Victorian Building Act that will affect them. Professionals in other states must be watchful for similar changes to their building control legislation.

These changes can place the hospital professional and their contractors in a vulnerable position. A contractor under the Act, is deemed to be anyone who; performs building works, alterations or rectification works, such as fire services, HVAC, electrical or general building work.

Until recently, in Victoria, the owner has always been responsible for ensuring that a building permit is obtained before any building works can occur. Section 16 now states in part "it is a defence for the land owner if a building practitioner or architect has been engaged to carry out the work" and the owner has not obtained the permit.

A Victorian Building Authority 'Fact Sheet' clearly defines "contractors" as Building Practitioners, under Section 16 of the Act. Therefore, if the owner does not obtain the building permit, it is incumbent on the contractor (hospital professional) to obtain a building permit or sight a copy of the building permit prior to commencing alterations to a building.

Schedule 8 of the Building Regulations describes that most building works require the need for a Building Permit. This includes any structural works, internal alterations where active or passive fire systems/ services or essential safety measures are altered or affected, and for most fit outs and any change of use.

Questions you should consider... Is the contractor aware of this requirement? Are they a registered building practitioner in the correct category? Have they allowed for the applicable permit fees in their quotation?

If a hospital professional issues a work order to a contractor to perform repairs, alterations or additions that requires the obtaining of a building permit, then the contractor must obtain the building permit prior to commencing work. If the owner or contractor does not obtain a building permit for the work, and is subsequently exposed, this could put the hospital professional in an invidious legal position between the parties, especially if insurance claims are involved.

Complications will arise when a hospital professional issues a purchase order to a contractor to commence building work (alterations) without first obtaining a building permit, not advising the contractor to include an allowance for the building permit, or advising the

contractor that the hospital is not obtaining the building permit. This hospital professional can be deemed to be the person in charge of carrying out the building works (alterations) in the building as the hospital professional is providing directions to perform building works. This professional is now in a vulnerable position.

Building Regulation 317 in part states: "Provision and display of permit information – A person who is in charge of the carrying out of building work on an allotment must take all reasonable steps to ensure that a copy of the building permit and one set of any approved plans, specifications and documents relating to that permit are available for inspection at the allotment concerned while the building work for which the building permit was issued is in progress".

Fines for performing building work without a building permit, for all buildings, is now up to $377,000 for a company, and $76,000 for an individual.

If you are a hospital professional or an individual, there are two separate offences you may be liable for when altering a building without the appropriate permit.

1. Carrying out building work without a current building permit.
2. Carrying out building work in breach of the Act, Regulations, or the permit.

Each offence is subject to a penalty as mentioned above. In most cases, alterations to existing building incur both offences/penalties.

Hendry recommends hospital professionals make themselves aware of all legal implications before deciding not to obtain a building permit for minor building work, repairs or alterations to an existing building that requires a building permit under the Building Act and Building Regulations. Hendry can provide building control advise and issue the necessary building permits for all types of projects, please call on 1800 875 371.

ABOUT THE HENDRY GROUP

Derek Hendry is the Founder of the Hendry Group, a property compliance solutions consultancy whose services include building surveying, disability access, essential safety measures, emergency planning and work health and safety. Hendry pioneered the private certification system of building approvals in Australia and operates nationally in all facets of building control. Hendry is aware of the importance of sharing knowledge, and regularly distributes industry news and updates through publications such as 'Essential Matters' Hendry's e-newsletter, blog sites and website. For more information please visit www.hendry.com.au

HIGH PROFILE BACKING FOR GS1 DRIVE

CUTTING COSTS, IMPROVING EFFICIENCIES

At the 2016 GS1 UK Healthcare Conference in London, delegates heard from speakers including Pat Mills, the Department of Health's commercial director, on the ongoing work to embed GS1 standards throughout the NHS in England in line with the DH's eProcurement Strategy, published in April 2014. This mandated that any service or product procured by an English NHS acute Trust comply with the standards – one of the most obvious representations of which is on barcodes – 'to enable Trusts to manage their non-pay spending by adopting master procurement data, automating the exchange of such data, and benchmarking their procurement against other Trusts and healthcare providers'. One of six 'demonstrator site' Trusts to provide a speaker at the 2016 GS1 UK national conference to report on their progress to date was Leeds Teaching Hospitals NHS Trust. Shortly after, HEJ editor, Jonathan Baillie, spoke to the Trust's associate director, Commercial and Procurement, Chris Slater, and to head of Healthcare at GS1 UK, Glen Hodgson.

In unveiling the DH's eProcurement Strategy in April 2014, the then Under-Secretary of State for Health, Dr Dan Poulter, explained that it would establish the GS1 coding and PEPPOL (Pan European Public Procurement On-Line) standards throughout the healthcare sector and its supply chains, introducing a requirement that any service or product procured by an NHS acute Trust in England comply. The initial deadline set for compliance at a service and product level is 2019/2020.

GS1 is 'a global non-profit-making organisation which sets standards that have provided a common foundation for business since the first barcode was scanned over 40 years ago'. Having introduced the GS1 barcode in 1974, the organisation's aim continues to be 'to bring efficiency and transparency to the supply chain using standards already used by a reported one million plus companies' – in areas ranging from retailing to foodservice. In the UK, GS1 standards are managed by GS1 UK, one of 112 independent, not-for-profit GS1 organisations worldwide – which is helping the DH drive implementation of GS1 identifiers and barcodes across the NHS, its supply chain, and 'solution-providers', at a 'product, place, and person' level.

MULTIPLE APPLICATIONS

In healthcare, the DH and GS1 UK say GS1 standards' scope to improve efficiencies, speed workflow and patient throughput, enable equipment to be located faster, and reduce procurement costs, is 'virtually unlimited'. The standards, and GS1 barcodes carrying a unique identifier, can be applied to many areas or 'use cases' – from patient identification to procurement. However, recognising that while some Trusts have used GS1 standards for some years, others may be less familiar, and to 'help Trusts understand where to start', the DH issued guidance as part of the eProcurement Strategy on three 'core enablers' and three 'primary use cases'. The Strategy mandated that each Trust adopt GS1 standards in all these areas, plus one additional 'use case'. The three core enablers were: 'Catalogue management', 'Patient identification', and 'Location numbering'. The DH said the three 'enablers' would allow any Trust to use GS1 standards to 'identify every person, product, and every place', and underpin the three primary 'use cases': purchase to-to-pay, inventory management, and patient safety recall.

DRIVING UPTAKE

GS1 UK has been working closely with the DH to drive uptake of GS1 standards across the NHS acute sector. This January, the Department announced that six NHS Trusts had been chosen as 'demonstrator sites of excellence' to receive support and a share of £12 m in funding to enable them to demonstrate what the DH believes will be the 'significant efficiencies and cost savings, reduced errors, and improved patient outcomes and patient safety' achievable. The six are:

- Derby Teaching Hospitals NHS Foundation Trust.
- The Leeds Teaching Hospitals NHS Trust.
- North Tees and Hartlepool NHS Foundation Trust.
- Plymouth Hospitals NHS Trust.
- Royal Cornwall Hospitals NHS Trust.
- Salisbury NHS Foundation Trust.

OUTLINING THE BENEFITS

At the GSI UK Healthcare Conference, representatives from all six 'demonstrators' explained what they foresaw as the potential benefits of widespread implementation, described their progress, and set out their plans to harness the standards to improve

operational efficiency, patient safety, and patient experience, while reducing costs. – all against a backdrop where Lord Carter's interim review had suggested that introducing GS1 standards would allow every English NHS hospital to save 'an average of £3 million each year', while simultaneously improving patient care. Speaking at the GS1 event, Lord Philip Hunt, GS1 UK's President, who is also treasurer of the All-Party Parliamentary Health Group, noted that Derby Teaching Hospitals NHS Foundation Trust had already saved 'at least £25,000 every month, just in the consumables used in general surgery, imaging, and pathology laboratories'. By the year-end, GS1 UK and the DH say there should be 'documented savings', with the demonstrator sites set to run until the end of 2017.

To find out more, I spoke firstly to Glen Hodgson, GS1 UK's head of Healthcare, and, secondly, to Chris Slater, who, as the Leeds Teaching Hospitals NHS Trust's associate director, Commercial and Procurement, is spearheading the work of England's third largest NHS acute Trust in adopting the standards.

BACKGROUND TO COLLABORATION

Glen Hodgson explained that GS1 UK had in fact worked closely with the Department of Health since the 2010 publication of the DH's Coding for Success document – which argued for a single identification method for products and places 'inside the NHS'. The document discussed adoption of patient identification and patient wristbands featuring GS1 identifiers, while the development of an International Standard, ISB 1077, for the first time allowed the NHS number to be slightly adjusted to incorporate a GS1 prefix, and used on patient wristbands. This' unique identifier' could be recognised in any healthcare system globally.

In 2012 the DH signed a five-year contract with GS1 UK to 'purchase membership' of GS1, and therefore licences for prefixes – effectively the building blocks of the GS1 standards, for all acute NHS hospitals and all NHS directly-funded entities across England. This gave each Trust the licence to issue GS1 codes; they could thus start using them themselves. In the early days, the numbers were typically used to track and trace aseptic compounds produced by hospital pharmacies, for other asset management, and for kitting of operating theatre procedure trays.

EARLY ADOPTERS

Glen Hodgson explained: "There were some early adopter hospitals. Then, in 2014, the DH published its eProcurement Strategy, mandating the use of GS1 standards throughout English NHS acute hospitals. The Strategy states that any product or service supplied to the NHS in England that results in an invoice should be GS1 compliant – from a pharmaceutical to a window pane. However, it recommends the service initially focus on implantable medical devices, pharmaceuticals, medical/surgical equipment, and, subsequently, on staff, contract purchasing, and stationery. The reason for the initial focus on pharmaceutical/medical devices is that forthcoming legislation requires their traceability and serialisation."

The legislation in question is the Unique Device Identification Directive – under which all medical devices supplied into the US already require a Unique Device Identifier (UDI), and the Falsified Medicines Directive (FMD), which aims to prevent falsified medicines entering the European supply chain. Under the FMD, all medicine packaging must contain a unique identifier, to enable the authenticity of prescription medicines to be verified by checking of serial numbers against a central database. By February 2018, suppliers not complying will be unable to trade, while compliance with the UDI will be mandatory 'between 2018 and 2020', depending on the class of device.

REQUIREMENT TO NOMINATE A LEAD

Moving to November 2014, and Glen Hodgson explained that a letter from Richard Douglas, then director of finance at the DH, asked every English acute Trust to nominate a GS1 lead, making it clear such individuals should ideally not be procurement or IT directors, since, as this was 'a culture change and business transformation programme', the Department wished it to receive Board-level attention.

Following the letter, 123 of the 154 English NHS Trusts nominated GS1 leads. The DH then asked Trusts to develop GS1 adoption plans, and said it would look to identify demonstrator sites, before in June 2015 announcing it would run a competition, and fund those selected. Trusts were invited to submit plans and confirm their wish to be part of the 'demonstrator' site programme. The DH said it would then compile a shortlist of 12, and fund each in developing a business case.

Fifty-four Trusts produced business plans, 29 confirmed their wish to be 'demonstrator' sites, and 12 were shortlisted during late 2015. In January 2016, the DH announced the six Trusts selected as 'demonstrator sites of excellence'. Glen Hodgson elaborated: "These demonstrator projects are now funded to the tune of £12 m overall over two years.

A DIFFERENT NAME

"Some Trusts," he added, "are further than others along the journey. As Chris Slater will explain, the six demonstrator sites came up with a different name to 'demonstrators' – 'Scan4Safety'. Accelerate to the current day," Glen Hodgson explained, "and we have had very clear support from the DH, with the Department's commercial director, Pat Mills, confirming at our conference that the Department was now planning for the next phase of implementation throughout the estate."

While Pat Mills had not gone into detail on this, Glen Hodgson believes the Department's medium-term intentions are clear. He said: "It's all about the ability to identify people, product, and places; delivering patient safety, regulatory compliance, and operational efficiencies. Our day two conference keynote speaker, Lord Prior, Parliamentary Under Secretary of State for NHS Productivity, felt the benefits of GS1 standards around procurement and patient safety were already clear; the sector should also, he said, be focusing on clinical productivity." Glen Hodgson explained that wider implementation of GS1 standards should enable improvements to clinical practice via a number of routes. He said: "For instance, at one demonstrator site, the Royal Derby Hospital (run by Derby Teaching Hospitals NHS Foundation Trust), in 30 of 35 operating theatres no item or person goes into a theatre without a GS1 barcode." In fact, using its own license, the Derby Teaching Hospitals NHS Foundation Trust has developed barcodes for numerous items, including standard kits – for gowns, drapes and gloves, for standard packs for general anaesthetics, and for standard kits for standard operations.

CLINICAL VARIATIONS

Glen Hodgson explained that the GS1 UK conference also saw Lord Prior highlight the example of maxillofacial surgery, and the clinical variation apparent between the maxillofacial surgeons at the Derby Trust. He said: "These variations might, for example, be around the different amount each spends on consumables, or it may be one surgeon can complete a particular procedure in 90 minutes, and another in 60. It may be that the consultant completing the procedure in an hour has nine people in theatre, and the one taking 90 minutes, seven. The question is: 'Should we have two healthcare assistants in the theatre to get the operation completed quicker?'"

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Following this work, Glen Hodgson said the intention was to use GS1 standards to look at what difference different practices could make to clinical outcomes. He explained that, at Derby, every patient, healthcare assistant, chief nurse, the theatre or ward staff, the consultant going into the operating room, plus every instrument used, would have its own GS1 number. "In fact," he added, "clinical variation is slightly beyond the scope of the original demonstrator sites. Nevertheless, the points that Lord Prior made about GS1 adoption's benefits to clinical productivity were echoed at our conference by Professor Sir Terence Stephenson, chair of the General Medical Council, who wholeheartedly supports the programme, and sees great opportunities for doctors to get involved. At the heart of all this is patient care and safety."

GOOD SOURCES OF DATA

Entering the discussions, Leeds Teaching Hospitals NHS Trust's associate director, Commercial and Procurement, Chris Slater said: "In fact, surgeons are very interested in costs, and if we can clearly show we have sound data sources, they become engaged." The Leeds Trust is currently England's third largest, with a £1.2 bn turnover. Chris Slater said: "Like all NHS organisations, we have challenges around quality, performance, and costs, and have been looking to meet these in various ways. My key focus is cost. However, when we start looking at efficient procurement, we begin to recognise that it can also improve the quality and performance of the organisation."

'UNSOPHISTICATED AND MANUAL'

Chris Slater explained that on joining the NHS in 2004 from a manufacturing and IT background, he rapidly realised that, 'outside of the retail operations', the way stock control and inventory were handled in a 'typical' hospital was 'fairly unsophisticated and manual'. He said: "It very much involved clinical staff replenishing, stocking, and stacking; so a lot of high-cost time was taken up on supply chain activity. We embarked on a programme to bring this work under the control of our supplies and procurement function, and put some automation around the process, using stock and inventory management. This entailed setting the data standards within a software package, and then overlaying that into an inventory system."

He continued: "The first GS1 barcode was used in 1974 in retail on Wrigley's chewing gum. You came into healthcare, and actually GS1 standards were not being applied. We found different manufacturers using different barcode standards, so the same product, from the same manufacturer, would feature different barcodes, depending on the point of manufacture.

"Using a retail analogy," he said, "you could have a checkout not recognising a product. So we have had to cope with different standards of barcodes and keep our systems working. It was clinical staff, however, who we were asking to monitor barcodes and book product out with patients on the operating table. They are not going to take time and correct a barcode error; they will simply take the product. Replenishment then doesn't happen, and you run out of stock, so the next patient doesn't get the product."

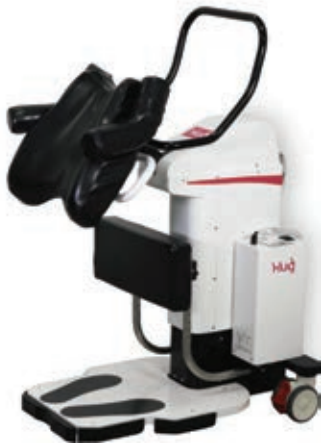
CRITICAL MASS

While GS1 standards were by no means new to suppliers, a barrier to wider adoption had, he explained, been lack of critical mass. Chris Slater elaborated: "Some of our suppliers have told us historically that, while acknowledging that we are a big customer, until the NHS adopts GS1 standards, changing their standards and packaging is quite costly. They have said: 'We are not really prepared to do it just for one Trust; we will wait for an NHS imperative.' Hence the need for DH to say: 'This is something all Trusts must comply with'. Thus, for the first time, we are getting a powerful message to suppliers that these are the standards the NHS is going to use, and that we will be building them into our contracts with them.

"Once we have begun standardising data, and can achieve automation in the supply chain – we can start tracking those products. Take the famous PIP breast implant issue, where 30,000 women received faulty products, but the sector didn't know who they were. Had those implants been barcoded and tracked into the patient notes using GS1 barcodes, we would have had a recall facility to notify the women, bring them in, and do the checks far more cost-effectively. By linking a product to the patient, we can identify the patient, and withdraw the faulty product, far more quickly."

TIME-CONSUMING RECALLS

Without such a system, a healthcare safety recall could entail deploying 'hundreds of staff 'walking around shelves removing product. Chris Slater said: "We can now input the GTIN, (Global Trade Identification Number) for an item, and identify which shelf it is on." Making this work effectively, of course,



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As conference delegates were reminded, the Department of Health's eProcurement Strategy, published in April 2014, mandated that any service or product procured by an English NHS acute Trust comply with the standards.

requires supplier engagement to populate the Trust's product catalogues with the appropriate GTIN. "However," said Chris Slater, "if six Trusts can do it, with the spread of all six we should be talking to at least 80 per cent of the suppliers, and probably collecting data on 80 per cent of the products they supply to the NHS."

"We won't initially track every piece of cotton wool or cannula. We will rather be barcoding the small 'kits' of theatre items, and will thus know that within the bill of materials, we have 'x' number of different items. The other important element – where it starts to link to estates – is that, under the current DH mandate, the first three standards relate to products, patients, and places. That means every location where we undertake activity – the bed bay, the theatre, the 'prep' room, or the side ward, will have a unique GS1 identifier barcode, or GLN (Global Locating number). Currently, within my own Trust's supply chain system, I have 300 transfer points across our seven hospitals – points where would ordinarily be able to track to. However, take this to the point where we carry out activity, and we have 25,000 locations, so part of this project involves mapping all those to unique GS1 GLNs."

LOCATION IDENTIFIERS

Chris Slater explained that currently there were two principal software systems that held location identifiers – Micad and Planet FM. He explained: "Generally these are used around estates and facilities management as opposed to procurement and the patient. We are now using the information we have within Micad for FM to bring in unique GLNs to map them to those location numbers – these could be rooms, door numbers, or office numbers. We are looking to ensure we have captured most of the 25,000 locations." Undertaking this work, the GS1 UK project team in Leeds is working with the Trust's Estates and Facilities Department. Chris Slater added: "We already have all the locations mapped via the Estates Department for estates management at a granular level. We have also worked closely with Micad, the software provider – recently downloading from the GS1 number bank 50,000 GLNs into our Micad system – and are now mapping the unique Micad references to the GLNs. We will subsequently produce physical barcodes, and affix these to all of those 25,000 locations; generally on doors, at handle level, probably using tamper-proof, non-removable barcodes.

A BROAD SPECTRUM OF STAFF

"Currently, we have IT personnel, procurement staff, estates and facilities personnel, and nursing and clinical teams involved. Over time staff involved will range from porters, to clinicians."

Mapping the various locations would, Chris Slater said, bring several important benefits. He said: "One very practical example is knowing where our patients are. Ask our medical director what really frustrates him, and he'll tell you it is not being able to locate a patient when a doctor is doing a ward round. However, if we scan patients in real-time to a real location, and our patient 'administration' system records the data, one look at the system will identify that the patient is, for example, in bay 6 in Ward 7."

TRACKING ROOM UTILISATION

The Trust would also be able to track room utilisation more accurately. Chris Slater explained: "All this starts to tie back together into one massive management information database that gives us data on patient flows, products, performance, patient safety, and recalls."

In future, I guessed implementation of GS1 standards would also help a large NHS Trust better manage availability of large items such as beds? Chris Slater said: "Such large assets are outside the scope of the initial three core enablers, but the same principles will apply. I believe Derby Teaching Hospitals NHS Foundation Trust is linking the barcodes generated in its main hospital to individual endoscopes and other surgical instruments so staff know exactly where each

is, and for what procedure, and on which patient, it was most recently used for. Should, for example, a subsequent claim arise that a particular 'endoscope' was defective, staff will be able to track where it came from, and its service history. Equally, the automated theatre supply chain process the Trust is using – based around GS1 barcodes – is seeing it save a significant amount every months via more efficient stock management."

'INTELLIGENT' BARCODES

I asked whether the plan, both within the Leeds Trust, and more widely, was for large-scale capital assets to be next to be widely GS1-'tagged'? Chris Slater responded "Absolutely, but we will then need to start using 'intelligent' barcodes or RFID tags. Once we put active tags on assets, we can start looking at our asset base, and whether we are utilising assets correctly."

Chris Slater said his Trust's GS1 work was progressing well: "We are engaging with suppliers, and, working together, the six demonstrator sites have held national supplier engagement days, facilitated by GS1 UK. One key goal is to get suppliers to recognise the need for GTINs and identify the potential savings. You can imagine that if, for the first time, the NHS is asking for the same item, coded the same way, in the same language, suppliers' back office costs will diminish significantly. Using a common business language will enable them to transmit invoices electronically, and help Trusts pay more promptly, because we will all recognise the same items being called the same thing. The major suppliers are already on board, but we will need to get distributors and wholesalers talking the same language. The six demonstrator sites are striving to segment the supplier base, so we are not going to the same suppliers asking the same questions. There is a lot of good collaboration."

REMOVING SOME OF THE COMPETITIVENESS

In fact, Chris Slater noted, the exercise was 'taking the usual competitiveness out of the equation'. He said: "We are talking about trying to improve each of our efficiencies. We all have a real common purpose."

After the first three months' work in Leeds, 'great progress' had been made. Chris Slater elaborated: "We have a project office at St James' University Hospital, and teams comparing and sharing data with suppliers. Currently I have about 12 Trust staff on the project day to day, but it ebbs and flows, and will continue doing so. For example, when we deploy GLN location stickers, I might need 50." He acknowledged that educating staff would be key: "This is driven right from the top table. All staff need to understand what this means to us as an NHS Trust, but also what adopting GS1 standards means to us as a business. We will be communicating news on our Trust website and staff Intranet. I think the title for the project all six demonstrator Trusts came up with – 'Scan4Safety' – encompasses the ethos and goals – it needed to have the words 'scan' and 'safety' in it."

Chris Slater explained that equipment-wise, the Trust had so far used fixed scanners, but that, looking forward, more mobile scanning technology would be needed.

COST-SAVING POTENTIAL

Clearly, alongside improving asset and property utilisation, facilitating product recalls, improving patient safety, and enhancing patient throughput and clinical efficiencies, saving money is a key goal, and I asked if the Trust's GS1 UK team had compiled any data on how much the exercise might save the organisation financially. Chris Slater replied: "I guess the tangible numbers are about inventory reduction, waste reduction through visibility, and less obsolete stock. Historically we have reduced inventory by about 25 per cent in areas where we used GS1 standards in about 12 months. A Trust our size typically carries stock worth about £18 m-£20 m. The less tangible number is around releasing time to care, and we need to look at how we capture that data, record it, and ensure that time is used productively.

"Working with the DH, we have devised metrics for capturing this, and to measure the efficiencies the project brings. It is, however, a bit early to be able to produce definitive data. Logically, however, there is no question there is the potential for considerable savings in time, cost, and wastage."

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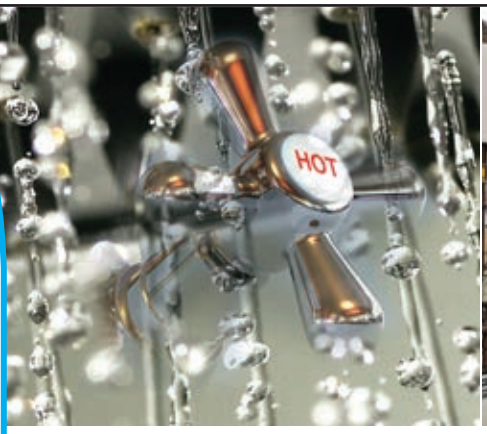

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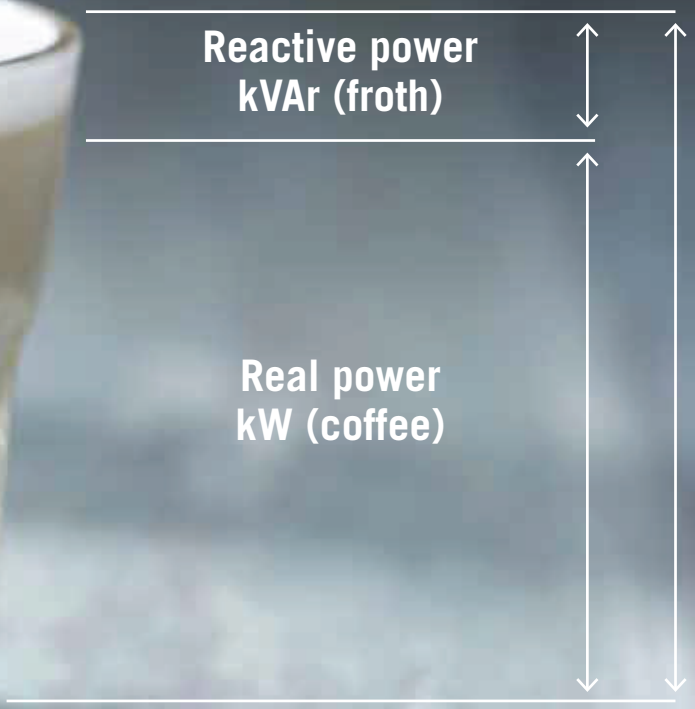
What is Power Factor (PF)?

When you pay for a latte, the last thing you want is more froth than coffee. The same thing can be said about power. Froth on a latte is like wasted energy.



$$\text{Power Factor} = \frac{\text{kW (coffee)}}{\sqrt{\text{kW}^2 + \text{kVAr}^2\ \text{(coffee + froth)}}}$$

PF is the ratio between Active – or Real – Power (kW) and Apparent Power (kVA) i.e. a measure of efficiency. It is a measure of how effective incoming power is being used by your electrical equipment, and is expressed as a numerical value between zero and one.

The higher the power factor, the more effective the electrical equipment is being used e.g. a power factor of 0.7 means that 70 per cent of power supplied to the equipment is being used effectively, and 30 per cent is being wasted. This wastage is an unnecessary cost!

An appliance with a low PF draws more current from the available power supply than an appliance with a high PF. Circuits with purely resistive heating elements (e.g. filament lamps, cooking stoves, etc.) have a PF of 1.0; circuits containing inductive or capacitive – reactive – elements (e.g. Transformers, Induction motors, Welding equipment, Arc furnaces, Fluorescent lighting, Electric motors, Solenoid valves, Lamp ballasts, etc.) often have a PF below 1.0.

Ideally your power factor should be as close to one (1.0) as possible to ensure your site is using energy efficiently.

ENERGY
systems & services

Energy Systems & Services Holdings Pty Ltd

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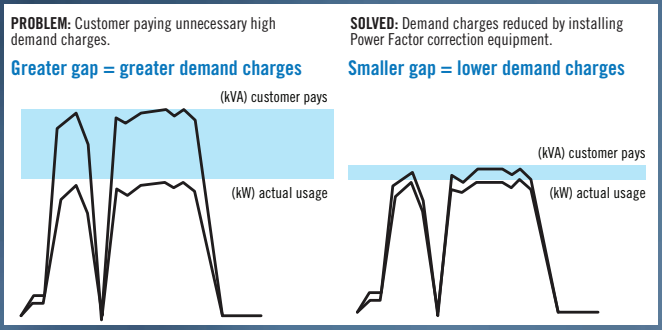
How does Power Factor impact my business energy cost?

Taking control of and monitoring Power Factor can lead to reduced kVA demand and therefore reduced electricity costs. Improving Power Factor can lead to savings on your business electricity bill.

Installing Power Factor Correction (PFC) equipment can be a cost effective measure to reduce your electricity bill. Energy Systems & Services has delivered PFC projects with short payback periods, in some cases less than a year!



Benefits of PFC…

- Reduced cost: Reduction in kVA demand and therefore electricity costs
- Equipment life: Extend the life of your equipment
- Compliance: Compliance with regulatory codes
- Expansion: More power available for site expansion without the need for new switchboards and cable
- PFC reduces the amount of reactive power required to be sourced from the electricity supplier
- Smaller sized transformer and installation power wiring (less current required due to PFC).
- Future plans of expansion (of plants, etc.) are more greatly obtainable.
- Financial (tariff) example:
  - 1000 kW load at PF of 0.75, S = 1333kVA
  - 1000 kW load at PF of 0.95, S = 1053 kVA
    Difference is 280 kVA => 280 x $0.3757 = $105.20 penalty per day or $3,156 penalty per month.

Energy Systems & Services (ESS) Holdings Pty Ltd.

ESS offer the following range of products and services:

- Supplier of PFC equipment
- Installer of PFC equipment
- Technical adviser on PFC equipment
- Project manager for supply and installation of PFC equipment
- Provider of specialised Financial Packages* for funding PFC supply and installation.

ESS are non-biased in the selection of components and systems adding flexibility to ensure a design, program, procedure or system is 'fit for purpose' and cost effective, with minimal disruption to the facility's operations.

Talk to ESS (www.energyservices.com.au) today to learn more about our specialised Financial Packages and to see if PFC equipment could benefit your site.

Financial Assistance for Business

Did you know supply authorities offer businesses in eligible areas funding to help cover the cost of installing PFC equipment? PFC could be a cost-effective initiative for your business to reduce electricity costs. Also ESS offer project finance for all electrical asset upgrade projects including power factor correction.

ENERGY
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SOLUTIONS FOR ENERGY EFFICIENCY & ASSET MODERNISATION

www.energyservices.com.au

NEWS

INTRODUCING THE LATEST FROM JAPAN – **THE HUG**, A MOBILITY SUPPORT ROBOT

Hug is designed with supporting people who face mobility issues. It allows you to move a person from bed to wheelchair or wheelchair to the toilet. Hug assists when needing to transfer a person to a sitting position or in situations where standing for a period of time is required, such as getting dressed. Hug supports those who have the ability to stand on their own, but for a particular reason, have limited mobility when standing.

Hug is ready to use, anytime. Hug does not use a sling or harness, which means no consuming setup time. Hug does not only raise a person, but brings them forward in a sliding motion to stand, effectively distributing their weight to the backs of the heels and allowing the person to feel comfortable while standing up.

The Hug allows and gives people their dignity as they are reluctant to move because they do not wish to burden others with heavy lifting. The Hug robot can now take over the lifting work that has been the domain of care workers to ensure less physical stress
and the avoidance of back injuries.

Hug
Mobility Support Robot

Contact: Gerald Koh,
Kobot Systems Pty Ltd
Tel: 04-1996-1978
Email: gkoh@kobot.com.au

CUTTING EDGE GAS CONDENSING TECHNOLOGY

HydroHeat Supplies are the exclusive importer of BAXI Boilers in Australia. Arguably the most efficient heating boilers available on the Australian market, the BAXI Power HT and Duo-Tec MP commercial range of wall and floor mounted boilers uses cutting edge gas condensing technology to maximise efficiency and extend lifespan. BAXI are experts in the field of high output condensing boilers and producing compact and scalable systems making them ideal for a range of commercial applications. Available in outputs from 35kW to 150kW.

HydroHeat Supplies support and maintain the BAXI brand throughout Australia. We supply boilers as part of complete hydronic heating system solutions and are synonymous with the BAXI ethos, being driven by sustainability and excellence in heating products.

For more information, visit
www.hydroheat.com.au

HYDROHEAT
SUPPLIES

STOP DRAIN FLIES AND ODOURS EMANATING FROM HOSPITAL WASTE SYSTEMS

The **Grate Seal one-way valve** and the **Grate Seal Bucket Trap** offer low-cost, effective solutions to common issues within waste systems, are simple to install and are made here in Australia.

The Grate Seal one-way valve prevents drain flies, hazardous sewer gasses, soap suds and vermin from entering habitable areas from waste pipes and drains.

It is a flexible rubber one-way valve, specially designed to fit straight into an existing waste outlet. The valve doesn't restrict flow – the Grate Seal can easily cope with the maximum allowable flows from plumbing fixtures.

The Grate Seal one-way valve can prevent unwelcome breakout from waste pipes in many areas, such as showers, laundries, plant rooms and toilet areas. Three sizes of product are available covering all common waste pipe diameters and the product is suitable for PVC, Copper, Cast Iron, HDPE and Earthenware pipes.

Installation is fast and easy, with no need for a water seal or for any alterations to existing outlets. The existing grate is simply removed, the pipes cleaned and the Grate Seal inserted, before the grate is reinstalled.

Conversely, the Bucket Trap is designed to prevent any unwanted debris from entering the hospital's wastewater system.

The Bucket Trap is the most cost effective product of its kind on the market and is the simplest to install, without any disturbance to the existing surface.

It's suitable for a wide range of applications such as kitchens, laundries and plant rooms. The product can be installed within 100mm PVC & HDPE pipes of any drainage outlet style, including trench grating.

For more information call Grate Seal on 1300 393 913 or email sales@grateseal.com.au.

NEW ENWARE LEVA SEQUENTIAL RANGE

Designed for Ensuite showering and handwashing applications in the Health and Aged care market these new products compliment the Leva range. Offering user benefits over traditional single lever mixer type tapware in terms of ease of use, there are also benefits to your facility in the potential for energy savings and a reduced risk of legionella.

Designed to be easy to maintain and clean with a modern design the mixers are suitable for most basin types; with the addition of a suitable spout (available separately from Enware). The Sequential ceramic disc cartridge moves progressively from "off" to "full cold" to "mixed" to "full warm" all in a single anti-clockwise rotation without the need to lift, offering much easier control for users with arthritic or mobility conditions.

As the tap does not draw any hot/warm water until the handle is moved to the mixed position, energy can be saved and potentially reduces risk of legionella by not drawing small amounts of warm/hot water into the pipework.

Installation is simple and unlike other single lever mixers some adjustability is offered with up to up to 25mm of depth variability. Spare parts are available and both products come with a 5 year warranty.

For more information contact Enware on 1300 ENWARE or go to email us at info@enware.com.au

IMPROVE ACCESS CONTROL WITHIN HEALTHCARE BUILDINGS

Codelocks have been helping estates and facilities managers implement cost-effective access control for many years. We understand that in a complex environment, access control products have to be easy to install and maintain, and above all effective. There are many areas within hospitals and healthcare facilities that can be given instant access protection using push button door locks. As well as the main access routes, there are also consulting rooms, reception areas, cleaning cupboards, staff rooms, washrooms, operating theatres, and areas used to store drugs and medical equipment to consider.

Codelocks new CL5510 smart lock makes access control easier, offering flexibility and convenience. The locks and technology allow building managers the ability to program locks via a smartphone, generate and send entry codes for easy access and issue smart cards for alternative entry.

The locks provide all users with an access method convenient to them, whether that's using a card, smartphone, or simple keypad code. For users that require regular temporary access like cleaners, a time-sensitive code can easily be issued on certain days or at specific times of the day. This function is useful for providing access outside of normal hours, for shift workers, or when contractors need access during certain periods for routine maintenance. The locks come with an audit trail facility which helps to monitor and track visitor and staff movement. Other advanced features, such as code-free entry, enables open access periods.

For more information on Codelocks smart locks visit www.codelocks.com.au

Connect and Control.
Code. Card. Phone.

TENTE AGV CASTORS FOR AUTOMATED GUIDED VEHICLES

Tente's AGV's are particularly effective for use in hospitals. These castors feature a Spring Loaded Directional Lock, if a castor loses ground contact, it automatically aligns in the direction of motion again. This is provided by a spring inside the castor. It prevents uncontrolled panning and ensures a smooth passage through doors, elevators and narrow alleys.

The slim design suits all AGV's and because of the spring loaded directional lock, it avoids damage at the collection site.

Due to stainless steel components and sealed ball bearings, it can easily be cleaned and provides protection against splashing water and detergents which is a crucial advantage in a medical environment. The optional XSX wheel provides additional safety, electrically conductive wheels protect against discharges.

The castors are rated up to 350kg per castor and can easily be relubricated with a grease nipple. Available in a total or modular directional lock as well as with brakes.

Contact Tente Australia for further information
1300 836 831 – sales@tente.com.au

South Pacific Laundry (SPL) has been a provider of commercial laundry and linen services to the hospitality industry in Melbourne for the last 20 years.

Currently, the South Pacific Group is establishing a strong network of modern laundry across Victoria, New South Wales, Queensland, Western Australia and South Australia with plans for several more facilities up the East Coast of Australia in 2017.

The relocation of our Sydney operations to a new larger facility in Bankstown together with the relocation of our Brunswick plant to Broadmeadows will establish South Pacific Laundry as the single largest privately owned laundry in Australia and in the Southern Hemisphere.

South Pacific Laundry specialises in the provision of quality linen and supplies for the customer service, hospitality and healthcare industries

SPL provides:

- A 365 day service to all its clientele with a 24 hour turnaround.
- A leading edge technology in RFID to assist housekeeping and managerial staff in time reduction and efficiency.
- Dedicated account managers and experienced support staff who are available 7 days a week.
- A dedicated software design package and centralised billing system enables seamless transactions, paperless and customised reports.
- Delivery rationalisation systems, providing and streamlining efficient delivery routes which will reduce the company's carbon footprint.
- Building of partnerships and sharing benefits with the customers from savings made through its constant laundry process innovations and group purchasing power of linen products.
- Dry cleaning, Uniform cleaning services, Housekeeping services, Dust mat hire and Cleaning services.
- Provision and supplying of Corporate uniforms/work wears and customised hotel room Amenities.

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