



WORLD PLUMBING COUNCIL

Least Developed and Developing Countries Scholarship 2018

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ABOUT THIS REPORT

This report is to present to the World Plumbing Council and its members a brief account of my observations and conclusions of the World Plumbing Council Least Developed and Developing Countries Scholarship 2018 study tour of Australia. It is presented in such a manner that it would contribute to the plumbing industry at large. While the scope of the study is limited in the review of the Australian (especially state of Victoria) practices and comparison that to an Indian context, it is expected that the observations and recommendations drawn from the report will be of interest to the members of the World Plumbing Council and likely generate discussion.

DISCLAIMER

This disclaimer informs the readers that the views, thoughts and opinion expressed in the text belong solely to the author and not necessarily to my employer, organization, committee or other groups or individuals.

INTRODUCTION

I started my career in Plumbing in 2010 as a Public Health Engineer (PHE) Design Engineer after completion of B.E. Environmental Science and Engineering. Planning and design of plumbing services, concept design based on evaluation for various options in coordination with architectural, structural input and other services, quantity estimation, ensuring all design work is carried out in accordance with company's quality standard procedures and client requirements, coordination between other sections/disciplines were my primary roles.

In 2012, I joined IAPMO India and the career I started here gave me completely different perspective of the plumbing industry. The few areas where I currently work and have tried to observe during my scholarship study are:

a. Plumbing Codes and Standards Development

Building codes provide safeguards. Although no code can eliminate all risks, reducing risks to an acceptable level helps. Historically, the scope of building codes in developed economics only focused on new buildings. More recently, building codes have expanded to cover existing

buildings when they undergo renovation or alternations. Identifying and implementing the best possible standards and codes — regardless of the country's requirements — is crucial.

In this context, India has not been an exception. The publication of the first edition of the National Building Code (NBC) of India in 1970 was a result of exhaustive research into the issues that most affect the Indian built landscape: lack of uniformity of the diverse regional policies, the need for development of a sound and updated building construction program in which 50% comprised new housing, and the need for developing new materials and construction techniques. In India, each municipality and urban development authority has its own building code, which is mandatory for all construction within their jurisdiction. All these local building codes are variants of NBC, which serves as model code providing guidelines for regulating building construction activity. Part 9: Plumbing of NBC very clearly specifies high-quality plumbing systems and components to ensure water fit for purpose is supplied and that it is effectively used with no minimal leakage. However, number of worrying trends and practices does not support the standards set by NBC. The main reasons for the low levels of compliance are a lack of enforcement towards non-adherence of NBC for plumbing works.

The plumbing industry in India has also voluntarily adopted the Uniform Plumbing Code – India (UPC-I), which has been developed jointly by the IAPMO Group and the India Plumbing Association (IPA) in 2008. The most recent version of the code is the 2017 UPC-I. Other supplement codes such as the Water Efficient Products- India (WEP-I), WE-STAND India, Uniform Solar Energy Code- India and the Uniform Swimming Pool Code- India has also been developed by the Plumbing Industry in India in the last decade.

b. Code based Training and Education

The plumbing requirements in the Indian market has changed dramatically over the years. But the personnel involved in the implementation of the sanitary system, especially the plumbers, are not well acquainted with modern and systematic steps of working, standards & newer materials and designs, thus resulting in poor hygiene causing pollution in general. The lack of plumbing infrastructure and a trained, certified workforce has long plagued the citizens of India.

In 2009, the ambitious Plumbing Education to Employment Program-PEEP was introduced in India as a comprehensive industry focused program with structured courses of study to develop

plumbing design engineers, plumbing construction managers/supervisors and plumbing installers/repairers. The emphasis of skilling by the current government with schemes such as Pradhan Mantri Kaushal Vikas Yojana (PMKVY) and Recognition of Prior Learning (RPL) are being promoted by the industry at present in India. Despite best efforts by the government, few hurdles such as lack of quality plumbing training, trained teachers for plumbing courses, proper resources or even the absence of licensing system remains a challenge. There is the broader issue of whether the education system delivers marketable skills.

c. Plumbing Product Testing & Certifications

India is among the least water-efficient countries. In India, non-compliant plumbing components are freely used and this besides affecting the efficiency and quality of water, increases water losses in buildings. This also points to large problems which include dire consequences for the future of effective water use as well as water leakages in building projects at metros which are facing acute water scarcity.

In the great majority of countries around the world, nearly every major plumbing manufacturer lists its products to a product performance standard. The Concept of Third-party certification performed by an independent and/or nationally recognized organization that has reviewed the manufacturing process of a product and has independently determined the final product complies with the specific standards and specifications for quality and performance of that product is quite new in India.

The UPC-I certification mark provided by IAPMO Plumbing Codes and Standards India Private Ltd. (aka IAPMO India) is a product certification body which lists and inspects samples taken from the supplier's stock or from the market or a combination of both to verify compliance to the requirements of applicable codes and standards.

d. I have also been a part of the Organizing team of the Community Plumbing Challenge of the International Water Sanitation and Hygiene foundation (IWSH- A charitable foundation of the IAPMO Group). My involvement with IAPMO has shown me the value of standardization and industry engagement in solving real life issues such as lack of safe drinking water and sanitation systems.

ACKNOWLEDGEMENTS

I have taken efforts in this study tour. However, it would not have been possible without the kind support and help of many individuals from organizations below:

- i. World Plumbing Council
<https://www.worldplumbing.org/>
- ii. Plumbing Industry Climate Action Centre
<https://www.picac.edu.au/>
- iii. Master Plumbers and Mechanical Services Association of Australia (MPMSAA)
<https://plumber.com.au/>
- iv. Victorian Building Authority
<https://www.vba.vic.gov.au/>
- v. Swinburne University – Trades and Engineering Technology
<https://www.swinburne.edu.au/about/our-structure/faculties-departments/vocational-trades-engineering-technology/>
- vi. IAPMO Oceana
<https://www.iapmooceana.org/>
- vii. Healthabitat
<https://www.healthabitat.com/>

The learning process has been greatly fruitful and rewarding with the support from various personnel representing these organizations.

ORGANISATION PROFILE

i. WORLD PLUMBING COUNCIL



The World Plumbing Council (WPC) is an international organization which aims to achieve the best possible plumbing for the world through growth and development of the world's plumbing industries. The WPC is made up of plumbing associations and plumbing industry participants from all over the world. There are currently over 200 members of the WPC from more than 30 countries around the world.

The triennial World Plumbing Conference of the WPC offers a unique opportunity for the global plumbing community to come together for knowledge sharing, networking and professional development. The 12th World Plumbing Conference was being organized in Melbourne in September 2019, focusing on the Four Pillars of Plumbing – Participation, Practices, Products and Protection. I thought to be travelling to Australia during the World Plumbing Conference would be the best way to be revitalized and inspired by the global plumbing community. It is through the WPC and its Education and Training Scholarship for applicants from Developing or Least Developed Countries, that I have taken this opportunity to travel to Australia and study about the Plumbing Industry at large.

ii. PLUMBING INDUSTRY CLIMATE ACTION CENTRE



A not-for-profit organisation, Plumbing Industry Climate Action Centre (PICAC) was formed through an industry partnership supported by the Plumbing Trades Employees Union, Master Plumbers and Mechanical Services Association of Australia, National Fire Industry Association, Air Conditioning Mechanical Contractors Association and the Plumbing Joint Training Fund.

PICAC's objective is to provide world-class training facilities in plumbing. Course offerings range from entry level and introductory courses, such as pre-apprenticeships in plumbing, to the Certificate III in Plumbing through to occupational health and safety training and specialised courses, such as medical gas or gas appliance servicing.

Apprentice plumbers trained at PICAC were greatly involved in the previous Community Plumbing Challenge (CPC) projects. Having witnessed the skills, efficiency and dedication of these plumbers in contributing to CPC's goal: to improve living conditions, public health and hygiene through hands-on implementation and community partnership, I visited them to learn more about Plumbing Training and Licensing.

iii. MASTER PLUMBERS

Master Plumbers and Mechanical Services Association of Australia (Master Plumbers) was established in 1891 and is the industry's



representative and voice on safety, standards and training. It is a registered national employer organisation providing representation and extensive services for a broad base of members in the plumbing and mechanical services sectors. The principal activities of the Association are to provide business services, industry representation, training and advice on industrial relations and employment to the membership.

The training courses delivered by Master Plumbers are at the state-of-the-art training facilities of Plumbing Industry Climate Action Centre (PICAC) on the East Coast of Australia. Master Plumbers and other industry partners operate courses from these facilities, and I met with them during the World Plumbing Conference and while visiting the Training center.

iv. VICTORIAN BUILDING AUTHORITY

The Victorian Building Authority (VBA) oversees regulation of building and plumbing practitioners to aid the achievement of efficient and competitive building and plumbing industries in Victoria.

The VBA's services include:

- responding to general enquiries from the public about the building and plumbing industry, Building Practitioners Board and Building Appeals Board
- facilitating the registration and licensing of builders and plumbers in Victoria
- providing expert technical advice and informed solutions to industry
- undertaking inspections, investigations and audits to enforce compliance with relevant legislation

- working with other agencies and regulators to ensure builders and plumbers are compliant and that their consumers are protected
- publishing data for building and plumbing practitioners and participate in their disciplinary processes
- administering the collection of building levies
- overseeing the work of building surveyors and Victoria's building permit system.

v. SWINBURNE UNIVERSITY – TRADES AND ENGINEERING TECHNOLOGY



Swinburne University of Technology (often simply called Swinburne) is an Australian public university based in Melbourne, Victoria which was founded in 1908.

The Department of Trades and Engineering Technology offer practical, industry-based courses. Students learn from experienced teachers in VCAL, pre-apprenticeship, certificate, diploma and advanced diploma level courses across multiple study areas:

- building
- electrical
- engineering
- vocational certificate in applied learning (VCAL)
- horticulture
- plumbing

Many apprentices from the department have been a part of CPC projects in the past and their skills in all/any building services are excellent.

vi. IAPMO OCEANA



IAPMO Oceana is accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ). Plumbing manufacturers who are looking to operate internationally or expand locally to accommodate new business can get their products certify

with IAPMO Oceana which will help demonstrate to customers that your product are in compliance with a performance-based product standard. IAPMO Oceana certifies plumbing and drainage products to use the WaterMark™ symbol to meet regulatory requirements.

IAPMO Oceana has a strong reputation within the global plumbing industry in Australia and has a thorough knowledge of the Australian regulatory environment for water and gas sectors.

vii. HEALTHABITAT

Healthabitat is an Australian company with the goal of improving the of disadvantaged people, particularly children, by improving their housing and the conditions of the living environment.

Healthabitat is a social business whose projects make immediate and measurable improvements to living conditions as prioritized by health gain and listed in the Healthy Living Practices.



health

HEALTHABITAT

Housing for health

The significance of water and sanitation is underscored by the Healthabitat Healthy Living Practices, developed as a result of a detailed study of the living environment of Aboriginal communities in Central Australia.

I was introduced to Healthabitat's Nepal Sanitation Studio in 2015 and it was my desire to witness these works being carried out in Aboriginal communities of Australia.

WORLD PLUMBING CONFERENCE

My scholarship study tour at Australia began with attending the 2019 World Plumbing Conference at Melbourne. The conference was attended by over 500 people from across the world and the event gave me an opportunity to connect and discuss ideas with the stalwarts in the industry.

The three-day conference explored the Four pillars of Plumbing (Products, Protection, Participation & Practices) with topics such as water and energy efficiency labeling schemes, piping failure and the opportunities available with hydrogen, WorldSkills and the impact that skills contests can have on industry development along with presentations on waterborne disease, regulations, backflow prevention, the use of tempering valves to prevent scalding and presentations focused on how plumbing practices can help achieve the Sustainable Development Goals. The whole event left me with a greater understanding of the real impact the plumbing industry can have on the big issues facing the world.

One of the biggest highlights of the conference for me was being key-note speaker of the session “Women in Plumbing” hosted by Master Plumbers Australia New Zealand (MPANZ). Master Plumbers Australia New Zealand had assembled a panel of female leaders from across the plumbing industry in Australia and Asia - Pacific to discuss topics specific to attracting more women into trades and into leadership roles within the plumbing industry.

Overall the two-hour session aimed to explore the role of women in the plumbing industry and stimulate debate about how the low representation of women in plumbing can be addressed and how construction careers for women can be promoted and encouraged.

The World Plumbing Conference 2019 (WPC 2019) concluded with the Gala Dinner where over 750 industry members, friends and family attended the night to celebrate a wonderful three days at WPC 2019.



Various session panelists at “Women in Plumbing” Session during WPC, 2019.

PLUMBING REGULATORY FRAMEWORK IN VICTORIA

Plumbing work has been regulated in Victoria for over 100 years. An objective of the regulatory framework is to ensure that the plumbing industry is sufficiently skilled and qualified to undertake the work to the required standard.

The three key documents which form the plumbing regulatory framework in Victoria are:

1. **Building Act 1993 (the Act)** sets out the requirements for building and plumbing work in Victoria and Part 12A of the Act sets out the legal framework for the regulation of plumbing work and plumbers. This includes:
 - licensing and registration of plumbers
 - restrictions concerning the carrying out of plumbing work
 - compliance certificates
 - inspection requirements for sanitary drainage work
 - insurance orders
 - rectification of defective plumbing work
 - modification of plumbing regulations
 - powers of the VBA's enforcement staff (plumbing inspectors and compliance auditors)
 - plumbing infringement notices
 - plumbing inquiries and disciplinary action
 - incorporation of the Plumbing Code of Australia into the regulations.

The overall objectives of the Act, some of which relate specifically to plumbing, are:

- to protect the safety and health of people who use buildings and places of public entertainment
- to enhance the amenity of buildings
- to promote plumbing practices which protect the safety and health of people and the integrity of water supply and waste water systems
- to facilitate the adoption and efficient application of:
 - national building standards
 - national plumbing standards

- to facilitate the cost-effective construction and maintenance of buildings and plumbing systems
- to facilitate the construction of environmentally and energy efficient buildings
- to aid the achievement of an efficient and competitive building and plumbing industry.

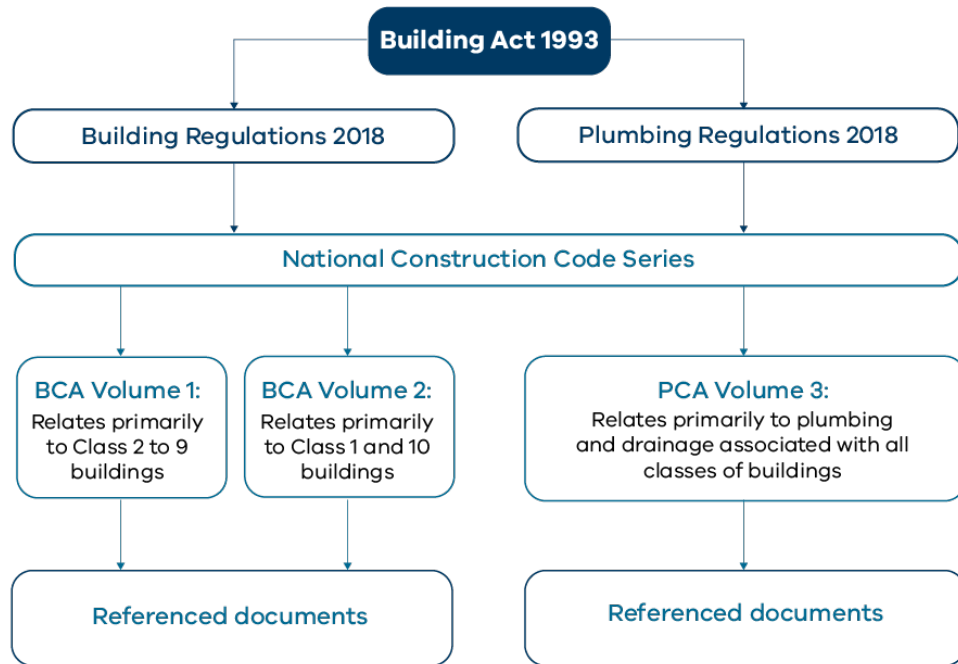
2. **Plumbing Regulations 2018** (the Regulations) In Victoria, all regulations 'sunset' (expire) after ten years and undergo a comprehensive review to ensure they remain fit for purpose and continue to meet their intended objectives. The Regulations cover for the following aspects of plumbing work in Victoria:

- define the scope of work for all classes of plumbing work and specialised plumbing work
- set out the qualification and experience eligibility requirements for registration and licensing in each class of plumbing work and specialised plumbing work
- set fees payable for registration and licensing applications and the price of a compliance certificate
- set out additional technical requirements with which work performed in specified classes of plumbing must comply, including some variations from the requirements in the PCA.

3. **National Construction Code** which combines building and plumbing construction requirements into a single code. The NCC is produced and maintained by the Australian Building Codes Board (ABCB), which is a joint initiative of federal, state and local governments (the Council of Australian Government, or COAG). The NCC consists of the Building Code of Australia (Volumes One and Two) and the Plumbing Code of Australia (Volume Three).

- Volume One: relates primarily to Class 2 to 9 buildings.
- Volume Two: relates primarily to Class 1 and 10 buildings.
- Volume Three: relates primarily to plumbing and drainage associated with all classes of buildings. Also known as the Plumbing Code of Australia (PCA).

The PCA contains the technical requirements for the design and construction of plumbing and drainage systems in new and existing buildings. Volume 3 applies to all classes of buildings whenever plumbing work is carried out. The PCA also applies to sites where water services are constructed independent of buildings.

Building regulatory framework**Plumbing regulatory framework****PLUMBING REGULATORY FRAMEWORK OF VICTORIA**

PLUMBING APPRENTICESHIP AND LICENSE

Apprenticeship and Traineeship play a major role in the Australian skills system. In Australia apprenticeship training continues to prove the most effective and comprehensive way of developing plumbing knowledge and skill. Industry led training has provided a broad – based approach to learning as it is most readily reflecting the nature of work they will be entering.

A four - year comprehensive plumbing apprenticeship program at PICAC, sets the standards for plumbers to be registered and ensures that they commence as work ready and skilled tradespeople. Working as an industry group (as Master Plumbers) in the provision of apprenticeship training enable timely response to market changes, ensuring that quality plumbers are moving into the field to meet demand.

Those who undergo design install and maintain plumbing and mechanical systems training at PICAC learn:

- Rainwater harvesting, water treatment and re-cycling
- Solar systems for commercial and residential buildings
- Environmental sustainability
- OHS and high risk licences
- Business development

The ability to partner with major firms, including manufacturers and distributors, and to invest in premium capital equipment and training methodologies gives PICAC's students the best chance for prospective employer confidence.

I had the pleasure of attending PICAC's Narre Warren campus which was inaugurated on 12 September 2019. It is the first Net Zero Energy education and research facility in Victoria. This training facility, designed for the plumbing industry, generated all energy required to support the operation of the building on site through the incorporation of several renewable energy technologies. PICAC also addresses industry training needs of new plumbing products and technologies.



GEOHERMAL ROOM AT PICAC NARRE WARREN CENTER

A typical training workshop at PICAC will include facilities such as

- In ground drainage and trench shoring training sand pit
- Multi-level training tower simulating three high rise building levels
- Plumbing and Mechanical Services training facilities
- Stationed valve room with various valve types for service, test and maintain training
- Purpose built fire protection training bays
- Gaseous fire suppression systems training room
- Functional electronic and diesel pumps installation for maintenance and live testing training
- Functional control indication panels and warning alarm training area
- Advanced welding facilities
- Safety and High Risk Licence training areas for forklift, EWP under/ over 11m, working at heights and on roofs, and boom lift)



PICAC NARRE WARREN CENTER



PICAC TRAINING CENTER AT BRUNSWICK



PICAC TRAINING FACILITY AT BRISBANE

I also visited the Croydon campus of Swinburne University which offers a four-year apprenticeship in Plumbing. Successful completion of this course will allow students to attempt the plumbing registration exam conducted by the Victorian Building Authority. I could witness VBA authorities assessing Certificate III Plumbing students during my visit.

For relevant classes of plumbing work, the current Regulations require plumbers to complete an apprenticeship and Certificate III qualifications or otherwise have a minimum of 2 or 4 years of experience (depending on the class of plumbing), before they are eligible for registration. This aims to ensure that plumbing practitioners are sufficiently skilled and qualified to carry out plumbing work safely and to a high standard. The department notes that for plumbers already registered or licensed in one class of plumbing work, the regulations provide a pathway where

a minimum of one year of experience is required to become registered or licensed in any additional plumbing class.

After becoming a registered plumber and gaining 2 years' experience, a person is eligible for licensing in any main class of plumbing beyond those included in the eligibility requirements for registration in that class.

Licensed plumbers have a significantly higher level of responsibility than registered plumbers, including responsibility for issuing Compliance Certificates stating that plumbing work meets regulatory standards. Registered plumbers are required to be supervised by a licensed plumber for work requiring a Compliance Certificate while licensed plumbers are responsible for the quality of work once they have issued the Compliance Certificate.

To become licensed, the additional requirements applicants must satisfy are the holding of insurance and the passing of the VBA exam for licensing, which reflects additional competencies required for licensing.

The effect of this is that a person may obtain a license after completing an apprenticeship (factoring in the need to complete additional competencies for licensing) and registered two years as a plumber, and therefore take on more responsibility and a wider ambit of work, without having to demonstrate a minimum amount of relevant industry experience working first as a registered plumber for an appropriate period of time.

To become licensed in a class or specialised class, an applicant must be eligible for registration in the corresponding class or specialised class, and undertake a VBA examination of competencies relevant for holding a licence in that class or specialised class. Licensing also requires being covered by the required type and level of insurance.

COMPLAINT PLUMBING PRODUCTS

Given the impact of Australia's climate variability on its water resources which is quite similar to that of India, Australia has developed an internationally - renowned expertise and experience in providing high-quality and sustainable water and sanitation services to urban and remote communities and industry, particularly during long periods of drought and water scarcity. Like many other developed countries, Australia has strict adherence of plumbing standards as well as the quality standards of products.

Today, Australia has one of the highest total per capita water consumption levels by international standards. Australian standards used for plumbing products are some of the strictest in the developed world, which is why they're the only continent that has access to potable water from coast to coast.

Water efficiency has been an essential component of Australia's response to drought. Water efficiency can often be a more cost-effective means of ensuring supply security than construction of supply side options and efficiency produces other benefits such as a reduction in energy use, and a sharing of water with the environment and other users (e.g. farmers).

Currently WaterMark Certification Scheme (WMCS) is the industry standard for plumbing products in Australia to protect consumer safety. Licensed plumbers are responsible for installing WMCS complaint products.

WaterMark Certification Scheme (WMCS)

Technology has had an important role to play in water efficiency. Water efficient versions of many appliances and fixtures are now available and information on their performance is provided through the The WaterMark Certification Scheme (WMCS), a Australian national mandatory certification scheme. It ensures plumbing materials and products are fit for purpose and appropriately authorised for use in plumbing and drainage installations.

The plumbing industry in Australia supports the use of the WaterMark™ which, when used properly, is an excellent way of helping Australian consumers be confident about the quality of the plumbing product to which it is applied. The WaterMark™ is applicable to products manufactured both locally and overseas.

The aim of the WaterMark Certification Scheme is to:

- ensure products meet specific specifications and standards; and
- assist Australian consumers to identify quality products produced both in Australia and overseas.

Products certified by an accredited testing and certification body are required to meet the minimum certification standards, which are set out in detail within the ABCB's Procedures for Certification of Plumbing and Drainage Products. The WaterMark™ can only be used on plumbing and draining products that comply with relevant specifications including:

- MP52 - Manual of Authorisation Procedures for Plumbing and Drainage Products;
- AS 5200 - Technical specification for plumbing and drainage products; Part 000: Procedures for certification of plumbing and drainage products.
- The Plumbing Code of Australia.

Under the Plumbing Code of Australia (PCA), it is unlawful for plumbing practitioners to install any plumbing and drainage products listed in the PCA (and the technical standards) if the products do not have the appropriate authorisation or certification under the WMCS.

Plumbing and Drainage products used in Australia and supplied under the WaterMark Certification Scheme (WMCS) shall bear the WaterMark logo once they have been certified by IAPMO Oceana. Applying the WaterMark logo to the product provides evidence that the product is –

- Manufactured under a nationally recognized certification scheme and certified by a WaterMark Conformity Assessment Body (WMCAB).
- Supplied and warranted by the supplier as complying with the appropriate specification or standard; and
- Easily recognized by the designers, specifiers, regulators, installers, distributors, retailers, and purchasers as being certified.

The WaterMark Scheme ensures the plumbing and drainage materials and products are fit for purpose and that their use in a plumbing or drainage installation is sustainable and does not create significant risks or any likely outcome of:

- personal illness, loss, injury or death;
- environmental degradation;
- contamination of the water resource;
- adverse impact on infrastructure (Private and Public);
- contamination of the water supply

Once products are certified, they can be marked with a WaterMark™ certification logo.

A REVIEW OF EFFECTIVE INITIATIVES BY HEALTHHABITAT'S HOUSING FOR HEALTH PROJECT

I was introduced to Healthhabitat's Nepal Sanitation Studio in 2015. The Sanitation Studio is an annual interdisciplinary studio held in Nepal in partnership with International Association of Plumbing and Mechanical Officials (IAPMO) and local Nepali teams - combining trades and design thinking to improve sanitation facilities both immediately and for the long term.

The significance of water and sanitation is underscored by the Healthhabitat Healthy Living Practices, developed as a result of a detailed study of the living environment of Aboriginal communities in Central Australia.

In Australia, I had the opportunity to survey Healthhabitat's - The Housing for Health sites in aboriginal communities of Grafton, NSW as a part of the World Plumbing Council scholarship study.

The Housing for Health

Housing for Health is a copyright methodology for improving living conditions in Aboriginal communities. It was initially developed in the late 1980s in the far north west of South Australia by a group that came to be known as Healthhabitat, who set about developing a methodology that focused on environmental changes that would lead to maximum health gains, particularly for children aged 0-5 years.

The Housing for Health process aims to assess, repair or replace health hardware so that houses are safe and the occupants have the ability to carry out healthy living practices (HLPs). All works carried out in the Housing for Health program are prioritised in terms of health benefit. The priorities are:

- i. Safety - Immediate life threatening dangers, particularly electrical, gas, fire, sewage and structural safety issues are addressed as the highest priority.
- ii. Healthy Living Practices - After safety issues have been addressed, the prioritised list of Healthy Living Practices from 1 (most important) to 9 provides a focus for prioritising repair and maintenance:

- iii. Washing people, especially children
- iv. Washing clothes and bedding
- v. Removing wastewater safely
- vi. Improving nutrition
- vii. Reducing the impact of crowding
- viii. Reducing the impact of animals, insects and vermin
- ix. Reducing the impact of dust
- x. Improved temperature control
- xi. Reducing minor trauma

These principles are also adopted by the National Framework for Design, Construction and Maintenance of Indigenous Housing and the National Indigenous Housing Guide (3rd edition). The first four points are considered critical healthy living practices, as they are essential for people to be able to practice healthy living. Most of the works carried out as part of this program focus on safety and these top four healthy living practices. The other 5 priorities are important for healthy living but are usually beyond the scope of the project budgets.

The Healthy Living Practices link your health and the place where you live, anywhere in the world. The Global Community Plumbing Challenge, in targeting the first three of the healthy living practices, aims to contribute to improvements to global health in regions where communities are still threatened by a lack of basic sanitation and safe drinking water systems.

Housing for Health process

The Housing for Health process consists of seven main stages:

- i. Project establishment
- ii. Community consultation and feasibility study
- iii. Preparing to implement Survey Fix 1
- iv. Survey Fix 1 (SF1)
- v. Major fix works
- vi. Survey Fix 2 (SF2)
- vii. Reporting back and project completion

Housing for Health Survey

I was part of SF1 which consisted of a comprehensive survey of around 240 items in all houses in the community. The survey was carried out by two teams of around four people and the first day was designated to training the teams in the testing and recording of those items. There is a standardised test for each item and the information is recorded on survey sheets. We also had a toolbox with us and any minor repairs not requiring a licensed trade are done on the spot. On an average it took us around 45 minutes to an hour to complete the survey fix at one house.

The completed surveys were then taken back to a central point in the community where the information from the surveys is entered into a database. Once entered into the database, a list of prioritised works required for each house is printed out for each trade (plumber, electrician etc.). The trades usually start about half a day behind the teams, so they have enough work when they begin. The community are involved in the selection of trades and where possible, local and/or Aboriginal trades are used.

The trades report back to the project manager on the work carried out and the reason for the problem (i.e. routine maintenance, faulty or damaged). This information is noted in the database. The database becomes the tool for managing the project.



HOUSING FOR HEALTH SURVEY TEAM AT GRAFTON, NSW



HOUSING FOR HEALTH SITE SURVEY PICTURES

RECOMMENDATIONS

Projections for global water stress that the global water picture is likely going to get worse over the next few decades. Larger populations and growing economies demand more water fit for purpose, and in some places, climate change will likely reduce available water supply. We know that drought risk is high and growing worldwide. We're already seeing the impact water scarcity has on citizens, on the environment and on economies. Few ideas below could have helped to shore up the dwindling water supply, alleviating impacts on buildings, people, planet and economy.

- i. A robust framework and ecosystem for informal plumbing apprenticeship after skills training can create a pathway for formalisation of informal sector and can also help in increased entrepreneurial activities in India. While the government has established the framework for the apprenticeship program and is providing support, having substantial incentives and facilitating environment must be built in the program to encourage industry-led partnerships. Our role as concerned industry players therefore must be to support regulators and standards by ensuring only compliant work is certified and doing what we can to ensure that the regulators do their jobs.
- ii. There are multiple issues affecting the implementation and adoption of apprenticeship programme by the industry in India. Lack of awareness regarding the apprenticeship programmes and the benefits accruing from these programmes is one of the key reasons for slow adoption.
- iii. Awareness creation programmes regarding apprenticeship opportunities in schools and higher education institutions for both technical and non-technical programmes can be rolled out to create awareness.
- iv. Upgradation of ITIs and Polytechnic colleges across India are essential to make apprentice pipeline relevant to the industry needs.
- v. It is urgent and imperative that not only should India adopt policies requiring all existing buildings as well as new construction to meet building criteria, but also put in place relevant laws and regulations for effective implementation of those policies. Honest implementation of laws is the need of the day in India.
- vi. Water efficiency measures must always be considered in policy decisions related to water supply security or sustainable water management.

- vii. It is important to note that all developed countries are sincere to adherence of plumbing standards as well as the quality standards of products. If all stake holders become responsible towards this aspect, this itself will be huge step towards establishment of good plumbing practices.
- viii. It is also essential that plumbing products in India are certified complying with the appropriate specification or standard under a nationally recognized certification scheme and are Easily recognized by the designers, specifiers, regulators, installers, distributors, retailers, and purchasers as being certified.
- ix. Green issues must be considered in the larger issues of economic development and growth. Any building code must be implemented considering these matters. This requires a mandatory code in the form of building by-laws to guide architects and developers of the present and future generations. Merely introducing laws and codes will not suffice. There is also a need for a proper enforcing authority to check building construction if urban development must meet the core environmental standards.

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