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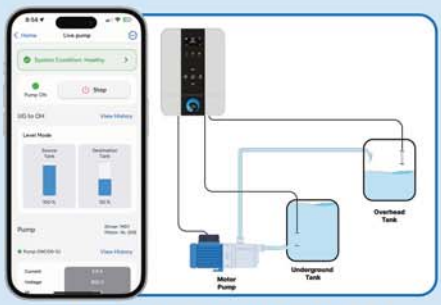
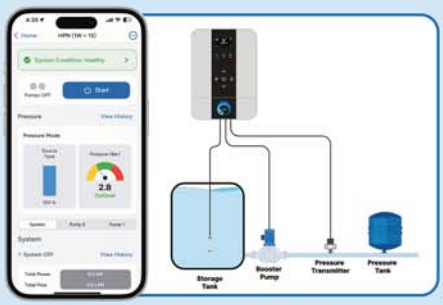


Water Level Automation



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MY PAGE

Dear Readers,

Wastage of water through leaks in India is a critical issue, with urban utilities losing an average of 38% of potable water, which is nearly double the global benchmark to leaks and theft. This results in an estimated 3.4 trillion liters of potable water lost annually. Major contributors include aging infrastructure, poor maintenance, and leaks in pipes, causing significant, sometimes 20-35% of total flow, losses.

Indian cities experience high levels of non-revenue water, with Delhi (58%), Mumbai (30%), and Chennai (30%) experiencing substantial losses. In studies across nine cities, 20-35% of the total water supply was lost through leaks in distribution mains and service pipes due to aging infrastructure and poor maintenance. A single leaky faucet can waste 19-20 liters per day.

This issue of IPT is focused on **Leak Detection System and Prevention**. Identifying and plugging the wastage of precious water at user point and in distribution due to leakages is the solution everyone should look at. Due to several technological innovations carried out recently, more options are available for identification of leaks. AI is also revolutionizing water leak detection by transitioning utilities from reactive, manual methods to proactive, data-driven, and automated systems.

Equally important is the role of Water Audits. A systematic water audit helps in assessing consumption patterns, identifying inefficiencies, and quantifying losses across the supply chain. In this direction, the **Water Audit Council (WAC)** an initiative by the Indian Plumbing Association (IPA) is playing a pivotal role in advancing water sustainability across India.

March has been a month of meaningful engagement and celebration for the plumbing fraternity. IPA Chapters across the country commemorated **World Plumbing Day (11th March)** through a series of impactful activities, including awareness drives and blood donation camps, reflecting their commitment to society. The day also marked the celebration of **IPA Foundation Day**, honoring the vision, contributions, and legacy of the association and its professionals who continue to drive excellence in the plumbing industry.

22nd March is also one of the important days being World Water Day.

As we step into April, the momentum continues with PlumbexIndia 2026, India's largest exhibition on Water, Sanitation, and Plumbing, **scheduled from 16th–18th April at BIEC, Bengaluru.**

We're also excited to spotlight two new activities Bathroom Challenge and Around the Drop Challenge, happening for the first time in the history of PlumbexIndia.

Looking forward to meeting you all there.

With warm regards,

Dipen Mehta
Member, IPT Editorial Board
Past Chair, IPA Ahmedabad Chapter

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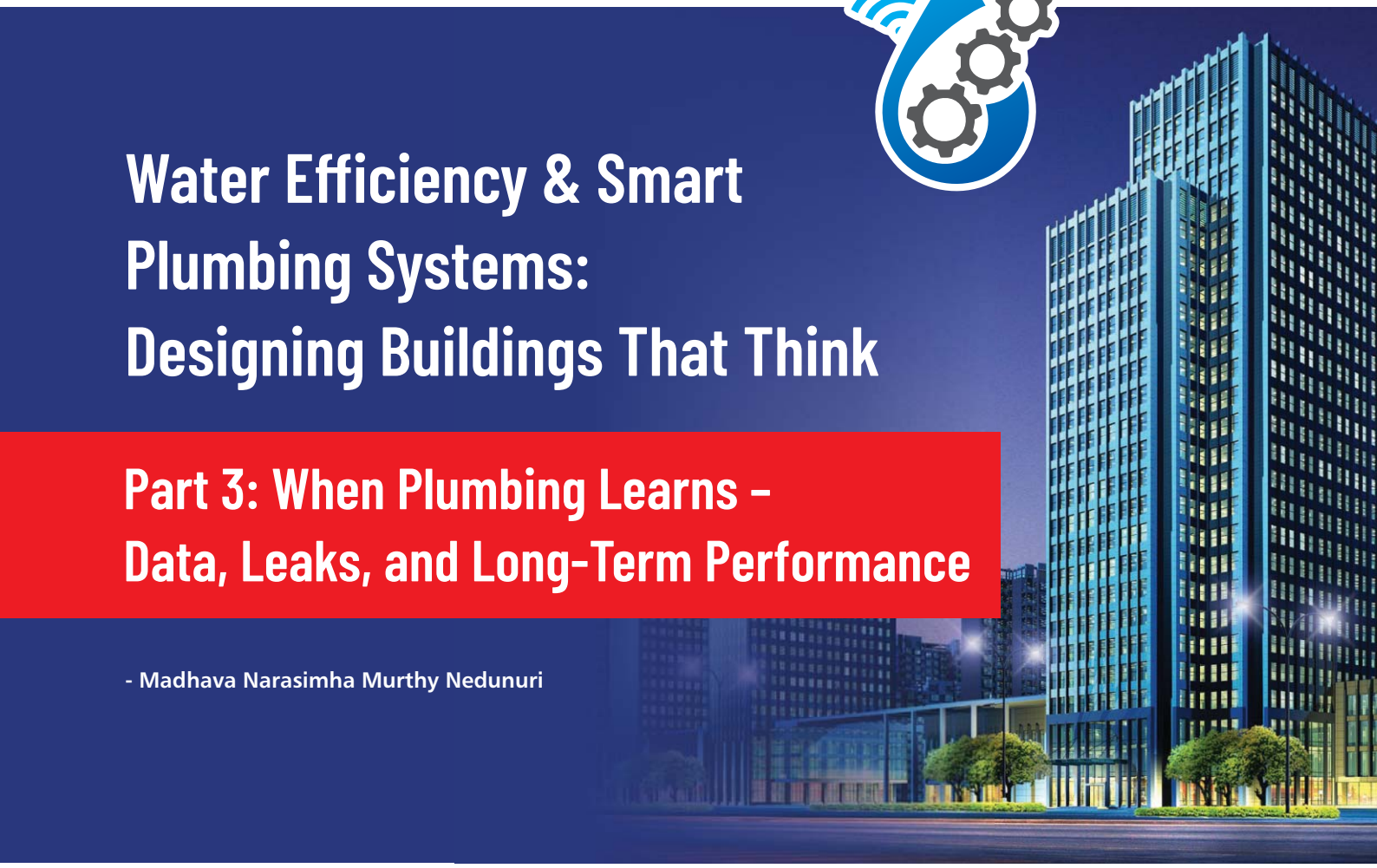

Water Efficiency & Smart Plumbing Systems: Designing Buildings That Think

Part 3: When Plumbing Learns – Data, Leaks, and Long-Term Performance

- Madhava Narasimha Murthy Nedunuri

Introduction

In Part 1, we examined why water efficiency fails when systems operate without visibility into how water behaves after occupancy. We identified water blindness as the root cause and introduced the four-layer smart water framework as a way to restore clarity.

In Part 2, we explored how visibility becomes practical—through smart metering, zonal monitoring, and transparent reuse systems that align engineering performance with human behaviour.

But visibility and implementation alone are not the destination. Over time, plumbing systems either drift into inefficiency or mature into intelligence. This part examines how sustained data, leak detection architecture, and calibrated operations transform townships from reactive water users into predictable, resilient systems.

Leak Detection Architecture

Townships rarely lose most of their water through spectacular bursts. Instead, they lose it through quiet, persistent leaks:

- Underground pipe seepage
- PRVs that drift and over-pressurise zones
- Overflowing sumps or overhead tanks because of faulty level controls
- Worn flush valves or semi-open internal valves

One of the most effective tools for detecting such losses is **night flow analysis**. Between 2 AM and 4 AM, legitimate demand in a residential development is minimal. Any significant, sustained flow during this window is a strong indicator of leakage.

When combined with zonal meters and pressure monitoring, night flow analysis can narrow down the suspected zone quickly. Smart systems go further by using ultrasonic flow sensors, pressure fluctuation signatures, pump run-time anomalies and automated alerts when patterns deviate from expected baselines.

Most township teams only understand the value of leak detection after experiencing a silent loss firsthand. One residential development in Bangalore faced a recurring

issue where their sump levels kept dropping overnight, despite no increase in consumption. Tanker trips multiplied, pumps ran longer, and residents began complaining about pressure fluctuations. The operations team initially assumed the municipal supply was irregular. Only after installing zonal meters did they discover a slow underground leak in a stretch of pipe that had settled slightly due to soil compaction. For months, the loss was too small to be visible on the surface, but large enough to drain thousands of litres daily. Once the pipe was exposed and repaired, night flow dropped instantly, pump cycles stabilised and tanker dependency reduced dramatically. The incident became a lesson: leaks rarely announce themselves - data does.

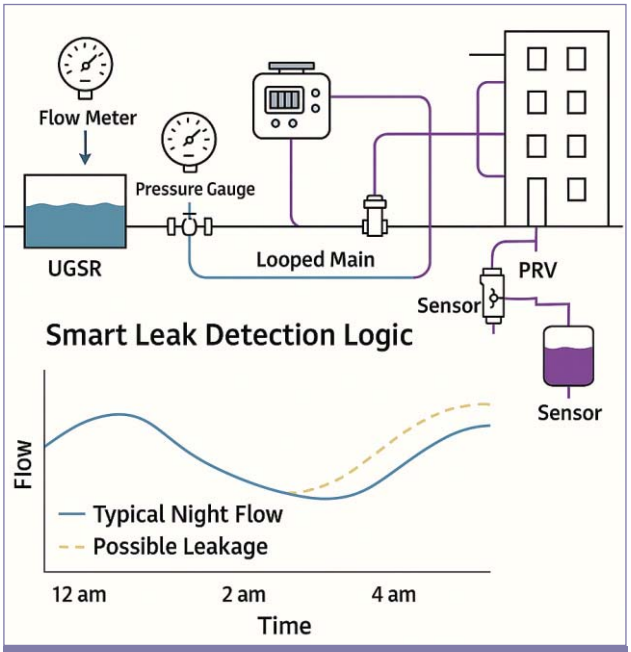

Fig1: Leak Detection Logic – Night Flow Curve

How Data Transforms a Township Over 10 Years

Water behaviour inside a township change steadily as families settle in, routines evolve, appliances increase, and infrastructure ages. What looks predictable in year one becomes entirely different by year five or ten. Morning peaks become sharper, evening loads stretch longer, and pressure expectations rise. Without data, these shifts stay hidden, and systems keep operating on outdated assumptions. Pumps overwork, leaks accumulate unnoticed, and reuse acceptance fluctuates depending on perception rather than fact. With data, these transitions become visible. You understand how demand actually behaves, where pressure zones drift, and which parts of the network are silently losing efficiency.

Over time, data becomes the memory the township relies on. It reveals recurring seasonal cycles, identifies leak signatures before they escalate, stabilizes STP reuse acceptance through transparency, and helps maintenance teams recalibrate infrastructure with confidence. A system that listens to itself becomes far easier to manage. Data gives a township what plumbing systems rarely have foresight. And a township that learns from its own behaviour becomes more resilient, more predictable, and far more sustainable in the long run.

How Smart Plumbing Reduces Opex

A smart water system changes operating cost structures in quiet but powerful ways. When pumps respond to actual remote demand rather than fixed assumptions, energy consumption drops. When leaks are identified early, tanker dependence decreases and raw water purchase is reduced. When metering is accurate and accepted, billing disputes decrease and administrative effort falls.

Operations teams benefit as well. Instead of chasing frequent complaints or guessing which tower has a problem, they can act on clear signals high night flow in one zone, unusual pump cycling in another, a sudden dip in reuse flow from the STP. The system provides direction. Maintenance shifts from firefighting to planned intervention. Over time, this reduces stress on teams and builds resident confidence.

Design Principles for Water-Efficient Townships

Townships that manage water well tend to follow a consistent set of design and operational principles:

- **Measure before managing:** Flow and pressure data should guide decisions, not guesswork.
- **Use looped mains:** Distribution networks should be designed for balance, redundancy and stability.
- **Keep potable and reuse networks separate:** Cross-connections must be avoided by design, not just by procedure.
- **Design for access:** PRVs, valves and meters should be easy to reach, inspect and replace.
- **Commission under realistic conditions:** Testing only during construction is not enough; systems

must be observed under real or simulated occupancy patterns.

- **Review annually:** As the township matures, data should be used to recalibrate pressures, pump schedules and reuse cycles.

These principles turn one-time design into a living, adaptable system.

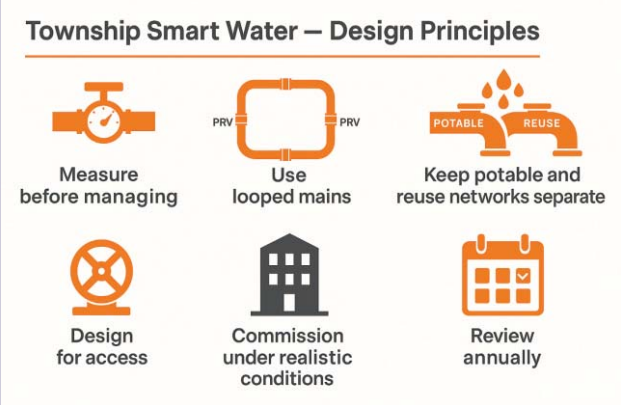

Fig 2: Township Smart Water – Design Principles

Conclusion

Water efficiency is ultimately the outcome of clarity, not control. Townships become resilient when their water systems move beyond mechanical distribution and begin to understand their own behaviour when pumps respond to real demand instead of assumptions, when leaks are detected before they become losses, when reuse is trusted because quality is transparent, and when consumption patterns guide planning rather than surprise it. A smart plumbing system is not defined by sensors or meters alone; it is defined by the intelligence that emerges when these elements work together. It is a system that prevents waste without depending on resident discipline, balances comfort with conservation, and evolves as the township grows. When buildings are designed to think quietly, consistently, and without drama they protect not just water, but the long-term harmony, sustainability, and dignity of the community they serve.

Madhava Narasimha Murthy Nedunuri
FIE, Senior MEP Leader

Madhava Narasimha Murthy Nedunuri, FIE, is a senior MEP leader who has spent two decades shaping complex building environments across India. His career spans leadership roles at Urbanac Infra Projects, IL&FS Engineering, Shapoorji Pallonji, and HCC, where he led delivery of high-rise residential towers, hospitals, malls, data centers, townships, and large commercial developments. A Fellow of The Institution of Engineers (India), Chartered Engineer, PMP®, PMI-RMP, and IGBC Accredited Professional, he is known for uniting technical clarity with execution reality. His approach emphasizes design-to-site alignment, lifecycle-focused decision-making, and building strong second-line leadership rather than dependence on individuals.

He can be reached at madhu091@gmail.com

MoU Signing

Council of Architecture (COA)

and the

Indian Plumbing Association (IPA)

An MoU was signed between the Council of Architecture (COA) and the Indian Plumbing Association (IPA) at Chitkara University on 26th February 2026,) during the SHAPE 2026, to jointly conduct the Indian Architectural Plumbing League (IAPL). The MoU was signed by IPA's National President, Gurmit Singh Arora, and COA's President, Abhay Vinayak Purohit, in the presence of eminent guests.

The IAPL initiative aims to benefit the architectural community by enhancing architects' understanding of plumbing design and encouraging the integration of efficient and sustainable plumbing systems in building projects.

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One Day Orientation Session on Indian Architectural Plumbing League (IAPL)

Indian Plumbing Association (IPA) signed an MoU with Council of Architecture (COA) to conduct a five-day offline initiative 'Indian Architectural Plumbing League (IAPL)' which aims to provide **immersive, hands-on learning experiences**, fostering deeper industry engagement and practical exposure for architectural professionals. Before the commencement of the IAPL, a "One-Day Online Capacity Building Program on *'Integrated Water & Sanitation: The Blueprint for Sustainable Architecture'*, was jointly organised by Indian Plumbing Association (IPA) and the Council of Architecture (CoA) on 17th March 2026 virtually, which concluded on a highly successful and impactful note witnessing 2368 architect participants. It also served as a curtain-raiser to the upcoming IAPL to be jointly organised by CoA and IPA.

Gurmit Singh Arora, National President, IPA and Ar. Abhay Vinayak Purohit, President, COA delivered the inaugural address, warmly welcoming all participants and called upon all to plan carefully Water, Sanitation and Plumbing systems, which are directly connected to human health and hygiene in the built environment .

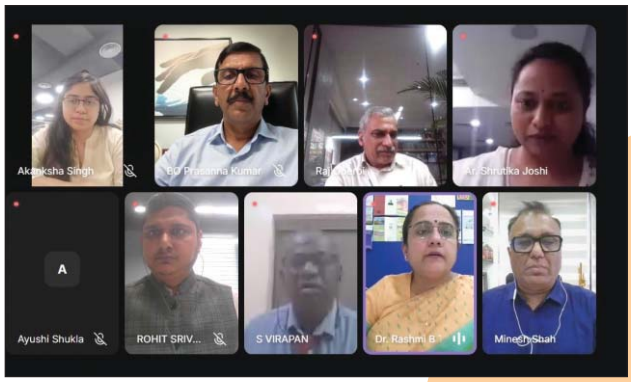
The programme witnessed enthusiastic participation from architects, planners, and industry professionals from across the country, reflecting the growing importance of sustainable water management in the built environment. With over **2,300 registrations from practicing and young architects**, the initiative emerged as a significant knowledge platform. The sessions were also live-streamed on YouTube, drawing substantial viewership and expanding its outreach beyond registered participants.

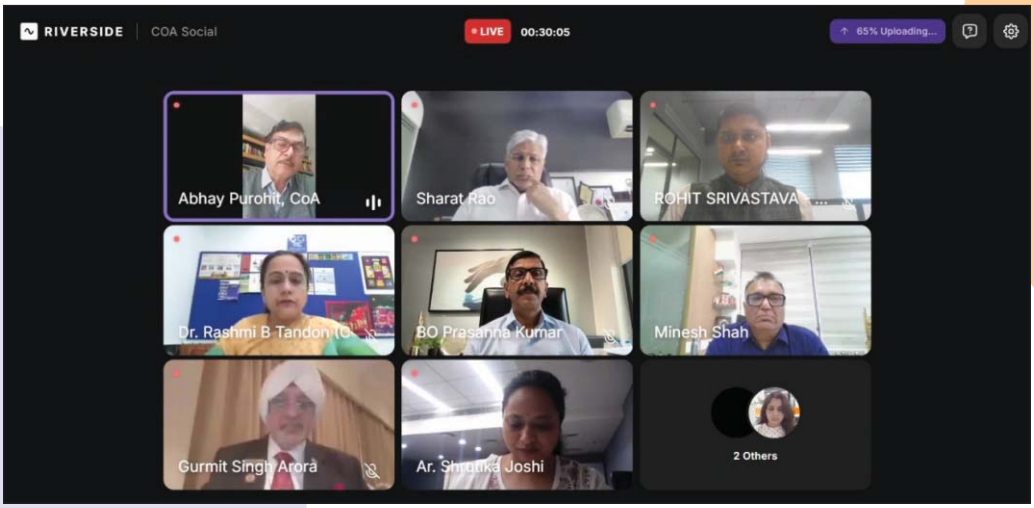
Structured Learning Through Expert Sessions

The programme was thoughtfully curated into four thematic sessions, each addressing a vital component of the water and sanitation ecosystem by expert speakers:

- **Session 1: The Foundation & The Fixtures**
  By B.O. Prasanna Kumar
- **Session 2: The Arteries & The Veins**
  By Sharat V. Rao
- **Session 3: The Exterior & The Integration**
  By Minesh Shah
- **Session 4: The Blueprint for Excellence & The Next Step**
  By Dr. S. Virapan

The success of this programme marks yet another milestone in IPA and CoA's ongoing efforts to integrate sustainability into mainstream architectural practice—paving the way for a resilient and resource-efficient future.





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PANEL DISCUSSION

Engineering Water Security for a Future-Ready India

16th April 2026, Thursday

As India faces growing challenges around water scarcity, infrastructure, and sustainability, this symposium aims to bring together key industry experts to discuss innovative solutions and future-ready strategies. The session will focus on advancing water management systems, policy frameworks, and technological interventions essential for long-term resilience; all of which will be thoughtfully deliberated by the experts.

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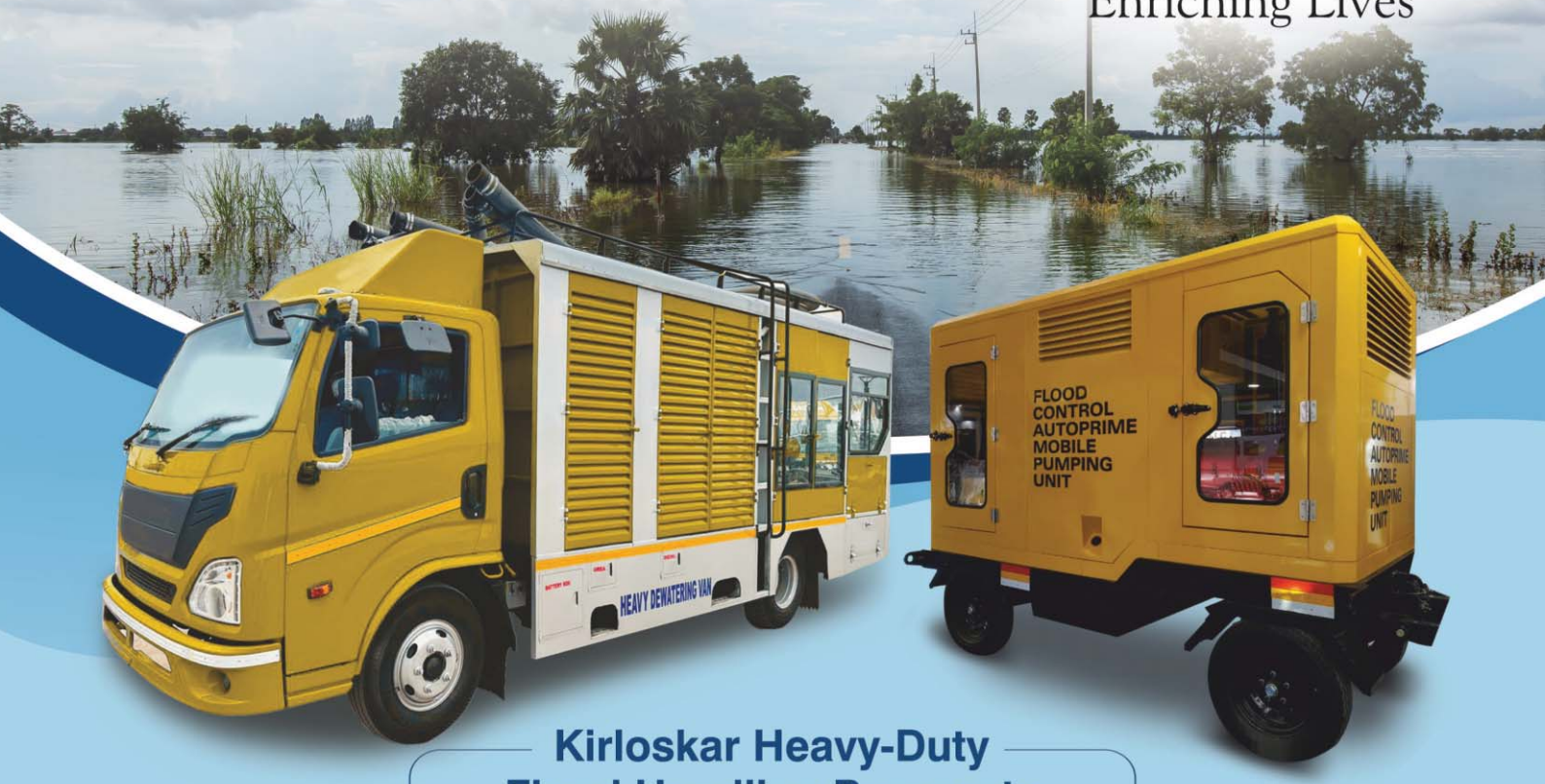

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PANEL DISCUSSION

Showcasing Women Leaders Shaping the Plumbing Sector

17th April 2026, Friday

This session celebrates the remarkable contributions of women leaders who are driving innovation and transformation in the plumbing sector. Bringing together inspiring voices from across the industry, the symposium will highlight their journeys, achievements, and the evolving role of women in shaping a more inclusive and progressive future. Key discussions will revolve around leadership, innovation, and opportunities for greater participation; all of which will be thoughtfully deliberated by the experts.

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Ar. Tapasya Das
Independent Consultant & Architect,
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PRESS MEET

CURTAIN RAISER

Date: 3rd April 2026 | **Venue:** ITC Gardenia, Bengaluru

The Press Meet for *PlumbexIndia 2026* was held at Plumeria Hall, ITC Gardenia, Bengaluru. The officials of the Indian Plumbing Association (IPA) initiated an interactive session with the media, setting the tone for meaningful discussions around water, sustainability, and the future of the plumbing industry.

Minesh Shah, National Secretary, IPA; Gurmit Singh Arora, National President; IPA Balkrishna Mehta, Chairman, IPA Bengaluru Chapter addressing the media.

Leading the conversation, **Gurmit Singh Arora, National President, IPA**, addressed some of the most pressing concerns of our time - water scarcity and conservation. He spoke about the larger challenges faced in the water sector and emphasized the importance of adopting sustainable and scalable solutions. Adding to this, **Minesh Shah, National Secretary, IPA**, provided a comprehensive overview of the Indian Plumbing Association(IPA). He highlighted the organization's ongoing initiatives, key achievements, and its continued efforts in driving awareness and excellence within the industry. **Balkrishna Mehta, Chairman of the IPA Bengaluru Chapter**, then brought the focus to the much-anticipated PlumbexIndia 2026. He shared insights into the scale and scope of the event, along with key highlights and what participants can look forward to. The session concluded with an interactive Q&A, where members of the media actively engaged with the speakers, making it a well-rounded and dynamic exchange of ideas.

Followed by this, the spotlight shifted to the Curtain Raiser of Plumbexindia 2026, held at the Mysore Hall, ITC Gardenia, in the evening. The Curtain Raiser commenced with a ceremonial lamp lighting by the esteemed guests and IPA leadership, symbolizing knowledge, unity, and the spirit of progress. This was followed by a warm and engaging welcome address by Balakrishna Mehta, Chairman, IPA Bengaluru Chapter, who set an enthusiastic tone for the evening. The gathering was further elevated by the presidential address delivered by Gurmit Singh Arora, National President, IPA, who inspired the audience with his vision for the future of the plumbing industry and sustainable water management.

Lamp Lighting Ceremony by IPA leadership and esteemed guests during the Curtain Raiser.

The event witnessed a thought-provoking panel discussion centered on the theme "Restoring the Value of Water." The discussion aimed to re-examine how water is managed, conserved, and governed, especially in the context of rapidly growing urban landscapes.

Additionally, the role of policy frameworks, community participation, and public awareness was underscored as essential components in ensuring equitable and responsible water usage. Overall, the session encouraged a shift in perspective—viewing water not just as a resource, but as a critical asset that must be protected and valued for future generations.

Curtain Raiser - PlumbexIndia 2026

The session was moderated by **B.O. Prasanna Kumar**, Joint Managing Director, DesignTree Service Consultants Pvt. Ltd., who steered the conversation seamlessly across a range of critical topics.
The panel featured an esteemed lineup of experts, including
Ar. Dinesh Verma – Founder and Principal Architect, ACE Group Architects
Sanath Kumar V – Chief Engineer (Design & QA), Bengaluru Water Supply and Sewerage Board (BWSSB)
Amar Mysore – Executive Director, Brigade Group
Dr. Hariharan Chandrashekar – Founder & Chairman, Biodiversity Conservation India Ltd. (BCIL)
Vijay Raj – Director, Farmland Rainwater Harvesting System
BSA Narayan – Managing Director, Maple Engineering-Design Services (India) Pvt. Ltd.

Panel Discussion on the theme "Restoring the value of water"

Speakers' felicitation by IPA's National President, National Vice President, and IPA Bengaluru Chapter Chairman

Each panelist brought in unique perspectives from their respective fields, architecture, engineering, urban infrastructure, environmental conservation, and water management. Together, they explored key issues such as urban water challenges, governance frameworks, the role of technology, and the importance of sustainable practices like rainwater harvesting. The discussion also highlighted the need for a more integrated approach, one that brings together policy, innovation, and community participation to effectively tackle the growing water crisis.

Overall, the day served as a powerful precursor to PlumbexIndia 2026, successfully bringing together thought leaders, industry experts, and the media to spark meaningful dialogue around one of the most critical resources "water."

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BACK TO BASICS

Doctor H_2O

- Dipen Mehta

01 Water is Life for Human

Water makes up about 70% of the human body, serving as a critical component for regulating temperature, lubricating joints, transporting nutrients and flushing waste. Daily, adults lose 1.5–2.0 litres through breathing and perspiration, requiring replenishment through fluids and food. A general daily intake goal is 2-3 litres.

Key Roles of Water in the Body:

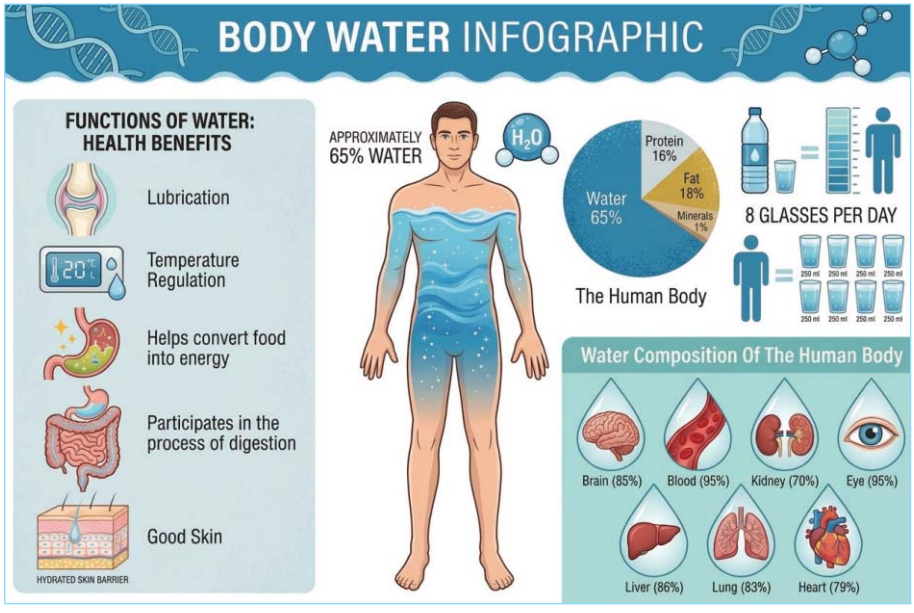
Temperature Regulation: Sweat evaporates to cool the body.

Joint & Tissue Health: Lubricates joints and cushions tissues/organs.

Cognition & Mood: Proper hydration improves brain function and alertness.

Waste Removal: Aids kidney function and removes toxins.

Nutrient Transport: Carries oxygen and nutrients to cells.



We humans have never respected and considered water as a doctor.

02 Drinking

Drinking water is vital for health, providing benefits such as maintaining hydration, aiding detoxification by flushing waste from the kidneys and liver, regulating body temperature, improving mood and cognitive function, boosting the immune system, supporting digestion, lubricating joints, and assisting in weight management. Adequate water intake helps prevent fatigue, headaches, and improves overall energy levels and physical performance.

Physical Health Benefits

Prevents Dehydration: Water is essential to keep your body hydrated, preventing issues like fatigue, headaches, and dry skin.

Supports Detoxification: Your kidneys and liver rely on water to filter waste and toxins from your body, excreting them through urine and sweat.

Regulates Body Temperature: Water helps maintain a stable internal body temperature, especially during exercise or illness.

Lubricates Joints: Water cushions and lubricates your joints, protecting sensitive tissues and improving mobility.

Aids Digestion: Sufficient water intake is crucial for proper digestion and regular bowel movements.

Boosts Energy and Reduces Fatigue: By sending oxygen to cells and organs, water helps fight fatigue and improves overall energy levels.

Supports Weight Loss: Drinking water can increase metabolism, reduce appetite by making you feel full, and replace high-calorie beverages with a healthy, zero-calorie alternative.

Mental & Cognitive Benefits

Improves Mood and Cognitive Function: Dehydration can negatively impact mood and cognitive function, while staying hydrated helps with focus and reduces stress hormones.

Enhances Skin Health: Proper hydration helps maintain skin's moisture balance, elasticity, and can lead to a healthier, brighter complexion.

Immune System Support

Strengthens the Immune System: A well-hydrated body allows immune cells to function optimally, transporting nutrients and removing waste, which strengthens your immune system.

How Much Water to Drink

A good starting point is about 3.7 liters (for men) and 2.7 liters (for women) of liquids per day, but this should be adjusted based on factors like activity level, temperature, and age.

03 Water fasting

Water fasting benefits include weight loss by burning fat, improved insulin sensitivity and blood sugar control, cellular repair through autophagy, and potential reduction in inflammation, although some benefits like detoxification lack strong scientific backing. It may also help regulate blood pressure. However, water fasting is an extreme practice and requires medical supervision, especially for individuals with pre-existing conditions.

Potential Benefits

Weight Loss: By reducing caloric intake, water fasting forces the body to burn stored fat and glycogen for energy, leading to weight loss.

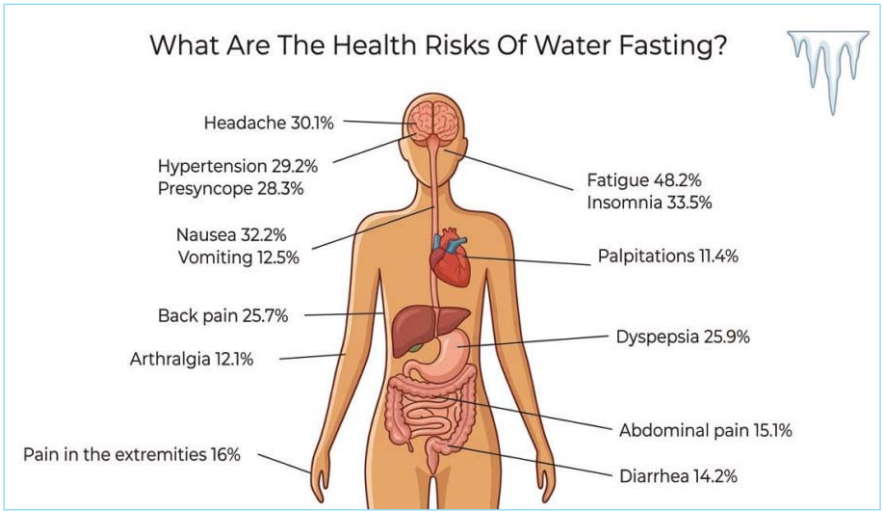
Improved Insulin Sensitivity: Taking a break from food consumption allows the body to reset its insulin response, which can improve insulin sensitivity and aid in blood sugar regulation.

Cellular Repair (Autophagy): Water fasting can trigger autophagy, a process where the body clears out damaged or old cell components and recycles them for new, healthier cells.

Reduced Inflammation: Fasting may reduce the production of inflammatory markers, which could help decrease chronic inflammation linked to various health issues like heart disease.

Blood Pressure Control: Some research indicates that water fasting, especially when supervised, can be an effective way to help normalize blood pressure in hypertensive patients.

Ketosis: During a fast, the body can enter ketosis, a metabolic state where it burns fat for energy instead of carbohydrates.



Important Considerations

Medical Supervision: Due to the extreme nature of water fasting, it is essential to consult a healthcare professional before attempting it, particularly if you have existing medical conditions like diabetes.

Detoxification: While some proponents claim fasting aids in detoxification, the body already has its own natural detoxification processes, and there is limited scientific evidence to support this specific benefit of water fasting.

Risks: Water fasting carries risks, and prolonged fasts can lead to serious complications.

04 Rain

Drinking properly collected and filtered rainwater offers benefits such as a soft, chemical-free (no chlorine or fluoride) composition, a naturally fresh taste, and improved alkalinity for potential gut health benefits. It acts as a sustainable, cost-effective water source, often considered purer than ground water before it hits the earth.

Potential Benefits of Rainwater

Free from Chemical Treatment: Unlike municipal tap water, rainwater does not contain added chlorine or fluoride.

"Soft" Water: Rainwater is naturally soft, which means it lacks the dissolved minerals like calcium and magnesium that can cause hard water, making it gentle on the body and plumbing.

Skin/Hair Care: Due to its soft nature, rainwater lacks chemicals found in tap water and can be gentle on skin and hair, avoiding the stripping of natural oils.

Alkaline Properties: Freshly collected rainwater is alkaline in nature, which is thought to aid in detoxifying the body and enhancing gut health.

Environmental Sustainability: Using rainwater reduces reliance on municipal water systems, providing a sustainable, renewable water source.

Cost-Effective: Harvesting rainwater can reduce monthly water bills.

Natural Taste: Rainwater has a cleaner, fresher taste compared to processed water.

Important Safety Precautions

While pure in the air, rainwater can gather contaminants while falling or collecting. It is essential to:

Always Filter/Treat: Rainwater should be filtered and purified (e.g., boiled) to remove germs, bacteria, parasites, and parasites.

Avoid Initial Rain: The first few minutes of rain usually wash contaminants from the air and rooftops, so it is best to avoid collecting it.

Storage Limitations: Do not store rainwater in plastic bottles for long periods.

This image outlines the purported benefits of bathing in rainwater.

It claims to improve physical health by hydrating skin, softening hair, boosting immunity, and soothing muscles.

The text suggests mental and emotional perks, including improved mood and reduced stress.

It highlights ecological and economic advantages, such as being eco-friendly and cost-effective.

Conclusion

Ayurvedic View: Ayurveda considers clean rainwater (Antareeksha Jalam) as a potent natural cleanser, capable of balancing bodily energies and removing toxins (Ama).

While safe to use for bathing, laundry, and gardening, drinking raw rainwater poses health risks. For safe consumption, it should be filtered, treated, and ideally not used as the sole source of hydration, as it lacks vital minerals.

05 Cold Water

Cold water baths can provide benefits such as increased alertness and energy, improved circulation and muscle recovery, enhanced mood and stress reduction, a potentially stronger immune system, and healthier skin and hair by tightening pores and sealing cuticles. Cold water immersion can also aid in weight loss by stimulating brown fat and is a popular tool for athletes to reduce post-exercise inflammation and soreness.

Physical Benefits

Improved Circulation: Cold water constricts blood vessels, forcing the body to pump blood more efficiently, which can improve skin tone and deliver more oxygen to organs.

Muscle Recovery: Cold water immersion reduces inflammation and muscle soreness after exercise by slowing blood flow to the affected areas.

Immune System Support: Regular exposure to cold water stimulates the production of white blood cells, which helps boost immunity.

Weight Management: Cold baths can activate brown fat, which burns calories to generate heat, potentially supporting weight loss efforts.

Mental & Emotional Benefits

Increased Alertness and Energy: The shock of cold water triggers the release of adrenaline and stimulates the nervous system, leading to a feeling of increased wakefulness.

Enhanced Mood: Cold water exposure can trigger the release of endorphins, the "feel-good hormones," which can reduce stress, improve mood, and boost mental clarity.

Stress Reduction: Regular cold baths may help the body and mind cope with stress by increasing resilience and promoting a positive stress response.

Beauty & Other Benefits

Healthier Skin and Hair: Cold water tightens pores and seals hair cuticles, reducing moisture loss, making skin look smoother, and hair appear shinier and healthier.

Reduced Inflammation: The anti-inflammatory effect of cold water can help manage pain and reduce chronic inflammation throughout the body.

Improved Sleep: Cold baths can help regulate body temperature and promote relaxation, which can lead to better quality sleep.

Tips for Cold Water Baths

Start slowly: You can begin by ending your regular warm shower with a short blast of cold water.

Focus on breathing: Controlled breathing can help manage the shock of the cold water.

Be consistent: Regular cold water immersion, even for short periods, can yield these benefits.

06 Hot Water

A hot water bath benefits the body and mind by improving blood circulation, relieving muscle tension, easing stress and anxiety, and promoting better sleep. The steam from the bath can also open pores, aiding in skin cleansing, and can help to clear nasal congestion.

Additionally, the increased core body temperature from hot water immersion can strengthen the immune system.

Physical Benefits

Improved Circulation: Hot water causes blood vessels to dilate, which increases blood flow throughout the body, delivering oxygen and nutrients to tissues.

Muscle Relaxation: Heat from the water helps to soothe muscles, reduce stiffness, and alleviate soreness, making it beneficial after a workout or for chronic pain like arthritis.

Relieved Congestion: The steam from a hot bath can help clear nasal passages by loosening mucus, making it easier to breathe when you have a cold or allergies.

Skin Cleansing: The steam helps to open pores, flushing out dirt and oil and leaving the skin feeling cleaner.

Immune System Support: Increasing core body temperature can mimic a mild fever, which may help strengthen the body's immune defenses.

Mental Benefits

Stress Reduction: Hot baths can help calm the mind, reduce feelings of anger, anxiety, and tension, and put you in a state of relaxation.

Improved Sleep: Raising your body temperature with a hot bath can trigger the release of melatonin, a hormone that promotes sleep, helping you fall asleep faster and get more restorative rest.

Mood Enhancement: A warm bath can evoke feelings of comfort and relaxation, significantly boosting your mood and combating symptoms of depression.

Use Essential Oils: Add essential oils like lavender, chamomile, or eucalyptus to your bathwater to enhance relaxation and moisturize your skin.

07 Contrast Therapy

Alternating hot and cold baths, known as contrast therapy, offer benefits such as improved circulation, faster muscle recovery, reduced soreness and swelling, enhanced lymphatic drainage, pain relief from soft tissue injuries, improved cardiovascular health, and boosted mental clarity and mood by stimulating endorphin release. This method uses the vasodilation and vasoconstriction of blood vessels to promote healing and recovery.

How it works

Vasodilation (Hot Water): Hot water expands blood vessels, increasing blood flow to the area to relax muscles and promote healing.

Vasoconstriction (Cold Water): Cold water constricts blood vessels, which helps reduce swelling, inflammation, and muscle soreness, and promotes the removal of waste products.

Vascular Pumping Effect: The repeated expansion and contraction of blood vessels creates a "pumping" effect, which boosts circulation and helps to flush out toxins from tissues.

Key Benefits

Pain Relief and Muscle Recovery: Reduces muscle soreness, inflammation, and fatigue after workouts, aiding in quicker recovery.

Improved Circulation: Stimulates blood flow throughout the body, enhancing cardiovascular health and tissue oxygenation.

Reduces Swelling and Edema: The vascular pumping effect helps transport waste products, decreasing swelling and improving function in the affected area.

Boosts Mental Clarity and Mood: Triggering the release of endorphins and dopamine can elevate mood, improve focus, and reduce stress.

Strengthens the Immune System: Enhances

lymphatic drainage, promoting white blood cell production, which stimulates the immune system.

Uses

Athletes: Commonly used by athletes for rapid recovery after games or intense training.

Soft Tissue Injuries: Effective for pain and swelling from strains, sprains, and other soft tissue trauma.

Chronic Conditions: Can help with pain, swelling, and stiffness associated with chronic conditions like arthritis.

Joint and Muscle Aches: Relieves stiffness in joints and can help with muscle spasms.

Common Techniques:

Contrast Baths: Alternating between hot water (95 – 113° F) and cold water (50 – 593° F).

Sauna & Cold Plunge: Alternating between an infrared/traditional sauna and an ice bath.

Typically, contrast therapy involves spending 3–4 minutes in heat followed by 1 minute in cold, repeated multiple times

08 Ice

Ice application (cryotherapy) provides significant benefits for the human body by reducing inflammation, swelling, and pain in injuries. It is effective for post-workout recovery, lowering muscle fatigue, and improving circulation. When applied to the skin, ice tightens pores, reduces acne, and decreases puffiness, while cold exposure boosts mental alertness.

Key Health Benefits of Ice

Pain Relief & Injury Management: Ice reduces blood flow to injured areas, alleviating swelling and numbing acute pain from sprains or strains.

Post-Workout Recovery: Ice baths or packs help reduce muscle soreness and fatigue after intense exercise by controlling inflammation.

Skin Care Enhancement: Applying ice to the face can tighten pores, reduce acne-induced redness, decrease puffiness around the eyes, and promote a healthy glow.

Reducing Body Temperature: Ice reduces fever when applied to the neck or armpits and can lower core body temperature during intense heat.

Mental Alertness: Cold, such as in a cold plunge or shower, can increase adrenaline and dopamine, boosting mood and focus.

Usage Guidelines & Risks

Method: Use ice packs, ice massages, or ice baths for short durations.

Skin Protection: Never apply ice directly to the skin for too long; wrap it in a cloth to prevent ice burns.

Duration: Apply in 15–20 minute intervals, allowing the skin to warm up in between.

Risks: Prolonged exposure can lead to tissue damage, necrosis, or frostbite.

09 Steam

Steam is a versatile tool for human health, primarily used for respiratory relief, skincare, and physical recovery. It works by delivering moist heat that can penetrate tissues more effectively than dry air.

Health & Wellness Benefits

Respiratory Relief: Inhaling steam helps loosen mucus in the nose, throat, and lungs. It is a common home remedy for temporary relief from symptoms of the common cold, sinusitis, bronchitis, and allergies.

Skin Health: Moist heat opens pores, allowing for a deeper cleanse of dirt, oil, and dead skin cells. This can help manage acne and blackheads and improve the absorption of skincare products like serums and moisturizers.

Circulation & Heart Health: Exposure to steam causes blood vessels to dilate (vasodilation), which increases blood flow and can lower blood pressure. Some studies suggest regular use may improve overall cardiovascular function by mimicking the effects of mild exercise.

Workout Recovery: Steam rooms are popular for relieving Delayed Onset Muscle Soreness (DOMS). The heat helps relax stiff muscles and joints by increasing blood flow, which delivers oxygen and nutrients to tired tissues.

Stress Reduction: Spending time in a steam room can lower levels of cortisol (the stress hormone) and trigger the release of endorphins, promoting a sense of relaxation and improved sleep quality.

Safe Usage & Risks

To enjoy the benefits safely, experts generally recommend limiting sessions and following specific precautions:

Duration: Keep steam room sessions to 15–20 minutes and facial steaming to 5–10 minutes.

Hydration: Drink plenty of water before and after to prevent dehydration from heavy sweating.

Burn Prevention: When steaming at home (e.g., over a bowl), keep your face at least 8–12 inches away from the water to avoid scalding.

Who Should Avoid It: People with heart conditions, low blood pressure, or who are pregnant should consult a doctor before using steam rooms. It is also not recommended for those with rosacea, as the heat can worsen redness.

10 Aqua Aerobics

Aqua aerobics offers numerous health benefits, including improved cardiovascular health, increased muscle strength and flexibility, and reduced stress on joints, making it ideal for people with arthritis, injuries, or those seeking a low-impact workout. The water provides natural resistance for muscle toning, buoyancy for reduced impact, and a cooling effect that allows for longer, more comfortable workouts. Additionally, water aerobics can improve balance, circulation, mood, and is a great way to stay active and social.

Physical Benefits

Low Impact & Joint Support: The water supports your body, significantly reducing stress on joints and muscles, which is perfect for individuals with arthritis, injuries, or those who can't tolerate land-based exercises.

Strengthens Muscles: The resistance of water works your muscles, providing a full-body workout that builds strength and endurance without the need for heavy weights.

Improves Heart Health: Aqua aerobics provides a good cardiovascular workout, strengthening your heart and lungs, which helps improve circulation and endurance.

Boosts Flexibility & Range of Motion: The buoyancy of water allows for a greater range of motion, helping to improve flexibility and overall functional fitness.

Prevents Overheating: Exercising in water helps you stay cool, allowing you to work out for longer periods without overheating.

Mental & Social Benefits

Stress Relief: The feeling of weightlessness and the massaging, cooling effect of the water can significantly reduce stress and create a sense of well-being.

Improved Mood: Like other forms of exercise, water aerobics can boost your mood and provide an enjoyable way to stay active.

Social Interaction: Participating in aqua aerobics classes can be a fun and social activity, offering a great way to connect with others.

Who Can Benefit?

Seniors: Water aerobics is an excellent way for older

adults to stay active, improve cardio fitness, and maintain muscle strength and balance.

People with Injuries or Chronic Conditions: It's an ideal alternative for those with arthritis, joint pain, or other conditions that make high-impact exercise difficult.

Pregnant Women: The supportive environment of water makes it a safe and effective way to exercise during pregnancy.

11 Swimming

Swimming offers benefits for physical health, including improved cardiovascular fitness, increased muscle strength and endurance, and better balance and flexibility, while its low-impact nature makes it suitable for people with joint pain, arthritis, or injuries. Mental health benefits include stress reduction, mood improvement, and enhanced cognitive function, as the rhythmic movements and underwater environment promote relaxation and a meditative state. The exercise also helps with weight management by burning calories and can be beneficial for managing conditions like asthma and high blood pressure.

Physical Benefits

Cardiovascular Health: Swimming strengthens the heart and lungs, improves circulation, and can help lower blood pressure and reduce the risk of heart disease.

Full-Body Workout: It engages nearly every major muscle group in the body, leading to increased muscle strength, tone, and endurance.

Low-Impact Exercise: The buoyancy of water supports the body, reducing pressure on joints, bones, and muscles, making it ideal for people with injuries, arthritis, or chronic pain.

Flexibility & Balance: Aquatic exercises can significantly improve flexibility, coordination, posture, and balance.

Weight Management: Swimming is an efficient way to burn calories, helping with weight loss and overall fitness.

Improved Lung Function: The specific breathing patterns in swimming can expand lung capacity and improve respiration, which can be helpful for people with asthma.

Mental Health Benefits

Stress and Mood Improvement: Swimming triggers the release of endorphins, which boost mood, reduce stress, and can help alleviate symptoms of depression and anxiety.

Cognitive Function: Increased blood flow and oxygen to the brain from swimming can enhance alertness, focus, memory, and overall brain power.

Relaxation and Meditation: The rhythmic nature of swimming and the underwater environment can create a meditative effect, promoting relaxation and improving sleep quality.

Other Benefits

Suitable for All Ages and Fitness Levels: Swimming is a versatile activity that can be adapted for various ages and fitness levels.

Helps with Chronic Conditions: It can be a beneficial therapy for individuals managing back pain or other conditions involving reduced mobility.

12 Hot Water Springs

Soaking in hot springs, a practice often called balneotherapy or hot potting, offers a variety of physical and mental health benefits driven by the combination of heat, buoyancy, and mineral absorption.

Physical Health Benefits

Pain Relief & Mobility: The warm water helps relax muscles and can block pain receptors, providing temporary relief for chronic conditions like arthritis, fibromyalgia, and lower back pain. The water's buoyancy also reduces pressure on joints, allowing for easier movement and improved flexibility.

Improved Circulation: Heat causes blood vessels to dilate (vasodilation), which increases blood flow and oxygen delivery to tissues. This can help lower blood

pressure in some individuals and support overall cardiovascular health.

Skin Health: Many hot springs are rich in sulfur and silica, which have antibacterial and anti-inflammatory properties. These minerals can help soothe symptoms of skin conditions like psoriasis, eczema, and acne.

Natural Detoxification: The heat induces sweating, which helps the body flush out toxins and impurities through the skin.

Boosted Immune System: Minerals like magnesium and zinc found in the water may be absorbed in trace amounts, potentially strengthening the immune system and increasing resistance to infections.

Mental & Neurological Benefits

Stress Reduction: Immersing yourself in warm, natural surroundings helps lower cortisol (the stress hormone) and triggers the release of endorphins, promoting deep relaxation.

Improved Sleep: A soak before bed raises the body's core temperature; the subsequent cooling after you leave the water mimics the body's natural circadian rhythm for sleep, leading to deeper and more restorative rest.

Enhanced Mood: The calming effects of the minerals (like lithium) and the connection with nature can alleviate anxiety and improve overall mental well-being.

Common Minerals and Their Functions

Sulfur: Relieves skin irritations, has antifungal/antibacterial effects.

Magnesium: Relaxes the nervous system, supports heart health, and boosts energy.

Calcium: Strengthens bones and supports heart and muscle function.

Silica: Smoothes and hydrates skin; may help with thinning hair.

Potassium: Helps regulate blood pressure and supports kidney health.

Limit Soak Time: Most experts recommend soaking for 15–20 minutes at a time to avoid overheating or dehydration.

Stay Hydrated: Drink plenty of water before and after your soak to replace fluids lost through sweating.

Consult a Doctor: If you are pregnant, have heart disease, or suffer from severe hypertension, consult a medical professional before visiting a hot spring.

13 Salt Water

Saltwater offers several benefits for the human body, whether it is consumed in small amounts, used as a topical treatment, or encountered in the ocean. While often associated with home remedies, its primary physiological roles involve electrolyte balance and antimicrobial action.

Internal Benefits (Drinking)

When consumed in moderation—often as a "sole" solution (saturated salt water) or a pinch in a morning

glass—salt water can support various bodily functions:

Enhanced Hydration: Sodium is an essential electrolyte that helps the body absorb and retain water at a cellular level. This is particularly beneficial for athletes or those sweating excessively in heat.

Digestive Support: Salt water can stimulate salivary glands and encourage the production of hydrochloric acid and enzymes in the stomach, which are necessary for breaking down food.

Electrolyte Replenishment: It provides vital minerals like sodium, potassium, and magnesium, which are crucial for nerve function and muscle contractions.

Improved Sleep: Some studies suggest that natural salt can help regulate stress hormones like cortisol, potentially leading to more restorative sleep.

Topical and External Benefits

Skin Health: Soaking in salt water (like the ocean or an Epsom salt bath) can help manage conditions like eczema and psoriasis by reducing inflammation and improving moisture retention.

Sore Throat Relief: Gargling with warm salt water is a medically backed method to reduce swelling and kill bacteria in the throat, providing relief from colds and allergies.

Oral Hygiene: It acts as a natural antiseptic, helping to heal mouth ulcers (canker sores), reduce gum inflammation, and fight bad breath.

Wound Healing: The mineral salts in seawater can act as natural antiseptics, helping minor skin scrapes and cuts to mend faster.

Important Precautions

While salt water has benefits, excessive intake can be harmful.

Health Risks: High sodium consumption is linked to high blood pressure (hypertension), kidney strain, and potential calcium loss in bones.

Dehydration: Drinking highly concentrated salt water (like seawater) will actually cause the body to lose more water than it gains, leading to severe dehydration.

Consult a Professional: Individuals with heart or kidney disease should consult a doctor before incorporating salt water into their daily routine.

Dipen Mehta
Editorial Board Member and Past Chair, IPA Ahmedabad Chapter
Managing Director, PCS Project Management Pvt Ltd. & Aqua Utility Designs

Dipen Mehta is a Project Management and MEP Consultant with a Bachelor of Engineering (Civil) from Saurashtra University, Rajkot. He has worked across various sectors in the building and construction industry. Mr. Mehta is a visiting faculty/ Studio Tutor for Plumbing Design Studio, Faculty of Technology, CEPT University, Ahmedabad.

He is an Editorial Board member and EC member, of IPA Ahmedabad and Past Chair, IPA Ahmedabad Chapter. He can be reached on dipenmehta.ipa@gmail.com.

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Wat-er View

COLUMN 27

PART 1

Apartments Offer Great Potential for Halving Water-Use

These retrofit solutions for apartments across India will make a substantive difference to the demand for Water from the residential sector which today accounts for approximately 50% of our daily urban water demand today, says columnist ***Hariharan Chandra****…*

Forty years ago, Mumbai was perhaps the only city after Delhi, which had apartments that people invested and lived in, but they were low-rise affairs with barely 3 floors atop the ground floor. As late as 1995, people in Bangalore or Pune would be reluctant to pick up a flat in an apartment for they thought it was too anonymous as living goes. The imperatives of the present-day, of location, commute time, safety of parents in an apartment community as against an individual home, easier access to water and energy without shortages and interruptions… these are all the reasons that prompt people to pick up apartments in recent times.

There is no single, definitive, real-time public database listing every single residential apartment or unit in Bangalore, but current market analysis indicates a high-density, rapidly growing residential market. We take this example of the silicon city as an example that holds good for any other city, too, with the percentage of such residents being about 25% of the entire population. A third live in slums and unregistered locations, while about 40% have the luxury of independent homes—small or large. Bangalore has, at a rough estimate, nearly 7,000 apartments, with an average of 100 homes hosted in each such facility, and about 500 people to every such community. That is approximately 3.5 million people who are apartment dwellers in that city. Pune's living demographics are much the same, and the numbers of flat dwellers is surging rapidly, with the high-rise culture catching up fast in that other pensioner paradise of another time. NOIDA or Gurugram, Hyderabad or Chennai, Kochi or Mangalore, the pattern is unchanging—about 25% of the city's dwellers residing in these apartments.

In the larger context of water, apartments offer every water professional the unique advantage of defining, and governing, the source as well as management of water. By the very nature of the density that apartments offer, and the quantum of land-to-FSI that builders utilise, *there is little as open areas*, and *even less as rooftop areas that can facilitate harvesting* the skies for rainwater which can be treated and used as drinking water. And yet Net Zero Water solutions are possible in all such apartments, thanks to inventive enterprise and technology shifts that are now available in the marketplace. This needs no help or mandate from the government. The state PCBs are encouraging of the new generation of zero-energy, zero-pumps based bioremediation treatment options available from a new crop of professionals. And if individual apartments follow the cardinal rule of solids-free sewage being treated or sent out to sewerage lines that will keep the city safe and clean. After all it's called 'public health engineering'.

These retrofit solutions for apartments across India will make a substantive difference to the demand for Water from the residential sector which today accounts for approximately 50-55% of our daily urban water demand in over 400 cities that host anywhere from 250,000 to a million people, or the agglomerations that host over 15 million.

Let us take the example of an apartment with, say, 150 homes to see how the community can – with very attractive economic returns on the investment in solutions as well as with clean, safe, high-hygiene water—achieve a drop of 50% in their water purchase. Let us assume this set of 150 homes is stacked in three blocks or towers of 25 flats apiece. This will mean, at a population of 4 to a home, daily consumption of about 600-700 Litres of water per home, or nearly 100,000 litres a day.

How can apartments such as these go both Net Zero Water and Net Zero Energy? All of the daily water need in almost all the cases are either from the water supply grid, or tankers that supply water drawn from borewells in the neighbourhoods that are yet to die, or from Borewells that exist within the campus, and which continue to offer enough water for the apartment not to have to buy water, or to buy only a partial amount to make up the deficit of daily demand.

If, hypothetically, there is an equal amount of this 1 lakhlitres of water drawn from the grid supply and from tankers outside—with no borewells within the apartment complex yielding any water as is mostly the case, this would mean about 36 million litres every year that is drawn, equally divided, from each such source. Even at a very low cost of ₹100/KL, or 10 Paise per litre, the apartment will be paying about ₹36 lakh a year to either the supply Board or the tanker-supplier. There is then the additional cost of treating waste water because of compliance requirements of the state pollution control board, even if no more than 30–40% of such treated water is actually utilised by their apartment for landscaped gardens. If they are lucky, they will also be using it for flush tanks, but the quantum used would be so low that over 50% of the total treated water will have to necessarily go out to the drains outside—after the apartment spends at least ₹40 per thousand litre, for its treatment. Typically, such treatment of waste water [apart from the capital cost incurred of about ₹25 lakh for every 100,000 litres of an 'STP"] will demand a regular, recurring, operating cost of approximately four paise to a litre, or an additional ₹12–14 lakh every year for the treatment of this water that is discharged by the apartment.

Is there a way of reducing this total cost of about ₹35-40 lakh by 50%, with greater reliability built into the apartment complex to ensure much less reliance on supply board, or on tankers or in-house Borewells?

The next decade will see a quiet, dramatic transformation—not in water-use pattern, but in the way, water is managed daily in any typical apartment—with simple, do-able measures that don't compromise either comfort or convenience for the resident population. Right now, what these Net Zero Water Solutions mean is that they enhance water security with 50% drop at the minimum, or a saving of about ₹18 lakh a year for every apartment of this size at the present purchase cost of 10 paise/litre. There will then be no water crisis of the kind that most apartments are grumbling about at the onset of every summer, and that newspapers delight in announcing as the summer heat grows. Every such apartment will cut dependence on water from the outside, and rely more on what they can control from within with simple systems to measure, monitor and manage. That, dear reader, will be effective and rewarding water governance.

There are apartments today, where the balance waste water of as much as 60-75% (after use of about 25-40% for gardens and, in a rare few cases, flush tanks that get treated used-water from dual plumbing lines) is treated back again to make for Drinking Grade Water—safe, clean, hygienic. The organic content that the common man fears of Faecal Coliform is just 1% of all such content. On the face of it, the prospect of having such used-water to be treated and given back as super-clean, high-hygiene water is repulsive for the regular Water consumer. In the last 4-5 years, the growing set of treatment systems completely eliminate such coliform in water, to make the water safe and 'healthy' for drinking. There are other systems—with zero pumps and zero energy and zero capital cost and a maintenance cost that is a fraction of existing Waste Water Systems—that are so good that the new generation of water-users will begin to take to such simple and effective practices that offer them freedom from Borewells, Tankers and the Supply Board, and yet offer them clean, safe water at costs that are very viable. There are other concerns, like the RO treated water we use in our kitchens. They are not at all 'healthy' as the High Court ban in Delhi showed some years ago, and that will merit a discussion from other discerning water professionals from among members of the IPA.

Here is a matrix of solutions that any apartment, large or small, can implement, if only the apartment had the right practising professionals to synthesise and steer the Net Zero Water approach to such solutions.

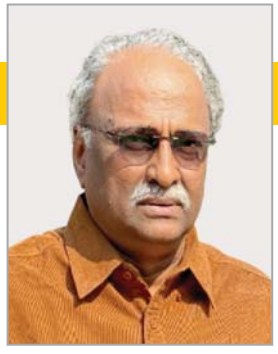
If we assume that about 50 million urban Indians live in apartments across all major cities, and if these solutions that are listed in this matrix, are implemented with competent professionals creating plans and systems that understand the Science and Management of Water, it will mean a reduction of urban per capita water demand across cities of 70 litres to a person. At about 50 million middle-class apartment dwellers, that's 3.5 billion litres every day of demand reduction. That's one Mumbai city fully fed with water every day! There will be a drop of 25% in every city's demand for water, since residential demand accounts for 50% in cities. You can imagine the positive impact on energy-use, for over 45-50% of any city's total energy demand goes for this 'invisible' cost of pumping water from long distance, and then through the distribution Mains and sub -

Type of Solution for a typical 150-flats Apartment	Capex Cost	Savgs Ltrs	Cost Savgs/yr	Payback Time
PCAs—aerators, relevant to high-rise buildings of over 3 floors.	02.75L	2.5 MLPA	₹2.5 lakh/yr	2+ yrs
A continuous monitoring process with real-time data alerts that anticipate leaks, malfunctions in water system.	03.00L			
Treatment of Surface and Rainwater harvest with existing down-takes from terrace. The treatment system will cover elimination of silica, colour, odour, reduce BOD, increase dissolved oxygen, neutralize PH, reduce conductivity.	14.60L	11 MLPA	11.00 lakh/yr	15 months
Waste Water... with no pumps, no energy, and maintenance cost that is 40-50% of a regular MBR/SBR option. One-time Capex [and an annual recurring cost of ₹6 lakh]. Capex recovery with water cost-saving is in 12 months. Treatment plant with pre and post storage capacities, filtration systems—including Plumbing distribution lines, for connecting sewage water from current drainage line to Sequence Tanks, plumbing works for interconnect of all sequence tanks.	14.00L	9 MLPA	9.00 /lakh/yr	18-20 months
TOTAL INVESTMENT AND RETURNS FROM WATER SOLUTIONS	**34.35**	**22.5 MLPA**	**22.50 lakh/yr**	**18 months**

Mains, and then consumed by every home and apartment and commercial building as energy for drawing from their UG tanks to their OH Tanks. It is a senseless waste of energy that is precious, and that can be saved if there was greater determination from apartment owners and willingness to embrace these new resource-efficient directions.

There will be no talk of water crisis, or of exploited borewells and threats of land subsidence from more Borewells, or of tankers and the thousands of cumulative kms they traverse city roads and cause tragic disasters of the kind we witnessed in Indore. There will be no need for more public expenditure to bring more river water from long-distance sources that don't anymore exist, or of the pollution of lakes and rivers in every city. All we need is to navigate through a very simple set of solutions that cost not much, yield returns that very few businesses can offer you, with IRRs of over 30%, and make cities liveable and resilient, at least from the point of view of water.

How can this be affected, however impossible the idea of such dramatic savings appears to be? Into the April edition of IPT, in Part 2 of this series, we will offer you a story of one such apartment that hosts 80 flats between 4 blocks of 10 floors, and buys every day 80,000 litres at a yearly cost of about 25-28 lakhfor about 25-28 million litres of fresh water. Many design professionals from the IPA fraternity could shape such changes for hundreds of these apartments across India while new buildings can surely gain from these Net Zero Water approaches.



Chandrashekar Hariharan

The writer is founder-trustee at AltTech Foundation and Prem Jain Memorial Trust, and a Senior Fellow at CII IGBC. As a green building pioneer and a Net Zero exponent, he currently mentors startups to harvest over 5 billion litres of low-carbon, low-TDS water every year for a variety of commercial and industrial projects. He can be reached at Hariharan@AltTech.Foundation

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CHAPTER NEWS

CHAPTER ELECTIONS

Ahmedabad Chapter Elections

Elections for the post of Hon. Treasurer, Exe. Committee Member and National Exe. Committee Member were held in IPA Ahmedabad Chapter for the remaining term 2024 – 2027 virtually on Friday, 27th February, 2026 in the Special General Body Meeting. All the candidates who filed nominations were elected unopposed and were administered the oath of office by the Returning Officer.

Returning Officer: Rohit Srivastava, Manager – Outreach, IPA

Election Date: 27th February, 2026

Sl. No.	Name of Candidate	Elected for the post	Result
1.	Pratik Shah	Hon. Treasurer	Unopposed
2.	Samir Diwanji	Exe. Committee Member	Unopposed
3.	Kairav Engineer	National Exe. Committee Member	Unopposed

Kairav Engineer
National Exe. Committee Member

Pratik Shah
Hon. Treasurer

Samir Diwanji
Exe. Committee Member

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STUDENTS CORNER

Leakage Detection in Concealed Water Supply and Drainage Systems in India

- Kalp Kachhadiya

Introduction: Why Hidden Leaks Are a Big Problem

Modern homes look clean because all the plumbing is tucked away inside walls, floors, and slabs. But this neat finish creates one major issue — when a leak happens, you can't see it until the damage is alreadyd o n e . A small leak that would've been easy to fix in an exposed pipe becomes a slow, silent problem inside concrete or masonry. By the time damp patches show up, the water might have already travelled far from the actual source.

In India, this problem gets worse because of inconsistent construction quality, mixed materials (GI, CPVC, uPVC), and daily pressure variations due to intermittent water supply. All of this makes concealed leaks one of the biggest reasons for water damage in Indian buildings — and also a hidden cause behind huge national water losses.

This report breaks down the standards, tools, science, and real-world methods used to detect these hidden leaks without breaking open entire walls or floors.

What the Codes Say (NBC, IS Standards)?

The National Building Code (NBC) 2016 acts as the constitution for construction activities in India. Part 9: Plumbing Services is the specific section relevant to this inquiry, divided into Section 1 (Water Supply) and Section 2 (Drainage and Sanitation).

The NBC 2016 represents a paradigm shift from "specification-based" codes to "performance-based" codes. It emphasizes that the ultimate goal of a plumbing system is not just to convey water, but to do so without compromising the structural integrity or health safety of the building

India actually has very clear guidelines for proper plumbing mainly NBC 2016, IS 2065 (water supply), and IS 1742 (drainage). When followed correctly, these drastically reduce the risk of future leakage.

IS 2065 — The Hydrostatic Pressure Test

This test is supposed to be done before pipes are concealed, but is often skipped on-site. What the code wants:

- Test the plumbing at 5 kg/cm^2 or higher
- Maintain pressure long enough to inspect carefully
- No patchwork allowed — if a joint leaks, it must be cut out and replaced
- Hot Water Systems: The code mandates a secondary test for hot water lines. After the initial hydrostatic test, the system should be charged with hot water to check for leaks caused by thermal expansion, a common failure mode in CPVC pipes.

Skipping this test is the biggest reason concealed lines later leak. IS 1742 — Drainage System Testing

Drainage doesn't run on pressure, so a different approach is used:

Smoke Test. This method is uniquely suited for drainage because it detects not just liquid leaks but also gas leaks (sewer gas).

- **Procedure:** Smoke is generated (using smoke bombs or machines) and introduced into the lowest point of the drainage stack. As the smoke rises, it fills the pipes. Once smoke appears at the roof vent, the vent is capped.
- **Pressure:** The system is pressurized to 25 mm of water column. This low pressure is sufficient to force smoke out of any crack, bad joint, or dry trap.
- **Detection:** The technician inspects the pipe lengths. Any visible wisp of smoke indicates a breach. This is particularly effective for finding leaks in "Shafts" or ducts where pipes are difficult to see clearly.

The Water Test For Underground Drainage. For underground drainage (e.g., stoneware or concrete pipes connecting manholes), the smoke test is less

effective due to the soil cover. Here, IS 1742 mandates a **Water Test.**

- **Procedure:** The lower end of the drain is plugged. The system is filled with water to a head of 1.5 meters.
- **Criteria:** The water level is monitored for 1 hour. Subsidence indicates leakage into the surrounding soil, which can undermine foundations and contaminate groundwater.

Pathology of Pipeline Failure: Why Concealed Pipes Leak

The root cause of most concealed leaks is found in the construction phase. The rush to complete projects often leads to the bypassing of rigorous IS 2065 testing protocols.

- **Improper Jointing:** In CPVC plumbing, the joint is formed by a chemical fusion (solvent welding). If the plumber applies too little solvent, or does not hold the joint for the required set time, the fusion is incomplete. This creates a "cold joint" that may hold water initially but will fail under the stress of thermal cycling or water hammer.
- **The "Bucket Test" Fallacy:** Instead of using a hydraulic pressure pump as mandated, many site contractors perform a "bucket test"—simply filling the tank and checking if water flows. This exerts only gravitational pressure (0.5 to 1 bar), which is insufficient to reveal weak joints that will burst under municipal supply pressure (3-4 bar).
- **Poor Waterproofing Integration:** In sunken slabs (bathrooms), the interface between the pipe outlet (e.g., a floor trap) and the concrete slab is a critical vulnerability. If the waterproofing membrane does not overlap correctly into the throat of the pipe, water seeps between the pipe and the concrete. This is often misdiagnosed as a pipe leak when it is actually a waterproofing failure.
- **Structural Settling:** Indian soil conditions vary from the rocky terrain of the Deccan Plateau to the soft alluvial soils of the Gangetic plains. Minor settling of the building foundation can exert shear forces on underground pipes. If the pipes are rigidly encased in concrete without protective sleeves (as recommended by NBC), they will shear or crack.

Acoustic Leak Detection:

Acoustic detection is the primary method for locating leaks in pressurized supply lines. It relies on the physics of fluid dynamics: when a pressurized fluid escapes through an orifice, it generates energy. This energy dissipates as vibration (sound) which travels through the pipe wall and the surrounding medium.

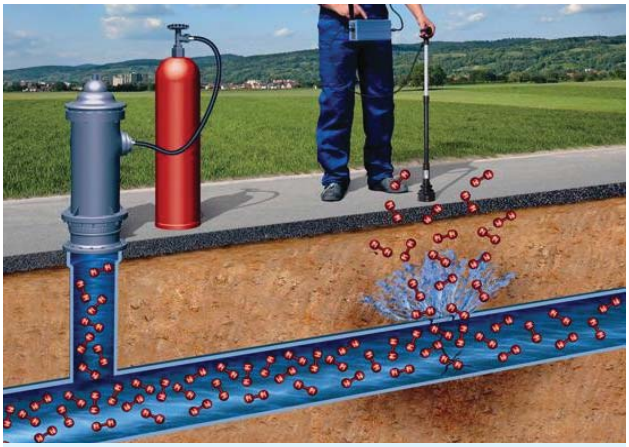

Figure 1 Acoustic Leak Detection

Limitations in the Indian Context:

Acoustic detection faces specific challenges in India:

- **Plastic Pipes (CPVC):** Sound travels poorly in plastic. While a leak noise might travel 100 meters in a GI pipe, it might travel only 10 meters in CPVC. This requires the technician to take readings at very close intervals (every 1 meter).
- **Intermittent Pressure:** Acoustic detection requires pressure. If the municipal supply is off, the test cannot be done unless the building's internal pumps are run to pressurize the line.

Infrared Thermography (IRT): Visualizing Temperatures:

Thermal imaging uses the principles of thermodynamics to detect moisture. It is a rapid, non-contact method ideal for scanning large areas.

Thermal cameras do not see water; they see temperature differences (\Delta T).

- **Evaporative Cooling:** As water leaks into masonry or concrete, it evaporates. Evaporation is an endothermic process (absorbs heat), causing the wet surface to be cooler than the surrounding dry area. On a thermal image, this appears as a dark blue or purple anomaly.
- **Thermal Capacitance:** Water has a higher specific heat capacity than concrete. Therefore, it heats up and cools down slower. A thermal scan done in the evening (as the building cools) might show wet areas as "warmer" because they retain heat longer than dry concrete.

- **Hot Water Leaks:** These are the easiest to find. A leak in a hot water line appears as a bright orange/red vein spreading through the floor.

Application Strategy

In India, timing is crucial. The best time for a thermal scan is often early morning or late evening when the thermal contrast between the building materials and the water is highest. Direct sunlight can heat up walls and mask the cool signature of a leak.

- **Cost:** Thermal imaging is a mid-range service in India. Basic scans cost between ₹3,500 to ₹5,000, making it accessible for many middle-class homeowners facing persistent dampness.

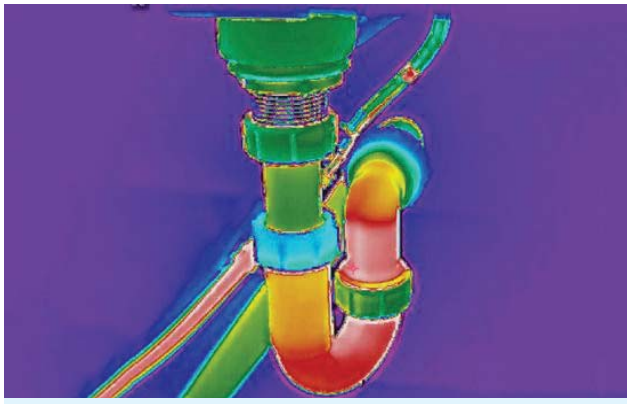

Figure 2 Infrared Thermography showing temperature Visual

Tracer Gas Detection

When acoustic and thermal methods fail—often due to small leaks in deeply buried plastic pipes or high ambient noise—Tracer Gas is the gold standard for precision.

1. **Drainage:** The water is drained from the leaking pipe section.
2. **Injection:** A tracer gas mixture (typically 95% Nitrogen and 5% Hydrogen) is injected into the pipe under pressure. Hydrogen is used because it is the smallest molecule in existence, non-toxic, and non-flammable at this concentration.
3. **Permeation:** The hydrogen molecules escape through the leak, penetrating through the pipe bedding, concrete slab, and even floor tiles much faster than water.
4. **Detection:** A technician walks the line with a sensitive hydrogen "sniffer" probe. The probe detects the gas as it emerges from the floor, pinpointing the leak often to within centimeters

Advantages and Costs

This method is the only reliable way to find very small leaks in plastic pipes buried under deep concrete or soil, where sound doesn't travel well. However, it is more labor-intensive (requires draining the system) and costly, typically requiring specialized quotes rather than a fixed menu price.

Comparative Analysis of Detection Technologies:

Feature	Acoustic Detection	Thermal Imaging (IRT)	Tracer Gas
Primary Physics	Vibration (Sound Waves)	Infrared Radiation (\Delta T)	Gas Permeability
Best Application	Pressurized metal pipes, Main supply lines	Hot water lines, Mapping seepage spread	Micro-leaks, Plastic pipes, Deep burial
Invasiveness	Non-Invasive	Non-Invasive	Minimally Invasive (Pipe access)
Accuracy	High for metal; Low for plastic	Moderate (Detects symptom, not source)	Very High (Pinpoints source)
Cost (India)	₹4,000 - ₹8,000	₹3,500 - ₹5,000	High (Project based)
Limitation	Background noise, Depth	Reflective surfaces (tiles), Weather	Time-consuming, System shutdown

Drainage System Leakage: A Distinct Challenge

While water supply leaks are driven by pressure, drainage leaks are driven by gravity and capillarity. They are often more insidious because they involve "black water" (sewage), posing severe health risks.

The Challenge of the Sunken Slab

A unique feature of Indian construction is the "sunken slab" in bathrooms—a depression in the floor slab to accommodate P-traps and pipes. This area is filled with porous material. If a drainage joint leaks here, the sunken area fills up like a swimming pool. The water then seeps through the ceiling of the apartment below. Since the pipes are buried under 1-2 feet of filling, acoustic detection is useless (no pressure noise).

Detection Solutions

- **Flood Test:** Plugging the drain outlets and flooding the sunken slab (before filling) is the standard preventive test.
- **Fluorescent Dyes:** Adding a UV-reactive dye to the toilet or drain water. If the dye appears in the ceiling dampness below, the source is confirmed.
- **CCTV Inspection:** For larger drain lines (4-inch and above), miniaturized cameras are inserted to visually inspect for cracks, root intrusion, or disjointed sections.

The Scale of Loss

The statistics are alarming. **Non-Revenue Water (NRW)** refers to water that is produced and pumped but is lost before it can be billed.

- **National Crisis:** Indian utilities lose an average of 38% of their water to NRW, nearly double the global benchmark of 15-20%.
- **City Data:** Delhi reports NRW levels as high as 58%. Hyderabad projects a doubling of leakage loss from 10 MGD in 2015 to 20 MGD in 2025.
- **Household Waste:** A single leaking toilet or concealed pipe can waste 45,500 liters of water per year per household. Nationally, this aggregates to 3.4 trillion liters annually.

Future Trends: AI, IoT, and Smart Water

Smart Meters and AI

Advanced Metering Infrastructure (AMI) can detect the signature of a continuous leak (e.g., water flowing at 3 AM). AI algorithms, such as those developed by FIDO, analyze acoustic data collected by sensors to distinguish between leak noises and background city noise with >90% accuracy. This removes the human error from acoustic listening

Wireless Sensor Networks (WSN)

WSNs involve deploying thousands of pressure and vibration sensors across a city's pipe network. In the Indian context, researchers are adapting these to handle intermittent supply, allowing utilities to see a real-time "heat map" of leakage across the city grid.

Conclusion and Recommendation:

The detection of leakage in concealed pipes is a sophisticated engineering challenge that sits at the intersection of fluid dynamics, material science, and environmental stewardship. For India, the stakes are incredibly high. The convergence of aging infrastructure, variable workmanship, and acute water stress demands a rigorous, standardized approach to plumbing. The IS 2065 Hydraulic Pressure Test is the single most effective vaccine against future leakage. Strict enforcement of this test during construction is paramount.

Kalp Kachhadiya
Civil Engineering Student
CEPT University, Ahmedabad

Kalp Kachhadiya (UCE23094), currently in the sixth semester at CEPT University, completed a Plumbing Design Studio in his fifth semester. Through this, he developed a strong understanding of water supply systems, drainage networks, and plumbing layout planning.

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Founder's Day & World Plumbing Day Celebrations

Ahmedabad Chapter

The IPA Ahmedabad Chapter organized a special program on 14th March 2026 at Club O7, Shela, to celebrate World Plumbing Day and the Founders Day of IPA. The event featured an insightful session on the Water Credit Initiative, delivered by Vihar Pancholi, MD & CEO, Universal Water Registry.

Pune Chapter

IPA Pune Chapter, in collaboration with COEP Tech University, Pune, organized a blood donation camp on 25th March, 2026 from 2:00 PM to 5:30 PM at COEP. The camp was conducted with the support of Mathurabai Vashishtha Blood Centre, KEM Hospital, Pune. A total of 68 individuals came forward to donate blood, resulting in a **final collection of 48 units.**

Kolhapur Chapter

The IPA Kolhapur Chapter, in association with the Department of Technology, Shivaji University, Kolhapur, successfully celebrated World Plumbing Day 2026 with great enthusiasm.

One of the highlights of this year's celebration was the introduction of a **"Token of Appreciation"** initiative by the **IPA Kolhapur Chapter.** This initiative aims to recognize individuals who have made valuable contributions to the plumbing fraternity. On this occasion, **Architect Gurunath Mali** was felicitated for his **significant contribution to the plumbing profession** and his continued support for the industry.

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Nashik Chapter

On the occasion of **World Plumbing Day**, the **IPA, Nashik Chapter** organized a **"Plumbing Maintenance Training for Women"** on **7th March 2026 (Saturday)** at Guru Gobind Singh College of Engineering and Research Center, Nashik. A total of 16 household women, 12 housekeeping staff members, and 10 IPA girl student volunteers actively participated in the workshop and benefited from the practical demonstrations and awareness session.

The IPA Nashik Chapter conducted a "Plumbing Maintenance Training for Women" on 28th February 2026 at Sandip Polytechnic, Nashik, as part of its ongoing skill development initiatives.

the IPA Student Chapter, Department of Civil Engineering, MET's Institute of Engineering, Nashik, successfully organized a Plumbing Awareness Quiz Competition to promote knowledge and awareness on plumbing systems, water conservation, and sustainable practices.

Chennai Chapter

IPA Chennai Chapter successfully hosted the Indian Plumbing Cricket League at the Indoor Cricket Court, St. Thomas Mount. The tournament witnessed enthusiastic participation, with 80 players across 11 teams.

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Founder's Day & World Plumbing Day Celebrations

Indore Chapter

On the occasion of World Plumbing Day, the IPA Indore Chapter organized a technical summit on "Challenges & Solutions for Sustainable Underground PHE Services" on 4th March 2026 at the Brilliant Convention Centre, Indore. The event brought together industry experts, professionals, and stakeholders to discuss the pressing challenges and emerging solutions in the field of underground Public Health Engineering (PHE) services. The session witnessed an enthusiastic participation of around **150 attendees**, creating a dynamic platform for knowledge exchange and meaningful dialogue.

Trivandrum Chapter

IPA Trivandrum Chapter held a Blood Donation Camp on 11th March, 2026 from 9 AM onwards at Regional Cancer Centre (RCC), Trivandrum. A total of 38 donors donated blood.

IPA Trivandrum Chapter in association with Mar Baselios College of Engineering and Technology (MBCET) conducted a competition on plumbing expertise on 23rd March 2026 at MBCET. Pipe Master 2.0 is a thrilling competition designed to test the students' skills in pipe cutting, threading and fittings installation.

Bengaluru Chapter

IPA Bengaluru Chapter conducted a panel discussion on *"Engineering Efficiency : Rethinking Pump Design for Sustainable Infrastructure"*

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