



Third Edition

Construction Products in India

the issues,
the potential
and the way ahead

Published by



Confederation of Construction Products and Services



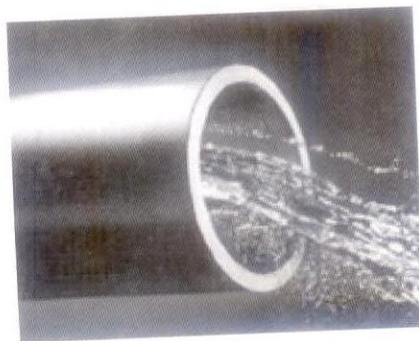
Pipes and Plumbing

By Charanjit S. Shah, a practicing architect in Delhi and Visiting Faculty at School of Planning and Architecture.

Though bathrooms made their appearance in the Egyptian palaces in the pre-Christian era, it was the Romans who gave it a pride place and transformed bathing into a luxurious art. The Roman baths offered facilities for steaming, massage, cleaning and even icy plugs.

Bathing became a social activity, which the Romans developed into an art and now with the advanced technology and revolutionary fittings & faucets and the luxurious & sophisticated needs and aspiration of the society, has developed a high taste of visual, status & prestige to the design of bathroom. Therefore there is a need for elaborate understanding of various elements like bathroom planning, standards & modern trends in sanitary fittings & fixtures and also addressing the vital issues of after sale service and the maintenance.

Even though the market is full of new innovative materials but real intelligent and professional selection and its application needs to be understood. The product needs to be analysed by the actual consumer in respect of its technical back ups, life and maintenance. The handling of the ultra modern fixture like sensors, single lever faucets is what is still not interactive with the actual consumer. The manufacturers need to make demonstrative efforts highlighting these sensitive issues to make the actual consumer understand these benefits. Construction of bathroom can be phased into two stages in actual execution. The



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A building's heating, cooling, lighting, and equipment systems all interact with each other, the building envelope and the building site in a multitude of complex ways.
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first, which is generally neglected, is most important and sensitive. It consists of the skeleton consisting of disposal and supply systems. Besides planning of bathrooms, it is the intelligent detailing such as respect of vertical stack system, its materials and the use of multi floor trap etc. that needs to be addressed. Highlighting the jointing materials and the high profile technical tests is also important to take care of future leakage and other hidden defects. One needs to avoid horizontal joints in the sunken portions. The various epoxy/polyurethane based construction chemicals and sealants for sunken in portion, other joints & floor traps etc needs special attention. Besides G.I. and copper pipes, the plastic pipes

are:

- low-density polyethylene pipes (LDPE).
 - High-density polyethylene pipes (HDPE).
 - Un-plasticized / rigid polyvinyl chloride pipes (P.V.C).
 - Polypropylene co-polymer pipes (P.P).
 - Aluminum polyethylene layered pipes.
- The selection criteria is listed in the table on the next page.

PVC Pipes

The type of Poly Vinyl Chloride pipes ranging from unplasticized (PVC-U), Chlorinated (PVC-C), Polyethylene (PE), Polypropylene Random Co polymer (PP-R), Poly butylene (PB) are flooded in today's global knit market with diversified advantages & disadvantages in respect of various environmental conditions due to effect of ultra violet light flammability and water hammer pressures etc.

Effect of Ultra Violet Light

The aggressive environments, elevated temperature & increased solar energy in hot dry climate is definitely a danger to plastic with direct exposure. The storage matrix in respect of spacing, height of storage and the shades from direct sunlight etc. are certain basic issues that need to be explained to maintain the quality of the product before and after the use.

PP, PB, PE plastic pipes suffer degradation upon exposure to UV light. It is recommended that they be either lagged, or protected by a UV absorbent water based paint coating. PVC-U pipes have carbon black, which protects the plastic from UV light and heat fatigue.

PVDF pipes are UV resistant but possibility of UV radiation may penetrate the pipe wall thickness and may react with the chemical being handled by the piping.

Flammability

PVC-U, PVC-C & PVDF have limiting oxygen index (LOI) values greater than 21 and will support combustion but will not burn if in direct contact with a flame. Toxic and Corrosive by products are produced on burning whereas, Polyolefines (PE, PP, PB) will burn in air at room temperature

THE COMPARISON CHART WOULD HIGHLIGHT VARIOUS SELECTION CRITERIA

CRITERIA	G.I PIPE	COPPER PIPE	H.D.P.E PIPE	P.V.C PIPE	ALPLYETHYLENE LAYERED PIPES
EFFECT OF HARD WATER	High scale formation	Scale formation is formation is prohibited due to smooth bore	Scale formation is formation is prohibited due to smooth bore	Scale formation is formation is prohibited due to smooth bore	Scale formation is formation is prohibited due to smooth bore
EFFECT OF SOFT WATER	Gets corroded	Gets corroded due to acidic nature of water	No effect	No effect	No effect
HEALTH CRITERION	Low due to lead content and corrosion	Good with ferrule but lead content in solder is bad for health	Very good	Very good	Very good
JOINTING TECHNIQUE	Threaded	Soldered / ferrule	Fusion weld	Solvent cement	Compression fittings
THERMAL STRENGTH PROPERTY					
AT 60° C. TEMPERATURE	Very good	Very good	Limited	Not recommended	Very good
AVAILABILITY OF FITTINGS	Very good	Average	Low	Good	Very good
THERMAL EXPANSION	Low good for concealed piping	Low good for concealed piping	Very high not to be used for concealed piping	High special care is required for use in concealed piping	Low good for using in concealed piping
EFFECT OF SUB- ZERO TEMPERATURE	Up to 0°C	Up to 0°C	Up to 40°C	Up to 0°C	Up to 40°C
U.V. RESISTANCE	Very good	Very good	Very good	Low	Very good
EASE IN INSTALLATION	Low	Average	Low	Good	Very good
FLOW PROPERTIES FOR FRICTION	Low	Very good	Very good	Very good	Very good

but the relative toxicity of their combustion is lower than with natural materials such as wood, wool & cotton. Even they don't pose the same dangers as PVC and PVDF because their molecular structure contains no halogens like chlorine etc.

Water Hammer

The pressure excess due to water hammer must be considered in addition to the hydrostatic load and this total pressure must be sustainable by the piping system. In the case of oscillating surge pressures extreme caution is needed as surging at the harmonic frequency of the system could lead to catastrophic damage.

Pressure Testing & Drying Period

The length of drying period before the joint may be subjected to Testing or operating pressure depends on the ambient temperature and the tolerances. In general allow atleast 15 hours if the test pressure is 15 bar and 24 hours if it is 21 bar. The pressure test would locate the leakages, bustings and the quality in respect of joints, chemicals and rubber gasket etc.

Composite Pipes

New innovative composite, layered pipes including high-density poly-ethylene (HDPE) or Medium density Polyethylene (MDPE). Lightly bounded with melt adhesives to the mid layers of aluminum core which is longitudinally welded in an overlapping way are ideal alternatives to GI, Copper and PVC pipes are most effectively used in medical, food stuff, chemical industry pipe system, also for under floor heating, gas pipe solar energy etc. They are also useful for varied temperature from -40°C to + 95°C. They are ecofriendly with less use of power and natural resources in manufacturing. Manufacturers need to develop factory made systems which can be installed by a plumber with least training whereas the architects and designers need to standardize toilet layouts for better & easy installations.

Copper Pipes

Copper pipes, which are commonly, & effectively being used in European world

tend to have more labour cost in India and commonly non-availability of its fittings makes it costly in comparison to GI pipes etc Copper pipes which are also inexpensive when one is ensured of corrosion, resistant, durable, leak proof, maintenance free healthy and environment friendly piping systems.

Disposal Piping

Conventionally one is using glazed Ceramic pipe, asbestos fiber pipe to Hume pipe in disposal piping work. In the last quarter of 20th Century there has been use of polyethylene pipes in Europe, North America etc. except in Asia. Polyethylene pipes are resistant to chemicals, compatible to environment protection and posses high degree of strength.

HDPE pipes for sewage and drainage disposal guarantees better flow of fluid, has increased strength to the external loading from heavy traffic and weight of soil above it, in addition to their endurance to the seismic loads due to their flexibility.

These HDPE pipes are completely hygienic, on toxic and heat resistant up to 80°C temperature. They are corrosion resistant and have high degree of elasticity.

The second stage of execution would reflect more in cosmetics and aesthetics besides being functional and utility bound. The various materials in respect of flooring, walling, fixture and faucet and application of lighting, ventilation, etc. are available in the market, which could suitably be used.

Flooring & Walling

High Range of materials from ceramic, vitrum vitrified to actual marble & granite tiles and innovative use of toughened glass, polycarbonate sheets with pre-laminated wooden floors have generated many mix and matches in bathrooms flooring. It is desirable to use appropriate fixing chemicals and grouts for better and permanent finishing.

Fixtures & Faucets

Chinaware bathroom fixtures have innovation in its selective usages. Full/Half Capacity Cistern to flush valves and the sensors in the fixtures are the product of high tech innovations. Stainless steel and moulded glass fixtures have good acceptability in consumer's psyche. This reflects in its effective application. C.P. faucets from full turn to half and Quarter turn to single lever to sensor faucets do have warmth and quality usage.

Besides the range of faucets there is a demand of shower panels, Jacuzzis, massages, mushrooms and bubbled showers, tubs and family

bath pools, cubicles with steam and sauna baths also in the domestic luxury bathroom.

False Ceiling, Ventilation & Lighting

The elements of interior highlight the effective and proper false ceiling and appropriate use of electric fixtures indicate the selective use in respect of spot, general & focused lighting. Besides fluorescent, CFL and halogen lighting it is the distribution and positioning which would matter the most to elevate the quality of presentation.

I would strongly recommend and suggest that we start using HDPE pipes for sewage and drainage disposal. The High tech innovation of PP-R(High Molecular Random) Copolymers Polypropylene PE & Aluminum Plastic Composite Pipes for water supply Systems instead of conventional glazed ceramic, asbestos, Hume pipes for disposal and G.I. & ordinary P.V.C pipes for water supply systems.

Most of the time the actual end - user and also the professionals are dependent on the plumbers. However, the plumber with little knowledge, blindly follows the conventional system without any know - how of the latest materials and their application. This is how problems multiply leading to bad detailing and workmanship. We still adopt 'soot gola' and 'safeda' where as technology has actually changed. We now have revolutionary and wonderful joinery chemicals and tapes that can be used to produce better quality of workmanship.



The industry should arrange some training and orientation programmes for plumbers to sense the product and also understand its acute intensity and behavior in respect to its high-tech quality and application.

The hardness of water plays a very vital and important role in determining the behavior pattern of various materials. Therefore, if possible proper treatment should be provided to the source water by way of chlorination etc. The uninterrupted water supply through the use of auto lift pumps having sensors in underground and overhead tanks are very effective and useful.

To conclude, bathrooms have indeed been graded as the Status symbol and always reflect the personality of the user. The overall behavior in respect of body, mind & intellect of a person is judged solely through the qualitative approach towards bathroom planning and maintenance.

These series of articles on various topics of practical concern is a beginning towards an understanding between the manufacturer, professional & the actual users highlighting various practical issues of concern. ■

POST Budget AC Demand

The demand for ACs is expected to grow stupendously at a compounded rate of 20 per cent during 2003-04 to 2005-06. The reduction in the import duty on consumer durables will not affect the domestic industry, as domestically manufactured consumer durables will continue to remain price-competitive even at the revised duty levels. However, players concentrating on the premium end / higher capacity segments (such as LG, Samsung and Sony) will benefit, as these products are mostly imported. The removal of the special excise duty (SED) of 8 per cent on ACs, along with a corresponding reduction in the abatement rate to 30 per cent (35 per cent last year), will result in an effective excise duty of 11.2 per cent (15.6 per cent). This will lead to a Rs 700-900 decline in AC prices, which will lead to a corresponding rise in demand, as ACs have displayed significant price elasticity in the past. The reduction in import duty on alloy steel, copper, zinc and polymers (ABS/HIP) will be marginally positive for the air-conditioner segments. The expected rise in disposable income of consumers (following the change in the tax brackets and norms) is expected to induce demand.