

## BUILDING SERVICE AND ENERGY MANAGEMENT

MODERN BUILDINGS HAVE BECOME MORE COMPLEX AND COSTLY. THE OPERATING COSTS ARE RELATED TO THE USE AND UNIT COST OF ENERGY.

TO REDUCE THE OPERATING COST, IT HAS TO EXAMINE EACH SERVICE WITH THE INTENTION OF REDUCING THE ENERGY CONSUMPTION THROUGH ACHIEVING HIGHER PROCESS OF EFFICIENCIES OR EFFECTIVENESS.

### LOAD SOURCES

AIR CONDITIONING, LIGHTING, DOMESTIC HOT WATER  
VERTICAL TRANSPORTATION, TENANTS GENERAL  
POWER

## ENERGY UNIT (ELECTRICITY)

$$\text{LOAD } \frac{\text{MJ}}{\text{m}^2 \text{ ANNUM}} = \frac{\text{ANNUAL KWH} \times 3.6}{\text{NET RENTABLE AREA (m}^2\text{)}}$$

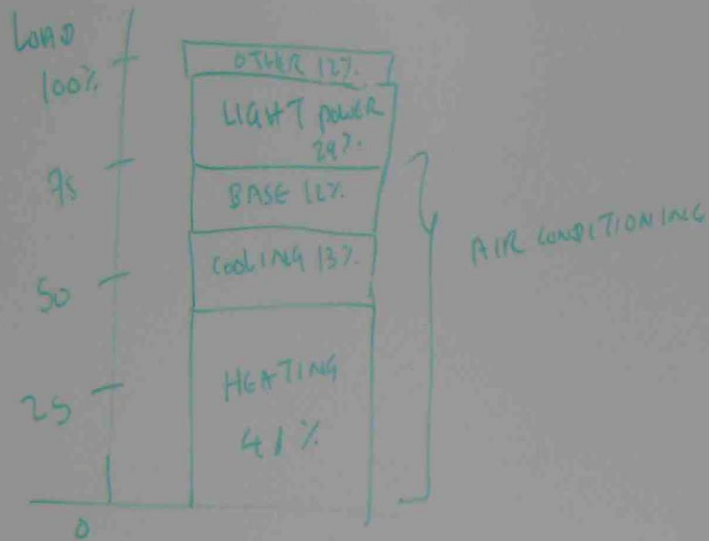
$$1 \text{ KWH} = 3.6 \text{ MJ}$$

OIL | GAS LOAD

$$\text{LOAD } \left( \frac{\text{MJ}}{\text{m}^2 \text{ ANNUM}} \right) = \frac{\text{OIL | GAS USED PER ANNUM} \times \text{CV} \times \text{EFFICIENCY}}{\text{NET RENTABLE AREA (m}^2\text{)}}$$

CV = CALORIFIC VALUE OF OIL | GAS

## Comparison of Building Load Sources



AIR CONDITIONING LOAD IS EFFECTED BY THE AMOUNT OF HEAT TRANSFER WHICH IS RELATED TO ROOM COOLING LOAD, SOLAR RADIATION, WINDOWS.

## FACTORS INFLUENCING ROOM LOAD

SOLAR RADIATION, WINDOW, WALL, LIGHT, PEOPLE, EQUIPMENT  
(INTERNAL FACTOR)

(EXTERNAL FACTOR)

SUN INCIDENCE, OUTSIDE AIR INFILTRATION,  
TRANSMITTED SOLAR RADIATION, HEAT CONDUCTION, SHADING

### WALL

BRICK MASONRY	2.2
CAVITY BRICK	1.9
CONCRETE SLAB	3.8

### Roof

CONCRETE SLAB, AIR SPACE	1.9
GYPSUM BOARD	
METAL DECK	0.44 → 0.76





## Types of working spaces

MINIMUM FRESH  
AIR PER PERSON  
LITRE / SECOND

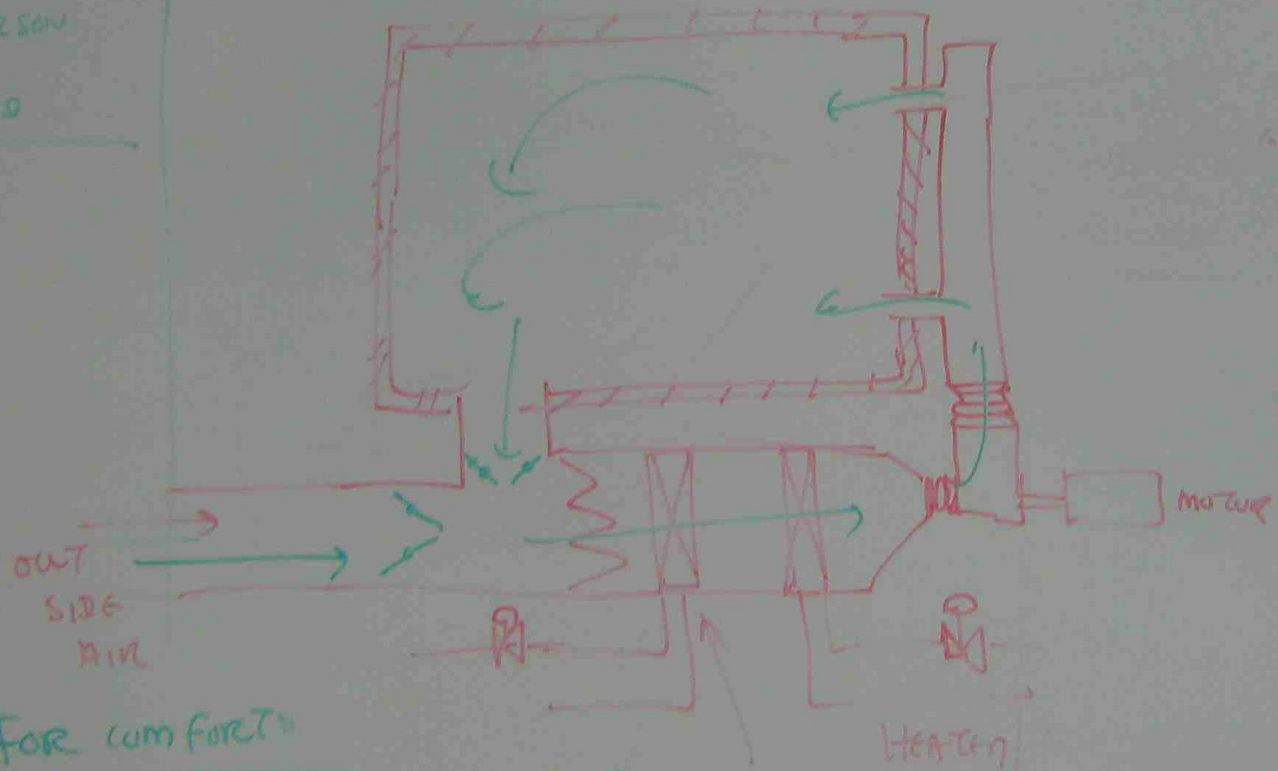
3.5

12.5

3.5

5

## FRESH AIR SUPPLY SYSTEM



For comfort

Room Temperature  $23^{\circ}\text{C}$

R.H = 80%

AIR MIXING UNIT IS  
UTILIZED TO EFFECTIVE  
USE OF ENERGY.

## LIGHTING

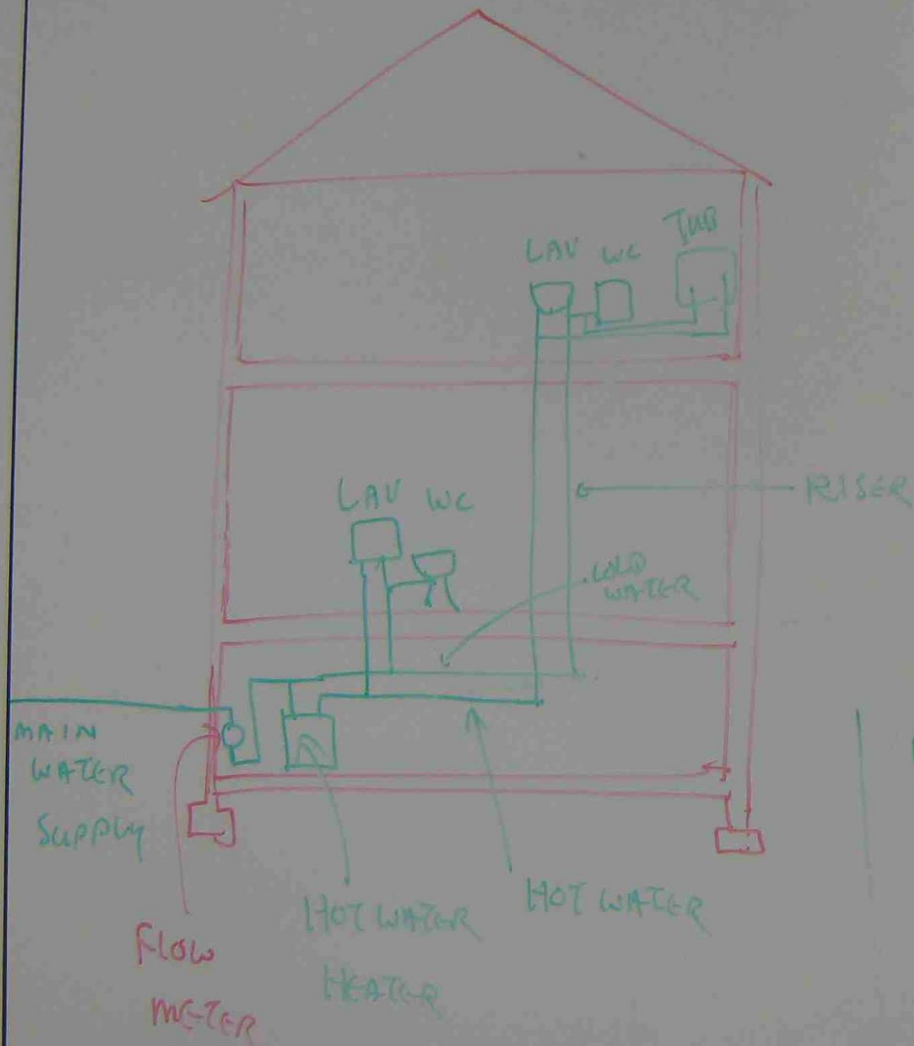
20 W/m<sup>2</sup> FLOURESCENT LIGHT

25 W/m<sup>2</sup> HEAT DISSIPATION

FACTORS AFFECTING BUILDING ENERGY

TIME OF OPERATION, ROOM TEMPERATURE DRIFT,  
ROOM RELATIVE HUMIDITY, GLASS SHADING,  
FRESH AIR, AIR MIXING, LIGHTING LEVEL

# BUILDING SYSTEM (1) - WATER SUPPLY



ENERGY USE

WATER HEATER

pump

THE PARTS OF A TYPICAL WATER SUPPLY SYSTEM CONSISTS OF  
 BUILDING MAIN, RISER, HORIZONTAL FIXTURE BRANCH, FIXTURE  
 CONNECTION AND A METER IN COMMUNITY WATER SYSTEM.

### PIPING MATERIAL

### PLASTIC PIPES.

TYPE	COLD WATER	HOT WATER
POLYETHYLENE (PE)	X	
POLY VINYL CHLORIDE (P.V.C)	X	
ACRYLONITRILE BUTADIENE STYRENE (A.B.S)	X	X
POLY VINYL DICHLORIDE	X	
CHLORINATED POLY VINYL CHLORIDE (CPVC)	X	X

COPPER  
BRASS

most popular  
in water piping



# PIPE FITTINGS



90° ELBOW



45° ELBOW



TEE

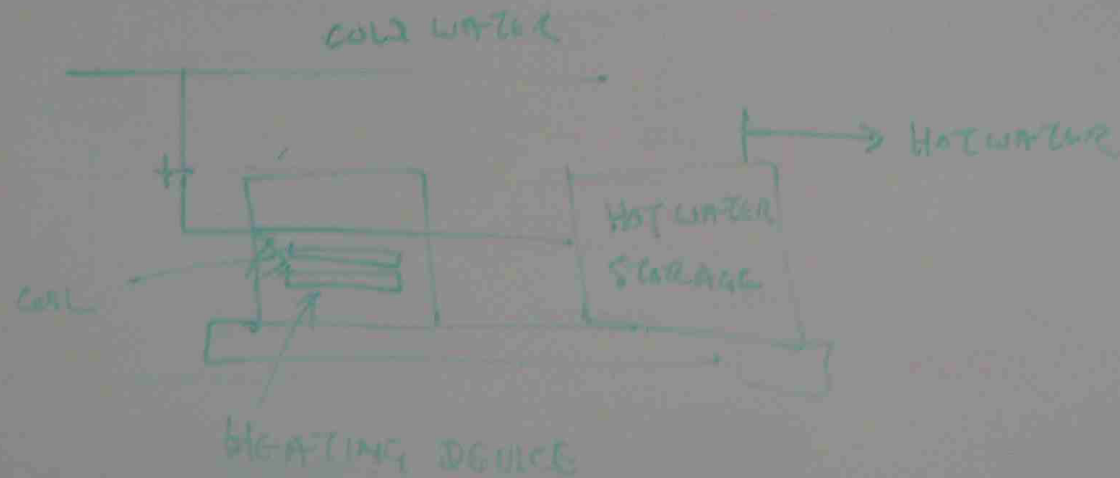
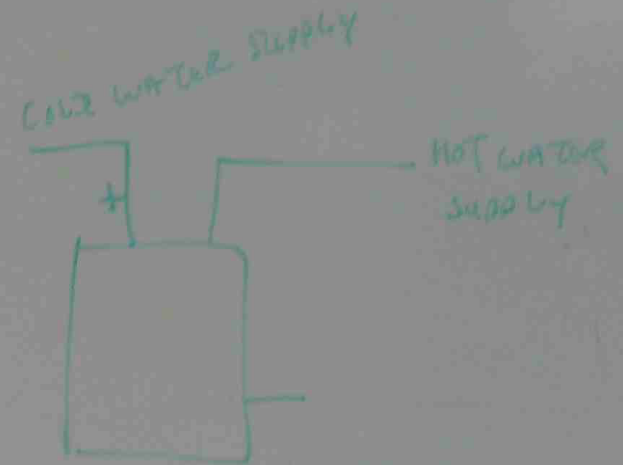
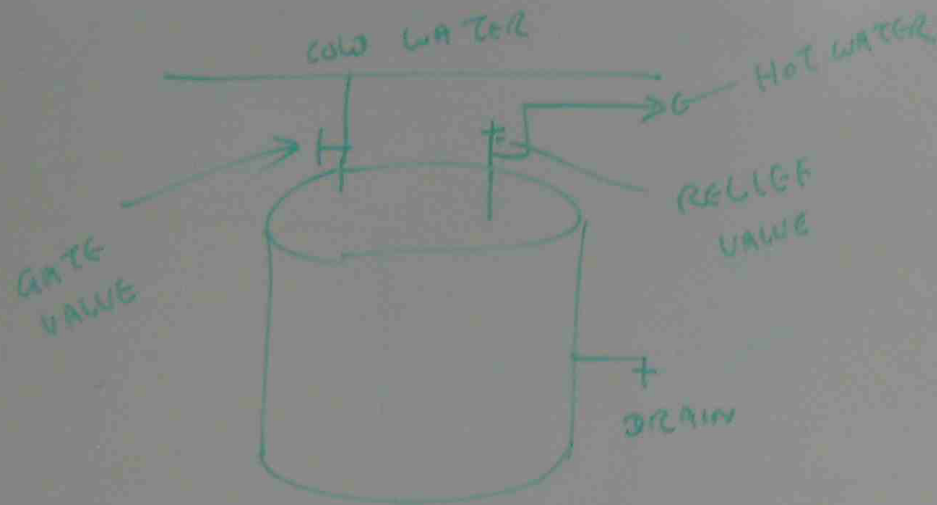


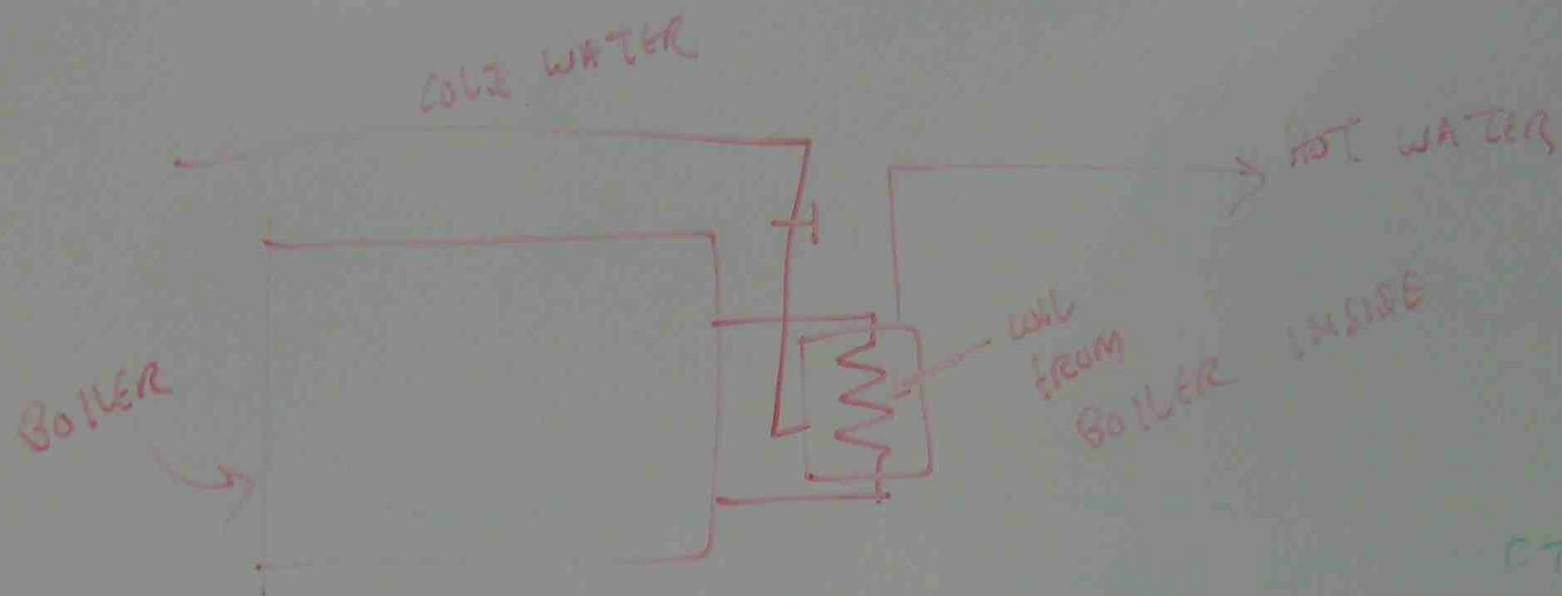
REDUCER

SHOCK ABSORBER - TO REDUCE INSTANT  
RISE OF WATER PRESSURE

EXPANSION BEND / LOOP - TO WITHSTAND  
TEMPERATURE  
DIFFERENCE

# HOT WATER SYSTEM



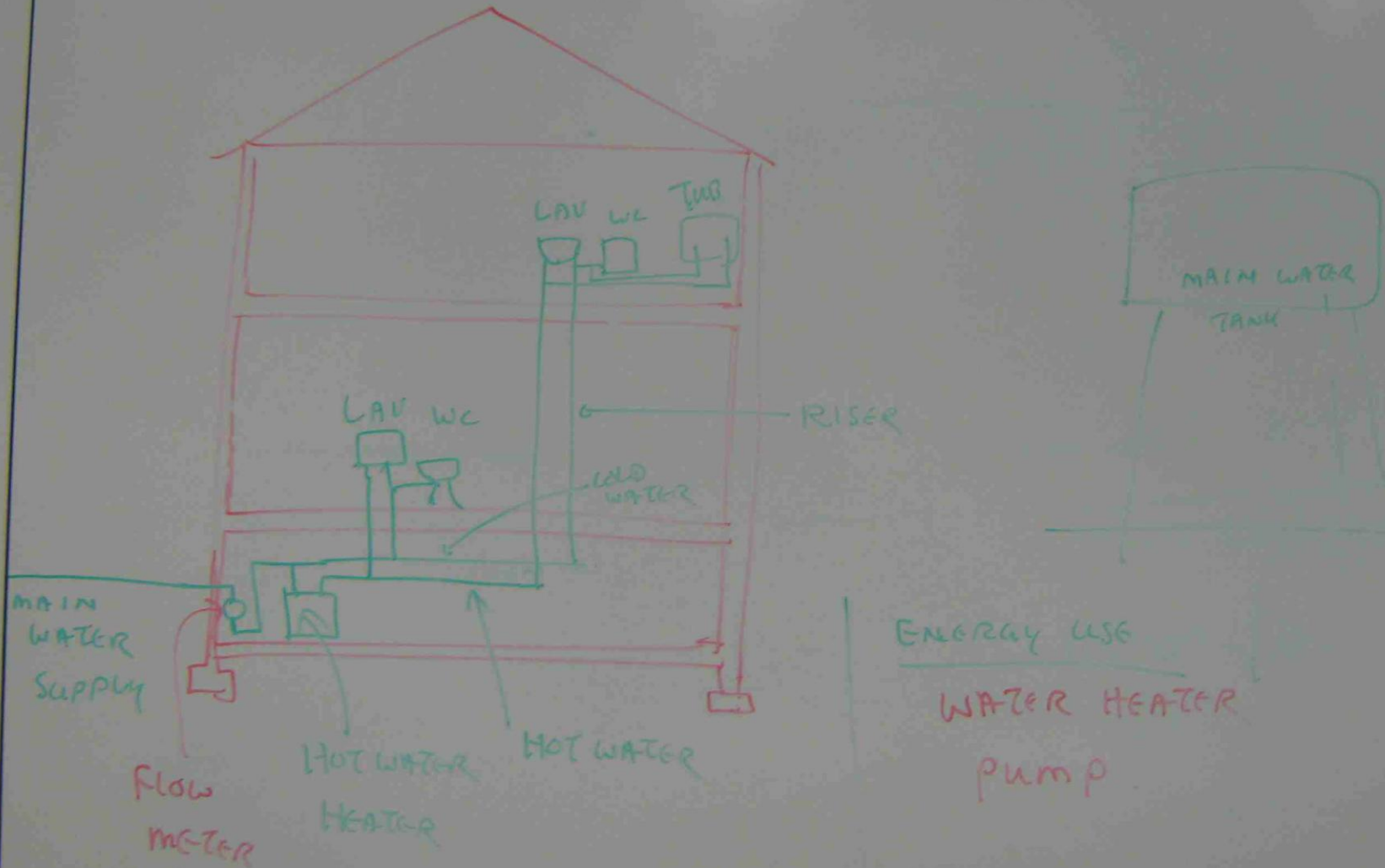


INDIRECT HEATERS.

CT

CL

# BUILDING SYSTEM (1) - WATER SUPPLY



USER



ENERGY USE

WATER HEATER

pump



THE PARTS OF A TYPICAL WATER SUPPLY SYSTEM CONSISTS OF  
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CHLORINATED POLYVINYL CHLORIDE (CPVC)	X	X

COPPER  
BRASS

MOST POPULAR  
IN WATER PIPING

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