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COST OPTIMIZATIONSTUDY IN WATER DISTRIBUTION WORK FOR NIET CAMPUS BY USING PVC PIPES

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ABSTRACT

Cost optimization of water distribution system design is a well-established research field, its primary focus is to minimize the cost of a proposed pipe network infrastructure, and this review paper contains a study of optimizing the cost of water distribution system in NIET,Greater Noida Campusby replacing the galvanized iron pipe to PVC pipes.

1. INTRODUCTION

1.1 Galvanized Iron Pipes

Iron or steel pipes coated with layer of zinc to protect them to corrosion or rusting. They are used because of higher longevity as well as durability, easier welding and rigorous fabrication, easy to cut, higher resistance of corrosion, anti-rust coating & super finished. GI pipes are used for main water supply system, for main water supply system. Firefighting equipment, Air-duct, various advantages, disadvantagesand maximum permissible pressure and temperature has been discussed below

ADVANTAGES	DISADVANTAGES
Low installation & maintenance cost	It should never be used underground unless properly covered
Handy to the diversity of application even galvanized pipes not free from flows.	Galvanized pipes may contain lead which corrodes quickly and the life span
Toughness	GI pipes may leave rough patches inside the pipe. Which result in series failure and stoppages that can be expansive to repair.
Anti-rust pipes	Heavy to handle
They are used to strength steel or iron	Develops blockages.

Maximum Permissible Pressure and Temperature for Tubes with Steel Coupling or Screwed and Socketed Joint

NOMINAL BORE (MM)	MAXIMUM PERMISSIBLE PRESSURE(MPA)	MAXIMUM PERMISSIBLE TEMPERATURE ℃
up to and including 25mm	1.20	260
Over 25 mm up to including 40mm	1.03	260
Over 40 mm up to and including 80mm	0.86	260
Over 80 mm up to and including 100mm	0.69	260
Over 100 mm up to and including 125 mm	0.83	177
Over 125 mm up to and including 150 mm	0.69	171
NOTE- 1 Mpa = 1 N/mm^2 = 0.102 0 kg/mm^2		

1.2 PVC Pipes

PVC stands for polyvinylchloride PVC pipes are extremely strong and most importantly, these pipes are 100% resistant to corrosion these pipes are use in a wide variety of application from Transpitation of drinking water over drainage solution to be advance fire sprinkler system. It properties like safety durability,cost efficiency, environment performance & recycle ability.PVC pipes are used for main water supply system, waste water conveying,firefighting equipment and airduct. It's various advantages, disadvantages and maximum permissible pressure and temperature has been tabled below

ADVANTAGES	DISADVANTAGES
It is not corroded easily	Available in small sizes.
It is totally unaffected by acid	Interior of pipe becomes rough with age-

	discharge carrying capacity is reduced.
They are out class pipes in respect of other pipes.	Large dia pipes are heavy and hence uneconomical
Easy to join	Likely to break during transportation or jointing.
Cost moderate	Pvc pipes joint can be very bulky

Maximum Permissible Pressure And Temperature For Pvc Pipes

NOMINAL PIPE SIZE (INCHES)	REQUIRED MINIMUM BURST PRESSURE(PSI) (KPA)		MAXIMUM OPERATING PRESSURE (PSI) (KPA)	
	Schedule 40[1]	Schedule 80[2]	Schedule 40	Schedule 80
½	1910	2720	358	509
¾	1540	2200	289	413
1	1440	2020	270	378
11/4	1180	1660	221	312
11/2	1060	1510	198	282
2	890	1290	166	243
21/2	870	1360	182	255
3	840	1200	158	225
4	710	1110	133	194
5	620	1040	117	173
6	560	930	106	167
8	500	890	93	148
10	450	790	84	140
12	420	600	79	137

2. Study Details and Calculation

2.1 Parameters comparison between GI pipes and PVC pipes

Specification of GI Pipes and PVC Pipes

PARAMETERS	GI PIPE	PVC PIPE

Full form	Galvanized iron	Poly vinyl chloride
IS code	Is 1239-2004	Is 4985-2000
Composition	Iron/Zinc	Chlorine/Ethylene/Color Pigments/Additives
Uses	Used for water supply/especially for underground layed water supplied piping	Used for water supply and drain pipes.
Durability	Very good	Good
Fire resistance	Yes	No
Installation	Time consuming and requires more man hours than PVC	Easily done through cold welding and saves man hours
Corrosion resistance	No	Yes
Thickness available(mm)	20/25/32/40/50/63/75/90/110/140/160/ up to 450 mm	15/20/25/32/40/50
Types of pipe quality (gauge)	Class A(low)/Class B(Medium)/ Class C (Heavy)	Class 1/ Class 2/ Class 3/ Class 5
Pipe Length (meters)	3 Meters	3 Meters/ 6 Meters

2.2 Price Table

2.2.1 GI Price Table

SIZE IN MM	GI PIPES PRICE LIST(PER METER) LIGHT(A CLASS)	GI PIPES PRICE LIST (PER METER) HEAVY (C CLASS)
15	93.95	118.95
50	320.85	463.05
65	446.40	583.25
80	522.35	729.05

2.2.2 PVC Price Table

SIZE IN MM	PVC PIPES PRICE LIST(RS.PER METER) LIGHT (A CLASS)	PVC PIPES PRICE LIST (RS.PER METER) HEAVY (C CLASS)
15	60	85
50	280.78	390.98
65	420	511.11

2.2.3 Calculation

Total required length of pipe = 6000ft = 1818 meters

Rate of GI pipes = Rs.118 per meters

Cost of total GI pipes=1818*118= Rs 214,524

Rate of PVC pipes =Rs. 85 per meters

For PVC pipe = 1818*85= Rs. 154,530

Difference between GI pipes and PVC pipe cost = 214,524-154,530 = Rs 59994 (approx. 60000)

LITERATURE OF REVIEW

i) Uri Ephrat, Abraham gleichman
US Patent 7, 201, 180, 2007

A water supply system comprising a supply line and a network of consumers, one of which being a monitored consumer who receives the least amount of pressure, a pressure regulation system comprising a pressure reducing valve (PRV) associated with a pilot valve preset to a nominal output pressure and a pressure control system comprising a differential control valve (DCV). A pickup unit is provided for measuring a flow parameter indicative of the pressure at the monitored consumer and emitting a pressure signal to a controller generating in turn.

ii) Roman slowinski
Fuzzy sets and system 19 (3), 217-237, 1986
A method is presented for solving a multicriteria linear program where the coefficient of the objective functions and the constraint are fuzzy numbers of the L-R type. Assuming the aspiration levels for particular criteria to be fuzzy and basing on comparison of fuzzy numbers, the original problem is transformed into a multicriteria linear program. The

latter is solved using an interactive technique involving a linear programming procedure in the calculation phase.

iii) William F Ogden
US Patent 2,117,907,1938

This invention is particularly applicable to dwellings having a water supply service involving a hot water tank or boiler arranged to provide hot water for the dwelling, and it contemplates an improved drainage system arranged to drain the hot water pipes of the dwelling with out at the same time draining the hot water from the hot water tank.

In the warmer climates, such as in the southern states of the United States, it is customary on cold nights when thereis danger of freezing to cut off cold water supply to the dwelling and drain the water.

iv) Cerelia M Hackley
US Patent 2,264,876,1941

This invention pertains to the water supply systems and ‘equipment for furnishing hot, cold or warm water for general use, as in homes, stores, o?
Ices and hospitals, or wherever required. The main object of the invention is provide in combination hand operated means for supplying hot or cold water to a wash bowl, sink or bath-tub, or the like, and foot operated means for steadily supplying water of any predetermined intermediate temperature.

3. Conclusion

After study,survey and calculation PVC pipes it is concluded that use of PVC pipes would be cheaper and would give same serviceable period of life in constructionby construction cell of NIET for water supply and waste water treatment purposes

REFERENCES

i)IS 1239-1 Steel Tubes, Tubular and Other Wrought Steel Fittings,
ii) IS 4985 Unplasticized PVC Pipes for Potable Water Supplies
iii) Palmer, David. "Water Supply System, "U.S. Patent No.5,304,286. 19 Apr.1994.
ii) Palmer, D.G.(1994).U.S. Patent No. 5,304,286. Washington, D.C: U.S. Patent and Trademark Office.