

be placed as low as possible in relation to the storage tank level, such as on a porch roof, the roof of a one-story extension or, if necessary, even on the ground. Both the coil and the circulation lines should be designed to facilitate the circulation flow as much as possible using long radius copper fittings or recessed galvanized iron fittings to match the materials of the coil, circulation lines and tank. The coil should be inclined as shown in Fig. 6 so that the north end is raised above the south end to secure an angle with the horizontal of about 53 deg. This will result in the inlet end of the coil being on the south side (or bottom) and the outlet end being on the north side (or top). This will satisfy conditions along the 30 deg N latitude which includes the portions of Florida and Southern California where these heaters are most frequently used.

The hot box is usually constructed of wood on the four sides and

TABLE 4. SUGGESTED SOLAR HEATER DESIGN DATA^a

DESIGN ITEM	BASED ON RATE OF 30 GAL PER DAY PER PERSON								BASED ON RATE OF 40 GAL PER DAY PER PERSON							
	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
No. of Occupants in Residence.....	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Hot Water Used at Night, gal per person.....	15	15	15	15	15	15	15	15	20	20	20	20	20	20	20	20
Hot Water Used at Night, gal total.....	15	30	45	60	75	90	105	120	20	40	60	80	100	120	140	160
Retained in Tank, 25 per cent, gal.....	4	8	11	15	19	23	27	30	5	10	15	20	25	30	35	40
Tank Capacity Required, gal.....	20	40	59	75	94	113	130	150	25	50	75	100	125	150	175	200
Hot Water Used During Day, gal.....	15	30	45	60	75	90	105	120	20	40	60	80	100	120	140	160
Total Water to be Heated:																
Gal per 8 hr period.....	35	70	104	135	169	203	235	270	45	90	135	180	225	270	315	360
Gal per hour.....	4.5	9	13	17	21	26	29	34	6	12	17	23	28	34	39	45
Copper Coil Required:																
Surface area, sq ft.....	25	50	75	100	121	145	168	192	32	64	96	128	160	192	224	256
Equivalent length 1 in. coil, ft.....	100	200	300	400	484	590	684	768	128	256	384	512	640	768	896	1024
Box Size:																
Area, sq ft.....	25	50	75	100	121	145	168	192	32	64	96	128	160	192	224	256
Width, ft.....	4	6	7	8	9	10	10	11	4	6	8	9	10	11	12	12
Length, ft.....	6	8	11	12.5	13.5	14.5	16.5	17.5	8	10	12	14	16	18	19	21

^aSun Effect and the Design of Solar Heaters, by H. L. Alt (A.S.H.V.E. TRANSACTIONS, Vol. 41, 1935, p. 131).

bottom, and is insulated. Over the top of the box glass sash are placed and the box should be constructed as near air-tight as possible. The interior surfaces should be painted white to reflect the heat while the coil should be painted black to absorb the heat. The box need not be deeper than necessary to house the coil and to protect it from the weather.

The addition of a light gage copper plate on the bottom of the box to which the pipe of the coil is soldered, for good metallic contact, will add to the amount of heat received by the coil due to the fact that this plate will receive all of the sun rays which fail to directly strike the coil. The heat from this source is transmitted to the coil through the plate instead of by heating the air surrounding the coil and from which only part of the heat enters the coil, the balance being transmitted through the glass sash.

Design data given in Table 4 may be used with some judgment in selecting the size of solar heater coil and box for a particular application. These data are based on consumptions of 30 and 40 gal of hot water per day per person.

FRICITION LOSS IN WATER SUPPLY PIPING

Fig. 7, showing friction loss in *fairly rough* pipe, has been reproduced from Fig. 4 of Building Materials and Structures Report BMS 79, Water Distributing Systems for Buildings, by Roy B. Hunter, *National Bureau of Standards*. For friction loss in tubing, as well as in smooth

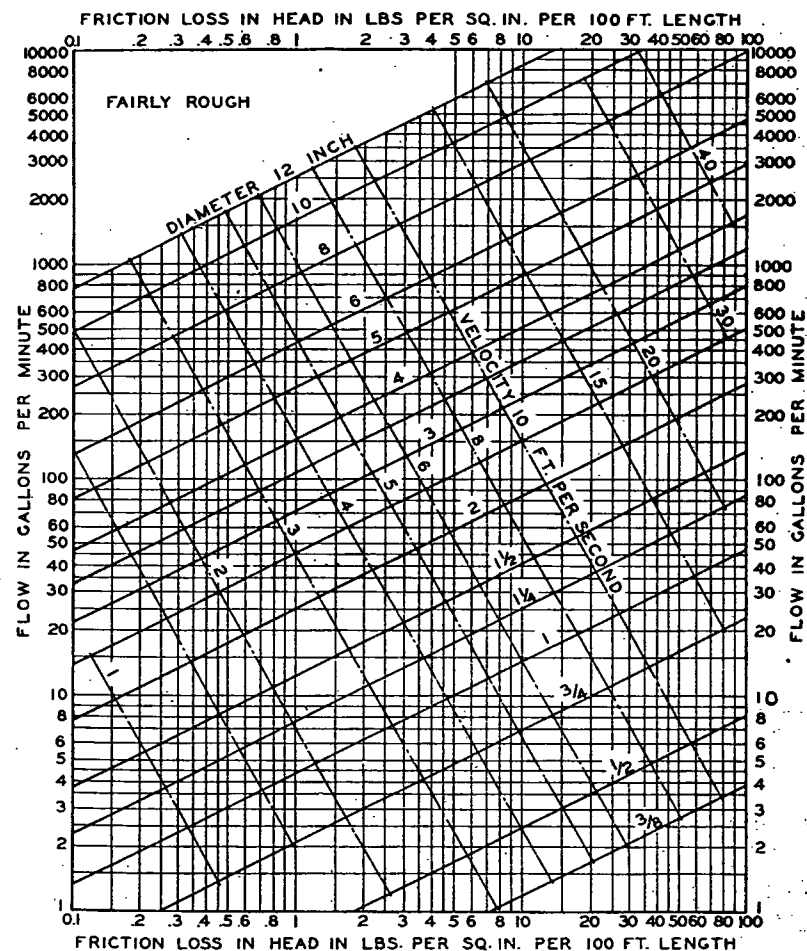


FIG. 7. FRICTION LOSS IN FAIRLY ROUGH PIPE

and rough pipe the reader is referred to Figs. 2, 3 and 5 in the same publication.

REFERENCES

- Laundry, Kitchen and Hospital Equipment, by H. C. Russell (A.S.H.V.E. TRANSACTIONS, Vol. 35, 1929, p. 45).
- Water Consumption, Cost and Savings, by G. C. St. Laurent (*American Hotel Association, Hotel Engineering*, Vol. 1, 1940).
- Plumbing Practice and Design, (1943) by Svend Plum (John Wiley & Sons, Inc.).