

ranted or when only rough comparisons are desired between several types, approximate unit costs are of value as time savers.

Approximate installed prices of the various parts are shown in Tables 1, 2, and 3 and, as indicated, vary with the size or capacity of the equipment. The apparatus and items included in each group are stated in the footnotes beneath the tables. By use of these three tables it is possible to obtain a reasonable approximation of the cost of heating or air conditioning a given space or building. In order to use the approximate values indicated in Tables 1, 2 and 3, a rough estimate of the load is required. If time does not permit a determination of the load and if extremely rough figures will suffice, Table 4 may be used as an indication of the price of various types of air conditioning applications.

Other first costs, incurred because of the installation of the air conditioning or heating and ventilating system, include costs of electrical work, plumbing, miscellaneous piping, building alterations, cutting, patching, remodeling, or redecorating after installation, consulting engineer's fees, licenses, permits, etc. These vary so widely that no approximations are possible and each case must be considered alone.

The length of the amortization period to be used depends upon: the type and remaining life of the building or space for which the system is to be used; the type of equipment to be employed as a part of the system; the character of the business; and the lease or ownership conditions. For small shops in rented quarters on short term leases, a period of 5 years or

TABLE 1. TYPICAL INSTALLED COSTS OF HEAT PRODUCING AND HEAT DISTRIBUTING SYSTEMS

BTU PER HOUR (MILLIONS)	Sq Ft EDR (STEAM) THOUSANDS	BOILER HORSE POWER	COST IN DOLLARS—PER MILLION BTU PER HOUR ^{a,b}			
			1	2	3	4
			BOILERS WATER TUBE	BOILERS FIRE-TUBE	HOT WATER SYSTEM FORCED CIRCULATION	DIRECT RADIATION SYSTEM STEAM
0.8	3.3	24		2100	8500	7850
1.2	5.0	36	2300	1750	8200	7600
1.6	6.6	48	2000	1570	8000	7350
2.0	8.3	60	1850	1460	7800	7200
3.0	12.5	90	1600	1230	7600	7000
4.0	16.6	119	1400	1100	7500	7000
5.0	20.8	149	1250	980	7500	7000
6.0	25.0	179	1160	920	7500	7000
7.0	29.2	209	1100	880	7500	7000
8.0	33.3	239	1050	850	7500	7000
10.0	41.6	299	1000		7500	7000
12.0	50.0	358	970		7500	7000
14.0	58.3	418	930		7500	7000
16.0	66.6	478	900		7500	7000
18.0	75.0	538	860		7500	7000

^a Columns 1 and 2 include hand fired boiler erected, with shaking grates and standard trimmings, Column 1 includes brickwork and rotating soot blowers. Foundations and piping are not included.

^b Columns 3 and 4 include direct radiation, piping, valves, specialties, and insulation. Boilers, condensate and circulating pumps, boiler connections, and all building construction or alterations are not included.

^c The approximate figures given above may vary as much as 30 per cent due to job conditions, labor rates, and locality. These figures represent the selling prices of the individual items indicated above based on costs encountered in the year 1940. It is suggested that correction be made according to the particular locality for increases in labor and material costs since that year.

TABLE 2. AVERAGE INSTALLED COSTS OF FORCED AIR HEATING AND AIR CONDITIONING APPARATUS

CFM SUPPLY AIR (THOUSANDS)	COST PER CFM—DOLLARS ^d			
	1	2	3	4
	AIR CONDITIONING EQUIPMENT ^a	HEATING AND VENTILATING EQUIPMENT ^b	DUCTS OFFICE BLDGS. ^c	DUCTS SPECIALTY STORES ^e
5	0.300	0.210		0.250
10	0.270	0.180		0.249
15	0.250	0.155		0.247
20	0.235	0.140		0.245
30	0.220	0.120		0.240
40	0.210	0.110	0.340	0.235
60	0.210	0.110	0.330	0.230
80	0.210	0.110	0.325	
100	0.210	0.110	0.320	
120	0.210	0.110	0.310	
140	0.210	0.110	0.305	
160	0.210	0.110	0.295	
180	0.210	0.110	0.290	
200	0.210	0.110	0.280	

^a Air conditioning equipment includes fans and drives, filters, heaters, spray dehumidifiers or cooling coils, automatic controls, apparatus casings and insulation, and recirculating pumps.

^b Heating and ventilating equipment includes fans and drives, filters, heaters, automatic controls and apparatus casings.

^c Includes ducts, grilles, outlets, insulation where required and specialties.

^d The approximate figure given above may vary as much as 35 per cent due to job conditions, labor rates and locality. Figures are based on conventional systems. Building alterations, piping, plumbing and wiring are not included. These figures represent the selling prices of the individual items indicated above based on costs encountered in the year 1940. It is suggested that correction be made according to the particular locality for increases in labor and material costs since that year.

TABLE 3. AVERAGE INSTALLED COSTS OF REFRIGERATION SYSTEMS, AND WATER SAVING DEVICES

TONS REFRIGERATION	COST—DOLLARS PER TON ^a					
	1	2	3	4	5	6
	RECIPROCATING (WATER COOLING) ^b	CENTRIFUGAL (WATER COOLING) ^c	RECIPROCATING DIRECT EXPANSION ^d	EVAPORATIVE CONDENSERS ^e	COOLING TOWER STEEL ^f	COOLING TOWER WOOD ^g
25	147		106	47		
50	132		86	40		
75	125		77	35		
100	120		72	32	47	40
150	115	137	68	30	45	38
200	113	124			44	36
250	110	115			42	35
300		107			40	33
400		97			38	31
500		93			36	29

^a Columns 1 and 2 include compressors, evaporators, and water-cooled condensers; auxiliaries: electric motor, starter and drive; refrigeration piping, refrigerant and insulation of cooler and suction lines. Turbine driven centrifugal equipment may cost about 4 to 6 per cent more than motor driven, if condensing turbine and steam condenser, with supplementary equipment, are used.

^b Column 3 includes same items as Column 2 except evaporator and auxiliaries are omitted.

^c Column 4—These values are additive to Columns 1 and 2.

^d Columns 5 and 6 include towers erected and a reasonable allowance for condenser water piping and pumps.

^e The approximate figures given above may vary as much as 25 per cent due to job conditions, labor rates and locality. Building alterations, supply water and plumbing connections, wiring, chilled water piping and pumps are not included in these figures and may vary widely. Chilled water piping and pump costs may vary between \$10 and \$50 per ton of refrigeration effect. These figures represent the selling prices of the individual items indicated above based on costs encountered in the year 1940. It is suggested that correction be made according to the particular locality for increases in labor and material costs since that year.