

WEIL-McLAIN

BOILER REPLACEMENT GUIDE

**STEP-BY-STEP PROCEDURES
FOR PROPERLY SIZING HOT WATER AND
STEAM REPLACEMENT BOILERS
FOR HOMES AND
SMALL COMMERCIAL BUILDINGS**

BOILER REPLACEMENT GUIDE

INTRODUCTION

This booklet is designed to give the quality-conscious hydronic heating contractor a step-by-step procedure for properly sizing hot water and steam replacement boilers. It is intended primarily for use in sizing boilers for homes, but in many cases can also be used for small commercial buildings.

All too often replacement boilers are sized simply by matching the rating of the old boiler. This can result in an oversized boiler which wastes fuel—or an undersized unit which will not heat the building.

By following the procedures in this booklet, the heating contractor will be able to accurately size replacement boilers, sell more replacement jobs, assure energy-efficient installations and render better service to his customers.

SIZING HOT WATER BOILERS—Page 3

There is only one accepted method for determining the proper size of a replacement hot water boiler: **THE HEAT LOSS OF THE BUILDING MUST BE CALCULATED**. By following the steps in this booklet, the total heat loss of the average house can be calculated in five or ten minutes. In most cases it should not be necessary to make a detailed calculation but, if it is required for any reason, use IBR Guide H-21 or the latest ASHRAE Handbook.

SIZING STEAM BOILERS—Page 9

To properly size a replacement steam boiler **DETERMINE THE TOTAL BTU CAPACITY OF THE CONNECTED RADIATION**. This method is necessary in order to assure adequate steam pressure to fill all parts of the system.

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SECTION I

PROCEDURE FOR SIZING HOT WATER BOILERS

STEP 1 COMPLETE A JOB SURVEY FORM

Certain key information is required for each boiler replacement job in order to calculate the heat loss, select the proper boiler and determine the selling price. Figure 1 is a Job Survey Form (part of a Weil-McLain Boiler Replacement Worksheet) to aid in recording the re-

quired information. It will serve as a checklist of the basic data for the existing installation and a permanent record for your job file. Boiler Replacement Worksheets to be used with this booklet are available through Weil-McLain distributors and sales representatives.

FIGURE 1
JOB SURVEY FORM

WEIL-McLAIN BOILER REPLACEMENT WORKSHEET JOB SURVEY FORM

CUSTOMER NAME _____ PHONE _____

ADDRESS _____

PREPARED BY _____ DATE _____

PRESENT HEATING SYSTEM: _____

TYPE OF RADIATION: _____

HEATING MEDIUM: ☐ Hot Water ☐ Steam

FUEL NOW USED: ☐ Natural Gas ☐ Propane ☐ #2 Oil ☐ Electricity

FUEL TO BE USED: ☐ Natural Gas ☐ Propane ☐ #2 Oil ☐ Electricity

IS SYSTEM HEATING SATISFACTORILY? ☐ Yes ☐ No

If no, what is the problem? _____

How can it be corrected? _____

RELOCATE BOILER? ☐ Yes ☐ No. If yes, estimated time _____ Materials _____

Corrosive Atmosphere? _____

PRESENT SOURCE OF DOMESTIC WATER: ☐ Tankless Heater ☐ AMTROL Type ☐ Other _____

WILL NEW BOILER HAVE A WATER HEATER? ☐ Yes ☐ No Type _____

HOUSE CONSTRUCTION:

GLASS _____

WALLS _____

CEILING _____

FLOOR _____

HOUSE DIMENSIONS (Use sketch for accuracy):

Basement _____' H L _____' x _____' W = _____ Sq. Ft.

First Floor _____' H L _____' x _____' W = _____ Sq. Ft.

Second Floor _____' H L _____' x _____' W = _____ Sq. Ft.

Mid-Level _____' H L _____' x _____' W = _____ Sq. Ft.

DESIGN TEMPERATURE DIFFERENCE _____ °F

NEW THERMOSTAT(S) REQUIRED ☐ Standard ☐ Clock Programmable

STEP 2 CALCULATE TOTAL HEAT LOSS

The form shown in Figure 2 (part of the Weil-McLain Boiler Replacement Worksheet) can be used for calculating total heat loss by following these steps.

1. Based on the type of construction, amount of insulation, etc., select the Construction Design Number from Table A below which most nearly matches each of the areas (levels) to be heated.
2. Determine the total square footage of each area to be heated from the Job Survey Form. Round to nearest hundred.
3. Based on the Construction Design Number selected and the square footage of each area, determine the heat loss (at 70° F design temp. diff.) from Table B (page 5). **NOTE:** Do not add in heat loss for

basements which are not to be heated; ignore crawl spaces which are open to basement areas.

4. If the Outdoor Design Temperature of the city is unknown, refer to back page. If the design temperature difference is other than 70° F., multiply the heat loss for each area by the appropriate correction factor from Table C (page 6). Round to nearest ten.
5. If it is a two story house, multiply the heat loss for the *first* level by the appropriate Ceiling Correction Factor from Table D (page 6). Round to nearest ten.
6. Add the adjusted heat loss for each area to determine the Total Heat Loss.

**FIGURE 2
HEAT LOSS CALCULATION FORM**

LEVEL	CONSTRUCTION NUMBER	SQ. FT.	HEAT LOSS (AT 70° F. DESIGN TEMP. DIFF.)	CORRECTION FACTOR AT ____° F.	TOTAL	CEILING CORRECTION FACTOR	ADJUSTED HEAT LOSS
FIRST LEVEL			_____ × _____ = _____		_____ × _____ = _____		
SECOND LEVEL			_____ × _____ = _____		_____ × _____ = _____		
MID-LEVEL			_____ × _____ = _____		_____ × _____ = _____		
BASEMENT			_____ × _____ = _____		_____ × _____ = _____		
FLOOR			_____ × _____ = _____		_____ × _____ = _____		
TOTAL HEAT LOSS							=====

**TABLE A
CONSTRUCTION CHARACTERISTICS**

CONSTRUCTION DESIGN NUMBER	FRAME CONSTRUCTION			CONSTRUCTION DESIGN NUMBER	BRICK CONSTRUCTION	
	WEATHERSTRIPPED GLASS	INSULATION THICKNESS			WEATHERSTRIPPED GLASS	CEILING INSULATION
		WALL	CEILING			
	Without Basement or Crawl Space				With 4" Brick & 4" Light Weight Block **	
1	Single	1"	2"	14	Single	2"
2	Double	1"	2"	15	Double	2"
3	Single	1"	3"	16	Single	3"
4	Double	1"	3"	17	Double	3"
5	Double	2"	3"		With 8" Brick**	
6	Double	3"	3"	18	Single	2"
	With Full Basement or Crawl Space			19	Double	2"
7	Double	3"	6" *	20	Single	3"
8	Double	3"	6"	21	Double	3"
9	Double	3"	9"		For Basements—Concrete or block walls 8' high, 6 1/2' below grade (stray heat from boiler & piping included). Or for unheated crawl spaces.	
10	Double	3"	12"	22†		
11	Double	6"	6"			
12	Double	6"	9"		4" Concrete Slab with 1" perimeter insulation.	
13	Double	6"	12"	23‡		

*With 2" Floor Insulation.

**Furred, lath & plaster.

†Use for basement heat losses WITHOUT fully exposed walls and for floor losses over closed unheated crawl spaces. For basements with fully exposed walls use FIRST FLOOR heat loss.

‡Use for grade level slab construction.

TABLE B
HEAT LOSS TABLE (In BTU/Hr)
 (Calculated At 70°F. Design Temperature Difference)

FLOOR AREA SQ. FT.	CONSTRUCTION DESIGN NUMBER										
	1	2	3	4	5	6	7	8	9	10	- 11
500	28,750	23,900	27,350	22,510	18,080	16,860	17,910	16,160	15,460	15,110	15,360
600	32,300	27,030	30,620	25,350	20,520	19,200	20,460	18,360	17,520	17,100	17,490
700	35,860	30,150	33,900	28,190	22,970	21,540	23,010	20,560	19,580	19,090	19,610
800	39,840	33,590	37,600	31,350	25,640	24,080	25,760	22,960	21,840	21,280	21,920
900	43,340	36,680	40,820	34,160	28,050	26,380	28,270	25,120	23,860	23,230	24,010
1000	46,890	39,800	44,090	37,000	30,500	28,720	30,820	27,320	25,920	25,220	26,140
1100	50,450	42,920	47,370	39,840	32,940	31,060	33,370	29,520	27,980	27,210	28,270
1200	54,000	46,040	50,640	42,680	35,390	33,400	35,920	31,720	30,040	29,200	30,400
1300	56,640	48,470	53,000	44,830	37,340	35,300	38,030	33,480	31,660	30,750	32,120
1400	60,200	51,590	56,280	47,670	39,790	37,640	40,580	35,680	33,720	32,740	34,240
1500	62,830	54,030	58,630	49,830	41,740	39,540	42,690	37,440	35,340	34,290	35,970
1600	65,530	56,490	61,050	52,010	43,730	41,480	44,840	39,240	37,000	35,880	37,730
1700	68,590	59,250	63,830	54,490	45,910	43,570	47,140	41,190	38,810	37,620	39,630
1800	71,720	62,040	66,680	57,000	48,130	45,710	49,490	43,190	40,670	38,410	37,950
1900	73,930	64,150	68,600	58,830	49,860	47,410	51,400	44,750	42,090	40,760	43,120
2000	77,050	66,940	71,450	61,340	52,080	49,550	53,750	46,750	43,950	42,550	45,070

TABLE B (Continued)

FLOOR AREA SQ. FT.	CONSTRUCTION DESIGN NUMBER											
	12	13	14	15	16	17	18	19	20	21	22	23
500	14,660	14,310	30,360	25,520	28,960	24,120	32,780	27,940	31,380	26,540	5,130	4,350
600	16,650	16,230	34,060	28,790	32,380	27,110	36,690	31,420	35,010	29,740	6,150	4,730
700	18,630	18,140	37,760	32,050	35,780	30,090	40,600	34,890	38,650	32,930	7,180	5,220
800	20,800	20,240	41,920	35,670	39,680	33,430	45,040	38,790	42,800	36,550	8,210	5,600
900	22,750	22,120	45,560	38,910	43,040	36,390	48,890	42,240	46,370	39,720	9,230	5,980
1000	24,740	24,040	49,260	42,170	46,460	39,370	52,810	45,720	50,010	42,920	10,250	6,370
1100	26,730	25,960	52,960	45,430	49,880	42,350	56,720	49,190	53,640	46,110	11,300	6,750
1200	28,720	27,880	56,660	48,690	53,300	45,330	60,630	52,670	57,270	49,310	12,330	7,150
1300	30,300	29,390	59,360	51,200	55,720	47,560	63,450	55,290	59,810	51,650	13,340	7,330
1400	32,280	31,300	63,060	54,460	59,140	50,540	67,360	58,760	63,440	54,840	14,370	7,720
1500	33,870	32,820	65,770	56,970	61,570	52,770	70,180	61,380	65,980	57,180	15,400	7,920
1600	35,490	34,370	68,540	59,500	64,060	55,020	73,050	64,020	68,570	59,540	16,420	8,110
1700	37,250	36,060	71,710	62,370	66,950	57,610	76,390	67,050	71,630	62,290	17,440	8,400
1800	39,060	37,800	74,950	65,270	69,910	60,230	79,780	70,110	74,740	65,070	18,480	8,690
1900	40,460	39,130	77,190	67,410	71,870	62,090	82,080	72,300	76,760	66,990	19,500	9,270
2000	42,270	40,870	80,420	70,310	74,820	64,710	85,470	75,360	79,870	69,760	20,600	9,560

NOTE: The BTU figures in this table are based upon I-B-R calculations where ceiling height is 8 ft. and where total window and door areas do not exceed 20 percent of the GROSS wall area. For 9 ft. ceiling height add 11 percent to heat loss; for 10 ft. ceiling height, add 22 percent. For lower levels ONE HALF or LESS below grade level, use FIRST FLOOR heat loss.

TABLE C
DESIGN TEMPERATURE CORRECTION FACTORS
For Other Than 70° Design Temperature Difference

DESIGN TEMP. DIFFERENCE	FACTOR	DESIGN TEMP. DIFFERENCE	FACTOR	DESIGN TEMP. DIFFERENCE	FACTOR
25°F	.35	55°F	.78	90°F	1.29
30°F	.42	60°F	.85	95°F	1.36
35°F	.50	65°F	.92	100°F	1.43
40°F	.57	75°F	1.07	105°F	1.50
45°F	.64	80°F	1.15	110°F	1.57
50°F	.71	85°F	1.20	115°F	1.64

NOTE: Conversion Factor for "In Between" temperatures can be determined by interpolation between the closest tabulated values. Example: The outdoor design temperature in Philadelphia, Pa. is 14°F. Indoor minus outdoor temperature equals 56°F. Interpolated factor equals 0.79 (Rounded).

TABLE D
CEILING CORRECTION FACTORS
For First Floor Heat Loss in Two Story Structure

CONST. NO.	FACTOR	CONST. NO.	FACTOR	CONST. NO.	FACTOR	CONST. NO.	FACTOR
1	.82	7	.88	13	.94	19	.82
2	.79	8	.86	14	.83	20	.89
3	.88	9	.91	15	.80	21	.88
4	.86	10	.94	16	.88	22	—
5	.83	11	.86	17	.87	23	—
6	.82	12	.91	18	.84		

STEP 3 SELECT THE BOILER

The size of the replacement boiler will be based on the Total Heat Loss of the building calculated in Step 2. The boiler should be selected based on its Net I-B-R Rating in BTU/Hr. For example, if the Total Heat Loss of the house is 85,000 BTU/Hr. then the Net I-B-R Rating of the replacement boiler must be at least 85,000. It can be more—but *never* less.

For convenience, Table E (opposite page) shows the Net I-B-R Water and Steam ratings for current Weil-McLain gas and oil boilers for homes and small commercial buildings.

STEP 4 DETERMINE THE BID PRICE

Figure 3 (opposite page) is a general checklist of the materials which may be required for a boiler replacement job (also part of the Weil-McLain Boiler Replacement Worksheet). This list can be used to figure the cost of all materials as well as labor, overhead and profit.

TABLE E NET I-B-R RATINGS IN BTU/Hr FOR WEIL-McLAIN BOILERS

NOTE: ALWAYS CONSULT PRODUCT LITERATURE FOR DETAILS.

GAS

TYPE GV Water Only

MODEL	WATER RATING
GV-3	53,000
GV-4	80,000
GV-5	106,000
GV-6	133,000

TYPE CGI Water Only

MODEL	WATER RATING
CGi-25	37,000
CGi-3	49,000
CGi-4	73,000
CGi-5	97,000
CGi-6	121,000
CGi-7	144,000

TYPE CG Water Only

MODEL	WATER RATING
CG-25	37,000
CG-3	50,000
CG-4	77,000
CG-5	102,000
CG-6	126,000
CG-7	151,000
CG-8	176,000

TYPE P-FG Water Only

MODEL	WATER RATING
P-FG-5	173,000
P-FG-6	215,000
P-FG-7	257,000
P-FG-8	301,000

TYPE AHE Water Only

MODEL	WATER RATING
AHE-45	33,000
AHE-60	44,000

TYPE EG Water & Steam

MODEL	WATER RATING	STEAM RATING
EG-30	53,000	46,000
EG-35	70,000	61,000
EG-40	88,000	76,000
EG-45	106,000	92,000
EG-50	123,000	107,000
EG-55	142,000	122,000
EG-65	177,000	152,000
EG-75	209,000	180,000

TYPE EGH Water & Steam

MODEL	WATER RATING	STEAM RATING
EGH-85	243,000	210,000
EGH-95	278,000	240,000
EGH-105	313,000	270,000
EGH-115	348,000	300,000
EGH-125	383,000	330,000

OIL

GOLD OIL

Water & Steam

MODEL	WGO WATER RATING	SGO STEAM RATING
GO-2	75,000	—
GO-3	100,000	85,000
GO-4	126,000	108,000
GO-5	152,000	130,000
GO-6	184,000	157,000
GO-7	210,000	180,000
GO-8	231,000	200,000
GO-9	257,000	221,000

No. 78

Water & Steam

MODEL	WATER RATING	STEAM RATING
378	242,000	209,000
478	348,000	300,000
578	453,000	391,000
678	559,000	482,000
778	664,000	573,000
878	770,000	665,000
978	876,000	755,000
1078	982,000	847,000
1178	1087,000	938,000
1278	1193,000	1039,000

TYPE CGs Water Only

MODEL	WATER RATING
CGs-3	50,000
CGs-4	74,000
CGs-5	97,000
CGs-6	122,000

NOTE: Weil-McLain commercial boilers available up to 6 million BTU/Hr.

FIGURE 3 MATERIAL LIST

QTY.	ITEM	AMOUNT	QTY.	ITEM	AMOUNT
	Boiler No.			Copper Pipe: 1/2"	
	Thermostats			3/4"	
	Zone Valves			1"	
	Balancing Valves			1 1/4"	
	Expansion Tank			1 1/2"	
	Flow Control Valve			Fittings	
	Low Limit or Reverse Acting Control				
	Pressure Reducing Valve				
	Flue Pipe				
	Extra Valves				
	Gas Piping			Electric Wiring	
	Oil Tank, Pipe and Fittings			Freight and Cartage	
	Insulated Domestic Water Storage Tank				
	Domestic Water Coil				
	Pipe			Incidentals	
	Fuel Valves				
	Circulators			TOTAL COST OF MATERIAL	
	Relay			Labor	
	Circuit Breaker (or fuse) Panel			Profit	
	240v. Disconnect Switch			Overhead	
	240v. 3-Wire Service Cable				
	SUB-TOTAL			Bid Price	

SAMPLE PROBLEM

STEP 1 COMPLETE A JOB SURVEY FORM

A properly completed Job Survey Form is shown in Figure 4. The key information:

- Two story house with unheated basement—816 sq. ft. of floor space each level.
- Construction: 4" brick and 4" light weight block, furred, lath and plaster; 3" ceiling insulation; double glass, weatherstripped.

- 80°F design temperature difference.
- Type of System: series loop.
- Type of Radiation: convector baseboard.
- Owner wants to replace his old boiler with a new high efficiency gas fired water boiler. Owner wants night set-back thermostat.

**FIGURE 4
JOB SURVEY FORM**

WEIL-McLAIN BOILER REPLACEMENT WORKSHEET JOB SURVEY FORM

CUSTOMER NAME C.L. JONES PHONE 327-9489

ADDRESS 18075 SKI RUN DRIVE, MONROE

PREPARED BY RKT DATE 2/15

PRESENT HEATING SYSTEM: SERIES LOOP

TYPE OF RADIATION: CONVECTOR BSBD.

HEATING MEDIUM: ☒ Hot Water ☐ Steam

FUEL NOW USED: ☒ Natural Gas ☐ Propane ☐ #2 Oil ☐ Electricity

FUEL TO BE USED: ☒ Natural Gas ☐ Propane ☐ #2 Oil ☐ Electricity

IS SYSTEM HEATING SATISFACTORILY? ☒ Yes ☐ No

If no, what is the problem? _____

How can it be corrected? _____

RELOCATE BOILER? ☐ Yes ☒ No. If yes, estimated time _____ Materials _____

Corrosive Atmosphere? No

PRESENT SOURCE OF DOMESTIC WATER: ☐ Tankless Heater ☐ AMTROL Type ☒ Other SEPARATE

WILL NEW BOILER HAVE A WATER HEATER? ☐ Yes ☒ No Type _____

HOUSE CONSTRUCTION:

GLASS DOUBLE GLASS, WEATHERSTRIPPED

WALLS 4" BRICK, 4" BLOCK — FURRED, LATH & PLASTER

CEILING 3" INSULATION

FLOOR WOOD OVER BSMT.

HOUSE DIMENSIONS (Use sketch for accuracy):

Basement 8 ' H L 34 ' x 24 ' W = 816 Sq. Ft.

First Floor 8 ' H L 34 ' x 24 ' W = 816 Sq. Ft.

Second Floor 8 ' H L 34 ' x 24 ' W = 816 Sq. Ft.

Mid-Level _____ ' H L _____ ' x _____ ' W = _____ Sq. Ft.

DESIGN TEMPERATURE DIFFERENCE 80 °F

NEW THERMOSTAT(S) REQUIRED ☐ Standard ☒ Clock Programmable

STEP 2 CALCULATE TOTAL HEAT LOSS

The Total Heat Loss for the example is calculated on the form shown in Figure 5 based on the following steps:

1. The construction of the house matches Construction Design Number 17 in Table A (page 4).
2. Each of the two levels is rounded to 800 sq ft (the basement is not heated)
3. From Table B (page 5) Construction No. 17 at 800 sq ft has a heat loss of 33,430 BTU/hr.
4. Table C (page 6) shows a 1.15 correction factor for 80°F Design Temperature Difference. Therefore, the heat loss for each area is 38,450 BTU/Hr (33,430 x 1.15 rounded).
5. Since it is a two story house, the first floor does not have a ceiling loss. Table D (page 6) indicates a Ceiling Correction Factor for Construction Number 17 of .87. Therefore, the total adjusted heat loss

for the first floor is 33,450 BTU/Hr. (38,450 x .87 rounded).

6. The total heat loss for the two levels is 71,900 BTU/Hr.

STEP 3 SELECT THE BOILER

The Total Heat Loss of 71,900 BTU/Hr. calculated in Step 2 is the minimum Net I-B-R Rating of the new boiler. The owner wants a high efficiency gas boiler. Therefore, from Table E (page 7) one of two models could be selected—either a GV-4 or an HE-5. The Model Number of the boiler would be recorded on the Materials List. (Figure 3, page 7). The list would then be used to calculate material cost; add labor, overhead and profit; and determine the selling price.

FIGURE 5
HEAT LOSS CALCULATION FORM

LEVEL	CONSTRUCTION NUMBER	SQ. FT.	HEAT LOSS (AT 70° F. DESIGN TEMP. DIFF.)	CORRECTION FACTOR AT 80° F.	TOTAL	CEILING CORRECTION FACTOR	ADJUSTED HEAT LOSS
FIRST LEVEL	17	800	33,430	1.15	38,450	.87	33,450
SECOND LEVEL	17	800	33,430	1.15	38,450		38,450
MID-LEVEL							
BASEMENT							
FLOOR							
TOTAL HEAT LOSS							71,900

SECTION II PROCEDURE FOR SIZING STEAM BOILERS

To properly size a replacement steam boiler, determine the total BTU capacity of the connected radiation in the building. This method is necessary so that the new boiler will produce adequate steam to fill the entire system. To make the calculations, determine the number of square feet of direct radiation in *each* radiator connected to the existing boiler. Follow these steps:

1. Identify the style of radiator.

Figure 6 shows the relative sizes of three different radiator styles. All are four tube, eight section radiators but the rating of each is different.

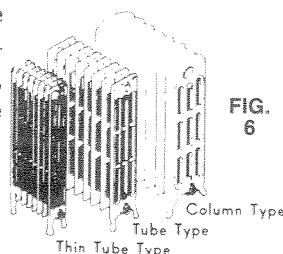


FIG. 6

2. Measure the height and width of the radiator.
3. Count the number of tubes in each section.

4. Count the number of sections.
5. Determine the square feet of radiation in each section. See Table F (page 10).
6. Multiply the square feet of radiation in each section by the number of sections.
7. Total the square feet of radiation for all the radiators in the building.
8. Convert the total square feet of radiation to BTU/hr. Each square foot of steam radiation is based on a heat emission of 240 BTU/hr. with standard 70°F air temperature and 215°F steam temperature in the radiator.
9. Size the replacement steam boiler by selecting a unit with a Net I-B-R Steam rating equal to or greater than the BTU/hr. capacity of the radiation.

EXAMPLE:

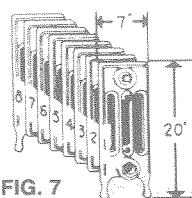


















FIG. 7

Figure 7 is a tube type radiator, 20" high by 7" wide. There are 4 tubes per section and 8 sections. Table F shows this size tube type radiator has $2\frac{1}{4}$ square feet of radiation per section. $2\frac{1}{4}$ times 8 (the number of sections) equals 18 square feet of direct radiation. 18 times 240 (BTU/hr.) equals 4320 BTU/hr. for this radiator.

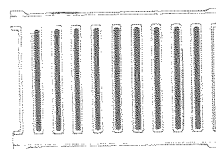
TABLE F SQUARE FEET OF RADIATION PER RADIATOR SECTION

OLD STYLE COLUMN RADIATORS						
NO. OF TUBES OR COLUMNS						
	1	2	3	4	5	6
Width	4 $\frac{1}{2}$ "	7 $\frac{3}{8}$ "	9"	11 $\frac{1}{2}$ "	12 $\frac{1}{2}$ "	12 $\frac{1}{2}$ "
Height In.						
45"	3 $\frac{1}{2}$	5	6	10	—	—
38"	3	4	5	8	10	—
32"	2 $\frac{1}{2}$	3 $\frac{1}{3}$	4 $\frac{1}{2}$	6 $\frac{1}{2}$	8 $\frac{1}{2}$	—
26"	2	2 $\frac{2}{3}$	3 $\frac{3}{4}$	5	7	7
23"	1 $\frac{2}{3}$	2 $\frac{1}{3}$	3 $\frac{1}{4}$	4 $\frac{1}{2}$	—	—
22"	1 $\frac{2}{3}$	2 $\frac{1}{4}$	3	4	6	6
20"	1 $\frac{1}{2}$	2	2 $\frac{3}{4}$	3 $\frac{1}{2}$	5	5
18"	1 $\frac{1}{3}$	1 $\frac{3}{4}$	2 $\frac{1}{4}$	3	5	4 $\frac{1}{3}$
17"	—	—	—	—	—	4
16"	—	—	—	—	4	3 $\frac{3}{4}$
15"	—	1 $\frac{1}{2}$	—	—	—	—
14"	—	—	—	—	4	3
13"	—	—	—	—	3	3

THIN TUBE RADIATORS					
NO. OF TUBES					
	2	3	4	5	6
Width	3 $\frac{1}{2}$ "	4"	4 $\frac{3}{4}$ "	6"	7 $\frac{7}{8}$ "
Height In.					
38"	2 $\frac{1}{2}$	2 $\frac{2}{3}$	—	—	—
32"	2	2 $\frac{1}{3}$	—	—	3 $\frac{2}{3}$
26"	—	—	2 $\frac{1}{3}$	3	3
25"	1 $\frac{1}{2}$	1 $\frac{2}{3}$	2	—	3
23"	—	—	—	2	—
22"	1 $\frac{1}{3}$	1 $\frac{1}{3}$	1 $\frac{4}{5}$	—	—
20"	—	—	1 $\frac{4}{5}$	—	2 $\frac{1}{3}$
19"	1	1 $\frac{1}{4}$	1 $\frac{2}{3}$	—	2 $\frac{1}{3}$
17"	—	—	—	2	—

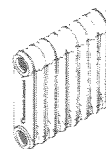
TUBE TYPE RADIATORS					
NO. OF TUBES					
	3	4	5	6	7
Width	5"	7"	8 $\frac{3}{4}$ "	9 $\frac{3}{4}$ "	12 $\frac{1}{2}$ "
Height In.					
38"	3 $\frac{1}{2}$	4 $\frac{1}{4}$	5	6	—
36"	3 $\frac{1}{2}$	4 $\frac{1}{4}$	5	6	7
32"	3	3 $\frac{1}{2}$	4 $\frac{1}{3}$	5	6
26"	2 $\frac{1}{3}$	2 $\frac{3}{4}$	3 $\frac{1}{2}$	4	5
23"	2	2 $\frac{1}{2}$	3	3 $\frac{1}{2}$	4 $\frac{1}{2}$
22"	—	—	—	—	4 $\frac{1}{2}$
20"	1 $\frac{3}{4}$	2 $\frac{1}{4}$	2 $\frac{2}{3}$	3	3 $\frac{2}{3}$
18"	—	—	—	—	3 $\frac{1}{2}$
17"	—	—	—	—	3
16"	—	—	—	—	3
14"	—	—	—	—	2 $\frac{1}{2}$

WALL TYPE RADIATORS



Size	Sq. Ft. Per Radiator
13 $\frac{1}{2}$ " x 17" x 3"	5
13 $\frac{1}{2}$ " x 21" x 3"	6
13 $\frac{1}{2}$ " x 22" x 3"	7
13 $\frac{1}{2}$ " x 29" x 3"	9

SECTIONAL WALL TYPE RADIATORS



Height	37"	26 $\frac{1}{2}$ "	21 $\frac{1}{2}$ "	15"	13 $\frac{7}{8}$ "
Sq. Ft. Radiation Per Section	2 $\frac{1}{2}$	1 $\frac{4}{5}$	1 $\frac{1}{2}$	1	$\frac{3}{4}$

CAST IRON BASEBOARD

Height	Sq. Ft. Radiation
7"	2.40
9"	3.35

APPENDIX

Other Considerations In Boiler Replacement

1. INSTALLATION INSTRUCTIONS

In order for the warranty on a new boiler to be honored, the boiler must be installed in strict accordance with the manufacturer's installation instructions. It is imperative that the heating contractor follow the instructions furnished with the equipment. If questions arise, he should contact his distributor.

2. GRAVITY SYSTEMS

Adding a circulator to a gravity system may improve circulation in areas that had poor circulation; however the circulator will not increase the amount of heat available per unit of time. The circulator should be operated with a reverse acting control to turn it ON when system water temperature reaches 110–120°F.; OFF at about 90–100°F.

3. STEAM HEATING SYSTEMS

Be sure to check the following: (a) total square feet of installed radiation, (b) modifications to the system from its original condition, (c) physical condition of the system, (d) condensate return time (slow?), (e) if the low water cutoff is activated frequently, (f) if there is a pump control to operate the condensate pump, (g) the possibility of buried (leaking) piping. Also, check the boiler water for contaminants by boiling two water samples in separate pans—one sample of tap water and one of boiler water. If the boiler water foams over like boiled milk, the water is contaminated and should be treated accordingly.

4. CLEANING STEAM BOILERS

The proper cleaning of new steam boilers is perhaps the most neglected step in steam boiler replacement. It is also a factor many installers overlook when estimating the cost of the job. After installation, a steam boiler

should be cleaned and flushed. Chemical additives for cleaning or water treatment must be carefully considered. When in doubt consult a reputable water treatment firm or Weil-McLain since most chemical generally cause more problems than they solve and can void the warranty. Never use petroleum products. In addition, a thorough check of the valves, vents and traps should be made to be sure they are in good working order and are of the type and size needed for the application.

5. CLEANING HOT WATER SYSTEMS

Old hot water systems may have mud, sludge or other accumulation which could affect the operation of a new boiler. If there is any evidence of deposits in the old boiler when it is removed, the piping and radiation should be flushed with cold water before the material hardens.

6. EXPANSION TANKS

New water boilers must be installed with a properly sized expansion tank in order to avoid the loss of system water during each warm-up cycle and the replacement of the lost water with fresh makeup water with the pressure reducing valve. The frequent addition of makeup water to a heating system can cause severe damage and must be prevented.

7. THERMOSTATS

Modern controls on a new boiler will usually require a different heat anticipator setting for the thermostat. Many older thermostats either have fixed-heat anticipators—or none at all. For proper boiler operation and owner satisfaction, the thermostat heat anticipator must be set properly. Follow instructions.

OUTDOOR DESIGN TEMPERATURES FOR SELECTED CITIES

ALABAMA		KANSAS		NORTH CAROLINA		WASHINGTON	
Anniston	22	Dodge City	5	Asheville	14	Seattle	26
Birmingham	21	Topeka	4	Charlotte	22	Spokane	2
Mobile	29	Wichita	7	Greensboro	18	Yakima	5
Montgomery	25	KENTUCKY		Raleigh	20	WEST VIRGINIA	
ALASKA		Louisville	10	Wilmington	26	Elkins	6
Anchorage	-18	LOUISIANA		NORTH DAKOTA		Parkersburg	11
Fairbanks	-47	New Orleans	33	Bismarck	-19	WISCONSIN	
Juneau	1	Shreveport	25	Fargo	-18	Green Bay	9
Nome	-27	MAINE		OHIO		LaCrosse	9
ARIZONA		Augusta	-3	Akron	6	Madison	7
Flagstaff	4	Bangor	6	Cincinnati	6	Milwaukee	4
Phoenix	34	Caribou	-13	Cleveland	5	WYOMING	
Tucson	32	Portland	1	Columbus	5	Cheyenne	1
Winslow	10	MARYLAND		Dayton	4	Lander	-11
Yuma	39	Baltimore	13	Sandusky	4	Sheridan	8
ARKANSAS		MASSACHUSETTS		Toledo	1		
Fort Smith	17	Boston	9	OKLAHOMA			
Little Rock	20	Nantucket	0	Oklahoma City	13		
CALIFORNIA		Springfield	0	Tulsa	13	CANADA	
Bakersfield	32	Worcester	4	OREGON		ALBERTA	
Eureka	33	MICHIGAN		Baker	6	Calgary	-23
Fresno	30	Battle Creek	5	Eugene	22	Edmonton	-25
Los Angeles	43	Detroit	6	Medford	23	Grand Prairie	-37
Oakland	36	Flint	1	Portland	23	McMurray	-39
Sacramento	32	Grand Rapids	5	Salem	23	BRITISH COLUMBIA	
San Diego	44	Lansing	1	PENNSYLVANIA		Kamloops	-10
San Francisco	38	Sault St. Marie	-8	Erie	9	Prince George	-31
San Jose	36	MINNESOTA		Harrisburg	11	Vancouver	19
COLORADO		Duluth	-16	Philadelphia	14	Victoria	23
Denver	1	Minneapolis	-12	Pittsburgh	5	MANITOBA	
Grand Junction	7	St. Paul	-12	Scranton	5	Churchill	-39
Pueblo	0	MISSISSIPPI		RHODE ISLAND		Dauphin	-26
CONNECTICUT		Meridian	23	Providence	9	Winnipeg	-27
Hartford	7	Vicksburg	26	SOUTH CAROLINA		NEW BRUNSWICK	
New Haven	7	MISSOURI		Charleston	27	Edmunston	-16
DELAWARE		Columbia	4	Columbia	24	Fredericton	-11
Dover	15	Kansas City	6	Greenville	22	Moncton	7
Wilmington	14	St. Louis	6	SOUTH DAKOTA		St. John	8
DISTRICT OF COLUMBIA		MONTANA		Huron	-14	NEW FOUNDLAND	
Washington	14	Billings	-10	Pierre	-10	Gander	1
FLORIDA		Butte	-17	Rapid City	7	Goose Bay	-25
Jacksonville	32	Helena	-16	TENNESSEE		St. Johns	7
Miami	47	Kalispell	7	Chattanooga	18	NOVA SCOTIA	
Pensacola	29	Miles City	-15	Knoxville	19	Halifax	5
Tampa	40	NEBRASKA		Memphis	18	Yarmouth	9
GEORGIA		Lincoln	2	Nashville	14	ONTARIO	
Atlanta	22	North Platte	4	TEXAS		Hamilton	1
Augusta	23	Omaha	3	Abilene	20	Kenora	-28
Macon	25	NEVADA		Amarillo	11	London	0
Savannah	27	Las Vegas	28	Austin	33	Ottawa	-13
IDAHO		Reno	10	Brownsville	39	Sault Ste Marie	-15
Boise	10	Winnemucca	3	Corpus Christi	35	Timmins	-28
Coeur D'Alene	-1	NEW HAMPSHIRE		Dallas	22	Toronto	1
Lewiston	6	Concord	3	Del Rio	31	PRINCE EDWARD ISLAND	
Pocatello	-1	Manchester	3	El Paso	24	Charlottetown	4
ILLINOIS		NEW JERSEY		Ft. Worth	22	QUEBEC	
Chicago	0	Atlantic City	13	Galveston	36	Montreal	-10
Moline	-4	Newark	14	Houston	32	Quebec	-12
Peoria	-4	Trenton	14	Port Arthur	31	Sept Isles	-22
Springfield	2	NEW MEXICO		San Antonio	30	Vald'Or	-27
Urbana	2	Albuquerque	16	UTAH		SASKATCHEWAN	
INDIANA		Roswell	18	Salt Lake City	8	Prince Albert	-35
Fort Wayne	1	NEW YORK		Vernal	0	Regina	-29
Indianapolis	2	Albany	-1	VERMONT		Saskatoon	-31
IOWA		Binghamton	1	Burlington	-7	YUKON	
Davenport	-5	Buffalo	6	VIRGINIA		Whitehorse	-43
Des Moines	-5	Massena	-8	Lynchburg	16		
Dubuque	-7	New York	15	Norfolk	22		
Mason City	-11	Rochester	5	Richmond	17		
Sioux City	-7	Syracuse	2	Roanoke	16		

NOTE: These values are the 97½% figures recommended in energy conservation standards, like ASHRAE 90A-1980. Adjustments may be made to reflect local climates which differ from the tabulated temperatures, or local weather experience.



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