

TESTING AND RATING STANDARD

for

BASEBOARD RADIATION



Eighth Edition
July 2005

The Hydronics Institute Division of GAMA



HYDRONICS INSTITUTE DIVISION OF GAMA

TESTING AND RATING STANDARD

for

BASEBOARD RADIATION

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SECTION 1: BASIC PROGRAM OUTLINE

1.1 Equipment Covered

1.1.1 Residential Baseboard Radiation. Steam or water heated room heaters designed for installation along the bottom walls of rooms, replacing the conventional decorative baseboard, that have a substantial portion of their frontal face surface directly exposed to the room and operate via recirculated room air.

1.2 Basis of Participation

Participation in this voluntary Program consists of the following:

1.2.1 Certification Application. Examination and evaluation of a certification application for every model submitted (see 2.2.2).

1.2.2 Continuing Test Program. Participation by the manufacturer in the periodic check test Program at the Program's designated test facility, the I=B=R Laboratory (see 3.4).

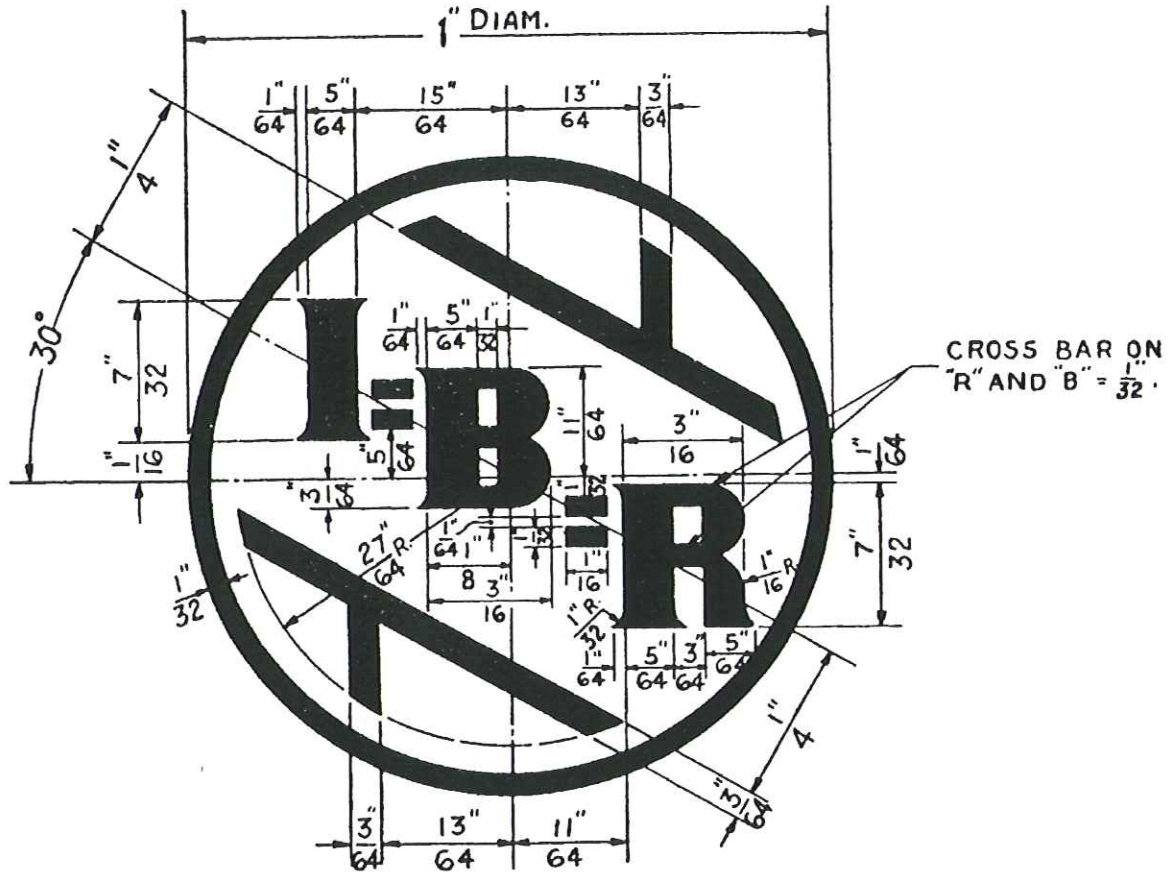
1.2.3 Challenge Test. Participation by the manufacturer in the challenge test procedure (see 3.5).

1.3 Evidence of Participation

1.3.1 By GAMA. GAMA will periodically publish a Directory, at intervals established by the Baseboard Rating Committee, listing all Participants and their models eligible under this Program (see 2.2.6).

1.3.2 By Participants. The manufacturer may indicate participation in the Program by affixing the appropriate I=B=R Certification Symbol (Seal) on all certified units included in the Program and by displaying the Seal on specification sheets, advertising, and in other literature carrying ratings, or claiming participation in the Program. The Seal may be affixed to units only at the time and place of manufacture, may not be sold, lent, or transferred in any manner other than affixing them to the Participant's certified units.

I=B=R TRADEMARK



Reg. U.S. Pat. Off.*

* Symbol © may be used in place of "Reg. U.S. Pat. Off."

FIGURE 12

NOTE: Above Dimensions are based on a Trademark of 1" diameter. If a larger or smaller design is required all dimensions must be changed proportionately.

1.4 Date of Effect of Program

For any Participant entering the Program after its initiation, the "date of effect" or "date of entry" is the date of signing the License Agreement of GAMA. Following acceptance of a certification application by the procedure outlined herein, the participating manufacturer can immediately begin to use the Certification Symbol (see 2.3).

SECTION 2: OPERATION OF PROGRAM

2.1 Cost of Program

2.1.1 General. In order to cover the costs of administration and operation of the periodic check test program, a per sample testing charge is assessed. The fees are published in the Program's Fee Schedule, available from GAMA on request, and are subject to review by the membership of GAMA's Hydronics Institute Division.

2.1.2 Changes in Fees. Any proposed increase in fees will be made known to all Participants at least thirty (30) days in advance of being finalized. Any final increase in fees will become effective no sooner than sixty (60) days after official notification of such final change.

2.1.2.1 Test Units and Shipping Costs. Participants shall provide units selected for testing at no charge. All costs of selecting and shipping samples to the I=B=R Laboratory are borne by the Program. All costs for testing and returning samples back to the Participant, if requested, will be borne by the Participant. Costs of challenge testing under Section 3.5 must be paid by the challenger requesting the testing before it may commence. Final allocation of challenge testing costs is governed by section 3.5.

2.1.2.2 Directory Costs. Electronic copies of the I=B=R Directory will be provided free of charge on the Program Administrator's website. Printed I=B=R Directories will be published annually in January and made available to the general public for purchase.

2.1.3 Specific Cases.

2.1.3.1 Manufacturers Entering the Program for the First Time. A manufacturer entering the Program for the first time shall submit Form 250 covering each model being submitted into the Program prior to being eligible to have the manufacturer name and models listed in the I=B=R Directory.

2.1.3.2 Private Brand Manufacturers Entering the Program for the First Time. A private brand labeler entering the Program for the first time, who purchases models certified under the Program by the original equipment manufacturers in the Program, shall file, or have the manufacturer file on behalf of the private brand, Form 240 and Form 241 to cover all models being submitted into the Program.

2.1.3.2.1 Extension Fees. Upon submittal of certification applications covering the submitted models being sold by the private brand

manufacturer, GAMA shall invoice the manufacturer a Private Brand Rating Extension Fee according to the Fee Schedule (see 2.1.1).

2.1.3.3 Private Brand Manufacturers Purchasing Previously Uncertified Models.

A private brand manufacturer who wishes to include models in the Program, but who purchases uncertified units from an original equipment manufacturer, shall certify such models under the procedure established under 2.1.3.2 and meet all other requirements of Program participation including filing certification applications and affidavits.

2.2 Procedure for Certification

2.2.1 Determination of I=B=R Ratings. Baseboard Ratings shall not be referred to as I=B=R Ratings or as having been tested in conformance with the procedure outlined in this Standard unless they have been approved in the manner prescribed in this Standard.

2.2.1.1 Steam. I=B=R Steam Ratings are determined from test data obtained in accordance with the procedure outlined in APPENDIX A and may include an addition to the capacity at standard test conditions of not more than fifteen percent (15%).

2.2.1.2 Water. I=B=R Water Ratings are determined from test data obtained in accordance with the procedure outlined in APPENDIX B. These ratings may include an addition to the water heat capacity of not more than fifteen percent (15%). I=B=R Water Ratings must be determined at a standard water flow rate of five hundred pounds per hour (500 lb/hr) for each average water temperature which the manufacturer desires to publish.

I=B=R Water Ratings may also be determined for an additional water flow rate of 2000 lb/hr for each average water temperature which the manufacturer desires to publish. These additional ratings shall be determined by multiplying the rating at the standard water flow rate (500 lb/hr) by the factor 1.057.

2.2.1.2.1 Additional Flow Rates. Ratings at rates of water flow other than standard conditions of 500 lb/hr and/or 2000 lb/hr shall be determined by applying the correction factors shown in Table D (APPENDIX B) directly to the rating at standard conditions (500 lb/hr).

2.2.1.2.2 Additional Pressures. A manufacturer may publish factors taken from Table C (APPENDIX B).

2.2.1.2.3 Additional Temperatures. I=B=R Water Ratings may also be determined for average water temperatures of 90°F to 140°F by applying the factors from Table E to the 150°F Rating.

TABLE E
BASEBOARD PERFORMANCE AT LOW WATER TEMPERATURES

65 °F Air Temperature		
Average Water Temperature, °F	Factor	
	Copper-Aluminum	Cast-Iron
150	1.00	1.00
140	0.84	0.82
130	0.69	0.68
120	0.55	0.54
110	0.41	0.42
100	0.28	0.32
90	0.17	0.22

2.2.2 Certification Forms. The Program Administrator will provide each original equipment manufacturer with application forms for certification of models (see Forms section in this Standard).

2.2.2.1 Originator of Submittal. Original Equipment Manufacturers submit all data forms.

2.2.2.2 Use of Data. All data submitted to the Program Administrator and developed by the Program Administrator, shall be held confidential, except such information that is published in the I=B=R Directory (see 2.2.6) or otherwise authorized for release by GAMA. Such data includes:

- Communication with Participant with regard to the test results on Participant's own units
- Communication with challenging Participant with regard to the Program Administrator's test results and findings of the challenged unit
- Communication with Licensor with regard to test results and findings which Licensor deems necessary for the proper operation of the Program

2.2.3 Reporting of Models. In reporting models for certification, and for publication in the I=B=R Directory, certified ratings shall be given for all models of a manufacturer's or private brand manufacturer's equipment submitted into the Program (see 1.1).

2.2.4 Responsibility. All ratings, submitted for publication by Participants on models manufactured for them, or models they manufacture under their own brand name or for the private labelers, shall in each case be submitted with a properly executed certification affidavit by the designated representative who has been authorized to undertake this responsibility by filing with GAMA of Form DR. The form for designating the representative to the Program (Form DR) must be filed with GAMA, will be maintained by GAMA and will be used by GAMA and the I=B=R Laboratory for notices, official communications, and a listing of who is authorized to submit new applications.

2.2.5 Acceptance of Certification Data. When the information contained in the certification application has been reviewed and approved, it will appear in the next issued I=B=R Directory, both printed and electronic versions, per the publication date specified by the Participant in their application.

2.2.6 Publication of Certified Ratings and Other Information. The following information pertaining to each model certified, shall be published in the Directory:

- Name of Manufacturer
- Address of the Manufacturer
- Trade or Brand Name of Model
- Model Number(s) or Designation(s)
- Fin Size
- Fin Thickness
- Fin Material
- Fin Spacing
- Tube Size
- Tube Material
- Height of Assembly

2.3 Minimum Data Required in Literature Listing I=B=R Ratings


The following Minimum Data must be published in all literature in which I=B=R Ratings are shown or which contain statements or representations, expressed or implied, to the effect that ratings have been determined as prescribed in this Standard (including, without limitation, any catalogs, installation instructions, bulletins, circulars, advertisements, price sheets or other items that contain I=B=R Ratings or such statements or representations). However, literature may contain statements or representations that ratings have been determined as prescribed in this Standard or indicate that baseboard radiation has an I=B=R Rating without including the Minimum Data listed below if such literature does not contain the actual ratings and makes a specific reference to and positive identification of other literature that is customarily distributed with and usually accompanies the literature in question and contains all the required Minimum Data, including the actual approved ratings.

2.3.1 General

- Name and designation

- I=B=R Seal with notation, "Reg. U.S. Pat. Off." or ® (see Figure 12). If literature, electronic or printed, mixes I=B=R Ratings with non-I=B=R ratings, then the I=B=R models, ratings, and Seal must be formatted as follows:
 - each unit and associated ratings in bold italic type
 - each I=B=R Rated unit line accompanied by arrows (▶ , ◀) to the left and right sides of the line. These must also be placed at the bottom of the of the page surrounding the statement "Bold, italicized units are I=B=R rated" and be accompanied by the Seal. See Example 1 below.

DiPaolo Series Baseboard Ratings												
Model	WATER RATE, GPM	Copper Tube Size	Pressure Drop per Foot, millinches	Average Temperature, °F, Forced Hot Water - Btuh/ft of active finned length								
				140	150	160	170	180	190	200	210	215
AD1	<i>1</i>	<i>1/2"</i>	<i>51</i>	<i>340</i>	<i>410</i>	<i>470</i>	<i>520</i>	<i>600</i>	<i>670</i>	<i>730</i>	<i>790</i>	<i>830</i>
	<i>4</i>	<i>1/2"</i>	<i>533</i>	<i>360</i>	<i>440</i>	<i>500</i>	<i>570</i>	<i>630</i>	<i>710</i>	<i>80</i>	<i>840</i>	<i>890</i>
AD2	1	3/4"	271	340	400	480	550	600	680	740	840	860
	4	3/4"	2794	360	430	510	580	650	720	790	910	930

▶ Bold, Italicized units are  rated. ◀

EXAMPLE 1

- Fifteen percent (15%) added to capacity in determining the ratings
- A statement that ratings are based on active length
- The difference between active length and total length, expressed in inches
- A cross sectional drawing indicating essential dimensions, including the height and depth of enclosure, size of inlet and outlet openings, and the location of the element with respect to the enclosure.
- If a finned tube element is used, a statement of the fin size, nominal spacing (fins per foot), and surface finish
- If an optional damper is listed as being available for installation in the baseboard unit, a statement shall be included concerning the rating of the unit with the damper installed in an "open" position, as follows:
 - If the percentage change in rating has been determined by test at the I=B=R Laboratory, and approved by the Program, the statement shall list the percentage increase or reduction in rating, or state that there is no change in the rating, if such be the case
 - If no approval has been issued by the Program, the statement shall clearly indicate that the I=B=R Rating does not apply when the optional damper is installed.

2.3.2 Steam

- I=B=R Rating in Btuh per linear foot of active length

2.3.3 Water

2.3.3.1 At standard flow rate of 500 lb/hr

- I=B=R Rating in Btuh per linear foot of active length for each average water temperature for which I=B=R Ratings have been approved.
- Water flow rate (500 lb/hr) upon which the rating is based, expressed in pounds per hour or gallons per minute
- Pressure drop for catalogued lengths at water flow rate of 500 lb/hr

2.3.3.2 At additional flow rate of 2000 lb/hr (if approved)

- I=B=R Rating in Btuh per linear foot of active length for each average water temperature for which these ratings have been approved at the one additional water flow rate. These ratings shall not be given greater prominence in literature than the ratings at the standard flow rate of 500 lb/hr.
- The water flow rate (2000 lb/hr) upon which the rating is based, expressed in pounds per hour or gallons per minute.
- Pressure drop for catalogued lengths at water flow of 2000 lb/hr.
- A statement that the use of I=B=R Ratings at this water flow rate (2000 lb/hr) is limited to installations where the flow rate through the baseboard unit is equal to or greater than the water flow rate (2000 lb/hr).
- A statement that where the water flow rate through the baseboard unit is not known, the I=B=R Rating at the standard water flow rate of 500 lb/hr must be used.

2.3.3.3 Table of Factors (optional). Manufacturers who publish a Table of Factors shall show the following information in their literature:

- Table of Factors taken from Table D.
- Accompanying statement reading: "If the calculated water flow rate through baseboard unit in a completely designed hot water heating system is greater than the standard flow rate (500 lb/hr), the rating of that unit may be increased by multiplying the standard I=B=R Rating at 500 lb/hr by the factor shown for the calculated flow rate".

- Pressure drop values at each flow rate for which a factor is shown as follows:
 - Finned-tube type pressure drop per foot of length, taken from Table D (when applicable).
 - For all units not consisting of a single, unobstructed standard size commercial pipe or tube – the formula for determining the pressure drop of any assembled length, taken from Figure 11B determined for the unit and an accompanying statement reading:

“The pressure drop must be separately calculated for each individual baseboard assembly. Do not add lengths of several units and divide by the total length before applying the factor”.

2.4 Appeals and Dispute Resolution

- 2.4.1 Review Committee. A review committee shall consist of the designated representatives from each of the manufacturers participating in the Program. Any general question regarding the testing conducted by the Laboratory or the proper implementation of the Program's procedures, as described herein, shall be referred to the Program's Review Committee. The Review Committee shall consider any such questions within fifteen (15) business days of receipt. As a result of that consideration, the Review Committee shall either render a decision or schedule a meeting or teleconference with the party that submitted the question.
- 2.4.2 Baseboard Rating Committee. Any issue which cannot be resolved by the Review Committee shall be referred to a three-member impartial panel appointed by the President of GAMA. The President of GAMA shall appoint the panel within fifteen (15) days after receiving notice of the dispute from the Review Committee. The panel shall give adequate notice and promptly hold a hearing affording all parties an opportunity to be heard. The panel shall render a decision within thirty (30) days of the hearing.

SECTION 3: TESTING REQUIREMENTS

- 3.1 General. The Program requires that all certification applications be based on tests.
- 3.1.1 Types of Tests. Within the Program, tests may be conducted under the following procedures:
- Initial Rating Test
 - Periodic Check Test
 - Challenge Test
- 3.1.2 Number of Units to be Tested. The total number of baseboard radiation units to be tested per year under the periodic check test program shall be equivalent to the total amount of OEM manufactured baseboard units submitted into the Program. These units will be obtained by the Program Administrator, on a random basis, from manufacturer stock.

3.1.3 Report on Results of Tests. Upon completion of the tests on each unit, the Program Administrator will send notification to the manufacturer. When a unit confirms its ratings, a letter stating the unit has passed its verification test along with a completed test report will be sent to the manufacturer. Should a unit fail to confirm its ratings, the Program Administrator will render the complete report to the manufacturer within thirty (30) business days.

3.2 Procedure for Obtaining Approval of I=B=R Baseboard Ratings. The Program requires that ratings tests be conducted for the manufacturer by the I=B=R Laboratory on all units to be rated. All tests shall be conducted in accordance with the provisions of the Standard as amended and in effect at the time of such testing.

3.2.1 Data Required for I=B=R Baseboard Ratings. Three complete sets of the following data, covering each type and height of baseboard to be tested, shall be submitted to the Program Administrator:

- 1) Request for Rating Test (Form 250) and attachments
- 2) Dimensional Data (Form 210/211) for each type or height of baseboard to be tested
- 3) For each type, a completely dimensioned, cross-sectional drawing, at least half scale, of the heating element in its enclosure, including the method of support or hanging of the element in its enclosure.
- 4) A drawing showing complete details of:
 - a) Fin Size
 - b) Fin Thickness
 - c) Fin Spacing
 - d) Fin Material
 - e) Tube Size
 - f) Tube Thickness
 - g) Tube Material
 - h) Method of Bond (finned tube units only)
 - i) External Finish of the Element (i.e. painted or unpainted; if painted, color of paint; if unpainted, description of external finish)
- 5) Installation instructions

3.2.2 Submittal and Testing of Units.

- Upon receipt by the Program Administrator of all the required data (see 3.2.1), the Program Administrator will notify the manufacturer that samples of the unit will be picked up by their designee and deposited at the I=B=R Laboratory. An invoice will then be sent to the applicant for the amount of the testing fee.

- The applicant will send to the Program Administrator the payment of the testing fee and advise of the date shipped and the carrier or method of shipment.
- If the finned tube type baseboard does not provide a means for positioning the heating element in the enclosure within $\pm 1/16$ " of the distance from the back panel to the front of the fins specified on Form 210, the test at the I=B=R Laboratory shall be conducted with the element in the location producing the lowest output.
- In the event that the unit received by the I=B=R Laboratory has dimensions which vary from those specified on Form 210 or 211 and the detailed dimensional drawing, subject to the tolerances indicated below, the applicant will be advised of such variations before tests are conducted. They will be given the option of submitting a new unit or advising the Program Administrator in writing that the I=B=R Laboratory measured dimensions are acceptable to them; in which case they will submit a revised Form 210/211 and a revised detailed dimensional drawing, in triplicate, which conform to the dimensions as determined by the I=B=R Laboratory.

In addition to the rating test, the applicant may request that tests be conducted in the I=B=R Laboratory on variations of a unit to verify that the unit can produce its output with specific dimensional variation exceeding the tolerances indicated below. The Program Administrator shall determine what tests shall be conducted.

- Finned tube type units
 - ◆ Fin size: $\pm 1/32$ "
 - ◆ Fin thickness: latest ASTM specification for material used
 - ◆ Fin spacing: between +1.5% and -2.5% of catalogued number of fins
 - ◆ All dimensions required in 3.2.1, item 3: $\pm 1/16$ "
- All other types of units
 - ◆ All dimensions: $\pm 1/16$ "
- Upon completion of all compliance procedures and confirmation of the model's ratings, one of the following methods of disposition, or any combination thereof, is to be employed with respect to those units that have been tested by the I=B=R Laboratory. Such units shall be:
 - Returned to the Licensee
 - Turned over to the Licensee's Carrier
 - Donated to learning institutions as designated by the Licensee
 - Otherwise disposed of in such manner as the I=B=R Laboratory and Licensee may agree to.

3.2.3 Reports from the I=B=R Laboratory. Results of tests in the I=B=R Laboratory, including Log Sheets (Form 200 for steam, Form 201 or 202 for water), Test Report Sheets (Form 220 for steam, Form 221 or 222 for water) and I=B=R

Laboratory Report (Form 260) will be sent to the applicant, accompanied by blank copies of Request for Approval of I=B=R Baseboard Ratings (Manufacturer) (Form 230). In no case may the applicant distribute, or otherwise publicize, reproductions of Forms 200, 201, 202, 220, 221, or 260.

3.2.4 Approval of I=B=R Baseboard Ratings.

- The applicant, within thirty (30) days after the I=B=R Laboratory Report (Form 260) has been mailed to them, may submit a signed copy of Request for Approval of I=B=R Baseboard Ratings (Manufacturer) Form 230. In no case, shall the requested ratings be approved if the ratings at 500 lb/hr as requested by the applicant exceed the ratings listed on the I=B=R Laboratory Report (Form 260) as issued by the I=B=R Laboratory.

The applicant may request a second test on the same unit or a new unit of the same dimensions. The provisions of sections 3.2.2 and 3.2.3 shall be applicable as regards such additional testing, except that the applicant shall not be entitled to request any further testing.

- If the ratings requested conform with all the limitations prescribed in this Standard, the Program Administrator shall give formal notification of approval of the requested ratings to the applicant. If the applicant already has a License for Baseboard Radiation, such notice will constitute authorization for the use of the requested I=B=R Ratings and Catalog Data. If they do not have a License, such authorization will be effective only upon the execution by GAMA and the applicant of such a License. Three (3) copies of the Participant's literature showing approved I=B=R Ratings and the Catalog Data prescribed in section 2.3 and of the Participants published installation instructions, must be filed with the Program Administrator as soon as possible after approval of the ratings. Three (3) copies of all future editions of such literature and instructions must be filed with the Program Administrator from time to time as soon as possible after issuance.
- In the event that the requested ratings are not approved, the Program Administrator will so inform the applicant.

3.2.5 Fees for Testing. The Program Administrator shall determine the fees for testing to be paid by participants, which may be different for members and non-members of GAMA, on the basis of operation of the Program. The fees may be revised at any time at the discretion of the Program Administrator. In the event that the fees are so revised, the revised rates shall not be applicable to the testing of any unit for which a Request for Rating Test (Form 250) was received prior to such action by the Program Administrator.

3.2.6 Publication of I=B=R Baseboard Ratings.

3.2.6.1 Use of I=B=R Seal. The manner in which approved I=B=R Ratings and the I=B=R Seal may be used is governed by the provisions of the License and section 2.3 of this Standard. A manufacturer who has received approval of ratings must include in their literature all of the data prescribed in section 2.3 of this Standard.

3.2.6.2 I=B=R Ratings. Each Participant, by accepting a License, agrees whenever, under any section of this Standard, any I=B=R Rating is granted, changed or withdrawn, or a rated product is changed or deemed changed so that a previously issued rating is no longer applicable thereto:

- Such Participant shall give written notice of the revised claims to all distributors or others under their control in the line of distribution, including private brand owners who are responsible for sales to dealers or other retail outlets. Copies of all such notices, reasonable action to notify brand dealers, and revised literature must be supplied to GAMA as soon as available. Failure to comply results in termination from the Program.
- The Program Administrator is authorized at any time in its discretion to give notice of such event to the public, trade, members of GAMA and Participants
- The Program Administrator shall have no responsibility for any errors in giving such notice made in good faith.

3.2.7 Data to be Kept Confidential. All data and information furnished to the Review Committee, Rating Committee, Program Administrator, or the I=B=R Laboratory, and all test data developed at the I=B=R Laboratory, pursuant to the provisions of any section of this Standard shall be considered confidential and shall not be disclosed to any person or persons except as otherwise provided in this Standard, and except that after a rating has been confirmed or approved for any product of the Participant, any Participant under this Standard may examine all such test and other data and information relating to such product in order to substantiate the basis upon which ratings have been approved. Such examination shall be conducted at such times as the Program Administrator may determine.

3.3 Procedure for Periodic Check Testing of Existing Product Ratings. The Program requires that periodic check tests be conducted by the I=B=R Laboratory on selected units of all Licensees' submitted products. All tests shall be conducted in accordance with the provisions of the Standard as amended and in effect at the time of such testing. Periodic check testing shall take place at such times and in such manner, not inconsistent with any specific provisions hereof, as determined by the Baseboard Rating Committee under the guidance of the Baseboard Review Committee.

3.3.1 Submittal and Testing of Units.

- The Program Administrator shall determine what unit(s) produced by existing Participants shall be tested at the I=B=R Laboratory and what tests shall be conducted. Units to be tested shall include at least one unit of each type, as determined by the Program Administrator, for which ratings have been approved. The Program Administrator shall advise the Participant of this determination and the amount of the fee for testing.

- The Participant will be required to provide any current production unit(s) which the Program Administrator designates and provide access to its premises for that purpose. The Program Administrator will select the unit(s) from the manufacturer's stock and will arrange for transportation to the I=B=R Laboratory.
- The Participant shall pay the costs involved in shipping the unit to the I=B=R Laboratory, and from the I=B=R Laboratory to any point designated by the Participant when testing has been completed.
- The participant shall send the following information to the I=B=R Laboratory along with the selected units:
 - Description of units shipped to the I=B=R Laboratory
 - Complete dimensioned scale drawings of units as installed
 - A certification that said unit(s) are current production units
 - Detailed installation instructions which must be the same as installation instructions that the manufacturer includes in their literature.
- If installation instructions for the finned tube type baseboard do not provide a means for positioning the heating element in the enclosure within $\pm 1/16$ " of the distance from the back panel to the front of the fins specified on Form 210, the test at the I=B=R Laboratory shall be conducted with the element in the location producing the lowest output.

3.3.2 Reports from the I=B=R Laboratory. Results of tests in the I=B=R Laboratory, including Log Sheets (Form 200 for steam, Form 201 or 202 for water), Test Report Sheets (Form 220 for steam, Form 221 or 222 for water) and I=B=R Laboratory Report (Form 260) will be sent to the Participant along with any other correspondence required as per section 3.3.3 when a unit fails to meet its ratings under check testing.

3.3.3 Verification Procedure. Upon completion of the test, the Program Administrator will compare results to the data on which the existing I=B=R Ratings are based.

3.3.3.1 Confirmed Ratings.

When the Program Administrator confirms existing I=B=R Ratings, they shall furnish the Participant formal notification to that effect via letter along with a completed test report, as per section 3.1.3.

In the event that the existing ratings are based on a capacity (at standard test conditions) more than three percent (3%) less than the capacity (at standard test conditions) as determined by the I=B=R Laboratory, the manufacturer within thirty (30) days after the Program Administrator has mailed such notice may submit a request for approval of increased ratings based on the test data developed at the I=B=R Laboratory.

3.3.3.2 Unconfirmed Ratings.

In the event that the existing ratings are based on a capacity (at standard test conditions) more than five percent (5%) in excess of the capacity (at standard test conditions) as determined by the I=B=R Laboratory, or if, for any other reason, the existing ratings are not confirmed by the I=B=R Laboratory, the Program Administrator will so inform the Participant and send them a copy of the I=B=R Laboratory log sheets and test report sheets as per section 3.3.2.

The Participant, within sixty (60) days after the Program Administrator has sent such notice, may discontinue the model, submit a request for approval to re-rate the model based on the test data as developed at the I=B=R Laboratory or request a second test on the same unit or new unit obtained in the same manner as the first unit and within 180 days of receiving such a request from the Participant. All costs incident to the selection and shipment of a second unit due to failure shall be borne by the Participant and invoiced with the testing fee. Failure to obtain the unit within 180 days of notification results in automatic re-rate to the I=B=R Laboratory's measured test results.

In the event that the Participant requests additional testing, they may in their discretion send a representative to inspect the installation and to witness the test. The provisions of sections 3.3.1 through 3.3.3 shall be applicable as regards such additional testing, except that the Participant shall not be entitled to request any further testing.

3.3.3.2.1 Failure. The Participant receiving such a notice indicating that any or all of their ratings have not been confirmed shall cease using such ratings and such ratings shall be considered to be withdrawn (effective at the end of the sixty-day period referred to in 3.3.3.2) provided, however, that in the event the Participant requests approval of lower ratings or requests additional tests, as provided in 3.3.3.2, their existing ratings may continue to be used pending final determination by the Program Administrator pursuant to such request.

3.3.3.3 Changed Product. In the event the unit selected from stock and taken to the I=B=R Laboratory has dimensions which vary from those specified on Form 210 and the detailed dimensional drawing, subject to the tolerances specified below, the Participant will be advised of such variations before tests are conducted and will be given the option of submitting a new test unit, as specified in section 3.3.3.2, within thirty (30) days after the Program Administrator has sent such notice or advising the Program Administrator in writing that the laboratory dimensions are acceptable to them, in which event the unit will be considered a changed product and be governed by the provisions of section 3.4.

- Finned tube type units
 - ◆ Fin size: $\pm 1/32$ "
 - ◆ Fin thickness: latest ASTM specification for material used

- ◆ Fin spacing: -2.5% of catalogued number of fins. No plus tolerance limitation.
 - ◆ All dimensions required by section 3.2.1, items 3, 4a, and 4c: $\pm 1/8"$
 - All other types of units
 - ◆ All dimensions required by section 3.2.1, items 3, 4a, and 4c: $\pm 1/8"$
- 3.3.4 Fees for Check Testing. All provisions of section 3.2.5 as regards fees and time for payment of fees shall be applicable to testing and additional testing performed under section 3.3, except as otherwise specifically provided herein.
- 3.4 Procedure for Obtaining I=B=R Baseboard Ratings for Changed Products. The Program requires that ratings tests be conducted for the manufacturer by the I=B=R Laboratory on all changed products. All tests shall be conducted in accordance with the provisions of the Standard as amended and in effect at the time of such testing.
- 3.4.1 Rating Applicability. An approved I=B=R Rating applies only to the exact product which was tested and rated. No I=B=R Rating shall be used for the product as changed unless and until an approved I=B=R Rating for the product as changed has been issued.
- 3.4.2 Definition of Changed Product. A product shall be considered changed if any of the data (including the data required by section 3.2.1) previously submitted with respect to the product is in any way inapplicable to the changed product.
- 3.4.3 Notification by Manufacturer of Change in Product. A manufacturer of a product for which an approved rating has been obtained who proposes to make any change in the product shall, prior to using any I=B=R Rating on such changed product or prior to introducing the changed product on the market with the same designation as the product being changed, send a written notice to the Program Administrator stating the changes proposed to be made, the approximate date on which the changed product is expected to be introduced on the market and the requested rating for the product as changed.

If the requested rating shall be the same as the prior rating, and if the Program Administrator decides that the proposed change will not adversely affect the rating, the Program Administrator shall give formal notification to that effect to the Participant, which will constitute authorization for the use, for said product as so changed, of the I=B=R Baseboard Rating and Catalog Data theretofore approved for the product being changed.

Unless the Program Administrator shall unanimously decide that the proposed change will not adversely affect the rating, or if the requested rating shall be different (either higher or lower) from the prior rating, the Program Administrator shall request the manufacturer to furnish such data and to have such tests performed at the I=B=R Laboratory as the Program Administrator may deem proper with respect to the product as changed. All tests and the determination of

what rating shall be approved shall conform to the provisions of sections 3.2.1 through 3.2.3.

- 3.4.4 Proof That Product Has Not Changed. The Program Administrator may at any time in its discretion request a manufacturer to furnish such proof as it deems appropriate that a product currently being produced and offered for sale as a rated product has not been changed (as defined in section 3.4.2) from the product for which the rating was previously approved. If, within twenty (20) days after such request or such longer period as the Program Administrator may determine, the manufacturer shall not furnish proof, satisfactory to the Program Administrator, that the product has not been changed, such product shall be deemed a changed product for all purposes of this Standard, and be governed by all the provisions of section 3.4, and such product shall no longer be an I=B=R rated product until and unless a rating therefore is obtained pursuant to the provisions of this section 3.4.4.
- 3.4.5 Fees. All of the provisions of section 3.2.5 as regards to fees and time of payment of fees shall be applicable to testing and additional testing performed under section 3.4.

3.5 Challenge Test Procedure.

If at any time a challenge is received against a model manufactured by a participant in the Program or, in the opinion of the Program Administrator, there is reason to believe that a product that has an approved I=B=R Rating is no longer entitled to such rating, then the I=B=R Laboratory may select and test a unit obtained from manufacturer stock or commerce, as the Program Administrator may deem proper with respect to the product. The provisions of sections 3.4.1 through 3.4.3 shall thereupon be applicable.

The cost of testing at the I=B=R Laboratory including selection, shipment, and disposition of the unit shall be completely borne by one of the two parties involved. In the event that the challenge test results show the challenge to be justified, the manufacturer of the model in question shall pay the costs and take appropriate actions as specified in section 4.2. In the event the test results do not bear out the challenge, the challenger shall pay the costs.

- 3.6. Procedure Revisions or Modifications. Amendments to the Standard may be proposed by the Program Administrator or Participants. Any proposed amendment shall be binding upon the parties and deemed part of the Standard if and when it is approved by three-fourths of the participants either by mail ballot to all participants or at a meeting of participants called by the Program Administrator. Not less than ten (10) days notice to all participants shall be given for the purpose of considering and acting upon such proposed amendment. Such mail ballot or notice, when sent to participants, shall be accompanied by a copy of the proposed amendment.

SECTION 4: ENFORCEMENT

- 4.1 Continued Violation. In the case of continued violation of provisions of the License Agreement or Procedures as outlined in this Standard, the I=B=R Certification Seal shall be withdrawn and the Participant's entire listing shall be removed from the next and subsequent issues of the Directory. When this action is taken, the next issue of the

Directory shall list the name of the Participant and the words "Listing Withdrawn" and section 4.2.2 will be applied if appropriate. Appeal of this action may be made to the Rating Committee as specified in section 2.4.2.

4.1.1 Notice of Violation. Before such withdrawal of privileges shall be made, the manufacturer shall have been notified of the violation(s) and have had fifteen (15) days during which to correct, or to have made substantial progress toward correction of the causes of the violation.

4.2 Failure Under Random or Challenge Tests. Except as noted below, if any model is found by random or challenge tests to be not in compliance, it shall be treated as an obsolete model (see 4.2.1), re-rated (see 4.2.2) or actions described in section 4.2.4 shall be taken.

4.2.1 Obsolete Model. Where a unit acquired under the periodic check test procedure has failed, and the manufacturer claims it to be obsolete (current production incorporating one or more changed components), its current counterpart shall be subjected to a ratings test at the I=B=R Laboratory to determine its rating.

4.2.1.1 List of Obsolete Models. When a model has been declared obsolete as described in 4.3.1, it shall not be listed in subsequent Directories.

4.2.2 Manufacturers Notice Under a Re-rating Determination. Upon a determination that a re-rating is necessary, the manufacturer is to revise the rating for that model(s) and all derivative models based on the test results according to the time periods established in section 4.3.6. Within fifteen (15) days, whether or not the model is in production, the manufacturer shall at their own expense give notice of the revised claims in writing to all distributors or others under their control in the line of distribution, including private brand owners, who are responsible for sales to dealers or other retail outlets. In addition, Participant shall make reasonable effort that dealers of the brand are notified. Copies of all such notices, reasonable action to notify brand dealers, and revised literature shall be supplied to the Program Administrator as soon as available. Failure to comply with the requirements of this subsection will result in the termination of the manufacturer from the Program.

4.2.3 Licensor Notification of Re-rating.

4.2.3.1 The Licensor shall advise other Participants of the determination of noncompliance and the subsequent re-rate action within sixty (60) days after the manufacturer of the model has been notified of the determination of noncompliance.

4.2.3.2 If the Program Administrator notifies the Licensor that the time period allowed them for notice under Section 4.2.2 has expired, Licensor will notify Participant that they are in default under the License Agreement and request that the notices be sent immediately. Concurrently with this, all other Participants will be advised of the re-rate action by letter.

4.2.3.3 If immediately after receiving the notice from Licensor under Section 4.2.3.2, Participant does not notify distributors and take reasonable action

to notify dealers of the re-rating, Licensor shall promptly take appropriate steps to exclude Participant from the Program and notify other Participants of this action.

- 4.2.4 Directory Notice of Withdrawal of Certification. If testing under the Program fails to verify a rating published in the Directory, and the manufacturer ceases to participate in the Program, consumers and others who have relied on the Directory rating will be notified that the previous ratings may be in question by inclusion of the following statement in the Directory - "Most recent testing of units of a model (or models) under the Program did not verify ratings in previous edition of the Directory" and by notification to all Program Participants by the Program Administrator of this pending Directory entry.
- 4.2.5 Directory Listing of Re-rated Models. Revised ratings will be identified in a suitable manner in the Certification Directory, and shall be so identified for at least 1 year. However, a model for which re-rating is required too late to appear in the latest edition of the Directory for that model year will appear with its revised rating in the next edition of the Directory and will be identified as a model of the previous year.
- 4.2.6 Revision of Literature. Any changes in model or Program participation ratings or status resulting from Section 4 activity shall require Participant to revise all literature (for example, specification sheets, full line folder, ad mats, plus any sales promotion and/or advertising materials which could be used with potential consumers) to reflect the changes within the following time periods:
- Printed Literature: 180 days
 - Electronic Literature: 90 days
 - Website Information: 30 days
- 4.3 Violations of Rules Concerning Advertising Literature. If a participant violates the procedures detailed in this Standard in the publication of specification sheets, literature and all other advertising, such publication shall promptly be discontinued or corrected, or the action described in Section 4.2 shall be taken. Indication of such discontinuance or correction must be furnished promptly to the Program Administrator.
- 4.4 Notice to Other Program Participants of Participant Withdrawal or Termination. If Program participation is cancelled under the Program, GAMA's Notification to all other Program participants shall include these terms: "As of (date), the (company) is no longer a participant in the I=B=R Baseboard Radiation Certification Program. Only units of the former participant covered by the Program that were manufactured before that date may continue to display the I=B=R Certification Seal, and the participant is not authorized to make further reference in literature and advertising materials to its participation in, or ratings pursuant to, the I=B=R Baseboard Certification Program."

DEFINITIONS

AIR TEMPERATURE (t_a) – “Air Temperature”, (t_a), as used in this Standard, refers to air temperature three inches (3”) above the floor and eighteen inches (18”) in front of the baseboard unit.

BASEBOARD RADIATION – “Baseboard Radiation”, as used in this Standard, shall apply to steam or water heated room heaters designed for installation along the bottom of the walls of rooms, replacing conventional baseboard. They operate with gravity recirculated room air, and have a substantial portion of their frontal surface directly exposed to the room.

CAPACITY

CONDENSATION CAPACITY – “Condensation Capacity”, as used in this Standard, is the total heat output of the unit divided by the active length of the unit and is determined as prescribed in APPENDIX A. It is expressed in Btuh per linear foot.

WATER HEAT CAPACITY – “Water Heat Capacity”, as used in this Standard, is the total heat output of the unit divided by the active length of the unit and is determined as prescribed in APPENDIX B. It is expressed in Btuh per linear foot.

I=B=R RATING

STEAM – “I=B=R Steam Rating” is the condensation capacity of the baseboard under standard test conditions, (see APPENDIX A), plus a maximum of fifteen percent (15%). I=B=R Steam Ratings are expressed in Btuh per linear foot of active length, and also may be expressed in square feet of steam per linear foot of active length.

WATER – “I=B=R Water Rating” is the water heat capacity determined under standard test conditions, (see APPENDIX B), plus a maximum of fifteen percent (15%). I=B=R Water Ratings are expressed in Btuh per linear foot of active length at various average water temperatures.

LENGTH

ACTIVE LENGTH – “Active Length” shall be used in determining the I=B=R Rating in Btuh per linear foot. “Active length”, as used in this Standard, shall be the length of the baseboard unit that has a major influence on the heat output. It shall not include any piping or connections beyond the heating element. The active length of baseboards of the finned tube type is the length of the finned section.

TOTAL LENGTH – “Total Length”, as used in this Standard, shall be the overall length of the baseboard or enclosure, excluding boxes added to the ends of the unit to conceal pipe connections and valves.

STANDARD TEST CONDITIONS

STEAM – “Standard test conditions”, as used in APPENDIX A of this Standard, are defined as an air temperature (t_a) of sixty five degrees (65 °F), a barometric pressure of twenty-nine and ninety two hundredths inches of mercury (29.92 in. Hg) and a saturated steam temperature of two hundred fifteen degrees (215 °F).

WATER – “Standard test conditions”, as used in APPENDIX B of this Standard, are defined as an air temperature (t_a) of sixty-five degrees (65 °F), a barometric pressure of twenty-nine and ninety-two hundredths inches of mercury (29.92 in. Hg) and a water flow rate (w) of five hundred pounds per hour (500 lb/hr), plus or minus five percent ($\pm 5\%$).

APPENDIX A

TESTS FOR DETERMINING STEAM CAPACITIES

I. PURPOSE

The purpose of this APPENDIX A is to provide a method for obtaining the condensation capacity of baseboard radiation under standard test conditions.

II. TEST ROOMS

A. TYPES

Tests shall be conducted in a warm-wall booth or a cold room of the size, construction, and other requirements prescribed herein. The basic differences between the two types of rooms are:

1. Warm-Wall Booth

A warm-wall booth has one side open and is located in a larger room. The open side of the booth shall have a shield projecting down vertically one foot from the ceiling. The larger room may be provided with a controlled means of maintaining desired temperatures, but the test booth shall be shielded from the radiant effects of any auxiliary heating or cooling equipment.

The air in the booth shall be free from draft, except that created by the baseboard unit under test in the course of its normal operation. The air temperature in the space surrounding the test booth shall be taken at the midpoint of the rear wall of the test booth, at a level of thirty inches (30") above the floor of the test booth, at a distance of twelve inches (12") from the rear wall. In addition, the air temperature shall be taken at the front edge of each side wall at a distance of twelve inches (12") from the wall and at two heights, - three inches (3") and sixty inches (60") above the floor of the test booth (see Figure 3-B). Temperatures taken at each point shall not show a variation in excess of plus or minus three degrees (± 3 °F) during the course of a test. The air temperatures at the front of the booth three inches (3") above the floor (temperature locations C and E, Figure 3-B) at all times must be between t_a and (t_a minus 10 °F). The temperature at the back of the booth shall be not less than fifty degrees (50 °F) at any time during the test. All temperatures shall be recorded on the test log sheet, (Form 200, 201 or 202).

2. Cold Room

A cold room has all sides closed with two or more walls exposed to an air space having a temperature less than fifty degrees (50 °F) but not less than minus ten degrees (-10 °F). The walls, floor, and ceiling of the cold room must be of customary good building construction. The walls, ceiling, and floor exposed to the cold air shall have a heat transmission coefficient not to exceed 0.27 Btu per square foot per °F difference per hour. The walls, floor, and ceiling not exposed to the cold air shall have a total heat exchange not to exceed five per cent (5%) of the total output of the baseboard unit. At least one of the exposed walls shall have a window of commercial construction and at least ten (10) square foot area, with the top of the windowsill located approximately thirty inches (30") above the floor. The total exposed window and door area shall not exceed twenty-five percent (25%) of the exposed area, including wall, window, and door.

B. SIZE

The floor area of the test room or booth shall not be less than one hundred (100) square feet not more than three hundred (300) square feet. No side wall shall be less than nine (9) feet long. The ceiling height shall be not less than eight (8) feet or more than ten (10) feet.

C. FLOOR

The floor shall be tight and constructed of commercial wood flooring. The floor of a warm-wall booth shall be at least one (1) foot and not more than four (4) feet above the floor of the larger room.

D. CEILING

A non-metallic ceiling shall be used. The inside ceiling shall be painted. The ceiling of a warm-wall booth shall be not less than one (1) foot from the ceiling of the larger room.

E. WALLS

Non-metallic walls shall be used. The inside walls shall be painted. The distance between any wall of a warm-wall booth and the wall of the surrounding room shall be not less than two (2) feet.

F. WALL AGAINST WHICH TEST UNIT IS PLACED

The wall against which the baseboard unit is placed for test shall be the wall opposite the open side in a warm wall booth, or an exposed wall in the cold room and shall have an inside surface composed of sheetrock. The thickness of the sheetrock shall be not less than three-eighths of an inch (3/8"). The bottom ground for the sheetrock shall consist of a board not more than three and five-eighths inches (3-5/8") wide, nailed to the studs at the floor level. The room side of the ground and the sheetrock or sheetrock shall be flush and there shall be no air leakage through or around the bottom ground.

The lower part of the wall shall be insulated with three and five-eighths inches (3-5/8") thick blanket insulation or equivalent, laid between the studs and in contact with the sheetrock and extending from the floor to at least twenty-four inches (24") above the top of the unit* (see Figure 2 for details of wall construction). In the cold room, this insulation may extend to the windowsill.

III. INSTALLATION OF TEST UNIT AND PIPING

A. LENGTH OF TEST UNITS

Tests shall be run on baseboard units having an active length of not less than seven (7) feet. If the active length is different from the total length, the relationship between them shall be the same as is regularly catalogued by the manufacturer (see 2.3.1).

* It is permissible to build an interior false wall inside the test room or booth, with the construction of the front surface complying with the provisions of this Standard and with 3-5/8" thick blanket insulation, or equivalent, between the permanent wall and the false wall. The height of this false wall shall be at least twenty-four inches (24") higher than the baseboard unit to be tested.

B. INSTALLATION OF TEST UNIT

The baseboard unit shall be installed at the approximate center of the wall of the test room or booth which has been insulated in accordance with Section II, Paragraph F, of this APPENDIX A. The baseboard unit shall be installed in accordance with the manufacturer's instructions and, unless otherwise specified, as close as possible to the wall. It shall pitch down from steam inlet end to outlet end not more than one (1") inch in twenty (20') feet. If the unit is installed so that the bottom edge is not parallel to the floor, a wedge shaped piece shall be used to provide a uniform inlet opening (see Figure 4). The distance between the end of the baseboard unit and the side walls of the room shall be at least six inches (6").

C. CONDENSATE PIPING

A two-pipe hookup shall be used. The condensate piping shall be connected to the lower tapping opposite the steam inlet of the baseboard unit. The pipe shall be insulated with one-inch (1") hairfelt or equivalent and shall drain the condensate freely from the baseboard unit to a receptacle. Suitable seals shall be provided in this condensate piping to prevent steam from issuing from the end of this piping. This pipe shall terminate outside the test room or booth and be provided with an air vent. Steam which might escape from this vent shall be conducted outside the test room or booth. A commercial steam trap, if used, must be of such design that the return outlet has a continuous, unbroken, deep, water seal. (Figure 4 illustrates a suitable piping arrangement.)

IV. TESTS

A. START OF TEST

The test shall be started only after a state of equilibrium has been reached. Such a state of equilibrium may be considered to exist if, for a period of at least thirty (30) minutes, the air temperature (t_a) does not vary more than one degree (1 °F) and the rate of condensation does not vary more than three percent (3%). Actual readings for this equilibrium period shall be taken at fifteen (15) minute intervals and shall be recorded on the test log sheet.

B. DURATION OF TEST

The test shall be conducted for not less than one (1) hour.

C. STEAM SUPPLY

Steam shall be supplied to the baseboard unit at pressure corresponding to a saturated steam temperature (t_s) of not less than two hundred fourteen degrees (214 °F) nor more than two hundred seventeen degrees (217 °F) and shall have a superheat of not less than two degrees (2 °F) nor more than five degrees (5 °F). The steam supply temperature (t_s') shall be measured by a thermometer* accurate to within one-half degree (0.5 °F) directly exposed to the steam and located within twelve inches (12") of the baseboard unit. The steam pressure shall be measured by a liquid filled manometer connected to the supply pipe. The supply piping shall be insulated with one inch (1") of hairfelt or equivalent and of such size as to cause only a negligible pressure drop between manometer and the baseboard unit. The piping inside the test shall be kept to a minimum. (Figure 4 illustrates a suitable piping arrangement.)

* The term "thermometer", as used in this Standard, applies to any temperature measuring device. As an alternate to measuring the steam pressure, a thermocouple located in the supply piping may be used to determine the saturated steam temperature. (Note: This installation must be approved by the Rating Committee prior to running any tests.)

D. AIR TEMPERATURE

The baseboard unit shall be tested with an air temperature (t_a) three inches (3") above the floor or not less than sixty degrees (60 °F) nor more than seventy-five degrees (75 °F). This temperature shall be measured at four or more points, spaced not more than twenty-four inches (24") apart throughout the length of the unit and eighteen inches (18") in front of the unit. The end thermometers shall be twelve inches (12") from the ends of the unit (see Figure 3-A). The thermometer used in the test shall be accurate within one-half degree (0.5 °F). The sensitive end of thermometers shall be not more than five-sixteenths of an inch (5/16") in diameter. The last two inches (2") of the temperature sensitive end shall be shielded against radiation by bright metal shields of such construction as not to interfere with the airflow (see Figure 1-A and 1-B for suggested constructions). It is recommended that temperature readings be taken in the center of the room or booth at levels of three inches (3"), thirty inches (30"), and sixty inches (60") above the floor and three inches (3") below the ceiling (see Figure 3-B).

E. AIR VENTING

The baseboard unit shall be vented continuously during the test by suitable means and the expelled air, gases, and steam shall be discharged outside the test room or booth. The vent in the condensate line mentioned in Section III, Paragraph C, may be used for this purpose and it is recommended that the air vent hole be not larger than 0.03 inches in diameter.

F. TEMPERATURE AND PRESSURE READINGS

1. The supply steam superheat temperature (t_s) and air temperature (t_a) shall be read at the beginning and at the end of each test. In addition, in a warm-wall booth, intermediate readings shall be taken every fifteen (15) minutes during the test. All readings of the supply steam superheat temperature (t_s) shall conform to the limitations of Section IV, Paragraph C. The average of all temperatures shall be used for calculation.
2. The supply steam pressure shall not vary more than plus or minus one-tenth of an inch of mercury (± 0.1 in. Hg) or equivalent, or, if saturated steam temperature reading has been approved by the Review Committee, this reading shall not vary during the test by more than four-tenths degree (0.4 °F)
3. The readings of the air temperature thermometers (t_a) shall not differ from one another by more than three degrees (3 °F) at any time during the test and the readings of each thermometer shall not vary more than one degree (1 °F) during the test. The average of all air temperatures (t_a) shall be used for calculation.
4. The air temperatures surrounding the test booth or room during the test shall be those specified in Section II, Paragraphs A1 or A2.
5. The barometric pressure shall be read at the beginning and end of the test period to the nearest two-hundredths inches of mercury (0.02 in. Hg).

G. CONDENSATE

The total condensate shall be collected and weighed to 0.01 pound accuracy. Two or more measurements of condensate should be made at half-hour intervals within the test time, and the condensation rate obtained on these measurements shall not vary more than three percent (3%). In addition, in a warm wall booth, intermediate readings shall be taken every fifteen (15) minutes during the tests.

H. NO-LOAD TEST

A no-load test to determine the amount of steam which is condensed by the condensate piping, exclusive of the test unit, shall be made. This no-load test shall be run under the same test conditions and following the same procedure as is provided in this Standard for a test on a baseboard unit. The no-load test shall be run for a minimum of two hours and the condensate collected per hour shall be deducted from the gross condensation of the baseboard unit before correcting to standard test conditions.

One of the two following methods for determining no-load shall be used.

1. Move either the supply piping or condensate piping and condensate seal and join them directly, using the shortest possible connection. The condensate collected per hour will then represent the total no-load correction.
2. If the piping is inflexible, substitute in place of the test unit a pipe of the same diameter and insulated in exactly the same manner as the condensate piping. The condensate collected per hour shall be divided by the total length of pipe from inlet thermometer to condensate seal (Figure 4) and then multiplied by the length of the permanent condensate piping. This value will then represent the total no-load correction as in (1) above.

If tests are to be made on various baseboard units and no changes are made in the length and arrangement of the permanent supply and condensate piping, it is permissible to run a series of no-load tests at various room temperatures. From this series of tests a no-load correction curve may be plotted using $t_s - t_a$ as the abscissa and no-load correction in pounds per hour as the ordinate. The correct no-load correction for each test may then be read from the curve.

If, however, any changes are made in the supply and condensate piping, it is necessary to run a no-load test for each different arrangement.

V. CALCULATIONS

A. CONDENSATION CAPACITY FOR TEST CONDITIONS

The condensation capacity of a baseboard unit for test conditions shall be determined by the formula:

$$H_c = \frac{W_s \times h_{fg}}{L_a}$$

where:

- H_c = Condensation capacity for test conditions, Btuh per linear foot
 L_a = Active length of baseboard unit, feet
 W_s = Net weight of condensate (gross weight of condensate minus no-load correction for piping), expressed in pounds per hour
 h_{fg} = Latent heat of evaporation steam corresponding to the saturated steam temperature in the baseboard unit during test. (Keenan and Keyes Tables). The reading of the pressure gauge described in section IV, Paragraph C, shall be used to determine the saturated steam temperature inside the baseboard unit, unless the Technical Committee has approved the use of a thermocouple for this purpose.

TABLE A*

Temperature °F	Absolute Steam Pressure		Latent Heat (h_{fg}) Btu/Lb.
	Lb. / Sq. In.	Inches of Mercury	
214.0	15.289	31.129	969.0
214.1	15.320	31.191	968.9
214.2	15.350	31.254	968.9
214.3	15.381	31.316	968.8
214.4	15.411	31.378	968.8
214.5	15.442	31.441	968.7
214.6	15.473	31.503	968.6
214.7	15.503	31.565	968.6
214.8	15.534	31.627	968.5
214.9	15.564	31.690	968.5
215.0	15.595	31.754	968.4
215.1	15.626	31.814	968.3
215.2	15.656	31.877	968.3
215.3	15.687	31.939	968.2
215.4	15.717	32.001	968.2
215.5	15.748	32.064	968.1
215.6	15.779	32.126	968.0
215.7	15.809	32.188	968.0
215.8	15.840	32.250	967.9
215.9	15.870	32.313	967.9
216.0	15.901	32.375	967.8
216.1	15.933	32.439	967.7
216.2	15.964	32.504	967.7
216.3	15.996	32.568	967.6
216.4	16.027	32.632	967.6
216.5	16.059	32.697	967.5
216.6	16.090	32.761	967.4
216.7	16.122	32.825	967.4
216.8	16.154	32.889	967.3
216.9	16.185	32.954	967.3
217.0	16.217	33.018	967.2

* As published by Keenan and Keyes

B. CORRECTION FACTORS FOR STANDARD TEST CONDITIONS

1. Correction for Steam Temperature to air Temperature Difference

The correction factor for converting the capacity obtained at the steam and air temperatures existing during the test to the standard steam and air temperature shall be determined by the formula:

$$C_s = \left[\frac{215 - 65}{t_s - t_a} \right]^{1.4} = \left[\frac{150}{t_s - t_a} \right]^{1.4}$$

where:

- C_s = Correction Factor
 t_s = Saturated steam temperature during test, °F
 t_a = Average air temperature during test, °F

TABLE B

Table of $C_s = [150 / (t_s - t_a)]^{1.4}$		Range: $t_a = 60.0$ to 75.0 F $t_s = 214.0$ to 217.0 F			
$t_s - t_a$	C_s	$t_s - t_a$	C_s	$t_s - t_a$	C_s
157.0	0.938	150.0	1.000	143.0	1.069
156.5	0.942	149.5	1.005	142.5	1.075
156.0	0.947	149.0	1.009	142.0	1.080
155.5	0.951	148.5	1.014	141.5	1.085
155.0	0.955	148.0	1.019	141.0	1.091
154.5	0.959	147.5	1.024	140.5	1.096
154.0	0.964	147.0	1.029	140.0	1.101
153.5	0.968	146.5	1.034	139.5	1.107
153.0	0.973	146.0	1.039	139.0	1.113
152.5	0.977	145.5	1.044		
152.0	0.982	145.0	1.049		
151.5	0.986	144.5	1.054		
151.0	0.991	144.0	1.059		
150.5	0.995	143.5	1.064		

2. Correction for Barometric Pressure

The correction factor (C_s) for average observed test barometric pressure should be taken from Table C.

TABLE C

HEATING CAPACITY CORRECTION FACTOR, C_B , FOR STATION PRESSURES OTHER THAN 29.92 in. Hg			
Station Pressure, P in. Hg	Ferrous Units	Copper Aluminum Units	Type R Cast-Iron Units
32.00	0.970	0.943	0.985
31.50	0.977	0.956	0.989
31.00	0.984	0.969	0.992
30.50	0.991	0.983	0.996
30.00	0.999	0.998	0.999
29.92	1.000	1.000	1.000
29.50	1.007	1.013	1.003
29.00	1.014	1.028	1.007
28.50	1.022	1.044	1.011
28.00	1.030	1.060	1.015
27.50	1.039	1.077	1.019
27.00	1.047	1.095	1.023
26.50	1.056	1.114	1.027
26.00	1.065	1.133	1.032
25.50	1.075	1.152	1.036
25.00	1.085	1.172	1.040

$$C_B = \left[\frac{29.921}{P} \right]^{.886} \text{ for copper units}$$

$$C_B = \left[\frac{29.921}{P} \right]^{.454} \text{ for ferrous units}$$

$$C_B = \left[\frac{29.921}{P} \right]^{.219} \text{ for type R cast-iron units}$$

C. CONDENSATION CAPACITY FOR STANDARD TEST CONDITIONS

The condensation capacity for standard test conditions (H_s) shall be determined as follows:

$$H_s = C_s \times C_B \times H_c \text{ Btuh per linear foot}$$

VI. SOURCES OF ERROR IN STEAM BASEBOARD UNIT TESTING

A. The major sources of error are as follows:

1. Entrained water brought into the baseboard unit with the steam.
2. Improper measuring of condensate caused by heat loss of supply and condensate piping.
3. Loss of condensate during the collection process by spillage or evaporation.
4. Incomplete venting of the baseboard unit.
5. Excessive air currents inside test room or booth due to disturbances.
6. Wet or insufficient insulation on piping.
7. Incorrect calibration of thermometers and scales.
8. Starting test before equilibrium is obtained.
9. Inaccurate air temperature readings (t_a) due to improper shielding.

SUGGESTED CONSTRUCTIONS OF THERMOMETER SHIELD OF BRIGHT METAL

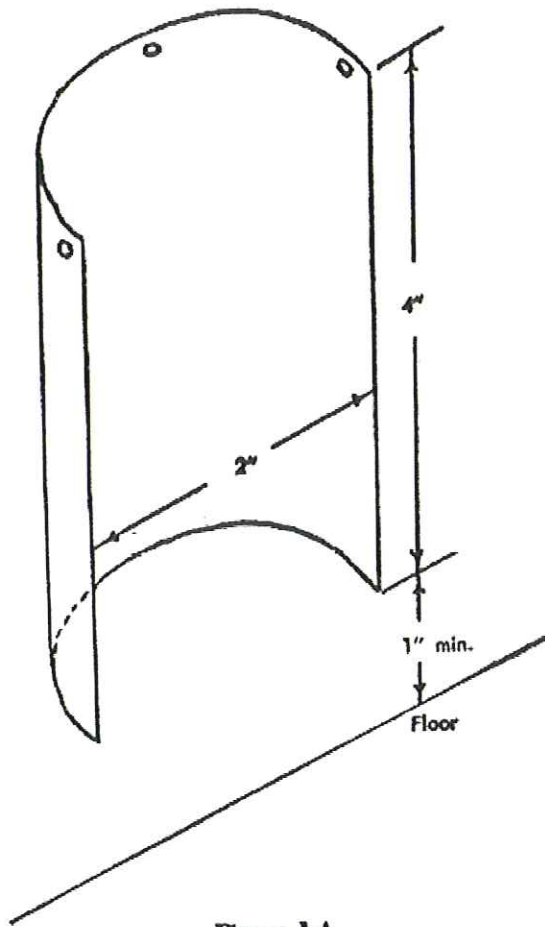


Figure 1-A

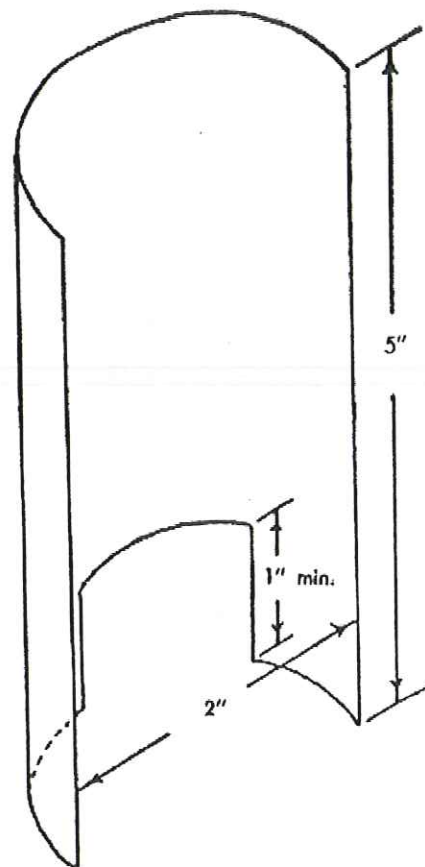
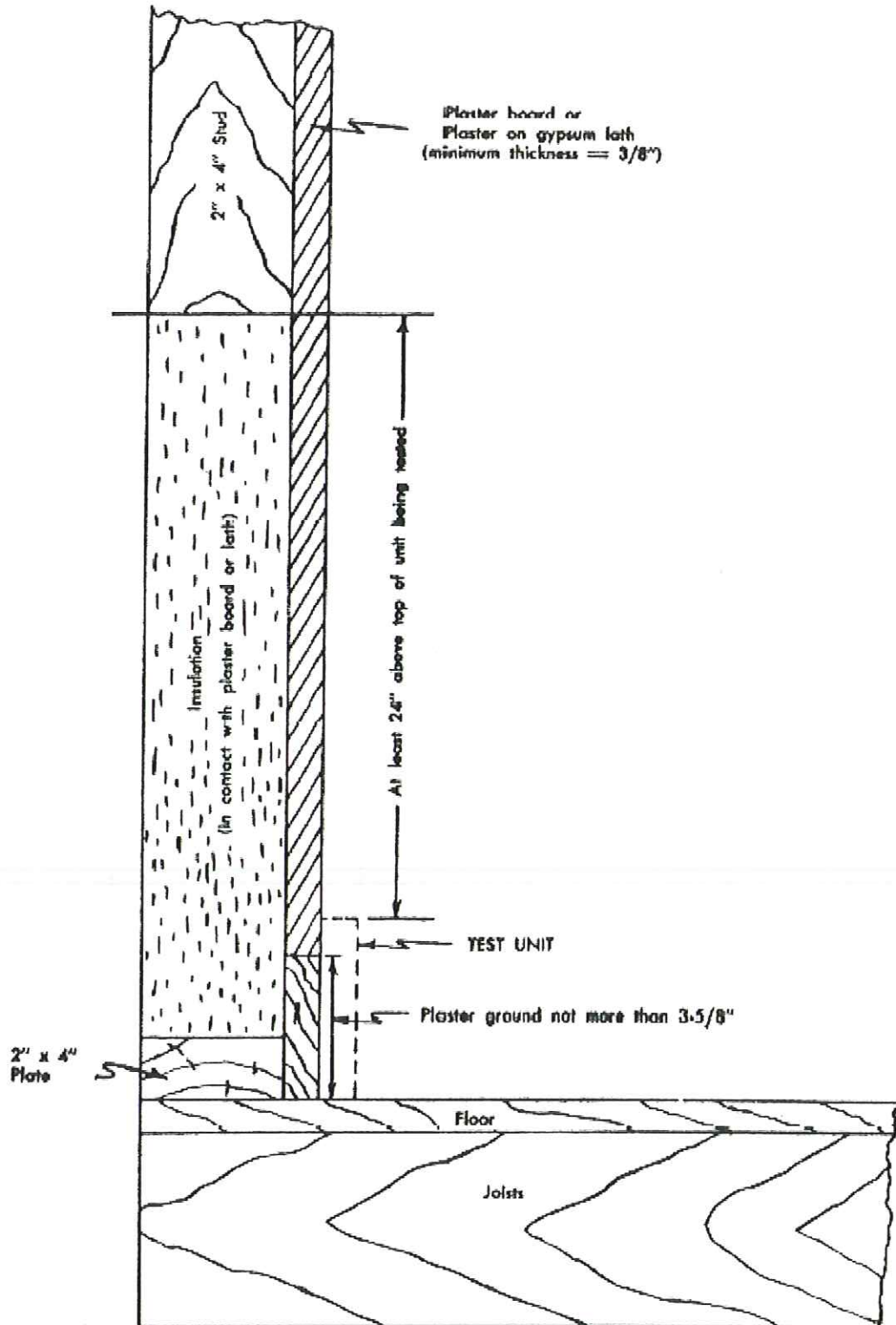


Figure 1-B

DETAILS OF WALL CONSTRUCTION BACK OF TEST UNIT

FIGURE 2



LOCATION OF THERMOMETERS FOR MEASURING AIR TEMPERATURE

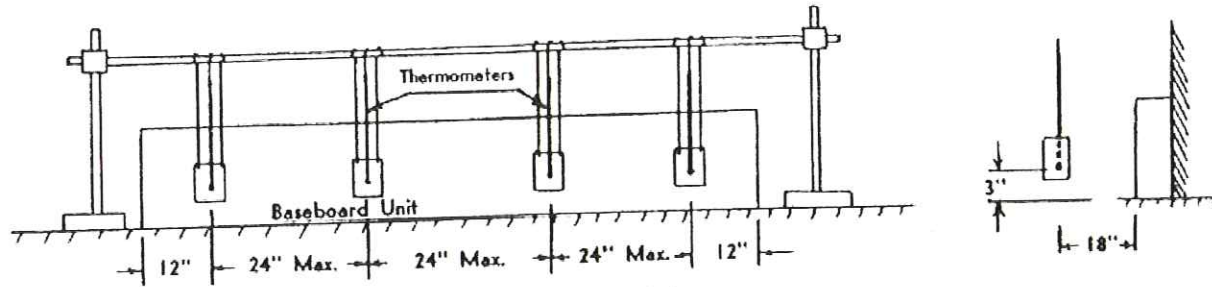
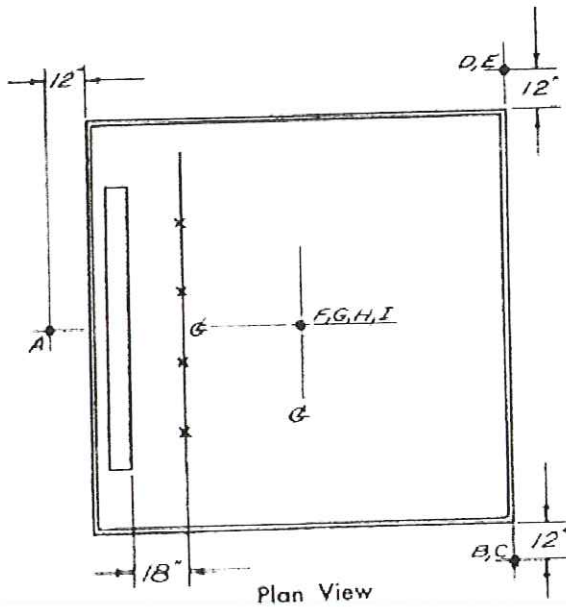


Figure 3-A



REFERENCES:

Air space temperatures: A, B, C, D, E
Part Two, Section II, Par. A-1

Booth or room temperatures: F, G, H, I
Part Two, Section IV, Par. D
Part Three, Section V, Par. F

Inlet air temperatures: X's
Part Two, Section IV, Par. D
Part Three, Section V, Par. F
Figure 3

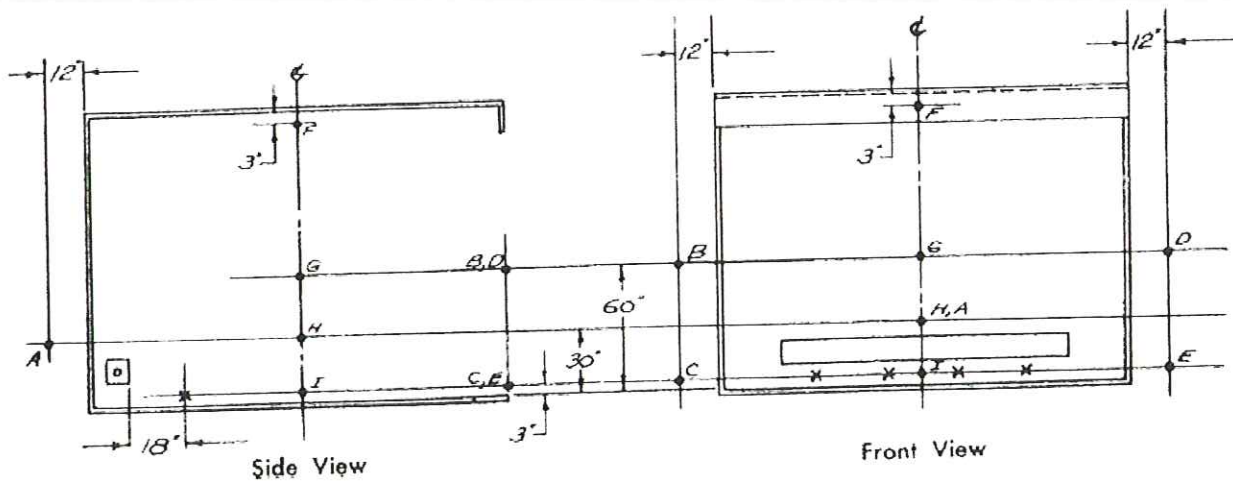


Figure 3-B

SUGGESTED METHODS AND EQUIPMENT FOR SUPPLYING STEAM TO THE BASEBOARD UNIT AND MEASURING THE CONDENSATE

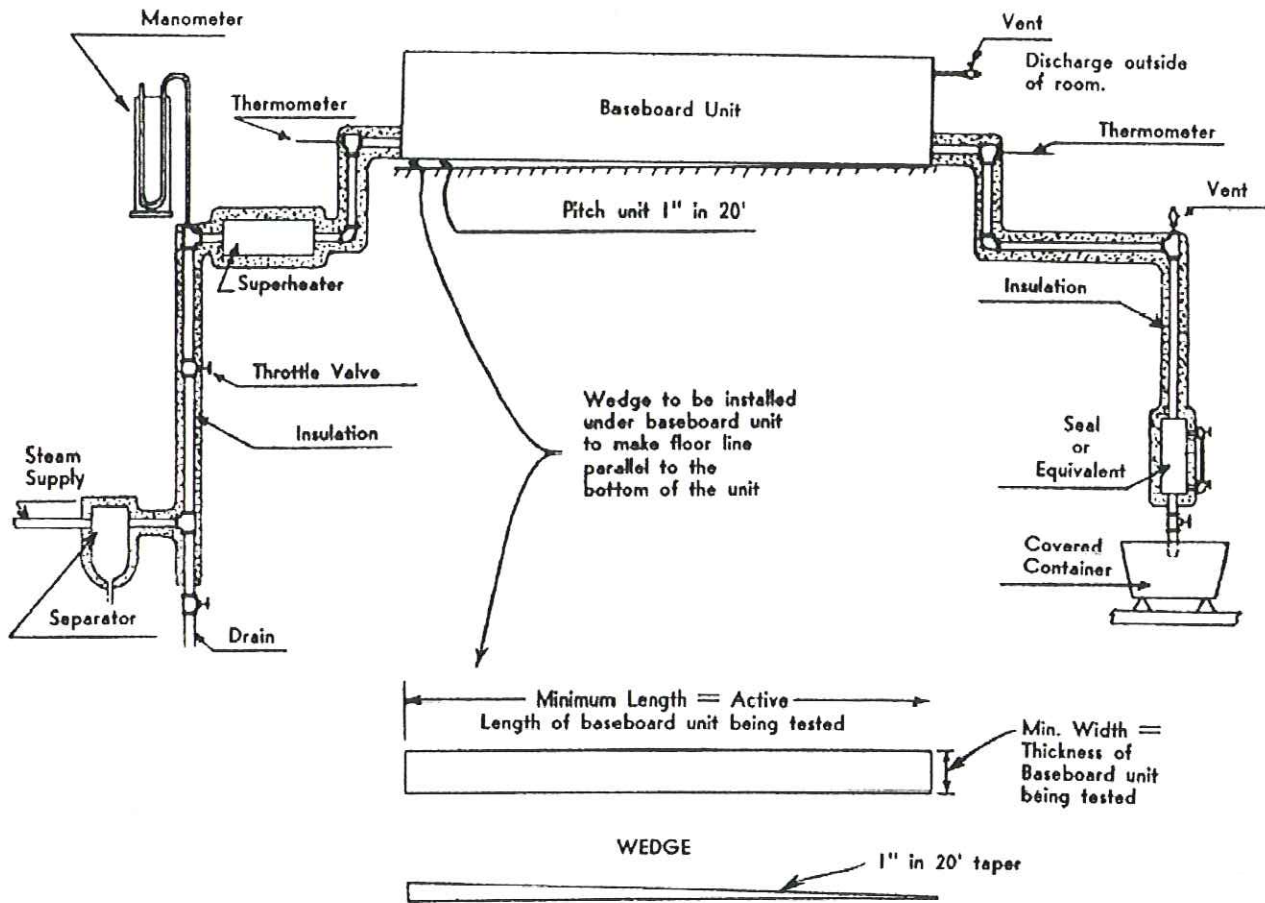


Figure 4

APPENDIX B

TESTS FOR DETERMINING WATER HEAT CAPACITIES

I. PURPOSE

The purpose of this APPENDIX B is to provide a method of obtaining the water capacity of baseboard radiation under standard test conditions. Two methods of test are provided as alternates: one known as the Weight Method and the other as the Electrical Method. In subsequent sections, where the two methods differ, alternate paragraphs are included.

A. WEIGHT METHOD

Essentially the Weight Method consists of passing heater water through the test unit at a standard rate of flow, measuring the temperature drop across the unit, collecting and weighing the water for a given time period, and calculating the water heat capacity by multiplying the weight of water per hour by the measured temperature drop. Figure 5-A shows a suitable piping arrangement for testing with the Weight Method.

B. ELECTRICAL METHOD

The Electrical Method consists of circulating heated water in a closed circuit comprising an electric heater, a circulating pump, the test unit and the necessary piping and control valves. The water flow rate is adjusted to the desired standard value by means of a throttling valve; heat is supplied to the system through electrical energy to maintain the desired average water temperature; and the water heat capacity is measured from the electric input minus the no-load input. Figure 5-B shows a suitable piping circuit for testing with the Electrical Method.

II. TEST ROOMS

The test room or booth used for conducting tests under this APPENDIX B shall be the same type, size and construction as described in APPENDIX A, Section II, Paragraphs A through F.

III. NUMBER OF UNITS TO BE TESTED

Tests shall be conducted on all units for which water ratings are desired.

IV. INSTALLATION OF TEST UNIT AND PIPING

A. LENGTH OF TEST UNITS

Tests shall be run on baseboard units having an active length of not less than seven (7) feet. If the active length is different from the total length the relationship between them shall be the same as is regularly catalogued by the manufacturer (see 2.3.1).

B. INSTALLATION OF TEST UNIT

The baseboard unit shall be installed at the approximate center of the wall of the test booth or room which has been insulated in accordance with Section II Paragraph F of APPENDIX A. The baseboard unit shall be installed in accordance with the manufacturer's instructions and, unless otherwise specified, as close as possible to the wall. The baseboard unit may pitch up from the water inlet end to the outlet end not more than one inch (1") in twenty feet (20'). If the unit is installed so that the bottom edge is not parallel to the floor, a wedge shaped piece shall be used to provide a uniform inlet opening (see Figure 4). The distance between the end of the baseboard unit and the side walls of the room shall be at least six inches (6").

V. TESTS

A. WATER FLOW RATES

Tests shall be conducted at a water flow rate of five hundred pounds per hour (500 lb/hr) in accordance with the provisions of Paragraphs B-H of this Section V. Correction factors for determining water heat capacities at water flow rates other than standard are given in Table C.

B. NUMBER OF TESTS

1. A minimum of four tests shall be conducted to establish performance curves for the baseboard. Tests shall be made at average water temperatures within ten percent (10%) of the maximum and minimum temperatures to be catalogued by the manufacturer. The intervals between tested average water temperatures shall not exceed twenty degrees (20 °F). Any results inconsistent with a characteristic curve shall be re-determined (see Section VI, Paragraph B, 1).
2. When it is desired to determine the effect on capacity caused by the installation of an optional damper, in the "open" position, comparison tests shall be conducted at 200 °F average water temperature, ± 5 F, with the damper installed in the "open" position and with the damper removed from the unit.

C. START OF TESTS

1. Weight Method

The test shall be started only after a state of equilibrium has been reached. Such a state of equilibrium may be considered to exist if, for a period of at least thirty (30) minutes, the air temperature (t_a) does not vary more than one degree (1 °F) and the rate of water flow does not vary more than two percent (2%). Actual readings for this equilibrium period shall be taken at ten (10) minute intervals and be recorded on the test log sheet.

2. Electrical Method

The test shall be started only after a state of equilibrium may be considered to exist if, for a period of at least thirty (30) minutes, the air temperature (t_a) does not vary more than one degree (1 °F) and the rate of water flow does not vary more than two percent (2%). A convenient means of checking water flow variation is to divide the electrical input (w) in watts by the temperature drop ($t_1 - t_2$) through the test unit. If $w / (t_1 - t_2)$ does not vary by more than three (3) watts per °F, the variation in flow rate will be less than two percent (2%). Actual readings for this equilibrium period shall be taken at ten (10) minute intervals and recorded on the test log sheet.

D. DURATION OF TEST

1. Weight Method

A test shall be conducted for not less than ten (10) minutes. During any test the flow rate shall not vary more than two percent (2%), and the inlet water temperature shall not vary more than one degree (1 °F). At least two such tests shall be made consecutively and the results averaged. The water heat capacities determined by these tests shall not vary more than three percent (3%).

2. Electrical Method

A test shall be conducted for not less than one (1) hour. During the test, the air temperature (t_a) shall not vary more than one degree (1 °F) and the rate of water flow shall not vary more than two percent (2%).

E. WATER SUPPLY

1. Weight Method

Hot water shall be supplied to the baseboard at a rate of five hundred pounds per hour (500 lb/hr), plus or minus five percent ($\pm 5\%$). The temperatures of the water entering and leaving the baseboard shall be measured by thermometers* in direct contact with the water or in wells as shown in Figure 7. These thermometers shall be accurate to one-quarter degree (0.25 °F) and shall be located in a tee within two feet (2') of the baseboard. The piping between the baseboard and these thermometers shall be insulated with the equivalent of one inch (1") hairfelt or better. The water shall be thoroughly mixed at the points of temperature measurement to avoid errors due to stratification. Figure 7 shows suitable piping arrangements to assure thorough mixing.

2. Electrical Method

Hot water shall be supplied to the baseboard at a rate of five hundred pounds per hour (500 lb/hr), plus or minus five percent ($\pm 5\%$). This flow rate may be established by the use of additional thermometers (t_3 and t_4) or by use of a flow meter in the test circuit (see Figure 5-B). When thermometers t_3 and t_4 are used, the value $w / (t_3$ and $t_4)$ must be held between 139 and 154 watts per °F. When a flow meter is used, the flow rate must be held between 475 and 525 pounds per hour. A convenient method of maintaining flow rate to these limits is to adjust the throttling valve.

The electrical input to the circuit shall be adjusted to provide the desired test average water temperature. The electrical heating units can conveniently be made of several elements having a total capacity greater than that of the longest baseboard unit to be tested. These heaters can be so wired that they be energized individually or in combinations to vary the heat input. Figure 6 is a suggested wiring diagram for the heaters and instruments in the electrical circuit. Final adjustment of heat input can be accomplished by means of a watt-hour meter with its smallest scale graduated to read in divisions of ten (10) watt-hours. It is necessary to connect the watt-hour meter between the variable transformer and the heaters, as shown in Figure 6, to avoid errors due to the losses in the transformer. In addition, it is desirable to have a voltmeter and ammeter or an indicating wattmeter to obtain instantaneous readings of input, w , to facilitate adjustment during the warm-up period.

$$w = E \times I$$

where:

- w = Input, in watts
- E = Electrical potential, in volts
- I = Current flowing, in amperes

The temperatures of the water entering (t_1) and leaving (t_2) the baseboard and the water entering (t_4) and leaving (t_3) the heater shall be measured by thermometers* in direct contact with the water or in wells as shown in Figure 7. these thermometers shall be accurate to one-quarter degree (0.25 °F). Thermometers t_1 and t_2 shall be located in a tee within two (2) feet of the baseboard. Thermometers t_3 and t_4 shall be located in a tee as close as practical to

* The term "thermometer", as used in this Standard, applies to any temperature-measuring device.

the heater (see Figure 5-B). The entire closed circuit including the heater section, the circulator, and all piping (except the test unit) shall be insulated with the equivalent of two inches (2") of hairfelt or better. The water shall be thoroughly mixed at points of temperature measurement to avoid errors due to stratification. Figure 7 shows suitable piping arrangements to assure thorough mixing.

F. AIR TEMPERATURE

The baseboard unit shall be tested with an air temperature (t_a) three inches (3") above the floor of not less than sixty degrees (60 °F) nor more than eighty-five degrees (85 °F). This temperature shall be measured at four or more points spaced not more than twenty-four inches (24") apart throughout the length of the unit and eighteen inches (18") in front of the unit. The end thermometers shall be twelve inches (12") from the ends of the unit (see Figure 3-A). The end thermometer used in the test shall be accurate within one-half degree (0.5 °F). The sensitive end of thermometers shall be not more than five-sixteenths of an inch (5/16") in diameter. The last two inches (2") of the temperature sensitive end shall be shielded against radiation by bright metal shields of such construction as not to interfere with the airflow (see Figures 1-A and 1-B for suggested construction). It is recommended that temperature readings be taken in the center of the room or booth at levels of three inches (3"), thirty inches (30"), and sixty inches (60") above the floor and three inches (3") below the ceiling (See Figure 3-B).

G. AIR VENTING

Before starting a test all supply piping shall be thoroughly vented by means of manual or automatic air vents. If the baseboard has a regular vent opening provided, before starting the test the baseboard shall be vented by means of a manually operated air vent.

H. READINGS

1. Weight Method

- a. The total water flow during the test periods shall be collected in a covered container and weighed to an accuracy of at least one-half percent (0.5%).
- b. The air temperature (t_a) shall be read at the beginning and at the end of each test. The readings of the air temperature (t_a) shall not differ from one another by more than three degrees (3 °F) at any time during the test and the readings of each thermometer shall not vary more than a total of one degree (1 °F) during the test. The average of all air temperatures (t_a) shall be used for calculation.
- c. The water temperature shall be read at the beginning and at the end of each test and during the test at intervals of not more than two (2) minutes. The readings of each thermometer shall not vary more than a total of one degree (1 °F). During the test the maximum variation in the water temperature drop shall not exceed one-half degree (0.5 °F). The average of the inlet water temperatures and the average of the outlet water temperatures shall be used for calculation.
- d. The air temperatures surrounding the test booth or room during the test shall be those specified in APPENDIX A, Section II, Paragraphs A1 or A2.
- e. The barometric pressure shall be read at the beginning and the end of the test period to the nearest two-hundredths inches of mercury (0.02 in. Hg). The average shall be used for determining C_B .

2. Electrical Method

- a. The electrical input to the circuit shall be measured at ten (10) minute intervals during the test by means of the watt-hour meter. The difference between initial and final readings for each period is the quantity of electricity used (wh_i).

- b. The air temperatures (t_a) shall be read at the beginning and end of each test and at ten (10) minute intervals during the test. The readings of air temperature (t_a) shall not differ from one another by more than three degrees (3 °F) at any time during the test and the readings of each thermometer shall not vary more than a total of one degree (1 °F) during the test. The average of all air temperatures (t_a) shall be used for calculation.
- c. The water temperatures (t_1 and t_2) shall be read at the beginning and at the end of each test during the test at intervals of not more than five (5) minutes. The readings of each thermometer shall not vary more than a total of one degree (1 °F).
- d. It is suggested that the instantaneous electrical input (w) shall be read by means of a wattmeter or by means of a voltmeter and ammeter ($w = E \times I$) at the beginning and at the end of each test and at intervals of not more than five (5) minutes. The value of $w / (t_1 \text{ and } t_2)$ should not vary more than plus or minus three (± 3) watts per degree during the test.
- e. The air temperatures surrounding the test booth or room during the test shall be those specified in APPENDIX A, Section II, Paragraphs A1 or A2.
- f. The pressure drop (ΔP) across the fixed orifice, or the flow rate shall be read at the beginning and end of the test and at fifteen (15) minute intervals during the test. The manometer shown in Figure 5-B shall be used to measure pressure drop in inches of water. The flow meter shown in Figure 5-B shall be used to measure flow rate of water supplied to the baseboard in pounds per hour. These values are later used as a means of adjusting flow rates in the no-load test.
- g. The electrical input (wh_p) to the circulating pump motor shall be read at ten (10) minute intervals during the test by means of a watt-hour meter or a wattmeter.
- h. When a flow meter is used, its accuracy shall be within plus or minus two and one-half percent ($\pm 2.5\%$).
- i. The barometric pressure shall be read at the beginning and end of the test period to the nearest two-hundredths inches of mercury (0.02 in. Hg). The average shall be used for determining C_B .

I. NO LOAD TEST (ELECTRICAL METHOD ONLY)

It is necessary to determine the no-load heat input to the circuit (wh_n) which is subtracted from the total head input (wh_t) during a test to determine the water heat capacity under test conditions.

A length of straight pipe, insulated with the equivalent of two inches (2") of hairfelt or better, shall be substituted for the test unit in the circuit. (An alternate method is to connect the supply piping directly to the return piping.) The flow rate through the circuit shall be adjusted to the same rate as prevailed in the test unit as indicated by the flow meter or the pressure drop.

The heat input shall be adjusted so that the average temperature $(t_1 + t_2) / 2$ is approximately equal to the average water temperature used during the regular test. The flow rate or pressure drop and the electrical input to the circulating pump motor shall be adjusted to within plus or minus percent ($\pm 5\%$) of the values that prevailing during the test. The no-load test shall then be run according to the same procedure as for a regular test (see Section V, Paragraphs C through H).

If no changes are made in the piping circuit for different baseboard units, it may be convenient to run a series of no-load tests at different average water temperatures at the standard flow rate of five hundred pounds per hour (500 lb/hr) and to plot a curve of no-load heat input (wh_n) versus average water temperature (t_w) minus air temperature (t_a). If changes are made in the circuit, no-load tests must be run for each set-up.

VI. CALCULATIONS**A. WATER HEAT CAPACITY UNDER TEST CONDITIONS****1. Weight Method**

The water heat capacity of a tested baseboard unit under test conditions shall be determined by the formula:

$$H_w = \frac{W(t_1 - t_2)}{L_a} \times C_B$$

where:

- H_w = Water heat capacity for test conditions, Btuh per linear foot
- W = Rate of water flow, pounds per hour
- t_1 = Average entering water temperature, degrees F
- t_2 = Average leaving water temperature, degrees F
- L_a = Active length of baseboard unit, feet
- C_B = Correction factor for average observed test barometric pressure

2. Electrical Method

The water heat capacity of a tested baseboard unit under test conditions shall be determined by the formula:

$$H_w = \frac{3.412(wh_t - wh_n)}{L_a} \times C_B$$

where:

- H_w = Water heat capacity for test conditions, Btuh per linear foot
- 3.412 = Heat equivalent of one watt, Btu
- wh_t = Total watt hours per hour during test
- wh_n = Total watt hours per hour during no-load test
- L_a = Active length of baseboard unit, feet
- C_B = Correction factor for average observed test barometric pressure

TABLE C

HEATING CAPACITY CORRECTION FACTOR, C_B , FOR STATION PRESSURES OTHER THAN 29.92 in. Hg			
Station Pressure, P in. Hg	Ferrous Units	Copper Aluminum Units	Type R Cast-Iron Units
32.00	0.970	0.943	0.985
31.50	0.977	0.956	0.989
31.00	0.984	0.969	0.992
30.50	0.991	0.983	0.996
30.00	0.999	0.998	0.999
29.92	1.000	1.000	1.000
29.50	1.007	1.013	1.003
29.00	1.014	1.028	1.007
28.50	1.022	1.044	1.011
28.00	1.030	1.060	1.015
27.50	1.039	1.077	1.019
27.00	1.047	1.095	1.023
26.50	1.056	1.114	1.027
26.00	1.065	1.133	1.032
25.50	1.075	1.152	1.036
25.00	1.085	1.172	1.040

$$C_B = \left[\frac{29.921}{P} \right]^{.886} \quad \text{for copper-aluminum units}$$

$$C_B = \left[\frac{29.921}{P} \right]^{.454} \quad \text{for ferrous units}$$

$$C_B = \left[\frac{29.921}{P} \right]^{.219} \quad \text{for type R cast-iron units}$$

B. CORRECTION FOR STANDARD TEST CONDITIONS

1. Plot the four test points on rectangular coordinate paper on which the abscissa shows the difference between the average water temperature [$t_w = (t_1 + t_2) / 2$] and the average air temperature (t_a) and the ordinate shows the water heat capacity (H_w) in Btuh per linear foot of active length. Draw a smooth curve through the test points. The vertical distance from any point to the curve shall not be more than one and one-half percent (1.5%) greater or less than the value of the water heat capacity at that location on the curve. Any point which has a greater deviation than this shall be re-determined.
2. Add a scale of average water temperature to the abscissa by adding 65 to the values of ($t_w - t_a$) (see Figure 8). Water heat capacities for the tested unit for each average water temperature to be catalogued shall be determined from this performance curve.

3. The effect of the installation of any optional damper in the baseboard unit shall be determined by comparing the test capacity obtained when the damper was installed with the test capacity of the unit without the damper, at the same average water temperature, as determined by a separate concurrent test or from the performance curve determined concurrently. This shall be expressed to the nearest multiple of 0.03 above or below 1.00.

C. FACTORS FOR DETERMINING RATINGS AT FLOW RATES AND PRESSURE DROP VALUES OTHER THAN STANDARD

1. Ratings at rates of water flow other than standard conditions 500lb/hr and/or 2000 lb/hr shall be determined by applying the correction factor shown in Table D directly to the rating at standard conditions (500 lb/hr)
2. Pressure drop values for units consisting of a single unobstructed standard size commercial pipe or tube shall be taken from Table D.

TABLE D

Table of $C_w = \left[\frac{W}{500} \right]^{0.04}$ and Pressure Drop									
W Rate of Flow lb/hr	GPM	C_w Correction Factor	Pressure Drop – Milinches per Foot						
			Element Tube Size						
			Steel Pipe – I.P.S.			Copper Tube - Nominal			
			"	1"	1 1/2"	"	"	1"	1 1/2"
500	1.0	1.000	40	13	3	260	47	13	6
750	1.5	1.016	87	27	7	520	96	26	12
1000	2.0	1.028	148	45	12	850	157	43	20
1250	2.5	1.038	224	69	17	1270	230	63	28
1500	3.0	1.045	315	96	24	1730	320	87	39
1750	3.5	1.051	415	127	32	2290	420	114	50
2000	4.0	1.057	535	163	41	2880	525	145	63
2250	4.5	1.062	670	200	51	3600	650	178	77
2500	5.0	1.067	810	245	62	4300	775	216	93
3000	6.0	1.074	1120	340	88	5900	1060	290	124

VII. PRESSURE DROP TESTS

The pressure drop of baseboard units consisting of a single, smooth, unobstructed, standard size, commercial pipe or tube is considered to be the same as standard pipe or tube, (see Table D).

Baseboard units which, in the opinion of the Program Administrator, do not consist of a single, smooth, unobstructed, standard size, commercial pipe or tube, shall be tested at the I=B=R Laboratory and shown in literature as specified in this Section VII. The formulas for pressure drop of such units shall be obtained as described below and shall be shown in literature in place of the pressure drop values shown in Table D.

All pressure drop tests shall be run using connecting pipes of standard pipe or tube of the same size as the baseboard tapings or headers or special fittings. If headers or special fittings are specified, they shall be used. The size of the connecting pipes shall be shown on the curve sheet (Figure 11-A).

Figure 9 shows the suggested apparatus for making the tests. The piezometer rings shall be constructed as shown in figure 10 and shall be located in accordance with the dimensions shown in Figure 9. The manometer shall be accurate to within plus or minus 0.05 inches of water ($\pm 0.05''$).

Tests shall be run on a minimum of two lengths of baseboard: the shortest complete length to be catalogued, and a length not less than ten (10) feet. Additional lengths may also be tested. Tests of each length shall be run at not less than four (4) flow rates with water at room temperature. No flow rate shall be less than 500 lb/hr; at least one flow rate shall be sufficient to produce 1.00 inch of water pressure drop on the manometer. The pressure drop indicated by the manometer represents the pressure drop of the baseboard unit plus connecting pipes. The pressure drop of the connecting pipes, obtained from Table D shall be subtracted from the manometer reading to obtain the pressure drop of the baseboard unit.

Plot the results obtained on logarithmic coordinate paper (see Figure 11-A for an example) on which the abscissa shows the water flow rate in pounds per hour and the ordinate shows the pressure drop of the baseboard unit only in milinches of water. Draw a straight line through all the points. Any point inconsistent with the characteristic straight line shall be re-determined. The straight lines shall pass through the vertical 500 and 3000 pounds per hour lines.

At each flow rate for which factors are to be listed in literature, including the standard 500 pounds per hour flow rate, plot the pressure drop of the baseboard unit tested on square ruled graph paper, showing milinches of water as ordinate and feet of length as abscissa (see Figure 11-B for an example). The points to be plotted shall be taken from the logarithmic curve (see Figure 11-A). Draw a straight line through the points plotted for each flow rate, extending from the left margin (zero feet of length) through the maximum length of baseboard listed on the abscissa. The pressure drop for any single assembled baseboard unit length may be read directly from these curves. To obtain a formula for pressure drop based on flow rate and length in feet:

- a. For each flow rate, find the milinch pressure drop at zero feet of length. This represents entrance and exit loss for an assembled unit of any length at that flow rate.
- b. For that flow rate, find the milinch pressure drop for the greatest length tested.
- c. Determine the unit pressure drop per linear foot, exclusive of entrance and exit losses, by subtracting (a) from (b) and dividing by the length used in (b).
- d. At each flow rate, the formula for obtaining pressure drop of an assembled length of baseboard unit will be: Pressure Drop, milinches = (a) + [(c) x length of baseboard, ft.]

EXAMPLE: (see 500 lb/hr line, Figure 11-B.)

Step 1 – Entrance and exit loss (a) = 45 milinches at 500 lb/hr flow rate

Step 2 – Pressure drop per foot, exclusive of entrance and exit losses, = (200 – 45) divided by 12' = 13

Step 3 – Baseboard pressure drop in milinches for any assembled length at 500 lb/hr flow rate = 45 + [13 x ft. of length].

VIII. SOURCES OF ERROR IN HOT WATER BASEBOARD UNIT TESTING

A. THE MAJOR SOURCES OF ERROR ARE AS FOLLOWS:

1. Incomplete venting of baseboard unit and supply piping.
2. Excessive air currents inside test room or booth due to disturbances
3. Wet or insufficient insulation on piping
4. Incorrect calibration of thermometers, scales, flow meter, watt-hour meter, or other electrical instruments used.
5. Starting test before equilibrium is obtained
6. Inaccurate water temperature readings due to stratification, accumulation of air at thermometer bulbs, or sensitive end of thermometer touching inside surface of pipe.
7. Inaccurate air temperature readings due to improper shielding.
8. Failure to take adequate precaution to prevent steaming of the water either in the system (electrical or weight method) or as discharged into the weighing container (weight method).

SUGGESTED METHODS FOR TESTING WATER HEAT CAPACITY OF BASEBOARD UNITS

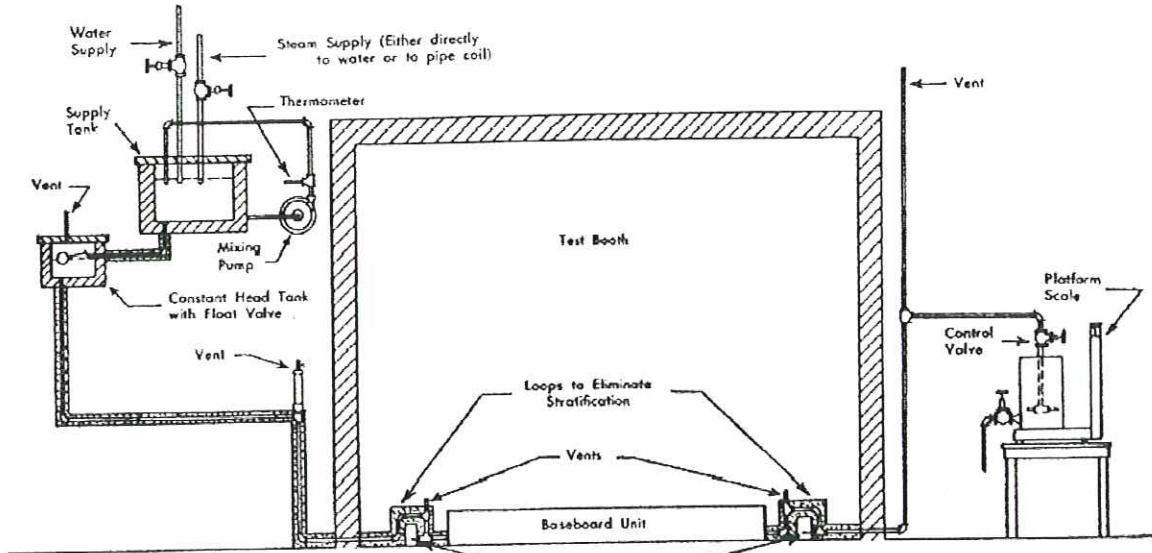
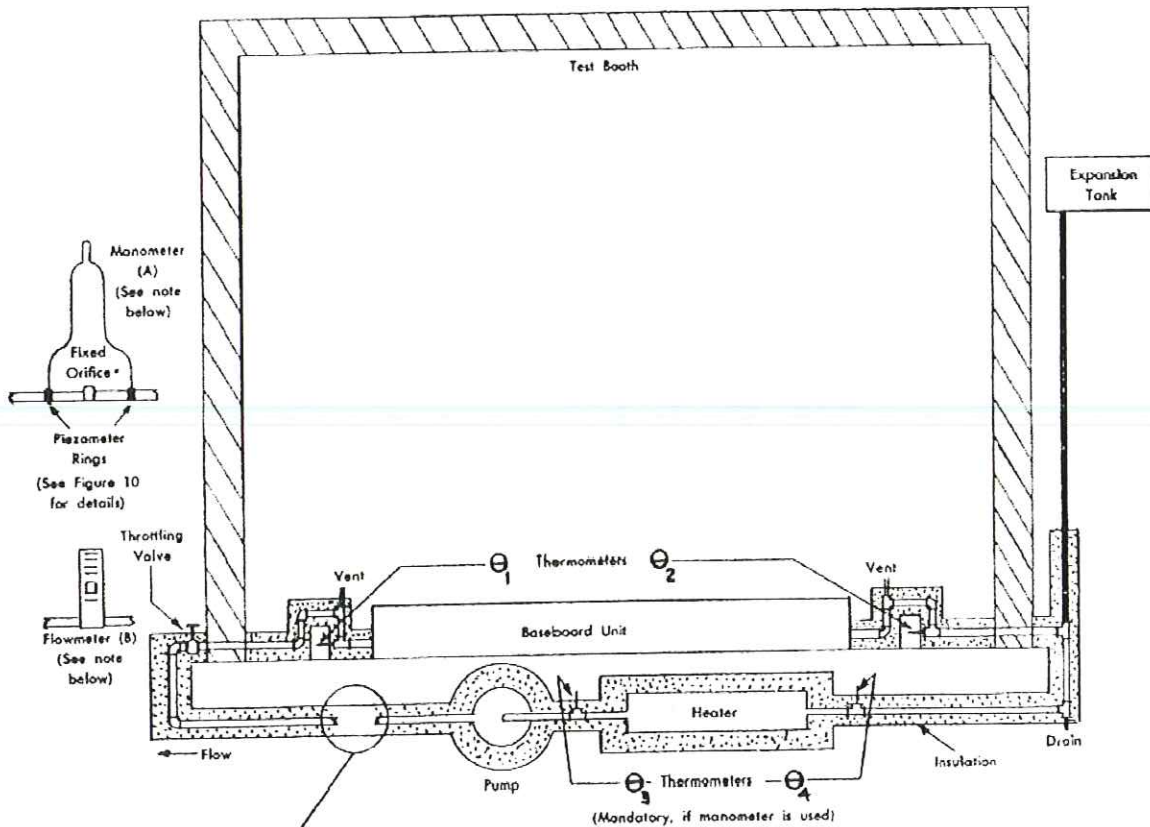


Figure 5-A (Weight Method)



NOTE: Install suitable flow measuring device, as suggested by Manometer (A) or Flow Meter (B) above, at any convenient point in the system.

*Fixed Orifice: A device to produce a pressure drop indication on the Manometer. May be drilled steel plate inserted in a pipe union. 3/16" diameter suggested.

Figure 5-B (Electrical Method)

WIRING DIAGRAM (Electrical Method)

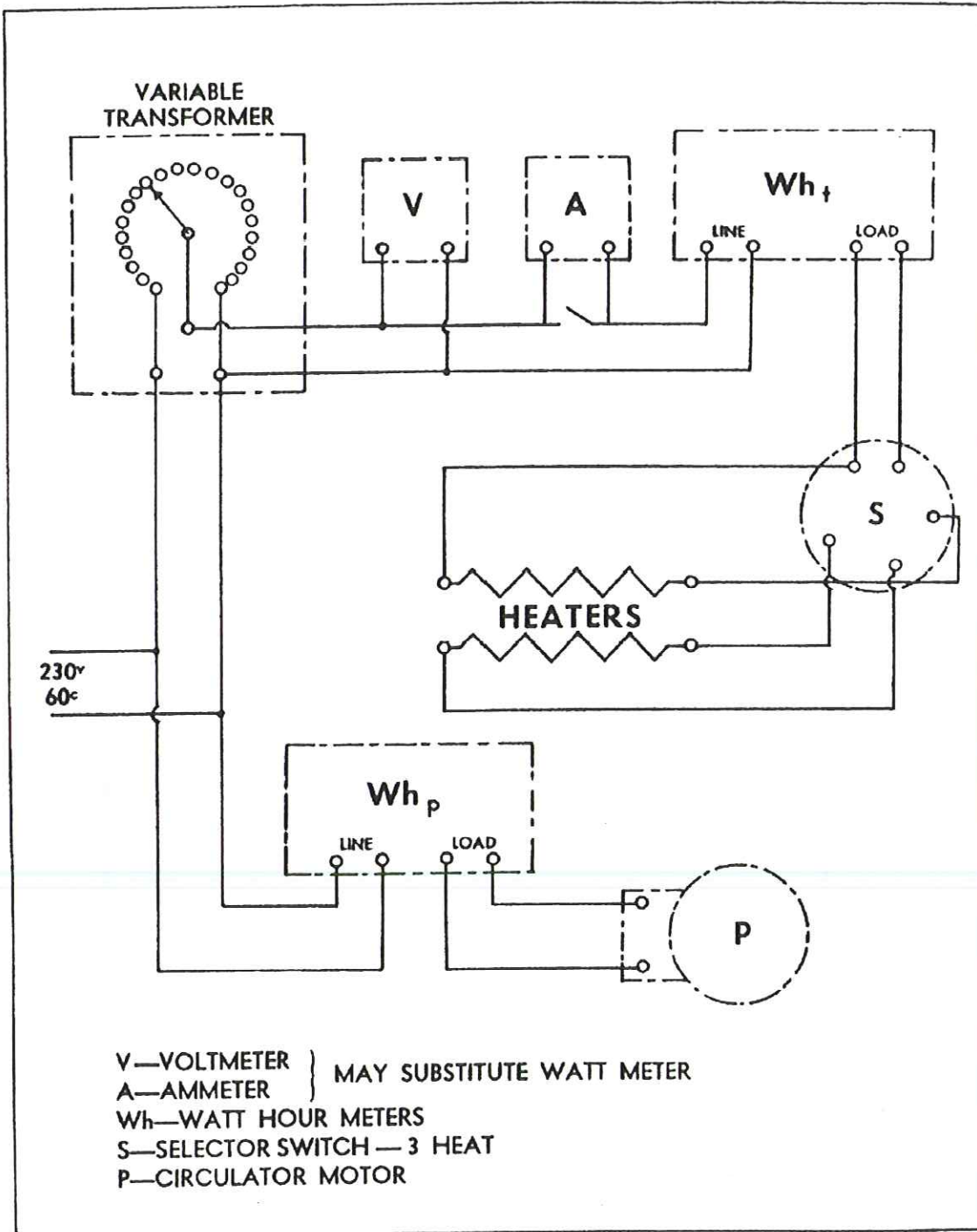
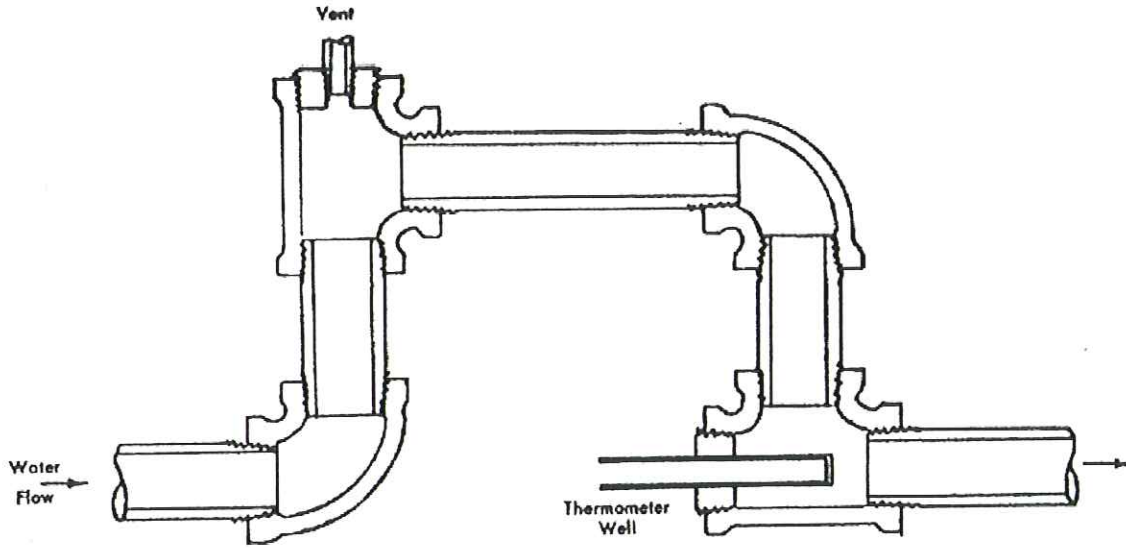


Figure 6

SUGGESTED METHODS FOR ASSURING THOROUGH MIXING

Alternate "A"



Alternate "B"

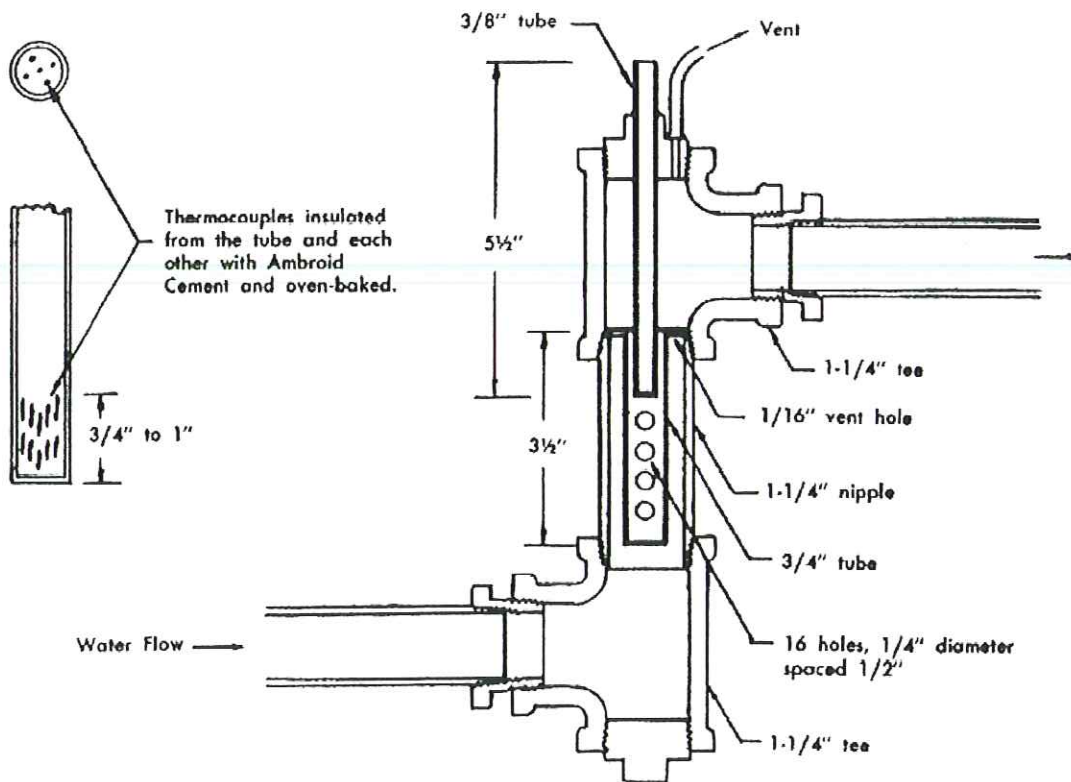


Figure 7

WATER HEAT CAPACITY CURVE

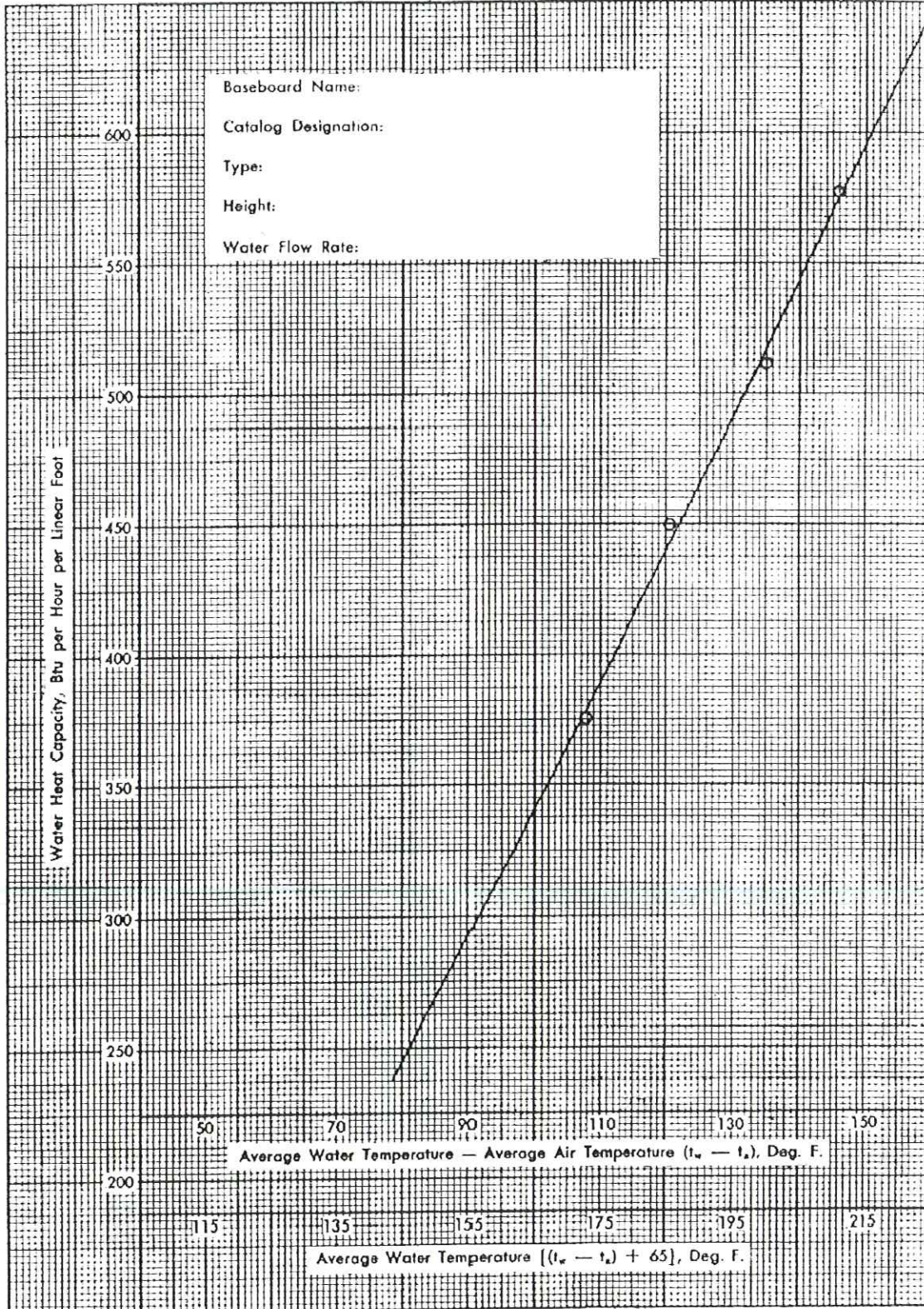


Figure 8

SUGGESTED METHOD FOR TESTING FRICTION THROUGH BASEBOARD UNITS

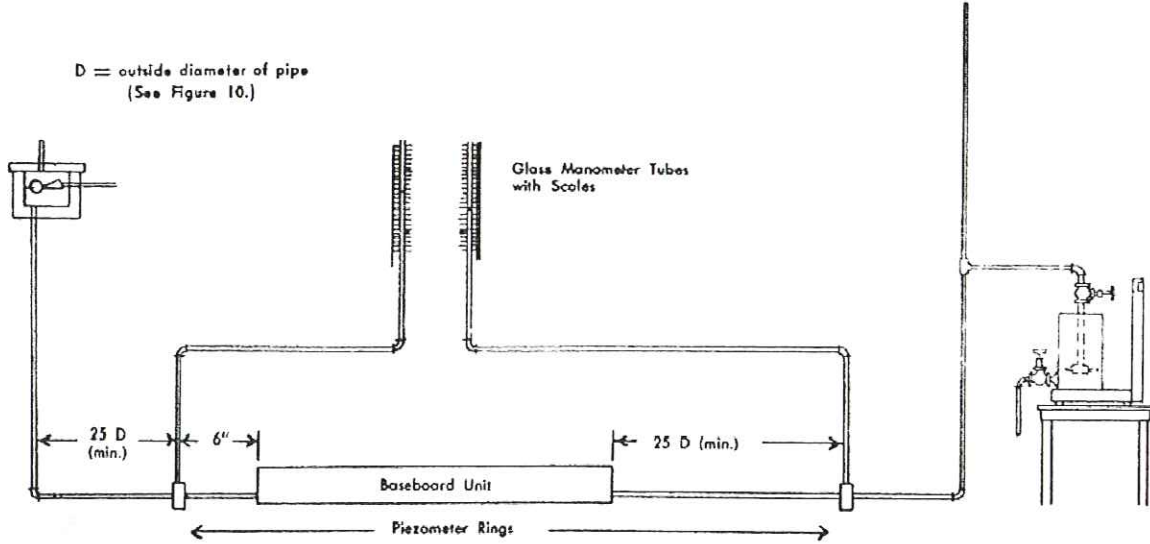


Figure 9

PIEZOMETER RING DETAIL

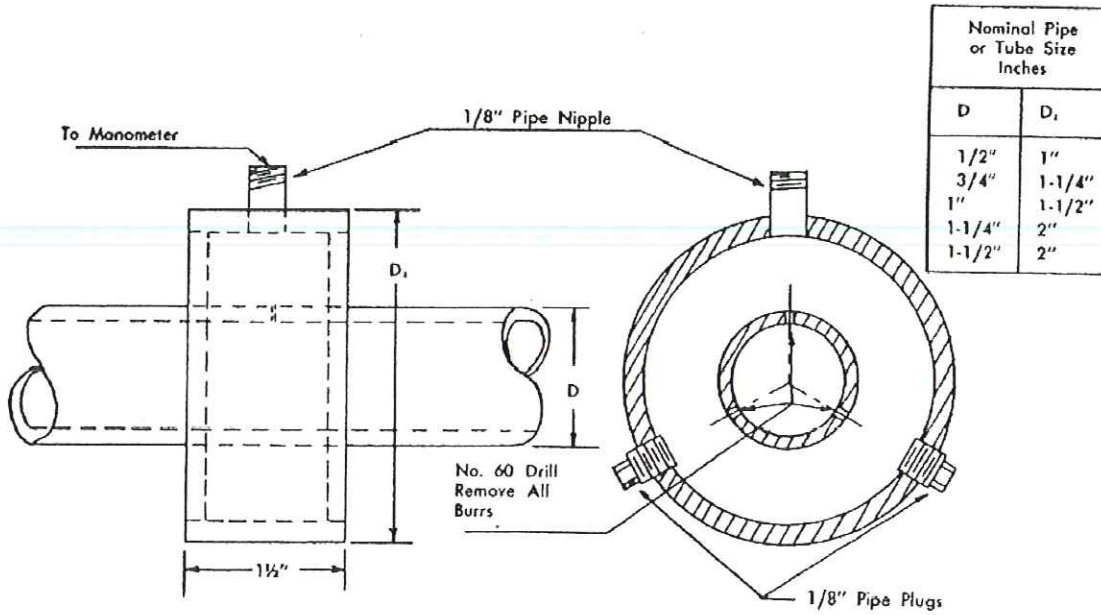


Figure 10

PRESSURE DROP vs. FLOW RATE FOR TESTED LENGTHS

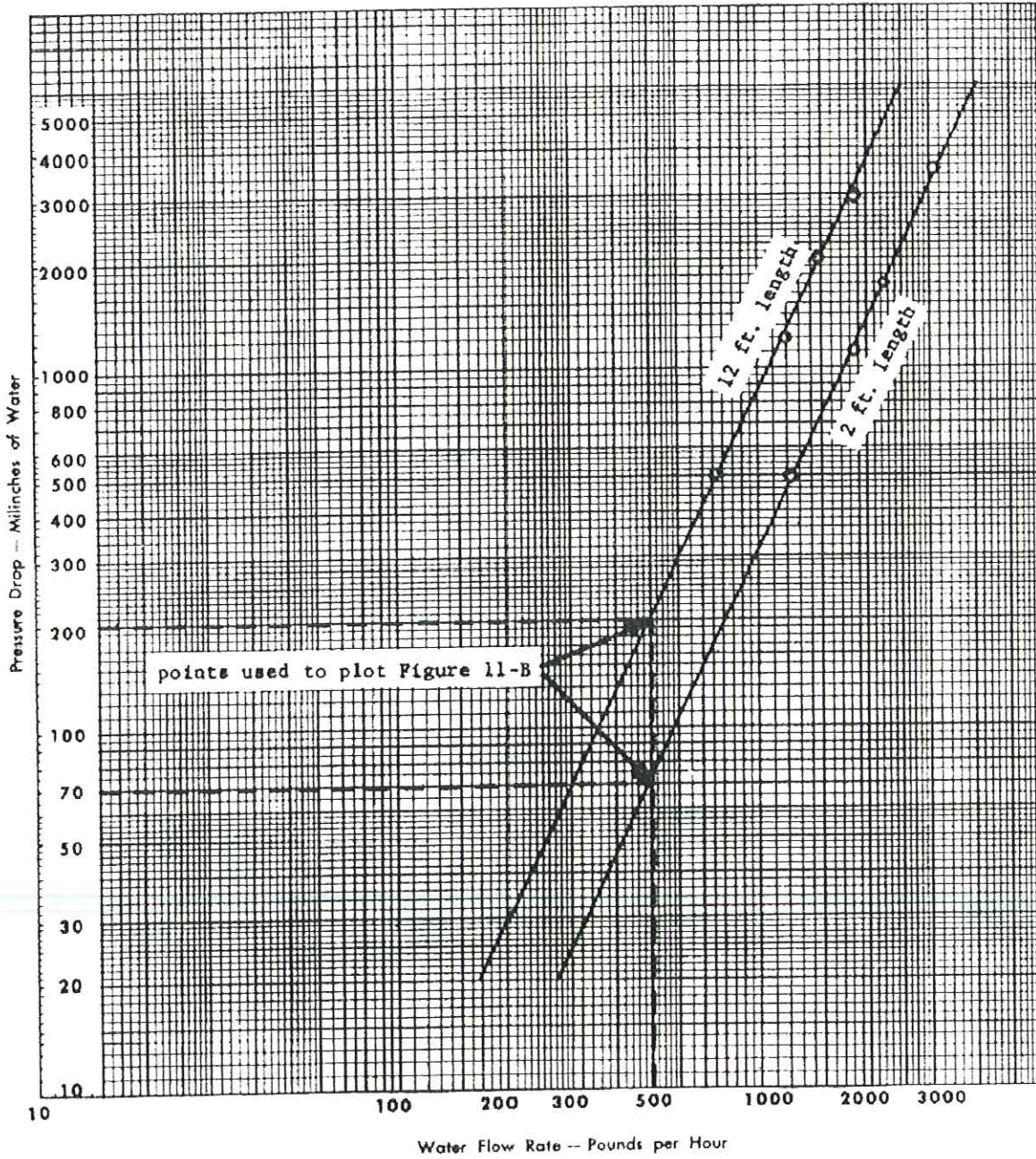


Figure 11-A

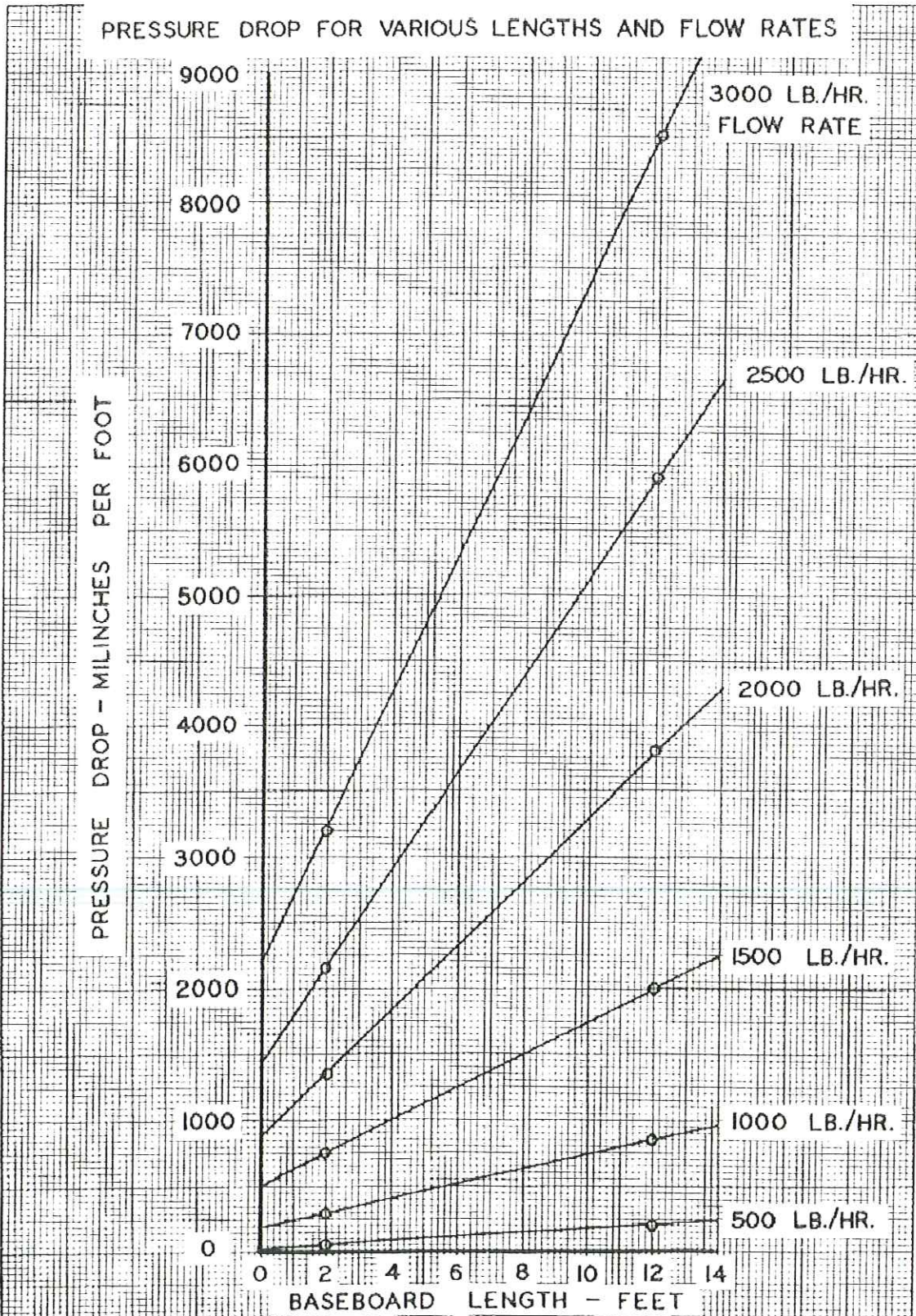


FIGURE 11-B

HYDRONICS INSTITUTE DIVISION OF GAMA

BASEBOARD RADIATION LOG SHEET - WATER (ELECTRICAL METHOD)

Manufacturer		Observer		Test No.															
Type of Test Room		Is Auxiliary Cooling Used?		Date of Test															
Baseboard Description		Active Length		Barometer															
		Feet		Temperature, Deg. F															
Time	Δp inches of Water	Electrical Input				Inlet Air, 3" Above Floor - 18" to Front			Outside Booth or Cold Room			Center of Room or Booth							
		Wh, watt hrs.	ΔWh, watt hrs.	Wh, watt hrs.	ΔWh, watt hrs.	Wh, watt hrs.	ΔWh, watt hrs.	Wh, watt hrs.	Wh, watt hrs.	A L5	B L1	C L3	D L2	E L4	I 3" Above Floor	L6	L8	L9	F 3" Below Ceiling
EQUILIBRIUM PERIOD																			
BAROMETER																			
TEST PERIOD																			
BAROMETER																			
TOTAL																			
GRAND TOTAL																			

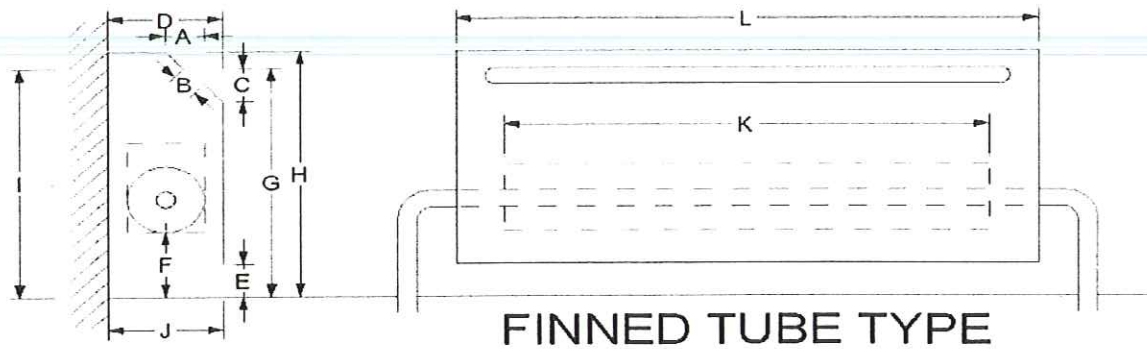
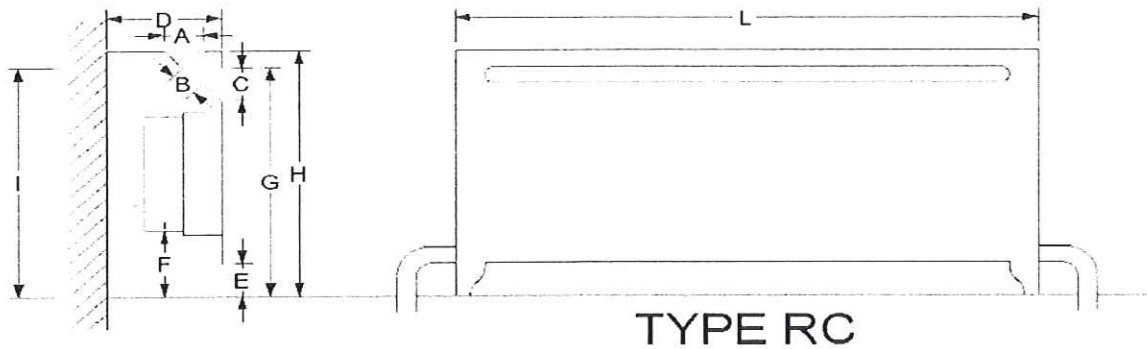
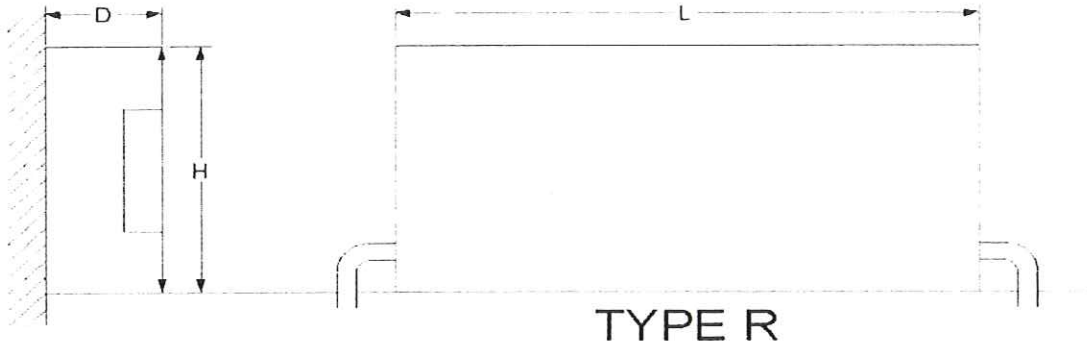
HYDRONICS INSTITUTE DIVISION OF GAMA

DIMENSIONAL DATA SHEET

BASEBOARD NAME:

CATALOG DESIGNATION:

TYPE (R, RC, Finned Tube):



MANUFACTURER:

BY:

TITLE:

DATE:

BASEBOARD RADIATION TEST REPORT (Steam)

Baseboard Name: _____ Catalog Designation: _____

Type (R, RC, Finned Tube) _____ Type of Test Room: Warm Wall Booth

1.	Test No.				
2.	Tested Height	In.			
3.	Tested Active Length of Baseboard	Ft.			
4.	Total Length of Tested Unit	Ft.			
5.	Barometric pressure	In. hg. or Lb/Sq. In.			
6.	Steam Supply Temperature (t _R)	°F			
7.	Absolute Steam Pressure	In. hg. or Lb/Sq. In.			
8.	Saturated Steam Temperature corresponding to Pressure (t _R)	°F			
9.	Superheat (Item 6 – Item 8)	°F			
10.	Average Air Temperature (t _a)	°F			
11.	Steam Temperature – Average Air Temperature (Item 8 – Item 10)	°F			
12.	Duration of Test	Hr.			
13.	Total Weight of Condensate during Test	Lb.			
14.	Gross Condensation Rate (Item 13 ÷ Item 12)	Lb/Hr.			
15.	No Load Correction	Lb/Hr.			
16.	Net Condensation Rate (Item 14 – Item 15)	Lb/Hr.			
17.	Latent Heat of Steam (h _{fg})	Btu/Lb.			
18.	Condensation Capacity of Test Conditions <u>Item 17 x Item 16</u> Item 3	Btu/Lb.			
19.	Correction Factor for Steam and Air Temperature (Section V, Paragraph B 1, PART TWO of I=B=R Baseboard Code)	C S			
20.	Correction Factor for Barometric Pressure (Section V, Paragraph B2, PART TWO of I=B=R Baseboard Code)	C B			
21.	Condensation Capacity for Standard Test Conditions (Section V, Paragraph C, PART TWO of I=B=R Baseboard Code)	Btu/Hr./Linear Ft.			
22.	Condensation Capacity for Standard Test Conditions (Item 19 ÷ 240)	Sq. Ft. of Steam/Linear Ft.			

Remarks: _____

MANUFACTURER _____

By: _____ Title: _____

Date: _____

BASEBOARD RADIATION TEST REPORT – WATER (Weight Method)

Baseboard Name:

Catalog Designation:

Type (R, RC, Finned Tube):

Type of Test Room:

1. Test No.				
2. Tested height	In.			
3. Tested Active Length of Baseboard	Ft.			
4. Total Length of Tested Unit	Ft.			
5. Average entering water temperature (t ₁)	°F			
6. Average leaving water temperature (t ₂)	°F			
7. Average water temperature (Item 5 = Item 6 ÷ 2)	°F			
8. Water Temperature Drop (Item 5 – Item 6)	°F			
9. Average inlet air temperature, (t _a)	°F			
10. Average water temperature minus inlet air temperature (Item 7 – Item 9)	°F			
11. Duration of Test	Min.			
12. Water Flow during test	Lb.			
13. Water Flow Rate [(Item 12 x 60) ÷ Item 11]	Lb. per hr.			
14. Correction for Barometric Pressure	C _B			
15. Water Heat Capacity under Test Conditions (H _w) (Item 13 x Item 8 x Item 14 ÷ Item 3)	Btu/hr/lin. ft.			

NOTE: Item 15 and Item 10 are used to plot the performance curve referred to in PART THREE, Section VI, Paragraph B. This curve should be attached to this Form.

REMARKS:

MANUFACTURER

By:

Title:

Date:

BASEBOARD RADIATION TEST REPORT – WATER (Electrical method)

Baseboard Name: _____ Catalog Designation: _____

Type (R, RC, Finned Tube): _____ Type of Test Room: _____

1. Test No.				
2. Tested height	In.			
3. Tested Active Length of Baseboard	Ft.			
4. Total Length of Tested Unit	Ft.			
5. Average entering water temperature (t ₁)	°F			
6. Average leaving water temperature (t ₂)	°F			
7. Average water temperature (Item 5 = Item 6 ÷ 2)	°F			
8. Water Temperature Drop (Item 5 – Item 6)	°F			
9. Average inlet air temperature, (t _R)	°F			
10. Average water temperature minus inlet air temperature (Item 7 – Item 9)	°F			
11. Duration of Test	Hr.			
12. Total Watt Hours during Test	Watt Hr.			
13. Total Watt Hours per hour (wh ₁) (Item 12 ÷ Item 11)	Watt Hr. per hr.			
14. Total Watt Hours per hour during no-load test (wh ₂)	Watt Hr. per hr.			
15. Correction Factor for Barometric Pressure	C _B			
16. Water Heat Capacity under Test Conditions [3.412 x Item 15 x (Item 13 – Item 14) ÷ Item 3]	Btu/hr/lin. ft.			
17. Water Flow Rate [3.412 x (Item 13 – Item 14) ÷ Item 8]	Lb/hr.			

NOTE: Item 16 and Item 10 are used to plot the performance curve referred to in PART THREE, Section VI, Paragraph B. This curve should be attached to this Form.

REMARKS:

MANUFACTURER

By: _____ Title: _____

Date: _____

BASEBOARD RADIATION LOG AND TEST REPORT – PRESSURE DROP

Baseboard Name:	Catalog Designation:
Type (R, RC, Finned Tube):	Type of Test Room:

Note: Pressure Drop Tests are not required for baseboards having water passages consisting of a single, unobstructed standard size, commercial pipe or tubing.

1. Test No.					
2. Date of Test					
3. Total Length of Tested Unit	Ft. and In.				
4. Time at start of Test	Min.				
5. Time at end of Test	Min.				
6. Duration of Test	Min.				
7. Gross weight of water and container at end of Test	Lb.				
8. Weight of empty container, Tare	Lb.				
9. Net weight of water (Item 7 – Item 8)	Lb.				
10. Water Flow Rate (Item 9 x 60 ÷ 6)	Lb./hr.				
11. Pressure drop (pp) Milinches of H ₂ O per tested length					
	Avg.				

NOTE: Item 11 and Item 10 are used to plot the performance curve referred to in PART THREE, Section VII, of the I=B=R Baseboard Standard. This curve should be attached to this form, and are to be published in our catalog.

12. The following pressure drops are taken from the above curve and the formula in PART THREE, Section VII of the I=B=R Baseboard Standard and are to be published in our catalog.

500 lb/hr Water Flow Rate

Catalogued Lengths								
Pressure Drop, milinches of H ₂ O								
Size of Connecting Pipe Used, inches								

Additional Water Flow, 2000 lb/hr

Catalogued Lengths								
Pressure Drop, milinches of H ₂ O								
Size of Connecting Pipe Used, inches								

REMARKS:

MANUFACTURER

By: _____ Title: _____

Date: _____

REQUEST FOR APPROVAL OF I=B=R BASEBOARD RATINGS (MANUFACTURER)							
Baseboard Name:			Catalog Designation:				
Type (R, RC, Finned Tube):			Height:				
Tube Material:		Tube Size:	Number of Fins per foot:				
Fin Material:		Fin Size: Height	Width:	Thickness:			
Physical Dimensions shown on Forms 210 and 211, dated:							
Test results shown on Form 220, dated:			Form 221 or 222, dated:				
Requested Ratings must be to nearest .05 sq. ft./lin. ft. and nearest 10 Btu/Hr/Linear Ft.							
1. Catalog Ratings, Steam (not to exceed maximum rating shown on Form 260)			Btu/Hr/Linear Ft.				
2. Percentage Added to Capacity to determine Catalog Rating			%				
3. Catalog Rating, Steam (Item 1 + 240)			Sq. Ft. of Steam/Linear Ft.				
1. Catalog Rating, Water (not to exceed maximum rating shown on Form 260)			Btu/Hr. Linear Ft.		Water Flow Rate, Lb/Hr		
List only those ratings at the water flow rates and average water temperatures to be included in your literature					Standard	*	
					500	2000	
			at	150	average	water	temperature
			"	155	"	"	"
			"	160	"	"	"
			"	165	"	"	"
			"	170	"	"	"
			"	175	"	"	"
			"	180	"	"	"
			"	185	"	"	"
			"	190	"	"	"
			"	195	"	"	"
			"	200	"	"	"
			"	205	"	"	"
			"	210	"	"	"
			"	215	"	"	"
			"	220	"	"	"
			"	225	"	"	"
			"	230	"	"	"
			"	235	"	"	"
			"	240	"	"	"
Optional Damper – Rating Factor							
* Fill in this column only if you desire approval of I=B=R Ratings for water flow of 2000 lb/hr and intend to show such ratings in your catalog.							
MANUFACTURER _____							
By _____		Title: _____		Date: _____			
DO NOT WRITE IN SPACE BELOW							
Approval of the above data as I=B=R Ratings and Catalog Data is hereby given for the unit specifically described above. See PART ONE, Section IV, of the I=B=R Baseboard Code for "Minimum Data Required in Literature Listing I=B=R Ratings". Copy of literature, and subsequent editions, must be submitted to the Institute office as soon as available.							
Hydronics Institute Division of GAMA _____			President				
Date Approved: _____							

REQUEST FOR APPROVAL OF I=B=R BASEBOARD RATINGS (PURCHASER)

Baseboard Name: _____ Catalog Designation: _____

Type (R, RC, Finned Tube): _____ Height: _____

Tube Material: _____ Tube Size: _____ Number of Fins per Foot: _____

Fin Material: _____ Fine Size: _____ Height: _____ Width: _____ Thickness: _____

Attachments: Forms 210 and 211, dated: _____ Form 241, dated: _____

Catalog Rating, Steam: _____ Btu/Hr/Linear Ft. _____ Sq. Ft. of Steam/Linear Ft. _____

Percentage Added to Capacity to determine Catalog Rating _____

Catalog Rating, Water – Btu/Hr/Linear Ft.

Average Water Temperature	Water Flow Rate Lb/Hr		Average Water Temperature	Water Flow Rate Lb/Hr	
	Standard 500	* 2000		Standard 500	* 2000
150			200		
155			205		
160			210		
165			215		
170			220		
175			225		
180			230		
185			235		
190			240		
195					

NOTE: List only those ratings at the Average Water Temperatures which will be included in your literature.

* If approved for License.

The above ratings are identical to those approved for the undersigned Licensee for

Baseboard Name: _____ Catalog Designation: _____

Physical dimensions shown on Forms 210 and 211, dated: _____

Test Results on Form 220, dated: _____ Form 221 or 222 dated: _____

Form 230 approved for Licensee on (date) _____

Name of LICENSEE _____

By _____ Title: _____ Date: _____

PURCHASER: _____

DO NOT WRITE IN SPACE BELOW

Approval of the above data as I=B=R Ratings and Catalog Data is hereby given. See PART ONE, Section IV, of the I=B=R Baseboard Standard for "Minimum Data Required in Literature Listing I=B=R Ratings". Copy of literature, and subsequent editions, must be submitted to the Institute office as soon as available.

Hydronics Institute Division of GAMA _____
 President

Date Approved: _____

CERTIFICATION BY LICENSEE AND PURCHASER OF IDENTICAL BASEBOARD UNIT

_____ (Licensee-Manufacturer) (hereinafter referred to as the "Licensee"), a Licensee under the I=B=R Testing and Rating Standard for Baseboard type of Radiation (hereinafter referred to as the Standard,) and _____ (Purchaser,) (hereinafter referred to as the "Purchaser",) hereby certify that the items to be resold by the Purchaser under its trade name and as listed on the enclosed Form 240 are identical in every respect with the products manufactured by the Licensee, listed below, that were tested and approved under the Standard.

Trade Name and Designation of Product of Licensee on which Rating was issued

Trade Name and Designation under which Purchaser will resell item

The Purchaser hereby agrees to use the I=B=R Ratings and I=B=R Emblem that the Licensee has been authorized to use with the above products only on the terms and conditions set forth in the Standard and in the License granted to the Licensee.

Forms 210, 211, and 240 for each of the above items are included in the original Test Reports sent to the Licensee.

The Purchaser agrees (i) that five copies of the Purchaser's literature showing approved I=B=R Ratings and the catalog data prescribed in Section IV of PART ONE of the Standard, and of the Purchaser's published installation instructions will be filed with GAMA Certification Services, and with the Licensee as soon as possible after approval of the ratings, and (ii) that two copies of all future editions of such literature and instructions will be filed with GAMA Certification Services, and with the Licensee, from time to time as soon as possible after issuance.

The Licensee agrees to use its best efforts to see that the Purchaser does not use I=B=R Ratings or the I=B=R Emblem, except in strict accordance with the provisions of the License and the Standard.

(Name and address of Licensee-Manufacturer)

By _____ Title _____ Date _____

(Name and address of Purchaser)

By _____ Title _____ Date _____

REQUEST FOR RATING TEST – BASEBOARD RADIATION

Baseboard Name:

Catalog Designation:

It is hereby requested that rating tests be conducted at the I=B=R Laboratory for the purpose of determining I=B=R Ratings on the above unit, as follows: (check applicable items.)

___ Steam Rating, Btu/Hr/Linear Ft.

___ Steam Rating, Sq. Ft. of Steam/Linear Ft.

___ Hot Water ratings at the following average water temperatures and standard water flow rate of 500 lb/hr, Btu/Hr/Linear Ft. (NOTE: Cross out those which you do not want.)

150	170	190	210	230
155	175	195	215	235
160	180	200	220	240
165	185	205	225	

___ Hot Water ratings at the above average water temperatures and the additional water flow rate of 2000 lb/hr, Btu/Hr/Linear Ft.

It is also requested that: (check, if desired)

___ One additional test be conducted as prescribed in the Code to determine the effect of the installation of the optional damper on the rating of the unit.

Name of witness: _____

___ (The Institute office will advise the witness when the test will be conducted.)

ATTACHMENTS: Attached hereto are signed copies of the following:

1. Dimensional Data (Form 210/211), dated _____
2. Element drawing showing complete details of fin thickness, fin size, fin spacing, tube size, tube thickness, method of bond, and external finish of element (painted, color of paint, unpainted, other finish,) dated (or DWG No.) _____
3. Cross-sectional drawing, at least half-scale, completely dimensioned, showing heating element in its enclosure, including the method of support or hanging, dated (or DWG No.) _____
4. Recommended methods of installation, dated _____

SHIPMENT: An eight-foot unit, complete with all necessary parts, and completely identified on the outside of the shipping container, will be shipped, freight prepaid, to the I=B=R Laboratory, 35 Russo Place, Berkeley Heights, New Jersey 07922.

CERTIFICATION: We hereby certify that the unit to be shipped to the I=B=R Laboratory is: (check one) _____ a current production unit; _____ identical to the unit as it is to be produced.

We hereby agree to be bound by the provisions of the I=B=R Testing and Rating Standard and further agree that no representation will be made that the above unit has been tested at the I=B=R Laboratory or tested in conformance with the procedures outlined in the Standard, unless and until (1) written authorization is received from the Institute, and (2) a valid License is in effect covering such unit.

MANUFACTURER _____

By: _____ Title: _____

Date: _____

I=B=R LABORATORY REPORT – BASEBOARD RADIATION

Manufacturer:

Test Number:

Baseboard Name:

Catalog Designation:

As requested on Form 250, dated _____ we have conducted the tests required under the I=B=R Code on a unit supplied by and identified by the manufacturer as being of the above catalog designation and have determined the maximum ratings that may be requested by the manufacturer. (These ratings include 15% addition to the test capacity and have been adjusted to the nearest .05 sq. ft. per linear foot (steam) and to the nearest 10 Btu per linear foot (steam and water.)

MAXIMUM RATINGS

STEAM, Btu/Hr/Linear Ft.						
Sq. Ft. of Steam/Linear Ft.						
WATER, Btu/Hr/Linear					500 lb/hr	2000 lb/hr
at	150	average	water	temperature		
"	155	"	"	"		
"	160	"	"	"		
"	165	"	"	"		
"	170	"	"	"		
"	175	"	"	"		
"	180	"	"	"		
"	185	"	"	"		
"	190	"	"	"		
"	195	"	"	"		
"	200	"	"	"		
"	205	"	"	"		
"	210	"	"	"		
"	215	"	"	"		
"	220	"	"	"		
"	225	"	"	"		
"	230	"	"	"		
"	235	"	"	"		
"	240	"	"	"		
Optional Damper – Rating Factor						

Date: _____ by _____ Title: _____

IMPORTANT NOTE: This Form may not be reproduced in any way and does NOT constitute approval or issuance of I=B=R Ratings. No representations may be made that the above unit has been tested in the I=B=R Laboratory or tested in conformance with the procedures outlined in the I=B=R Testing and Rating Code for Baseboard Radiation or that the above ratings are I=B=R Ratings unless and until (1) written authorization is received from the Institute and (2) a valid License is in effect covering such unit.



GAMA – An Association of Appliance & Equipment Manufacturers
 35 Russo Place • P.O. Box 218 • Berkeley Heights, New Jersey 07922
 908-464-8200; FAX: 908-464-7818
 www.gamanet.org • certification@gamanet.org

Form DR Rev04.04



CERTIFICATION SERVICES

REPRESENTATIVE ASSIGNMENT FORM

Designated Representative	Alternate Representative	Payment Contact
Name	Name	Name
Title	Title	Title
Company	Company	Company
Street Address	Street Address	Street Address
City, State, Zip	City, State, Zip	City, State, Zip
Country	Country	Country
Telephone Number	Telephone Number	Telephone Number
Fax Number	Fax Number	Fax Number
E-Mail Address	E-Mail Address	E-Mail Address

Please identify products and locations from which testing selections should occur:

Please identify any companies or private branders associated with these products:

Certification communication and invoices shall be addressed to the Designated Representative, or if unavailable, the Alternate, named above. GAMA shall contact the Payment Contact for questions regarding the status of payment of certification program fees. This authorization revokes and cancels all other previous authorizations.

 Signature (Designated Representative)

 Date

Return to GAMA Headquarters: 2107 Wilson Boulevard • Suite 600 • Arlington, VA 22201; FAX: 703-525-6790; email: accounting@gamanet.org

INTERNAL USE ONLY: [] CFO → [] Billing → [] Stats → [] Cert Mgr → [] Cert Admin



**BASEBOARD RADIATION LICENSE AGREEMENT FOR
MANUFACTURERS OR RESELLERS**

This Agreement is made this _____ day of _____, 200__, by and between Gas Appliance Manufacturers Association, Inc. (GAMA) a not-for-profit corporation incorporated in the State of Illinois, having its principal office at 2107 Wilson Boulevard, Suite 600, Arlington, Virginia, 22201, hereinafter called "Licensor" and

_____ having its principal offices in the City of _____, hereinafter called "Licensee".

WHEREAS Licensor has recognized the latest edition of the Testing and Rating Standard for Baseboard Radiation, hereinafter referred to as "Test Standard"; and

WHEREAS Licensor sponsors an energy efficiency certification program for baseboard under the name of "I=B=R Certification Program", hereinafter referred to as "Program", based on the use of the Test Standard as the measure of output ratings (Btuh/ft active length) by the residential baseboard industry; and

WHEREAS, to promote public confidence in these ratings, the Program provides for certification by Licensee and verification by Licensor of stated output ratings of residential baseboard with said Test Standard, through 1) the performance of independent verification tests each year on a portion of Licensee's models as set forth in 3.3 of the Test Standard and 2) inclusion of Licensee's models and in a Directory to be published by Licensor; and

WHEREAS the I=B=R Laboratory shall act as the designated laboratory of said Program (hereafter referred to as "Laboratory") and, pursuant to the guidelines set out in the Test Standard for participants, is responsible for scheduling, conducting, and monitoring verification tests, and carrying out such other duties as are usually incident to such administration; and

WHEREAS Licensee is willing to participate in said Program;

NOW, THEREFORE, it is agreed by and between the parties hereto as follows:

LICENSEE:

A-1. Shall, upon the signing of the Agreement, designate on the Representative Assignment Form and file with GAMA the Designated Representative who will be the Licensee's official Program contact person(s) to receive all notices and communications and who is authorized to file the Certification Affidavit as required in 2.2.4 of the Test Standard. A Licensee who is a private labeler, and whose suppliers are Licensees in the Program who have provided certification affidavits via CAFS for the private labeler's models, need not submit certification affidavits, but if any of such private labeler's suppliers are not licensees under the Program, private labeler must provide certification affidavits via CAFS for those models.

A-2. Shall supply to GAMA Certification Services, at such times as shall be specified by the Laboratory, information on all models sufficient to enable GAMA Certification Services and the Laboratory to facilitate the setting of testing priorities for each Licensee.

A-3 (a) Shall aid GAMA Certification Services in acquiring the data listed in 2.2.6 of the Test Standard to allow publication in a Directory of data respecting all of Licensee's submitted models manufactured by or for Licensee or which it manufactures for a private labeler, which are in

manufacturer's stock or distribution system under its control or are manufactured on or after the date this Licensing Agreement is executed by Licensee.

(b) Shall, for all submitted products, certify to GAMA Certification Services the ratings to be certified using the procedures set forth in 2.2 of the Test Standard.

(c) Shall have the option, if agreed to by private labeler, of submitting the ratings of private brand models manufactured by Licensee for sale to, and distribution by, a reseller who is a separate legal entity unrelated to Licensee. However, if a private brand is to be certified, with either the manufacturer or the reseller as the Licensee, the ratings of all models of that brand within the scope of this Program must be certified and included in the Program as required in 2.1.3.2 and 2.1.3.3 of the Test Standard.

A-4. Shall be subject to, or may invoke, the complaint test procedure provided for in 3.5 of the Test Standard if a Licensee believes the certified ratings of another Licensee's models to be misstated.

A-5. Shall allow GAMA Certification Services and the Laboratory to have such access to its production lines, warehouses and other facilities and provide such other assistance as may be necessary to promptly obtain such models as are needed in performing the testing at the Laboratory's facilities or other obligations under the Program, and shall instruct the Laboratory as to the disposition of units tested as provided for in 3.2.2 of the Test Standard.

A-6. Shall provide units selected for test at no charge. The costs of selecting, shipping and handling units to and from the Laboratory and testing generally shall be paid by the Licensee.

A-7. Shall not make public any test reports, other than the ratings verified under this Program, which Licensee receives from GAMA Certification Services under this Program.

A-8. Shall accept the Laboratory's determination as to the accuracy of the ratings of Licensee's models, which shall be made in accordance with all provisions of Test Standard and this License Agreement.

A-9. Shall agree to be governed by the enforcement provisions set out in Section 4 of the Test Standard.

A-10. Shall not, after termination of this Agreement, affix or authorize to be affixed an I=B=R Certification Symbol, hereinafter referred to as "Seal", to any units within the scope of this Program that are manufactured thereafter by or for Licensee and shall not make or authorize further reference in Licensee's product literature or advertising materials to Licensee's participation in, or ratings pursuant to, Licensor's certification program or Seal.

A-11. Shall use the I=B=R ratings and appropriate Seal only as specified herein or in 1.3.2 of the Test Standard. If any provision of this License or Test Standard is not adhered to by the Licensee, this License may be cancelled or terminated by the Licensor as applied to all residential baseboard sold by said Licensee and all I=B=R ratings will be withdrawn as follows:

(a) The President of Licensor shall send a notice to the Licensee, by certified mail, specifying the violation in reasonable detail and stating that this License will terminate and all I=B=R ratings will be withdrawn on a date to be specified in such notice which shall be not less than thirty (30) days from the date thereof, unless the Licensee takes the action provided for in subparagraph (b) below.

(b) This License will terminate and all I=B=R ratings will be withdrawn on the date specified in the above-mentioned notice unless, prior to such date, the Licensee ceases the violation specified in such notice, takes all reasonable steps to correct such violation, and advises the Licensor in writing, by registered mail, in reasonable detail, as to the action taken by the Licensee in connection with the cessation and correction of such violation. The "reasonable steps"

referred to above shall, in case the violation consists of the publication and distribution of literature which fails to contain correct ratings or the required Minimum Data, include comparable publication and distribution of corrected literature.

A-12. Shall make no use of the Licensor's or Laboratory's trademarks or name in any manner that is not consistent with Licensor's role in this Program or the Laboratory's functions and responsibilities as the designated laboratory of the Program. It is understood that the Licensor's or Laboratory's performance of duties under the Program constitutes neither an endorsement by the Licensor or Laboratory of any Licensee's product, or certification of any aspects of the product other than those listed in the Test Standard.

A-13. Shall abide by, and comply with, provisions of the Test Standard and any changes made thereto, for the implementation of the Program. Provisions of the Test Standard may not be inconsistent with this License Agreement.

A-14. Shall refrain from using reproduction of the Seal or making any reference to GAMA or I=B=R certification in connection with advertising or other representations to the public in referring to products that have not been certified under the Program, or from which certification has been withdrawn.

A-15. Shall, unless prohibited by A-14, be allowed and encouraged to make proper usage and promotion of the Program and the Seal in its promotional material, specification sheets, literature and advertising. Proper methods of referring to the Program and authorized methods of reproducing the Seal shall be set forth in letters of instruction from Licensor or in the Test Standard.

A-16. Shall support the Program financially by providing the required information and paying the relevant charges outlined in B-3 below.

A-17. Shall have a right to have Licensee's written views considered in all aspects of the implementation or modification of this Program.

LICENSOR:

B-1. Shall publish electronic or hard copies of a Directory at such times as, in its discretion, it believes shall best serve the purposes of the Program, which Directory shall contain a listing of all submitted models of each participating Licensee which are within the Program.

B-2. (a) Shall notify all program participants when Licensee is required to rerate a model or models as required in 4.2.3 of the Test Standard, or terminate a Licensee from the Program as required in B-3 of this License Agreement.

(b) Shall note in the Directory terminations for continued violations, discontinued models, the inability to verify ratings, rerated models, and termination for nonpayment of fees as required in 4.1, 4.2.1.1, 4.2.4 and 4.2.5 of the Test Standard.

B-3. Shall administer the cost of the Program by fees established by the Licensor, which may include, among others, testing and check testing fees, an initial fee of issuance of a License, annual or other periodic License fees, processing fees for each product or group of products for which ratings are granted, and initial, annual or other periodic fees for extensions of ratings to purchasers who sell I=B=R Rated products under their own name, or any trade name or catalog designation different from the Licensee's. Fees may be different for members and non-members of the Licensor or may be imposed on non-members and not on members. The amount of the fees, the type of fees, the period which fees cover, the product or group of products upon which the fees are

based, and all other factors relevant to the determination of the fees, may be changed at any time in the discretion of the Licensor. No such change shall be effective until at least thirty (30) days written notice has been given the Licensee.

B-4. Shall hold all other information received from the Laboratory or Licensee in strictest confidence except for actions required in 2.2.2.2 of the Test Standard.

B-5. Shall assure Licensee of Licensor's dedication that the Program be administered in a fair, impartial manner and that any question or complaint that is not resolved by reference to the Test Standard will be addressed conscientiously and expeditiously.

IT IS FURTHER AGREED THAT:

A. Amendments to the Standard may be proposed by the Program Administrator or participants. Any proposed amendment shall be binding upon the parties and deemed part of the Standard if and when it is approved by three-fourths of the participants either by mail ballot to all participants or at a meeting of participants called by the Program Administrator. Not less than ten (10) days notice to all participants shall be given for the purpose of considering and acting upon such proposed amendment. Such mail ballot or notice, when sent to participants, shall be accompanied by a copy of the proposed amendment.

B. A test, for purposes of this Agreement, is a test conducted by the Laboratory in accordance with Appendix A or Appendix B of the Test Standard. Certified ratings must be within the allowable tolerances as stated in the Test Standard or as set forth in letters of instruction from Licensor or Laboratory to Licensee when a change in allowable tolerances may become effective before a change in the Test Standard.

C. In the event that an incorrect rating is published in any Directory, or used elsewhere, Licensee agrees not to hold Licensor liable in any way for any damage caused by such ratings or the notification of such ratings or rerating, unless such damage was the result of an intentional tort or gross negligence by Licensor. Licensee agrees that the integrity of the Program requires public notification of incorrect and corrected ratings in order to establish and maintain public confidence.

D. A specific designation applicable solely to the product for which an I=B=R Rating is requested must be assigned to the product. Neither that designation nor any confusingly similar designation shall be used for any other product whether I=B=R Rated or not. In the event that a product is changed as defined in 3.3.3.3 of the Test Standard and the Rating is affected by such change, a new designation must be assigned to the changed product.

E. The Licensor hereby grants to the Licensee, subject to all of the terms and provisions of this License and of the Test Standard, the right and license to use duly and properly obtained I=B=R Ratings and the I=B=R Seal in connection with the resale of the submitted item, pursuant to the terms of this License Agreement and the Test Standard. The Licensee agrees to use its best efforts to see that no purchaser of any item for which an I=B=R Ratings has been duly and properly obtained by the Licensee uses an I=B=R Rating or Seal except in strict accordance with the foregoing.

F. This Agreement shall extend for an initial period of two (2) years and shall be automatically renewed for successive additional periods of two (2) years each, unless either party, at least thirty (30) days prior to the date of expiration, gives notice in writing that it does not wish the Agreement to be renewed; provided, however, that either Licensor or Licensee may terminate this License Agreement upon sixty (60) days written notice to the other party except that termination notable under B-2(b) of this Agreement may be made upon written notice of less than 60 days.

G. The interpretation of this Agreement and the parties' performance thereunder shall be governed by the laws of the State of Virginia.

H. In the event any part or parts of this Agreement are found to be void, the remaining provisions shall nevertheless be binding with the same effect as though the void parts were deleted.

I. This Agreement, being the final and complete understanding between the above parties, supersedes and nullifies all prior agreements.

GAS APPLIANCE MANUFACTURERS ASSOCIATION, INC.

By _____
President, GAMA Date

Licensee

By _____
Name (Please Print)

Title

Signature Date

