

# VPMIA

## 48<sup>th</sup> ANNUAL SCHOOL of INSTRUCTION

*Strength through Leadership, Education and Unity*

April 6–8, 2011  
Harrisonburg, Virginia



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### 2009 VIRGINIA MECHANICAL CODE

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### 2009 VIRGINIA FUEL GAS CODE

This is a fully integrated Code based on the 2009 *International Fuel Gas Code*®.

### 2009 VIRGINIA PROPERTY MAINTENANCE CODE

This is a fully integrated code based on the 2009 *International Property Maintenance Code*®.

### 2009 VIRGINIA REHABILITATION CODE

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### 2009 VIRGINIA ENERGY CONSERVATION CODE

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Includes Virginia Industrialized Building Safety Regulations, Virginia Manufactured Home Safety Regulations, Virginia Amusement Device Regulations, Virginia Certification Standards, and Virginia Building and Fire Code Related Laws Package.

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The complete collection includes: 2009 *Virginia Construction Code*, 2009 *Virginia Residential Code*, 2009 *Virginia Statewide Fire Prevention Code*, 2009 *Virginia Plumbing Code*, 2009 *Virginia Mechanical Code*, 2009 *Virginia Fuel Gas Code*, 2009 *Virginia Property Maintenance Code*, 2009 *Virginia Rehabilitation Code*, 2009 *Virginia Energy Conservation Code*, and 2009 *Virginia Regulations*.

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- Butt joints on inside layer also saves labor and material

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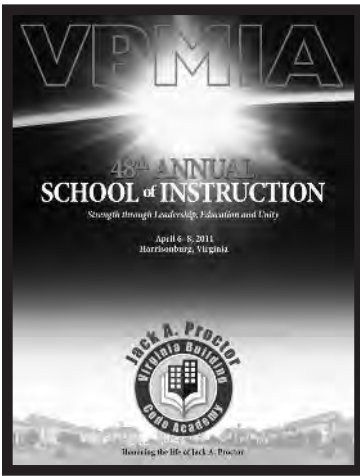


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*From the editor:*

As this publication goes to press, it is with great sadness that VPMIA notes the passing of a valued pioneer of the Building Code community, and one of our own, Jack A. Proctor.

Take a few minutes to peruse the two technical articles included in this year's edition. ICC's Lee Clifton has presented a fine piece on Thermal Expansion and Wes Davis from the Air Conditioning Contractors of America (ACCA) has offered a timely article about an ACCA form, designed with the Code Official in mind.

Thanks to Skip Harper's efforts, the VPMIA 2010-2011 Active Member Listing is available online at [www.vpmia.org](http://www.vpmia.org). You will find the Associate Member listing, starting on page 23.

I hope you will enjoy this School of Instruction and visit the Tabletop exhibitors. *Ron Bladen*

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# President's Corner



As my term as President of VPMIA comes to a close, I would like to take a minute to reflect on the last year and what the Organization has accomplished.

- We made substantial contributions this past year to ICC events and several scholarships.
- We achieved over an 80% success rate at the code Change hearings.
- We've increased our membership.
- We have provided trade certification training for the Contractors of the Commonwealth.
- We have educated and trained our own in the codes and their updates.
- We have started talking to the other ICC Chapters in the Commonwealth to determine where we can work effectively together.

I'm a results oriented person and as such, these accomplishments mean a lot to me. They show an organization committed and ready to lead the code enforcement community forward into the 21st century. I have been both proud and humbled to be given the opportunity to lead the organization in such an exciting and productive time. The people of this organization are exceptional and capable individuals who are willing and able to come together and work together to create a built environment that is safe and sustainable for the citizens of Virginia and through our code development initiatives, the citizens of the World.

I would like to give a special thanks to the VPMIA Board of Directors that worked with me to provide the Leadership to the organization this year. They kept me on track when I was tempted to over react to situations. I could always count on sound advice when decisions needed to be made. I feel very comfortable leaving office, knowing that VPMIA is in good hands and will be led, successfully into the future.

If I were to be asked what advice I would offer to the Officers to come, it would be to listen to the membership. They're smart, capable and willing to get the job done. If you let it be known something needs to be done, you can count on someone stepping up and doing it! The men and women of this organization are Awesome!

Thank you for the opportunity to serve as President of this great Organization and thank you for all of your support in the last year.

Sincerely,

**Bob Adkins, President  
Virginia Plumbing and Mechanical  
Inspectors Association**

# Program

## VPMIA 48th Annual School of Instruction

April 6—8, 2011

### Wednesday, April 6

Holiday Inn Harrisonburg  
1400 East Market Street  
Harrisonburg, VA 22801  
540-433-2521

7:00 - 8:15 a.m.	<b>REGISTRATION</b>
8:30 - 10:00 a.m.	Backflow Preventers
10:00 - 10:30 a.m.	<b>BREAK</b>
10:30 - 12:00 p.m.	Solar Hot Water
12:00 - 1:00 p.m.	<b>LUNCH</b>
1:00 - 2:30 p.m.	Acid Waste Piping
2:30 - 3:00 p.m.	<b>BREAK</b>
3:00 - 4:30 p.m.	WaterFurnace GeoThermal
5:00 - 6:00 p.m.	<b>PRESIDENT'S WELCOME</b>
6:00 - 7:30 p.m.	<b>BUFFET DINNER</b>

### Thursday, April 7

8:30 - 10:00 a.m.	DHCD 2009 Administrative
10:00 - 10:30 a.m.	<b>BREAK</b>
10:30 - 12:00 p.m.	Navien Tankless Water Heaters
12:00 - 12:15 p.m.	<b>VPMIA GENERAL MEMBERSHIP MEETING - PART 1</b>
12:00 - 1:00 p.m.	<b>LUNCH</b>
1:00 - 2:30 p.m.	CaptiveAire
2:30 - 3:00 p.m.	<b>BREAK</b>
3:00 - 4:30 p.m.	CaptiveAire (Continued)
6:30 - 10:00 p.m.	<b>BANQUET—AWARDS</b>

### Friday, April 8

8:00 - 9:00 a.m.	<b>BREAKFAST BUFFET</b>
9:00 - 12:00 p.m.	<b>GENERAL MEMBERSHIP MEETING - PART 2</b>

#### **ACTIVE**

\* MR. U. EARL ALLEN  
\* MR. E. W. BAUGHAN  
\* MR. FRANK BOSMA  
\* MR. E. R. CARR  
\* MR. EUGENE COBANKS  
MR. M. D. COOPER  
\* MR. GORDON I. DAMERON  
\* MR. JAMES B. JONES, JR.  
\* MR. PARL C. KING  
\* MR. CHARLES E. MANNION  
\* MR. JOHN B. MASON  
MR. CURTIS H. NUNALLY  
\* MR. WILLIAM G. PRIDY

#### **ASSOCIATE**

\* MR. JOSEPH E. BAKER  
\* MR. T. C. BROWN  
\* MR. CHARLES E. WESSMAN

#### **LADIES AUXILIARY**

\* MRS. RUTH BIANCO  
\* MRS. ANN COBANKS  
\* MRS. IRMA DRAKE  
MRS. RUTH JACK  
MRS. MARGARET KING  
MRS. SONIA SCHROECK  
MRS. SHIRLEY WILLIAMS  
\* Indicates Deceased



**VPMIA Charter Members**

# *Ladies Auxiliary* Program

VPMIA Ladies Auxiliary will gather in Harrisonburg to assist with Registration Wednesday morning and start our own program of activities. Wednesday, April 6<sup>th</sup> there will be a craft project. We will begin around 9:00 a.m. and progress on our project most of that morning. Wednesday afternoon is free for exploring: shopping, antiquing, etc. The President's Welcome is another opportunity to mingle.

On Thursday, April 7<sup>th</sup>, we will meet back in the craft room to complete the painting of our rose project and go over to the Beauty Spa around 10 a.m.

After the Spa, we will meet up for lunch at the Boston Beanery Restaurant & Tavern (located just up the street from the Spa)

for our yearly Ladies Auxiliary Business Meeting, where we will approve last year's minutes, elect our new officers for 2011-2012 and attend to any business brought up.

The Banquet, with installation of officers, is scheduled for Thursday evening.

Don't forget about Friday morning (Sherry has the B-I-N-G-O game and is ready for some serious competition! ) There will be plenty of prizes, snacks, drinks, etc. at the craft/B-I-N-G-O room.

Ladies attending the SOI are welcome to join in the fun. Updates or schedule changes will be posted at the VPMIA Registration Table.

## *2010-2011 Roster as of April 2010*

Sherry D. Rimel (President)  
VPMIA (Paul)  
1159 New Hope Road  
Staunton, VA 24401  
540-248-6627 (H)  
540-332-7086 (W)  
rimelsd@comcast.net

Mary Thuot (Vice President)  
VPMIA (Michael)  
3197 Adam Keeling Road  
Virginia Beach Va 23454  
757-496-0355  
mthuot2686@aol.com

Jane Fitzgerald (Secretary/Treasurer)  
VPMIA (Ron Bladen)  
5716 North 7th Street  
Arlington, VA 22205  
703-527-4210 (H)  
703-527-1238 (W)  
msfitz13@verizon.net

Teresa Hudson  
VPMIA (Charles)  
1010 W. Atlantic St  
South Hill, VA 23970  
(434) 447-7905  
Teresa.Hudson@southside.edu

Tammy Kushner  
VPMIA (Wayne)  
124 Woodward Ct  
Front Royal VA 22630-6836  
wkush32@comcast.net

June Seay  
VPMIA (John)  
280 Coles Rolling Road  
Scottsville, VA 24590  
434-286-3139  
jws5z@virginia.edu  
seayit2@yahoo.com

Ethel Showman  
VPMIA (Geary)  
1221 St. Luke Road  
Woodstock, VA 22664  
540-459-2789  
eshowman@shentel.net

Sandy Tomberlin  
VPMIA (Guy)  
1358 Ebenezer Road  
Bluemont, VA 20135  
540-554-2765 (H)  
703-324-1817 (W)  
sandytomberlin@wildblue.net



# VPMIA *Strategic Plan*

## **GOAL # 1 Enhance and increase communications of VPMIA with the public**

**(Communications)**

### ***Initiative action:***

- Actively promote a positive image of code enforcement's role in the community.
- Advertisements in trade, industry, state DHCD, and community publications.
- Commitment to code development to achieve the superior level of health, safety, and welfare for our citizens.

## **GOAL # 2 Increase and expand education (Training – Communications)**

### ***Initiative action:***

- Encourage increased participation from all interested parties who interact with any and all aspects of code enforcement.
- Increase awareness of the educational benefits of the association.
- Promote credentialing programs provided by the state DHCD.

## **GOAL # 3 Uphold the highest levels of professionalism**

**(Leadership – Professionalism)**

### ***Initiative action:***

- Instill and promote leadership values.
- Always display integrity.
- Adherence to code of ethics.
- Share knowledge at all levels.
- Maintain and promote certifications.
- Respect others.

## **GOAL # 4 Promote relationships with industry and related professional organizations**

**(Cooperation)**

### ***Initiative action:***

- Participate in the code development process.
- Encourage cooperative working relationships with construction-industry professionals.
- Become involved as active or associate

members to other professional organizations such as VBCOA, ICC, VCCCA, IAIEI, and PMPV.

- Solicit speakers and provide speakers for these organizations to enhance communication.
- Continue to actively participate in DHCD towards uniform application and development of the model building codes and standards.

## **GOAL # 5 Broaden and expand VPMIA Membership (Membership)**

### ***Initiative action:***

- Develop information package of the organization benefits.
- Provide more member services.
- Develop a more wide spread advertisement program for membership, including associate members.

## **GOAL # 6 Continue leadership and participation in code development process (Leadership – Code Development)**

### ***Initiative action:***

- Enhance and develop strategies for

- participation in International Code Council Code developmental process.
- Encourage participation on state and national committees.
- Provide financial support towards member participation in these activities.

## **GOAL # 7 Promote the adoption of the International Code Council family of model codes**

**(Communications – Training)**

### ***Initiative action:***

- Provide analysis and impact of benefits for industry, where necessary.
- Provide training for code enforcement officials and industry.
- Interact with DHCD to provide uniform enforcement of model codes.

## **GOAL # 8 Ensuring financial viability of VPMIA**

### ***Initiative action:***

- Align financial resources to organizational outcomes.
- Achieve goal objectives.
- Operate within budgeted plan.

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# Awards

## OUTSTANDING SERVICE

### Gordon I. Dameron Active Award

1981-1982	Kenneth R. Synder, Jr.
1982-1983	Jesse R. Hurt
1983-1984	George H. Williams, Jr.
1984-1985	Robert M. Broome
1986-1987	Paul M. Adams
1988-1989	Paul Hostetler & Joseph Hall
1989-1990	Dennis W. McNaughton
1990-1991	Floyd Proffitt
1991-1992	Jeffrey Shawver
1992-1993	Tommy Cantrell
1993-1994	Hassel E. DeShazo
1994-1995	Doug Stover & Jack Rhoden
1995-1996	Robert D. Carroll
1996-1997	Roy N. McFarland, Jr.
1997-1998	Kathleen T. Dye
1998-1999	-----
1999-2000	Michael D. Thuot
2000-2001	Guy Tomberlin
2001-2002	John B. Seay, Jr.
2002-2003	Dennis Martinelli
2003-2004	Geary Showman
2004-2005	James T. Moore
2005-2006	Wayne Kushner
2006-2007	James Anjam
2007-2008	Richard Witt
2008-2009	Paul Rimel
2009-2010	-----

### David L. Carr Associate Award

1981-1982	William E. Foley
1982-1983	John V. Duley
1983-1984	J. C. Nuckols
1984-1985	Lawrence R. Muse
1986-1987	David Maupin
1987-1988	Ronald Bryant
1988-1989	Robert W. Price
1989-1990	Fred Borden, Jr.
1990-1991	Billy E. Leeder
1992-1993	James B. Muncy
1993-1994	John Otto
1994-1995	Danny & Laurie Crigler
1995-1996	James B. Hyler
1996-1997	J. C. Nuckols
1997-1998	James S. Steinle
1998-1999	Thomas C. Roberts
1999-2000	David Johnston
2000-2001	David L. Maupin
2001-2002	Lorrie Norton
2002-2003	Allen Tryall
2003-2004	Jonathan Sargeant
2004-2005	-----
2005-2006	-----
2006-2007	-----
2007-2008	Jay Otto
2008-2009	-----
2009-2010	-----

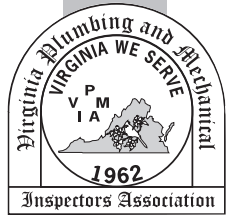
## LIFETIME MEMBERSHIP

### D. Paul Jack Active Award

1988-1989	Edward J. Baldwin, Jr.
1989-1990	George H. Williams, Jr.
1990-1991	Kenneth R. Snyder, Sr.
1991-1992	Jesse R. Hurt
1992-1993	Douglas Stover
1993-1994	Ernest "Bud" Lester
1994-1995	Paul Hostetler
1995-1996	Paul M. Adams
1996-1997	Michael D. Redifer
1997-1998	Hassel E. DeShazo
1998-1999	Kathleen T. Dye
1999-2000	-----
2000-2001	William F. Hines
2001-2002	Larry Dehaven
2002-2003	Lawrence Nuckols
2003-2004	Roy McFarland, Jr.
2004-2005	Guy Tomberlin
2005-2006	Stephen P. Borders
2006-2007	Charles Gerber
2007-2008	James T. Moore
2008-2009	Geary Showman
2009-2010	Dennis Martinelli

### John A. Otto Associate Award

1988-1989	Cecil F. Hardee, Sr.
1989-1990	J. Richard Maher
1990-1991	David L. Carr
1991-1992	Robert W. Price
1992-1993	-----
1993-1994	Billy E. Leeder
1994-1995	James B. Muncy
1995-1996	Thomas C. Roberts
1996-1997	Tom Kreutzer
1997-1998	James S. Steinle
1998-1999	John Otto
1999-2000	-----
2000-2001	Herbert L. Joyner
2001-2002	Laurie/Danny Crigler
2002-2003	Dave Johnson
2003-2004	-----
2004-2005	-----
2005-2006	-----
2006-2007	David Maupin
2007-2008	-----
2008-2009	-----
2009-2010	-----



# *Exhibitors*

## Meet Our 2011 Tabletop Exhibitors

ARLINGTON COUNTY JOB FAIR  
Shahriar Amiri, CBO

CAST IRON SOIL PIPE INSTITUTE  
Michael Steele

CHARLOTTE PIPE & FOUNDRY COMPANY  
Vic Hines

DUCTMATE  
John Junker & John Sorna

HARRY EKLOF & ASSOCIATES  
Herb Edwards & Kim DeForrest

THE JOYCE AGENCY  
Jonathan Sargeant & Jason Hawk

JAY OTTO ENTERPRISES, INC.  
Jay Otto

THERMAL CERAMICS  
Tom Harlan & David Kies



## BOARD OF DIRECTORS

*President*  
**Robert Adkins**

*Vice President*  
**Bane Compton**

*Secretary*  
**Ron Bladen**

*Treasurer*  
**Paul Rimel**

*Executive Secretary*  
**Geary Showman**

## DIRECTORS

- |            |                  |
|------------|------------------|
| AT LARGE   | Wayne Kushner    |
| DISTRICT 1 | James Anjam      |
| DISTRICT 2 | William Aldridge |
| DISTRICT 3 | Curtis Campbell  |
| DISTRICT 4 | Leon Yoder       |

## COMMITTEE CHAIRMANSHIPS

*Advertising/Yearbook*  
Ron Bladen

*Auditing*  
Geary Showman

*Awards*  
John Seay

*By-laws/Parliamentarian*  
Guy Tomberlin

*Certification/Education/Training*  
Paul Rimel

*Finance*  
Geary Showman

*Legislative*  
Ronald Clements

*Membership/Website*  
Skip Harper

*Nominating*  
Wayne Kushner

*Plumbing, Mechanical & Fuel Gas*  
Richard Grace

*School of Instruction*  
Ron Bladen

*Time and Place*  
Dennis Martinelli

*50<sup>th</sup> Anniversary*  
Dustin McLehaney & Skip Harper

# Resolutions



## **Resolution of Respect for William Lloyd Norman**

**Whereas**, Before his death on February 27, 2011, William (Bill) Lloyd Norman was a long time member of the Virginia Plumbing and Mechanical Inspectors Association; and

**Whereas**, Bill Norman was a 1967 graduate of Granby High School in Norfolk, VA who attended Old Dominion University; and

**Whereas**, Mr. Norman was a proud Master Plumber who retired after 24 years from the City of Newport News as a Plumbing Inspector; and

**Whereas**, The Virginia Plumbing and Mechanical Inspectors Association notes with great sadness the passing of William (Bill) Lloyd Norman; now, therefore, be it

**Resolved**, That the Officers, Board of Directors, and the entire membership of the Virginia Plumbing and Mechanical Inspectors Association join the family of William (Bill) Lloyd Norman in celebration of his life and do also offer their most heartfelt sympathy at the loss of this cherished family member; and

**Resolved further**, That the Virginia Plumbing and Mechanical Inspectors Association stands in readiness to assist the family of William (Bill) Lloyd Norman in any manner desired or requested; and

**Resolved further**, That this resolution be respectfully submitted to Mr. Norman's family as a permanent memorial to the memory of William (Bill) Lloyd Norman.

Adopted this Seventh day of April, 2011.

ATTEST: **Bane Compton**  
Bane Compton, Vice President

**Robert Adkins**  
Robert Adkins, President



## Resolution of Respect for Jack Allen Proctor, Sr.

**Whereas**, Before his death on March 10, 2011, Jack Allen Proctor Sr. was widely recognized throughout the Commonwealth as “The Father of Virginia’s Building Code”; and

**Whereas**, Jack Allen Proctor Sr. proudly served his country for twenty-two years in the United States Navy, and then in 1973 began his illustrious career as the *first* Building Code Official of Shenandoah County, Virginia; and

**Whereas**, In 1975, Mr. Proctor was employed as Virginia’s *first* Building Code Supervisor and then through a series of promotions, became Administrator of all Virginia Building and Fire Code Regulations; and

**Whereas**, Jack spent many hours in attendance at meetings and public hearings, advocating for a Uniform Statewide Building Code in an effort to ensure the health, safety and welfare of all those living in, working in and visiting the Commonwealth; and

**Whereas**, In pursuit of this goal, Jack worked tirelessly with Virginia’s legislators, Virginia’s Building and Fire Code Officials, design professionals, builders, and numerous other constituent groups to author, modify, and adopt Virginia’s first Statewide Building Code, thereby resulting in the Commonwealth becoming one of the first states in the nation to adopt a uniform statewide code; and

**Whereas**, Jack Allen Proctor Sr. was the driving force in creation of a statewide code training academy who’s purpose was to educate and certify all Virginia code enforcement personnel, and through which a knowledgeable and nationally respected cadre of code officials evolved, and due to which upon his retirement it was named, The Jack A. Proctor Virginia Building Code Academy; and

**Whereas**, Mr. Proctor was instrumental in Virginia’s adoption of the International Code Council’s family of model codes and was actively involved in the creation of Virginia’s Industrialized Building, Manufactured Home, and Amusement Device Regulations; and

**Whereas**, Jack served as President of the National Academy of Code Administration; President of the National Council of States on Building Codes and Standards; President of the International Academy for Professional Code Administration; Chairman of BOCA’s State Code Administrators Committee; and served on the National Board of Governors for Code Inspector Certification; and

**Whereas**, Mr. Proctor received the Gene Rowland State Achievement Award in 1991; the BOCA Albert H. Baum Award in 1993; and the BOCA Wilbur H. Lind Award in 2002; and

*Continued*

continued

**Whereas**, Jack Allen Proctor Sr. is an Honorary Member of the Virginia Plumbing and Mechanical Inspectors Association; and this Association notes with great sadness the passing of our mentor and friend; now, therefore, be it

**Resolved**, That the Officers, Board of Directors, and the entire membership of the Virginia Plumbing and Mechanical Inspectors Association join the family of Jack Allen Proctor Sr. in celebration of his life and do also offer their most heartfelt sympathy at the loss of this cherished family member; and

**Resolved further**, That the Virginia Plumbing and Mechanical Inspectors Association stands in readiness to assist the family of Jack Allen Proctor Sr. in any manner desired or requested; and

**Resolved further**, That this resolution be respectfully submitted to Mr. Proctor's family as a permanent memorial to the memory of Jack Allen Proctor Sr., "The Father of Virginia's Building Code".

Adopted this Seventh day of April, 2011.

*Robert Adkins*  
Robert Adkins, President

ATTEST: *Bane Compton*  
Bane Compton, Vice President

---

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or visit **[www.phccweb.org](http://www.phccweb.org)**.



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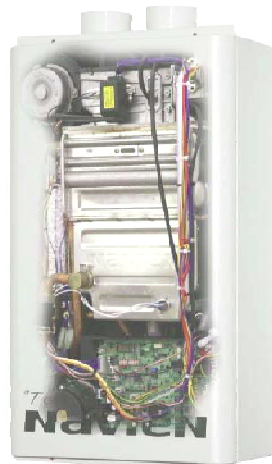


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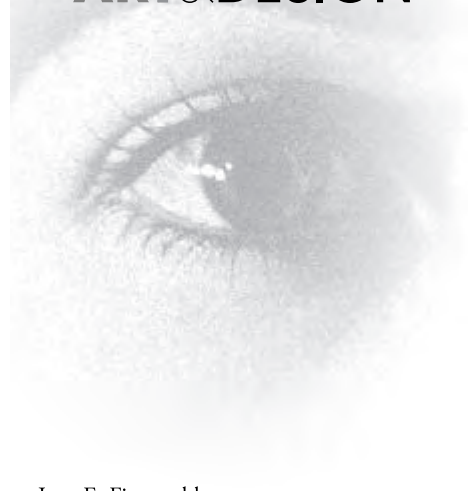
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# Thermal Expansion Control in Water Distribution Systems

The 2009 International Plumbing Code (IPC) Section 607.3 addresses thermal expansion control in water distribution systems.

by Lee Clifton

Let's take a closer look at thermal expansion control. A "closed" water distribution system equipped with a storage-type water heater or a hot water storage tank must be provided with a means of controlling thermal expansion. A "closed" system is created where a backflow preventer or a check valve is installed anywhere in the water supply piping up to the connection to the water heater. The presence of a water pressure reducing valve in the water supply piping also requires provisions for thermal expansion control.

To understand how to control thermal expansion we must understand what thermal expansion is. Conductive materials, such as water, expand when heated. When water is heated in a confined space (the water heater and the distribution system with all outlets closed), the expanding water causes the pressure to increase within the confined space. This is referred to as thermal expansion.

Why the need to control thermal expansion? If thermal expansion is not controlled, the pressure in the confined space can become greater than the working pressure of the components of the system, resulting in plumbing system component damage. For example, most faucets are not designed to properly operate at pressures above 80 psi and not designed to withstand pressures exceeding 125 psi. The welds on hot water tanks can also experience stress fatigue which will eventually cause the welds to fail causing the tank to leak. If thermal expansion is not controlled, the pressure in the water distribution system can exceed 150 psi causing the Temperature and Pressure (T&P) Relief Valve on the water heater to discharge water to keep the pressure from exceeding 150 psi. Constant operation of the T&P valve can lead to a leaky valve producing corrosion which might cause it to not relieve pressure as designed. Clearly a non-functioning relief valve on a hot water tank can lead to an explosion of the tank.

Why are we seeing more examples of thermal expansion in our water systems? One reason is water companies are required to protect the public water system against backflow or back siphonage of water from buildings supplied with potable water. At a minimum, water companies are required by the Federal Clean Water Act to install double-check-valve back flow protection on water service lines to every building. Where water services to buildings were established

many years ago, they may not currently have any backflow protection. However, most water utilities will eventually change the water meter (as they become inaccurate with age) and at that time, backflow protection will be installed with the new water meter.

The installation of a pressure reducing valve also will require control of thermal expansion. The purpose for installing a water pressure reducing valve is to protect a water distribution system from public water main pressures greater than 80 psi. Even if a water pressure reducing valve has an internal bypass to allow thermally expanded water to move into the public water main, this movement of water will not occur until the pressure in the water distribution system is greater than the pressure in the public water main. For example, if the public water main pressure is 120 psi, the pressure in the water distribution system will rise to 120 psi.

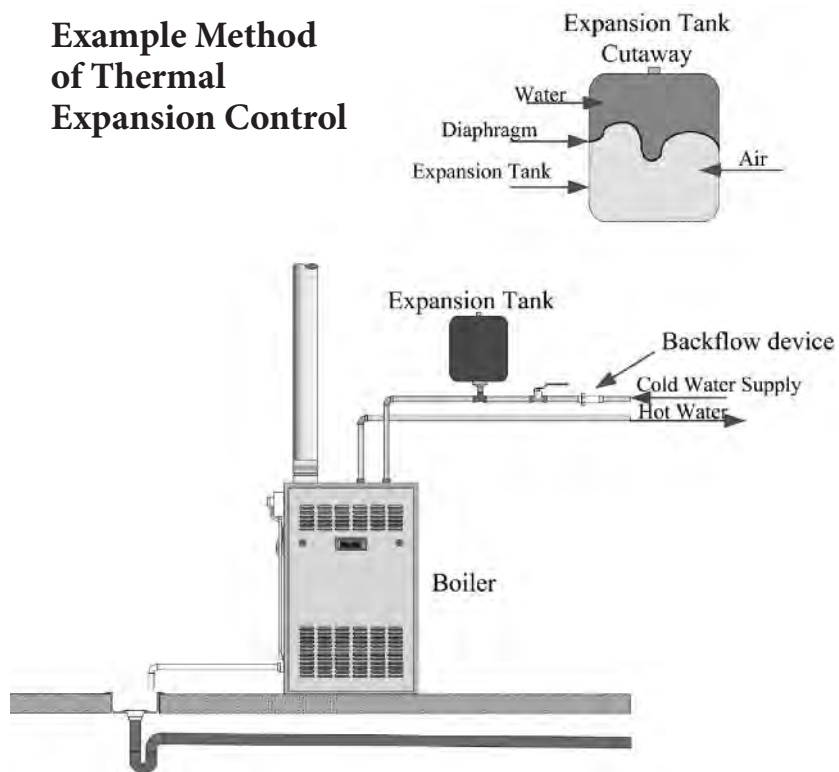
to relieve at a pressure slightly higher than the normal system operating pressure.

- A thermal expansion tank.

An example of a pressure relief valve for controlling thermal expansion is a special water closet flush tank fill valve that relieves a small amount of water into the tank over flow to keep pressure from raising the system. Other type of pressure relief valves are listed for use to control thermal expansion and available to be used as long as the discharge is routed to a safe place of disposal.

The common way to control thermal expansion is to install a small tank with an air chamber that is separated by a rubber bladder from the water distribution system. When the pressure rises in the closed system to higher than the air charge on the tank, the volume of the air is reduced, which allows

## Example Method of Thermal Expansion Control



So how does the code allow us to control thermal expansion? The following devices can be used to control thermal expansion:

- A pressure relief valve (not the T&P valve) rated for intermittent use and set

the water distribution system pressure to remain constant when water is being heated.

So how do we determine the size of a thermal expansion tank? The precise sizing of a thermal expansion tank for a water dis-

**Figure 3**

SUPPLY PRESSURE (psig)	WATER HEATER (Gallons)						
	20	30	40	50	80	100	120
40							
50							
55							
60							
70							
80							
90							
100							
110							
120							

Tank A  
 Tank B  
 Tank C  
 Multiple tanks required

Note: Expansion based on 50°F Temperature rise.

Tank size A → 2.1 gallon tank (1.26 gallon acceptance volume)

Tank size B → 4.5 gallon tank (2.8 gallon acceptance volume)

Tank size C → Not available → Consult factory

tribution system with a water heater depends on the lowest incoming water temperature, the final temperature of the hot water, the size of the water heater tank and the pressure of the initial tank air charge. Most manufacturers of thermal expansion tanks provide sizing programs or tables.

**Figure 3** is one manufacturer's table (Courtesy of Watts Industries).

To select the correct expansion tank, using the selection guides in this product guide, choose the supply pressure (for pressures between those shown, use next highest supply pressure), read across the chart to the correct tank as indicated by the water heater capacity. For capacities between those shown, use next highest capacity. To accommodate the thermal expansion re-

quired for higher temperature and/or higher pressure systems, multiple tanks may be used. Where it is determined that multiple tanks are required, the expansion tank manufacturer can assist with sizing.

A critical part of installing a thermal expansion tank is to adjust the initial air charge in the tank to the normal water distribution system pressure. For example, if the system pressure is 60 psi, adjust the tank pressure before connecting to the system to 60 psi. Never apply more than 80 psig to precharge the tank.

Locate the expansion tank on the cold water line downstream of the water heater shut off valve.

**NOTE:** Adequate support for the tank will need to be provided as it become heavier when filled with water.

☆☆☆

Lee Clifton is the Director of Plumbing Programs for the International Code Council, Plumbing & Mechanical Activities. Prior to joining the Code Council, Lee was with the City of Los Angeles for 21 years. As the Principal Inspector with the City of Los Angeles this included planning, organizing and coordinating the training programs for inspectors and clerical staff. Lee has served on the Board of Directors for the Southern California Health and Housing Council and participated on the Strategic Planning Committee to end lead poisoning in Los Angeles County. In prior years he also served as a Senior Plumbing Training Officer for the Department of Building and Safety. Lee has taught the model plumbing code for the Plumbing, Heating, Cooling, Contractor Association of the Greater Los Angeles Area and the North Orange County Regional Occupation Program. His career began as a second generation plumber, working for his father at Clifton Plumbing Inc. in Tampa, Florida and then entering the United States Coast Guard. Lee completed his plumbing apprenticeship training in southern California.

Lee holds an L.A. City Journeyman Plumber's license; numerous certificates for training and medical gas inspection and an ICC Certified Plumbing & Mechanical Inspector. He is a member of the American Society of Sanitary Engineers, the American Society of Plumbing Engineers and a member of the American Backflow Prevention Association. In the past Lee has participated on numerous industry committees and has authored many technical books and publication. The latest is the 2012 Significant Changes to the International Plumbing Code which will be out this spring.



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D. PAUL JACK	1966*	JESSE R. HURT	1982	ROY N. McFARLAND, JR.	1999/2000
FRANK B. BOSMA	1967*	CHARLES DEDIAN	1983	CLEATIS DYE, JR.	2001
U. EARL ALLEN	1968*	KENNETH R. SNYDER, SR.	1984	CHARLES GERBER	2002
HARRY CONTE	1969	LAWRENCE J. NUCKOLS	1985	GUY TOMBERLIN	2003/2004
JAMES B. JONES	1970*	JOHN W. THURSTON	1986*	GEARY SHOWMAN	2004/2005
L. W. FURMAN	1971	WILLIAM F. HINES	1987	MICHAEL THUOT	2005/2006
GEORGE H. WILLIAMS	1972*	LESLIE A. COURTNEY	1988	JOHN SEAY	2006/2007
W. T. DRAKE	1973*	JIMMY A. ENGLISH	1989	DENNIS MARTINELLI	2007/2008
BENJAMIN BIANCO	1974	DOUGLAS L. STOVER	1990	JOHN MILLS	2008/2009
J. L. SHIFFLETT	1975	ROBERT M. BROOME	1991	R. WAYNE KUSHNER	2009/2010
HOMER O. DENNIS	1976	PAUL D. HOSTETLER	1992		
JULIAN E. MEREDITH	1977*	DENNIS W. McNAUGHTON	1993		
EDWARD T. PARSONS	1978*	JOHN S. TRENARY	1994		

*\*Denotes deceased*

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# Verifying HVAC System Design

By Ron Bladen, Terry Ford, Russ Goyen, and Wes Davis

## Editor's note:

During the timeframe this article was originally created, Fairfax County was using a different Residential HVAC Certification Form. However, the County will be switching to the ACCA format in the very near future. At least two other counties in Virginia are currently requiring ACCA's Form.

Several companies have approved computer programs based on the ACCA Manual J. One of these companies, Elite Software, recently incorporated this form into their program, so that once the user has completed the load calculations, they merely click an icon, all the pertinent data is processed and printed out on the new form. Other companies are expected to follow Elite's lead.

HVAC system design requirements are required by the International Code Council (ICC). Code officials have expressed concerns about possessing sufficient knowledge, expertise, or understanding to enforce this residential code requirement. To provide perspective, some code officials who are already enforcing an HVAC system design requirement agreed to share some lessons-learned from their experiences. These men serve in jurisdictions that are completely different demographically and geographically. But their experiences with residential HVAC system design review are remarkably similar.

**ACCA**  
Air Conditioning Contractors of America

### Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)

County, Town, Municipality, Jurisdiction  
Header Information

Contractor \_\_\_\_\_  
Mechanical License # \_\_\_\_\_  
Building Plan # \_\_\_\_\_  
Home Address (Street or Lot#, Block, Subdivision) \_\_\_\_\_

Form RPER 1  
15 Mar 09

**REQUIRED ATTACHMENTS**

Manual J Form (and supporting worksheets):  
or MJ/IAE Form\* (and supporting worksheets):  
DEM performance data (heating, cooling, blower):  
Manual D Friction Rate Worksheet:  
Duct distribution system sketch:

**ATTACHED**

Yes  No   
Yes  No   
Yes  No   
Yes  No

### HVAC LOAD CALCULATION (IRC M1401.3)

**Design Conditions**

**Winter Design Conditions**

Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Total heat loss \_\_\_\_\_ Btu

**Summer Design Conditions**

Outdoor temperature \_\_\_\_\_ °F  
Indoor temperature \_\_\_\_\_ °F  
Grains difference \_\_\_\_\_ Δ Gr @ \_\_\_\_\_ % Rh  
Sensible heat gain \_\_\_\_\_ Btu  
Latent heat gain \_\_\_\_\_ Btu  
Total heat gain \_\_\_\_\_ Btu

**Building Construction Information**

**Building**

Orientation (Front door faces) \_\_\_\_\_  
North, East, West, South, Northeast, Northwest, Southeast, Southwest

Number of bedrooms \_\_\_\_\_  
Conditioned floor area \_\_\_\_\_ Sq Ft

Number of occupants \_\_\_\_\_

**Windows**

Eave overhang depth \_\_\_\_\_ Ft

Internal shade \_\_\_\_\_  
Blinds, drapes, etc. \_\_\_\_\_

Number of skylights \_\_\_\_\_

Roof  
Eave Depth  
Window

### HVAC EQUIPMENT SELECTION (IRC M1401.3)

**Heating Equipment Data**

Equipment type \_\_\_\_\_  
Furnace, Heat pump, Boiler, etc.

Model \_\_\_\_\_

Heating output capacity \_\_\_\_\_ Btu  
Heat pumps - capacity at winter design outdoor conditions

Auxiliary heat output capacity \_\_\_\_\_ Btu

**Cooling Equipment Data**

Equipment type \_\_\_\_\_  
Air Conditioner, Heat pump, etc.

Model \_\_\_\_\_

Latent cooling capacity \_\_\_\_\_ Btu  
Sensible cooling capacity \_\_\_\_\_ Btu  
Total cooling capacity \_\_\_\_\_ Btu

**Blower Data**

Heating CFM \_\_\_\_\_ CFM  
Cooling CFM \_\_\_\_\_ CFM  
Static pressure \_\_\_\_\_ IWC  
Fan's rated external static pressure for design airflow

### HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)

Design airflow \_\_\_\_\_ CFM

External Static Pressure (ESP) \_\_\_\_\_ IWC

Component Pressure Losses (CPL) \_\_\_\_\_ IWC

Available Static Pressure (ASP) \_\_\_\_\_ IWC  
ASP = ESP - CPL

Longest supply duct: \_\_\_\_\_ Ft  
Longest return duct: \_\_\_\_\_ Ft  
Total Effective Length (TEL) \_\_\_\_\_ Ft

Friction Rate: \_\_\_\_\_ IWC  
Friction Rate = (ASP × 100) ÷ TEL

Duct Materials Used (circle)  
Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_  
Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) \_\_\_\_\_

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name \_\_\_\_\_  
Contractor's Signature \_\_\_\_\_ Date \_\_\_\_\_

Reserved for County, Town, Municipality, or Authority having jurisdiction use.

\* Home qualifies for MJ/IAE Form based on Abridged Edition Checklist.

**QUESTION:**

**What would you recommend to those beginning an HVAC system design review?**

**Terry Ford:** Go slow. Code Officials must understand that there are some old bad habits that need to be changed. Contractors and sub-contractors generally want to do the right thing. However, these energy efficient requirements may be new to some.

**Russ Goyen:** Code officials should be prepared, and not go into this “piece-meal”. For example, ensure someone qualified reviews the designs; simply requiring contractors to hand in a form is detrimental. You won’t be able to tell the good designs from deficient designs. Additionally, you will cause justifiable irritation and resentment by the HVAC contractors who know you are simply creating paperwork. I recommend that approved designs be on the jobsite when contractor calls for inspection. I would also suggest that inspectors ensure the design was followed, and to know when there is room for certain deviations that are bound to arise in the field.

**Ron Bladen:** Ensure that the staff responsible for reviews and inspections are trained accordingly. Reviewers must become more knowledgeable about the technical aspects of the Manual J, D, and S; inspectors must know the applicable Codes. Both aspects, review and inspection, must be consistent and uniformly enforced. Current Codes must be enforced by the Code Officials and adhered to by the HVAC GC’s.

It’s a two-way street. I have been an inspector and a reviewer. As an inspector, I would say that many GC’s did not know what Codes were currently in effect. Also, many GC’s, whether they were familiar with the Codes or not, were frustrated because depending which jurisdiction they were in, the Codes were interpreted and therefore, enforced differently. Knowledge of the current Codes is the responsibility of the GC; different in-

terpretations of the Code by adjoining jurisdictions needs to be worked out and eliminated. The GC and the Code Official should work together and correct any deficiencies in this process. There needs to be an open dialogue between the two entities; you would be surprised how much we could learn from one another. We owe it to our customers.

**QUESTION:**

**So, enforcing this part of the code requires some planning?**

**Russ Goyen:** The standardized review form that ACCA created would be an entry level evaluation that would be very effective. I think its value is as much for contractor/designer education as for plan reviewer education.

There will be a learning process for all, no doubt. The standardized form will set new guys on the right track and help them ask the right questions as they delve into the details of loads, equipment and duct design. They MUST familiarize themselves with the ACCA manuals. Your form sends them to the appropriate sections. Very important.

In our experience here in Idaho Falls, and in my involvement with other jurisdictions across the state as they have been developing a strategy for enforcement, I see it as a process. And that process has certain educational plateaus that must be reached, more or less in order, and the training should correspond.

The Authority Having Jurisdiction must first make a decision as to when the requirement for HVAC designs will be implemented, say, 6 months to a year ahead. This is the time to present a seminar for both contractors and code people. The presentation should explain the need and the benefits in a way that gets everyone on board, and makes it clear to contractors what the AHJ will expect.

For code people, especially those who will actually be doing the reviews, the next training would show them what a design should look like (the ACCA standardized form will greatly

facilitate this), and how to identify and comment on any mistakes or questionable items in the design. They need to learn which mistakes are minor enough to be overlooked, and which need to be corrected. They need to familiarize themselves with J, S and D, and learn to make references to such in their review comments.

The training sessions should be far enough in advance of the start date for enforcement to give everyone a chance to attend, but not so far ahead that people forget it by the time the program starts.

**Terry Ford:** As building departments we are tasked to ensure the various adopted codes are met and to check designs. The HVAC field is extensive, and the learning curve is steep. Without training, the average building person can not even begin to understand the critical details. A thought on training, it seems webinars are a great choice in this time of tight funds as it permits training of even remote departments, it allows more than one to attend, it is relatively inexpensive, and it has a method of feedback from the attendees.

I like the ACCA form because it details the results of various software or manual calculations in one place and in an organized fashion. I feel if the form is properly filled out and verified by our plan checker that we can rest assured that the designed system is satisfactory. Then if the inspector is sent to the field with a new look for detail we will have a satisfactory installation.

The ACCA Code Committee released a form to simplify and speed the review of an HVAC system design (IECC 403.6, and IRC M1403.1, 601.1) at [www.acca.org/files/?id=361](http://www.acca.org/files/?id=361). The form, which evaluates objective elements of an HVAC systems design, is accompanied by instructions and examples ([www.acca.org/files/?id=358](http://www.acca.org/files/?id=358)) ([www.acca.org/files/?id=359](http://www.acca.org/files/?id=359)) ([www.acca.org/files/?id=360](http://www.acca.org/files/?id=360)).

(Continued from the previous page)

As I mentioned earlier, move slowly. The approach we took was to implement the Voluntary Energy Savings Program in our Town. This got the builder to thinking energy and we gradually educated them through this process. I ran monthly workshops on subjects including how to deal with that mysterious HVAC system and the importance of moving from the 'thumb-rules'.

QUESTION:

**Did you meet resistance, how did you cope with it?**

**Terry Ford:** We created a form based on the one generated by ACCA ([www.acca.org/codes/reviewform](http://www.acca.org/codes/reviewform)). It has a place for objective information, and it's part of our permit submittal process. The HVAC sub-contractors also see that this really levels the playing field and improves their service to their customers.

**Russ Goyen:** We had some very steep initial resistance from HVAC contractors, a few of whom are simply against any change. We also faced a steep internal learning curve. Understanding the design process and interpreting designs can take some time. We were able to get some training from ACCA, but in the end, we simply understood the impact on the community and persevered.

**Ron Bladen:** Reaction from Contractors has been a mixed bag. Some un-

derstood and are okay with the program, some were not. Some actually did not understand that different duct materials (galvanized, flex) had different air flow capacities. I had some say to me "I've been doing this for \_\_\_\_ (fill in the blank) years and I've never heard of such a thing." Some applicants knew what they were supposed to do, but a surprising number did not.

QUESTION:

**What is one of your favorite success stories?**

**Terry Ford:** One of the biggest problems this resolved was the rampant over sizing of equipment. One instance was when an HVAC designer proposed a 4.0 ton unit for a small cabin. After performing the necessary calculations, he discovered the cabin only needed a 1 1/2 ton unit. The larger unit would have been very expensive to install, the utility bills would have been excessive, and the owner's would have been less comfortable. Conversely, we had another designer submit a Manual J with the wrong design temperatures. He used high temperature desert conditions for a home that was in the mountains. The heating system would have been grossly undersized if we had not reviewed the HVAC system design.

**Russ Goyen:** In the beginning, some local HVAC contractors joined together to scuttle the requirement for HVAC designs. The group was led by a large-volume residential HVAC contractor with operations state-wide. However, he did a complete turnaround after seeing the value to his operation. He now says that he does

the designs regardless of whether or not the local jurisdiction requires it. He has also volunteered to travel, at his own expense, to these other jurisdictions to address groups of contractors encouraging them to participate in a design requirement program.

**Ron Bladen:** I was contacted by a person that did Manual J's for a number of HVAC sub-contractors in our jurisdiction. This person could not understand why their HVAC Heat Loss/Gain Certifications would not pass my review. We talked at length about all the correct equipment to satisfy the Manual J heat losses and gains. And how all that information needed to be transferred to the certification form. The "light bulb" went on and he was more than willing to comply. He also brought to my attention that no other jurisdiction was requiring this type of information. That is not a good situation and hopefully that will change in the near term.

ooo

In closing, the code officials emphasized that as "First Enforcers" the focus is to simply ensure that the HVAC system design follows the procedures. Code officials should focus on verifying the design process, and avoid attempting to design an HVAC system for the contractor. It is hoped that for those who seek to enforce this part of the residential code, this residential plan review process is simple, effective, and easy to implement.

The contributors: Ron Bladen is a Code Specialist for Fairfax County, VA; Terry Ford is Chief Building Official for the Town of Dewey-Humboldt, AZ; and Russ Goyen is the Chief Plumbing and Mechanical Inspector for the city of Idaho Falls, Idaho.

This form is intended to consolidate information that will be quick and easy to review, but will offer an objective indication of whether the HVAC System design process was followed. Some code officials, involved in the development of the form, are already enforcing an HVAC system design requirement. They volunteered to take a few minutes to share their insights, experiences, and recommendations for implementation of HVAC system design review.

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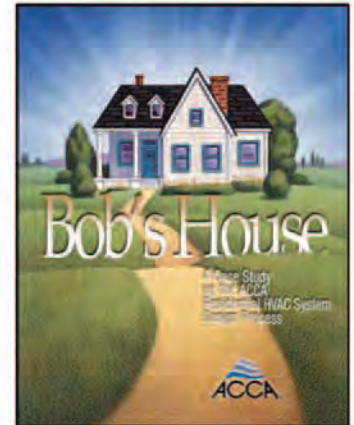
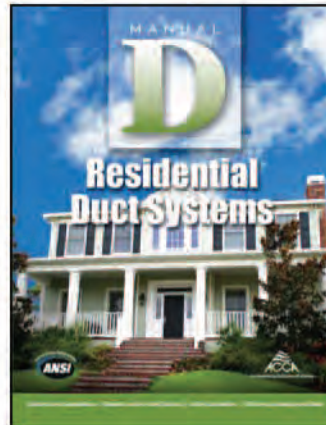
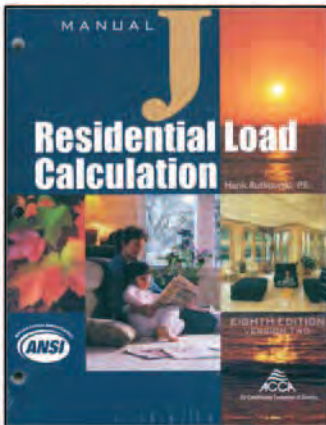
# YOUR HVAC RESOURCE CENTER

The image shows a detailed form titled "Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)". The form is organized into several sections: "Header Information" with fields for contractor name, license number, and address; "REQUIRED ATTACHMENTS" with checkboxes for various documents; "HVAC LOAD CALCULATION (IRC M1401.3)" with sub-sections for "Winter Design Conditions" and "Summer Design Conditions"; "HVAC EQUIPMENT SELECTION (IRC M1601.1)" with sub-sections for "Heating Equipment Data", "Cooling Equipment Data", and "Blower Data"; and "HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)" with sub-sections for "Design Airflow", "Equipment Design CFM", and "Total Effective Length". The form also includes a "Building Construction Information" section and a "Windows" section. At the bottom, there is a declaration section and a signature line for the contractor.

## Residential Plans Examiner's HVAC Review Form

This form was developed to support an AHJ that desires to enforce the required HVAC system design process (see IRC 2009 M1401.3 and M1601.1). The form requests key information that allows you to provide a quick and simple evaluation of just a few objective HVAC system design aspects. To download a **free** copy, visit [www.acca.org/industry/codes](http://www.acca.org/industry/codes). The form can be modified and customized with your logos, phone numbers, addresses, or other information for internal department use.

You can purchase these essential code reference materials (*ACCA Manual J, S, & D*) for your library at [www.acca.org/store](http://www.acca.org/store). Also look at *Bob's House*, written for code officials, this is the illustrated guide through the residential HVAC design process.



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