OSFM
NC DEPARTMENT OF INSURANCE

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MIKE CAUSEY, INSURANCE COMMISSIONER & STATE FIRE MARSHAL
BRIAN TAYLOR, CHIEF STATE FIRE MARSHAL

December 16, 2019

Danny Gough
PO Box 745
Lewisville, NC 27023

RE: 2004 Manual S, Section 3-4
Cold Climate

Mr. Gough:

This letter is in response to your request for formal interpretation dated December 3, 2019 that I received by email on December 3, 2019. You stated in your request:

> "In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False"

Remarks:

The term "cold climate" is not defined in Manual S, 2004. Section 3-4 does state in parentheses just after the term "cold climate" "(where heating costs are a primary concern)". The term "cold climate" and the remark in parentheses leave it to the user of the manual to make a subjective determination with regards to when to consider a location a cold climate. Based on the purpose of the 25% allowance in Section 3-4 and Mr. Rutkowski's letter (see attached) it appears that the intent is to apply this allowance where cooling is a minor consideration compared to heating and not that heating is just a greater consideration than cooling.

Conclusions:

It is not possible to respond as "True or False" to the question asked above because there will be some cases where Manual J will consider a location a cold climate where the heat loss exceeds the heat gain and other locations where that would not be considered a cold climate even though the heat loss exceeds the heat gain. Based on Mr. Rutkowski's letter I would conclude that heat loss to heat gain is not the only parameter to consider when determining a "cold climate" condition. Based on Mr. Rutkowski's letter apparently the intent is to allow the 1.25 factor in locations where cooling is insignificant to heating, but again that is not necessarily objective and leaves it to the designer to make the determination of what is "significant".

Until the term "cold climate" is defined or quantified in Manual S the use of the term is subjective and falls to the HVAC system designer to define.

Opinion:

Based on the remarks above this office considers Climate Zone 3A as designated in Figure N1101.2(1) and Table N1101.2 of the 2012 NC Residential Code and Figure R301.1 and Table R301.1 of the 2012 NC Energy Conservation Code to be “warm or moderate climate” as used in Manual S, Section 3-4 because the differential between heat loss and heat gain are insignificant.

As a matter of reference, a copy of your letter (Attachment A below) requesting a formal interpretation is included with this letter.

Please call if you have comments or questions.

Sincerely,

Carl Martin, RA
Chief Code Consultant

cc: File
Robbie Davis, Chairman – BCC
Keith Rogers, Chairman Mechanical Code Standing Committee – BCC

ATTACHEMNT A

APPENDIX E
APPEALS
NORTH CAROLINA
BUILDING CODE COUNCIL

325 North Salisbury Street, Room 5_44
Raleigh, North Carolina 27603
(919) 647-0009

APPEAL TO NCDOI/NCBCC Hearing Date_____/_____/_____

GS 153A-374, GS 160A-434
Formal Interpretation by NCDOI __X_____
Appeal of Local Decision to NCDOI _____

GS 143-140, GS 143-141
Appeal of Local Decision to NCBCC _____
Appeal of NCDOI Decision to NCBCC _____

APPELLANT *Danny G Gough* **PHONE (336) 463 - 2005 x** _____
REPRESENTING *Kristina Kolodziej, Homeonwer - Huntersville NC Climate Zone 3*
ADDRESS *PO Box 745*
CITY *Lewisville* **STATE** *NC* **ZIP** *27023*
E-MAIL *housedoc@yadtel.net* **FAX (** _____ **)** _____ **-** _____
North Carolina State Building Code, Volume *2012 NC Mechanical Code* **– Section** *312 - 312.1*
REQUEST ONE: **[X] Formal Interpretation by NCDOI** **[ ] Appeal of Local Decision to NCBCC**
[ ] Appeal of Local Decision to NCDOI **[ ] Appeal of NCDOI Decision to NCBCC**

Type or print. Include all background information as required by the referenced General Statutes and the attached policies. Attach additional supporting information.

This appeal seeks clarification of one and only one issue embodied in the requirement of Section 312.1 in the 2012 NCMC, specific to Section 3-4 in ACCA Manual S, 2004, in reference to sizing limitations of heat pump equipment.

The question is controversy can be answered with a simple true or false reply to the following statement. No further commentary is necessary. The relevant statement is,

In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False

See the attachment for further support

REASON:

The homeowner is seeking resolution from a licensed HVAC contractor who has been disciplined by the State Board of Examiners for an oversized and improperly installed heat pump system. The Board instructed the contractor to employ an engineer to determine the necessary modifications, repairs and replacements to comply with code and the Board's Rules. The contractor's engineer has created a totally new definition for the intent of the oversizing limitations in Manual S that are inconsistent with the historically held view.

Signature: _____ Date: *Dec 3, 2019*

This attachment provides background information and support to the formal interpretation request presented to NCDOI.

This matter was initially brought to the attention of Dan Dittman PE, by email on Oct 19, 2019 at 11:52 AM. The content of the email provided:

"……a controversy about the definition of "colder climate", in the earlier edition of Manual S.

The matter came to light when Bill Timberlake PE, came up with his new theory that the definition is related to the Manual J load. If the heat loss is greater than the heat gain, then Bill thinks the home is deemed to be in a cold climate and the 25% x total heat gain, oversizing limit applies. If the heat gain is higher, then the 15% x total heat gain applies.

Of course my view as well as what I was taught by Hank Rutkowski PE, the author of the Manuals, is this new theory is totally nonsensical. I have stated many reasons why.

After numerous attempts and even a conference call with Bill, Hank and I, Bill still has not been convinced to abandon his theory. Since the determination of the term is critical to a case before the Board of Examiners, it is now fallen back on your doorstep.

So, here is my question, would it be helpful if I had Hank Rutkowski write a letter defining the term, addressed to NCDOI? I don't even think a formal interpretation would be necessary, if you can defer or refer to the interpretation to the Hank, who wrote the books in the first place.

We definitely need someone with more authority than me to take a position."

Dittman provided his reply to the question Oct 21, 2019 at 5:04 PM.

Mr. Gough,

Any letter from the author would be appreciated; there would be no better source. In talking with Mr. Wes the other day, I understand the newer version of Manual S provides better clarity.

p.s. David Rittlinger is our new Mechanical Code Consultant, I am copying him so he can stay familiar with the issue.

Relying on Dittman's advice, Hank Rutkowski PE, (the author of the ACCA/ANSI technical manuals), was engaged to author a letter addressing the intent of the Manual S section. Mr. Rutkowski's letter is attached hereto.

Rutkowski's executive summary offers a direct answer to the controversy where he provides,

> **Executive Summary**
> 1. The following presentation explains why simply comparing building heat loss Btuh to heat gain Btuh, for the purpose of increasing the oversize factor to 1.25, is not the intent of ***Manual S 2004*** procedures, not even close.

Rutkowski's letter was sent to David Rittlinger PE and cc'd to Dittman by email on Oct 30, 2019 at 2:20 PM. The email reviewed the background of the controversy again to bring Rittlinger up to date on the matter.

Rittlinger provided an email reply on November 5, 2019 at 10:20 AM. His response massages sections of the 2018 NCMC, which are totally irrelevant to the question. He then clearly states what I believe to be the "close" to Rutkowski's opinion, but fails it fails to be directly on point. To wit,

> "The use of "colder climates" in 5-5 Sizing Limitations of the 2004 ACCA Manual S for Residential Equipment Selection is interpreted to mean that equipment should be sized based on climatic data and not specific load calculation data for a particular structure."

Unfortunately, the discourse moved on to further cloud the issue and contradicts his previous finding. All redundant commentary requires mental gymnastics from players unfamiliar with the subject matter, which will result in further delay for the owner to address her damage.

I asked for clarification in an email response on November 5, 2019 at 10:58 AM.

Rittlinger promptly responded at 11:34 AM with a commentary on climate zones and degree-days, again totally irrelevant to the question.

On November 5, 2019 at 10:40 PM, I sent a completely new email inquiry seeking to start with a clean slate that would not be clouded by the immaterial commentary included previously.

This email reviewed the background anew and included Hank Rutkowski's letter.

The relevant question was framed as a static statement simply requiring a true or false reply, highlighted in bold, as follows.

Good Morning David,

On Oct 30, 2019, I emailed a letter from Hank Rutkowski PE, author of the majority of the ACCA technical Manuals J,S,T,D ZR et al. I have attached the letter to this email as well. I understand you have reviewed the letter.

To provide some background, Caryl Mechanicals, a licensed HVAC contractor from Monroe, NC was the subject of disciplinary action by the Board of Examiners. As part of a consent agreement, the contractor agreed to hire an engineer to determine if the system they installed was oversized. Based on the outcome of the Manual J and S, the contractor would make the necessary repairs and/or replacements to comply with the ACCA design process, a requirement of the Board's rules.

The subject property is located in Huntersville, NC, which is in Climate Zone 3.

Pursuant to this agreement, the contractor retained Bill Timberlake PE.

Bill completed the Manual J on the subject property. But when he applied the Manual S procedure, he came up with a totally new thesis regarding the definition of "cold climate" in 2004 Manual S.

Bill's position was that since the heat loss of the subject home was greater than the heat gain, it met the intended definition of "**cold climate"** in Manual S and justified increasing the oversizing limit from 15% to 25% x the total heat gain.

This practice and theory is wholly inconsistent with what Hank has taught from the first publication of Manual S back in the mid 90's.

Rather than debate the issue with Bill, I scheduled a 3 way conference call with Hank Bill and myself. However, even after 45 minutes, Hank was not successful in convincing Bill to reevaluate his position.

So, I asked Dan Dittman if he would weigh in for DOI in an informal opinion on the matter, He suggested guidance from ACCA would be appropriate. When I mentioned Hank, Dan replied that there would be no better source for the intent than the author of the book.

So, I asked Hank to generate a letter addressing his intent. This is the ultimate purpose of his letter.

Specifically, I asked Hank to speak to a section in 2004 ACCA Manual S, regarding the intent of the term "**cold climate**" and how it is to be appropriately applied to expand the oversizing limit from 15% to 25% for heat pump systems. (15% or 25% x the total heat gain)

While the history and exhaustive commentary from Hank's letter is excellent information, the entire matter can be succinctly boiled down to one specific question which I think should settle the issue without further delays from a formal interpretation request.

I framed the question as a statement which can be either true or false. To wit,

In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False

Hank seems to answer the question in paragraph 1. under his **Executive Summary,** where he states,

"1. The following presentation explains why simply comparing building heat loss Btuh to heat gain Btuh, for the purpose of increasing the oversize factor to 1.25, is not the intent of Manual S 2004 procedures, **not even close**." (**Emphasis Mine**)

I know you have tons of stuff on your plate. So, I have tried to be sensitive of your time. But I also respect and value your input.

After reviewing Hank's letter, would you share your position on the question?

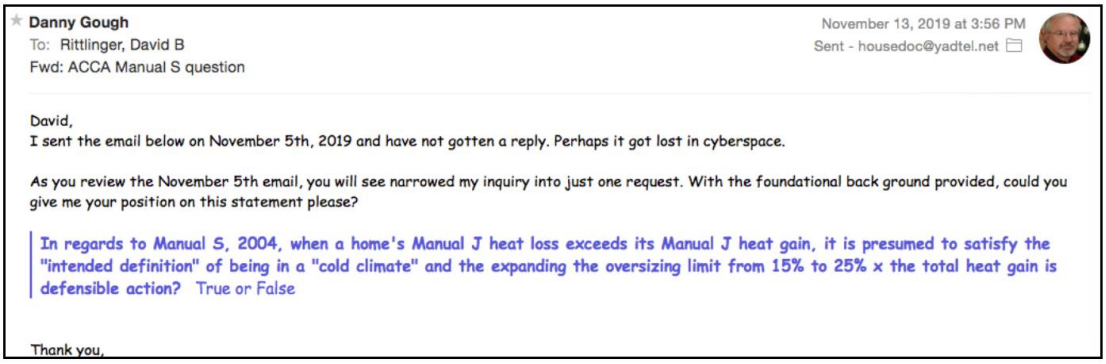
Is the statement True or False?

Thanks again for your consideration.

Danny Gough
Energy Solutions, Inc.
PO Box 745
Lewisville, NC 27023
336 463 2005
336 463 5855 Fax
housedoc@yadtel.net

On November 13, 2019 at 3:56 PM I sent a follow up email repeating the question framed as a true or false statement that would clarify the issue.

This email provided.



Danny Gough
To: Rittlinger, David B
Fwd: ACCA Manual S question

November 13, 2019 at 3:56 PM
Sent - housedoc@yadtel.net

David,
I sent the email below on November 5th, 2019 and have not gotten a reply. Perhaps it got lost in cyberspace.

As you review the November 5th email, you will see narrowed my inquiry into just one request. With the foundational back ground provided, could you give me your position on this statement please?

> In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False

Thank you,

Rittlinger provided a response on November 18, 2019 at 9:28 AM. The response was largely a copy and paste of his earlier response on November 5, 2019. That response referenced the 2018 NCMC and provided other irrelevant commentary.

There was one additional sentence at the end of the discourse, which provided.

> ".....The choice of which equipment sizing factor to use is solely at the discretion of the designer, installer and home owner based on a life-cycle cost analysis of the specific building and location."

Although this last phrase dances around the intent described by Rutkowski, it still did not provide a clear answer to the immediate question.

I sent my last response on November 19, 2019 at 8:43 AM. In it, I explained my frustration of not getting a clear answer for the owner to proceed with her remediation. I closed the email asking Rittlinger for his opinion on how to proceed, specifically asking for his opinion on whether a formal interpretation would be appropriate. I never received a reply to this last email.

Once again, this confusing course has still not answered the question, which is best framed by my static statement,

In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False

I also emphasize that Ms. Kolodziej, the owner, continues to struggle with adverse health complications in her home and has been seeking redress for over a year.

Moreover, the 2018 codes are not relevant to the question. The finding of facts revolve around the licensee's expectation for sizing and design under the 2012 code. This was the code that was enforceable at the time the permit was issued. Although the 2018 codes will be enforceable for any new installation, they are NOT controlling on the immediate question.

In conclusion, I am seeking a formal interpretation of this ONE topic on the intended definition of colder climate in the Manual S section referenced in the relevant code.

In regards to Manual S, 2004, when a home's Manual J heat loss exceeds its Manual J heat gain, it is presumed to satisfy the "intended definition" of being in a "cold climate" and the expanding the oversizing limit from 15% to 25% x the total heat gain is defensible action? True or False

David Rittlinger, PE.
Senior Mechanical Engineer
NCDOI-OSFM
1202 Mail Service Center
Raleigh, NC, 27600-1202

David;
Danny Gough has asked me to comment on the intent of a paragraph found in ***Manual S***, 2004 text. I told him I would be happy to do this, providing the AHJ that he is working with wants to hear what I have to say. Danny has informed me that… Yes, the AHJ would entertain my comments.

Executive Summary

1. The following presentation explains why simply comparing building heat loss Btuh to heat gain Btuh, for the purpose of increasing the oversize factor to 1.25, is not the intent of ***Manual S 2004*** procedures, not even close.

2. Moreover, the use of the 25% oversize limit must be based on factual knowledge of the seasonal cost for heating, and the seasonal cost for cooling. This can be per credible statistics pertaining to what local homeowners typically pay for air-air heat pump heating cost vs. cooling cost for a given location (city or town). Or, this can be based on comprehensive energy calculations (bin hour method or hourly method) for a specific location and a specific structure.

3. The ***Manual S*** intent is for the homeowner to decide whether to invest in larger equipment, based on the savings in annual energy cost, and the marginal cost for using larger equipment (per a simple… How many years does it take to break even calculation). However, the undesirable effect on indoor humidity control must also be considered (homeowners, in general, know nothing about this, so they must depend on the expertise, competence, and experience of a practitioner).

4. ***Manual S*** calculations must be based on an accurate ***Manual J*** load calculation (10% error, or less), on proper use of OEM expanded performance data (per ***Manual J*** outdoor and indoor design conditions), and on proper use of such data per ***Manual S*** procedures.

5. Seasonal energy calculations must be based on accurate ***Manual J*** load calculations for full load and all part load conditions, on an accurate equipment performance model for full load and all part load conditions (e.g., Btuh output values and KW input values), and on an accurate accounting of local weather behavior (e.g., circumstantial solar beam radiation, cloud cover, outdoor dry-bulb and wet-bulb temperatures, indoor dry-bulb temperature and relative humidity, internal loads, etc.).

6. When use of a 1.25 factor has not been defended by a local energy use study, or a comprehensive energy calculation, the ***Manual S*** over size limit defaults to 1.15 for locations that experience wet coil cooling.

Report
Regarding the intent of this ***Manual S*** Version 1, Revision 2, 2004 text:

"When heating and cooling is required, the heat pump equipment should be sized so that the sensible cooling capacity is greater than the calculated sensible cooling load, and the latent cooling capacity is greater than the latent load. Ideally, the total cooling capacity should not exceed the total cooling load by more than 15 percent. However, in colder climates, the total cooling capacity may exceed the total cooling load by as much as 25 percent. (A larger package will produce a lower thermal balance point, and this will translate into lower operating costs during the heating season.)"

The key words are… "colder climates" and "will translate into lower operating costs during the heating season". Unfortunately, a mathematical definition of what this really means is not provided. So, some history of where this came from is provided here:

This concept came from this Carrier Corp. manual for heat pump use:
A Guide for Residential Heat Pumps with selection and installation procedures
(copyright, Carrier Corp 1974 and 1978).

The Carrier rationale for the 1.25 option was that more compressor heat, and less electric coil heat, reduces energy costs and electric power use for locations that had electric utility bills that are dominated by heating cost. For example, for a typical single family detached home in Ohio (where I live), the annual heating cost is the dominant cost (say three to five times the annual cooling cost).

The related wording in the Carrier book is:
"Generally, the size of the heat pump is determined by the cooling load. However, in some areas, local utilities may stipulate a *[maximum thermal]* balance point *[value]*. If so, then it would determine how the unit is sized for the load. If the balance point has not been stipulated, and the need *[e.g., KWH and cost]* for heating is much greater than for cooling, then over sizing for the cooling load (25% to 35%) may be considered. Realize that with over sizing, there exists a higher first cost, higher installation cost (larger electric main KW service, etc.), and less than ideal summer humidity control. Humidity control can be improved by operating the blower at low speed for cooling and high speed for heating. The number of heating hours and the cost of local and future power will determine the payoff period required to offset the *[increase]* in initial cost."

On the next page, Carrier provides a map that has five climate zones, and some instructions that say in general… Oversize for heating for zones 1, 2, and 3 (from Canadian broader to southern borders of Indiana, Ohio, and Pennsylvania), and size for the cooling load for zones 4 and 5 (from the northern borders of Kentucky, West Virginia, and Maryland to the gulf coast).

So, a version of this Carrier guidance, with the approval of the ACCA technical committee, appears in the earlier versions of ***Manual S***.

> Note that this guidance was significantly upgraded and refined in the 2014 ANSI version of ***Manual S.*** Now over sizing decisions are based on the HDD65 and CDD50 values for a specific city or town, and the ***Manual J*** sensible heat ratio for a specific home.

The problem with ***Manual S***, 2004 is that "colder climates" is not explained, and there is no mathematical procedure to determine when 1.15 or 1.25 applies.

My thinking when I wrote this was: Just look at the energy bill for heating vs. the energy bill for cooling for air-air heat pump homes in a given city. If we see we are spending significantly more for heating than for cooling, 1.25 can apply; if not, 1.15 applies.

Manual S 2004 provides examples on page 4-3 (see Figure 4-2) where we see that:
> For Akron, Ohio heating is about $1,000; and cooling is about $170, so 1.25 can apply (the savings for an extra half ton is about $44 per year for $0.055 electricity).
> For Atlanta, GA heating is about $365; and cooling is about $790, so 1.15 applies (the negative savings for an extra half ton is about $13 (additional cost) per year for $0.055 electricity).
> For Minneapolis, MN heating is about $1,600; and cooling is about $195, so 1.25 can apply (the savings for an extra half ton is about $46 per year for $0.06 electricity).
> For Seattle, WA heating is about $795; and cooling is about $95, so 1.25 can apply (however the savings for an extra half ton is about $0 per year for $0.06 electricity).
The reason that there is no savings in Seattle is that they have mild winter weather, with little need for electric supplemental heat (so 1.15 should apply).

Note that the ***Manual S*** Figure 4-2 examples show estimated costs for the heating season and the cooling season, and the annual yearly savings for all energy purchased (or not). The ***Manual S*** 2004 intention was for a HVAC contractor to look at the ratio of local heating cost to local cooling cost (practitioners should have some feel for this) to decide if the 1.25 adjustment applies, or not.

Going back to the guidance in the Carrier manual we see that when the 1.25 factor is applicable … "The number of heating hours and the cost of local and future power will determine the payoff period required to offset the *[increase]* in initial cost."

This means that the homeowner needs more information (e.g. estimates of installed costs for two different size units, and the annual reduction in energy cost per use of a larger unit). Which means that the HVAC contractor has make annual energy use calculations for unit A vs. unit B. Furthermore:

> Annual energy use calculations must be based on an accurate ***Manual J*** calculation for the winter heating and summer cooling loads, and for all part load conditions, plus a compressive and accurate model for equipment behavior for full load, and for all part load conditions.

> There is no ANSI standard for residential energy calculations. However, a comprehensive bin-hour calculation can be used (see the ASHRE method book for Bin Hour Calculations), or an hourly method can be used (see the ASHRAE hand book). Or,

talk to the people at ECOTOPE (who make bin-hour and hourly calculations for research projects).

> My calculations use the bin-hour method, as implemented by my own computer models (see the latest version of ***Manual S***, Appendix 6).

> I have no knowledge of, or experience with, the use of any ***Manual J*** software product that does energy calculations, so I cannot comment on the accuracy of these products. However, the accuracy of any computer model depends on the accuracy of the input data. We all know that garbage in equal's garbage out.

> Note that SEER and HSPF methods are bogus and must not be used (see ACCA ***Manual RS***, Section 11 for a brief explanation).

> Very few practitioners can make the calculations that are required for a homeowner to make an informed decision on this 1.25 vs. 1.15 matter. One solution is for the local AHJ to investigate the payback for typical housing and to make this information available to practitioners and homeowners.

Note that the **Manual S** oversize ratio equals the total (sensible plus latent) cooling capacity (Btuh units) per use of OEM expanded performance data applied to the local summer design conditions (per MJ8 table 1A), and the entering air conditions for a summer design day (75°F and 50% RH for this case, because there is no outdoor air); divided by an accurate value for the total (sensible plus latent) ***Manual J*** cooling load.

> The project engineer's calculations show (about) 3 tons of capacity for a 3-ton load so the ***Manual S*** oversize factor is 1.0 (compiles with 1.15 and 1.25).

> My load calculation shows (about) a two-ton load, so the oversize factor for this load and a 3 Ton unit is 1.5 (does not comply with 1.15 or 1.25).
At the end of the day, using a ***Manual S*** procedure to justify an equipment size is only valid if this calculation is based on an accurate ***Manual J*** load. So the whole discussion about 1.25 vs. 1.15 is not relevant until everyone agrees we have an accurate value for the ***Manual J*** load.

> This means that all parties must agree on all aspects of the input data.

> This means that all parties must agree on proper use of MJ8 procedures and MJ8 worksheets (a vendor software program cannot be used, because we cannot be certain about the accuracy of the software output for various reasons).

> This work takes a lot of time and is rather expensive when liability is the primary issue (meetings, calculations, reviews, resolutions of issues, more calculations, more meetings, and more resolution of issues, etc.).

I can tell you this… Before MJ8 Version 1 was released, ACCA convened a committee consisting of two software houses, two major OEMs, two contractors, and Hank

Rutkowski (MJ8 author). A set of plans (for the personal home of one of the OEMs) was given to each member, and each member was to perform a MJ8 calculation, and report back to the committee. The results are provided below (one OEM could not complete the task). Everyone agreed that the HTR answer was the correct answer. HTR and Mfg A used MJ8 worksheets; the others used a software product.

Heating

Form J1 Summary	J8 vs J7 Pct'g
Windows and Glass Doors	8.2%
Wood and Metal Doors	-7.0%
Above Grade Walls and Partitions	0.6%
Ceilings and Ceiling Partitions	-9.6%
Passive Slab Floor	22.5%
Infiltration	-28.3%
Duct Loss	183.9%
Ventilation	na RFW
Form J1 totals as submitted =	

Manual J 8th Editior

Average	MJ8 Heat Loss (Btuh)					
All	ACCA-HTR	Soft 1	Mfg A	Mfg B	Cont'r	Soft 2
16775	16798	17232	16383	16686	16553	17242
1989	2078	1759	2042	2079	2099	1759
7063	7271	7308	6760	6911	7079	6975
6265	6370	6369	6231	6092	6224	6370
13484	14012	13512	13173	13239	11874	11692
11626	9166	13304	10296	13738	14552	16101
8365	6683	7079	6185	13511	5838	13952
0	0	0	0	0	0	0
65567	62378	66563	59965	72256	64219	74091

Sensible Cooling

Form J1 Summary	J8 vs J7 Pct'g
Windows and Glass Doors	17.9%
Wood and Metal Doors	23.4%
Above Grade Walls and Partitions	-15.4%
Ceilings and Ceiling Partitions	14.9%
Infiltration	-7.5%
Total Internal Gains	64.0%
Sensible Duct Gain	186.4%
Ventilation	na RFW
AED Excursion	na
MJ7 Table 6 RSM Multiplier	na
Form J1 totals as submitted =	

Manual J 8th Editior

Average	MJ8 Heat Loss (Btuh)					
All	ACCA-HTR	Soft 1	Mfg A	Mfg B	Cont'r	Soft 2
14978	15033	15095	13828	15954	14586	17316
1447	1400	1262	1633	1491	1506	1261
2704	2411	2836	3078	2492	2760	2689
7841	7616	7893	8308	7548	7645	7823
2889	1547	3688	2640	3679	3223	3594
4591	4003	5155	4182	5025	3020	3320
8542	6722	5317	6929	15200	3274	15122
na	0	0	0	0	0	0
1222	1592	1892	0	1403	0	820
na	ns	ns	ns	ns	ns	ns
44213	40324	43138	40598	52793	36014	51945

Latent Cooling

Form J1 Summary	J8 vs J7 Pct'g
Infiltration	-6.9%
Total Internal Gains	-27.5%
Latent Duct Gain	na
Ventilation	na RFW
Form J1 totals as submitted =	
Manual J SHR values =	

Manual J 8th Editior

Average	MJ8 Heat Loss (Btuh)					
All	ACCA-HTR	Soft 1	Mfg A	Mfg B	Cont'r	Soft 2
3140	1739	3965	2720	4135		3868
890	800	1158	800	800		800
691	572	513	534	1143		1100
0	0	0	0	0		0
4720	3111	5636	4054	6078		5768
0.904	0.928	0.884	0.909	0.897		0.900

And I can say this… In the last 40 years, I have had many reasons and opportunities to do load calculations for homes in various USA climate zones. In general, simple singlefamily detached homes built after 1985 tend to be in the 1,000 SF per ***Manual J*** Ton to 1,200 per ***Manual J*** Ton range.

I personally have 2,400 SF for a 2 Ton unit, and this equipment has never operated continuously, even when the outdoor temperature is 10 degrees higher than the ***Manual J*** design value with no cloud cover.

I have had various opportunities to compare my load calculation for a particular structure with one done by some other practitioner or engineer. My calculation was always smaller, by 1/2 Ton to 1 Ton, or more.

Hank Rutkowski