

*The following is an excerpted article from the December 2012 Engineering Newsletter published by the North Carolina Department of Insurance – Office of State Fire Marshal.*

**The Roles of the Code Officials and the State Board of Examiners of Plumbing, Heating, and Fire Sprinkler Contractors (hereafter Board) and Verification of Calculations for HVAC Systems- Manual J, Manual S, Manual D**

This article is a reiteration of the roles of a Code Official and the Board with regards to verification of calculations of an HVAC system installed primarily in dwellings, but it is applicable in general for residential or commercial. The intent is to encourage Code Officials to understand the rules, and use as a resource, the State Board of Examiners of Plumbing, Heating, and Fire Sprinkler Contractors in regards to load calculations and the performance of HVAC systems before and after installation.

Code Official's Role:

Requires "...For one and two-family dwellings and townhouses, heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J, or other approved heating and cooling calculation methodologies." NCMC Section 312.1.

Similarly, Section 603.2 of the NCMC requires "...Ducts installed within a single dwelling unit shall be sized in accordance with ACCA Manual D or other approved methods..."

The three sets of calculations most commonly used for residential construction are ACCA Manual J, ACCA Manual S, and ACCA Manual D. Several reoccurring questions have come up concerning these calculations, and this article is restating the expectations of a Code Official's review of these calculations. The primary question asked is: "Is the permitting Agency required to take, review, and retain the calculations performed by the contractor for Manual J, Manual S, and Manual D?"

In short, the Code requires these calculations be performed, and be available, but no peer review is required.

Refer to Section 107.1 of the NC Administrative code for minimum inspections. As is the case for a review of plans from a design professional, a quick check certainly can be performed by experienced code officials, but a line-item by line-item review of the design professional's load calculations is usually not warranted or expected.

Likewise, it is within the permitting Agency's authority to require drawings and specifications and additional data as required in order to determine the compliance with the applicable Codes, refer to Section 106.2.1 and 106.2.2 of the NC Administrative Code. Some agencies require these calculations before a permit is issued, some before final inspection, and others not at all. Several agencies have a policy of scanning the Manual J, Manual S, and Manual D in, and keeping it with the other design documents. This also is effective, as it demonstrates that the calculations were performed, and does not slow turnaround time for a permit.

Please note that care is needed to be taken by the inspector if the licensee is directed to change the installation of equipment after performing a review in accordance with Manual J, D & S. Our observation has been that if a complaint is filed with the State Board of Examiners of Plumbing, Heating & Fire Sprinklers, the inspector will be asked for the basis of the modification. If an inspector mandated a design to the contractor, understand that the inspector could be held liable should a system performance problem surface.

*The Role of State Board of Examiners of Plumbing, Heating, and Fire Sprinkler Contractors*

In addition to the Mechanical Code, a licensee of the Plumbing, Heating, and Fire Sprinkler Contractor Board (Board) is subject to the rules set forth By G.S. 87-21, and in particular 21 NC Administrative Code 50.0505 which addresses General Supervision and Standard of Competence. This Board is charged with the examination, regulation, investigation, and discipline of licensees (<http://nclicensing.org/>). As such, in cases where an in-depth investigation of performance is required, this Board should be the primary contact.

The requirements of the Board are sometimes used synonymously with the Building Code, but the Board Rules are more distinct for residential heating systems, especially in regards to zoning and temperature differentials. Also, the Board requires all licensees to perform, and keep records of, load calculations performed for each heating system, air conditioning system, or both, prior to the installation. Refer to paragraph (d) in a reprint of the 21 NCAC 50.0505 section below.

Excerpt of Board Rules:

21 NCAC 50 .0505 GENERAL SUPERVISION AND STANDARD OF COMPETENCE

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(b) The provisions of the North Carolina Building Code, including the provisions of codes and standards incorporated by reference, and adopted by the Building Code Council of North Carolina are the minimum standard of competence applicable to contractors licensed by the Board. Licensees shall design and install systems which meet or exceed the minimum standards of the North Carolina State Building Code, manufacturer's specifications and installation instructions and standards prevailing in the industry.

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(d) Every newly installed residential heating system, air conditioning system or both shall be designed and installed to maintain a maximum temperature differential of four degrees Fahrenheit room-to-room and floor-to-floor. On multilevel structures, contractors shall either provide a separate HVAC system for each floor or to install automatically controlled zoning equipment for each level with individual thermostats on each level to control the temperature for that level. The seasonal adjustment needed to maintain the four degrees Fahrenheit room-to-room and floor-to-floor maximum temperature differential shall not be accomplished through the use of manual dampers.

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(e) All licensed HVAC contractors or licensed technicians shall perform a room-by-room load calculation for all newly installed residential structures prior to installing heating systems, air conditioning systems, or both, which calculations shall be specific to the location and orientation where the HVAC system or equipment is to be installed. A written record of the system and equipment sizing information shall be provided to the homeowner, owner or general contractor

upon request and a copy shall be maintained in the job file of the licensee for a minimum of six years. Load calculations shall be performed by a licensee who holds the appropriate license from this Board, or a licensee may utilize a load calculation carried out for this particular structure and location by a North Carolina Licensed Professional Engineer.

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(f) When either a furnace, condenser, package unit or air handler in an existing residential heating or air conditioning system is replaced, the licensed HVAC contractor or licensed technician is required to perform a minimum of a whole house block load calculation. When a furnace, condenser, package unit or air handler in a residential heating or air conditioning system is replaced, the licensee shall ensure that all systems and equipment are properly sized. The licensee may utilize industry standards, reference materials, evaluation of the structure, and load calculations. A written record of the system and equipment sizing information shall be provided to the homeowner, owner or general contractor upon request and a copy shall be maintained in the job file of the licensee for a minimum of six years. If a load calculation was not performed or if a load calculation was performed and it is later determined by the Board that the unit installed was undersized or oversized, the installation will be considered as evidence of incompetence. Load calculations shall be performed by a licensee who holds the appropriate license from this Board, or a licensee may utilize load calculations carried out for this particular structure and location by a North Carolina Licensed Professional Engineer.

*History Note: Authority G.S. 87-18; 87-23; 87-26;*

*Eff. February 1, 1976;*

*Readopted Eff. September 29, 1977;*

*Amended Eff. July 3, 2012; January 1, 2010; March 1, 2005; January 1, 2004; July 1, 2003; July 1, 1991; October 1, 1989; May 1, 1989.*

### Summary

In order to minimize redundancy, a code official should consider the statutory authority the Board has in governing its licensees, and use this knowledge in forming departmental policies with regard to calculations required and depth of review of those calculations.