

**NORTH CAROLINA  
BUILDING CODE COUNCIL**

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Proposed Petitions for Rule Making Item No. \_\_\_\_\_

PROPONENT: Ad Hoc Energy Committee (Via Jonah Butcher and Jeff Tiller)

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CITY Asheville STATE NC ZIP 28801

North Carolina State Building Code, North Carolina Energy Conservation Code

**CHECK ONE:**  Revise section to read as follows:  Delete section and substitute the following.  
 Add new section to read as follows:  Delete section without substitution.

~~LINE THROUGH MATERIAL TO BE DELETED~~

UNDERLINE MATERIAL TO BE ADDED

Type or print. Continue proposal or reason on plain paper attached to this form. See reverse side for instructions.

\*\*See attached

Will this proposal add to the cost of construction? Yes  No

Explain total economic impact for added cost or savings in REASON. **Provide a fiscal analysis of any increase in cost.**

**REASON:**

This code change is part of the package of changes being brought forward from the ad hoc energy committee. This particular section was removed from the main body due to concerns in the design community about the specific language being used. The intent of the change and cost impacts have been vetted by the ad hoc committee and recommended to the council. This change was singled out to draw attention to it with the intent of fixing the concerns of the design community. The specific change adds several requirements to the HVAC system completion section with the intent to verify a minimum level of system performance.

Signature



DATE:

3/8/10

BCC CODE CHANGES  
FORM 5/1/02

**503.2.9 HVAC system completion.** Prior to the issuance of a certificate of occupancy, the design professional shall provide evidence of system completion in accordance with Sections 503.2.9.1 through 503.2.9.3.

**503.2.9.1 Air system balancing.** Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the *International Mechanical Code*. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 10 horsepower (hp) (7.4 kW) and larger.

**503.2.9.2 Hydronic system balancing.** Individual hydronic heating and cooling coils shall be equipped with means for balancing and pressure test connections.

**503.2.9.3 Manuals.** The construction documents shall require that an operating and maintenance manual be provided to the building owner by the mechanical contractor.

The manual shall include, at least, the following:

1. Equipment capacity (input and output) and required maintenance actions.
2. Equipment operation and maintenance manuals.
3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions.

Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments.

4. A complete written narrative of how each system is intended to operate.

### **503.2.9 HVAC system completion.**

HVAC system completion shall include provisions for system balancing, manuals, and system performance in accordance with this section.

#### **503.2.9.1 System balancing.**

All HVAC systems shall be balanced. Test and balance activities shall include as a minimum the following items:

1. Air systems balancing: Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the North Carolina Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 10 hp (18.6 kW) and larger.

**Exception:** Fan with fan motors of 1 hp or less.

2. Hydronic systems balancing: Individual hydronic heating and cooling coils shall be equipped with means for balancing and pressure test connections. Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.

**Exceptions:**

1. Pumps with pump motors of 5 hp or less.

2. When throttling of an individual pump results in no greater than 5% of the nameplate horsepower draw above that required if the impeller were trimmed.

3. Systems with automatically adjusting valves at each terminal.

503.2.9.2 Manuals. An operating and maintenance manual shall be provided to the building owner by the mechanical contractor.

The manual shall include, at least, the following:

1. Submittal data stating equipment model number and capacity (input and output) and selected options for each piece of equipment.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Name and address of at least one service agency.
4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
5. A complete narrative of how each system is intended to operate.
6. Names and addresses of designer of record, HVAC designer, contractor, and builder

### 503.2.9.3 System Performance

System Performance Report shall be conducted by one of the following:

1. NC licensed Professional Engineer
2. NC licensed HVAC contractor
3. A Building Commissioning Authority Certified Commissioning Professional

503.2.9.3.1 Equipment functional performance testing. Equipment functional performance testing shall demonstrate the correct installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications. Equipment functional performance testing shall not be performed until the preliminary or final Air System Balancing reports have been completed and verified.

This demonstration is to prove the operation, function, and maintenance serviceability for each of the verified systems. Testing shall include all modes of operation, including:

1. All modes as described in the Sequence of Operation.
2. Redundant or automatic back-up mode.
3. Performance of alarms and mode of operation upon a loss of power and restored power.
4. Proper duct insulation
5. Proper refrigerant charge
6. Economizer operative where required

503.2.9.3.2 Controls functional performance testing. HVAC control systems shall be tested, to the extent practical, to document that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to document they operate in accordance with approved plans and specifications.

**503.2.9.3.3 System Performance Report.** A report of test procedures and results shall be completed and provided/  
submitted to the owner and code official. The report shall be identified as "System Performance Report" and shall  
identify:

1. Functional Performance Test procedures and results used during the System performance process including measurable criteria for test acceptance, provided herein for repeatability.
2. System Balancing Report. A written report on either preliminary or final system balancing activities and measurements accordance with Section 503.2.9.1.2