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Subject: 2008 Building Energy Efficiency Standards comments

## **Nonresidential, Fault Detection and Diagnostics (FDD) for Packaged Direct-Expansion Units**

1. In review of the proposed credit for nonresidential FDD we were able to identify the analysis procedure in NACM N2 and acceptance test requirements in NA7.5.10, but were not able to find general requirements for an FDD system that is eligible for the credit. We support the addition of a credit for application of FDD; however, there needs to be a general description of what qualifies as an eligible system. The NACM N2 document indicates a cooling performance adjustment factor and air economizer maximum outdoor air fraction value corresponding to systems with FDD; however, there is not indication that the FDD system has to identify related faults to allow use of either or both of the credits. The functional test indicated in NA7.5.10.2 leads one to conclude that FDD for these systems is only related to refrigerant charge and indoor airflow.
2. The use of the word “packaged” in NACM N2 on page 2-71 and page 2-75 and in NA7.5.10 implies a restriction that does not seem to be justified. It is not clear why the credit would not apply to split systems. It is suggested that the appropriate sections be modified to clearly indicate the type of systems that are eligible for the FDD credit. Possible language would be “unitary direct expansion air conditioners and heat pumps.”
3. NACM N2, page 2-71 and 2-75: suggest removing the word “controls” after “fault detection and diagnostics (FDD)” since this creates confusion about the function of the FDD.

4. NA7.5.10.1, Construction Inspection indicates “Verify FDD hardware is installed on equipment by the manufacturer and that equipment make and model include factory-installed FDD hardware ...” This implies that only factory-installed FDD is acceptable; however, there is no apparent justification for why a field-installed option would not be acceptable. This could be compared to an air economizer, which is potentially more complicated than FDD, but is not required to be factory-installed. There is an apparent inconsistency in that the air economizer credit could be obtained for FDD with a field-installed air economizer and a FDD system, but the FDD system must be factory-installed. In this case the FDD system may not be applicable to the economizer; although, there is no specific requirement that the FDD system be able to detect economizer faults.
5. NA7.5.10.2, Functional Testing, items 1 and 2 indicates “1. Test low airflow condition by replacing the existing filter with a dirty filter or appropriate obstruction. 2. Verify that the fault detection and diagnostics system reports the fault.” It is not clear under what conditions the test must be conducted and what would be accepted as an “appropriate obstruction.”
6. NA7.5.10.2, Functional Testing, item 3 indicates “Verify that the system is able to verify the correct refrigerant charge.” It is not clear under what conditions the test must be conducted or exactly how the test should be conducted. Does this mean operate the system in cooling mode and confirm that there is no indication of a charge fault?
7. NA7.5.10.2, Functional Testing, item 4 indicates “Calibrate outside air, return air, and supply air temperature sensors.” This implies the sensors are required; however, there is no indication of why. Requiring these sensors would potentially discourage suppliers from developing innovative FDD methods or burden them with non-essential sensors. Additionally, sensor calibration would not normally be considered part of a functional test and there are no specific requirements for what constitutes a valid sensor calibration.

## **Nonresidential, Automatic fault detection and diagnostics (FDD) for air handling units and zone terminal units**

1. In review of the proposed credit for nonresidential FDD we were able to identify the analysis procedure in NACM N2 and acceptance test requirements in NA7.5.11, but were not able to find general requirements for an FDD system that is eligible for the credit. We support the addition of a credit for application of FDD; however, there needs to be a general description of what qualifies as an eligible system. Apparently the zone terminal part applies only to air system terminal units and not systems like water source heat pumps.

## Low-rise Residential, Space Cooling, Charge Verification

1. We support the addition of requiring charge verification for TxV units and the addition of an option for a charge indicator in lieu of field verification testing; however, the requirements for the Charge Indicator (presented in JA6) are prescriptive and limited to a particular technical approach. This prevents the application of other existing technical approaches (e.g., US Patent 6,571,566) and precludes developers from using other innovative methods. Additionally, the technical approach has documented technical flaws (e.g., Temple, K. and Rossi, T., “Enhanced Refrigeration Diagnostics for an Improved Air Conditioning Tune-up Program,” ACEEE 2006 Summer Study on Energy Efficiency in Buildings) including sensitivity to other system faults. Additional details on our technical concerns will be provided upon request

Sincerely,

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