

Exhibit J

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**DEPARTMENT OF ENERGY**

**Office of Energy Efficiency and Renewable Energy**

**10 CFR Parts 434 and 435**

**[Docket No. EE-RM-79-112-C]**

RIN 1904-AA69

**Energy Code for New Federal Commercial and Multi-Family High Rise Residential Buildings**

**AGENCY:** Office of Energy Efficiency and Renewable Energy, DOE.

**ACTION:** Final rule.

**SUMMARY:** The Department of Energy today issues a rule that establishes building energy efficiency standards for new Federal commercial and multi-family high rise residential buildings pursuant to the requirements of the Energy Conservation and Production Act (ECPA). The final rule revises the current interim Federal standards to conform generally with the format of the current voluntary building energy codes. The final rule contains substantive changes from the interim rule in the areas of lighting, mechanical ventilation, motors, building envelopes, fenestration rating test procedures, and test procedures for heating and cooling equipment.

**DATES: Effective Date:** This regulation is effective October 8, 2001. The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of October 8, 2001.

**FOR FURTHER INFORMATION CONTACT:**

Ronald B. Majette, Office of Codes and Standards, EE-43, U.S. Department of Energy, Room 1J-018, 1000 Independence Avenue, SW., Washington, DC 20585-0121, Tel: 202-586-0517

Francine B. Pinto, Office of General Counsel, GC-72, U.S. Department of Energy, Room 6E-042, 1000 Independence Avenue, SW., Washington, DC 20585-0103, Tel: 202-586-7432

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**I. Introduction**

**A. Authority**

Section 305(a)(1) of the Energy Conservation and Production Act, as amended (ECPA), 42 U.S.C. 6834(a)(1), requires the Department of Energy ("Department" or "DOE") to establish by rule energy standards for new Federal buildings. In developing this final rule, the Department is directed to consult with other Federal agencies as well as

private and State associations and other appropriate persons.

Section 305(a)(1) requires that the rule contain energy efficiency measures that are technologically feasible and economically justified. Since ECPA establishes that the new standards meet, at a minimum, the requirements of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)/Illuminating Engineering Society of North America (IESNA) Standard 90.1-1989 (hereinafter Standard 90.1-1989) (Section 305(a)(2)(A)), the Department is not required to establish the technological feasibility and economic justification for these minimum statutorily prescribed requirements (otherwise referred to as the "statutory baseline"). The Department is interpreting this minimum requirement to include those addenda to Standard 90.1-1989 which were in effect at the time the Energy Policy Act of 1992 (EPACT), which amended ECPA, was enacted. Since these addenda were part of Standard 90.1-1989 at the time EPACT was enacted, they are part of the baseline against which the final rule is compared for the purposes of assessing its energy and economic impacts.

Section 305(a)(2)(A) requires that the rule contain energy saving and renewable energy specifications that meet or exceed the energy saving and renewable energy specifications of Standard 90.1-1989 for commercial buildings and of the Model Energy Code (MEC), 1992, for residential buildings. MEC 1992 exempts multi-family high-rise residential buildings (over three stories in height above ground) which comply with Standard 90.1-1989. As a result, Standard 90.1-1989 is the applicable standard under section 305 of ECPA for high-rise residential buildings. The final rule complies with section 305(a)(2)(A).

The rule issued today is required to become effective no later than one year after it is issued. (Section 305(a)(1)). The effective date is October 8, 2001.

Section 305(a)(2)(B) requires that to the extent practicable, the new Federal building energy standards use the same format as the appropriate voluntary building energy code. The final rule revises the current interim Federal standards to conform generally with the format and language of the codified version of Standard 90.1-1989. The addenda to Standard 90.1-1989 included in the final rule are also generally incorporated in their codified form.

Section 305(a)(2)(C) further requires that the final rule be established in consultation with the Environmental

TABLE 403.2.9.1.—MINIMUM PIPE INSULATION (IN.)<sup>a</sup>

Fluid Design Operating Temp. Range (F)	Insulation conductivity <sup>a</sup>		Nominal pipe diameter (in.)				
	Conductivity Range Btu in./ (h ft <sup>2</sup> F)	Mean Temp. F	<1.0	1.0 to 1.25	1.5 to 3.0	4.0 to 6.0	8.0
<b>Heating systems (Steam, Steam Condensate, and Hot Water)<sup>b, c</sup></b>							
>350 .....	0.32–0.34	250	1.0	1.5	1.5	2.0	2.5
251–350 .....	0.29–0.32	200	1.0	1.0	1.5	2.0	2.0
201–250 .....	0.27–0.30	150	1.0	1.0	1.0	1.5	1.5
141–200 .....	0.25–0.29	125	1.0	1.0	1.0	1.5	1.5
105–140 .....	0.22–0.28	100	0.5	0.5	0.75	1.0	1.0
<b>Domestic and Service Hot Water Systems</b>							
105 and Greater .....	0.22–0.28	100	0.5	0.5	0.75	1.0	1.0
<b>Cooling Systems (Chilled Water, Brine, and Refrigerant)<sup>d</sup></b>							
40–55 .....	0.22–0.28	100	0.5	0.5	0.5	0.5	0.5
Below 40 .....	0.22–0.28	100	0.5	0.5	0.5	0.5	0.5

<sup>a</sup> For insulation outside the stated conductivity range, the minimum thickness (T) shall be determined as follows:  $T = r\{1 + t/r\}^{K/k} - 1$   
 Where T = minimum insulation thickness (in), r = actual outside radius of pipe (in), t = insulation thickness listed in this table for applicable fluid temperature and pipe size, K = conductivity of alternate material at mean rating temperature indicated for the applicable fluid temperature (Btu in/h ft<sup>2</sup> F); and k = the upper value of the conductivity range listed in this table for the applicable fluid temperature.  
<sup>b</sup> These thicknesses are based on energy efficiency considerations only. Safety issues, such as insulation surface temperatures, have not been considered.  
<sup>c</sup> Piping insulation is not required between the control valve and coil on run-outs when the control valve is located within four feet of the coil and the pipe diameter is 1 inch or less.  
<sup>d</sup> Note that the required minimum thickness does not take water vapor transmission and possible surface condensation into account.

TABLE 403.2.9.2.—MINIMUM DUCT INSULATION R-VALUE<sup>a</sup>

Duct location	Cooling supply ducts				Heating supply ducts				Return ducts
	CDD65 ≤500	500< CDD65 ≤1,000	1,000< CDD65 ≤2,000	CDD65 ≥2,000	HDD65 ≤1,500	1,500< HDD65 ≤4,500	4,500< HDD65 ≤7,500	HDD65 ≥7,500	
Exterior of Building .....	R-3.3 ..	R-5.0 ..	R-6.5	R-8.0 ..	R-3.3 ..	R-5.0	R-6.5	R-8.0 ..	R-5.0
Ventilated Attic .....	R-3.3 ..	R-3.3 ..	R-3.3	R-5.0 ..	R-5.0 ..	R-5.0	R-5.0	R-5.0 ..	R-3.3
Unvented Attic .....	R-5.0 ..	R-5.0 ..	R-5.0	R-5.0 ..	R-5.0 ..	R-5.0	R-5.0	R-5.0 ..	R-3.3
Other Conditioned Spaces <sup>b</sup> .....	R-3.3 ..	R-3.3 ..	R-3.3	R-3.3 ..	R-3.3 ..	R-3.3	R-3.3	R-3.3 ..	R-3.3
Indirectly Conditioned Spaces <sup>c</sup> .....	none ...	R-3.3 ..	R-3.3	R-3.3 ..	R-3.3 ..	R-3.3	R-3.3	R-3.3 ..	none
Buried .....	none ...	none ...	none ...	none ...	R-5.0 ..	R-5.0	R-5.0	R-5.0 ..	R-3.3

<sup>a</sup> Insulation R-values, measured in (h.ft<sup>2</sup>.°F)/Btu, are for the insulation as installed and do not include film resistance. The required minimum thickness do not consider water vapor transmission and possible surface condensation. The required minimum thicknesses do not consider water vapor transmission and condensation. For ducts that are designed to convey both heated and cooled air, duct insulation shall be as required by the most restrictive condition. Where exterior walls are used as plenum walls, wall insulation shall be as required by the most restrictive condition of this section or subsection 402. Insulation resistance measured on a horizontal plane in accordance with RS-6 (incorporated by reference, see § 434.701) at a mean temperature of 75 °F. RS-6 is incorporated by reference at § 434.701.  
<sup>b</sup> Includes crawl spaces, both ventilated and non-ventilated.  
<sup>c</sup> Includes return air plenums, with and without exposed roofs above.

**403.2.9.2 Duct and Plenum Insulation.** All supply and return air ducts and plenums installed as part of an HVAC air distribution system shall be thermally insulated in accordance with Table 403.2.9.1. Exceptions are as follows:

(a) Factory-installed plenums, casings, or ductwork furnished as a part of the HVAC equipment tested and rated in accordance with subsection 403.1

(b) Ducts within the conditioned space that they serve. (incorporated by reference, see § 434.701)ca a06oc0.186

**403.2.9.3 Duct and Plenum Construction.** All air-handling ductwork and plenums shall be constructed and

erected in accordance with RS-34, RS-35, and RS-36 (incorporated by reference, see § 434.701). Where supply ductwork and plenums designed to operate at static pressures from 0.25 in. wc to 2 in. wc, inclusive, are located outside of the conditioned space or in return plenums, joints shall be sealed in accordance with Seal Class C as defined in RS-34 (incorporated by reference, see § 434.701). Pressure sensitive tape shall not be used as the primary sealant where such ducts are designed to operate at static pressures of 1 in. wc, or greater.

**403.2.9.3.1** Ductwork designed to operate at static pressures in excess of

3 in. wc shall be leak-tested in accordance with Section 5 of RS-35, (incorporated by reference, see § 434.701), or equivalent. Test reports shall be provided in accordance with Section 6 of RS-35, (incorporated by reference, see § 434.701)m or equivalent. The tested duct leakage class at a test pressure equal to the design duct pressure class rating shall be equal to or less than leakage Class 6 as defined in Section 4.1 of RS-35 (incorporated by reference, see § 434.701). Representative sections totaling at least 25% of the total installed duct area for the designated pressure class shall be tested.

**403.2.10 Completion.**