

COUNCIL OF THE DISTRICT OF COLUMBIA

NOTICE

D. C. LAW 3-39

"District of Columbia Energy Conservation Code Act of 1979"

Pursuant to Section 412 of the District of Columbia Self-Government and Governmental Reorganization Act, P. L. 93-198, "the Act", the Council of the District of Columbia adopted Bill No. 3-52, on the first reading, second reading and reconsideration of the second reading, July 17, 1979, July 31, 1979 and September 25, 1979 respectively. Following the signature of the Mayor on October 16, 1979, this legislation was assigned Act No. 3-107, published in the October 19, 1979, edition of the D. C. Register, (Vol. 26 page 1735) and transmitted to Congress on October 19, 1979 for a 30-day review, in accordance with Section 602 (c)(1) of the Act.

The Council of the District of Columbia hereby gives notice that the 30-day Congressional Review Period has expired, and, therefore, cites this enactment as D. C. Law 3-39, effective December 6, 1979.

Arrington E. Dixon

ARRINGTON DIXON
Chairman of the Council

Dates Counted During the 30-day Congressional Review Period:

October 19, 22, 23, 24, 25, 26, 29, 30, 31 .

November 1, 2, 5, 6, 7, 8, 9, 13, 14, 15, 16, 19, 20, 26,
27, 28, 29, 30

December 3 4 5

3-39

Enrolled Original

IN THE COUNCIL OF THE DISTRICT OF COLUMBIA

Conservation Code Act of 1979

AN ACT

3-107

IN THE COUNCIL OF THE DISTRICT OF COLUMBIA

To amend existing regulations governing the construction of buildings in the District of Columbia to achieve more efficient utilization of energy in new and existing buildings.

SEC. 1.
BE IT ENACTED BY THE COUNCIL OF THE DISTRICT OF COLUMBIA,
That this act may be cited as the "District of Columbia Energy Conservation Code Act of 1979".

Sec. 2. The District of Columbia Energy Conservation Code as added to the 1972 D.C. Building Code by section 3 of this act shall apply to the buildings, structures, equipment, signs, devices, and premises in the District of Columbia for which regulations are herein provided and for which a permit application has not been filed before the effective date of this act for the purpose of construction, alteration, change, repair, or improvement.

Sec. 3. The 1972 D.C. Building Code, effective September 23, 1972 (issued as Title 5A-1, DCRR), is amended by adding the following provision designated as the Title

ARTICLE

SEC-1 and entitled the "District of Columbia Energy Conservation Code" to read as follows:

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"302.0 - Heating, Ventilating and Air Conditioning

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Heating Systems

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"401.0 - Performance Efficiency

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"403.0 - Recirculation System

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"TITLE SEC - 1
"DISTRICT OF COLUMBIA ENERGY CONSERVATION CODE

"ARTICLE 1 - GENERAL PROVISIONS

"SECTION 100.0 - TITLE AND SCOPE

"Sections

"100.1 Title

"100.2 Purpose and Scope

"100.3 Exempt Buildings or Portions Thereof

"100.4 Application to Existing Buildings

"100.5 Alternative Systems

"Sec. 100.1 Title.

"These Regulations shall be known as the Energy Conservation Code of the District of Columbia and may hereinafter be referred to as 'the Code' or 'this Code'.

"Sec. 100.2 Purpose and Scope.

"This Code sets forth the minimum requirements for the design and construction of building envelopes; the design and selection of heating, ventilating, and air-conditioning systems; service water heating; electrical distribution and

illuminating systems; and equipment required for the purpose of effective use of energy. This Code is applicable to all new buildings and other structures or portions thereof hereafter erected and to existing buildings and other structures when the renovation work of such buildings involves the reconstruction of the building envelope or the replacement or modification of systems which utilize energy; and to the illuminating systems of existing buildings open to the public.

"Sec. 100.3 Exempt Buildings or Portions Thereof.

"(1) Buildings and other structures, or portions thereof, which are neither heated nor cooled, shall not be required to comply with the provisions of this Code.

"(2) Buildings and other structures, or portions thereof, whose peak design rate of energy usage is less than one watt per square foot or 3.4 Btu per hour per square foot of floor area for all purposes, shall be exempted from complying with the provisions of this Code.

"(3) Buildings and other structures owned by the United States or under exclusive control of officers of the United States in their official capacity, shall be exempted from complying with the regulations of this Code. If the lessor

is responsible for maintenance and repairs to the property leased to the United States, such property is not deemed to be under exclusive control of officers of the United States.

"Sec. 100.4 Application to Existing Buildings.

"(1) Additions to Existing Buildings. Additions to existing buildings or structures may be made to such buildings or structures without making the entire building or structure comply. The new addition shall conform to the provisions of this Code as they relate to new construction only.

"(2) Renovation of Existing Buildings. When the renovation work of an existing building involves reconstruction of 50% or more of the building envelopes or replacement of building equipment, or both, the reconstructed portion and the new equipment shall be in compliance with this Code. Where strict compliance would present an extreme hardship to an owner, the Director of the Department of Housing and Community Development (hereinafter referred to as the 'Director') may grant a variance; however such a variance must be predicated on appropriate compensating conditions.

"(3) Historic Buildings. Historic buildings are exempt from this code. This exemption shall apply to those buildings which have been specifically designated as historically significant by the appropriate D.C. Commission, or listed in the 'National Register of Historic Places', or which have been determined to be eligible for listing.

"(4) Illumination levels in existing buildings open to the public shall not exceed levels as specified herein this Code.

"Sec. 100.5 Alternative Systems.

"(1) Alternative building systems and equipment design may be approved by the Director when it can be demonstrated that the proposed overall energy consumption will not exceed that of a similar building with similar forms of energy requirements designed in accordance with the provisions of this Code.

"(2) When such alternative systems utilize solar, wind or other nondepletable energy sources for all or part of its energy sources; such nondepletable energy supplied to the buildings may be excluded from the total energy chargeable to the proposed alternative design.

"(3) Proposed alternative designs submitted as requested for exception to the standard design criteria must be accompanied by an energy analysis prepared in accordance with applicable provisions of the latest revision of ASHRAE Standard 90. Other established principles of environmental technologies may be utilized in preparing the required energy analysis if approved by the Director.

"SECTION 101.0 - DEFINITIONS

"Sections

"101.1 General

"101.2 Definitions

"Sec. 101.1 General.

"In the interpretation of this Code, words shall have their usually accepted meaning or such as the context may imply. Words used in the present time include the future; words in the singular number include the plural number and those in the plural number include the singular number; and words in the masculine gender include the feminine gender.

"Sec. 101.2 Definitions.

"Unless otherwise expressly stated, the following terms shall for the purpose of this Code, have the meaning indicated in this Section."

"Air transport factor. The ratio of the rate of useful sensible heat removal from the conditioned space to the energy input to the supply and return fan motor(s), expressed in consistent units and under the designated operating conditions."

"Building envelope. The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior."

"Building equipment. Heating, ventilating, and air conditioning systems; service water heating; electrical distribution and illuminating systems; and equipment required for the purpose of effective use of energy."

"Coefficient of Performance (COP) - Cooling.

"(1) Electrically operated HVAC Equipment. The ratio of the rate of net heat removal to the rate of total energy input expressed in consistent units and under designated rating conditions. The rate of net heat removal as used within this definition shall be the change in the total heat contents of the air entering and leaving the equipment

(without reheat). The total energy inputs as used within this definition shall be determined by combining the energy inputs to all elements of the equipment, including, but not limited to, compressors, pumps, supply-air fans, return-air fans, condenser-air fans, cooling tower fans and pumps, and the heating, ventilating and air conditioning system equipment control circuit.

"(2) Applied HVAC System Components. The ratio of the rate of net heat removal to the rate of total energy input expressed in consistent units and under designated rating conditions. The rate of net heat removal as used within this definition shall be the difference in total heat contents of the water or refrigerant entering and leaving the component. The total energy input as used within this system shall be determined by combining the energy inputs to all elements and accessories of the component, including, but not limited to, compressors, internal circulating pumps, condenser-air fans, evaporative-condenser cooling water pumps, purge, and the heating, ventilating and air conditioning system components control circuit.

"(3) Heat-operated HVAC System Equipment. The ratio of the net cooling output to the total heat input. The rate of net heat removal as used within this definition shall be the

difference in total heat contents of the water or refrigerant entering and leaving the component. The total energy input as used within this system shall be determined by combining the energy inputs to all elements and accessories of the component, including, but not limited to, compressors, internal circulating pumps, condenser-air fans, evaporative-condenser cooling water pumps, purge, and the heating, ventilating and air conditioning system components control circuit.

"Coefficient of Performance (COP) - Heating - Heat Pump. The ratio of the rate of net heat output to the rate of total energy input expressed in consistent units and under designated rating conditions. The rate of net heat output as used within this definition shall be the change in the total heat contents of the air entering and leaving the equipment, excluding supplementary heat. The total energy input as used within this definition shall be the combined energy input to all elements except supplementary heaters of the heat pump, including, but not limited to, compressors, pumps, supply-air fans, return-air fans, outdoor-air fans, cooling-tower fans and the HVAC system equipment control circuit.

"Degree day, heating. A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature is less than 65 degrees F, there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65 degrees F.

"Efficiency, building system. The ratio of useful energy (at the point of use) to the thermal energy input at the building wall for a designated time period, expressed in percent.

"Energy. The capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical, and chemical; in customary units, measured in kilowatt-hours (kwh) or British thermal units (Btu).

"Energy efficiency ratio. (EER). The ratio of net cooling capacity in Btu per hour to total rate of electric input in watts under designated operating conditions.

"Energy, recovered. (See recovered energy).

"Existing Buildings Open to the Public. Those buildings which are open to the public during normal business hours.

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and which respectively exceed 20,000 square feet of gross floor area, except excluded buildings.

"**Exterior envelope.** (See building envelope).

"**Floor area.** The sum of areas of all the floors of the building, including basements, cellars, mezzanine and intermediate floored tiers and penthouses, measured from the interior faces of exterior walls or from the centerline of walls separating buildings, without deduction for hallways, stairs, closets, thickness of walls, columns or other features.

"**Covered walkways, open roofed-over areas, porches and similar spaces shall be excluded.**

"The floor area does not include such features as pipe trenches, exterior terraces or steps, chimneys, room overhangs, etc.

"**Fuel.** A substance which may be burned to give heat or generate electricity; a nuclear substance used to generate electricity.

"**Gross wall area.** The normal projection of the exterior wall area bounding interior space which is conditioned by an HVAC system.

energy-using system; includes opaque wall, window and door areas.

"The gross area of exterior walls consists of all opaque wall areas, including foundation walls above grade, between floor spandrels, peripheral edges of floors, window areas including sash, and door areas, where such surfaces are exposed to outdoor air and enclose a heated or mechanically cooled space including interstitial areas between two such spaces.

"Heat. The form of energy that is transferred by virtue of a temperature difference.

"Heat pump. (See unitary heat pump).

"Heated space. Space, within a building, which is provided with a positive heat supply to maintain air temperature of 50 degrees F or higher.

"Humidistat. An instrument which measures changes in humidity and controls a device(s) for maintaining a desired humidity.

"HVAC. Heating, ventilating and air conditioning.

"HVAC system. A system that provides either collectively or individually the processes of comfort heating, ventilating,

and/or air conditioning within or associated with a building.

"Infiltration. The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building, caused by the pressure effects of wind and/or the effect of differences in the indoor and outdoor air density.

"Non-depletable energy sources. Sources of energy (excluding minerals) derived from incoming solar radiation including photosynthetic processes; from phenomena resulting therefrom including wind, waves and tides, lake or pond thermal differences; and energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

"Opaque areas. All exposed areas of a building envelope which enclose conditioned space, except openings for windows, skylights, doors and building service systems.

"Outside air. Air taken from the outdoors and, therefore, not previously circulated through the system.

"Overall thermal transfer value (OTTV). An overall coefficient of heat gain expressed in units of Btu per hour per square foot per degree F.

"**Packaged terminal air-conditioner.** A factory-selected combination of heating and cooling components, assemblies or sections, intended to serve a room or zone." ~~To provide free delivery and installation of packaged source units or~~

"**Positive heat supply.** Heat supplied to a space by design or by heat losses occurring from energy-consuming systems or components associated with that space."

"**Power.** In connection with machines, power is the time rate of doing work. In connection with the transmission of energy of all types, power refers to the rate at which energy is transmitted; in customary units, it is measured in watts (W) or British thermal units per hour (Btu/h)."

"**Recovered energy.** Energy utilized which would be wasted from an energy utilization system."

"**Reheat.** The application of sensible heat to supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air to provide cooling."

"**Roof assembly.** A roof assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thereby creating a building transmission heat loss or gain, where such assembly is exposed to outdoor air and encloses a heated or mechanically cooled space."

"Room air conditioner. An encased assembly designed as a unit primarily for mounting in a window or through a wall, or as a console. It is designed primarily to provide free delivery of conditioned air to an enclosed space, room or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

"Sequence. A consecutive series of operations.

"Service systems. All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

"Service water heating. Supply of hot water for domestic or commercial purposes other than comfort heating.

"Service water heating demand. The maximum design rate of energy withdrawal from a service water heating system in a designated period of time (usually an hour or a day).

"Shading Coefficient (SC).

SC = Solar Heat Gain of Fenestration (West Elev. at 4 pm Sun Time, 9/21)
Solar Heat Gain Unshaded DSB (West Elev. at 4 pm Sun Time, 9/21)

consists of building sections, walls, floors, spaces, and surfaces, etc., where:

DS means double strength

B means grade class

"System. A combination of central or terminal equipment or components and/or controls, accessories, interconnecting means, and terminal devices by which energy is transformed so as to perform a specific function, such as HVAC, service water heating or illumination.

"Terminal device. The means by which the transformed energy from a system is finally delivered; i.e., registers, diffusers, lighting fixtures, faucets and similar elements.

"Thermal resistance (R). A measure of the ability to retard the heat flow from one side of insulation material to the other. It is expressed numerically as the reciprocal of the thermal transmittance value (U) of the same material.

"Thermal transmittance (U). Overall coefficient of heat transmission expressed in units of Btu per hour per square foot per degree F. It is the time rate of heat flow. The U value applies to combinations of different materials used in series along the heat flow path, single materials that

comprise a building section, cavity air spaces, and surface air films on both sides of a building element.

"Thermal transmittance (U_0). Overall (average) heat transmission of a gross area of the exterior building envelope, expressed in units of Btu per hour per square foot per degree F.

"The U_0 value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors, and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floors, or roof/ceiling.

"Thermostat. An instrument which measures changes in temperature and controls device(s) for maintaining a desired temperature.

"Unitary cooling and heating equipment. One or more factory-made assemblies which include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

"Unitary heat pump. One or more factory-made assemblies which include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions. It is designed to provide the functions of air-circulating, air cleaning, cooling and heating with controlled temperature, and dehumidifying, and may optionally include the function of humidifying. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

"Ventilation air. That portion of supply air which comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

"Zone. A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device.

"SECTION 102.0 - ADMINISTRATIVE AUTHORITY

"Sections

"102.1 Director of the Department of Housing and Community

Development

Serialized Original

"102.2 Verbal Waiving of Regulations Insufficient

"Sec. 102.1 Director of the Department of Housing and Community Development.

"(1) General Duties and Powers. The Director of the Department of Housing and Community Development is the Administrative Authority charged with the enforcement of this Code, the making of interpretations of these regulations and the approval of equipment, material and designs.

"(2) Special Powers and Limitations. The Director shall enforce the intent of the regulatory requirements as well as the regulations themselves, as approved by the Mayor. However, he shall not have the power to amend the regulations.

"Sec. 102.2 Verbal Waiving of Regulations Insufficient.

"Under no circumstances whatever shall verbal permission given by anyone, whether connected with the government of the District of Columbia or not, be considered a justification for any deviation from or violation of these regulations.

"SECTION 103.0 - PLANS AND SPECIFICATIONS

"Sections

"103.1 Submittal of Drawings Required

"103.2 Details

"103.3 Preparation by Registered Engineers and Architects

"103.4 Certification of Plans

"Sec. 103.1 Submittal of Drawings Required.

"With each application for building permit, copies of plans and detailed drawings to indicate the conformance with this Code shall be submitted in quadruplicate to the Building and Zoning Regulations Administration of the Department of Housing and Community Development for the approval of the Director, who may also require four sets of specifications or other necessary engineering criteria.

"Sec. 103.2 Details.

"The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed including, but not limited to, design criteria, exterior envelope component materials, thermal transmittance values of the envelope elements, thermal resistance values (R) of insulating materials, size and type of apparatus and equipment,

equipment and systems controls and other pertinent data to indicate conformance with the requirements of this Code.

"Sec. 103.3 Preparation by Registered Engineers or Architects.

"All plans and specifications required by this Code shall be prepared by professional engineers or registered architects, licensed to practice in the District of Columbia, except those for one-or-two-family dwellings of three stories or less and those having a floor area less than 5,000 square feet regardless of the usage of the building.

"Sec. 103.4 Certification of Plans.

"Each set of plans and specifications submitted under the proposed alternative systems, Sec. 100.5, shall be certified by the designer on the prints with his seal and signature to the fact that the total calculated energy consumption of the alternative system will not exceed that calculated for a similar building with similar forms of energy requirements designed in accordance with the provisions of this Code.

"SECTION 104.0 - INSPECTIONS

*Enrolled original***"Sections****"104.1 General** to the number of days of the work in**"104.2 Inspection During Construction****"104.3 Uncovering of Construction at the Owner's Expense****"104.4 Final Inspection****"Sec. 104.1 General.**

"All construction or work which is required to be done by this Code shall be subject to inspection by the Building Inspectors of the Building and Zoning Regulation Administration, Department of Housing and Community Development.

"Sec. 104.2 Inspection During Construction.

"Inspections shall be made to determine that the work is done according to approved plans and permits; that the materials used comply with the required standards; that due precautions are observed and work performed in compliance with applicable laws, regulations and requirements.

"Sec. 104.3 Uncovering of Construction at the Owner's Expense.

"No construction shall be covered until it has been inspected, tested and accepted as prescribed in this Code. If any work is covered before inspection it shall be

uncovered for inspection after notice to uncover the work has been issued to the owner. The cost of the uncovering shall be borne by the owner.

"Sec. 104.4 Final Inspection.

"The final inspection shall determine the full completion of construction and installation of required equipment; performance tests as required and full compliance with all applicable regulations.

"SECTION 105.0 - SEVERABILITY

"Sections

"105.1 Severability

"Sec. 105.1 Severability.

"If any provision of this Code, or the application thereof to any person or circumstances is held invalid, the remainder of this Code and application of such provision to other persons and circumstances shall not be affected thereby.

"ARTICLE 2 - EXTERIOR ENVELOPE REQUIREMENTS

"SECTION 200.0 - SCOPE AND GENERAL REQUIREMENTS

"Sections - Buildings that are heated or mechanically

"200.1 Scope - intended so as to provide the required

"200.2 General Requirements

"Sec. 200.1 Scope.

"The intent of this Article is to provide the minimum requirements for thermal design of the exterior envelope construction in the interest of energy conservation. These requirements are based upon the following design parameters:

"(1) Outdoor design temperature shall be not greater than 10 degrees F Dry Bulb in winter; not less than 92 degrees F Dry Bulb and 78 degrees F Wet Bulb in summer.

"(2) Indoor design temperature shall be not greater than 72 degrees F for heating and not less than 78 degrees F for cooling.

"(3) Annual Fahrenheit Heating Degree Days shall be not less than 4200.

"(4) Degree north latitude shall be 38 degrees -51'.

"Sec. 200.2 General Requirements.

"(1) All buildings that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components.

"(2) A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements of the exterior envelope as provided in this Article when requirements differ.

"(3) The required thermal transmittance value (U_0) of any one component, such as roof/ceiling, wall or floor may be increased and the U_0 value for any other components decreased: PROVIDED, That the overall heat gain or loss for the entire building envelope does not exceed the total resulting from conformance to the required U_0 values.

"(4) In addition to the criteria set forth in this Article, the proposed design may take into consideration the thermal mass of the building in considering energy conservation in accordance with recognized design procedures when so approved by the Director.

"SECTION 201.0 - EXTERIOR WALLS

"Sections

"201.1 Applicability

"201.2 Combined Thermal Transmittance Value (Uo)

"201.3 Allowable Thermal Transmittance Value (Uo)

"Sec. 201.1 Applicability.

"The provisions in this Section shall apply to all building exterior walls which are exposed to outdoor air and enclosing a heated or mechanically cooled space. For the purpose of this Code the gross area of exterior walls consists of all opaque wall areas including foundation walls above grade, peripheral edges of floors, window areas including sash, and door areas.

"Sec. 201.2 Combined Thermal Transmittance Value (Uo).

"(1) Heating Criteria for Walls. The combined thermal transmittance value (Uo) of exterior walls of buildings and structures, or portions thereof, that are heated shall be computed using the following equation (201-1):

$$U_o = \frac{U_w A_w + U_g A_g + U_d A_d}{A_o} \quad (201-1)$$

Where:

Uo = the average thermal transmittance of gross wall area,
Btu/h·ft²·F

Ao = the gross area of exterior walls, ft²

Uw = the thermal transmittance value of all elements of the
opaque wall area, Btu/h·ft²·F

Aw = opaque wall area, ft²

Ug = the thermal transmittance value of the window area,
Btu/h·ft²·F

Ag = window area (including sash), ft²

Ud = the thermal transmittance of the door area, Btu/h·ft²·F

Ad = door area, ft²

NOTE: Where more than one type of wall, window and/or door is used, the $U \times A$ term for that exposure shall be expanded into its sub-elements, as:

$$U_{w_1} A_{w_1} + U_{w_2} A_{w_2} + U_{w_3} A_{w_3}, \text{ etc.}$$

"(2) Cooling Criteria for Walls. The overall thermal transfer value, OTTV, for the gross area of exterior walls of all buildings and structures, or portions thereof, that are mechanically cooled shall be computed using the following equation (201-2):

$$\text{OTTV} = \frac{(U_w A_w T_{\text{Deq}}) + (A_f S_F SC) + (U_f A_f \Delta t)}{A_o} \quad \text{-- (201-2)}$$

WHERE:

OTTV = average or combined thermal transfer value, Btu/h·ft²

A_o = the gross area of exterior walls, ft²

U_w = the thermal transmittance value of all elements of the opaque wall area, Btu/h·ft²F

A_w = opaque wall area, ft²

U_f = the thermal transmittance value of the fenestration area, Btu/h·ft²F

A_f = fenestration area, ft²

T_{Deq} = temperature difference value, degree F (See Table 201-2)

SC = shading coefficient of the fenestration area (see definitions)

Δt = temperature difference between exterior and interior design conditions, degree F

SF = solar factor value, 126 Btu/h·ft²

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NOTE: Where more than one type of wall is used, the total of
the respective terms for those elements shall be expanded
into sub-elements, as: If more than 0.74 Btu per hour per
square foot is required, multiple walls may be allowed
to have a lower value than the individual walls.

$$\{ (U_{w1} A_{w1} T_{Deq1}) + (U_{w2} A_{w2} T_{Deq2}) + (U_{w3} A_{w3} T_{Deq3}) , \text{ etc.}$$

TABLE 201-2 - TEMPERATURE DIFFERENCES OF WALLS FOR
USE WITH EQUATION (201-2)

Weight of Construction lbs/ft ²	T _{Deq} Factor °F
0 - 25	44
26 - 40	37
41 - 70	30
71 and above	23

building, and the following criteria shall be met:
building, and the following criteria shall be met:
criteria:
per hour

Sections

*Sec. 201.3 Allowable Thermal Transmittance Value (Uo).

"(1) For Use Group L-2. Exterior walls of detached or semi-detached dwellings shall have an average thermal transmittance value (U_0) not more than 0.24 Btu per hour per square foot per degree F, and row dwellings may be allowed to have a U_0 value not more than 0.31.

"(2) For Limited Use Group L-1. Buildings of Use Group L-1, hotels and multiple dwellings, three stories and less, shall have an average combined thermal transmittance value (U_0) of exterior walls of not exceeding 0.31 Btu per hour per square foot per degree F.

"(3) For All Other Buildings. Buildings not covered by subsections (1) and (2) above shall have: as for heating criteria, a combined thermal transmittance value (U_0) of not more than 0.31 Btu per hour per square foot per degree F for buildings three stories or less in height and 0.37 for buildings more than three stories in height, and for cooling criteria, an overall thermal transfer value (OTTV) of 33 Btu per hour per square foot or less.

"SECTION 202.0 - ROOF ASSEMBLY

"Sections

"202.1 Applicability

"202.2 Gross Area of Roof Assembly

"202.3 Combined Thermal Transmittance Value (Uo)

"202.4 Maximum Allowable Uo Value

"Sec. 202.1 Applicability.

"The provisions in this Section shall apply to building roof assembly where such assembly is exposed to outdoor air and encloses a heated or mechanically cooled space. For the purpose of this Code the said roof assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thereby creating a building transmission heat loss or gain.

"Sec. 202.2 Gross Area of Roof Assembly.

"For the purpose of this Code, the gross area of roof assembly shall consist of the total interior surface of such assembly, including skylights, exposed to the heated and/or mechanically cooled space. Where ceiling air plenums are employed, the roof/ceiling assembly shall: for thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly, and for gross area purposes, be based upon the interior face of the upper plenum surface.

"Sec. 202.3 Combined Thermal Transmittance Value (Uo).

"The combined thermal transmittance value (U_o) for roof assembly of buildings heated or mechanically cooled shall be computed by using the following equation (202-1):

$$U_o = \frac{U_r A_r + U_s A_s}{A_o} \quad \text{---(202-1)}$$

WHERE:

U_o = the average thermal transmittance value of gross roof/ceiling area, $\text{Btu}/\text{h}\cdot\text{ft}^2\text{F}$

A_o = the gross area of roof/ceiling assembly, ft^2

U_r = the thermal transmittance value of all elements of the opaque roof/ceiling areas, $\text{Btu}/\text{h}\cdot\text{ft}^2\text{F}$

A_r = opaque roof/ceiling area, ft^2

U_s = the thermal transmittance of all skylight elements in the roof/ceiling assembly, $\text{Btu}/\text{h}\cdot\text{ft}^2\text{F}$

A_s = skylight area (including frame), ft^2

NOTE: Where more than one type of roof/ceiling and/or skylight is used, the $U \times A$ term for that exposure shall be expanded into its sub-elements, as:

$$U_{r1} A_{r1} + U_{r2} A_{r2}, \text{ etc.}$$

"(1) For Limited Group L Residential Buildings. For buildings used as single and two-family dwellings and for buildings of three stories or less used as hotels or multiple dwellings, the average combined thermal transmittance value of the roof/ceiling assembly shall be no greater than 0.05 Btu per hour per square foot per degree F. However, roof/ceiling assemblies in which the finished interior surface is essentially the underside of the roof deck, such as a wooden cathedral ceiling, may have a U_o value not to exceed 0.08 Btu per hour per square foot per degree F.

"(2) For Other Buildings. For a building heated or mechanically cooled and not covered in subsection (1) above shall have its average combined thermal transmittance value (U_o) not more than 0.09 Btu per hour per square foot per degree F.

Sec. 203.
"SECTION 203.0 - FLOORS OVER UNHEATED SPACES

"Sections

"203.1 Applicability

"203.2 Maximum Allowed Thermal Transmittance Value

"Sec. 203.1 Applicability.

"The provisions of this Section shall apply to floor of heated or mechanically cooled space located over an unheated space regardless whatsoever the use Group of the building and structure or portions thereof might be.

"Sec. 203.2 Maximum Allowed Thermal Transmittance Value.

"The floors of a heated or mechanically cooled space located over an unheated space shall have a combined thermal transmittance value not exceeding 0.10 Btu per hour per square foot per degree F.

SECTION 204.0 - SLAB ON GRADE FLOORS

"Sections

"204.1 Thermal Resistance Requirement

"204.2 Installation of Insulation

"Sec. 204.1 Thermal Resistance Requirement.

"For slab on grade floors, regardless the type of occupancy of the building, the perimeter of the floor adjacent to exterior walls shall be insulated with a material having a thermal resistance value (R) not less than 5.67 for heated slabs and 3.63 for unheated slabs.

"Sec. 204.2 Installation of Insulation.

"The insulation installed around the perimeter of the slab on grade floors adjacent to exterior walls shall be extended downward from the top of the slab for a minimum distance of 24 inches or downward to the bottom of the slab then horizontally beneath the slab for a minimum total distance of 24 inches.

"SECTION 205.0 - AIR LEAKAGE FOR ALL BUILDINGS

"Sections

"205.1 Applicability

"205.2 Test for Rate of Air Leakage

"205.3 Allowable Air Infiltration Rate

"205.4 Caulking and Sealants

"205.5 Air for Combustion and Ventilation of Furnaces

"Sec. 205.1 Applicability.

"The requirements of this Section shall apply to all buildings and structures, or portions thereof, and apply to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled and are not applicable to the separation of interior conditioned spaces from each other.

"Sec. 205.2 Test for Rate of Air-Leakage.

"For the purpose of this Code, compliance with the criteria for air leakage shall be provided by manufacturer as determined by the Standard Method of Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors, ASTM E283-73, at a pressure differential of 1.567 pounds per square foot, which is equivalent to the effect of a 25 mph wind.

"Sec. 205.3 Allowable Air Infiltration Rate.

"(1) Windows. Windows shall be designed to limit air leakage; the air infiltration rate shall not exceed 0.5 cfm per foot of sash crack.

"(2) Sliding Glass Doors- Residential Patio Type. Sliding glass doors of this type shall be designed to limit air leakage; the air infiltration rate shall not exceed 0.5 cfm per square foot of door area.

"(3) Entrance Swinging Doors for Residential Use. Entrance swinging doors used for egress or ingress from residential living units shall be designed to limit air leakage; the air infiltration rate shall not exceed 1.25 cfm per square foot of door area.

"(4) Swinging, Revolving or Sliding Doors for Other than Residential Use. These shall be designed to limit air

leakage; the air infiltration rate shall not exceed 11 cfm per linear foot of door crack.

"(5) Locally constructed windows, double glazed or single glazed with storm windows, when all are sealed in accordance with Sec. 205.4, such windows may be deemed acceptable by the Director.

"(6) Locally constructed doors fitted with storm doors when both are sealed in accordance with Sec. 205.4 may be deemed acceptable by the Director.

"Section

"Sec. 205.4 Caulking and Sealants.

"Exterior joints around windows and door frames; openings between walls and foundations, between walls and roof/ceilings and between wall panels; openings at penetrations of utility services through walls, floors and roofs; and all other such openings in the building envelope shall be caulked, gasketed, weatherstripped or otherwise sealed in an approved manner.

"Sec. 205.5 Air for Combustion and Ventilation of Furnaces.

"Due to the limited infiltration allowed under this Section, proper air supply for combustion and ventilation of furnaces shall be provided in accordance with Sec. 1107.0 of

Building Code

Title 5A-1 of the 1972 D.C. Building Code as amended by D.C. Law 2-18, and Sec. 304 of the 1973 Gas Code (Title 5D-2, DCRR).

"ARTICLE 3 - HEATING, VENTILATING AND AIR CONDITIONING SYSTEM AND EQUIPMENT

"SECTION 300.0 - GENERAL

"Sections

"300.1 Scope

"300.2 Exceptions

"Sec. 300.1 Scope.

"This Article regulates the design of the heating, ventilating and air conditioning system and the performance requirements of heating, ventilation and air conditioning equipment for effective utilization of energy in all buildings and structures or portions thereof. Replacement or modification to existing heating, ventilating and air conditioning systems and/or equipment shall also be required to comply fully with this Article.

"Sec. 300.2 Exceptions.

"Special applications such as but not limited to hospitals, laboratories, thermally sensitive equipment, computer rooms and facilities with open refrigerated display cases may be exempt from complying with the requirements of this Article when approved by the Director.

"SECTION 301.0 - DESIGN REQUIREMENTS

"Sections

"301.1 Design Parameters

"301.2 Cooling with Outdoor Air

"301.3 Mechanical Ventilation

"301.4 Simultaneous Heating and Cooling

"301.5 Energy Recovery

"301.6 Energy for Air Delivery

"Sec. 301.1 Design Parameters.

"The design parameters specified below shall apply for all computations regulated under this Article.

"(1) Outdoor design temperature shall be no greater than 10 degrees F dry bulb in winter; not less than 92 degrees F dry bulb and 78 degrees F wet bulb in summer.

"(2) Indoor design temperature shall be no greater than 72 degrees F for heating and no less than 78 degrees F for cooling.

"(3) Annual Fahrenheit Heating Degree Days shall be not less than 4200.

"(4) Indoor design relative humidity for heating shall not exceed 30 percent. For cooling, the actual design relative humidity within the comfort envelope as defined in ASHRAE Standard 55-74, 'Thermal Environmental Conditions for Human Occupancy' shall be selected for minimum total HVAC system energy use.

"(5) Ventilation. Where mechanical ventilation is provided, the minimum requirements for outdoor air to be supplied for various uses and occupancies shall be as specified in Sec. 503.9 of Title 5A-1 of the 1972 D.C. Building Code as amended by D.C. Law 2-18.

"(5) Duct Work. All duct work shall be designed, constructed and erected in accordance with the requirements in Article 11 of Title 5A-1 of the 1972 D.C. Building Code as amended by D.C. Law 2-18.

"Sec. 301.2 Cooling with Outdoor Air.

"(1) Each fan system shall be designed to use up to and including 100 percent of the fan system capacity for cooling with outdoor air automatically whenever its use will result in lower usage of energy than would be required under its normal operation.

"(2) With occurrence of any one or more of the following conditions, cooling with outdoor air is not required.

"1. Fan system capacity is less than 5,000 cfm or 134,000 Btu per hour total cooling capacity.

"2. The quality of the outdoor air is so poor as to require extensive treatment of the air.

"3. The need for humidification or dehumidification requires the use of more energy than is conserved by outdoor air cooling.

"4. The use of outdoor air cooling may affect the operation of other systems, such as return or exhaust air fans or supermarket refrigeration, so as to increase the overall energy consumption of the building.

"5. Internal/external zone heat recovery or other energy recovery is used.

"6. When all space cooling is accomplished by a circulating liquid which transfers space heat directly or indirectly to a heat rejection device such as a cooling tower without the use of a refrigeration system.

"Sec. 301.3 Mechanical Ventilation.

"Each mechanical ventilation system, supply and/or exhaust, shall be equipped with a readily accessible means for either shutoff or volume reduction and shutoff when ventilation is not required.

"Sec. 301.4 Simultaneous Heating and Cooling.

"Systems employing both heating and cooling simultaneously in order to achieve comfort conditions within a space shall only be used with the approval of the Director to those situations where more efficient methods of heating and air conditioning cannot be effectively utilized to meet system objectives. Utilization of simultaneous heating and cooling by reheating or recooling supply air or by concurrent operation of independent heating and cooling systems serving a common zone shall be restricted as delineated below.

"(1) Recovered energy, provided the new energy expended in the recovery process is less than the amount recovered.

may be used for control of temperature and humidity. New energy is defined as energy, other than recovered energy, utilized for the purpose of heating or cooling.

"(2) New energy may be used, when necessary, to prevent relative humidity from rising above 60 percent for comfort control or to prevent condensation on terminal units or outlets, or functioning of special equipment.

"(3) New energy may be used for temperature control if minimized as specified below.

"1. Reheat Systems: Systems employing reheat and serving multiple zones, other than those employing variable air volume for temperature control, shall be provided with control that will automatically reset the system cold air supply to the highest temperature level that will satisfy the zone requiring the coolest air. Single zone reheat systems shall be controlled to sequence reheat and cooling.

"2. Dual Duct and Multi-Zone Systems: These systems shall be provided with control that will automatically reset the cold deck air supply to the highest temperature that will satisfy the zone requiring the coolest air and the hot deck air supply to the lowest temperature that will satisfy the zone requiring the warmest air.

"3. Recooling Systems: Systems in which heated air is recooled, directly or indirectly, to maintain space temperature shall be provided with control that will automatically reset the temperature to which the supply air is heated to the lowest level that will satisfy the zone requiring the warmest air.

"4. For systems with multiple zones, one or more zones may be chosen to represent a number of zones with similar heating/cooling characteristics. A multiple zone heating, ventilation and air conditioning system that employs reheating or recooling for control of not more than 5,000 cfm or 20 percent of the total supply air of the system, whichever is less, shall be exempt from the supply air temperature reset requirements of paragraphs 1, 2 and 3 above.

"(4) Concurrent operation of independent heating and cooling systems serving common spaces and requiring the use of new energy for heating or cooling shall be minimized by one or both of the following:

"1. By providing sequential temperature control of both heating and cooling capacity in each zone.

"2. By limiting the heating energy input through automatic reset control of the heating medium temperature (or energy input rate) to only that necessary to offset heat loss due to transmission and infiltration and, where applicable, to heat the ventilation air supply to the space.

"Sec. 301.5 Energy Recovery.

"Consideration shall be given to the use of recovery systems which will conserve energy provided the amount expended is less than the amount recovered when the energy transfer potential and the operating hours are considered.

"Sec. 301.6 Energy for Air Delivery.

"The air transport factor for each all-air HVAC system shall not be less than 4.0. The factor shall be based on design system air flow for constant volume systems. The factor for variable air volume systems may be based on average conditions of operation. Energy for transfer of air through heat recovery devices shall not be included in determining the factor; however, such energy shall be included in the evaluation of the effectiveness of the heat recovery system.

EQUIPMENT PERFORMANCE REQUIREMENTS

"Sections

"302.1 General

"302.2 System Equipment

"302.3 System Components

"302.4 Heat Pumps

"302.5 Supplementary Heater

"302.6 Combustion Heating Equipment.

"Sec. 302.1 General.

"The requirements of this Section apply to equipment and mechanical component performance for heating, ventilating and air conditioning systems of new construction or as replacement and modification to existing systems. Where equipment efficiency levels are specified, data furnished by the equipment supplier, certified under a nationally recognized certification program or rating procedure shall be submitted as evidence as to satisfy these requirements to the Director for his approval.

"Sec. 302.2 System Equipment.

"(1) Heating, ventilating and air conditioning system equipment whose energy input in the cooling mode is entirely

electric shall show a coefficient of performance (COP) and energy efficiency ratio (EER) not less than the values specified in Table 302-1. These requirements apply to, but are not limited to, unitary cooling equipment (air and water source), packaged air conditioners, and room air conditioners. This paragraph does not apply to equipment used in areas having open refrigerated food display cases.

TABLE 302-1 - MINIMUM EER AND COP FOR ELECTRIC HEATING, VENTILATING AND AIR CONDITIONING SYSTEM EQUIPMENT

Standard Rating Capacity	EER	COP
Under 65,000 Btu/h	6.1	1.8
65,000 Btu/h and over	6.8	2.0

"(2) Heat operated cooling equipment shall show a coefficient of performance (COP) in the cooling mode not less than the values specified in the following Table 302-2. These requirements apply to, but are not limited to, absorption, engine-driven and turbine-driven equipment. The

coefficient of performance (COP) is determined excluding the electrical auxiliary inputs.

Heat operated cooling equipment in heating systems

component shall have the minimum cooling mode efficiency and minimum coefficient of performance required by the applicable standard. The minimum coefficient of performance required for each heat source is less than the minimum required for the system under ASHRAE 35.

TABLE 302-2 - MINIMUM COP FOR HEATING, VENTILATING AND AIR CONDITIONING SYSTEM HEAT OPERATED COOLING EQUIPMENT

Heat Source	Min. COP
Direct fired (gas, oil)	0.40
Indirect fired (steam, hot water)	0.65

"Sec. 302.3 System Components.

"Heating, ventilating and air conditioning system components whose energy input in the cooling mode is entirely electric shall show a coefficient of performance (COP) and energy efficiency ratio (EER) not less than the values specified in the following Table 302-3.

TABLE 302-3 - MINIMUM COP AND EER FOR ELECTRICALLY DRIVEN HEATING, VENTILATING AND AIR CONDITIONING SYSTEM COMPONENTS

Component	Condensing Means	Air		Water		Evaporator	
		EER	COP	EER	COP	EER	COP
Self-contained Water Chillers	Centrifugal	7.5	2.2	12.9	3.8		
	Positive Displacement	7.2	2.1	10.9	3.2		
Condenserless Water Chillers	Positive Displacement	8.9	2.6	10.9	3.2		
Compressor and Condenser units 65,000 BTU/h and over	Positive Displacement	7.8	2.3	11.5	3.3	11.3	3.3

"Sec. 302.4 Heat Pumps. Heater operation is permitted during

transient conditions such as start-up or load change.

"Heat pumps whose energy input is entirely electric
shall show a coefficient of performance (COP), heating, not
less than the values specified in the following Table 302-4.

TABLE 302-4 - MINIMUM COP FOR HEAT PUMPS, HEATING MODE

Source and Outdoor Temperature (°F)	Minimum COP
Air source ----- 47 DB/45WB	2.2
Air source ----- 17 DB/15WB	1.2
Water source --- 60 Entering	2.2

"Sec. 302.5 Supplementary Heater.

"(1) The heat pump shall be installed with a control to prevent supplementary heater operation when the heating load can be met by the heat pump alone.

"(2) Supplementary heater operation is permitted during transient periods, such as start-ups, following room thermostat set-point advance and during defrost.

"(3) A two-stage room thermostat which controls the supplementary heat in its second stage shall be accepted as meeting this requirement. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Supplementary heat may be derived from any source of electric resistance heating or combustion heating in consistence with the tariff filed by the serving utility.

"Sec. 302.6 Combustion Heating Equipment.

"All gas and oil fired comfort heating equipment shall show a minimum combustion efficiency of 75 percent at maximum rated output. Combustion efficiency shall be defined as 100 percent minus stack losses in percent of heat input. Stack losses are the total of loss due to sensible heat in dry flue gas, incomplete combustion, and sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

"SECTION 303.0 - INSULATION OF DUCTS

"Sections

"303.1 General

"303.2 Required Thermal Resistance

"303.3 Exceptions

"303.4 Vapor Barrier Required

"Sec. 303.1 General.

"The provisions of this Section regulate the thermal insulation requirements of ducts, plenums and enclosures in all buildings and structures.

"Sec. 303.2 Required Thermal Resistance.

"All duct systems, or portions thereof, shall be insulated to provide a thermal resistance, excluding film conductances, of

"Sec. 303.2

$$R = \frac{\Delta t}{15} \text{ h}\cdot\text{F}\cdot\text{ft}^2/\text{Btu}$$

Vapor barrier

Required

"Where Δt = the design temperature differential between the air in the duct and the surrounding air in Fahrenheit.

Section

"Sec. 303.3 Exceptions.

"Duct insulation is not required in any of the following cases:

"(1) Where Δt is 25 degrees F or less.

"(2) Supply or return air ducts installed in basements, cellars, or unventilated crawl spaces with insulated walls in single and two-family dwellings.

"(3) When the heat gain or loss of the ducts, without insulation, will not increase the energy requirements of the building.

"(4) Exhaust air ducts.

"(5) Duct within heating, ventilating and air conditioning system.

"Sec. 303.4 Vapor Barrier Required.

"Where required to prevent condensation, insulation with vapor barriers shall be installed in addition to insulation required under Sec. 303.2.

"SECTION 304.0 - CONTROLS

"Sections

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"304.1 General

"304.2 Temperature Control

"304.3 Humidity Control

"304.4 Zoning for Temperature Control

"304.5 Control Setback and Shut off

"Sec. 304.1 General.

"All heating, ventilating and air conditioning systems shall be provided controls as specified herein this Section.

"Sec. 304.2 Temperature Control.

"Each heating, ventilating and air conditioning system shall be provided with at least one thermostat for the regulation of temperature. Each thermostat shall be capable of being set from 55 degrees F to 75 degrees F, where used to control heating only and from 70 degrees F to 85 degrees F where used to control cooling only. Where used to control both heating and cooling it shall be capable of being set from 55 degrees F to 85 degrees F, and shall be capable of operating the system heating and cooling in sequence.

"Sec. 304.3 Humidity Control.

"If a heating, ventilating and air conditioning system is equipped with a means for adding moisture to maintain

specific selected relative humidities in spaces or zones, a humidistat shall be provided. This device shall be capable of being set to prevent new energy from being used to produce space relative humidity above 30 percent relative humidity. Where a humidistat is used in a heating, ventilating and air conditioning system for controlling moisture removal to maintain specific selected relative humidities in spaces or zones, it shall be capable of being set to prevent new energy from being used to produce a space relative humidity below 60 percent.

"Sec. 304.4 Zoning for Temperature Control.

"(1) In all buildings and structures of Use Group L-2, single and two-family dwellings, at least one thermostat for regulating of space temperature shall be provided for each separate heating, ventilating and air conditioning system. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut-off the heating or cooling input to each zone or floor, excluding unheated or uncooled basements and garages.

"(2) In all buildings and structures of Use Group L-1, hotels and multiple dwellings, each individual dwelling unit shall be considered separately and shall meet the requirements for single and two-family dwellings above.

"(3) In all buildings and structures other than Use Group L-2 and in spaces other than dwelling units in Use Group L-1, at least one thermostat for regulation of space temperature shall be provided for each separate heating, ventilating and air conditioning system and for each floor of the building.

"Sec. 304.5 Control Setback and Shut-off.

"(1) Residential Use Group L-1, and L-2. In buildings and structures of residential Use Group L-1 and L-2 the thermostat required in Secs. 304.4(1) and (2) or an alternate means including, but not limited to, a switch or clock, shall provide a readily accessible manual or automatic means for reducing the energy required for heating and cooling during periods of non-use or reduced need including, but not limited to, unoccupied periods and sleeping hours. Lowering thermostat set points to reduce energy consumption of heating systems shall not cause energy to be expended to reach the reduced setting.

"(2) Other Buildings and Occupancies. In all other buildings and structures, or portions thereof, each heating, ventilating and air conditioning system shall be equipped with a readily accessible means of shutting off or reducing the energy used for heating, ventilation and air

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conditioning during periods of non-use or alternate uses of the building spaces or zones served by the system, such as with manually adjustable automatic timing devices, manual devices for use by operating personnel, or automatic control systems.

"SECTION 305.0 - INSULATION OF PIPING FOR STEAM AND
HOT WATER HEATING SYSTEMS

"Sections

"305.1 Piping Insulation - General

"305.2 Insulation Thickness

"305.3 Vapor Barriers

"305.4 Insulation Not Required

"Sec. 305.1 Piping Insulation - General.

"All piping serving as part of a heating or cooling system installed to serve buildings and within buildings shall be thermally insulated as shown in Table 305-1.

TABLE 305-1 - MINIMUM PIPE INSULATION

PIPING SYSTEM PIPES	FLUID TEMPERATURE RANGE, F.	INSULATION THICKNESS IN INCHES FOR PIPE SIZES						
		RUNOUTS Up to 2"	1" and Less	1½ to 2"	2½ to 4"	5" and 6"	8" and Larger	
Heating Systems								
Steam and Hot Water								
High Pressure/Temp	306-450	1½	1½	2	2½	3½	3½	
Med. Pressure/Temp	251-305	1½	1½	2	2½	3	3	
Low Pressure/Temp	201-250	1	1	1½	1½	2	2	
Low Temperature	120-200	½	¾	1	1	1	1½	
Steam Condensate (for Feed Water)	Any	1	1	1	1½	1½	2	
Cooling Systems								
Chilled Water,	40-50	½	½	¾	1	1	1	
Refrigerant, or Brine	Below 40	1	1	1½	1½	1½	1½	

"Sec. 305.2 Insulation Thickness.

"Insulation thickness in Table 305-1 is based on insulation having thermal resistances in the range of 4.0 to 4.6 degree F by hour by square foot per Btu per inch of thickness on a flat surface at a mean temperature of 75 degrees F. Minimum insulation thickness required for materials having R values other than that said above shall be determined by using the following subsections.

"(1) For materials with thermal resistance greater than 4.6 degree F by hour by square foot per Btu per inch of thickness, the minimum insulation thickness may be reduced as follows:

$$\text{New Minimum Thickness} = \frac{4.6 \times \text{Table 305-1 thickness}}{\text{Actual R}}$$

"(2) For materials with thermal resistance less than 4.0 degrees F by hour by square foot per Btu per inch of thickness, the minimum thickness shall be increased as follows:

120 degrees F

"(3) For materials with thermal resistance greater than 4.0 degrees F by hour by square foot per Btu per inch of thickness, the minimum thickness shall be increased as follows:

Required New Minimum Thickness = $\frac{4.0 \times \text{Table 305-1 thickness}}{\text{Actual R}}$

"(4) Unvented attics shall be insulated with vapor barriers two-ply polyethylene or equivalent.

"Sec. 305.3 Vapor Barriers.

"The required thermal resistance does not consider condensation. Additional insulation with vapor barriers shall be provided to prevent condensation unless it can be shown that condensation is not a problem.

"Sec. 305.4 Insulation Not Required.

"Piping insulation is not required in any of the following cases:

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"(1) Piping installed within heating, ventilation, and air conditioning equipment.

"(2) Piping at temperatures between 55 degrees F and 120 degrees F.

"(3) When the heat loss and/or heat gain of the piping, without insulation, does not increase the energy requirements of the building.

"(4) Piping installed in basements, cellars or unventilated crawl spaces with insulated walls in single and two-family dwellings.

Boilers - "ARTICLE 4 - SERVICE WATER HEATING SYSTEMS

**Sec.* "SECTION 400.0 - GENERAL AND SCOPE

**Sections*

"400.1 General

"400.2 Scope

"*Sec. 400.1 General.*

"Hot water for domestic, sanitary and swimming pool purposes shall be generated and delivered in a manner conducive to saving heat energy.

"Sec. 400.2 Scope.

"The purpose of this Article is to provide criteria for design and equipment selection that will produce energy savings when applied to service water heating.

"SECTION 401.0 - PERFORMANCE EFFICIENCY

"Sections

"401.1 Electric Storage Water Heaters

"401.2 Gas- and Oil-Fired Storage Water Heaters

"401.3 Hot Water Storage Tank

"401.4 Combination Service Water Heater/Space Heating
Boilers.

"Sec. 401.1 Electric Storage Water Heaters.

"All automatic electric storage water heaters shall have a stand-by loss not exceeding 4 watts per square foot of tank surface area when listed in accordance with the Household Automatic Electric Storage Type Water Heaters, ANSI C72.1-72.

"Sec. 401.2 Gas- and Oil-Fired Storage Water Heaters.

"All gas- and oil-fired automatic storage heaters shall have a recovery efficiency (Er) not less than 75 percent and a stand-by loss percentage (S) not exceeding:

$$"S = 2.3 + 67/V$$

"WHERE:

$$"V = \text{rated volume in gallons}$$

"The method of test of Er and S shall be as described in the Gas Water Heater, Volume III, Circulating Tank, Instantaneous and Large Automatic Storage - Type Water Heaters, ANSI Z21.10.3-74, with the exception that in testing oil-fired units CF equals 1.0; Q equals total gallons of oil consumed; and H equals total heating value of oil in Btu/per gallon.

"Sec. 401.3 Hot Water Storage Tank.

"Heat loss from unfired hot water storage tanks shall be limited to a maximum of 15 Btu per hour per square foot of external tank surface area. The design ambient temperature shall be no higher than 65 degrees F.

"Sec. 401.4 Combination Service Water Heater/Space Heating Boilers.

"Service water heating equipment shall not be dependent on year round operation of water space heating boilers; that is, boilers that have as another function, winter space heating.

"Exempt from this provision are systems with service/space heating boilers having a stand-by loss (Btu per hour) less than:

$$"33.25 \text{ pmd} + 1000$$

"Where pmd is the probable maximum demand in gallons per hour as determined in accordance with System Volume of 1976 ASHRAE Handbook and Product Directory. The stand-by loss is to be determined for a test period of 24-hour duration while maintaining a boiler water temperature of 90 degrees F above ambient.

"SECTION 402.0 - TEMPERATURE CONTROLS

"Sections

"402.1 General

"402.2 Shut Down

"402.3 Swimming Pools

"Sec. 402.1 General.

"Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. Temperature setting range shall be in accordance with Table 1 of Chapter 37, Systems Volume, ASHRAE 1976 Handbook and Product Directory.

"Sec. 402.2 Shut Down.

"A separate switch shall be provided to permit turning off the energy supplied to electric service water heating systems. A separate valve shall be provided to permit turning off the energy supplied to the main burner of all other types of service water heating systems.

"Sec. 402.3 Swimming Pools.

"(1) Heated swimming pools shall be equipped with controls to limit heating water temperatures to no more than 80 degrees F, except pools used for therapeutic purposes shall be exempt from complying with this requirement.

"(2) Uncovered or unenclosed heated pools shall be controlled so that the electric or fossil-fueled pool water heating systems are inoperative whenever the outdoor air temperature is below 60 degrees F.

"SECTION 403.0 - RECIRCULATION SYSTEM

"Sections

"403.1 Circulating Pump

"403.2 Piping Insulation

"Sec. 403.1 Circulating Pump.

"Circulating hot water systems shall be arranged so that the circulating pump can be conveniently turned off, automatically or manually, when the hot water system is not in operation.

"Sec. 403.2 Piping Insulation.

"For recirculation systems, piping heat loss shall be limited to a maximum of 25 Btu per hour per square foot of external pipe surface for above ground piping and a maximum of 35 Btu per hour per square foot of external pipe surface for underground piping. Maximum heat loss shall be determined at a temperature difference equal to the maximum water temperature minus a design ambient temperature no higher than 65 degrees F.

"SECTION 404.0 - CONSERVATION OF HOT WATER

"Sections

"404.1 Showers

"404.2 Lavatories in restrooms of Public Facilities

"Sec. 404.1 Showers.

"Showers used for other than safety reasons shall be equipped with flow control devices to limit total flow to a maximum of 3 gpm per shower head.

"Sec. 404.2 Lavatories in Restrooms of Public Facilities.

"Lavatories in restrooms of public facilities shall:

"(1) Be equipped with outlet devices which limit the flow of hot water to maximum of 0.5 gpm.

"(2) Be equipped with devices which limit the outlet temperature to a maximum of 110 degrees F.

"(3) Be equipped with self-closing valves that limit delivery to a maximum of 0.25 gallons of hot water.

"ARTICLE 5 - LIGHT AND ELECTRICAL DISTRIBUTION SYSTEMS

"SECTION 500.0 - GENERAL

"Sections

"500.1 Distribution Systems

"500.2 Energy for Lighting

"Sec. 500.1 Distribution Systems.

"Electrical distribution systems shall be designed for efficient distribution of electrical energy from the service entrance to the points of use. The provisions herein provided are minimum requirements and shall be thoroughly observed in the design of electrical distribution systems in all buildings, structures, and portions thereof.

"Sec. 500.2 Energy for Lighting.

"(1) Electric power used for lighting shall be limited to not more than 3.0 watts per square foot of floor area in all buildings. When part or all of the building is remodeled, the electric power to be used for lighting shall be calculated on the basis of the total floor area in the entire building. In the design of energy conserving lighting systems, the criteria specified in the latest edition of the Handbook of the Illuminating Engineers Society (IES) shall be observed.

"(2) Illumination levels in existing buildings open to the public shall not exceed those levels recommended by the latest edition of the IES Handbook.

"SECTION 501 - DISTRIBUTION SYSTEM REQUIREMENTS

"Sections

"501.1 Power Factor

"501.2 Voltage Drop

"501.3 Separate Metering

"Sec. 501.1 Power Factor.

"Utilization equipment, rated greater than 1,000 W and lighting equipment greater than 15 W, with an inductive reactance load component, shall have a power factor of not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with this Code, shall be switched with the utilization equipment, except where this results in an unsafe condition or interferes with the intended operation of the equipment.

"Sec. 501.2 Voltage Drop.

"In any building the maximum total voltage drop shall not exceed 3 percent in branch circuits of feeders, for a total of 5 percent to the farthest outlet based on steady state design load conditions.

"Sec. 501.3 Separate Metering. ~~Electric power used for lighting purposes in dwelling units shall be metered separately.~~
"In all new multi-family dwellings (Use Group L-1), for which an application for a construction permit has been filed on or after the effective date of this Code, electric energy consumption which is controlled within each individual dwelling unit shall be separately metered. Hotels, motels and dormitories shall be exempted from these requirements.

"SECTION 502.0 - CONTROLS OF LIGHTING

"Sections

"502.1 Interior Lighting

"502.2 Facade Lighting

"Sec. 502.1 Interior Lighting.

"Energy used for lighting purposes is a product of the lighting load and the hours of usage. Therefore, circuiting and switching shall be provided so that:

"(1) Lighting in task area larger than 250 square feet can be reduced by at least one-half when the task is not being performed or is relocated.

"(2) Lighting can be turned off when a space is empty and not being used.

"(3) Lighting can be reduced or turned off, manually or automatically, where daylight is adequate and can be used effectively.

"Sec. 502.2 Facade Lighting.

"Electrical power consumed by facade light shall be no greater than 2 percent of the total interior lighting load of the building. Facade lighting shall be turned off automatically when daylight is adequate, except single- or two-family dwellings, for which facade lighting may be turned off manually.

"ARTICLE 6 - DESIGN AID

"SECTION 600.0 - ACCEPTABLE THERMAL TRANSMITTANCE
VALUES OF BUILDING ASSEMBLIES

"Sections

"600.1 Purpose

"600.2 Approval of Other Assemblies

"600.3 Insulation Details

"Sec. 600.1 Purpose.

"The purpose of this Section is to recognize the established thermal transmittance value (U) of various wall, roof and floor assemblies with regard to the thermal

resistance value (R) of the insulation materials used therein. The higher the R value of each component the assembly possesses, the lower U value the assembly rates.

"Sec. 600.2 Approval of Other Assemblies.

"Assemblies presented herein are the ones used most commonly by the construction industry. They are not intended to be inclusive. Other assemblies may be used provided that documentations indicating the thermal transmittance value of each assembly is submitted to the Director for his approval.

"Sec. 600.3 Insulation Details.

"Details shown here in the following Tables are for insulation only and shall not be considered as complete construction details.

"SECTION 601.0 - SIZING OF GLAZED OPENINGS

"Sections

"601.1 Computation of U_w .

"601.2 Sizing of Glazed Openings

"Sec. 601.1 Computation of U_w .

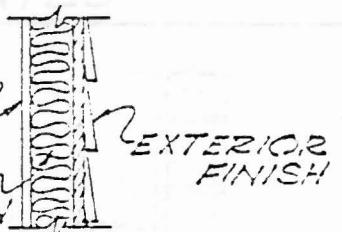
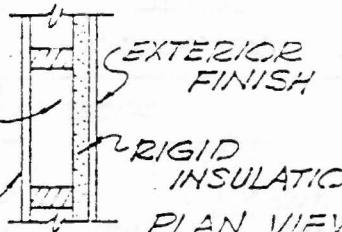
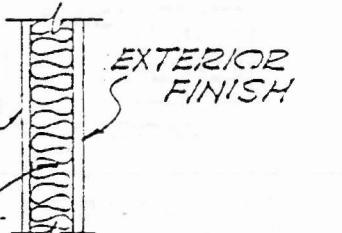
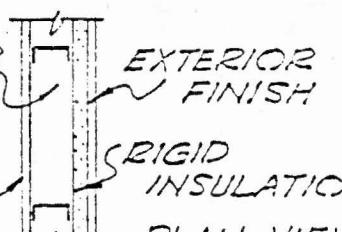
"The combined thermal transmittance value (U_o) of the exterior walls shall not exceed the value specified in Sec. 201.3 as appropriate for the building type. The U_w of the wall shall be computed by using the equation (201-1) in Sec. 201.2.

"Sec. 601.2 Sizing of Glazed Openings.

"(1) Figure 601 may be used to determine the permissible size of the single glazed opening area in an opaque exterior wall of a given thermal transmittance (U_o) value.

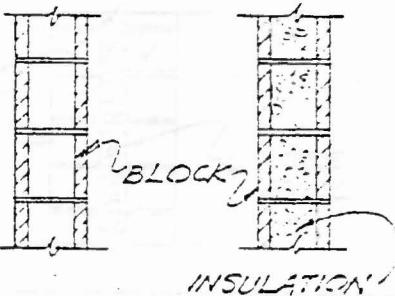
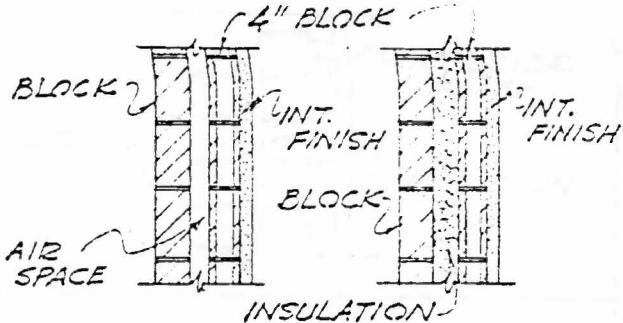
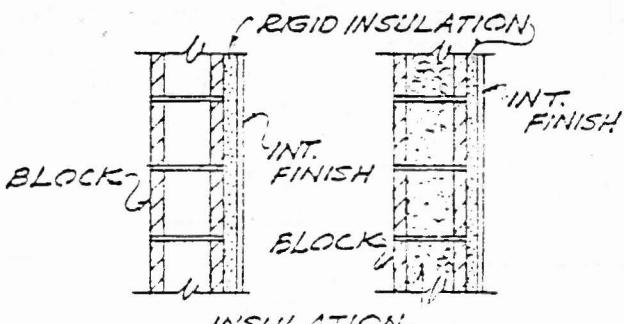
"(2) Figure 602 may be used to determine the permissible size of the double glazed opening area in an opaque exterior wall of a given thermal transmittance (U_o) value.

TABLE 601 - WALL ASSEMBLIES-I

DETAILS		R VALUE OF INSULATION	U _n
WOOD STUD CONSTRUCTION		7	.12
	INTERIOR FINISH	11	.09
	INSULATION	14	.07
	EXTERIOR FINISH	19	.05
AIR SPACE		4	.15
	INTERIOR FINISH	6.25	.11
	RIGID INSULATION	8	.09
	PLAN VIEW	10	.08
	EXTERIOR FINISH	12.5	.06
	INTERIOR FINISH		
STEEL STUD CONSTRUCTION		7	.12
	INTERIOR FINISH	11	.08
	INSULATION	14	.06
	EXTERIOR FINISH	19	.05
AIR SPACE OR INSULATION		4	.15
	INTERIOR FINISH	6.25	.11
	RIGID INSULATION	8	.09
	PLAN VIEW	10	.08
	EXTERIOR FINISH	12.5	.06
	INTERIOR FINISH		
NOTE:			
1. TYPICAL INTERIOR FINISH: GYPSUM WALLBOARD; LATH AND PLASTER; OR 3/8" MINIMUM WOOD PANELING.			
2. TYPICAL EXTERIOR FINISH: STUCCO; WOOD OR WOOD SIDING; OR BRICK VENEER.			

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TABLE 602 - WALL ASSEMBLIES-II

DETAILS	R VALUE OF INSULATION		U _n
	8" BLOCK	6" BLOCK	
 8" BLOCK INSULATION	NO INSUL.	.37	
	LOOSE FILL IN CORES	.18	
	NO INSUL.	.34	
	LOOSE FILL IN CORES	.14	
 8" BLOCK AIR SPACE 6" BLOCK INT. FINISH INSULATION	NO INSULATION NO INT. FINISH	.25	
	LOOSE FILL IN CAVITY	.14	
	NO INSUL. WITH INT. FINISH	.19	
	LOOSE FILL IN CAVITY WITH INT. FINISH	.11	
 8" BLOCK RIGID INSULATION INT. FINISH 6" BLOCK INSULATION	NO INSULATION WITH INT. FINISH	.23	
	LOOSE FILL IN CORES WITH INT. FINISH	.12	
	1" RIGID GLASS FIBER INS. AND INT. FINISH	.14	
	R=7 INSULATION WITH INT. FINISH	.10	

NOTE:
TYPICAL INTERIOR FINISH - 1/2" GYPSUM BOARD APPLIED ON FURRING STRIPS

TABLE 603 - WALL ASSEMBLIES - III

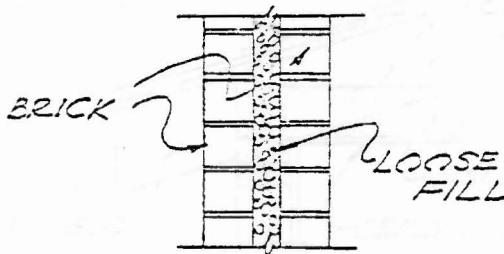
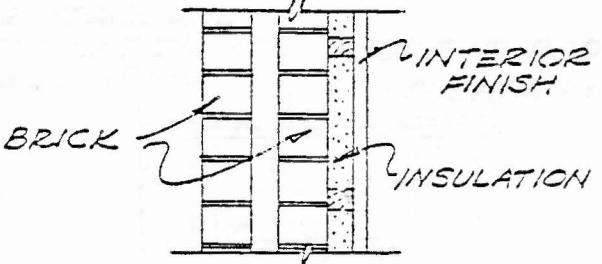
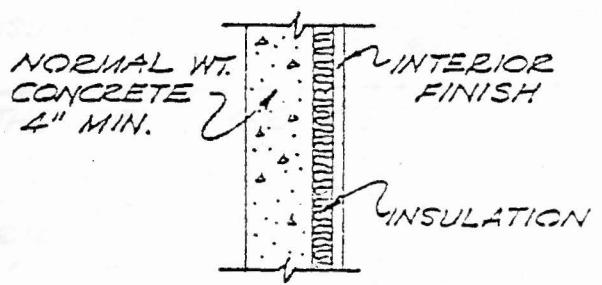
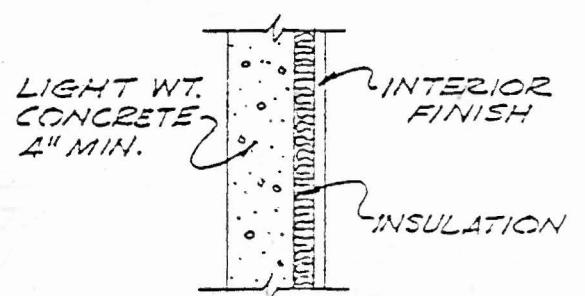
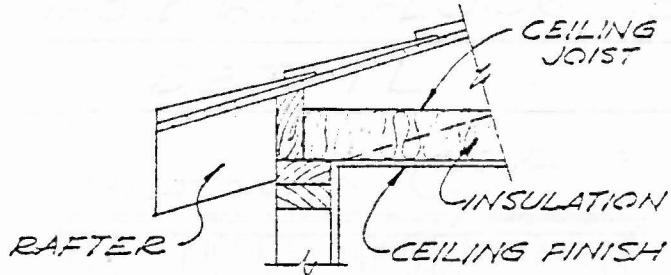
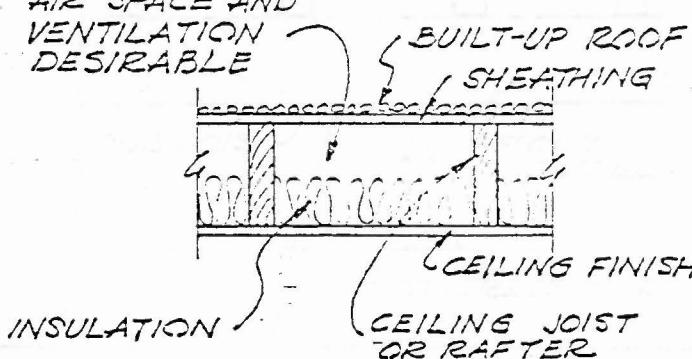
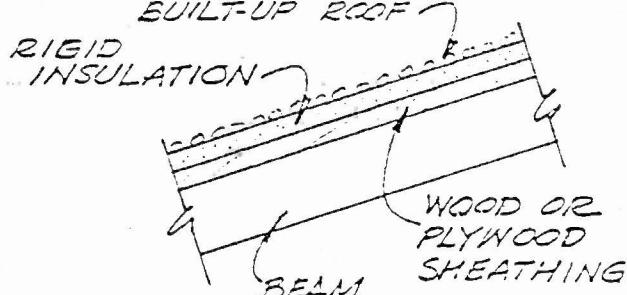
DETAILS		R VALUE OF INSULATION	Uw
BRICK MASONRY CONSTRUCTION		SOLID GROUT IN SPACE 2" SPACE W/ LOOSE FILL R = 4	.35 .16
		4" SPACE W/ LOOSE FILL R = 8	.10
CONCRETE CONSTRUCTION		4 6.25 7 11	.12 .09 .09 .07
		4 6.25 7 11	.18 .13 .12 .08
		4 6.25 7 11	.17 .12 .11 .08
NOTE:		TYPICAL INTERIOR FINISH: 1/2" GYPSUM BOARD APPLIED ON FURRING STRIPS	

TABLE G04 - ROOF ASSEMBLIES

DETAILS	R VALUE OF INSULATION	UR
	11	.09
	14	.07
	19	.05
	22	.04
	30	.03
	11	.08
	14	.06
	19	.05
	22	.04
	30	.03
CATHEDRAL TYPE CEILING	WOOD DECKING 9.5	.08
	PLYWOOD 10.5	.08
NOTE:		
1. TYPICAL CEILING FINISH: GYPSUM WALLBOARD OR LATH AND PLASTER.		
2. SKYLITES NOT EXCEEDING ONE PERCENT OF THE ROOF AREA ARE PERMITTED.		

Unrolled original

TABLE 605 - FLOOR ASSEMBLY

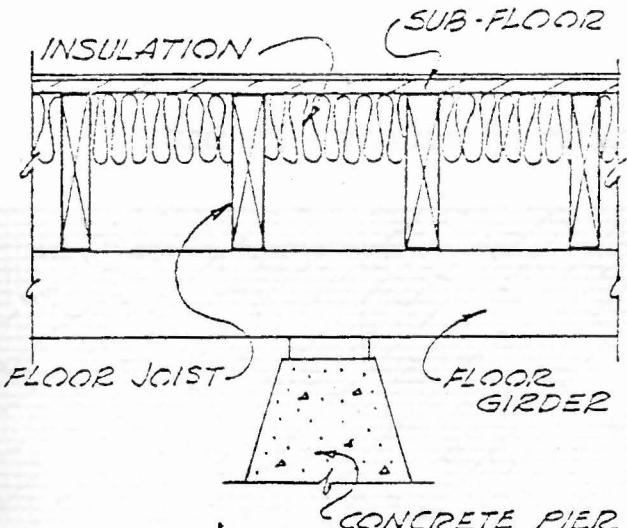
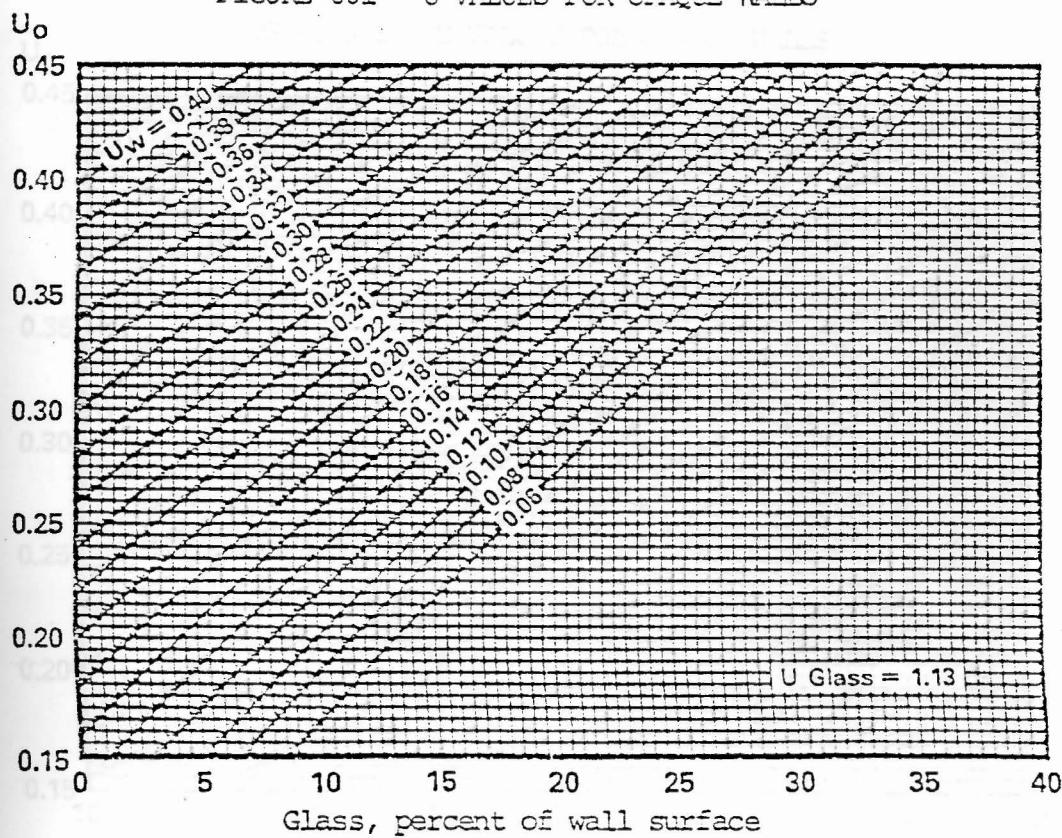
DETAIL	R VALUE OF INSULATION	U _F
	NO INSULATION	.32
	4	.15
	6.25	.12
	7	.11
	11	.08

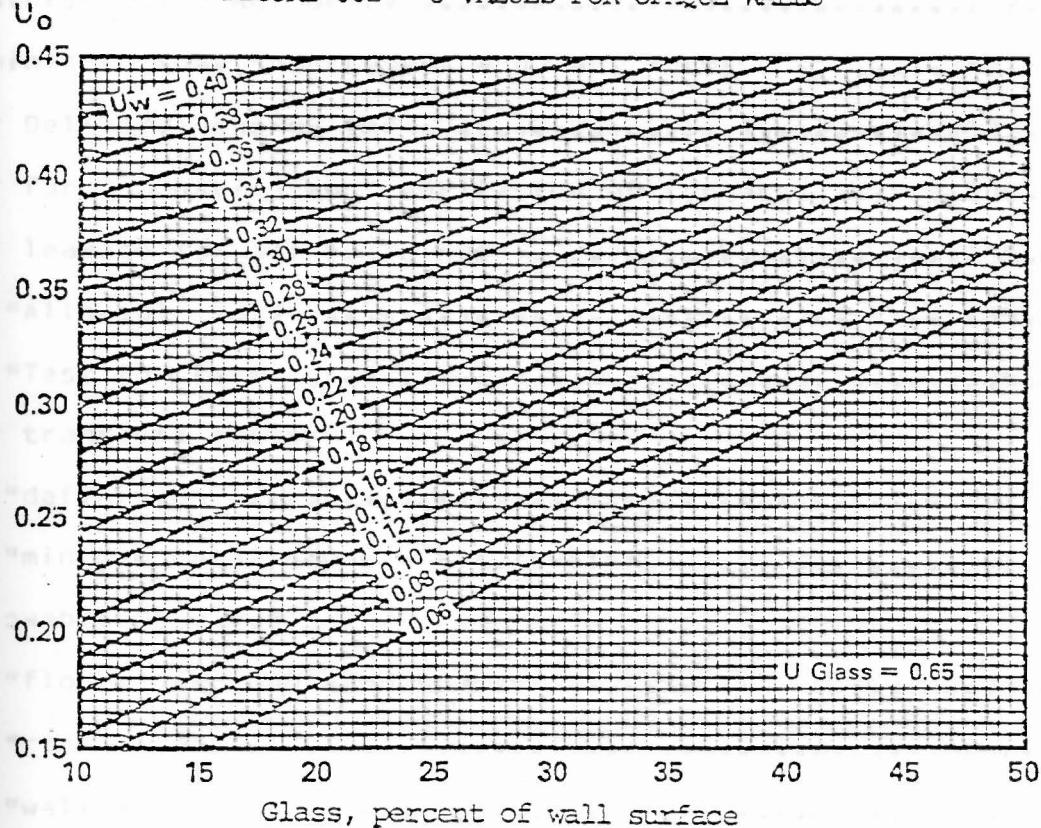
FIGURE 601 - U VALUES FOR OPAQUE WALLS



Combinations of Wall and Single Glazed Openings for use with Section 201.3. One-half the opaque door area shall be included in the total glazed opening area.

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FIGURE 602 - U VALUES FOR OPAQUE WALLS



Combinations of Wall and Double Glazed Openings for use with Section 201.3. One-half the opaque door area shall be included in the Total glazed opening area.

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404-2000-Subpart
404-2000-Subpart

any person who violates or fails to comply with any of the requirements contained in this Title.

Conservation of energy by building owners shall be required to meet the following standards:

shall be required to meet the following standards:

defined as follows:

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order of the Board of Appeals.

Community Board may issue an order of injunction.

Sec. 5. Injunctions - (a) A zoning board of appeals

associations, or other persons, groups, or organizations

is about to commit a violation of the zoning law, or a violation of

violation of any other provision of this Title, or orders its removal, demolition, or alteration.

corporation, firm, or other entity, or any officer,

Court of the

practices and procedures of the zoning board of

interlocutory injunctions, or any other action, without bond.

injunction - commences with the filing of a complaint.

order.

Sec. 6. Appeals - (a) Appeals from the decisions

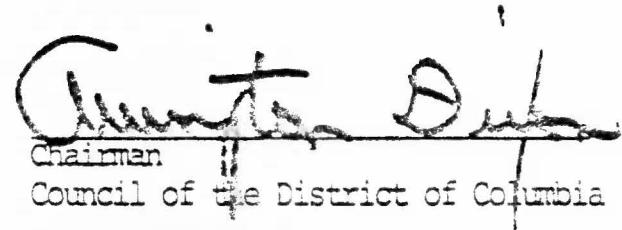
of the Council.

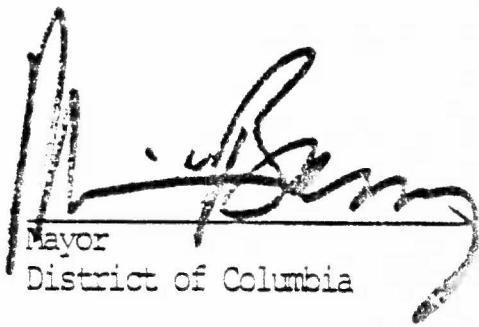
Sec. 4. Any person who violates or fails to comply with any of the provisions or requirements of the Energy Conservation Code or orders authorized pursuant to such Code shall be guilty of a misdemeanor and upon conviction, be fined not more than three hundred dollars (\$300) or, in lieu of or in addition to any fine, imprisoned for not more than ten (10) days. A like fine may be imposed for each and every day that such violation shall continue after a final order of the Director of the Department of Housing and Community Development to correct an unlawful condition.

Sec. 5. Whenever it appears that any person, association, or business entity has engaged, is engaged, or is about to engage in acts or practices constituting a violation of any provision of the Energy Conservation Code or orders issued under the authority of such Code, the Corporation Counsel may bring an action in the Superior Court of the District of Columbia to enjoin those acts or practices, and upon a proper showing, an ex parte, interlocutory, or permanent injunction may be granted without bond. The Superior Court may also issue a mandatory injunction commanding compliance with any such provision or order.

Sec. 6. This act shall take effect as provided for acts of the Council of the District of Columbia in section

502(c)(1) of the District of Columbia Self-Government and
Governmental Reorganization Act.


Chairman
Council of the District of Columbia


Mayor
District of Columbia

APPROVED: October 16, 1979

COUNCIL OF THE DISTRICT OF COLUMBIA

RECORD OF OFFICIAL COUNCIL ACTION

DOCKET NO: Bill 3-52

ACTION: To Adopt (7/17/79)

VOICE VOTE: Unanimous

Absent: All Present

ROLL CALL VOTE:

COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D
DIXON					KANE					SHACKLETON				
WINTER					MASON					SPAULDING				
CLARKE					MOORE					WILSON				
HARDY					RAY									
TARUTIS					ROLARK									

X - Councilor Vote A - Present N. V. - Not Voting

CERTIFICATION OF RECORD

V. H. Johnson
Secretary to the Council

ACTION: To Adopt (7/31/79)

VOICE VOTE: Unanimous

Absent: All Present

ROLL CALL VOTE:

COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D
DIXON					KANE					SHACKLETON				
WINTER					MASON					SPAULDING				
CLARKE					MOORE					WILSON				
HARDY					RAY									
TARUTIS					ROLARK									

X - Councilor Vote A - Present N. V. - Not Voting

CERTIFICATION OF RECORD

V. H. Johnson
Secretary to the Council

ACTION: To Reconsider (9/25/79)

VOICE VOTE: Unanimous

Absent: All Present

ROLL CALL VOTE:

COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D	COUNCIL MEMBER	AYE	NAY	N.V.	A&D
DIXON					KANE					SHACKLETON				
WINTER					MASON					SPAULDING				
CLARKE					MOORE					WILSON				
HARDY					RAY									
TARUTIS					ROLARK									

X - Councilor Vote A - Present N. V. - Not Voting

CERTIFICATION OF RECORD

V. H. Johnson
Secretary to the Council