COMMUNITY DEVELOPMENT DIVISION
Building Conservation Health Planning Zoning

MEMORANDUM

TO: Mark Rees, Town Manager

FROM: Curt Bellavance, Director

RE: Massachusetts Green Communities Act Assistance Program

DATE: February 3, 2010

On Monday, February 1 our office held the first meeting as part of the Green Communities Assistance Grant. The grant was awarded to North Andover by the Department of Energy Resources (DOER). The grant provides an energy consultant to work with the Town and provide an action plan for becoming a "Green Community". The consultant assigned to North Andover is ICF International.

In order to become a Green Community the Town must commit to the five goals listed below. If the Town becomes a Green Community then there are additional State funds available to the Town. The funds have been set aside in an Energy Trust which can only be used for specific purposes related to energy reduction.

The consultant is required to produce an Action Plan that will assist the Town on reaching the five goals. This memo briefly describes the five criterion needed to be "adopted" for becoming a Green Community.

Criterion 1 – As of Right Zoning
The Town must demonstrate that an Industrial District (Osgood Landing) zoning specifies medium and heavy manufacturing related to alternative energy. Our office will work with DOER on any specific language requirements. **ATM must adopt zoning changes.** See attach B.

Criterion 2 – Expedited Permitting
North Andover has adopted the 43D Expedited Permitting process but will need to adopt Criterion #1 within the 43D district (Osgood Landing) to meet DOER requirements.

1600 Osgood Street, North Andover, Massachusetts 01845
Phone 978 688 9521 Fax 978 688 9542 Web www.townofnorthandover.com

Criterion 3 – Baseline GHG Inventory & Plan to Reduce GHG Emissions

The North Andover Sustainability Committee (NASC) has made significant progress on the energy-use baseline. The Town has been working with Peregrine, who developed DOER's new Mass Energy Insight tool. Also, Town vehicle fuel use and mileage are tracked using the Gasboy software. Some Town buildings were audited in 2009. The consulting group Snyder is developing a baseline inventory for the schools. **The Town would have five years to reduce their energy consumption by 20% based on the baseline audit.**

Criterion 4 – Green Vehicle Fleet Purchasing Policy

The Town has a current inventory of its municipal vehicles and would need to commit to purchasing green vehicles in the future. The process of replacing older vehicles with green vehicles would need to be outlined in a Green Vehicle Fleet Purchasing Policy and Plan. **The Board of Selectmen and/or Town Manger would need to adopt a vehicle purchasing policy.**

Criterion 5 – Stretch Code

This is the criterion that may generate the most debate. The Town would need to adopt the Stretch Code, which is an appendix to the State Building Code (780 CMR) adopted by the Board of Building Regulations and Standards last year. The Stretch Code is based on the *International Energy Conservation Code (IECC)* and is an optional code that exceeds the current energy code and provides higher construction standards for both residential and commercial construction. **ATM must adopt the code.** See Attachment C.

The following people were present at the meeting.

Curt Bellavance	Division of Community Development	Director
Bruce Thibodeau	Division of Public Works	Director
James Mealey	Public Schools	Business Manager
Jerry Brown	Building Department	Inspector of Buildings
Stephen Sakakeeny	Sustainability Committee	Volunteer
Steve Foster	Sustainability Committee	Volunteer
Susan Almonó	Sustainability Committee	Volunteer
Leiran Biton	ICF International	Consultant

Proposed Zoning Bylaw amendment to allow business use at the Gatehouse on the Stevens Estate property.

Article _____. <u>Amend North Andover Zoning Bylaw – Section 4.121 Residence 1, 2 and 3.</u> To see if the Town will vote to amend the Town of North Andover Zoning Bylaw, Section 4.121 in order to allow businesses uses, not to exceed 7,500 square feet on municipally owned property with a minimum of 50 acres.

Amend Section 4.121 by adding the underlined language to read as follows:

4.121 Residence 1 District
Residence 2 District
Residence 3 District

21. Professional offices **not exceeding** 7,500 square feet located on municipally owned property containing a minimum of fifty (50) acres.

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780 CMR Appendix 120 AA
Stretch Energy Code

The Stretch Energy Code is the *International Energy Conservation Code (IECC) 2009* with amendments contained herein.

CHAPTER 1 - ADMINISTRATION

SECTION 101 - SCOPE AND GENERAL REQUIREMENTS

Remove sections 101.1, 101.2, and 101.3 and replace with:
101.1 Title. This code shall be known as the Massachusetts Stretch Energy Code and shall be cited as such. It is referred to herein as "this code."

101.2 Scope. This code applies to residential and commercial buildings. Buildings not included in this scope shall comply with 780 CMR 13, 34, 61, or 93, as applicable.

101.3 Purpose and Intent.
The purpose of 780 CMR 120.AA is to provide a more energy efficient alternative to the base energy code applicable to the relevant sections of the building code for both new construction and existing buildings. A municipality seeking to ensure that construction within its boundaries is designed and built above the energy efficiency requirements of 780 CMR may mandate adherence to this appendix.
This appendix may be adopted by any municipality in the commonwealth, by decision of its governing body. In a city having a Plan D or Plan E charter the governing body shall be the city manager and the city council, and in any other city the mayor and city council. In towns the governing body shall be the board of selectmen. In order to be adopted, the appendix must be considered at an appropriate municipal public hearing, subject to the municipality's existing public notice provisions. If adopted by a municipality this appendix rather than 780 CMR 13, 34, 61, or 93, as applicable, shall govern.
This appendix shall regulate the design and construction of buildings for the effective use of energy. This appendix is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve the effective use of energy. This appendix is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

Remove section 101.4.3 Exceptions and replace with:
Exceptions
1. Storm windows installed over existing fenestration.
2. Repairs to an existing sash and frame.
3. Existing ceiling, wall or floor cavities, of the building envelope, exposed or accessible during construction provided that any empty cavities are filled with insulation that meets or exceeds an *R* value of R - 3.5/inch.
4. Reroofing or residing over uninsulated roofs or walls where the sheathing is not exposed.
5. Replacement of existing doors that separate conditioned space from the exterior shall not require the installation of a vestibule or revolving door, provided, however, that an existing vestibule that separates a conditioned space from the exterior shall not be removed,
6. Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.
7. Alterations that replace only the bulb and ballast within the existing luminaires in a space provided that the alteration does not increase the installed interior lighting power.

Remove section 104.1 and replace with:
104.1 General. Construction or work for which a permit is required shall be subject to inspection by the code official or approved inspection agencies.

Remove section 104.5 and replace with:
104.5 Approved inspection agencies. The code official is authorized to require or accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

Delete sections 107, 108 and 109

CHAPTER 2 – DEFINITIONS

Insert in section 202:
FENESTRATION PRODUCT, FIELD-FABRICATED is a fenestration product including an exterior glass door whose frame is made at the construction site of standard dimensional lumber or other materials that were not previously cut, or otherwise formed with the specific intention of being used to fabricate a fenestration product or exterior door. Field fabricated does not include site-built fenestration with a label certificate or products required to have temporary or permanent labels.
FENESTRATION PRODUCT, SITE-BUILT is fenestration designed to be field-glazed or field assembled units using specific factory cut or otherwise factory formed framing and glazing units. Examples of site-built fenestration include storefront systems, curtain walls, and atrium roof systems.
FURNACE ELECTRICITY RATIO. The ratio of furnace electricity use to total furnace energy computed as ratio = (3.412*EAE)/(1000*EF + 3.412*EAE), where EAE (average annual auxiliary electrical consumption) and EF (average annual fuel energy consumption) are defined in Appendix N to subpart B of part 430 of title 10 of the Code of Federal Regulations and EF is expressed in millions of Btu's per year.
ON-SITE RENEWABLE ENERGY. Includes solar photovoltaic; active solar thermal that employs collection panels, heat transfer mechanical components and a defined heat storage system; wind; small hydro; tidal; wave energy; geothermal (core earth); biomass energy systems; landfill gas and bio-fuel based electrical production. Onsite energy shall be generated on or adjacent to the project site and shall not be delivered to the project through the utility service.

CHAPTER 3 – CLIMATE ZONES

Delete section 301 and replace with:
Climate Zone 5 and moisture regime A (Moist) shall be used in determining the applicable requirements from Chapters 4 and 5 for locations in Massachusetts.

Delete Chapter 4 and replace with:
CHAPTER 4 – ADVANCED RESIDENTIAL ENERGY EFFICIENCY
401.1 Scope. This chapter applies to residential buildings.
401.2 New construction. New low-rise (three stories or less) residential buildings including townhouses shall require a HERS (Home Energy Rating System) index rating as verified by a RESNET (Residential Energy Services Network) certified HERS rater.

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- For units equal to or greater than 3,000 sq ft in conditioned floor space, a HERS rating of 65 or less is required.
- For units less than 3,000 sq ft, a HERS rating of 70 or less is required.
- In addition, all new construction shall demonstrate compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist[1].

401.3 Prescriptive option for residential additions. Additions to an existing building, building system or portion thereof shall conform to the most recent Energy Star for Homes Prescriptive Builders Option Package (BOP), except for heating and cooling equipment and appliances, and shall demonstrate compliance with:

- The Energy Star Qualified Homes Thermal Bypass Inspection Checklist.
- Envelope insulation requirements that meet or exceed IECC 2009 requirements (Chapter 4, Section 402) for climate zone 5.

401.4 Performance option for residential additions. The performance approach and HERS ratings of 401.2 may be followed in lieu of the prescriptive requirements of 401.3

401.5 Prescriptive option for alterations, renovations or repairs. Alterations, renovations or repairs that involve accessing the building envelope shall require the affected portion of the envelope to comply with 401.3. Envelope insulation shall meet or exceed IECC 2009 requirements (Chapter 4, Section 402) for climate zone 5, or fully fill existing cavities with insulating material which meets or exceeds an R value of R 3.5/inch.

401.6 Performance option for alternations, renovations or repairs. In all cases of alternations, renovations or repairs the performance approach of 401.2 may be followed in lieu of the prescriptive requirements of 401.5 with the following HERS rating requirements:

- For units equal to or greater than 2,000 sq ft in conditioned floor space, a HERS rating of 80 or less is required.
- For units less than 2,000 sq ft, a HERS rating of 85 or less is required.
- Compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist.

Change Chapter 5 title to:
CHAPTER 5 – ADVANCED COMMERCIAL ENERGY EFFICIENCY

Remove section 501.1 and 501.2 and replace with:
501.1 Scope. The requirements contained in this chapter are applicable to new construction of commercial buildings, or portions of commercial buildings.

Exceptions:
1. Commercial buildings less than 5,000 sq. ft.
2. Commercial buildings from 5,000 to 40,000 sq. ft. in area with these uses:
   - Supermarkets
   - Warehouses
   - Laboratories

[1] http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Bypass_Inspection_Checklist.pdf

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- A building of specialized use by variance to this appendix through appeal to the BBRS.

501.1.1 Buildings greater that 100,000 sq. ft. Buildings greater than 100,000 sq. ft., and additions to such buildings greater than or equal to 30% of the existing conditioned floor area, shall be designed to achieve energy use per square foot equal to at least 20% below the energy requirements of *ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except for Low-Rise Residential Buildings*, Appendix G, measured by industry-accepted energy modeling.

501.1.2 Special energy use buildings. Buildings greater than 40,000 sq. ft. in area, and additions to such buildings greater than or equal to 30% of the existing conditioned floor area with these uses:

- Supermarkets
- Warehouses
- Laboratories

shall be designed to comply with the performance requirements of 501.1.1.

501.1.3 Performance option for buildings from 5,000 to 100,000 sq. ft. Buildings between 5,000 sq. ft. and 100,000 sq. ft. shall comply with the performance requirements of 501.1.1, or the prescriptive option 501.1.4.

501.1.4 Prescriptive option for Buildings from 5,000 to 100,000 sq. ft. The requirements contained in section 501.1.4.1 and beyond of this chapter are applicable to buildings from 5,000 to 100,000 sq. ft. and additions to such buildings greater than or equal to 30% of the existing conditioned floor area where the addition has its own heating system.

501.1.4.1 Application. The *commercial building* project shall comply with the requirements in Sections 502 (Building envelope requirements), 503 (Building mechanical systems), 504 (Service water heating), 505 (Electrical power and lighting systems), and 507 (Advanced Prescriptive Options) in its entirety.

Compliance with section 507 requires complying with any ONE of the following prescriptive options:

a. 507.2.1 Efficient Mechanical Equipment
b. 507.2.2 Reduced Lighting Power Density
c. 507.2.3 On-Site Supply of Renewable Energy

Compliance with section 507 does not remove the requirement to comply with any other mandatory requirements in this code.

SECTION 502 - BUILDING ENVELOPE REQUIREMENTS

Delete from section 502.1.1, the last sentence:

Buildings with a vertical fenestration area or skylight area that exceeds that allowed in Table 502.3 shall comply with the building envelope provisions of ASHRAE/IESNA90.1.

Remove Table 502.1.2, Table 502.2(1) and Table 502.2(2) and replace with:

TABLE 502.1.2 - BUILDING ENVELOPE REQUIREMENTS OPAQUE ELEMENT, MAXIMUM U-FACTORS

Roofs	All Other	Group R
Insulation entirely above deck	U - 0.039	U - 0.039

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Metal buildings (with R-5 thermal blocks)	U - 0.049	U - 0.049
Attic and other	U - 0.027	U - 0.027
Walls, Above Grade		
Mass, exterior insulation	U- 0.080	U- 0.071
Mass, interior insulation	U- 0.085	U- 0.085
Metal building	U- 0.061	U- 0.061
Metal framed	U- 0.064	U- 0.057
Wood framed and other	U- 0.051	U- 0.051
Walls, Below Grade[a]		
Mass, exterior insulation	C- 0.119	C- 0.119
Mass, interior insulation	C- 0.063	C- 0.063
Floors		
Mass	U- 0.074	U- 0.064
Metal Joist	U- 0.033	U- 0.033
Wood Joist/Framing	U- 0.033	U- 0.033
Slab-on-Grade Floors		
Unheated slabs	F- 0.540	F- 0.520
Heated slabs	F- 0.580	F- 0.580
Opaque Doors		
Swinging	U- 0.37	U- 0.37
Roll-up or sliding	U- 0.50	U- 0.50

For SI: 1 inch = 25.4 mm.
ci – Continuous Insulation
a. When heated slabs are placed below grade, below grade walls must meet the F-factor requirements for perimeter insulation according to the heated slab-on-grade construction.

TABLE 502.2
BUILDING ENVELOPE REQUIREMENTS - OPAQUE ASSEMBLIES

Roofs	All Other	Group R	Note: IECC 2009 equivalent
Insulation entirely above deck	R-25 ci	R-25 ci	Zone 7
Metal buildings (with R-5 thermal blocks [a,b])	R-13 + R-19	R-19 + R-10	Zone 7
Attic and other	R-38	R-38	Zone 2-7
Walls, Above Grade			
Mass, exterior insulation	R-11.4 ci	R-13.3 ci	Zone 5
Mass, interior insulation	R-13	R-13	N/A
Metal building [c]	R-13 + R-5.6 ci	R-13 + R-5.6 ci	Zone 5-6
Metal framed	R-13 + R-7.5 ci	R-13 + R-7.5 ci	Zone 5-6
Wood framed and other	R-13 + R-7.5	R-13 + R-7.5	Zone 6
Walls, Below Grade[d]			
Mass, exterior insulation	R-7.5 ci	R-7.5 ci	Zone 5-6
Mass, interior insulation	R-19	R-19	N/A
Floors			
Mass	R-10 ci	R-12.5 ci	Zone 5
Metal Joist	R-30	R-30	Zone 4-8
Wood Joist/Framing	R-30	R-30	Zone 4-8
Slab-on-Grade Floors			

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Unheated slabs	R-10 for 24 in. below	R-15 for 24 in. below	Zone 6
Heated slabs	R-15 for 36 in. + R-5 ci below	R-15 for 36 in. + R-5 ci below	NBI Core Performance Values
Opaque Doors			
Swinging	U – 0.37	U – 0.37	
Roll-up or sliding	R – 4.75	R – 4.75	

For SI: 1 inch = 25.4 mm.
ci – Continuous Insulation
NR – No Requirement

a. Thermal blocks are a minimum R-5 of rigid insulation, which extends 1-inch beyond the width of the purlin on each side, perpendicular to the purlin.
b. The first R-value is for faced fiberglass insulation batts draped over purlins. The second R-value is for unfaced fiberglass insulation batts installed parallel to the purlins. A minimum R-3.5 thermal spacer block is placed above the purlin/batt, and the roof deck is secured to the purlins. Reference: ASHRAE/IESNA 90.1 Table A2.3 including Addendum "G"
c. The first R-value is for faced fiberglass insulation batts installed perpendicular and compressed between the metal wall panels and the steel framing. the second *rated R-value of insulation* is for insulation installed from the inside, covering the girts. Reference: ASHRAE/IESNA 90.1 Table A3.2 Appendix "G"
d. When heated slabs are placed below grade, below grade walls must meet the exterior insulation requirements for perimeter insulation according to the heated slab-on-grade construction.

Remove section 502.3.2 (including Table 502.3) and replace with:

502.3.2 Maximum *U*-factor and SHGC. For vertical fenestration, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3, which is uniformly set at 0.40. For skylights, the limit is set at 3% of roof area, but can be expanded to 5% of roof area in conjunction with automatic daylighting controls. In all cases, the maximum *U*-factor and solar heat gain coefficient (SHGC) shall be as specified in Table 502.3.

TABLE 502.3
BUILDING ENVELOPE REQUIREMENTS: FENESTRATION

	All
Framing materials other than metal with or without metal reinforcement or cladding	
U-Factor	0.35
Metal framing with or without thermal break	
Curtain Wall/Storefront *U*-Factor	0.42
Entrance Door *U*-Factor	0.80
All Other *U*-Factor [a]	0.45
SHGC-All Frame Types	
SHGC	0.40

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Skylights (3% maximum, or 5% maximum with automatic daylighting controls [b])	
U-Factor	0.45
SHGC	0.40

a. All other includes operable windows, fixed windows and doors other than entrance doors.
b. Automatic daylighting controls shall meet the requirements of Section 505.2.2.1.3

502.4 Air leakage (Mandatory).

Remove section 502.4.1 and 502.4.2 and replace with:
502.4.0 Air Barriers. The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier system shall also be provided for interior separations between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions.

The air barrier shall have the following characteristics:
1. It must be continuous, with all joints made airtight.
2. Materials used for the air barrier system shall have an air permeability not to exceed 0.004 cfm/ft^2 under a pressure differential of 0.3 in. water (1.57psf) (75 Pa) when tested in accordance with ASTM E 2178. Air barrier materials shall be taped or sealed in accordance with the manufacturer's instructions.
3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
4. Air barrier materials shall be maintainable, or, if inaccessible, shall meet the durability requirements for the service life of the envelope assembly.
5. The air barrier material of an envelope assembly shall be joined and sealed in a flexible manner to the air barrier material of adjacent assemblies, allowing for the relative movement of assemblies due to thermal and moisture variations and creep. Connections shall be made between:

a. joints around *fenestration* and *door* frames
b. junctions between *walls* and foundations, between *walls* at building corners, between *walls* and structural *floors* or *roofs*, and between *walls* and *roof* or *wall* panels
c. openings at penetrations of utility services through *roofs, walls*, and *floors*
d. site-built *fenestration* and *doors*
e. building assemblies used as ducts or plenums
f. joints, seams, and penetrations of vapor retarders
g. all other openings in the *building envelope*

502.4.0.1 Air Barrier Penetrations. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made air tight.

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502.4.1 Window and door assemblies. The air leakage of window, skylight and door assemblies that are part of the building envelope shall be determined in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, or NFRC 400 by an accredited, independent laboratory, and *labeled* and certified by the manufacturer. Window and skylight air leakage shall not exceed 0.2 cfm/ft² at 1.57 pounds per square foot (psf) (75Pa), or 0.3 cfm/ft² at 6.24 psf (300 Pa). Door assembly air leakage shall not exceed 0.3 cfm/ft² for all other products at 1.57 psf (75Pa).

Exceptions:
a. Site-constructed windows and doors that are sealed in accordance with Section 502.4.8.
b. Commercial entrance doors covered by section 502.4
c. Garage doors shall be permitted to use air leakage determined by test at standard test conditions in accordance with ANSI/DASMA 105.
d. Doors and Access Openings to Shafts, Chutes, Stairwells, and Elevator Lobbies. These doors and access openings shall either meet the requirements of 502.4.3 or shall be equipped with weather seals, except weatherseals on elevator lobby doors are not required when a smoke control system is installed.

502.4.2 Curtain wall, storefront glazing and commercial entrance doors. Curtain wall, *storefront* glazing and commercial-glazed swinging entrance doors and revolving doors shall be tested for air leakage at a pressure of at least 1.57 pounds per square foot (psf) (75 Pa) in accordance with ASTM E 283. For curtain walls and *storefront* glazing, the maximum air leakage rate shall be 0.06 cubic foot per minute per square foot (cfm/ft²) (1.1 m³/h × m²) of fenestration area. For commercial glazed swinging entrance doors and revolving doors, the maximum air leakage rate shall be 1.00 cfm/ft² (18.3 m³/h × m²) of door area when tested in accordance with ASTM E 283.

Remove section 502.4.5 and replace with:
502.4.5 Outdoor air intakes and exhaust openings. Stair and elevator shaft vents and other outdoor air intakes and exhaust openings integral to the building envelope shall be equipped with not less than a Class I motorized, leakage-rated damper with a maximum leakage rate of 4 cfm per square foot (6.8 L/s · C m²) at 1.0 inch water gauge (w.g.) (1250 Pa) when tested in accordance with AMCA 500D. These air tight, operable dampers shall be installed when the air barrier is penetrated by:

1. Fixed open louvers such as in elevator shafts and machine rooms.
2. Mechanical system components which allow infiltration or exfiltration of air when the systems are inactive, such as atrium smoke exhaust systems, elevator shaft smoke relief openings, and other similar elements.

Such dampers shall be set in the closed position and automatically open upon:

1. the activation of any fire alarm initiating device of the building's fire alarm system;
2. the interruption of power to the damper.

Exception: Gravity (nonmotorized) dampers are permitted to be used in buildings less than three stories in height above grade.

Remove section 502.4.7 and replace with:
502.4.7 Vestibules. Building entrances that separate *conditioned space* from the exterior shall be protected with an enclosed vestibule, with all *doors* opening into and out of the vestibule equipped with self-closing devices. Vestibules shall be designed so that in passing through the vestibule it is not necessary for the interior and exterior *doors* to open at the same time. Interior and exterior *doors* shall have a minimum distance between them of not less than 7 ft when in the closed position. The exterior envelope of conditioned vestibules shall comply with the requirements for a conditioned space. The interior and exterior envelope of unconditioned vestibules shall comply with the requirements for a semi-heated space.

Exceptions:
a. *Building entrances* with revolving *doors*.
b. *Doors* not intended to be used as a *building entrance*.
c. *Doors* opening directly from a *dwelling unit*.
d. *Doors* that open directly from a *space* that is less than 3000 ft^2 in area and is separate from the *building entrance*.
e. *Doors* used primarily to facilitate vehicular movement or material handling and adjacent personnel doors.

Add section 502.5 Vapor retarders.
502.5 Vapor retarders. Class I or II vapor retarders are required on the interior side of walls.

Exceptions:
1. Basement walls.
2. Below grade portion of any wall.
3. Construction where moisture or its freezing will not damage the materials.

502.5.1 Class III Vapor retarders. Class III vapor retarders shall be permitted where any one of the conditions in Table 502.5.1 are met.

TABLE 502.5.1 - CLASS III VAPOR RETARDERS

Climate Zone	Class III vapor retarders permitted for:
5	Vented cladding over OSB Vented cladding over Plywood Vented cladding over Fiberboard Vented cladding over Gypsum Insulated sheathing with R-value >= R5 over 2x4 wall Insulated sheathing with R-value >= R7.5 over 2x6 wall

502.5.2 Material vapor retarder class. The vapor retarder class shall be based on the manufacturer's certified testing or a tested assembly. The following shall be deemed to meet the class specified:
Class I: Sheet polyethylene, non-perforated aluminum foil
Class II: Kraft faced fiberglass batts or low perm paint

(paint with 0.1 < perm <= 1.0)
Class III: Latex or enamel paint

SECTION 503 - BUILDING MECHANICAL SYSTEMS

Insert at end of section 503.1:

NOTE: Compliance path a. (Efficient Mechanical Equipment) in section 507 is not available for equipment installed according to the minimum performance values outlined in section 503.2.3. In this case, compliance can be met with one of the following paths:

b. 507.2.2 Reduced Lighting Power Density
c. 507.2.3 On-Site Supply of Renewable Energy

Replace section 503.2.1 with:

503.2.1 Calculation of heating and cooling loads. Design loads shall be determined in accordance with the procedures described in the ASHRAE/ACCA Standard 183. The design loads shall include an accurate representation of the building envelope, lighting, ventilation and occupancy loads based on the specific design characteristics of the project. Heating and cooling loads shall be adjusted to account for load reductions that are achieved when energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE *HVAC Systems and Equipment Handbook*. Alternatively, design loads shall be determined by an *approved* equivalent computation procedure, using the design parameters specified in IECC 2009 Chapter 3.

Insert at end of section 503.2.5.1, Exceptions:

5. Building spaces where CO_2 Sensors are inappropriate measures for ventilation needs because of ventilation needs other than occupant requirements.
6. Building spaces where the primary ventilation needs are for process loads.

Replace sections 503.2.9 – 503.2.9.3 with:

503.2.9 Mechanical systems commissioning and completion requirements.

503.2.9.1 System commissioning. Commissioning is a process that verifies and documents that the selected building systems have been designed, installed, and function according to the owner's project requirements and construction documents. Drawing notes shall require commissioning and completion requirements in accordance with this section. Drawing notes may refer to specifications for further requirements. Copies of all documentation shall be given to the owner. The building official may request commissioning documentation for review purposes. At the time of plan submittal, the building jurisdiction shall be provided, by the submittal authority, a letter of intent to commission the building in accordance with this code.

503.2.9.1.1 Commissioning plan. A commissioning plan shall include as a minimum the following items:

1. A detailed explanation of the original owner's project requirements,

2. A narrative describing the activities that will be accomplished during each phase of commissioning, including guidance on who accomplishes the activities and how they are completed,
3. Equipment and systems to be tested, including the extent of tests,
4. Functions to be tested (for example calibration, economizer control, etc.),
5. Conditions under which the test shall be performed (for example winter and summer design conditions, full outside air, etc.), and
6. Measurable criteria for acceptable performance.

503.2.9.1.2 Systems adjusting and balancing. All HVAC systems shall be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates. Test and balance activities shall include as a minimum the following items:

1. **Air systems balancing.** Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 10 hp (18.6 kW) and larger. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

Exception: Fans with fan motors of 1 hp or less.

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

Exceptions:
1. Pumps with pump motors of 5 hp or less.
2. When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller were trimmed.

503.2.9.1.3 Functional performance testing

503.2.9.1.3.1 Equipment functional performance testing. Equipment functional performance testing shall demonstrate the correct installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications. This demonstration is to prove the operation, function, and maintenance serviceability for each of the Commissioned systems. Testing shall include all modes of operation, including:
1. All modes as described in the Sequence of Operation,
2. Redundant or automatic back-up mode,

3. Performance of alarms, and
4. Mode of operation upon a loss of power and restored power.

Exception: Unitary or packaged HVAC equipment listed in Tables 503.2.3 (1) through (3) that do not require supply air economizers.

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

503.2.9.1.4 Preliminary commissioning report. A preliminary report of commissioning test procedures and results shall be completed and provided to the Owner. The report shall be identified as "Preliminary Commissioning Report" and shall identify:

1. Itemization of deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.
2. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.
3. Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.

503.2.9.2 Acceptance. Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the building official has received a letter of transmittal from the building owner that states they have received the Preliminary Commissioning Report as required by Section 503.2.9.1.4. At the request of the building official, a copy of the Preliminary Commissioning Report shall be made available for review.

503.2.9.3 Completion requirements. The construction documents shall require that within 90 days after the date of certificate of occupancy, the documents described in this section be provided to the building owner.

503.2.9.3.1 Drawings. Construction documents shall include as a minimum the location and performance data on each piece of equipment.

503.2.9.3.2 Manuals. An operating manual and a maintenance manual shall be in accordance with industry-accepted standards and shall include, at a minimum, the following:

1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
3. Names and addresses of at least one service agency.

4. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
5. A complete narrative of how each system is intended to operate, including suggested setpoints.

503.2.9.3.3 System balancing report. A written report describing the activities and measurements completed in accordance with Section 503.2.9.1.2

503.2.9.3.4 Final Commissioning Report. A complete report of test procedures and results identified as "Final Commissioning Report" shall include:

1. Results of all Functional Performance Tests.
2. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.
3. All Functional Performance Test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

Exception: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

SECTION 505 - ELECTRICAL POWER AND LIGHTING SYSTEMS (Mandatory)

Replace sections 505.2.2.1 and 505.2.2.2 with:

505.2.2.1 Automatic lighting controls. All commercial buildings shall be equipped with automatic control devices to shut off lighting in compliance with one of the following automatic control technologies:

1. Section 505.2.2.1.1 Occupancy Sensors
2. Section 505.2.2.1.2 Time Clock Controls
3. Section 505.2.2.1.3 Automatic Daylighting Controls

505.2.2.1.1 Occupancy sensors Occupancy sensors must be installed in all classrooms, conference/meeting rooms, employee lunch and break rooms, private offices, restrooms, storage rooms and janitorial closets, and other spaces 300 sf. or less enclosed by ceiling height partitions. These automatic control devices shall be installed to automatically turn off lights within 30 minutes of all occupants leaving the space, except spaces with multi-scene control.

505.2.2.1.2 Time Clock Controls In areas not controlled by occupancy sensors, automatic time switch control devices shall be used. It shall incorporate an override switching device that:

1. Is readily accessible.
2. Is located so that a person using the device can see the lights or the area controlled by that switch, or so that the area being lit is annunciated.
3. Is manually operated.

4. Allows the lighting to remain on for no more than 4 hours when an override is initiated.
5. Controls an area not exceeding 5,000 square feet (465 m^2).

Exceptions:
1. In malls and arcades, auditoriums, single-tenant retail spaces, industrial facilities and arenas, where captive-key override is utilized, override time may exceed 2 hours.
2. In malls and arcades, auditoriums, single-tenant retail spaces, industrial facilities and arenas, the area controlled may not exceed 20,000 square feet (1860 m^2).

505.2.2.1.3 Automatic daylighting controls. Automatic controls installed in day lit zones must control lights in the day lit areas separately from the non-day lit areas. Controls for calibration adjustments to the lighting control device shall be readily accessible to authorized personnel. Each daylight control zone shall not exceed 2,500 square feet. Automatic daylighting controls must incorporate an automatic shut-off ability based on time or occupancy in addition to lighting power reduction controls.

Controls will automatically reduce lighting power in response to available daylight by either one of the following methods:

1. Continuous dimming using dimming ballasts and daylight-sensing automatic controls that are capable of reducing the power of general lighting in the day lit zone continuously to less than 35% of rated power at maximum light output.

2. Stepped Dimming using multi-level switching and daylight-sensing controls that are capable of reducing lighting power automatically. The system should provide at least two control channels per zone and be installed in a manner such that at least one control step shall reduce power of general lighting in the daylit zone by 30% to 50% of rated power and another control step that reduces lighting power by 65% to 100%. Stepped dimming control is not appropriate in continuously occupied areas with ceiling heights of 14 feet or lower

Exception: Daylight spaces enclosed by walls or ceiling height partitions and containing 2 or fewer luminaire are not required to have a separate switch for general area lighting.

Retain section ***505.2.2.3 Daylight zone control.***

Replace section 505.2.3 with:

505.2.3 Additional Controls for specific uses

a. Display/Accent Lighting—display or accent lighting shall have a separate control device.
b. Case Lighting—lighting in cases used for display purposes shall have a separate control device.

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c. Hotel and Motel Guest Room Lighting—hotel and motel guest rooms and guest suites shall have a master control device at the main room entry that controls all permanently installed luminaires and switched receptacles.
d. Task Lighting—supplemental task lighting, including permanently installed undershelf or undercabinet lighting, shall have a control device integral to the luminaires or be controlled by a wall-mounted control device provided the control device is readily accessible and located so that the occupant can see the controlled lighting.
e. Nonvisual Lighting—lighting for nonvisual applications, such as plant growth and food warming, shall have a separate control device.
f. Demonstration Lighting—lighting equipment that is for sale or for demonstrations in lighting education shall have a separate control device.

Exceptions: a., b. and d. Where LED lighting is used no additional control is required.

Insert at end of section 505.5.2:
NOTE: Compliance path b. (Reduced Lighting Power Density) in section 507 is not available for lighting installed according to the values in table 505.5.2. In this case, compliance can be met with one of the following paths:
a. 507.2.1 Efficient Mechanical Equipment
c. 507.2.3 On-Site Supply of Renewable Energy

Replace, but retain notes and exception, Table 505.5.2 with:
TABLE 505.5.2 - INTERIOR LIGHTING POWER ALLOWANCES

LIGHTING POWER DENSITY		
	Whole Building	**Space by Space**
Building Area Type[a]	**(W/ft²)**	
Active Storage		0.8
Atrium – First Three Floors		0.6
Atrium – Each Additional Floor		0.2
Classroom/lecture/training		1.3
Conference/Meeting/Multipurpose		1.3
Corridor/Transition		0.5
Dressing/Locker/Fitting Room		0.6
Electrical/Mechanical		1.5
Food Preparation		1.2
Inactive Storage		0.3
Laboratory		1.4
Lobby		1.1
Restroom		0.8
Stairway		0.6
Automotive Facility	0.9	
Automotive – Service Repair		0.7
Convention Center	1.2	
Exhibit Space		1.3
Audience/Seating Area		0.9

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Courthouse	1.2	
Audience/Seating Area		0.9
Courtroom		1.9
Confinement Cells		0.9
Judges Chambers		1.3
Dining: Bar Lounge/Leisure	1.3	
Lounge/Leisure Dining		1.4
Dining: Cafeteria/Fast Food	1.4	
Dining: Family	1.6	
Dining		1.4
Kitchen		1.2
Dormitory	1.0	
Living Quarters		1.1
Bedroom		0.5
Study Hall		1.4
Exercise Center	1.0	
Dressing/Locker/Fitting Room		0.6
Audience/Seating Area		0.3
Exercise Area		0.9
Exercise Area/Gymnasium		1.4
Gymnasium	1.1	
Dressing/Locker/Fitting Room		0.6
Audience/Seating Area		0.4
Playing Area		1.4
Exercise Area		0.9
Healthcare Clinic	1.0	
Corridors w/patient waiting, exam		1.0
Exam/Treatment		1.5
Emergency		2.7
Public & Staff Lounge		0.8
Hospital/Medical supplies		1.4
Hospital - Nursery		0.6
Nurse station		1.0
Physical therapy		0.9
Patient Room		0.7
Pharmacy		1.2
Hospital/Radiology		0.4
Operating Room		2.2
Recovery		0.8
Active storage		0.9
Laundry-Washing		0.6
Hospital	1.2	
Hotel	1.0	
Dining Area		1.3
Guest quarters		1.1
Reception/Waiting		2.5
Lobby		1.1
Library	1.3	
Library-Audio Visual		0.7

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Stacks		1.7
Card File & Cataloguing		1.1
Reading Area		1.2
Manufacturing Facility	1.3	
Low bay (< 25 ft Floor to Ceiling Height)		1.2
High bay (>25 ft Floor to Ceiling Height)		1.7
Detailed Manufacturing		2.1
Equipment Room		1.2
Control Room		0.5
Motel	1.0	
Dining Area		1.2
Guest quarters		1.1
Reception/Waiting		2.1
Motion Picture Theater	1.2	
Audience/Seating Area		1.2
Lobby		1.0
Multi-Family	0.7	
Museum	1.1	
Active Storage		0.8
General exhibition		1.0
Restoration		1.7
Bank/Office – banking activity area		1.5
Office	0.9	
Enclosed		1.0
Open Plan		1.0
Parking Garage	0.3	
Penitentiary	1.0	
Performing Arts Theater	1.6	
Audience/Seating Area		2.6
Lobby		3.3
Dressing/Locker/Fitting Room		1.1
Police Stations	1.0	
Fire Stations	0.8	
Fire Station Engine Room		0.8
Sleeping Quarters		0.3
Audience/Seating Area		0.8
Police Station Laboratory		1.4
Post Office	1.1	
Sorting Area		1.2
Lobby		1.0
Religious Buildings	1.3	
Lobby		1.7
Worship/Pulpit/Choir		2.4
Retail[b]	1.3	
Department Store Sales Area		1.3
Specialty Store Sales Area		1.8
Fine Merchandise Sales Area		2.9
Supermarket Sales Area		1.3
Personal Services Sales Area		1.3

Mass Merchandising Sales Area		1.3
Mall Concourse		1.7
School/University	1.2	
Classroom		1.3
Audience		0.7
Dining		1.1
Office		1.1
Corridor		0.5
Storage		0.5
Laboratory		1.1
Sports Arena	1.1	
Ring Sports Arena		2.7
Court Sports Arena		2.3
Indoor Playing Field Arena		1.4
Town Hall	1.1	
Transportation	1.0	
Dining Area		2.1
Baggage Area		1.0
Airport - Concourse		0.6
Terminal - Ticket Counter		1.5
Reception/Waiting		0.5
Warehouse	0.8	
Fine Material		1.4
Medium/Bulky Material		0.9
Workshop	1.4	

Replace section 506 with:

SECTION 506 – TOTAL BUILDING PERFORMANCE

As referenced in section 501.1, buildings establishing compliance with this appendix through total building performance shall be designed to achieve energy use per square foot equal to at least 20% below the energy requirements of *ASHRAE/IESNA Standard 90.1-2007, Energy Standard for Buildings Except for Low-Rise Residential Buildings*, Appendix G, measured by industry-accepted energy modeling.

Add Section 507:

SECTION 507 - ALTERNATIVE PRESCRIPTIVE COMPLIANCE PACKAGES

507.1 Requirements. Buildings complying with the prescriptive option of section 501.4.1 shall meet the requirements of any one of the following sections:

a. 507.2.1 Efficient Mechanical Equipment
b. 507.2.2 Reduced Lighting Power Density
c. 507.2.3 On-Site Supply of Renewable Energy

507.2.1 Efficient Mechanical Equipment

This mechanical alternative compliance option is intended to allow the builder to meet the requirements of section 507 by choosing to install efficient mechanical equipment.

This section does not replace the requirements in section 503, but is one of several optional compliance packages.

Mechanical equipment choices that fulfill requirements for section 507.2.1 shall comply with the following:

a. Package unitary equipment shall meet the minimum efficiency requirements in Tables 507.2.1(1) and 507.2.1(2)

b. Package Terminal Air Conditioners and Heat Pumps shall meet the minimum efficiency requirements in Table 507.2.1(3)

c. Warm air furnaces and combination warm air furnaces / air conditioning units shall meet the minimum efficiency requirements in Table 507.2.1(4)

d. Boilers shall meet the minimum efficiency requirements in Table 507.2.1(5)

e. Electric chillers shall meet the energy efficiency requirements in Table 507.2.1(6)

f. Absorption chillers shall meet the minimum efficiency requirements in Table 507.2.1(7)

TABLE 507.2.1(1)
UNITARY AIR CONDITIONERS AND CONDENSING UNITS, ELECTRICALLY OPERATED, EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Subcategory Or Rating Condition	Minimum Efficiency[a]
Air conditioners, Air cooled	< 65,000 Btu/h	Split system	15.0 SEER 12.5 EER
		Single package	15.0 SEER 12.0 EER
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	11.5 EER[b] 11.9 IPLV[b]
	≥ 135,000 Btu/h and < 240,000 Btu/h	Split system and single package	11.5 EER[b] 11.9 IPLV[b]
	≥ 240,000 Btu/h and < 760,000 Btu/h	Split system and single package	10.5 EER[b] 10.9 IPLV[b]
	≥ 760,000 Btu/h		9.7 EER[b] 11.0 IPLV[b]
Air conditioners, Water and evaporatively cooled		Split system and single package	14.0 EER

For SI: 1 British thermal unit per hour = 0.2931 W.

a. IPLVs are only applicable to equipment with capacity modulation.

b. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

TABLE 507.2.1(2)
UNITARY AND APPLIED HEAT PUMPS, ELECTRICALLY OPERATED, EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Subcategory Or Rating Condition	Minimum Efficiency[a]
Air cooled (Cooling mode)	< 65,000 Btu/h	Split system	15.0 SEER 12.5 EER
		Single package	15.0 SEER 12.0 EER
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	11.5 EER[b] 11.9 IPLV[b]
	≥135,000 Btu/h and < 240,000 Btu/h	Split system and single package	11.5 EER[b] 11.9 IPLV[b]
	≥ 240,000 Btu/h	Split system and single package	10.5 EER[b] 10.9 IPLV[b]
Water source (Cooling mode)	< 135,000 Btu/h	85°F entering water	14.0 EER
Air cooled (Heating mode)	< 65,000 Btu/h (Cooling capacity)	Split system	8.5 HSPF
		Single package	8.0 HSPF
	≥ 65,000 Btu/h and < 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb outdoor air	3.4 COP
		77°F db/15°F wb outdoor air	2.4 COP
	≥ 135,000 Btu/h (Cooling capacity)	47°F db/43°F wb outdoor air	3.1 COP
		77°F db/15°F wb outdoor air	2.1 COP
Water source (Heating mode)	< 135,000 Btu/h (Cooling capacity)	70°F entering water	4.6 COP

For SI: °C = [(°F) - 32] / 1.8, 1 British thermal unit per hour = 0.2931 W.
db = dry-bulb temperature, °F; wb = wet-bulb temperature, °F
a. IPLVs and Part load rating conditions are only applicable to equipment with capacity modulation.
b. Deduct 0.2 from the required EERs and IPLVs for units with a heating section other than electric resistance heat.

TABLE 507.2.1(3)
PACKAGED TERMINAL AIR CONDITIONERS AND PACKAGED TERMINALHEAT PUMPS

Equipment Type	Size Category	Minimum Efficiency
Air conditioners	< 7,000 Btu / h	11.9 EER
& Heat Pumps (Cooling Mode)	7,000 Btu / h and < 10,000 Btu / h	11.3 EER
	10,000 Btu / h and < 13,000 Btu / h	10.7 EER
	≥ 13,000 Btu / h	9.5 EER

a. Replacement units must be factory labeled as follows: "MANUFACTURED FOR REPLACEMENT APPLICATIONS ONLY: NOT TO BE INSTALLED IN NEW CONSTRUCTION PROJECTS." Replacement efficiencies apply only to units with existing sleeves less than 16 inches (406 mm) high and less than 42 inches (1067 mm) wide.

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TABLE 507.2.1(4)
WARM AIR FURNACES AND COMBINATION WARM AIR FURNACES/AIR-CONDITIONING UNITS, WARM AIR DUCT FURNACES AND UNIT HEATERS, EFFICIENCY REQUIREMENTS

Equipment Type	Size Category (Input)	Subcategory Or Rating Condition	Minimum Efficiency	Test Procedure
Warm air furnaces, gas fired	< 225,000 Btu/h	-	90% AFUE or 90% *Et*	DOE 10 CFR Part 430 or ANSI Z21.47
	≥ 225,000 Btu/h	Maximum capacity	90% *Ec*, note 1.	ANSI Z21.47
Warm air furnaces, oil fired	< 225,000 Btu/h	-	85% AFUE or 85% *Et*	DOE 10 CFR Part 430 or UL727
	≥ 225,000 Btu/h	Maximum capacity	85 % *Et*, note 1.	UL 727
Warm air duct furnaces, gas fired	All capacities	Maximum capacity	90% *Ec*	ANSI Z83.8
Warm air unit heaters, gas fired	All capacities	Maximum capacity	90% *Ec*	ANSI Z83.8
Warm air unit heaters, oil fired	All capacities	Maximum capacity	90% *Ec*	UL 731

For SI: 1 British thermal unit per hour = 0.2931 W.
1. Units must also include an IID (intermittent ignition device), have jackets not exceeding 0.75 percent of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space. Where there are two ratings, units not covered by the National Appliance Energy Conservation Act of 1987 (NAECA) (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h [19 kW] shall comply with either rating.
Et = Thermal efficiency
Ec = Combustion efficiency (100% less flue losses)
Efficient furnace fan: All fossil fuel furnaces in zones 3 to 8 shall have a furnace electricity ratio not greater than 2% and shall include a manufacturer's designation of the furnace electricity ratio.

TABLE 507.2.1(5)
BOILER, EFFICIENCY REQUIREMENTS

Equipment Type	Size Category	Minimum Efficiency
Gas Hot Water	< 300,000 Btu/h	90% *Et*
	> 300,000 Btu/h and < 2.5 mBtu/h	89% *Et*
Gas Steam	< 300,000 Btu/h	89% *Et*
	≥ 300,000 Btu/h	89% *Et*
Oil	< 300,000 Btu/h	90% *Et*
	≥ 300,000 Btu/h	89% *Et*
***Et* = thermal efficiency**		

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TABLE 507.2.1(5)
CHILLERS - EFFICIENCY REQUIREMENTS

		Required Efficiency-Chillers		Optional Compliance Path - Required Efficiency - Chillers With VSD	
Equipment Type	**Size Category**	Full Load (KW/ Ton)	IPLV (KW/ Ton)	Full Load (KW/Ton)	IPLV (KW/ Ton)
Air Cooled w/ Condenser	All	1.2	1.0	N/A	N/A
Air Cooled w/o Condenser	All	1.08	1.08	N/A	N/A
Water Cooled, Reciprocating	All	0.840	0.630	N/A	N/A
Water Cooled, Rotary Screw and Scroll	< 90 tons	0.780	0.600	N/A	N/A
	90 tons and < 150 tons	0.730	0.550	N/A	N/A
	150 tons and < 300 tons	0.610	0.510	N/A	N/A
	≥ 300 tons	0.600	0.490	N/A	N/A
Water Cooled, Centrifugal	< 150 tons	0.610	0.620	0.630	0.400
	150 tons and < 300 tons	0.590	0.560	0.600	0.400
	300 tons and < 600 tons	0.570	0.510	0.580	0.400
	≥ 600 tons	0.550	0.510	0.550	0.400

a. Compliance with full load efficiency numbers and IPLV numbers are both required.
b. Only Chillers with Variable Speed Drives(VSD) may use the optional compliance path here for chiller efficiency.

TABLE 507.2.1(6)
ABSORPTION CHILLERS - EFFICIENCY REQUIREMENTS

Equipment Type	**Required Efficiency Full Load COP (IPLV)**
Air Cooled, Single Effect	0.60, but only allowed in heat recovery applications
Water Cooled, Single Effect	0.70, but only allowed in heat recovery applications
Double Effect - Direct Fired	1.0 (1.05)
Double Effect - Indirect Fired	1.20

507.2.2 Reduced Lighting Power Density.
Whole Building Lighting Power Density (Watts/ft^2) must be reduced by at least 10% from the values in table 505.5.2, or as shown in table 507.2.2.

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507.2.2.1 Automatic Daylighting Controls.
Automatic daylighting controls shall be installed in the daylight zone and shall meet the requirements of 505.2.2.1.3.

TABLE 507.2.2
REDUCED INTERIOR LIGHTING POWER ALLOWANCES

LIGHTING POWER DENSITY	
Building Area Type[a]	**Reduced whole building (W/ft²)**
Automotive Facility	0.8
Convention Center	1.1
Court House	1.1
Dining: Bar Lounge/Leisure	1.2
Dining: Cafeteria/Fast Food	1.3
Dining: Family	1.4
Dormitory	0.9
Exercise Center	0.9
Fire Station	0.7
Gymnasium	1.0
Healthcare-Clinic	0.9
Hospital	1.1
Hotel	0.9
Library	1.2
Manufacturing Facility	1.2
Motel	0.9
Motion Picture Theater	1.1
Multi-Family	0.6
Museum	1.0
Office	0.8
Parking Garage	0.3
Penitentiary	0.9
Performing Arts Theater	1.4
Police	0.9
Post Office	1.0
Religious Building	1.2
Retail[b]	1.2
School/University	1.1
Sports Arena	1.0
Town Hall	1.0
Transportation	0.9
Warehouse	0.7
Workshop	1.3

See IECC 2009 Table 505.2 for notes and exception.

507.2.3 On-site Supply of Renewable Energy
The building or surrounding property shall incorporate an on-site renewable energy system that supplies 3% or more of total building electrical loads. On-site power generation using nonrenewable resources does not meet this requirement.

The jurisdiction shall be provided with an energy analysis that documents the renewable energy contribution to the building or a calculation demonstrating that the on-site supply of renewable energy:

a) Is capable of providing at least 3 percent of the total energy load of the building, or
b) Has an installed maximum generating capacity equal to or greater than 0.50 watts per square foot of usable floor space.

Insert IECC 2009 Chapter 6 – Referenced Standards