CIVANO ENERGY CODE
COMMUNITY OF CIVANO, LLC

SYNOPSIS

The Civano Energy Code provides a quantifiable standard against which building plans can be measured to ensure that the finished buildings can be expected to enjoy substantially less energy usage than would have been the case under the Tucson Model Energy Code.

Tucson/Pima County Sustainable Energy Standard

Work done by several members of the Tucson-Pima County Metropolitan Energy Commission resulted in a standard of compliance that modifies the Model Energy Code, now called the International Energy Conservation Code for developers and builders. The standard, named the "Sustainable Energy Standard" by the Tucson/Pima County Building Code Committee, requires improved building energy efficiency by at least 50 percent over the IECC and is available to anyone outside of Civano. Its wide adoption is strongly promoted by the Commission.

The Sustainable Energy Standard provides technical guidelines allowing other developments, (new and retrofit) to incorporate Civano performance guidelines for energy conservation, water use and waste into more general building projects. The Sustainable Energy Standard has been adopted by the City of Tucson for all City-owned buildings (to be built or renovated).

The Standard has been updated to the new International Energy Conservation Code and will be made available to the public through the City's plans examination process for voluntary use by anyone who wants to build to a higher standard pending final approval be the City Council. The U.S. Department of Energy has provided support to continue development of the Sustainable Energy Standard as a design tool.

Use the links below to access the Civano Energy Code/Sustainable Energy Standard and related resources:

LINKS

Civano Energy Code/Sustainable Energy Standard

Arizona Sustainable Energy Standard Compliance Checklist 1
Arizona Sustainable Energy Standard Compliance Checklist 2
Metropolitan Energy Commission Website
Download Custom MECcheck Software For Pima County
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For further information, contact Al Nichols, Al Nichols Engineering, at alnichols@aol.com.

Arizona Software Revised Checklist
1/9/99

| GLAZING:
[ ] | All glazing facing between 20-165 degrees of North or 195-340 degrees of
| North shall have a minimum summer shading coefficient of 0.39. All
| glazing facing between 165-195 degrees shall have a minimum summer
| shading coefficient of 0.5 or less. This may be accomplished by the use
| of overhangs, covered porches, tinted glazing, or other approved
| methods.

[I added "of North" to the above text, since it didn't specify how these degrees are to be measured. Please verify this is correct.]

|
| HVAC EQUIPMENT:
[ ] | 1. Air Conditioner, 12.0 SEER or higher
| Make and Model Number _____
| Air conditioning systems sized under the guidelines of the Air
| Conditioning Contractors of America (ACCA) Manual J Procedures,
| (Sections 7-27, 7-28 and 7-29 at outside conditions of 105 degrees F.
| and inside conditions of 75 degrees F). Other provisions of this
| standard notwithstanding, air conditioning equipment shall have a
| minimum SEER of 12 or a minimum EER of 10.

[If heating equipment is selected by the user or an SEER higher than 12 is indicated, it will be reflected in this section. However, the 12 SEER air conditioner will be a default selected for the user which they cannot go below.]

|
| PLANS:
[ ] | Plans must indicate verification of proper installation before drywall
| installation. The "Insulation Installation Warranty" must be completed
| and signed by a representative of the developer and builder.
|
|
[ ] | Plans must indicate whole-window assembly U-factors, solar heat gain
| coefficients, visible light transmittance and air leakage values of
| fenestration products in accordance with the National Fenestration
| Rating Council 100-91, *Procedure for Determining Fenestration Product*

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| *Thermal Properties* (Standard RS-51).
|
| The minimum design characteristics to qualify as a Thermal Break are:
| a. The material used as the thermal break must have a thermal
| conductivity of not more than 3.6 Btu/inch/hr/sq. ft./F, and;
| b. The thermal break must produce a gap not less than 0.210 inches, |
and;
| c. All metal members of the product exposed to interior and exterior
| air must incorporate a thermal break meeting the criteria in (a)
| and (b) above.
| In addition, the product must be clearly labeled by the manufacturer
| that it qualifies as a thermally broken product. Non-metal products may
| include metal fasteners, hardware, and door thresholds.
|
| Plans and specifications must show the method of utilizing "beneficial
| use of solar energy", which can include any of the following:
| - Solar thermal or solar electric space heating systems.
| - Trombe wall or clear view collectors for space heating.
| - Solar Photovoltaic systems.
| - Solar thermal/electric power generating systems, including stand-
| alone and grid connected parabolic trough and dish Stirling.
| - Solar daylighting systems specifically designed to capture and
| redirect visible solar energy while controlling infrared energy
| (conventional skylights are specifically excluded) for at least one
| half of the non-bedroom space.
| - Passive building heating for the winter through the use of optimum
| window shade structures and orientation.
| - Solar water systems for domestic water heating or space heating.
| - Solar pool or spa water heating.
| - Solar oven that is built into the structure.
| - Solar food dehydrator that is built into the structure.
| - Solar water distiller attached to building.
|
| AIR LEAKAGE:
[ ] | Joints, penetrations, and all other such openings in the building
| envelope that are sources of air leakage must be sealed.
|
[ ] | A representative of the developer and/or builder will perform a blower
| door test after completion but before occupation of the residence. The
| representative will certify that the tested rate of air leakage of each
| system (based on the floor area served by that system) does not exceed a
| maximum of 0.35 ACH based upon the results of the blower door test(s).
| An Air Leakage Warranty verifying a maximum of 0.35 ACH shall be
| provided to the homeowner.
[Reference a blower door test standard?]
|

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[ ] | Recessed lighting fixtures when installed in building envelope must be
| constructed to accept only lamps with efficacy greater than 40
| lumens/watt and must meet one of the following requirements:

[Neither the standard nor the sample checklist submitted by AI contained a list of requirements completing this sentence. Where are the requirements referred to above? Are you referring to the following paragraph? If so, I will combine them]

|
[ ] | Recessed lights must be type IC rated and installed with
| no penetrations or installed inside an appropriate air-tight assembly
| with a 0.5" clearance from combustible materials and 3" clearance from
| insulation.
|
| VAPOR RETARDER:
[ ] | Required on the warm-in-winter side of all non-vented framed
| ceilings, walls, and floors.
|
| MATERIALS IDENTIFICATION:
[ ] | Materials and equipment must be identified so that compliance can
| be determined. Manufacturer manuals for all installed heating
| and cooling equipment and service water heating equipment must be
| provided. Insulation R-values and glazing U-values must be clearly
| marked on the building plans or specifications.
|
| DUCT INSULATION:
[ ] | Ducts in unconditioned spaces must be insulated to ___.
| Ducts outside the building must be insulated to ___.
|
| DUCT CONSTRUCTION:
[ ] | All ducts must be sealed with mastic and fibrous backing tape.
| Pressure-sensitive tape may be used for fibrous ducts. Duct tape
| is not permitted.
|
[ ] | The HVAC system must provide a means for balancing air and water
| systems. For structures with a floor area greater than 5000 square feet
| with forced-air climate control, balancing must be performed by an
| engineer, or included as part of a commissioning process from the design
| and construction phase. Certification and results of the balancing shall
| be submitted to the jurisdiction, the owner and the designer of the
| project.

[The first sentence above will be included in all reports. The last two sentences will be included in reports where the user has indicated 5000 or more square feet of conditioned space. Who is responsible for submitting the balancing requirements? Modify to read "...must be submitted by the builder to the jurisdiction..."?]

|
[ ] | All ducts must be leak tested in accordance with this standard. The
| tested rate of air leakage is not to exceed ____ in CFM at 25

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| pascals (0.1 inches WC). A representative of the developer and/or
| builder will perform a field inspection and leakage test of the
| ductwork before drywall installation. The field representative will
| certify successful completion of this test.

[The actual requirement will be printed in the checklist based on taking 3% of the conditioned floor area entered by the user. There does not appear to be any support in this standard for the duct leak test. Is there a reference? What is meant by "...in accordance with this standard"? Is there an ASTM Standard you want referenced? Please clarify.]

|
| TEMPERATURE CONTROLS:

[ ] | Thermostats are required for each separate HVAC system. A manual
| or automatic means to partially restrict or shut off the heating
| and/or cooling input to each zone or floor shall be provided.
|
| WATER HEATING

[ ] | Water heating system must be one of the following:
| - Solar water heater.
| - Instant gas water heater with electronic ignition.
| - Heat pump electric water heater.
| - Heat recovery water heater from air conditioning or other sources.
| - Gas water heater exceeding 90% efficiency (condensing types).
|

[ ] | Electric storage water heaters to have a standby loss not exceeding 4
| watts/ft2 of tank surface or 43 watts, whichever is greater.
|

[ ] | Plumbing fixtures must meet the following maximum usage requirements
| unless special requirements dictate otherwise:
| - Water closets: 1.6 gallons per flush.
| - Kitchen showers and lavatory faucets: 3 gallons per minute.
| - Urinals: 1 gallon per flush.

[What constitutes special requirements? Ambiguous and difficult to enforce.]

|
| METERING:

[ ] | Provisions shall be made to determine the energy consumed by each tenant
| by separately metering individual dwelling units or tenant spaces.

[This requirement will only be included if multi-family is selected in the software.]

|
| WOOD BURNING STOVES and FIREPLACES:

[ ] | A wood-burning stove or fireplace shall be considered as providing the
| required space heating energy only when installed as backup energy for a
| solar-thermal collection system.
|

[ ] | Wood-burning stoves shall be labeled to show compliance with the
| following U. S. Environmental Protection Agency (EPA) standards for
| particulate emissions during operation:

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| - Stoves with catalytic elements 4.1 grams per hour
| - Stoves without catalytic elements 7.5 grams per hour
|
[ ] | Catalytic stoves shall have an accessible, modular, replaceable catalyst element.
|
[ ] | Wood-burning fireplaces shall produce useful heat and be provided with a means of supplying 100% of the combustion air for operation from the outside, and shall limit particulate emissions to less than 7.5 grams per hour. All fireplaces shall be provided with a tight fitting glass door and a positive means of circulating the heated air in the occupied space.
|
[ ] | Direct vent gas fireplaces shall have a minimum of 70% overall efficiency.
|
| SWIMMING POOLS:
[ ] | All heated swimming pools must have an on/off heater switch. Pool pumps require a time clock.
|
[ ] | All recreational swimming pools and spas must utilize solar energy as the only water heating source. Medical and rehabilitation pools smaller than 3,000 gallons water capacity must use solar energy as the primary water heating source, with a new energy source permitted as backup.
|
| HVAC PIPING INSULATION:
[ ] | HVAC piping must be insulated to the following levels (in.):
|

	PIPE SIZES (in.)			
HEATING SYSTEMS:	TEMP (F)	2" RUNOUTS	0-1"	1.25-2" 2.5-4"
Low pressure/temp.	201-250	1.0	1.5	1.5 2.0
Low temperature	120-200	0.5	1.0	1.0 1.5
Steam condensate	any	1.0	1.0	1.5 2.0
COOLING SYSTEMS:				
Chilled water or	40-55	0.5	0.5	0.75 1.0
refrigerant	below 40	1.0	1.0	1.5 1.5

|
| CIRCULATING HOT WATER SYSTEMS:
[ ] | Recirculating systems must have time clocks as required in Sec. 504.5.3, switches as required in Sec. 504.6, and pipes must be insulated to the following levels (in.):
|

	PIPE SIZES (in.)			
	NON-CIRCULATING	CIRCULATING MAINS & RUNOUTS		
HEATED WATER TEMP (F):	RUNOUTS 0-1"	0-1.25"	1.5-2.0"	2.0+"
170-180	0.5	1.0	1.5	2.0

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140-160	0.5	0.5	1.0	1.5
100-130	0.5	0.5	0.5	1.0

[Note that the above text also included a reference to Section 504.7, but this section is not available in my copy of the standard nor on the web site. Please verify the insulation levels I inserted are the same as your requirement. Also Sections 504.6 and 504.5.3 referenced in the text are missing from my copy and from the copy currently on the web site. I would prefer to put the actual requirements in the checklist rather than reference a section in the standard, but if you prefer this we need to make sure that section exists.]

Additional requirements for Sustainable Energy Standard Compliance using Chapter Five, Residential, 1995 MEC Check Software at 7,000 HDD

Chapter 1

Plans indicate verification of proper installation before drywall installation and the completion of the "Insulation Installation Warranty" and signature` by a representative of the developer and builder.

Plans indicate whole-window assembly U-factor, solar heat gain coefficient, visible light transmittance and air leakage values of fenestration products in accordance with the National Fenestration Rating Council 100-91, *Procedure for Determining Fenestration Product Thermal Properties* (Standard RS-51).

The minimum design characteristics to qualify as a Thermal Break are:

a. The material used as the thermal break must have a thermal conductivity of not more than 3.6 Btu/inch/hr/sq. ft./F, and;

b. The thermal break must produce a gap not less than 0.210 inches, and;

c. All metal members of the product exposed to interior and exterior air must incorporate a thermal break meeting the criteria in (a) and (b) above.

In addition, the product must be clearly labeled by the manufacturer that it qualifies as a thermally broken product. Non-metal products may include metal fasteners, hardware, and door thresholds.

Air conditioning systems sized under the guidelines of the Air Conditioning Contractors of America (ACCA)Manual J Procedures, Specifically Sections 7-27, 7-28 and 7-29 at outside conditions of 105 degrees F. and inside conditions of 75 degrees F. Other provisions of this standard notwithstanding, air conditioning equipment shall have a minimum SEER of 12 or a minimum EER of 10.

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Water heating systems demonstrating compliance -

Solar water heaters.
Instant gas water heaters with electronic ignition.
Heat pump electric water heaters.
Heat recovery water heaters from air conditioning or other sources.
Gas water heaters exceeding 90% efficiency (condensing types) .

Plans and specifications shall show the method of utilizing "beneficial use of solar energy".

Solar thermal or solar electric space heating systems.
Trombe wall or clear view collectors for space heating.
Solar Photovoltaic systems.
Solar thermal/electric power generating systems, including stand-alone and grid connected parabolic trough and dish Stirling.
Solar daylighting systems specifically designed to capture and redirect visible solar energy while controlling infrared energy (conventional skylights are specifically excluded) for at least one half of the non-bedroom space.
Passive building heating for the winter through the use of optimum window shade structures and orientation.
Solar water systems for domestic water heating or space heating.
Solar pool or spa water heating.
Solar oven that is built into the structure.
Solar food dehydrator that is built into the structure.
Solar water distiller attached to building.

Chapter 3

Wood-burning stove or fireplace shall be considered as providing the required space heating energy only when installed as backup energy for a solar-thermal collection system.

Wood-burning stoves. Wood-burning stoves shall be labeled to show compliance with the following U. S. Environmental Protection Agency (EPA) standards for particulate emissions during operation:

Stoves with catalytic elements	4.1 grams per hour
Stoves without catalytic elements	7.5 grams per hour

Catalytic stoves shall have an accessible, modular, replaceable catalyst element.

Fireplaces. Wood-burning fireplaces shall produce useful heat and be provided with a means of supplying 100% of the combustion air for operation from the outside, and shall limit particulate emissions to less than 7.5 grams per hour. All fireplaces shall

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be provided with a tight fitting glass door and a positive means of circulating the heated air in the occupied space.
Direct vent gas fireplaces shall have a minimum of 70% overall efficiency.

Chapter 5

Glazing. All glazing facing between 20 - 165 degrees or 195 - 340 degrees shall have a minimum summer shade or shading coefficient of 0.39. All glazing facing between 165-195 degrees shall have a minimum summer shade or shading coefficient of 0.5 or less. This may be accomplished by the use of overhangs, covered porches, tinted glazing, or other approved methods.

An Air Leakage Warranty verifying a maximum of 0.35 ACH shall be provided to the home owner. A representative of the developer and/or builder will perform a blower door test after completion but before occupation of the residence. The representative will certify a maximum of 0.35 ACH based upon the results of the blower door test. An Air Leakage Warranty verifying a maximum of 0.35 ACH shall be provided to the homeowner.

Recessed lighting fixtures. When installed in the building envelope, recessed lighting fixtures shall be constructed so as to accept only lamps with efficacy greater than 40 lumens/watt, and meet one of the following requirements:

Balancing, For structures with a floor area greater than 5000 square feet with forced-air climate control, balancing shall be performed, or included as part of a commissioning process from the design and construction phase. Certification and results of the balancing shall be submitted to the jurisdiction, the owner and the designer of the project.

All ducts shall be leak tested in accordance with this standard. The tested rate of air leakage is not to exceed 3% of conditioned floor area in CFM at 25 pascals (0.1 inches WC). A representative of the developer and/or builder will perform a field inspection and leakage test of the ductwork before drywall installation. The field representative will certify successful completion of this test.

All recreational swimming pools and spas shall utilize solar energy as the only water heating source. Medical and rehabilitation pools smaller than 3,000 gallons water capacity shall use solar energy as the primary water heating source, with a new energy source permitted as backup.

Recirculating systems shall be provided with time clocks as required in Sec. 504.5.3, switches as required in Sec. 504.6, and pipe insulation as required in Sec. 504.7.

Plumbing fixtures shall meet the following maximum usage requirements unless special requirements dictate otherwise:

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Water closets: 1.6 gallons per flush.
Kitchen showers and lavatory faucets: 3 gallons per minute.
Urinals: 1 gallon per flush.

Energy Consumption - Other Than Electrical. In multifamily dwellings , provisions shall be made to determine the energy consumed by each tenant by separately metering individual dwelling units or tenant spaces.

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