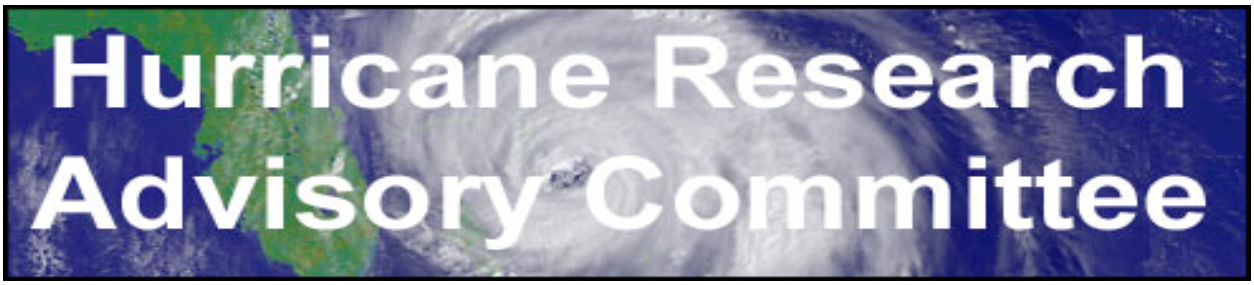

AIR CONDITIONING EQUIPMENT WORKSHOP

REPORT TO THE FLORIDA BUILDING COMMISSION

DECEMBER 8, 2009

ORLANDO, FLORIDA

FACILITATION, MEETING AND PROCESS DESIGN BY

FCRC CONSENSUS CENTER

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FLORIDA BUILDING COMMISSION

HURRICANE RESEARCH ADVISORY COMMITTEE

REPORT OF THE DECEMBER 8, 2009 WORKSHOP

Opening and Welcome
Jeff Blair, welcomed participants and opened the workshop at 1:15 PM. All workshop participants were provided with an opportunity to provide their names and representation.

HRAC Workgroup Members Present (Non-Commission HRAC Members):
Joe Crum, Do Kim, Jaime Gascon, Tim Reinhold, and Richard Reynolds.

FBC Members Present:
Raul L. Rodriguez, AIA, Chair, Bob Boyer, Ed Carson, Dale Greiner, Jon Hamrick, Scott Mollan, Rafael Palacios, James Schock, Chris Schulte, and Jeff Stone.

DCA Staff Present
Rick Dixon, Mo Madani, Jim Richmond, and Ann Stanton.

Meeting Facilitation
The meeting was facilitated by Jeff Blair from the FCRC Consensus Center at Florida State University. Information at: http://consensus.fsu.edu/

FCRC CONSENSUS CENTER

Project Webpage
Information on the project, including agenda packets, meeting reports, and related documents may be found in downloadable format at the project webpage below:
http://consensus.fsu.edu/FBC/hrac.html

Workshop Agenda Review and Scope
Jeff Blair reviewed the Workshop agenda and scope including the following objectives:

- ✓ To Review Workshop Agenda and Scope
- ✓ To Review FBC and ASCE 7 Wind Load Requirements for Roof Mounted Equipment and Issues Identified at October HRAC Meeting
- ✓ To Hear Industry Report on Status of Compliance with Florida Building Code Wind Standards
- ✓ To Hear Overview of Local and State Options for Demonstrating Compliance
- ✓ To Hear Overview of Product Approval Registry System
- ✓ To Identify and Discuss Needed Next Steps

Presentation on FBC and ASCE 7 Wind Load Requirements for Roof Mounted Equipment
Mo Madani, FBC Codes and Standards, provided a summary of the State Product Approval system and answered participant's questions. Following is a summary of the PowerPoint presentation:

2007 Florida Building Code, Mechanical

- 301.12 Wind resistance. Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports (FL's) as determined in accordance with the Florida Building Code, Building. Roof mounted mechanical units and supports shall be secured to the structure…

ASCE 7-05

- 6.5.15 Design wind Loads on Other Structures. The design wind force for other structures shall be determined by the following equation:

  F = (qz)(GCf)(Af)(1b)(N)

  Where

  qz = velocity pressure evaluated as height z of the centroid of area Af using exposure defined in Section 6.5.6.3

  G = gust-effect factor from Section 6.5.8

  Cf = force coefficients from Figs. 6-21 through 6-23

  Af =projected area normal to the wind except where Cf is specified for the actual surface area, ft.sq.
- 6.5.15.1 Rooftop Structures and Equipment for Buildings with h <= 60 ft. The force on rooftop structures and equipment with Af less than (0.1Bh) located on buildings with h<= 60 ft shall be determined from Eq. 6-28, increased by a factor of 1.9. The factor shall be permitted to be reduced linearly from 1.9 to 1.0 as the value of Af is increased from (.1Bh) to (Bh).
- "Other structures" means structures, other than buildings, for which loads are specified in this standard"

Other structures include:

- Fig. 6-21: Chimneys, Tanks, Rooftop Equipment & Similar Structures.
- Fig. 6-22: Open Signs & Lattice Frameworks.
- Fig. 6-23: Trussed Towers.

SECTION 1602 DEFINITIONS AND NOTATIONS

- OTHER STRUCTURES. Structures, other than buildings, for which loads are specified in this chapter.

DCA08-DEC-205

- Rooftop…
- Question: Whether appliances is required to resist wind pressures even if the permit applicant is unable to find appliance manufacturer who is will provide supporting wind resistance documentation?
- Answer: yes, mechanical equipment exposed to wind is required to be designed for wind resistance regardless of whether the manufacturers of the equipment are willing to provide design information and documentation.

ASCE 7-2010

- Rooftop structures and equipment provides for:
- Lateral force Fh.
- Vertical uplift force Fv.
- Components and cladding pressure on each wall

Both the FBC & ASCE 7 consider mechanical equipment as "other structures"

- ASCE 7 provides for Design wind Loads on Other Structures including rooftop units and structures in general.
- Unit (exterior panels & fasteners) must be designed to resist forces due to wind, with consideration of overturning, sliding, and uplift.

(Attachment 2—FBC Provisions)

Issues Identified at the October 2009 HRAC Meeting Overview

Rick Dixon, FBC Executive Director, provided participants with an overview of issues and answered participant's questions.

Overview:

Broward County Board of Rules and Appeals (BORA) sent a letter to 59 air-conditioning manufacturers to ensure they were aware of the Florida Building Code's wind load requirements for mechanical equipment exposed to the wind. A copy of the Commission's final order on Declaratory Statement DCA-08-DEC-205 clarifying that pursuant to section 301.12 Florida Building Code, Mechanical Volume: "mechanical equipment, appliances and support that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the Florida Building Code, Building. This may be accomplished by design or by application of Section 301.12 Roof-mounted mechanical units and supports shall be secured to the structure. The use of wood "sleepers" shall not be permitted." was also sent. BORA reported that only three (3) manufacturers responded, none of which they felt demonstrated compliance with the requirements of the Code.

At the June 2009 meeting, Broward County Board of Rules and Appeals (BORA) requested that the Commission address issues regarding the Mechanical Code's requirement for mechanical equipment exposed to wind to be designed for wind resistance. The Commission issued a declaratory statement (DCA08-DEC-205) addressing this issue and verifying that this provision of the Code applies. BORA indicated that they contacted manufacturers none of whom have equipment that complies with the relevant provisions of the Code and that building departments do not appear to be enforcing the provision. Representatives of BORA requested that the Commission contact manufacturers to ensure they comply with the Code on this issue.

Subsequently, Chairman Rodriguez sent a letter to the Air-Conditioning, Heating, and Refrigeration Institute. The Commission referred this issue to the HRAC so they could work with stakeholders to ensure that the wind-load requirements of the Code are being complied with and to evaluate issues and options for ensuring same. At the October 2009 HRAC meeting there were multiple presentations on the topic and it was agreed a workshop would be convened to evaluate the issue further.

Summary of Manufacturer's Concerns

- Local jurisdictions are requiring different information and signed and sealed documentation.
- The Code is not specific on how the equipment is to be evaluated. No referenced test standard.
- Disclosure of proprietary information for public records.

Industry Report on Status of Compliance with Florida Building Code Wind Standards
Karim Amrane, Air Conditioning, Heating, and Refrigeration Institute (AHRI), provided participants with an overview of industry initiatives regarding complying with the Code's wind resistance requirements for air conditioning equipment and appliances exposed to wind, and answered participant's questions.

Summary of Report:
AHRI received letter from FBC regarding the requirement to comply with the Florida Building Code's wind resistance requirements for air conditioning equipment and appliances exposed to wind.
AHRI has conveyed the message to manufacturers.
Have spoken with manufacturers and discussed what the Institute can do.
There is a great deal of confusion.
Expect to have procedure in place soon.
Industry is exploring drafting a standard or guidelines for how equipments should demonstrate compliance with the Code.
Question is, how to go about it: should it be an ANSI standard, not sure but possibly yes.
May consider a certification program.
AHRI is already writing seismic criteria, and may be able to use that as a template.
A time frame to comply has not been provided and that is a concern.
Will be exploring issue with members.
Will report back to this group when we have something in place.

Summary of Comments and Discussion:
Dixon: Would a AHRI standard be an ANSI-approved standard? ANSI provides for non-industry participants.
Amrane: Can't say at this point. Standard development process is open to non-members.
Palacios: When DEC statement came before Commission, I was the only member who voted against it because I felt that it put all responsibility on the contractor. The I-Codes have wind load maps that have been in place for years.
Reynolds: Are you proposing an ANSI standard or an internal standard. That is initially an in-house standard because of time constraints.
Amrane: If AHRI decides to write a standard, outside participation will be invited. You need a standard before industry can start testing to it.
Dixon: On the seismic standard, where are you in the process?
Amrane: Not yet final. No set schedule at this point.

Local and State Options for Demonstrating Compliance Overview
Mo Madani, FBC Codes and Standards, provided a summary of the State Product Approval system and answered participant's questions. Following is a summary of the PowerPoint presentation:

Product Approval, Rule 9B-72
- This rule applies to approval of products and systems which comprise the building envelope and structural frame, for compliance with the structural requirements of the Florida Building Code.

Scope
(1) Products in the following categories as defined by subcategories of subsection 9B-72.010(31), F.A.C., shall be available for approval by the Commission pursuant to Rule 9B-72.090, F.A.C., for use in the state:
(a) Panel Walls; (b) Exterior Doors; (c) Roofing Products; (d) Skylights; (e) Windows; (f) Shutters; and (g) Structural Components.
(2) This rule applies to approval of products and systems, which comprise the building envelope and structural frame, for compliance with the structural requirements of the Florida Building Code.

"Optional" State Product Approval
- Accreditation bodies accredit and monitor the competency and performance of an agency carrying out specific tasks.
- Evaluation entities conduct product evaluations based on tests reports, and/or rational analysis.
- Testing labs conduct product tests.
- Quality assurance agencies monitor product production.
- Certification agencies evaluate products based on tests and/or rational analysis; conduct quality assurance; certify compliance with standards; and list and label products.
- Validation entities certify compliance with standards and certify to the Florida Building Commission that product approval applications are correct.
- All products in the eight categories must be manufactured with a quality assurance program in place, monitored by a Commission approved quality assurance entity.

METHOD 1: Products with Code Performance Criteria and Standardized Test, or Comparative or Rational Analysis using one of the following four options:
- Option A: a certification mark or listing
- Option B: a test report
- Option C: an evaluation report from an evaluation entity
- Option D: an evaluation report from a Florida Architect or Engineer

METHOD 2: Products Which Have No Standardized Test, or Comparative or Rational Analysis using one of the following two options:
- Option A: an evaluation report from an evaluation entity
- Option B: an evaluation report from a Florida Architect or Engineer

Applications for state product approval are $500 per product sub-category.
One $500 application would cover a manufacturer's entire line under one of these subcategories.

Four Methods for State Approval
- Certification Method
- Test Report
- Evaluation Report from an Evaluation Entity
- Evaluation Report from a Florida licensed Architect or a Florida Professional Engineer

9B-72.080 Product Validation
Two Types of Validation: Administrative Validation; and Technical Validation
The validation process has been added to Certification Mark or Listing method on the Florida State Product Approval System.

Administrative Validation:
Applicable to:
A certification mark or listing from an approved certification agency
An evaluation report from a Florida Registered Architect or Licensed Engineer independent from the manufacturer
An evaluation report from an approved evaluation entity (i.e. ICC)
Administrative Validation Criteria:
Criteria consists of:

- Verification of certification, certification agency status, product description, testing standards per Florida Building Code and compliance documentation with the current code.
- Verification of installation instructions, anchorage requirements and product performance under certification.
- Verification of any limits of use included as certified and use of rational analysis within the scope of certification

Technical Validation:
Applicable to:

- A test report from an approved testing laboratory
- An evaluation repot from an approved evaluation entity that is not an independent third party from the manufacturer

Technical Validation Criteria:

- In addition to criteria for Administrative Validation, Technical validation includes:
- Determination that the evaluator has complied with acceptable standards of engineering principles.
- Engineering verification that the evaluation complies with the Code.
- Copy of the application complying with all aspects of rule 61G15-36 F.A.C. must be filed with the Commission.

Product Approval Registry System Overview
Mo Madani, FBC Codes and Standards, provided a summary of the State Product Approval system as an option for manufactures' to demonstrate their products comply with the Code's provisions, and answered participant's questions.

Staff recommended, and the Product Approval POC voted that AC equipments that are attached to the building envelope fall within the scope of Rule 9B-72 as follows:

(1) Roof top AC equipment
(a) Category of product: Roofing products; and Subcategory: either "roofing accessories that are an integral part of the roofing system" or "product introduced as a result of new technology, or
(b) Category of product: Structural components; and Subcategory: either "pre-engineered air conditioner stands" or "products introduced as a result of new technology".
(2) Wall mounted AC equipment:

Category of product: Structural components; and Subcategory: either "pre-engineered air conditioner stands" or "products introduced as a result of new technology".

Compliance method: Certification mark or listing, test report, evaluation report from an entity or evaluation report from an architect or engineer.

Summary of Comments and Discussion:
- Tim Alford, Nordyne: What does the $500 product approval fee cover? Tie-down kit?
- Madani: A/C equipment with installation instructions and stand, all as one product.
- Andrew Karl, Goodman: Administrative criteria: Evaluation by Florida registered engineer; does it require a third party?
- Madani: Another engineer has to validate.
- Irvin Derks: What assurance does the company have that proprietary information remains confidential? Detailed structural drawings have been required. How is report validated?
- Madani: Report has sufficient information to determine product meets relevant standard(s). Validation constitutes a summary of report. Does require installation instructions. Validation engineer reviews test report. Calculations are not required to be submitted.
- Dixon: Administrative validation checks whether all required information is provided. Not technical validation.
- Palacios: evaluator has proprietary information.
- Amrane: if AHRI wanted to become an evaluation agency what would it cost.
  Madani: $600. One time fee to become certification agency. Renewable.

(Attachment 3—Option for Demonstrating Compliance with Code)

Participant Discussion and Issues

Workshop participants were encouraged to ask questions, and provide comments and recommendations. Following is a summary of the discussions:

Summary of Comments and Discussion;
- George Alverez: I designed the first A/C tie down. Past year has been tough; there appears to be no direction from the State. Local inspectors are asking for different information from jurisdiction to jurisdiction. Last unit rated for specific height, weight, measurements. Should not matter what manufacturer provides a unit that meets the specification for the tie-down. Repetition of certification is being required.
- Jimmy Buckner: I am an evaluation and validation entity and can provide some answers. In Florida, there are about 470 jurisdictions, tremendous variability of interpretations. There is a process to comply with the Code. Chapter 16 of the FBC building structures and parts thereof. Existing standards may be modified to be used. Some issues may be public knowledge, e.g. weight of metal. State evaluation doesn't get into the proprietary information; evaluation report may say size bolts, not internal components. Test reports are not available for public record. The optional State Product Approval works well and will provide industry with a reasonable and consistent method for demonstrating that their products comply with the Code.
- Jim Shock: Florida Product Approval System can bridge the time frame problem.
- Chris Schulte: What are B.O.'s currently using as criteria. Sees them looking at the tiedowns, not so much the actual units.
- Jon Hamrick: [DOE] asks for a test of the box.
- Jaime Gascon, Miami-Dade: Some of the concerns are legitimate. Confusion across state can be addressed by Product Approval. It is a way to show uniform compliance. Set of engineering calculations for each system required as backup. Product approval breaks it down to one submittal. Some packaged systems have been reviewed by M/D; no cooling towers.

- Palacios: Cooling towers, engineer submits statement that cooling tower is designed to meet X mph wind. Readily accepted. Code says that systems meet wind load.
- Rusty Carroll: You have certified that cooling towers meet code?
- Jaime Gascon: Issue came up because no evidence was available to determine if a unit meets the wind loads. Strapping is evidence of this need/approach. Need a way to determine if unit meets the intent of the Code.
- Rusty Carroll: Broward County has contacted 59 manufacturers asking for documentation. None have responded to provide such evidence. Industry is not showing evidence of complying. If FBC required Product Approval, would get compliance.
- Rafael Palacios: Certification by engineer has been accepted for cooling towers.
- Chris Schulte: Why aren't engineers going for product approval. Concerned that the association is exploring putting a committee together to develop a standard. Too slow of an approach considering this has been in the Code for years. If you want to sell units in Florida, get product approval or some other method to demonstrate compliance with the Code.
- Jim DiPietro: Ground level and wall penetrating equipment is also and issue. Are they exempt? Is it part of the envelope of the building. Problem in Broward is single family homes.
- Mo Madani: Had a solution in 2004 Code, got removed during the 2007 Code Update process. Perhaps need to re-think the issue. However, DEC requests so far have been specific to rooftop units.
- Rick Dixon: Concerns came from FEMA after major storms. Saw evidence of rooftop units coming off the top of buildings and pieces of systems damaging roofing.
- Ron Reguiro, WPB. Author of DEC request. Had asked for certification, prevailed with local board. Asked for DEC to get clear understanding as to the scope of the wind load requirements. Pushback from enforcement because DECs viewed to apply to cooling towers. Got clarification from Commission that all equipment is covered by the Code. If a determination that all equipment is covered by 9B-72, doesn't all equipment have to meet it?
- Mo Madani: Not all equipment has to go through product approval because manufacturer/contractor can go directly to building departments if they choose.
- Rick Dixon: There are some things that manufacturer may not have to do: e.g. independent third party verification. Statute defines 7 types of products. If local requires QA, may be required.
- Is there any set of criteria for roof-top stands? Miami-Dade costs $2000 for product approval.
- Mo Madani: Code gives performance compliance criteria.
- Tim Alford, Nordyne: Most of the frustration is in subjective interpretation of Code calculations. Have a letter signed by a FL P.E., stamped & sealed. Sometimes it works, sometimes it doesn't. What is good enough? It seems to come down to State approval.
- Dale Greiner: Mo is correct. To get uniformity, best way is State approval. You can expect a different mind set every time at the local level.
- Jim Richmond: Clarify that State approval is an alternative. Once have State approval must be accepted by local jurisdictions if it falls under specific conditions. Any decision by local can be appealed to the Commission, ultimately the Florida Supreme Court.
- Alvarez: Locals can turn down State approval under some conditions?
- Rick Dixon: Specific conditions are established by the state approval and if they are not met use of the product can be turned down by the local official.
- Mo Madani: Based on what we're hearing, locals would like to see State approval, most would welcome it. Most don't have staff or experience, looking for safe ground to stand on.
- Rafael Palacios: Is Miami-Dade County approval equal to State approval.
- Jim Richmond: Yes, if only applies to Miami-Dade. Most jurisdictions would accept, but it not same as State approval.

- Rafael Palacios: Is Florida the only State who care about wind loads since the requirements are in the I-Codes?
- Audience: YES.
- Rafael Palacios: No-one has asked what happens if the unit comes apart.
- Ed Carson: Wall-mounted equipment: Picture window must comply with the Code, but the PTAC unit right under it does not have to. Absurd.
- Chris Schulte: Site-specific letters. Guess that manufactures are spending money on specific letters, guess site-specific. If general criteria can be determined, maximum design pressure, get approval, something to hold on to and accept.
- Tim Alford: Kits put together with maximum design load in mind. Letters don't have calculations, perhaps why local B.O.'s don't believe it. Not site-specific.
- Alvarez: Graphs with different loads, signed, sealed, not accepted.
- Dave Steven, Rheem: Philosophical question. Why are professional engineers required to have another level of validation?
- Rick Dixon: The Legislature decided to set a higher standard than just design criteria for certain building components due to hurricane hazards.
- Raul L. Rodriguez, AIA, Chair: If you want uniformity, the State product approval option is the only method to achieve it.

Adjourn
The Workgroup concluded at 3:05 PM.

ATTACHMENT 1

MEETING ATTENDANCE—PUBLIC

Public Meeting Attendance	
NAME	**REPRESENTATION**
Dick Wilhelm	FMA/WDMA
Kevin Messer	Florida AC Distributors
Irvin Derks	Bard MFG Co.
John Michael	Atex
Donny Pittman	City of Orlando
Ron Reguerio	City of West Palm Beach
Gary Griffin	B&I Contractors
Kenneth White	Carrier Corp.
Paul Selman	Thybar Corp
Rudy Camera	PTC
Do Kim	Do Kim & Assoc.
Frank O'Nell	Full Service Green
Jimmy Buckner	CBuck Engineering
Tim Alford	Nordyne
Jorge Alvarez	Snaprite Mfg
David Stephens	Rheem
Jim Fishman	Goodman
Andrew Karl	Goodman
Tim Reinhold	Inst for Bus. & Home Safety
Richard Reynolds	FHBA

ATTACHMENT 2

FBC EQUIPMENT WIND RESISTANCE REQUIREMENTS

2007 Florida Building Code Wind Resistance Requirements for Air Conditioning Equipment and Appliances

Summary:

Florida Building Code, Mechanical
Section 301.12 Wind Resistance.
Requires equipment and appliances to comply with the Florida Building Code, Building.

Florida Building Code, Building
Section 1609.1.1 requires determination of wind loads in accordance with Chap 6 of ASCE 7-2005.

ASCE 7-2005
Section 6.5.15.1 establishes the method for determining wind loads on rooftop equipment.

The relevant sections of the codes and standards are given below:

2007 Florida Building Code, Mechanical
301.12 Wind resistance. Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the Florida Building Code, Building. Roof mounted mechanical units and supports shall be secured to the structure. The use of wood "sleepers" shall not be permitted.

2007 Florida Building Code, Residential
M1307.2 Anchorage of appliances. Appliances designed to be fixed in position shall be fastened or anchored in an approved manner. Strapping shall be at points within the upper one-third and lower one-third of the appliance's vertical dimensions. At the lower point, the strapping shall maintain a minimum distance of 4 inches (102 mm) above the controls.

M1307.3 Wind resistance. Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the Florida Building Code, Building.

2007 Florida Building Code, Building
1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures. All exterior wall coverings and soffits shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section 1609.1.1.

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapter 6 of ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

ASCE 7-05

6.5.15 Design wind Loads on Other Structures. The design wind force for other structures shall be determined by the following equation:

F = (qz)(GCf)(Af)(1b)(N)

Where

qz = velocity pressure evaluated as height z of the centroid of area Af using exposure defined in Section 6.5.6.3
G = gust-effect factor from Section 6.5.8
Cf = force coefficients from Figs. 6-21 through 6-23
Af = projected area normal to the wind except where Cf is specified for the actual surface area, ft. sq.

6.5.15.1 Rooftop Structures and Equipment for Buildings with h <= 60 ft. The force on rooftop structures and equipment with Af less than (01Bh) located on buildings with h<= 60 ft shall be determined from Eq. 6-28, increased by a factor of 1.9. The factor shall be permitted to be reduced linearly from 1.9 to 1.0 as the value of Af is increased from (.01Bh) to (Bh).

Additional Background Information Relating to HVAC Equipment Construction Design:

1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

All exterior wall coverings and soffits shall be capable of resisting the design pressures specified for walls for components and cladding loads in accordance with Section 1609.1.1.

1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapter 6 of ASCE 7. The type of opening protection required, the basic wind speed and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

ASCE 7 -05

Other structures include: Chimneys, Tanks, Rooftop Equipment & Similar Structures "Figure 6-21".

Chapter 1, of ASCE 7 - 05 defines "Other structures" to mean structures, other than buildings, for which loads are specified in this standard

SECTION 1602 DEFINITIONS AND NOTATIONS

OTHER STRUCTURES. Structures, other than buildings, for which loads are specified in this chapter.

1601.1 Scope. The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

1604.1 General. Building, structures and parts thereof shall be designed and constructed in accordance with strength design, load and resistance factor design, allowable stress design, empirical design or conventional construction methods, as permitted by the applicable material chapters.

1604.2 Strength. Buildings and other structures, and parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this code without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this code without exceeding the appropriate specified allowable stresses for the materials of construction.

Loads and forces for occupancies or uses not covered in this chapter shall be subject to the approval of the building official.

1604.3 Serviceability. Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift.

1604.3.1 Deflections. The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604.3.2 through 1604.3.5 or that permitted by Table 1604.3.

1604.3.2 Reinforced concrete. The deflection of reinforced concrete structural members shall not exceed that permitted by ACI 318.

1604.3.3 Steel. The deflection of steel structural members shall not exceed that permitted by AISC 360, AISI-NAS, AISI-General, AISI-Truss, ASCE 3, ASCE 8, SJI JG-1.1, SJI K-1.1 or SJI LH/DLH-1.1, as applicable.

1604.3.4 Masonry. The deflection of masonry structural members shall not exceed that permitted by ACI 530/ASCE 5/TMS 402.

1604.3.5 Aluminum. The deflection of aluminum structural members shall not exceed that permitted by AA ADM1.

604.4 Analysis. Load effects on structural members and their connections shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility and both short- and long-term material properties.

Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their service life.

Any system or method of construction to be used shall be based on a rational analysis in accordance with well-established principles of mechanics. Such analysis shall result in a system that provides a complete load path capable of transferring loads from their point of origin to the load-resisting elements.

The total lateral force shall be distributed to the various vertical elements of the lateral-force-resisting system in proportion to their rigidities, considering the rigidity of the horizontal bracing system or diaphragm. Rigid elements assumed not to be a part of the lateral-force-resisting system are permitted to be incorporated into buildings provided their effect on the action of the system is considered and provided for in the design. Except where diaphragms are flexible, or are permitted to be analyzed as flexible, provisions shall be made for the increased forces induced on resisting elements of the structural system resulting from torsion due to eccentricity between the center of application of the lateral forces and the center of rigidity of the lateral-force-resisting system.

Every structure shall be designed to resist the overturning effects caused by the lateral forces specified in this chapter. See Section 1609 for wind loads, and Section 1610 for lateral soil loads.

1604.8 Anchorage.

1604.8.1 General. Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed loads.
1604.9 Counteracting structural actions. Structural members, systems, components and cladding shall be designed to resist forces due to wind, with consideration of overturning, sliding, and uplift. Continuous load paths shall be provided for transmitting these forces to the foundation. Where sliding is used to isolate the elements, the effects of friction between sliding elements shall be included as a force.

1605.1 General. Buildings and other structures and portions thereof shall be designed to resist the load combinations specified in Section 1605.2 or 1605.3 and Chapters 18 through 23. Applicable loads shall be considered, including wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.

TABLE 1604.5
OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES
OCCUPANCY
CATEGORY NATURE OF OCCUPANCY

Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:

- Agricultural facilities
- Certain temporary facilities
- Minor storage facilities
- Screen enclosure

ATTACHMENT 3

OPTION FOR AC EQUIPMENT CODE COMPLIANCE

DETERMINING AIR CONDITIONING EQUIPMENT COMPLIANCE WITH FBC WIND STANDARDS

Summary of Manufacturer Concerns:

1. Local jurisdictions are requiring different information and signed and sealed documentation.
2. The Code is not specific on how the equipment is to be evaluated. No referenced test standard.
3. Disclosure of proprietary information for public records.

Solution Option: **State Product Approval**

Issue: Discussion of application of the State Product Approval System to the installation and the superstructure of AC Equipment

Background:

(1) **2007 Florida Building Code, Mechanical**

301.12 Wind resistance. Mechanical equipment, appliances and supports that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the Florida Building Code, Building. Roof mounted mechanical units and supports shall be secured to the structure. The use of wood "sleepers" shall not be permitted.

(2) Declaratory Statement DCA-08-DEC-205 clarifying that pursuant to section 301.13 Florida Building Code, Mechanical Volume: "mechanical equipment, appliances and support that are exposed to wind shall be designed and installed to resist the wind pressures on the equipment and the supports as determined in accordance with the Florida Building Code, Building.

(3) At the June 2009 meeting, Broward County Board of Rules and Appeals (BORA) requested that the Commission address issues regarding the Mechanical Code's requirement for mechanical equipment exposed to wind to be designed for wind resistance.

(4) Hurricane Research Advisory Committee (HRAC).
The Commission referred this issue to the HRAC so they could work with stakeholders to ensure that the wind-load requirements of the Code are being complied with and to evaluate issues and options for ensuring same. At the October 2009 HRAC meeting there were multiple presentations on this topic "see attached report from the October 09 HRAC meeting". As part of the discussion, the Committee discussed whether the State Product

Approval Program can be used to approve the structural aspects/attachments of AC units for demonstrating compliance with the wind requirements of the FBC.

(5) Rule 9B-72 State Product Approval System

9B-72.005 Scope
(2) This rule applies to approval of products and systems, which comprise the building envelope and structural frame, for compliance with the structural requirements of the Florida Building Code.

9B-72.010 Definitions.

(d) For roofing products: built up roofing, modified bitumen roof system, single ply roof systems, spray applied polyurethane roof system, roofing fasteners, roofing insulation, asphalt shingles, wood shingles and shakes, roofing slate, roof tile adhesives, cements-adhesives-coatings, liquid applied roof systems, underlayments, metal roofing, roofing tiles, waterproofing, roofing accessories that are an integral part of the roofing system and products introduced as a result of new technology;

(g) For structural components: truss plates, wood connectors, anchors, exterior coolers-freezers, insulation form systems, engineered lumber, pre-engineered air conditioner stands, structural wall components, and roof deck, and products introduced as a result of new technology.

9B-72.070 Product Evaluation and Quality Assurance for State Approval

Product Compliance Methods:

There are two methods by which a manufacturer can demonstrate that their product complies with the Code:

Method 1: This method encompasses products, for which the code establishes performance criteria, standardized testing or comparative or rational analysis. Approval under this method would require submittal and validation using one of the following compliance methods:

(a) Certification mark or listing,
(b) Test report,
(c) Evaluation report from an entity or
(d) Evaluation report from an architect or engineer.

Method 2: This method covers products, for which there is no standardized testing, or comparative or rational analysis established in the code. Approval under this method would require submittal and validation using one of the following compliance methods:

(a) Evaluation report from an entity.
(b) Evaluation report from an architect or engineer.

(6) Similar products currently approved under the PA program:

Roofing products:

Roofing accessories that are an integral part of the roofing system:
Ridge vents, Turbien ventilation

Products introduced as a result of new technology
Roof top Solar AE – Collectors
DC – PVB Penthouse Fan Enclosure

Structural components:
Pre-engineered air conditioner stands
Aluminum A/C Stands, Mechanical stands for solar collectors panels

Products introduced as a result of new technology

Staff recommendation:

It is the staff's opinion that AC equipments that are attached to the building envelope fall within the scope of Rule 9B-72 as follows:

(1) Roof top AC equipments
(a) Category of product: Roofing products; and Subcategory: either "roofing accessories that are an integral part of the roofing system" or "product introduced as a result of new technology, or
(b) Category of product: Structural components; and Subcategory: either "pre-engineered air conditioner stands" or "products introduced as a result of new technology".
(2) Wall mounted AC equipments:
Category of product: Structural components; and Subcategory: either "pre-engineered air conditioner stands" or "products introduced as a result of new technology".

Compliance method: Certification mark or listing, test report, evaluation report from an entity or evaluation report from an architect or engineer.