June 12, 2008

RECEIVED

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FLORIDA BOARD OF PROFESSIONAL ENGINEERS

Mr. Jack Beamish, Investigator
Florida Board of Professional Engineers
2507 Callaway Road, Suite 2006
Tallahassee, FL 32303-5268

Re: Case No. 2008008617 – Mr. Do Kim, P.E.

Dear Mr. Beamish:

At your request, I have made a review of the files and documentation submitted for the referenced case. The complaint alleges negligence or incompetence in the preparation of the permit plans and details for a screen enclosure structure at the Dunlat Residence in Palm City Florida.

Documentation:

The following documents were reviewed.

1. A Florida Board of Professional Engineers Uniform Complaint Form, 2 pages with attachments, prepared and signed by Mr. Steven M. Sincere, P.E.

   The attachments to the complaint forms are as follows.

   A. Seventeen pages of computer generated output from an unknown analysis program, indicated as designs of various members of the screen enclosure depicted in plans prepared by Mr. Do Kim. (Document 1B below)

   B. A set of drawings including sheets 1 thru 6 of 6, bearing the following information.

      Client: Jay K Screens
      Project Location:
      Dunlat Residence
      4492 SW Branch Terrace W.
      Palm City, FL 34990

      Do Yeon Kim, P.E.
      Fla. Reg. Number 49497

      Do Kim & Associates, LLC
      CA#26887
      3300 Henderson Blvd., Suite 106

5/61

Tampa, FL 33609

Although a seal is not evident, the drawing documents appear to be signed and dated 12-4-07.

2. A two page correspondence dated April 22, 2008 from Mr. Do Kim, P.E. to Mr. Jack Beamish with the following documents attached.

   A. A copy of Test Report No. 07-01330199.1, dated January 24, 2008, prepared by Testing Evaluation Laboratories, Inc.

   B. A three page Product Evaluation Report dated August 1, 2007, signed by Wendell W. Haney, P.E. indicated as Report No. FL-9328-1.

   C. Drawing No. FL-3675 prepared by R.W. Building Consultants and signed by Mr. Wendell W. Haney, P.E. (This document addresses the 2x8 TRAC Beam)

   D. A three page Product Evaluation Report dated August 11, 2006, signed by Wendell W. Haney, P.E.

   E. Drawing No. FL-1114 prepared by R.W. Building Consultants and signed and sealed by Mr. Wendell W. Haney, P.E. (This document addresses the 2x7 and 2x5 TRAC Beams)

   F. Forty plus or minus pages of calculations and data. The calculations are hand written on calculation paper bearing the following information.

      Do Kim & Associates, LLC
      Consulting Structural Engineers
      3300 Henderson Blvd., Suite 106,
      Tampa, FL 33609

      The calculation pages are not signed and sealed.

Allegations:

Based on his analysis of the structure and structural framing elements of the screen enclosure structure depicted in document 1B above, Mr. Sincere alleges that Mr. Kim, in preparing those documents has not complied with Florida Administrative Code 61G15-19.001(4) or 61G15-19.001(5) or Florida Statute 471.003(1)(g).

Discussion

Mr. Sincere has included with his complaint, output documentation from a three dimensional finite element analysis program (which he did not identify), indicating the stresses in various elements of a screen enclosure structure, and a comparison of the stresses as analyzed, to the Code prescribed allowable stress for such members, in the form of interaction ratios. The calculation documentation submitted indicates that the stresses in various elements analyzed exceed acceptable levels as follows.

1. Beam1 – 2x8 Trac Beam – Member Length = 336.14 ft. – Max IR = 43
2. Purlins – AAF2x3H – Member Length = 273.58 ft. – Max IR – 638.3
3. Down Purlins - AAF2x3H – Member Length = 80.23 – Max IR = 953.2
4. Wind (Roof) Braces – AAF2x3H – Member Length = 184.42 ft. – Max IR = 1003.6
5. Eave Rails - AAF2x3H – Member Length = 143.92 ft. – Max IR = 598.8
6. Flow Through Wall Column – 2x7 Trac Beam - Member Length = 133 ft. – Max IR = 5.2
7. Non Flow Through Wall Column – 2x7 Trac Beam - Member Length = 86 ft. – Max IR = 5.4
8. Corner Columns – 2x5 Trac Beams – Member Length = 20.0 ft. – Max IR = 2.3
9. Chair Rails – AAF2x3H – Member Length = 155.75 – Max IR = 1.2
10. K-Braces – AAF2x3H – Member Length 84.49 ft. – Max IR = 670.4

Regarding the output documentation, I note first that the member lengths set forth in the computer generated output for the above framing members appear to be extremely exaggerated. The actual member lengths are significantly less than this stated length. I note further that the member length is stated in the individual member output specifically as "Total Length of Members" which may indicate multiple element lengths added together. Calculations for a specific member are acutely dependent on the specific length of the specific member analyzed. My question is ..... what relevance could total length of anything other than the specific element analyzed have to do with the calculations for that specific element? Is this the length used in the calculations for the output generated? If not, what is the length used in the member calculations? No other length is given in the output for each specific element.

I note further that in general, the interaction ratios set forth in the subject output documents are enormous to the point of being meaningless. This could have resulted from using exaggerated element lengths in their derivation.

I note further that the element modeled by Mr. Sincere for items 3, 4, 5, 9, and 10 (AAF2x3H) are not the same section as the elements specified in Mr. Kim's drawings. Mr. Sincere has modeled the members as 2x3x.045. The drawings specify a 2x6x.06 section which is a heavier, stronger section than the section modeled.

According to the construction drawings "Non Flow Through Wall Columns" (columns in the side walls perpendicular to the host structure) appear to be 2x5 Trac Beams. Item 7 above indicates that 2x7 Trac Beams were modeled and analyzed for these elements.

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It is apparent that the calculations which are the basis of this complaint may be flawed. Even if they are not, the analysis documentation submitted by Mr. Sincere is so brief that the information therein cannot be verified. As a minimum, Mr. Sincere would need to identify the software and the analysis method, (ASD of LRFD) loading assumptions, framing assumptions, support conditions, releases, material properties, dimensions, local and global axis reference, etc. so that his "numbers" can be verified. He may also want to review his calculations in order to verify that he has modeled the structure accurately in accordance with Mr. Kim's drawings and specifications.

Mr. Kim states in his response (document 2 above) that for this design (the Dunlat screen enclosure) he elected to use "tested product performance values" in lieu of analytical calculations in proportioning some of the structural elements. Mr. Kim has submitted the documentation for two Florida product approvals (FL-7350 & FL 9328) addressing the design capacities of 2x8, 2x7, and 2x5 TRAC beams based on load testing. Mr. Kim has also submitted calculations in support of his designs. The calculations however, appear to be generic and exemplary and do not apply to any specific element of the subject structure. Mr. Kim states further in his response that three dimensional analyses are "no[w]t required in Florida and that most structures are designed using two dimensional analyses.

In addition to reviewing the documentation in the file, I have made my own 3 dimensional and two dimensional analyses based on my interpretation of document 1B above and on ordinary design assumptions as are typically used in the design of screen enclosures. I submit the following observations and opinions based thereon.

Opinions:

1. The Florida Building Code does not require three dimensional finite element analyses in the design of screen enclosures nor does any other applicable code or design manual.

2. Although the designs of the 2x8 Trac Beam roof beam members do not admit to rational analyses, they are within the design parameters set forth in the product approval documents listed above with the exception of deflection.

3. For the 2x8 Trac Beam roof beam members, the deflection at design load exceeds L/80.

4. The 2x7 Trac Beam column sections are within the design parameters set forth in the product approval documents listed above.

5. The 2x5 Trac Beam corner columns are over stressed with design load applied in the weak axis direction.

6. The 2x5 Trac Beam side wall column sections (other than the corner columns) are within the design parameters set forth in the product approval documents listed above.

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7. The 2x3x.045 roof purlins are apparently within the prescriptive limitations set forth in Table 103 of the AAF "Guide To Aluminum Construction in High-Wind Areas".

8. The 2x3x.06 + 1x2x.04OB Eve rails appear to be within the prescriptive limitations of Table 101e of the AAF "Guide To Aluminum Construction in High-Wind Areas".

9. The 2x3x.06 diagonal roof bracing is overstressed at various locations at design loading.

10. The 2x3x.06 girts appear to be within the prescriptive limitations of Table 104e of the AAF "Guide To Aluminum Construction in High-Wind Areas".

11. The outer wall k-bracing is apparently within stress tolerances for it's intended loading. The end wall k-bracing is prescriptive in accordance with the "AAF Guide to Aluminum Construction in High-Wind Areas".

The following Florida Building Code Sections are relevant to observation/opinions 3, 5 and 9 above.

FBC 2004

SECTION 1604 GENERAL DESIGN REQUIREMENTS

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.

1613.1 Allowable deflections.

The deflection of any structural member or component when subjected to live, wind and other superimposed loads set forth herein shall not exceed the following:

8. Members supporting screens only L/80

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2002.2 Structural Aluminum Construction.

The design, fabrication and assembly of structural aluminum for buildings or structures shall conform to AA ASM 35 and Specifications for Aluminum Structures, Aluminum Design Manual, Part 1-A and 1-B, of the Aluminum Association. The use of aluminum alloys not listed in the manual shall be permitted provided their standard of performance is not less than those required in the manual and the performance is substantiated to the satisfaction of the building official.

2003.6 Allowable unit stresses.

2003.6.1

The design, fabrication and assembly of aluminum members for building and other structures shall conform to the standard set forth in Section 2003.2 and as otherwise set forth herein.

2003.6.2

The use of aluminum alloys, other than those listed in the standard shall provide performance not less than those required by the standard and as set forth herein.

2003.6.3

Aluminum members shall be limited by the deflections set forth in Section 1613 .

Aluminum Design Manual 2005

3.4 Design Stresses

Design stresses ϕFL shall be determined in accordance with the provisions of this Specification.

FBC 2002.4.1

The following design guides shall be accepted as conforming to accepted engineering practices:

AAF Guide to Aluminum Construction in High Wind Areas.

Opinion:

In my opinion, as indicated in observation/opinions 3, 5 and 9 above, Mr. Kim has not utilized due care in performing in an engineering capacity and has failed to have due regard for acceptable standards of engineering principles.

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Additional Opinion

This additional opinion is in reference to statements made in the product approval documents reviewed and does not apply to Mr. Kim.

On page 2 of 9 in document 2A above under Section 4.0 Specimen Installation, I encountered the following statements.

"Each end of the assembled beam specimen was affixed to a post just as would be done in the field for actual erection of a structure. The posts were anchored to the concrete floor of the lab as would be done in the field for actual assembly. This arrangement facilitates testing with the end fixity of the beam (to column?) as it would be in actual installations in the field. See drawing L-3931 for details on the connections". Drawing L-3931 depicts a moment transferring beam to column connection with fastener arrangement similar to mansard beam knee and gable ridge beam splice connections.

I have reviewed hundreds if not thousands of sets of plans for screen enclosures and screen enclosure specifications and "Master Files", and I have yet to see a beam to column connection detailed or constructed in the manner indicated in drawing L-3931. Typical beam to column connections are detailed with a cluster of fasteners located in a relatively small area which provides negligible moment capacity through the joint. You may refer to the "Main Post/Column to Roof Beam Connection Detail" on page 4 of 6 of Mr. Kim's drawings or to page 1-12 of the "AAF Guide to Aluminum Construction in High Wind Areas", "Typical Schematic Section @ Bearing Wall Column", for an industry typical beam to column connection detail. In my opinion, the tested connection is not "as it would be in actual installations in the field."

I also observed in the photograph of the "Mansard Connections" that the column section of the test assembly is only a few inches in height at best. In a normal beam to column frame assembly, the joint at the beam column connection would translate laterally in plane proportionally to the parameters of the system. (Framing member length and stiffness, restraint, loading, etc.) In my opinion the arrangement shown will allow almost no lateral movement at the beam to column connection and therefore negates a normal effect of the column on the framing system. Again, the tested specimen is not "as it would be in actual installations in the field."

In my opinion, the test specimen depicted in the referenced photograph is modeled as a single span beam, fixed at both supports against translation and rotation. I opine further that the unrealistic fixity at the supports of the test specimen has returned unrealistic, un-conservative test results. It may be appropriate for FDCA, Product Approval to review this application further.

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Qualification:

I have provided the above opinions based on my observation and interpretation of the documentation referenced above. No endorsement or certification of the subject structures or any elements thereof is given.

I appreciate the opportunity to provide this review service to you. Please call on me at your convenience if there is anything further regarding this matter.

Sincerely,

J Berryman
6/16/08

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