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**Memo Letter**

**Date;** Tuesday, May 10, 2011

**Memo;**

<b>To;</b>	Kurt Weiland Pittsfield Township Building Dept.	<b>From;</b>	Tom Fitzpatrick, PE
<b>Via;</b>	e-mail		
<b>Re;</b>	<b>Thompson Building, City of Ypsilanti ---- Proposed Temporary Shoring Review</b>		
<b>Copies to;</b>	File		

Kurt;

I have received the drawings and limited calculations for the proposed shoring of the south free standing wall along Cross Street, of the Thompson Building. I have reviewed the information per your request. I understand that there will be road work done on Cross Street soon. This will certainly create vibrations into the fire damaged building which will need bracing to ensure safety of the public as well as workers. The following comments are not intended to reflect an in depth review of the submittal. It is not my intention to recreate the analytical work done to arrive to this point. However, some calculation was performed to verify assumptions made in the submittal. Review was performed using *Minimum Design Loads for Buildings and Other Structures*, by the American Society of Civil Engineers/Structural Engineers Institute (ASCE/SEI 7-05) as referenced in all major building codes. Wood elements and connections were evaluated using *The National Design Specification for Wood Construction ASD/LRFD*, 2005 edition, published by the American Wood Council (NDS). This standard is also referenced in all major building codes.

The following items reflect my concerns and comments.

1. There appears to be an un-braced wall between bays 2 and 3 shown on the drawings. This wall appears to be at least 24 feet tall and as such could fall toward the south and damage or take out

- the adjacent bracing wall thereby destroying the bracing system. This should be a consideration in anticipation of heavy vibrations due to road construction.
2. I would agree that it is appropriate to treat the wind bracing as a Main Wind Force Resisting System (MWFRS), with exposure B, using a 90 mph 3 second gust wind speed. However I do arrive at a larger wind force of 12psf on the proposed structure. This amounts to a 20% increase in wind load and wind induced forces. There is no derivation of the wind load in the calculations other than just stating what is used.
  3. It may be difficult to obtain the 2x6 bracing members in the lengths shown on the drawings. This should be checked with local sources and adjustments made if needed.
  4. There is inconsistency between the joist layout on the plans and the calculations. There is no calculation to show that the joists are ok for bending, shear, and deflection. The calculations indicate that the every joist should be doubled spaced at 16 inch centers for office loading and the drawings show every other joist doubled for the same load condition and spacing. My computer analysis indicates that for Southern Yellow Pine (SYP), No. 2 the floor joists should be (2) 2x12 at 16" c/c (every joist doubled) for the stated office loading.
  5. The drawings indicate a SYP No. 2 lumber or material having a bending strength of  $F_b=1200$  psi, a shear strength of  $F_v=125$  psi, and a modulus of  $E=1,800,000$  psi. It should be noted that SYP has different strengths depending on depth of member. For 2x6's  $F_b=1250$  psi,  $F_v=175$  psi, and  $E=1,600,000$  psi, which conforms to the requirement shown on the drawings except for the E value. To get an E value as high as what is specified you would need to use Select Structural grade of SYP regardless of size of member. A 2x12 of No.2 grade has an  $F_b = 975$  psi which is considerably less than shown on the drawing.
  6. The tie connection through the wall has no supporting calculation. The 3" long lag bolts will exceed the thickness of the members at the roof and are close to the depth of the doubled members at the floors. A depth of penetration of 8 times the screw diameter is required to obtain full lag screw capacity. What is length of weld required for detail?
  7. There is no indication if the design is for full bodied lag screws or reduced body lag screws. There can be a significant difference. Additionally, There is no layout or parameter system for edge distances, spacings, end distances, depth of penetration for the lag screws. There are reductions for all of these items if the minimums to obtain full capacity are met.

8. The ledger that supports the floor/roof joists is anchored to the brick wall with HILTI system epoxy anchors. The adhesive should be called out (HIT HY 20 or HIT HY 150) and the anchor type (HAS etc) should be named. The depth of embedment should be indicated as well as minimum spacing between adjacent anchors. HIT HY 20 does not show a 5/8" diameter anchor. Also the required force should be stated along with the expected factor of safety. HILTI should be contacted to perform in situ testing on the masonry to determine if the design/published values can be used. HILTI provides this service at no cost.
9. Verify that there is adequate wall and floor dead weight to overcome the tensile forces induced by the bracing into the masonry walls. Some consideration should be made to account for the eccentricities of the members and walls at connections.

Respectfully submitted

A handwritten signature in black ink, reading "Thomas R. Fitzpatrick". The signature is written in a cursive style with a long horizontal flourish extending to the right.

Thomas R. Fitzpatrick, PE, M ASCE/SEI

End of Memo