Report on Laboratory Testing of TI-PROBOARD™ (Type AFP/09) for North American Tile Tool Company.

Submitted to:

Brian Turner
North American Tile Tool Company
1452 Donaldson Hwy
Erlanger, KY 41048
Tel: (859) 525-8891
Fax: (859) 525-8899
Email :Brianturner@nattco.com

Vern Kallenborn
North American Tile Tool Company
1452 Donaldson Hwy
Erlanger, KY 41048
Tel: (859) 525-8891
Fax: (859) 525-8899
Email :v.kallenborn@insightbb.com

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Testing Conducted by: Mr. Abheetha Peiris (Ph.D. Student)
Mr. Drew Thompson (MS Student)

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Report Prepared by: Abheetha Peiris and Drew Thompson
Tel: (859) 257-8010
Fax: (859) 257-4404
E-mail: abheetha@engr.uky.edu , dcthom3@uky.edu

Report Reviewed by: Dr. Issam Harik

Contact: Dr. Issam E. Harik
University of Kentucky
Department of Civil Engineering
176 Raymond Building
Lexington, KY 40506-0281

Tel: (859) 257-3116
Fax: (859) 257-1815
E-mail: iharik@engr.uky.edu

SUMMARY

This report presents the results of two tests carried out on TI-PROBOARD™ panels.

Test Series #1: In Series #1, three TI-PROBOARD™ composite panels Type AFP/09, with screed mortar, are tested to determine their flexural capacities. The panels were subjected to a line load at mid span and the ultimate load at failure was recorded for each of the specimens (Figure 1). The test results are presented in Table 1.

Table 1: Results for Test Series #1 – Flexural Capacity of TI-PROBOARD™ Composite Panels Type AFP/09 with Screed Mortar

Specimen Number	Span in.	Width in.	Thickness in.	Load at Failure[1] lbf/ft	Deflection at Failure in.	Type of Failure
1	16	12	0.375	2,633	1.79	All three specimens failed when the laminate in the panel split underneath and along the length of the ribs along the outside edges.
2	16	12	0.375	2,553	1.75	
3	16	12	0.375	2,604	1.83	
Average				**2,597**	**1.79**	

[1] The line load was applied using a 12" long steel bar.

Test Series #2: In Series #2, a single TI-PROBOARD™ composite panel Type AFP/09, with screed mortar, is tested to determine the pull-out strength of the panels from the screws. The panel was subjected to a uniformly distributed load and the load at which the panel came off the screws was recorded (Figure 6). The test results are presented in Table 2.

Table 2: Results for Test Series #2 – Pull-out capacity of TI-PROBOARD™ Composite Panels Type: AFP/09 with Screed Mortar

Specimen Identification	Span in.	Width in.	Thickness in.	Failure Load[2] Lbf/ft^2	Maximum Deflection In.	Type of Failure
4	16	12	0.375	259[3]	0.09[4]	Specimen failed when panel split at screws and separated from the support.

[2] The load was applied using a 12"×12" steel plate

[3] The weight of the steel loading plate and spacer plates has been added to the applied load

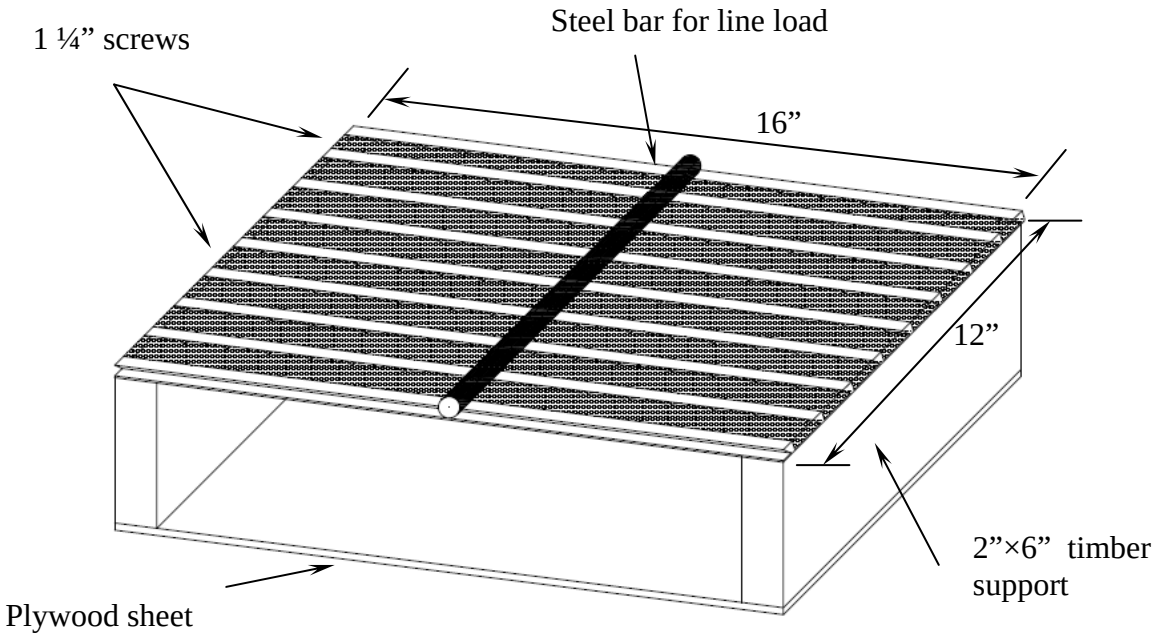
[4] The deflection due to the loading plate and spacer plates are not included

DETAILS

Test 1: Composite Panel (Type: AFP/09) Flexural Test

The testing of the TI-PROBOARD™ panels (Type: AFP/09) was conducted in a manner similar to the ASTM D790 test, but with several modifications to accommodate the specimen size and actual field support conditions.

1. Three test specimens were provided by North American Tile Tool Company. All panels were prepared for flexural testing to determine the ultimate load at failure.
2. The panels spanned 16” from outside to outside of the 2”×6” timber supports, and each panel was 12” wide with an average thickness of 0.375”. The panels included dove-tailed ribs spaced 1 ½” apart and had screed mortar placed between the ribs.
3. The panels were fastened to the supports by 1 ¼” length screws. Two screws were applied on each side with one near mid-span and the other next to the rib at the edge where the connection to the adjoining rib was placed [Fig. 1 (a)].
4. A 12”×16” plywood piece was attached to the bottom of the supports to prevent the supports from moving during the loading. A line load was applied on the specimens using a 12” long steel bar as seen in Figure 1.
5. The loading rate was set at 0.1”/min. Failure was defined as the point where a sudden drop in the load carrying capacity was observed at which point the test was terminated.
6. All three specimens failed suddenly with a splitting noise at an average failure load of 2,597 lbs/ft (Table 1). The load deformation plots for all three specimens are given in Figure 2.
7. Splitting of the panels was observed, on all three specimens, underneath the ribs near the edges as shown in Figure 3.
8. The panels also had local splitting at screw locations (Fig. 4), but in all cases the panel was yet to break away from the screw when failure occurred under the ribs.
9. Cracking and spalling of concrete was observed on the surface (Fig. 5) especially between the ribs closer to the edges on all three specimens.



(a) Specimen layout

(b) Specimen under flexural load

Figure 1: TI-PROBOARD™ panels (Type: AFP/09) Specimen for Flexural tests

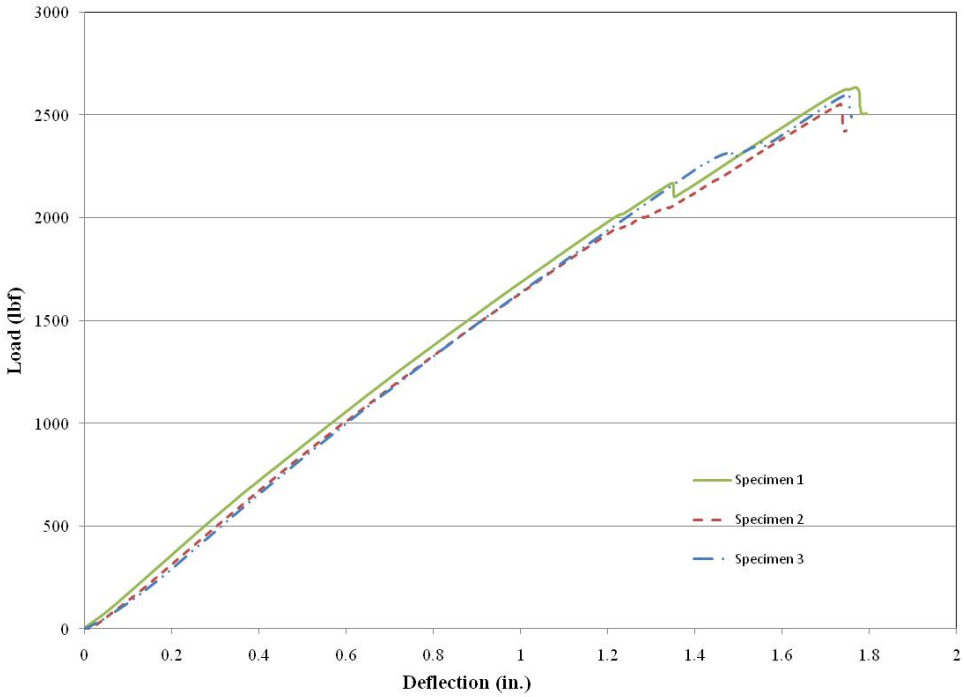


Figure 2: Load-Deflection relation for all specimens

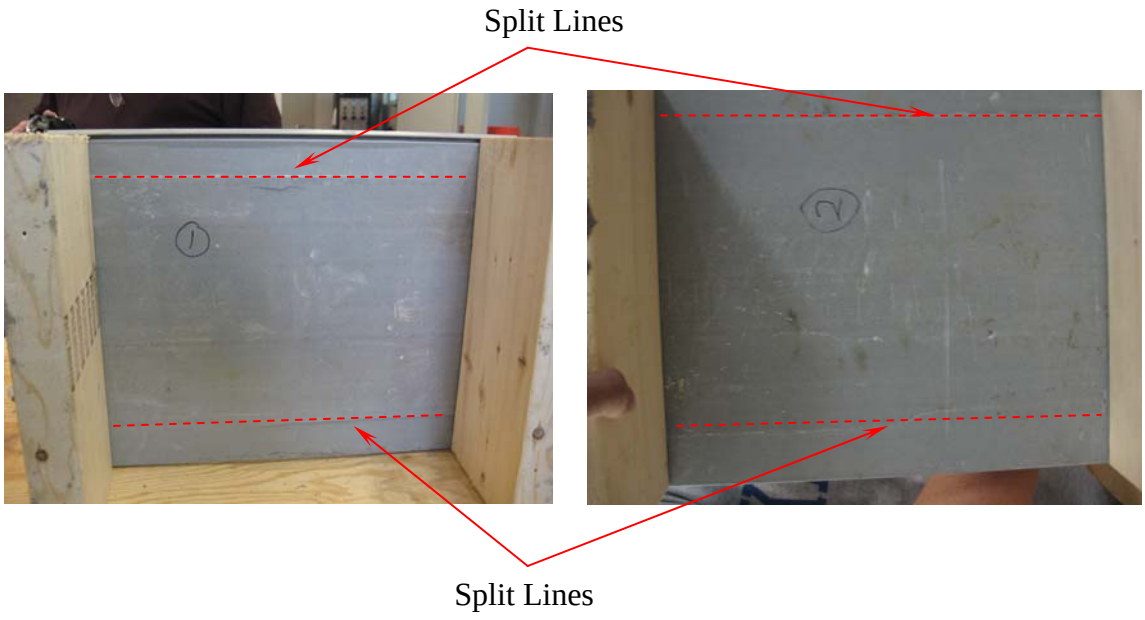


Figure 3: Splitting of panel under ribs next to edge in specimen 1 and 2

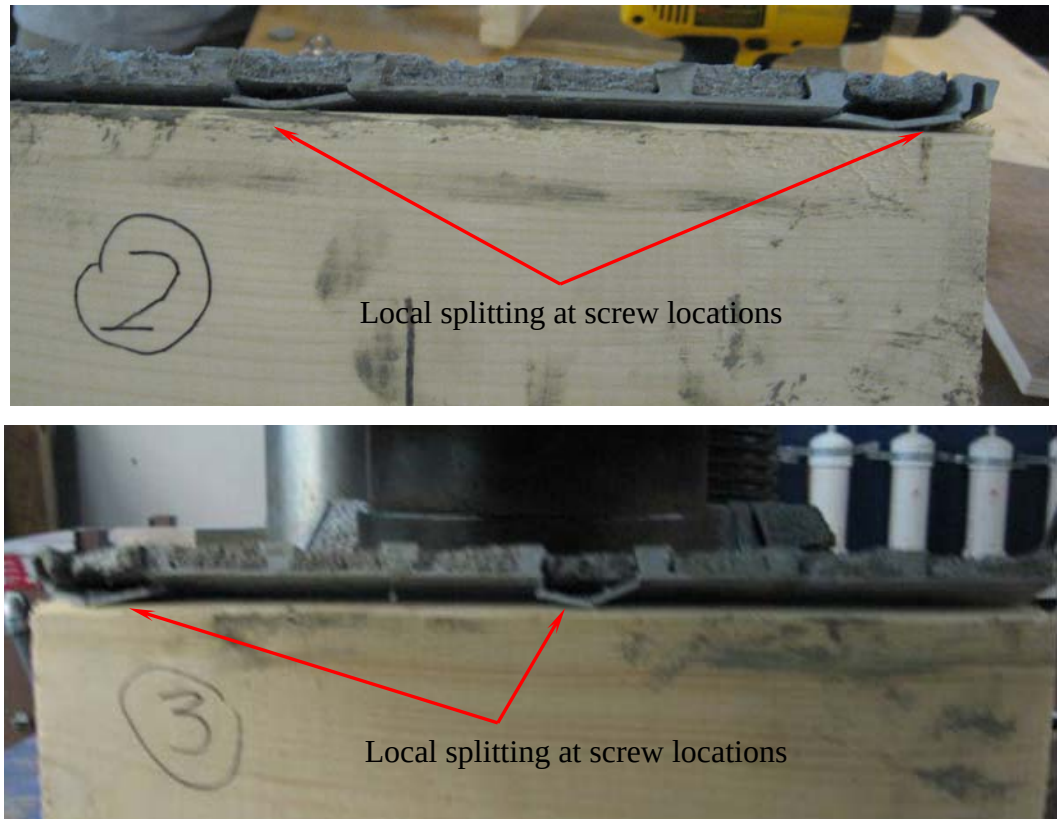


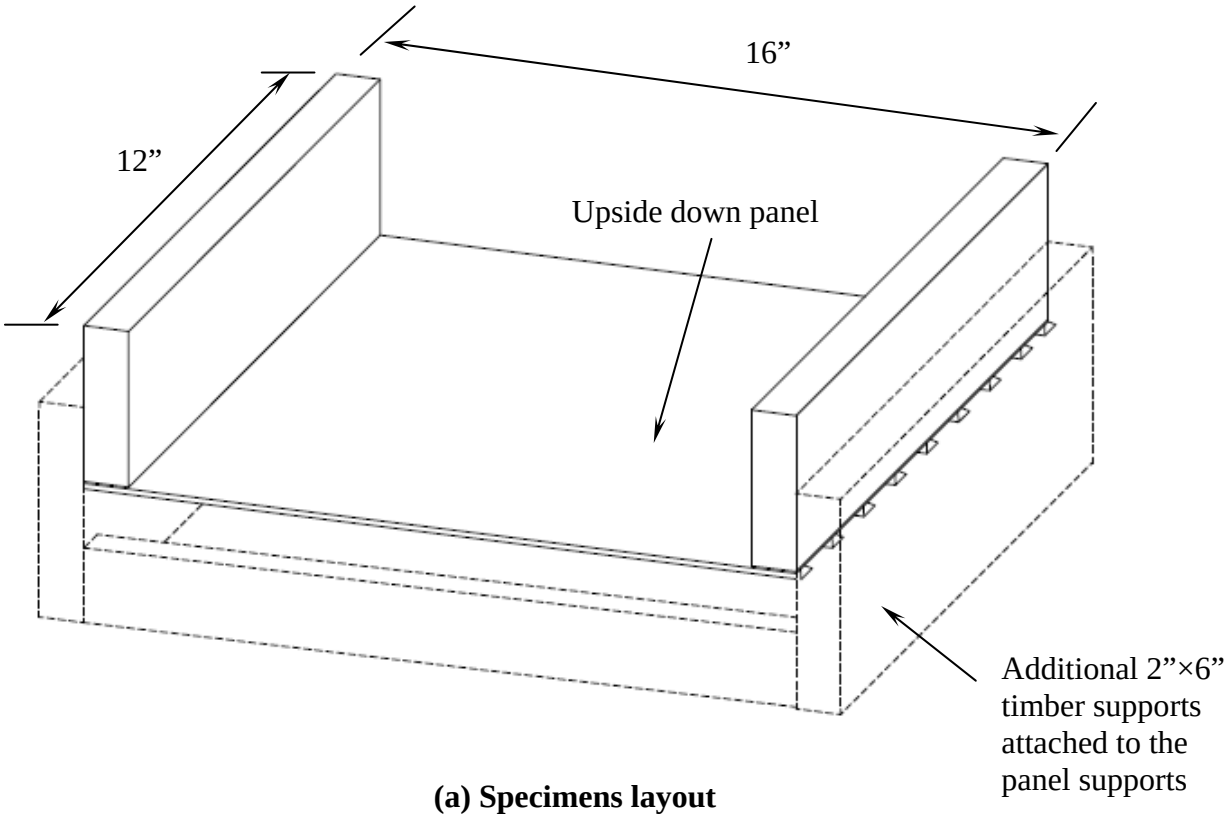
Figure 4: Local splitting of panel near screw locations in specimens 2 and 3

Figure 5: Concrete cracks and spalling on top surface of specimen 2

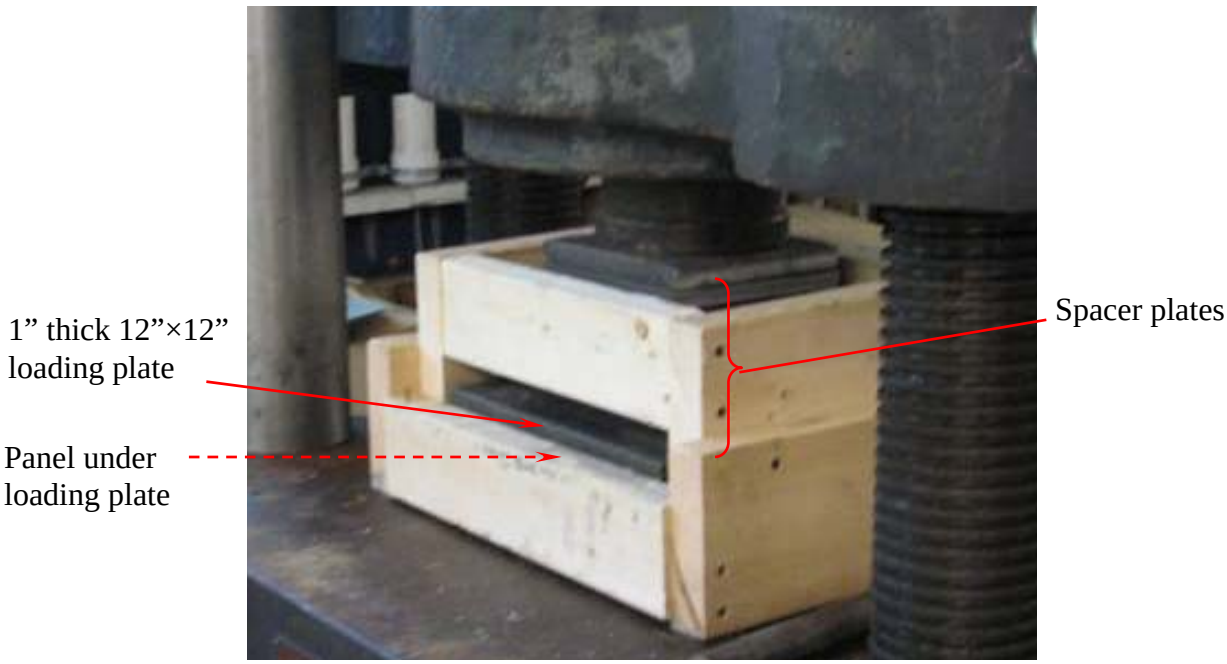
Test 2: Composite Panel (Type: AFP/09) Pull-out Test

The testing of the TI-PROBOARD™ panel (Type: AFP/09) for pull-out from the screws was performed by applying a uniform load to the underside of the panel.

1. The test specimen was provided by North American Tile Tool Company. The panel was prepared for pull-out testing to determine the load at which the panel would come free of the screws.
2. The panels spanned 16” from outside to outside of the 2”×6” timber supports, and each panel was 12” wide with an average thickness of 0.375”. The panels included dove-tailed ribs spaced 1 ½” apart and had screed mortar placed between the ribs.
3. The panels were fastened to the supports by 1 ¼” length screws. Two screws were applied on each side with one near mid-span and the other next to the rib at the edge where the connection to the adjoining rib was placed [Fig. 1 (a)].
4. Additional 2”×6” timber supports were attached to the existing 2”×6” timber supports as seen in Figure 6 to set the panel upside down in order for load application. The supports were connected to each other to prevent them from moving during loading.
5. 1” thick 12”×12” steel plate was placed on the underside of the panel in order distribute the applied load as a uniform load as seen in Figure 6 (b). The weight of the loading plate as well as the spacer plates used was 117 lbs.
6. The loading rate was set at 0.1”/min. Failure was defined as the point where sudden a drop in the load carrying capacity was observed.
7. At an applied load of 142 lbf a sharp drop in load carrying capacity was observed as seen in Figure 7. This is believed to be when the panel splits away from the screws at mid span as seen in Figure 8. The load is seen to pick up after the initial drop as the panel cantilevers from the screws at the edge.
8. The weight of the steel plates used as the loading plate and as the spacer pates have been added to the applied load and reported as the ultimate pull-out load of 259 lbs/ft^2 (Table 2). The deflections due to the steel plates were not measured and are neglected.



(a) Specimens layout



(b) Specimen under loading

Figure 6: TI-PROBOARD™ panel (Type: AFP/09) Specimen for Pull-out test

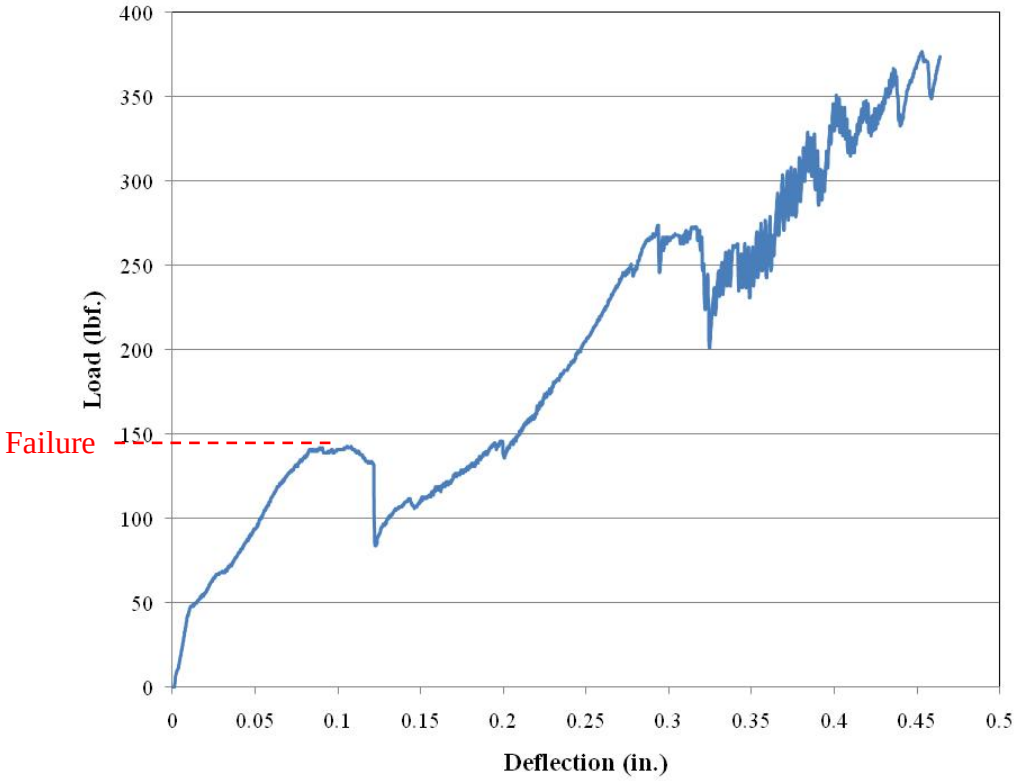


Figure 7: Load-Deflection relation AFP/09 type pull-out specimen

Figure 8: Local splitting of panel at screw at mid-span