

Pallet Design Evaluation

Test Report-No: 2014-FQA102

Client

Company: Universal Fastener Outsourcing

Contact Name: Jim Boyd

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Purpose of the Test

Determination of the fastener quality using MIBANT test.

Test Program

ASTM F680 – Standard Test Method for Nails

Test Period

04/1/2014-04/11/2014

Test Performed By

The Center for Packaging and Unit Load Design,
Virginia Polytechnic Institute & State University,
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Fastener Specifications

The 3” x 0.120” fastener was investigated in this study. The specifications of the investigated fastener design are presented in Table 1.

Table 1 Specifications of investigated fastener designs.

Component	Fastener Design
Fastener type	Helical
Wire diameter (in)	0.122
Thread crest diameter (in)	0.135
Nominal fastener length (in)	3.00
Thread length (in)	1.69

MIBANT Test

Morgan Impact Bend-Angle-Nail Tester (MIBANT) was used to test the quality of the fastener design. During the test the fastener was secured into the MIBANT tester and a 3.5 lbs. weight was dropped to exert 3.33 ft-lbf energy to the head of the fastener. The bending of the fastener was measured and the Fastener Withdrawal Index (FWI) and Fastener Shear Index (FSI) was calculated based on calculation method published in ANSI MH1 (2005). The experimental setup is presented in Figure 1 while the results of the test are published in Figure 2.



Figure 1 Experimental setup for the MIBANT test.

Customer: Jim Boyd Universal Fastener Outsourcing Cell: (479) 283-0526 Email: jboyd@911-nails.com		Prepared by: Virginia Tech, Center for Packaging and Unit Load Design 1650 Research Center Dr. Blacksburg, VA 24061													
File Date:		4/11/2014													
Fastener Specifications															
Customer's Fastener ID: _____															
Fastener ID:	2014-FQA-100000														
Fastener Type:	Helical														
Fastener Length:	2.77	inches													
Thread Length:	1.69	inches													
Thread Diameter:	0.135	inches													
Wire Diameter:	0.122	inches													
Head Diameter:	0.275	inches													
Flutes:	N.A.														
Helixes:	25														
Thread Angle:	9														
Calculated Thread Angle:	N.A.														
MIBANT Angle:	18														
FWI:	167														
FSI:	121														
		<table border="1"> <thead> <tr> <th colspan="2">Minimum Fastener Withdrawal Index (FWI)</th> <th colspan="2">Minimum Fastener Shear Index (FSI)</th> </tr> <tr> <th>Multiple Use</th> <th>Limited Use</th> <th>Multiple Use</th> <th>Limited Use</th> </tr> </thead> <tbody> <tr> <td>65</td> <td>50</td> <td>55</td> <td>40</td> </tr> </tbody> </table>		Minimum Fastener Withdrawal Index (FWI)		Minimum Fastener Shear Index (FSI)		Multiple Use	Limited Use	Multiple Use	Limited Use	65	50	55	40
Minimum Fastener Withdrawal Index (FWI)		Minimum Fastener Shear Index (FSI)													
Multiple Use	Limited Use	Multiple Use	Limited Use												
65	50	55	40												
Fastener Sample Measurement Data															
Thread Diameter (in.):		MIBANT Angle (Degrees):													
0.134	0.135	0.134	0.135												
0.135	0.135	0.135	0.135												
0.135	0.134	0.135	0.134												
0.134	0.135	0.134	0.135												
0.134	0.134	0.135	0.135												
0.135	0.135	0.135	0.135												
0.135															
Minimum:	0.134	Maximum:	0.135												
Average:	0.125	CV (%):	0.26												
Minimum:	13.0	Maximum:	19.0												
Average:	17.6	CV (%):	6.38												
Partial Shank Failures:		0													
Complete Shank Failures:		0													
Head Failures:		3													
MIBANT Drop Weight:		3.5													
**Average adjusted to standard 3.50lb drop weight = 18															

Figure 2 Results of the fastener quality evaluation of investigated fastener design using MIBANT test according to ASNI MH1 (2005).

The fastener was classified as **Multiple Use** based on the criteria defined by ANSI MH1 standard as listed in Table 3.

Table 3 Industry Recommended Minimum Fastener Quality Levels Based on Pallet Service

	FWI	FSI
Repair	40	30
Limited Use	50	40
Multiple Use	65	55

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