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**TEST REPORT**  
**LIMIT STATE DESIGN CAPACITIES FOR A RANGE OF MiTek**  
**NAIL MOUNTED FACE MOUNT I-JOIST HANGERS, FOR**  
**AUSWOOD JD4 TIMBER JOINT GROUP**

**CLIENT:**

**AUSWOOD TIMBER**  
**Auswood International Melbourne**  
**19-43 Enterprize Road, City of Melbourne Victoria 3003**

**JOB NUMBER:** **AUSWOOD/24/001**

**REPORT NUMBER:** **2401/0330**  
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*This report represents results for the specimens tested only and it shall not be interpreted to be representative or guarantees of any current or future production of the product. This Test Report can only be reproduced in full.*

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## 1. Introduction

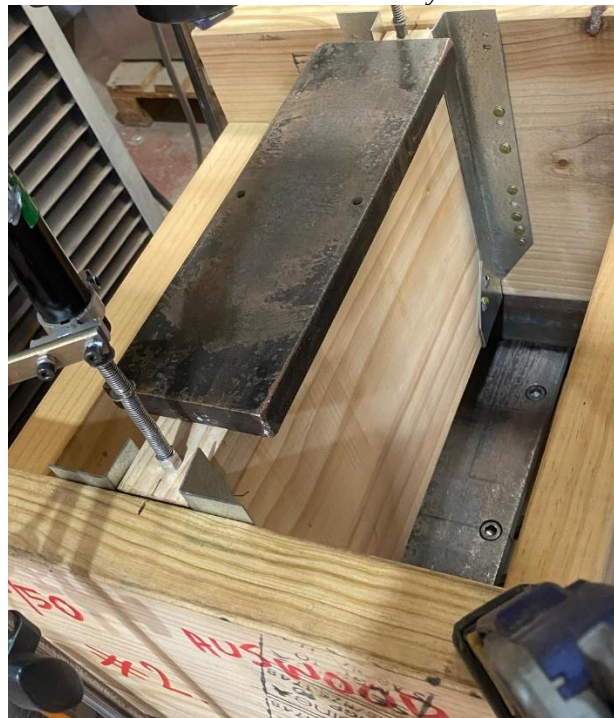
A range of MiTek face mount I-Joist hangers were tested and the design capacity in the downward direction was evaluated for AUSWOOD JD4 timber group connections.

## 2. Executive summary of test results

**Table 1 Design capacities of MiTek Face Mount I-Joist Hangers derived from testing.**

| Face Mount I joist hanger ID | Nail per hanger on the support beam | Design capacity, $\phi N_j$ (kN), for supporting beam with joint group JD4, based on 1.2G+1.5Qf load case | Test results based on AS1649 analysis |
|------------------------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------|---------------------------------------|
| IBHF 24060                   | 10                                  | 7.3                                                                                                       | 10.6                                  |
| IBHF 30050                   | 12                                  | 8.7                                                                                                       | 10.1                                  |
| IBHF30060                    | 12                                  | 8.7                                                                                                       | 9.5                                   |

*Note: 40x3.75mm MiTek RN40375 hot dipped galvanized nails were fixed on the Supporting beam. See Figure 1 for. The minimum thickness of the support beam was 45mm. Solid timber beams were used in lieu of I-Joists to ensure the failure at connection rather than in the I-Joist. All specimens were tested in the downward direction only.*



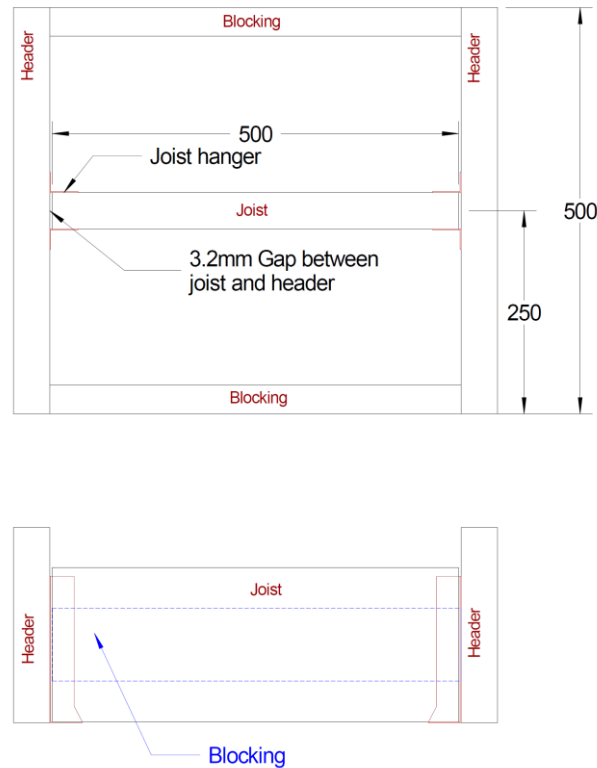
**Figure 1 I-Joist Face Mount Hanger Connection detail.**

## 3. Test specimens

All test specimens were prepared using MGP10 treated radiata pine, which was sourced locally with MiTek I-joist face mount hangers given in Table 1, using 40x3.75mm MiTek RN40375 hot dipped galvanized nails. The results within this report refer to the specimens tested only and shall not be used in any manner that implies an endorsement of the product or manufacturer. In the absence of an Australian Standard dedicated to determining the Joist Hangers capacity, the test setup was similar to the setup described

in ASTM D7147, see Figure 2. 10 replicates for each of the sizes shown in Table 1 were tested, with a total of 30 specimens. The test data was analysed in accordance with AS1649.

Solid timber beams were used in lieu of the I-joist to prevent flange crushing, and suitable blocking sizes were used to ensure that the hangers were sufficiently supported.



**Figure 2** *Joist Hanger test specimen details.*

#### **4. Testing methodology**

Tests were undertaken in accordance with ASTM D7147. A downward load was applied onto the middle member that face mounted to MGP10 solid timber beams, See Figure 3 for a typical test setup. Test specimens preparation and tests were carried out in Universal Testing Facility.



**Figure 3** Joist Hanger typical test setup

## 5. Test results and analysis

### 5.1. Test results for IBHF 24060

Load results per I-joist hanger

| Specimen ID | Maximum load $x_i$ , N | $\log x_i = y_i$ | $y_i^2$ |
|-------------|------------------------|------------------|---------|
| 1           | 41636                  | 4.62             | 21.34   |
| 2           | 48894                  | 4.69             | 21.99   |
| 3           | 47254                  | 4.67             | 21.85   |
| 4           | 42116                  | 4.62             | 21.39   |
| 5           | 48026                  | 4.68             | 21.92   |
| 6           | 50828                  | 4.71             | 22.15   |
| 7           | 52748                  | 4.72             | 22.30   |
| 8           | 42780                  | 4.63             | 21.45   |
| 9           | 46204                  | 4.66             | 21.76   |
| 10          | 45880                  | 4.66             | 21.73   |

$$s = \sqrt{\left[ \frac{n \sum y_i^2 - (\sum y_i)^2}{n(n-1)} \right]} = 0.03451$$

s is the standard deviation of the logarithmic values.

$\bar{y} = \frac{\sum y_i}{n}$ , where n=number of specimens tested=10 and  $\bar{y}$  is the mean logarithmic value = 4.67

For n=10,  $y_{5\text{percent}} = \bar{y} - ks = 4.56$ ; the logarithmic of the 5<sup>th</sup> percentile lower probability limit (LPL), where  $k=1.92$ .

For Category D fasteners, AS1649, Clause 3.2.6

$ULL_1 = \frac{P_1}{5N}=365$ ,  $P_1$  is the 5<sup>th</sup> percentile LPL of maximum loads,  $N$  =total number of fasteners=10.

$ULL_2 = \frac{P_2}{8N}=291$ ,  $P_2$  is the average of maximum loads,  $N$  =10.

$R_{bwl} = \text{lowest}(ULL_1, ULL_2) = 291$  N =Basic working load capacity per nail.

The limit state characteristic load capacity  $R_k = 3.65R_{bwl}=1064$ N per nail.

The total capacity for 10 nails =  $10 \times 1064 = 10639$ N.

## 5.2. Test results for IBHF 30050

Load results per I-joist hanger

| Specimen ID | Maximum load $x_i$ , N | $\log x_i = y_i$ | $y_i^2$ |
|-------------|------------------------|------------------|---------|
| 1           | 46662                  | 4.67             | 21.80   |
| 2           | 47388                  | 4.68             | 21.86   |
| 3           | 50230                  | 4.70             | 22.10   |
| 4           | 37590                  | 4.58             | 20.93   |
| 5           | 32590                  | 4.51             | 20.37   |
| 6           | 45228                  | 4.66             | 21.67   |
| 7           | 42428                  | 4.63             | 21.42   |
| 8           | 46174                  | 4.66             | 21.76   |
| 9           | 43774                  | 4.64             | 21.54   |
| 10          | 49072                  | 4.69             | 22.00   |

$$s = \sqrt{\left[ \frac{n \sum y_i^2 - (\sum y_i)^2}{n(n-1)} \right]} = 0.05745$$

s is the standard deviation of the logarithmic values.

$\bar{y} = \frac{\sum y_i}{n}$ , where n=number of specimens tested=10 and  $\bar{y}$  is the mean logarithmic value = 4.64.

For n=12,  $y_{5\text{percent}} = \bar{y} - ks = 4.47$ ; the logarithmic of the 5<sup>th</sup> percentile lower probability limit (LPL), where  $k=1.92$ .

For Category D fasteners, AS1649, Clause 3.2.6

$ULL_1 = \frac{P_1}{5N}=243$ ,  $P_1$  is the 5<sup>th</sup> percentile LPL of maximum loads,  $N$  =total number of fasteners=12.

$ULL_2 = \frac{P_2}{8N}=230$ ,  $P_2$  is the average of maximum loads,  $N$  = 12.

$R_{bwl} = \text{lowest}(ULL_1, ULL_2) = 460$  N =Basic working load capacity per nail.

The limit state characteristic load capacity  $R_k = 3.65R_{bwl}=839$ N per nail.

The total capacity for 12 nails =  $12 \times 839 = 10063$ N.

### 5.3. Test results for IBHF 30060

Load results per I-joist hanger

| Specimen ID | Maximum load $x_i$ , N | $\log x_i = y_i$ | $y_i^2$ |
|-------------|------------------------|------------------|---------|
| 1           | 52512                  | 4.72             | 22.28   |
| 2           | 53960                  | 4.73             | 22.39   |
| 3           | 46108                  | 4.66             | 21.75   |
| 4           | 46022                  | 4.66             | 21.74   |
| 5           | 48116                  | 4.68             | 21.92   |
| 6           | 37166                  | 4.57             | 20.89   |
| 7           | 42008                  | 4.62             | 21.38   |
| 8           | 34376                  | 4.54             | 20.58   |
| 9           | 33512                  | 4.53             | 20.48   |
| 10          | 42136                  | 4.62             | 21.39   |

$$s = \sqrt{\left[ \frac{n \sum y_i^2 - (\sum y_i)^2}{n(n-1)} = 0.0721 \right]}$$

$s$  is the standard deviation of the logarithmic values.

$\bar{y} = \frac{\sum y_i}{n}$ , where  $n$ =number of specimens tested=10 and  $\bar{y}$  is the mean logarithmic value = 4.63

For  $n=12$ ,  $y_{5\text{percent}} = \bar{y} - ks = 4.41$  the logarithmic of the 5<sup>th</sup> percentile lower probability limit (*LPL*), where  $k=1.92$ .

For Category D fasteners, AS1649, Clause 3.2.6

$ULL_1 = \frac{P_1}{5N} = 216$ ,  $P_1$  is the 5<sup>th</sup> percentile LPL of maximum loads,  $N$  =total number of fasteners=12.

$ULL_2 = \frac{P_2}{8N} = 227$ ,  $P_2$  is the average of maximum loads,  $N$  =12.

$R_{bwl} = \text{lowest}(ULL_1, ULL_2) = 216$  N =Basic working load capacity per nail.

The limit state characteristic load capacity  $R_k = 3.65R_{bwl} = 788$  per nail.

The total capacity for 12 nails = 12x 788= 9453.

## 6. Design capacities

The design capacities given in Table 1, were based on computations in combination with test results. The 3.75mm nail capacity = 1110N per nail for JD4 in accordance with AS1720.1, Table 4.5(B). The design capacity,  $\phi N_j$  (kN), for supporting beam with joint group JD4, with a load case of 1.2G+1.5Q<sub>f</sub> (Dead load + Floor live load), given that the capacity factor of 0.85 and a duration factor of 0.77 was used.