EFFECT OF MATERIAL PROPERTIES AND ANCHORAGE LOCATION ON LOAD-BEARING CAPACITY OF SCREW-CONNECTED AND HUNG CABINETS

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Abstract. Effects of material type and thickness of selected wood-based composites for construction of cabinets and anchorage location of screws attaching cabinets to the wall on the vertical load-bearing capacity of four-sided wall cabinets were investigated. Experimental results show that screw anchorage location significantly affected the load-bearing capacity of four-sided wall cabinets. Cabinets anchored to the wall from their sides had a significantly higher vertical load-bearing capacity than the ones anchored to the wall from their top. Plywood (PLY) cabinets had a significantly higher vertical load-bearing capacity than medium-density fiberboard (MDF) and particleboard (PB) cabinets. MDF cabinets tended to have higher vertical load-bearing capacities than PB, but the significance was affected by screw

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anchorage location and material thickness. The vertical load-bearing capacity of PB cabinets was governed by its material modulus of rupture (MOR) and density, whereas MDF cabinets anchored from the sides were governed by their material internal bond strength and MDF cabinets anchored from the top by their material MOR and thickness. The vertical load-bearing capacity of PLY cabinets was dominated by material thickness only.

**Keywords:** Medium-density fiberboard, particleboard, plywood, load-bearing capacity, four-sided wall cabinets.

**INTRODUCTION**

Today, most of all furniture made in the world is based on wood-based panel products, such as particleboard (PB) and medium-density fiberboard (MDF) because the mechanical, physical, and surface qualities of these panels are engineered compared with solid wood. One reason these products are used is because the mechanical, physical, and surface qualities of these panels are engineered. Also, the general properties of wood-based panel products are uniform from one board to another, which makes them suitable alternatives to solid wood for industrial manufacturing of furniture such as upholstered furniture, office furniture, and kitchen cabinets. Furniture manufacturers can easily set up industrial-scale facilities to manufacture case goods using newly developed industrial machinery and wood-based panel products.

Several studies have been done about the joints used to connect panels together to form cases. Kotas (1957, 1958a) carried out the first study known on the structural characteristics of case furniture. The results of his work were incorporated into a design manual (Kotas 1958b). Case furniture constructed with wood-based panel products and connected with mechanical fasteners tends to have failure related to panel edge delamination. This is particularly true when butt-type joints are constructed. In the tests carried out by Bachmann and Hassler (1975) on furniture connected with demountable fasteners of metal and plastic inserts, free edge panel delamination was the typical failure mode. Bending moment resistance of joints connected with screws was nearly double that with demountable fittings. Doweled constructions performed better than demountable hardware but poorer than screw connections. However, when the edge of an exposed panel was laminated with mahogany veneers, bending moment resistance of dowel construction was 43% higher than that of screw connections.

Ho and Eckelman (1994) evaluated the effects of number of screws and screw diameter, length, and position on joint strength, stiffness, and durability of case furniture constructed of PB. Experimental results showed that screw length significantly affected strength and durability of cases connected with larger diameter screws. Length was less important with smaller diameter screws because they tended to fail in fatigue. Results also tended to indicate that the most efficient way to strengthen a case was to put fasteners near the open face. Maximum fastener strength was obtained when fasteners were placed not closer than 88.9 mm from one another.

Kasal et al (2008) studied effects of screw sizes on load-bearing capacity and stiffness of five-sided furniture cases constructed of MDF and PB. The five-sided case was tested under a static load by supporting it at three points. Results indicated that MDF cases had a significantly higher load-bearing capacity than PB cases, but the significance of stiffness of MDF compared with PB cases depended on screw diameter. PB cases connected with 5-mm-diameter and 50-mm-long screws, which were the largest and longest screws evaluated in the experiment, yielded the maximum load-bearing capacity and stiffness.

Limited studies were found on effects of panel material type and thickness and anchorage location of screws mounting the cabinet to the wall on the load-bearing capacity of a four-sided wall cabinet in resisting a downward load applied vertically. Very few studies were found for screw anchorage location. In general, wall cabinets are anchored by L-shaped connectors from
the top or bottom panel or by the side panel depending on the preference and practicality of application. However, there is not enough information regarding the advantages in choosing one anchorage location or another. In anchorage of cabinets to the wall, the purpose should be to directly transfer the loads on horizontal panels to the wall or wall studs. It is expected that anchoring from the side panels would create a more reliable and better transfer of loads to wall or wall studs. Therefore, the objective of this study was to investigate effects of material type and thickness of wood-based composite panels used for construction of cabinets and location of screws anchoring wall cabinets on the vertical load-bearing capacity of four-sided wall cabinets.

MATERIALS AND METHODS

Configuration and Construction of Wall Cabinets

The configuration of four-sided wall cabinets in this study is shown in Figs 1 and 2. Usually, wall cabinets are constructed with a back panel, which mainly is made of thinner MDF or ply-wood (PLY) material, thus making the cabinets five-sided. In this study, for the ease of calculation and to simplify the construction and have better insight into the effect of anchorage, a back panel was not attached to the cabinet specimens. All tested four-sided wall cabinets consisted of a top, a bottom, and two side panels of the same material. They measured 650 mm high, 650 mm wide, and 320 mm deep. Twelve sets of four-sided wall cabinets consisting of five replicates of each combination of material type, panel thickness, and anchorage location were constructed as shown in Table 1. Three types of panel materials, PB, MDF, and okoume (Aucoumea klaineana) PLY, were used to construct the cabinets. Two thicknesses of PB and MDF were used (18 and 16 mm), and two thicknesses of PLY were used (18 and 15 mm). Two anchorage locations, from the sides and from the top, were considered for each combination of panel material type and thickness.

All panels were obtained from commercial suppliers. In construction of four-sided wall cabinets, 3.66-m × 1.83-m × 18-mm full-sized sheets of PB and MDF, 2.8-m × 2.1-m × 16-mm
full-sized sheets of PB, 2.44-m × 2.1-m × 16-mm full-sized sheets of MDF, and 2.2- × 1.7-m full-sized sheets of 15- and 18-mm-thick PLY were cut into top, bottom, and side panel strips separately. These strips were then cut into the final required member lengths for cabinet construction.

To connect the case members to each other, 4-mm-diameter and 50-mm-long steel Phillips head flat wood screws were used in the corner joints. Figure 3 shows the placement of screws in the corner joints of four-sided cabinets. Screws were driven into the center of the top and bottom panels through side panels with predrilled pilot holes. The diameter of all pilot holes was equal to approximately 80% of the root diameter of the screws, and the depth of all pilot holes was equal to approximately 75% of screw penetration (Eckelman 2003). All cabinet samples were stored in a conditioning chamber set to reach equilibrium moisture content of 8% prior to testing to eliminate moisture content variations.

Testing

A total of 60 four-sided wall cabinets were tested under vertical downward static loads by following the procedure suggested by Silas (2003) and outlined in ANSI/KCMA (1995). Figures 1 and 2 show the loading condition of cabinets anchored from the sides and top, respectively. The cabinet sample was fixed on the wooden beams (studs) using L-shaped connectors with screws. Screws that were 3.5 mm in diameter and 18 mm long were used to connect the brackets to the cabinets, and 5-mm-diameter and 60-mm-long screws were used to connect the cabinets to the wall. The distance from the horizontal symmetric axis of each L-shaped connector to the top surface of the top panel was 80 mm for the cabinets anchored from the sides, whereas the symmetric center line of the L-shaped connector was 80 mm from the outside surface of two sides for the cabinets anchored from the top. A vertical downward load was applied to the top surface of the top panel through a loading strap. All tests were carried out on a 50-kN-capacity universal testing machine at a loading rate of 6 mm/min. During the static tests, failure modes and ultimate failure loads were recorded. In addition to cabinet testing, physical and mechanical properties of PB, MDF, and PLY were tested (ASTM 2001a, 2001b).

RESULTS AND DISCUSSION

The physical and mechanical properties of PB, MDF, and PLY panels used to construct tested cabinets are summarized in Table 2. Table 3 summarizes the mean ultimate vertical bearing loads of the four-sided wall cabinets tested.
Theoretically, it is expected that if cabinets are anchored by means of L-shaped connectors attached to the top or bottom panel, failure would result from splitting (delamination of the panels at each end at the point of screw entry into the end of the top or bottom panel). This situation also depends on how the side panel is connected to the top panel. Normally, top and bottom panels are supposed to be positioned between two side panels, which results in lateral shear stresses in fasteners and force to delaminate the edges of top and bottom panels. Although it is not common, sometimes the top and bottom panels are positioned on the edges of side panels. In this case, there are almost no lateral stresses, but fasteners tend to withdraw from the edges of the side panels. Conversely, if the cabinets are anchored by means of L-shaped connectors attached to the side panels, then the screws attaching the L-shaped connector to the wall will still be loaded in tension, whereas the screws used to attach the L-shaped connector to the side panels of the cabinet will be loaded in lateral shear. In addition, because the L-shaped connectors are not close to the edges of side panels, panel material is loaded in lateral shear, which takes out the possibility of panel material failure. In this case, fastener strength becomes a more prominent factor in the vertical load-bearing capacity of the cabinets.

In all these considerations, the L-shaped connectors are expected to be strong enough to not bend in loading. However, if L-shaped connectors have a tendency to bend under load, the cabinet is still expected to be stronger if the L-shaped connectors are positioned on side panels, which would not be loaded in bending.

In conclusion, it is presumed that anchoring from side panels has advantages such as less stress on L-shaped connectors and panel material and allowing use of the strongest screw in terms of vertical load-bearing capacity of cabinets.

Table 2. Physical and mechanical properties of particleboard (PB), medium-density fiberboard (MDF), and plywood (PLY) used in the study.

<table>
<thead>
<tr>
<th>Material type</th>
<th>Panel thickness (mm)</th>
<th>MC (%)</th>
<th>Density (g/cm³)</th>
<th>MOR (N/mm²)</th>
<th>MOE (N/mm²)</th>
<th>G</th>
<th>IB (N/mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PB</td>
<td>18</td>
<td>7.01</td>
<td>0.58</td>
<td>11.20</td>
<td>2031</td>
<td>1110</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>6.25</td>
<td>0.66</td>
<td>20.82</td>
<td>2611</td>
<td>1826</td>
<td>0.47</td>
</tr>
<tr>
<td>MDF</td>
<td>18</td>
<td>6.28</td>
<td>0.75</td>
<td>37.32</td>
<td>2563</td>
<td>2017</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>5.81</td>
<td>0.73</td>
<td>35.44</td>
<td>3303</td>
<td>1858</td>
<td>0.97</td>
</tr>
<tr>
<td>PLY</td>
<td>18</td>
<td>7.29</td>
<td>0.59</td>
<td>54.23</td>
<td>5173</td>
<td>1513</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>7.50</td>
<td>0.59</td>
<td>74.71</td>
<td>8413</td>
<td>1797</td>
<td>1.14</td>
</tr>
</tbody>
</table>

MC, moisture content; MOR, modulus of rupture; MOE, modulus of elasticity; G, shear modulus; IB, internal bond strength.

Table 3. Mean ultimate vertical bearing loads of four-sided wall cabinets tested in this study.

<table>
<thead>
<tr>
<th>Material type</th>
<th>Panel thickness (mm)</th>
<th>Anchorage location</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Side</td>
<td>Top</td>
</tr>
<tr>
<td>PB</td>
<td>18</td>
<td>3568 (4)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>4173 (6)</td>
</tr>
<tr>
<td>MDF</td>
<td>18</td>
<td>3694 (3)</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>3934 (9)</td>
</tr>
<tr>
<td>PLY</td>
<td>18</td>
<td>5423 (13)</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>5060 (10)</td>
</tr>
</tbody>
</table>

* Values in parentheses are coefficients of variation.

PB, particleboard; MDF, medium-density fiberboard; PLY, plywood.

A two-factor analysis of variance (ANOVA) general linear model was performed for individual data to analyze main effects (panel thickness and anchorage location) and their interactions
on the mean ultimate vertical bearing load of four-sided cabinets for each of three panel material types, PB, MDF, and PLY, respectively.

ANOVA results indicated that the two-factor interaction for PB cabinets was statistically not significant at the 5% significance level, whereas the two main effects were significant. Therefore, two significant main effects were analyzed with the two-factor interaction being ignored. Tables 4 and 5 summarize the mean comparisons of ultimate vertical bearing loads for the main effects, panel thickness, and anchorage location, respectively.

For four-sided cabinets constructed of MDF, ANOVA results indicated that the two-factor interaction was statistically significant at the 5% significance level. Therefore, the two-factor interaction was further analyzed. A one-way classification with four treatment combinations of panel thickness × anchorage location was created. The protected least significant difference (LSD) multiple comparisons procedure at the 5% significance level was performed to determine the mean differences of those treatment combinations using the LSD value of 280 N. Table 6 gives the mean comparisons of ultimate vertical bearing loads for panel thickness effect within each of two anchorage locations. Table 7 gives the mean comparisons of ultimate vertical bearing loads for anchorage location effect within each of two panel thicknesses.

For cabinets constructed of PLY, ANOVA results indicated that the two-factor interaction was statistically not significant at the 5% significance level, the main effect thickness with a p value of 0.0336 was marginally significant, and the main effect anchorage location with a p value of 0.0003 was significant. Therefore, a one-way classification with four treatment combinations of panel thickness × anchorage location was created. The protected LSD multiple comparisons procedure at the 5% significance level was performed to determine the mean differences of those treatment combinations using the LSD value of 764 N. Table 8 gives the mean comparisons of ultimate vertical bearing loads of four-sided medium-density fiberboard cabinets for anchorage location for each panel thickness.

Table 4. Mean comparisons of ultimate vertical bearing loads of four-sided particleboard cabinets for panel thickness.

<table>
<thead>
<tr>
<th>Panel thickness</th>
<th>18 mm</th>
<th>16 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2471 B*</td>
<td>2903 A</td>
<td></td>
</tr>
</tbody>
</table>

* Means not followed by a common letter are significantly different from one another at the 5% significance level.

Table 5. Mean comparisons of ultimate vertical bearing loads of four-sided particleboard cabinets for anchorage location.

<table>
<thead>
<tr>
<th>Anchorage location</th>
<th>Side</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>3871 A*</td>
<td>1503 B</td>
<td></td>
</tr>
</tbody>
</table>

* Means not followed by a common letter are significantly different from one another at the 5% significance level.

Table 6. Mean comparisons of ultimate vertical bearing loads of four-sided medium-density fiberboard cabinets for panel thickness within each of two anchorage locations.

<table>
<thead>
<tr>
<th>Anchorage location</th>
<th>18 mm</th>
<th>16 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side</td>
<td>2165 A</td>
<td>1878 B</td>
</tr>
<tr>
<td>Top</td>
<td>3934 A</td>
<td>3676 B</td>
</tr>
</tbody>
</table>

* Means not followed by a common letter are significantly different from one another at the 5% significance level.

Table 7. Mean comparisons of ultimate vertical bearing loads of four-sided medium-density fiberboard cabinets for anchorage location for each panel thickness.

<table>
<thead>
<tr>
<th>Panel thickness (mm)</th>
<th>Side</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>3694 A*</td>
<td>2165 B</td>
</tr>
<tr>
<td>16</td>
<td>3934 A</td>
<td>1878 B</td>
</tr>
</tbody>
</table>

* Means not followed by a common letter are significantly different from one another at the 5% significance level.

Table 8. Mean comparisons of ultimate vertical bearing loads of four-sided plywood cabinets for panel thickness within each of two anchorage locations.

<table>
<thead>
<tr>
<th>Anchorage location</th>
<th>18 mm</th>
<th>15 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side</td>
<td>5423 A*</td>
<td>5060 A</td>
</tr>
<tr>
<td>Top</td>
<td>4498 A</td>
<td>3676 B</td>
</tr>
</tbody>
</table>

* Means not followed by a common letter are significantly different from one another at the 5% significance level.
gives the mean comparisons of ultimate vertical bearing loads of PLY cabinets for panel thickness effect within each of two anchorage locations. Table 9 gives the mean comparisons of ultimate vertical bearing loads of PLY cabinets for anchorage location effect within each of two panel thicknesses.

To analyze material type effects on the load-bearing capacity of four-sided cabinets, a two-factor (material type and anchorage location) ANOVA general linear model was performed for each of two panel thickness levels, respectively. ANOVA results indicated that the two-factor interaction was significant at the 5% significance level for each of two thickness levels. Therefore, a one-way classification with six treatment combinations of material type and anchorage location was created for each of two thickness levels. The protected LSD multiple comparisons procedure at the 5% significance level was performed to determine the mean differences of those treatment combinations. The LSD values were 552 and 392 N for 18- and 16-mm thickness levels, respectively. Tables 10 and 11 summarize mean comparisons of ultimate vertical bearing loads for material type within each of two anchorage locations for each of two thickness levels, respectively.

### Thickness Effects

Table 4 indicates that 16-mm-thick PB cabinets had a significantly higher ultimate vertical bearing load than 18-mm-thick cabinets. This significant difference could be explained by the fact that the 16-mm PB had a higher modulus of rupture (MOR) value than the 18-mm one, which governs the failure mode of side panel edge breakage of cabinets anchored from the top. For cabinets anchored from the sides, the significance can be explained by the fact that the 16-mm PB had a higher density than the 18-mm one, which governs their failure modes caused by lateral shear loads on screws anchoring brackets to the sides because a higher density PB in general can yield a higher lateral shear resistance to screw withdrawal (FPL 2010). Table 2 shows that 16-mm PB had a higher density than 18-mm PB. Therefore, 16-mm PB cabinets had a significantly higher ultimate vertical bearing load than the 18-mm ones, although in this case, the 16-mm cabinet had less screw penetration in the sides than the 18-mm cabinet. This result also implies the increase in screw lateral withdrawal resistance from material face is more sensitive to density increase than screw penetration depth increase.

Table 6 shows that 16-mm MDF cabinets anchored from the sides had a higher ultimate vertical bearing load than 18-mm ones, but it was not significant. This is because 16-mm MDF has a higher internal bond strength (IB)
than 18-mm MDF (Table 2), which governs the failure mode of top panel edge delamination caused by anchoring screws subjected to lateral shear loads. The 18-mm cabinet had a significantly higher ultimate vertical bearing load than the 16-mm one when the cabinet was anchored from the top. This can be explained by its failure mode of side panel edge breakage, which is governed by the material MOR and thickness, ie higher MOR and thicker materials will yield higher vertical resistance loads. Table 2 shows that the thicker 18-mm MDF has a higher MOR value.

Table 8 shows that 18-mm PLY cabinets anchored from the sides had a higher ultimate vertical bearing load than 15-mm ones, but it was not significant. The 18-mm cabinet had a significantly higher ultimate vertical bearing load than the 15-mm one when the cabinet was anchored from the top. These results appear contradictory to the explanation of MDF based on IB and MOR values shown in Table 2, ie higher IB and MOR values will yield higher lateral shear resistance loads because 15-mm plywood had higher IB and MOR values than 18-mm plywood. One possible explanation of this would be that in this case, PLY thickness might dominate the lateral shear resistance load of four-sided cabinets because of the relatively larger difference between the two thicknesses.

Anchorage Location Effects

Tables 5, 7, and 9 show in general that a four-sided cabinet anchored from its sides had a significantly higher ultimate vertical bearing load than one anchored from its top. The mean ultimate vertical bearing load of a PB cabinet anchored to the wall from its sides is almost 2.6 times that of one anchored from its top (Table 5). For 18- and 16-mm-thick MDF cabinets anchored from their sides, mean ultimate vertical bearing loads are 1.7 and 2.1 times that of cabinets anchored from their tops, respectively (Table 7). The mean ultimate vertical bearing loads of 18- and 15-mm-thick PLY cabinets anchored from their sides are 1.2 and 1.4 times that of cabinets anchored from their tops, respectively (Table 9).

These results indicate that anchorage location significantly affected vertical load-bearing capacity of four-sided cabinets constructed with wood-based composites. The significance is mainly caused by the fact that the modes and locations of failed joints of tested four-sided cabinets were significantly affected by anchorage location, ie where the cabinet is attached to the wall, because the two anchorage positions yielded two totally different cabinet failure modes governed by different strength properties of the materials used to construct the cabinets. This appears to imply that the cabinet constructed with the configuration used in this study (Fig 1) has a lower vertical load-bearing capacity if its joints failed because of side panel edge fractures.

Material Type Effects

Tables 10 and 11 show that, in general, PLY cabinets had significantly higher ultimate vertical bearing loads than MDF and PB ones. The significantly higher ultimate load is mainly because of PLY having higher MOR values than MDF and PB materials in the case of top-anchored cabinets with a failure mode of side panel edge breakage and possible higher lateral shear resistance loads of screws from edges than MDF in the case of side-anchored cabinets.

There were no significant differences in ultimate vertical bearing loads between PB and MDF cabinets anchored from the sides, and PB cabinets showed an even higher ultimate vertical bearing load than the MDF cabinet (Table 11), although, in general, MDF had higher mechanical properties than PB (Table 2). Based on the failure modes observed, the ultimate vertical bearing load of PB cabinets is governed by the lateral shear resistance load of screws from PB faces, whereas the ultimate vertical load of MDF cabinets is governed by the lateral shear resistance load of screws from edges of the top.
For the cabinets anchored from the top, the ultimate vertical bearing load of MDF cabinets was significantly higher than PB ones when 18-mm-thick panels were used. If the 16-mm thick panels were used, the ultimate vertical bearing load of MDF cabinets was higher than the PB ones, but it was not significant. This would be explained by their failure mode of side panel edge breakage, which might be governed by their material MOR values (Table 2). The MOR difference between 18-mm-thick MDF and PB materials is 26.12 N/mm², which is much higher than the difference of 14.62 N/mm² between their corresponding 16-mm-thick panels.

CONCLUSIONS

Effects of material type and thickness of wood-based composite panels for construction of four-sided cabinets and anchorage location of screws attaching cabinets to the wall on the vertical load-bearing capacity of four-sided wall cabinets were investigated. Experimental results showed that, in general, screw anchorage location significantly affected the vertical load-bearing capacity of four-sided wall cabinets constructed with wood-based composites used in this study because it can alter the locations where the cabinet joints will fail. A four-sided cabinet anchored to the wall from its side panels had shown a significantly higher vertical load-bearing capacity than the one anchored to the wall from its top panel. Therefore, anchorage of the cabinet to the wall from the side panels should be recommended instead of anchoring the cabinet to the wall from the top panel.

The four-sided wall cabinet constructed of PLY had a significantly higher vertical load-bearing capacity than those of MDF and PB. MDF cabinets tended to have higher vertical load-bearing capacities than PB, but the significance was affected by screw anchorage location and material thickness. These significant or nonsignificant differences in vertical load-bearing capacities of four-sided wall cabinets constructed of three wood-based composites were mainly caused by the differences in their mechanical properties, mainly MOR and screw lateral withdrawal resistance. Cabinets constructed with the materials of greater mechanical properties will yield higher vertical load-bearing capacities. Finally, it should be recommended to use PLY in construction of cabinets for higher vertical load-bearing capacity when costs can be ignored.

Experimental results also indicated that the four-sided wall cabinet constructed of 16-mm-thick PB had a significantly higher vertical load-bearing capacity than 18-mm-thick PB because 16-mm PB had higher MOR and density values than 18-mm PB. Therefore, 16-mm PB could be used instead of 18-mm PB. The vertical load-bearing capacity of MDF cabinets anchored from the sides is governed by their material IB value, which yields a nonsignificant difference in the vertical load-bearing capacity between the cabinets constructed of 16- and 18-mm MDF materials. The vertical load-bearing capacity of MDF cabinets anchored from the top is governed by their material MOR and thickness, ie the 18-mm-thick cabinet constructed of a higher MOR value and thicker material will yield a significantly higher vertical load-bearing capacity than the 16-mm cabinet with a lower MOR value. The vertical load-bearing capacity of PLY cabinets might be dominated by material thickness. The 18-mm PLY cabinet had a significantly higher vertical load-bearing capacity than the 15-mm cabinet when the cabinet was anchored from the top, but this was not significant when the cabinet was anchored from the sides.

This study provides key information about how cabinets anchored to the wall and how vertical load-bearing capacity of the cabinets were affected by panel type and panel thickness. This information could be helpful in product engineering of furniture cabinets.

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