# Plywood

Plywood is made up of three or more layers of wood bonded together with adhesive to make large flat sheets. Plywood is manufactured using hard woods (red or white lauan in the Philippines), softwoods, or a combination of the two. Each veneer is glued with its grains running perpendicular to the previous layer, strengthening the sheet in both directions. The quality, number of layers and treatment of the veneers with sealants determines the application of the plywood. Since the 1930's, extensive logging in the Philippines, targeting trees of all ages has depleted forests by approximately 80% by the 1980s[1]. This has resulted in the Philippines becoming a net importer of wood and no longer a major player in the export of plywood.

## Typical applications in humanitarian shelter projects

- Formwork for reinforced concrete construction.
- Internal and external wall cladding (non-structural). Typically < 10mm thick.
- Internal and external wall cladding/structural bracing. Typically > 10mm thick, marine grade plywood, with an adequately designed system of fastenings (the length, quantity and pattern of nailing in accordance with engineer's specifications is critical for reaching the intended design strength).

Figure 1 – A shelter constructed by the beneficiary of the Catholic Relief Services shelter program in San Jose, Caloogan, Municipality of Palo, Leyte, Philippines. (Photo: J. Girsang, CRS)

## Background information

### Advantages

- Ease of handling and assembly
- Readily available in bulk quantity
- Range of standard sizes available

### Disadvantages

- Imported, therefore can be relatively expensive for the householder to replace.
- Not breathable, does not allow adequate ventilation in hot and humid climates.
- Uses hardwood veneers which are depleting in the Philippines.
- Bonded with chemical adhesives that can have negative environmental and health consequences.
- If untreated/not painted, can rapidly warp and decay (figure 2) within a few months.
- Needs to be painted in order to seal it, further protecting it from the elements and prolonging its life. This might be unaffordable for the householder.

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| **Product info** | Commonly available size 1.20x2.40m (4'x8') and sometimes 0.9x1.8m (3'x6'). Thickness ranges from 2.5mm (3 ply) to 25mm (9 ply). |
| **Suppliers** | Plywood in the Philippines is imported and distributed through small and large scale hardware merchants. |
| **Alternatives to plywood** | Amakan, bamboo<br><br>Amakan should be stored in a dry location and needs to be treated prior to installation by dipping in sea water, drying, and then varnishing. It is a sustainable option when combined with reforestation and livelihood activities. It is typically fixed to timber wall framing with external bamboo/coco lumber battens. (Figure 3). Due to its permeability, amakan seems appropriate for the hot and humid local climate. This also helps to balance internal pressure within the house during strong winds, potentially reducing roof damages. |

[1] http://www.rainforestrelief.org/What_to_Avoid_and_Alternatives/Rainforest_Wood/What_to_Avoid_What_to_Choose/By_Country/Asia/Philippines.html

| **Existing standards for plywood and construction with plywood in the Philippines** | |
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| **Classification of plywood** | Plywood is graded into 5 types: A, B, C, D and E which denote the quality of the face and back of the plywood sheet. Generally, the face has a better quality than the back, grade A being the best with no visible defects. |
| **Applications** | **Structural:** Type I - intended for exterior or outdoor use, able to withstand weather and exposure to moisture. In order to prolong its life particularly in harsh environments, it is recommended to protect it with paint or a sealant. |
| | **Non-structural:** Type II - intended for interior use and can retain its strength when occasionally exposed to moisture. |
| **National standards** | PNS 196:2000 |
| **Quality control during procurement** | • Each sheet of plywood should be either edge branded or stamped on the face or back.<br>• Check for name of manufacturer, type, grade (face/back), thickness, country of manufacture.<br>• Certification markings: PS marking for locally produced plywood or ICC marking for imported plywood. Imported plywood should also be supported by a proper, valid and official Import Commodity Clearance (ICC).<br>• Refer to Plywood Consumer's Guide, published by Department of Trade and Industry, Philippines for further information. |

**Plywood construction tips**

- ✓ **Storage:** Store panels under cover, in a well-ventilated area in order to avoid warping and damage from direct sunlight and moisture. Place weight on the top of stacked plywood to minimize warping from humidity. Panel edges and corners are vulnerable to damage and should be protected.
- ✓ **Installation:** Nail plywood at least 1cm away from its edge and fix mid-length to wall framing. For formwork, ensure appropriate thickness and type of plywood is used.
- ✓ **Treatment:** Treat plywood (face, back and all four edges) with paint or sealants to protect the sheet from moisture absorption and consequent warping. Consider sealing plywood with anti-termite treatment to reduce the risk of insect attack.

Figure 2: warping of untreated plywood, Bantayan Island, Philippines. (Photo: R. Dodds, Humanitarian Shelter Working Group Philippines 2014)

| **Some useful reference documents for plywood in the Philippines:** | |
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| For information on types, grades and certification of plywood in the Philippines. | Department of Trade & Industry, Philippines (2008), Consumer's Guide: Product quality and safety, Plywood http://www.bps.dti.gov.ph/information-materials/doc_download/9-consumers-guide-on-plywood.html |
| Provides a methodology for calculating the amount of plywood for concrete formwork. | Max B. Fajardo Jr. (2000), *Simplified Construction Estimate*, Philippines: 5138 Merchandising Publisher |

Figure 3: Shelter with amakan wall cladding, YPDR PAH Joint Housing Program, Bantayan Island, Philippines. (Photo: Joseph Ferris III, YPDR)

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