

Foreword

The formulation of this National Standard was initiated by the Agricultural Machinery Testing and Evaluation Center (AMTEC) under the project entitled "Enhancing the Implementation of AFMA Through Improved Agricultural Engineering Standards" which was funded by the Bureau of Agricultural Research (BAR) of the Department of Agriculture (DA).

This standard has been technically prepared in accordance with PNS 01-4:1998 (ISO/IEC Directives Part 3:1997) – Rules for the Structure and Drafting of International Standards. It provides specifications of wood-based panels for agricultural machinery and structures.

The word “shall” is used to indicate requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted.

The word “should” is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that certain course of action is preferred but not necessarily required.

In the preparation of this standard, the following references were considered:

ISO 8336:1993, Fiber-cement flat sheets

ISO 12466-2:1999, Plywood – Bonding quality – Part 2: Requirements

PNS 652:1990, Specification for wood wool cement board for low-cost housing application

PNS 102:1988, Specification for Hardboards

PNS 196:2000, Plywood - Specifications

PNS 230:1989, Specifications for particle boards

Engineering Materials – Wood-based panels – Specifications

1 Scope

This standard establishes specifications and provides technical information of wood-based panels for agricultural engineering.

2 References

The following normative references contain provisions which, through reference in this text, constitute provisions of this standard.

ISO 8336, Fiber-cement flat sheets

PNS 196, Plywood – Specifications

3 Application

Wood-based panels shall be used as walls, floors, and ceiling for agricultural structures as well as for machine structural purposes.

4 Definition**4.1****exterior plywood**

type of plywood intended for outdoor or marine uses, also known as Type I

4.2**face**

surface of the plywood showing veneer of higher grade than that of the back side

NOTE: The terms face and back do not apply when the same grade or veneer is used on both sides of the plywood.

4.3**face-plywood**

plywood faced with a material other than wood, such as metal or plastic

4.4**fiberboard**

panel made of consolidated ligno-cellulosic fibers with the primary bond derived from their inherent adhesive properties and/or the addition of resin or other materials

4.5

fiber-cement flat sheets

consist essentially of an inorganic hydraulic binder or a calcium silicate binder formed by the chemical reaction of a siliceous material and a calcareous material reinforced by organic fibers and/or inorganic synthetic fibers

4.6

interior plywood

type of plywood intended for inside use, having limited moisture resistance

4.7

lumber core

side board made up of well machined lumber strips properly dried and glued together

4.8

lumber core plywood

ply board

plywood made up of face/back veneer, crossboard core veneer and well composed kiln dried lumber core

4.9

panel

sheet of plywood

4.10

particle board

board principally made from wood chips and formed by hot press process with adhesive

4.11

ply

stratum or layer used in referring to the successive layers of veneer in a panel

4.12

plywood

assembled product made of layers of veneers and/or lumber core held together by an adhesive, the chief characteristics of which is the alternate cross layers, distributing the longitudinal wood strength

5 Classification of wood based panels

Wood based panels shall be classified as:

5.1 Adhesive bonded

For the purposes of this standard, the panels that shall be discussed under adhesive bonded panels are as follows:

- a) Plywood and plyboard
- b) Fiberboard
- c) Particleboard

5.2 Cement bonded

For the purposes of this standard, the panels that shall be discussed under cement bonded panels are as follows:

- a) Fiber cement flat sheets
- b) Wood wool cement bonded boards

6 Plywood

6.1 Classification

6.1.1 Class 1 (dry conditions)

This bonding class is appropriate for veneer plywood intended for use in normal interior climates.

6.1.2 Class 2 (humid conditions)

This bonding class is appropriate for veneer plywood intended for protected external applications (e.g. behind cladding or under roof coverings), but capable of resisting weather exposure for short periods (e.g. when exposed during construction). It is also suitable for interior situations where the service moisture condition is higher than the class 1 level.

6.1.3 Class 3 (exterior conditions)

This bonding class is designed for veneer plywood intended for exposure to weather over sustained periods.

6.2 Grading of plywood and its allowable defects

Grades of plywood shall be determined by the defects inherent in wood, and by manufacturing defects visible on finished panels, it shall be in accordance with PNS 196.

6.3 Dimensions

6.3.1 Length and width – Length and width of plywood for general purpose shall be in accordance with Table 1.

Table 1 – Length and width of plywood

Length, mm	Width, mm
1,820	910
2,130	910
2,440	1,220
3,050	1,220
3,050	1,530

6.3.2 Thickness and number of plies – The thickness and number of plies of plywood for general purpose shall be in accordance with Table 2.

Table 2 – Thickness number of plies

Thickness, mm	Number of plies
3	3
4	3
5.5	5
10	5
12	7
15	7
19	7
25	7

NOTE: For 15 mm and thicker plyboards, these shall be composed of the following: face/back veneer, crossboard core veneer and well composed kiln dried lumber core in 5 plies.

6.4 Quality

Quality of plywood shall comply with PNS 196.

6.5 Packing and marking

6.5.1 The plywood shall be packed or crated to provide suitable protection from the elements.

6.5.2 Each plywood shall be marked by edge branding. Stamp marking on the face or bark shall be acceptable for panels thinner than 5mm. The mark whether on edge, on the face or on the back shall contain the following:

- a) Name of the manufacturer
- b) Type, grade (face/back, in that order), and thickness

NOTE The grade of plywood by appearance is determined by the grade of the two surfaces of the panel. The better quality is called face, the opposite side is called back.

- c) Country of manufacture.

7 Fiberboard (high density)

7.1 Classification

7.1.1 Types

Fiberboard shall be classified into the following types according to moisture resistance:

7.1.1.1 Standard fiberboard

A high density fiberboard without subsequent treatment generally intended for interior use.

7.1.1.2 Tempered fiberboard

A high density fiberboard that has been specially treated with drying oil, petroleum derivatives or other compounds stabilized by baking or heating, and generally intended for the use where moisture resistance is required.

7.1.2 Classification

Each type shall be further classified according to surface finish as follows:

7.1.2.1 Plain

A hardboard without any factory-applied finish.

7.1.2.1.1 Smooth-one-side (S1S)

High density fiberboard with a smooth surface on one side and a screen impression on the other side.

7.1.2.1.2 Smooth-two-sides (S2S)

High density fiberboard with smooth surfaces on both sides.

7.1.2.2 Decorative

Hardboard which has a pattern impressed on one surface, e.g. simulating some other materials such as leather, sawali, wood grain, bark, diamond, fine weave, and others.

7.1.2.3 Perforated

Usually SIS hardboard with holes punched or drilled at the factory for use with various fixtures to provide decorative wall-mounted storage facilities or which may be used for acoustic purposes.

7.2 Dimensions

Dimensions of hardboards shall conform to Table 3.

Table 3 – Dimensions of high density fiberboard

Dimensions in millimeters

Parameter	Dimension
Width	610
	910
	1,220
Length	1,220
	2,440
	3,660
Thickness	2.50
	3.20
	4.80
	6.40

7.3 Mechanical and physical properties

Physical and mechanical properties of hardboards shall conform to Table 4.

Table 4 – Mechanical and physical properties of hardboards

Type	Nominal thickness, mm	Density, Kg/m ³	Modulus of rupture, MPa	Water absorption, % by mass		Thickness swelling, %		Screw holding, N	Nail Head Pull-Through, N	Tensile strength parallel to surface, MPa
				21±2 °C	30±2 °C	21±2 °C	30±2 °C			
Standard	2.5	900	35	30	-	20	-	-	195	18
	3.2	900	35	30	53	18	29	195	345	18
	4.8	900	35	25	49	16	26	290	440	18
	6.4	950	35	20	34	14	23	490	590	18
Tempered	3.2	950	44	25	45	16	25	245	490	22
	4.8	950	44	16	35	14	23	390	590	22
	6.4	950	44	16	27	14	17	490	685	24

7.4 Marking

Hardboard packages shall be legibly and indelibly marked with the following information:

- a) Name and trademark of manufacturer
- b) Classification as to types and classes, i.e. Tempered, Plain, and “S1S”
- c) Dimensions
- d) Number of pieces
- e) Country of manufacture

8 Particle board

8.1 Classification

8.1.1 According to the condition of the face and back

8.1.1.1 Pressed particle boards

8.1.1.2 Veneered particle boards

8.1.1.3 Impregnated-paper coated particle board

8.1.2 According to the bending strength for pressed particle boards:

8.1.2.1 Type 200

8.1.2.2 Type 150

8.1.2.3 Type 100

8.1.3 According to the type of bonding

8.1.3.1 Type U

8.1.3.2 Type M

8.1.3.3 Type P

8.1.3.4 Type Po

8.2 Dimensions

Dimensions of particle boards shall comply with Table 5. Thickness of particle boards shall comply with Table 6.

Table 5 – Dimensions of particle boards, mm

Nominal lengths	Nominal widths						
	300	400	600	800	1,000	1,200	1,600
300	X	-	X	-	-	X	-
400	-	X	X	X	X	X	X
600	X	X	X	X	X	X	X
800	-	X	X	X	X	X	X
1,000	-	X	-	-	X	-	-
1,200	X	X	X	-	X	X	X
1,800	X	-	X	X	-	X	X
2,000	X	X	X	-	X	X	X
2,250	X	X	-	X	X	X	X
2,400	X	X	X	X	X	X	X
2,500	-	-	-	X	X	X	X
2,700	-	X	X	X	X	X	X
3,000	-	-	-	X	X	X	X
3,200	-	X	X	X	X	X	X
3,600	-	X	X	X	X	X	X
4,000	-	X	X	X	X	X	X

Table 6 – Thickness of particle boards, mm

Thickness	3.2	4.0	5.0	6.0	8.0	10.0	12.0	15.0
		18.0	20.0	25.0	30.0	40.0	60.0	80.0

8.3 Mechanical and physical properties

Physical and mechanical properties of particle boards shall be as specified in Table 7.

Table 7 – Mechanical and physical properties of particle boards

Classification	Bending strength, kg/cm ² (min)	Modulus of elasticity, kg/cm ² (min)	Internal bond strength, kg/cm ² (min)	Face screw holding strength, kg/cm ² (min) ^a	Edge screw holding strength, kg/ (min) ^b
1. Pressed and impregnated paper-coated particle boards					
1.1 Type 200	180	2.5x10 ⁴	5	50	25
1.2 Type 150	140	2.0x10 ⁴	3	40	20
1.3 Type 100	80	1.5x10 ⁴	2	30	15
2. Veneered	Longitudinal-250 Lateral-90	3	50	-	Longitudinal-40 Lateral-15

8.4 Markings

Particle boards shall be marked with the following information:

- a) Manufacturer's name and trademark
- b) Classification; condition of the face and back, bending strength (for pressed particle boards), bonding; in that order.
- c) Dimension: W x L x T
- d) Country of manufacture

9 Fiber-cement flat sheets

9.1 Classification

9.1 Type A

Type A sheets are intended for external applications where they may be subjected to the direct action of sun and rain. They may be supplied coated or uncoated. These sheets are further classified into three categories according to their modulus of rupture (Table 8).

9.2 Type B

Type B sheets are intended for internal and external applications where they will not be subjected to the direct action of sun and rain. These sheets are further classified into five categories according to their modulus of rupture (Table 8).

Table 8 – Classification of fiber-cement flat sheets based on modulus of rupture

Values in megapascals

Category	Minimum modulus of rupture	
	Type A sheets	Type B sheets
1	-	4
2	-	7
3	7	10
4	13	16
5	18	22

9.2 Dimensions

9.2.1 Nominal length and width

Flat fiber-cement sheets are normally available in nominal lengths of 3,000 mm and nominal widths of up to 1,250 mm. Sheets of greater nominal lengths and widths may be supplied.

9.2.2 Thickness

Flat fiber-cement sheets are normally available in thickness from 3 mm to 30 mm, although thickness outside this range may be supplied.

9.3 Mechanical and physical properties

Where the product is supplied coated, the following mechanical and physical specifications shall apply to the coated product.

9.3.1 Modulus of rupture

The modulus of rupture of sheets shall be as specified in Table 8.

9.3.2 Apparent density

The manufacturer shall specify in his literature the minimum apparent density for each category of sheet and shall not be less than this value when tested in accordance with the method specified in section for the test for apparent density in ISO 8336.

9.4 Marking

Fiber-cement flat sheet packages shall be legibly and indelibly marked with the following information:

- a) Name and trademark of manufacturer
- b) Classification
- c) Dimensions
- d) Number of pieces
- e) Country of manufacture

10 Wood wool cement board

10.1 Dimensions and mass

The shape and dimensions of the wood wool cement board on air-dried state shall conform to Table 9 and the minimum mass and specific gravity shall be as specified in Table 10.

Table 9 – Dimensions of wood wool cement board

Unit: mm

Width	Length	Thickness
600	900	10
	2400	12
900	900	20
	1800	30
		50

Table 10 – Minimum mass and specific gravity of wood wool cement board

Thickness mm	Mass kg/m ²	Specific gravity
10	5.0	0.65
12	6.0	0.60
20	10.0	0.55
30	14.0	0.50
50	19.0	0.45

10.2 Marking

Wood wool cement board packages shall be legibly and indelibly marked with the following information:

- a) Name and trademark of manufacturer
- b) Dimensions
- c) Number of pieces
- d) Country of manufacture