3-and 5-layer panels

Spruce
Douglas Fir
Larch
Pine

Architects

Clients

Structural engineers

Carpenters

Timber contractors







Creative designs

Fresh perspectives

Cost-efficient floorspace

Ecological construction

Natural environment

Innovative timber solutions

Introduction

Introduction

Why use dold products?
What are their big advantages over other building materials?

„Because they combine the natural beauty of wood with the extra loadbearing strength of a modern, engineered solid wood panel. Our ***dold***® 3-layer and 5-layer panels offer a unique combination of versatile characteristics, plus a wide range of applications as a construction material."

The number of materials and products used in Timber Construction is constantly growing, and because of this, users need to carefully and continually evaluate the proper-ties and suitability for use, of any new construction product on the market.

When selecting new products and materials for use in any construction project, the most important criteria nowadays include its ecological neutrality, a good surface finish and ease of application. It is also important that the product's basic raw material – in this case, the sawlogs – comes from properly Certified (PEFC) sources.

Alongside well-established construction materials such as KVH, Glulam, OSB, plywood and plasterboard, as well as composite **I**-beams, it should now be unimaginable to contemplate building any timber construction without using our 3-layer and 5-layer panels.

The following pages will enable all those engaged in wood construction – designers, architects and builders – to use these high-quality panels both confidently and economically.

The Span Tables for our ***dold***® products have been produced using German National Technical Approvals, so that these products can be used safely for both decorative (non loadbearing) and loadbearing elements of construction.

Contents

Contents

Panel Types and Thicknesses
Loadbearing Construction Elements
- **Roof Eaves & Soffits**
- **Ceiling Diaphragm Panels**
- **Roof Sections / Hall Construction**

External Cladding
- **Industrial Buildings**
- **Public Buildings**
- **Residential Buildings**

Interior Construction
Surfaces
- **Durability**
- Rainfall
- Sunlight
- Ultraviolet Radiation
- **Protection of the External Timber**
- **Surface treatment**
- **Coatings**

Grade criteria for the outer layers of Spruce, Douglas Fir and Larch
Technical data
- **Features of the material**
- **Permissible Stress Values**

Calculation guides
Recommendations for Use and Storage
Declared Values
Declaration of conformity

Panel Types and Thicknesses

Panel Types and Thicknesses

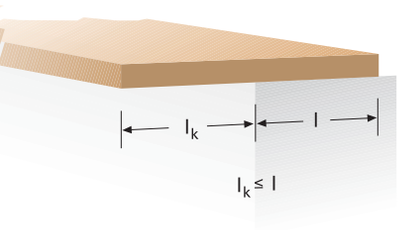
Panel type [make-up]	**Thickness** [mm]	**Length** [m]	**Width** [m]
3-layer (1A)	13	5.0	1.25 / 2.05 / 2.50
3-layer (2A)	16	5.0	1.25 / 2.05 / 2.50
without national tech. approval	19	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (3A)	21	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (4A)	27	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (5A)	32	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (6A)	42	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (7A)	52	5.0 / 6.0	1.25 / 2.05 / 2.50
3-layer (8A)	60	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (1B)	35	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (2B)	42	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (3B)	52	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (4B)	55	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (5B)	55	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (6B)	70	5.0 / 6.0	1.25 / 2.05 / 2.50
5-layer (7B)	80	5.0 / 6.0	1.25 / 2.05 / 2.50

Loadbearing Construction Elements

Loadbearing Construction Elements

Roof Eaves & Soffits

Present-day requirements for energy efficiency require an airtight roof construction with significant thicknesses of insulation. Thin roof eaves and soffits are often required for either structural or aestetic reasons – and with 3-and 5-layer panels used as self-supporting eaves overhangs, it is possible to rapidly construct eaves with spans from 1.0 m to 1.6 m, and with ready-to-use surfaces.



Advantages

- Lightweight roof eaves overhangs can be easily achieved
- No need to trim rafter ends
- Where soffits are loadbearing significant airtight eaves insulation can be achieved
- Sanded panels may be used without the need for fungicides or additional surface coatings





Ceiling Diaphragm Panels

For the transmission of horizontal forces within a building, it is possible to use our 3- and 5-layer panels in ceiling constructions, to act as a diaphragm (in accordance with DIN 1052: Part 10.3).

In order to achieve this, the large-format panels should be laid with the grain of the outer lamination at right-angles to the direction of the span of the floor joists; and to have a tongue & groove joint along their unsupported long edges.

Advantages

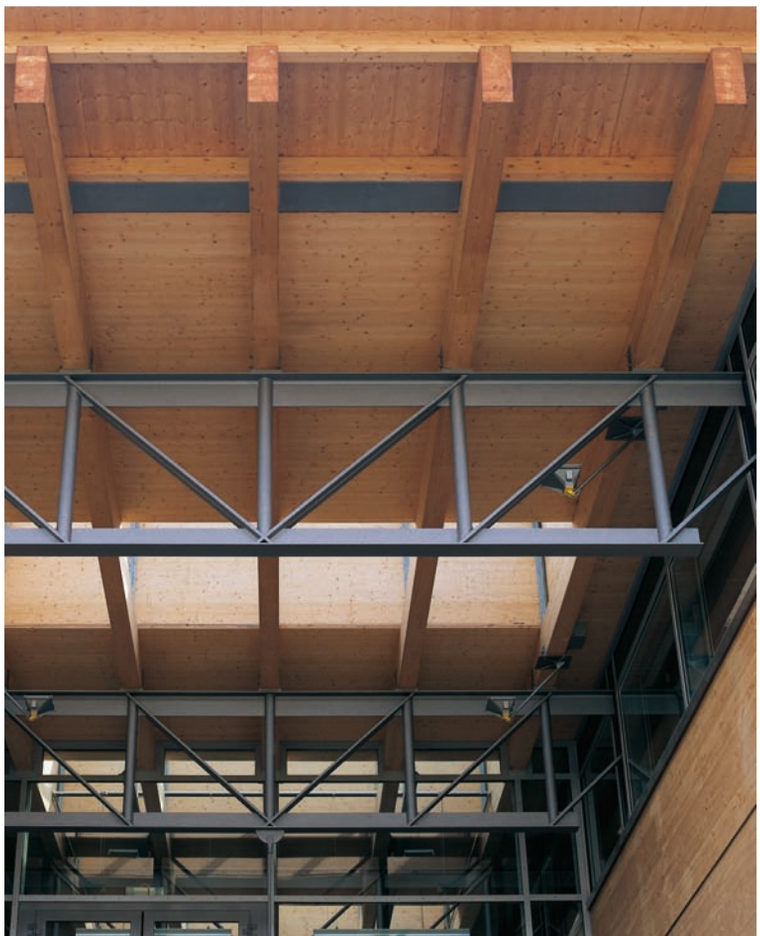
- Achievement of roof panels which meet the requirements of DIN 1052: Part 1
- Use in domestic buildings, even where joist spacings are in excess of 830 mm
- Floor stiffness greater than achievable with OSB-4
- Superior sound transmission properties between floors

Roof Sections / Hall Construction

When our 3- and 5-layer panels are used as load-bearing elements, roofs may be constructed without the need for intermediate purlins. It is also possible (when approved by a structural engineer) to obviate the need for main purlins and diagonal bracing.

Advantages

- Achievement of roof panels in accordance with DIN 1052: Part 1.
- With panel sizes of 5 m to 6 m long, the main truss spacings can be opened out (with panel butt-joints on the truss beams)
- The greater panel thicknesses of 42 mm to 80 mm make it possible to achieve self-supporting panels without the need for timber supports
- 3- and 5-layer panels can replace the need for steel ties and reinforcing rods in roof construction





External Cladding

External Cladding

Industrial Buildings
Public Buildings
Residential Buildings



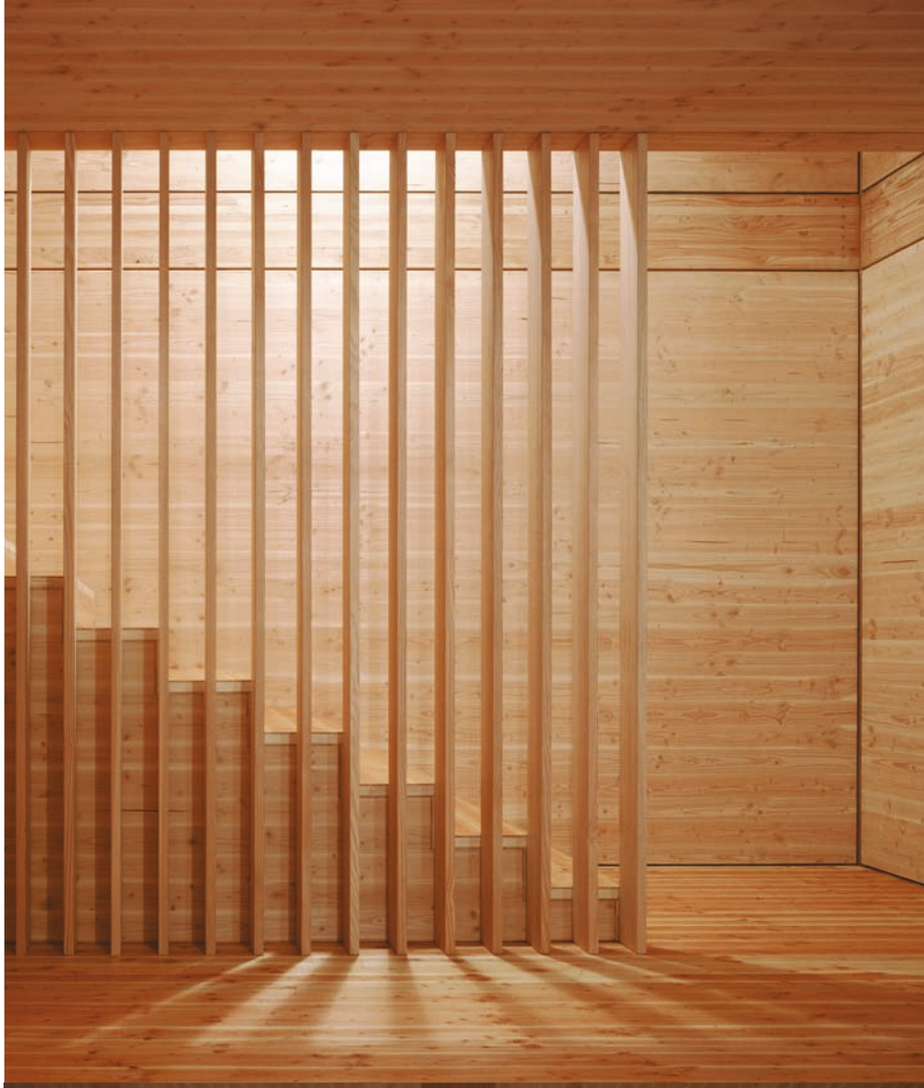
Advantages

- The wide variety of formats makes it possible to design external claddings to your own requirements, with attractive solutions possible even for large structures
- Panels using Larch or Douglas Fir in the outer 7 mm thick layer can be used without the need for protective finishes
- Cladding panels which have a wire-brushed or prepared (textured) surface will have a greater degree of resistance to weathering



Interior Construction

Interior Construction







Surfaces



Durability

The moisture content of our 3- and 5-layer panels is naturally an essential factor in achieving their durability. Matters relating to weather protection of the claddings need to be addressed by the designer or architect; even where the more resistant species of Larch and Douglas Fir are used. We can only make general recommendations here, regarding the influence of weather on the panel surfaces.

By influence of weather we understand:

Rainfall

Direct wetting for long periods will cause the moisture content of the timber to increase. Uneven moisture distribution within the panels may lead to splits in the surface layers, despite the „cross-banded“ glued construction of the product. If the moisture content should exceed 18 % for extended periods, then some fungal staining may occur, which will detract from the appearance of the panels.

Sunlight

The panel surfaces are heated by solar gain and this can lead to moisture differences within the surface and the development of splits. Lighter-coloured surfaces are less prone to solar gain and so heat up less: therefore consideration should be given to the use of lighter-coloured surface finishes, rather than darker ones.

Ultraviolet Radiation

UV radiation will accelerate the weathering of timber, by decomposing its surface; and as a result, some surface deterioration is to be expected. Sometimes, architects and specifiers choose to let timber “weather” naturally; but not all clients like this effect. In order to protect the wood surface, only finishes with high levels of pigmentation should be employed



Protection of the External Timber

It is much better to protect timber by means of „positive action“ than to use other methods, such as chemicals. Here are some suggestions for extending the life of the surface finish:

- Install a ventilated cladding, with adequate movement gaps
- Construct adequate eaves overhangs for protection
- Use water-shedding profiles at joints
- Protect against splash-up at the base of panels (minimum 300 mm between cladding base and ground level)
- Put a machined chamfer on the edge of the panel in order to prevent water collecting
- Protect panel edges by coating or treatment

Surface Treatment

The panels should have the outer face wire-brushed or sand-blasted, to remove the softer tissue (earlywood). The remaining hard material (latewood) has greater resistance to splitting (surface checking) and finishes will adhere better because the roughened wood has a greater surface area for uptake.



Coatings

We use only SIKKENS products, applied in two stages. Each piece passes through a dryer after coating, and the edges are treated at the same time. Such a process results in an even spread of finish, giving a visually homogeneous surface.

Exterior wood finishes having a „microporous“ surface are suitable: this is because moisture can pass through the coating without causing it to flake or peel off. Non-pigmented finishes are not suitable for outdoor use. The RAL Colour range produces an opaque finish, which masks the natural colour of the wood surface. These products contain a high proportion of pigments and are suitably microporous, so the finish will not crack or peel off.

Grade Criteria for the outer layer of Spruce, Douglas Fir, Larch and Pine

Grade Criteria for the outer layer of
Spruce, Douglas Fir, Larch and Pine

The panels are judged by appearance into three grades: (A, B, C)
(See below an extract from Ö-Norm B-3022, DIN EN 13017-1)

Grade Criteria	Grades		
	A	B	C
General Requirements	Perfect gluing No open joints	Perfect gluing No open joints	Perfect gluing
Structure and grain direction	Close-grown straight grained	Good wood structure, slight spiral grain	No special requirements
Knots	Sound, tight knots, permitted size of knots: Spruce: 30 mm Douglas Fir: 50 mm Larch: 50 mm	Sound, tight knots, occasionally black knots permitted	No special requirements
Repaired knot holes	Occasionally permitted	Permitted	No special requirements
Resin pockets	Occasionally permitted, max. size 2 x 30 mm	Permitted up to 5 mm x 50 mm	No special requirements
Repaired resin pockets	Occasionally permitted	Permitted	No special requirements
Bark pockets	Not permitted	Occasionally permitted	No special requirements
Fissures	Slight fissures on the surface occasionally permitted	Slight fissures on the surface occasionally permitted, continuous fissures on the ends with lengths up to 50 mm occasionally permitted	No special requirements
Amount of pith	Practically none	Permitted	No special requirements
Compression wood	Practically none	Permitted	No special requirements
Insect attack, worm holes	Not permitted	Not permitted	Live insect attack not permitted, worm holes occasionally permitted

Technical data

Technical data

Features of the material

Moisture content ex works (average)	u = 9 ± 3 %
Density at 9% m.c.	480 kg / m³
Vapour permeability KD	μ = 70
Vapour permeability unseasoned	μ = 150
Gluing	Phenolic resin (hot pressed)

Characteristic strength and stiffness values [N/mm²] of selected panel types

(in line with German National Approval Number: Z-9.1-258) for dimensioning according to DIN 1052:2008-12

		3-layer solid timber panels								5-layer solid timber panels						
Nominal thickness [mm]		13	16	21	27	32	42	52	60	35	42	52	55	55	70	80
Thickness of outer layer [mm]		4,2	4,4	6,9	6,9	6,9	6,9	6,9	6,9	6,7	6,9	6,9	6,9	6,9	6,9	6,9
Intermediate layer [mm]		-	-	-	-	-	-	-	-	7,2	7,2	7,2	7,2	7,2	7,2	7,2
Central layer [mm]		4,6	7,2	7,2	13,2	18,2	28,2	38,2	46,2	7,2	13,8	23,8	26,8	26,8	41,8	51,8
Strain of panel																
Bending stress	$f_{m,0}$	33,0	30,0	29,0	23,9	22,1	19,0	16,6	15,0	21	20	19,1	16	23,9	21,4	19,9
	$f_{m,90}$	5,8	7,2	5,6	8,0	10,0	13,1	15,3	16,6	11	11,7	11,9	15,8	8	10,8	12,3
Modulus of elasticit bending	$E_{m,0}$	10500	10000	10500	9700	9000	7700	6700	6100	8500	8100	7800	6500	9700	8700	8100
	$E_{m,90}$	800	1300	750	1600	2300	3500	4500	5200	2700	3200	3500	4800	1500	2600	3200
Shear	f_v	1,5								1,5						
Modulus of shear	G	60								60						
Strain of diaphragm																
Bending stress	$f_{m,0}$	17,7	15,2	18,0	14,2	12,1	9,4	7,8	6,9	16,2	18,0	19,7	7,4	14,2	11,4	10,0
	$f_{m,90}$	10,1	12,6	9,8	13,6	15,7	18,4	20,0	21,0	11,6	9,8	8,1	20,4	13,6	16,4	17,7
Compressive strength	$f_{c,0}$	14,4	12,4	14,7	11,5	9,9	7,7	6,3	5,6	13,2	14,7	16,1	6,0	11,6	9,3	8,2
	$f_{c,90}$	8,2	10,2	8,0	11,1	12,8	15,0	16,3	17,1	9,4	8,0	6,6	16,6	11,0	13,4	14,4
Tensile strength	$f_{t,0}$	10,5	9,0	10,7	84,0	7,2	5,6	4,6	4,0	9,6	10,7	11,7	4,4	8,4	6,7	5,9
	$f_{t,90}$	6,0	7,4	5,8	8,0	9,3	10,9	11,8	12,4	6,8	5,8	4,8	12,1	8,0	9,7	10,5
Shear	f_v	2,7								2,7						
Modulus of elasticity bending	$E_{m,0}$	7200	6200	7300	5800	4900	3800	3100	2800	6600	7300	8000	3000	5800	4600	4100
	$E_{m,90}$	4100	5100	4000	5500	6400	7500	8100	8500	4700	4000	3300	8300	5500	6700	7200
Modulus of shear	G	600								600						

Make-up of panel: * |---| ** ||-||

This table has been drawn up exclusively using values from the German national technical approval Z-9.1-258 and may only be used to assess products manufactured by ***dold***®.

Values for uses below an angle 0-90° can be taken from the German National Technical Approval n° Z-9.1-258. Intermediate values may be interpolated linearly.

If 3- or 5-layer panels are expected to be exposed to a moisture level of more than 18 % m.c. during a prolonged period (ie, several weeks) then the permissible stresses must be reduced by 25 %.

Glue Bond Quality	Class SWP/3 in accordance with CEN/TS 13354	
Formaldehyde Class	E1	
Reaction to fire	Class	D
	Smoke Classification	s2
	Stability	d0
Impact sound absorption	0.1 for frequencies from 250 Hz - 500 Hz (in accordance with prEN 13986:2004 (D))	
	0.3 for frequencies from 1000 Hz - 2000 Hz (in accordance with prEN 13986:2004 (D))	
Thermal conductivity	0.12 W/m*k (in accordance with prEN 13986:2004 (D))	
PCP content	< 5 ppm	

Vapour permeability

	Dry situation	Humid situation
3-layer solid timber panel	150	76
5-layer solid timber panel	135	67

(in accordance with prEN 13986:2004 (D))

Airborne sound absorption

3-layer solid timber panel [mm]	16	21	27	32	42	52	60
R (db)	7.22	26.9	28.2	28.8	30.4	31.8	32.6
5-layer solid timber panel [mm]	35	42	52	55	55	70	80
R (db)	29.6	30.6	31.8	32.1	32.1	33.5	34.2

(in accordance with prEN 13986:2004 (D))

Calculation guides

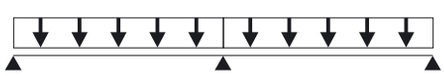
Calculation guides

Permissible maximum spans indicated in [m] in case of a load H
Permissible deflection = l/300



Total Distributed Load [kN/m²]	**Panel thickness** [mm] **(structure)**							
	16 (2A)	**21 (3A)**	**27 (4A)**	**32 (5A)**	**42 (6A)**	**52 (7A)**	**60 (8A)**	
1	0.92	1.21	1.50	1.78	2.23	2.62	3.02	
1.5	0.81	1.06	1.31	1.55	1.95	2.29	2.64	
2	0.73	0.96	1.19	1.41	1.77	2.08	2.40	
2.5	0.68	0.89	1.10	1.31	1.64	1.93	2.23	
3	0.64	0.84	1.04	1.23	1.54	1.82	2.10	
3.5	0.61	0.80	0.99	1.17	1.47	1.73	1.99	
4	0.58	0.76	0.94	1.12	1.40	1.65	1.90	
4.5	0.56	0.73	0.91	1.08	1.35	1.59	1.83	
5	0.54	0.71	0.88	1.04	1.30	1.53	1.77	

Permissible maximum spans indicated in [m] in case of a load H
Permissible deflection = l/300



Total Distributed Load [kN/m²]	**Panel thickness** [mm] **(structure)**							
	16 (2A)	**21 (3A)**	**27 (4A)**	**32 (5A)**	**42 (6A)**	**52 (7A)**	**60 (8A)**	
1	1.25	1.64	2.03	2.41	3.02	3.56	4.10	
1.5	1.09	1.44	1.78	2.10	2.64	3.11	3.59	
2	0.99	1.31	1.61	1.91	2.40	2.82	3.26	
2.5	0.92	1.25	1.50	1.78	2.23	2.62	3.02	
3	0.87	1.14	1.41	1.67	2.08	2.47	2.85	
3.5	0.83	1.08	1.34	1.59	1.92	2.34	2.70	
4	0.79	1.04	1.28	1.52	1.80	2.24	2.59	
4.5	0.76	1.00	1.23	1.46	1.70	2.15	2.49	
5	0.73	0.96	1.19	1.41	1.61	2.08	2.40	

These tables may only be used for an initial assessment of the dimension. Prior to installation of the panels, an exact static proof must be supplied. The net weight of the panel must be taken into consideration.
The stress value for panels with one or more spans is not taken into account.

In the table, creep deflection as well as the weight of persons working on a panel (for example if the panel is used as part of a roof construction) have not been taken into consideration.
These tables have been drawn up exclusively using values from the German National Technical Approval n° Z-9.1-258 and may only be used to assess products manufactured by ***dold***®.

Recommendations for Use and Storage

Recommendations for
Use and Storage

Recommendations for **the use of our panels** are given below.

If the panels are to be used out-of-doors, these recommendations must be strictly followed. We will not guarantee any panels where these recommendations have not been adhered to.
Please advise your customers of these Conditions of Use.

- If multi-layer panels are used for exterior claddings, we recommend quality grade AB/C, having a thickness of 21 mm. Lower grades and thicknesses may result in visual or technical problems.

- Surface checking (fissuring) is a natural characteristic of timber used externally and is not to be considered as a fault. In general, thinner panels with outer layers less than 7 mm in thickness may tend to fissure and reveal the inner layers.

- Scouring or sand-blasting of the outer surface will considerably reduce fissuring/checking. Moreover, scoured panels are more suitable for treatment with exterior finishes, since they give better uptake and retention.

- Panels treated on one face only will tend to distort. It is recommended to treat both front and back faces prior to installation.

- Panels must be protected against moisture uptake. Users should follow general guidelines for timber protection given in current and relevant EN Standards.

- All edges must be protected against the possibility of water entrapment by suitable detailing (eg by chamfering the edges) and/or by using metal profiles to cover horizontal edges.

- Multi-layer panels which are not protected by suitable surface finishes may react to contact with moisture and metals by showing a blackish discolouration. Only appropriate stainless steel or other non-ferrous fixings should be used. It is not advised to carry out work which may generate metal dust, in the vicinity of these multi-layer panels.

Recommendations for **the storage of our panels** are given below.

The multi-layer panels must be stored flat and horizontally, in enclosed dry storage. They must be placed on bearers, spaced at maximum 1 m centres, and must be carefully covered and protected during storage. If this is not done, then damage and distortion to the panels may occur, for which we will not accept any responsibility.
Please advise your customers of these Conditions of Storage.

Conditions Governing Use of Multi-Layer Panels:
Dold Holzwerke GmbH will not accept any responsibility for wrong use or application of their products. For outdoor use, panels must be treated with an appropriate surface finish and protected against moisture movement or distortion in service by correct design detailing and installation.

All data is subject to change without prior notification

CE

Applicable technical grade					
0766 – CPD –					
0036	0039	0037	0040	0038	0041
L3	L5	L3	L5	L3	L5
SWP 1		SWP 2		SWP 3	

Dold Holzwerke GmbH
Talstrasse 9
DE-79256 Buchenbach
Phone: +49 (0)7661/3964 - 0
e-mail: panel@dold-holzwerke.com

2005

EN 13986 E1

Declaration of conformity
0766 – CPD – 0038/0041

Dold Holzwerke GmbH
Talstrasse 9
DE-79256 Buchenbach

This Certifies that the products: **L3 - L5 three- and five-layer solid timber panels**
(for **exterior** application – technical class **SWP/3 L3 and L5**)

manufactured by: Dold Holzwerke GmbH
Talstrasse 9, DE-79256 Buchenbach/Schwarzwald
Phone: +49(0)7661/3964-0, e-mail: panel@dold-holzwerke.com

and intended for constructional use
– for **exterior applications** as a **structural** element –
exhibit the following characteristics:

	(L3) 3-layer solid timber panel	**(L5) 5-layer solid timber panel**
Thickness	13 - 60 mm	35 - 80 mm
Reaction to Fire	D-s2, d0	D-s2, d0
Density	430 kg/m³ (min) E1	430 kg/m³ (min)
Formaldehyde Class	E1	E1
PCP Content	< 5 ppm	< 5 ppm

[corresponding to EN 13986: 2002, enclosure ZA]

Accompanying Certificate no. **0038/0041** (copy attached)
Issued by **IHD – Dresden**, having the identification number **0766**

Buchenbach, 31st March 2006

Dold Holzwerke GmbH
Dipl. Ing (FH) Klaus Faller
(Production Manager)

Declaration of conformity

Dold Holzwerke GmbH
Talstrasse 9
DE-79256 Buchenbach

This Certifies that the products: **L3 - L5 three- and five-layer solid timber panels**
(for **exterior** application – technical class **SWP/3 L3 and L5**)

manufactured by: Dold Holzwerke GmbH
Talstrasse 9, DE-79256 Buchenbach/Schwarzwald
Phone: +49(0)7661/3964-0, e-mail: panel@dold-holzwerke.com

and intended for constructional use
– for **exterior applications** as a **non-structural** element –
exhibit the following characteristics:

	(L3) 3-layer solid timber panel	**(L5) 5-layer solid timber panel**
Thickness	13 - 60 mm	35 - 80 mm
Reaction to Fire	D-s2, d0	D-s2, d0
Density	430 kg/m³ (min)	430 kg/m³ (min)
Formaldehyde Class	E1	E1
PCP contents	< 5 ppm	< 5 ppm

[corresponding to EN 13986: 2002, appendix ZA]

Buchenbach, 31st March 2006

Dold Holzwerke GmbH
Dipl. Ing (FH) Klaus Faller
(Production Manager)

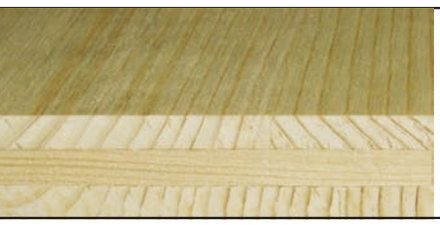
Note 1: For products used as structural elements, a copy of the Certificate issued by in-house Production Control must be attached to the declaration.
Note 2: For products for which Certification is required (for example, treatment with Flame-retardants) a copy of the Conformity Certificate issued by the Notified Body must be attached.
Note 3: This Declaration and each attached Certificate must be supplied in the language(s) of the country in which the product is to be used.
Note 4: It is recommended that the Reaction to Fire Classification, as claimed for all applications to which the panels are to be put, should be specified on the reverse of the Validity Conditions. Panels are to be installed without a ventilation gap, directly onto supports comprised of a product of Class A1 or A2-s1, d0, with a minimum density of 10 kg/m3 (for example, thermal insulation products such as Rockwool or glass wool) or at least by a product of Class D-d2, d0, with a density of 400 kg/m3 (for example, fibre insulation boards).



3-layer



5-layer



Spruce



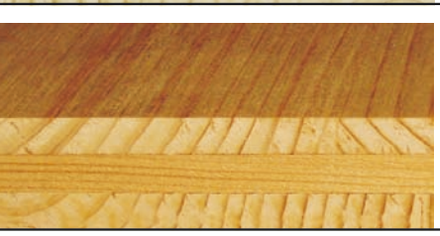
Douglas Fir



Larch



Pine



Thermowood

© 06/2006 dold Holzwerke - GB

For further details, please contact

Dold Holzwerke GmbH
Talstrasse 9
DE – 79256 Buchenbach, GERMANY

Phone: +49 7661 3964 334
Fax: +49 7661 3964 339
E-mail: panel@dold-holzwerke.com
www.dold-holzwerke.com

Dold Puidutööstuse AS
Riia maantee 56
EE - 71009 Viljandi, ESTONIA

Phone: +372 435 2500
Fax: +372 435 2519
E-mail: contact@dold-estonia.com
www.dold-estonia.com

All technical data subject to change without notice