

## SmartPly Frame

SmartPly Frame is an OSB/3 panel that is specifically engineered to provide superior racking resistance, stiffness and durability to framed structures. It is the ideal sheathing panel for a wide variety of load-bearing applications including: external walls, party walls, internal walls and partitions, spandrel (gable) panels, warm walls, reverse walls and Structural Insulated Panels (SIP's).



### Quality & Environmental Certification:

SmartPly OSB is manufactured in accordance with the requirements of EN 300: Oriented Strand Boards (OSB) - *definitions, classification and specifications*.

SmartPly OSB is CE marked in accordance with the harmonised standard EN 13986: *Wood-based panels for use in construction - characteristics, evaluation of conformity and marking*. This standard is a technical specification for wood-based panels which implements the provisions of the Construction Products Directive (CPD). In addition to the CE mark, SmartPly OSB panels are marked 2+ Structural for ease of reference.

SmartPly OSB/3 is certified by the Irish Agrément Board (IAB) and the British Board of Agrément (BBA). Due to this certification it is permitted for structural use by Homebond (Ireland) and NHBC (UK) when used in accordance with the requirements of the Building Regulations in the country of

use. Other quality certification includes SINTEF (Norway) and KOMO (Netherlands).

SmartPly has achieved I.S. EN ISO 9001:2008, the internationally recognised quality management system which is certified by the National Standards Authority of Ireland (NSAI).

SmartPly has Forest Stewardship Council (FSC) Chain of Custody certification for its manufacturing, processing, sales and distribution processes.

SmartPly operates under an Integrated Pollution Prevention Control (IPPC) licence, which is monitored by the Environmental Protection Agency (EPA) in Ireland.

All SmartPly OSB/3 products are manufactured using formaldehyde-free resin.

**SmartPly**<sup>®</sup>  
The Smart OSB Answer to Plywood

**Suitability:** The selection of SmartPly OSB/3 Frame panels depends on an overall assessment of wall performance of which the most important factors are:

- **Strength and stability:** SmartPly Frame panels are primarily used to provide the necessary wall panel stiffness to resist lateral (racking) forces due to wind loads. Framed external walls are required to carry the dead load and imposed loads (including wind loads) acting on the structure and transmit them to the foundations.

- **Durability/ambient moisture conditions:**

SmartPly Frame panels are engineered to perform structurally in humid conditions thanks to its advanced resin formulations. The use of SmartPly Frame in wall panels enables rapid enclosure of the structure before claddings are applied and the sheathing panels provide a solid backing for fixing breather membranes, cavity barriers, cavity trays, flashings, etc. The sheathing also reduces the risk of damage or distortion of manufactured wall panels during transport and erection.

Moisture conditions can affect the performance of OSB wall sheathing panels. Wall structures should be assigned to one of the three service classes defined in EN 1995-1-1 (Eurocode 5). OSB/3 is only suitable for service class 1 and 2.

As well as conditions in service, consideration must also be given to the construction phase where high levels of moisture or humidity often exist. In such conditions SmartPly strongly recommends the use of OSB/3. Detailed guidance is provided in the 'Moisture Content' section of this technical datasheet.

- **Thermal performance:** SmartPly Frame sheathing can have a positive effect on the thermal performance of framed walls. The sheathing can help to ensure the specified performance of insulation materials as it encloses and supports the insulation, thereby helping to prevent thermal bridging and thermal looping. SmartPly Frame panels have a textured finish on one face (the inside face when installed in a wall panel) which can provide a good friction-fit to prevent sagging of fibre-based insulation.

The use of SmartPly Frame in Passive and low-energy framed buildings is increasing in popularity due to its

natural ability to resist the passage of air (not to be confused with water vapour permeability). The sheathing can act as either an external wind barrier or internal air barrier, which further improves the thermal performance of framed walls by protecting the insulation from the effects of moisture movement.

Due to the growing awareness of the thermal performance of buildings and the resulting changes to building regulations, there are many new and innovative framed wall systems in use, for example closed panels or reverse walls. A condensation risk analysis or advanced hygrothermal assessment of any such wall system is recommended to ensure that the OSB will not be at risk of moisture damage throughout the life of the building. Always check current regulations specific to the country of use.

**Specification & design:** As design values can vary between manufacturers, it is important to ensure that the SmartPly Frame panels specified by the designer are those used on site. All SmartPly panels are clearly marked with the following information:

- (a) Major axis (length of panel, direction of laying arrows)
- (b) Production identification number
- (c) Product Certification mark (e.g. BBA, IAB)
- (d) CE marking
  - i. Manufacturer's name / Logo (SmartPly)
  - ii. Notified body identification number
  - iii. Quality certification (EN 300, EN 13986)
  - iv. Panel type (e.g. OSB/3)
  - v. Thickness (e.g. 18mm)
  - vi. Formaldehyde class (e.g. E1)
- (e) Additional marking for ease of reference (e.g. 2+ structural)
- (f) FSC certification

Note: Markings may vary depending on product type.

The most popular panel sizes for wall sheathing are 2397 x 1197mm and 2697 x 1197mm, which are ideally suited to timber frame manufacturing although other panel sizes are available. For the full product range, please refer to the Product Selector table in SmartPly technical datasheet #1 – 'About SmartPly'.

The most common thickness of SmartPly Frame sheathing is 9mm, although 11mm is recommended where extra strength and/ or dimensional stability is required. Recommended sheathing thickness for typical stud centres are given in Table 1 (below), subject to structural design requirements:

Table 1 Thickness of SmartPly OSB Frame sheathing panels for typical wall stud centres	
Stud centres (mm)	Sheathing thickness (mm)
400	9 / 11
600	11

SmartPly Frame panels are square edge (SE), but tongue & groove (T&G) panels in greater thicknesses are available on request. Guidance on expansion gaps, laying and fixing is provided below.

Wall diaphragms must be designed to resist both horizontal and vertical actions imposed upon them. Two alternative simplified methods of calculation are given in EN 1995-1-1 (Eurocode 5) and it is the designer's responsibility to ensure the correct method is used for a particular country of use.

**Method A:** This method should only be applied to wall diaphragms with a tie-down at their end; that is the vertical member at the end is directly connected to the construction below.

**Method B:** This method is applicable to walls made from wood-based panels only (including SmartPly Frame), fastened to a timber frame. This method covers requirements for strength, stability and stiffness and is derived from BS 5268-6, so compliance should ensure that the horizontal deflection of individual wall panels does not exceed  $0.003h$  or  $h/333$ , where  $h$  is the storey height. However, for medium-rise buildings tighter deflection limits may be more suitable.

The fastening of the panels to the frame must be by either nails or screws and the fasteners must be equally spaced around the perimeter of the panel. Fasteners within the perimeter of a sheet must be spaced at not more than twice the perimeter fastener spacing. Detailed guidance is provided in the 'Fixing' section of this technical datasheet.

### Transportation, storage & handling:

Careful transportation, storage and handling are important to maintain panels in their correct condition for use.

Precautions must be taken during storage, prior to delivery and on site to minimise changes in moisture content of the OSB panels due to weather.

Panels must be stored on dry bases, and packs must be evenly supported on bearers with spacer sticks at regular intervals (depending on panel thickness but max 600c/c). Packs should be sheeted with tarpaulins or other impervious material so arranged to give full cover, but at the same time to permit free passage of air around and through the pack. Care must be taken not to deform stacked panels. Bands should be cut as soon as practical and safe to avoid permanently deforming the panels. During transport and handling it is particularly important to protect edges and corners with suitable coverings to prevent damage from chafing or slings.

Fabrication of structural timber frame wall panels should be carried out by an approved timber frame manufacturer. Prefabricated panels incorporating SmartPly Frame must be protected from the weather and care must be taken not to deform stacked panels during storage and transport to site. Where the sheathing panels are required to have low moisture contents, it might not be possible to maintain suitable conditions on site other than for short periods, and deliveries must be arranged accordingly.



**Assembly and erection:** The erection sequence and site storage must be planned so as to minimise the length of time that panels are left uncovered. Re-use polythene wrapping to provide weather protection to open packs during erection or site delays. In the case of prefabricated wall panels, lifting points must be clearly indicated and care needs to be taken during lifting to avoid distortion of the panels, straining of the fixings and joints and damage to edges.

Installed OSB/3 panels can withstand short periods of temporary wetting during construction, although such exposure must be minimised as much as possible. A correctly specified and fitted breather membrane is required to provide protection to the wall panels during construction and throughout the life of the building, so care is required to ensure that the breather membrane is correctly lapped at wall panel junctions, over DPC's and cavity trays, etc. Particular care is required to protect panel edges around openings. Damaged breather membrane must be suitably repaired as quickly as possible. Long-term weather protection of timber frame walls is achieved by the external cladding, so this should proceed as soon as practicable after the erection of the wall panels.



**Moisture content:** Moisture content of wood-based panel products varies in accordance with the moisture content of the surrounding environment and is affected primarily by the relative humidity (RH) of the surrounding air. It moves towards and maintains an equilibrium moisture content (emc), i.e. one that is in equilibrium with the surrounding air. This means that the moisture contents of the panel products will vary depending on the situation of use and with time as temperature and humidity conditions change. Although it is not possible to give precise levels, the figures in table 2 (below) give a general indication of the range of moisture contents in wood-based panels in various conditions:

**Table 2 Equilibrium moisture content & conditions of use (extracted from DD CEN/TS: 12872)**

Service class	Normal range of RH at 20°C	Approx emc	Conditions of use
1	30% to 60%	4% ≤ emc ≤ 11%	Dry installations, no risk of wetting in service
2	65% to 85%	11% ≤ emc ≤ 17%	Risk of wetting during installation and risk of occasional wetting in service

As required by EN 300, the ex-works moisture content of SmartPly OSB panels is in the range of 2 -12%, depending on the type of panel. As recommended in BS 8103-3, the moisture content of panels at the time of erection or fixing must be no greater than 12%. As a guide, normally the following moisture content ranges are encountered for various heating conditions:

**Table 3 Typical moisture contents for various heating conditions (extracted from BS 8103-3)**

Unheated	15% to 19%
Intermittent heating	10% to 14%
Continuous heating	9% to 11%
Underfloor heating	6% to 8%

This indicates that unconditioned newly manufactured panels can increase in moisture content when installed in a building under construction and subsequently change in moisture content as the building is occupied, heated and dries out, with the consequence of dimensional changes. For guidance purposes it may be assumed that a 1% change in panel

moisture content will cause a dimensional change in panel width, length and thickness as given in Table 4 (below):

<b>Table 4 Dimensional change for a 1% change in panel moisture content (Extracted from DD CEN/TS: 12872)</b>			
Panel type	Length %	Width %	Thickness %
OSB/3	0.02	0.03	0.5

**Conditioning:** To minimise dimensional changes, the sheathing panels must be conditioned in the service class for the intended use by loose laying or stacking with spacers as appropriate. The length of time allowed for conditioning will vary depending on the panel and the likely condition of use. A minimum period of 48 hours is required but a longer period of up to 1 week is necessary in more extreme conditions. Failure to condition panels can result in buckling of the installed OSB panels.

**Expansion gaps:** The ‘Moisture Content’ section of this technical datasheet explains how wood-based panels experience dimensional change when subjected to changes in moisture content. It is necessary to allow for such movement by incorporating expansion gaps as follows:

- **Perimeter, upstands and abutting construction:**

A gap must be left wherever panels abut any rigid upstand or abutting construction such as a concrete wall, column, lift shaft, chimney, etc. This gap must be 2mm per metre length of wall but not less than 10mm wide. This gap applies where both square edge and T&G panels are used.

- **Long walls:** On long walls (above approximately 10-12m), it may be necessary to divide the area into smaller independent sections by incorporating intermediate expansion gaps. These gaps must allow for a possible overall expansion of 2mm per metre length of wall and applies where both square edge and T&G panels are used.

The spacing of these gaps depends largely on the type of wall and its design, i.e. external, party, internal partition, etc. In order to simplify the installation of the panels, where possible these intermediate expansion gaps should coincide with other designed-in breaks in the wall plane, for example at party walls, structural movement zones, etc. These expansion gaps must be covered by adequately lapped breather membrane

A sensible spacing for intermediate expansion gaps is 7200mm, i.e. every 3 panels where they are laid perpendicular to the studs or every 6 panels where they are laid parallel to the studs. This dimension also suits nominal framing centres of 400 and 600mm. It is important that the panels are installed in the direction of the design.

This guidance applies to thermal and moisture movements of the OSB only. Structural movement of the wall panels should also be accommodated if specified by the designer.

- **Between square edge panels:** A 3mm gap must be left between all adjoining square edges of panels. It is essential that the gaps are kept free from plaster and mortar droppings and other debris during construction.

**Notes:** Where thicker panels with T&G joints are used for wall sheathing, these panels have an expansion gap included in the T&G joint, so panels must be butted together with the joints glued but the requirement for perimeter and intermediate expansion gaps still applies.

Depending on stud material and width, extra studs or noggins may be required to support panel edges and facilitate edge fixing of panels. Panels should have a minimum bearing of 17.5mm on studs, rails or noggins. Most commercially available timber stud widths (the most common being 38mm CLS) provide adequate edge support while also facilitating the 3mm expansion gaps between square edge panels. Where narrow studs (<38mm) are used, a double stud or extra noggins will be required or T&G4 panels should be used.

The above guidance is based on the requirements for expansion gaps given in BS 8103-3 and DD CEN/TS 12872 and SmartPly’s long-term experience. However, it is recommended to calculate the specific expansion requirements for every sheathing application taking both the moisture content during construction and the expected in-service equilibrium moisture content into account. Failure to leave adequate expansion gaps can result in buckling of the OSB panels.

**Installation:** SmartPly Frame sheathing panels can be used in wall panel assemblies either prefabricated off-site or in 'stick-built' framed construction assembled on site. Prefabricated panels are typically protected from the elements by breather membrane but when building using the 'stick-built' method, the area of sheathing installed in any working day must be no greater than can be quickly protected from wetting. Supporting studs should be plumb and in line. Studs, rails and noggins must provide adequate support for the panel edges in line with the design of the wall structure, as described above.

Timber studs or rails treated with water-borne preservative or which have high moisture contents must be dried to moisture contents less than 20% prior to fixing the OSB sheathing panels as the water can migrate from wet timber into the panels and may cause localised swelling.

SmartPly OSB sheathing panels have maximum strength and stiffness along the length (major axis) and are therefore typically laid to best structural advantage with the long edge in line with vertical load paths. However, panels must be installed in the direction assumed by the design and must take such factors as racking resistance, disproportionate collapse, wind and seismic forces into account. Maximum strength and stiffness will be obtained if each panel is continuous over at least two spans between studs. To facilitate ease of installation, panels are marked with laying direction arrows, indicating the major axis. Panels must be laid with the identification marks facing the wall structure.

For square edge panels, it is essential that panels are supported continuously along all edges by studs, rails or noggins. For T&G panels, both short edges must be supported by the centre line of a stud or noggin but no support is necessary under the long edges set between correctly spaced studs. When using either square edge or T&G panels, joints along the short edges must be staggered and the panel length must not be less than two stud spacings. It is essential that edges around the perimeter of the wall panel are continuously supported, either on studs, rails or noggins.

T&G panel joints should be glued using a moisture resistant polyvinyl acetate (PVA) adhesive conforming to EN 204

ensuring a snug fit with all T&G joints. This ensures a reliable distribution of strength, stiffness and spanning capacity along and across the panel.

**Fixing:** All panels must be fastened firmly to the supporting timber with flat head smooth round steel wire nails or machine-driven steel nails. Typical specified nail diameters are 2.8, 3.0, 3.1 and 3.35mm, depending on the building class and method of driving. The smaller of these diameters is preferable for  $\leq 38\text{mm}$  thick studs to reduce the possibility of splitting. Detailed guidance on nail specification is given in EN 1991-1-7 (Eurocode 1).

All fixings should be a minimum of 50mm in length or 2.5 times the thickness of the panel, whichever is greater. In service class 2, fixings must be corrosion resistant.

Fixings should be spaced at 150mm centres along panel perimeters and at 300mm centres on intermediate studs. Fixings must be at least 10mm from the edge of the panel. In order to avoid buckling, fixings should commence at the top centre of the panel and continue outwards and downwards.

The above recommendations are a combination of those extracted from the 'Manual for the design of timber building structures to Eurocode 5', EN 1991-1-7 (Eurocode 1) and based on SmartPly's long-term experience. A structural engineer may specify different fixings requirements based on calculated design but such mechanical fixing must not excessively restrict the natural movement of the OSB panels.



**Finishing:** As there are many different methods of timber frame wall construction in use, it is the designer and contractors responsibility to ensure that adequate design and construction measures are employed that provide adequate long-term moisture protection to the timber frame structural inner leaf.

This involves the careful design and installation of the structural timber frame, foundation system, type of fixings, vapour control layer, insulation, breather membrane, services penetrations, wall ties, dpc, cavity trays, flashings, cavity barriers, firestops and cladding system.

Detailed recommendations for control of condensation are given in BS 5250 which now refers to EN ISO 13788 as the method of calculation (Glaser method), but more modern and advanced methods of hygrothermal simulation are recommended, as detailed in EN 15026.

Energy upgrades to existing timber frame buildings require specialist knowledge and expert advice must be sought before proceeding with such upgrade work. It is not recommended to fill the cavity of a timber frame building unless the specific upgrade is independently certified not to pose any risk of moisture damage throughout the life of the building.

The application of rigid ceramic tiles to OSB panels, which expand and contract in response to changes in relative humidity / moisture content, is generally not recommended by SmartPly due to the great care in specification, site practice and end-use conditions that are necessary to avoid cracking at joints or through tiles. However, guidance on this application is provided in BS 5385-3 and The Tile Association publication 'Tiling to timber sheets and boards, timber substrates and alternative products'. Furthermore, technical advice from the tile, adhesive and grout manufacturers must be strictly followed.

Important notes: The recommendations provided in this technical datasheet for the correct use of SmartPly Frame sheathing panels are specifically designed to ensure longevity and performance of this quality product in service. It is therefore essential that these recommendations are strictly followed. The product is designed to be installed by a competent timber frame manufacturer, general builder, or a contractor, experienced with this type of product. SmartPly Europe Ltd cannot be held responsible for damages arising from non-adherence to these recommendations, or product failures resulting from inadequate structural design or misuse of this product.

In order to provide comprehensive guidance for the correct use of OSB products, this technical datasheet makes reference to relevant BS & EN standards as well as publications from other authoritative bodies. SmartPly Europe Ltd cannot be held responsible for claims arising from the use of any information that has been extracted from such sources.

Further guidance on the selection and use of OSB for wall sheathing can be found in EN12871, DD CEN/TS 12872 and WPIF Panel Guide.

For further information and/or technical advice please contact your local SmartPly Sales Representative or SmartPly Technical Support Personnel through any of our European offices.

As we continually update our technical datasheets, please check on [www.smartply.com](http://www.smartply.com) that you have the latest version.

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The Smart OSB Answer to Plywood