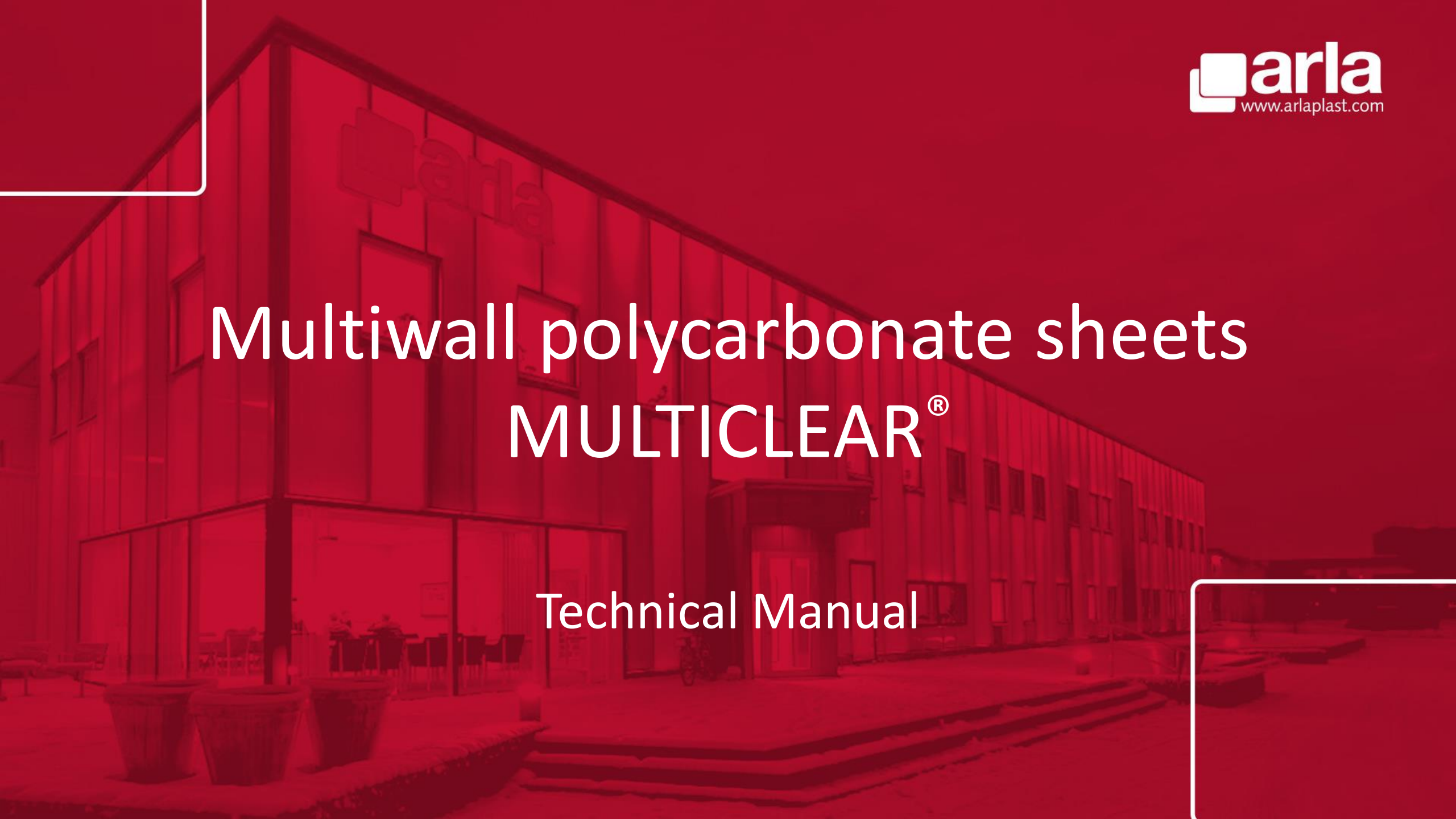

Multiwall polycarbonate sheets MULTICLEAR®

Technical Manual

MULTICLEAR®

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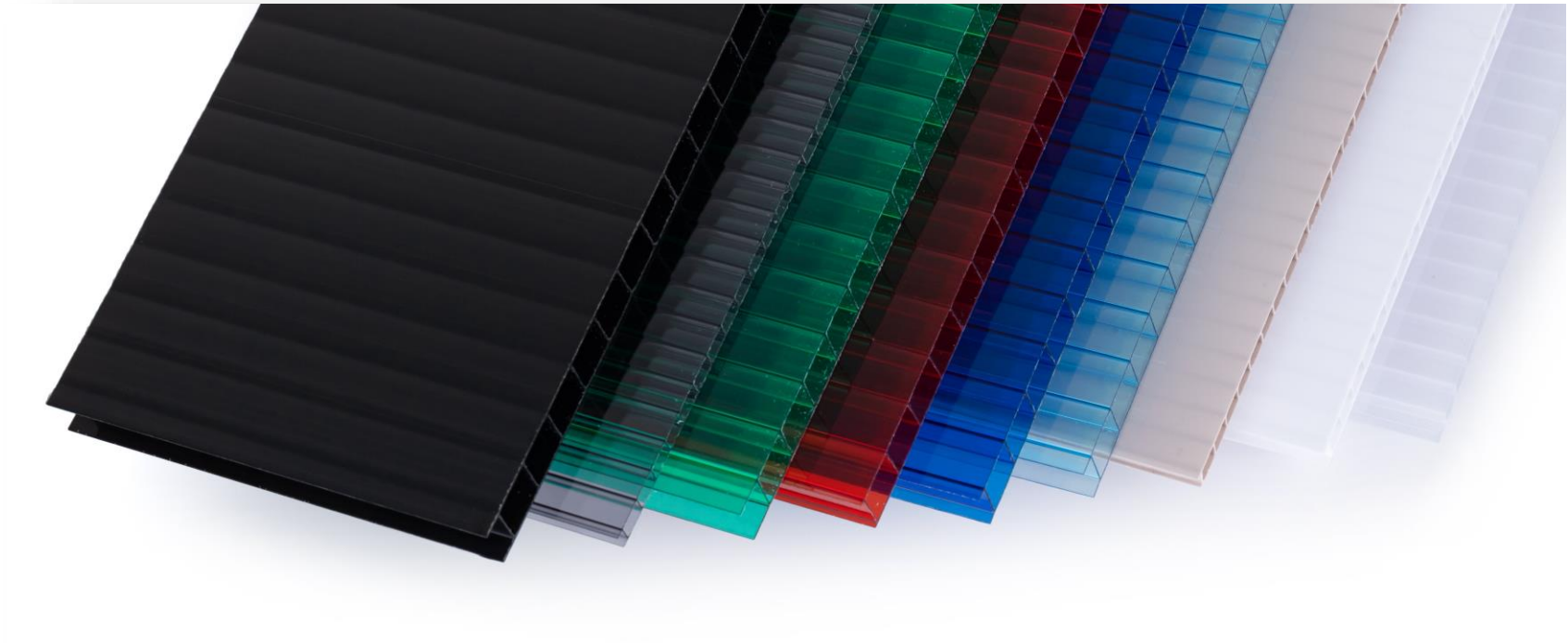


MULTICLEAR®

MULTICLEAR® is a range of high quality extruded multiwall polycarbonate (hereinafter PC) sheet. Arla Plast extrusion lines, producing PC multiwall sheets MULTICLEAR® are designed according to the latest state-of-the-art extrusion process control systems, hence facilitating to extrude top quality PC multiwall sheets of uniform, long term sustainable quality and efficient energy consumption. PC multiwall sheet has superior impact strength at a quarter of the weight at equivalent thickness of mineral glass.

The impact strength is more than four times higher than PVC and more than ten times than PMMA (acrylic). Outstanding aesthetic quality replacing glass and other plastics. in continuous glazing applications. MULTICLEAR® sheets are available in clear transparent, light diffusing opal white, or transparent or opaque colours. Sheets are virtually unbreakable and can be used in flat or curved applications. It is always protected against degradation by UV radiation by a uniform, at least on one side co-extruded layer containing the best commercially available UV absorber. The double-sided UV protection is standardly available and recommended for sheets thicker than 6 mm as double-sided protection eliminates the risk of wrong installation by nonprotected side towards the sunshine.

MULTICLEAR® sheets are covered by a ten-year limited warranty against discolouration, reduction of light transmission and impact strength reduction due to weathering.

In case of fire, MULTICLEAR® sheet range will melt without burning droplets ,allowing heat and smoke out of the building, hence reducing the growth of fire by flame spread. That is also one of reasons why are our sheets used in building and construction projects worldwide.

MULTICLEAR® sheets range have good thermal and sound insulation properties. The polycarbonate resin also offers good chemical resistance and allows the Multiclear sheets to be used in extreme climates. The opal colours are produced using diffusing additives offering a quality translucent product with uniform light diffusion. Arla Plast provide pre-installation/sealing guidelines, wind and snow loading calculations, sheet thickness application criteria, design and regulatory support Europe wide. The service includes CNC knife for cutting for cut-to-size sheets without any saw dust inside of the channels.

MULTICLEAR® is suitable for various applications, in industrial, public and private buildings. Applications include building (roof lights, cladding, sidewalls, conservatories, domes, skylights, sheds, car ports, smoke vents, swimming pool covers, suspended ceilings, glasshouses, sunrooms, railway/metro stations, airports, stadium roofing and partitions, ..), lighting (lamp optics and neon sign boxes, ..), packaging (pallet shields, protective covers for fragile items ...), advertising (Illuminated signs and advertising panels ..), agriculture (greenhouses, lorry/tractor ports and farm/barn buildings,..).

For every application there is a suitable MULTICLEAR® structure, from simple twin wall, to complex geometries.

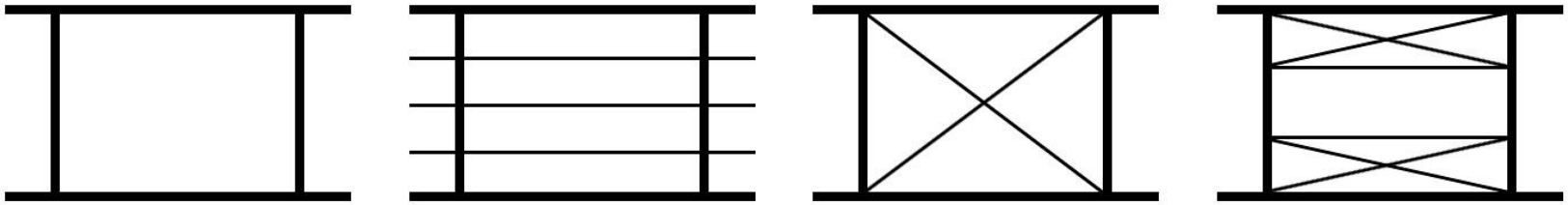
Contents

1. Why MULTICLEAR®?

MULTICLEAR® sheet are a special group of thermoplastic building products, with CE Marking and Declaration of Performance.

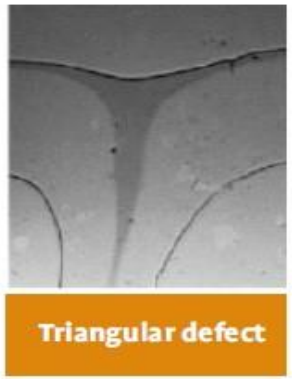
They are extruded out of polycarbonate (PC), a thermoplastic resin with a high light transmission, neutral tint, highly stable and applicable in a large temperature range. PC has the highest impact resistance of all transparent materials, more than 200 times the impact resistance of glass, and is regarded as virtually unbreakable.

MULTICLEAR® sheet consist out of two parallel surface layers, vertical ribs for rigidity and, where applicable, a number of horizontal layers and X-structures. The horizontal layers divide the air in pockets. More layers result in a better heat insulation (U-Value). The X-structures increase the rigidity and load bearing capacity of a sheet.



As MULTICLEAR® sheet are light-weight, area weight ranging from 0,8 to 4,0 kg/m², they are easy to handle and install. In combination with their excellent load bearing characteristics, this enables a light and open construction, compared to other glazing materials. For special applications, MULTICLEAR® sheets with higher load bearing characteristics and higher surface weight are available on request. MULTICLEAR® Ultra is a grade of MULTICLEAR® sheet with a special weight for a specific applications.

MULTICLEAR® sheet have a very even UV-protection layer, being produced on special equipment that allows consistent even and equal protection layers.



Against many competitive multiwall sheets, the production equipment allows to avoid a common “triangular” defect in the UV-layer at the location of the ribs, which could lead to failure in the application. This protection provides our MULTICLEAR® sheet with a highly effective protection against weathering, backed with a warranty. Contact us for custom protection and warranty.

MULTICLEAR® sheet are not only light in weight, they also have a high light transmission up to 84%, depending on the structure, colour and thickness of the sheet**.** Coloured sheets reduce light intensity, which results in pleasant room climate and ambience. Opal white translucent colours offer improved light transmission, and a more diffuse but brighter light, ideal for working environments.

When too much sunlight causes too much heat transmission, we recommend our MULTICLEAR® solar control types, in both clear and tinted versions. MULTICLEAR® sheet can be installed for both flat and curved applications. The minimum recommended radius is 150 times the sheet thickness.

Contact us if intended application has a radius is which is smaller.

In case of fire, MULTICLEAR® sheet will melt and allow venting where heat and smoke will be let out and therefore reduce the growth of fire by flame spread. Polycarbonate is self-extinguishing, and our MULTICLEAR® polycarbonate sheet have a B-s1,d0 classification to the European reaction to fire standard EN 13501-1. This is the best obtainable classification for a thermoplastic product.

All our UV protected MULTICLEAR® sheets are covered by a 10 year limited Warranty.
MULTICLEAR® sheets as from 8 mm thickness are also CE marked as a building product.

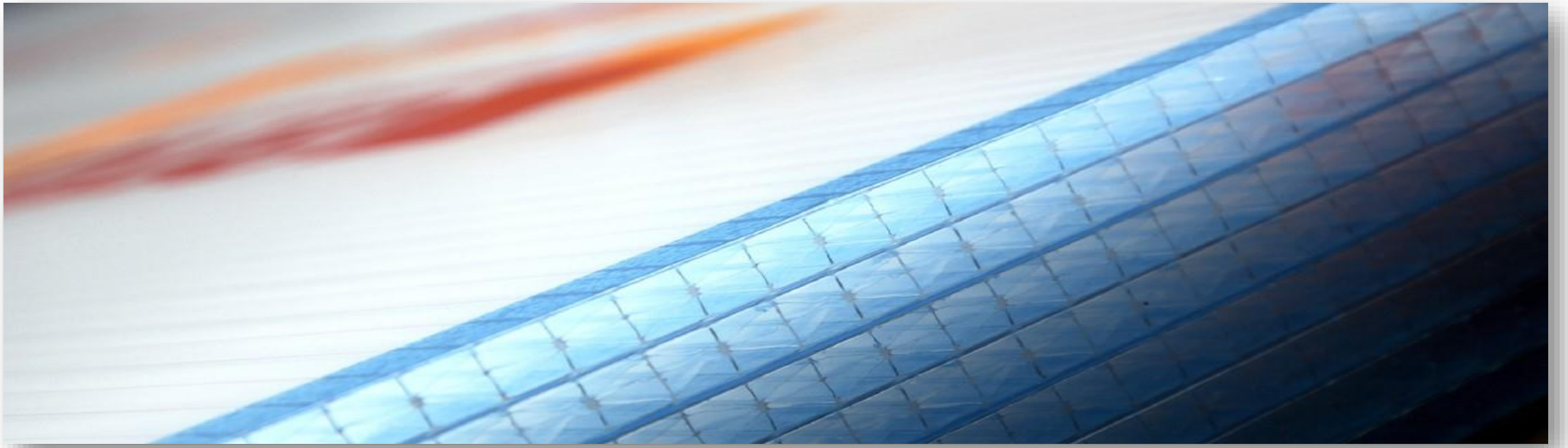
Special colour? Special surface weights? Recycled? Special sizes or thicknesses? MULTICLEAR® sheets can do it!

Therefore, MULTICLEAR® sheets

Warranty

Our MULTICLEAR® sheet are extruded with an even coextruded UV protective layer, avoiding any risk of delamination. MULTICLEAR® polycarbonate sheet has a standard limited warranty covering 10 years, against loss of light transmission and yellowing and considering hail resistance.

Custom-made warranties for custom-made products for a dedicated application or market are possible as well. Contact us for more information. detailed warranty statement is available from your distributor or on our website www.arlaplast.com.



Declaration of performance and CE marking

According to Regulation (EU) No 305/2011 laying down harmonised conditions for the marketing of construction products, provisions for an intended use or uses of a construction product in a Member State, aimed at fulfilling basic requirements for construction works, determine the essential characteristics: the performance of which should be declared.

Declaration of Performance (DoP)

When a construction product is covered by a harmonised standard or conforms to an European Technical Assessment which has been issued for it, the manufacturer shall draw up a Declaration of Performance when such a product is placed on the market.

General principles and use of CE marking

The general principles set out in Article 30 of Regulation (EC) No 765/2008 shall apply to the CE marking. The CE marking shall be affixed to those construction products for which the manufacturer has drawn up a declaration of performance in accordance. If a declaration of performance has not been drawn up by the manufacturer, the CE marking shall not be affixed.

By affixing or having affixed the CE marking, manufacturers indicate that they take responsibility for the conformity of the construction product with the declared performance as well as the compliance with all applicable requirements laid down in this Regulation and in other relevant Union harmonisation legislation providing for its affixing.

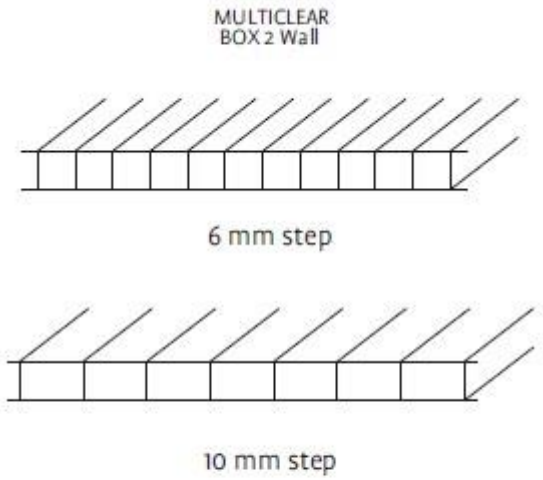
DoP

CE

According to rules and regulation above, Arla Plast declares a summary of the properties of an each and every specific sheet (type, colour, thickness, surface weight, fire classification) in accordance with the harmonized product standard EN 16153. The DoP number applicable for the sheet is printed on the pallet CE label.
This code can be used to obtain the Declaration of Performance in pdf format on our website www.arlaplast.com or www.arlaplast.com/support-service/product-related-information/polycarbonate/ – click on the applicable DoP and use the code as password to access the document. In case there is a property which was not determined, or not declared, it will be marked NPD (No Performance Determined). Our DoP is available in all official European languages.

2. Product range

PRODUCT	Nominal Sheet Thickness [mm]	Step [mm]	U-value [W/m²K]	Nominal Mass per Unit Area [g/m²]	Width [mm]
Multiclear® Box 2Wall	4	6	3,9	800	2100
	6	6	3,5	1200 - 1300	2100
	6	10	3,5	1200 - 1300	2100
	8	10	3,2	1500	980, 1200, 1250, 2100
	10	10	3,0	1500 - 1700	980, 1200, 1250, 2100
Multiclear® Box 3Wall	16	20	2,3	2500 - 2700	980, 1200, 1250
Multiclear® Box 7Wall	16	16	1,8	2500 - 2700	980, 1200, 1250, 2100
	20		1,6	2800 - 3000	
Multiclear® 5X	10	10	2,5	1500 - 1700	980, 1200, 1250, 2100
	16		2,0	2500 - 2700	
	20		1,8	2800 - 3000	
	25		1,6	3400 - 5000	
Multiclear® STRONG 6W	8	10	2,5	1400 - 1500	980, 1200, 1250, 2100
	10		2,2	1500 - 1700	
	16		1,9	2500 - 2700	
Multiclear® Box 11Wall	25	20	1,2	3400	980, 1050, 1200, 2100
	32	20	1,1	3600	



*Step (mm): this is the distance in mm between two vertical ribs and can be seen through the sheet as darker lines.

"Ultra" indicate MULTICLEAR® sheet with different surface weight. U-value in W/m²K): this is the overall heat transfer coefficient that describes how heat is conducted. A lower value indicates a better thermal insulation. Weight in grams per square meter. Some surface weights outside the indicated range are possible as MULTICLEAR® Ultra. Higher surface weights increase loading capacity. Most sheets types are available in clear, opal and bronze. Some sheets are available in solar control versions - see solar properties or product data sheet. Custom colours on request.

3. Properties

MULTICLEAR® sheet are extruded out of polycarbonate, a thermoplastic top-class material with excellent properties, and renowned for its high impact resistance for a transparent material. Our multiwall production facilities at Arla Plast s. r. o. are located in the Czech Republic at the centre of our main market.

At Arla Plast we extrude polycarbonate not only like multiwall MULTICLEAR® sheet, but also as solid sheet, in thickness between 0,75 mm and 21 mm. These solid sheets are available as clear transparent (Makroclear, Makrolife), in transparent or diffuse (translucent) colours (Colorado) and a large opaque range (Makrotech, RPC).

For more information see www.arlaplast.com or contact us at info@arlaplast.com

Arla Plast s. r. o. management system is according to ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and ISO 50001:2018, hereby ensuring consistency of quality. Typically, polycarbonate can be used in a temperature range of -100°C to +125°C and even beyond.

Impact and strength

MULTICLEAR® polycarbonate sheet has a very high impact strength, but certain conditions should be avoided, such as extreme stresses, sharp notches and bad cuts (see installation) or incompatible chemicals (see chemical resistance and cleaning). MULTICLEAR® sheets provide protection against hail, due to the high impact resistance of the polycarbonate. Therefore, our MULTICLEAR® sheets have a 10-year warranty on weathering and hail resistance.

These outstanding properties have been confirmed in hail simulation tests. In tests, Artificial hailstones of PA 6.6 with a diameter of 20 mm (4.5 g) were shot at room temperature against the weathered surface of a MULTICLEAR® sheet at a speed of 21 m/s, resulting in a kinetic energy of 1 J, and did not penetrate the sheet. These data were based on studies where a natural hailstone of 23 mm in diameter has an average impact speed of 17 m/s and a kinetic energy of 1 J. Studies on hailstones have concluded that the chances of hailstones over 10 mm in diameter in western Europe, are below 5%. Tests also have been performed using water-ice hailstones. Contact us for more info. (See Warranty)

It is not recommended to walk directly on the sheet, despite their high impact resistance, as sheet can deform causing it to slip out of the profiles. (See Installation).

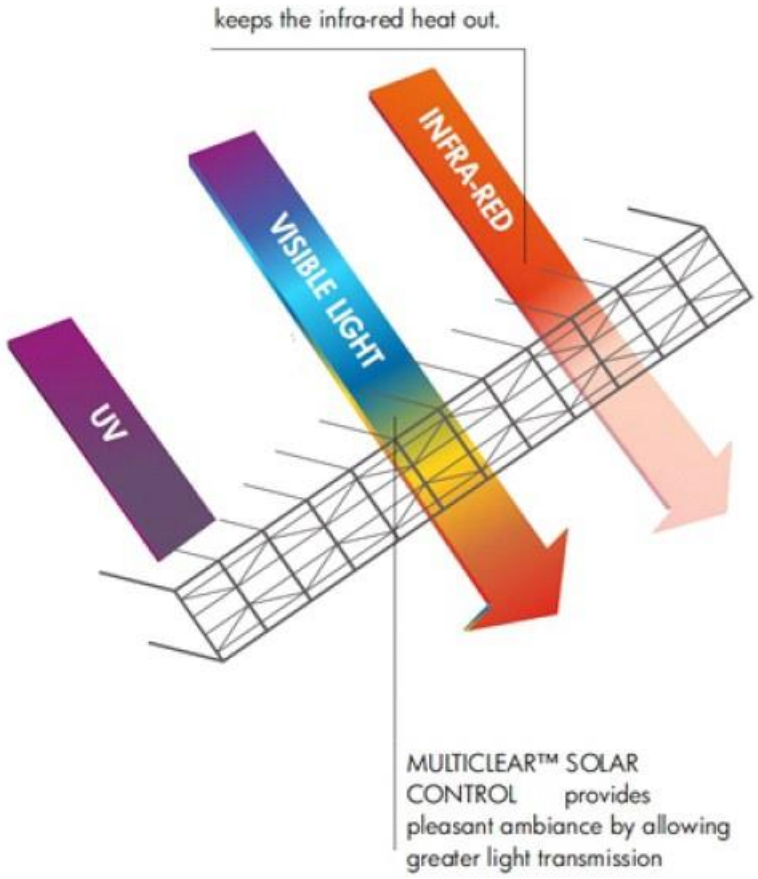
Solar properties

The solar emission spectrum at sea level covers UV-radiation (290-380 nm), the visible part (380-780 nm) and an Infrared part (780-2500 nm).

UV transmission
The UV range covers wavelengths from 100 to 400 nm and is split between UV-A (315-400 nm), UV-B (280-315 nm) and UV-C (100-280 nm). Shorter wavelengths are more energetic.
Our Multiwall sheet absorbs all UV radiation between 290 nm and 365 nm, partially between 365 and 380 nm and allows 380-400 nm. Meaning it absorbs all UV-C, UV-B and main part from UV-A.

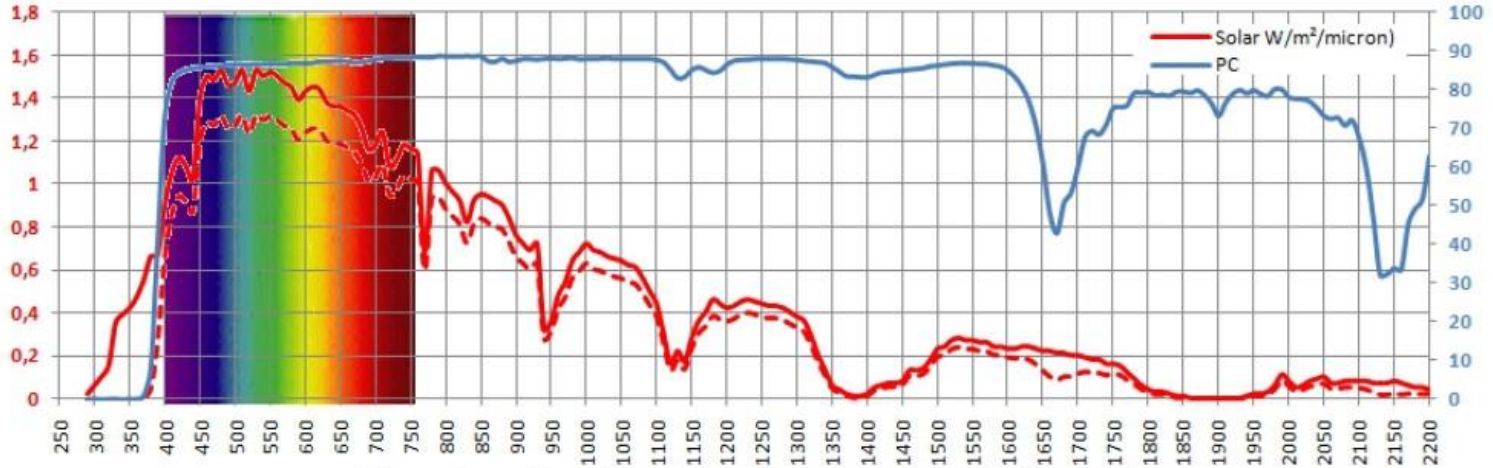
Light transmission
With light is meant the visible part of the spectrum, from 380 to 780 nm wavelength. Light transmission is the ratio of transmitted light vs incoming light. The incoming light spectrum used is typical daylight also known as D65, which corresponds roughly to the average mid-day light in Western & Northern Europe, comprising both the light diffused by a clear sky and direct sunlight.

MULTICLEAR® sheets have a light transmission value of up to 84%, depending on the structure, colour and sheet thickness (for more details, see the product data sheets). Transparent coloured or translucent sheets reduce light intensity avoiding hot spots and sharp light, which results in pleasant room climate. Specially developed opal white sheets offer improved light transmission, whilst diffusing the light better, which is ideal for work environments.



Solar radiation transmission

The solar emission spectrum ranges from UV radiation, over Visible to Near Infrared radiation, or heat, covering the range of wavelengths from 290 to 2300 nm. All MULTICLEAR® sheets with UV protection layer block most of the harmful UV radiation (100% for UVB) up to 385 nm, reduce NIR transmission (heat) and have an excellent light transmission. The use of pigments in coloured sheet will reduce mainly the light transmission, and to some extent also the NIR. The range of solar control types specifically targets at reducing the NIR transmission, as this concerns the solar heat.



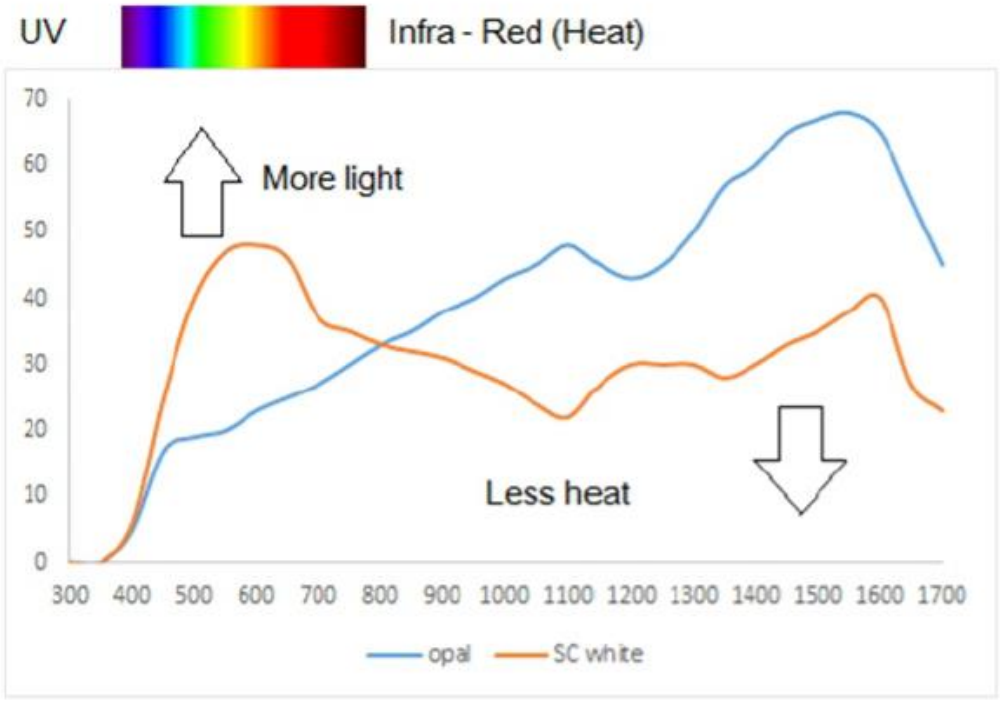
Solar spectrum and transmission spectrum of polycarbonate in function of wavelength

Solar control types

MULTICLEAR® Solar Control (SC) sheet belong to the MULTICLEAR® sheet range of high quality, multi-wall polycarbonate sheets. Arla Plast heat management glazing makes use of an innovative technology of solar energy absorption for the transparent SC grades (Silica Green (SG) and Clear), a combination of absorption and selective reflection for the SC White (opal) grade, and selective reflection for the SC metallic grey.

The solar spectrum of MULTICLEAR® SC grades shows reduced heat trans-mission (NIR) when compared to clear products without solar control, or to dark colours which not only reduce the heat but also the visible light transmission.

These MULTICLEAR® SC sheet versions all block an important amount of near-Infrared (NIR) heat but let in high levels of visible light. Our Solar Control multiwall sheet therefore offer high light transmission combined with a reduced solar heat transmission (g-value), both sides UV protection, light weight, easy installation, long-term weather resistance, high impact strength, outstanding thermal insulation and are available in a number structures (2 to 11 Walls, Strong and 5X structures).



Solar radiation transmission of Solar Control White grade vs standard opal MULTICLEAR® sheet, in function of the wavelength: High transmission in the visible range while suppressed transmission in the near infrared range.

MULTICLEAR® Solar Control sheet absorb all UV radiation, and a large part of the Infrared radiation (heat), whilst transmitting most of the visible light. This will reduce the temperature below the glazing during the hottest time of the day. Solar heating simulation test with an IR lamp gives following temperature difference:

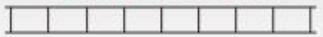
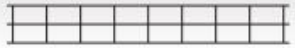
For Multiclear® 16 mm :
Clear vs Solar control Transparent : -9°C
Clear vs Solar control White : -17°C

For Multiclear® 25 mm :
Clear vs Solar control Transparent : -6°C
Clear vs Solar control White : -10°C

For Multiclear® 32 mm :
Clear vs Solar control Transparent : -5°C
Clear vs Solar control White : -7°C

Solar heating simulation test arrangement:

- Wooden double wall box insulated by XPS in the middle chamber, with black painted interior, thermocouple inside and outside, infrared lamp above the measured sample
- Compare temperature increase of standard against solar control grade sheet
- Follow temperature in the box few hours until steady state is reached

PRODUCT	Nominal Sheet Thickness [mm]	Clear		Opal		Bronze		SC White		SC Grey		SC Transparent		SC SG	
		LT [%]	g-value	LT [%]	g-value	LT [%]	g-value	LT [%]	g-value	LT [%]	g-value	LT [%]	g-value	LT [%]	g-value
Multiclear® Box 2Wall 	4	84		70		60									
	6	82		60		50									
	8	83		66		50	0,62								
	10	82	0,78	64	0,69	49									
Multiclear® Box 3Wall 	16	74	0,74	48	0,56	25		61	0,63			59	0,57	61	0,50
Multiclear® Box 7Wall 	16	64	0,61	45	0,49	25		51	0,50			60	0,50	61	
	20	62	0,60	45	0,49	23		50	0,47				0,48	47	0,47
	10	64	0,63	55	0,59	35				22	0,27			51	0,48
Multiclear® 5X 	16	64	0,64	45	0,53	25		50	0,54	12	0,27	55	0,56	42	0,42
	20	64	0,65	46	0,54	23		49						47	0,41
	25	63	0,64	44	0,53	20						50	0,45		
Multiclear® STRONG 6W 	10	64	0,61	57	0,57	35		53	0,55	17	0,29			56	0,50
	16	64	0,61	45	0,48	25		51	0,51	8	0,21	50	0,49		0,45
Multiclear® Box 11Wall 	25	53	0,49	38		23									
	32	53	0,50	34		20									

Solar value definitions:
Light and energy transfer values measured acc EN 14 501, EN 410

Light transmittance Ty [%]: Light transmittance of the sample measured against standard solar radiation in visible range 380-780 nm

Solar Direct transmittance Te [%]: Solar transmittance measured against standard solar radiation in visible + near infrared range 300 -2500 nm

Solar Direct Reflectance Re [%]: Solar reflectance measured against standard solar radiation in visible + near infrared range 300 -2500 nm

Total Solar Energy Transmittance TST [%] or Solar gain (g value): Solar direct transmittance + secondary heat transfer factor of absorbed IR radiation heat and consequent transfer across material by convection

Shading coefficient SC: Ratio of TST transmitted by given material against standard, which is 3 mm mineral glass whose TST is 87%, hence SC= TST%/87

Light weight

With area weights from 800 to over 3600 g/m², MULTICLEAR® sheets are amongst the lightest rigid glazing materials. Depending on the application, they are designed to offer the best loading capacity at minimal surface weight, which allows for less light-blocking support structures, resulting in bright and light constructions.
Where required, the area weight can be adapted, when using our MULTICLEAR® Ultra range.

Flexibility

Although MULTICLEAR® sheet are considered a rigid glazing material, it has some flexibility, which helps for certain loading conditions, but also allow it to be cold curved in a radius. (See installation).
This flexibility also means the sheet will deflect under load, which is why rabbets should be minimum 20 mm, avoiding the sheet to slip from the profiles used.

Sound reduction

Despite the low surface weight, MULTICLEAR® sheets do offer noise reduction, mainly depending on weight and thickness.
Sound reduction from 15 to 20 dB can be obtained (for more details, see the product data sheets).
In order to obtain better sound reduction values, a multiple glazing with air gap should be considered. As to avoid resonance, the layers should be of different stiffness. (contact us for more information)

Thermal properties

Temperature resistance
MULTICLEAR® sheets can be used at temperatures between -100 °C up to +120°C. This also ensures good dimensional stability in the typical range for building applications, ca -30 to + 85°C.
As MULTICLEAR® sheet do absorb Near-Infrared radiation (see solar properties), the sheet will reach higher temperatures than the ambient air. Clear sheet can reach 15°C higher temperatures, while black sheet can reach up to 25°C higher. Solar control sheet and opalescent white sheet will get only 5-10°C higher as they also reflect some heat. These increased temperatures are important when calculating thermal dilatation. (See Installation)

Thermal insulation
MULTICLEAR® sheet have a much better thermal insulation than solid sheet of the same thickness, due to the presence of (multiple) layers of air. This thermal insulation is indicated by the U-value, which is the overall heat transfer coeficient that describes how much heat is conducted through the sheet thickness. A lower value indicates a better thermal insulation and can be obtained by using sheet with more layers, using thicker sheet of the same structure, and/or by using multiple glazing with other MULTICLEAR®, or solid sheet. For more details, see the individual product data sheets, or the table of properties.

In case of fire

In case of fire, the suitability of a building material depends on it fire-related properties, toxicity and density of fumes. Like any thermoplastic product, MULTICLEAR® sheet are not fire resistant, and will melt at the temperatures occurring in a large fire. This however will create openings in the roof covering, where heat and smoke can escape, which is a requirement for highly suitable heat exhaust systems (surfaces that have already melted below 300°C).

Fire

MULTICLEAR® sheet is extruded from polycarbonate resin. Polycarbonate is one of the best thermoplastics with regards to fire performance, as it is regarded as auto-extinguishable without the use of flame retardants. Polycarbonate has a LOI >26%, which indicate that the concentration of oxygen needed to maintain a fire is over 26%, which is higher than the oxygen content in our atmosphere.

In case of fire, MULTICLEAR® sheet re often considered as not contributing to flame spread. Fire performance ais measured in different countries according to local fire regulatory tests. For the European EEA, the fire classifications to EN 13501-1 is used for the building and construction applications, as defined by the European product standard EN 16153 (See also CE-Marking).

Our MULTICLEAR® sheet have class B-s1,d0 to EN 13501-1. For fire classifications in other areas, please contact our technical support. MULTICLEAR® has a flash ignition temperature (FIT) of > 450°C and a self-ignition temperature (SIT) of over 630°C

Smoke & toxicity

Fire propagation and ignitability are still the major parameters for a good fire classification, but both smoke density and toxicity have become equally important.

As shown in the Fire classification to EN 13501-1, smoke density and spread are in the lowest class, resulting in s1 classification. As polycarbonate mainly consists out of carbon (C), hydrogen (H) and oxygen(O), combustion products are similar to those coming from burning paper or wood, and contain mainly carbon dioxide (CO^2), carbon monoxide (CO) and water (H_2O) which are the main contributors to the toxicity level.

Depending on the fire parameters, mainly a minor quantity of aliphatic and aromatic hydrocarbons are formed. Combustion products are essentially non-corrosive, and do not contain sulphur (S), cyanides (CN) or halogens (Cl, Br, I, F).

Chemical resistance

Polycarbonate is a very strong and impact resistant material. However, in contact with certain chemicals, the material can lose its high impact properties, show hazing and/or even become brittle. It is important that before installation of MULTICLEAR® sheet, all possible contact with non-compatible chemicals and materials is avoided. When cleaning or treating the sheet, care should be taken not to use products that can damage the sheet. The overall chemical resistance is dependent upon the following parameters: concentration of the chemical, exposure time, temperature and internal stress levels.

The shortlist below is only a guideline and is only applicable for pure product. In case you want Arla Plast to perform compatibility testing of materials intended to be used for the cleaning or installation of MULTICLEAR® sheets, the product sample, TDS and SDS, together with indications on above application parameters are required.

Note that the chemical resistance needs not only to be considered when cleaning the sheet, but also when using seals and any other fixing elements. E.g. PVC (with plasticizer), impregnating agent, strong industrial cleaning agent and corrosive solvents should be avoided at all times. The limited warranty provided for MULTICLEAR® sheet excludes contact with non-compatible products.

To avoid stress cracking, avoid incompatible vapours from nearby sources (production processes, environment) to attack MULTICLEAR® sheet surface, or entering channels of the sheet by using suitable sealings between the sheet and the profiles, and securing the channels.

Indication of chemical incompatibility is often visible as cracks, white or yellow discoloration.

Polycarbonate is compatible with the following chemicals:

- ✓ alcohols (except methanol)
- ✓ mineral acids
- ✓ mild soaps and detergents
- ✓ neutral and acid salts
- ✓ oils, fats, waxes
- ✓ oxidizers and reducing agent
- ✓ saturated aliphatic hydrocarbons

Polycarbonate is NOT compatible with the following chemicals:

- ✗ aldehydes
- ✗ alkaline chemicals (bases)
- ✗ amines
- ✗ ammonia
- ✗ aromatic hydrocarbons
- ✗ esters
- ✗ halogenated hydrocarbons
- ✗ ketones
- ✗ methanol

Condensation

Dew point

The Dew point is the highest temperature of a surface where humid air condenses. This dewpoint temperature depends on air temperature and relative humidity as can be determined from the graph.

In case of MULTICLEAR® glazing, the inside surface temperature depends on outside temperature, inside air temperature and the U-Value of the MULTICLEAR® installation. To check if a certain MULTICLEAR® sheet is suitable to avoid condensation, dewpoint temperature should be lower than the calculated inside surface temperature.

The inward facing surface temperature of the glazing can be calculated using following formula:

$Tis = Ti - U*(Ti-To) / \alpha o$

Where:

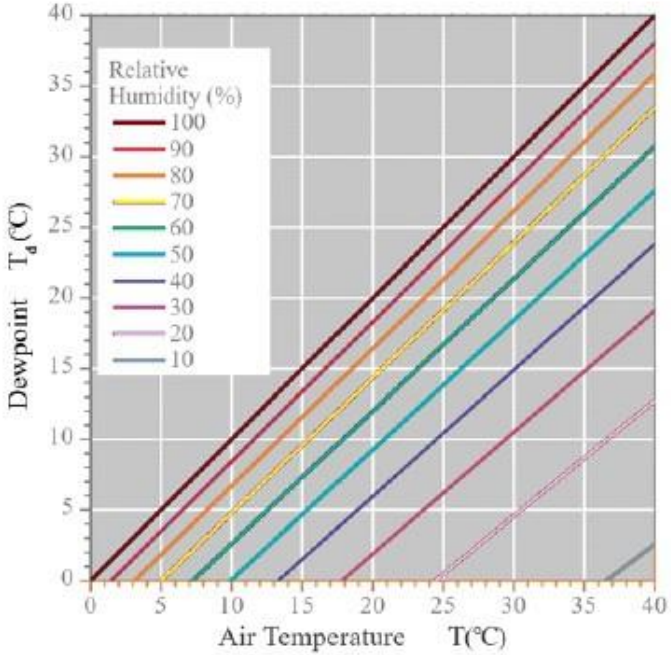
Tis = inward facing surface temperature (°C)
Ti = inside air temperature (°C)
To = outside temperature (°C)
U = U value of the glazing
αo = Outer heat coefficient = 23 W/m²K

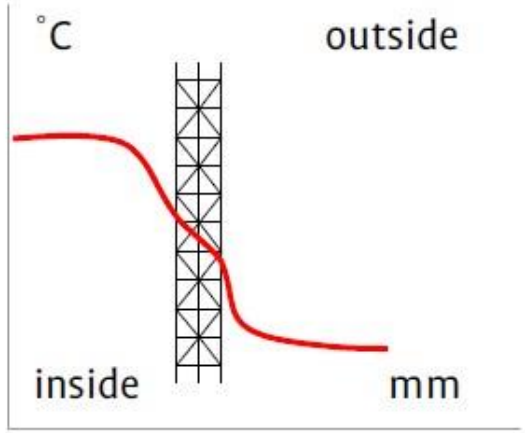
Example of a swimming pool glazing:

Ti = +25°C
To = -20°C
U = 1.6 W/m²K for 20 mm MULTICLEAR® Box 7Wall
αi = Inner heat coefficient = 8 W/m²K
RH = 70%

Then using the above formula, Tis = 21.9°C

On the Dewpoint graph, an air temperature of 25°C results in a dewpoint temperature of 19 °C. As this is lower than the calculated sheet surface temperature, no condensation will occur.





4. Storage and handling

MULTICLEAR® sheet needs to be installed according to prescribed and commonly used practices. For most applications, the sheet will either need to be installed flat, with a minimum slope of 5°, or curved.

Handling
MULTICLEAR® sheet should be handled with care to prevent damage and scratching. Lifting with forklifts must always be done on the wooden pallets as support, never directly on the sheet. The type of forklifts or cranes should be adapted to the sheet size. Take necessary precautions to avoid extreme flexing of the pallets, which can either lead to breakage, or damage by the pallet or nails coming from the pallet.

Use gloves to handle sheet as edges can be sharp. Avoid extreme flexing of the sheet. The PE protection film protects the sheet surface against scratches and should be removed only just prior to the actual installation, as this film can be relatively quickly degraded by sunlight radiation (UV exposure).

Before inserting the sheet into the framing profiles remove the masking locally. Do not use a cutter, but peel off the masking protection. To avoid troubles with degraded protection film, remove it as soon as possible, once the sheet is installed.

Safety
Never walk on a stack of sheet, never walk on a sheet. If walking on the installed glazing is required, apply a rigid support (wooden beam or similar) covering the roof surface.

Storage
MULTICLEAR® sheet is protected by masking film, protecting the sheet surface against scratches but can be degraded by high temperatures and direct sunlight. This might result in problems to remove the masking after installation. MULTICLEAR® sheet should therefore be protected from atmospheric influences like sun and rain, preferably to be stored inside.

MULTICLEAR® sheets have to stay covered by the white protective PE film until just before installation. The edges should remain taped to prevent dust to enter. The sheet must be stored horizontally on wooden pallets with a maximum load of 1000 kg and no more than 3 pallets should be stacked on top of each other. When sheet edges are sealed just by transport tape, make sure these are protected against sun and rain.

Note that MULTICLEAR® sheet are not vapour-tight. Water vapor permeability of PC film of thickness 100 µm according to ISO 15106-1; is 15 g/(m²·24 h) @ 23 °C; 85 % RH

In certain conditions, this can lead to condensation inside the channels of MULTICLEAR® sheets.

5. Installation

MULTICLEAR® sheet mostly have a UV protection on both sides. In case you use a sheet with 1 side UV protection, make sure to install this sheet with the UV-protection to the outside. Check this carefully before removing the masking.

Curved glazing

MULTICLEAR® sheets are flexible and can be bent into the desired shape. Always bend in the length direction of the channels (ribs).

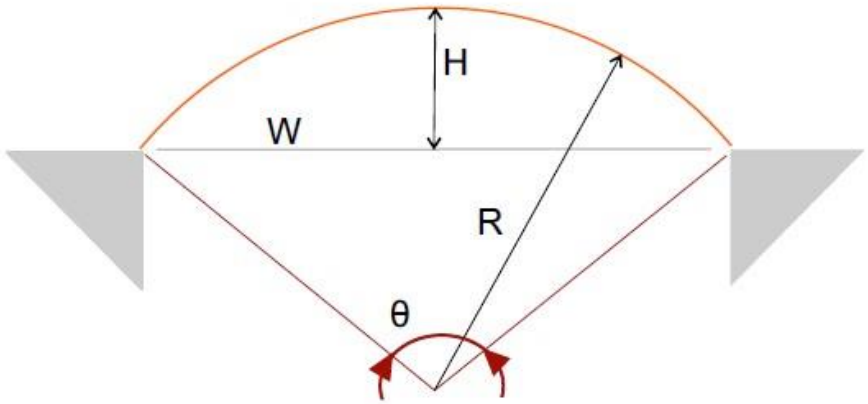
For the mounting in curved roof systems, the multiwall PC sheets can be bent at ambient temperature. As per EN 16153:2013, the bending radius shall be at least 150 h (h= overall sheet thickness). This corresponds to an extreme fibre elongation of 0,33 %. Bending in a radius smaller than 150x h is not covered by 10-years limited warranty.

For indoor applications, the minimum radius can be reduced to 125 x the sheet thickness in absence of UV radiation.

When using the more rigid type of sheets, it is recommended to make the first 300 mm of the profile linear, as it is difficult to curve a short edge. If smaller radii are wished for, the sheet might be drape formed. Contact us for more information in that case.

Calculation of curved sheet

In a curved sheet application, there is a relation between sheet length, radius and span to cover. Additionally, enclosed angle and height of the curve can be obtained equally.



$$R = \frac{\left(\frac{W}{2}\right)^2 + H}{2H}$$

$$L = 2 \times R \times \cos^{-1}\left(1 - \frac{H}{R}\right)$$

$$H = R - \sqrt{R^2 - \left(\frac{W}{2}\right)^2}$$

The best loading capacity in case of curved sheet, is obtained with narrow sheet in a smaller radius.
Contact us for the most suitable sheet type for your loading situation and curve parameters.
When using the more rigid type of sheets, it is recommended to make the first 300 mm of the profile linear, as it is difficult to curve a short edge.

Example: To cover an opening of 2 x 4 m with MULTICLEAR® :
Option 1: Flat sheet 2 x 4 m. Depending on the wind/snow load, the sheet weight will be highest.
Option 2: Radius 2000 mm (half a circle = smallest radius) => H = 2000 mm, sheet length 6283 mm. Here the lightest sheet can be used.
Option 3: Height of curvature H = 825mm => R = 2836 mm, sheet length 4439 mm

Flat glazing
See also loading curves, valid for 4 sides supported.

Vertical installation
When installed vertically, the MULTICLEAR® sheet should have the channels (ribs) vertical or under a minimum slope of 20°. This is to avoid that condensation (see condensation) is collected inside the channels.

Sloped flat installation
For sloped glazing application, a minimum slope of 5° (minimum 90 mm/meter sheet length) in the channel direction is required to allow superficial rainwater removal under worst conditions.



Cut-to-size

At Arla Plast we can supply you with cut-to-size sheet in the dimensions of choice. As we use knife cutting operations, there will be no dust in the channels.

If you decide to cut the sheet to size yourself, make sure to use suitable tools such as a standard electrical circular saw, or a jigsaw. Special fine-toothed blades, that are suitable for plastics, are recommended. The masking film should be left on the sheet during sawing to prevent scratching. The cut must be free of cracks or dents. Hot knife cutting is best to prevent dust.

After the cutting step blow away dust build-up in the channels with dry com-pressed air. Preferably with ionized air, as this avoids re-attraction of the dust by static charge. For the more complex sheet structures with narrow chambers, dust removal might be difficult. It is therefore recommended to either have them purchased at Arla Plast cut-to-size or use a rotating knife instead saw.

After the cutting step, the sheet edges should be closed by sealing tape again. On request we can apply the special sealing aluminium closing tape, or breathing type treated by biocide additives, draining condensed water from the structure of the MULTICLEAR® sheet and reducing the growth of algae inside . Contact us for more info.

Drilling

Holes can be drilled with high speed power drills using appropriate tooling. The sheet should be supported during drilling to prevent vibration.

The holes should be kept clean and care should be taken to prevent any dust to enter the channels. The fixing holes must be drilled oversize to allow for thermal dilatation of the sheet after installation (see thermal expansion calculation and use the longest free dimension as length). The drilled edge must be free from notches.

Edge sealing

Peel back approximately 50 mm of the masking film from all cut edges of the sheet on both sides. Edge sealing should be watertight on the surface, to avoid entry from rainwater, and is valid also for drilled holes.

Both wet types and dry types can be used. As Wet types, neutral silicones can be used, as for dry types, Neoprene are suitable. When applying a wet sealant, or tapes, it is preferred that the edges are cleaned from dust and dirt. (See Cleaning for more info)

Our protection masking does not contain surfactants which could reduce adhesion on the MULTICLEAR® Surface. Be sure that all sheet edges are smooth and rounded before applying venting tape or alu tape, to avoid that the tape will be punctured.

The highest location of an open edge should be sealed totally with aluminium tape or similar gas tight tapes. The lower open edge, or in case of barrel vaults both edges, should be covered with a venting tape (treated fabric) preferably with a hydrophilic coating, to allow for easy drainage of condensation water, and avoiding entry of algae and bugs into the channels, e.g. Multifoil.

When MULTICLEAR® sheet are delivered, they mostly are protected with a coloured transport tape. This tape should not be used for installation.

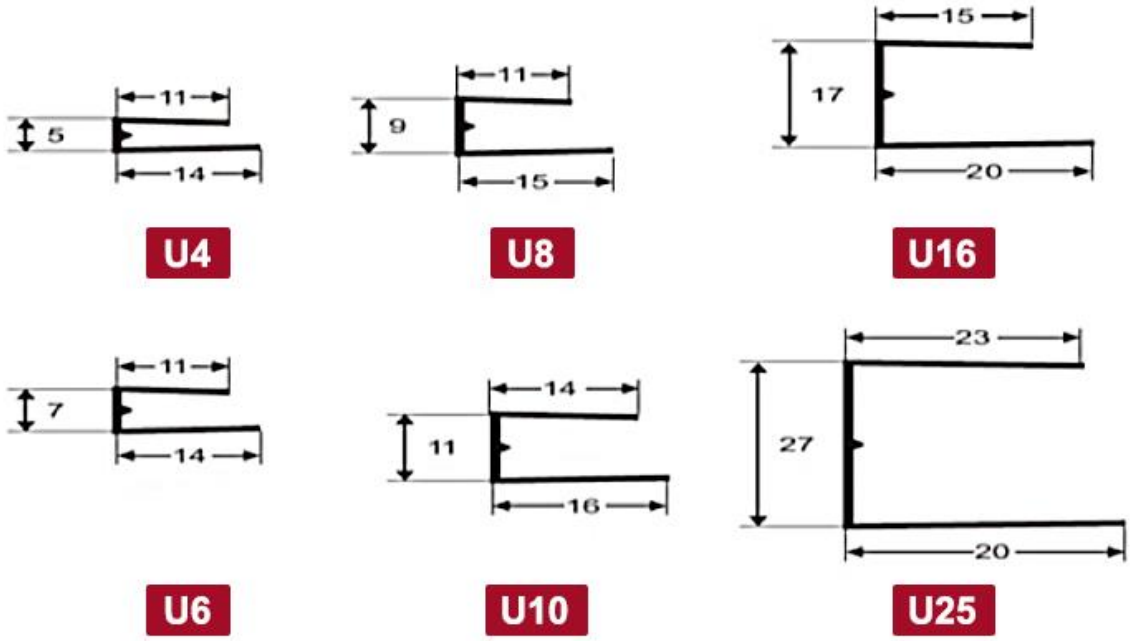
Do not install the MULTICLEAR® with damaged tapes. Make sure that all materials coming in contact with MULTICLEAR® sheet are compatible. Check Chemical resistance or contact Arla Plast. We can make a compatibility test in case of doubts. Avoid PVC and other materials containing plasticiser.

Edge profiles

When the cut edges are installed using glazing bars, so-called U-profiles can be used, provided they have a distance-holder and drainage zone.

The distance holder avoids the continuous contact between venting tape and condensation water.

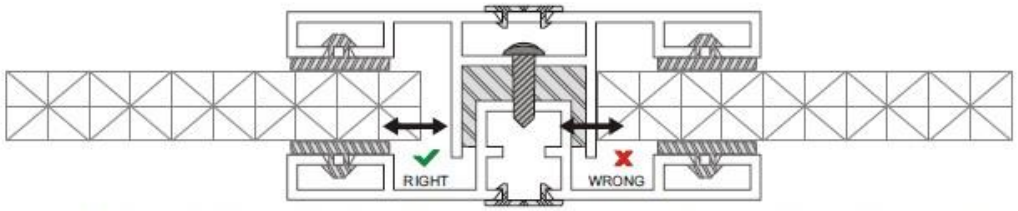
The drainage zone should be sufficiently large (> 8 mm) to remove leaked water and condensation water. Standard venting tapes will lose their function if constantly wet resulting in water build-up in the chann



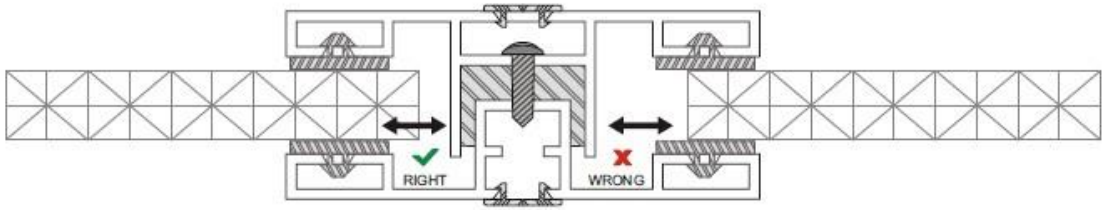
The external surface coming in contact with the U-Profile should be properly sealed as to reduce water leakage from rain.

Glazing bars

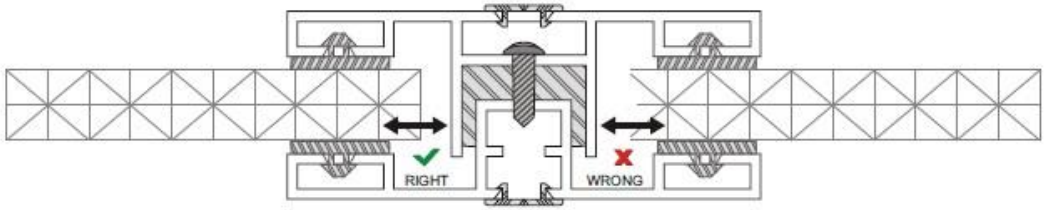
Peel back approximately 5 cm of the masking film from all edges of the sheet on both sides before placing the sheet in the glazing bars. Do not use cutters to remove the masking locally as you risk cutting the sheet surface, which has a negative effect on ageing and impact resistance. For the correct installation of MULTICLEAR® sheet it is important to observe the correct instructions when fitting the sheets in the glazing bars and support profiles



The sheet should be installed to allow the thermal expansion as calculated according to the formula in next paragraph.



Wind and snow load provoke mechanical deflection of the sheet. This results also in a reduction of the width inserted in the glazing bar. Excessive loading therefore can cause the so-called “pop-out” of the sheet out of the profile. In order to prevent this from happening, the insertion in profile should be minimum 20mm.



In order to guarantee maximum clamping effect, the sheet should not be clamped with open edges. This weakens the clamping and will cause pop-out.
At least two ribs should always be under the gasket .

Thermal movement

A very important factor to consider when installing polycarbonate (PC) sheet MULTICLEAR® is the change of dimensions due to the temperature variations.. As with most polymers, this thermal movement of PC is much higher than the one of other building materials (4x higher than aluminum, 6x higher than steel and up to 10x higher than glass). Therefore, sufficient space needs to be provided in the fixing profiles to allow this thermal movement. Also, when drilling holes through the sheet for fixing, the necessary oversize needs to be considered in order to avoid cracking and over stretching of the sheet at bigger temperature changes. MULTICLEAR® sheets expand when temperature increases and contracts when it gets colder. This is called thermal movement, and has to be considered by the fixing procedures and/or installation elements design.

Coefficient of Linear Thermal Expansion (CLTE)

The CLTE is a material inherited, isotropic constant, i.e. at the same rate in every direction and the same for all colours. **α = 0,000065 mm/mm.K**

The change of dimensions due to the temperature variations can be calculated using the formula: **L = L0*α *(T1-T0)**

Where:

AL = Thermal movement (in mm) when temperature changes from T_0 to T_1 (this can be negative)

L_0 = Length in mm at temperature T_0

T_1 = Temperature in °C

T_0 = Original temperature in °C

An expanded calculation, where rabbet depths can be calculated can be found on our website; under product related information.

Example:

MULTICLEAR® sheet 4000 mm long (L_0), at 20°C (T_0). What will be the size at minus 15°C (T_1=-15°C)?

?L = 4000*0,000065*(-15-20) = -9,1 mm (The minus sign indicates that the sheet will shrink 9,1 mm)

For this reason, all fastening and clamping devices must allow sufficient room for both expansion and shrinkage. If the sheet edge touches the inner part of the profile and the temperature increases further, the sheet will not be able to expand. The sheet will distort, or in extreme cases, it might get damaged. If the sheet is installed with the edge too close to the outer extremity of the profile, the sheet could slip out of the support frame when it shrinks during cold winter weather. This risk is increased by other factors such as wind load but more severely by snow load.

The thermal movement can cause a creaking noise when sheet is moving over the profiles, but it does not compromise the functionality of the sheet. The design of sealing joints must allow for this movement to prevent the joints coming out of the profiles or the profiles damaging the sheet.

6. Cleaning

MULTICLEAR® sheets can be cleaned with lukewarm water containing a mild soap or neutral detergent. Use a soft cloth or a clean sponge. Rinse well with clean water.

When dirt, bird droppings or sand is deposited on the surface, try to remove it first with waterjet, after soaking the area with water. Avoid rubbing on the surface as this might cause scratching the sheet.

Fresh paint splashes, grease, smeared glazing compounds, etc. can be removed before drying by rubbing lightly with ethanol or isopropanol or petroleum ether on a soft cloth followed by a thorough wash and finish by rinsing with clean water.

Larger areas can be cleaned with a waterjet and/or steam cleaner (max. 90° C). Continuously move the waterjet around to avoid local damage. Make sure not to use the waterjet or steam cleaner on areas which are not compatible or where there is risk of damage (such as sealings, gaskets...). Make sure that all chemicals used are compatible with the polycarbonate sheet. In case of doubt, contact us at Arla Plast.

7. Loading

Wind and snow loading

Wind and snow loading are normally determined by the appropriate local building norms and can be calculated by an engineering office. In absence of these the following information can be used to determine your wind and snow loading.

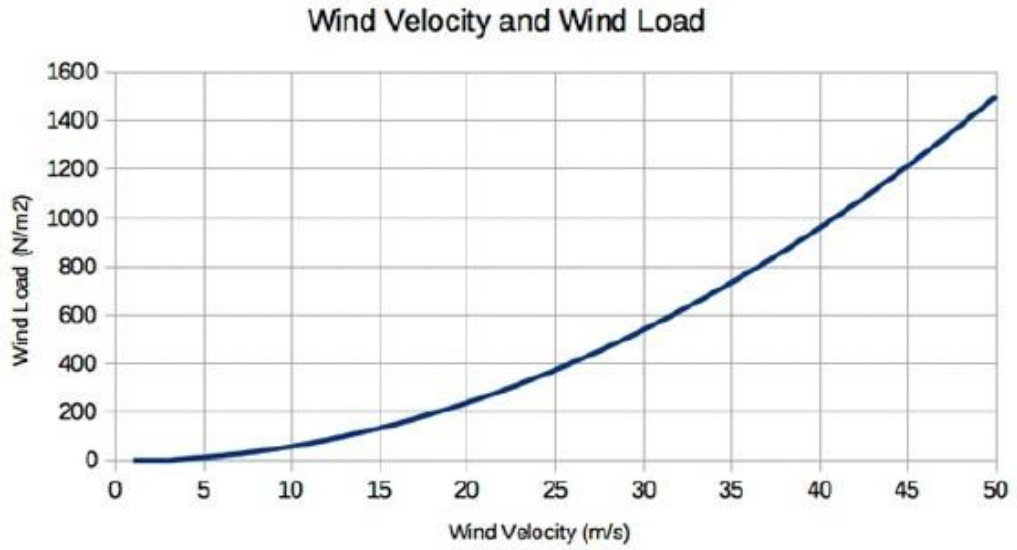
Wind loading
Wind load (N/m^2) = Cp*q

Where:
Cp is the pressure coefficient (see further)
q = dynamic wind load (N/m^2)
$q = k.v^2$

Where
k = 0,613 (factor based on typical values for air density and gravitational acceleration)
v = design wind velocity in m/s

Pressure coefficient (Cp)
The Pressure coefficient or Cp value is a calculated factor deceleration of the wind by building or glazing geometry, it is necessary to include an appropriate value. The Cp is a function of form and type of building, height of glazing location, shape of glazing (flat, vertical or inclined, curved glazing), and it is different near edges and summits. This is the reason why this is preferably done by an engineering office.

The total wind loading can be positive (indicating a wind pressure force), or negative (indicating a wind suction load). Detailed pressure coefficient values can be found in the national building standards.



wind speed (m/s)	wind pressure (N/m^2)
10	61
15	138
20	245
25	383
30	552
35	751
40	981
45	1240
50	1530
55	1850

Beaufort	2	4	6	8	9	10	11	12
Denomination	Light breeze	Moderate breeze	Strong breeze	Gale	Strong gale	Storm	Violent storm	Hurricane
Wind speed	3,3 m/s	7,9 m/s	13,8 m/s	20,7 m/s	24,4 m/s	28,4 m/s	32,6 m/s	>32,7 m/s

Snow loading

Snow loading on roof glazing should be considered equivalent to a vertically, uniformly distributed load, acting per m² of the horizontal projection of the glazing.

A roof made of MULTICLEAR® sheet does not permit immediate melting of the snow, due to its excellent thermal insulation, and therefore the load produced by the snow must be carefully taken into consideration.

Indicative surface loading per centimetre of snow height on horizontal surfaces:

Fresh snow	10 N/m² per cm
Dry snow, less than a week	20 N/m² per cm
Old snow, more than a week	35 N/m² per cm
Wet snow	50 N/m² per cm

Similar to the wind loading correction factors, more precise snow loading factors can be obtained from the local building standards, as snow can be concentrated near edges and on slope changes.

Note that, depending on the values for wind suction or wind pressure, the substructure of in installation does not always work as with snow loading, which is a pure vertical pressure. (see also installation and loading graphs)

For large glazing projects, we can offer custom support for given wind-and snow load. Contact Arla Plast for more information.

Loading graphs

Where MULTICLEAR® is used in roofing or walls, the forces from wind and snow must be absorbed by a suitable substructure. We recommend taking the support distance for each load from the loading graphs (see further). The loads applied count as uniformly distributed linear loads; load components acting vertically on the sheet, both in compression (snow/wind) and suction (wind)). These values are guiding values, which were determined in extensive tests on actual sheet. The values published are calculated with a safety factor of 1. However, this does not replace the country-specific certifications prescribed. Each sheet type has been submitted to extensive and realistic tests to determine the load bearing parameters. Our published values are calculated based on these tests —not on a model using suction only, as is often the case with other producers.

Curved glazing

For curved glazing, it is recommended to apply profiles on all 4 sides. In general, for limited widths, the result is also valid for installations with 2 curved sides clamped. Please contact technical support at Arla Plast for an accurate calculation, as there are too many parameters to have this displayed in graphical form.

Flat glazing

Flat glazing is normally supported on 4 sides, where the two lengths are rigidly supported, for instance on the roof members. Often a so-called 3 side clamping is used, where the 4rd side (width) is a simple U-profile or similar, with little or no bearing capacity. In case of supports on two sides only, and the widths with provided with a simple U-profile or similar, with little or no bearing capacity, then the sheet length is not important, as the deflection will be nearly the same all over the length of the sheet.

Load-bearing characteristics

These load bearing characteristics have been determined in an unfavourable situation, where the sheets are not fixed, but four sides supported (abbreviated 4ss). Restrictions were applied for pop-out, deflection and internal tension. The curves show the load bearing capacity for MULTICLEAR® sheets (supported on all sides with a rabbet depth of 20 mm) as a function of unsupported span length and sheet width. If the rabbet depth is smaller, the support distances should be reduced accordingly.

Increasing the rabbet might increase loading capacity, as it allows for more lateral movement due to deflection, provided the other restrictions are not exceeded. Adding intermediate supports (under the sheet) only help for pressure loading (snow), unless the sheet is prevented from lifting on these locations (point fixing or pressure profiles).

Contact technical support at Arla Plast for an accurate calculation.

How to use graphs?

Method 1

Given: Load and sheet type. What is the maximum distance between supports?

- Select your sheet type and thickness
- At the given load you will find the unsupported length on the x-axis, via the sheet width curve.
- If unsupported length is too short, switch over to sheets with higher load-bearing capability. (or reduce sheet width).

Method 2

Given: Sheet thickness, length and loading. What is the maximum width?

- Select your sheet type and thickness
- At the given load and the unsupported length, the sheet width is found at the intersection of both lines.
- If the intersection is not on one of the presented width curves, choose the smaller width.
- If width is too small, reduce sheet length or switch over to sheets with higher load-bearing capability.

Loading curves per product

In the following pages, the loading curves for each product are displayed, based on four sides supported calculation results. The width curves are always presented in the same manner, for ease of comparison:

w500	=> 500 mm width	Dark blue (only on thicknesses of 10 mm and less)
w700	=> 700 mm width	Light blue
w980	=> 980 mm width	Green
w1050	=> 1050 mm width	Yellow
w1200	=> 1200 mm width	Red
w1250	=> 1250 mm width	Brown
w2100	=> 2100 mm width	Black

Note that for sheets of 8 mm and less, the max indicated load is 2000 N/m², where for all the other thicknesses, the limit on the graph is 2500 N/m². For specific calculations, contact Arla Plast.

Examples

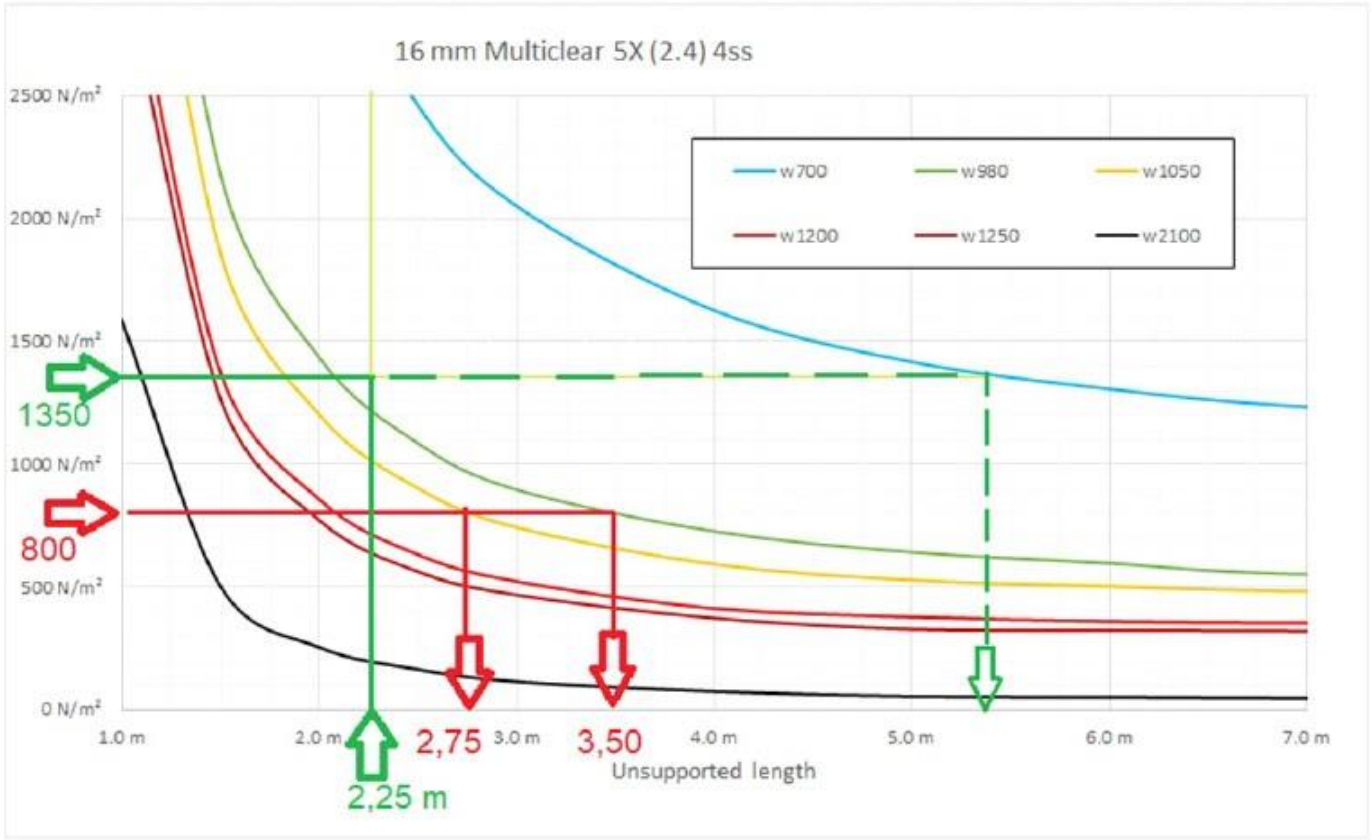
Type of sheet 16 mm MULTICLEAR® 5X

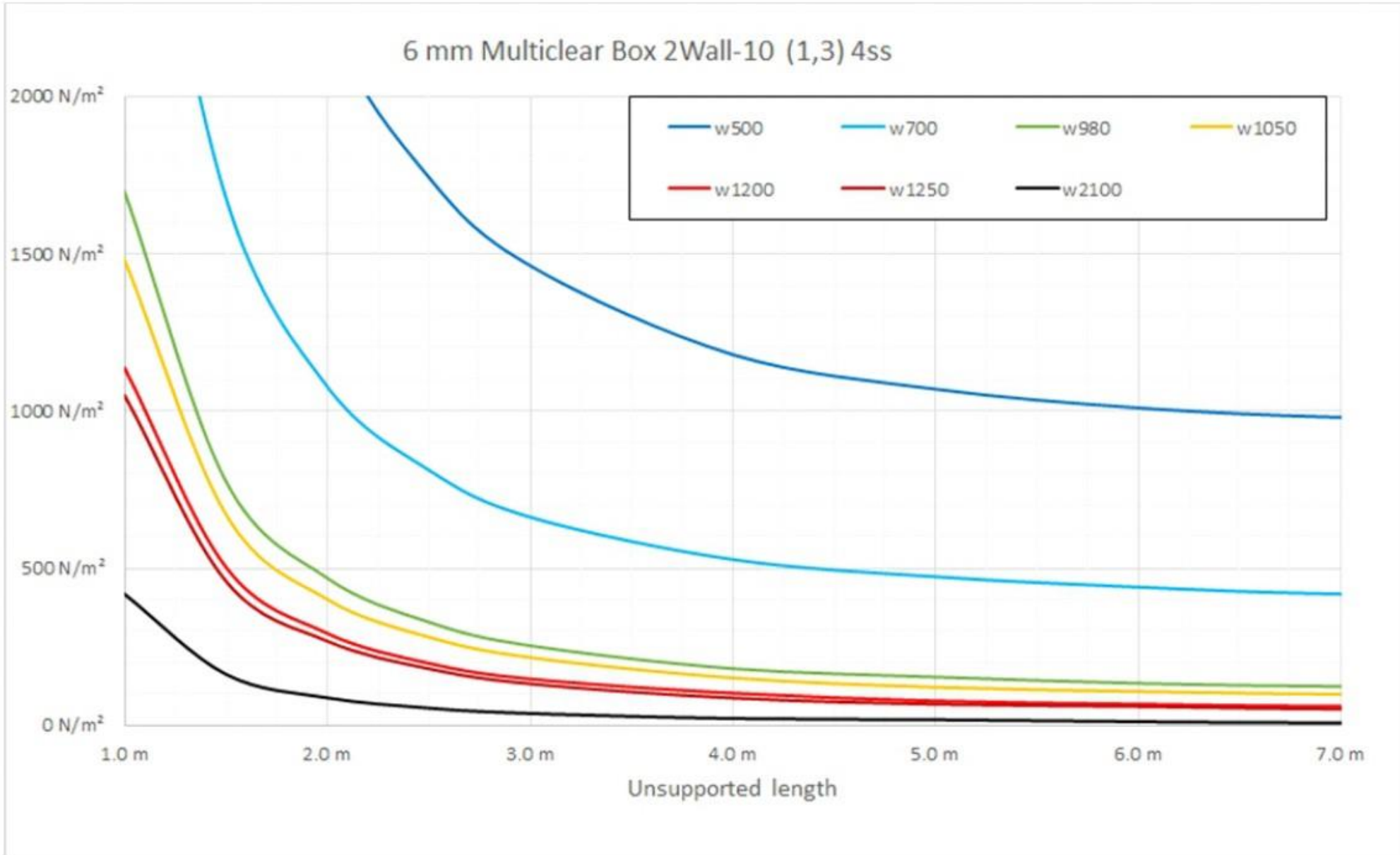
Example 1: (red arrows)

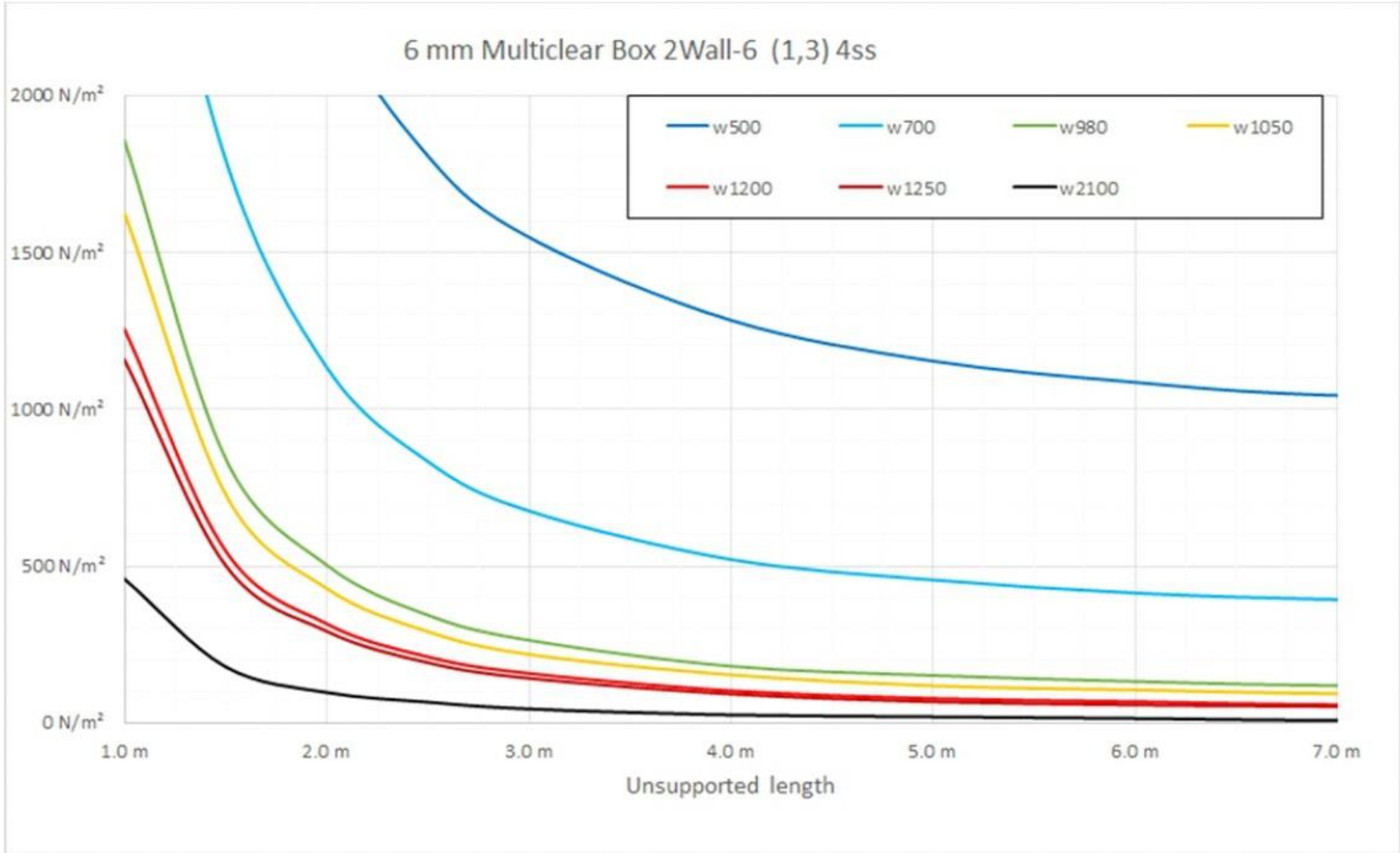
Snow load: 800 N/m²
This sheet type in width of 1050 mm (yellow line w1050) can have an unsupported span (length) of 2,75 m.
This sheet type in width of 980 mm (green line w980) can have an unsupported span (length) of 3,50 m.

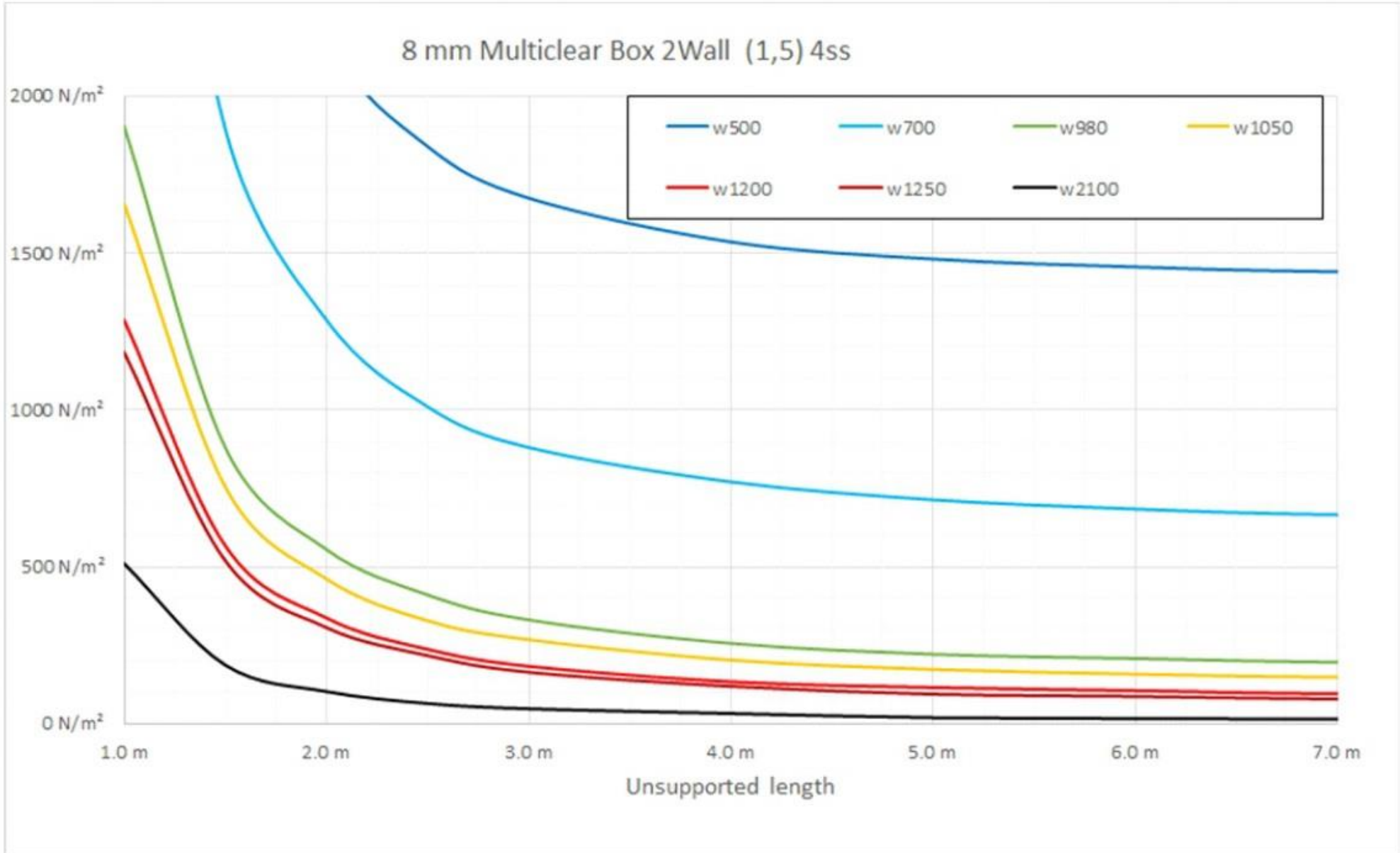
Example 2: (green arrows)

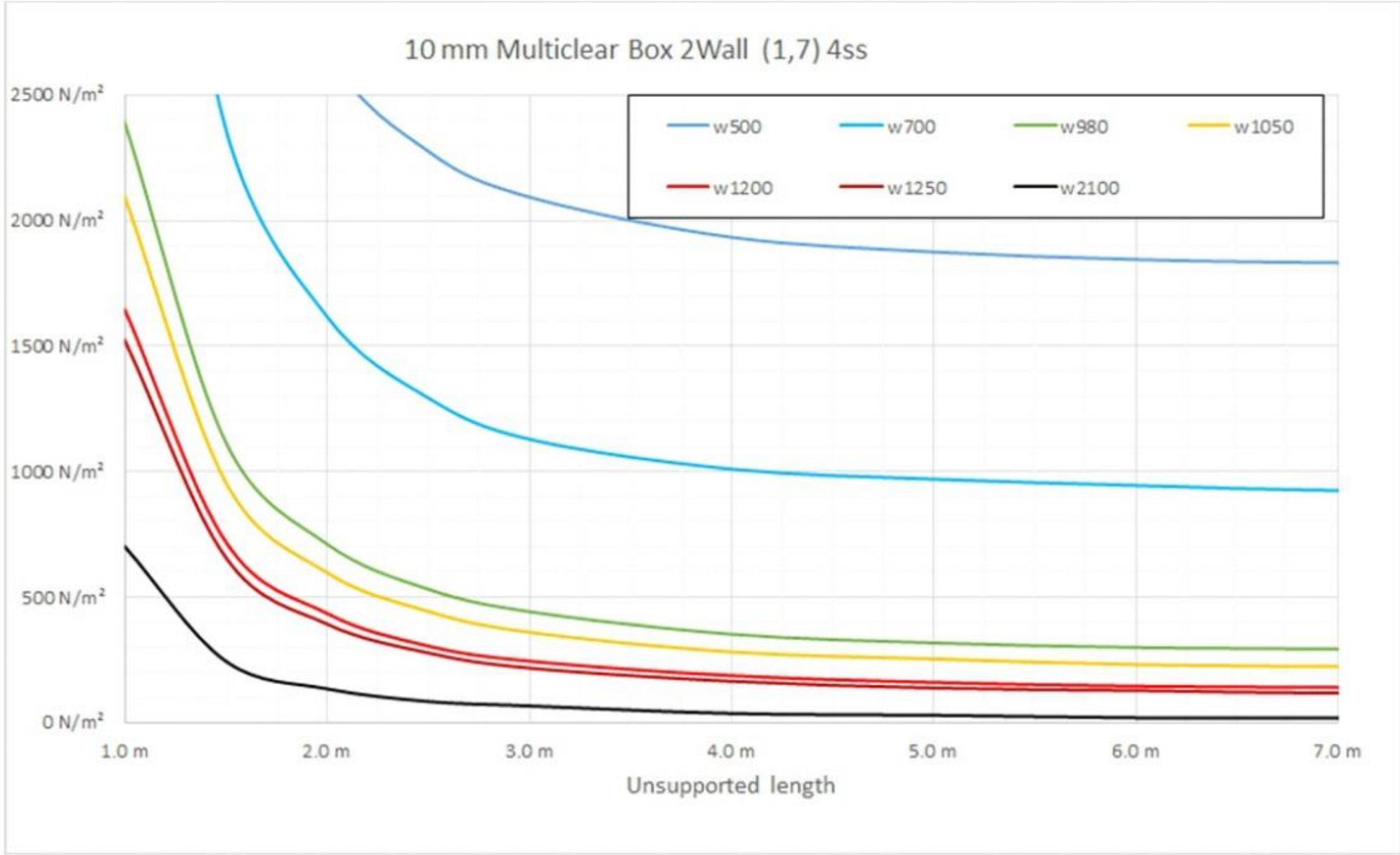
Load of 1350 N/m², Sheet length 2,25 m
The two lines do not intersect on a presented width-curve. So you need to take a smaller width. In this case we move to the blue curve of w700.
If suitable, a longer width can be chosen (up to 5,37 m). Or you can choose to take a lighter sheet (mostly thinner) if that is possible.

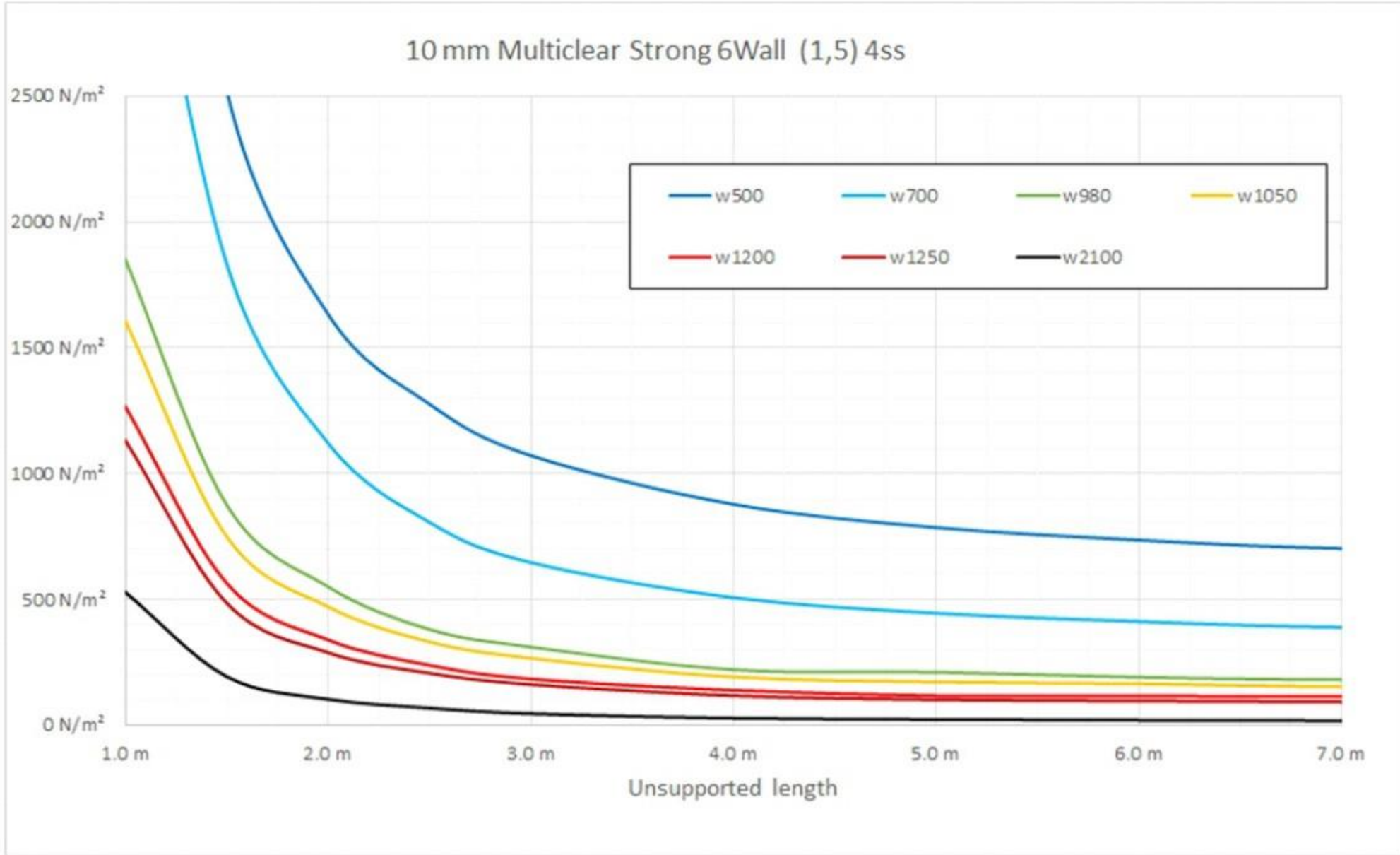


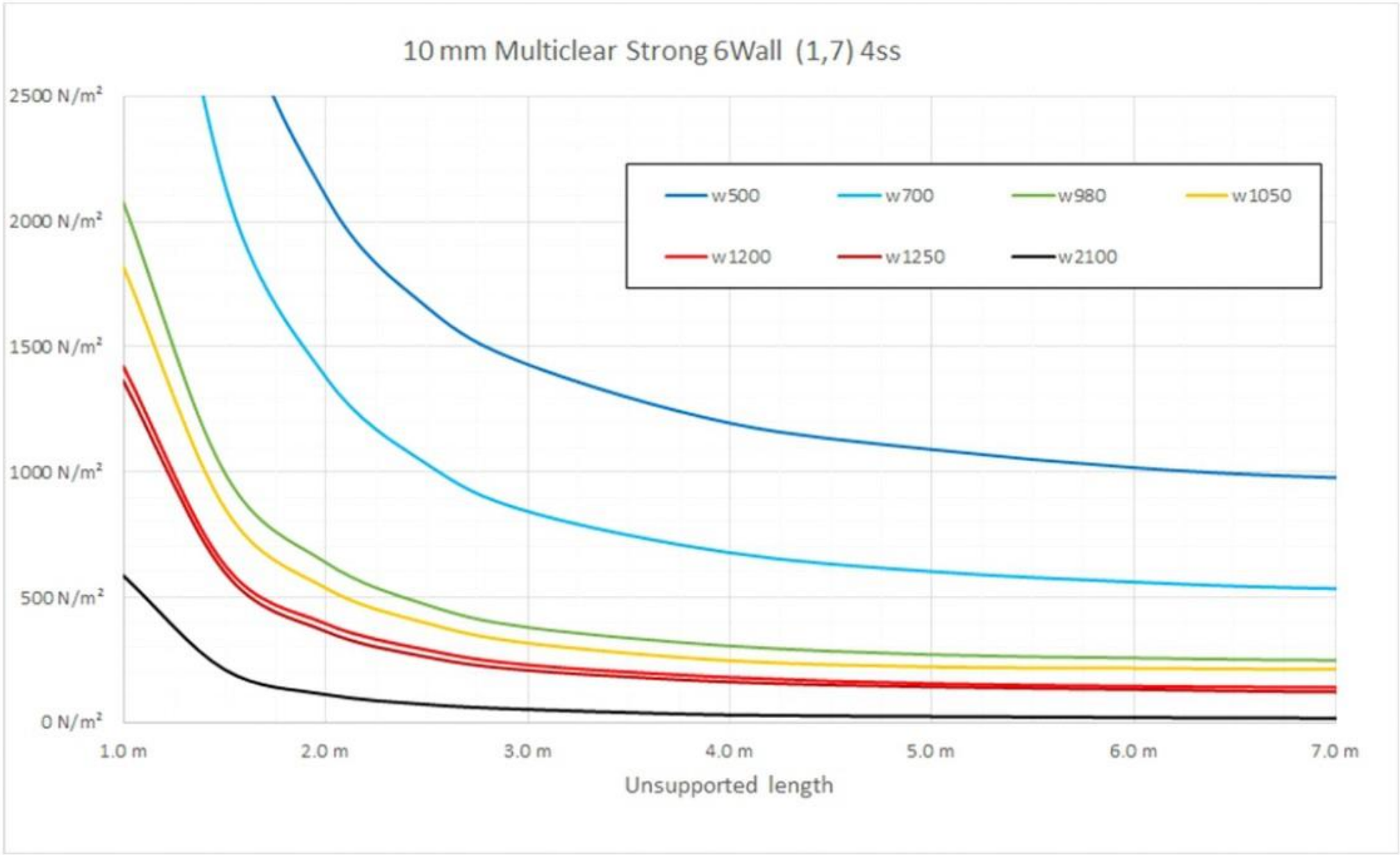

6 mm Multiclear Box 2Wall-10 (1,3) 4ss
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length

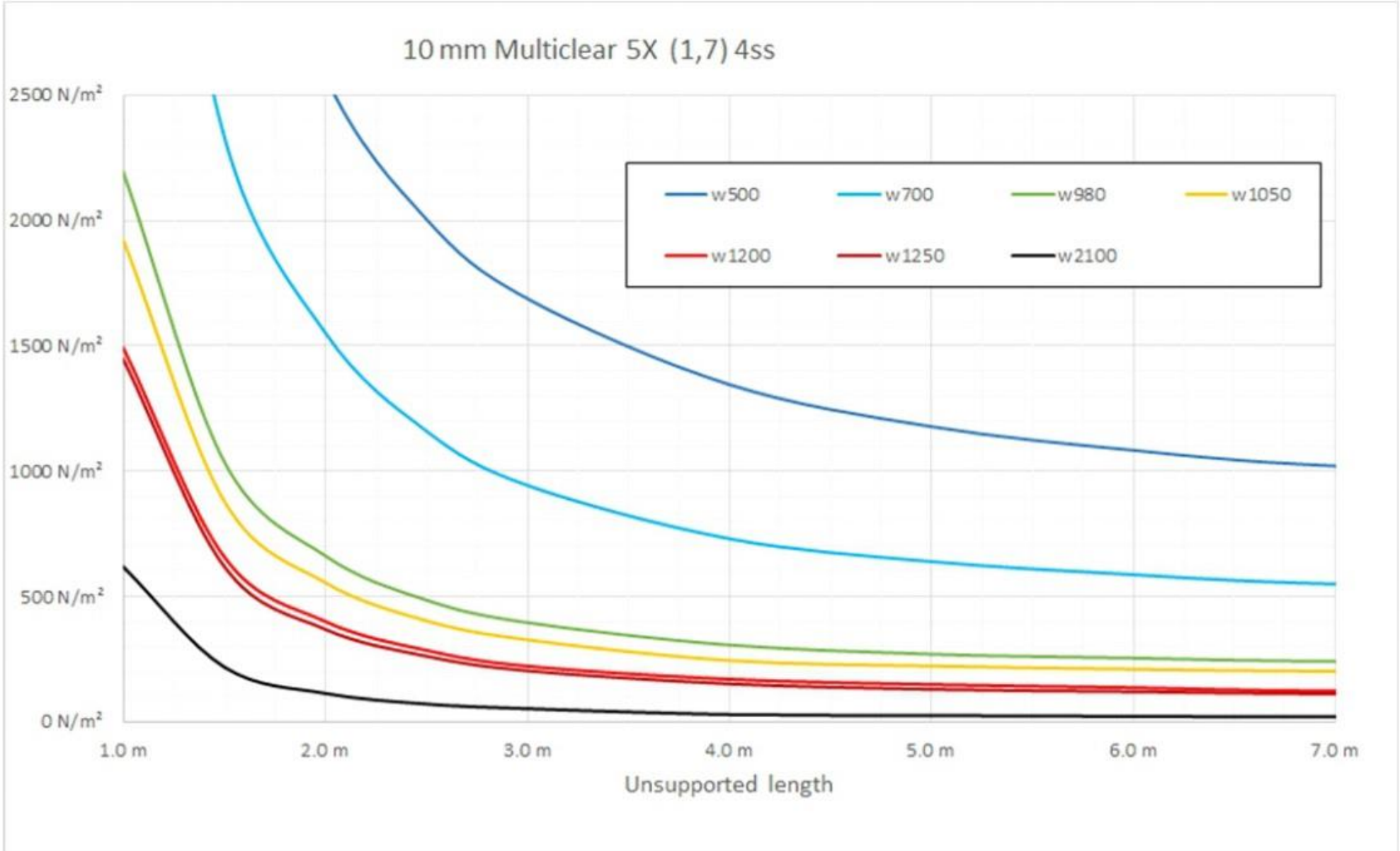

6 mm Multiclear Box 2Wall-6 (1,3) 4ss
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


8 mm Multiclear Box 2Wall (1,5) 4ss
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


10 mm Multiclear Box 2Wall (1,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


10 mm Multiclear Strong 6Wall (1,5) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


10 mm Multiclear Strong 6Wall (1,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


10 mm Multiclear 5X (1,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w500
w700
w980
w1050
w1200
w1250
w2100
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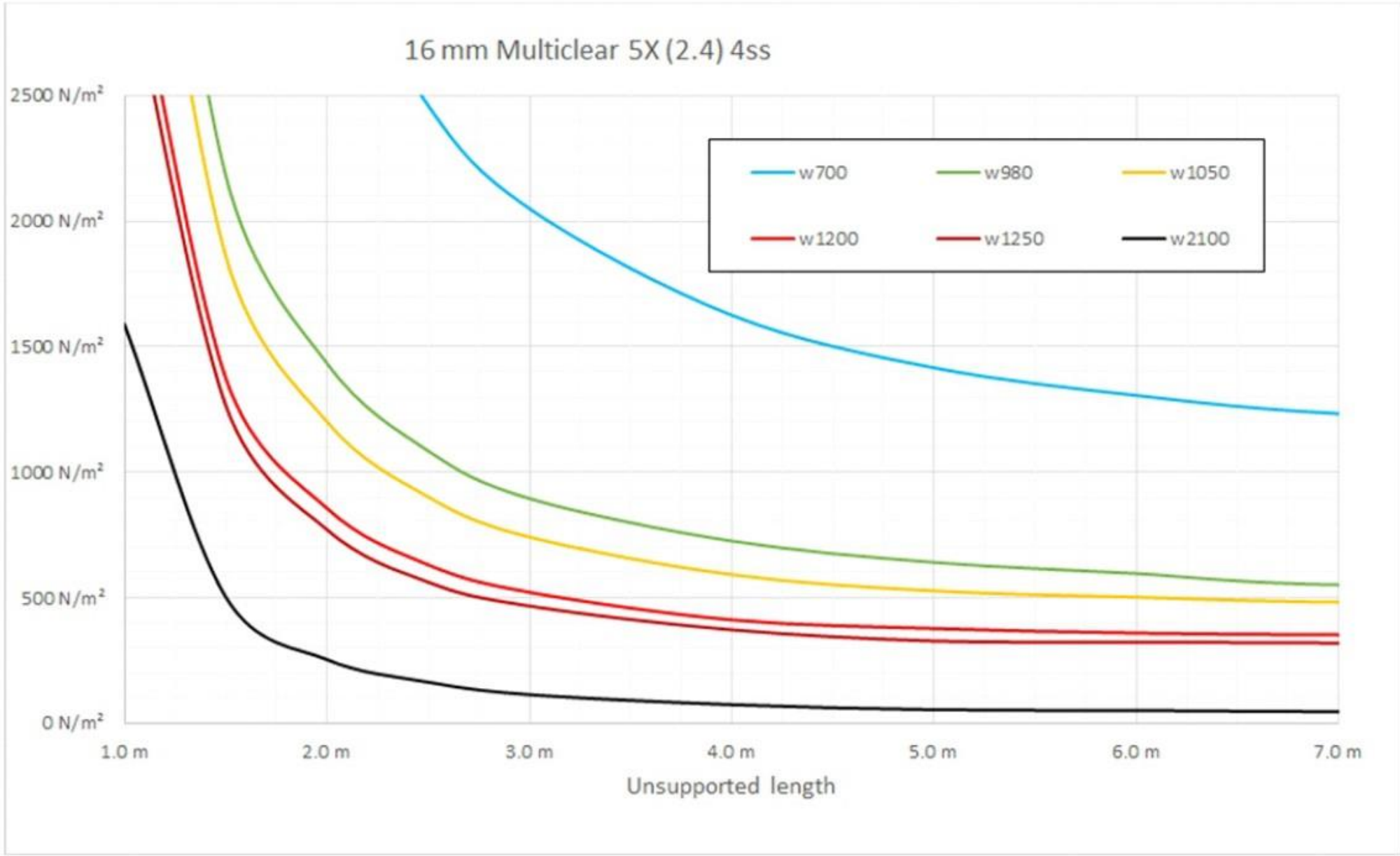
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


16 mm Multiclear 5X (2.4) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
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2.0 m
3.0 m
4.0 m
5.0 m
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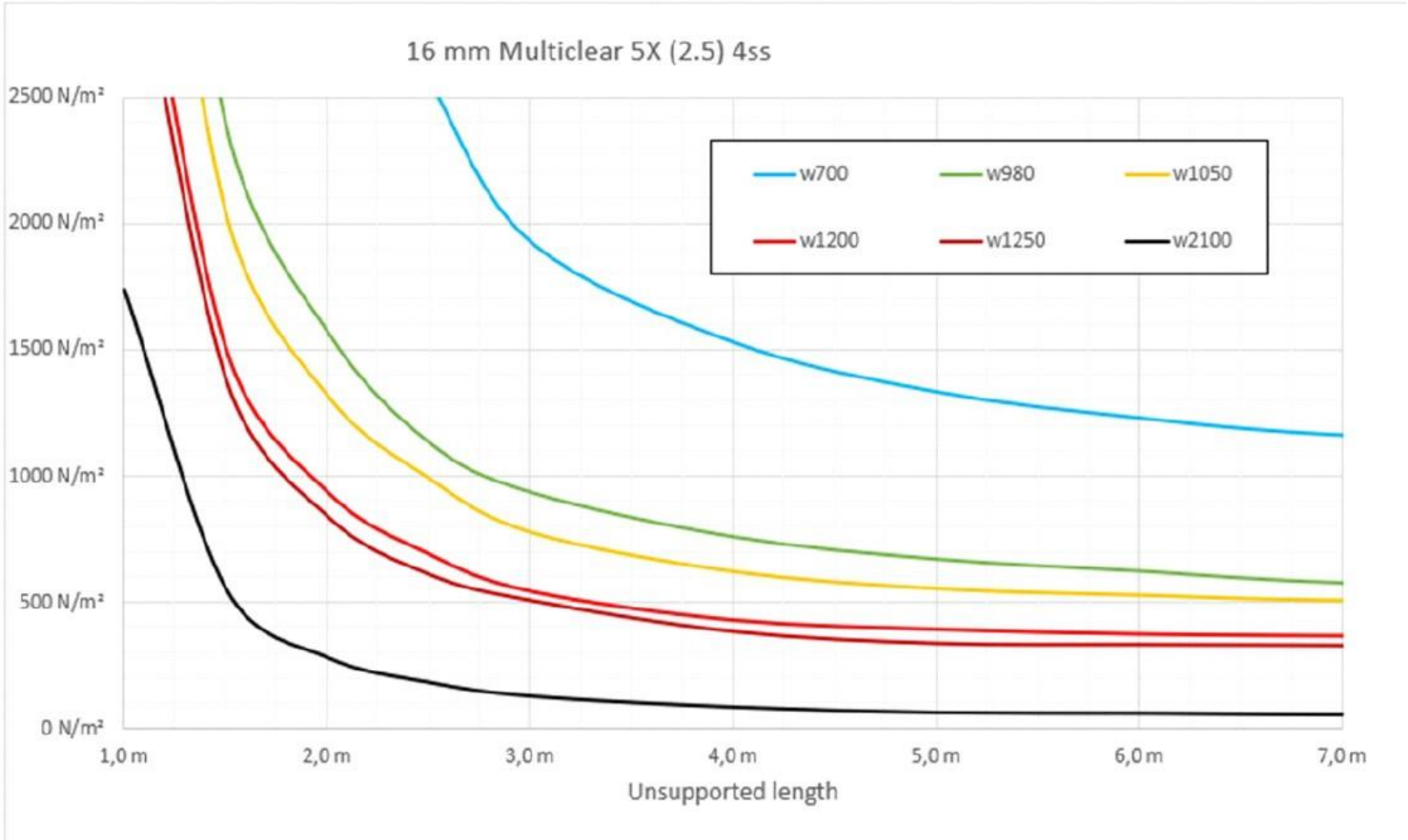
7.0 m
Unsupported length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1000 N/m²
500 N/m²
0 N/m²
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w980
w1050
w1200
w1250
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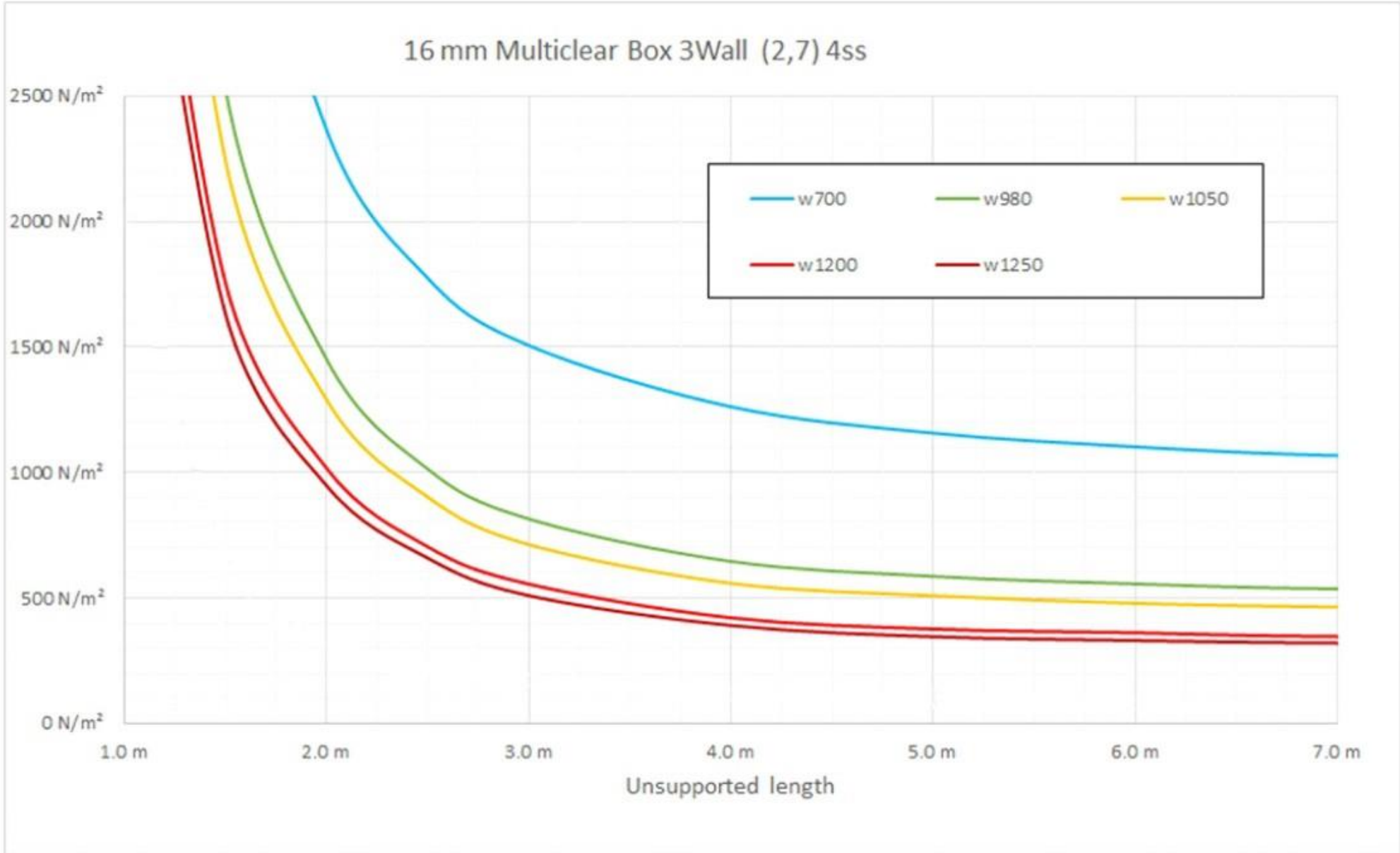
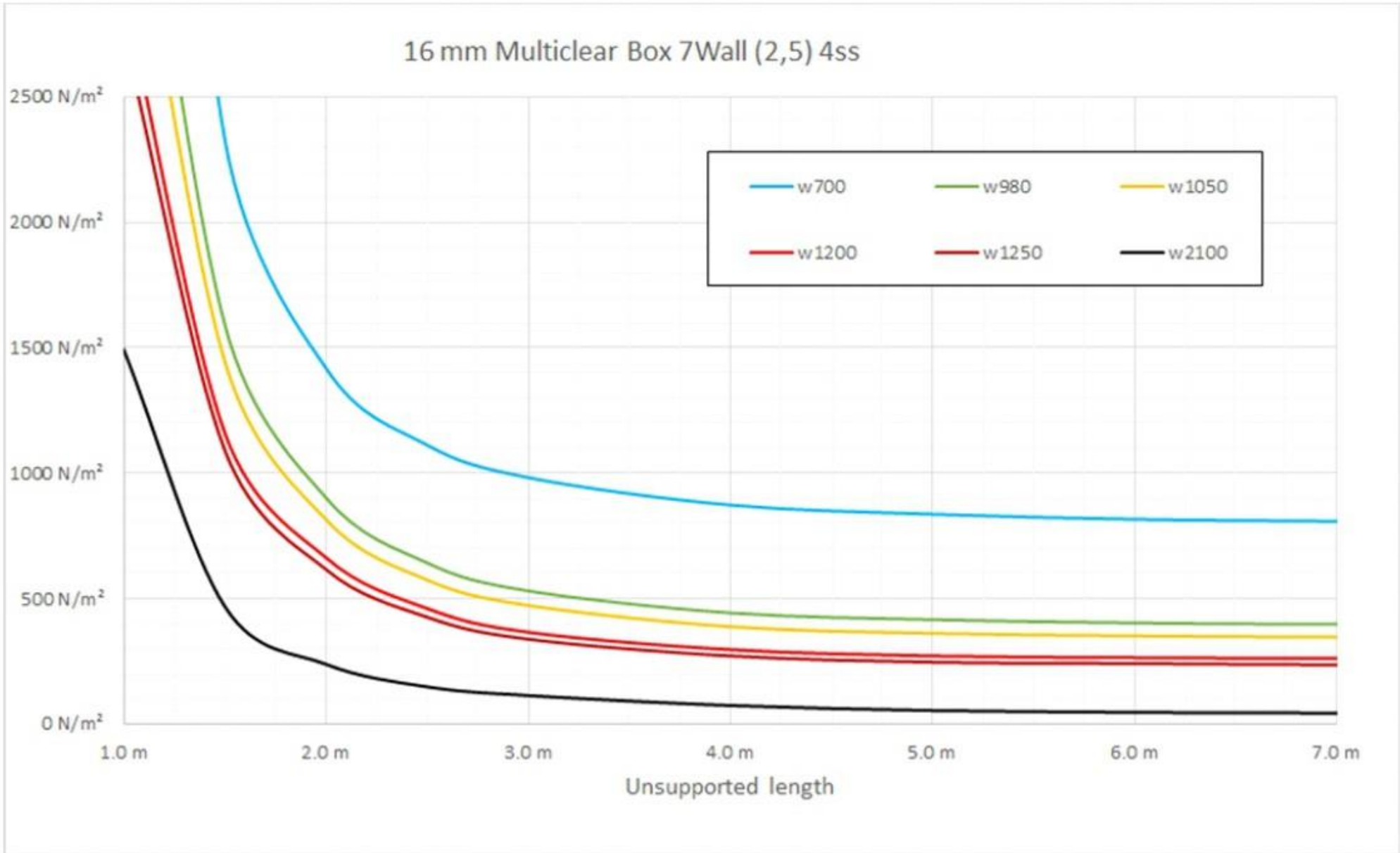
2,0 m
3,0 m
4,0 m
5,0 m
6,0 m
7,0 m
Unsupported length


16 mm Multiclear Box 3Wall (2,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


16 mm Multiclear Box 7Wall (2,5) 4ss
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1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
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w980
w1050
w1200
w1250
w2100
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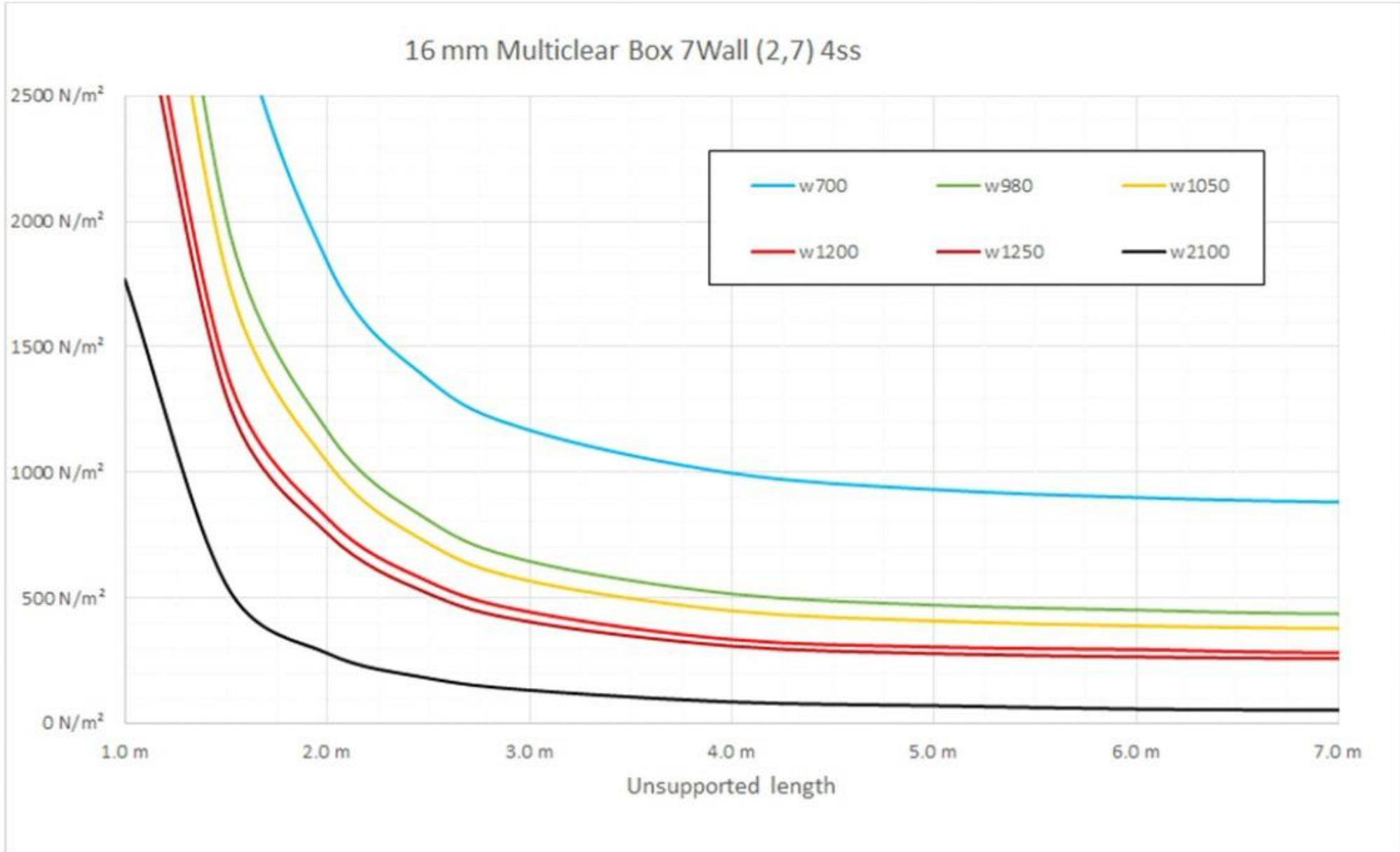
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


16 mm Multiclear Box 7Wall (2,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
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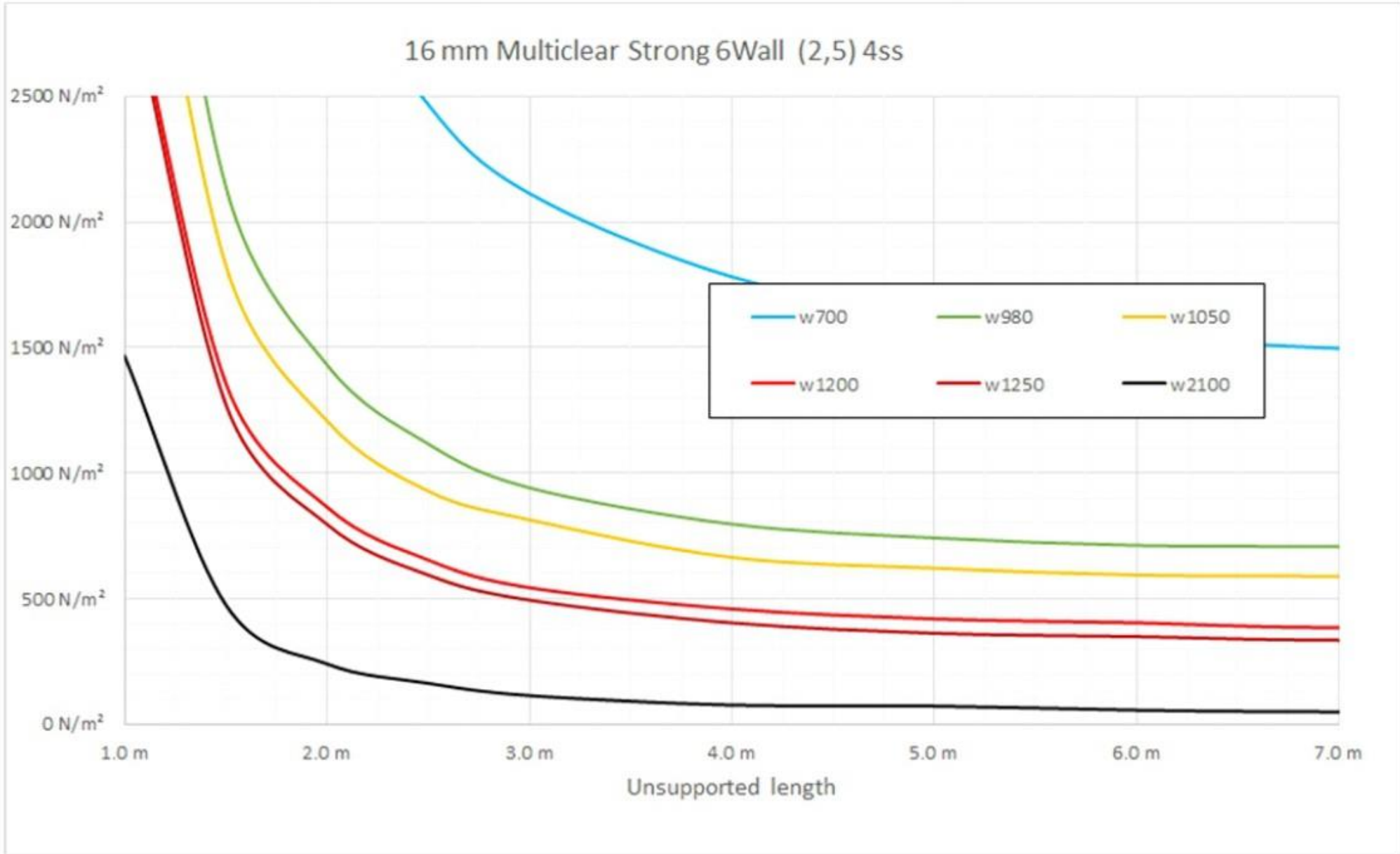
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


16 mm Multiclear Strong 6Wall (2,5) 4ss
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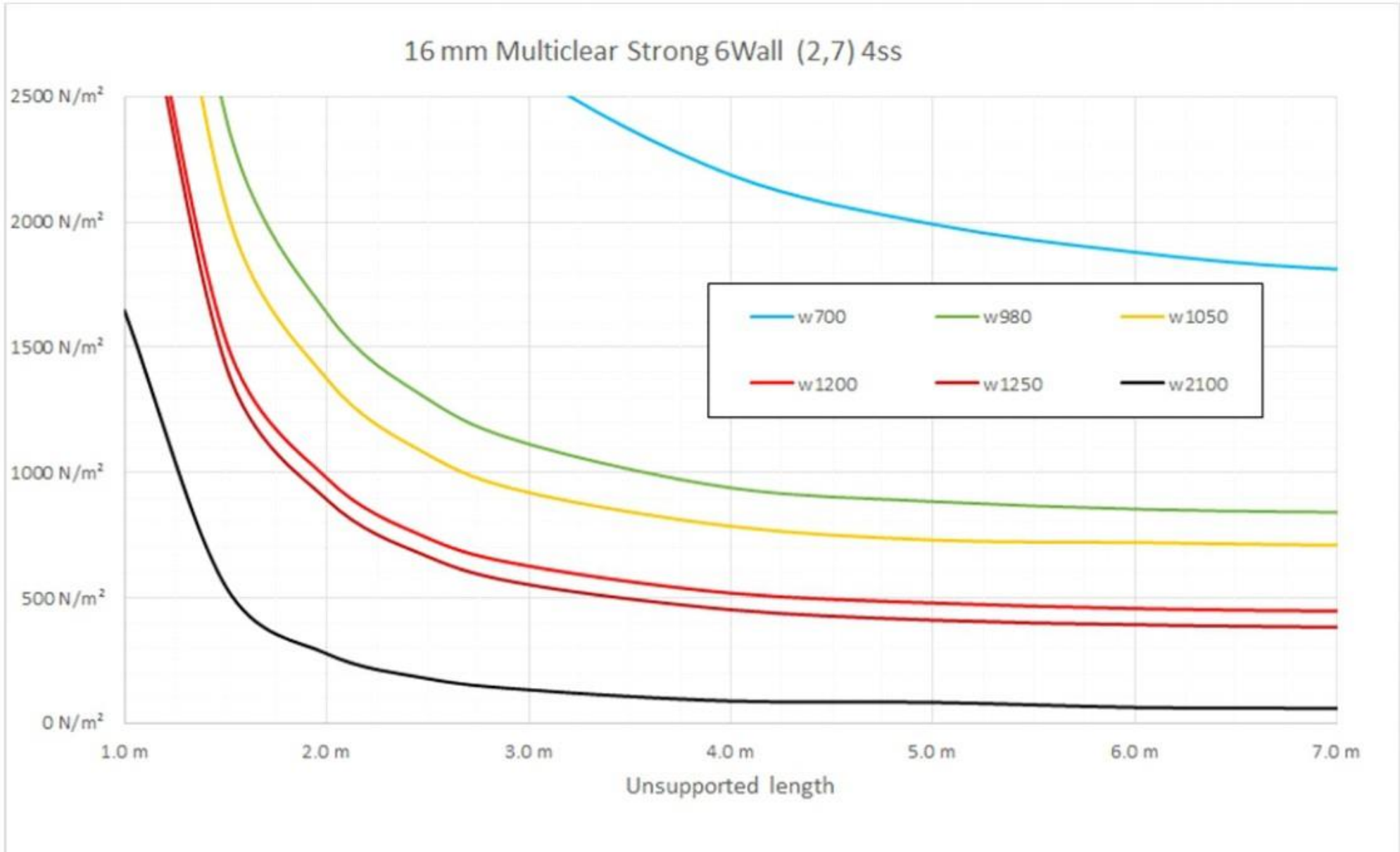
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


16 mm Multiclear Strong 6Wall (2,7) 4ss
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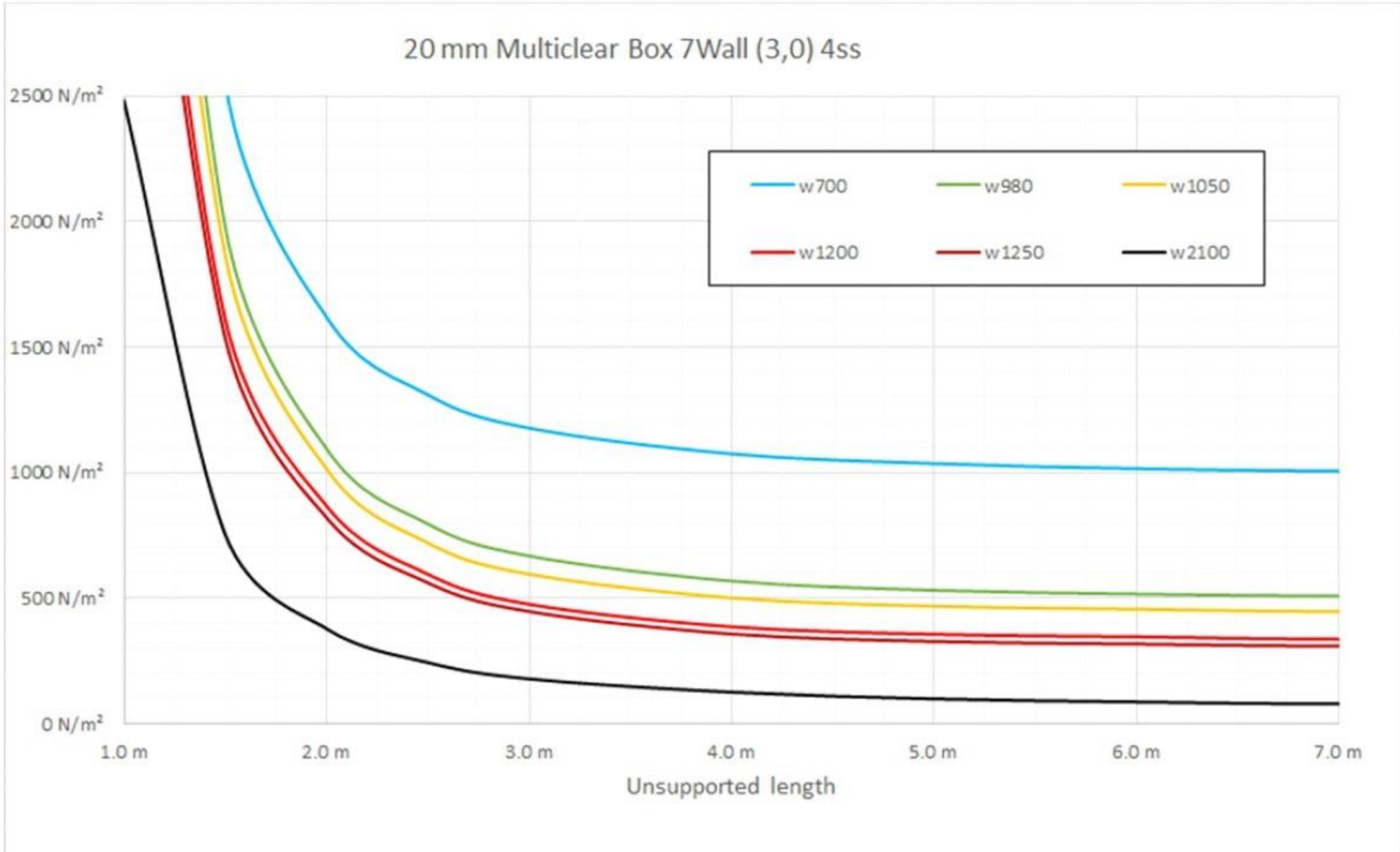
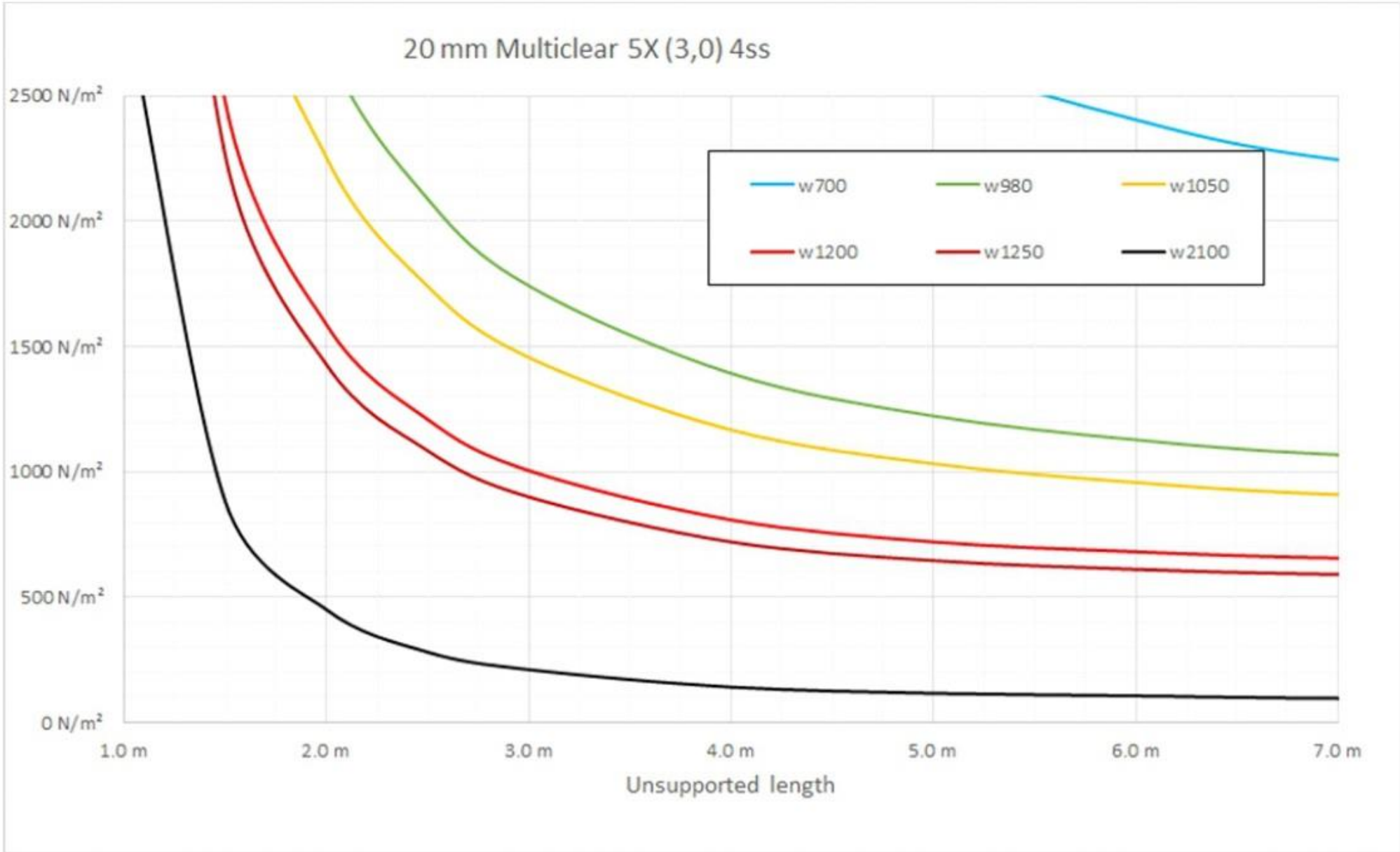
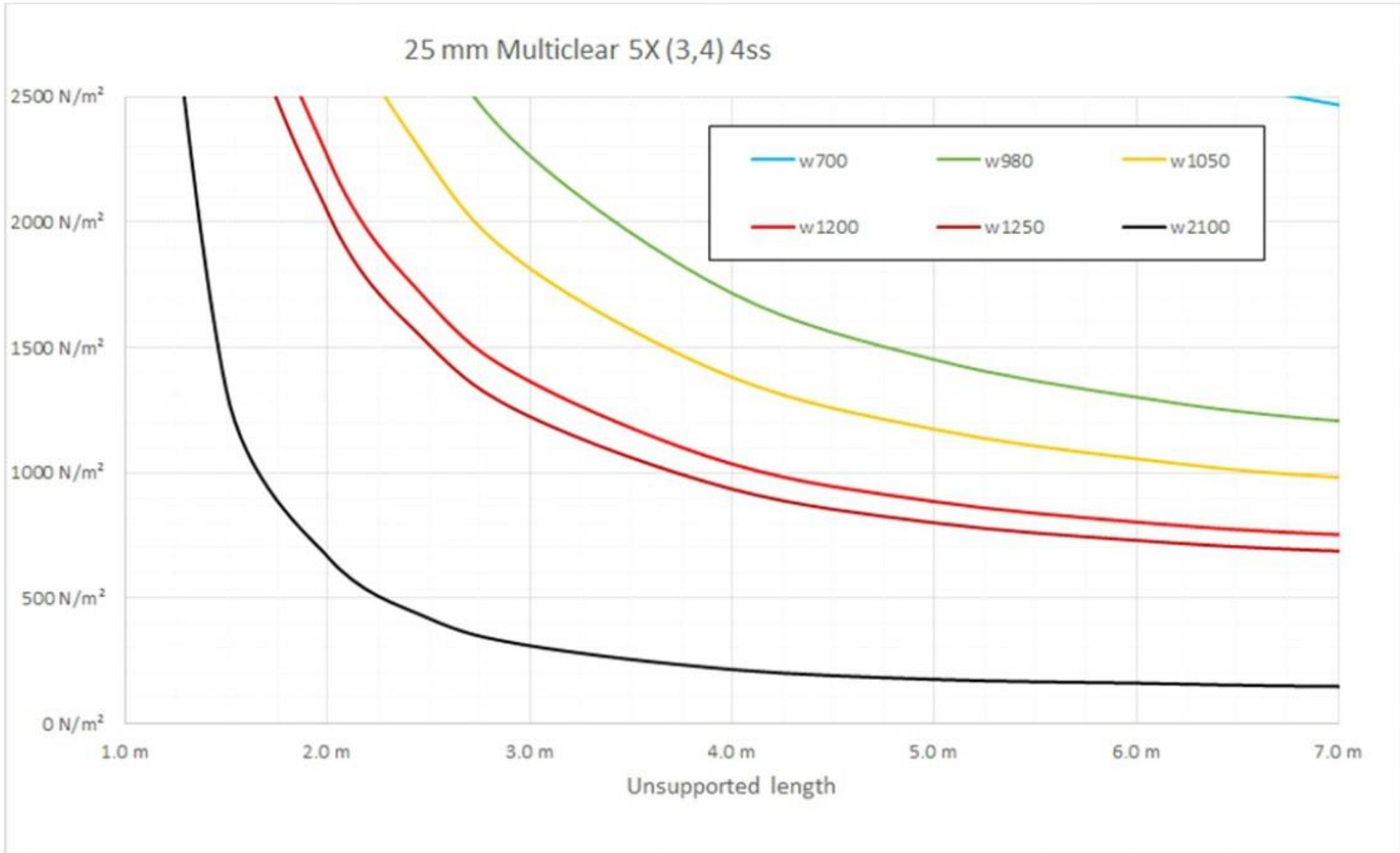
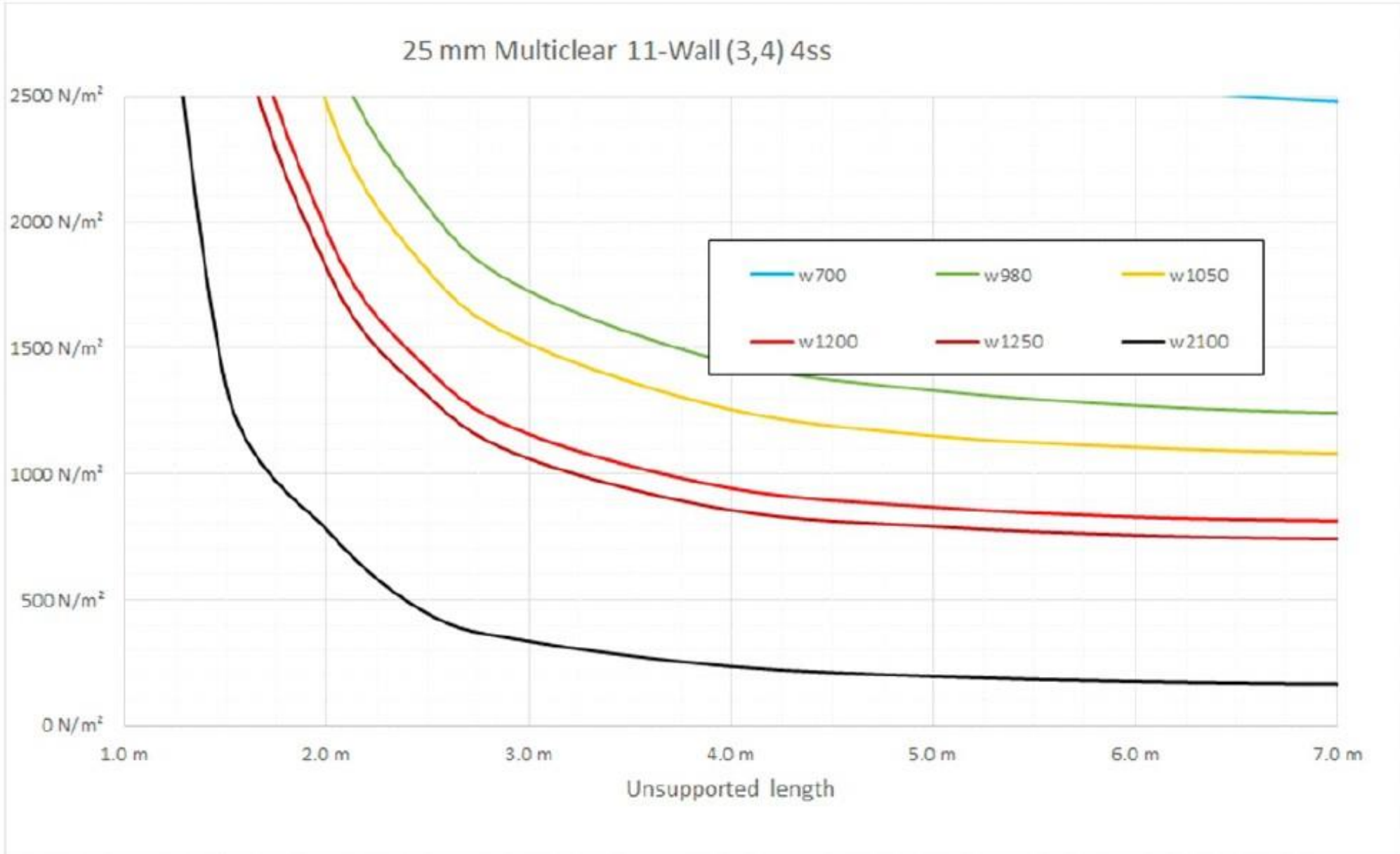
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length

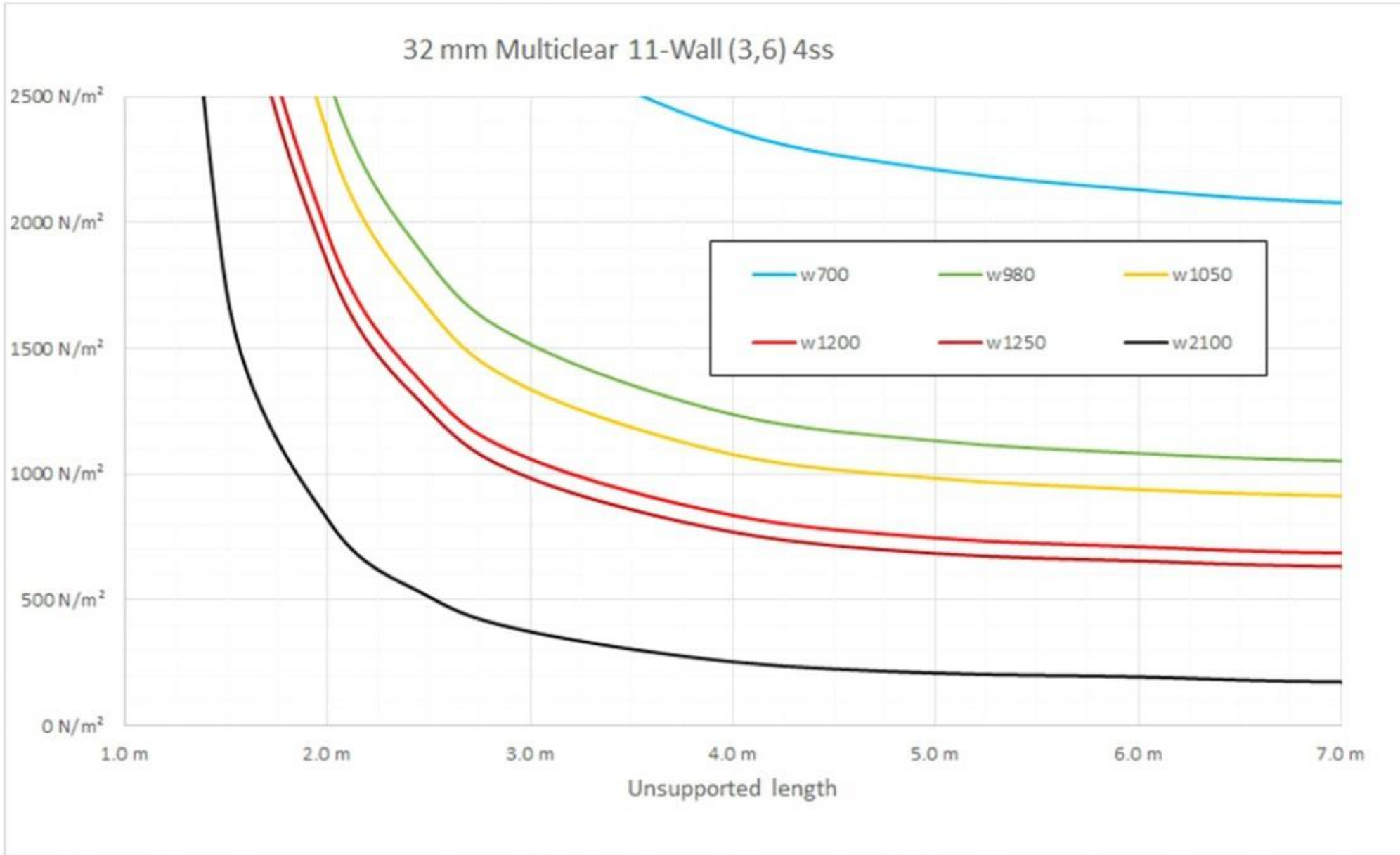

20 mm Multiclear Box 7Wall (3,0) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length

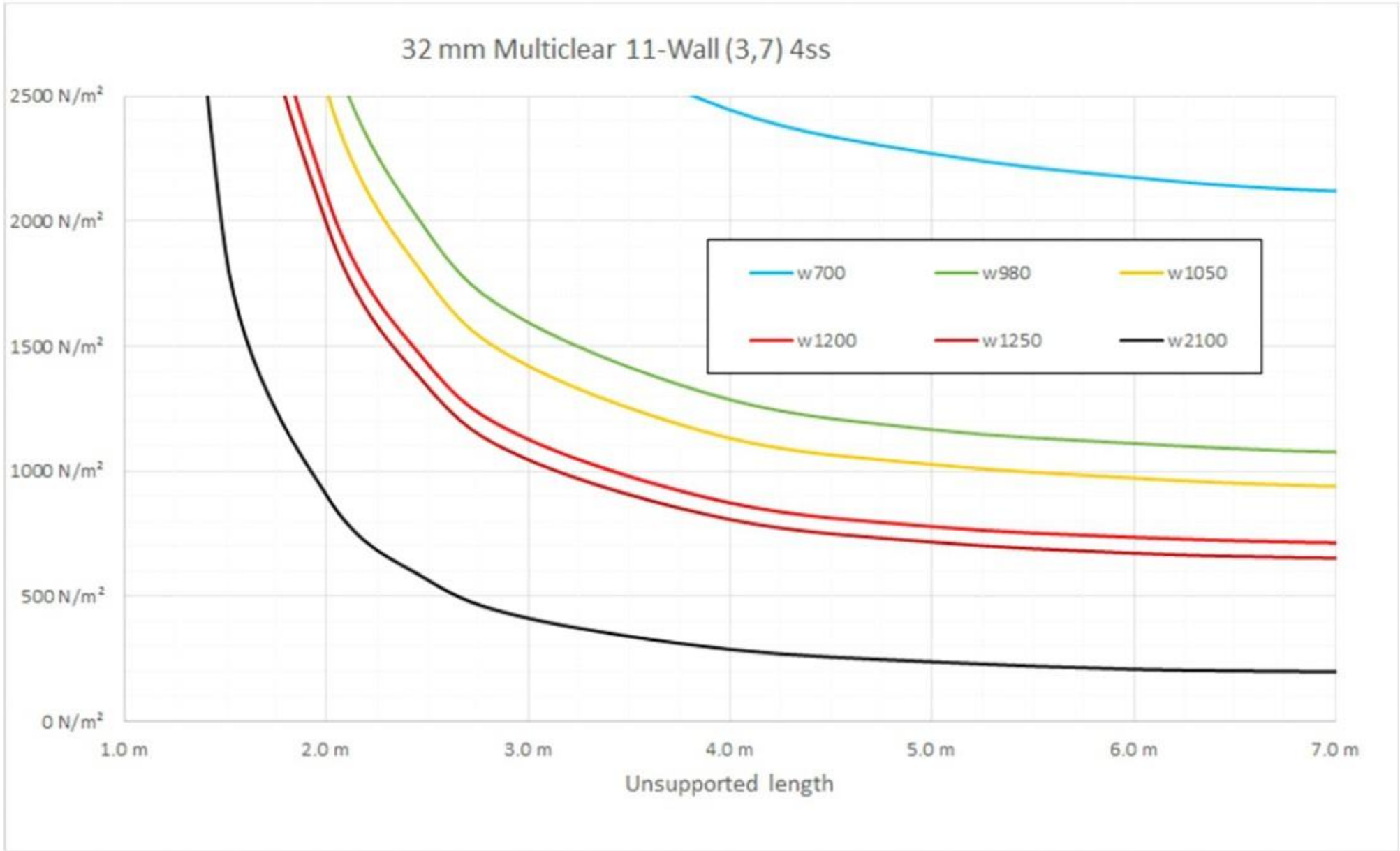

20 mm Multiclear 5X (3,0) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


25 mm Multiclear 5X (3,4) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length

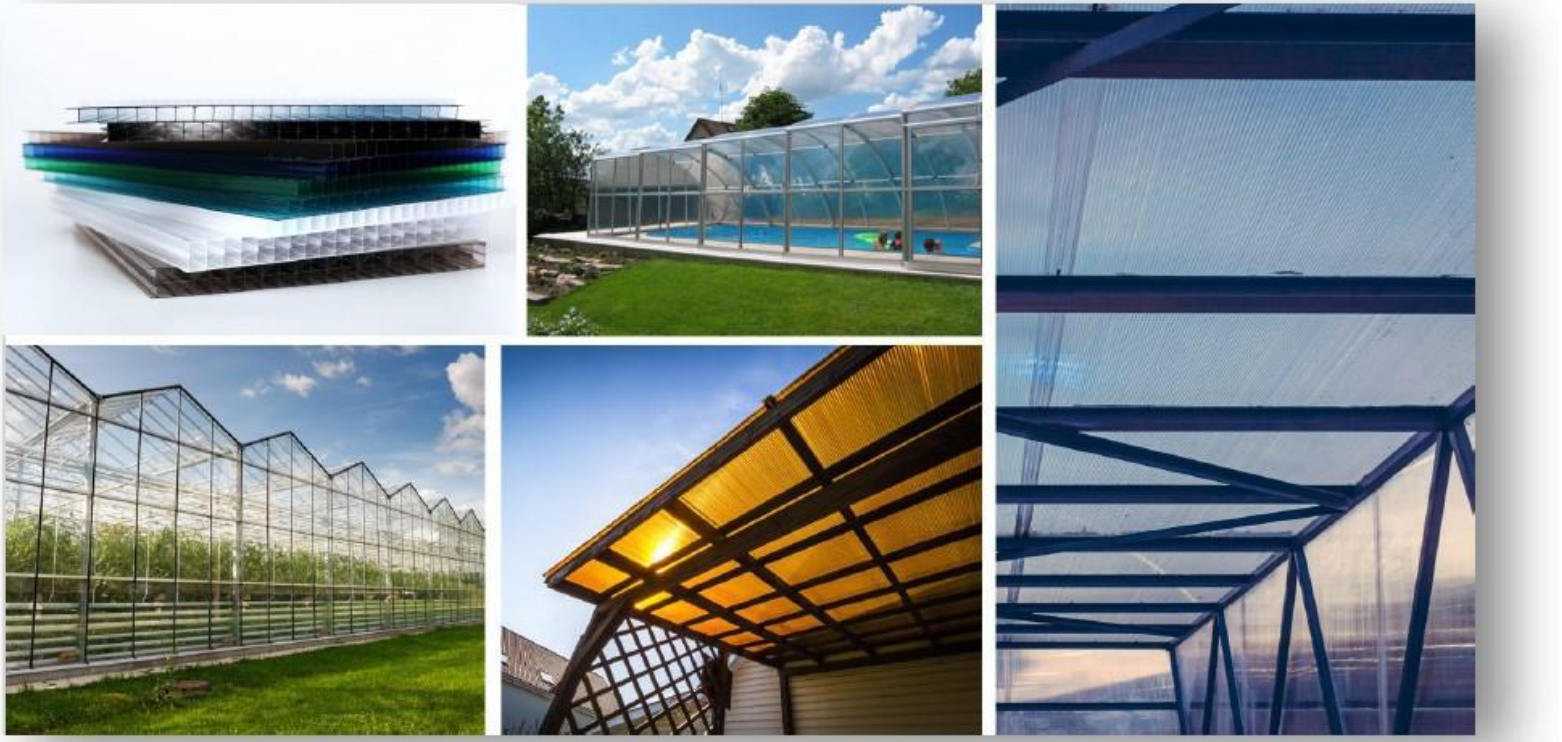

25 mm Multiclear 11-Wall (3,4) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


25 mm Multiclear 11-Wall (3,2) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


32 mm Multiclear 11-Wall (3,6) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length


32 mm Multiclear 11-Wall (3,7) 4ss
2500 N/m²
2000 N/m²
1500 N/m²
1000 N/m²
500 N/m²
0 N/m²
w700
w980
w1050
w1200
w1250
w2100
1.0 m
2.0 m
3.0 m
4.0 m
5.0 m
6.0 m
7.0 m
Unsupported length

MULTICLEAR®



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