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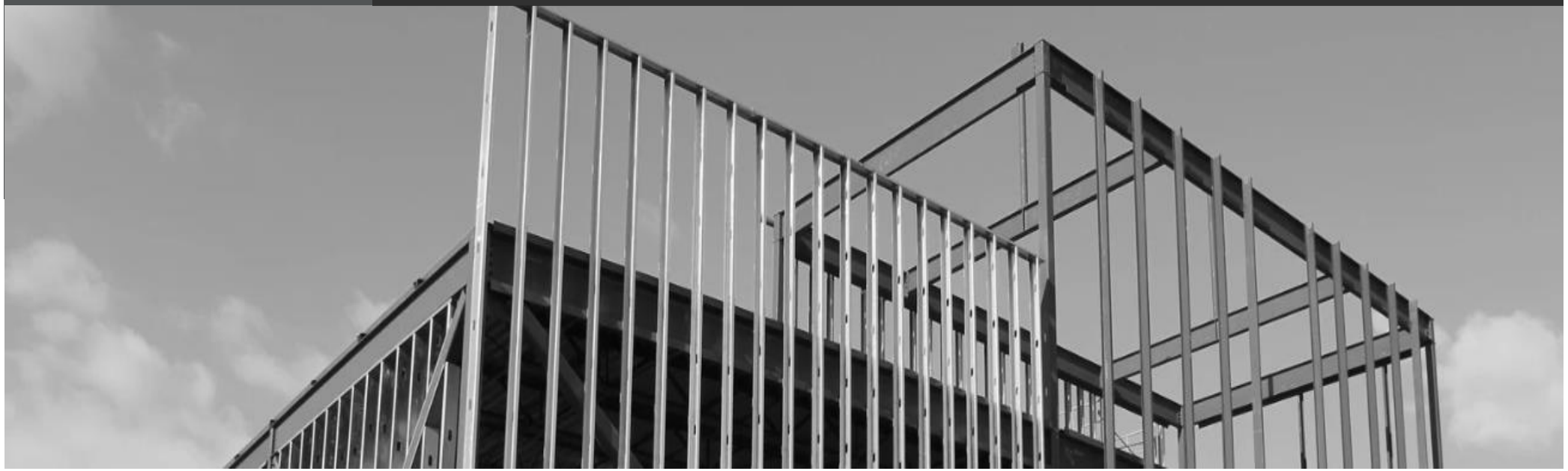
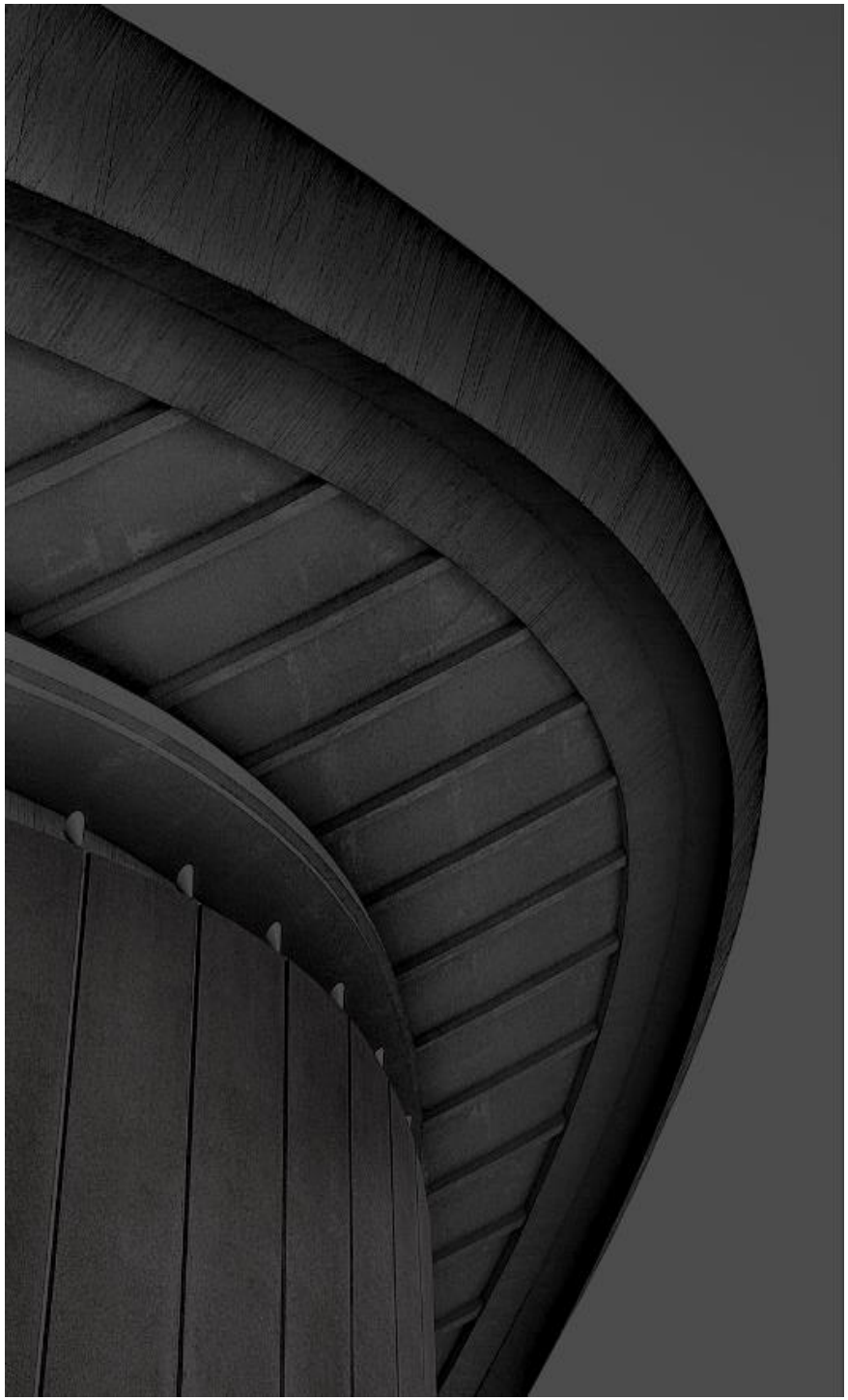
Houses and Buildings - Dry Constructions





Index:

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Steel Constraction

The steel construction has revolutionized the way of building since the second half of the 19th Century.
The ease with which steel is combined with other materials allows a considerable variety of construction solutions.
The material in question is considered the key element between engineering and architecture, because of its specific qualities.
Alongside the traditional construction methods is the off-site construction, also called "dry", precisely for the non-use of water in the assembly process.
These facilities offer many more advantages than traditional buildings.

In Japan, light steel frames were used since the 50s for the necessary post-war reconstruction and later spread throughout the world.
A great boost was given by the pioneering studies led by G. Winter in the 1950s in the United States at Cornell University. Mr. Winter, for the first time, codified a specific calculation methodology to this type of section; It was so that the technology began to spread even among the less experienced designers but the lack of a real standard of reference has prevented for some time the spread on a large scale.

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Steel Constraction

American Iron and Steel Construction (AISI) and North American Steel Framing Alliance (NASFA) initiatives in the United States led to the publication of the "Residential Steel Framing Manual" (AISI, 1997) containing valuable design indications and constructive suggestions.
In Europe, initiatives to support this technology have been seen only in more recent times, one of the most significant being the one conducted in Finland with the research program called "Finnesteel" in the period 1995-2000 developed by the National Technology Agency of Finland (TEKES).

In Italy, the research activities were carried out at the Federico II University in Naples (concluded in 2011) and at the Iuav University in Venice (publication "Progettare e costruire in acciaio sagomato a freddo" edited by MariaAntonia Barucco).
Several UNI EN standards have been issued in recent years for steel constructions, in particular the 1090-2:2018 and 1090-4:2018 that take note of this constructive solution and regularize it in all its many aspects.
Currently, both the client and the market are looking for features in the residential buildings such as safety, reliability, sustainability and efficiency, requirements introduced by the concept of Building 4.0.

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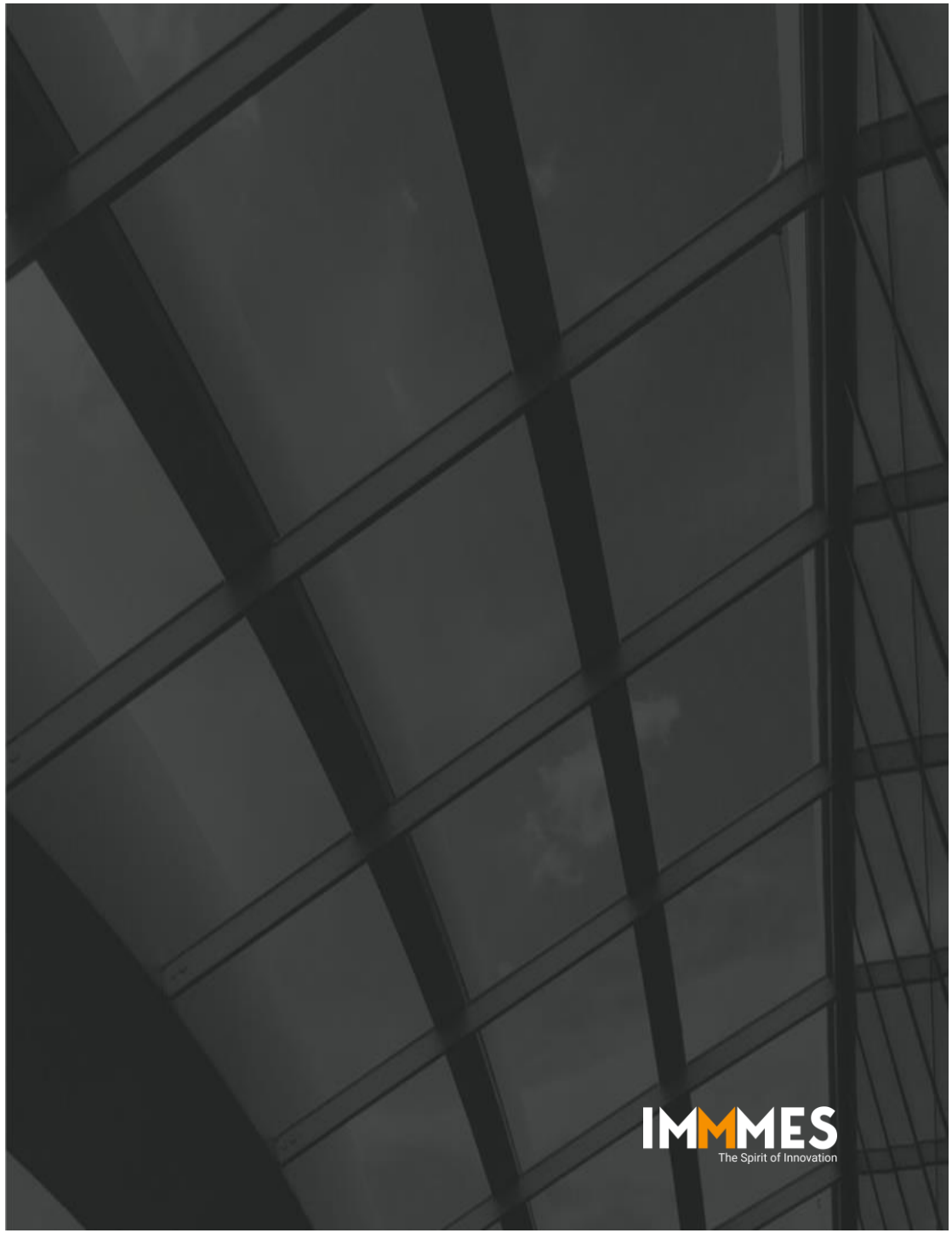
Advantages of the dry construction



Advantages of the dry construction (1/2)

Optimization and respect of times/costs. The detail of setting upstream of the project and the strong accuracy in the initial phases of study and design facilitate the next phase of assembly on site and reduce the margin of error, with a consequent streamlining of the total timing. This makes it easier to keep the initially budgeted costs unchanged;

Speed: the use of prefabricated construction systems reduces the time of construction of these structures;

Sustainability: the use of steel as the main material and the minimization of adhesives and binders, replaced by mechanical bolts or joints, allows the disassembly and recycling of many elements;

Anti-seismic structure: lightness and ductility make the steel resistant to seismic events (seismic-resistant structure);

Performance of the wall: the basic construction of the wall allows a class A level of energy efficiency. The planned variations allow you to get up to category A4+.
The Steel Frame construction system allows maximum integration with all thermal and acoustic insulation systems provided by the world of "dry" construction.
The product of this interaction is a layered system in which each layer performs a specific function. The choice of materials and their correct position is decisive in order to achieve high energy standards;

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Advantages of the dry construction (2/2)

Durability: a characteristic of steel is its resistance over time, without the need for maintenance. The hot-dip galvanizing of the sheets at the origin (from which we start for the cold forming of the profiles) guarantees the metal properties of the material, thus protected against corrosion. The steel does not require maintenance over time, it is not subject to deformations due to settling, as an isotropic material, and it does not fear the aggression of micro-organisms, mold or insects;

Quality and precision: the use of prefabricated components allows to have a higher quality and avoids errors, thanks to the accuracy and precision in the study phase. The structural design is developed on the basis of technical specifications thanks to dedicated software that allows you to have the 3D model directly. Once the project has been defined and approved by the client, all the elements that make up the building are realized by the integrated production system and assembled in our factory;

Total aesthetic freedom and customization: from the design point of view, whether it is completely new projects or redevelopments or modifications of existing buildings, the flexibility and versatility of steel provide an unparalleled level of architectural freedom, as well as the fact that the material in question is effectively integrated into any type of material and context;

Safety on site is another advantageous element of dry construction. During the processing phase, it is not necessary to use heavy vehicles, thanks to the lightness of the material used and the transfer of the pre-assembly phase at the manufacturing workshops.

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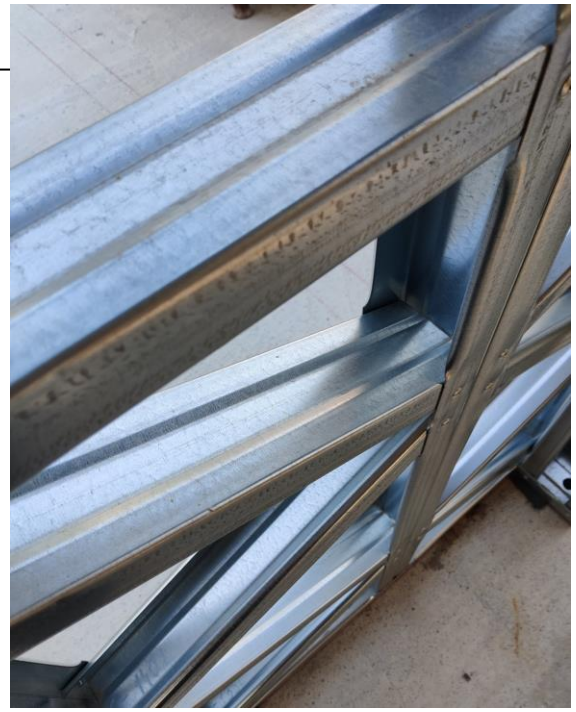
Focus - Earthquake proof structure



The seismic resistance of buildings with metal structures is one of the main advantages of this construction method.

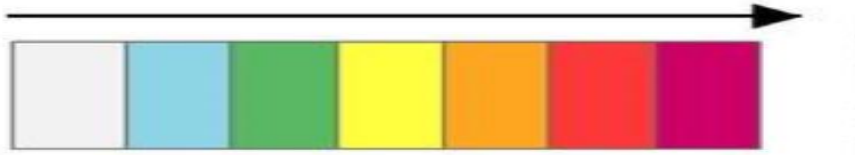
Several companies in the sector, in order to meet the need to have earthquake-proof buildings, have started to invest significantly in steel constructions.

This material allows the realization of highly resistant, lightweight and elastic constructions, which do not collapse under their rigidity and weight. The ductility of steel favors (compared to other materials) considerable greater energy dissipation caused by the seismic events of an earthquake. The design is adapted to meet any level of seismic protection of the installation area.

The quality of the steel, combined with the attention to detail and thanks to the prefabrication of the off-site profiles, make the dry construction the best anti-seismic solution.

SISMIC AREA	I	II	III	IV
Resistance	The structure meets the requirements of the anti-seismic regulations of the various areas, even at high risk, thanks to the engineering and the numerous qualities of the material used.			

Minimum risk



Maximum risk

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Focus – Speed and Economy

The high production precision and the lightness of the metal profiles, allow quick assembly of the structure, with a consequent reduction of labor and construction costs.
The off-site prefabrication allows to transport the ready-to-assemble elements directly on site, ensuring maximum accuracy, thus eliminating any risk of error.

Unlike traditional systems, the dry one does not require the use of water, nor of materials that require long shutter speeds, allowing a significant saving of time.

All this allows you to fall within the estimated time frame from the initial project, without waste of material and with a limited impact on the territory.
Speed and precision guarantee economic savings over the entire construction of the structure.

Example of timing for the construction of a building of 225 square meters and 120 square meters divided by macro:

Type of work	Construction times for a house of 225sqm commercial	Construction times for a house of sqm commercial
laying structure and fixing on the ground	12 working days	7 working days
infill structure, internal insulation, waterproofing	15 working days	20 working days
installation of internal, external and roof insulation	25 working days	
realization against internal sides and walls plasterboard partitions	20 working days	25 working days
realization of plants, electric, thermo sanitary, controlled mechanical ventilation and photovoltaic	25 working days	
construction of screeds and floors and walls, including rest periods	30 working days	15 working days
installation of windows and sanitary ware	5 working days	

Focus - Sustainability

The Light Steel Frame constructions are considered entirely environmentally friendly.
The building process of dry construction is characterized by a lower use of energy, compared to traditional building sites.

Steel, the main material used, is totally recyclable and reusable, thanks also to the ease of disassembly guaranteed by the use of mechanical joints instead of adhesives and binders of typically wet processes. In addition, much of the steel used in construction comes from recycling.

The dry construction system, unlike the traditional one, does not involve the use of water, a fundamental resource, ensuring significant water savings.

The precision with which the construction site is managed, from the design phase to that of assembly, avoids the waste of materials.

The house, once finished, guarantees high energy efficiency, through the use of insulation materials and the installation of renewable energy systems.

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Open Profile Structure

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Light Steel Frame

The open profile structure is part of one of the Modern Construction Methods at the base of which is the revolutionary Light Steel Framing (LSF) process. The process is characterized by the cold bending of thin strips of variable thickness (10/10 mm, 12/10 mm) of hot rolled galvanized steel sheets.

This technological innovation of the construction method allows high customization possibilities of the project, complete freedom of design and guarantees an excellent resistance-to-weight ratio from a mechanical point of view as well as a marked elastic ductility in terms of deformation.

The lightness of the profiles used does not require handling with heavy vehicles, involving a use of less energy, even in terms of labor.
The partial off-site assembly and in general the integrated management of the entire production cycle, make this method of building accurate and fast, with low processing costs.

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Data using steel

The weight of the structure per square meter of wall varies from 11.5 to 14.00 kg, the pitched roof weighs about 10 kg/ sqm while the flat roof weighs about 16.50 kg/ sqm.

A house of 225 sqm on two levels with flat roof has a total metal weight of about 7,700 kg, while a house of 150 sqm on two levels with sloping roof has a total metal weight of about 6,780 kg.

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Energy efficiency

Dry construction, with the Light Steel Frame (LSF) system, guarantees significant savings in operating costs: the system is considered energy efficient thanks to the materials used for the exterior cladding and the possibility of inserting the best insulation materials, to important limitation of heat and acoustic transmissions through walls and roofing.

Even at the key nodes (thermal bridges) the absence of heat loss is guaranteed.

To allow thermal efficiency, glass wool with a density of about 40 kg/m3 will be injected through the holes in the panels.

To confirm the sustainability of the construction and the achievement of high energy classes, to complete the structure, many systems can be easily integrated to obtain renewable energy, such as heating systems, heat pumps and photovoltaic panels.

The average consumption of Italian buildings has been estimated at 160 Kwh/m2-year. A Class A house must have a consumption less than or equal to 30 Kwh/m2-year: five times less.

The standard Immmes wall achieves a transmittance of 0.13 W/m²K.

	Classe A4	$\leq 0{,}40\ EP_{gl,nren,rif,standard}$
$0{,}40\ EP_{gl,nren,rif,standard} <$	**Classe A3**	$\leq 0{,}60\ EP_{gl,nren,rif,standard}$
$0{,}60\ EP_{gl,nren,rif,standard} <$	**Classe A2**	$\leq 0{,}80\ EP_{gl,nren,rif,standard)}$
$0{,}80\ EP_{gl,nren,rif,standard} <$	**Classe A1**	$\leq 1{,}00\ EP_{gl,nren,rif,standard)}$
$1{,}00\ EP_{gl,nren,rif,standard} <$	**Classe B**	$\leq 1{,}20\ EP_{gl,nren,rif,standard)}$

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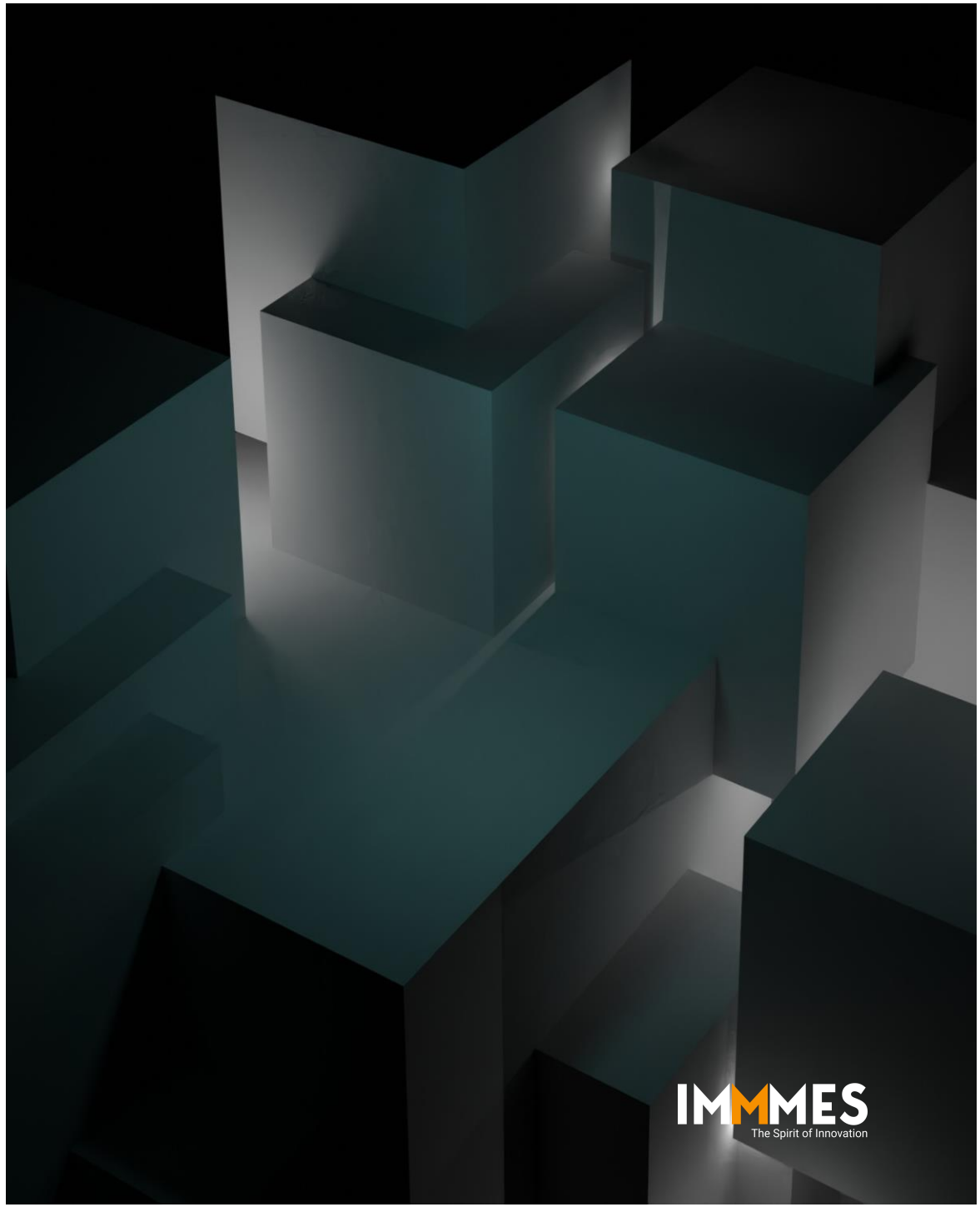
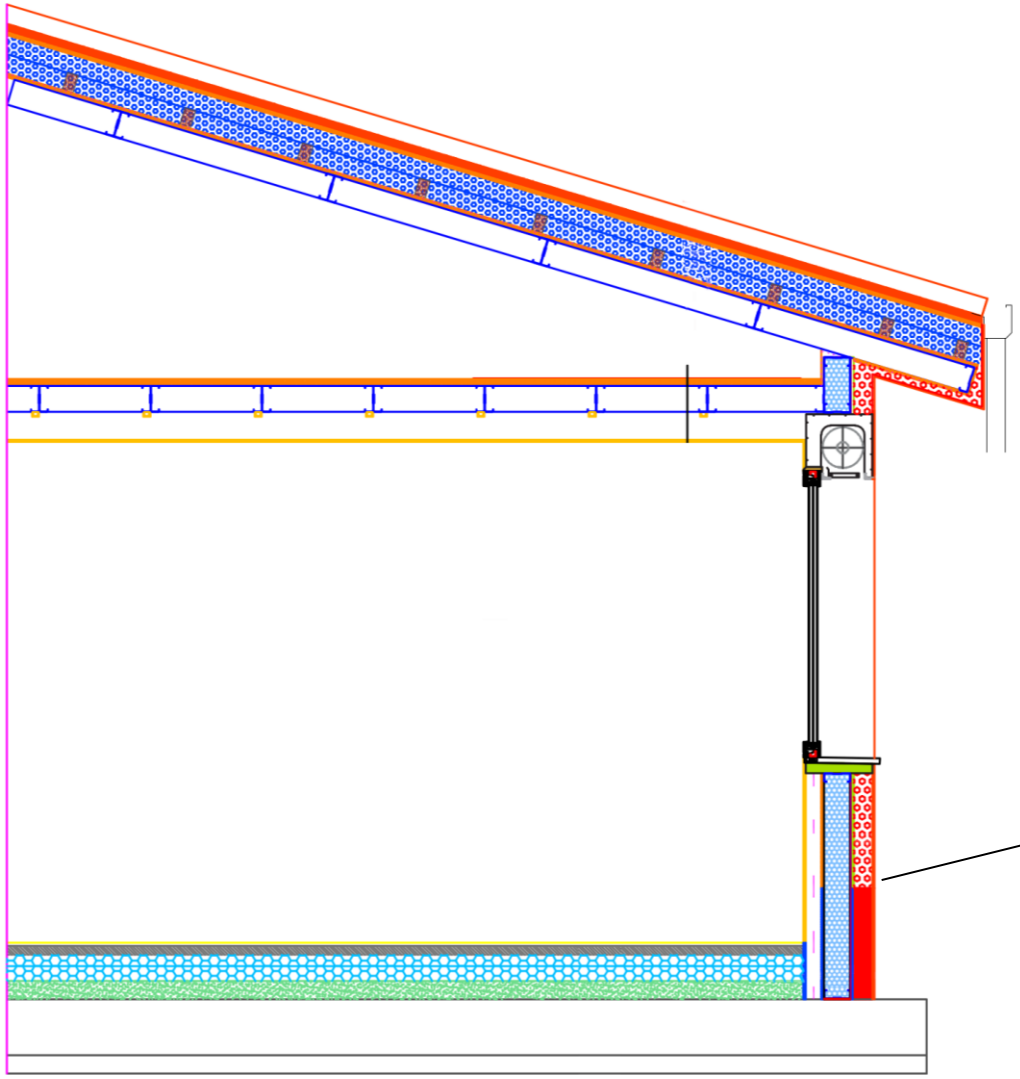
Type of housing

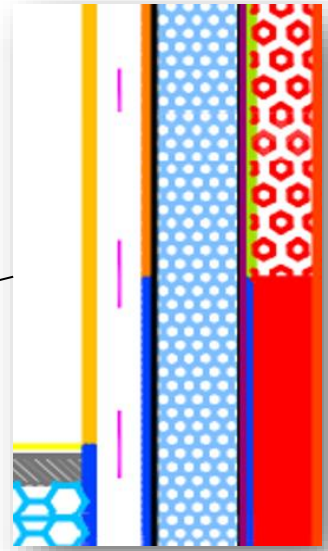


Pitched roof to a floor



PERIMETER WALL, (details of FIRST 600 mm lower in Blue)
From the inside to the outside:

- 12.5 mm plasterboard sheet / 12.5 mm aquapanel
- 75 mm warp with perlite inside
- Riwega DB 155 vapour barrier
- OSB3 panel sp.12 + anti-vibration strip/ 12.5 mm aquapanel plate
- Acoustic mat
- Steel frame inside with a sheath tape at the foot
  Insufflation with glass wool of 40 kg/mc sp. 140 mm
- Acoustic mat
- 18 mm OSB3 panel / 12.5 mm aquapanel plate
- 100 mm EPS panel/ 100 mm XPS panel
- Skim coat and plaster



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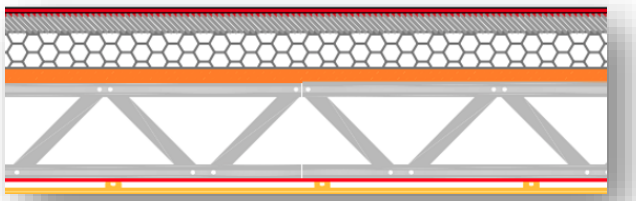
Pitched roof with two floors

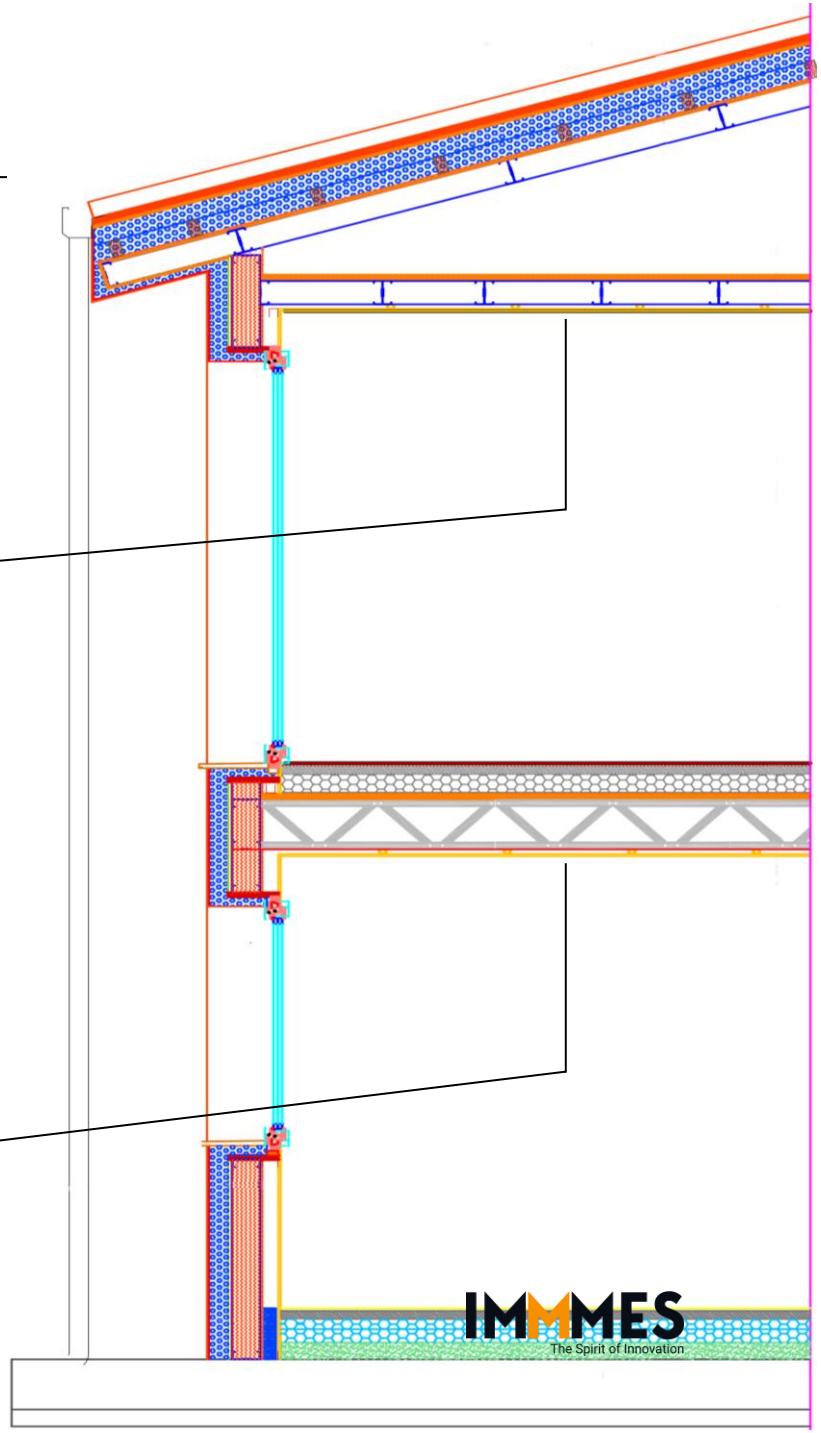
ATTIC, ACCESSIBLE, NOT HABITABLE
From the inside to the roof:

- 12.5 mm plasterboard sheet
- Approximately 70 mm implant space
- Steel frame 140 mm
- 18 mm OSB 3 panel
- 12 mm OSB 3 panel

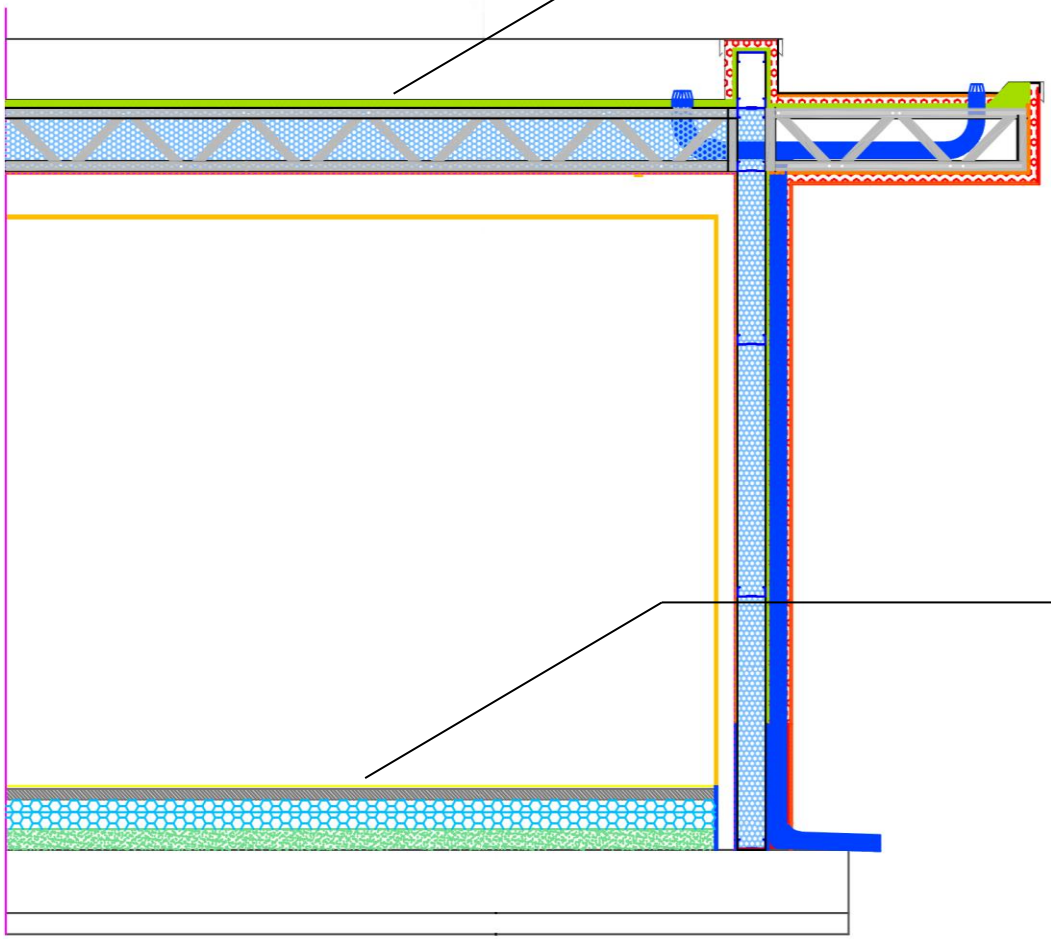
INTERFLOOR SLAB
From the inside to the outside:

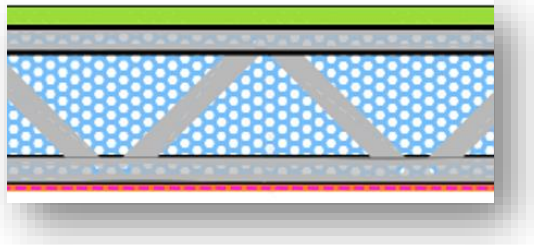
- 12.5 mm plasterboard sheet
- Steel frame 300 mm
- Rigid plane with double panel OSB 3 of 18 mm
- Grazing mat
- Lightened screed sp. 100 mm
- Self-leveling screed 40 mm
- Wood flooring 11 mm





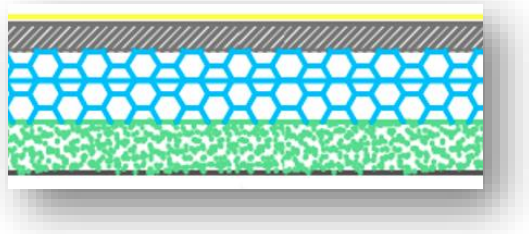
Flat roof with one floor





FLAT ROOF
From the inside to the outside:

- 12.5 mm plasterboard sheet
- Cavity for installations 250-300 mm
- Riwega DB 155 vapor barrier
- PSB panel 3 sp. 12 mm
- Steel frame h 300 with inside:
  Insufflation with glass wool 40 kg/mc 300 mm
- Rigid table with 18 mm OSB 3 double panel
- Evalon VSK waterproof membrane 1.5 mm



BASE
From the inside to the outside:

- Stoneware flooring 10 mm
- Self-levelling screed 35 mm
- Lightened screed 100 mm
- XPS panel with leather 60 mm
- XPS panel with leather 80 mm
- Foundation 300
- Mixed substrate 100 mm

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Focus - Wall thickness

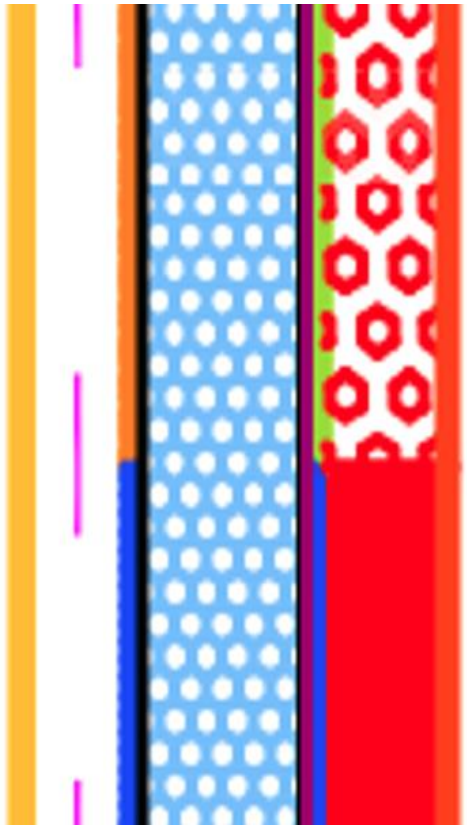

Figura 1.

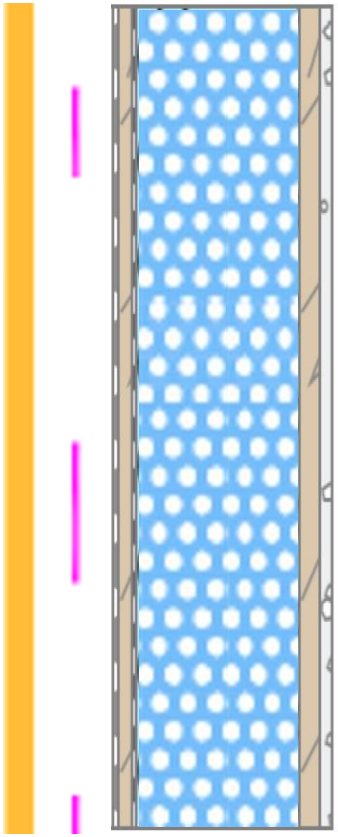

Figura 2.

The types of housing proposed can be made up of walls complete with an external coat, as shown in the previous examples (and in Figure 1.), or may be exempt from it.

The difference between the two options is imperceptible. The absence of the external coat raises the thermal transmittance index of 0.055 W/m2k, largely within the limit required by law.

Both options ensure the achievement of the maximum energy classes A4 and A4+.

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Open profile structure - final result

The construction system in Light Steel Frame (LSF) allows architectural and stylistic freedom, leaving ample room to the creativity of the Client and the Architect.

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Open profile structure - final result

The ease with which steel is combined with other materials allows a wide range of choice of design components, both materials and finishes.

The buildings made with this method are unique and modular over time, each element can be customized to meet any need.

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