



GREENMAPPING REPORT

with reference to international green building standards. Ref.s:

- LEED V4.1.®

ISSUED FOR

TERASTEEL

2021.1 –ENG.

HABITECH GREENMAP.



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GREENMAPPING REPORT

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1. PRODUCT MAPPING REPORT

Habitech Distretto Tecnologico Trentino, the centre of excellence in sustainability for building, energy and transport sectors, developed GREENMAP - the program addressed to the industrial sector – manufacturing and services.



GREENMAP catalyzes sustainability as strategic tool for innovation and development and supports Clients in structuring new corporate outcomes.

The PRODUCT MAPPING service of GREENMAP helps clients to explain and verify contribution of products according to the credit requirements of international standards used for the “final product” of the supply chain process, the green building, as LEED.

During our mapping activities further scenario for technology development and innovation can emerge.

This mapping report is referred to followings reference:

- The international green building rating system LEED®

The materials involved in a project can contribute toward satisfying credits and issues.

It is important that products and materials to build green buildings can point out their contribution to sustain and to specific requirements.

Introduction

The certifications adopted as reference involve the building as a whole, not just the individual product, but it's easy to understand the fundamental role that products play in the sustainability and certification goal of the building itself.

All the products involved in a project can therefore contribute to credits as long as they're in conformity with the requirements.

Anyone participating in a green project will look for supplier partners of products which conform to the required parameters, and will look for manufacturers able to set information, documentations and certifications that qualify the sustainable performance of their product and the quality of their processes.

2. TERASTEEL

TeraSteel has constantly invested in technological development and currently is capable to produce zinc coated profiles and thermal insulating panels with polyurethane foam PUR and flame retardant polyurethane foam PIR, as well as metal accessories.

TeraSteel production facilities are located in Saratel, Bistrita-Nasaud County (production facility for thermal insulating panels) and in Bistrita (production facility for zinc coated panels), Romanian.



In 2017, following a 7 million euro investment, TeraSteel has opened a new factory in Serbia – TeraSteel DOO. This is the first production facility located outside Romania, but also the first Romanian entirely private owned factory opened abroad after 1990. The investment was meant to complete the production capacity of TeraSteel facility in Romania. Since March 2018, there is also a self-supported corrugated sheets TRS 153-840 production line and from the second half of 2018 began the production of panels with mineral wool.

Moreover, with modern logistic and IT structures, that allow fast order processing and fulfilment, TeraSteel managed to develop commercially both internally and internationally on markets such as Hungary, Czech Republic, Slovakia, Ukraine, Moldavia, Austria, Germany, Holland, Slovenia, Croatia and Switzerland.

Currently, TeraSteel exports its products in over 25 countries.

Source: www.terasteel.ro

3. TERASTEEL PRODUCTS ANALYZED: LEAD BY TERASTEEL

Lead by TeraSteel: an innovative solution for metal buildings that reaches a new level of performance in what concerns sustainability, thermal insulation and resistance to fire. Lead by TeraSteel contributes to the reduction of the CO2 footprint, providing architects a higher freedom of design as well as optimised costs for the beneficiaries.

The new insulation technology V PLUS Perform™ insulation technology by Dow is a polyurethane solution that allows the production of a new generation of insulation panels. Therefore, the heat transfer coefficient is 20% better than standard polyisocyanurate foam (PIR).

The V Plus Perform technology with cyclopentane provides superior resistance and reaction to fire: Superior reaction to fire; Class B-s1, d0; Resistance to fire: 30 min.

Lead
by TeraSteel

LEAD INTO THE WORLD TO COME!

- CO₂ Footprint Reduction
- Improved Energy Efficiency
- Increased Resistance to External Factors
- Cost Efficiency
- Reuse of Materials
- Fire Safety

POWERED BY **TeraSteel**

Made with **DOW** V PLUS Perform™ insulation technology

Lead
by TeraSteel

Made with **DOW** V PLUS Perform™ insulation technology

What is Lead?
An innovative solution for metal buildings that requires a new level of performance in terms of sustainability, thermal insulation and fire safety giving architects greater freedom of design, while reducing the negative impact on the environment.

We offer:
Better insulation, better fire safety, better design choices, better environment initiatives, in one word, **SUPREME EFFICIENCY.**

Why are we different?
We are not just adding value to your construction, **we deliver it to you.**

- We provide design, products documentation, manufactured steel structures and assembly of industrial, commercial or agricultural Turnkey Halls, as well as for a large spectrum of steel buildings.

Lead by TeraSteel - Excellence of next generation buildings.

- Our proposal is based on outstanding efficiency in terms of insulation, cost reduction over time, fire safety, resistance and reliability of turnkey steel halls. Designed, produced and assembled by TeraSteel, Lead is a unique solution on the Romanian market, solving a full package of architectural challenges.

Why Lead?

CO₂ CO ₂ Footprint Reduction	- Lower decarboning footprint - CO ₂ footprint reduction	Cost Efficiency	- Energy consumption savings up to 20% compared to market average (CO ₂ footprint) - Reduced construction cost up to 10% - Reduced maintenance costs - Optimized ROI in about 7 years
Improved Energy Efficiency	- Better thermal transfer up to 20% - 20% Reduction	Reuse of Materials	- Minimal impact on greenhouse gas emissions and recycling - Reusability of steel
Increased Resistance to External Factors	- Magnesium-oxide non-flammable coating which offers unparalleled post-combustion resistance even to the toughest environments - Independent fire protection (UL) reflection as well as acoustic	Fire Safety	- Double legal insurance compliance - Superior fire reaction, achieving Class B-s1, d0 - Fire resistance (120 min) - 20% Reduction

Source: <https://www.terasteel.co.uk/lead/lead-by-terasteel-3>

4. GREEN BUILDING SCHEME REFERENCE: LEED v4.1

BD+C Building Design + Construction



LEED - Leadership in Energy and Environmental Design – is the most widely used third-party verification system for green buildings, with around 1.85 million square feet being certified daily; it works for all buildings and all phases of development.

The LEED Rating System is a voluntary, consensus driven, internationally recognized green building certification system providing third party verification that a building or community was designed and built using strategies aimed at improving performance across metrics such as energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and resource stewardship. LEED provides building owners, design teams, and operators a concise framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. Project teams use LEED as both design guide and verification system to measure progress towards defined performance goals.

LEED is structured to encourage interdisciplinary project teams to engage in an integrated project delivery process.

LEED v4.1

LEED v4.1 is the next generation standard for green building design, construction, operations and performance

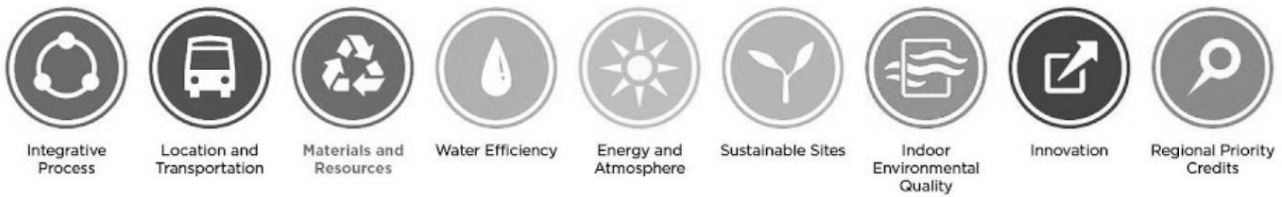
LEED helps buildings to focus on efficiency and leadership to deliver the triple bottom line returns of people, planet and profit. Today's version of LEED, LEED v4.1, raises the bar on building standards to address energy efficiency, water conservation, site selection, material selection, day lighting and waste reduction.

LEED is the world's leading green building project and performance management system, delivering a comprehensive framework for green building design, construction, operations and performance.

LEED v4.1:

- Ensures that all building stakeholders – developer, property manager, occupant and the community benefit from sustainable design, construction, operations and performance.
- Supports projects to implement sustainable and healthy building practices to realize environmental, economic, social and community benefits for decades to come.
- Emphasizes integrative design to ensure better design, translation of design into high quality construction, optimize operations and high performance of a building.
- Helps buildings deliver higher quality beyond market practices by incorporating innovative design, technologies, construction and material selection strategies.
- Focuses on both performance oriented sustainable strategies and outcomes.
- Helps buildings consume fewer resources, reduce operating costs, increase value and create safer and healthier environments for its occupants.
- Helps buildings reduce their GHG/carbon emissions.
- Helps buildings use toxin free materials to deliver cleaner indoor air to improve productivity, focus and reduce respiratory illnesses of its occupants.
- Prioritizes sustainable materials, helping manufacturers to design, produce and deliver building materials that reduce a building's environmental impact. LEED v4.1 also helps manufacturers reduce energy, water, waste during manufacturing, carbon footprint during distribution and transportation and overall carbon emissions through the entire production lifecycle.

The LEED certification system is based on a checklist with PREREQUISITES, mandatory, and CREDITIS, optional strategies identified by the project team, under each of these 9 credit categories. To achieve certification, projects must document compliance with all prerequisites and a sufficient number of credit requirements based on credits targeted.



LEED has four levels of certification, depending on the point thresholds achieved:

Certified 40–49 points, Silver 50–59 points, Gold 60–79 points, Platinum 80 points and above



The newest version of LEED is flexible; with reference guides LEED was developed to address all buildings everywhere.

- LEED BD+C - Building Design and Construction New Construction and Major Renovation
- LEED ID+C - Interior Design and Construction
- LEED O+M - Building Operations and Maintenance
- LEED Residential
- LEED Cities and Communities
- LEED Recertification

For more info: www.usgbc.org

How products can contribute

LEED is a green certification system for buildings. It involves the building as a whole, not just the individual product. The materials involved in a project can therefore contribute toward satisfying credits as long as they're in conformity with the requirements. The LEED green building certification program does not certify individual products. USGBC provides specific policies that regulate the use of the brand and the correct statements to communicate that a specific product contributes to the LEED credits:

"Manufacturers may reference LEED in their product literature following USGBC publicly available trademark policy: "Products that meet the LEED performance criteria can only contribute toward earning points needed for LEED certification. DO SAY Product 'A' contributes toward satisfying Credit 'X' under LEED".

5. TERASTEEL MATRIX OF CONTRIBUTION TOWARDS LEED V4.1 CREDITS

In the green building sector, in the innovative market trends and in LEED v4.1 the point of view on materials is focused, as well as on performances, more and more on ingredients and on sustain of supply chain.

The analysis developed in this report outputs the checklist of contribution of TERASTEEL to LEED categories by highlighting specific contribution toward satisfying intent and requirement of LEED credits.

Shown below the results of analysis and the synthetic checklist of contribution toward satisfying LEED v4.1 (LEED V4.1 BD+C) credits.

LEED v4.1 BD+C

Mapping of products contribution has been developed with reference to credits of LEED V4.1 BD+C Reference Guide for Green Building Design and Construction:

LEED BD+C v4.1 - Building Design and Construction - valid for:

- ✓ NEW CONSTRUCTION & MAJOR RENOVATION
- ✓ CORE & SHELL
- ✓ SCHOOLS
- ✓ RETAIL
- ✓ HOSPITALITY
- ✓ DATA CENTERS
- ✓ HEALTHCARE



TeraSteel - MATRIX OF CONTRIBUTION LEED v4.1 BD+C



INTEGRATIVE PROCESS

- IP PREREQUISITE INTEGRATIVE PROCESS PLANNING AND DESIGN
- IP CREDIT INTEGRATIVE PROCESS

SUSTAINABLE SITES

- SS CREDIT RAINWATER MANAGEMENT
- SS CREDIT HEAT ISLAND REDUCTION

ENERGY AND ATMOSPHERE

- EA PREREQUISITE FUNDAMENTAL COMMISSIONING AND VERIFICATION
- EA CREDIT ENHANCED COMMISSIONING AND VERIFICATION
- EA PREREQUISITE MINIMUM ENERGY PERFORMANCE
- EA CREDIT OPTIMIZE ENERGY PERFORMANCE

MATERIALS AND RESOURCES

- MR PREREQUISITE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING
- MR CREDIT CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT
- MR CREDIT BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION - SOURCING OF RAW MATERIALS
OPTION 2 LEADERSHIP EXTRACTION PRACTICES – RECYCLED CONTENT

INDOOR ENVIRONMENTAL QUALITY

- EQ CREDIT LOW EMITTING MATERIALS
- EQ CREDIT THERMAL COMFORT

INNOVATION IN DESIGN

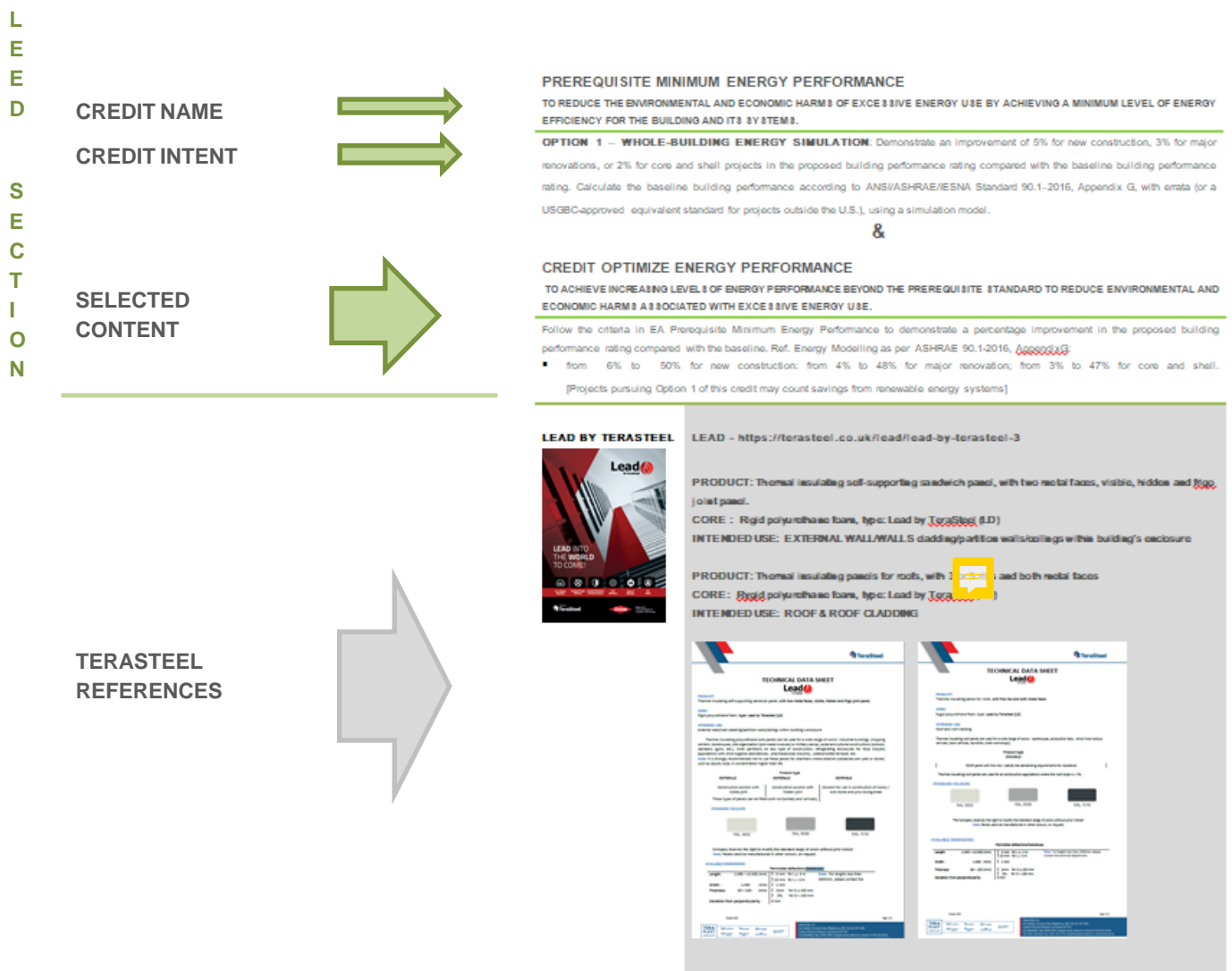
- IN CREDIT INNOVATION

5.1 ANALYTIC SECTION: LEED CREDITS AND TERA STEEL REFERENCES

In this paragraph the LEED credits (of contribution matrix) are detailed with intent, content and related references to document the requirements.

Each form refers to each single prerequisite or credit and contains an extract from the rating system (selected for the present scope of work) and the manufacturer references to document the requirements.

The reference of contribution is the rating LEED BD + C V4.1. Forms are listed per category of contribution and structured as follows:





INTEGRATIVE PROCESS

LEED v4.1 BD+C

PREREQUISITE INTEGRATIVE PROCESS PLANNING AND DESIGN

MAXIMIZE OPPORTUNITIES FOR INTEGRATED, COST-EFFECTIVE ADOPTION OF GREEN DESIGN AND CONSTRUCTION STRATEGIES, EMPHASIZING HUMAN HEALTH AS A FUNDAMENTAL EVALUATIVE CRITERION FOR BUILDING DESIGN, CONSTRUCTION AND OPERATIONAL STRATEGIES. UTILIZE INNOVATIVE APPROACHES AND TECHNIQUES FOR GREEN DESIGN AND CONSTRUCTION.

Use cross-discipline design and decision making, beginning in the programming and pre-design phase. At a minimum, ensure the following process:

- Prepare an Owner's Project Requirements (OPR) document. Develop a health mission statement and incorporate it in the OPR. The health mission statement must address "triple bottom line" values—economic, environmental and social. Include goals and strategies to safeguard the health of building occupants, the local community and the global environment, while creating a high-performance healing environment for the building's patients, caregivers and staff.
- Preliminary Rating Goals. As early as practical and preferably before schematic design, conduct a preliminary LEED meeting with a minimum of four key project team members and the owner or owner's representative. As part of the meeting, create a LEED® action plan that, at a minimum:
 - Determines the LEED certification level to pursue (Certified, Silver, Gold, or Platinum);
 - Selects the LEED credits to meet the targeted certification level; and
 - Identifies the responsible parties to ensure the LEED requirements for each prerequisite and selected credit are met.
- Integrated project team
- Design Charrette. As early as practical and preferably before schematic design, conduct a minimum four-hour, integrated design charrette with the project team as defined above. The goal is to optimize the integration of green strategies across all aspects of building design, construction and operations, drawing on the expertise of all participants.

&

CREDIT INTEGRATIVE PROCESS

TO SUPPORT HIGH-PERFORMANCE, COST-EFFECTIVE PROJECT OUTCOMES THROUGH AN EARLY ANALYSIS OF THE INTERRELATIONSHIPS AMONG SYSTEMS.

To support high-performance, cost-effective project outcomes through an early analysis of the interrelationships among systems.

Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses described below to inform the owner's project requirements (OPR), basis of design (BOD), design documents, and construction documents.

ENERGY RELATED SYSTEMS Perform a preliminary "simple box" energy modeling analysis before the completion of schematic design that explores how to reduce energy loads in the building and accomplish related sustainability goals by questioning default assumptions. Assess at least two potential strategies associated with the following:

- Site conditions.
- Massing and orientation.
- **Basic envelope attributes.** Assess insulation values, window-to-wall ratios, glazing characteristics, shading, and window operability.
- Lighting levels.
- Thermal comfort ranges..
- Plug and process load needs.
- Programmatic and operational parameters.

Document how the above analysis informed design and building form decisions in the project's OPR and BOD and the eventual design of the project, including the following, as applicable: Building and site program; Building form and geometry; Building envelope and façade treatments on different orientations; Elimination and/or significant downsizing of building systems (e.g., HVAC, lighting, controls, Exterior materials, interior finishes, and functional program elements); and Other systems.



Integrative Process Worksheet LEED v4 IP Credit Integrative Process

For BD+C projects

Identify and document the items found under the following sections:

- Energy-Related Systems
- Water-Related Systems

For ID+C projects

Identify and document the items found under the following sections:

- Energy-Related Systems
- Site Selection

For one additional point, complete Water-Related Systems

Energy-Related Systems

Required for BD+C and ID+C projects

LEAD BY TERASTEEL



TeraSteel turnkey system is made by a dedicated team with the expertise to provide complete, optimal solutions for each project: architects, design engineers, project managers and assemblers with experience offer consulting to design teams.

“We offer efficient solutions for any project, optimization of the construction solution, complete design services that ensure obtaining the necessary permits, making the metal structure, joining plates and assembly. The team of designers and construction engineers examine in detail the projects or sketches offered to identify the best constructive solutions that lead to optimal costs of achieving the construction objective and avoiding unnecessary costs of additional works”

In addition, TeraSteel reorganized its internal design process according to the new BIM rules: it created models with 3D features, which allow users to see the entire building, at the desired level of detail and how it is affected by any modifications made - appearance, space, dimensional conflicts, sizing of installations, energy performance, planning for construction, lists of materials, scheduling of construction stages and many more.

BIM technology allows architects, designers and engineers to design, build and exploit the building much easier and more efficiently.

Lead is a TeraSteel innovative solution for metal buildings that reaches a new level of performance in what concerns sustainability, thermal insulation and resistance to fire. Lead by TeraSteel contributes to the reduction of the CO2 footprint, providing architects a higher freedom of design as well as optimised costs for the beneficiaries. The new insulation technology V PLUS Perform™ is a polyurethane solution that allows the production of a new generation of insulation panels. Therefore, the heat transfer coefficient is 20% better than standard polyisocyanurate foam (PIR). The V PLUS Perform™ insulation technology by Dow with cyclopentane provides superior resistance and reaction to fire: Class B-s1, d0; Resistance to fire: 30 min.

In 2020 TeraSteel developed the LEED credits matrix to map Lead contribution to specific requirements by major green building rating systems.

TeraSteel - MATRIX OF CONTRIBUTION LEED v4.1 BD+C	
INTEGRATIVE PROCESS	
IP-1	INTEGRATIVE PROCESS PLANNING AND DESIGN
IP-2	INTEGRATIVE PROCESS
SUSTAINABLE SITES	
SS-1	RAINWATER MANAGEMENT
SS-2	HEAT ISLAND REDUCTION
ENERGY AND ATMOSPHERE	
EA-1	FUNDAMENTAL COMMISSIONING AND VERIFICATION
EA-2	FINANCES COMMISSIONING AND VERIFICATION
EA-3	MINIMUM ENERGY PERFORMANCE
EA-4	OPTIMIZE ENERGY PERFORMANCE
MATERIALS AND RESOURCES	
MR-1	CONSTRUCTION AND DISPOSAL WASTE MANAGEMENT PLANNING
MR-2	CONSTRUCTION AND DISPOSAL WASTE MANAGEMENT
MR-3	BUILDING PRODUCT SELECTION AND OPTIMIZATION - SOURCE OF AIR MATERIALS
INDOOR ENVIRONMENTAL QUALITY	
IEQ-1	LOW EMITTING MATERIALS
IEQ-2	THERMAL COMFORT
IEQ-3	Acoustic Performance
INNOVATION IN DESIGN	
ID-1	INNOVATION



SUSTAINABLE SITES

LEED v4.1 BD+C

CREDIT RAINWATER MANAGEMENT

TO REDUCE RUNOFF VOLUME AND IMPROVE WATER QUALITY BY REPLICATING THE NATURAL HYDROLOGY AND WATER BALANCE OF THE SITE, BASED ON HISTORICAL CONDITIONS AND UNDEVELOPED ECOSYSTEMS IN THE REGION.

In a manner best replicating natural site hydrology processes, retain (i.e. infiltrate, evapotranspire, or collect and reuse) on site the runoff from the developed site for, at minimum, the 80th percentile of regional or local rainfall events using low-impact development (LID) and green infrastructure (GI) practices. GI and LID strategies can be either structural or non-structural. Points are awarded according to Table 1.

For all projects, the use of coal tar sealants shall be prohibited in any application exposed to stormwater, wash waters, condensates, irrigation water, snowmelt, or icemelt. Examples of acceptable techniques include the following:

- planting rain gardens with native or adapted plant material (e.g. trees shrubs);
- installing a **vegetated roof**;
- using permeable paving, consisting of porous above-ground materials (e.g., open pavers, engineered products), a base layer designed to drain water away from the building, and (often) a 6-inch-deep (150 millimeters) subbase; and
- installing permanent infiltration or collection features (e.g., vegetated swale, rain garden, rainwater cistern) that can retain 100% of the runoff from at minimum, the 80th percentile of regional or local rainfall events.

LEAD BY TERASTEEL



TeraSteel GREEN ROOF

The green roofs that will be mounted on a sandwich panel support have a lightweight structure. It is covered with easy-to-maintain vegetation such as sedum species, herbaceous plants and grasses, which are adapted to the extreme weather conditions on roofs.

TeraSteel GREEN ROOF

What is a
 lightweight **GREEN ROOF**?

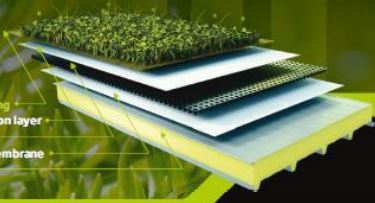
The green roofs that will be mounted on a sandwich panel support have a lightweight structure. It is covered with easy-to-maintain vegetation such as sedum species, herbaceous plants and grasses, which are adapted to the extreme weather conditions on roofs. The costs of installing and maintaining lightweight green roofs are low and they are more durable than conventional roofs.



TeraSteel
 BUILD BETTER

www.terasteel.ro

TeraSteel GREEN ROOF



Green roof covering
 Geotextile filtration layer
 Drainage layer
 Waterproofing membrane
 ISO Ac, Lead

Advantages of a lightweight **GREEN ROOF:**

- Aesthetic value, that offers a green and cheerful appearance of the building, which improves the living environment;
- Reduction in sewer system loads: the green roof system slows down rainwater run off during peak loads period that occur at times of increasingly heavy rainfall;
- Combating the greenhouse effect: unlike concrete roofs, green roofs do not convert solar energy into heat, but into water vapour instead. This has a cooling effect on the surrounding area;
- Protection of the waterproofing membrane: the vegetation helps to counteract the harmful effect of sunlight and rain on the waterproofing membrane. Thus, the waterproofing membrane is protected and its lifespan increases;
- Background noise reduction.

TeraSteel
 BUILD BETTER

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 E-mail: marketing@terasteel.ro
www.terasteel.ro

DOCUMENTS

TeraSteel GREEN ROOF <https://www.terasteel.co.uk/lead/lead-by-terasteel-3>

CREDIT HEAT ISLAND REDUCTION

TO MINIMIZE EFFECTS ON MICROCLIMATES AND HUMAN AND WILDLIFE HABITATS BY REDUCING HEAT ISLANDS

Option 1. Nonroof and Roof

Meet the following criterion:

$$\frac{\text{Area of Nonroof Measures}}{0.5} + \frac{\text{Area of High-Reflectance Roof}}{0.75} + \frac{\text{Area of Vegetated Roof}}{0.75} \geq \text{Total Site Paving Area} + \text{Total Roof Area}$$

Use any combination of the following strategies.

Nonroof Measures

- Use the existing plant material or install plants that provide shade over paving areas (including playgrounds) on the site within 10 years of planting.
- Provide shade with structures covered by energy generation systems, such as solar thermal collectors, photovoltaics, and wind turbines.
- Provide shade with architectural devices or structures. If the device or structure is a roof, it shall have an aged solar reflectance (SR) value of at least 0.28 as measured in accordance with ANSI/CRRC S100. If the device or structure is not a roof, or if aged solar reflectance information is not available, it shall have at installation an initial SR of at least 0.33 as measured in accordance with ANSI/CRRC S100.
- Provide shade with vegetated structures.**
- Use paving materials with an initial solar reflectance (SR) value of at least 0.33.
- Use an open-grid pavement system (at least 50% unbound).

High-Reflectance Roof

Use roofing materials that have an aged SRI equal to or greater than the values in Table 1. If aged SRI is not available, the roofing material shall have an initial SRI equal to or greater than the values in Table 1.

Table 1. Minimum solar reflectance index value, by roof slope	Slope	Initial SRI	Aged SRI
Low-sloped roof	≤ 2:12	82	64
Sleep-sloped roof	< 2:12	39	32

LEAD BY TERASteel



Vegetated roof: TeraSteel GREEN ROOF

The green roofs that will be mounted on a sandwich panel support have a lightweight structure. It is covered with easy-to-maintain vegetation such as sedum species, herbaceous plants and grasses.



DOCUMENTS

- TeraSteel GREEN ROOF: <https://www.terasteel.co.uk/lead/lead-by-terasteel>



ENERGY AND ATMOSPHERE

LEED v4.1 BD+C

PREREQUISITE FUNDAMENTAL COMMISSIONING AND VERIFICATION

TO SUPPORT THE DESIGN, CONSTRUCTION, AND EVENTUAL OPERATION OF A PROJECT THAT MEETS THE OWNER'S PROJECT REQUIREMENTS FOR ENERGY, WATER, INDOOR ENVIRONMENTAL QUALITY, AND DURABILITY.

COMMISSIONING PROCESS SCOPE: Complete the following commissioning (Cx) process activities for mechanical, electrical, plumbing, and renewable energy systems and assemblies, in accordance with ASHRAE Guideline 0-2005 and ASHRAE Guideline 1.1-2007 for HVAC&R Systems, as they relate to energy, water, indoor environmental quality, and durability. Requirements for exterior enclosures are limited to inclusion in the owner's project requirements (OPR) and basis of design (BOD).

- Develop the OPR
- Develop a BOD

The commissioning authority (CxA) must do the following: Review the OPR, BOD, and project design; Develop and implement a Cx plan; Confirm incorporation of Cx requirements into the construction documents; Develop construction checklists; Develop a system test procedure; Verify system test execution; Maintain an issues and benefits log throughout the Cx process; Prepare a final Cx process report; Document all findings and recommendations and report directly to the owner throughout the process.

&

CREDIT ENHANCED COMMISSIONING AND VERIFICATION

TO FURTHER SUPPORT THE DESIGN, CONSTRUCTION, AND EVENTUAL OPERATION OF A PROJECT THAT MEETS THE OWNER'S PROJECT REQUIREMENTS FOR ENERGY, WATER, INDOOR ENVIRONMENTAL QUALITY, AND DURABILITY.

Implement, or have in place a contract to implement, the following commissioning process activities in addition to those required under EA Prerequisite Fundamental Commissioning and Verification.

OPTION 2. BUILDING ENCLOSURE COMMISSIONING

Fulfill the requirements in EA Prerequisite Fundamental Commissioning and Verification as they apply to the building's enclosure in addition to mechanical and electrical systems and assemblies. Complete the following commissioning process (CxP) activities for the **building's thermal envelope** in accordance with ASHRAE Guideline 0-2013 and ASTM E2947-16: Standard Guide for Building Enclosure Commissioning, as they relate to energy, air and water tightness, indoor environmental quality, and durability.

The qualified independent member of the design or construction team responsible for BUILDING ENCLOSURE COMMISSIONING must

complete the following:

- Review contractor submittals
- Verify inclusion of systems manual requirements in construction documents for enclosure systems
- For specialty enclosure systems with controls and automation: verify inclusion of operator and occupant training requirements in construction documents, verify systems manual updates and delivery, verify operator and occupant training delivery and effectiveness, verify seasonal testing, review building operations 10 months after substantial completion.
- Develop an on-going enclosure commissioning plan for maintenance, renewal and revitalization cycles.

LEAD BY TERA STEEL



LEAD - <https://terasteel.co.uk/lead/lead-by-terasteel-3>

PRODUCT: Thermal insulating self-supporting sandwich panel, with two metal faces, visible, hidden and frigo joint panel.

CORE : Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: EXTERNAL WALL/WALLS cladding/partition walls/ceilings within building's enclosure

PRODUCT: Thermal insulating panels for roofs, with 3 ribs and both metal faces

CORE: Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: ROOF & ROOF CLADDING

TECHNICAL DATA SHEET
Lead
by TeraSteel

PRODUCT:
Thermal insulating self-supporting sandwich panel, with two metal faces, visible, hidden and frigo joint panel.

CORE:
Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE:
external wall/wall cladding/partition walls/ceilings within building's enclosure

Thermal insulating polyurethane core panels can be used for a wide range of works: industrial buildings, shopping centers, storerooms, site organization (pre-erected modules) or military camps, social and cultural constructions (schools, canteens, gyms, etc.), inner partitions in any type of construction, refrigerating enclosures for food industry applications with strict hygiene (laboratories, pharmaceutical industry), waterproofed terraces etc.
Note: It is strongly recommended not to use these panels for chambers where alkaline substances are used or stored, such as caustic soda, in concentration higher than 3%.

Product type	ISOPEr/LD	ISOPEr/LD	ISOFRi/LD
Constructive solution with visible joint	Constructive solution with hidden joint	Solution for use in construction of rooms / cold stores and processing areas	

These types of panels can be fitted both horizontally and vertically

STANDARD COLOURS:

RAL 9002 RAL 9006 RAL 7016

Company reserves the right to modify the standard range of colors without prior notice!
Note: Panels can be manufactured in other colours, on request.

AVAILABLE DIMENSIONS:	Permissible deflections/tolerances:
Length: 2.000 – 13.500 [mm]	± 5 mm for L ≤ 3 m ± 10 mm for L > 3 m
Width: 1.000 [mm]	± 2 mm
Thickness: 80 – 200 [mm]	± 2mm for D ≤ 100 mm ± 2% for D > 100 mm
Deviation from perpendicularity	6 mm

October 2020 Page 1 of 1

TECHNICAL DATA SHEET
Lead
by TeraSteel

PRODUCT:
Thermal insulating panels for roofs, with five ribs and both metal faces

CORE:
Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE:
Roof and roof cladding

Thermal insulating roof panels are used for a wide range of works: warehouses, production halls, which hold various services (auto services, laundries, small workshops).

Product type
ISOA3/LD

Roof panel with five ribs – satisfy the demanding requirements for resistance

Thermal insulating roof panels are used for all construction applications where the roof slope is > 7%.

STANDARD COLOURS:

RAL 9002 RAL 9006 RAL 7016

The Company reserves the right to modify the standard range of colors without prior notice!
Note: Panels can be manufactured in other colours, on request.

AVAILABLE DIMENSIONS:	Permissible deflections/tolerances:
Length: 2.000 – 13.500 [mm]	± 5 mm for L ≤ 3 m ± 10 mm for L > 3 m
Width: 1.000 [mm]	± 2 mm
Thickness: 80 – 150 [mm]	± 2mm for D ≤ 100 mm ± 2% for D > 100 mm
Deviation from perpendicularity	6 mm

October 2020 Page 1 of 1

PREREQUISITE MINIMUM ENERGY PERFORMANCE

TO REDUCE THE ENVIRONMENTAL AND ECONOMIC HARMS OF EXCESSIVE ENERGY USE BY ACHIEVING A MINIMUM LEVEL OF ENERGY EFFICIENCY FOR THE BUILDING AND ITS SYSTEMS.

OPTION 1 – WHOLE-BUILDING ENERGY SIMULATION: Demonstrate an improvement of 5% for new construction, 3% for major renovations, or 2% for core and shell projects in the proposed building performance rating compared with the baseline building performance rating. Calculate the baseline building performance according to ANSI/ASHRAE/IESNA Standard 90.1–2016, Appendix G, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), using a simulation model.

&

CREDIT OPTIMIZE ENERGY PERFORMANCE

TO ACHIEVE INCREASING LEVELS OF ENERGY PERFORMANCE BEYOND THE PREREQUISITE STANDARD TO REDUCE ENVIRONMENTAL AND ECONOMIC HARMS ASSOCIATED WITH EXCESSIVE ENERGY USE.

Follow the criteria in EA Prerequisite Minimum Energy Performance to demonstrate a percentage improvement in the proposed building performance rating compared with the baseline. Ref. Energy Modelling as per ASHRAE 90.1-2016, Appendix G:

- from 6% to 50% for new construction: from 4% to 48% for major renovation; from 3% to 47% for core and shell.

[Projects pursuing Option 1 of this credit may count savings from renewable energy systems]

LEAD BY TERA STEEL



LEAD - <https://terasteel.co.uk/lead/lead-by-terasteel-3>

PRODUCT: Thermal insulating self-supporting sandwich panel, with two metal faces, visible, hidden and frigo joint panel.

CORE : Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: EXTERNAL WALL/WALLS cladding/partition walls/ceilings within building's enclosure



PRODUCT: Thermal insulating panels for roofs, with 3 or 5 ribs and both metal faces

CORE: Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: ROOF & ROOF CLADDING

TECHNICAL DATA SHEET
Lead
by TeraSteel

PRODUCT: Thermal insulating self-supporting sandwich panel, with two metal faces, visible, hidden and frigo joint panel.

CORE : Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: External wall/wall cladding/partition walls/ceilings within building's enclosure

Thermal insulating polyurethane core panels can be used for a wide range of works: industrial buildings, shopping centers, storehouses, site organization (pre-made modules) or military camps, social and cultural constructions (schools, centers, gyms, etc.), inner partitions on any type of construction, refrigerating enclosures for food industry applications with strict hygiene (laboratories, pharmaceutical industry), waterproofed terraces, etc.
Note: It is strongly recommended not to use these panels for chambers where alkaline substances are used or stored, such as caustic soda, in concentration higher than 3%.

ISOPERILD	Product type ISOPERILD	ISOPERILD
Constructive solution with visible joint	Constructive solution with hidden joint	Solution for use in construction of rooms / cold stores and processing areas

These types of panels can be fitted both horizontally and vertically

STANDARD COLOURS:

RAL 9002	RAL 9008	RAL 7016
----------	----------	----------

Company reserves the right to modify the standard range of colors without prior notice!
Note: Panels can be manufactured in other colours, on request.

AVAILABLE DIMENSIONS:

Length	Width	Thickness	Deviation from perpendicularity
2,000 – 13,500 (mm)	1,000 (mm)	80 – 200 (mm)	± 0.2%

Permissible deflections/tolerances:

Length	Width	Thickness	Deviation from perpendicularity
± 5 mm for L ≤ 3 m	± 2 mm	± 2 mm for D ≤ 100 mm	± 2%; for D > 100 mm

Note: For lengths less than 2000mm, please contact the technical department.

TECHNICAL DATA SHEET
Lead
by TeraSteel

PRODUCT: Thermal insulating panels for roofs, with five ribs and both metal faces

CORE: Rigid polyurethane foam, type: Lead by TeraSteel (LD)

INTENDED USE: Roof and roof cladding

Thermal insulating roof panels are used for a wide range of works: warehouses, production halls, which hold various devices (auto services, nurseries, small workshops).

Product type ISOGARLD

Roof panel with five ribs – satisfy the demanding requirements for resistance

Thermal insulating roof panels are used for all construction applications where the roof slope is > 7%.

STANDARD COLOURS:

RAL 9002	RAL 9008	RAL 7016
----------	----------	----------

The Company reserves the right to modify the standard range of colors without prior notice!
Note: Panels can be manufactured in other colours, on request.

AVAILABLE DIMENSIONS:


Length	Width	Thickness	Deviation from perpendicularity
2,000 – 13,500 (mm)	1,000 (mm)	80 – 180 (mm)	± 0.2%

Permissible deflections/tolerances:


Length	Width	Thickness	Deviation from perpendicularity
± 5 mm for L ≤ 3 m	± 2 mm	± 2 mm for D ≤ 100 mm	± 2%; for D > 100 mm

Note: For lengths less than 2000mm, please contact the technical department.

Technical manuals of products – packaging, transport, handling and storage instructions, assembly instruction, durability and maintenance.




Lead
by TeraSteel

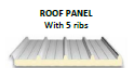


Product Types


Visible joint WALL PANEL
Hidden joint „frigo” joint




ROOF PANEL
With 5 ribs



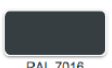
THE COLORS OF THE METALLIC FACES - see section „documentation – commercial catalog” from the company website, the standard colors for each type of product. On request, the products can be manufactured in other colors.



RAL 9002



RAL 9006



RAL 7016

OVERVIEW

The aesthetic aspect of the metallic faces – environmental conditions (solar radiation, climate, the area of construction, location) can lead in time to a change of the original color. Loss of color intensity is a natural phenomenon that can not be controlled.

Observance of the frequency and maintenance recommendations lead to a longer period of time for the aesthetic aspect of the metallic faces and for a longer service life.

MAINTENANCE OF THE HEAT INSULATING PANELS WITH PRE-PAINTED GALVANIZED STEEL FACES

1). INITIAL MAINTENANCE

To avoid damaging the metallic surfaces, the transport, handling, storage and assembly recommendations, noted on the instructions attached to the panel packs, must first be observed. In order to maintain the initial appearance for a long time and to protect it against corrosion, the panels require certain maintenance while assembling, immediately after installation and throughout its life.

During installation, the handling and installation instructions must be strictly observed, in order to not affect the protective layers of the sheet and shape resulting from the profiling. Any scratching possibilities on the board must be removed and any splinters that may result during assembly must be removed immediately.

If the panes were required without the protective foil, it is necessary to take additional measures during handling and during assembly.

When the assembly is finished, remove the protective foil from the panels as well as the traces of grease and dust with a solution with a weak cleaning agent (pH=7) using a cotton cloth or a sponge. Then rinse the surface with clean water. Cleaning should be done at temperatures above zero degrees. Cleaning is vital for the life of the panels as it removes any traces of dust, flakes or other impurities that can be deposited during the assembly and can affect the protective sides of the sheet. Also, after this cleaning, you may notice possible defects (eg scratches) that occurred during assembly. Deep scratches should be repaired immediately with retouch paint to prevent corrosion (if the scratch is not in depth, no retouching is required). It is important that the retouch paint is applied with a fine brush only on the scratch and does not spread over a large surface. The reason for this is that, in time, the retouch paint will change its color shade, it does not have the same properties as the original paint of the board.

2). PERIODIC MAINTENANCE

During life, panels must be inspected periodically to detect any pollutant collection: dust, leaves, branches or any other corrosive agents. Any such long collection and storage area should be cleaned immediately by washing with water. It is forbidden to use any cleaners or detergents containing chlorine or other corrosive substances.


Every year, the drainage system of rainfall and snowfalls is inspected; if necessary it is cleaned or replaced. The surface of the panels is washed with water at a pressure of max. 50 bar, to remove various deposits. The water jet is particularly inclined in the joint area.


Attention!! Do not use abrasive products or whose active substances attack the paint layer.

If scratches, rust or paint has broken out on small surfaces, lightly clean with a metal brush, remove all impurities, dry, then apply 2 layers of metal paint (compatible with the original one). If the surface is large, consult a specialist in the field.

Check fasteners - if necessary, get tightened.

Rain water is usually sufficient to keep the paint layer clean.






October 2020

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Tel: 0263 238 202; Fax: 0263 342 276; marketing@terasteel.ro / www.terasteel.ro

PACKING, TRANSPORT, HANDLING, STORAGE



PACKING

TRANSPORT

HANDLING

STORAGE

MINIMUM REQUIREMENTS FOR ASSEMBLY

OVERVIEW

WALL PANELS

ROOF PANELS

HEALTH AND SAFETY CRITERIA ANALYSIS

TERASTEEL SA
Măgheruș Sieu-Măgheruș, Județul Bistrița-Năsăud
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- DOCUMENTS - Technical manuals and catalogs
- <https://terasteel.co.uk/>
 - <https://terasteel.co.uk/lead/lead-by-terasteel-3>
 - <https://terasteel.co.uk/catalogs>
 - <https://terasteel.co.uk/category/thermal-insulating-panels>



MATERIALS AND RESOURCES

LEED V4.1 BD+C

PREREQUISITE CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLANNING

TO REDUCE CONSTRUCTION AND DEMOLITION WASTE DISPOSED OF IN LANDFILLS AND INCINERATION FACILITIES BY RECOVERING, REUSING, AND RECYCLING MATERIALS. DEVELOP AND IMPLEMENT A CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT PLAN

Develop and implement a construction and demolition waste management plan:

- Establish waste diversion goals for the project by identifying at least five materials (both structural and nonstructural) targeted for diversion. Approximate a percentage of the overall project waste that these materials represent.
- Specify whether materials will be separated or commingled and describe the diversion strategies planned for the project. Describe where the material will be taken and how the recycling facility will process the material.
- Provide a final report detailing all major waste streams generated, including disposal and diversion rates.

&

CREDIT CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT

TO REDUCE CONSTRUCTION AND DEMOLITION WASTE DISPOSED OF IN LANDFILLS AND INCINERATION FACILITIES BY RECOVERING, REUSING, AND RECYCLING MATERIALS. RECYCLE AND/OR SALVAGE NONHAZARDOUS CONSTRUCTION AND DEMOLITION MATERIALS

Recycle and/or salvage nonhazardous construction and demolition materials. Calculations can be by weight or volume but must be consistent throughout. Exclude excavated soil, land-clearing debris, and alternative daily cover (ADC). Include wood waste converted to fuel (biofuel) in the calculations; other types of waste-to-energy are not considered diversion for this credit.

However, for projects that cannot meet credit requirements using reuse and recycling methods, waste-to-energy systems may be considered waste diversion if the European Commission Waste Framework Directive 2008/98/EC and Waste Incineration Directive 2000/76/EC are followed and Waste to Energy facilities meet applicable European Committee for Standardization (CEN) EN 303 standards.

Option 1: divert at least 50% or 75% of total construction and demolition materials (at least three materials streams)

Option 2: Do not generate more than 2.5 pounds of construction waste per square foot (12.2 kilograms of waste per square meter) of the building's floor area.

CREDIT BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION SOURCING OF RAW MATERIALS

TO ENCOURAGE THE USE OF PRODUCTS AND MATERIALS FOR WHICH LIFE-CYCLE INFORMATION IS AVAILABLE AND THAT HAVE ENVIRONMENTALLY, ECONOMICALLY, AND SOCIALLY PREFERABLE LIFE-CYCLE IMPACTS. TO REWARD PROJECT TEAMS FOR SELECTING PRODUCTS VERIFIED TO HAVE BEEN EXTRACTED OR SOURCED IN A RESPONSIBLE MANNER

- **RECYCLED CONTENT** Products meeting recycled content criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

Recycled content is the sum of postconsumer recycled content plus one-half the preconsumer recycled content, based on weight.

The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

LEAD BY TERA STEEL



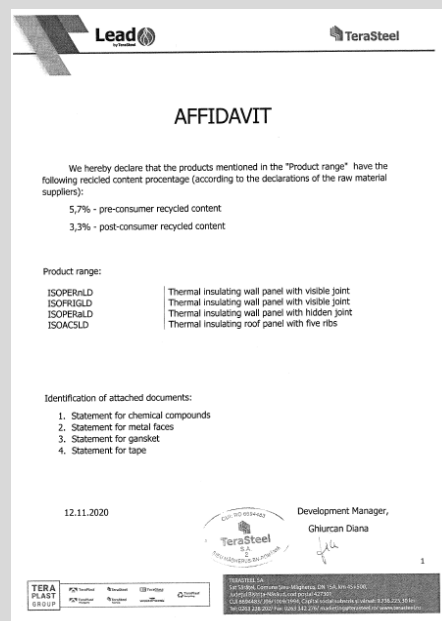
What is RECYCLED CONTENT?

Recycled content is defined in ISO 14021: 'Recycled content is the proportion, by mass, of recycled material in a product or packaging. Only pre-consumer and postconsumer materials shall be considered as recycled content, consistent with the following usage of the terms:

- **PRE_CONSUMER material:** Material diverted from the waste stream during a manufacturing process. Excluded is reutilization of materials such as rework, regrind or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- **POST-CONSUMER material:** Material generated by households or by commercial, industrial and institutional facilities in their role as end-users of the product, which can no longer be used for its intended purpose. This includes returns of material from the distribution chain.

DOCUMENTS

TeraSteel pre-consumer and post-consumer recycled content





INDOOR ENVIRONMENTAL QUALITY

LEED v4.1 BD+C

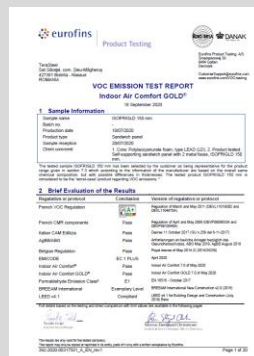
CREDIT LOW EMITTING MATERIALS


TO REDUCE CONCENTRATIONS OF CHEMICAL CONTAMINANTS THAT CAN DAMAGE AIR QUALITY, HUMAN HEALTH, PRODUCTIVITY, AND THE ENVIRONMENT.

Use materials on the building interior (everything within the waterproofing membrane) that meet the low-emitting criteria below. [...] INSULATION [At least 75% of all insulation, by cost or surface area] **meets the VOC EMISSION EVALUATION**

The insulation material category includes all thermal and acoustic boards, batts, rolls, blankets, sound attenuation fire blankets, foamed-in place, loose-fill, blown, and sprayed insulation.

LEAD BY TERASTEEL



Regulation or protocol	Conclusion	Version of regulation or protocol
French VOC Regulation		Regulation of March and May 2011 (DEVL1101903D and DEVL1104875A)
French CMR components	Pass	Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)
Italian CAM Edilizia	Pass	Decree 11 October 2017 (GU n.259 del 6-11-2017)
AgBB/ABG	Pass	Anforderungen an bauliche Anlagen bezüglich des Gesundheitsschutzes, ABG May 2019, AgBB August 2018
Belgian Regulation	Pass	Royal decree of May 2014 (C-2014/24239)
EMICODE	EC 1 PLUS	April 2020
Indoor Air Comfort®	Pass	Indoor Air Comfort 7.0 of May 2020
Indoor Air Comfort GOLD®	Pass	Indoor Air Comfort GOLD 7.0 of May 2020
Formaldehyde Emission Class ⁵	E1	EN 16516 - October 2017
BREEAM International	Exemplary Level	BREEAM International New Construction v2.0 (2016)
LEED v4.1	Compliant	LEED v4.1 for Building Design and Construction (July, 2019) Beta

DOCUMENTS

- EUROFINS VOC EMISSION TEST REPORT Indoor Air Comfort GOLD®

CREDIT THERMAL COMFORT

TO PROMOTE OCCUPANTS' PRODUCTIVITY, COMFORT, AND WELL-BEING BY PROVIDING QUALITY THERMAL COMFORT.

Meet the requirements for both thermal comfort design and thermal comfort control.

Option 1. ASHRAE Standard 55-2016

Design heating, ventilating, and air-conditioning (HVAC) systems and **the building envelope to meet the requirements of ASHRAE Standard 55-2016**, Thermal Comfort Conditions for Human Occupancy, with errata or a local equivalent. For natatoriums, demonstrate compliance with ASHRAE HVAC Applications Handbook, 2011 edition, Chapter 5, Places of Assembly, Typical Natatorium Design Conditions, with errata.

OR

Option 2. ISO and CEN Standards

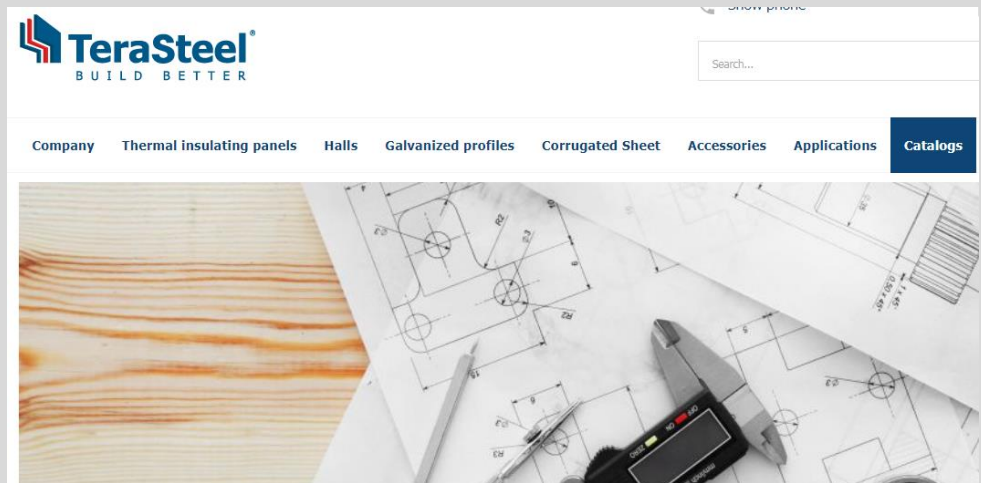
Design HVAC systems and the building envelope to meet the requirements of the applicable standard:

- ISO 7730:2005, Ergonomics of the Thermal Environment, analytical determination and interpretation of thermal comfort, using calculation of the PMV and PPD indices and local thermal comfort criteria; and
- CEN Standard EN 15251:2007, Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings, addressing indoor air quality, thermal environment, lighting, and acoustics, Section A2.

LEAD BY TERASTEEL



THERMAL INSULATING PANELS Lead by TeraSteel



Catalogs

Find the technical documentation specific to your project. If you want the documentation in the printed version, please contact us at marketing@terasteel.ro.

DOCUMENTS - Datasheet & conductivity infos

- <https://terasteel.co.uk/>
- <https://terasteel.co.uk/lead/lead-by-terasteel-3>
- <https://terasteel.co.uk/catalogs>
- <https://terasteel.co.uk/category/thermal-insulating-panels>

INNOVATION

LEED v4.1 BD+C

INNOVATION

TO ENCOURAGE PROJECTS TO ACHIEVE EXCEPTIONAL OR INNOVATIVE PERFORMANCE.

To achieve all five innovation points, a project team must achieve at least one pilot credit, at least one innovation credit and no more than two exemplary performance credits.

Option 1. Innovation: achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system. Identify the the intent, requirements, submittals and design strategies used to meet the requirements.

AND/OR

Option 2. Pilot (1 point) Achieve one pilot credit from USGBC's LEED Pilot Credit Library.

AND/OR

Option 3. Additional Strategies

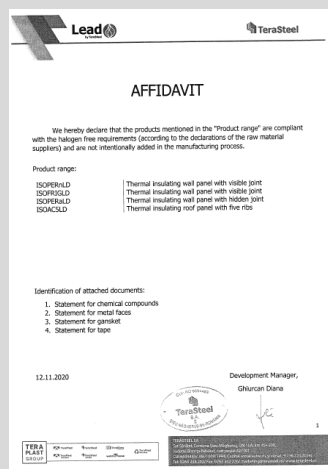
- Innovation
- Pilot
- Exemplary Performance: achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance

LEAD BY TERA STEEL



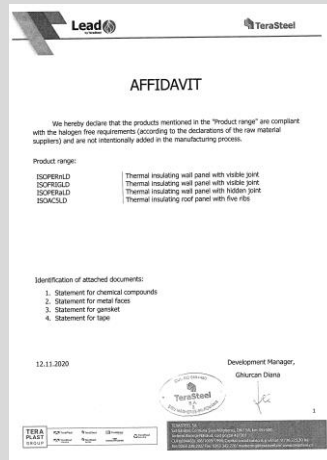
➤ CADMIUM (Cd) and LEAD (Pb) NOT PRESENT Manufacturer Declaration

Product Range - available upon request



➤ **HALOGEN FREE Manufacturer Decalaration**

Product Range - available upon request



➤ **TeraSteel BIM**

<https://terasteel.co.uk/catalogs>

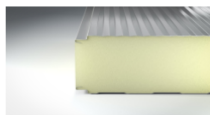
<https://terasteel.co.uk/download-bim-documentation>

Download BIM documentation

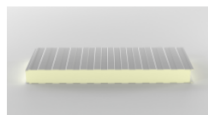
A BIM object is a geometrically defined construction element that includes all the characteristics of the physical product.

The BIM (building information technology) concept is a digital representation (a real-scale 3D model) of a building with all the functional and material characteristics included - both for the building as a whole but also for each of its components, from the project phase. BIM technology allows architects, designers and engineers to design, build and operate the building much more easily and efficiently.

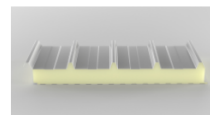
Each of them is free to download as project files for ARCHICAD and Revit.



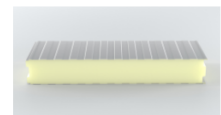
IsoPer A LEAD - thermal insulating wall panel with hidden joints



IsoPer N LEAD - thermal insulating wall panel, with visible joints



IsoACS LEAD - thermal insulating roof panel with 5 ribs



IsoFrig LEAD - thermal insulating panel for refrigerated rooms

bimobject®



GREENMAP è un programma di
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