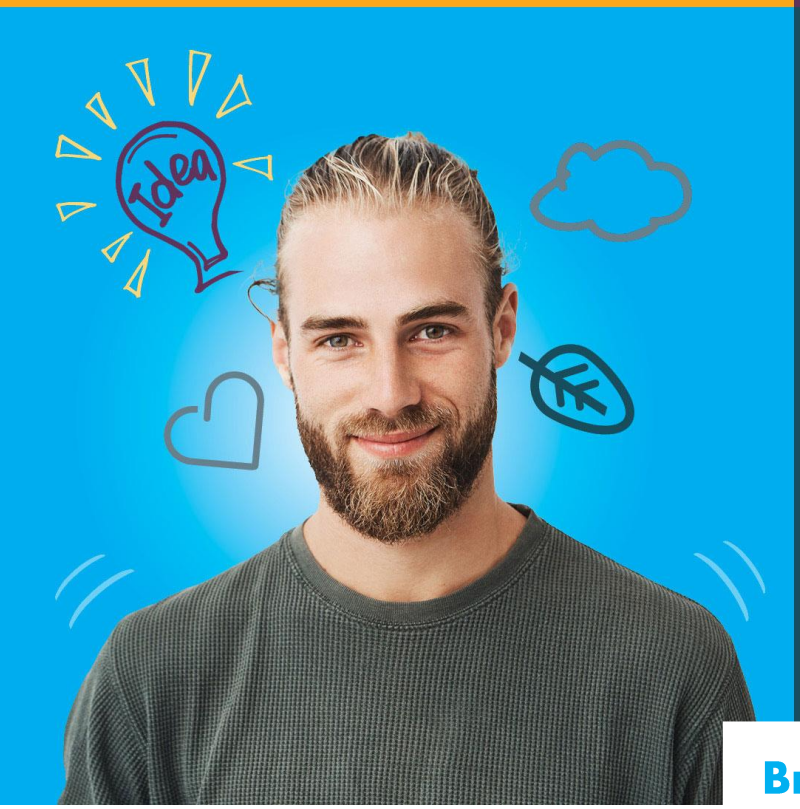
KNAUF INSULATION

RACE TO ZERO

YOUR CHANCE TO BUILD A BETTER WORLD



Briefing

Everything you need to take part in the competition is contained in this document

challenge.
create.
care.

Knauf Insulation's 'Race to Zero' is an international student competition to find innovative solutions to construction industry challenges while creating buildings that are good for people and good for the environment.

Our industry is undergoing a revolutionary transformation and we are excited to offer final year students and 2020 graduates with engineering, design and construction backgrounds a unique opportunity to help us shape a more sustainable future.

I. Competition background

The European Commission has launched a strategy called the Renovation Wave — an ambitious plan to renovate 35 million buildings by 2030 by doubling the annual rate of renovation. A key focus is social housing.

- In Europe buildings are responsible for 36% of carbon emissions and 40% of energy use while 34 million people cannot afford to pay their bills. The Renovation Wave aims to generate hundreds of thousands of new jobs, improve living conditions for millions and take climate action.
- To achieve such a major ambition, pioneering new innovations are needed to shorten delivery times, resolve labor shortages and upscale the entire renovation process.

Our competition aims to find innovative solutions to these challenges.

What's at stake?

Prizes:

- 1st team prize: 15.000 €, plus the opportunity of employment at Knauf Insulation;
- 2nd team prize: 10.000 €, plus the possibility to have an internship at Knauf Insulation.

In addition to the prestige and publicity associated with winning this international competition, winners will be given the opportunity to have hands-on experience of Knauf projects and the chance to work with Knauf Insulation's world-beating team of experts.

Who can enter?

Our Race to Zero competition is open to teams of a maximum of two people — final year students as well as 2020 graduates — with backgrounds in Architecture, Construction Engineering, Design or any other related discipline.

- Entrants must be from university or college faculties in Belgium, France, Italy, Spain Luxembourg, Netherlands or Portugal and located in the same country for the duration of the competition.
- We actively encourage diversity of team members in line with our commitment to promoting diversity and inclusion.

II. Competition purpose (the why)

The key question of this competition is: how can we guarantee the success of massive social housing renovation programs while ensuring performance targets are achieved and industry challenges are accommodated?

The competition winners will achieve the following:

- Energy efficiency: provide large scale, nearly zero energy retrofit solutions;
- Sustainability: reduce the environmental impact of buildings, find circular economy solutions to waste and improve living conditions in terms of fire safety, acoustics and indoor air quality;
- Affordability: meet social housing renovation budgets;
- Scalability: enable an industrialized approach to renovation;
- Creativity: demonstrate innovative concepts that deliver solutions to the challenges above.

III. Competition task & specifications (the what)

The expected outputs of the competition are innovative construction systems that address the needs above and meet the technical specifications below to enable Knauf Insulation to scale up to an industrialization phase.
The competition criteria are set for the opaque building envelope at application level (detailed below), meaning for the construction elements, not at building level.

Language	English
Location & climate zone	Detail the selected geographical location as well as the climate model applying.
Type of works	Renovation of an existing building, with no major change of volumes or extension.
Building type	Each team is free to select one building in its country that is most representative of national/regional construction types and meets the criteria below. This building would be the basis of the concept work in the competition for each team. Social housing multi-family building: medium-sized building (ground floor + 4 floors), detached (4 façades) in one module, with total building height ≤ 15 meters. Building occupancy: only residential (families), with approximately 30 accommodation units.

	External wall (load-bearing walls): either plain walls or beams and columns systems are possible.
Applications to focus on	The student competition focuses on the building envelope, with the following applications: • Roof: either flat roof or pitched roof; • External wall: either façade or internal insulation (renovation and insulation of the external wall from inside); • Basement ceilings.

Energy efficiency	The goal is to engineer energy efficient solutions at building elements level which could fit into nearly zero energy buildings holistic solutions.
	In order to do so, the maximum thermal transmittance U values (Umax in W/m²K, with Up ≤ Umax), without taking into consideration thermal bridges, are set as shown below:
	• Roof (flat roof, pitched roof)
	  • Benelux, France (excluding Southern France*): Umax 0.10 W/m²K;
	  • Mediterranean area (Italy, Spain, Southern France): Umax 0.18 W/m²K.
	• External wall
	  • Benelux, France (excluding Southern France*): Umax 0.15 W/m²K;
	  • Mediterranean area (Italy, Spain, Southern France): Umax 0.2 W/m²K.
	• Basement ceilings
	  • Umax 0.24 W/m²K if on the ground with crawl space;
	  • Umax 0.15 W/m²K if above the ground.
	Detailed calculation of the thermal transmittance U values shall be provided.
	As potential thermal bridges must not weaken the overall performance of the building envelope, specific attention is required for the technical details (element junctions such as façade/roof, façade/openings…). It is requested to detail the technical points at scale 1/10 as well as the components list.
	* South of Latitude 44.5° N.

Summer comfort	For Italy, Spain and Southern France (South of latitude 44.5° N), the competition requests to take into account summer comfort in order to reduce the need for additional energy demand during hot temperature periods.

	Various technical reports from institutes have proven that the main contributors to summer comfort, ahead of the building envelope and referring to the building design, are solar protections and the ventilation system. In spite of this, the competition requires to work on this parameter for each building element. The performance to engineer is the thermal dephasing (also called thermal phase lag or phase shifting, units in hours/minutes), i.e. the time span between the highest external temperature and the highest internal temperature. Target phase shift values are: • Roof (flat roof, pitched roof): 11 hours; • External wall: 11 hours. It is requested to provide the detailed calculation of the thermal dephasing.
Airtightness	The airtightness values must fit at building element level one of these two criteria: • n50 (Passive house methodology): < 1 h-1 or • Q4Pa-surf (Blower-door test): < 0.5 $m^3/(h.m^2)$ Major detail points of the building envelope would need special attention. It is requested to detail these points, such as junction areas (façade/roof, façade/floor…) as well as the openings (windows, doors). Detail at scale 1/10 and list the components.

Fire safety	• Roof
	  ◦ Flat roof
	  The roof structure must be REI30 fire resistant.
	  Fire protection from the outside: B roof (t3).
	  ◦ Pitched roof
	  The roof load-bearing structure must be R30 fire resistant.
	  The system must have a fire screen on the inside with a REI60 fire resistance.
	• External wall
	  ◦ Façade fire-safe system with an A2-s1, d2 classification.
	  ◦ (Or if from inside) internal insulation system achieving an A2-s2, d0 classification.
	• Basement ceilings
	  Fire-safe system with a B-s1, d0 classification.

Acoustics	For ease of calculation, external noise level difference (DnT,A,tr) requirements have been converted into sound reduction indexes (Rw) assuming typical ratio of opaque and transparent building envelope elements and standard levels of urban background noise.

	The required acoustics performance for each application is defined as below: • Roof (flat roof, pitched roof): Rw ≥ 45 dB; • External wall (façade or internal insulation): Rw ≥ 50 dB, with glazed elements (windows, balcony doors, skylights, etc.): Rw ≥ 32 dB • Basement ceilings: Rw ≥ 55 dB. As acoustics need a holistic approach, main details of the building envelope elements would require special attention. It is requested to detail these points, such as the openings (windows, doors), element junctions (façade/roof, façade/floor, …)… at scale 1/10 together with providing the component list.
Indoor Air Quality	Indoor Air Quality requirements apply for pitched roof and in the case of internal insulation solutions for the external wall. They will be based on the material assessment (technical datasheets): • Total VOC (TVOC) emission 28 days < 1000 µg/m³; • Formaldehyde emission 28 days < 10 µg/m³.
Sustainability	The environmental impact of the proposed solutions will be evaluated on the two following criteria: The Life Cycle Assessment (LCA)* at building element level (not at the whole building level, then excluding heating and cooling, ventilation, …). For each building element, it is requested to provide the following calculated indicators: • Monetarized environmental impact in €/m²; • Carbon footprint in kg CO_2 eq/m², according to the EN 15804+A1 standard. The recycled content of the materials used for the retrofit: It is requested to detail the recycled content of the materials (% in weight of the total renovation materials) as well as the potential amount of re-used materials (% in weight) in the retrofit works. The highest ratios will be scored higher in the competition. For these 2 criteria, it is requested to provide the calculated ratios/m² for each building element. Knauf Insulation EPD or FDES can be found on www.inies.fr, on the International EPD website environdec.com and on Knauf Insulation website https://www.knaufinsulation.com/downloads/environmental-product-declarations-epd. * Totem is one of the free online LCA tools available at https://www.totem-building.be. NB: in the Totem tool, set the data

	for only 1 sqm for each building element (considering 1 sqm of living area).
Circularity	Circularity construction seeks to lower the environmental impact throughout the design, construction, use and deconstruction of the building using new concepts such as constructive scalability (flexibility for different types of uses, i.e. changing family compositions), reuse, reconversion, etc. As regards to circularity, this competition focuses on waste management, deconstruction and scalability.
Waste management	Waste management during the renovation phase: Scope: primarily only the waste generated by the retrofit operations, excluding the waste from the potential deconstruction of existing elements. It is requested to detail the ratio of renovation waste (in %, based on the weight), to categorize it according to the Lansink ladder (target levels: Reuse, Recycle and Recover) as well as the description of the recycling hypothesis. Highest ratios in the upper levels (Reuse, Recycle) will get highest scores in the competition.  Lansink Waste management ladder A bonus will be granted to solutions addressing the management of waste produced in the deconstruction part of this retrofit.
Deconstruction	Part of circularity requirements is to anticipate as much as possible the deconstruction phase. It is requested to detail both the ability to dismantle the proposed construction elements and the possible reuse of the materials.
Reversibility	A bonus will be granted for concept solutions allowing reversibility and reuse in order to cope with potential changes in the use of the building throughout its whole lifetime. It is required to detail which and how the building elements can be modified, i.e. façade compartments, roof elements, etc.

Affordability	The proposed solutions must fit social housing standard retrofit costs. They also need to comply with Life Cycle Cost (LCC) analysis (ISO 15686-5), ranging from construction, building lifetime down to the building end-of-life. These 3 costs are to be provided separately.
	
	Renovation costs :
	
	Target total installed cost (materials + labor) per square meter of building element (not per sqm of living space):
	• Roof
	  • Flat roof: ≤ 70 €/m²
	  • Pitched roof: ≤ 65 €/m²
	• External wall
	  • Façade: ≤ 160 €/m²
	  • Internal insulation: ≤ 50 €/m²
	• Basement ceilings: 80 €/m²
	
	Maintenance costs:
	
	To be calculated and detailed on a 30-year period in €/m² based on industry standard costs. It is required to detail the cost calculation hypothesis: materials life span, maintenance frequency, operation costs.
	
	End of life cost in €/m², which covers dismantling operations and waste management; it is required to detail the cost calculation hypothesis.

Scalability: industrialization	The proposed solutions must use as much as possible off-site production (prefabrication), in order to reduce on-site installation and need for labor. Attention will also be paid to what makes the proposed solution scalable to an industrialized phase, it is also requested to detail how this can be achieved.
Others	Proposed solutions are not to be specific to Knauf Insulation product ranges, the competition is open to all insulation solutions.

Deliverables

Only digital deliverables will be accepted.
Each team submission file must contain:

- Overall presentation and the philosophy of the concept solutions.

For each target application (roof, external wall, basement ceilings) the below outputs are expected at building element level, referring to the competition task and specifications above:

- Sketches of proposed solutions: sketches, mounted pictures and zoomed in 1/10 sketches for the technical details;
- Energy efficiency: U value calculation, summer comfort and air tightness performances;
- Detailed delivered performances related to the competition task and specifications: fire safety, acoustics, Indoor Air Quality, sustainability, circularity;
- Table of performances detailing the estimated values for each requirement stated in the specifications above;
- Quantity and cost table: total installed cost (materials + installation) in €/m^2 at building element level and breakdown per materials.

Timing

- Close of subscriptions: 28th May 2021
- Close of submissions: 30th September 2021
- National judging round: 15th October 2021
- European judging round: 29th October 2021
- Final presentation & announcement of winners: in November 2021

Good luck!