

Global Warming Potential

Impact of material choices



ArcelorMittal



Methodology of the study



Extraction of the bill of materials for each structural element



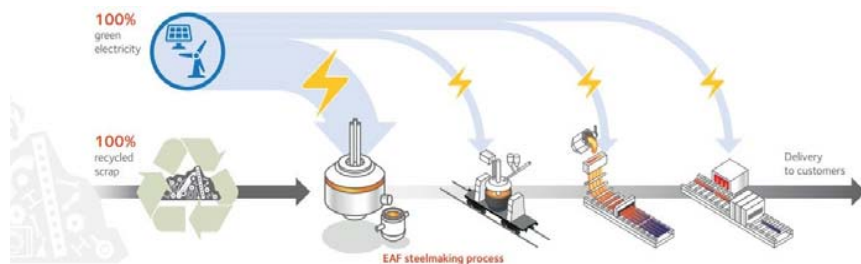
Computation the **Global Warming Potential** for each structural solution



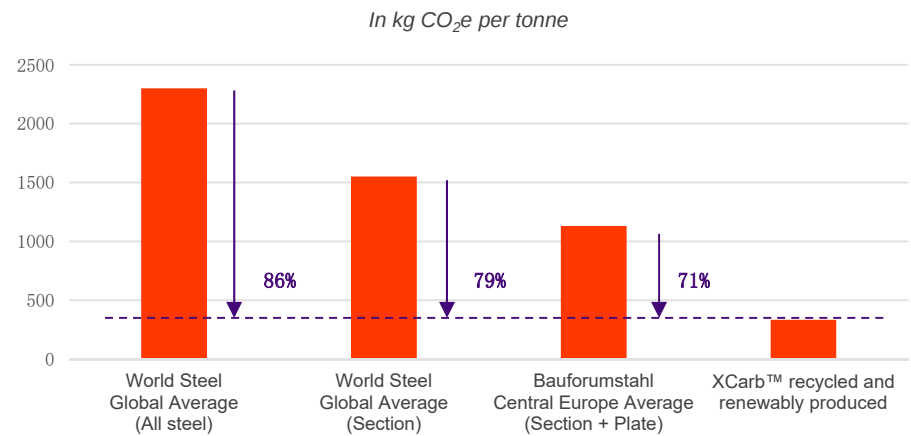
Comparison of the results in terms of Global Warming Potential

Embodied carbon for steel products

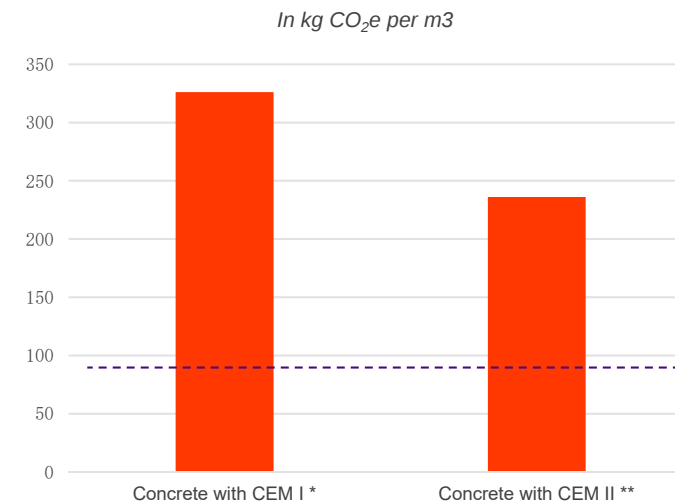
By using exclusively renewable energy sources, ArcelorMittal produces XCarb® steel



CO₂e saving is 86% for each tonne of steel



Embodied carbon for concrete



* Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM I, 0% recycled binders (340 kg/m³; 21.2 lbs/ft³ total cement) (One Click LCA)

** Ready-mix concrete, normal strength, generic, C35/45 (5000/6500 PSI) with CEM II/B-V, 30% fly ash content (340 kg/m³; 21.2 lbs/ft³ total cement) (One Click LCA)

01 CASE STUDY - column

Column multi-storey column subject to axial load, buckling length 3.5m

industrial building



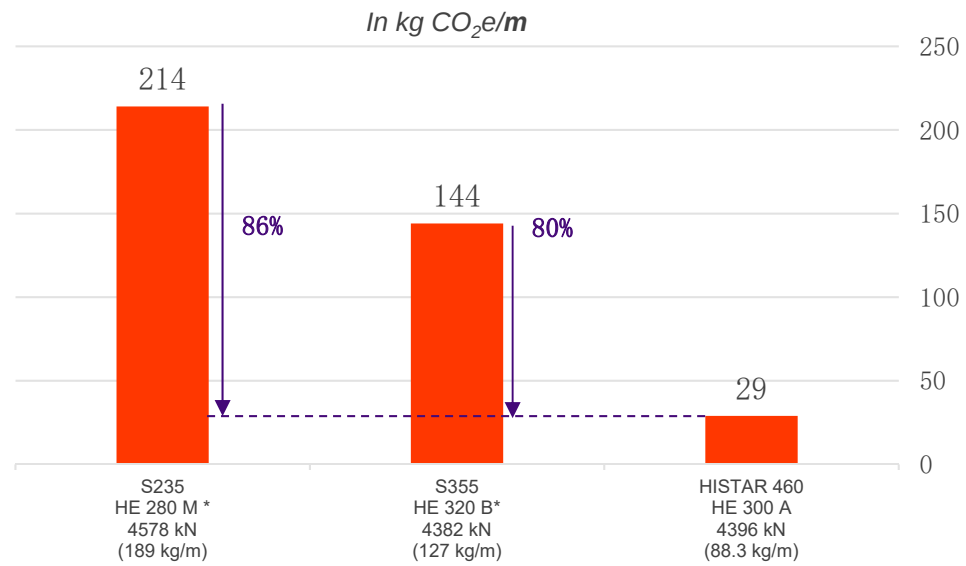
High rise



CO₂e saving / industrial building



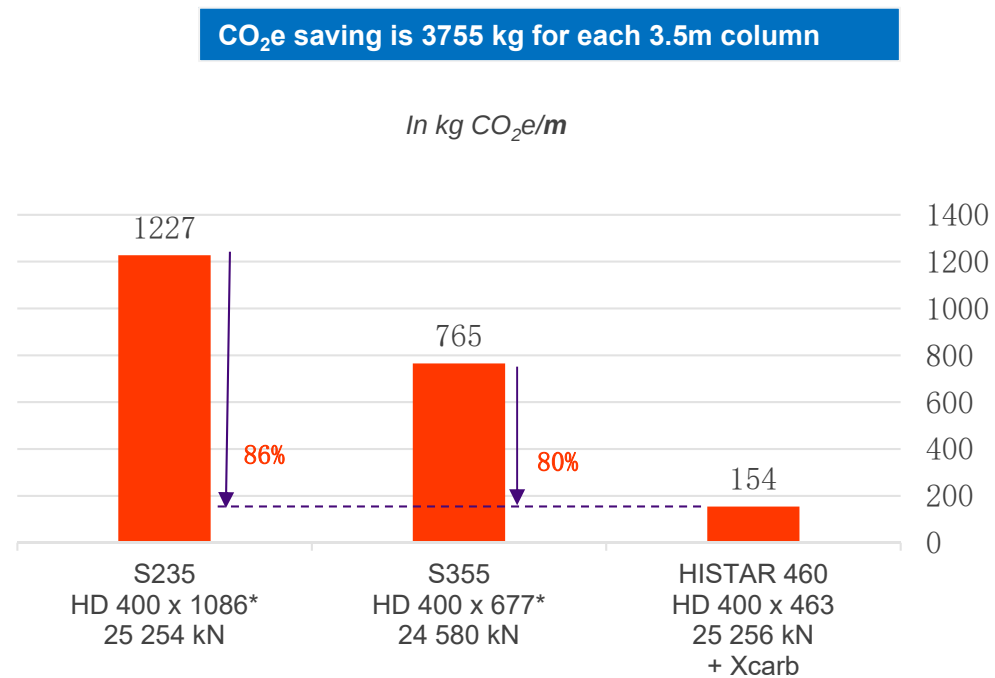
CO₂e saving is 647 kg for each 3.5m column



* Bauforumstahl EPD | A1-A3 | 1130 kgCO₂e/t

XCarb
Recycled and renewably
produced

CO₂e saving / high rise construction



* Central Europe Bauforumstahl EPD | A1-A3 | 1130 kgCO₂/t

02 CASE STUDY - industrial warehouse

Warehouse



24m double-span logistics warehouse

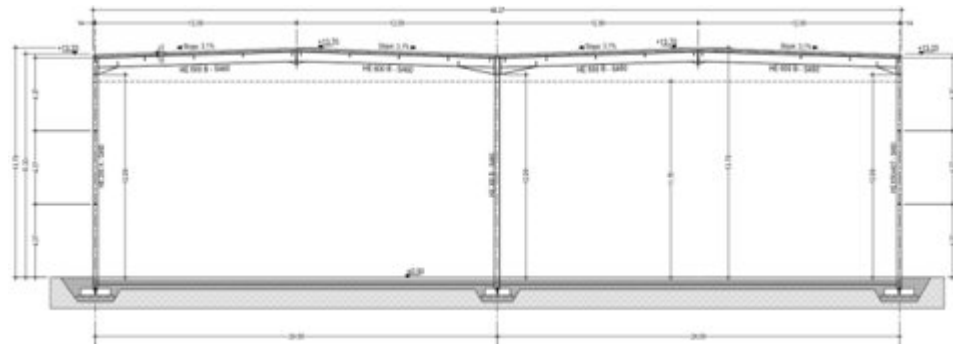
Roof slope: low slope roof 3%

Out of plane distance between frames: 12m

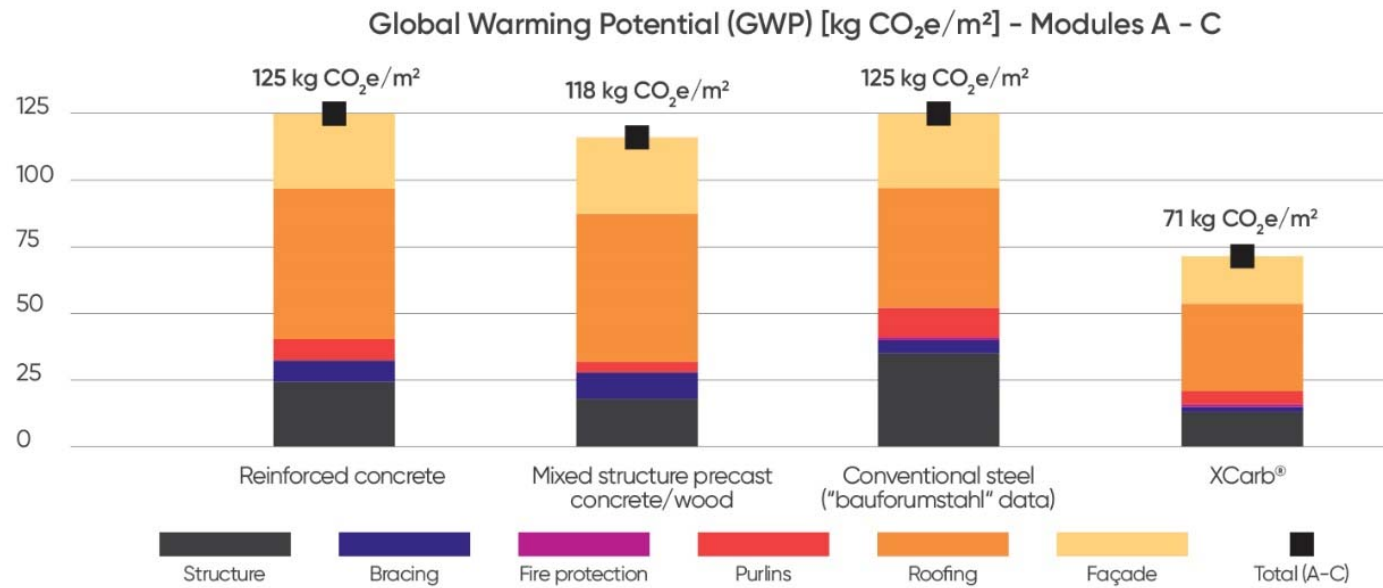
Free height: 11,70m

Fire protection requirements: R60 for France and R30 for Germany

Area of analysis: 1x frame / $(24\text{m}+24\text{m}) \times (12/2+12/2) = 576\text{m}^2$



CO₂e saving / logistics warehouse



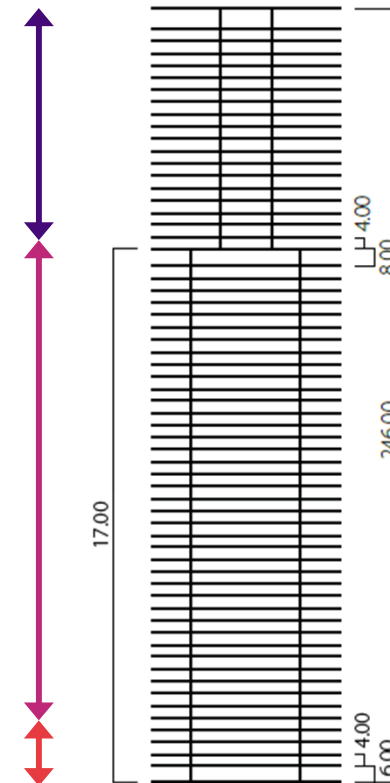
Reduction of approximately 40% when using XCarb® recycled and renewably

~ 40% reduction

03 CASE STUDY - tall building

Case study - Tall Buildings

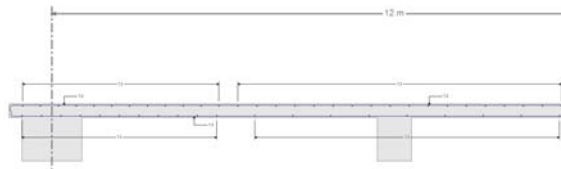
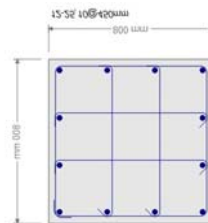
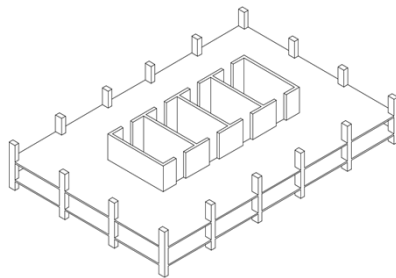
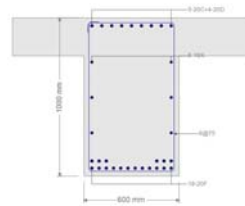
◆	Height and floor dimensions
◆	246 m (equivalent to 60 storeys) e 40x60 m in plan view
◆	Location
◆	London, UK
◆	Impact category
◆	Climate Change, computing the GWP
◆	Lifespan
◆	100 years
◆	Function
◆	Commercial, offices and residential
◆	Parameter for results interpretation
◆	Material used



Case study - Tall Buildings

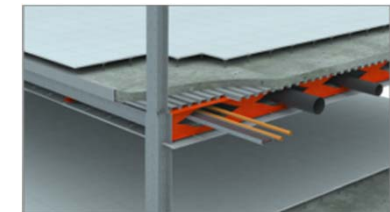
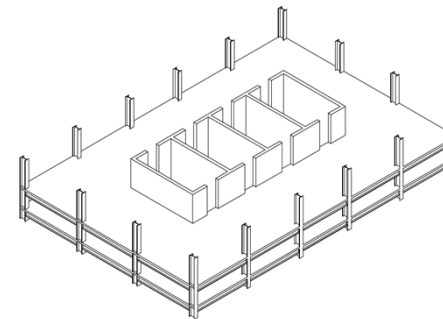
Concrete solutions

1. Two-way solid slab with beams
2. Full post-tensioned inside

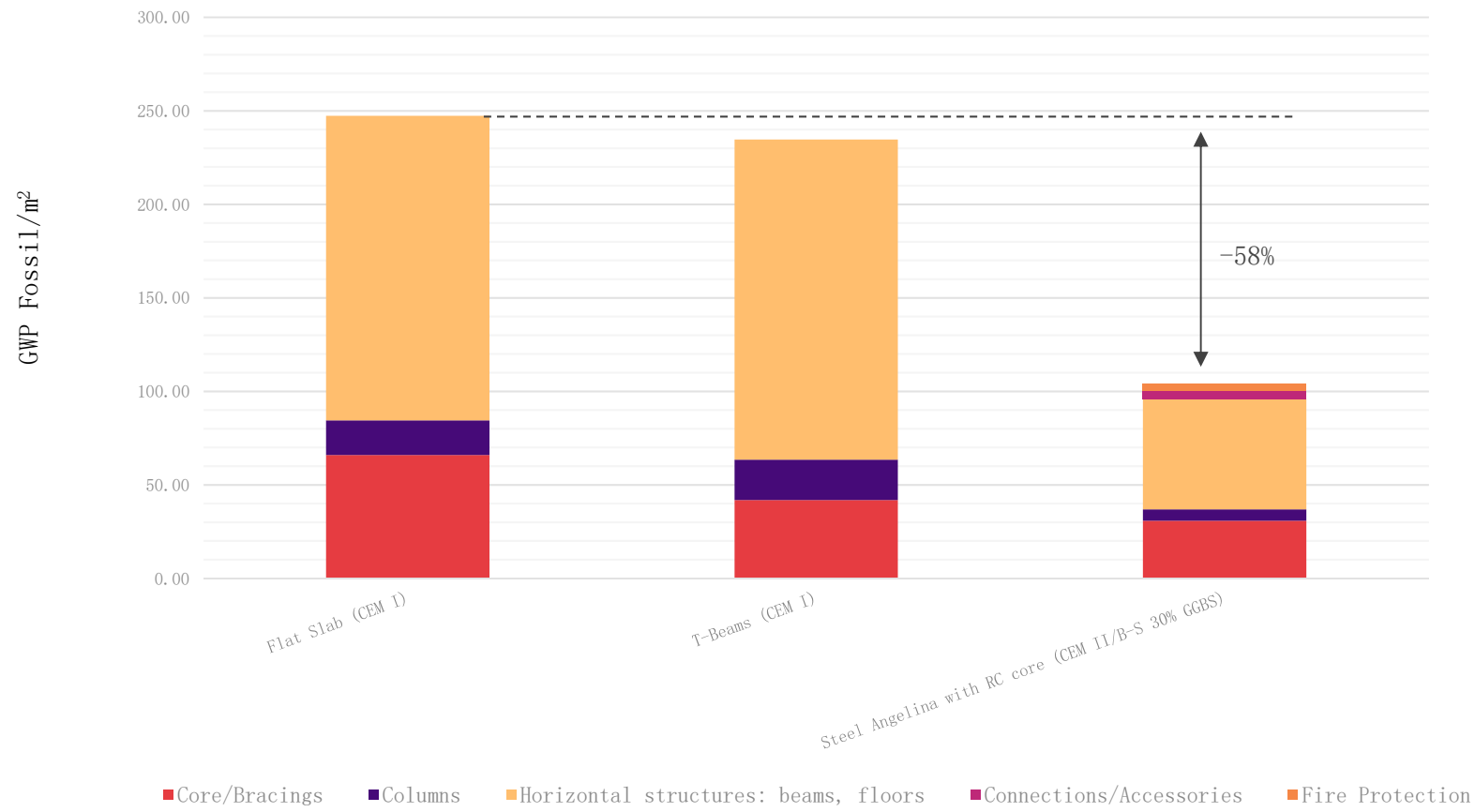


Steel solutions

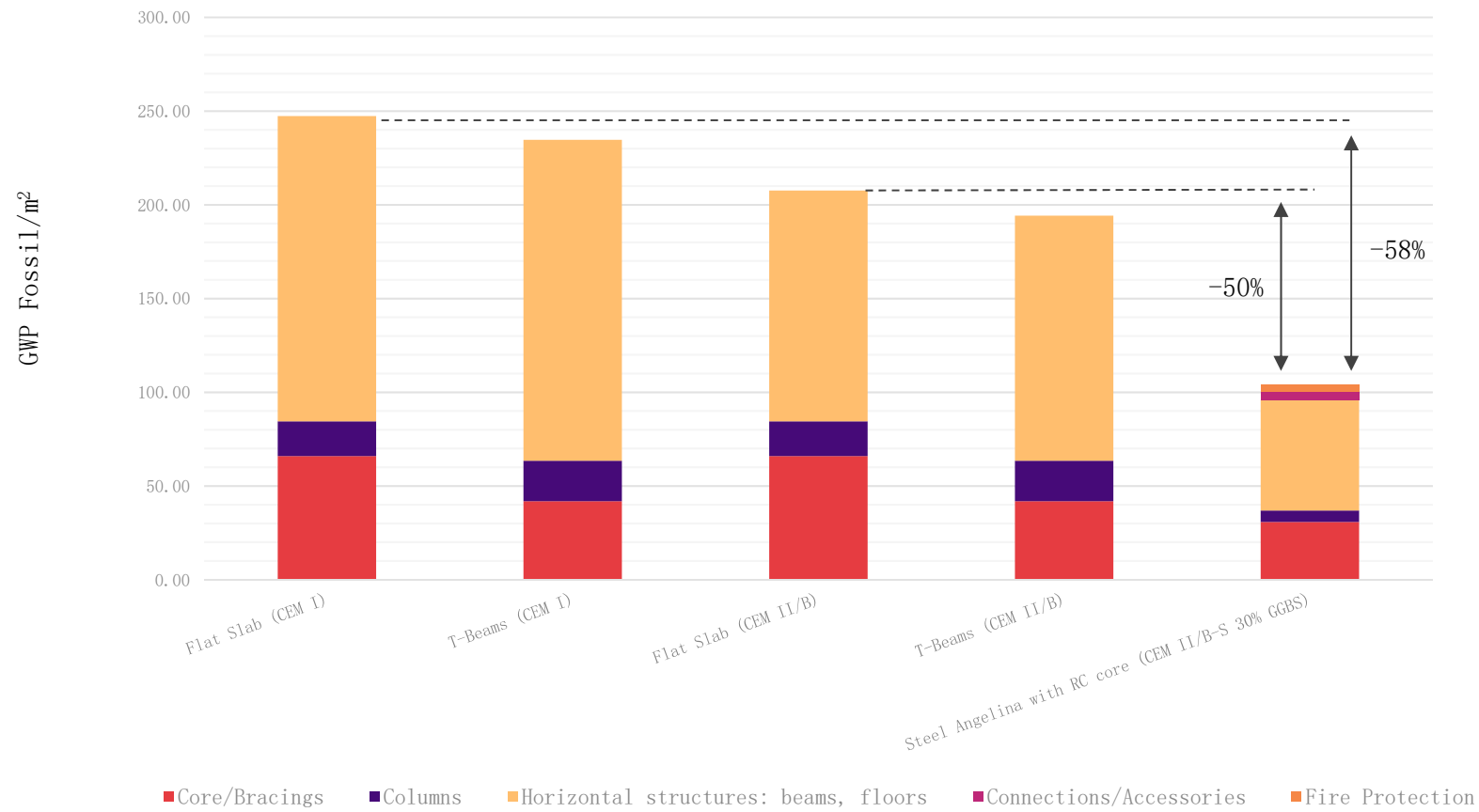
1. Angelina beams and steel column with metal deck



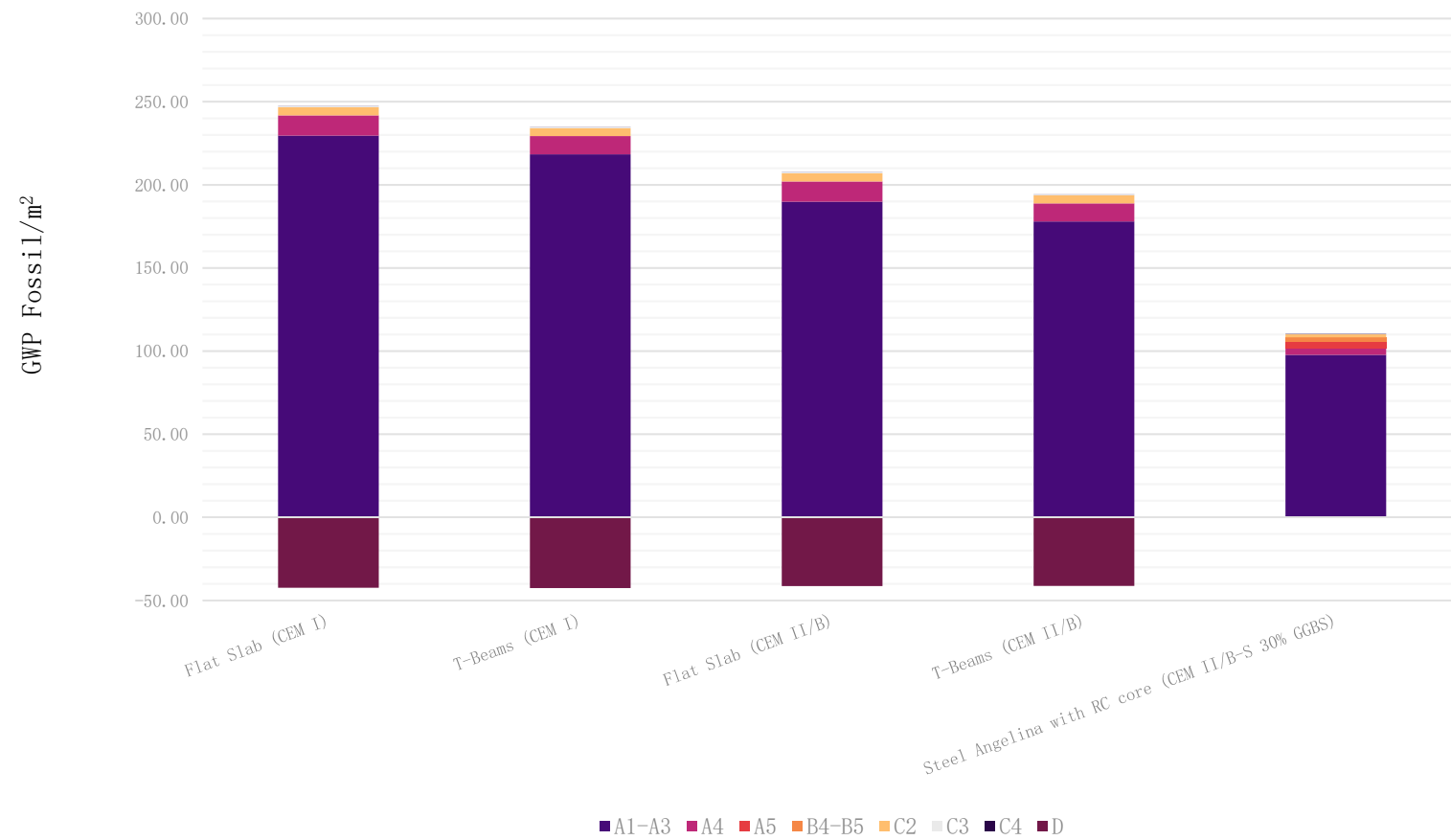
GWP Fossil / m² - Building Elements [A-C]



GWP Fossil / m² - Building Elements [A-C]



GWP Fossil / m² - LCA Module [A-D]



Conclusions



All horizontal structural elements (beams and slabs) are the most climate-impacting components



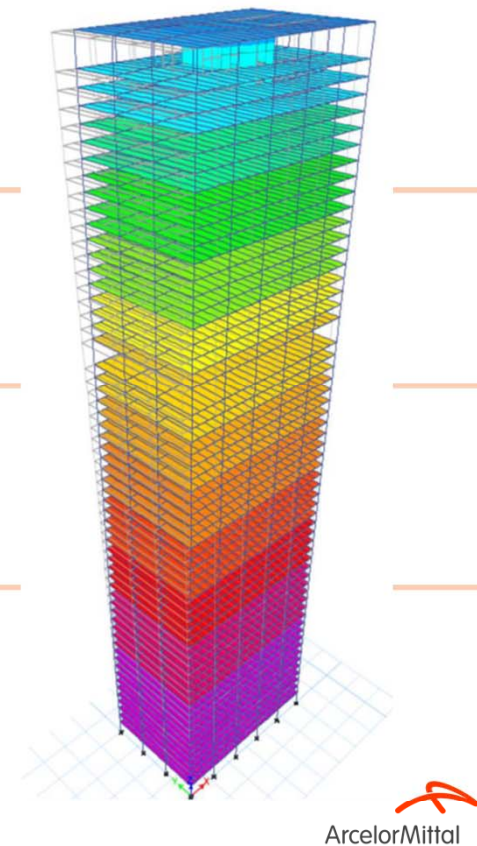
The use of low environmental impact steel (XCarb) significantly reduces the environmental impact of the structure



The A1 - A3 modules, related to the production of materials, are the most impactful



Module D, related to the recycling and reuse of materials, has a negative contribution for low-environmental-impact steels



Thanks for the attention

