Material and design efficiency

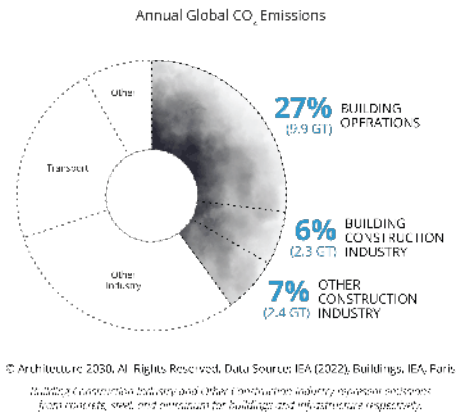
Reducing the environmental footprint in construction

Olivier Vassart

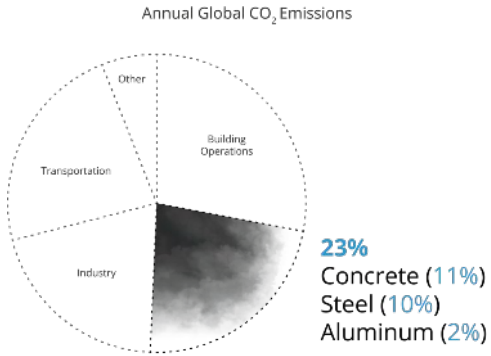
CEO Steligence®

The impact of the construction to the climate change

Buildings and construction currently account for around 40% of CO_2 emissions



Building Construction Industry and Other Construction Industry emission estimates from concrete, steel, and aluminum for buildings and infrastructure respectively.



Data Sources: Global ABC Global Status Report 2018, EIA

Global building floor area is expected to **double** by 2060

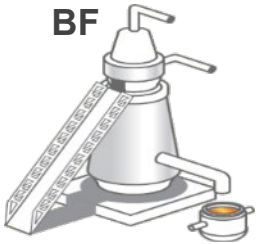
Data Source: IEA, Energy Technology Perspectives 2020 – February 2021 Revised Edition

ArcelorMittal

Several numbers on steel carbon intensity

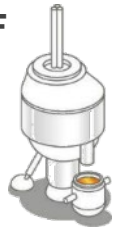
Each steelmaking route has its own carbon footprint

BF

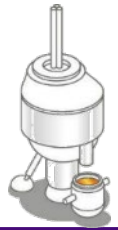


BOF

DRI-EAF



SCRAP-BASED EAF

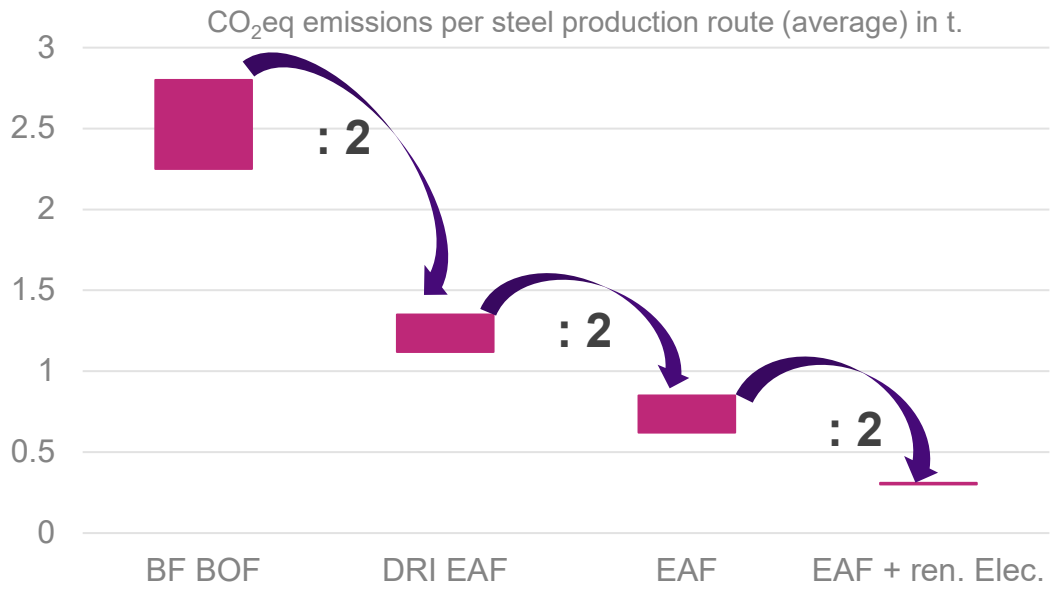


+ renewably produced electricity

Steelmaking route	Blast furnace-basic oxygen furnace (BF-BOF)	Direct reduced iron (DRI) followed by an EAF	Electric arc furnace (EAF)	EAF with renewably produced electricity
Main input	Coal and iron ore	**direct reduced iron (sponge iron)**	**scrap**	scrap
Main CO_2 source	**Chemical interaction between carbon (coal) and iron ore**: iron reduction produces pig iron which is converted into steel.	Emissions from the use of **natural gas as reductant** Emissions from purchased **electricity**	Emissions from **purchased electricity**	Emissions from **purchased electricity**
Emissions (incl. rolling mill)	Between 2.25 / 2.8 t. CO_2/t	Between 1.12 / 1.35 t. CO_2/t	Between 0.62 / 0.85 t. CO_2/t	Around 0.3 t. CO_2/t

ArcelorMittal

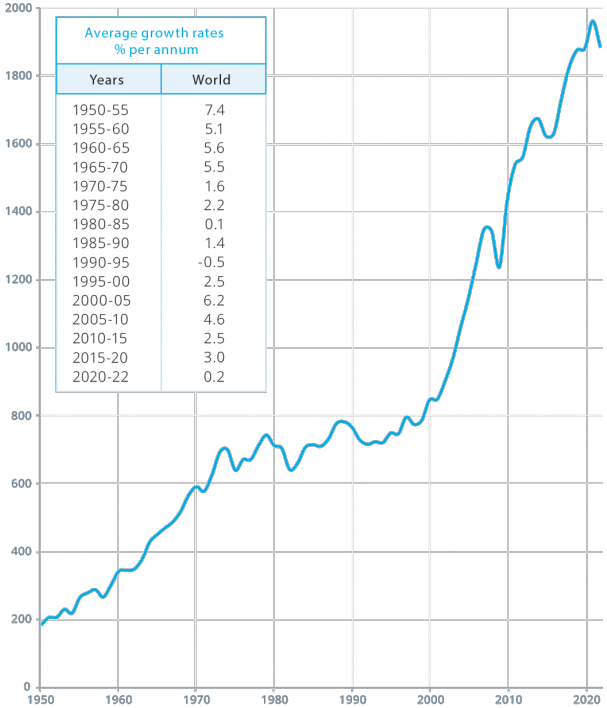
Each steelmaking route has its own carbon footprint

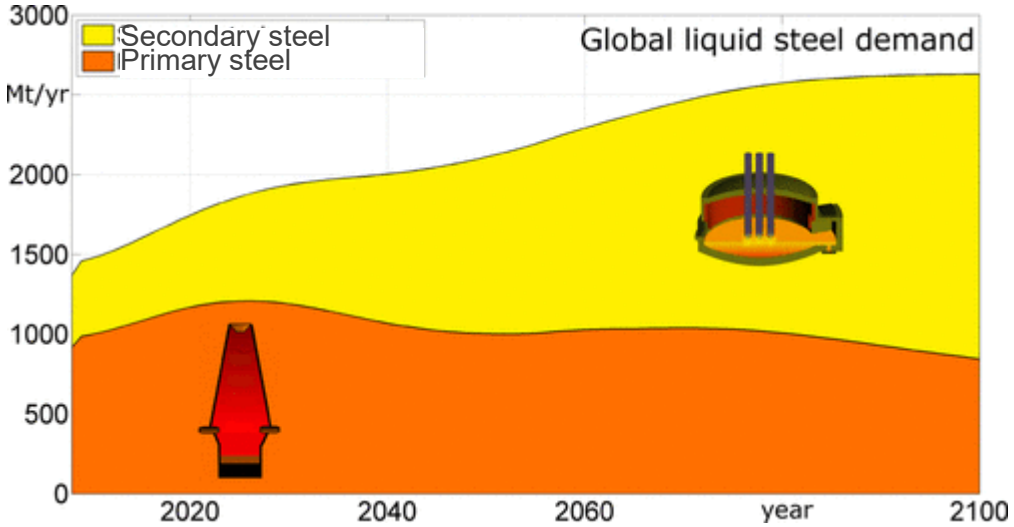


ArcelorMittal

The big picture

million tones, crude steel production



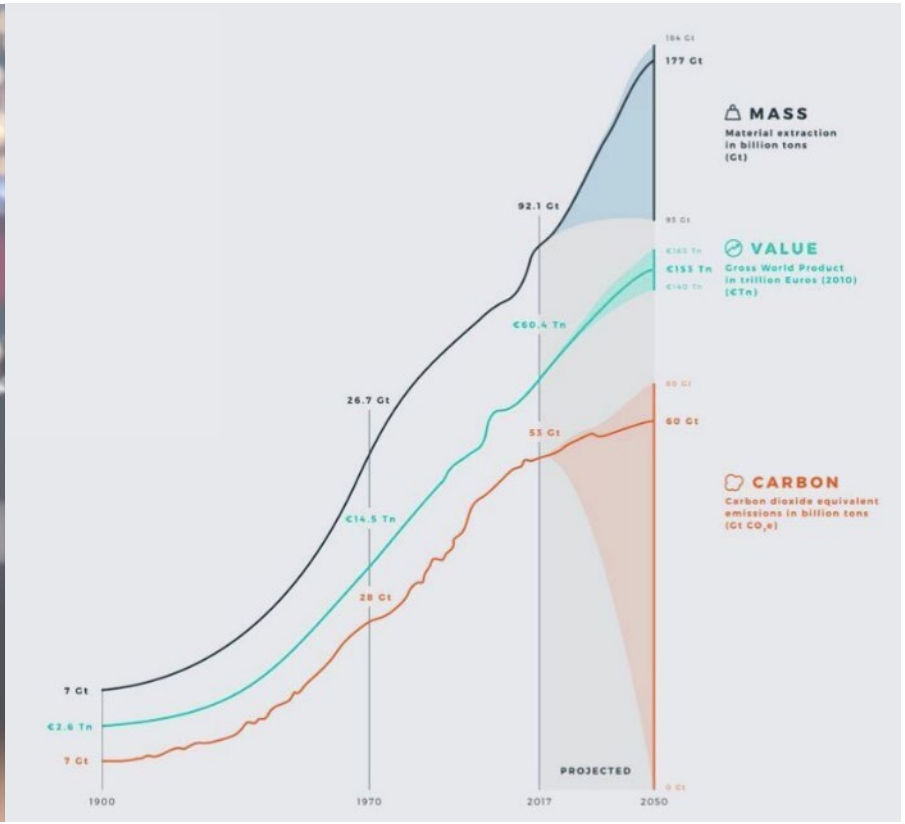


https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2023/

ArcelorMittal

Focus on construction

Is the solution only focused decarbonizing material production?



Source : Circularity Gap Reporting Initiative 2022

ArcelorMittal

The impact of the construction to the climate change

Actions to reduce carbon footprint (on a yearly basis)

Cut one return flight from New York to Chicago		Save 1.000 $kgCO_2e$
Cut meat, dairy and beer from your diet		Save 2.000 $kgCO_2e$
Stop driving your car		Save 3.000 $kgCO_2e$
Achieve 20% structural steel embodied carbon reduction of a 200m high rise building		Save 6.000.000 $kgCO_2e$

The structural engineer has more opportunity to reduce carbon emissions than most other people

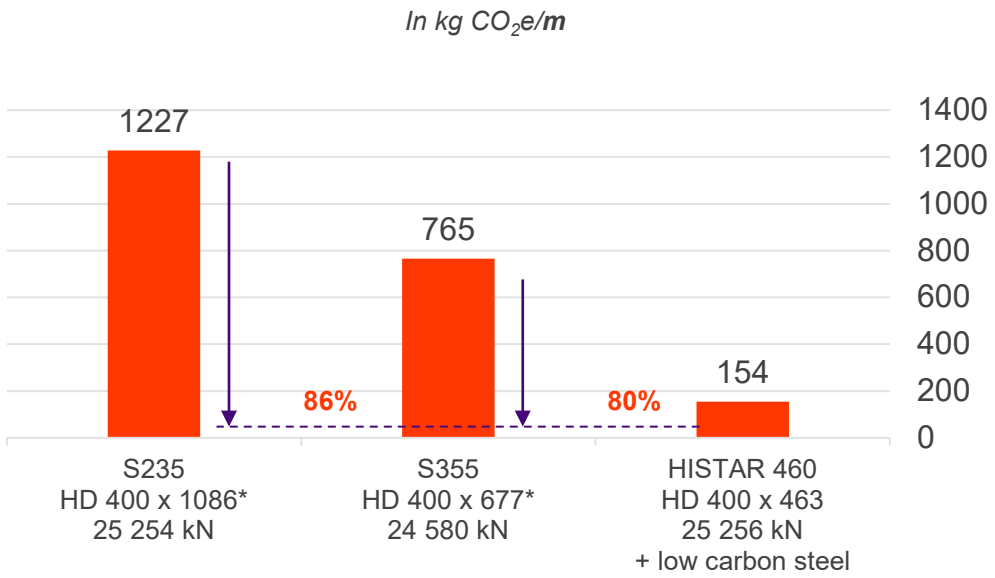
ArcelorMittal

Intelligent material selection makes ALL the difference

High rise construction

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

CO_2e saving is 3755 kg for each 3.5m column



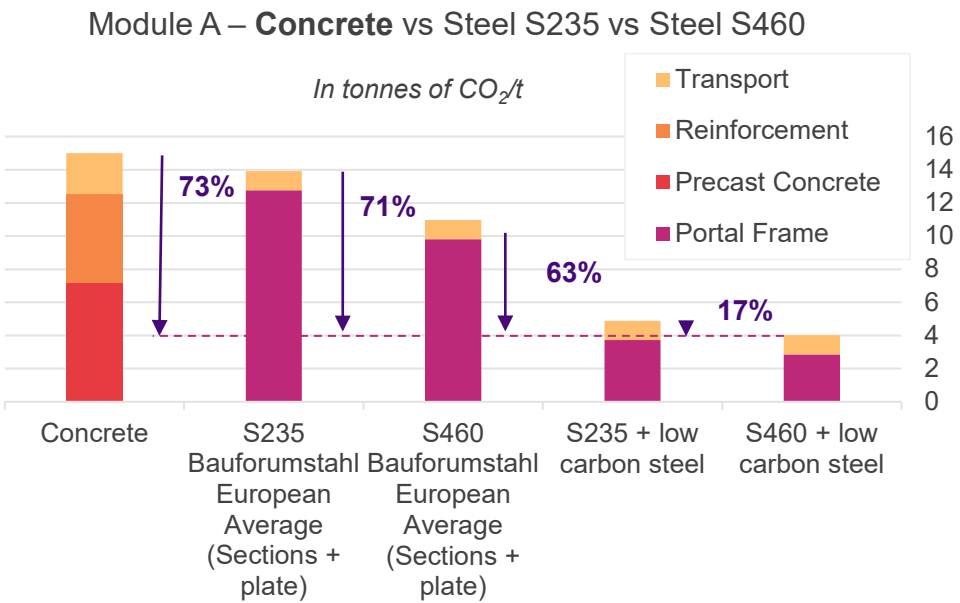
* Central Europe Bauforumstahl EPD | A1-A3 | 1130 $kgCO_2/t$

ArcelorMittal

Intelligent material selection makes ALL the difference

Single-storey industrial building
LVS3 * without envelope

CO_2e saving can be as high as 73%

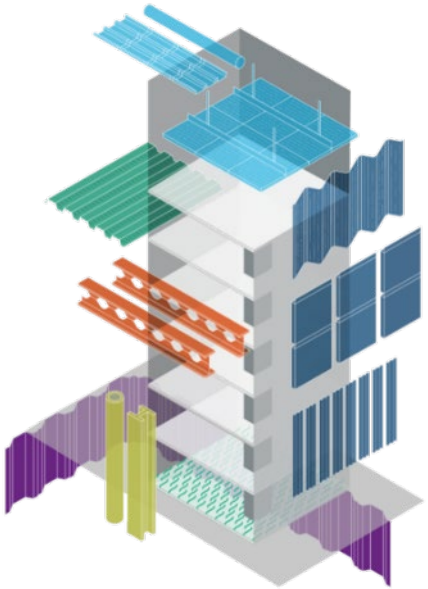


* LVS3 European project
https://op.europa.eu/en/publication-detail/-/publication/cbb3472d-fbbe-11e5-b713-01aa75ed71a1

ArcelorMittal

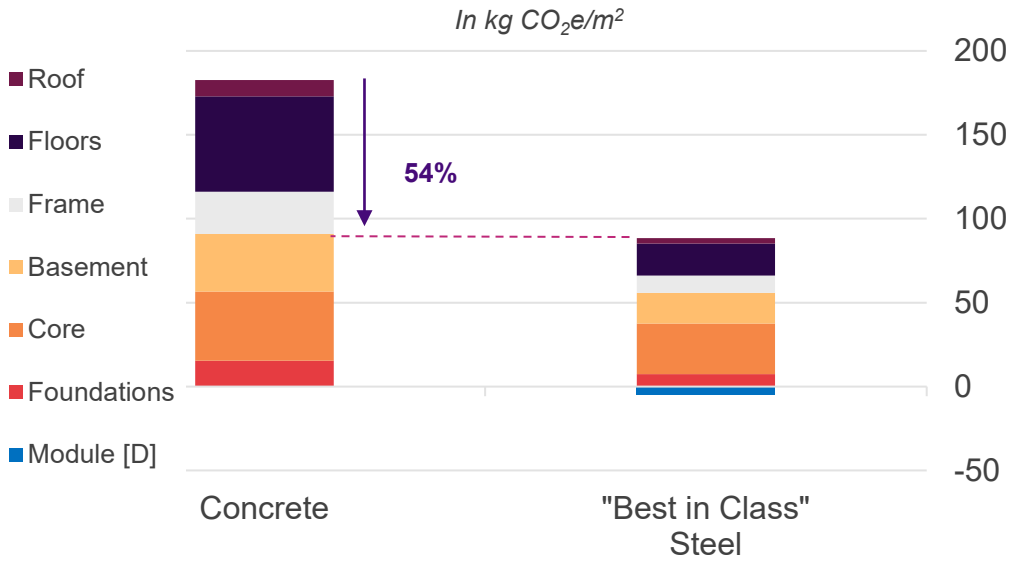
Intelligent material selection makes ALL the difference

The Steligence® office building



CO_2e saving can be as high as 54%

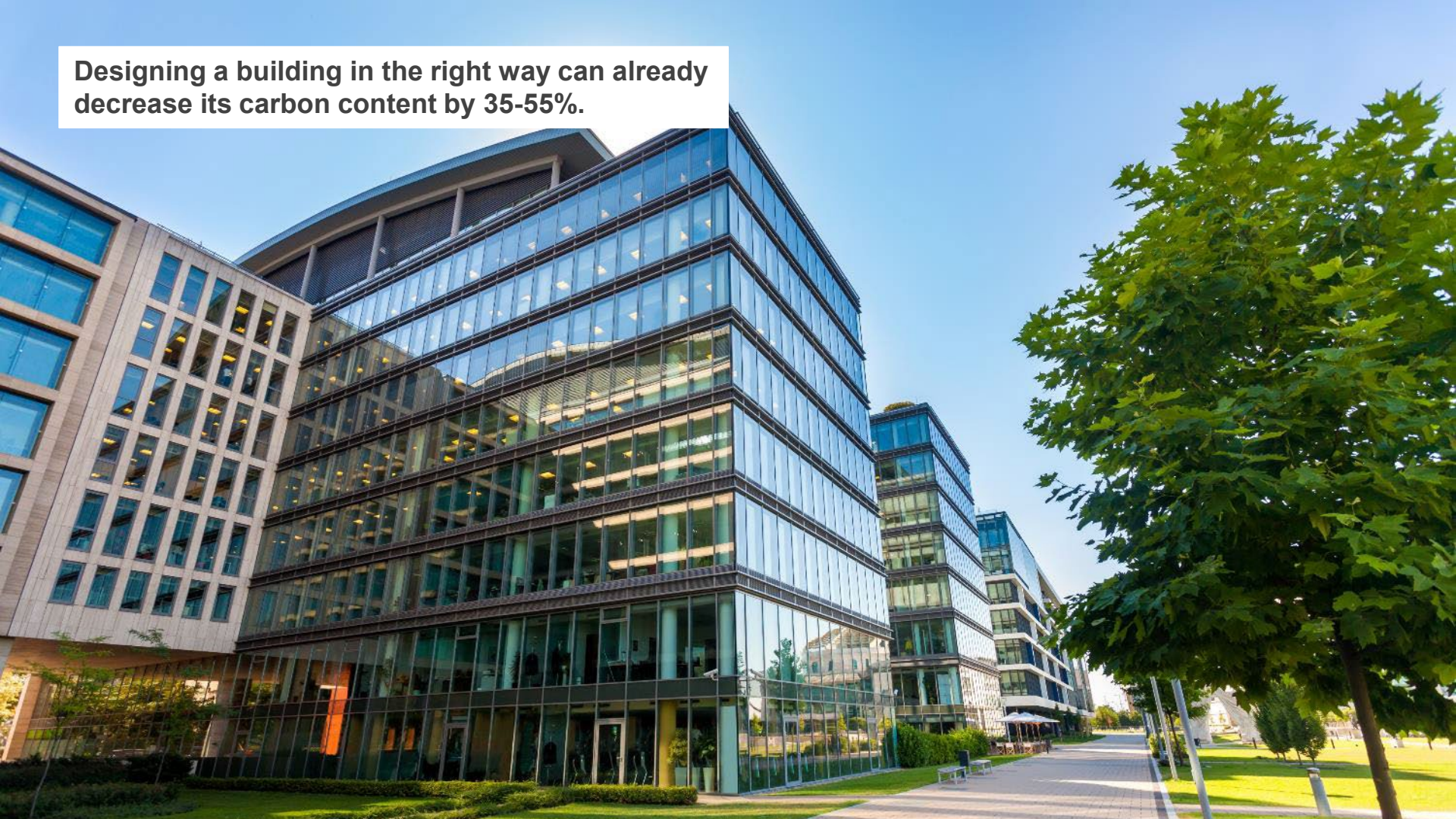
Cradle to cradle | [A-C] + [D]



182 $kgCO_2e/m^2$

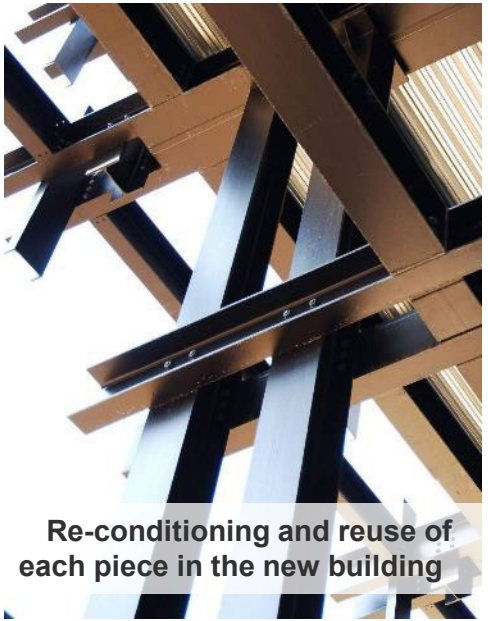
83 $kgCO_2e/m^2$

ArcelorMittal

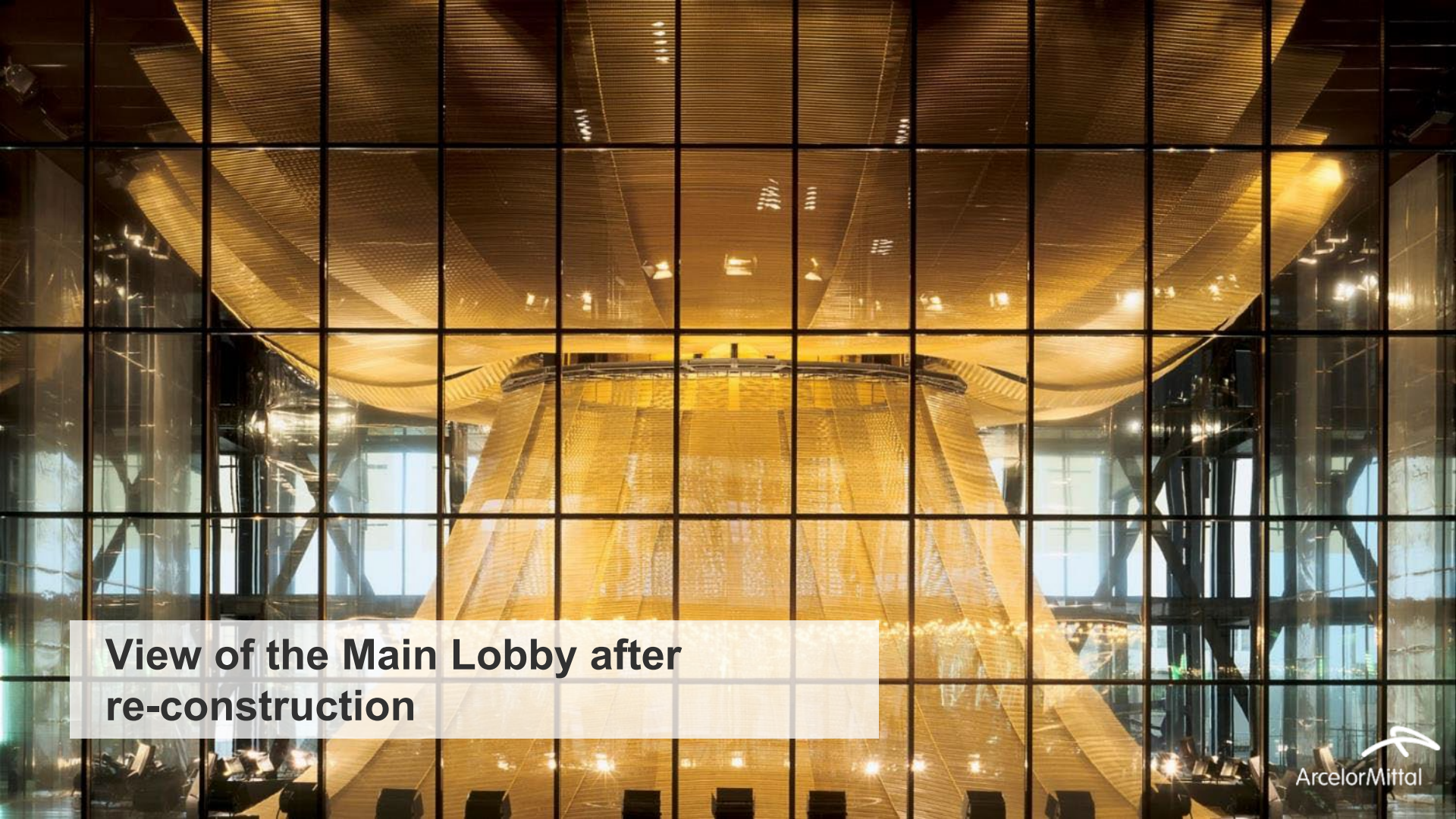

Designing a building in the right way can already decrease its carbon content by 35-55%.

Refurbish & Re-use: European Court of Justice in Luxembourg

Dismantling of the of building piece by piece



Re-conditioning and reuse of each piece in the new building



View of the Main Lobby after re-construction

ArcelorMittal

Re-use : Mundo LLN (Belgium)

mundo
Louvain-la-Neuve

ArcelorMittal

Re-purpose : project „Petite Maison“ (Esch-Belval / Luxembourg)

ArcelorMittal