ArcelorMittal

# Do you speak Sustainable Construction ?

# Steel – Recyclability and Flexibility

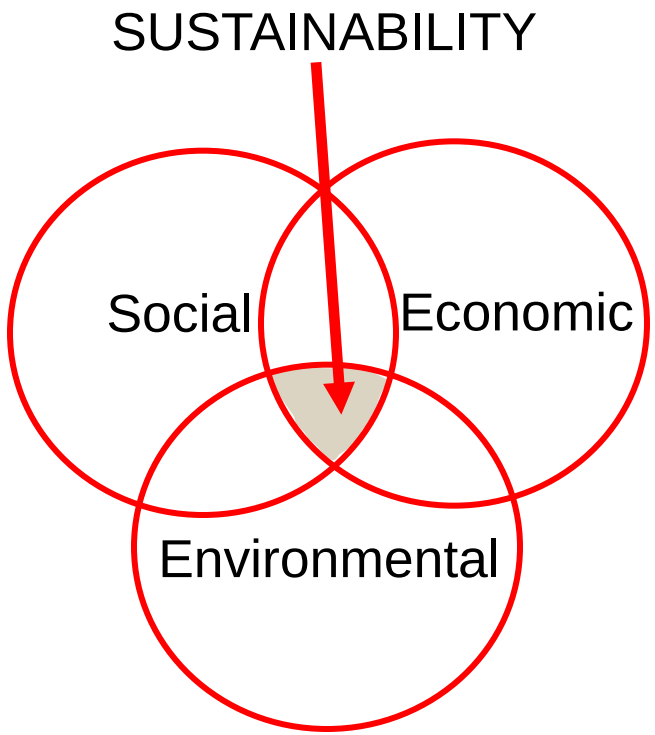
Bruxelles, May 20th, 2010

# Sustainable Construction

- SOCIAL =
  Health and Safety, Comfort
  Aesthetics, Urban Redevelopment

- ECONOMIC =
  Life Cycle Costs, Maintenance, Value preservation, Functionality, Flexibility, Reusability = *Reconstruction, → ECODESIGN*

- ENVIRONMENTAL =
  Climate effects, Waste (= landfill), Energy consumption, Raw material, Recycling



# Steel Industry Strengths and Weaknesses

## Strengths

- Recycling

  ! Cost-effectively without subsidies.

  Steel = 100% recyclable and structural shapes are to 99% recovered and recycled without any loss of quality. UPCYCLING to high strength steel is standard practice.

- Flexibility / Adaptability of buildings = High
- Low waste / Off-site fabrication = Safer and cleaner
- Good engineering properties maximise performance
- Quick and efficient erection = Reduced nuisances (=preassembled modules)
- Reusability / Reconstruction = ECODESIGN

## Weaknesses

- Energy intensive production (= same applies to concrete)
- Transport of raw materials (= minor effect on carbon footprint)

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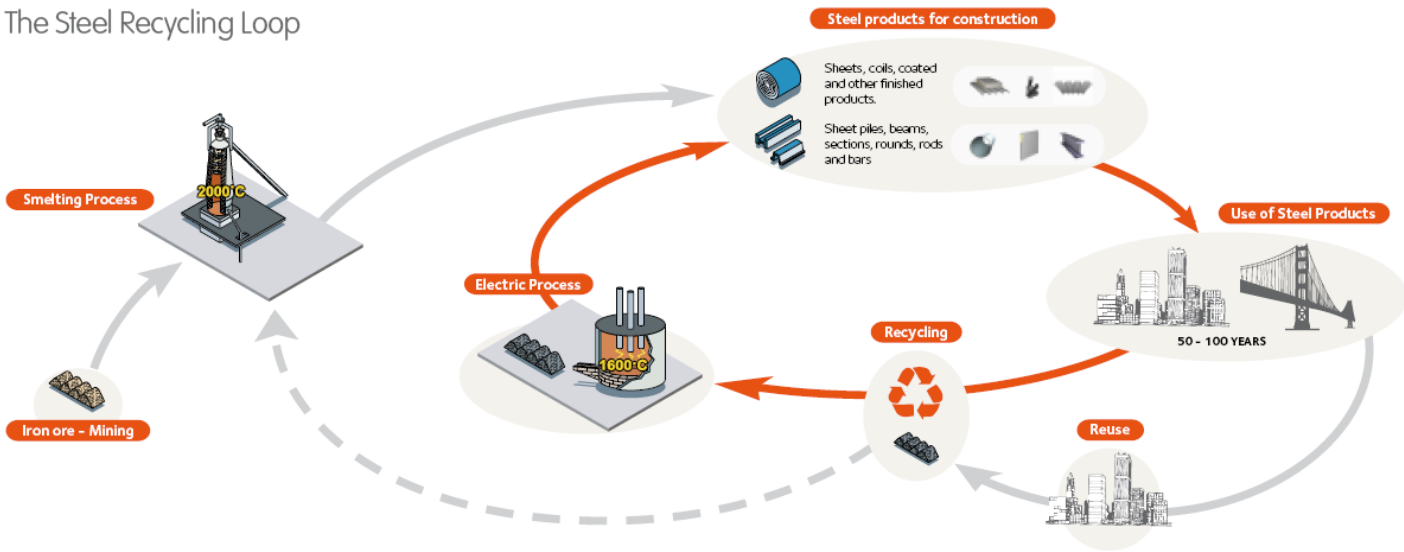
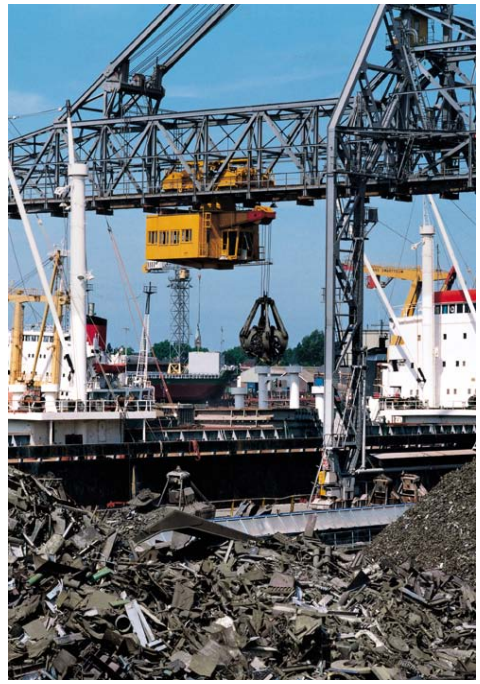
# Natural resources- Raw material
# High savings through scraps

- Steel is worldwide the most recycled material,  Cost-effectively!
- Recovered Steel is 100% recycled. Recovery rate of sections is 99%!
- Steel is recycled indefinitely
- Steel is upcycled



14 tonnes of steel recycled every second around the world!

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# Socio cultural sustainability
# Urban redevelopment and renovation

**Advantages:**
Reduced waste, noise, dust, jobsite work and traffic interference by pushing pre-fabrication including modular construction while improving safety and comfort for workers and residents.

## Steel is the material of choice

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# Ecodesign = Reuse = Second life

Design of intelligent modular steel structure for easy dismantling and reconstruction

Car Park at Munich Airport 1972: rebuilt in 2 parts: 1995 in Neuss and 1996 in Gross-Gerau

Christ Building Hannover - 2000: rebuilt as:

- a cloister in Volkenroda (D)
- and a laboratory in Aachen

# Ecodesign: Second Life of Steel Structures

1958 Brussels


1958 Brussels

2008 Prag (CZ)


2008 Breendonk (B)

# Concrete Industry Strengths and Weaknesses

## Strengths

- Local sourcing of raw materials (steel scrap is local raw material too)
- High thermal capacity (steel-concrete composite has it too)
- Inherent fire, sound and vibration properties (well engineered steel structure has it too, -- performance and cost-efficiency)

## Weaknesses

- Energy intensive production
- Downcycling not recycling
- Can be difficult to demolish and extract valuable components
- Heavy and resource inefficient
- High levels of waste

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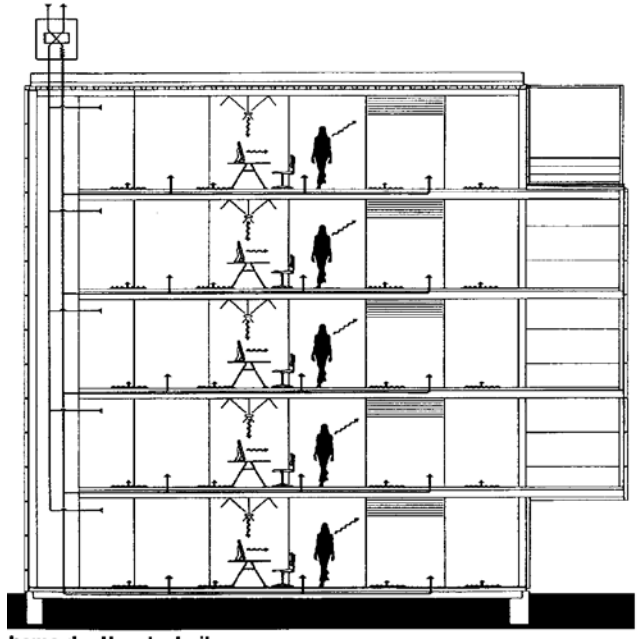
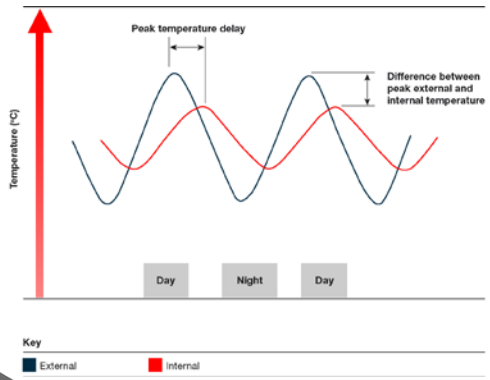
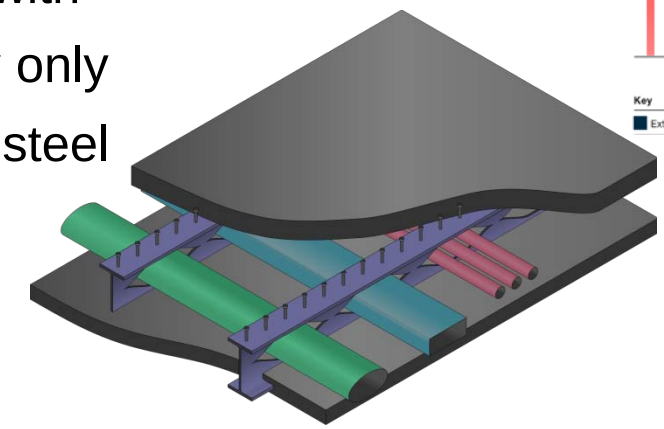
# Energy consumption
# Steel fosters low energy construction

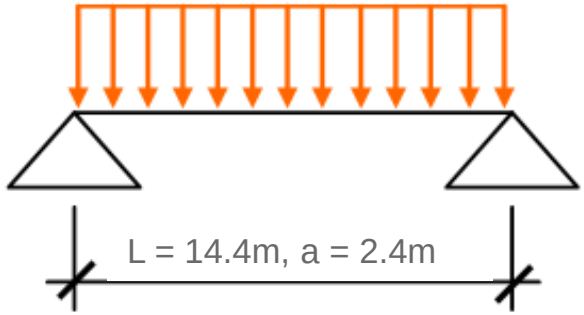
- Over 80% of the energy (and consequently $CO_2$ emissions) result from the service life of a building.
- The combination of steel solutions with high performance insulation is reducing drastically the thermal losses of a building.
- Optimally tailored thermal mass with minimal weight is cost-effectively only possible by combining structural steel with concrete.

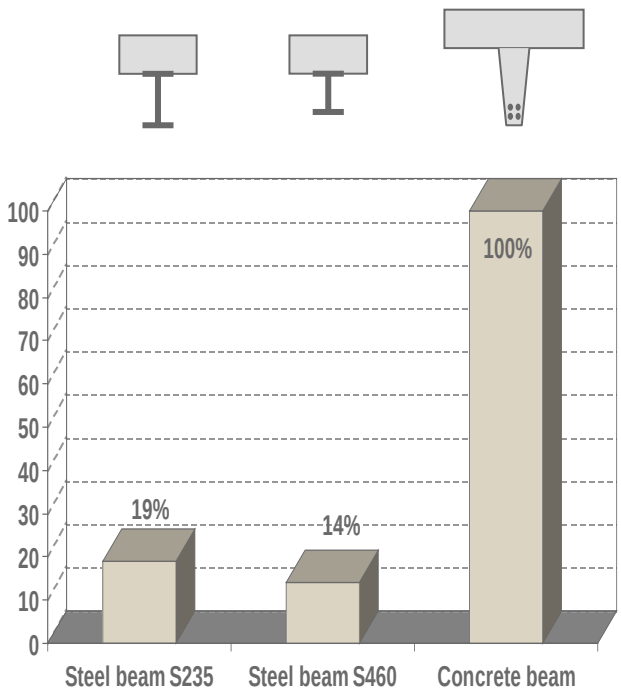




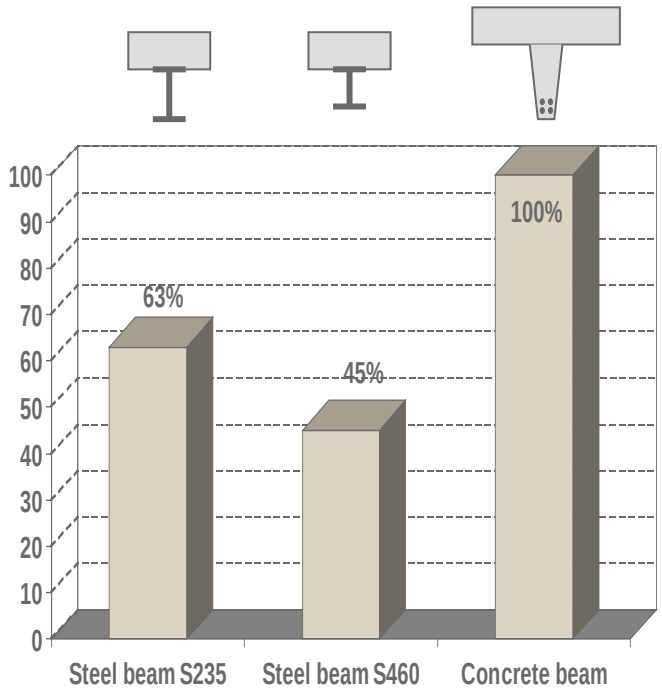



# Life Cycle Assessment of beams

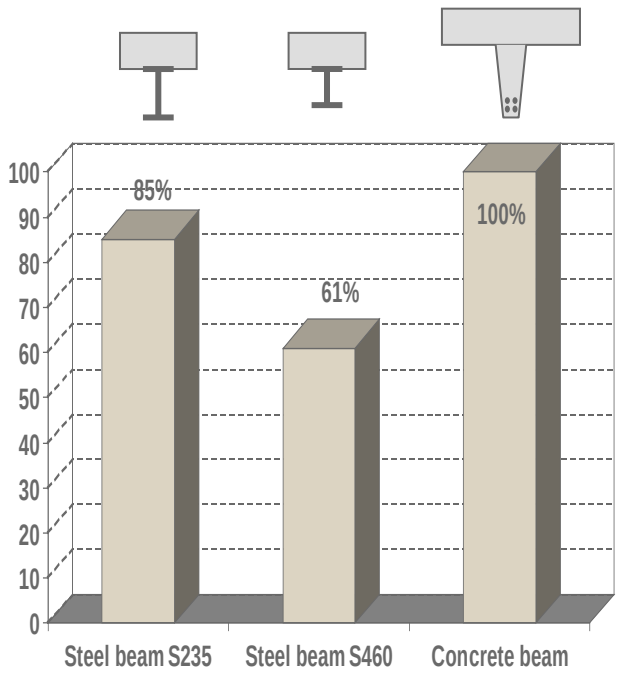



Weight

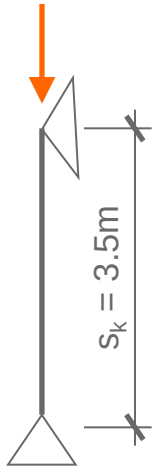


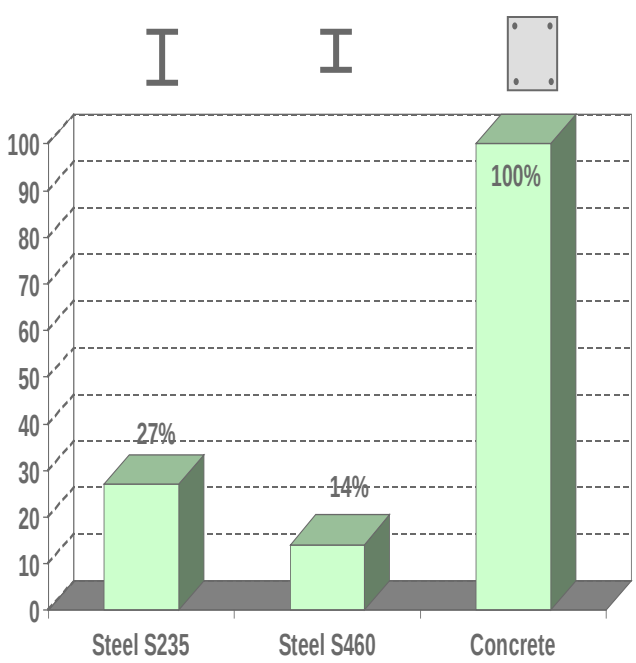

Global Warming Potential




Primary Energy Consumption

# Life Cycle Assessment of columns

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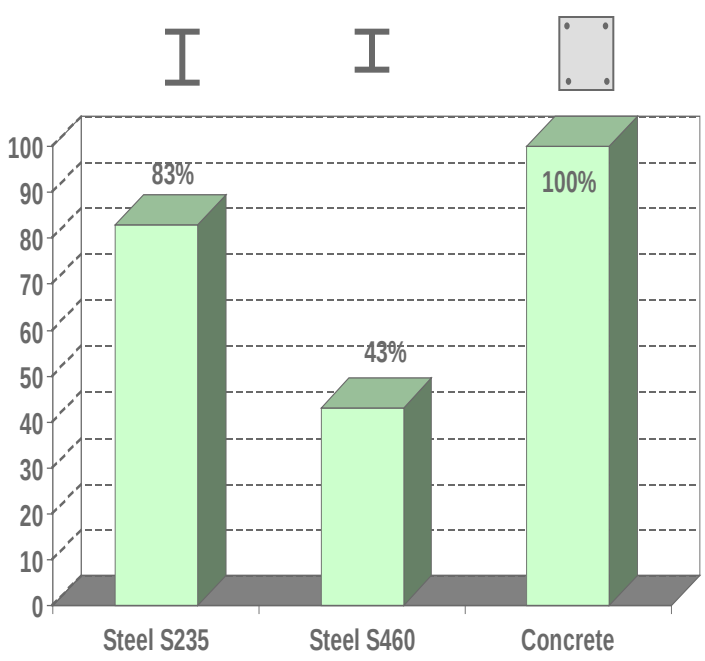


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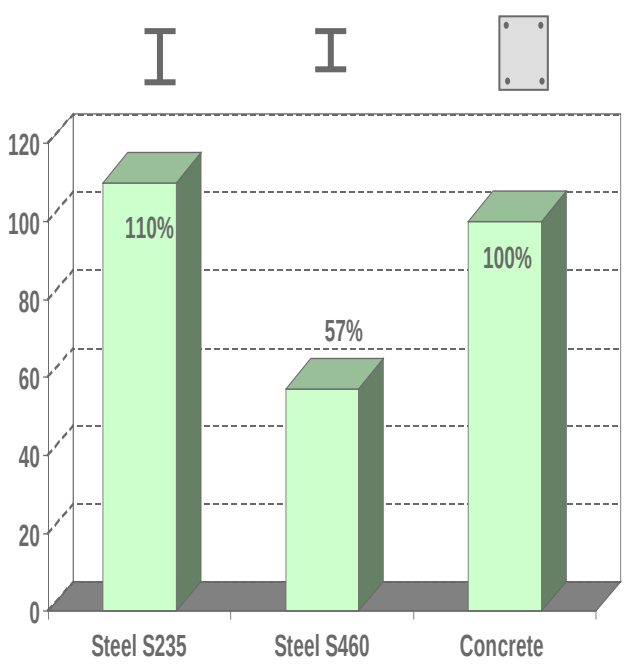
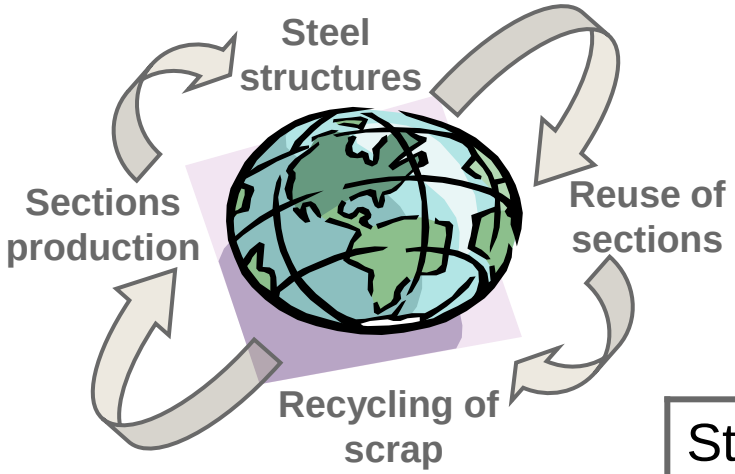



Primary Energy Consumption

# Summary




| | Steel |
|---|---|
| Embodied energy / $CO_2$ per functional unit → | ☹ ☺ |
| Recycling rate | ☺ ☺ |
| Recycled content | ☺ |
| Waste | ☺ |
| Flexibility / Reuse | ☺ |
| « Green » assessment ratings | ☺ ☹ |
| Thermal mass | ☺ ☹ |
| Transport / local sourcing | ☺ ☹ |