

Exemplars: Resource Efficiency in Construction Products

Mineral ceiling tile recovery and recycling service

Armstrong Ceilings operates a recovery and recycling service for its mineral ceiling tiles. Globally, Armstrong has recycled over six million m² of old ceiling material and diverted more than 30,000 tonnes of construction waste from landfill. On the Birmingham University Hospital project almost 43 tonnes was diverted from landfill and an estimated 19.5 tonnes of embodied CO₂ was offset.

Product details

Armstrong Ceilings provides ceiling tiles made of mineral, metal, wood or resin. The majority of Armstrong's mineral tiles for the UK market are manufactured in Team Valley, Tyne and Wear. This is also where all recycling of Armstrong's mineral ceiling tiles takes place. Armstrong Ceilings offers two recycling services to the UK market: Post-Consumer Recycling (end of life); and Off-Cut Recycling.

Post-Consumer Recycling

Armstrong Ceilings will visit a site and take back the old ceiling tiles that meet its recycling programme requirements. Existing transport networks are used and the service is provided for free if 2,000m² of acceptable tiles (≈5,500 tiles) are collected.

Off-Cut Recycling

Armstrong Ceilings has also developed an off-cut recycling programme. This diverts from landfill waste arising during the installation of larger projects.

Resource efficiency benefits

- Armstrong's mineral tiles contain between 30% and 82% recycled content.
- Over 98% of Armstrong ceiling tiles sold in the UK are 100% recyclable. (The 2% non-recyclable tiles are polycarbonate and/or composites.)
- 100% of returned recyclable off-cuts and end-of-life tiles are recycled.
- Embodied carbon figure of 19 kgCO₂e. *
- Embodied water figure of 0.18 m³. *

* Environmental Product Declaration (EPD) 331b for 600x600x15mm ceiling panel and 15mm grid.

Business Case

- Offsets the rising cost of sending tiles to landfill. (Landfill tax is increasing annually at £8 per tonne per year, from £64 per tonne on 31 March 2012 to £80 per tonne by 1 April 2014.)
- Offsets the contractor's cost of skips and transportation of waste.
- Separately managing the ceiling tile off-cut waste at the time of installation provides tidier working conditions and a safer working environment.
- Segregating the ceiling tile off-cut waste reduces contamination of the other recyclable waste streams.

On projects of sufficient duration, Armstrong can recycle tile off-cuts into new tiles for installation on the same project.



Armstrong's recovery and recycling service: segregation of mineral ceiling tile off-cuts at the point of installation.

Resource Efficiency

Recycled content

- 30% to 82% recycled content, depending on the product. Typical products are 55-60%. (Reported in accordance with ISO 14021 :2001 and WRAP's 'Rules of Thumb' guide 2008).
- Recycled content constitutes:
 - slag and other mineral wools
 - paper/cellulose
 - recovered ceiling tiles

Resource scarcity and security

- Armstrong has substituted a proportion of the mineral wool in their tiles with prelate. Prelate is abundant in nature. Known reserves account for over 400 years of present day usage. (Ref: U.S. Geological Survey, January 2011)

Embodied carbon

- 18 to 20 kgCO₂e for 1 square metre of tile over a 60yr study period. (EPD ENP331)
- Armstrong estimates that processing 1kg of prelate requires 0.91 MJ of energy. This is 91% less than for 1kg mineral wool (~10.5 MJ/kg).
- Measures implemented at Team Valley include:
 - retro-fitting of energy meters
 - improved insulation of dryer stations

Embodied water

- 0.17 to 0.18 m³ water extraction for 1 square metre of tile over a 60yr study period (EPD ENP331).

End of life (e.g. reuse; recyclability)

- All Armstrong brands of pulpable mineral ceiling tiles (dated as January 2000 or after) are acceptable for end-of-life recycling.
- The service is offered for free to any project with 2,000m² or more of tiles (≈5,500 tiles).

When ceiling tiles were in the BRE Green Guide to Specification, lifecycle analysis awarded Armstrong's mineral tiles with an 'A' rating.

Birmingham University Hospital

Project type:	Acute and adult psychiatric facilities
Location:	Queen Elizabeth Medical Centre
Client:	University Hospital Birmingham NHS Foundation Trust
Contractors:	Balfour Beatty Construction Titan Ceilings
Project type:	Refurbishment
Value:	£582 million

The architect specified Armstrong for the replacement of existing ceiling tiles.

- 117,000m² of Bioguard Plain tile in wards and treatment rooms.
- 3,000m² of Bioguard Acoustic tiles in waiting rooms, restaurant and dining areas.

Standard practice would have been to send to landfill off-cuts from the installation of new tiles. (The typical wastage rate when installing mineral ceiling tiles is 3%.) On this project the off-cuts were instead collected and segregated from other wastes. Armstrong Ceilings recovered the segregated ceiling tile waste, recycled it in their Tyne and Wear factory and returned the waste to the construction site as new ceiling tiles.



Mineral ceiling tiles - Birmingham University Hospital



Dedicated ceiling tile off-cut storage area

Data was also collected on the basis of the kg of recoverable ceiling tiles per collection made by Armstrong. This metric is important as contamination of collection bags reduces the business case for the off-cut recycling programme.

Year	Recoverable ceiling tiles per collection
2008	1,844kg / 432m ²
2009	2,910kg / 728m ²
2010	3,176kg / 794m ²

* In 2009 a dedicated storage area was provided for ceiling off-cuts. This resulted in a dramatic decrease in the level of contamination in ceiling off-cut bags. The increase in quality control improved the business case for the recovery programme.

"This major project identified ceiling tile cut offs as an item that would be unacceptable to send to landfill. The project pushed the boundaries with Armstrong and Titan and all three parties agreed to trial the recycling scheme."

Jim Duffy, head of environment and quality,
Balfour Beatty Construction Northern



Recycling of recovered end-of-life tiles

All mineral ceiling tile off-cuts were collected as the ceiling was installed over three years.

- Over 10,650m² of ceiling tiles were recycled.
- 42,847kg of ceiling tile waste was diverted from landfill.
- 19.5 tonnes of CO₂ was offset - based on Armstrong Ceiling's calculation that recycling 1 tonne of mineral tile offsets 456kg CO₂ compared to making new.

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