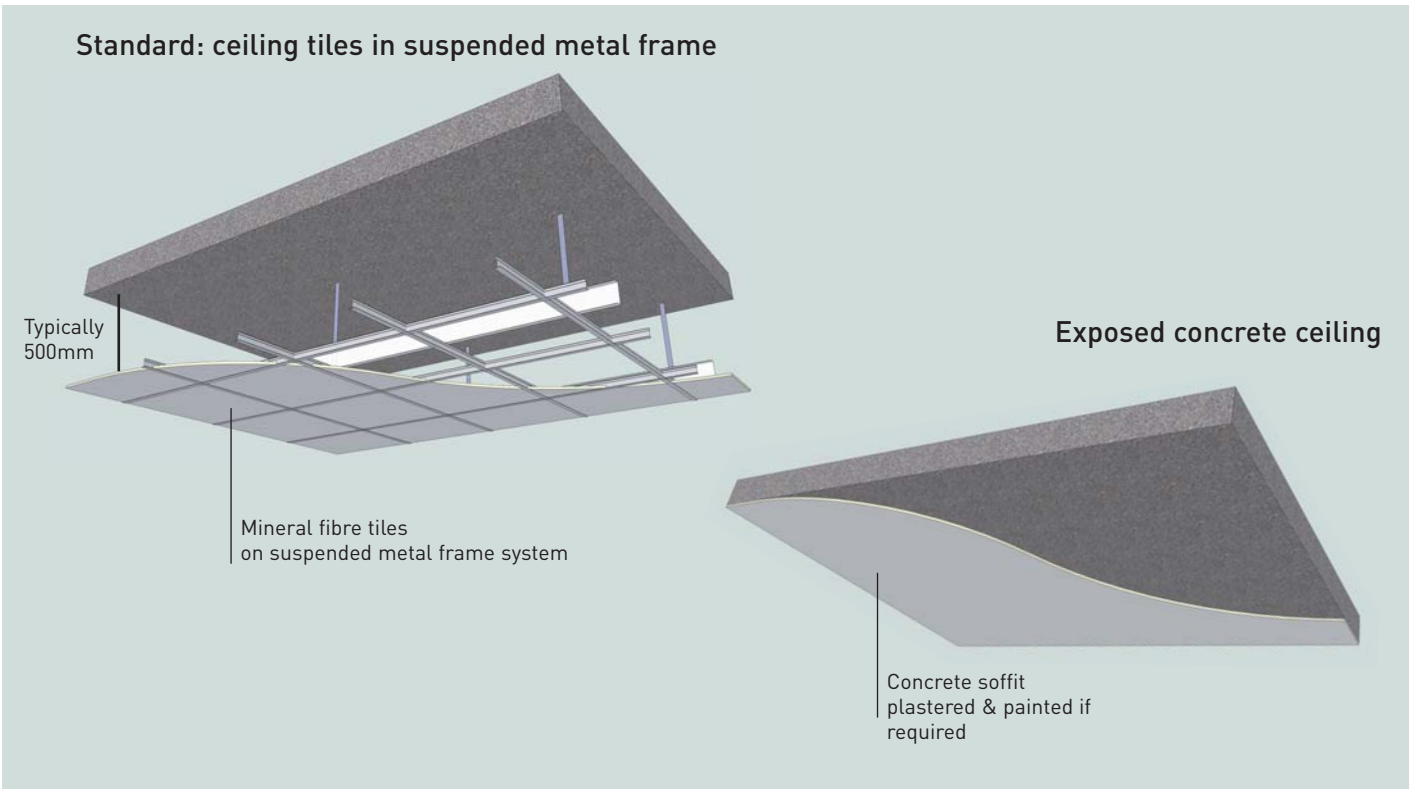


Designing out Waste: design detail sheet

# Exposed ceiling



**The best opportunities for improving materials resource efficiency in construction projects occur during the design stage. Implementing these opportunities can provide significant cost savings, reductions in waste disposed to landfill, and carbon reductions.**

This sheet is part of a series highlighting alternative design details which use less materials or result in less waste being created than 'standard' details used in construction. The benefits provided by the alternative design detail are quantified, and technical considerations presented.

**Potential benefits:**

- Typical cost savings of £18/m<sup>2</sup>.
- Major labour savings.
- Up to 6 tonnes of materials saved per 1000m<sup>2</sup>.
- Up to 100% embodied carbon saving for ceiling finish.



Photo source: Morley von Sternberg

Modern commercial buildings tend to use suspended ceiling tiles to provide a uniform and 'desirable' ceiling finish, held in place by a grid of metal channels suspended on wires from the slab/beams above.

However, the installation of such systems can result in high levels of materials use and wastage. Traditional mineral fibre tiles, for example, can be easily damaged; off cuts are usually discarded and disposed to landfill. In addition, service life is often limited.

Leaving the underside of the concrete slab exposed can provide a high quality, durable ceiling alternative, either left bare or finished with a wide variety of textures or colours. It can also provide benefits in materials resource efficiency.

Exposure of the slab represents good passive design, allowing efficient exploitation of the thermal mass of the building; it can reduce the need for mechanical heating and cooling.

Where completely exposed concrete isn't an option, 'canopy systems' (clusters of ceiling tiles) can result in substantially less materials use and waste compared to wall-to-wall coverage. It is also possible to specify recycled content.

## Further information

- Canopy systems generally use fewer materials than standard suspended ceilings. They can be arranged to avoid the need to cut tiles and to cover specific parts of the ceiling area only.
- Room acoustics can be controlled through diffusion or absorption by special surface finishes, canopy systems, or other room finishes (e.g. carpets).
- Exposing the thermal mass of the concrete represents good passive design.
- It is important to establish a design strategy for distributing M&E services at an early stage.
- Concrete is not the only option for exposed ceilings; in situ steel shuttering or timber can also be left exposed.

WRAP has produced a range of guidance and tools to help design teams with designing for resource efficiency in construction projects. These resources are freely available at [www.wrap.org.uk/construction](http://www.wrap.org.uk/construction)

Potential benefits*	
<b>Materials/waste</b>	<ul style="list-style-type: none"> <li>■ A typical suspended ceiling system requires materials amounting to around 5.75kg/m<sup>2</sup>.</li> <li>■ The total volume of materials required is around 37m<sup>3</sup> per 1000m<sup>2</sup>.</li> <li>■ Of this, 7.5% is typically wasted.</li> <li>■ Exposed ceilings avoid off cuts/damaged tiles.</li> </ul>
<b>Cost</b>	<ul style="list-style-type: none"> <li>■ Minimum net savings of £18/m<sup>2</sup>.</li> <li>■ A small additional cost may be required to achieve the desired concrete finish.</li> </ul>
<b>Time</b>	<ul style="list-style-type: none"> <li>■ Typical labour saving of 1.5 hours/m<sup>2</sup>.</li> </ul>
<b>Carbon</b>	<ul style="list-style-type: none"> <li>■ Embodied carbon saving of 10.4 tonnes per 1000m<sup>2</sup> achievable.</li> <li>■ Exposed thermal mass can help to reduce energy consumption for operational heating and cooling.</li> </ul>
<b>Recycling</b>	<ul style="list-style-type: none"> <li>■ Consider specifying concrete with recycled content.</li> <li>■ Simplified deconstruction/demolition from eliminating soft-strip.</li> <li>■ If canopy systems are specified, ceiling tiles with high levels of recycled content are available.</li> <li>■ Both mineral and steel ceiling tiles are recyclable.</li> </ul>
<b>Constructability</b>	<ul style="list-style-type: none"> <li>■ Extra care is required in the specification and installation of exposed concrete to ensure a quality finish.</li> <li>■ Quality control is necessary to minimise variations in concrete appearance.</li> </ul>
<b>Replicability</b>	<ul style="list-style-type: none"> <li>■ Suitable for many types of buildings, although may affect other considerations such as aesthetics, acoustics and M&amp;E service routes.</li> </ul>

\*All stated benefits are provided as guidance only and may vary from project to project.

#### Design stage of implementation:

RIBA Stage B (Design Brief)

#### Relevant standards:

EN 206-1 Concrete (BS 8500)

EN 13369 Precast Concrete

#### NBS Ref:

K40 (Demountable Suspended Ceilings)

E05 (In situ concrete construction)

E20 (Formwork for in situ concrete)

E30 (Reinforcement for in situ concrete)

WRAP and Faithful+Gould believe the content of this report to be correct as at the date of writing. However, factors such as prices, levels of recycled content and regulatory requirements are subject to change and users of the report should check with their suppliers to confirm the current situation. In addition, care should be taken in using any of the cost information provided as it is based upon numerous project-specific assumptions (such as scale, location, tender context, etc.). The report does not claim to be exhaustive, nor does it claim to cover all relevant products and specifications available on the market. While steps have been taken to ensure accuracy, WRAP cannot accept responsibility or be held liable to any person for any loss or damage arising out of or in connection with this information being inaccurate, incomplete or misleading. It is the responsibility of the potential user of a material or product to consult with the supplier or manufacturer and ascertain whether a particular product will satisfy their specific requirements. The listing or featuring of a particular product or company does not constitute an endorsement by WRAP and WRAP cannot guarantee the performance of individual products or materials. This material is copyrighted. It may be reproduced free of charge subject to the material being accurate and not used in misleading context. The source of the material must be identified and the copyright status acknowledged. This material must not be used to endorse or used to suggest WRAP's endorsement of a commercial product or service. For more detail, please refer to WRAP's Terms & Conditions on its web site: [www.wrap.org.uk](http://www.wrap.org.uk).

**Waste & Resources  
Action Programme**

The Old Academy  
21 Horse Fair  
Banbury, Oxon  
OX16 0AH

Tel: 01295 819 900  
Fax: 01295 819 911  
E-mail: [info@wrap.org.uk](mailto:info@wrap.org.uk)

Helpline freephone  
0800 100 2040

[www.wrap.org.uk/construction](http://www.wrap.org.uk/construction)

