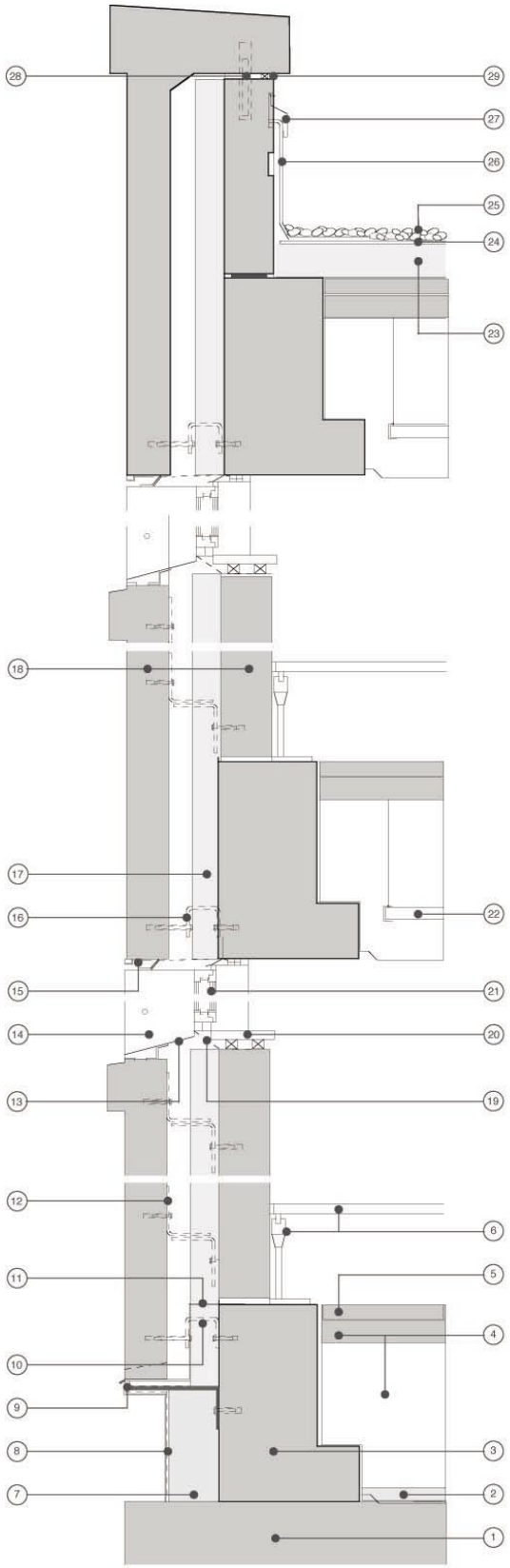
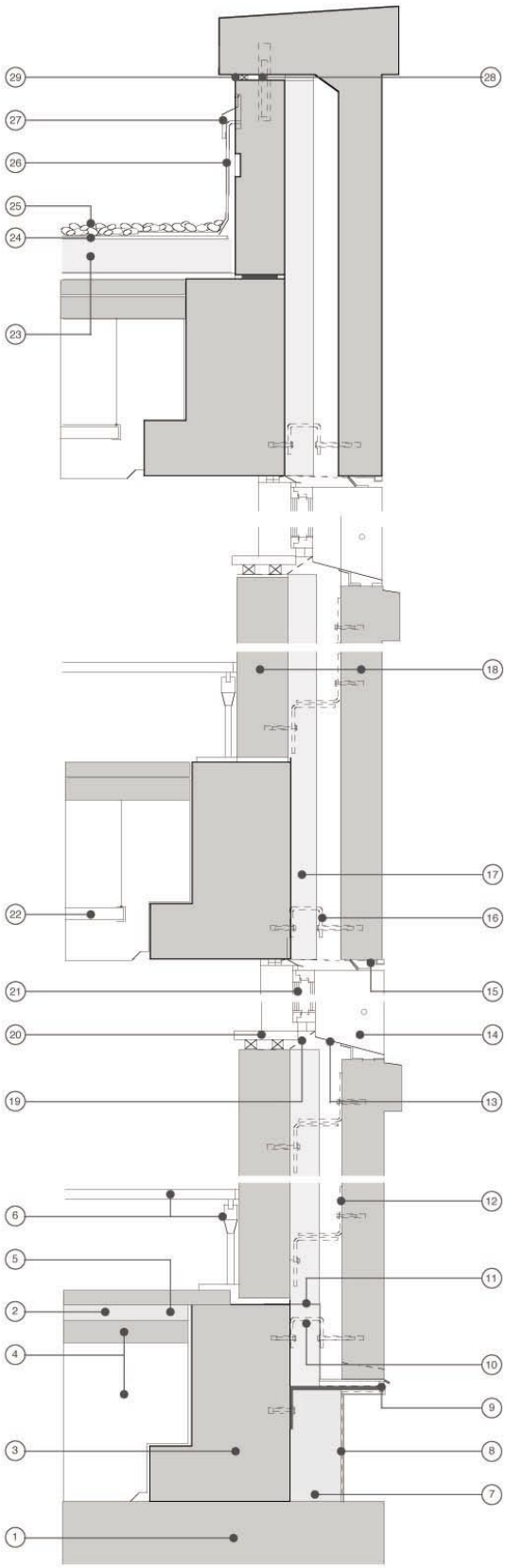
6.5 Concrete Frame and Panel

Relatively rare (in Scotland) heavyweight construction usually associated with commercial applications.

Typical Specification

1. Pad foundation
2. 50mm rigid polystyrene eps butt jointed insulation
3. 690 x 350mm pre-cast concrete beam
4. Pre-cast concrete double T-unit spanning between beams
5. 50mm structural screed
6. 300mm deep access floor system
7. 175mm expanded polystyrene insulation
8. Mesh and waterproof cement render
9 Bond breaker and sealant
10. Stainless steel shelf angle attached using wedge anchor insert with 10mm gusset centrally welded
11. Continuous aluminium flashing
12. 140 x 180 x 10mm stainless steel angle
13. PPC aluminium sill with silicone sealant
14. PPC aluminium window trim sealed with silicone
15. Weephole in recessed joint
16. 135 x 115 x 215mm stainless steel channel
17. 100mm expanded polystyrene insulation
18. 150mm sandstone coloured pre-cast panel
19. EDPM membrane locked into window
20. Treated timber window sill
21. Thermally broken triple-glazed window
22. Mineral tile as suspended ceiling system
23. Non-compressible extruded polystyrene insulation
24. Built-up Mineral Felt Roofing
25. Stone chippings as ballast
26. Asphalt up-stand on high-bond primer
27. Aluminium flashing mechanically fixed into rebate in panel
28. Dowel fixing
29. Silicone seal





Alternative Specification

1. Pad foundation
2. 50mm rigid polystyrene eps butt jointed insulation between T-units and screed as separating layer (a)
3. 690 x 350mm pre-cast concrete (i*) beam
4. Pre-cast concrete (i*) double T-unit spanning between beams
5. 50mm floating (a) structural screed (Other screeds to be separated, not bonded) (a)
6. 300mm deep access floor system, using tackifier adhesive (waterbased adhesive) for carpet tiles (b) (j*)
7. 175mm expanded polystyrene insulation
8. Mesh and waterproof cement render
9. Bond breaker and sealant
10. Stainless steel shelf angle attached using wedge anchor insert with 10mm gusset centrally welded, bolted at agreed centres to avoid compromise of concrete structure and re-use potential (c)
11. Continuous mill finish (d) aluminium flashing
12. 140 x 180 x 10mm stainless steel angle
13. Mill finish (d) aluminium sill with silicone sealant
14. Mill finish (d) aluminium window trim sealed with silicone
15. Weephole in recessed joint
16. 135 x 115 x 215mm stainless steel channel
17. 100mm expanded polystyrene insulation
18. 150mm unreinforced (e) sandstone coloured pre-cast panel
19. LDPE (k*) membrane locked into window
20. Untreated (f) timber window sill
21. Thermally broken triple-glazed window
22. Metal (g) (l*) tile as suspended ceiling system
23. Non-compressible extruded polystyrene insulation
24. Mechanically fixed, recyclable (h) roofing system
25. Stone chippings as ballast
26. Mechanically fixed, recyclable (h) up-stand to suit
27. Mill finish (d) aluminium flashing mechanically fixed into rebate in panel
28. Dowel fixing
29. Silicone seal

Explanation

From the point of view of deconstruction and re-use of components, this form of construction is very poor. Whilst it is theoretically possible to re-use components, it is unlikely ever to be practical or cost effective so to do.

Because component dimensions are fixed, almost all of the components would have to be re-used together (with replacements made at exactly the same size as the originals) and there could be problems with concrete decay and difficulties with fixings (removing in the first place and then re-fixing). One possibility for reuse might be for the re-use of the structure and internal components only (simpler fixings and no decay / weathering problems) with a new external finish and insulation. This is perhaps more likely than complete re-use due to the poor visual quality of concrete external panels and the inevitable requirement for increased insulation levels.

Thus the only realistic re-use option for this form of construction is refurbishment of the original building, and to this end the main priority (not noted in the details) is that adequate floor to ceiling heights are formed which can be assumed to be acceptable for a variety of future occupation requirements.

It was anticipated that the use of dry gasket seals, in place of the silicone-type sealants conventionally specified, would have gone some way to help render the detail more easily re-used. However, the low likelihood of re-use, and the fact that it makes very little difference which sealants are used (in terms of dismantling), that no other sealants are considered as effective as silicone, and that no other exponent of this technology could be found in the UK means the issue does not appear.

Roof membranes and insulation are prioritised because of the volumes involved, while carpet and ceiling tiles prioritised because of the frequency of their replacement under normal circumstances.

HIGH PRIORITY

Floor to Ceiling Heights

Adequate Floor to Ceiling Heights will enable multiple occupational functions to be accommodated and so potentially extend the life of the building.

Some care needs to be taken with regard to cill and window head heights relative to changing floor and ceiling levels.

MEDIUM PRIORITY

Recyclable Roofing (h)

Mechanically fixed roofing membranes can be more easily removed and recyclable materials effectively represent a zero waste option.

Higher first costs.

Carpet Tile Adhesive (b)

A relatively weak adhesive will allow tiles to be removed easily and without damage to other components.

An improvement on this is to use leased, recycled tiles.

Durable ceiling Tiles (g)

Durable tiles, for example metal or some mineral options, will withstand repeated disruption and reduce waste.

First costs will be higher than eps alternatives.

LOW PRIORITY

Floating / Unbonded Screed (a)

Separating the screed simplifies eventual deconstruction and allows the floor system to be separately re-used if necessary.

Edge insulation is important to ease deconstruction without undue damage to adjacent components.

Agreed Fixing Locations (c)

It is possible that fixings or their locations could prevent re-use of components and this should be avoided.

Discussion to be had at the same time as locations are agreed with Engineer.

Mill finished Metal (d)

Mill finished metals increase the efficiency of recycling through reduced costs and pollution.

Though there may be aesthetic implications.

Unreinforced Concrete Panels (e)

Metal reinforcement complicates the process of recycling of concrete elements.

There is not a huge difference in cost, but different machines are needed, with fewer companies able to supply so costs are bound to be slightly higher.

Untreated timber (f)

Timber only needs to be treated when there is a risk of decay.

Important principle but of minor concern here due to the low volumes involved.

Costs

Most of the cost implications of the alterations in this detail are marginal.

It is more difficult to lay a creed over insulation, but in practice it is likely that the costs for this alteration would be the same.

The cost difference between mill finished or coated metalwork is marginal and is likely to depend more on the particular system chosen. Similarly, the choice of carpet tile will be more significant than the specification of a particular adhesive system.

An unreinforced panel is likely to be cheaper than a reinforced one, given the costs associated with steel generally, but again this is likely to depend more on the particular product and system chosen.

At the time of this study untreated timber was approximately £30 / cubic metre less to purchase than treated timber.

A more durable ceiling tile is likely to be around 30% more expensive while the recyclable mechanically fixed roof membrane was around twice the price of the asphalt.

Defects Liability / Insurance Issues

No additional issues have been raised regarding the alternative details although further details and confirmation would be required regarding the weather-proofing of the panels, particularly regarding the joints, as well as their capacity to allow for thermal and moisture-related movement.

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(a) **Unbonded or Floating Screed** (Specification Item 2, 5)
A cementitious mix is more compatible with other likely waste for crushing, but the depth may be reduced to 35mm or less if polymer added to mix (eg. Ronacrete: 01279 638 700). To cater for movement of the screed and to offer a degree of insulation around the edges and so reduce 'cold bridging' it is important to position an edge strip of a material like eps, woodfibre board, dense mineral fibre or similar. This edge strip also helps in the ultimate dismantling of the screed.
Contact: eg. RMC Readymix (0117 977 9534)

(b) **Carpet Tile Adhesive** (Specification Item 6)
Rigid floor finish tiles may be clipped or mechanically held down to much the same effect.
Contact: Best Image (0870 350 2602 / www.best-image.com), Construction Resources (0207 450 2211 / www.constructionresources.com)

(c) **Agreed Fixings Locations** (Specification Item 10)
Significant fixing locations into the concrete beams, column and panels will have to be agreed between Architect, Engineer and Contractor / Manufacturer in any case, so this really means adding another criteria to that discussion, whereby the locations do not prejudice any future possibilities.
Contact: n/a

(d) **Mill finish Metal** (Specification Item 11, 13, 14, 27)
Most sheet metals used in construction are coated in one way or another. These coatings tend to be either metallic, for example zinc plating (galvanising), anodising or similar, or plastic based, for example, polyester powder coated, pvc, enamel and so on. All coated sheet metal CAN be recycled (it is very rarely re-usable) but the various coatings do complicate and therefore increase the cost of reclaiming the metal. The most cost effective recycling of metal is clearly when there is no contamination by coatings, glues etc. This being the case, the best practice when using sheet metal – from the point of view of recycling – is to use unbonded (mechanically fixed) uncoated sheet. Steel cannot easily be used without some form of protective coating, whereas aluminium, copper and some others can be used with a mill finish which requires no additional coating and is nonetheless extremely durable.

(e) **Unreinforced Concrete Panels** (Specification Item 18)
There is not a huge difference but it is worth trying to avoid reinforced components for this reason.
Contact: Any Concrete Panel Manufacturer.

(f) **Untreated Timber** (Specification Item 20)
There is no such risk here and this means the timber used can be safely composted at the end of its service life.
Contact: n/a

(g) **Metal Ceiling Tiles** (Specification Item 22)
Suspended ceilings are advantageous from the point of view of Design for Deconstruction as they enable considerable amounts of services to be hidden, yet easily accessible for maintenance and alteration. This advantage is somewhat reduced if ceiling tiles are easily damaged and need frequent replacement.
Contact: Several Manufacturers and Suppliers.

(h) **Mechanically fixed, Recyclable Roofing** (Specification Item 24, 26)
A number of Manufacturers produce roofing membranes, usually of TPO or EPDM material. Some TPO membranes have been shown to last for as long as 40 years under test conditions, generally EPDM membranes are cheaper and arguably of less durability. TPO membranes may be heat welded which gives greater comfort at difficult junctions, whereas EPDM membranes may be more suitable for siple roof applications.
Contact: eg: TBS Elastomers (01698 464 620 / www.tbselastomers.com) Flag (01428 604 500 / www.flag.it)

(i*) **Using PFA in Concrete** (Specification Item 3, 4)
Using PFA (Pulverised Fuel Ash) in concrete reduces the amount of (virgin) cement required and utilises a waste product instead.

Reducing the amount of cement used is valuable because of the very high energy requirements of cement manufacture. Up to 40% of cement in concrete may be offset by PFA with additional advantages in waste reduction. PFA improves the flowing characteristics of concrete, fills in voids better and also improves the performance of concrete in its hardened state. It is not generally used however for cladding panels externally because of difficulties in overcoming colour variations which are more readily resolved with 'purer' cement based batches.
Contact: Any cement Manufacturer.

(j*) **Recycled or Leased Carpet Tiles** (Specification Item 6)
Recycled material tiles reduce the waste stream, reduce resource use and often reduce energy and pollution associated with manufacture of components. Leased components return to the Manufacturer for recycling.
Contact: eg. Interface Carpets (01274 690 690 / www.interfaceeurope.com)

(k*) **Using Recycled Material Membranes** (Specification Item 19)
Using recycled material reduces both resource use and waste.
We know of three manufacturers who utilise recycled content in their damp proof membranes and courses. Visqueen in Oxfordshire [01993 776346 / www.visqueenbuilding.co.uk] provide both dpms and dpcs with between 60% and 97% recycled LDPE. Frank Mercer in Lancashire [01942 841 111 / www.toughsheet.co.uk] manufacture dpms and dpcs with 98% post consumer recycled LDPE and claim a cost saving and improved performance over conventional materials. Capital Valley Plastics Ltd. in Gwent [01495 772 255 / www.capitalvalleyplastics.com]] supply dpms with 100% recycled, mostly post consumer LDPE. All three are potentially recyclable at end of life but no apparent measures are in place to ensure this happens.

(l*) **Recycled Ceiling Tiles** (Specification Item 22)
Recycled material tiles reduce the waste stream, reduce resource use and often reduce energy and pollution associated with manufacture of components.
Contact: eg. Armstrong Ceilings (0800 371 849 / http://ceilings-eu.armstrong.com/CeilingsHome.asp)

Caveat

It is important to emphasise the scope and purpose of the following drawings and specifications.

They are included solely to show practitioners the sort of alterations that can be made in order to enable buildings to be repaired, altered and disassembled without undue damage to adjacent elements or the elements themselves, to afford as much re-use as possible and to increase the ease and cost effectiveness of re-use and recycling in construction generally.

Their purpose is not to offer approved details in any sense, but to illustrate the *difference* between details and specifications which do not address deconstruction issues, and those that do. It is the *differences* between the originals and alternatives which is intended to be illustrative, not necessarily the alternatives themselves.

The original details have been taken from conventional details and specifications we believe to be broadly representative of their construction types. We hope the principles shown, and the specific references made will assist designers in making similar changes in their own work, but it goes without saying that SEDA cannot take responsibility for any work undertaken as a result of the use of these details.

Specifically, these details are not intended to show best practice in any sense, nor are they even intended to be up to date. We have striven in the preparation of these details and specifications to keep as close to the original as possible. We have done this in order to show that some quite fundamental alterations – in terms of deconstruction - may be made with the minimum of visual or functional impact on the original. Where these original details and specifications do not meet current standards or aspirations, the alternatives given are likely to be similarly wanting. To re-iterate, the purpose is not to produce approved details, but to illustrate the process of improvement – in terms of deconstruction only – that may be made.