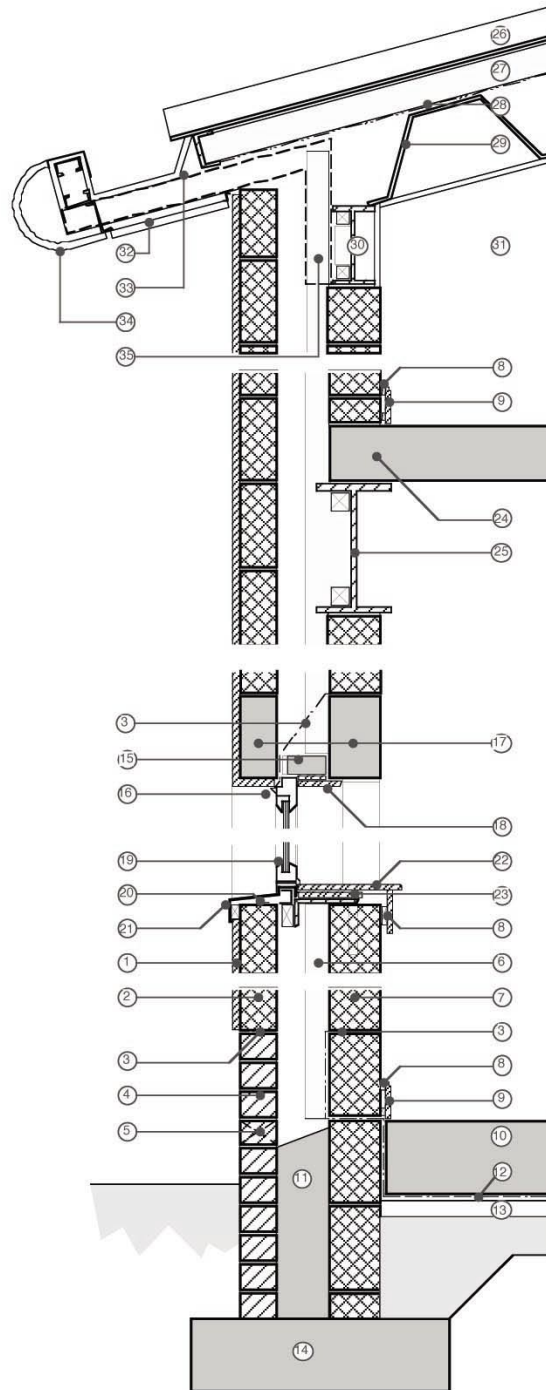


6.1 Steel Frame + Concrete Block Cavity Wall

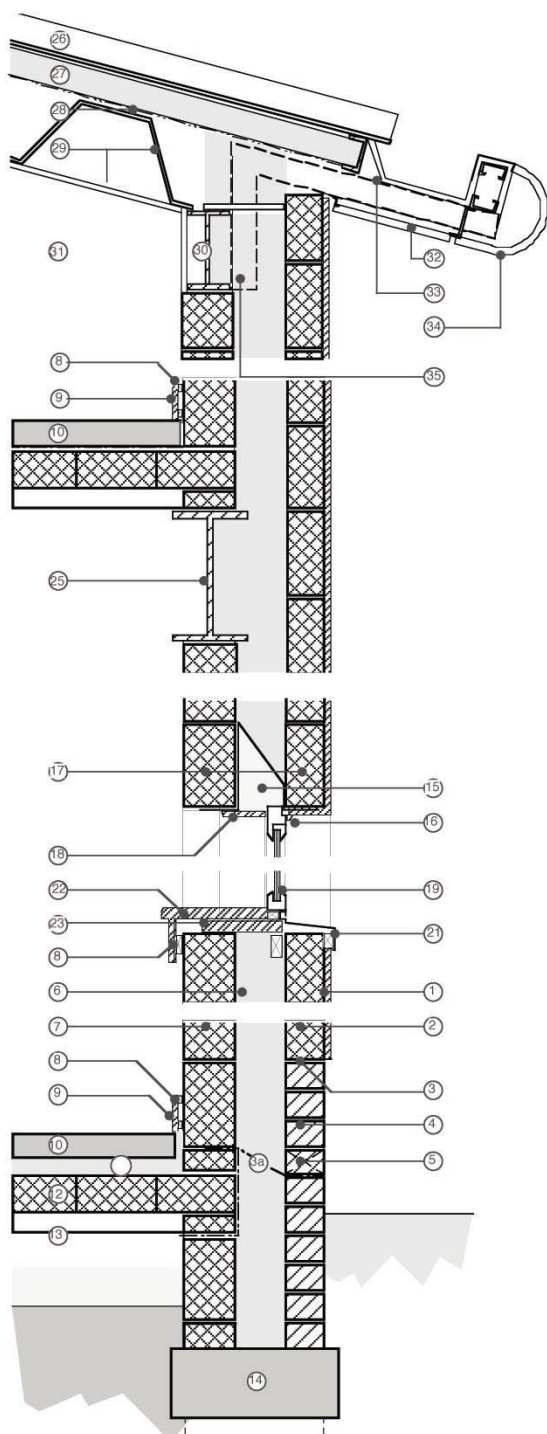
Standard, durable and economic heavyweight construction applicable to most project types.

Typical Specification

1. Drydash, cement: lime: sand render (2:1:9) in two coats
2. 100mm dense concrete blockwork in 1:1:5 mortar
3. PVC damp proof course
4. 100mm facing brickwork in 1:1:5 mortar
5. Perpend weep slot @ 900mm centres
6. 60mm butt jointed mineral fibre slab insulation held to wall @ 600mm centres
7. 140mm concrete blockwork in 1:1:5 mortar with 2 coats matt emulsion paint finish
8. Soft wood timber packer nailed to wall
9. 15mm MDF skirting board nailed to packer, both with 2 coats satin emulsion paint finish
10. 200mm Insitu concrete reinforced slab, float finish
11. 140mm wide standard mix ST2 concrete fill
12. Polyethylene damp proof membrane dressed up and lapped with DPC
13. 50mm rigid polystyrene eps butt jointed insulation
14. Trench foundations
15. 40mm mineral fibre slab compressed into void
16. Polysulphide sealant
17. Reinforced Concrete lintols to Str. Eng. specification
18. 15mm MDF surround nailed to packer, with 2 coats satin emulsion paint finish
19. Proprietary aluminium double glazed window unit screwed to masonry or support steelwork
20. Mastic tape
21. PPC pressed metal cill glued to packer
22. 15mm MDF cill and apron nailed to packer, with 2 coats satin emulsion paint finish
23. Secondary steel support angle to structural engineers specification
24. 150mm insitu reinforced concrete slab, float finish
25. Steel beam to structural engineers specification
26. Standing seam roof mechanically fixed to support structure
27. 100mm butt jointed mineral fibre slab insulation mechanically fixed
28. Reinforced polyethelene vapour barrier laid loose with lap joints
29. 200mm structural metal deck
30. Eaves beam to structural engineers specification
31. Raking rafter to structural engineers specification
32. PPC metal soffit bolted to outrigger
33. Prefomed gutter and single ply lining mechanically fixed
34. PPC bullnose gutter mechanically fixed to roof structure
35. Cranked mild steel outriggers bolted to eaves beam



Alternative Specification



33. Pre-formed gutter and single ply lining mechanically fixed
34. Mill finish bullnose gutter mechanically fixed to roof structure (j)
35. Cranked mild steel outriggers bolted to eaves beam
36. External grade plywood board shot-fired to eaves beam to close cavity, 5mm gap to block.
37. Eps insulation stuffed into gap to complete insulated envelope and reduce air infiltration

1. Lime: sand (a) render in two coats
2. 100mm dense concrete (n*) blockwork in lime (a) mortar
3. PVC (o*) damp proof course
- 3a. Horizontal supported or rigid cavity tray c/w stopends (b)
4. 100mm facing brickwork (p*) in lime (a) mortar
5. Perpend weep slot @ 900mm centres
6. Full fill blown cavity insulation, above and below cavity tray (c) Note: care under window.
7. 140mm concrete (n*) blockwork in lime (a) mortar with 2 coats matt emulsion (q*) paint finish
8. Soft wood timber packer nailed to wall
9. 19mm softwood skirting board with 2 coats biodegradable satin emulsion finish screwed to packer (d)
10. Min. 65mm screed with float finish, insulation/ expansion edge strip (e)
11. 50mm rigid polystyrene eps butt jointed insulation
12. 150 depth beam and block floor with standard block infill, lime grouted, min. 75mm ventilated and drained cavity beneath. Slip block infill. (f)
13. PVC (o*) damp proof course under beams, dressed up and into blockwork, lapped with cavity tray
14. Pre-cast, post tensioned ground beam over piles (g)
15. Insulated steel lintol supporting both block leaves (h)
16. Rubber gasket sealant (i)
17. (Standard concrete blocks only on steel lintol)
18. 15mm untreated sw timber surround with 2 coats biodegradable satin emulsion finish screwed to packer (d)
19. Proprietary aluminium double glazed window unit screwed to masonry or support steelwork [mastic tape deleted]
21. Mill finish pressed metal cill screwed to packer (j) allow for differential movement.
22. 15mm untreated sw timber cill and apron with 2 coats biodegradable satin emulsion finish screwed to packer (d)
23. c. 25 x 150mm untreated sw timber packer screwed to timber packer below, supporting window and cill, closing cavity and supporting cill board
25. Steel beam to structural engineers specification (k)
26. Standing seam roof mechanically fixed to support structure (l)
27. 100mm butt jointed eps (m) slab insulation mechanically fixed
28. Reinforced polyethelene vapour barrier laid loose with lap joints
29. 200mm structural metal deck (j)
30. Eaves beam to structural engineers specification (k)
31. Raking rafter to structural engineers specification(k)
32. Mill finish metal soffit bolted to outrigger (j)

Explanation

The greatest volume of waste likely to end up in landfill in this detail is the concrete blocks and mortar. Though downcycling of concrete rubble as hardcore is cost effective and common, even in-situ, the relative value of re-used blocks and the potential to reduce the largest volume of waste from going to landfill makes this the priority.

It is also possible that a major refurbishment might involve the removal of the walls while the frame, floors and roof might remain, this reinforces the prioritisation of the walls.

Linked to this is the cavity insulation. The original detail leaves little realistic opportunity for re-use of the batts, damage is almost inevitable given the difficulty in removing the blocks without considerable force, whilst sucking out injected beads before demolition of the cavity walls enables a very high percentage of the material to be re-used.

Generally windows now installed are likely to be entirely recycled at the end of their service life. However, if they are made easy to remove (from the wall and glass from frame) and repair (dry fixing, timber frame) then re-use may become cost effective which is the aim.

The mechanical bonding of individual roof elements is already good practice. Although most steel structure may be expected to last the lifetime of the building, the reduction in energy associated with reuse as opposed to recycling makes this item a high priority.

By volume, timber skirting is insignificant, but if a natural paint finish is used, it can be safely composted.

HIGH PRIORITY

Lime Mortar and Render (a)

Lime mortar and render is softer than the blocks and enables easy demolition and cleaning of the blocks, so they can be re-used.

No need for movement / expansion joints with lime mortar, better protection of walls from moisture / freezing.

Full Fill Cavity Insulation (c)

EPS Beads are injected and can be extracted again and re-used.

(Fibres and Foam cannot be easily extracted and re-used)

Three important criteria must be met for this to work: the beads must be unbonded, the design must ensure no leakage of beads, and the cavity must be reasonably clean at installation.

Built-Up Roofing (l)

Built-up roofing components, mechanically fixed will enable easier, and therefore more cost effective re-use and recycling.

Bonded or 'sandwich' panels can be recycled but as yet this is technically demanding, with few facilities available and high cost.

Bolted Steel Structure (k)

Most solid steel is recycled already, but bolted elements, of standard, repeated lengths will encourage component re-use, thus big energy savings.

Structural component re-use is rarely cost effective, though one supplier provided components and associated structural engineering advice, see index.

MEDIUM PRIORITY

Cavity Tray / No Trench Fill (b)

Trench fill makes any re-use of adjacent blocks impossible. The Cavity Tray performs the same task and is easy to remove.

Separate inserts for insulation fill required below tray. No concrete used and better perimeter insulation levels attained.

MEDIUM PRIORITY**Screed/Beam and Block Floor (e, f)**

Allows for greater re-use (rather than recycling) of materials, if grouted with lime and separated from screed etc.

Also dispense with need for dpm, and reduces oversight material. However ventilation is required to solum, and less thermal mass available within insulated envelope.

Screw fixed skirting (d)

Screw fixing allows the skirting to be used for easy access / re-fixing, also reduced damage if dismantling

Principal benefits are within lifetime use for access to services, as re-use of skirting is unlikely in practice.

Window Detail (i)

Both glass and frame of metal and plastic windows will be recycled if easily removed and separated.

Ensure easy mechanical removal of all components (by screw or 'click' fix or rubber gasket) Avoid all glues, mastics, putties etc.

LOW PRIORITY**Steel Lintol (h)**

Simplifies construction / dismantling, allows for use of continuous blockwork, avoids problems of cavity tray and insulation.

EPS or XPS Insulation (m)

Mineral Fibre insulation may soon become notifiable waste, adding cost to demolition efforts, so eps or xps is to be preferred.

Timber with biodegradable finish (d)

The resin bond of MDF is not biodegradable whereas untreated timber with biodegradable finish can be composted.

Pre-cast Ground Beam (g)

Large volume re-use possible if un-tensioning is straightforward and sizes compatible.

Mill finished Metal (j)

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

Costs

Lime render is comparable in cost to a high quality cement render, but adds around 60% to the cost of the economical dry dash originally specified.

Lime mortar sourced from a bulk silo adds around 33% to the cost of the walls overall. However, depending on the areas involved, using the alternative opening detail (which is cheaper than the original) and by substituting block walls only for the facing brick, this figure can be reduced to around 15%.

The cavity tray detail is more expensive than the trench fill, but the full fill insulation is cheaper than the batts, and overall the alternative is comparable in cost to the original detail and offers better insulation levels, in addition to allowing complete re-use of components.

At ground level, the beam and block floor is more expensive (by around 100%) than the slab, but the beam and block floor is cheaper than the reinforced slab at first floor by a similar margin. Taken together, the alternative is less than 10% more expensive, but with a second floor added, the alternative detail is around 10% cheaper.

EPS insulation in the roof adds around 50% to the cost, but this should be balanced against potential disposal costs in future.

The use of ground beams is not cost effective generally, unless specific requirements of a site dictate otherwise.

Defects Liability / Insurance Issues

No additional issues have been raised regarding the alternative details.

6.1 Index

- (a) **Lime Mortar and Render** (Specification Items 1, 2, 4, 7)
There is no need for a movement or expansion joint with lime mortars and renders, and because the lime is vapour transmissive, there is better protection for the blocks against moisture freezing within the construction. Lime render may be coated with lime washes, which in addition to being traditional have a subtler and arguably more attractive finish than conventional masonry painted finishes.
Contact: eg: Limetec: 0845 603 1143 / www.limetechnology.co.uk
- (b) **Cavity Tray / No Trench Fill** (Specification Item 3a)
Separate inserts for insulation fill required below tray. No concrete used and better perimeter insulation levels attained.
Contact: eg. Timloc System 2000 (01405 765 567)
- (c) **Full Fill Cavity Insulation** (Specification Item 6)
Three important criteria must be met for this to work: the beads must be unbonded, the design must ensure no leakage of beads, and the cavity must be reasonably clean at installation. The defects liability assessment raised the issue of the importance of third party accreditation and approved installers as well as the need for correct and thorough installation of the material under windows and other awkward areas such as the proposed damp proof tray.
Contact: eg. Tebbway / Polypearl : 01724 847 844
- (d) **Screw fixed Timber Skirting with Biodegradable Paint** (Specification Item 9, 18, 22)
This could help reduce ultimate demolition and disposal costs. Timber is also likely to sustain repeated removal and replacement better than MDF and so remain in use for longer. Principal benefits of the screw fixing are within lifetime use for access to services, as re-use of skirting is unlikely in practice. Nailing the timber packers to the concrete blocks is likely to lead to less damage than plugging and screw fixing, so this has been left unchanged. However, it is worth noting that nailing the packers to the mortared perpend will protect the blocks further from damage in the event of the removal of the packer. The depth of the skirting has been increased to 19mm to reduce the risk of warp. Alternatively there are a variety of pre-finished metal skirtings which are potentially more durable than timber and suitable for reuse, these are more costly but can be integrated with service runs and even heating pipes so saving costs elsewhere. Contact: eg: Heat Profile: 01483 537 000 / www.heatprofile.co.uk
- (e) **Unbonded Screed** (Specification Item 10)
Cementitious mix more compatible with other likely waste for crushing, but 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)
- (f) **Beam and Block Floor** (Specification Item 12)
Also dispense with need for dpm, and reduces oversight material. However ventilation is required to solum, and less thermal mass available within insulated envelope.
Contact: Precast Flooring Federation (PFF), 0116 253 6161
- (g) **Pre-cast Ground Beam** (Specification Item 14)
Installation is fast and less weather dependant, site removal much simpler and probably cheaper.
Contact: eg. Roger Bullivant, www.roger-bullivant.co.uk
- (h) **Steel Lintol** (Specification Item 15)
Use of continuous blockwork simplifies construction and means fewer 'one-off' units for potential re-use. Steel lintols are easier to re-use.
Contact: eg. Catnic (029 2033 7900)
- (i) **Window Detail** (Specification Item 16)
In practice this means frames should be screw fixed to sub-frames or packers, and glass should be dry fixed within the frame. Timber windows only represent a better environmental option if they are untreated and dry glazed (i.e not putty or silicone fixed / bonded to frame etc.) This is because a treated timber frame is now likely to represent toxic waste, and the low value of the frame material (as opposed to metal or plastic) will preclude the economic sense of dismantling the window unless it is easy so to do. This is best achieved by specifying an untreated timber frame with full or partial aluminium external facings, biodegradable internal coatings, such as by Osmo (01296 481 220 / www.osmouk.com) and gasket dry fixed glazing units (e.g by Exitex 00 353 4293 71244 / www.exitex.ie). Anglian Windows (operate a 100% reclamation of post consumer materials) on 01603 787 000. Compressible fillers may be able to be used in place of silicone between the window frame and building fabric, such as Compriband (01914190505 / www.compriband.co.uk), this product is likely to leave less of a residue between connecting surfaces when removed.

- (j) **Mill finish Metal** (Specification Item 21, 29, 32, 34)
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 (which is exposed and must be carefully re-touched if there is any site cutting required), whereas aluminium, copper and some others can be used with a mill finish which requires no additional coating and is nonetheless extremely durable.
- (k) **Bolted Steel Structure** (Specification Item 25, 30, 31)
Structural component re-use is rarely cost effective, though one supplier provided components and associated structural engineering advice, see below.
Contact: Bioregional Reclaimed (Surrey) 0208 404 0647
- (l) **Built Up Roofing** (Specification Item 26)
Bonded or ‘sandwich’ panels can be recycled but as yet this is technically demanding, with fewer facilities able to do the work and therefore less cost effective.
Contact: any built –up roofing supplier
- (m) **EPS or XPS Insulation** (Specification Item 27)
Demolition Contractors contacted agreed that H&S concerns about mineral wool would mean it may soon be classed with asbestos. Expanded or extruded polystyrene has been used to reduce potential future costs.
Contact: any e/xps supplier.
- (n*) **Recycled Content Concrete Blocks** (Specification Item 2)
Using recycled aggregates in blocks reduces resource use and removes materials from the waste stream.
Masterblock 01285 646 800 / www.masterblock.co.uk] manufacture lightweight and dense concrete blocks made of 100% recycled aggregates with a cement binder. At present they are the only company we know of doing so, though Thermalite in Birmingham [01675 468 451 / www.thermalite.co.uk] make aerated blocks which contain up to 85% recycled pfa (pulverised fuel ash) in their manufacture, though note there are concerns about the health implications of what may be radioactive slag waste.
- (o*) **Using Recycled Material DPCs** (Specification Item 3, 13)
Using recycled material reduces both resource use and waste. In addition, PVC is widely held to be a particularly hazardous material both in manufacture and in use.
We know of three manufacturers who avoid PVC and 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.
- (p*) **Reused Brickwork** (Specification Item 4, 7)
Bricks are one of the few construction elements which remain relatively easy to source for re-use.
One source, UK wide, is Salvo (www.salvo.co.uk), other sources will include local scrap merchants and salvaged building material suppliers.
- (q*) **Mineral Paint finishes to Blockwork** (Specification Item 7)
Conventional paint finishes tend to form a ‘skin’ which can become damaged when blocks are re-used, and which cannot be easily overpainted.
Mineral paints, on the other hand, form no such ‘skin’ and instead bond with the block forming more of an integral surface finish. Blocks using mineral paint finishes are likely in practice to be more readily overpainted and thus more cost effective when re-used.
Contacts include Keim Paints (01746 714 543 / www.keimpaints.co.uk) and Beecks Paints, available for Natural Building Technologies (01844 338 338 / www.natural-building.co.uk)

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.