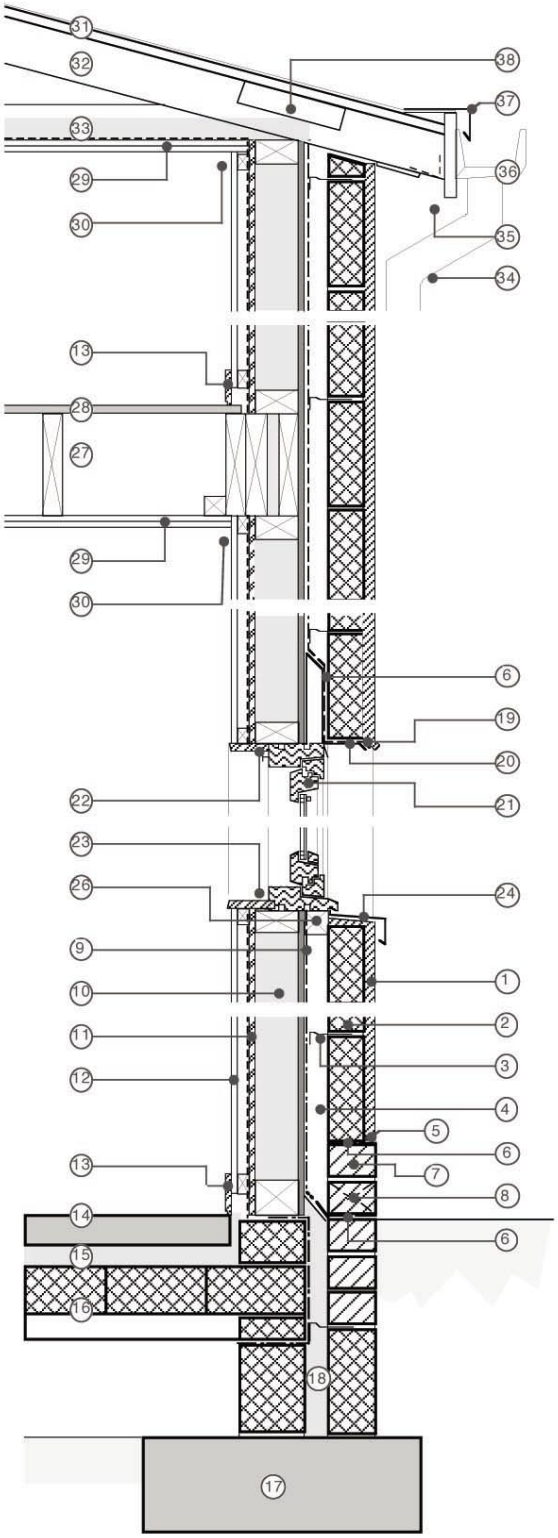
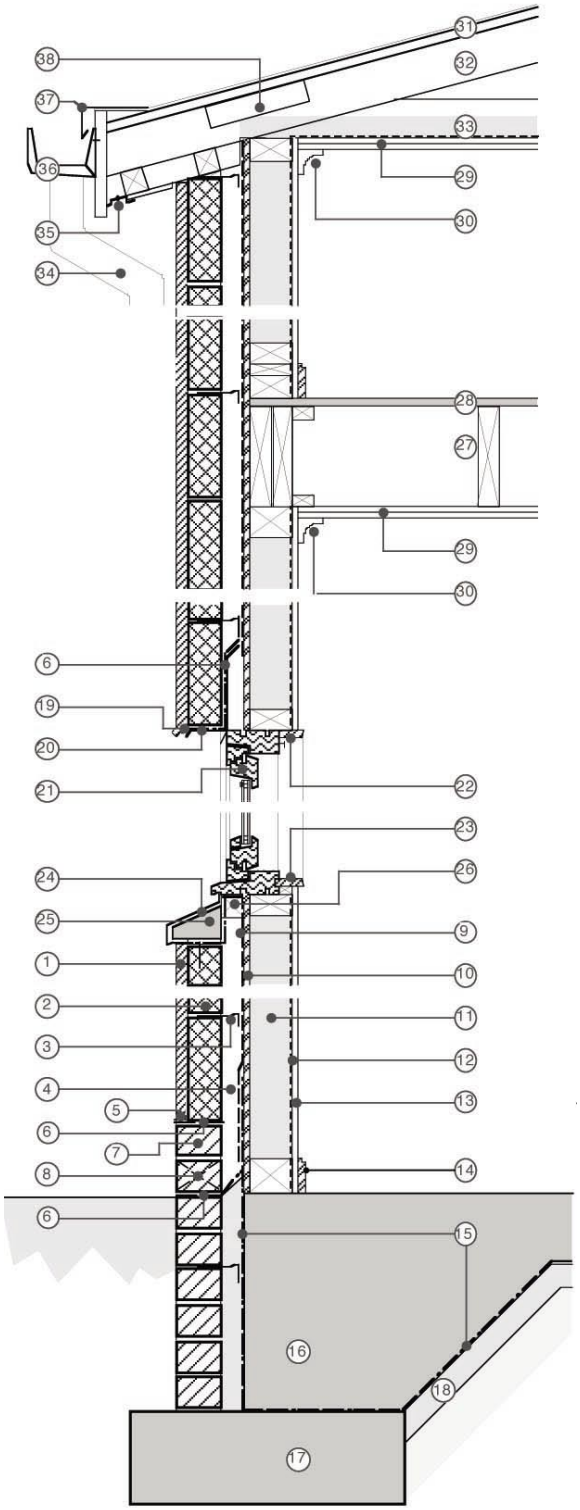
6.2 Timber Frame with Concrete Block Outer Leaf

Standard, fast and economic 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. Cavity wall ties mechanically fixed @ 900mm centres horizontally and 450mm vertically - all staggered
4. 50mm ventilated cavity
5. Expamet render stop bead mechanically fixed @ 600mm centres
6. PVC damp proof course
7. 100mm facing brickwork in 1:1:5 mortar
8. Perpend weep slots @ 900mm centres
9. Breather paper fixed to ply
10. 12.5mm sheathing ply nailed to studs
11. 95mm soft wood studs @ 600mm centres - nail fixed to form frame with 100mm mineral fibre quilt insulation held in cavity by frame construction
12. Vapour barrier stapled to interior side of studs
13. 12.5mm plasterboard
14. 75 x 15mm MDF skirting board nail fixed to frame
15. Polyethylene damp proof course dressed up edge of slab and tucked behind dpc / breather paper
16. 150mm insitu reinforced concrete slab with float finish
17. Trench foundations
18. 50mm rigid polystyrene eps butt jointed edge insulation beneath slab
19. Render stop nailed to blockwork at 600mm centres
20. Galvanized steel lintol and cavity closer to structural engineers spec
21. Proprietary pine tilt and turn double glazed window unit screwed to masonry or support framework
22. 15mm MDF nail fixed internal surround
23. 15mm MDF nail fixed cill
24. Aluminium ppc flashing mechanically fixed to frame
25. Precast concrete cill on 1:1:5 mortar
26. SW packer cavity closer
27. Timber joists @ 450mm centres fixed at perimeter support by mechanically fixed steel joist hangers
28. 18mm tongue and groove chipboard screwed to joists
29. 2 layers 12.5mm plasterboard nailed to u/side of joists
30. Extruded polystyrene cornice glue fixed - 1 coat satin emulsion finish
31. Proprietary single ply membrane roofing with profiles @ 600mm centres - membrane mechanically fixed to ply sheathing deck fixed to truss
32. Proprietary timber roof truss with bolted joints
33. 100mm rigid polystyrene eps butt jointed insulation
34. UPVC down pipe
35. Vents within soffit
36. Aluminium ppc gutter mechanically fixed to edge board by brackets
37. Mechanically fixed angle flashing
38. Insulation stop





Alternative Specification

1. Lime: sand (a) render in two coats, or dry cladding materials (p*) eg. timber,/ mineral board
2. 100mm dense (q*) blockwork in lime (a) mortar
3. Cavity wall ties mechanically fixed @ 900mm centres horizontally and 450mm vertically - all staggered
4. 50mm ventilated cavity
5. Render stop bead fixed @ 600mm centres
6. PVC (r*) damp proof course and rigid tray
7. 100mm facing brickwork (s*) in lime (a) mortar
8. Perpend weep slots @ 900mm centres
9. Taped and sealed breather paper fixed to 10mm 'Panelvent' board (b) screwed (c) to studs.
10. 95mm untreated (b) soft wood studs @ 600mm centres with 100mm cellulose fibre (b) insulation
11. Vapour Check (b) stapled to OSB board (b), screwed (c) to studs. Vapour check taped and sealed.
12. 12.5mm t+f p'board (t*) over 25mm service void (d)
13. 19mm softwood skirting board with 2 coats biodegradable (e) paint finish screwed (c) through board to raised (f) packer, min. 50mm space behind for services (f)
14. Min. 65mm screed with float finish, insulation / expansion edge strip (g)
15. 50mm rigid polystyrene eps butt jointed insulation
16. 150 depth beam and block floor with standard block infill, lime grouted, min. 75mm ventilated and drained cavity beneath. Slip block infill. (h)
17. Pre-cast, post tensioned ground beam over piles (i)
18. 50mm rigid polystyrene eps butt jointed edge insulation in cavity to cavity tray
19. Render stop nailed to blockwork at 600mmcentres
20. Galv. steel lintol / cavity closer to Struct. Eng.'s spec
21. Proprietary pine tilt and turn double glazed window unit (u*) screwed to masonry or support framework
22. 19mm timber internal surround with 2 coats biodegradable (e) paint finish, screw fixed, (c)
23. 19mm timber cill with 2 coats biodegradable (e), screw fixed, (c)
24. Mill finish (j) aluminium external cill flashing mechanically fixed to frame, supported by block / mortar build-up beneath (no cill piece) (k)
26. SW packer cavity closer
27. Timber joists @ 450mm centres fixed at perimeter support by mechanically fixed steel joist hangers
28. 22mm t+g timber boards screw (l) fixed to joists
29. 2 layers 12.5mm t+f plasterboard (t*) screwed (c) to underside of joists
30. No cornice (v*)
31. Proprietary single ply membrane roofing with profiles @ 600mm centres - membrane mechanically fixed (m) to ply sheathing deck screwed (c) to truss
32. Proprietary timber roof truss with bolted joints
33. 100mm flexible batt (n) insulation with fine mesh overlay to prevent disruption and keep clean
34. UPVC (w*) down pipe
35. Galv. steel mesh strip stapled to back of eaves board and back of timber soffit board beforescrew fixing to trusses, leaving requisite gap. Timber soffit boards to be painted with natural finish (o)
36. Mill finish (j) aluminium gutter mechanically fixed to edge board by brackets. Timber edge board, finished with natural coating. (e)
37. Mechanically fixed angle flashing
38. Insulation stop

Explanation

While the replacement of cement mortar and render with lime allows for a significant volume of potential landfill to be recovered, the other two high priorities for this detail focus on the potential to reduce the disruption and waste which arises from frequent service and internal finish alterations.

The service void offers construction process advantages and subsequent ease of medium and long term service alterations, while the small gap provided behind the screw fixed skirting allows for rapid and easy access to services without disruption to the wall finish.

The breathing wall reduces the waste at the end of the life of the building, but far greater volumes of waste are likely to be saved by the two measures above which address waste arisings from the building in use, hence their respective prioritisation.

Whilst the use of polystyrene at low levels within the cavity is unavoidable, it makes less sense in the loft, where rigid boards cannot realistically be cut to precisely fit between joists, and re-use is unlikely.

The use of timber boards instead of chipboard for the upper floor is preferred from the point of view of resource use, waste reduction, and health of occupants, but to do so carries cost penalties, largely from inconveniences on site, which can only be partly offset against the cost of additional floor finishes, and so remains a low priority.

Despite making little reduction in the waste overall, some of the low priority measures cost little or no more than the conventional specification and as such may be recommended for those with minimal leeway on cost.

HIGH PRIORITY

Service Void (d)

This allows for flexibility of services arrangements in the long term without disruption or risk of damage to the insulated wall fabric

This measure is likely to reduce major fabric disruption and waste arisings from service re-routing / upgrading - one of the most common reasons for demolition and waste.

Screw fixed skirting (c)

Screw fixing allows the skirting to be used for easy access to services without further disruption to the wall surface.

Principal benefits are within lifetime use for access to services, as re-use of skirting is unlikely in practice. Advantageous with or without service void (or indeed with other inner leaf constructions)

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.

MEDIUM PRIORITY

‘Breathing’ Wall (b)

The ‘breathing’ wall uses only non-toxic materials, and with intrinsic protection against decay, allows all timber used to be untreated, so all materials may be safely re-used, recycled or composted - a zero waste option.

Hygroscopic insulation materials must be used.

Natural, Flexible Loft Insulation (n)

Rigid insulation between joists is unlikely to be re-used so a flexible alternative is to be preferred. Natural, biodegradable insulants offer a safe and zero waste alternative to man-made alternatives.

Flexible batts are also more likely to fit snugly and realise the anticipated energy savings.

MEDIUM PRIORITY

Screed / Beam and Block Floor (g, h)

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

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 Fixing (f)

Causes less damage and allows for greater re-use of materials than nailing.

Where components may be moved during their service life, screw fixing makes such removal and replacement easy and less disruptive.

LOW PRIORITY

Screwed Timber Floor Boards (l)

Allows for complete re-use of materials with no waste and safe composting of materials at the end of their life.

Timber with 'Natural' Paint (e)

Neither MDF or conventional paints are biodegradable whereas untreated timber with 'natural' paints can be safely composted.

Mechanically fixed Roofing (m)

Mechanically fixed components are easier to dismantle and re-use.

Pre-cast Ground Beam (i)

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

Eaves Detail (o)

Significantly improved detail but small volumes.

Mill finished Metal (j)

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

Simplified Cill (k)

Simplified detail, cost benefit but small volumes.

Costs

Lime render adds around 60% to the cost of the economical dry dash originally specified and lime mortar sourced from a bulk silo adds around 33% to the cost of the walls overall. However, by using the alternative opening detail substituting block walls only for the facing brick, this figure can be reduced to around 15%.

With careful design, cost neutrality could be achieved by substituting, for example, the first floor outer leaf with lightweight cladding such as timber.

The most advantageous measure is the breathing wall, service void and screw fixed skirting, though this costs around 75% more, due largely to the additional layer of OSB and the creation of the service void. However, the increased benefits in terms of ease of making alterations and upgrades, the improved recovery of components, the likely reduced cost of disposal, the increased insulation levels (linked to energy and cost savings) and reduced health risks to occupants make this measure arguably the most cost effective in the long run.

Replacing the chipboard floor with timber nearly doubles the cost, while substituting polystyrene for mineral wool, and natural flexible insulation for the polystyrene in the ceiling both add about 65% cost. Substituting the mdf for timber with natural coatings adds marginally to the cost, whereas removing the cornice and the revised eaves detail both reduce costs.

The beam and block floor is more expensive (by around 100%) than the slab. The use of ground beams is not cost effective, unless specific requirements of a site dictate otherwise.

Defects Liability / Insurance Issues

No additional issues have been raised regarding the alternative details, although the relative locations of the damp proof tray and sole plate were queried.

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(a) **Lime Mortar and Render** (Specification Item 1, 2, 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) **'Breathing' Wall** (Specification Item 9, 10, 11)
The 'breathing' wall works by using an external sheathing with a high vapour permeability. This means that any moisture getting into the wall can easily escape (as long as the cavity is ventilated) so there is no risk of moisture build-up. The timber is protected therefore and need not be treated, the use of the hygroscopic cellulose insulation normally marketed as an integral part of the system is recommended.
Contact: Excel Industries: 01685 845 200

(c) **Screw Fixing** (Specification Item 9, 11, 13, 22, 23, 29, 31)
Screws enable components to be more readily removed without damage either to the component being removed, or the component to which it was fixed, a double benefit which enhances the possibility of components being able to be re-used, rather than recycled or even dumped. Several screw systems are now available where pre-drilling is not required, which reduced the cost and time differential between this and conventional nailed fixings.
Contact: n/a

(d) **Service Void** (Specification Item 12).
Services, Fittings and Fixtures are the elements of a building that are most likely to be altered or upgraded most often. Making it easy for Clients to alter these elements makes long term running of the building cheaper and reduces waste because removed elements often cause damage to other parts of a building, simply because of the layering of the construction.
Contact: n/a

(e) **Timber, with Biodegradable Paint Finish** (Specification Item 13, 22, 23, 36)
This could help reduce ultimate demolition and disposal costs. At the end of the life of the component, the component cannot be disposed of without a degree of pollution to the ground and groundwater and so should be treated as a separate waste. A 'natural' paint finish which is non-toxic and biodegradable on untreated timber will allow an otherwise 'natural' to be safely composted at the end of its life and so represent a zero waste option in the long term. Timber is also likely to sustain repeated removal and replacement better than MDF and so remain in use for longer.
Contact: eg. Natural Building and Decorating: 01546 886341, NBT Paints: 01844 338338, Construction Resources: 0207 450 2211, OS Colour: 01296 481220

(f) **Screw fixed skirting and Gap behind** (Specification Item 13)
Even though in this alternative detail there is a service void, the value of this detail is that everyday alterations to services may be made without access / damage to the general wall surface
Contact: n/a

(g) **Unbonded Screed** (Specification Item 14)
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)

(h) **Beam and Block Floor** (Specification Item 16)
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

(i) **Pre-cast Ground Beam** (Specification Item 17)
Installation is fast and less weather dependant, site removal much simpler and probably cheaper.
Contact: eg. Roger Bullivant, www.roger-bullivant.co.uk

(j) **Mill finish aluminium** (Specification Item 24, 36)
One advantage of aluminium over steel is that it needs no coatings to be durable. Plastic coatings add toxicity to the material and complicate the recycling process, adding to the pollution associated with extraction of the metal.
Contact: eg. ARWS (029) 2039 0576, Alumasc (01744 648 400)

(k) **Simplified Cill** (Specification Item 24)
Alternatively remove the aluminium and retain the masonry cill, but it is of less value to recyclers and inflexible in terms of window sizes for which it is useful and so is less likely to be re-used or recycled at the end of its service life.
Contact: n/a

(l) **Screw fixed Timber Floor Boards** (Specification Item 28)
To optimise this detail, the timber should be of reasonable quality (worth re-using), 4-side tongue and grooved, and screwed down with a minimum of (visible) fixings to make removal as easy as possible. In addition, a natural oil or wax finish should be applied which does not need to be sanded off before subsequent application of finishes.
However, there are a number of difficulties. If the timber is fixed as soon as the frame is up, the timber laid will probably shrink and move once the building is weathertight and heated, necessitating a 'second fix' to avoid large gaps between boards. In addition, the floor will inevitably get dirty (and require some remedial treatment) unless conscientiously protected throughout the build. If the timber is installed after the building has been made weathertight and with the heating on, a temporary floor surface (and possibly bracing element) will be needed for a large part of the build and then removed.

(m) **Mechanically fixed Roofing** (Specification Item 31)
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. Mechanically fixed roofing components can be separated allowing for simpler recycling potential.
Contact: any built –up roofing supplier

(n) **Natural, flexible loft Insulation** (Specification Item 33)
Flexible batts (or loose fill options) are also likely to fit snugly and realise the anticipated insulation levels. Natural, biodegradable insulants offer a safe and zero waste alternative to man-made alternatives which, in some cases, may become notifiable waste and so represent a potential hidden cost (and waste) at the time of eventual disposal.
Contact: eg. Second nature Thermafleece (01768 486 285 / www.secondnatureuk.com), Construction Resources: (0207 450 2211 / www.constructionresources.com/), Excel Industries: (01685 845 200 / www.excelfibre.com/building), NBT: (01844 338338 / naturalbuildingproductscouk.ntitemp.com/)

(o) **Timber and Mesh Eaves Detail** (Specification Item 35)
This is a zero-waste alternative to the painted mdf/ply and pvc ventilator detail.
Contact: n/a

(p*) **Alternative cladding materials**
Dry fixed materials such as timber or other rigid boards are easier and cheaper to dismantle, offering greater potential for reuse.
The use of timber is ideal as it offers in addition a compostable, zero waste option, while some mineral, timber fibre based and other synthetic products are recyclable.

(q*) **Recycled Content Concrete Blocks** (Specification Item 2)
Recycled content blocks reduce waste going to landfill and the embodied energy and pollution of the block used.
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. Note however concerns about health implication of potentially radioactive slag waste.

(r*) **Non-PVC Damp Proof Courses and Membranes** (Specification Item 6)
PVC is generally acknowledged as a particularly environmentally deleterious material and many environmental organisations advise against its use. LDPE options are easily and cheaply available, some are made of recycled material.
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.

(s*) **Re-used Bricks** (Specification Item 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.

(t*) **Alternatives to Plasterboard** (Specification Item 12, 29)
Plasterboard is ubiquitous and immensely useful, but it is difficult to fix in such a way as to enable complete re-use, and it is not necessarily safe to go to landfill.
Most uses of plasterboard involve either a complete skim coat, or a partial skim, both of which prevent any realistic re-use of the board once removed, as the screws attaching them are covered. This could be overcome by the use of a lining paper which can be removed, instead of skimming the boards. Since plasterboard (technically, 'gypsum based board') is normally painted, or coated in some other way, this coating can render the waste partially toxic. Alternative finishes such as timber boards or boards with secret fixings could be used to simplify dismantling.

(u*) **Window Detail** (Specification Item 21)
Timber windows should be untreated and dry glazed.
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, and 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).

(v*) **No Cornice** (Specification Item 30)
Applied cornices are not likely to be re-used or recycled and hamper attempts to re-se of recycle surfaces to which they are fixed.
From the point of view of re-use, Cornices represent yet another component with little likelihood of re-use, get in the way of re-use of other materials and components, and unless fixed very lightly with a non-toxic adhesive, are best avoided.

(w*) **Non- PVC Rainwater Goods** (Specification Item 34)
PVC is generally acknowledged as a particularly environmentally deleterious material and many environmental organisations advise against its use. Metal based alternatives to pvc are common and more durable, if more expensive.
Mill finished aluminium systems are likely to be the alternative with the greatest potential for re-use, though copper systems are also available. Galvanised steel and painted cast iron options are also commonly used.

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.