DETAILED DESIGN STAGE

Tendering/briefing documentation – standard clauses for better buildings

Introduction

Now that the concept design is complete attention needs to be paid to the detailed design work and the selection of materials. Even though the most crucial decisions have already been made, attention to detail can be vital to achieve good overall environmental performance of the building.

All the principles of the concept design phase still apply, but there are additional considerations that are applicable to the more detailed design work. The following clauses should be complied with:

The least environmentally damaging material should be chosen for each application. Consideration should be given to embodied energy, toxicity, damage caused throughout the materials lifecycle, sustainability and renewability of the resource and to the technical performance of the material.

The following describes preferences for some materials over others and lists materials that are not to be used:

- NZ grown plantation timber should be used instead of plastics or steel wherever possible. Timber framing for example is preferable to steel framing, because of the energy consumed in steel manufacture. Glue-laminated timber beams can often replace steel beams.
- Only NZ plantation grown timber or timber from certified sustainable sources (Forest Stewardship Council) should be used. This means no Rimu, Cedar, Teak or Kwila or other rainforest timbers. The use of recycled timbers is encouraged.
- Locally made materials are preferable because they consume less energy during transport. This also supports the local economy.
- Products, which are repairable and serviced locally, are preferable.
- Paints, finishes and glues should be water based wherever possible. However care should be taken to choose products that will be durable and suitable for the intended use and that are capable of being maintained. Use of “Environmental Choice” accredited paints is encouraged.
- Soft PVC (vinyl) should be avoided, where possible. Linoleum can be a good alternative for floor coverings.
- Pre-nailed framing reduces the amounts of off-cuts generated, because of better efficiencies at

the pre-nailing yard than on site.

- The use of materials with recycled content, such as concrete containing crushed concrete as aggregate, is encouraged, as is the re-use of materials. The Auckland Regional Council is in the process of publishing a directory of recycled building materials.

Further Information:

For hazardous substances, such as some paints, glues and sealants, manufacturers supply Material Safety Data Sheets, these will contain information about toxicity, first aid measures and other useful information. Suppliers should generally be able to supply comprehensive information about their products.

The Materials Section of the *Sustainable Home Guidelines*, Waitakere City Council, 1998, available in full at www.waitakere.govt.nz or from Waitakere City Council, Private Bag 93109, Henderson, Waitakere City, 09-8390400

The Auckland Regional Council is producing a list of recycled building materials, ph.: 09-366 2000

All domestic type hot water heaters used should comply with NZS 4305:1996 Energy Efficiency – Domestic Type Hot Water Systems. Where larger commercial type systems are used, such as a boiler, the most efficient type practical should be used.

Reason:

Large amounts of hot water are consumed by water heating systems. Audits of Council's community centres and libraries have shown that this is an area of potential saving through efficiencies.

Possible Solutions:

The use of solar hot water systems is desirable. There are several systems available commercially and they have been shown to work well in commercial situations, such as motels. It will be necessary to combine such a system with an electric or gas back-up system. One option is to use swimming pool type solar water heaters to preheat the water, before heating it by an electric or gas system.

The use of A-rated cylinders will achieve the standards described in NZS 4305:1996.

Co-generation could be an option. This is a system where electricity and hot water is generated on site, generally from a gas-fired system. It would be advisable to involve a specialist consultant in the design of such a system.

Hot water should be generated as close as possible to the point of use. For hot water needs far away from most other hot water uses small under bench type hot water cylinders, or instantaneous systems can work well.

Cost Implications:

A more efficient system is often more expensive, however this extra cost is generally recovered through lower running costs.

Further Information:

NZS 4305:1996 Energy Efficiency – Domestic Type Hot Water Systems.

Very good information and advice can be obtained from the Energy Efficiency and Conservation Authority (EECA), EECA can also recommend suitable consultants. EECA: www.eeca.govt.nz, Auckland: 377 53 28 or Wellington (main office): 04-470 22 00

The *Heating Water* chapter of the *Sustainable Home Guidelines*, Waitakere City Council, 1998, available in full at www.waitakere.govt.nz or from Waitakere City Council, Private Bag 93109, Henderson, Waitakere City, 09-8390400

Artificial lighting should be of the most energy efficient type available. Lights should be placed to illuminate areas to required levels; care should be taken not to exceed necessary lighting levels. Lighting layout should have regard to natural light available (see also Concept design).

Reason:

Lighting in office-type buildings accounts for 30-50% of the building's electricity use. It has been shown that electricity use from lighting can be reduced significantly without reducing lighting levels.

Possible Solutions:

The first priority should always be to utilise natural light, however additional lighting will also be needed.

Fluorescent lights should be 26mm triphosphor fluorescent tubes using electronic rather than electromagnetic ballast. The relatively new 16mm T5 lamps are 18% more efficient than 26mm triphosphor tubes and this would be an even better option. Good

reflectors and diffuser selection is important for energy efficiency and comfort.

In general incandescent bulbs should be avoided; compact fluorescents are a good alternative. However in areas where lights are used only occasionally and for short periods of times (such as cleaning cupboards), incandescent bulbs are more cost effective.

Lighting levels should be 500 lux for desktops and 250 lux for walkways, filing and storage rooms, community halls, passageways and toilet blocks. Task lighting is preferable to lighting up large areas to provide adequate lighting levels to a few desks. Light coloured internal paint finishes will reflect light and less lights are needed to achieve the desired lighting levels.

The use of occupancy sensors or timers might be appropriate in some cases.

Photocell-controlled dimmers to control artificial lighting are useful in areas where natural light is present some of the time.

Light-emitting diode (LED) emergency exit signs are more efficient than other types.

Employing a lighting consultant specialising in energy efficiency should be considered.

Cost Implications:

More efficient lights are generally more expensive, however the lower running cost more than offsets this.

Further Information:

Very good information and advice can be obtained from the Energy Efficiency and Conservation Authority (EECA), EECA can also recommend suitable consultants. EECA: www.eeca.govt.nz, Auckland: 377 53 28 or Wellington (main office): 04-470 22 00

All appliances should have a good energy rating (four or more stars) and be water efficient. No in-sink waste disposal units should be installed. Fridges should not contain ozone depleting substances (CFCs, HFCs and HCFCs).

Reason:

Reducing water and energy consumption will reduce the running costs of the building as well as reduce its environmental impact. Ozone depleting substances increase UV radiation and therefore skin cancer rates.

Possible Solutions:

Use of four star energy rated appliance or better.

Appliances can be rated under *Australian Standard SAA MP 64-1995* for water efficiency, however this is not common in New Zealand. Water consumption data should be obtained about appliances and the best option chosen from this information.

Manufacturers should also be able to supply information on the type of coolant used in their appliances (fridges). CFCs, HFCs and HCFCs should be avoided.

Appliances which can be serviced locally are preferable.

Cost Implications:

This varies, but water and energy efficient appliances are often no more expensive than other types.

Further Information:

Manufacturers should be able to supply all the necessary information.

If air-conditioning is required the most energy efficient system practical should be chosen. Air-conditioning should only be supplied to those areas where temperature and air exchange cannot be controlled by mechanical or natural means and only at those times when other control is inadequate. All air conditioning equipment has to be free of ozone depleting substances, such as CFCs, HCFCs, R11 or R12.

Reason:

Air conditioning systems consume a large proportion of the electricity used in a commercial building. Often adequate temperature control can be achieved without comprehensive air conditioning. Many employees perceive naturally ventilated spaces to be more comfortable and healthier than air-conditioned spaces.

Possible Solutions:

The first step is to assess the need for air-conditioning. Various systems offer advantages and disadvantages depending on the building users requirements and the form and layout of the building.

Things to take into consideration are the size of spaces requiring air conditioning and the purpose for which these spaces are used. A library, for example, has higher humidity control requirements to preserve books and an office with high computer use will have additional cooling requirements. Open plan layouts need to be treated differently from individual offices.

All this information needs to be supplied to the person designing the system (for extensive systems this will generally be a services engineer – it is important to select a person experienced in energy efficiency issues). Energy use data for the different options should then be obtained and the most appropriate system chosen.

It is advisable to build some flexibility into the system to allow for changes in use patterns of the building.

Cost implications:

Running and maintenance costs of air conditioning systems are high. Choosing an efficient system will therefore result in cost savings, even if a higher up-front investment is required.

Further Information:

Very good information and advice can be obtained from the Energy Efficiency and Conservation Authority (EECA), EECA can also recommend suitable consultants. EECA: www.eeca.govt.nz, Auckland: 377 53 28 or Wellington (main office): 04-470 22 00

Heating systems should be energy efficient and be situated and designed to allow energy efficient use by building occupants.

Reason:

Heating buildings uses energy. There are many different options for heating and it is therefore important to choose the most appropriate system for the specific building and use.

Possible Solutions:

Heating needs in northern New Zealand are relatively low, low cost simple systems are therefore generally appropriate.

Care should be taken not to over design the heating system.

Heaters should be positioned to take advantage of natural air movement in the building (heat rises, heaters should therefore be low to the ground and not under or next to windows). In rooms with high ceilings reversible de-stratification fans can help to push the warm air back down. In summer they will help to cool the room.

Radiant heaters are generally more efficient, however because they do not respond as quickly as convection heaters, they are less appropriate for infrequent use (such as a community hall, where

different users have different heating requirements). Where heating needs are known and relatively constant centrally controlled radiant heaters (such as radiators supplied by a boiler) can work well.

Under floor heating supplied by a solar hot water system or a heat pump water heater might be a good option for frequently occupied buildings.

Cost Implications:

Lower running costs result in long-term savings. However where the heating need is small care should be taken to weigh initial investment up against running costs.

Further Information:

Suppliers and installers of heating systems can supply energy use data for their equipment. However they tend to recommend over design.

Very good information and advice can be obtained from the Energy Efficiency and Conservation Authority (EECA), EECA can also recommend suitable consultants. EECA: www.eeca.govt.nz, Auckland: 377 53 28 or Wellington (main office): 04-470 22 00

Heat loss in winter and heat gain in summer should be reduced as far as practicable through good insulation.

Reason:

Good insulation will reduce heating requirements in winter and cooling requirements in summer. It will also raise the comfort level in the building.

Possible Solutions:

Insulation levels should, as a minimum, comply with NZS 4243:1996, however it is desirable that higher levels of insulation are installed as far as this is practical and does not result in unreasonable costs.

A light roof colour will reduce heat gain in summer.

Aluminium window joinery with thermal breaks will reduce heat loss through window frames (not needed for timber joinery). Double-glazing will reduce heat loss, however this is not generally cost effective.

Tight fitting thermal curtains will reduce heat loss at night where curtains are appropriate to the building use. Care needs to be taken that these are fitted properly to a pelmet. Other features that can be used to reduce heat loss are automatic double doors, low e-glass and air curtains.

Cost Implications:

All the above measures result in additional costs, however these are not large (with the exemption of double glazing) and are generally justified through lower running costs and improved comfort levels.

Further Information:

Very good information and advice can be obtained from the Energy Efficiency and Conservation Authority (EECA). EECA: www.eeca.govt.nz, Auckland: 377 53 28 or Wellington (main office): 04-470 22 00

Compliance with the AAA rating for water efficiency criteria in Australian Standard SAA MP 64-1995.

Reason:

A reduction in water use reduces the running costs of the building through lower water and power bills (hot water). Water resources in the Auckland region are under pressure, it is therefore important that public buildings set a good example of conserving water.

Possible Solutions:

The following will achieve compliance with the standard:

Showers and Taps:	No more than 9 litres per minute

Toilets:	litre dual flush
Urinals:	Smart demand operation or waterless urinal
Dishwashers:	No more than 18 litres per programme (standard sized machine)

No in sink disposal units should be installed.

Cost Implications:

Water efficient fixtures are generally no more expensive than other type fixtures.

Further Information:

Further information on water saving devices can be found in the *Sustainable Home Guidelines*, Waitakere City Council, 1998, available in full at www.waitakere.govt.nz or from Waitakere City Council, Private Bag 93109, Henderson, Waitakere City, 09-8390400

Space should be provided in the design to allow for functional recycling facilities

Reason:

To allow the users of the building to recycle some of their waste, such as paper, glass and plastics, appropriate facilities need to be allowed for.

Possible Solutions:

The necessary space will vary depending on the use and size of the building. However it will generally be necessary to provide a lockable space, sheltered from rain and wind that is accessible by trucks. The space needs to be large enough to accommodate separate containers for recycling. For community uses separate glass, plastic, and metal can facilities would be needed and for any office type activity cardboard and paper facilities would be expected. The users of the buildings should be consulted.

Cost Implications:

There is an additional cost in providing additional space.

Further Information:

Local waste management companies can provide sizes of containers and collection requirements. Yellow Pages under *recycling*.

Provision should be made for bicycle parking and other appropriate facilities for cyclists

Reason:

The use of alternative transport to the car is desirable. It is therefore important that public buildings provide for the needs of cyclists.

Possible Solutions:

Bicycle parking should be outside the main entrance where good surveillance exists and where a strong public statement can be made. Ideally this parking should be covered and provision should be made to lock bikes securely (provide something bikes can be locked to).

Providing showers and changing facilities for cyclists is useful where this fits in with the overall use of the building.

Care should be taken to resolve any potential safety issues between cyclists and motorists or cyclists and pedestrians.

Cost Implications:

There is an additional cost in providing these facilities.