Site and Architectural Design Principles for Buildings

For the Atomic Weapons Establishment

Issue 2

Directorate of Major Projects
Head of Engineering and Design Management

Approvals

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Amendments

Issue	Date	Detail of change	Checked	Approved
1	Nov 2005	Original Issue	RM	
2	September 2006	Minor Corrections	IDW	

Draft C issued for Site Development Group endorsement.

Distribution

The Master (Original) copy of this document shall be held in the AWE Design Authority Office, all other copies shall be uncontrolled copies and must check with AWE Design Authority on the revision status of this document.

Contents

1.0 INTRODUCTION

AWE has identified a need for rationalisation of its building stock to achieve working efficiencies, cost savings and investment in new infrastructure to improve the working environment and site image.

Four of the key corporate drivers that will influence design proposals are:-

- Create a working environment that facilitates business effectiveness and efficiency.
- Provide a more modern working environment for staff in order to retain and attract staff.
- Contribute to an improved image and character of AWE towards a 'Science and Technology Park'.
- To work towards the Government's aims to make sites and buildings more sustainable.

The guidelines in this document consolidate and expand on architectural and landscaping aspects, covered in the AWE Site Development Strategy Plan (SDSP) and are primarily to help unify the architectural approach for all new and refurbished buildings, working towards creating a Science and Technology Park image and character for the site.

The items covered within this document are not intended to be fully comprehensive as there will be specific project needs and factors that will be necessary to address on an individual basis.

However each project team will be required to work within the envelope of architectural principles outlined in this document. Where there is a conflict between these principles and specific project needs, this should be discussed and agreed with the AWE Design Authority (ADA).

During the design process there should be a continuing involvement with the ADA by way of reference and a review of proposals at key stages.

Where a Supplier is named it should be understood that other "Equal and Approved" alternatives can also be used.

2.0 AWE POLICIES AIMS.

2.1 General Comment

The policy items in section 2.0 are based on those noted in the AWE Management System Policies - 'Managing for Excellence' document (AWE/DSDG/A/PS/AD/011 Issue 2 November 2004). Only the main policies that would affect the site and Architectural design have been included here.

Please refer to the above document for comments on AWE's aims, management systems, policies and commitments.

Some policies and comments in this section (2.0) are being reviewed, if there are changes to any of these, this section will be changed to reflect this.

Other documentation that should be reviewed in conjunction with the Site and Architectural Design Principles for Buildings are as follows:-

- Engineering Building Regulations Compliance Model – Ref No AWE/DMP/LL4854227
- Engineering Counter Terrorism Measures Design – Ref No AWE/DMP/LL4482539

2.2 Sustainability

Sustainability issues are to be considered in all new developments and major refurbishment projects. The principles of sustainable development include improving quality of life and using all available means to eliminate waste, curb pollution and conserve energy and natural resources.

2.3 Disability

The following notes on Disability are not included in the Management Policies document mentioned in 2.1, but are noted here as good practice.

AWE values a diverse workforce and is committed to the employment and retention of people with disabilities. This includes providing an appropriate working environment to enable disabled people to develop and utilise their skills and qualifications.

In terms of the buildings and hard landscaping access AWE is governed by the requirements of:-

- The Disability Discrimination Act 1995 (DDA) and any subsequent amendments (as of April 2004 the government is out for consultation on a Disability Discrimination Bill).
- Part M of Building Regulations – Access to and use of buildings.

Access to and within individual buildings is to be suitable for disabled people, both physically and sensory impaired.

To help ensure AWE complies with the DDA, buildings and their approaches should be designed in accordance with latest guidance, in particular BS 8300: 2001-Design of buildings and their approached to meet the needs of disabled people – Codes of Practice. Part M of the Building Regulations has been revised generally to bring it into line with BS 8300 and came into force on 1 May 2004. (The BS 8300 is due to be reviewed and updated in 2005 and this could update some elements of Part M).The following are some of the aspects which need to be addressed when considering buildings and external hard landscaping:-

- Entrance door widths and lobby sizes, glazing, handle sizes and positions.
- Disabled WC's.
- Ramp, stair and path designs.
- Clarity of objects, materials for those with impaired sight.
- The design of lifts.
- Disabled parking.

A few recent publications that can assist in auditing and managing existing buildings, or when designing of new, are noted in items 22, 23 and 24 in the references section.

2.4 Health and Safety

AWE's overriding objective is to ensure that none of our activities harm our employees, the public, or the environment.

We embrace a comprehensive policy on the environment, health and safety, which includes:

a) We consider that none of our activities is more important than the health and safety of any individual or the protection of the environment.

b) As a minimum we will comply with all relevant legislation and any other requirements to which we subscribe.

c) We will encourage a pro-active safety culture, and ensure that each employee is trained, experienced and competent to perform his or her duties.

d) We will delegate the responsibility for Health & Safety matters to the appropriate level in the organisation.

e) We will strive to remove all causes for accidents and other abnormal events, and to minimise the consequence of such if they occur.

f) We will consult effectively with employees, their representatives and other stakeholders on Health & Safety matters.

g) We will ensure that all our operations are performed, and seen to be performing safely.

h) We will strive to continually improve performance in all areas of Assurance, prioritised on the basis of risk.

i) We will measure Health & Safety performance against agreed objectives and targets, and report progress to all stakeholders.

j) We will apply our Health & Safety policy, standards, objectives and targets to contractors and suppliers.

Each employee is to ensure that:

- They fully understand their responsibilities and act in a safe manner at all times, thus avoiding danger (by their acts or omissions) to themselves, other staff members, and members of other organisations, the public or the environment.
- They support management at all times in their health & safety endeavours.

2.5 Environment

AWE Plc takes great care to reduce the impact of its operations on the environment. It also takes its social responsibilities such as labour practices, human rights and stakeholder relations very seriously. And not least, AWE makes a significant contribution to the local economy both directly, in terms of wages and contracts, but also indirectly through its support for local schools and charities.

AWE takes into account the environmental effects of its activities, measures and assesses the impact of its activities on the environment and to make arrangements to minimise any effect.

AWE fosters environmental awareness within the Company and encourages commitment towards good environmental performance targets that reflect best industry practice. AWE reports annually on the environmental performance of the Company.

2.6 Quality

The AWE statement on this (Nov 2004) requires AWE to provide products and services that always meet the agreed requirements of our customers and to continuously improve all aspects of our business. A commitment that is relevant to construction works is:

- We will maintain our certification to the international ISO9001 Quality Standard, which forms the basis of our Assurance Management system. All our suppliers and contractors will be required to work to the same requirements as our Assurance Management System.

Aspects to do with ‘quality’ standards for architecture and landscaping will be detailed within the AWE contract documentation, which includes the project Quality Control Plan.

2.7 Security

AWE is committed to identifying, implementing and maintaining management practices that ensure the Company’s assets, which include personnel, information and nuclear material, are protected from all threats, whether internal or external, deliberate or accidental.

AWE is committed to:

a) Meeting and maintaining effectively and efficiently the national security requirements of our customers, other stakeholders, relevant legislation and regulatory authorities;

b) Encouraging a pro-active security culture through awareness education and training;

c) Ensuring the protection of the special nuclear materials for which we are custodian;

d) Working with all relevant stakeholders in the development and implementation of security strategy and systems which ensure that security standards are achieved but which are not unnecessarily restrictive on our employee’s business activities;

e) Maintaining the highest standards for our Information Security Management System

through a risk management process, to ensure that

- confidentiality of information will be assured,
- integrity of information will be maintained,
- availability of information and information systems will be met,
- business continuity plans will be produced, maintained and tested,
- all breaches of security will be reported and investigated,

f) Ensuring that all security systems are maintained to the highest standards to provide optimum system performance at all times.

In order to help achieve these objectives some buildings require special protection. In some cases this involves an enhancement of their structure, as set out in JSP440**.** Extracts of this are set out in the following sections.

The needs for this will be agreed with AWE Corporate Security Section for each building or part of, on an individual basis. Typically, there are restrictions on parking distances from buildings. In general no new parking should be nearer than 25 m to the face of a building, if within the site. Any external parking should be at least 100 m from a building that is on or adjacent to the secure fence line. For further details refer to Counter Terrorism Measures Design Ref No DMP/LL4482539.

There can be an exception to this in some cases with regard to disabled employees providing an Access Management Strategy is in place listing responsibilities, authorised approach route, and procedures.

In all cases, security aspects will require the approval of AWE Corporate Security Section.

Guidance on security aspects for design of facilities at AWE are provided in 'Security Standards Applicable to AWE Projects' June 2004.

2.8 Emergency Response

AWE has developed appropriate site and facility emergency plans and maintains an appropriate state of readiness to respond to emergencies.

Arrangements are in place for any foreseeable emergency that affects facilities, the environment, operations, activities, staff or any other groups; AWE trains personnel in these emergency response procedures.

Records of all exercises and rehearsals undertaken are maintained, and lessons learned incorporated into emergency response procedures.

3.0 CONTEXTUAL AND SITE ISSUES

3.1 General

New and refurbished buildings will be designed within the guidelines of this document and the overall aims of the Site Development Strategic Plan (SDSP).

3.2 External Image

The site is currently being improved by landscape planting. Further improvements may include changes to secure fence positions. The removal of the steam main that currently runs near the fence would improve the external perception of the site.

The design and location of any new buildings within view from outside the site will need to be considered in relation to:

- Impact at site boundary.
- Current and proposed orientation.
- The aim to reduce the nuclear secure NSCPA site area.

3.3 Building Masses

The mass of a building should be considered in relation to the whole site and in particular the adjacent buildings together with surrounding area.

Mass and position of large industrial buildings in relation to lower offices and laboratories should also be considered carefully.

3.4 Western End and South Road

Particular emphasis shall be put on the importance of any new buildings at the 'Western End' and along South Road, as improvements in these areas will have a significant impact on improving the site image.

3.5 Views and Vistas

Views and vistas from and onto the buildings and surrounding landscaping should be exploited.

3.6 Statutory Requirements

a) Planning

All planning consent submissions must be submitted via “The Site Planning Liaison Manager”. Both internal and external approvals will be sought through this route. Planning consent will be sought from the Local Planning Authority by the MOD.

A process for consultation between MOD, AWE representatives, and the Local planning Authority, has been agreed and will be followed by each project.

Having regard to best practice in planning design, sustainable development, compliance with national policies and reducing environmental impact is likely to assist in any discussions with the Local Planning Authority, and result in fewer valid objections.

For more information, contact the Site Planning Liaison Manager: Building C21.2 Ext. 50042. Building development issues likely to be of particular interest and possible concern to the local authority, and others, include:-

- Where a building can be seen from areas outside the site.
- Buildings near the perimeter.
- Tall / large buildings that change the skyline.
- Whether there is any increased risk to the community.
- Where there would be any increased noise, light or other pollutions.
- Sustainability issues such as:-

  The use of Brownfield, (previously developed) land - encouraging accessibility by modes of travel, other than the private car and conserving wildlife.
- Anything that impacts on ‘Grim’s Bank’ feature or its setting.
- Contaminated land issues.
- Where a development within the AWE site impacts on surrounding conservation areas.
- Visual impact.
- Traffic.

An Environmental Impact Statement (EIS) maybe required where the proposed development is likely to result in significant environmental effects, by virtue of its nature, size and location, an EIS will be submitted with the planning application if required.

Note that all projects require an appropriate level of Environmental Impact Assessment in accordance with MoD policy and company standards. For more information, contact the Head of Environment.

b) Building Regulations

For detail information refer to the Engineering Building Regulations Compliance Model. Ref No DMP/LL4854227.

HSE and Crown Fire Regulations will apply.

c) Other External influences that may also effect the Development of the Site

- The Health and Safety Executive (HSE).
- The Nuclear Site License.
- Explosives safeguarding requirements: this includes areas in which it is not possible to build unless the building is specifically protected.
- The Environment Agency (EA).
- Defence Estates requirements.

4.0 BUILDING FORMS AND MASSING

4.1 Building Form and Scale

Building form is determined by various factors, including number of storeys, building size, footprint, intended use, environment approaches, structural systems and limits established by adjacent spaces and structures.

4.2 Building Storeys

When determining the proposed number of storeys. Consideration should be given to the compatibility of the proposal with the existing, adjacent buildings, and the cost.

The heights and distances from surrounding buildings should ensure adequate daylight (Refer to BRE report for site planning for daylight and sunlight) and ventilation is not prevented to either building. Views from both buildings should also be considered and, where beneficial, good views retained.

4.3 Building Massing and Composition.

These will vary to suit the needs of particular buildings and site. However, the following highlights a number of issues that should be considered. In conjunction with these, surrounding buildings and planning issues such as those noted in 3.6 will need to be addressed, and proposals agreed with the Site Development Team (SDT).

Buildings should express a balanced composition of massing, fenestration and detailing.

Particular elements for consideration

- Where possible provide a break in planes for each change in mass, such as that shown in figure 1. This will apply in particular to some of the larger industrial buildings. The minimum offset vertically and set back will help articulate the forms.
- Where possible achieve the 1 metre offset vertically, and 1½ metre offset horizontally (figure 1) for example but, where not appropriate or possible, due to building function or site, consider articulating the adjacent forms in a different way.
- Large building massing could have breaks where beneficial to reduce the overall mass.
- Provide a change in plane, and/or mass, and/or texture at primary entrance facades. For some buildings this could be via the use of canopies or recesses and differing materials.
- The use of glazing can maximise day lighting and provides a slick lightweight appearance.
- Consider the relationship between different masses and the proportions of respective elements.
- Articulate secondary facades by means of plane, materials and/or colour changes and window patterning to suit the building function and location. (see figure 3 for examples)

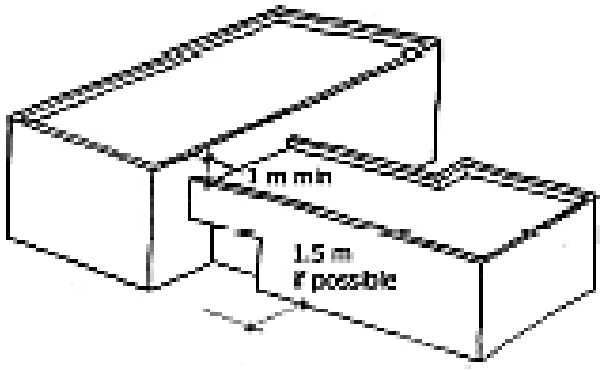


Figure 1 - Example of building massing

4.4 Building flexibility, adaptability and future expansion

All new building designs should address where appropriate, possible future changes of use, in the design of the structure, interiors and fabric, and extensions that might reasonably be predicted.

In each case, the degree to which this is undertaken will need to be agreed at the design stage with the Project Sponsor. These considerations should not adversely effect the proposed user's requirements.

Definitions

The term's "flexibility" and "adaptability" are commonly used in a loose interchangeable way to imply that the accommodation allows a degree of responsiveness to changing user needs. The following definitions for these terms will help to clarify the different emphasis in the approaches

to design that can be developed to meet both initial and future requirements:

a) Flexibility

Enables different activities to be accommodated in given spaces without physical rearrangement taking place;

b) Adaptability

Refers to the design of a building, which allows physical rearrangement of various building elements, services and furniture.

Flexibility

The level of flexibility will need to be carefully considered in relation to the widest range of work that may take place in the foreseeable future. Where possible this would result in new needs and organisational changes being met by moving people and their equipment rather than by physical alteration of the layout.

Examples of aspects that can affect flexibility:

- The size and shape of rooms being suitable for various activities without having to change the spatial and services framework.
- The type and size of storage units such as the use of modular storage –where shelves and trays can be flexible in depth, position.
- Partition acoustic performances.

Adaptability

Adaptability of a facility will depend on the detailing, design and specification of building and service elements as well as furniture and equipment so that they may be conveniently and cost effectively altered.

The way in which this is done will vary depending upon how easy it is to make the adjustment and the design team should propose simple, elegant methods that allow adaptability to take place where appropriate without compromising current needs.

Examples of aspects that can affect adaptability:

- The use of shell or core designs.
- Type of partitions.
- Window designs (openings, mullion and transom lines etc.) and spacing.
- Structural grids.
- Depth of plan.
- Raised floors to allow services changes.
- Use of ‘soft spaces ’such as storage areas between areas that may need to expand.
- Services provisions.

4.5 Roof forms, colours and materials

It is proposed that new and refurbished buildings start moving towards the required image of a Science and Technology Park using agreed colours. This will help achieve a fresh, clean and modern image, which will enhance landscaping, tree planting etc.

It is envisaged that more precise factory materials, such as windows, claddings, and louver’s, would be used in a way that takes advantage of factory made items. In addition, a level of standardisation should be considered where it can be an advantage both for initial capital costs and longer-term maintenance costs.

Other materials could be used for contrast in texture and for areas, which are more individual.

Where appropriate consideration should be given to the use of raised standing seam metal roofs, however, this does not preclude the use of other materials for sloping or curved roofs. This type of roof would complement the nature of the façade, reduce on site construction time and allow for a variety of forms such as those shown in Figure 2.

Flat roofs should be avoided where possible and careful consideration to all issues should be undertaken before a flat roof is adopted. Where possible, pitched / sloping roofs can be used to allow natural light to enter the upper floors and be designed to maximise the advantage of the shape and space created on the inside for particular functions. In some situations, it will be beneficial to use the top floors for rooms, which could benefit from the increased height visually, for increased ventilation and daylight. This could influence the overall building layout.

The pitched or curved roof form can be tailored to the particular needs of the building, adding individuality to the aesthetics.

Further information on colours, roofs and materials are noted in sections 5.

Figures 30, 31 and 32 show examples of parts of office or laboratory roofs being pitched or curved to suit and improve the spaces below.

Figure 3 includes examples that use agreed colours curtain walling with solar shading and roof over-hangs, which constitutes part of the building form.

Where appropriate the form and function of the building can be made more aesthetic, while keeping to the agreed colour palette while maintaining a uniform approach to the architectural style.

The use of glazing can make a building facade look more permeable, expressive and add interest.

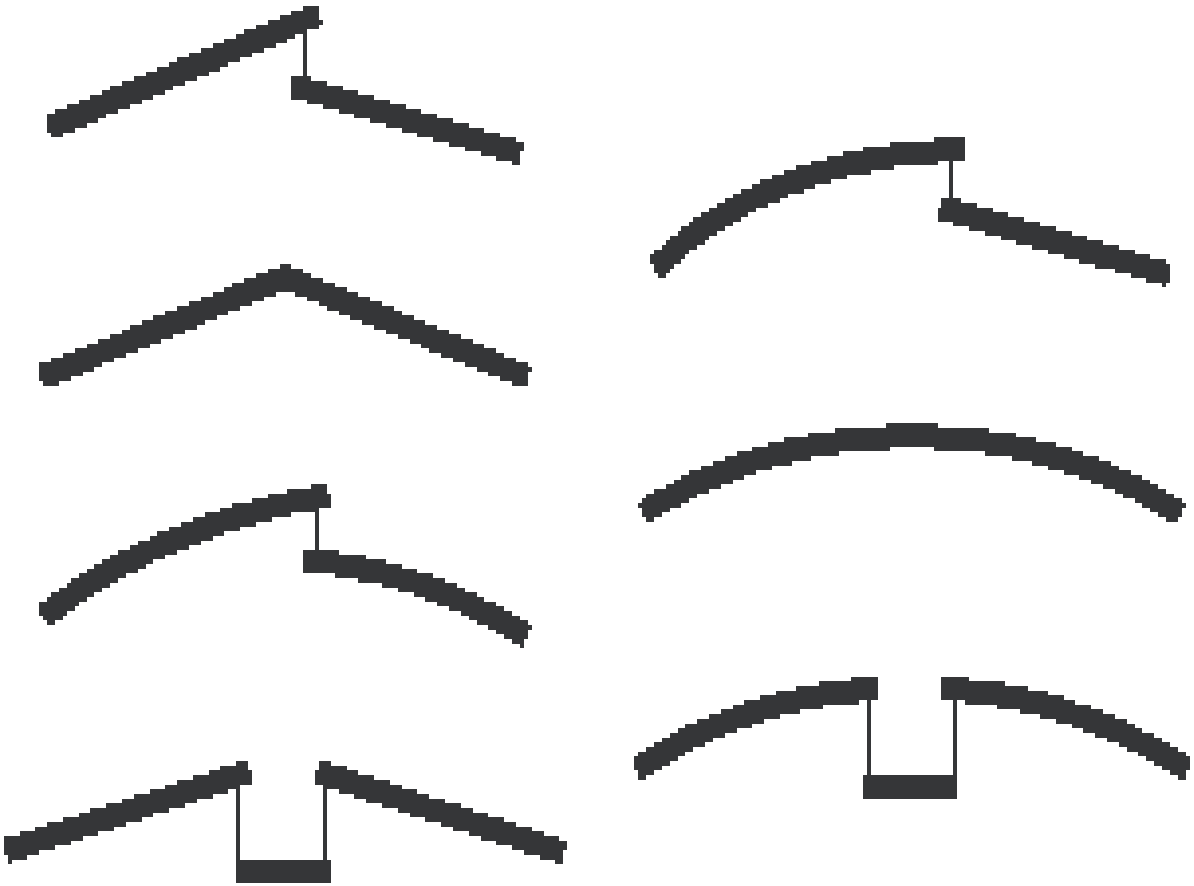


Figure 2 - a few examples of roof profiles using metal roofs

Figure 3

5.0 NEW OFFICE AND SIMILAR TYPE BUILDINGS ARCHITECTURAL DESIGN PRINCIPLES

5.1 General Comments

Comments and Approvals

During the design concept phase every building should be evaluated using a number of factors before deciding on the preferable approach. These include consideration of the following criteria: -

- Interface with continuing AWE operations.
- The project brief requirements.
- Buildability.
- Site constraints.
- Surrounding Buildings.
- The overall aims and policies noted in this Design Principles document.
- Improving the working environment for staff.
- The capital available.
- Life cycle costing.

Whilst some criteria will place initial cost constraints on the project, many building design aspects can affect a building's performance with regard to running costs, maintenance, staff well being and efficiency etc. These should be assessed on an individual building basis.

The following references and comments in this section highlight some of the main aspects that should be addressed and give some examples of best practice. As noted, which answers are considered to be most appropriate will need to be assessed for each building.

Reference should also be made to:

- The current British Council for Offices BCO Guide – best practice in the specification for offices.
- Environmentally Smart Buildings - a Quantity Surveyor's guide to the cost-effectiveness of energy efficient offices (Good Practice Guide 274).
- The Chartered Institute of Building Services Engineers (CIBSE) guides entitled 'Energy efficiency in building'.
- The requirements of the latest edition of the Building Regulations in particular part L2 – the conservation of fuel and power.
- Environmental design guide - for naturally ventilated and day lit offices - BRE.

These documents comment on some of the complex interrelated issues concerning the design of offices (and other similar type) buildings including spatial allocation, materials of construction, lighting, office equipment heat generation, orientation / glazing/shading, ventilation/cooling techniques and the procedures that should be followed in selecting appropriate solutions.

The BCO Guide 2000 in particular can help make informed decisions in establishing a brief for offices and similar buildings, and can help AWE evaluate advice given by their advisers.

General notes on building project requirements.

Project inception – Due to the variety of uses and building types that this chapter is applicable to, the extent to which the guidance contained within it will be appropriate for specific projects shall be agreed with the AWE Engineering Manager and AWE Design Authority (ADA) upon appointment of the design team. The main aspects to be agreed are highlighted in the following notes, which, where relevant shall be incorporated into the agreed project brief prior to design being commenced.

a) Use of an architect

All building projects should involve the use of reputable and suitability qualified and experienced person (SQEP) architects from project inception, and they should be an integral part of the design team. They can play a major role in the overall building and site design decisions, and help improve schemes if involved early enough.

b) Compliance with the brief

All buildings and associated landscaping works should comply with the project brief requirements, except where there are alternative approaches that the design teams believe would be of benefit to AWE. In such cases early discussion should take place with the AWE

Engineering Manager and the AWE Design Authority (ADA).

c) Compliance with wider AWE requirements

AWE has separate standards, procedures, instructions, etc. that set out requirements for security, and what is required to minimise risks from explosions etc. These requirements will differ according to the building location and use. These should be established at the initiation of the project as the requirements can have a major impact on the building design, construction, and costs. In some cases they could also influence the location of the building. For example see 5.16

d) Compliance with legislation

The building(s) shall comply as a minimum with the Building Regulations, Statutory Authority and legal requirements such as the Disability Discrimination Act (DDA), and the aims and issues noted in section 2.0 for Sustainability, Disability, Health and safety, Environment, Quality, Security and Emergency Response. In some cases the project brief may contain higher standards, if so then these should be used. See also 5.10 and 5.11.

e) Contextual and site issues

Part of the overall site strategy is to improve the external and internal images of the site, Sections 3.0 and 4.0 include comments on some of the issues. Inclusive of aspects that are likely to affect planning issues and the overall size, position and design of the building.

f) Aesthetics

The aesthetic image of the building(s) is to be of a modern, commercial Science and Technology Park images shown in figures 3 and 4 in sections 4 and 5. Generally the buildings are to be in colours agreed with the AWE Design Authority. The building image should be considered in conjunction with other functional needs for the facades, such as the possible use of external solar shading.

g) Allowing for future changes

The building and site proposals shall consider and allow for future flexibility, adaptation and expansion to the extents agreed with the AWE's Engineering Manager and the AWE design Authority (ADA).

h) Economies

The design and proposed construction methods of the building shall take into account the advantages of reducing site set up and site construction time, economies of scale, and repetition in reducing capital costs.

i) Views out

The proposals should consider the views from the building. This can influence the building position, the building design, the positions, sizes and shapes of windows, the landscaping and parking proposals. Where possible views out should not be obscured by parked cars. See also 'views' in 5.8

j) Natural light

Where possible and appropriate the building should maximise the use of natural light to enhance the occupants well being and reduce running costs. See 5.7 and 5.8.

k) Solar and internal heat gains

The building design should address the need to reduce solar heat reaching the interior and internal heat gains as they increase during the day. This can reduce plant capital and running costs, and improve the occupant's environment. See section 5.4 & 5.5. Also consider using 'Thermal Mass' to help reduce mechanical cooling and help to stabilise temperatures.

l) Natural ventilation

Natural ventilation should be used if possible and appropriate in conjunction with other methods of reducing heat gain. In some cases the ventilation will need to be supplemented or replaced by mechanical ventilation, but even if provided their use can be reduced via the use of solar shading, good use of thermal mass, higher floor to ceiling heights etc. See section 5.6 & 5.7 and Figures 26 and 27 and adjacent text.

m) Internal staff environments

Internal staff environments as a minimum should comply with the brief and regulation requirements. They should also aim generally to provide a more modern and attractive working environment that will help retain and attract staff.

Figure 4

n) Life cycle

The life expectancy, maintenance periods in years, and appropriate life cycle costs should be addressed for each building and shall be agreed in each case with the AWE Engineering Manager and AWE Design Authority (ADA). Where capital costs are the main concern the payback periods for any enhancements above Building Regulation or other brief requirements will need careful analysis and agreement. See the following item 5.2.

o) Quality

Material specifications and quality shall be agreed with the AWE Engineering Manager and the AWE Design Authority (ADA) in advance of final building contracts. Where appropriate and required material samples should be submitted for approval. The choice of particular materials should also take into account the sustainability aims. See sections 2.0.

p) Sustainability issues

These should include consideration of:-

- **Site aspects**

Encompassing as building location i.e. use of previously used sites rather than green field where appropriate, the use of permeable paving, reducing off site storm water drainage discharge and providing suitable facilities for cyclists.

- **Building aspects**

Where appropriate the maximising of natural daylight, the use of solar controls, using more sustainable construction, water saving measures and efficient plant and engineering aspects.

q) Landscape

The soft and hard landscaping should be in line with the general principles and examples noted in section 9.0. The extent and nature of landscaping which is to be included in a particular building contract should be established early on and designed and costed into the overall proposals. The external vehicular circulation and overall landscaping proposals can often have an influence on the position and appearance of a new building and should be designed in conjunction with it. A Landscape Architect who is suitability qualified and experienced person (SQEP) should be used to help ensure the detailed proposals are satisfactory.

r) Comments and approvals

The AWE Design Authority (ADA) should be involved in all stages of the design process and especially the initial and concept stages of the design process. It shall be standard practice to invite the DA to all meetings where important decisions are to be made with regard to the design.

In addition to this formal procedure, submissions of the design should be made in an appropriate format, at the recognised RIBA design stages formalising the involvement of the ADA throughout the project period.
Sufficient time periods (to be agreed for individual projects) should be allowed for comments, consequential changes to be made, and the checking of the documentation for the signing of the final approval.

5.2 Examples of Life cycle design Considerations

If energy use and environmental factors are considered early enough in the design process many of the design and specification aspects can may have no or little additional costs. Many other aspects can have a Reasonable ‘payback period’. What is crucial is that each building should be designed and considered as a whole and individual element not isolated out. While individually some elements may cost more, they can give both capital and running cost savings elsewhere.

Examples of this include: -

a) Where an office block is designed to maximise natural ventilation and reduce solar gain, this can reduce engineering capital and running costs. To achieve this, factors such as the building orientation, building widths, building mass, fenestration design and solar shading will need to be considered, to establish the optimum design for a particular building.

b) As part of an overall design approach the use of thermal mass in the fabric for the floors, walls etc. and ‘night venting’ (to cool the thermal mass), can help reduce internal temperatures and consequently reduce engineering capital and running costs.

c) The use of appropriate light sensors that switch off lights when not required, or/and increased insulation levels, while costing a

little more in capital costs can have reasonable payback periods. However the number and type of light sensors used, or optimum 'U value' etc. will need to be assessed for each building.

d) Early decisions on the percentage use of open plan offices can help reduce both capital and running costs if the building is designed to maximise the advantages of this approach.

While open plan offices may be difficult for any staff initially to accept there are some good examples where staff have gone from buildings where they have cellular air-conditioned offices into open plan, mainly naturally ventilated offices and found it acceptable. These buildings have been carefully designed to facilitate an open plan approach.

The open plan concept needs to be considered as part of the overall building design from the start, as it can affect building widths, area per person, etc. To make open plan work successfully consideration of the staff, working environment as a whole will need to be addressed. While there would be reduced costs from less area per person and less partitions, reduced plant, etc., there may need to be additional capital cost invested into aspects such as solar shading, high thermal mass floors etc.

e) The use of a 'mixed mode' approach to ventilation, heating and cooling, natural ventilation is used, to reduce energy, and improve staff well being, and provision is also made for mechanical ventilation and cooling, to provide back up for when natural ventilation is not sufficient.

While this approach can have a greater capital cost it can reduce running costs substantially, and provide a back up for when the temperatures are excessive and the building design is unable to reduce it sufficiently into the 'comfort zone'.

Early agreement and approval shall be obtained for the capital cost of any such measures.

5.3 Environmental Comfort

The Project team is required to address the issues associated with creating visual and thermal comfort, appropriate use of natural lighting and ventilation, and a suitable acoustic environment.

The building orientation, its solar shading and overall design will affect its performance. Consideration should be given to creating a more End User controllable local environment in order to improve their perception of comfort. More details of these requirements should be set out in the project sponsor specification but their impact will affect the external design and overall building design approach and this can differ according to the particular building requirements and situation.

External or mid-pane shading combined with internal shading is one option that could be considered.

A good source of guidance on the best ways to maximise natural ventilation and daylight in offices is the environmental Design Guide by BRE, 1998.

Figure 5 is an extract from this guide to show some of its approach.

The design tables in the guide take into account the following criteria to help determine if a space is likely to be hot and unacceptable to occupants if only naturally ventilated. In these cases the design should ideally be improved using the aspects noted. Greater use of mechanical cooling may be required if a number of criteria are not satisfied.

Correction factors can be made to take account of location in the UK. If rural or urban, orientation, internal heat gains, window type and placement, if early morning cooling is used (for heavyweight construction only), single or double sided rooms, openable area of window, width or room, visible sky angle, window height in wall and reflectance of internal surfaces.

The tables can be used as part of the design process to help improve a building's performance.

5.4 Overheating

Solutions to reduce overheating, and the use of day lighting, and other environmental and sustainability considerations, can affect a building's image and overall design.

Non-domestic buildings, such as offices, tend to be densely occupied and have additional heat gains from equipment and lights. They generally have lower surface area to volume ratios than smaller domestic buildings, with associated lower fabric losses. They are occupied during the daytime when the air temperature is at its highest and solar gains are present. These factors would probably result in overheating unless steps are taken to avoid it.

The following can reduce the need for or level of mechanical cooling ventilation, and should be considered for each building as a whole. The use of:-

- Shallow plans (such as max. 5x the floor to ceiling height where open plan and double sided ventilation See figures 9, 10 & 11).
- High floor to ceiling heights (3.0 m or greater).
- Natural rather than artificial light, where appropriate.
- Large areas of internally exposed thermal mass, particularly for ceilings/floors.
- Window designs that provide good natural ventilation and day lighting without over glazing.
- Artificial light sensors to compensate for daylight and occupancy levels.
- Low-energy light fittings.
- Appropriate solar shading and building orientations.
- Through ventilation – where the planning of offices etc, will allow. Splitting up cellular offices into small groups so that there is open plan areas full width between, can help.
- Stack effect ventilation routes.
- Allowing occupants a high degree of control over their local environment over-riding automatic controls of lights, louvers, windows and heating.
- Early morning cooling (but only for heavy weight buildings – subject to security considerations).
- Higher performance glazing types, such as Low E, double-glazed.

These aspects are not mutually exclusive and need to be considered together. Where one or more are not possible this is likely to lead to the need for greater mechanical cooling.

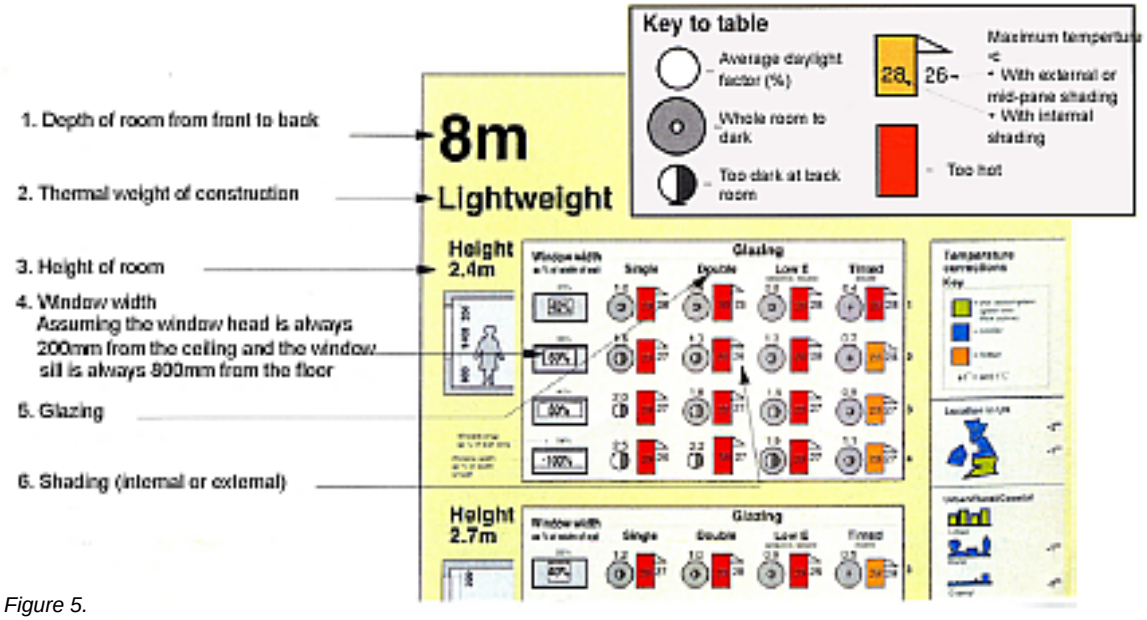


Figure 5.

KEY For Figure 6

1. **External solar gains:** The heating effect of solar radiation on external surfaces conducted into the building interior.

2. **Internal solar gains:** Solar radiation passing through windows.

3. **Conductive gains:** Heating flowing from the hot air outside to the cooler interior through opaque fabric and glazing.

4. V**entilation gains:** Heat carried into the building by warm fresh air introduced to replace stale but cooler air.

5. **Artificial lighting gains.**

6. **Internal gains:** From occupants and equipment.

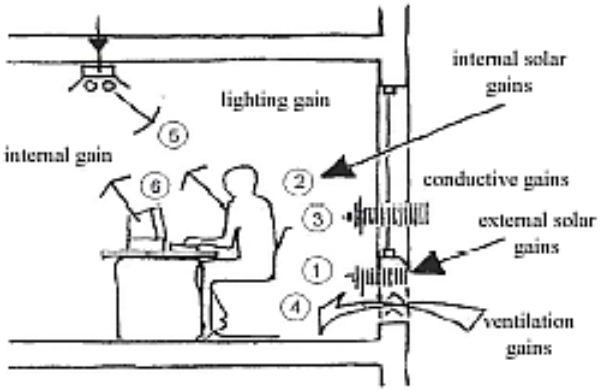


Figure 6 - The main source of Heat Gain.

Reduction at source is always the best strategy. However, residual gains may be rejected by ventilation, provided external temperature is below the internal temperature. The effect of gains may also be moderated by the presence of large areas of medium or heavyweight (high admittance) exposed internal surfaces.
To avoid or reduce the need for mechanical cooling it is preferable to start by using shallow plan buildings. Consideration and utilisation of passive measures such as solar shading, insulation and avoidance of unnecessary artificial lighting, together with items previously in 5.4 reducing the need for daytime mechanical cooling loads to a minimum.

Analysis of the approaches possible and client needs will help determine if a mixed mode solution i.e.: using natural and mechanical means in some form is most appropriate. The aim being to minimise the need to use the mechanical back up. Mixed mode covers two conditions.

a) Has a perimeter zone operating in passive mode (with openable windows, etc.), and air conditioning is used only in certain internal spaces, or where there are particular environments, or

b) Operates for part of the year in a passive mode, and only adopts air conditioning during extreme (warm) conditions. This is commonly provided by local packages as stand alone units and is often referred to as 'comfort cooling'.

The mixed mode approach looks promising as a low energy solution, particularly for large, medium-deep plan buildings, but needs careful engineering design to ensure that the interaction between the passive and air conditioned zones does not lead to energy wastage. For example, if not handled correctly, you could end up with simultaneous heating and cooling in different parts of the building.

For the mechanical ventilation/cooling back up, consider using 'displacement ventilation' and chilled ceilings to be more energy efficient than full air conditioning, but this needs careful building analysis in each case. Some building designs, such as deep plan lightweight buildings, may not allow this.

People want to control their environment

A key finding of case studies of offices is that occupants are prepared to tolerate what are objectively poor conditions if they can take actions which they feel improve their own comfort. For example, in a sealed air-conditioned building they may find 23^0C ± 1^0 acceptable but in a naturally ventilated building they may be happy with temperatures up to 27^0C. In deep-plan offices, people who have a view from a window by their desk – a window they can open in hot weather – are generally far more content than those who are remote from a window.

Some of the images in Figures 7, 8, 15 & 16 show the effects of some more recent environmental design methods.

5.5 Solar Shading

Solar shading is being taken more seriously by many clients and designers and is now included as a factor in the Building Regulations Part L2. Solar radiation gains made through windows is likely to have a greater impact than external solar gains – that of the heating effect of solar radiation on external surfaces conducted into the building interior. The first line of defence is to consider the orientation of the building if this is an option. The major glazed facades where possible should face south or north. The former receiving useful gains in winter, but relatively little in summer, due to the high solar elevation. West and South West facades are particularly vulnerable to overheating from solar gains.

To prevent degrees of direct solar radiation by shading:

- External shading is more effective than internal shading; comparing white louvers in both positions they can be nearly four times as effective. Louvers between panes of double or triple glazing can have a shading performance approaching that of external louvers.
- Movable shades give better responses to varying sky conditions than fixed overhangs, which respond to seasonal solar elevation only. Fixed shades often compromise daylighting objectives during times of lower sky luminance.
- Gains from west facing glazing are more likely to cause overheating than gains from south facing glazing, which can sometimes cause overheating in lightweight buildings, or buildings with lightweight finishes.

Other gains that should be considered are indicated in Figure 6.

Figures 15, 16 and 29 show examples of vertical louvers which are probably the most effective solar shading option, particularly for south facing facades, where used on West and South West facades a motorised type of vertical louver can be more effective due to the lower sun angle.

The Building Research Establishment (BRE) have published 3 useful guides on solar shading:-

- Solar Shading of Buildings – Report 364, 1999.
- Control of Shading – Information Paper IP12/02, 2002.
- Retro Fitting Solar Shading – Information Paper IP11/ 02, 2002.

Solar Gain

It is estimated that un-shaded glass can absorb solar energy at up to 500 watts per square metre during midsummer. Therefore by shading all or a proportion of the glazed façade for the summer months significant reductions in solar gain can be achieved resulting in lower peak loads on air conditioning plant (if used) which in turn can lead to considerably less powerful air conditioning systems being required for the building with a lower initial capital outlay and reduced running costs.

‘Solar Shading of Buildings’ discusses a number of different shading options that could be considered, and discusses the advantages and disadvantages of various factors such as:

- Fixed and adjustable shading.
- Window orientation and the movement of the Sun.
- Loss of daylight.
- Views out.
- Types of glazing.
- Mid-pane blinds and louvers.
- Internal Shading.

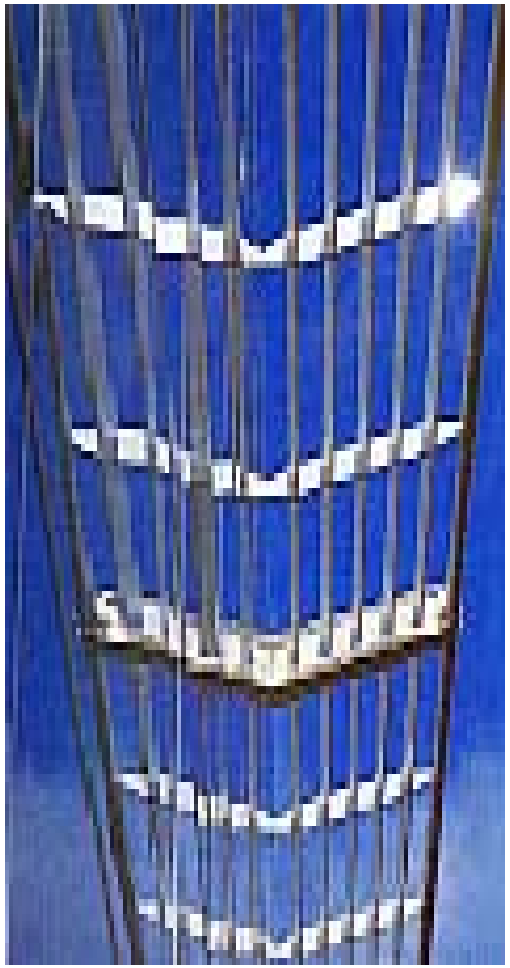
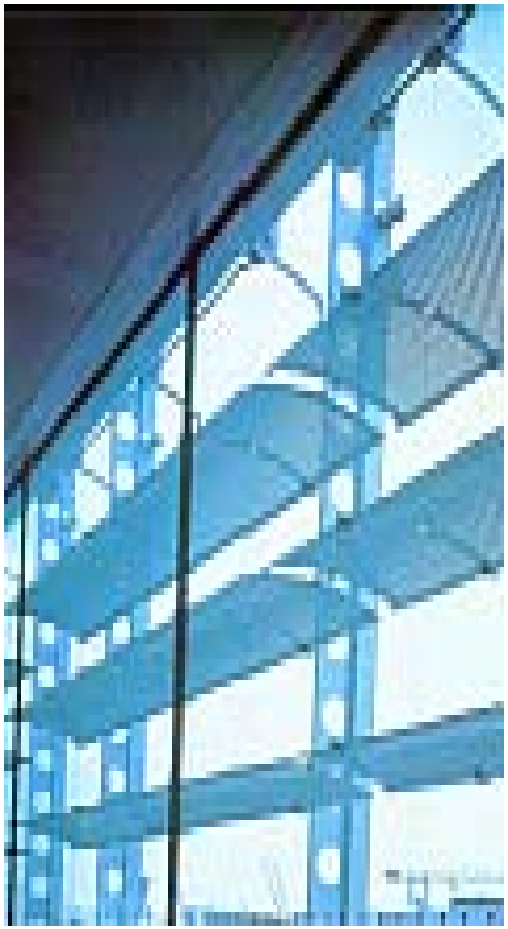


Figure 7 shows an example of the use of external horizontal louvers.



Figures 8 shows the use of vertical perforated metal external louvers.

5.6 Ventilation

The maximum depth a room can be naturally ventilated depends primarily on the level of heat gains on hot summer days. Achieving good indoor air quality in the heating season is a less severe constraint.

The pattern of ventilation is influenced by the type of windows and whether the room is ventilated on one or two sides. (as shown in figure 9 to 13)

Today most office windows have only one opening element but there is a case for having two or three separate opening elements at different levels:

- A small adjustable window close to the ceiling which can be finely adjusted and which can act as a secure night ventilator in summer. It has been suggested that this window should be controlled by people further from the window,
- A large main window high enough not to blow papers, to open on still, hot days to give maximum air movement,
- A small window just above sill height also appears to be popular with occupants for extra year-round ventilation and for night ventilation, if secure.

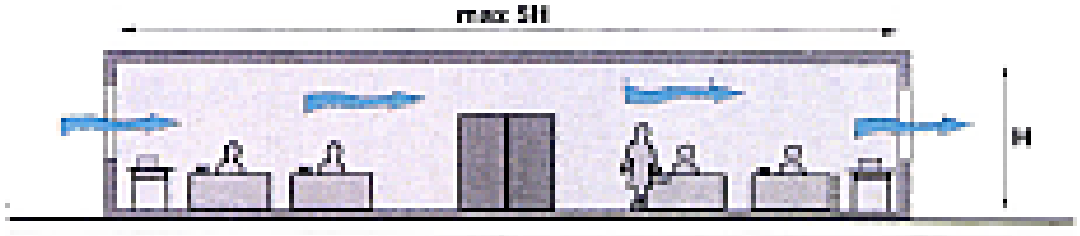


Figure 9. Double-sided ventilation. Wind-powered cross-ventilation is most effective for cooling in summer – for rooms up to five times as deep as they are high.

Figure 10. Wind cannot move through a one-sided room but the turbulence created when the wind meets the building can drive air in and out of the window.

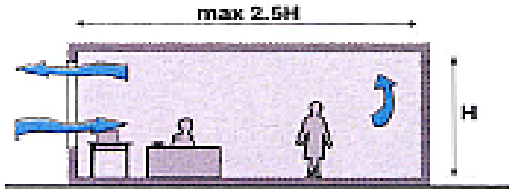


Figure 11. The stack effect can ventilate a one-sided room most effectively if the window is open to its full height, or open at the top and bottom.

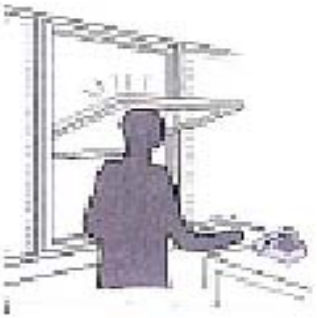


Figure 12. Swivel windows, when fully open, may obstruct both furniture and people.

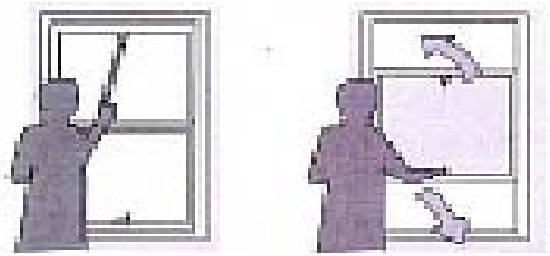


Figure 13. Sash windows can provide trickle ventilation all the year round (left) and good stack ventilation in summer

Air stratification and ceiling fans

Where warm layers of air move to the top and cooler layers form below:

In offices this effect can give a temperature gradient about 1½^0 difference between the head and foot.

Where overheating is a problem as conventional offices installing ceiling fans, as shown in figure 14 can make the space more comfortable but at least 3m height is needed for fans to work effectively.

These aspects help and the way air stratification can help raise pollutants above peoples heads are some of the reasons why high ceilings in offices can be an architectural asset and make environmental conditions more acceptable to their occupants.

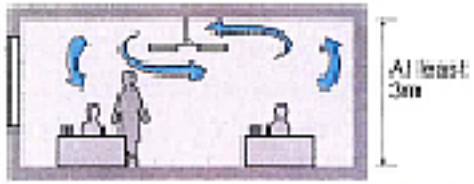


Figure 14. The air movement created by ceiling fans reduce perceived air temperatures by up to 3^{0}c in offices at least 3m high.

Use of Thermal Mass

See 5.22 and Figures 30 & 31 for comments on the use of thermal mass to help reduce the need for mechanical cooling and to help stabilise temperatures.

5.7 Details of Architectural expression of Environmental Control Systems

Building designed to best utilise best environmental guidance will affect the architectural image, both internally and externally. There are many ways this can be done and it is essential that the client's brief, the procurement method, and design team are carefully considered at the outset, to help ensure the most appropriate answer and design is achieved in practice.

Figure 15.

Figure 16.

Ways of controlling solar gain and maximising the use of daylight can be used to reduce the use of artificial light. Using external louvers to control solar light, while still allowing daylight in and views out, avoiding the 'blinds down, lights on' situation often prevalent in offices in winter perimeter of the window.

5.8 Designing for Daylight

One of the attractions of using artificial light has been its stability and predictability. Daylight is always variable and frequently unpredictable. It is these characteristics which account for people's like for daylight and for the sparkle that daylight brings to the interior of a building, but also makes it a challenge to work with. We want daylight and sunshine in the right places but don't like glare, downdrafts, loss of privacy, ultra-violet damage and severe temperature savings.

The lighting, heating and ventilation of buildings, whether natural or artificial are interdependent. Together they have profound on sequences for the form a building will take too much glazing, the wrong kind of glazing, or glazing in the wrong place, will produce heat losses or heat gains which may have to be countered by artificial heating or cooling. Too little glazing usually means too much artificial lighting – and sometimes artificial cooling as well. Daylight design should form part of a considered architectural strategy for the building as a whole.

The important topic of daylighting design is beyond the scope of this document, and there is much guidance on this subject which should be used. The following just highlights a few of the issues.

Window Design

As a general rule of thumb, the higher the window is placed on the wall the deeper the daylight penetration. Where windows are high and unobstructed it is possible to achieve adequate daylight on the working surface for a depth equal to about twice the ceiling height assuming the room is side lit and glazing to wall area ratio about 65% so taller rooms can be day lit to greater depth.

Window frame materials should be light coloured to reduce contrast with the view, and should have a non-specula finish to eliminate glare.

The window jambs and sills can be beneficial light reflectors. Deep jambs should ideally be

splayed (angled to open towards the interior) to reduce the contrast around the perimeter of the window.

Corridors/toilets	100 – 150 lux
General office	500
Drawing office	500 – 750
High precision tasks	1500

Table 1. Shows some typical recommended illuminances.

Various sources list optional luminance for different activities. These are generally based on uniform and constant levels of artificial light falling on the working plane see table 1.

The starting point for daylight design however is not a set of absolute values, but instead the **daylight factor,** which is a measure of indoor daylight illuminances at a given location as a percentage of illuminance outdoors. Recommended minimum daylight factors (DF) for an office is 2% and factory 5% (for Northern European conditions.) lower daylight factors may be perfectly satisfactory for subsidiary spaces such as circulation areas. A particular DF value is a combination of the 3 components note and Figure 17. Daylight within a space comes from three sources:

1. Externally Reflected Component (ERC)

This includes external ground surfaces, adjacent buildings, wide windows cills / louvers. Remember that excessive exterior reflectance can result in glare.

2. The direct sun/sky component (SC)

This if often blocked from occupied spaces because of heat gain, glare and ultraviolet (UV) degradation issues. And making an environment suitable for people near the window can often adversely affect those further away. The use of devices such as light shelves, a shown in Figure 23 can assist with this.

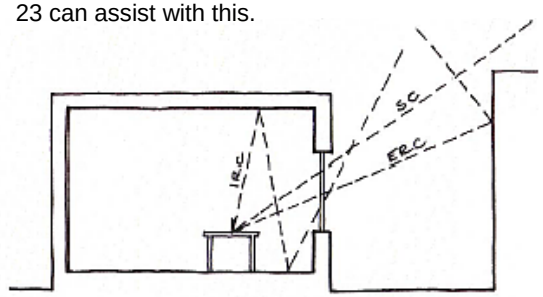


Figure 17. Shows day light factor components

3. Internally reflected component (IRC)

This is the daylight reflected off the surrounding wall, ceiling and floor surfaces.
Surfaces that are reflective but not specula reflections will bounce the daylight around the room without creating uncomfortable bright spots.

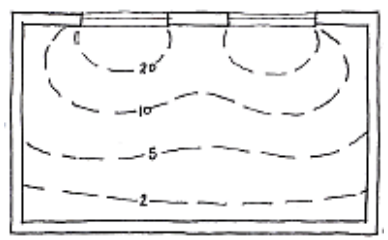


Figure 18. Two-dimensional display of daylight factor curves on workplane or floor.

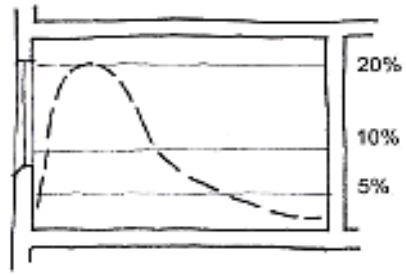
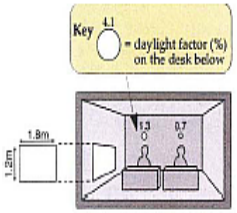
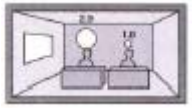


Figure 19. One-dimensional display of daylight factor distribution on the floor in a plane perpendicular to the window.

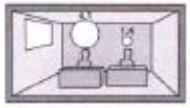
Figures 18 – 19. Show how daylight factors can be mapped once calculated to show the 'DF' within a space. The average daylight factor is the same for all three rooms in figures 20 a b and c but these show how greatly the head of the window affects the actual daylight factors at two desks in the small office. Generally while the higher the window is the greater the daylight factor on both desks. But this could also cause sitting people to lose most of their external view Figure 21.



A) Window down to the floor – poor daylight. See the commentary in the text.



B) Window just above the working plan, getting better.



C) Window head at the ceiling – good daylight, bad design.

Figure 21.

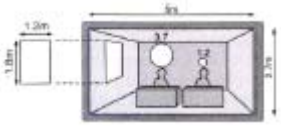


Figure 22. A vertical window – best compromise.

Figure 22 shows how using a vertical window gives a better design. Widening the small window would improve the daylight further.

Light Shelves

A light shelf is a horizontal light reflecting overhang placed above eye-level with a transom window placed above it. As shown in Figure 23 daylight is reflected off the shelf and improves daylight penetration while providing some shading near the window. It can help reduce window glare. These devices are most effective on southern façades. Exterior shelves are more effective shading devices and actually increases the amount of light though the daylight aperture as compared to interior shelves. A combination of exterior and interior shelves will work best in providing an even illumination gradient.

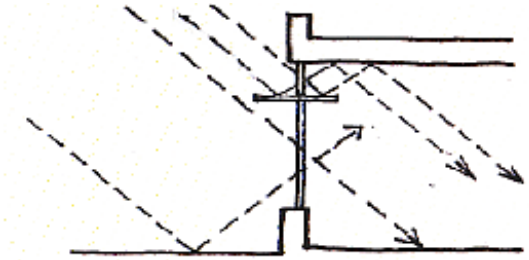


Figure 23 - daylighting light Shelf

These devices should be considered for South faces where external vertical louvers are not being used.

Views

Where a window is intended to provide a view of the outside its design will depend on the nature of the exterior landscape, the size and proportions of the interior space and the positions and mobility of the people who occupy it. A window head that is too low, a sill that is too high on a transom awkwardly placed may cut across the line of slight if people sitting or standing in a room. On the other hand a high sill can be used to screen an unsightly foreground from much of the room. With any window type, apart from a roof light, people positioned in the depths of a room will see less of the landscape and skyscape than do people located by the window, and windows which are very restricted either in height or in breadth reduce the area of the room from which some view is obtainable. Minimum areas of glazing from rooms which are lit from one side only as shown in figure 24 – this total area should be distributed so as to provide some view from all occupied parts of the room.

A British Standard daylight code notes " All occupants of a building should have the opportunity for the refreshment and relaxation afforded by a change of scene and focus… unless an activity requires the exclusion of daylight, a view out - of - doors should be provided irrespective of its quality.

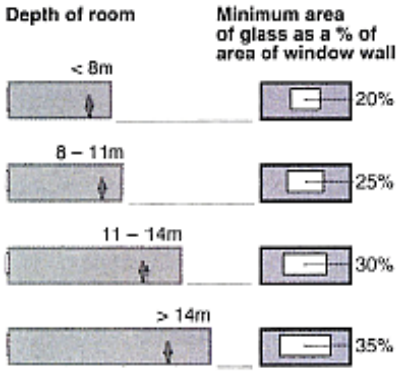


Figure 24. Deep rooms need bigger windows for views.

When developing building layouts and windows views can to be analysed in 3 layers.

- Upper (distant) the sky down to the sky line.
- Middle - fields, buildings.
- Lower (close) - the foreground, for example, plants, paving and people. Views which, include all 3 layers are the most satisfying.

Though not always possible it should be part of the initial aims. Satisfaction with views is much reduced where there is no sky visible.

Top Lighting Strategies

Because the sky is generally brighter at its zenith than near the horizon, horizontal roof lights admit more daylight per square metre of glazed area than do vertical windows. A horizontal roof light is proportionately three times more effective as a source of daylight than a vertical window, they cast their light over a space in a more uniform way and are less likely to be obstructed either internally or externally.

Figure 25. Shows internal view of roof light adjacent to wall

Direct sunlight from horizontal openings can be diffused by translucent glazing, and glare controlled by baffle systems. Good effects can be created by fitting angled reflectors below horizontal roof lights or locating the roof light beside a wall, so that ceilings and walls are awash with light – as shown in Figure 25.

The disadvantage of horizontal roof lights is that compared to vertical windows they can collect more light and heat in summer than in winter – usually the opposite of what is desired. Figures 26 and 27 show standard and improved versions.

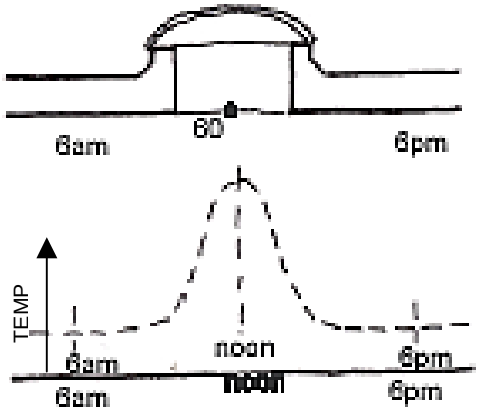


Figure 26. Typical skylight:

- *Shallow well*
- *High daylight and heat gain at noon*
- *Sharp fall off of daylight in am and p.m.*

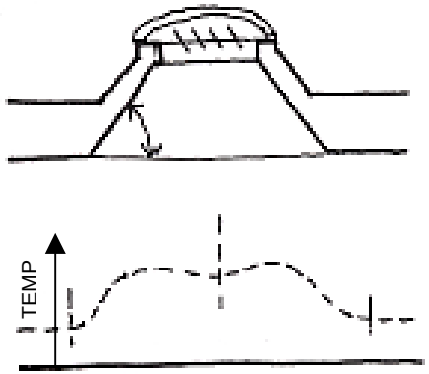


Figure 27. Improved skylight

- *Deep well to soften and spread daylight*
- *Splayed side walls for wider distribution*
- *Pivoting reflectors to reduce noon daylight while increasing am and p.m. daylight*

5.9 Siting and External Aesthetics

The Site Development Strategy is seeking to ensure that new developments contribute to creating the image and character of a 'Science and Technology Park'. The nature of the building materials, colours, design and forms and their relationships to the other buildings and external space will affect the outcome.

The importance of the space between buildings and future phases should be carefully addressed. Movement between buildings and car parking should become as pleasant an experience as possible for AWE staff regarding hard and soft landscaping and pedestrian routes.

The new buildings should in a colour palate as agreed with the ADA to give a fresh clean and

modern science and technology park image which may be enhanced by tree planting. Where pitched roofs are used, colours should be agreed with the ADA raised seam metal roofing as appropriate these can be used in various forms, to admit light into upper floors and to maximise the advantage of the shape and space that can be created for the rooms under. In some situations, it will be beneficial to use the top floors for rooms which, could benefit from the increased height visually, for increased ventilation and daylight, this could influence the overall building layout.

5.10 Building Standards

The buildings will meet or exceed as appropriate, (or required by the brief) Current Statuary Legislation, British Standards, Building Regulations, Statuary Codes of Practice, AWE procedures and Requirements.

The building design will give the appropriate consideration to the following:-

- Being environmentally engineered.
- Providing a good levels of natural daylight.
- Have good solar control.
- Providing mixed mode ventilation.
- Have low energy controllable lighting.
- Offering low operating costs.
- Provide a healthy and productive environment.
- Allow occupant control of the environment.

5.11 Building Regulations

The building should comply with the detailed procedures for compliance with the Building Regulations as set out in the document "Engineering Building Regulations Compliance Model Ref DMP/LL 4854227" shall be followed.

Building projects in the design stage wherever possible shall take into account forth coming changes in the Building Regulations where appropriate and agreed by AWE, BCCO or BCCC.

5.12 Building Orientation

The Project team is required to carefully consider the development of the design, the preferred orientation of the new facades and the implications for solar shading and areas of glazing in determining orientation.

5.13 Building Section

Figure 29 shows an example section through a south facing façade and highlights some of the internal environmental issues that can affect the nature of the facade.

This example is only one approach. While it is one of the most efficient in terms of solar shading. Other approaches should also be considered to find out which is preferable for a particular building and orientation. Considering the factors highlighted in 5.1 and 5.5. Figures 30 and 31 show how the roof can be used to improve the environmental quality of rooms on upper floors.

Figure 32 shows a roof arrangement that can be used to get improved natural ventilation and daylight into a wider block. It is possible to use this method for, say, an office area and then the same block width for laboratories.

Some laboratories may require substantial areas of enclosed or open plant on the roof. If so it this needs to be considered in relation to the other elements of the façade to reduce its impact.

Where there are exposed flues they should be stainless steel clad visually if flues are small in diameter they should be grouped together and equally spaced. See example figure 28. The position of the flues should be considered from a visual aspect as well as function. If placed and designed well they can form interesting features to a building.

Figure 28. Example of equally spaced flues in stainless steel

Louvers reflect high altitude sun-light

Lowest louver on South-side 1.8/1.9m from floor.

Maintenance / access walkways which also act as a shading device (subject to AWE security approval)

Opening window vents at high levels can assist structural cooling at night.

Vertical sun screening system louver's can be fixed or rotating and motorised for optimum efficiency in shading. It is particularly difficult to room over heating from solar gain on Western and south-western elevations due to low sun angles and the increased heat gain from occupants during the day. The use of vertical perforated rotating louver's are a particular advantage on the (W and SW) faces as when closed, they will still allow views out, and give a better light quality. A vertical system of louver's can usually achieve protection against lowest angles of sunlight than a horizontal system.

A system with an access walkway is more costly to install initially but it can offer long term savings in the form of lower façade maintenance costs (subject to AWE security approval). This is only one example of solar shading, the one most suitable will need to be assessed for each building. See items 5.1, 5.5 and 5.13.

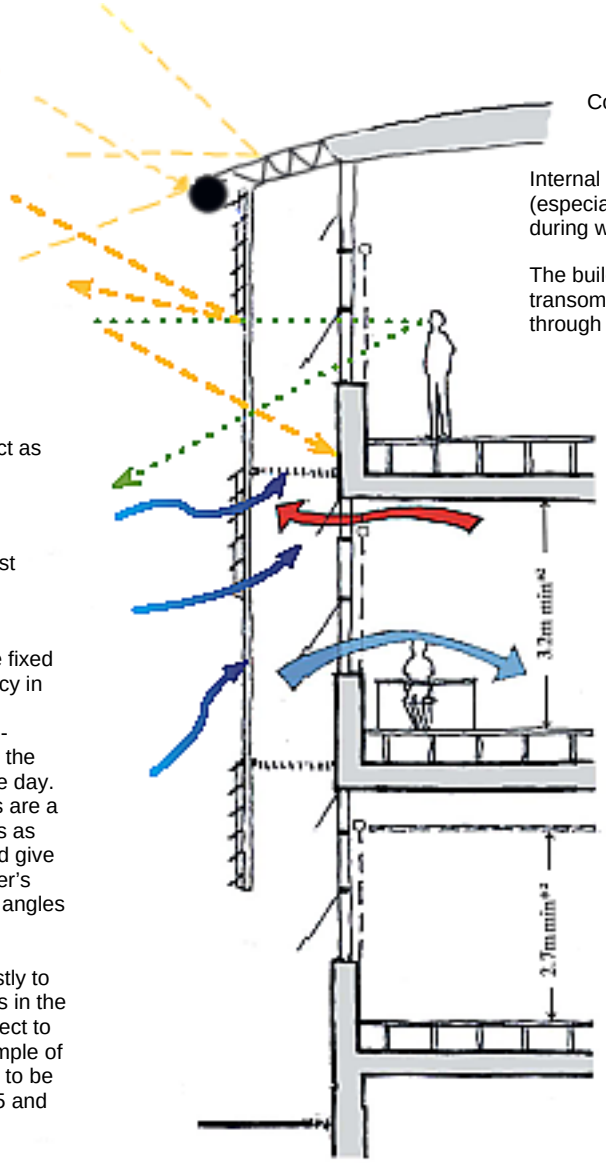


Figure 29. Example of South, East or West facing section using vertical louvers.

Concrete roof slab*1

Internal blinds for glare control (especially for lowest Sun angles during winter months) and privacy.

The building is adjacent to transom to allow ventilation through the upper window.

Raised floor with services below.

Concrete floor *1

Use of concrete soffits act as heat sink in summer.

Higher ceilings to aid air stratification.

Fresh air drawn in.

Where laboratories are required, a suspended ceiling could be added to allow for services / ventilation ducts over.

*1 Preferably, the floor / roof arrangement should expose a heavy thermal mass of concrete to the ventilating air below. Where light weight steel roof and floor slabs are used instead of concrete this will reduce the mass – heat sink capacity of the building and consequently increase the need for supplementary mechanical cooling. Figure 45 shows a range of thermal masses with various floor types with associated ceilings for offices.

The use of light weight floors can also reduce their impact sound and airborne sound reduction acoustic properties between floor levels and, may reduce the floors structural capacity.

*2 Subject to specific project analysis.

Figures 30 & 31 show 2 examples of how advantage can be taken of the roof above the top storey to improve:-

- The special quality of rooms.
- Greater daylight
- Natural ventilation

This approach is particularly useful for larger spaces such as open plan offices and conference rooms.

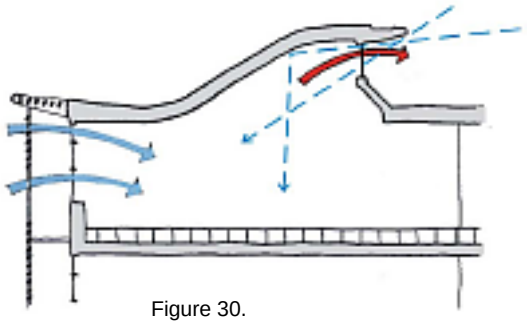


Figure 30.

Clerestory windows

Reflected daylight off ceilings improves light quality and reduces glare

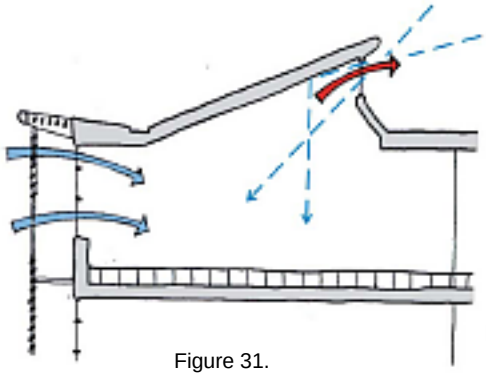
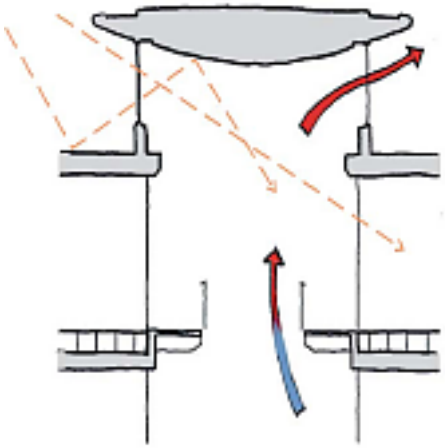


Figure 31.

Light colours on roof reflect daylight into space whilst minimising solar gains.

This arrangement can be useful as a way of increasing a block width and improving natural ventilation and day light.



Use of light coloured ceilings to improve reflectivity.

Figure 32.

5.14 Structures and Building Elements

Both Aldermaston and Burghfield sites have special requirements with regard to Counter Terrorism Measures for all building elements.

Refer to AWE's CTM document 'Engineering Design Guide Counter Terrorist Design Measures' and individual building requirements.

5.15 Maintenance

For each project, a sponsor's specification will be produced detailing the maintenance requirements. This will include the need to:-

- Ensure large plant can be installed or replaced with out undue disruption in position.
- Design the building to ensure a minimum maintenance regime with consideration given to be able to easily maintain systems, components and equipment.
- Address maintenance and running costs.
- Have a spare's listing/policy.
- Have a cost-effective planned maintenance regime.
- Maintain the building, systems and equipment strictly in accordance with the various manufactures recommendations.
- Use materials for roofs that have a guaranteed life (period to be determined for each project), have low maintenance and are relatively easy to repair.
- Allow accessibility for maintenance.
- Optimise maintenance requirements.
- An O&M Manuel is to be prepared for the building, a copy of which will be held by the facilities manager and additional copy placed in a central archive.

5.16 The Duties of the designer under the Construction (Design and Management) CDM Regulations 1994

All designers and design houses are to comply with AWE policies and procedures and the current CDM regulations.

5.17 Storage Space for Recyclable Materials

Where reasonable, secure central refuge stores, for both recyclable and waste material should be incorporated within the project design.

5.18 Use of Thermal Mass

Office and similar type interiors should address the quality and appropriateness of the space for the function and those who have to work in them. They should be responsive and designed to take advantage of the natural environment, and contribute to a general sense of well being for users.

Materials such as concrete have a high 'thermal mass' – the ability to store heat. The amount of heat that can be absorbed in a single day depends on its surface area in a ribbed slab it can absorb far more than a massive column. Any insulating outer layers such as suspended ceilings can prevent heat from reaching the inner layers and consequently make the structure 'very light'. See Figure 33 for some examples.

Exposing a concrete floor can help stabilise temperature, help keep people cool and comfortable, and with the assistance of night ventilating of the floor reduce the need for mechanical cooling.

Concrete floor slabs can be used in conjunction with a steel frame. Figure 34 shows some ways of reducing acoustical problems that can be caused by exposing concrete ceilings.

The BRE study noted that the following are key considerations in incorporating thermal mass into the design of a building:-

- Envelope design - solar control in summer, insulation and airtightness in winter;
- Internal heat gains - electric lighting, local extract, grouping heat sources;
- Operation period - effect of total gains on overheating;
- Ventilation (day and night) - natural, mechanical, mixed mode;
- Thermal mass element - access and capacity;
- Control of night cooling - avoid overcooling;

- Evaluation - methods, performance criteria;
- Acoustics - integration of acoustic treatment, flanking transmission for open ceilings;
- Lighting, sprinklers, and smoke detectors - integration, surface profiling impact of on flow of natural light, soffit finish for uplighting;
- Flexibility - layout / partitioning re: air movement and integration with lighting / profiling;
- Problem areas - top floors with lightweight roof, corner offices with high gains;
- Upgrade strategies - allowances for additional future services.

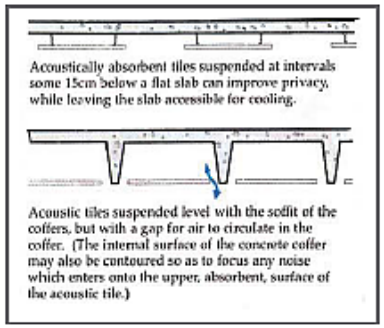


Figure 34. Shows ways of providing acoustic absorption while still getting some benefits from the thermal mass of the ceiling.

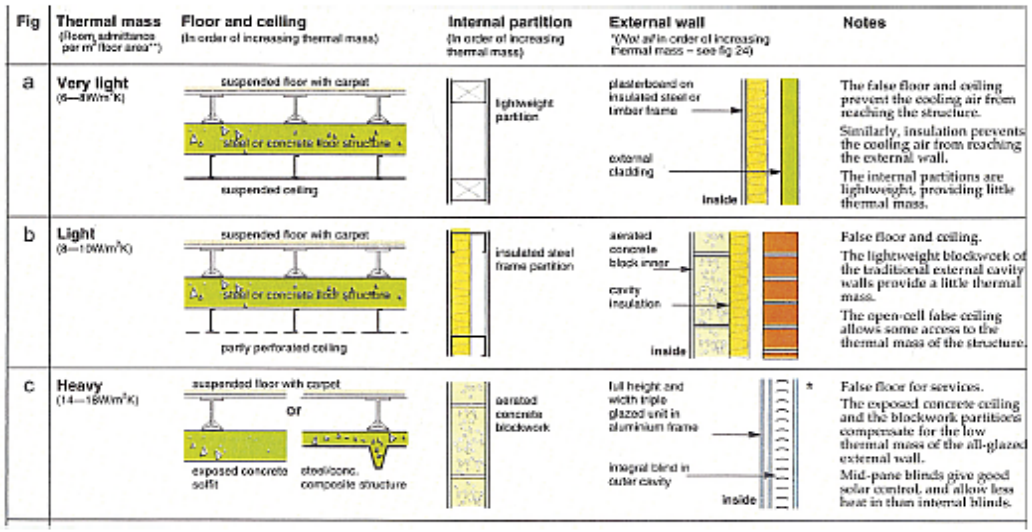


Figure 33. The thermal mass of some typical office rooms.

5.19 Aesthetics and Finishes

External Treatment of New Units at Aldermaston and Burghfield.

a) Massing and Orientation

In general, the roof pitch should be a minimum of 6 degrees. A roof with greater pitch should only be considered for functional reasons such as housing the plant or augmenting the internal environment to encourage passive ventilation. A sloped roof might also be used to improve the internal aesthetic environment, such as roof top lighting in executive office areas. See examples in figures 30 & 31.

b) Construction Elements

Early consultation with the AWE Design Authority (ADA) is strongly recommended, to agree the appropriate palette of materials and the building aesthetics for a particular building.

Suggested palette of materials for wall elements are as follows:-

- Facing Brickwork
- Insulated Render
- Micro Profile metal cladding
- Louvered / perforated mesh for solar control.

Suggested palette of materials for roof elements are as follows:-

- Raised metal seam clad roof of 6 degree minimum pitch either in a curved or pitched format.

- Other forms of roof shall be considered and pursued dependant upon the status of the building and its relationship with the surrounding buildings and its overall status to that of the site.

c) Aesthetics

- Where appropriate, consideration shall be given to defining floor levels on the flank walls to aid with reducing the effect of the building mass.
- It is desirable that the junction between wall and roof elements be expressed, creating the impression of a floating roof.
- Staircase and lifts can fall within the building line or be pulled out as a external feature of the building line accentuating this element of the building façade.
- Consideration shall be given to emphasising the entrance through the use of materials and elements such as canopies.
- Consideration shall be given to integrated gutters.
- Internal down pipes or unobtrusive metal down pipes should be considered for ease of future maintenance and as a possible security measure.

External building materials should follow the palette indicated here; (see figures 35 to 40)

Figure 35
Insulated render system.

Figure 36
Profiled steel cladding metallic grey, fine and wide rib contrast.

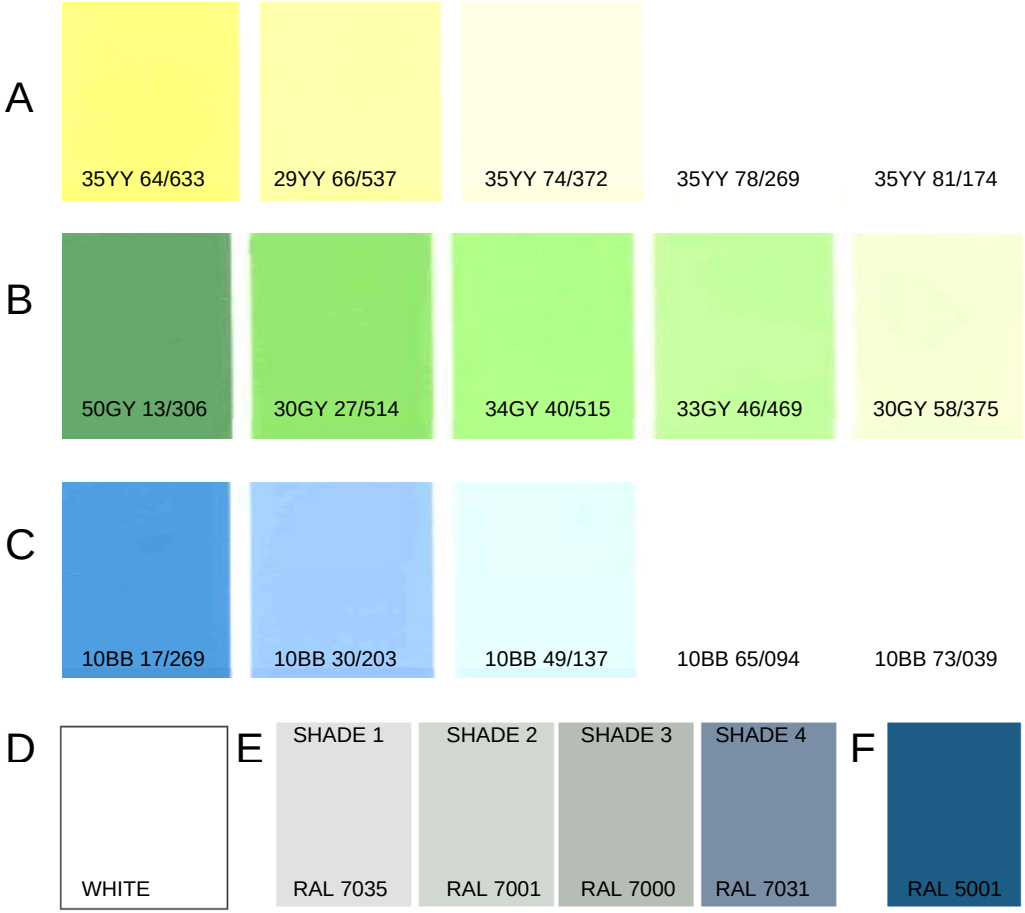
Figure 37
Reconstituted stone blocks.

Figure 38
Aluminium finished louvers.

Figure 39
Perforated metal light shelves/screens.

Figure 40
Curtain walling.

5.20 **External Materials**



5.21 **Colours**

Colour swatches A through C indicate accent colours. The darker tints of each swatch are to be used less than the lighter tints.

Swatch D, E & F are colours most frequently to be applied to the Exterior.

E Shades 1-4, F and aluminium/stainless steel are to be used for window frames, infill panels and spandrel, roof structure, steel structure and service doors as appropriate and agreed.

Consideration should be given to the colour of the following elements in consultation with Design Authority (DA)

- Wall and Roof Elements.
- Eaves and Verges.
- Doors.
- Window Frames.
- Infill Panels.
- Columns and Bracing.
- External Louvers.

NOTE

This page does not give a true colour rendition. Reference numbers refer to Dulux Paints only.

6.0 NEW INDUSTRIAL BUILDINGS ARCHITECTURAL DESIGN PRINCIPLES

6.1 General information

For general comments see also sections 1.0, 2.0, 3.0 and 4.0.

Most of the general summary comments and building project requirements listed in section 5.0 will also apply to New Industrial buildings and where relevant should be included. Where a new industrial building includes offices or similar areas, nearly all of the comments in section 5.0 will apply to those areas. The main exception is likely to be aesthetic requirements, which will usually need to be in line with the comments in this section.

While project teams should use the design requirements in this document, before finalising the type and cladding profiles, finish and door window designs, comments / agreement should be sought from the AWE Design Authority (ADA).

All cladding systems employed are to comply with the latest requirements of the Building Regulations.

6.2 Wall Cladding and Windows

a. Cladding to be composite (sandwich) panel. Steel frames etc. to be designed to suit.

b. Cladding generally to be taken near to the ground. Where there is a risk of damage, where possible and appropriate to the overall design, use the approaches noted in 6.3 to protect it.

c. Specific cladding profiles and joint types will need to be approved by the AWE Design Authority for the individual building. Generally it is proposed that the more prominent profile sheet be used such as a RW Trapezoidal type profile by Kingspan (see Figure 41) or similar approved for industrial type buildings. In prominent locations such as South Road it is proposed that a micro profile cladding be used such as Kingspan micro-rib (see Figure 42) or similar approved.

The use of vertical or horizontal cladding should be considered on a project basis.

d. Where window infill panels are being used any recessed edge details should be designed to be consistent and look continuous for the windows and false panels.

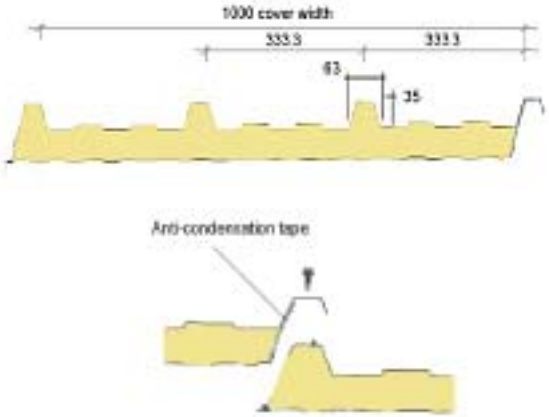


Figure 41. Shows RW Trapezoidal type profile and joint detail. For notes on thickness see 6.8.

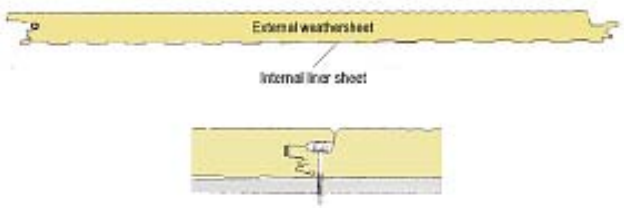


Figure 42. Shows Micro – rib panels and joint details.

Figure 43. RW wall panel vertically laid (this is at a smaller scale than the horizontal ribs shown in figure 44 both are at 333.3 centres).

Figure 44 - RW wall panel horizontally laid (windows would need to be designed to suit).

Figure 45 – Micro – rib wall panel horizontally laid (windows would need to be designed to suit).

a) See also item 6.6 for colours, 6.8 for thermal insulation type and 6.9 for Thermal performance.

b) With the type of insulation (HCFC free/LPC) noted here Kingspan have a minimum 500m^2 rolling size.

c) Where window infill panels are being used any recessed edge details should be designed to be consistent and look continuous for the windows and false panels.

d) Where brick plinths are being used below the cladding they should be dense engineering brick work in a grey / blue (such as Staffordshire blue engineering bricks) ideally the visible brickwork at the base of the cladding would not exceed 3 courses.

Figures 46 and 47 show 2 typical head and cill details between cladding and windows, with associated photos see figures 43 to 45. Those shown in figures 46 to 49 are suited for where the RW wall panels are used. Either can be used for the Micro Rib walls and should be determined on a project specific basis depending on whether a flush or recessed appearance is preferred.

Figure 46. Typical head and cill detail through a recessed window used with an RW type profile cladding.

Figure 47. Typical integral window / cladding detail used with the micro – wall type cladding.

Figure 48. Recessed windows in profiled cladding

Figure 49. Flush window in micro wall cladding.

6.3 Wall Protection

Where required suitable impact protection is to be placed round exposed parts of the building to protect from vehicles which are passing, loading or unloading (particularly near doors) and where there is a risk of knocks from pedestrians.

Use either tubular type rails as shown in figure 50 & 51. Alternatively where appropriate kerbs could be set at a distance from the building as shown in figure 52 which will provide some protection. Gravel (rather than grass) should be used between the building and kerbs.

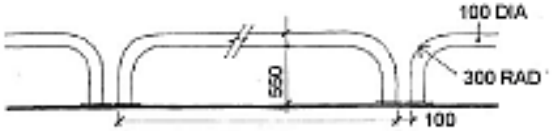


Figure 50. Length to suit specific situations – use equal lengths in one stretch.

These sizes are to suit cars, where larger heavier vehicles are likely to hit them they may need to be increased to suit the sizes and loads envisaged.

Figure 51. Examples of the protection rails in use, the rail should either be the same blue as used for doors etc. if used, or the same as the cladding to suit the particular project.

Figure 52. Shows kerbs set back from the building.

6.4 Roofs

Where appropriate composite panels could also be used for the pitched roofs, for similar reasons, as for wall elements.

In some situations a more sculptured approach could be considered for roofs and walls but this will need to be considered for the individual project.

6.5 Eaves and Verge Details

The eaves and verges should be detailed in a manner to portray a modern science & technology park image. See figure 45.

Safety for roof access should be addressed using appropriate ‘safety rails’, ‘Mansafe’ or similar devices. Having the boundary wall can provide extra safety at the edges. Gutter calculations should now comply with BSEN 12056-2000-3 (this has replaced BS6367:1983) and complies with the European standards to which all rainwater calculations must now comply.

6.6 Colours and finish

a) Wall and Roof colours

The colour palette of the wall cladding and roof is to be agreed with the AWE Design Authority (ADA), (Early consultation with the ADA is recommended).

The particular finish and colour of walls will need to be decided for each building and position.

b) Colours of Eaves and Verges etc.

The top edges of the building can be a contrasting colour to the wall cladding.

Figure 53. Examples of the use of silver and blue doors, or using a blue lining rather than door colour to articulate the opening.

c) Door Colours

Doors can be a contrasting colour. Choice to suit requirements of each building.

d) Window Frame Colours

These should be in the same colour as the door openings. The colour palette for these elements is to be agreed with the AWE Design Authority (ADA) to suit the particular project.

e) False Infill panels as part of strips of windows

Where these are used they should be designed to look similar to the windows units externally.

f) Structural Columns and Bracing Colour

The colour palette for this element is to be agreed with the AWE Design Authority (ADA). In general it is to contrast and compliment the colour of the wall element.

g) External Louvres (to chiller rooms etc.)

The colour palette for this element is to be agreed with the AWE Design Authority (ADA.). In general it is to contrast and compliment the colour of the wall element. See figures 54 to 56.

Figures 54 and 55. Show use of blue for external structural columns on grey silver cladding.

Figure 56. Colours for industrial buildings – see 6.6 comments.

6.7 Thermal Insulation Type

The insulation in the building fabric should comply with current AWE policy regarding thermal performance, CTM requirements, and Part L2 of the current building regulations.

6.8 Thermal Performance

The overall insulation levels of roofs, floors, walls and windows as a minimum should comply with Part L2 of the current building regulations and AWE policy.

6.9 Internal Environment

The production of a well balanced internal working environment in which people work, careful consideration should be given to the following elements. Views out, use of daylight and natural ventilation, the use of solar shading should be considered, and where needed, reduction in solar heat gain.

6.10 Natural Ventilation

Wherever possible within operation areas of the building, natural ventilation should be employed. The minimum standard for this element of the building should be that of the current building regulations and AWE policy.

6.11 Natural Lighting

Natural lighting is desirable in office and operation areas to improve the level of visual comfort. A suitable day light factor should be achieved in accordance with the current recognised / approved design guides. The interior can be lit by either roof lights or windows or both.

6.12 Solar Shading

Where windows face other than North, solar control measures should be considered. This is particularly important for South and West facing

windows. Where possible avoid West facing window and consider horizontal louvers on South facing windows.

6.13 Adequate Views

Good views can improve occupants well being, therefore where possible and appropriate, provide an adequate view of the outside from the operational areas and offices. In order to provide a complete view of the outside the observer should be able to see the ground, the horizon and sky. Therefore, window-sill height should be no more than 1.1 metres and head height of least 1.8 m. The amount of glazing provided should be in accordance with guidance on minimum window area for a satisfactory view given in British Standard BS 8206: Part 2: 1992 (Ref.) and shown in table 2.

Depth of room	Minimum glazed area as a % of area of window wall
Less than 8m	20%
8-11m	25%
11-14m	30%
Greater than 14m	35%

Table 2. Minimum glazed area for a satisfactory view (see figure 24 for diagram of this)

6.14 The design and positions of windows, doors, escape stairs, canopies, flues, etc.

a. The size and positions will partly be determined by internal room, daylighting, need for views, ventilation, escape and access requirements. However, these issues should be considered in conjunction with the design of the building and facades as a whole. For instance, the use of strip or circular windows, and different arrangements of windows and doors could improve the overall image and give greater variety. Canopies and/or cladding arrangements can help emphasis main building entrances. These elements can take on greater prominence when used on simpler buildings.

b. Project teams should discuss their proposals with the architects during the initial phase of the design.

c. The positions of some windows may be required to be placed away from potential blast areas.

d. The design of the escape stairs should be considered carefully, as well as providing the functional requirements and not being circular, they should be simple but elegant in their design and construction due to their prominence. Consideration should also be given to their colour. This can either match the cladding colour or contrast with it in a different shade of the same colour.

6.15 Recycled Materials

Where possible and appropriate use:-

- Suitable uncontaminated demolition material in fill and hard-core or a granular road base as both.
- Crushed concrete aggregate complying with the quality and grading requirements of BS 882: 1993 for use in concrete for foundations, over-site slabs, hard standing, paths or site roads.

6.16 Blockwork

Where possible blockwork should contain at least 50% by volume of waste or recycled material.

6.17 Construction

High construction standards need to be ensured, particularly with the increased air permeability and insulation requirements and the need to avoid air leaks, as part of Part L2 Building Regulations requirements. Specifying the use of devices such as thermographic photography and air permeability tests and note that where there is none compliance this will have to be rectified, can help ensure higher standards.

6.18 Health and Safety

In addition to the HSE requirements, consideration and provision must be given to the safety for future maintenance and cleaning. Fixings and anchors for harnesses and ropes are to be provided where necessary. Appropriate use of materials for a location or locations in line with current design guides and practices should also be employed.

7.0 EXISTING BUILDINGS - EXTERNAL TREATMENT ARCHITECTURAL DESIGN PRINCIPLES

7.1 Structure and Building Regulations

All proposals to existing buildings are based on the assumption that these buildings, where required, will be substantiated structurally and constructionally, and upgraded to satisfy appropriate functional criteria such as fire safety, disabled, part L2 air tightness legislation and upgrading insulation and energy efficiency.

This is also an opportunity for the systematic removal of asbestos material which occurs internally and externally throughout the site.

7.2 Services

The rationalisation of services in all sectors and their future implementation is fundamental as obviously this has functional and visual implications site wide.

This is a high risk item. Proposals where possible should be designed to minimise disruption to existing water, electricity, gas and steam services, telephone and IT are kept to an absolute minimum. The operational policy of each building should be assessed, as part of a refurbishment checklist. The opportunity for rationalisation should be implemented on a building by building basis. This particularly applies to Waste removal and materials storage policies. It is assumed that even simple tidying up measures such as relocating and hiding air conditioning units on the roof should be considered as part of any new requirement or refurbishment of an existing building.

7.3 Design Principles

In making the proposals for the upgrading of the environmental and visual impact of existing buildings to that of a Science and Technology Park the following principles have been considered:

- **Building functional use relationships / site strategy.**
- **Security and safety parameters** sections 5.14, and 5.16.
- **Environmental strategy route rationalisation for staff, visitor's vehicles and goods.**
- **Spaces for people / landscape.**
- **Visual cohesion / architectural palette.**

7.4 Visual Cohesion

The site area excluding the Citadel is composed of a variety of buildings ranging from masonry construction to steel framed with metal cladding or curtain walling. Many are in varying degrees of condition. Roof construction is predominantly flat with roof light or clerestories.

7.5 Massing and Orientation

The single most important factors for the degree of visual improvement to be implemented on each building are its location and orientation.

For example, exposed blank or visually poor corners and cluttered vistas along the south road need to be targeted.

Introducing a controlled variety of cladding materials, the apparent massing of a building can be reduced, remodelled and enlivened.

A second skin' can be the most cost effective way of regenerating the appearance of a building. This element and can be self supporting and ideally have an effective solar response allowing for solar heat control natural ventilation (unless air conditioned) and glare.

The associated architectural forms of this environmental strategy can be used to develop a sharper 'High-Tec' aesthetic to existing buildings through the addition of louvers at window head level.

7.6 Functional use and hierarchy

A hierarchy of specification and level of improvement needs to be established between offices, laboratories and workshops and industrial storage buildings.

Industrial buildings depending on location fall in a lower priority, however examples for controlling the impact of massing are shown in section 4.0.

Laboratories and workshops should fall in a higher grade. In this function group robustness of external and internal cladding material and freedom of service access are considered of more importance

Offices and some laboratories require the highest user - friendly and therefore highest specification finishes.

It is suggested that functional use could be expressed through colour in a restrained manner without compromising security.

7.7 External wall finishes and Entrance Treatment

Recommendations are composed of common features and variants specific to each building as follows: see figures 57 and 58.

7.71 Common features

- Change of material around main entrance.
- Change of material to flank walls.
- A main entrance canopy.

7.72 Palette of Base Materials

- Insulated render over existing masonry.
- Replaced framed panels/glazing systems.

7.73 Palette of Accent Materials

- Self coloured render.
- Mesh cladding.

7.74 Palette of Canopy Materials

(a) Common features

- Asymmetrical colour coated steel framed flat roofed canopy of fixed width. Steel channel fascia edge and metal ceiling lining with integrated lighting.

(b) Variants

- Length of canopy.
- Method of fixing**-** free-standing or cantilevered from existing structure.
- Glazed panels or top lights.
- Feature wall finish.

7.8 Windows and Doors (see figures 58 & 59)

In the event of existing windows being replaced, all new windows should follow the design guidelines set out in the new buildings section of this documents**.**

It is recommended that windows above all main entrances are replaced to complete the main entrance panel treatment.

Generally minor use doors should be painted a recessive colour i.e. all fire doors, single leaf and double leaf service doors.

Large scale access doors and solid main entrance doors where appropriate should be emphasised, or painted in the accent for the building see figure 58, or as noted for figure 53. But this will be subject to specific buildings proposals.

Glazed main entrance screens should also be replaced.

7.9 Roof Finish

Obtrusive rain water pipes on the South Road elevation where they encroach on new entrance panel zone may need to be relocated.

All South facing building windows along South Road and site wide, where relevant should be treated with a solar protection response along the design guidelines out lined for new offices.

Entrance Definition Wall Materials

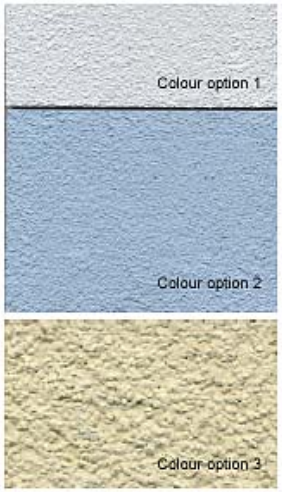


Figure 57.

Self coloured renders
Finish colour options 1, 2 & 3 or apply feature screen finishes
Finishes option 4, cedar slats
Finish option 5, aluminium mesh
Finishes option 6, tension wire and planting

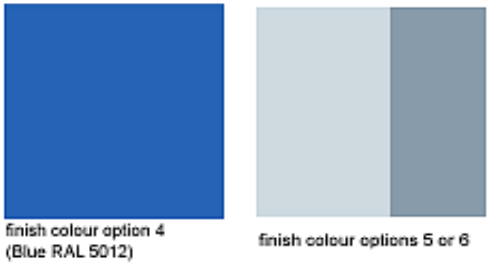
Note this page is not a true colour rendition.
Refer to samples and specification.

Figure 58.

Where appropriate (to suit each project) main services access doors or their linings to be in accent colour 4 (Blue RAL 5012), silver, or grey to suit the particular design, or other approved. Other services access doors to be grey/silver – similar to the adjacent cladding.
Also see figure 53 for examples.

All existing doors, windows, spandrel and infill panels to be painted colour option 5 or 6 as specified.

Figure 59.



For all new windows take C1-5 and D2.1 as models and paint colour options as above.

8.0 INTERIOR DESIGN

8.1 GENERAL

New and refurbished building interiors shall accord with the guide lines of this section and comply with the relevant requirements of the Building Regulations, DDA and BS8300.

8.2 FLEXIBILITY

Flexibility should be incorporated within partition layouts wherever possible. This can nominally be achieved through the arrangement of their layout or a system of demountable partitions.

Consideration should also be given to access floors and datum trucking, maximising the flexibility available to services and the position of electrical sockets and switches.

This will allow for easy alteration / adaptation in the future for different processes and functions to take place within the building, increasing its future flexibility.

8.3 AESTHETICS

The image of the interiors are to reflect a modern organised, business environment decorated in a suitable manner in accordance with the colour palette in section 5.0.

It is the intention where possible for new accommodation to maximise the use of open plan arrangements, employing a suitable modular furniture system where applicable to achieve this ideal (see figure 60 – A to H).

8.4 MATERIALS / FINISHES

Consideration should be given to the quality of the materials used within the interiors. In general contract grade materials should be used.

Finishes to wall elements and floors should take into account the textural requirements of the current Disabled Discrimination Act (DDA).

The various finishes to the materials can be used in an innovative way to define areas, tasks and functions throughout the interior of the building (see figure 60 – A, B, G).

Different materials can be used in an imitative way throughout the interior to create a series of visual sign posts giving order creating a unique environment which is easy to visually relate too.

8.5 FEATURES

Features within a interior can take many forms, and can be expressed in water features usually found in front entrance areas, bespoke seating areas, curved feature walls to name but a few of the many features available to punctuate an interior.

These features need to be given careful consideration and used with caution within an interior to achieve the best results.

Used wisely these features can give a richness and statue to the interior, which would otherwise be lacking.

8.6 COLOUR

Colour is too important to consider merely as an aspect of aesthetics. It greatly affects visibility, effectiveness, feelings and behaviour. Colour can create conditions that can cause fatigue, increase stress, decrease visual perception, damage eyesight, increase possible worker errors, and negatively affect orientation and safety. Incorrect use of colours and patterns in interior and exterior environments can create visual impairment and cause serious accidents.

Colour has a lot of unexplained rules, about how to use it that if not articulated, is hard to capture intuitively.

The rule of thumb for good colour contrast within an interior, as with other elements of design stems from the “Golden Mean”. The rule of thumb being a 70%, 25%, and 5% split between colours.

To explain this further, the main colour (70%) would nominally be applied to the floors and possibility some areas of the wall element. A lighter tone (25%) would be applied to features such as upholstery. The contrasting colour (5%) is used to highlight the overall scheme in the form of desk lamps, wall hangings or focal points within the area such as break out areas decorated in the contrasting colour.

An alternative to using the main colour (70%) on the wall elements, they can be painted in a cream, so that the shell of the room shows off everything else.

If this area of the colour spectrum for the wall elements is used, Creams, beige, mushroom camels, beige and grey’s, which are considered

to be neutral colours, you can discount them from the main colour (70%) thus allowing you to use more of the colour on floors, fabrics and furniture.

Care must be taken when choosing colour combinations and it must be borne in mind that this is a specialist field of design in its own right.

8.7 LIGHTING

Lighting should be an integral part of the overall interior design. Levels of lighting should be appropriate for the tasks and functions that an area is intended to support, with a degree of flexibility incorporated to allow for the functions of that area to change without a detrimental effect to the require lighting levels.

The lighting units themselves within any given area should be a combination of ceiling units giving a background lighting level and specific light units for specific tasks (see figure 60 – D, E, H).

8.8 MAINTENANCE

Materials for interior use should be chosen with care and with a view to match the tasks of the environment into which they are being put, thus minimising the required amount of maintenance.

Access to services ducts and there size should be considered carefully to accommodate the proposed services with an inbuilt capacity for future alterations / flexibility.

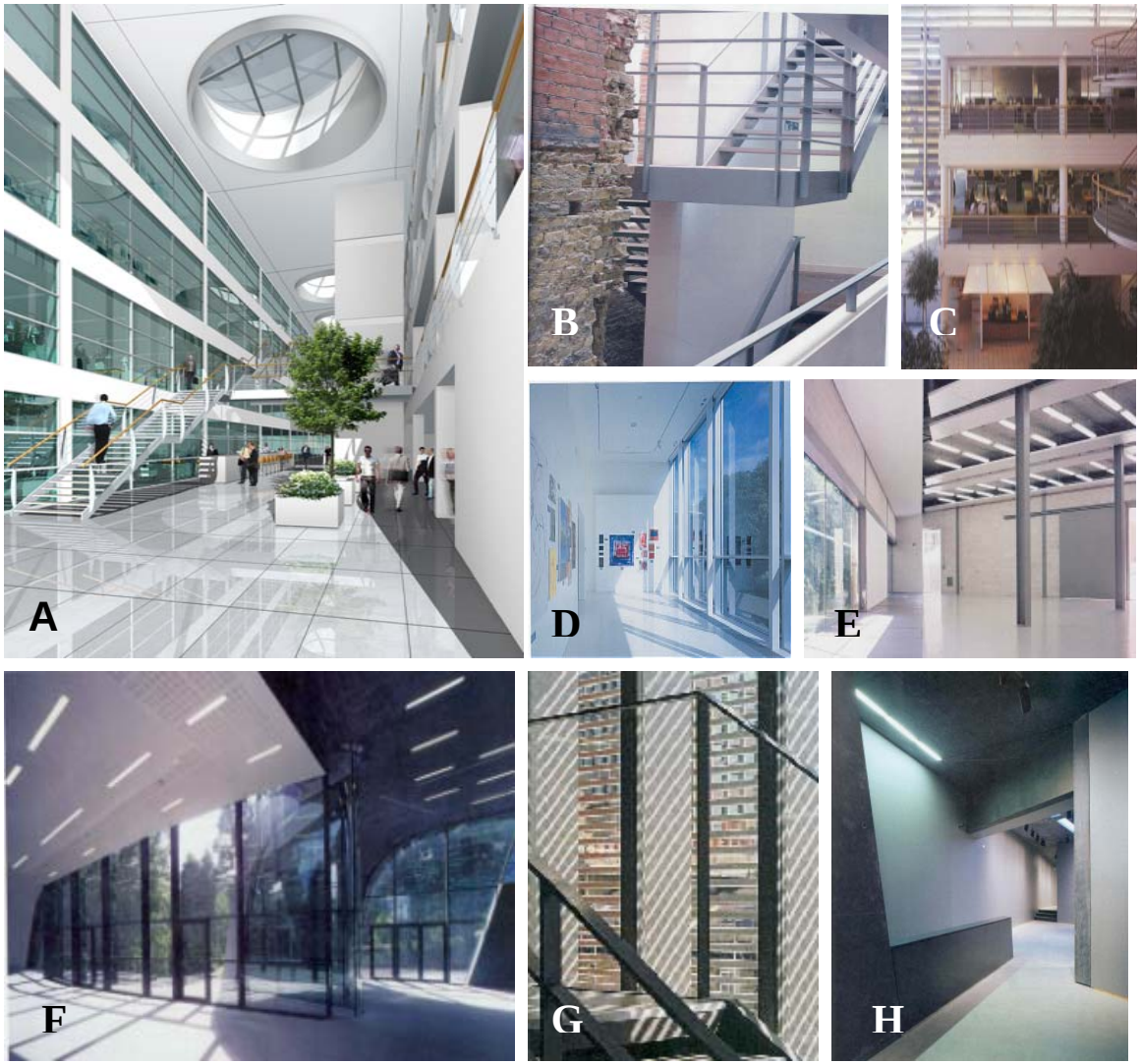


Figure 60.

9.0 LANDSCAPE ISSUES

9.1 Introduction

Landscape components contribute significantly in the establishment of character and uplifting exterior environments. Together they can form distinctive and coherent landscapes that bring about visual continuity and a strong sense of identity. In the case of AWE this is crucially important as the site is made up of diverse areas and uses which demand a way forward that helps to bring about a more unified approach. Well designed co-ordinated landscapes also improve the image and function of the working environment. At AWE where a science park image is the vision this is of fundamental importance.

Landscape Elements include:

- Hard Landscape
- Street Furniture
- Car Parking
- Soft Landscape
- Signage
- Lighting
- Security Elements

9.2 Hard Landscape

The overriding objective should be to keep to a limited palette of materials, and achieve a simplicity of design.

For this site, where a clean contemporary science park image is to be projected a standard palette of materials is to be used, that includes concrete slabs, pavers bound gravel, and asphalt that can be applied site-wide.

This palette would relate to a general application that responds to durability and cost. In order to emphasise focal spaces, building entrances and areas of special character more prestigious natural materials would be used such as stone and brick.

Detail design should conform to inclusive mobility and disabled access recommendations set out in department for transport (DfT) guides and BS8300:2001codes. Refer to website: www.mobility-unit.dft.gov.uk/inclusive for relevant inclusion and mobility guidelines, information and updates.

Principles

- Use paving treatments to clearly differentiate between pedestrian and vehicular traffic.
- Use specific pavement treatments using colour, pattern or material change at key locations.
- Use square, light grey coloured concrete slabs, in stack bond for pedestrian spinal routes.
- Use contrasting coloured bound gravel for free flowing feature spaces, cycle lane definition and some parking spaces.
- Use interlocking grey coloured concrete pavers for crossovers and small space improvements.
- Use blue-brick and grey granite as feature paving.
- Use asphalt for large-scale vehicular areas.

Recommendations

A Granite:- Light grey, sawn, flame finished granite paving ref. S380 supplied by Pomery Natural Stone.

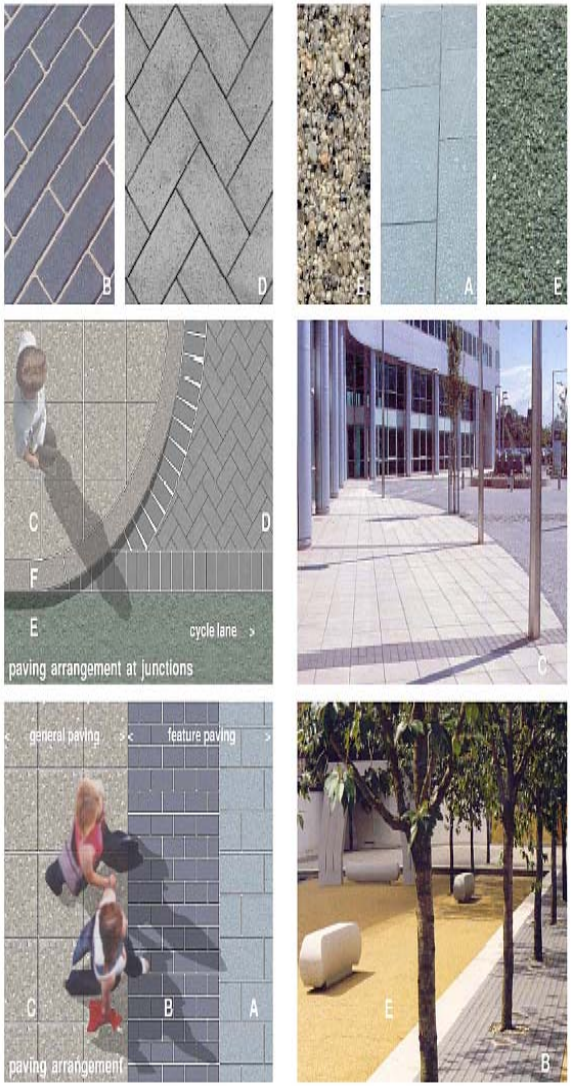
B Brick:- 'Slim pave' blue dragfaced, chamfered brick 200 x 66 x 65mm supplied by Baggeridge Brick plc.

C Slabs:- 'Appalachian' grey textured concrete slabs 400 x 800 x 65mm for general application with larger modular size 600 x 600 x 50 responding to large scale spaces supplied by Charcon. Laid stack bond.

D Pavers:- 'Parliament' grey concrete block 200 x 100 x 65mm supplied by Charcon.

E Bound Gravel:- Resin bonded surfacing supplied by Ayton Asphalt Ltd.

F Kerbs:- Standard pre-cast concrete (refer BS 7263)



9.3 **Street Furniture**

Street Furniture imprints significantly upon the quality of external spaces. Chosen carefully, and planned with thought and consideration, it can contribute significantly to the visual and functional qualities of external spaces. The formation of a unified approach is important in seeking to achieve unity throughout the landscape.

Principles

- The style of the furniture should be modern, simple in form, and crisp in detailing. Materials should be light and natural coloured, such as stainless steel and a combination of timber. The placing of furniture within spaces should be such that they contribute to the architectural expression of a space by, for instance, forming a focus, a repeating element, or defining and enclosing a space.
- Street furniture should be made of durable, low maintenance and sustainable materials.
- Street furniture along pedestrian corridors should be out of the flow of traffic.
- Flagpoles, fountains and public art should be used in prominent, highly visible areas.

Street furniture includes:

- Public art
- Seats
- Tree grilles
- Bins
- Raised planters
- Bollards
- Cycle shelters

Recommendations

A Seating:- Standard seat to be 'foil' supplied by Factory Furniture comprising Cumaru hardwood from a replenishable source fixed to cast aluminium supports. The 'foil' bench measures 2010 x 400 x 450mm High. Ground or wall cantilevered. In special circumstances curved seating is available.

B Bins:- Supplied by Factory Furniture.

C Bollards:- Supplied by Factory Furniture.

D Tree grilles:- Supplied by Factory Furniture.

E Raised Planters of hot dipped Planters:- galvanised steel frame construction with timber cladding detailing. All planters to incorporate self watering / reservoir system and to be moveable by forklift. Tree planters – 1500mm max diameter square, 800mm max height, shrub planting to suit. Supplied by Factory Furniture.

F Fencing:- For the purpose of this document, security fencing remains the prescribed AWE standard. Boundary fencing is UNI Steel Cage fencing, 1.43m height, finished with Adronit Triplex plus standard colour paint RAL 7030 "stone grey". Supplied by MM-Aronit Ltd, Bristol.

G Cycle Stands:-3. Cycle stands supplied by Factory Furniture. Hot dip galvanised finished.

9.3 Car Parking

The Site Development Strategic Plan concept is to rationalise and consolidate car parking by the removal of a significant amount of parking from building frontages and encourage parking in newly created or reorganised car parks specifically located to serve key sectors of the site.

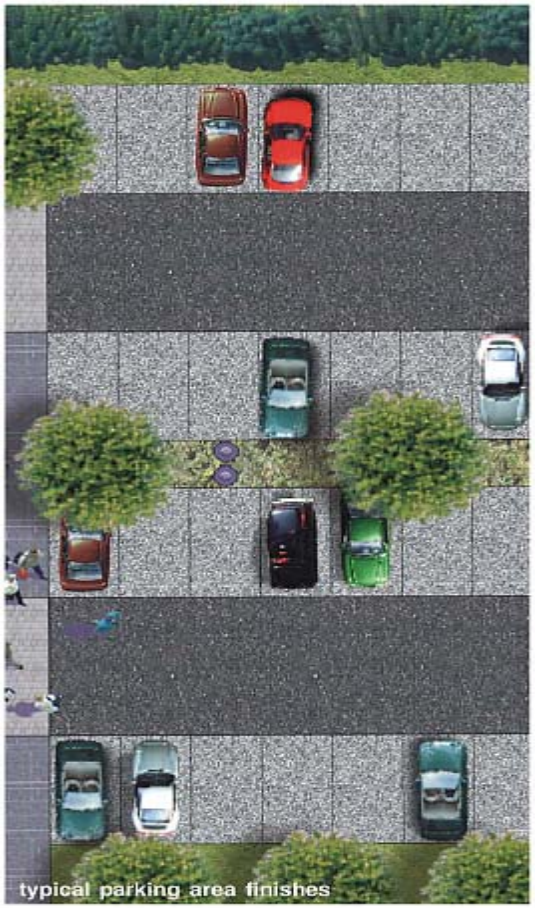
The objective is to ensure that both new and existing car parks are seen as an integral part of the landscape framework and not unfortunate voids dominated by hard surfacing and rows of cars. It is important that the treatment of these areas should also reflect the intended environmental qualities of the remainder of the site.

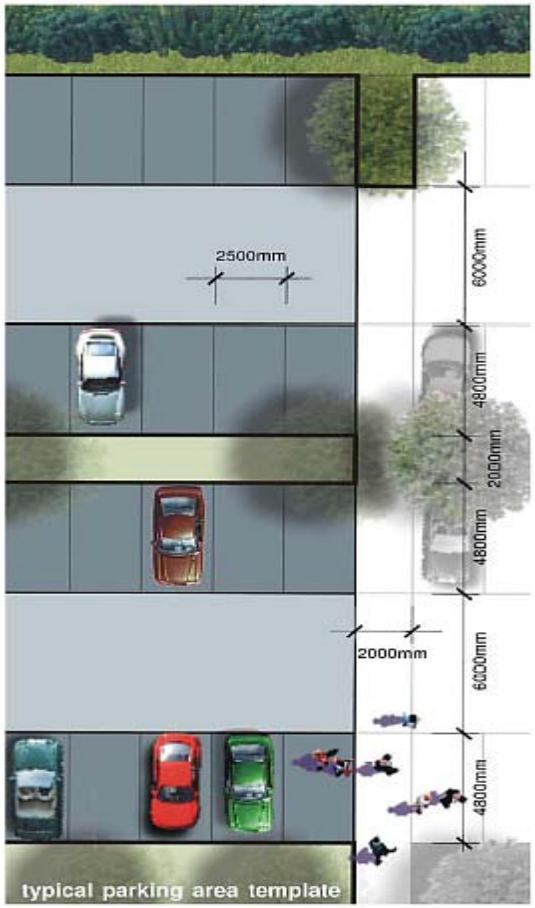
Layout, location and treatment should assist in minimising the impact of hard surfacing, and reduce the scale of hard surfaced space through the introduction of trees and shrubs planting, as well as the simple use of materials, to define car parking bays, aisles and pedestrian routes.

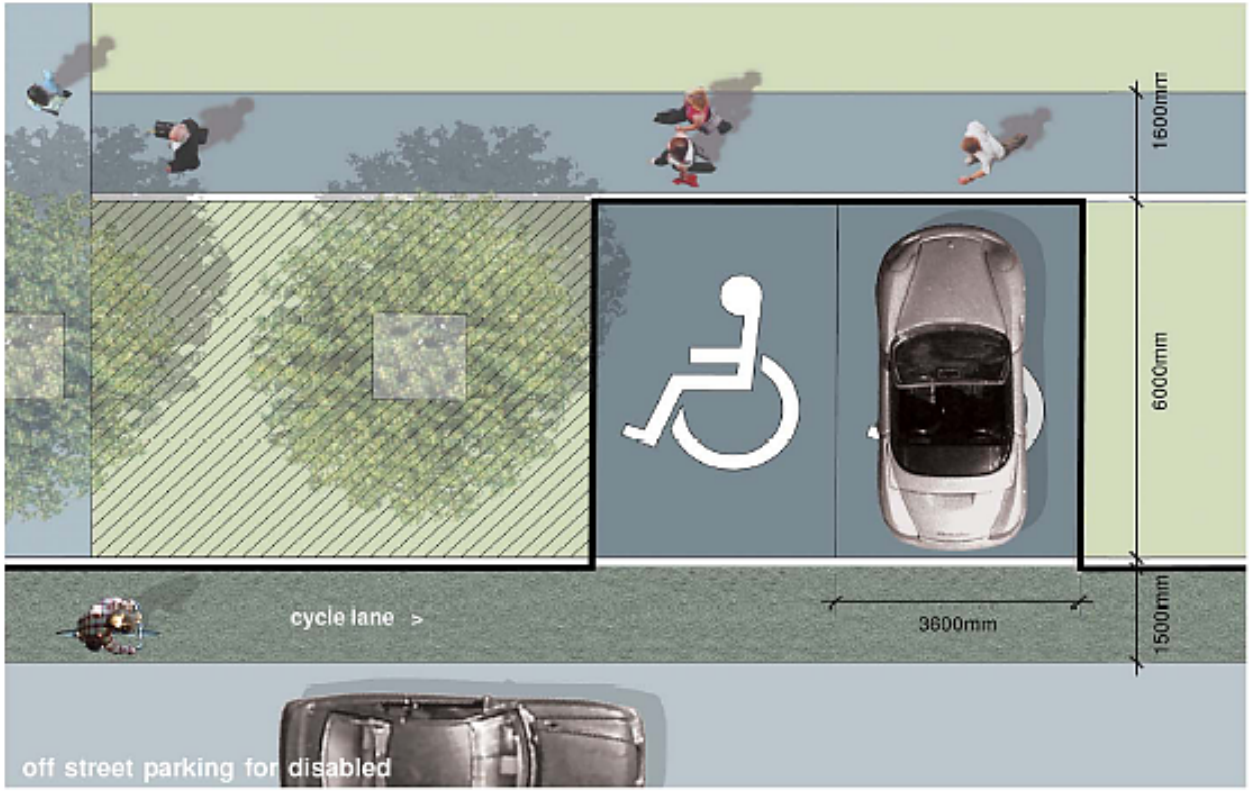
In this way, the use of car parks, by visitors and employees alike, can become a pleasant experience.

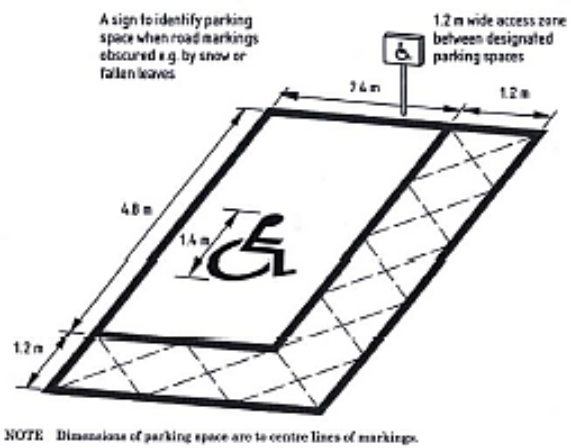
Principles

- The parking system will provide clearly marked accessible pedestrian routes.
- Lighting of Car Parks should be in a form that illuminates key routes and key areas in a visually coherent and interesting manner. Refer to section 9.6 for details.
- Designated disabled parking bays are to be provided in accordance with BS 8300:2001 and Department for Transport Inclusive Mobility guide 'A Guide to Best Practice on Access Pedestrian and Transport Infrastructure'. (refer examples over page)
- Soft landscape elements will improve the visual and environment effects of car parking through screen planting to divide plots and accent planting to accentuate entrances.









above top: designated on street disabled parking bay
above: designated off street disabled parking bay

extracts from 'BS8300: 2001'

9.4 Soft Landscape

The contribution of a soft landscape framework to the external environment at AWE cannot be underestimated as a means of helping to make that all important conversion from industrial site to science park character. Soft landscape through the use of trees, shrubs, groundcover and grass areas can contribute, very significantly, to defining the character of spaces, places and routes throughout the site, helping to make AWE a desirable place to visit and in which to work.

- Plant selection will be based on long term low maintenance objectives.
- Tree planting will be introduced to humanise scale and soften the harsh building environment at AWE..
- Where ground conditions prevent in-ground tree and shrub planting, consideration will be given to the siting of plant containers.
- Planting will be maintained in perpetuity through the implementation of a landscape management plan.

Recommendations

The plant palette provides a package to enable the development of a unifying landscape framework. The skill in design lies in the selection that will respond to location, scale and function. The palette can be expanded to include enlivening “feature” species at high profile sites in business areas and public spaces.




Principles

STANDARD PLANTING PALETTE		
TREES	Acer campestre “Elsrijk”	Medium
	Alnus species	Medium
	Amelanchier lamarckii	Small
	Betula utilis jacquemontii	Medium
	Fraxinus angustifolia “Raywood”	Medium – Large
	Ginko biloba	Medium
	Liquidamber stryraciflua	Medium – large
	Pinus species	Evergreen
	Prunus avium “Plena”	Medium
	Prunus padus “Watereri”	Medium
	Quercus species	Large
	Robinia species	Medium flowering
	Sorbus aucuparia species	Small – Medium
SHRUBS	Ceanothus species	Groundcover
	Clematis species	Climber
	Cotoneaster species	Shrub
	Cotoneaster species	Groundcover
	Elaeagnus ebbingei	Shrub
	Euonymus fortunei	Groundcover
	Hedera species	Groundcover
	Hedera species	Climber
	Hebe species	Shrub
	Hebe species	Groundcover
	Lonicera species	Climber
	Lonicera pileata	Groundcover
	Prunus laurocerasus “Mount Vernon”	Groundcover
	Symphoricarpus chenaultii “Hancock”	Groundcover
	Viburnum species	Groundcover
	Viburnum species	Shrub
	Vinca species	Groundcover
	Vitis coignetiae	Climber

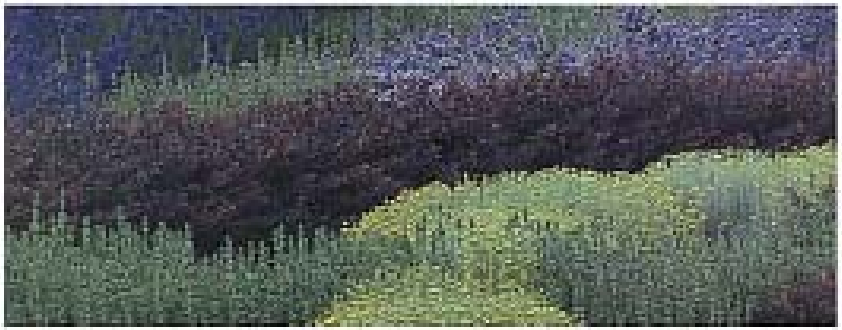


Table 3

9.5 Signage

As a form of communication signage gives direction, provides information, regulates conduct and identifies features in our environment. A signage system that communicates well improves the operations, safety and perception of the site. Signage within the site is severely fragmented, providing a perception of disorder and complexity.

Through the adoption of a signage strategy that introduces new, site specific signage elements, the site can be unified under a simple and legible system of signage and way finding.

Signage categories include:

A Identification
B Directional
C Regulatory
D Interpretative

Principles

- Create a unique identity by incorporating logo and standardised graphics into all orientation, identification, and directional signage.
- Organise signage to reduce visual clutter and improve legibility.
- Promote safety and security through clear and legible information delivery.
- Replace old signs with new.

Requirement

- There is a necessity to develop a site-wide signage strategy that is supported by a specialist company, to satisfy all signage categories.
- Identification signage: entrances, buildings, facilities, operations.
- Directional signage to the above.
- Regulatory signage: traffic, safety, security.
- Interpretative signage: wayfinding, pedestrians, cyclists, visitors.

9.6 Lighting

Light has an important influence on the character of spaces and routes, as well as basic safety, during hours of darkness. The opportunity also exists to:

- Enliven key routes and spaces on the site in a visually coherent and interesting manner.
- Incorporate the use of various levels of lighting, including pedestrian level lighting, feature lighting, in ground, and uplighting for trees.

Lighting columns and fixtures can also, in themselves, form an interesting repeating element within the architecture and design of routes and spaces, and should be considered carefully with the other components of street furniture, signage and soft landscape. Additionally, careful consideration should be given to the design of lighting so that it limits light pollution. Lighting elements, as with other furniture elements provide an opportunity to homogenise the external environment, allowing for a strong and more legible experience.

Lighting standards for design and fixtures are needed for the following zones:

- Roadways.
- Parking areas.
- Security areas (dealt with by AWE).
- Building areas.
- Pedestrian areas.

Lighting to be in accordance with BS 5489 part 3.

Principles

- Lighting should create a hierarchy of fixture to organise the lighting of the site.
- Lighting should increase site safety and security.
- Lighting fixtures should reinforce a Science Park image.
- Lighting fixtures should be selected for functional compatibility, cost-efficiency, energy efficiency, ease of maintenance, and minimal light spillage.
- The lighting system should strive to reduce the negative environmental effects of outdoor lighting by incorporating light controls, monitoring operating times, minimising light trespass and reducing light intensities where possible.
- Lighting should be compatible with recommendations set out in BS 5489.

Recommendations

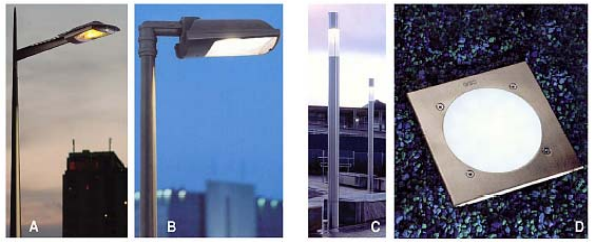
Lighting supplied by Woodhouse Uk Plc, Leamington Spa.

A Primary roads 8m ‘Cometa’ single or twin headed.

B Car parks and minor roads 8m ‘Stradex’, single or twin headed

C Pedestrian highlights 4m ‘Rotterdam’ stack.

D Amenity in-ground uplighters. ‘Geo’ with frosted glass finish.



9.7 Security Elements

Security is an important function at AWE. Properly designed security and demarcation features can combine both effectiveness and attractiveness, contributing positively to visual appearance of the site. This document encourages design opportunities for meeting enclosing criteria while improving the image of the site.

Security elements include:

- High-level security fencing.
- Demarcation fencing (high visual impact)
- Demarcation fencing (low visual impact)
- Anti-intruder fencing.
- Palisade fencing.
- Barriers.
- Bollards.

All security elements are to be in accordance with relevant British Standards.

Principles

- New projects construction should begin with the removal of existing fencing that is no longer required. Substandard and obsolete fencing should be removed following a conditions survey site wide.

- High-level, perimeter security fencing is prescribed by the AWE security services elsewhere. However, as a principle a standard approach to style, materials and colour for new and replacement fencing would positively uplift and unify so mitigating to some extent the significant visual impact of the fencing system.

- All security elements are to be of steel manufacture.

Recommendations

1. High Level Security Fencing

High-level security fencing is considered separately by AWE and no specific reference is made to it in this document.

2. Demarcation Fencing (High Visual Impact)

Fencing:- UNI Steel Cage fencing, 1.43m height, finished with Adronit Triplex plus standard colour paint RAL 7030”stone grey”. Supplied by MM-Adronit Ltd, Bristol.

3. Demarcation Fencing (Low Visual Impact)

For the purpose of this document, low visual impact, demarcation fencing remains the prescribed AWE standard. The detail of this type of fencing is to be confirmed by AWE but would be based upon British Standard 1722 part 10 chainlink fencing.

4. Anti-intruder Fencing

For the purpose of this document, anti-intruder fencing remains the prescribed AWE standard. The detail of this type of fencing is to be confirmed by AWE but would be based upon British Standard 1722 part 10 chainlink fencing.

5. Palisade Fencing

For the purpose of this document, palisade fencing remains the prescribed AWE standard. The detail of this type of fencing is to be confirmed by AWE.

6. Barriers

For the purpose of this document barriers remain the prescribed AWE standard. In areas of high visual impact an alternative to the standard will be considered.

7. Bollards

For use in areas of high visual impact refer to street furniture section of this document. For bollards in other areas the prescribed AWE standard will apply.

Fencing Paint Colour

Fencing considered to be of high visual impact will be finished in standard colour paint RAL 7030 “Stone Grey”. Other fencing that is considered desirable to colour will be finished in RAL 6005 “green” to match existing. Where for maintenance purposes or for other reasons paint is considered inappropriate, a hot dip galvanised finish will be prescribed.

References

1. Engineering Building Regulations Compliance Model – Ref No AWE/DMP/LL4854227
2. Engineering Counter Terrorism Measures Design – Ref No AWE/DMP/LL4482539