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Mark Scheme (Results)

Summer 2012

Principal Learning

Construction and the Built Environment (CB301/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1(a)	Natural and artificial lighting – Description of any two of the following considerations: • It is important to have the correct balance of natural and artificial lighting (1). People prefer to work by natural light but this is not always possible, therefore artificial lighting needs to be provided to preserve the effect of daylight (1). • Combined lighting allows the designer more flexibility when designing the internal layout of the building (1). Consequently deeper room plans can be used, but this creates an extra energy cost (1). • A north-south facing building is the optimal orientation to maximise the use of natural light (1). This will lead to a reduction in artificial lighting and energy cost. • The effect of increased natural light in a building will create a solar heat gain (1). This can be balanced by using louvres for shading, or reflective glazing to diffuse the sunlight (1). • The size and shape of the windows can be used to maximise the amount of natural light entering the building (1). Research shows that taller windows produce greater light penetration into the room. Whereas, multiple windows create more even illumination, but have less penetration into the room (1). • The colour appearance of a surface is affected by the quality of light from the source (1). Colour rendering is the ability of a light source to reveal the colour appearance of surfaces (1). • The light level should be enough for people to move about the building with ease and safety. • Internal reflectivity as a means of changing the direction of the light. • The avoidance of effects that annoy other people or pollute the night sky eg security lighting.	**(4)**

	Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	
Question Number	Answer	Mark
1(b)	Transport networks – Description of any two of the following considerations: • The importance of infrastructure to the success of a design solution (1). Leading to improved transport systems that give accessibility to all people (1). • The inclusion of traffic calming measures to increase safety and reduce the incidence of accidents (1). The measures could include roundabouts, chicanes, footpath widening etc. (1). • The inclusion of low speed areas to reduce the speed of vehicles (1). Design considerations could include the use of road humps, raised junctions, electronic speed indicators, speed cameras, general speed signage etc. (1). • Existing transport systems can be developed/extended into the new, or instead of a new layout (1). Forms of transport that could be utilised for this approach include trams, trains, canals/waterways and buses rather than motor vehicle routes (1). • Ease of access by vehicles, bicycles and pedestrians to the transport network. • Integration of the local transport network with the national network. • Combined cycle and pedestrian networks. • Provision for access of emergency service vehicles. • Use of short wheel based delivery vehicles and the reduction in weight. Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	**(4)**

Question Number	Answer	Mark
2	Use of anthropometric data when designing a building – Description of any three of the following examples: • The measurement of people/human factors applied to the sizing of building elements (1). The data is provided in the form of charts or tables (1). • Anthropometric principles include – design for the extreme, design for adjustability and design for the average (1). Inclusive design to cater for the greatest diversity of human needs as possible (1). • The age or size/height of specific groups needs to be considered (1). A typical example being a Child Care Centre with toilets and basins at lower levels (1). • Inclusive design or designing for the widest possible audience to consider heights, reach, grip, sight lines etc. (1) Examples include: • Doors/door handles (1). • Stairs (1). • Signs (1). • Kitchen units/furniture (1). • Baths and shower cubicles (1). • The specific use of a building. • The design satisfies DDA or Equality Act requirements. Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	**(6)**

Question Number	Answer	Mark
3	Benefits to the public sector client of using the PFI procurement route – Description of any three of the following benefits: • The risk relating to cost and time when procuring a project is allocated to the private sector partner (1). This	**(6)**

	is because the public sector partner finances the construction of the asset and other costs and only recoups the money when the asset works to a specified level of service (1). • Traditionally the public sector partner acquired a project or service and paid for it as a capital project (1). Whereas, the cost of a PFI project is often deferred for twenty to thirty years. The principle being that the government does not have to increase its public sector borrowing (1). • The public sector partner obtains best value for money not necessarily from the lowest bid (1). This is facilitated by the non-adversarial tendering/contractual arrangement where the private sector partner will be looking for further future work (1). • PFI projects can provide an opportunity for fast track working particularly when a partnership arrangement is formed (1). Therefore, the private sector partner can take early possession of the asset unlike the usual end-on traditional procurement method (1). • The types of project procured by the PFI method usually involve a degree of complexity eg. power stations, bridges, hospitals, schools etc. (1). Private sector companies have specific expertise in the design and management of large construction projects (1). • The risk of poor performance by the private sector partner is reduced because the payments are linked to their performance. Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	

Question Number	Answer	Mark
4	Characteristics of a long-life, loose-fit building - Description of any four of the following characteristics: • The building is designed to meet the immediate needs of the client/occupier (1). However, the design makes provision for future change if required (1). • Typical buildings using the long-life, loose-fit approach are those used for educational purposes and in the main schools (1). The adaptability of the floor plate allows the internal layout to be easily reconfigured (1). • Similarly, the design of the mechanical services takes into account possible future modification or expansion of the building (1). This is usually achieved by a modular approach where the ductwork can be easily altered and the piping system has sufficient capacity to be expanded when first installed (1). • Ideally, the design of the building's external envelope should be timeless ie. not designed in the current fashion (1). This can be achieved using materials that are durable and often improve with age (1). • Long-life, loose-fit buildings will increase the return on investment due to the longevity and adaptability of the building (1). The intention being for the building to last a minimum of eighty years (1). • A reduction in embodied energy is achieved through the longer life of the building. • The flexibility of long-life, loose-fit buildings allows upgrading of the thermal efficiency to meet future standards. Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	**(8)**

Question Number	Answer	Mark
5	Factors that could influence the decision of a designer when designing the upper floor of a house – Description of any three of the following factors: • The joists should span in the shortest direction as this is the most economic method (1). Otherwise, deeper joists or mid-span walls would be required to support the floor and so prevent deflection (1). • The imposed loads of beds, furniture, bathroom suites etc. need to be considered (1), although the source of the load may only occupy part of the floor it is assumed that the load is transferred to the whole floor (1). • The dead loads are constant through the life of the building as they are unable to be moved (1) typical dead loads include the floor type, floor finish and ceiling finish (1). • The transmission of sound from storey-to-storey needs to be kept to acceptable levels through the use of insulation (1). Insulation reduces airborne sound ie. speech, television etc. and resists impact sound ie. footsteps etc. on the floor (1). • The floor should restrict fire spreading upwards or downwards and would be categorised depending on its height above the ground (1) The categories are less than 5m high - 30 minutes fire resistance required, more than 5m high – 60 minutes fire resistance required (30 minutes for a 3-storey house) (1). • The floor should resist moisture, water vapour, rot or insect attack through the type or material used for its construction (1). Types of construction include suspended timber, pre-stressed concrete planks or beams and blocks (1). • The floor structure should resist movement through shrinkage, warping, bowing etc. (1). Therefore,	**(6)**

	pre-stressed concrete could be considered, if timber is used strutting would be required, together with the joists having an appropriate moisture content, typically 15% (1). • Cost of the floor structure. • Sustainability of the material, embodied energy and its eventual re-use/recycle at the end of the building's life. • Requirement of any mechanical lifting plant for pre-stressed concrete components. • Time taken to construct the floor structure. • Site safety when working at height to construct the floor. • Comfort of the floor when walking on it would affect the choice of floor finish. • Maintenance in use. • Perceived quality control of factory produced units. Any other appropriate answer. No marks for identification only 1 mark for a brief description 2 marks for a detailed description	

Question Number	Answer	Mark
6	Benefits of green roof technology – Explanation of any three of the following benefits: • Rainwater run-off from a green roof is considerably less than that of a traditional roof (1). During heavy rainfall the reduced rate of release lessens problems with storm surges (1). • Older settlements have combined surface water and foul water sewers where in the event of significant rainfall the sewage treatment plant becomes unable to treat all the excess water (1). To alleviate this problem the rainwater collection system can be easily incorporated into urban drainage and flood alleviation schemes (1). • The lifespan of the roof is extended	**(6)**

	because the green roof protects the exterior roof membrane (1). Therefore, reducing the resources for replacement and repair (1). • Green roofs usually have a greater mass than traditionally constructed roofs this creates inbuilt insulation (1). These cooling properties can reduce the need for air conditioning in the summer (1). • The growth media, plants and layers of trapped air helps to insulate a building against sound (1). This can be a benefit where buildings are situated close to airports, busy roads, heavy industry etc. (1). • Green roofs are highly visible and produce a distinctive image (1). The image of the building signals the intent for a sustainable design (1). • The green roof plants/media can filter the pollutants and heavy metals out of rainwater. • Green roofs can contribute to biodiversity through creating a habitat for invertebrates and birds. • The use of a green roof can increase the value of the building. Any other appropriate answer. No marks for identification only 1 mark for a brief explanation 2 marks for a detailed explanation	

Question Number	Indicative Content
7	Benefits to the community of the regeneration of a town or city centre – Coherent and balanced discussion that includes some of the following benefits: • Creation of better places for people to live and work. • Higher quality and more modern shopping facilities. • Creation of new public spaces for comfort, relaxation, enjoyment, sport/educational activity. • Opportunity to create public/private sponsored leisure facilities. • Opportunity to build new affordable homes for key workers and also mixed tenure developments within or close to the town centre. • Opportunity to renovate historic or landmark buildings and so create distinctiveness.

		• Improved street scene eg. trees, nature, water, traffic, advertisements, changing views etc. • Improved lighting ie. **statutory** that aids pedestrians to find their way at night and the safe passage of vehicles and **amenity** that enhances the street scene through colour and vitality of signs, shop lighting and seasonal lighting. • Improved security through the street layout allowing control of spaces, natural surveillance, presence of people undertaking activities etc. • Improves the image of the area and can attract businesses and tourists. • Can attract funding through government grants/initiatives and inward public/private investment. • Enhanced public transport and pedestrian movement systems that give accessibility to all people. • New buildings are constructed from energy efficient materials and to a high standard of insulation. • Improved employment opportunities through increased investment in the area. Other acceptable answers would be considered.
Level	**Mark**	**Descriptor**
	0	No rewardable material, no marks for identification only.
1	**1-5**	Description of one or two undeveloped and/or unsupported ideas. May lack cohesion. No discussion. Lacks appropriate terminology.
2	**6-10**	General description of four points for discussion or two points that have been fully discussed. Minimal use of appropriate terminology.
3	**11-15**	Discussion of four points not fully developed. Some use of appropriate terminology.
4	**16-20**	A good range and development of relevant points. Clear discussion. Sound use of appropriate terminology.

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