Solution to AD16 2005

Note: with discursive questions of the type common in this module, it is not feasible to present cut-and-dried "solutions". Rather the notes below summarise the main points to be made in each question — but the order of presentation, and chosen illustration, may vary.

Q1 (a). This refers to the first lecture by Deborah Sharpley on planning issues; and to a lesser extent to what John Hewe said on the cathole-clay visit to the new English Faculty. An answer would have to refer to the hierarchy of plans — and government policy on planning: the strategic "structure plan" at County level, the local plan more site specific. Each have perhaps ten years of life, and permission is most easily gained for a development in accordance with these plans. So if land does not have planning permission, it will be necessary for the owner to arrange (at public inquiries etc) for the various plans to zone his land for use (strategy, then district) — all taking time — before actually applying for permission. Note that planning law is in flux, new Act, new guidelines.

Impact assessment (EIA) needed for all major development, comparing what happens with/without the

proposed works on ecology, air and water quality, noise and vibration, geology and soils, landscape and visual amenity, social impact, traffic impact etc. — engineers and other professionals have to do predictions, prepare an EI Statement (public document) etc.

In extreme cases of impact, permission not granted — or it may be subject to conditions (e.g. on colour of building, of English Faculty): or the developer may be made to enter into a "Section 106" agreement, to pay money to mitigate impact (e.g. new roadworks elsewhere), or to provide certain amenities within the development (schools, open areas, affordable housing, etc).

(b) Most will choose the English Faculty, which they all visited. (i) approval from University — 3 stages, CPP process, different levels of detailed care at each stage: and (ii) planning permission: required Atkins and Morrison overall plan for Sidgwick site, to convince planners that Victorian villa could be replaced; then detailed drawings of building. Stipulations — adjust building to avoid tree; agreed colour; set-back from West Road; contribution to speed bumps. Filling in with the overall plan for site dictated the 'courtyard' form; and the position framing the site entrance.

Q2 (a) This refers mainly to the 2 lectures by Liddell on the design process: conception (only rough hand calculations, cost based on standard rates and areas, only architect and one or two engineers involved).

scheme design (for planning permission): prelim. computer calculations on harder or innovative aspects; some refinement of costs by considering process of construction: a few specialists consulted).

detail design (for tender documents, or negotiation for first stage of a 2-stage tender): full studies of special situations: all the various engineering consultants involved: full advice from quantity surveyor on costs.

construction drawings (after traditional contract let, or result of a design-and-build contract) for workers to use: full design to Codes; full involvement of any specialist sub-contractors; full list of quantities and Bill; building method and preliminaries.

Decision making — regular meetings, exchange of drawings by email etc. Must ensure that all members of the team "buy-in" to overall decisions, perhaps accept non-optimal design in their own area in interest of scheme as a whole (e.g. steelwork sub-contractor, Arsenal stadium).

Speed construction by getting main contractor in early — e.g. by Design and Build, where foundations and frameworks can

be started before fit-out fully designed. Similarly with a 2-stage Construction management arrangement, where main contractor is appointed early, to give advice on "buildability", and designers can be "novated" to be responsible to the contractor for further detailed design. But however - have to have good broad decisions made about later work, otherwise after detailed design you find that the foundations etc. have some deficiency.

(b) They had a lecture by da Silva on Osaka. Or could choose the Sandi tower described by Pugh. Osaka: striking globe building in harbour; structural design of steel frame holding glass: building physics problems of internal environment (solar gain etc): forces due to tsunami: cost. Architect seems to have proposed the basic concept, left much of the rest of the design to engineers — who had to work out scheme for the frame (and the cable trusses at the crown) and all joints. Environmental engineer had to analyse solar gain, consider solutions (e.g. shades) and listen the glass-metal-glass sandwich of varying translucency. Structural engineers had to consider the tsunami. Cost estimates would have been very difficult — no standards to go on. Eventually contractor proposed his own float-out scheme (presumably cheaper for him). Does not really fit the usual route.

Q3. (a) This refers to the lecture by Corrigan at Metspace, and also to those by Clarke. "Design responsibility" important for clarity on who is making decisions at a given stage, who is bearing risk and liability for any mistakes — can be very different for the various procurement routes.

Traditional route : design responsibility lies with the lead designer (usually architect) who with all other engineers is working directly for the client — throughout. Main contractor has little d.r. except for his temporary works — but specialist sub-contractors may have some.

Design-and-build : main contractor offers a "one stop shop" and has responsibility for design throughout. Often employs professional engineers to work for him or designers.

2-stage tender — in various forms : design is taken in traditional way to the scheme-design stage. Then by tender or indicative rates interview etc a main contractor is appointed "early" (i.e. before job fully designed). Might then continue as a management contractor, organizing sub-contractors but with little d.r. — or he might take over full responsibility as a design-and-build from that stage on, with the original designers "novated" to work now for the contractor. There could be problems of liability, depending on when an incorrect design

decision is made, before or after the "novation".

A main contractor would consider such matters as the employer's financial standing, the design team's experience and performance so far, and commercial risks/exposure, third party obligations etc — before agreeing to take on a novated design team. The CDM Regulations say that quite a lot of people are 'designers", apart from the obvious — e.g. engineers on temporary works, engineers for specialist contractors — and all should do a "risk assessment" of all the design risks.

(b) This refers to the lecture by Peter Miller on Arsenal stadium steelwork sub-contract and also to the Scrabe cladding sub-contractor for the English Faculty. This is a specialist team or person, offering some special (often patented) system — as distinct from the ordinary sub-contractor doing routine work like carpentry etc. Their expertise will extend to design, from a practical viewpoint, and not just carrying out someone else's design — and may have implications for the rest of the project. So they need to be brought on board early to give full benefit — possibly by some form of 2-stage procurement, with specialists appointed at first stage (as at Arsenal stadium).

Q4. (a) This refers to the lecture on safety by Clarke. HtS Sincriminal code. Aultan intended to sweep away all industry-specific ad-hoc Acts and rules, and introduce an overall goal-setting approach, applicable across all workplaces. Hence HtS at Work Act, 1977. Aims to ensure welfare of all, and adequate resources for competent safety personnel — emphasing the importance of risk assessment for all major activities.

For construction under the Act come Construction (Health and Safety) Regulations 1996, on such matters as toe boards, guard rails, helmets — i.e. site precautions. But also the Construction (Design and Management) Regulations of 2000 — introducing the "planning supervisor", rules for the principal contractor, rules for anyone classed as a 'designer', mainly about doing risk assessments of the design and its consequences so as to eliminate, reduce or control the various risks.

(b) This refers mainly to the lecture by Craddock on risk management, and also to some of what Clarke said. Many things can go wrong with a

project - producing risk to cost, programme, fitness of result, aesthetic appearance, environmental impact, health and safety etc. The client might be unclear on what is wanted or make late changes: the design team might have unclear working relationships with poor results; design information to contractor might be unclear or delayed; the contractor may have poor control on site, or encounter unforeseen problems etc.

Some risks impinge directly on financial value (e.g. risks to cost or programme if there are liquidated damages), some risks impinge more on reputation and the next job prospects (e.g. poor finishes). Identify by thought, brain-storming sessions, experience from previous jobs. Assess by considering likelihood (on rough scale 1→5) and severity of consequences (usually on cost or value) multiplied to identify serious risks — to eliminate or reduce by design, transfer to others by contractual arrangements, insure against etc. Not much detail needed: each party involved does own assessment of risks to itself and to project due to it: at various stages, risk register updated as jobs goes on, and uncertainty reduces, but impact of risk may increase. Decide to insure against high impact, low probability risks, etc.

Q5. This question is intended to allow students who may by chance have prepared material not featuring in the first 4 questions, but nevertheless relevant to the course, to show what they know.

(a) This refers to the environmental impact lectures by Guthrie, and also to sustainability issues in the English Faculty building (which all visited and reported upon, some writing about sustainability, some about energy management).

Main feature is that all major construction now under EU directive requires an Environmental Impact Statement, comparing situations with and without the development, a public document (non technical) which can feature in public inquiries on planning applications, covering ecology, social impact, traffic, noise etc. etc. On sustainability, there is little mention in the actual rules — but sustainability of the development may well be taken into account when the decision is taken whether the assessed impact is acceptable, even after mitigation measures. Building regulations impose various requirements or limits on energy use (ventilation, energy management, insulation) which are related to sustainability. It is also mentioned in University standard specification — which may be cost driven

(b) This refers mainly to the first lecture by Clarke, but different procurement routes were also covered by Corrigan, Neve and others.

Traditional route: client appoints designer, who do complete drawings + tender documents: contractor chosen on tender price, no influence on design. Tends to be confrontational, but ok for simple jobs — standard contract forms.

Design and build: contractor takes main role, client just does outline specification: designer work for contractor.

Management contracting / construction management: declining.

Latham and Egan reports said industry inefficient, confrontational — ought to go more for teamwork with contractor and specialists brought in early, promoting buildability.

Public sector — driven by EU + UK rules OJEC best value
private " — driven by market forces much freer.

Recent contracts promote teamwork — often by 2 stages; main contractor + specialists on basis of interview and indicative prices: refine design, decide work packages: then tender for main works (not always won by main contractor initially appointed). Latest development: PFI etc, DBFO — where buildings are built, maintained and operated by the contractor/owner, and only leased out to the end user.

(c). This refers to the lecture by Anthony Lavers. Under the traditional contract, or the law of tort, a professional was legally expected to exercise "reasonable care and skill" in doing his work. Should do things consistent with what an 'ordinary competent practitioner' would have done. Reasonable steps have to be taken to ensure the suitability of a specified component, etc.

But in some contracts, e.g. Design and Build, the contractor is expected to ensure "fitness for purpose" and would be liable for any defect (however caused) whatever level of skill he had applied. Professionals should ensure that when working for a contractor (who has such liability) the liability is not somehow passed on to them. For example, if asked to give a warranty of their work, to ensure that the level is "reasonable care and skill" and not the more onerous "fitness for purpose". Of course, the professional could attempt to take out insurance against being held liable in such ways.

(d) This refers to the lecture by Hayward, the last one in the course.

Professional indemnity insurance is necessary in construction work, but a significant overhead — protecting the professional against claims (or paying them when he is found liable for some action, inaction or deficiency) but also giving reassurance to a client (who would not employ someone without PII, against whom he could not recover if things went wrong). Hallmark of quality.

Covers legal liabilities for breach of contract, negligence or breach of statute (but not against fines in criminal courts). Usually has a limit of indemnity, norm req £5m: each and every claim.

Covers claims made in a certain time period (not claims for a certain project etc) — so it has to be maintained (even after retirement) until all possibility of a claim has passed. Requires notice to insurer of any potential claim.

Should be taken out by all professional firms, and all individuals acting as lone professionals — and kept alive as above. Claims can be for design errors, over-design (i.e. excessive cost of contractor), acting beyond experience or brief, delays in design info. to contractor etc.