4D16 Construction and Management
2012-2013
Al-Tabbaa and Liddell

1. (a) Definitions of EIA: *[30%]*

*"... the **systematic** process of identifying the **future consequences** of a current or proposed action." (IAIA)*

*"...the systematic, **reproducible** and interdisciplinary evaluation of the potential effects of a proposed action and its practical alternatives on the **physical, biological, cultural and socio-economic** attributes of a particular geographical area." (USEPA, 1993)*

*"... an analytical process that **systematically** examines the possible environmental consequences of the implementation of **projects, programmes and policies.**"* (OECD, 1997)

*"...a **procedure** that must be followed for certain types of project before they can be given 'development consent'. The procedure is a means of drawing together, in a **systematic** way, an assessment of a project's likely **significant environmental effects**. This helps to ensure that the importance of the predicted effects, and the scope for reducing them, are properly **understood by the public and the relevant competent authority** before it makes its **decision**."* (DCLG, 2000)

What is Environmental Impact Assessment?

Within the project lifecycle

Development Phase	Process
Feasibility Studies	Initial environmental investigations/ due diligence
Project Planning & Design	Environmental Impact Assessment (EIA)
Construction	Environmental Management Plans (EMP)
Operation	Environmental Management Systems (EMS)

The general EIA process:

Screening	Is an EIA Required? (Schedule in EIA Regs)	Consultation/Communication
Scoping	What should be included?	
Impact Assessment	Technical Assessments	
Environmental Statement	The document to be submitted	
Monitoring and Management	The follow up	

(c) CB1 case, wind:

Major Urban Redevelopment, Listed in the Local Plan, Station Area Redevelopment Framework, Mixed Land Use, Involved in Outline Planning Application, Masterplan not detailed design, Gives "agreement in principle", Some matters reserved for subsequent detailed applications.

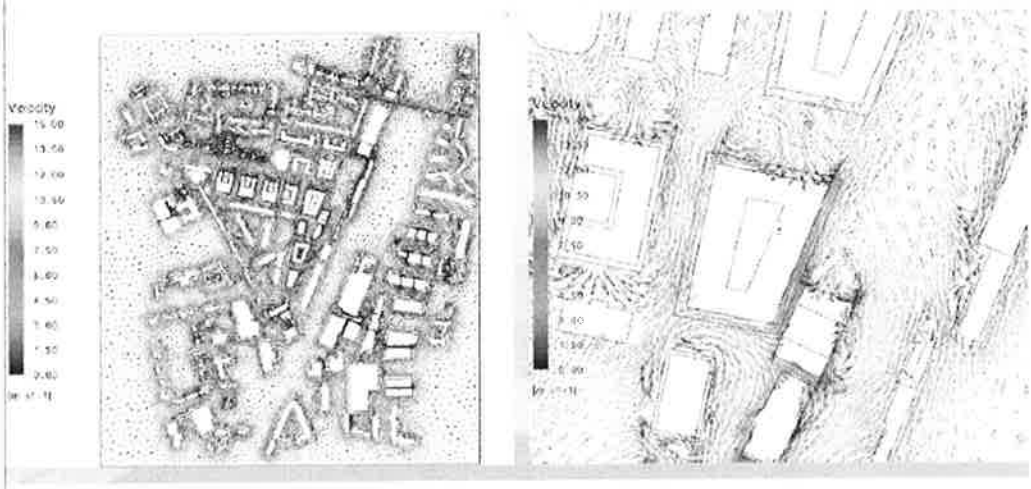
Baseline – Met office data for the area to determine "normal" wind conditions

Impact Identification – Impacts relate to comfort/safety when using open spaces

Technical Assessment

- 3d Computational Fluid Dynamics (CFD) model
- Included development and surrounding area
- Outputs include "Vector" maps of wind speed

Technical Assessment



Vector Plots showing modelled wind speeds

- University of Bristol Comfort Criteria
  - Provides thresholds for wind speeds and land uses

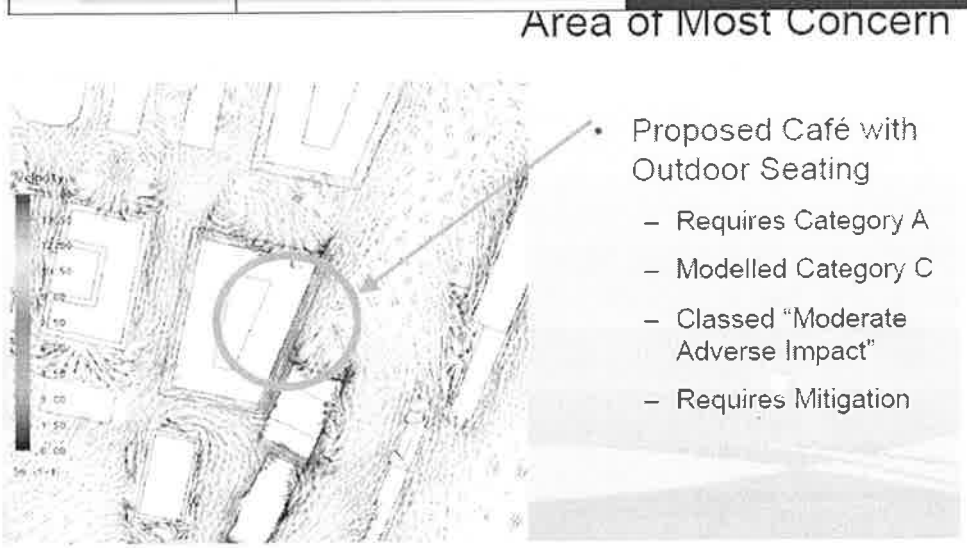
Classification code	Description	Velocity threshold	Probability of exceedence
A	Pedestrian sitting, standing and sitting in long exposure to wind	4 m/s	5%
B	Pedestrian standing, standing and sitting in short exposure to wind	6 m/s	5%
C	Pedestrian walking, leisurely walking	8 m/s	5%
D	Business walking, fast walking	10 m/s	5%
-	Danger	15 m/s	0.022%

- Standardising Significance Criteria
  - Apply technical criteria to standard 7 point scale of significance across all chapters

Substantial Beneficial	**3 classifications lesser than the Bristol Comfort Criteria for Use**
Moderate Beneficial	2 classifications lesser than the Bristol Comfort Criteria for Use.
Minor Beneficial	1 classification lesser than the target Bristol Comfort Criteria for Use.
Negligible	Complies with the target of Bristol Comfort Criteria for Use.
Minor Adverse	1 classification greater than the target Bristol Comfort Criteria for Use.
Moderate Adverse	2 classifications greater than the target Bristol Comfort Criteria for Use.
Substantial Adverse	**3 classifications greater than the target Bristol Comfort Criteria for Use**

Characterising impacts: Example: Café vs pathway

Classification code	Description	Café use	Pathway
A	Pedestrian sitting, standing and sitting in long exposure to wind	Negligible	Moderate Beneficial
B	Pedestrian standing, standing and sitting in short exposure to wind	Minor Adverse	Minor Beneficial
C	Pedestrian walking, leisurely walking	Moderate Adverse	Negligible
D	Business walking, fast walking	[illegible]	Minor Adverse
-	Danger		



Mitigation:

- Hierarchy for Mitigation
  - Eliminate (e.g. move buildings to prevent funnelling of wind)
  - Reduce (e.g. install wind breaks)
  - Compensate (e.g. Free coffee!)
- Proposal adapted to allow for a combination of tree planting and public works of art to act as wind breaks

Monitoring and management:

- Long term commitment to ensure mitigation is successful
- Monitoring to confirm residual impact
- Management to maintain mitigation measures (e.g. what happens if all the trees die?)
  - Developer/occupier should to commit to necessary ongoing management

[50%]

(c) International variations in EIA:

- Almost all countries have some form of EIA legislation
- Fundamentals normally the same but variability in implementation
  - political will to implement
  - capacity to implement
  - authority of decision makers
  - engagement with public
  - national perceptions of key issues (by both public and state)
- International Finance plays an important role
  - Equator Principles
  - Reputation
  - Development Bank mandates
  - Caution not to replace local standards

[20%]

2. (a) The basic design stages are: Brief, Concept design, Schematic or scheme design, Design development, Tender Documentation. See also RIBA stages B to G or the ACE schedule of services stages 2 to 6 (the terminology changes but the content is pretty much the same). The design is controlled by the client or his representative requiring submittal of appropriate documentation, drawings, models and reports which have to be approved before design proceeds to the next stage. Referred to as "gateways" in the RIBA Plan of Work. Approvals are often only partial and include changes in the brief. [40%]

(b) (i) The advantages of the GMP Design and Build procurement process with GMP is that the client has one body responsible for delivering the project with limits to the time and cost. The disadvantage is that certain risks are then carried by the Design/Build Contractor who will include those risks in his pricing. In the two stage tender process the individual work packages are taken to Scheme Design stage and bid by the specialist contractors usually in an open process. The GMP is only agreed when the contractor has prices for most of the packages and considers that he has cost certainty for the whole project. [20%]

(ii) In this process a design team of architect and engineers will have prepared the concept design which will have been included in the Client's Requirements document. The Design/Build contractor will have to engage his own design team to complete the project. Very often he engages the original design team via a route where the original designers contract is transferred to the Contractor, a process known as "novation". [20%]

(iii) The changes in the engineer's duties are covered by a novation agreement. The client retains the engineer's responsibilities for the structural work through Co-lateral warranties. The change in client can lead to conflicts of loyalty for the engineer. [20%]

3 (a) Weaknesses of traditional procurement route on complex projects: If the initial design is not representative of the final design, there may be significant design growth. If the initial design dos not take account of complexities in the build sequence/site constraints. Or For some other reason, the initial design cannot be constructed in the manner envisaged. Then: delays/claims/disputes.

Alternative procurement route for complex structures: In complex structures design is influenced by: fabrication process, construction method, sequence, temporary works. Design team needs input from contractor. But there is no design to tender and make sections Hence a suitable alternative is using two stage procurement. [20%]

(b) Refer to extensive lecture notes. [40%]

(c) (i) Plant design objectives: [40%]

- Greatly Simplified Plant
  - Construction, Maintenance, Operation, Safety
- Increased Operation and Safety Margins
  - Design Basis Accidents, PRA (core melt prevention & mitigation)
- Competitive Cost of Power
  - Less Than Coal Plant
- Short Construction Schedule
  - 3 Years for nth of a kind
- Modular Construction
  - Leverage simplification to maximize certainty of cost and schedule

- Licensing Certainty
  - NRC Final Design Approval / Certification
  - Extensive testing of passive systems
  - Pre-Engineered / Pre-Licensed Standard Design
    - Reduce Costs,
    - Increase Licensing Certainty
- No Plant Prototype
  - Proven Components
  - Proven Systems
- Improved Availability
  - Inspection, Maintenance

(ii) Advantages and impact of modular construction:

ADVANTAGES

- Reduce Construction Schedule
- Increased Productivity and Quality Control at Module Fabrication Facilities
- Reduce Field Work and On-site Manpower During Construction
- Standardisation Reduces Costs for Multiple Plant Orders

IMPACTS

- ✘ Increased Engineering for Modules
- ✘ Increase Temporary Support Structure / Lifting and Rigging Requirements
- ✘ Early Material Requirements; Advance ordering of Long-lead Items
- ✘ Additional Transportation Cost (Large trailer truck, Barge)

Reductions in Construction Cost and Schedule Demonstrate Net Savings

Modular Concepts

- Initial construction schedule of 48 months from first concrete to core load;
  - decreasing to 36 months for nth plant
- Utilise proven techniques
- Maximize use of modularization
  - Designed for truck/rail shipment
  - maximum module size
    - 12' x 12' x 80'
    - [3.6mx3.6mx24.4m]
    - [80 Ton]
  - Barge shipment where available
- Construction Cost (1/3/7 Rule)

(iii) Examples of lessons learnt so far:

Lessons Learned

China Lessons Learned are reviewed monthly and sent to US Projects for Action/Info. China Results include:

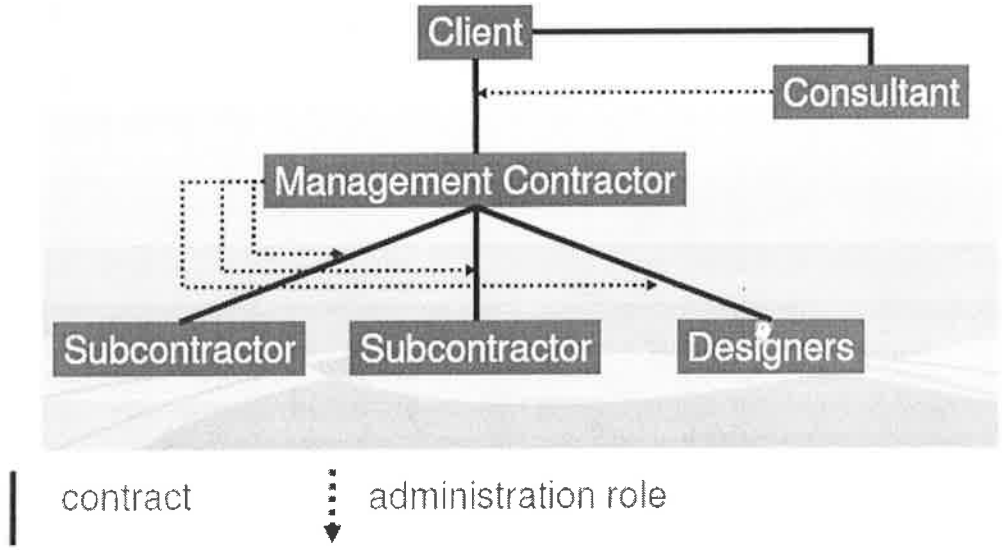
- NI Basemat Lessons Learned
- Module fabrication
- Module setting
- CV Bottom Head fabrication for Haiyang 1 took 25% less time than for Sanmen 1
- Procurement and manufacture of NSSS Equipment

Westinghouse is using modern and proven ways of capturing lessons learned and applying a process that ensures their implementation.

Over 6900 LL from China

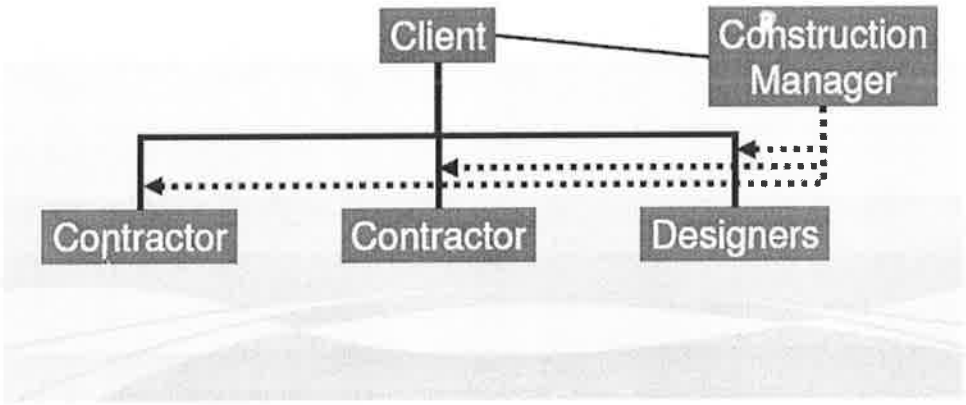
Year	2009	2010	2011	2012
Lessons Learned	1198	1816	2175	1765

4. (a) Management contracting: [20%]



- Client often pays subcontract costs + fee percentage to cover Management Contractor's own costs
- Client has influence over competitive subcontractor selection
- Management Contractor is single point of responsibility
- Allows early start
- Most cost risk remains with Client

Construction management



- Client has a number of direct contracts with works contractors and designers
- Client retains the interface risk
- Construction Manager advises Client on packaging and procurement of work
- Construction Manager administers contracts
- Flexibility:
  - allows earlier start as packages are defined
  - can choose appropriate form of works contracts

(b) (i) PII is a form of liability insurance that provides cover for the financial consequences of professional negligence following a breach of professional duty by the way of neglect error or omission. In addition it provides an indemnity in respect of the legal costs and other costs and expenses incurred in the defence of any claim. It is neither compulsory by Law nor mandatory by professional regulation. It is frequently a pre-requisite to being on a client's panel and/or a contractual requirement –- most written appointments contain a clause requiring you to take out and maintain PII.

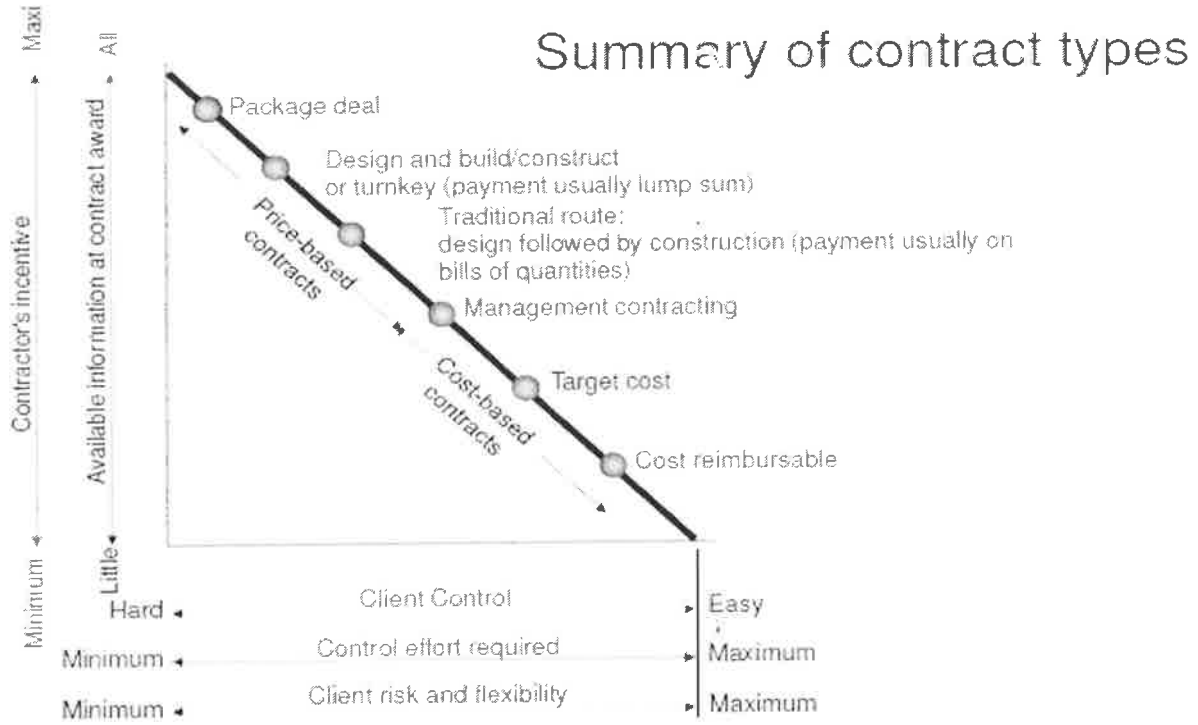
(ii) PII is important because:

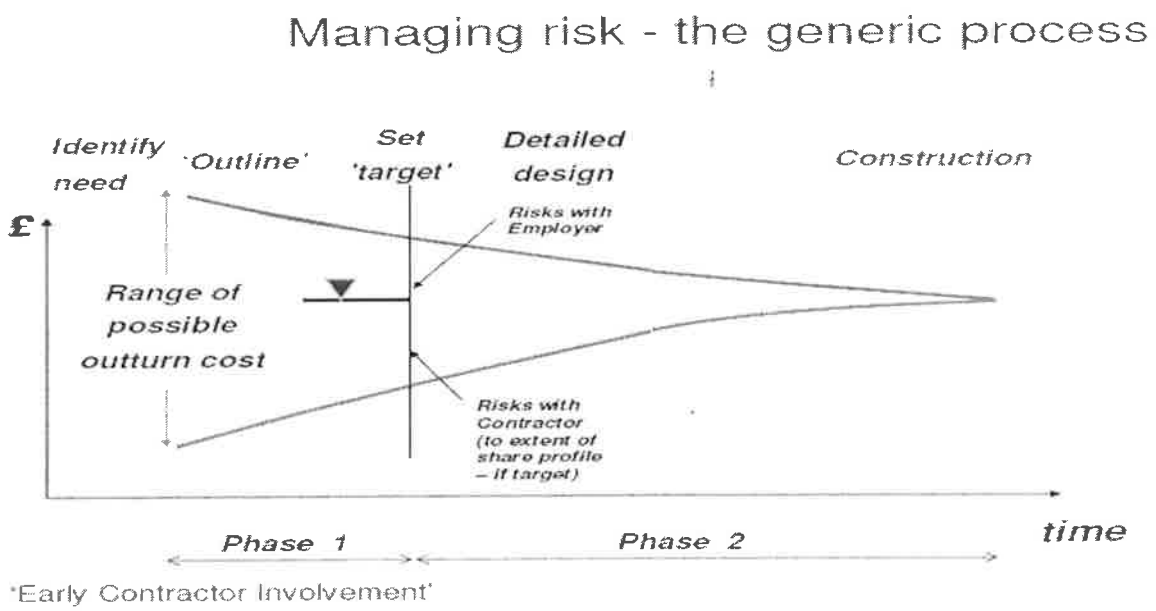
- A necessity to conduct business
- A significant overhead
- Protection for the engineer
- Protection for the engineer's customer hence a facilitator of the construction industry
- A hallmark of quality
- A major factor in the legal development of the profession

(iii) Premiums are expensive – PII will probably be the engineer's most expensive overhead.
Major rating factors:
* Cover Choices i.e. the limit of indemnity and excess you choose. LOI: Assess what you need. Buy what you can reasonably afford – based on your largest project plus delays and legal costs and/or a severe personal injury. Excess – you pay the first £x of any claim. Intended to: avoid small claims. create a financial incentive to insured
* Risk Factors:
    - Number of professional staff and their professional qualifications
    - Experience – CV's
    - Supervision – ratio of partners/staff
    - Type of work split between high risk and low risk
    - Fee Trends
    - Five largest projects in past three years and i: next twelve months
* Claims: Ultimately insurers look to recoup their money over the long term therefore premiums reflect claims experience (your own and the whole profession). The ultimate sanction is that a firm with a bad claims experience will not get affordable cover
* Insurance Market Cycle: i.e. Supply and demand

Historically big premiums and long-tail nature of the risk make PII attractive business for insurers especially when interest rates are high but does that still apply? [40%]

(c) Risk assessment: brain storming, insight, identify hazards, then assess likehood of severity, often a simple 1-5 scale, and overall assessment using product. Tackle most serious risks. Eliminate, control/mitigate, maybe insure against the rare event with very serious consequences. Different contracts apportion risk differently e.g. client bears all risk of late design information under a traditional contract, but contractor bears all risk under design and build contract. View of contract will vary according to risk seen e.g. contractor may put in a higher price to bear more risk.



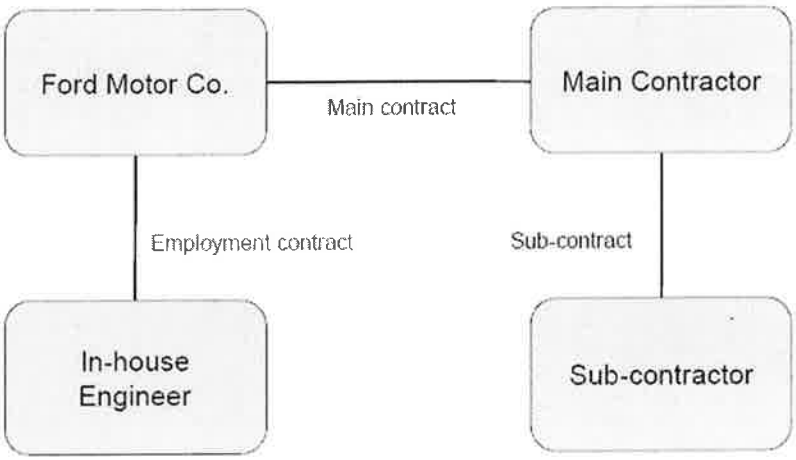


[40%]

5. (a) The most recent development of the duty to warn was the Court of Appeal decision of *Plant Construction plc v Clive Adams Associates* [2000] 69 Con LR 106. Excavation sub-contractors at Ford's research and engineering centre had submitted a design for temporary support during excavation. Ford's in-house engineer had overruled the sub-contractors and insisted on a different design. The support collapsed. The sub-contractors were found to have owed a duty of care to the main contractors to warn them of the inadequacy of the client's proposals. They had not discharged that duty by producing their own design; they should have "protested more vigorously" at the engineer's decision.

In traditional procurement, basic liability for design is still carried by the client's design team: architect, engineer and quantity surveyor. The contractor is obliged and entitled to build what the design requires. However, this basis position is frequently modified by:

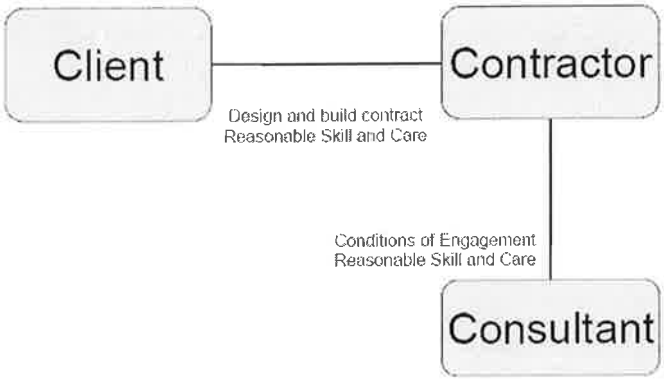
- a contractual obligation of notification of discrepancies in design documents and inconsistency with statutory law
- Contractor's Designed Portion (where relevant, as in JCT form)
- The duty to warn. [40%]



(b)

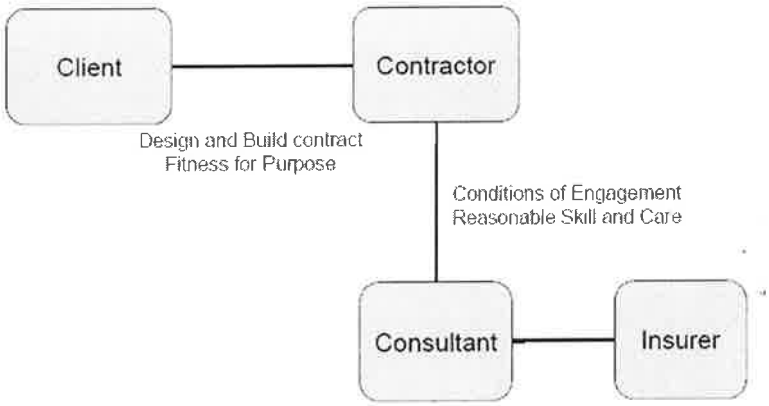
(i) Contractor gives fitness for purpose duty under design and build contract and consultant gives fitness for purpose duty under conditions of engagement. Contractor can claim 100% of its liability to client for breach of fitness for purpose of design. This will be the position either under explicit contractual provision or may be implied if the consultant is aware that the contractor is accepting a fitness for purpose obligation: *Greaves v Baynham Meikle* [1975] 1 WLR 1095. Note that no such obligation is normally given under UK consultants' conditions of engagement and there may be difficulty in extending professional indemnity insurance cover for fitness for purpose.

The Client loses out



(ii) Contractor gives fitness for purpose duty under design and build contract but consultant accepts only reasonable care and skill duty under conditions of engagement. This means that the contractor accepts full liability for the design to the client, but can only recover against the consultant if breach of reasonable care and skill can be shown. This leaves the contractor accepting a degree of design risk which it cannot pass on.

The Contractor in the sandwich



(iii) Contractor only gives reasonable care and skill duty under design and build contract and consultant accepts only reasonable care and skill duty under conditions of engagement. This is likely to be satisfactory to contractor and consultant (and consultant's insurers) but leaves the client only protected in terms of design liability where it can prove lack of reasonable care and skill. [60%]

The Consultant under Pressure