

AN INTRODUCTION TO DESIGN  
RESPONSIBILITY & DESIGN RISK

# THE DESIGN PROCESS

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# What are design risks?

- Achieving the desired functional outcome
- Cost
- Programme
- Quality
- Other:
  - Health & safety
  - Buildability
  - Environment
  - Risks in the ground: major area of uncertainty
- Risks as perceived by Employer, Designer and Contractor
- Fitness for purpose vs reasonable skill and care
- Performance specifications

# The design process

- Delivering desired outcome whilst identifying and managing the design risks
- RIBA Plan of Work stages:
  - 0 Strategic Definition
  - 1 Preparation and Brief
  - 2 Concept Design
  - 3 Developed Design
  - 4 Technical Design
  - 5 Construction ...
- Cost certainty increases through the stages
- Ease of introducing design change decreases through the stages

# In an engineering design office ...

- Take concept or Architect's drawings
- Devise structure, analyse:
  - Methods of structural analysis, geometry, material properties
  - Applied loads, load factors
  - Design standards – British Standards, Eurocodes
  - Previous experience – state of the art
- Prepare initial design, drawings / model
- Develop the design:
  - Coordinate - design team meetings
  - Late inputs – Client & Architect changes, M&E information
  - Contractor changes
  - 'Value Engineering'
- Iterate, refine, document design, check, Issue for Construction
- Optimisation: balance between cost/time and design refinement

# Design interfaces

- Extent of design responsibility - is it clearly defined?
- Fragmentation of design responsibility:
  - Subcontractor design...
  - Oversight of the design by the Engineer
  - D&B contracts - role of contractor ...
- Temporary works:
  - Default is that the engineer is responsible for the permanent works and the contractor for the temporary works
  - Structure has to be buildable
- Considering and conveying design risks:
  - Documentation, drawings, method statements
  - Risk assessments: generic vs specific
  - CDM

## ... where designs go wrong

- Rarely the sole cause of structural failures (because attention given to this, and inherent redundancy in design)
- More often at interfaces and packages that sit between parties
- Often caused by a combination of factors  
For example, design and workmanship...
- Rare to find actual shortcomings in design codes ...  
... but more on this later...
- State of the art...?

## ... where designs go wrong

- Obligations:
  - Appointments not being clear / not accurately reflecting brief
- Interfaces:
  - Fragmentation: gaps left between packages
  - Subcontract design: definition of interfaces, eg steelwork connections
  - Relying on subcontractor's design when not entitled to do so
- Temporary works:
  - Unclear responsibility for temporary works
  - Defining the interfaces: eg retaining wall prop stiffnesses
  - Ignoring how the structure can behave - inadequate identification of risks

## ... where designs go wrong

- In the ground:
  - Unforeseen conditions, inadequate SI.
  - Overlooking water pressure
- Design process:
  - 'The devil is in the detail'
  - Reliance placed on incomplete or under-developed designs
  - Resources / keeping up with site / incomplete details
  - Disproportionate impact of late changes on design process
  - Lack of robustness in design, such as leaking basements
  - 'Value Engineering' not realising the benefits promised, causing delay or other unintended consequences
  - Tried and tested? Beware of novel projects



# Some issues for lawyers

- Identifying the cause(s) in a complex process:
  - Often a combination of causes
  - Separating design from other causes, such as workmanship
  - Relevance of load factors
- Delay claims: whether the design is the cause of delay, or the delayed design a consequence...
- How much reliance can be placed on incomplete designs
  - ... the importance of notes and adequacy of caveats
- Reasonable skill and care vs fitness for purpose
  - State of the art ...