

Built Environment Portfolio

Construction Technology A

Maintenance and Repair

First some reminders...



Plant and Property Maintenance

Legal framework

- Health and safety at work act 1974 (HSW act)
 - Workplace health, safety and welfare regulations 1999
 - Management of health and safety at work regulations 1999 (MHSW regulations)
 - Control of asbestos at work regulations 2002
 - Control of substances hazardous to health regulations 2002 (cover legionnaire's disease)

Plant and Property Maintenance

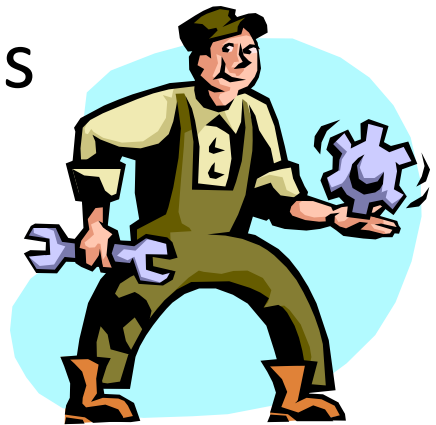
- Electricity at work regulations 1989
- Fire precautions (workplace) regulations 1997 (amended)
- Provision and use of work equipment regulations 1998 (PUWER)
- Construction (design and management) regulations
- Statutory maintenance tests

Construction Work

- ...generally includes all works to a structure, including term maintenance, work on fixed plant, engineering works, painting and decorating, refurbishment work etc.

So what is maintenance?

...is a combination of all technical and associated administrative actions needed to retain an item or system in (or restore it to) a state in which it can perform its required function efficiently and as expected.



...or to put it another way, do the right thing right!

Types of maintenance

- Planned
 - Programmed
 - Preventative
 - Cyclical
- Unplanned
 - Reactive
 - Normal response
 - Emergency response



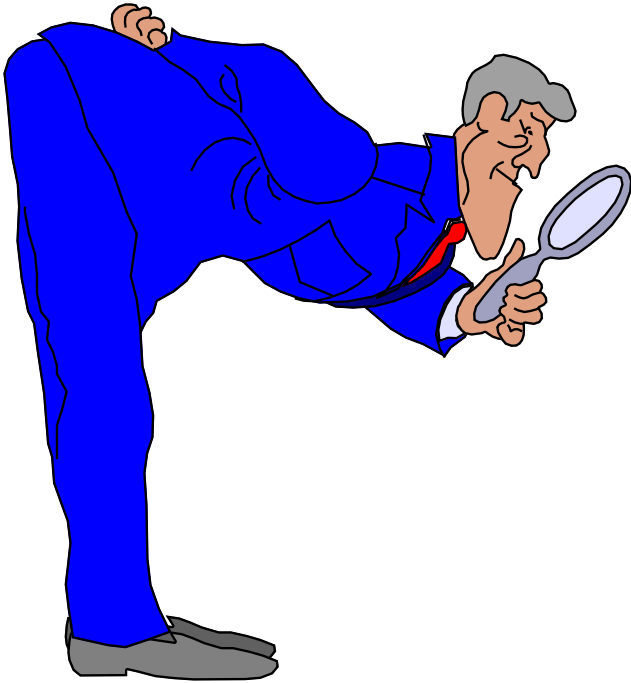
Why is maintenance so important?

- Case Study - MOD Estate (UK)
 - 240,000 ha
 - 3,000+ sites
- The Built Estate
 - 45,000 buildings + 55,000 families' quarters
 - 280 naval, army and airfield bases
 - 676 statutorily protected buildings
 - 204 research, storage and communication facilities
 - 196 Sites of Special Scientific Interest
 - 598 scheduled monuments
- The Rural Estate
 - 160,000 ha
 - 60 training areas
 - 50 small arms, test and bombing ranges

Repair & Maintenance expenditure (£ million)

Year	All Construction Output	Total Repair & Maintenance Expenditure	R & M as % of Construction Output
2003	95095	40358	42
2004	104350	40219	39
2005	109084	40137	38
2006	115776	38837	34
2007	124354	38915	31
2008	125983	39710	32
2009	108764	35810	33

What does maintenance include?



- Inspections
- Assessments
- Repairs
- Surveys
- Renewals

The building maintenance systems

- Building fabric
 - Structural maintenance
 - Painting and redecorating
 - Floors
 - Windows
 - Space division
 - Fittings and fixtures



Case study: cleaning concrete buildings

- Preparation
 - Identify concrete surface
 - Identify surface soiling
 - Trial cleaning
 - Cleaning preparation



The building maintenance systems

- Building services
 - Heating, ventilation and air-conditioning
 - Building management systems
 - Power systems
 - Pressure systems
 - Public health
 - Fire safety



The building maintenance systems

- Support system
 - Grounds and landscaping
 - Car parks
 - Road networks
 - Drainage
 - Boundary walls and fences



Typically, building maintenance will require effective and efficient planning that...

- examines key issues appropriate to formulating a maintenance policy
- explains how to carry out condition surveys
- considers the legal implications of maintenance
- gives guidance on how to present maintenance needs to clients
- delivers an appropriate maintenance budget
- examines the different ways of funding maintenance
- offers practical advice for putting the policy into practice

Why have a maintenance policy?

- Buildings are a costly and valuable asset
- Potential losses
- Well-being and productivity
- Business objectives
- Lack of focus
- Health and safety hazards



Formulating the maintenance policy statement

- The maintenance policy in relation to the overall management policy
 - The user need and use pattern of the building
 - The suitability of the buildings for their intended use
 - The legal framework of occupancy

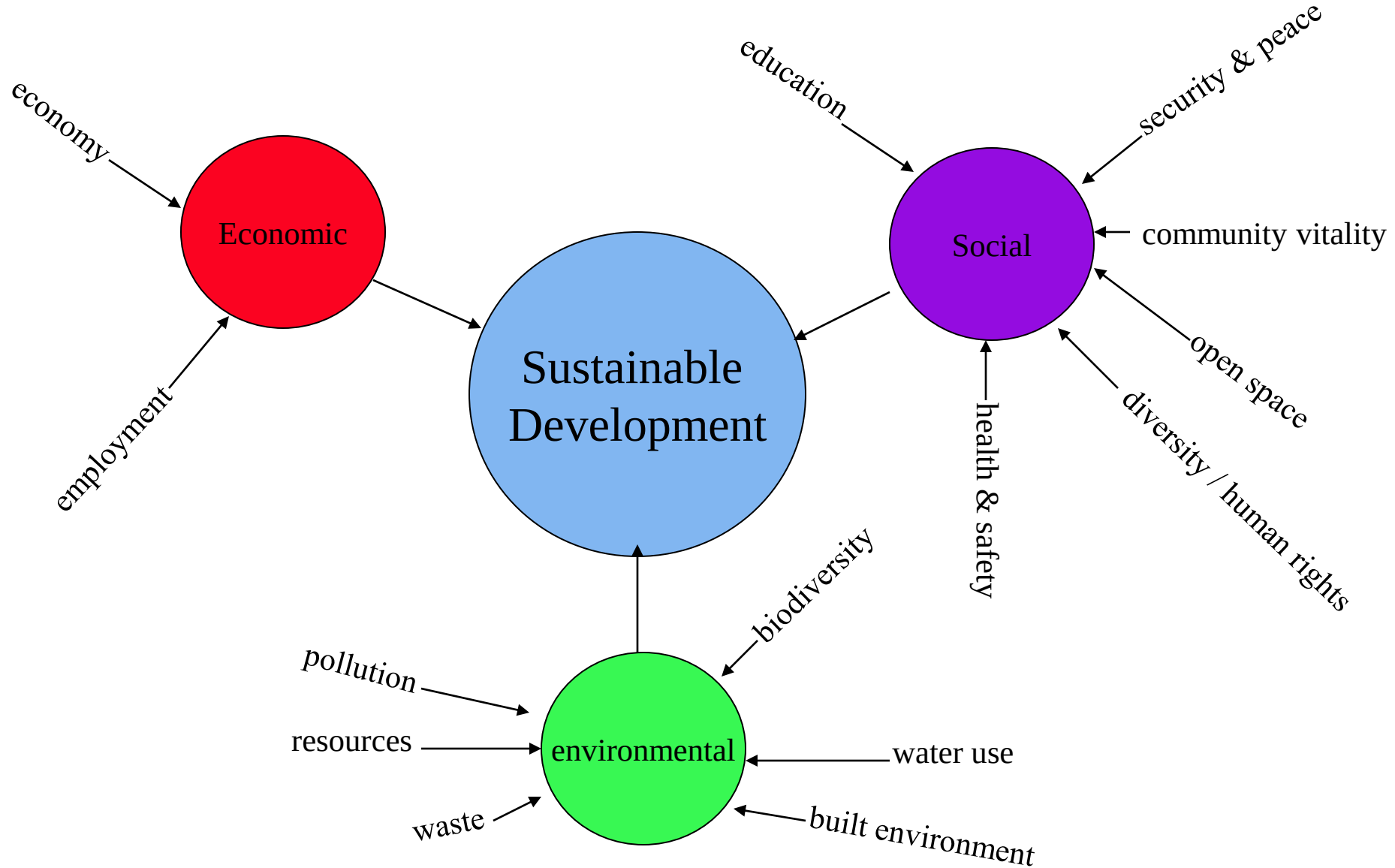
Formulating the maintenance policy statement

- Legal considerations and responsibilities
 - Town and country planning legislation
 - Building regulations
 - Fire safety legislation
 - Health and safety
 - DDA
 - Leases and service charges

Formulating the maintenance policy statement

- Environmental policy
 - Local environmental issues
 - Materials sourcing
 - Waste treatment
 - Energy management
- Business obligations
 - Identify significant environmental impacts in relation to operation of the estate

Businesses & Sustainable Development



Maintenance policy

- Will need to consider...
 - Building users
 - Organisation
 - Procurement
 - Monitoring and feedback

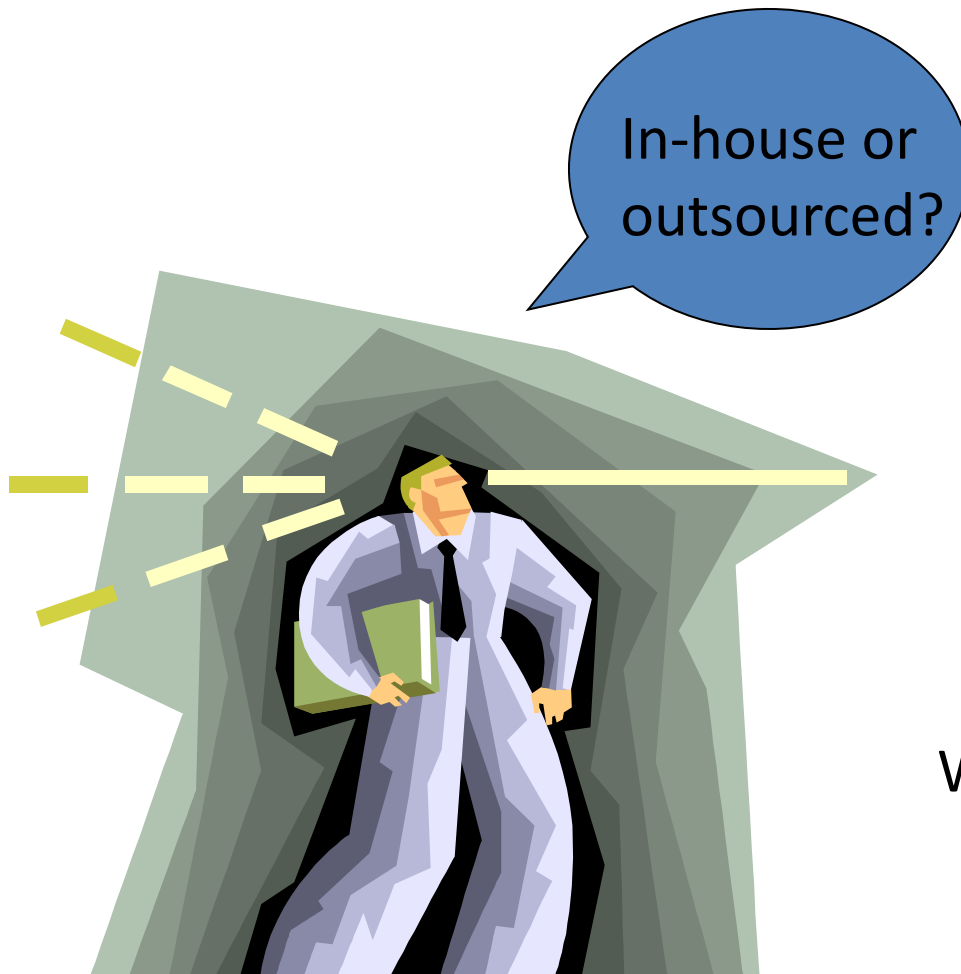


and then there is the assets!

Asset register

Asset No	Item	Location	Purchase date	Initial Value (£)	Job sheet ref
W30	Heating pump	West wing	1999	650	P/2/01
W31	DHWS pump	West wing	2000	480	P/2/01
W32	Boiler	West wing	2001	3500	B/2/04
W33	Extract fan	West wing roof	2000	620	F/1/00
W34	Fluorescent lighting	West wing	2003	550	L/2/99

Maintenance procurement



Priority?

Cost?

What?

When?

How?

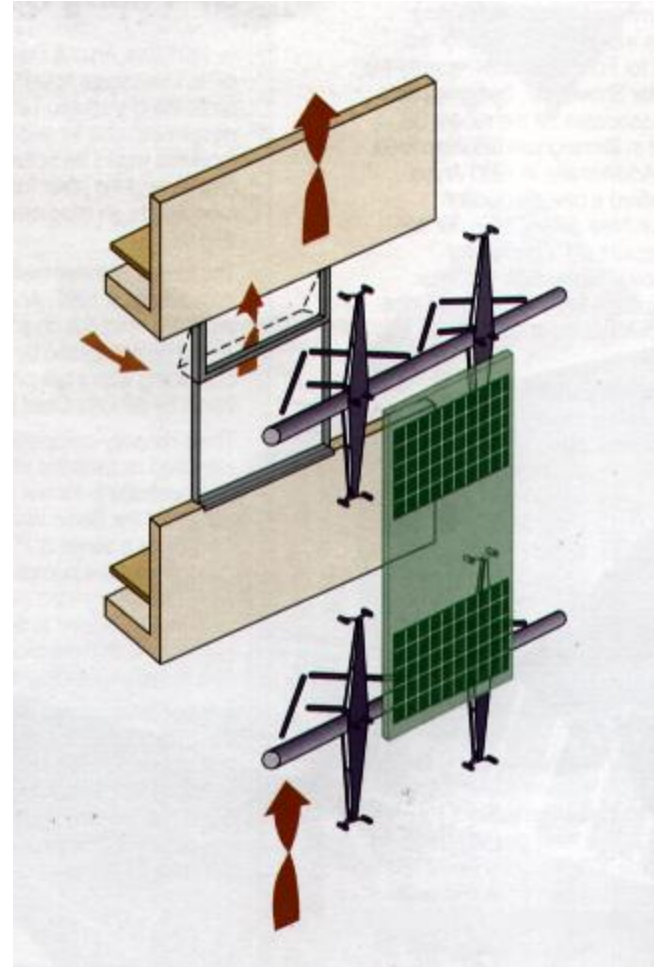
SLA?

Alternatives to planned maintenance

- Innovative management and technology
- JIT
- JITM
- Automated /automatic maintenance

The smart approach

- Sensors
- Actuators
- Smart materials
- Smart systems



Discussion

- You are responsible for the selection of potential contractors for maintenance programmes.

Put forward the key issues that need to be considered prior to formulating any contract.

Building defects

- What is a defect?
 - Failure to achieve the normal or an agreed standard
 - Deficiency
 - Imperfection
 - Fault
 - Error

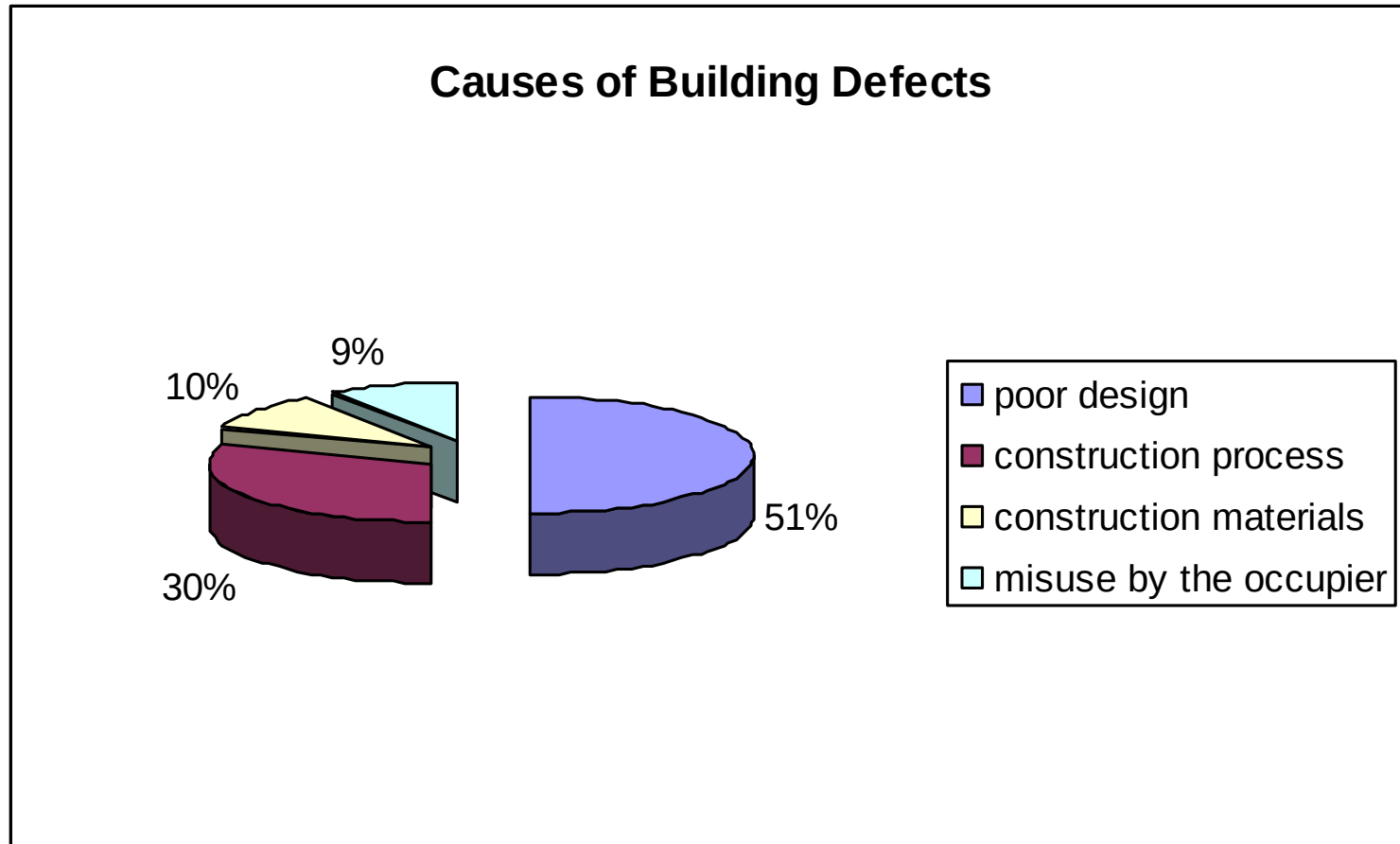


Building defects



- Causes of building defects
 - Materials
 - Under specified sizing
 - Lack of bracing in roofs
 - Strutting
 - Environmental compatibility
 - Movement accommodation

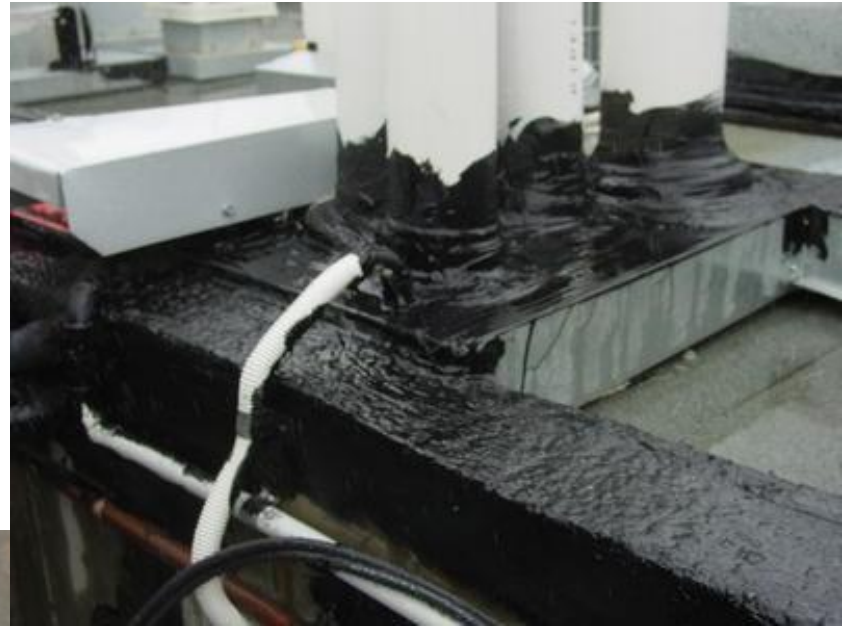
Building defects



Building defects

- Construction faults
 - Poor workmanship
 - Lack of understanding
 - Poor supervision





Building defects



- Design faults
 - Calculation mistakes
 - Misapplication of standards
 - Lack of appreciation
 - Underestimates of loadings
 - Poor detailing



Building defects

- Design faults include:
 - Incorrect choice of materials for exposure conditions
 - Inadequate attention to structural joints and connections
 - Inadequate specification of workmanship and tolerances
 - Buildability





Building defects



- Design faults cont...
 - Poor supervision
 - Failure to carry movement joints through all materials in the plane of joints
 - Lack of appreciation of structural stability

Building defects

- User faults
 - Overloading
 - Additional services
 - Alterations without structural design checks
 - Lack of maintenance
 - Lack of periodic inspection
 - Unskilled / cosmetic repairs
 - Excessive wear and tear





Building defects: workshop

In selected groups (three maximum) visit a range of buildings on the Mount Pleasant Campus and locate at least three defects. These might be slight, moderate or severe. Prepare brief notes for each of the defects giving where possible probable causes. Include in your comments actions that you would propose for rectifying the defects.