BUILDING CONSERVATION AND ENVIRONMENT: COMMISSIONING USEFUL RESEARCH AND UNDERSTANDING PRACTICAL RESULTS

TOBIT CURTEIS ASSOCIATES LLP
What is Building Environment. Why does it matter

- Conditions to which historic fabric is exposed - moisture, heat, light
- Greatest agent of deterioration outside mechanical change
- Direct impact on energy efficiency, cost
- We try and manipulate it for human comfort rather than building stability
Historic building environment is driven by the weather (very different to modern buildings)
DEFINING THE QUESTIONS – WHAT DO YOU WANT TO KNOW

- Background Conditions (benchmark data)
- Specific Failures
- Specific Developments
- Exhibitions and Displays
- Building Performance
Background Conditions (benchmark data)

- Establish how a building performs before any problems or changes occur so when they do, you have the information available - allows long term planning. (building envelope/ rainwater disposal/ microclimate)
Specific Failure

- Damage to stonework/fabric
- Damage to artefacts
- Discomfort of users
Specific Developments

- Glass doors to promote visual accessibility
- Conservation measures – protective glazing
- Heating changes anticipated
  - *Difference between heating engineer monitoring and performance/conservation monitoring.*
  - *Working with heating advisors/ M&E consultants/ heating engineers*
Exhibitions and Displays

- Establish present conditions and risks
- Design control measures
- Evaluate impact of exhibition changes on historic fabric
- Working with exhibition designers/ case manufacturers/ project managers/ architects
- Most exhibition experience (designer/ conservator/ curator) is in museums – not uncontrolled cathedrals
- Get building performance advice very early

- Differentiate design/ diagnostic environmental research and long term museum monitoring
Building Performance

- Building heat is uncomfortable
- Energy costs/ carbon footprint is unnecessarily high
- Building fabric is deteriorating
- Difference between building performance/ conservation specialist and consulting engineer.
COMMISSIONING USEFUL RESEARCH

- Identify the right discipline and consultant (moisture survey, engineering survey, MBG survey etc.)
- References/ methodology from similar projects
- Define the questions in collaboration with consultant and core project team (architect, client)
- Don’t produce a specification which is too prescriptive
- Don’t define tools – identify aims/ deliverables
- Consultant should be able to explain methodology and techniques
- Consultant should be part of design team
ENVIRONMENTAL SURVEY: SEQUENCE AND TOOLS

- Preliminary environmental assessment
  - Physical history
  - Current building condition (deterioration types/patterns)
  - Rainwater disposal system
  - Microclimate
    - Anticipated performance
    - Actual performance
    - Artificial influences (heating/visitors)
  - Preliminary conclusions
  - Further research (if necessary)
Tools for investigations

Basic building examination
GEOGRAPHY & MACRO CLIMATE
(MAPPING TOOLS ONLINE DATA)
UNDERSTAND RAINWATER DISPOSAL (LOCAL OPENING UP)
SUPERFICIAL MOISTURE MAPPING
A MBIENT CONDITIONS (HUMIDITY, TEMPERATURE, LIGHT, UV)

UNDERLYING CAUSES OF DETERIORATION

HUMIDITY, TEMPERATURE, LIGHT, UV RADIATION
Understand the limitations of the analytical technique
CORRELATE DATA WITH DETERIORATION: DEVELOP MODEL
IR THERMOGRAPHY (THERMAL IMAGING)
CONVECTIVE SYSTEMS
RADIANT SYSTEMS
BUILDING HEAT LOSS

HEAT LOSS AS WELL AS HEAT INPUT
MICROCLIMATE: BUILDING HEAT LOSS (AIR LEAKAGE)

BUILDING ENVELOPE
PERSONAL / LOCAL HEAT LOSS
RADIANT/ CONVECTIVE HEAT LOSS
Conductive heat loss
Hidden heat sources/damage
MOISTURE EVAPORATION
➢ **USE RESULTS TO ESTABLISH BUILDING PERFORMANCE MODEL**

- Identify areas of failure that are understood
- Identify areas of failure which require further investigations
FURTHER INVESTIGATIONS: ENVIRONMENTAL MONITORING

Long term temporal data correlating physical change with environmental parameters
DESIGN MONITORING TO ADDRESS SPECIFIC QUESTIONS
EXTERNAL WEATHER

[Graph showing external weather conditions from 23-09-2009 to 03-10-2009]
BUILDING ENVELOPE: BUFFERING
SEASONAL PATTERNS/ HEATING EFFECTS
CANTERBURY CATHEDRAL: SOUTH OCULUS
Condensation on protected/ unprotected glass
CANTERBURY CATHEDRAL: BLACK PRINCE’S TESTER
HEAT INPUT FROM HEATING, HEAT LOSS FROM WINDOWS
EXHIBITION DESIGN AND ENVIRONMENTAL CONTROL MEASURES
Solar mapping
IN DEPTH MOISTURE INVESTIGATION
Below-ground water & Hydrogeology
VIBRATION MONITORING
Work with structural engineers
STRUCTURAL MONITORING

Structure - S Aisle - LDT1, LDT2, LDT3, LDT4 - From 02-Jan To 24-Jun
COMMISSIONING AND UNDERSTANDING ENVIRONMENTAL RESEARCH

KEY POINTS

- Identify consultant with precise skills/experience
- Define question accurately with consultant
- Research must have practical building applications
- Specify aims and deliverables, not tools
- Always carry out preliminary environmental assessment first
- Obtain baseline environmental data before any project, if possible
- Address environmental issues at outset of any project
- Establish long term relationship with consultant