

**“In and Out Air Strategies.
From Climate Change to Microclimate.
Library, Archives and Museum
Preservation Issues”**

5-6 March 2009

Bibliothèque nationale de France

<http://www.ifla.org/VI/4/pac.htm>

British Library Low Oxygen Case Study The Future of Fire Prevention in Archival Storage

**Bibliothèque nationale de France
5-6 Mars 2009**

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The British Library

The British Library at St Pancras, London



The British Library Centre for Conservation



The British Library Centre for Conservation



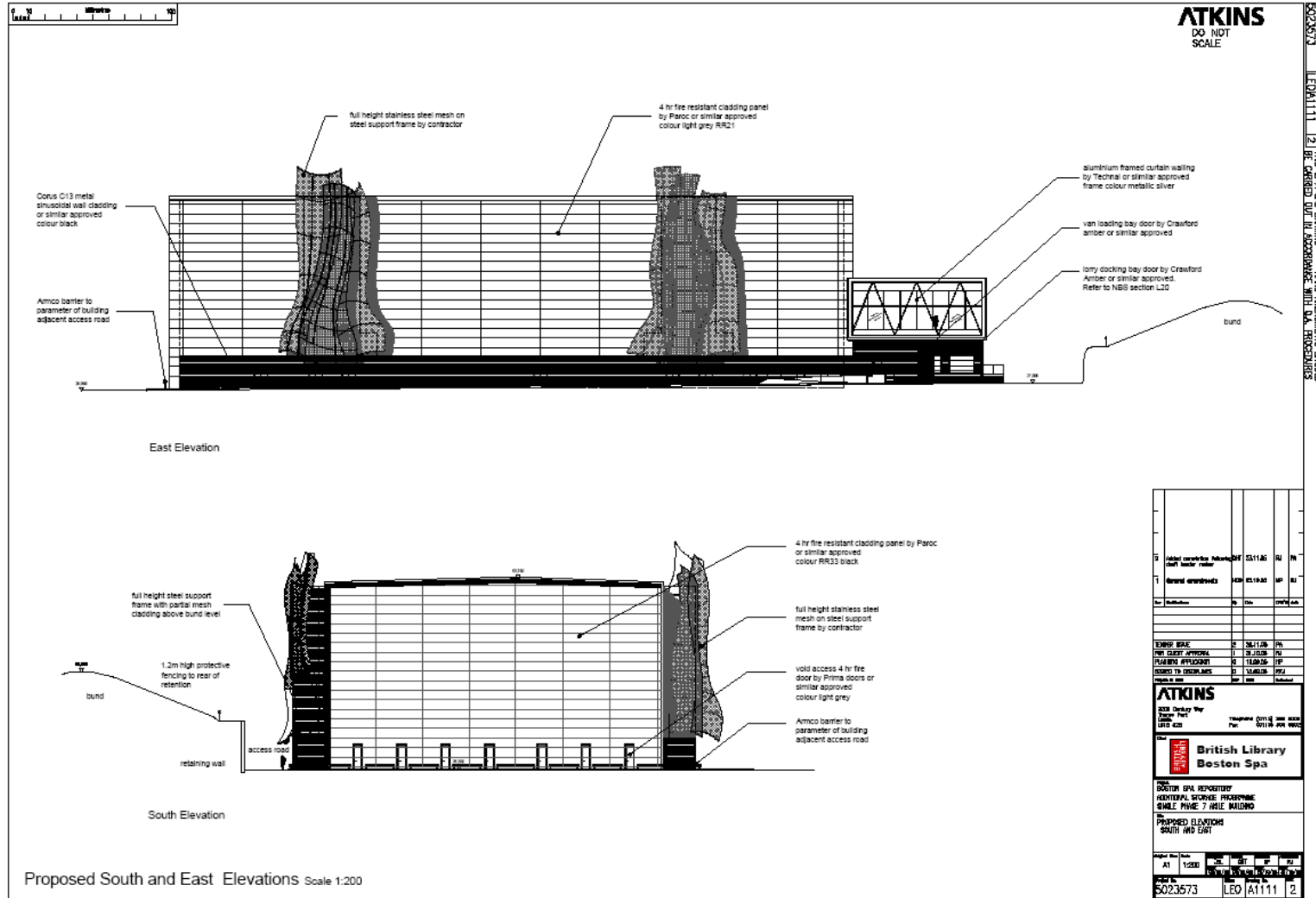
The British Library Centre for Conservation – conservation studios



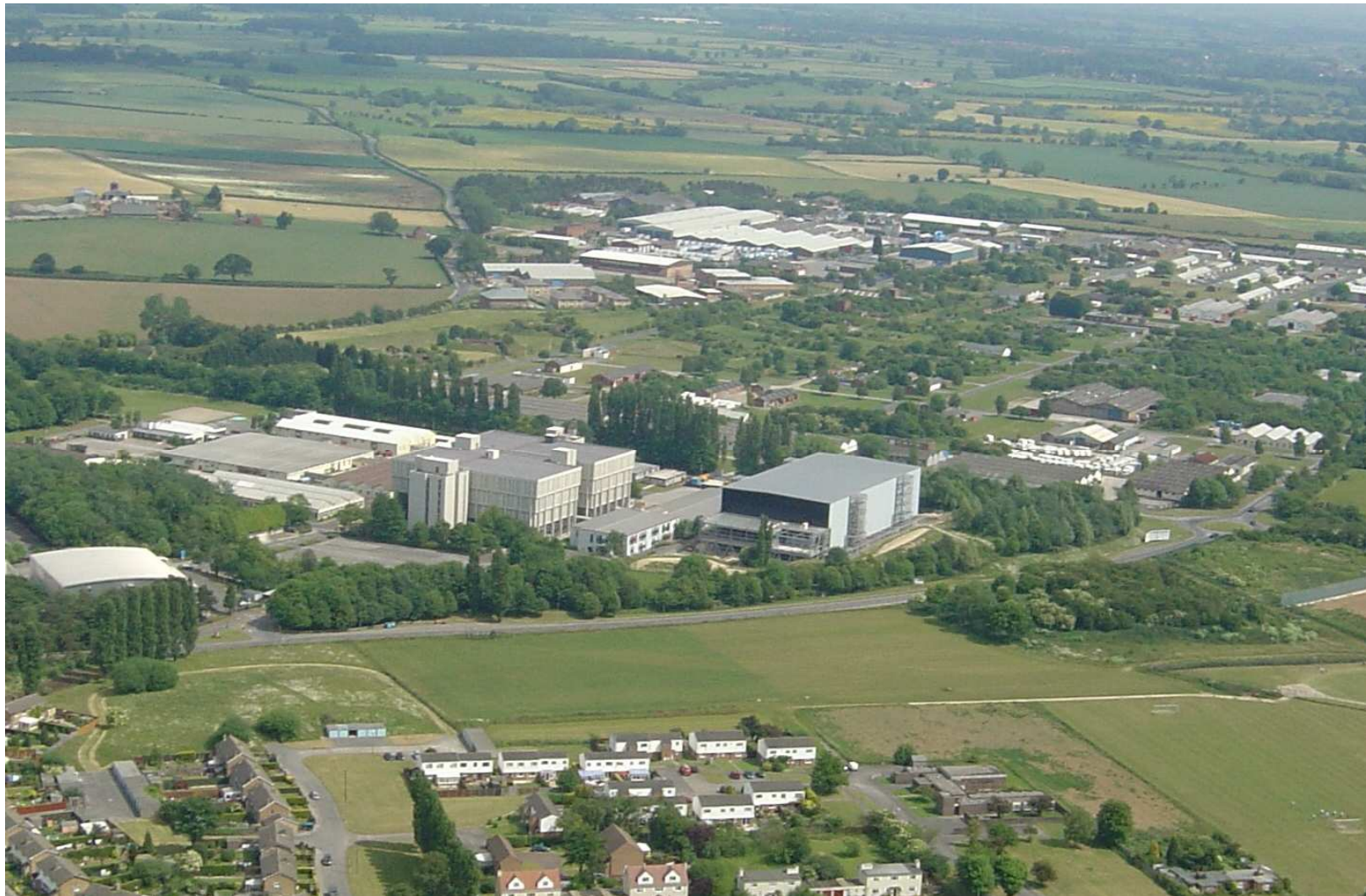
Additional Storage Programme (ASP) Brief for construction

- 262 kilometres storage (should last until 2016)
- High Density, High Bay, fully Automated, controlled environment
- Low oxygen (15%) fire prevention
- High sensitivity smoke detection systems
- Temperature 16C Relative Humidity 52%
- Two separate four hour fire compartments
- 70 year design life
- Energy efficiency / sustainability
- Minimal environmental impact

The ASP building



ASP aerial view



Additional Storage Building, Boston Spa



ASP construction: interior prior to racking installation



PAROC mineral wool
composite panel cladding

4-hour fire rating

Racking 70 feet tall

Crane aisles 2.6 feet wide

Additional Storage Building – high bay, high density racking



Fire Protection in UK Archives – the received wisdom

British Standard 5454:2000

- Sprinklers
- Fire compartments
- 4-hour protection
- Smoke extraction
- Reactive model (thermal trigger): fire is a prerequisite

The reality

- Risk of accidental or partial water discharge
- Freezers to salvage wet books
- For some: no fire suppression at all
- Inefficient building design

Why sprinklers did not suit ASP

- Sprinkler heads required at all 25 levels of racking
- Fire Compartments incompatible with efficient automation and HD building design
- How maintain sprinkler pipes in racking (up to 70 feet in height)?
- Totes fill with water, books are immersed, racking buckles..?

Low Oxygen (OxyReduct)



OxyReduct used in mainland Europe by the Gas, Oil, IT, and Chemical industries

Used where water would cause more problems

Approved by European fire institutes and insurance bodies

Benefits of Low Oxygen

- Preventative model: reassurance to collection specialists
- Nitrogen is an inert gas: no effect on paper-based collections
- Ideal for new build with automation
- Proven effectiveness in preventing fire
- Early detection of even non-visible pyrolysis
- Continuous monitoring throughout storage space
- Assets are protected for min. 72 hours even if OxyReduct system fails catastrophically
- Simple to install and maintain

... not for everyone? Issues in legacy buildings



Groningen University Archive



Groningen University Archive



Further investigation & risk assessment



Hugo Boss cloth warehouse
Germany

2002: two cloth storage
warehouses with sprinklers

2004: single cloth storage
warehouse with OxyReduct

Hugo Boss not viable if cloth
stocks lost to fire

Building holds next 3-4 years'
of stock

Implementation at the British Library: specification

- 15% Oxygen level throughout storage areas
- Independent parallel air sampling Vesda system
- Nitrogen tanker port
- 3 Nitrogen compressors: 2 online, 1 standby, all 3 in emergency
- Building Air Leakage Index specification value: 0.5. Achieved 0.17

Implementation: building air tightness



Hammersens, Osnabruck

PAROC air test box:

- 4 metres square
- 400mm thickness
- 4-hour fire resistance
- High thermal capacity
- ASP: 11 KM of joints

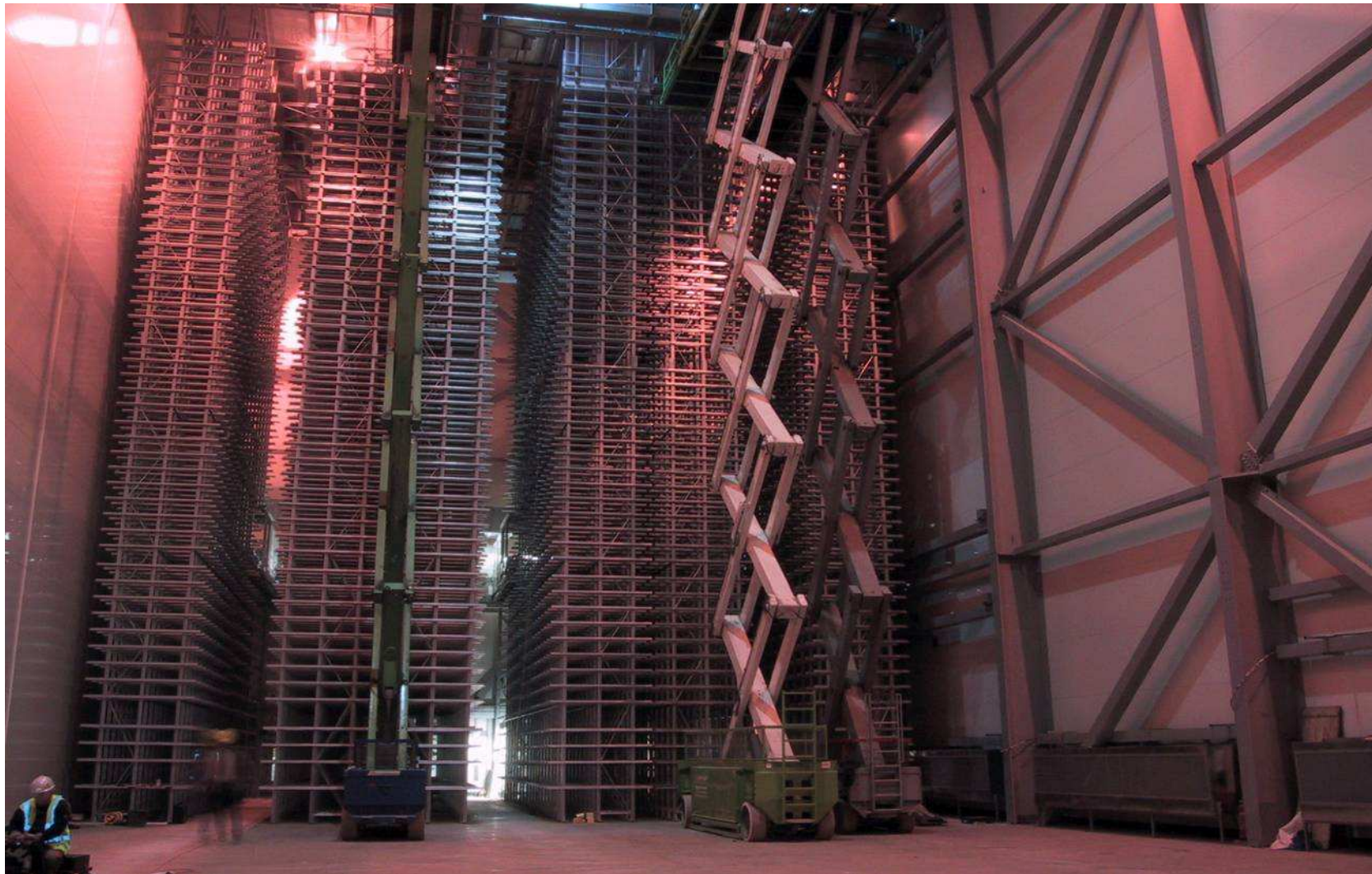
Air Leakage Index value of 1 =

1 cubic metre of air leaking through

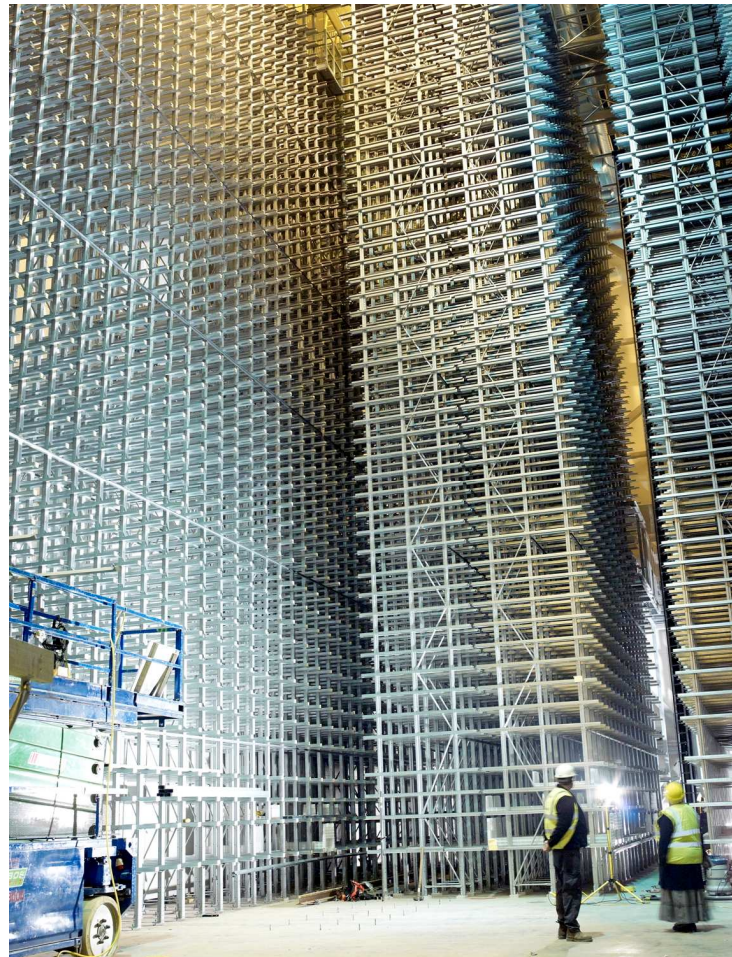
1 square metre of building envelope

in 1 hour

Installing High Bay, High Density 21 metre Racking



Installing High Bay, High Density 21 metre Racking



Picking stations



Turntable at Picking Station



Conveyor System



Visitors' Viewing Gallery



Totes in Loading Bay



Crane in Aisle

