SFPE Chicago November 2011

REGENSTEIN (MANSUETO) ADDITION LIBRARY A.S.R.S. PROTECTION

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Images Courtesy of Murphy/Jahn

Presentation Content

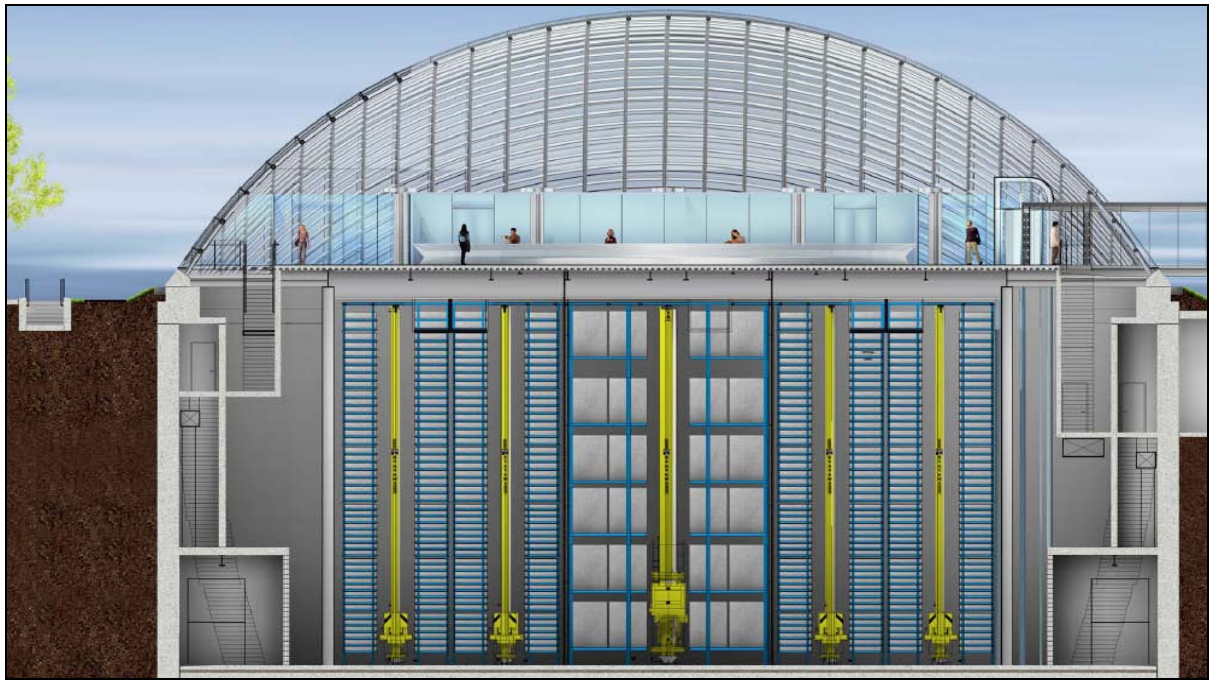


Image Courtesy of Murphy/Jahn

- Project Description & Initial Concepts
- Code Compliance Challenges
- Fire Protection Challenges

Project Overview

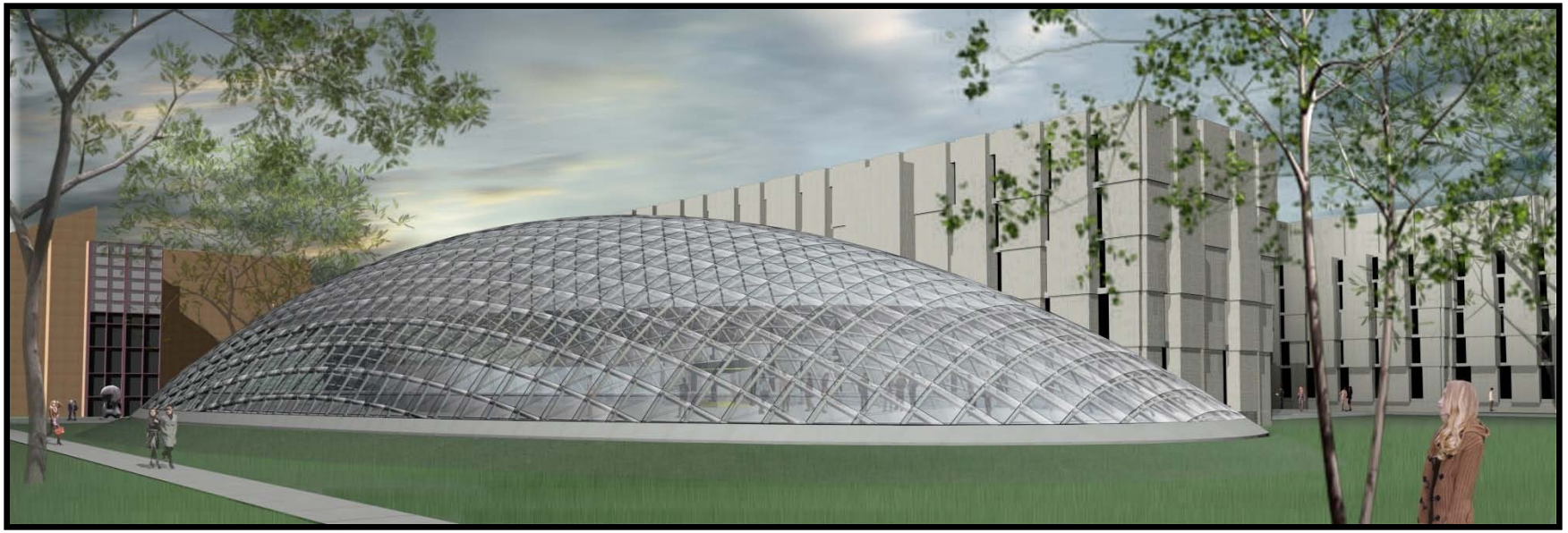
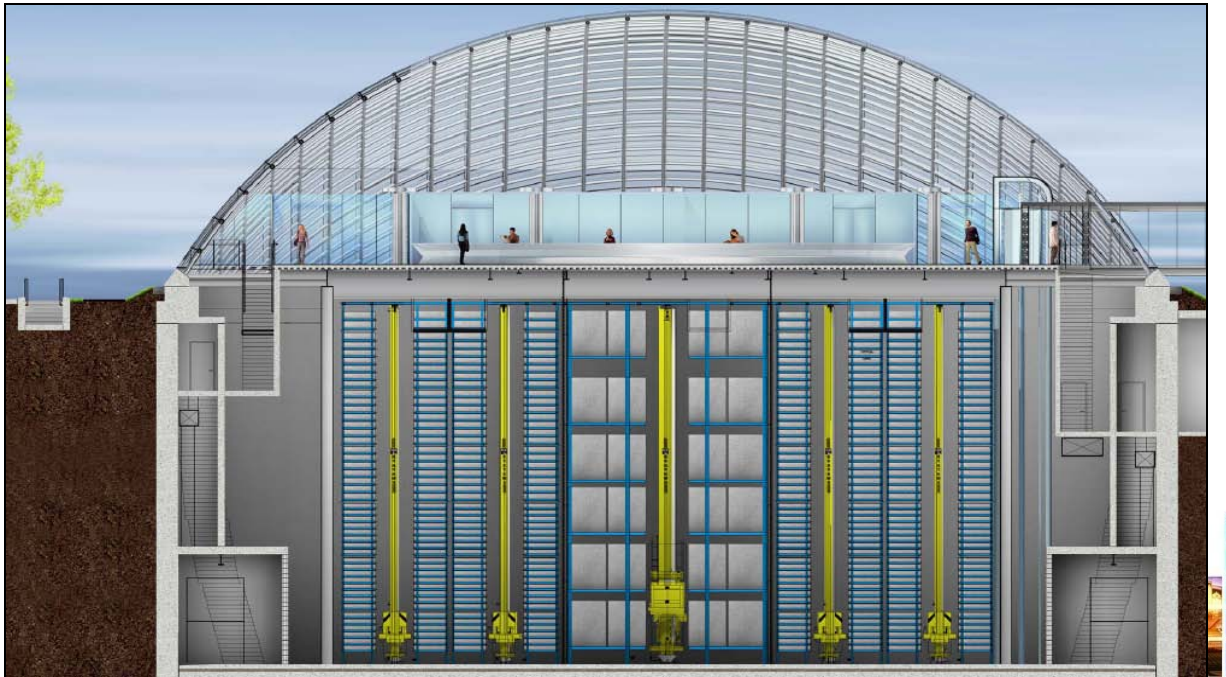


Image Courtesy of Murphy/Jahn

- Existing Library (6 stories, ~572,285 ft^2)
  - Being retrofitted with AS
- Glass and Steel Dome Addition
- ASRS – 55 feet below grade

Initial Design Concepts

- Rack supported floor
- Vision “mote”
- Unprotected (fireproofing) steel dome
- Observation room on mezzanine



Building Description

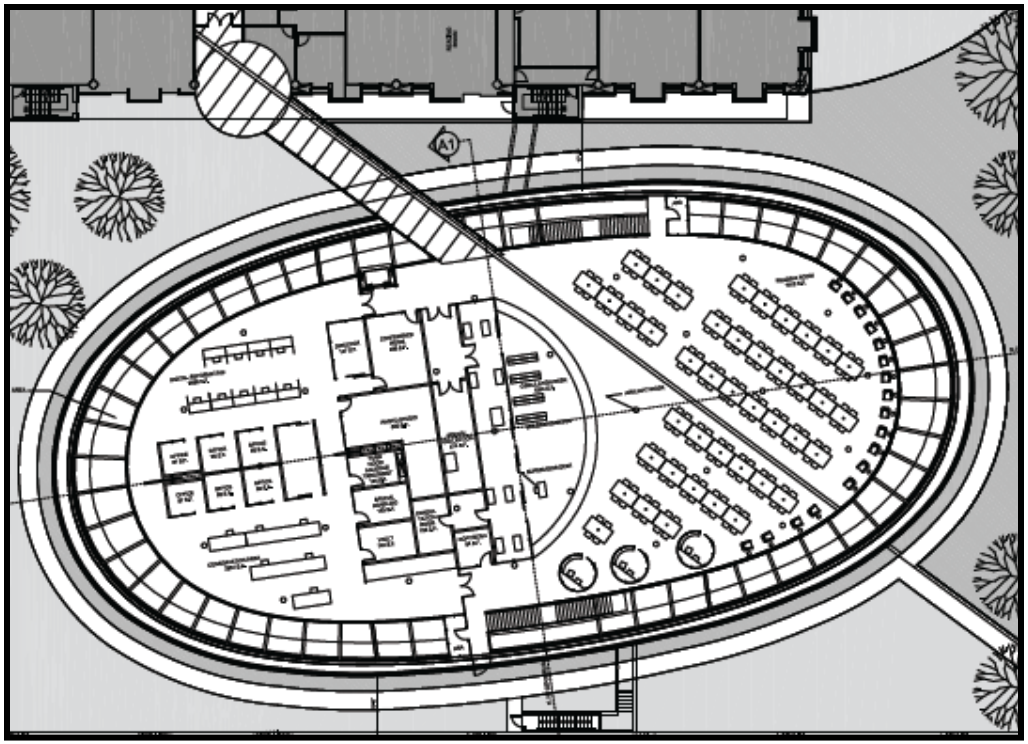
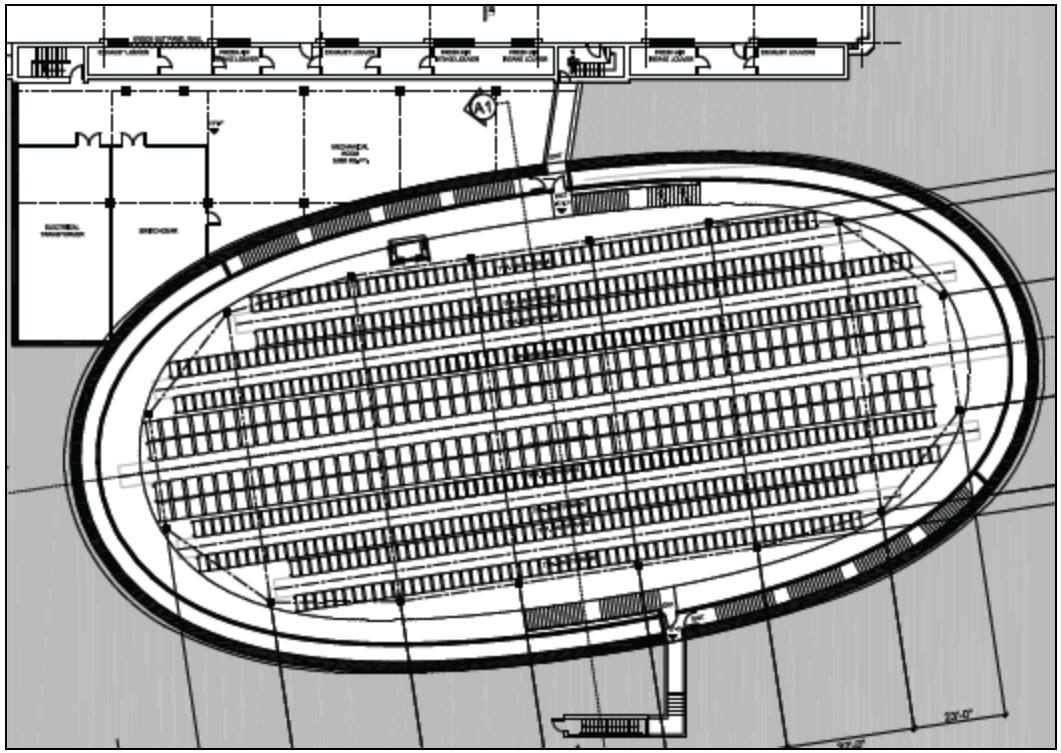


Image Courtesy of Murphy/Jahn

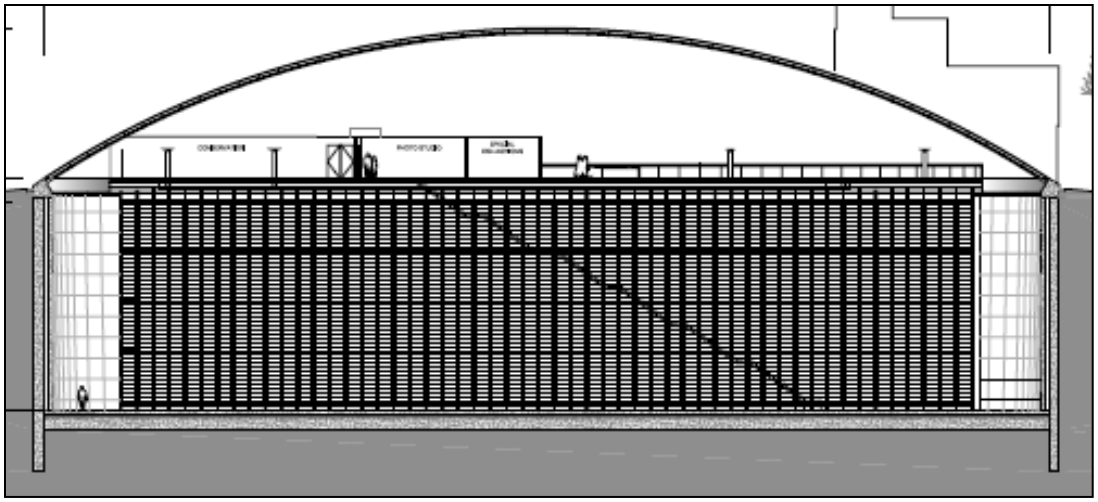
- First Floor (~23,809 ft^2)
  - Reading Room
  - Materials Retrieval
  - Book Preservation

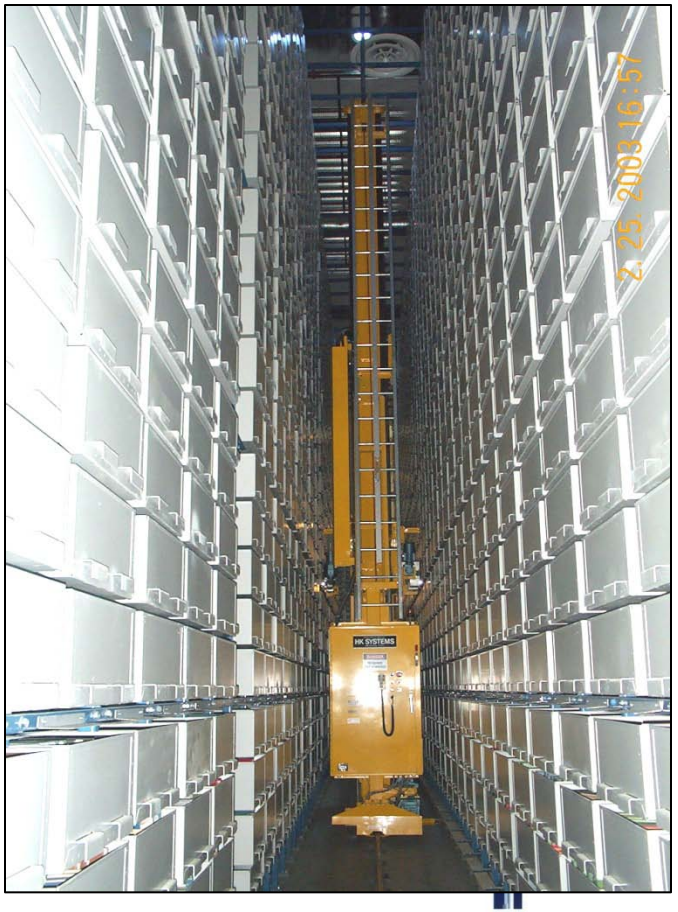
Building Description



- Mezzanine (~7,985 ft^2)
  - Mechanical equipment
  - Emergency exit

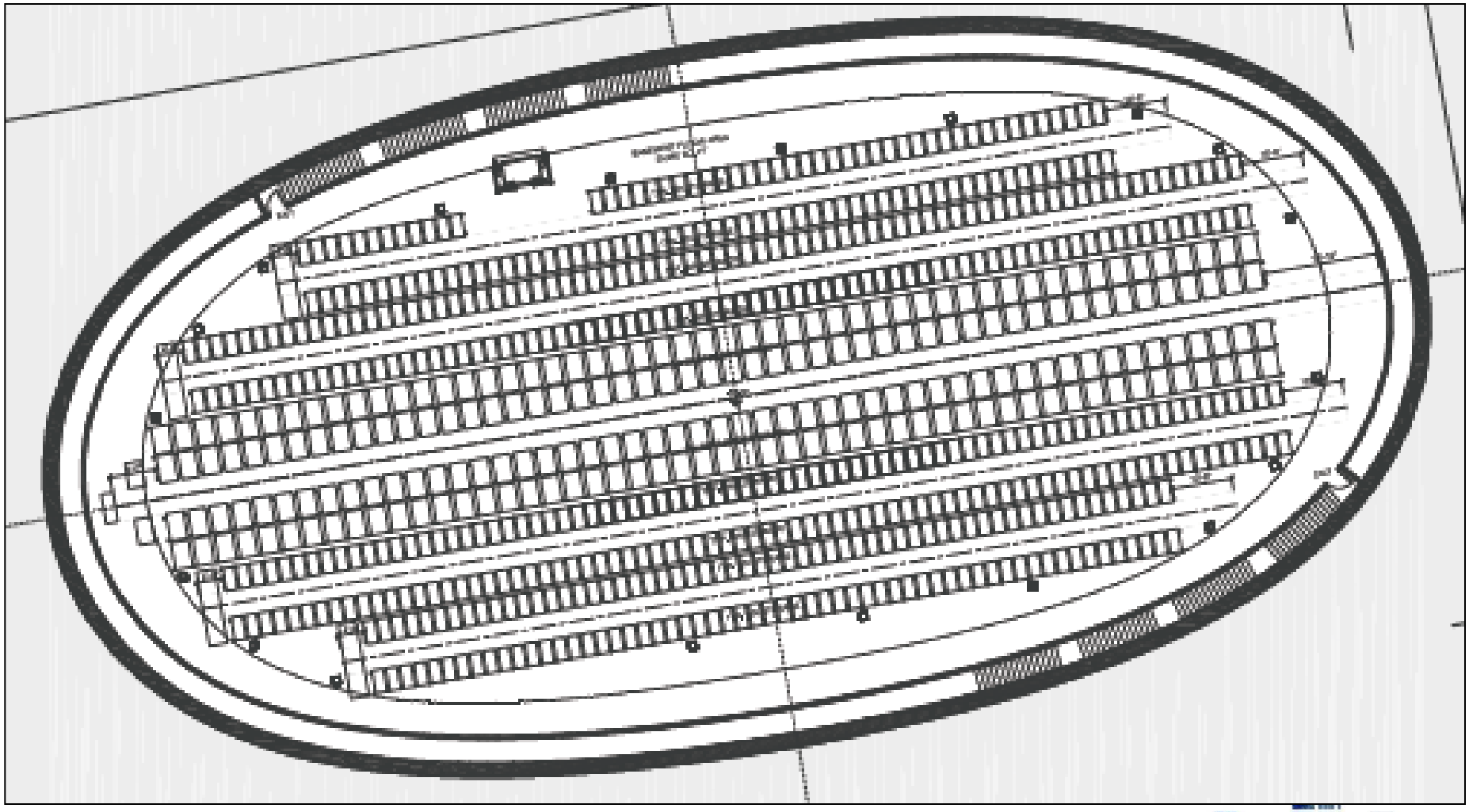
Building Description





- Basement (~23,715 ft^2)
  - Book Storage
  - ASRS
  - Approximately 55 feet below grade

Building Description



Code Compliance Challenges

- Occupancy Classification
- Separation from Regenstein
- Construction Type
  - Existing Library - Type 1B Construction (NFPA I(332) or IBC 1A)
  - Addition - Unprotected?
- Unprotected Steel Dome

Occupancy Classification

- Addition vs. Stand Alone Building
  - Evaluate Uses
  - Reading Level and Stacks Area
    - Entire use to serve library
  - CBC Occupancy: C-1 (Large Assembly)
  - Accessory occupancies – Stacks area
    - CBC: 5% of building auxiliary use
  - CBC - all storage rooms > 100 sq ft
    - 2 Hr

Construction Type

- Addition vs. Stand Alone Building
  - Evaluate Construction Type
  - Existing Building
  - Addition
    - CBC: Type 1-B construction
  - Single Building – No Fire Separation

Construction Type

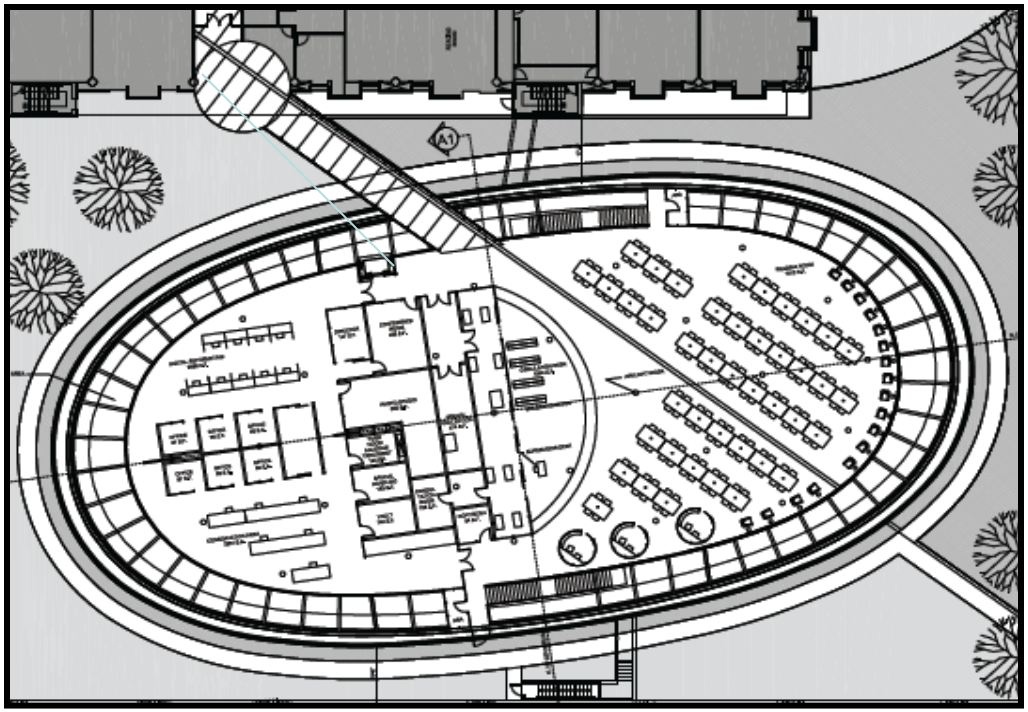
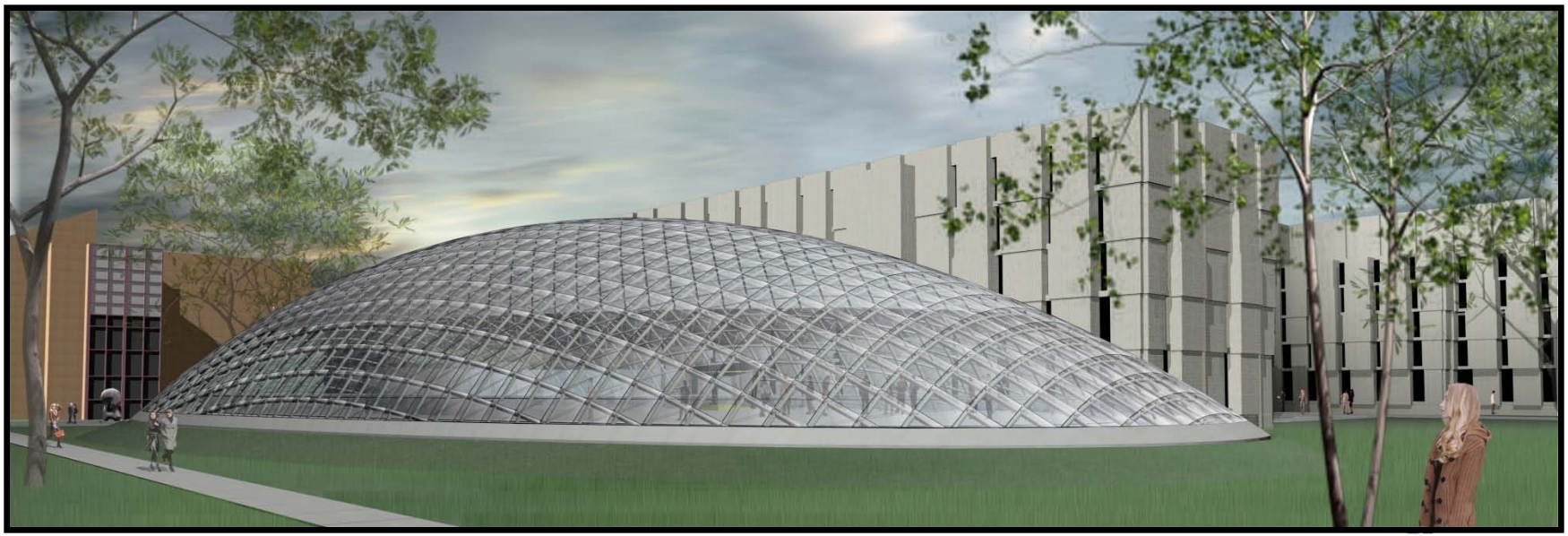


Image Courtesy of Murphy/Jahn

- 2-Hr Fire Barrier Separation from Regenstein
- CBC Table 6(13-60-100)
  - Note (p) permits unprotected roofs in light hazard sprinklered occupancies

Unprotected Steel Dome

- Is it a Roof or a Wall?



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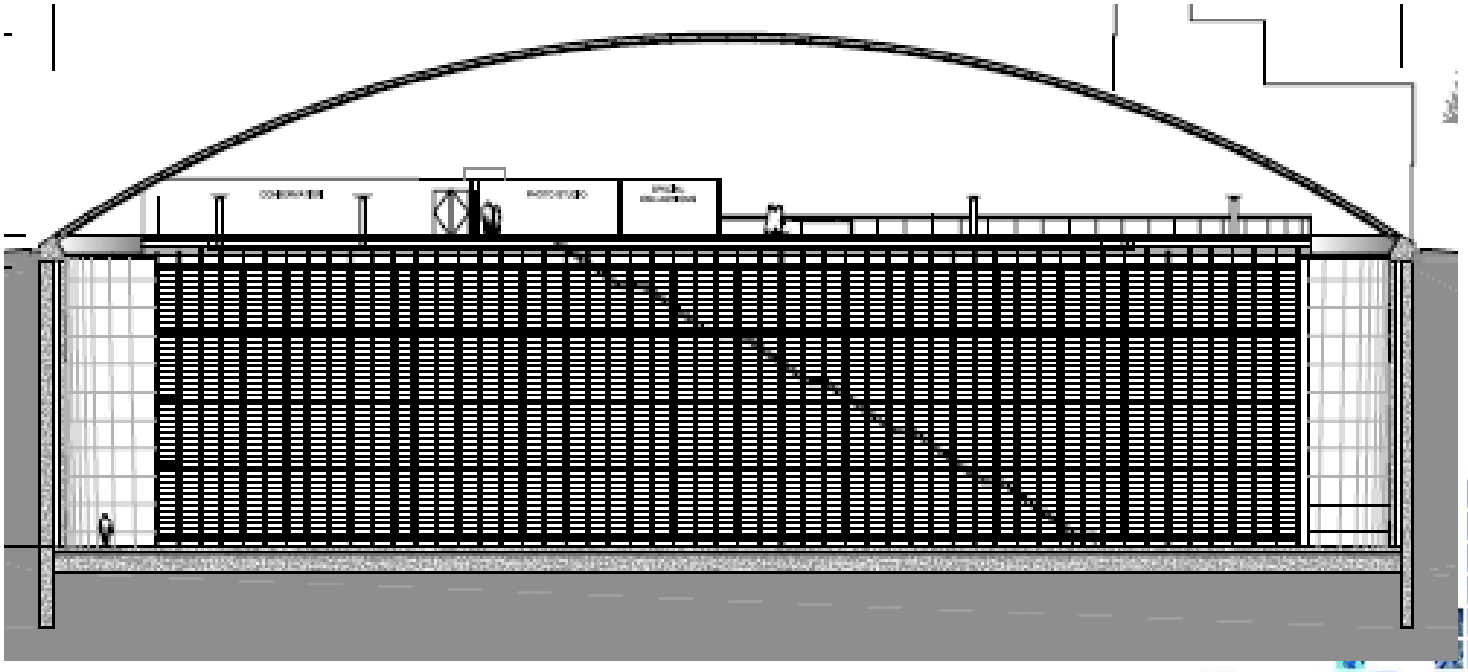
Unprotected Steel Dome

- CBC Definition: roofs are all assemblies less than 75 degrees relative to horizontal
- Dome connection to grade at all points is < 75 degrees to horizontal
- It is a Roof!!
  - FRR *Not Required* per Note (p)!!

Unprotected Steel Dome

- Limited combustibles near points of connection to “grade”



Fire Department Concerns

- Engaged Early
  - Tour
  - Meetings
- Access to building
- Response point
- Combustibles in basement
  - Firefighting challenges

Fire Protection Challenges

- ASRS
- Different Storage Arrangements
  - Open pallet
  - Bin Box
- Firefighter Building Access
- Firefighter Manuverablity in ASRS

Storage Arrangements

- Bin Box
  - Ordinary combustibles
  - 5 sided steel containers
  - 24” wide, varying heights, 48” deep
  - 1” clearance between rows of boxes
- Open Pallet
  - Oversized Books
  - Maps, Charts, Drawings
  - Portfolios

Storage Arrangements

Protection Options for ASRS

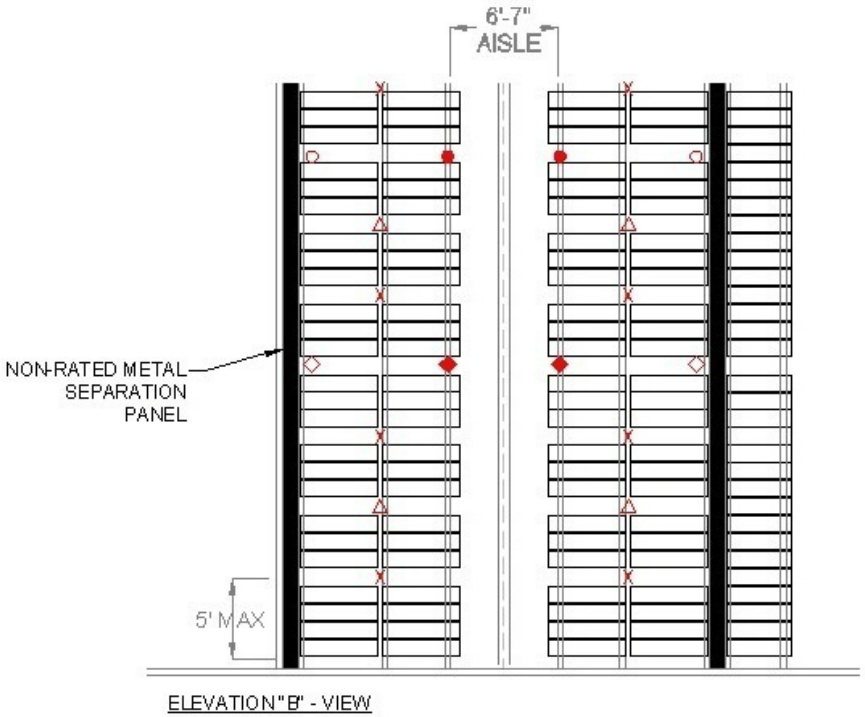
- NFPA 13 does not directly address other than as high rack storage
- CBC has nothing specific
- FM Data Sheet specifically for ASRS
- Need to build on:
  - Limited ignition sources
  - Limited occupant access
  - Separation and Confinement of Combustibles

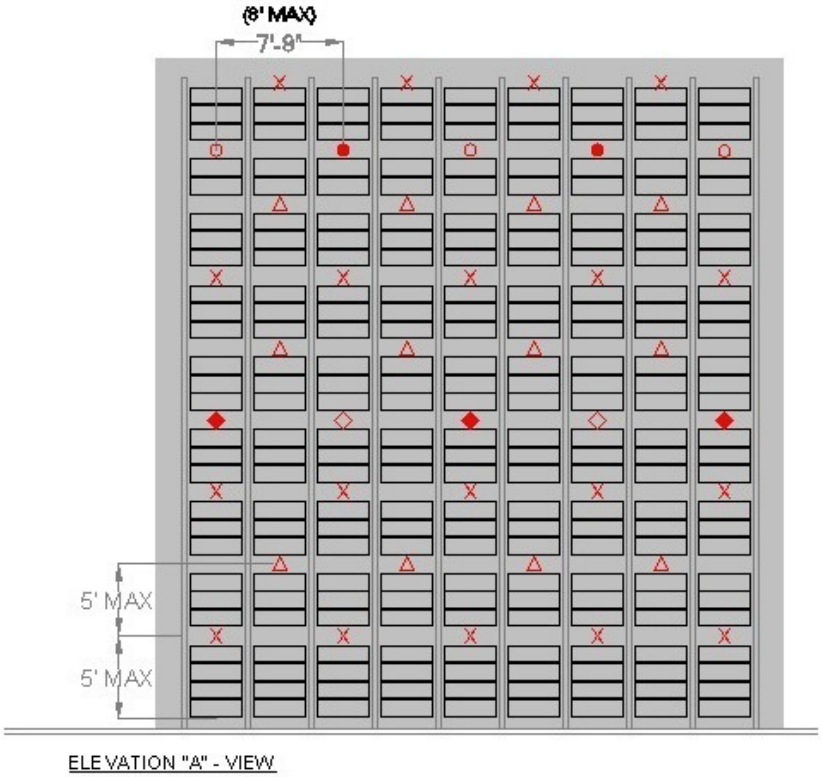
FM Data Sheet 8-34

- Automatic sprinkler requirements
  - Bin Box storage
    - Ceiling sprinklers
    - No in-rack sprinklers
  - Pallet storage
    - Ceiling sprinklers
    - In-rack sprinkler system

Sprinkler Protection

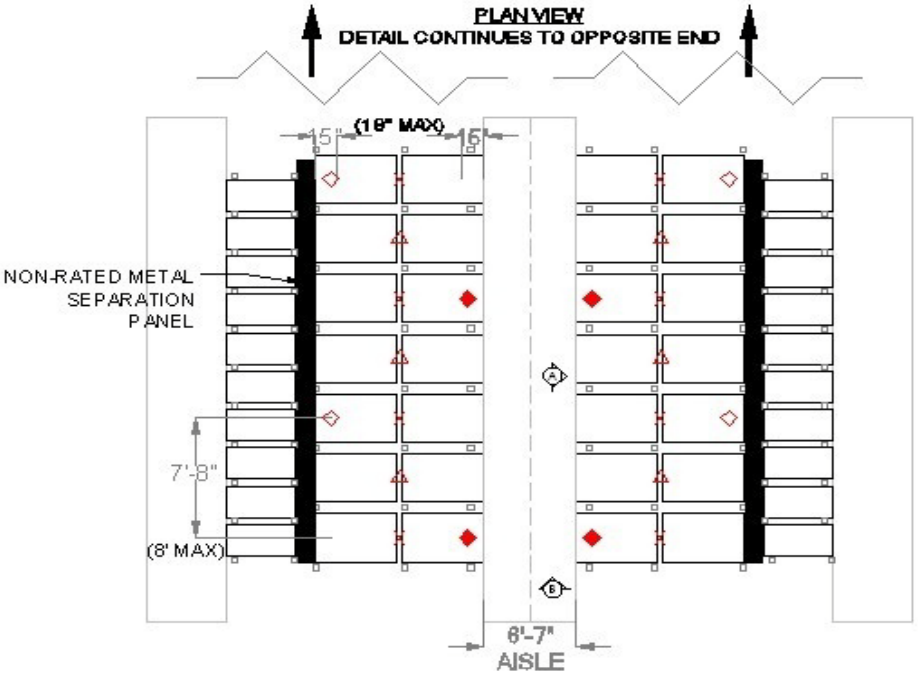
- In-rack Sprinklers for Open Pallet

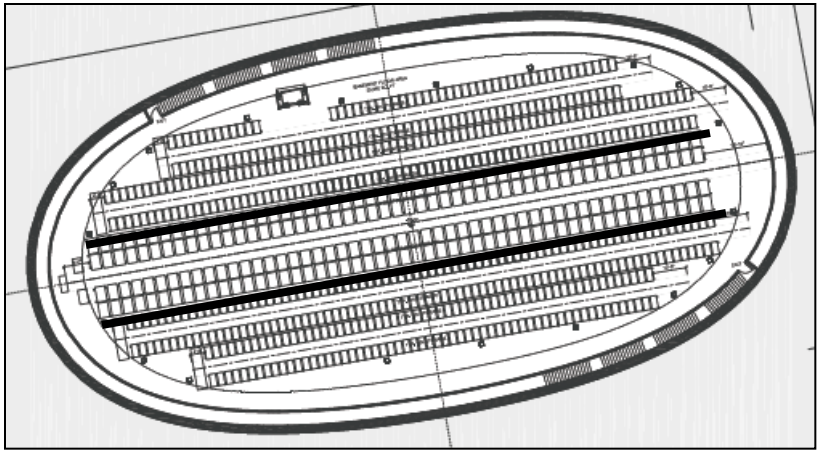




Sprinkler Protection

- Physical separation of sprinkler systems





Smoke Exhaust

- Not required by CBC
- Have you ever fought a basement fire?
- Book stack area heat & smoke exhaust
  - Remove smoke and heat to aid fire fighting
  - Volume based exhaust system (BOCA)
  - Activated by sprinkler water flow
  - Manual override controls

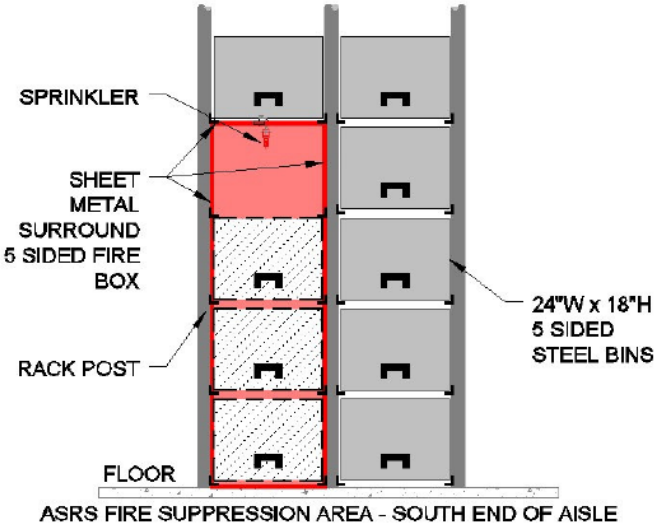
Early Detection Options

- Rack Supported Floor Considerations
  - Aspirating Smoke Detection
    - No place in racks to locate pipe
  - Beam Detectors
    - Robot movements
  - Video smoke detection
    - Insufficient lighting
    - Technology too new
  - Fire Command Room

Firefighting Options

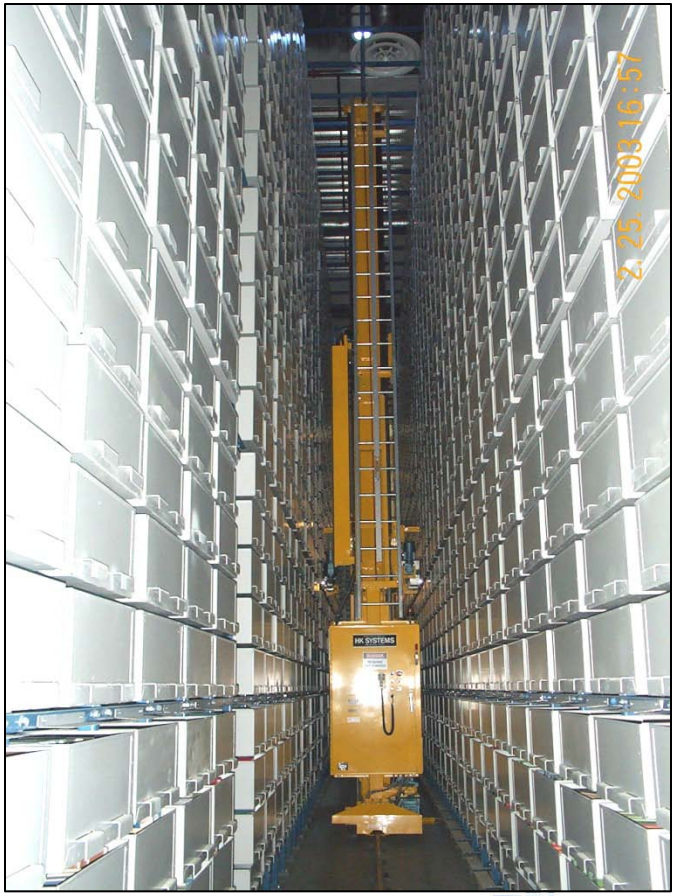
- Reduced oxygen environment
  - Volume too large (150,000 cu ft)

- “Addressable” Linear Heat Detection Hybrids
  - ASRS and Linear Heat
  - Robot mounted suppression systems
  - “Fire box”



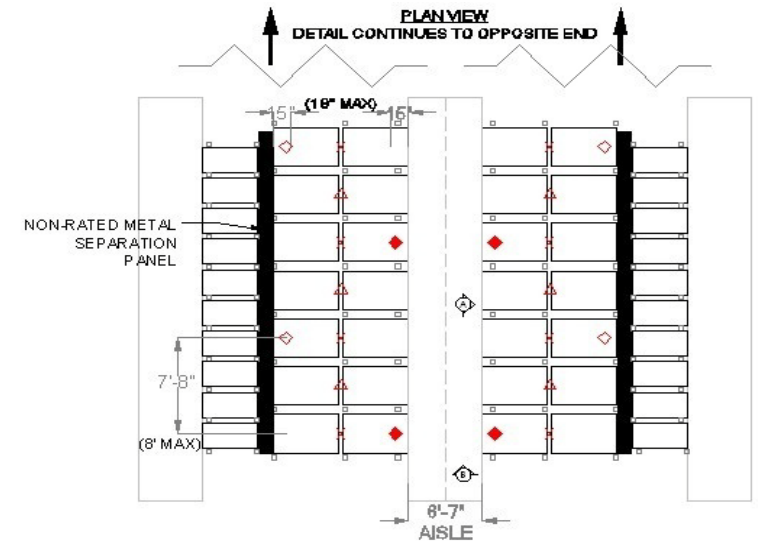
Implemented Solutions

- Limited Ignition Sources
  - Reduced lighting
  - Controlled access
  - Electric ASRS robots
- Confined fuel loads



Implemented Solutions

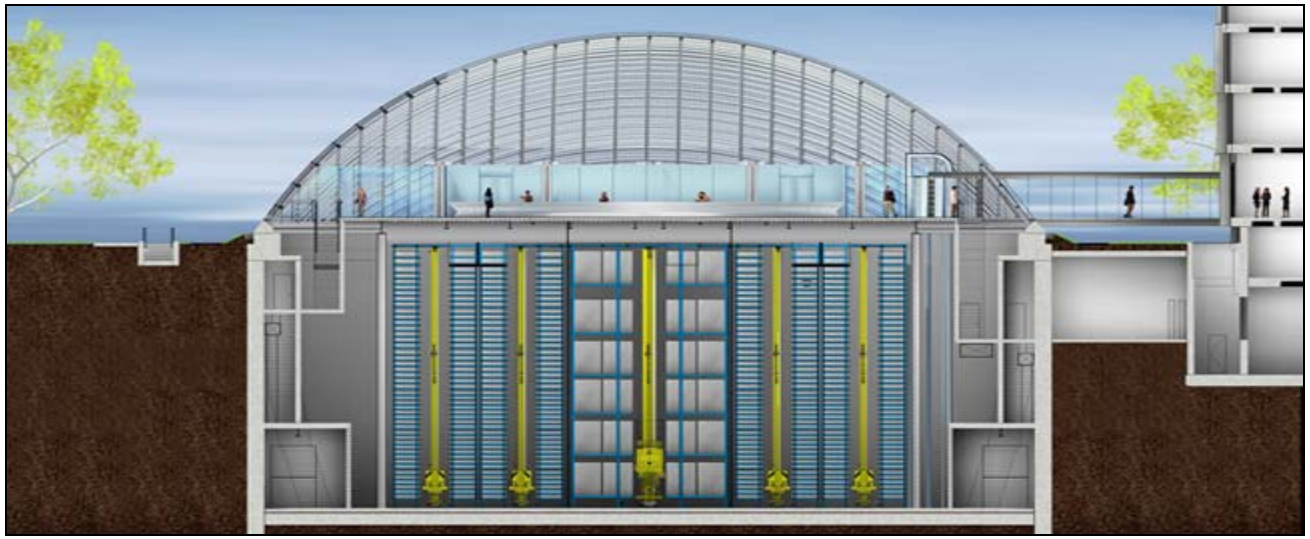
- Dual Hazard Sprinkler Protection
- Fire Alarm/Detection
  - Detection not required by CBC
  - Spot type detection at ceiling (CFD request)
- Smoke Exhaust
- “Separation” of Hazards



Implemented Solutions

- ASRS manual mode to allow FD
- Ladder (w/ safety harness system) on robot
- FD hose valves throughout space
- Separate Fire Department (FD) access

Thank You



Special thank you to Murphy/Jahn

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