Sustainable Design in Renovation - Case Studies

AIA Course Learning Objectives:

• Understand sustainable design components applicable in renovations
• Understand why renovation work is sustainable even using LEED NC criteria
• Understand what role phasing plays in sustainable renovations
• Understand how sustainable design practices can apply in historic building renovations
  • Building Envelope
  • HVAC systems
  • Lighting
  • Water Conservation
LEED New Construction & Major Renovations
LEED Commercial Interiors
LEED Existing Building
LEED Operations & Maintenance

- Performance period based
- Requires Over 20 Sustainable Practices Policies to be in place and periodic reporting
  - Site & Building Maintenance
  - Sustainable purchases – office supplies
  - Green Cleaning
  - Documenting Worker Productivity
- HAZMAT removal or encapsulation
- Existing Building Commissioning – plan for continuous improvements
- Enhanced Metering
- Outdoor Air
- Energy Star Rating – minimum 60 pts
- Similar Water Efficiency Requirements
LEED New Construction & Major Renovations

LEED Commercial Interiors

LEED Existing Building

LEED Operations & Maintenance

- Performance period based
- Requires Over 20 Sustainable Practices Policies to be in place and periodic reporting
  - Site & Building Maintenance
  - Sustainable purchases – office supplies
  - Green Cleaning
  - Documenting Worker Productivity
- HAZMAT removal or encapsulation
- Existing Building Commissioning – plan for continuous improvements
- Enhanced Metering
- Outdoor Air
- Energy Star Rating – minimum 60 pts
- Similar Water Efficiency Requirements
Renovation of Moorhead Federal Office Building
Moorhead Federal Office Building

- GSA
- Downtown Pittsburgh, PA
- Built in 1962
- 27 stories
- Over 50 agencies
- 1500 Occupants
- Gross square feet: 783,000 sf
- Typical tenant floor: 22,680 sf
- Typical floor to floor ht: 12’-0”
Moorhead Federal Office Building

Energy Efficiency & Code Driven Scope

- Design the retrofit of the existing building to a Class A facility
- ADA / Life Safety Code Upgrades
- Upgrade/replace all building systems including HVAC, Electric, Plumbing, Life Safety
- Remove all asbestos containing materials
- Thermal Improvement of Curtainwall
- Meet or exceed Sustainable Design Initiatives
- Improve Tenant Work Environment
Moorhead Federal Office Building

Phasing Goals & Objectives:

- Consolidate Agency Spaces
- Maximize Occupancy During Renovation – GSA Receives Rent
- Minimize tenant agency disruption and number of moves
BUILDING LIMITATIONS

- Zones for HVAC
- Asbestos Abatement Containment
- Maintain Life-safety during Construction
- Maintain Building operations

PHASING PLAN DEVELOPMENT

Housing Plan

Blocking & Stacking

Phasing Plan

TENANT CRITERIA

- Maximize internal agency adjacencies
- Minimize number of moves
- Minimize swing space
- Minimize tenant disruption
- Minimize impact of any recent renovation
PHASING – DRIVEN BY HVAC DISTRIBUTION

- 23rd Floor
- 12th Floor
- Basement
Moorhead Federal Office Building

Phasing possibilities:

• One phase – total building renovation
• Two phases – half building renovation
• Four phases – quarter building renovation
• Half floor renovation
• More than 4 phases
Moorhead Federal Office Building

Phasing possibilities:
- One phase – total building renovation
- Two phases – half building renovation
- Four phases – quarter building renovation
- Half floor renovation
- More than 4 phases

Major Analysis Factors:
- Internal vacant space was available
- GSA as landlord desired to maximize tenant occupancy during construction - keeps rent
- More phases increased Cost of Construction
- External customized swing space is expensive and not sustainable
**Phasing Comparisons**

- Number of Tenant Moves
- Amount of External Swing Space
- Duration of Construction

---

<table>
<thead>
<tr>
<th>PROPOSED PHASING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGENCY REQUIREMENTS:</td>
</tr>
<tr>
<td>A. AGENCY ADJACENCIES ACCOMMODATED EXCEPT:</td>
</tr>
<tr>
<td>• SBA DESIRE TO BE NEAR COE</td>
</tr>
<tr>
<td>• AIR FORCE DESIRE NOT TO BE WITH OTHER RECRUITING OFFICES</td>
</tr>
<tr>
<td>• RRB DESIRE TO BE NEAR IRS.</td>
</tr>
<tr>
<td>B. AGENCY LOCATION ACCOMMODATED EXCEPT:</td>
</tr>
<tr>
<td>• CD-ITA</td>
</tr>
<tr>
<td>• DOL-LMS AND DOL-WHD</td>
</tr>
<tr>
<td>• DOT-FEA AND DOT-FHWA</td>
</tr>
<tr>
<td>• GPO-BOOK</td>
</tr>
<tr>
<td>• MEPs</td>
</tr>
<tr>
<td>• USAFR-AF AND USAFR-MARINES</td>
</tr>
<tr>
<td>• US SENATE</td>
</tr>
<tr>
<td>• US ATT</td>
</tr>
<tr>
<td>C. LARGE AGENCIES MOVE ONLY ONCE</td>
</tr>
<tr>
<td>• COE</td>
</tr>
<tr>
<td>• MEPS</td>
</tr>
<tr>
<td>• PARTIAL IRS</td>
</tr>
<tr>
<td>• VA</td>
</tr>
<tr>
<td>D. NUMBER OF AGENCIES WITH NO SWING SPACE:</td>
</tr>
<tr>
<td>23 (253,211 SF)</td>
</tr>
<tr>
<td>E. NUMBER OF AGENCIES MOVING TO IN-SWING:</td>
</tr>
<tr>
<td>15 (66,205 SF)</td>
</tr>
<tr>
<td>F. NUMBER OF AGENCIES MOVING TO OUT-SWING:</td>
</tr>
<tr>
<td>10 (49,407 SF)</td>
</tr>
<tr>
<td>G. NUMBER OF AGENCIES W/ MORE THAN ONE MOVE:</td>
</tr>
<tr>
<td>25</td>
</tr>
<tr>
<td>H. EXPANSION/FUTURE GROWTH RATE:</td>
</tr>
<tr>
<td>11,704 SF</td>
</tr>
<tr>
<td>I. AGENCIES PERMANENTLY OUT OF BUILDING:</td>
</tr>
<tr>
<td>• DEA</td>
</tr>
<tr>
<td>• GPO-FS</td>
</tr>
<tr>
<td>• USSS</td>
</tr>
<tr>
<td>INS</td>
</tr>
<tr>
<td>J. AGENCIES MOVING INTO BUILDING FROM LEASED SPACE:</td>
</tr>
<tr>
<td>• EEOC</td>
</tr>
<tr>
<td>• IRS</td>
</tr>
</tbody>
</table>

**MECHANICAL:**
- SPLIT MCH ZONE IN PHASE 1 INTO 2 SUB-PHASES. ONE AHU WILL SHUT DOWN AND THE OTHER WILL SERVE THE FLOORS IN PHASE 2.

**PLUMBING:**
- SAME REGARDLESS OF PHASING

**ELECTRICAL:**
- SAME REGARDLESS OF PHASING

**HAZMAT:**
- SAME REGARDLESS OF PHASING

**COST:**
- IN-SWING SPACE: $993,075 (66,205 SF @ $15/SF)
- OUT-SWING COST: $1,333,989 (49,407 SF @ $27/SF)
- TOTAL: $2,327,064

**CONSTRUCTION TIME FRAME:**
- 57 MONTHS
PHASING PLAN – MINIMIZE MOVES, CONSOLIDATE AGENCIES IN CONTIGUOUS AGENCY SPACE
Existing Stacking

Proposed Stacking - Phase 5 Final

PHASING PLAN – MINIMIZE MOVES, CONSOLIDATE AGENCIES IN CONTIGUOUS AGENCY SPACE
PHASING – DRIVEN BY HVAC DISTRIBUTION
Moorhead Federal Office Building

Five Phases Selected

• HVAC Driven
• Cost of Construction for adding a fifth phase was lower than the Cost of External Swing Space and Rent Loss
Moorhead Federal Office Building

Five Phases Selected
- HVAC Driven
- Cost of Construction for adding a fifth phase was lower than the Cost of External Swing Space and Rent Loss

Phasing - Sustainable Design
- Maintained Building Operations
- Optimized Use of Existing Vacant Space
  - Minimize number of moves
  - Minimize use of External Swing Space
- Major agencies moved only once
Renovation of Moorhead Federal Office Building

SCOPE ELEMENTS
HAZARDOUS MATERIAL ABATEMENT
Extent of Curtainwall – 80%
ENVELOPE UPGRADES – GOAL: INCREASE ENERGY EFFICIENCY OF BUILDING
CURTAINWALL - ENVELOPE UPGRADE
RESULTS: ENERGY SAVINGS
MECHANICAL SYSTEM UPGRADE – GOAL: INCREASE BUILDING PERFORMANCE
RESULTS – ENERGY SAVINGS

Total BTUs Used

- Pre Renovation: BTUs
- Post Renovation: BTUs
RESULTS – ENERGY SAVINGS

Pounds of Steam per Heating Degree Day

Pre Renovation: Lb Steam Per HDD

44.1 lb

Post Renovation: Lb Steam Per HDD

27.1 lb
CORRIDOR RENOVATION
TYPICAL UPDATED ELEVATOR LOBBY
RESTROOM RENOVATION – ADA & LOW USE WATER FIXTURES
NEW RECONFIGURABLE TRAINING ROOMS
CONFERENCE ROOMS
RENOVATED CAFETERIA SPACES
MILITARY ENTRANCE PROCESSING STATION (MEPS)
MECHANICAL
TENANT SPACES
Renovation of Birch Bayh Federal Courthouse
Birch Bayh U.S. Courthouse Renovation
General Services Administration Region Five

Indianapolis, Indiana

EYP/Architecture & Engineering
Scope of Renovation

- New cooling and heating system
- New state of the art temperature and humidity controls
- New roof
- New building sprinkler system
- Fire alarm system improvements
- New fire department control room
- Emergency power upgrade
- New lighting
  - Replace outdated electrical distribution system
  - Renovate plumbing system
  - Repair exterior building facade windows
  - ADA accessibility upgrades
  - Sustainable (LEED/Green) Design
Project Goals

- Preserve the historic building fabric – limit the impact of the work on the building
- Design of systems upgrade and improvements to improve building performance
- Seamless integration of new infrastructure
  - Mechanical Systems and Controls
  - Interior Lighting and Controls
  - Fire Suppression and Fire Alarm Systems
  - Plumbing Systems
  - Building Envelope
  - Hazardous Materials
- Limit disturbance to the tenants and the public
- Obtain LEED certification
- Maintain public access to the US Courts
Building Envelope

Roof Replacement
- Complete Roof Replacement

Building Exterior

- Exterior Metal Windows
  - Repair and Refinish

- Building Exterior
  - Exterior Facade to Remain Unchanged

Building Exterior

- Exterior Wood Windows
  - Repair and Refinish
  - Install Interior Storm Panels

- Building Exterior
  - Exterior Facade to Remain Unchanged
 Peer Review Meeting Pre 50% Presentation Meeting

4th Floor Attic

Existing building shafts to be abated.

Shafts

Interstitial space above loading dock at 1st floor to be abated.

1st Floor Interstitial Space

Piping at basement to be abated.

Basement areas

EYP/ Birch Bayh United States Courthouse Renovation - Hazardous Materials
Monumental Stairs

Entrance Vestibule

South Corridor - 1st Floor
Phasing Plan

- HVAC Distribution
- Tenant Impact Summary
- US Courts Impact
- Detailed Phasing Plan
- Swing Space Configurations
Tenant Impact Summary

- Most tenants have to move to swing space
- Tenants that need to move to accommodate work will only have to move out and back once and it will be only for one phase
- Requires construction work during the day and after hours
- There will be tenant disruptions during construction throughout the renovation period
- All activities remain functional within the building, however, close coordination of schedules will be needed
HVAC Distribution

- **Air Handling Units:**
  - Multiple AHU’s dispersed throughout the Sub-Basement, Basement, and First Floor
  - Large AHU’s on the fourth and fifth floor roofs serving quadrants of the second through fifth floors
  - Historic Courtrooms served by individual AHU’s in fourth floor attic space

- HVAC distribution is the key to phasing
**Phasing Plan**

- **Phase 1:**
  - Sub-Basement & Basement upgrades
  - Create basement swing spaces

- **Phase 2:**
  - First floor upgrades
  - Create 5th floor swing space

- **Phase 3:** SW Quadrant floors 2-4

- **Phase 4:** SE Quadrant floors 2-4

- **Phase 5:** NW Quadrant floors 2-4

- **Phase 6:** NE Quadrant floors 2-4 and remaining tenants
Phasing Impact on US Courts
Phase 3: SW Quadrant

- Move tenants to designated swing space
Sustainable Design

Leadership in Energy & Environmental Design (LEED)

- LEED - Existing Building – Energy Efficiencies
  - Building Envelope
  - Building Systems
  - Water Use Reduction
  - Sustainable Building Management and Sustainable Work Practices
    - Recycling
    - No Smoking
    - Green cleaning
    - Alternative Transportation
ARRA Funding

RECOVERY IN PROGRESS
Working for you. Working for Indianapolis.

President Barack Obama

High-Performance Green Building Improvements
BIRCH BAYH FEDERAL BUILDING
AND U.S. COURTHOUSE
Recovery

The Project’s Economic Impact

- $69.3 M Recovery Act funding
- New business for 23 companies
- High-performance, green technology
- Paychecks for up to 120 on-site workers
- Upgrades for historic landmark
Greening

Before & After

Plants in Place of Asphalt

- A mix of drought-resistant varieties
- Covers 30,000 sq. ft. of roof
- Doubles roof life
- Insulates the building
- Adds as much oxygen to the air as 18 trees

BIRCH BAYH FEDERAL BUILDING AND U.S. COURTHOUSE
High-Performance Green Building Improvements
Green Roof Sunlight Analysis
A Saving Switch to Digital

- Upgrading from pneumatic controls
- Monitors, fine tunes the building’s operating systems
- Maximizes comfort & efficiency
- One keyboard vs. 300 manual controls
- Goal: 10% energy savings
- Interfaces 30+ systems

BIRCH BAYH FEDERAL BUILDING
AND U.S. COURTHOUSE
High-Performance Green Building Improvements

GSA
Conserving

Harvesting Rainwater

- Roof drains connect to five 2,000 gallon holding tanks
- Collects water to supply building's toilet fixtures
- Diverts roof run-off from city's sewage system
- Goal: Reduce building's city water use by up to 30%

BIRCH BAYH FEDERAL BUILDING AND U.S. COURTHOUSE
High-Performance Green Building Improvements
West Facing Building Section

1. Light Court / Green Roof
2. Rainwater Collection
3. Five 2,000 Gallon Holding Tanks
4. Supply to Low Flow Toilet Fixtures
5. Heat Reflecting Coating on Roofs
Supplement Existing Windows with Interior Storm Windows
Protecting

Saving Lives & History

- Sprinkler coverage area will be 6 times larger
- +10 miles of lines, 3,725 sprinkler heads
- Entire building will be covered
- Installation preserves historic decor
- Improves life safety by 74%
- Fire alarm will use voice alert
First Floor Corridor
Mosaic tile ceiling to remain undisturbed

Sprinkler main located at adjacent space

Flexible sprinkler line installed from sprinkler main

Extended throw sprinkler installed through wood window header

Clerestory window along corridor

Section through 1st Floor Corridor
Renovation of Building 644
• Originally built as a bowling alley for the Navy in 1965
• Bowling Alley expansion in 1968 and 1979
• Later converted to a Federal Law Enforcement Training Center (FLETC) for the Department of Homeland Security
• Now - Renovated to Class A office space for the Department of State
• 43,000 GSF
Building 644

New Floor Plan

EYP/
SUSTAINABLE DESIGN GOALS
LEED SILVER

LEED ELEMENTS

• Building Reuse – Maintain 75% of Existing Walls, Floors, & Roof
• Construction Waste Management – Divert 50% from Disposal
• Water Use Reduction – 20% Reduction
• Optimize Energy Performance - 14% Existing Building Renovations
• Improving Indoor Environmental Quality
  • Daylight & Views, Daylight 75% of Spaces
  • Outdoor Air Delivery Monitoring
  • Low-Emitting Materials - Adhesives & Sealants, Paints, Carpet Systems)
  • Controllability of Systems – Lighting
Building 644

Existing Floor Plan

- Exterior Wall Type
Building 644

Exterior Upgrades
East

Kept Slab and Roof,
Demolished Metal
“Butler Building”
Walls
Building 644

Exterior Upgrades
East

New Masonry
Building 644

Exterior Upgrades

East

New Masonry
Building 644

Exterior Upgrades
East

New Masonry
Building 644

Exterior Upgrades
East

New Masonry
Building 644

Exterior Upgrades
West

Kept Slab and Roof, and CMU Walls for the West Building
Kept Slab and Roof, and CMU Walls for the West Building.
Building 644

Exterior Upgrades
West

Saw-cut CMU
Building 644

Exterior Upgrades
West

Saw-cut CMU,
Add Steel
Reinforcement for
new Window
Openings
New Steel Reinforced Concrete Jambs for new Window Openings
Building 644

Exterior Upgrades
West

New Steel
Reinforced
Concrete Jambs &
Steel Lintel for new
Window Openings
Building 644

Brick Matching
Original was
Still Available

North
South
East
West
Design Challenges:
- 2 structural systems
- High Seismic Zone
- High Wind Zone
- Poor Soil Conditions
Structural Upgrades

Additional Piles
New Grade Beams
Lateral Force Resistance
Additional Bracing at Roof
Building 644

Interior Renovations

Solar Light Tubes
Collaboration during Construction

Building 644
Building 644
Building 644
Building 644

Open office areas in the bowling alley area,
Sustainable Design in Renovation - Case Studies

AIA Course Learning Goals:

• Understand sustainable design components applicable in renovations
• Understand why renovation work is sustainable even using LEED NC criteria
• Understand what role phasing plays in sustainable renovations
• Understand how sustainable design practices can apply in historic building renovations
  • Building Envelope
  • HVAC systems
  • Lighting
  • Water Conservation
Joint Education Training Conference

Charles Enos
2013 Urbahn Medal Recipient

May 21, 2014

EYP/