Safe, Secure, and Sustainable Facilities Symposium

Federal Facilities Council of the National Academies

Institute for Infrastructure and Information Assurance

at James Madison University

Safe, Secure, and Sustainable Facilities

May 13, 2010

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KNOWLEDGE AGENDA

Building Security Overview

Six case studies from:

1. **U.S. Department of State, Bureau of Overseas Buildings Operations**
2. **U.S. General Services Administration**
3. **U.S. Army Corps of Engineers**

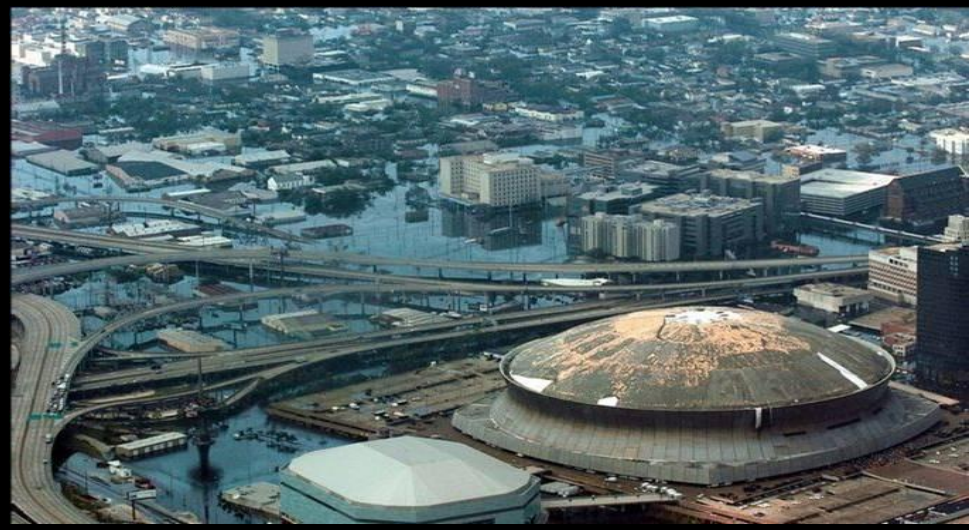
SECURITY PLANNING

- Start planning early
- Assemble team
- Easy to make decisions and adjust for costs, staffing
- Avoid costly coordination and delayed schedules

Pentagon Reconstruction, 2002

ESTABLISH LONG TERM GOALS

- Prevent loss of life
- Minimize injury
- Protect critical assets
- Business continuity
- Mitigate risk
- Disaster planning and response



New Orleans, after Katrina, 2005

THREATS TO U.S. ASSETS

- Terrorism, Blast
- Chem Bio Radiological Nuclear (CBRN)
- Natural Disasters
- Workplace Violence
- Crime
- Power loss
- Cyberterrorism
- Data loss

GLOBAL SECURITY THREATS

- Improvised Explosive Device (IED)
- Vehicle borne IED (VBIED)
- Suicide bomber IED (backpack, belt)
- Homemade IED
- Chemical Biological Radiological Nuclear (CBRN)

Khobar Towers, Saudi Arabia, 1996

Baghdad Govt. Bldg, Oct. 2009

IDENTIFY POTENTIAL TARGETS

1. National icons, landmarks
2. Critical infrastructure
3. Civic buildings, courthouses, hospitals
4. Financial centers
5. Transportation hubs
6. Venues with large concentrations of people
7. International businesses and foreign interests

Wall Street, NYC
Nationals Stadium, DC

Security Planning: Requires A Multidisciplinary Team

1. Architect
2. Attorneys
3. Blast Engineer
4. Building owner or landlord
5. Chemical, Biological, Radiological Specialist
6. Client project manager
7. Code officials
8. Construction Manager
9. Cost Estimator
10. Electrical Engineer
11. Facility managers
12. Fire Protection Engineer
13. Government personnel
14. Interior Designer
15. Landscape Architect
16. Local law enforcement
17. Mechanical Engineer
18. Planners
19. Security client reps
20. Security Operations Specialist/Consultant
21. Structural Engineer
22. Technical Security Specialist
23. Telecommunications Engineer
24. Tenants/tenant groups
25. Traffic Engineer

THREAT & VULNERABILITY RISK ANALYSIS (TVRA)

- Review adjacent uses and targets
- Identify weaknesses in facilities, infrastructure
- Special Events with VIPs and crowds
- Prioritize needs
- Budget
- Worst case scenarios

Obama Inauguration
January 20, 2009

LIABILITY AND RISK

- **Post 9/11 standard of care is evolving**
- **Driving force for owners and insurers**
- **No comprehensive national program for funding security improvements in every federal facility**
- **Strategic risk reduction**

Balance risk assessment and cost

NATURAL DISASTERS

- Floods (water damage)
- Tornadoes (high wind)
- Hurricanes, tsunamis
- Earthquakes
- Wildfires
- Snow loads on roofs
- Lightning
- Smoke and fire
- Mold, mildew

Kansas Floods, 2001

Greensburg, Kansas tornado, 2007

Los Alamos, NM fires, 2000

SECURITY DESIGN 101

1. **LEARN FROM PAST**
- Terrorism events
- Natural disasters
2. **INTEGRATE**
- Design
- Technology
- Operations
3. **BALANCE**
- Security
- Openness
- Design Excellence

World Trade Center, NYC
9-11-2001 at 9:03 AM
Photo: Bruce Eisenberg, AIA

BUILDING SECURITY:
Design-Technology-Operations

1. Site Planning
2. Landscape Design
3. Architecture- Egress, lobbies, glazing
4. Engineering: Structural, MEP
5. Interior Design

Lloyd D. George U.S. Courthouse
Las Vegas, Nev. US GSA
Arch: Cannon Design/Harry Campbell Assoc.

BUILDING SECURITY:
Structural & MEP Engineering

Protective Design: (Structural)

- **Standoff, setback from street**
- **Redundancy to prevent progressive collapse**
- **Hardening to enhance walls, stairwells, loading docks, windows, mail rooms**

Mechanical, Electrical, Plumbing

- **Fire protection**
- **Redundant building systems**
- **Air distribution systems**

Freedom Tower, Lower Manhattan Ground Zero site , SOM

GSA: Before Oklahoma City, 1995

- No standards for vehicle impact resistance
- No blast resistance
- No stand-off distances
- No magnetometers or X-ray machines
- No perimeter security measures

Alfred P. Murrah Federal Building

GSA: After Oklahoma City

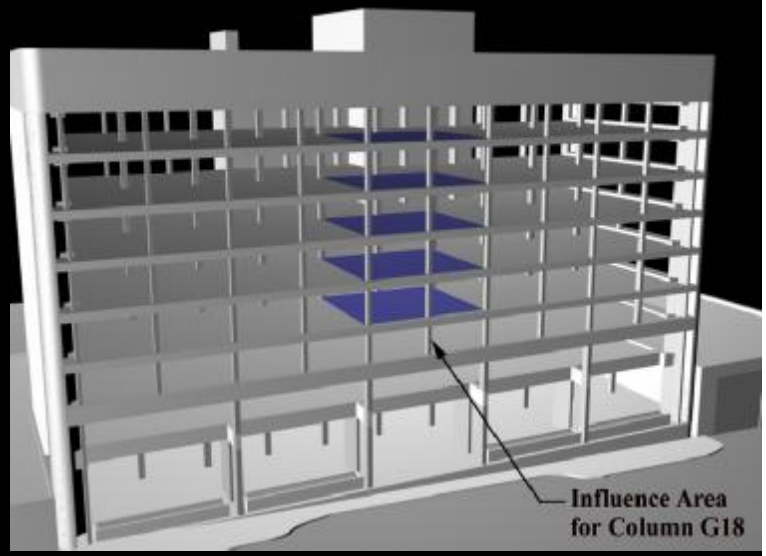
- Identify targets
- Determine levels of protection
- Understand the threats and design responses
- Develop design strategies
- Budget for security countermeasures

Murrah Building before demolition

Progressive Collapse

Oklahoma City, 1995

- **Studies identified columns that failed and why**
- **Most fatalities attributed to building collapse and flying glass shards**
- **Laminated glass, blast windows are alternatives**



Murrah Federal Building
Influence Area of Columns
Image: Thornton-Tomasetti Group

New OKC Federal Building

- **MEETS SEE CRITERIA**
- Safety and security
- Open and welcoming
- Transparent security
- **Structural concrete designed to prevent progressive collapse**
- **Blast-resistant exterior**
- **Sustainable design: views**
- **Energy efficient**
- 2006 GSA Design Award

Oklahoma City Federal Bldg., 2004
Photos: US GSA

SITE PERIMETERS: First Line of Defense

- Standoff
- Hardened exteriors
- Landscaping
- Water features
- Public art integrated with street furniture
- Artists, sculptors collaboration

Landscaped exterior, Federal Bldg

Image: GSA

STREETSCAPE ELEMENTS: Design Opportunities

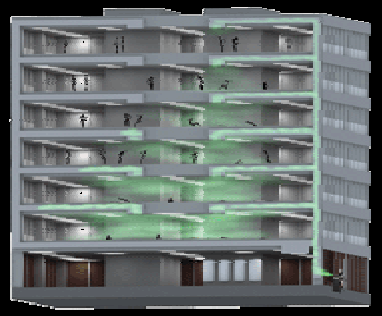
1. Benches, Bollards
2. Doors, Walls
3. Window Grilles
4. Stairs
5. Fences
6. Gates, Turnstiles
7. Guard Booths
8. Planters, Water
9. Landscaped trenches
10. Grade changes, berms

Street furniture, elevation changes
Images: GSA

BUILDING SECURITY:
Design-Technology-Operations

- **Biometrics: hand, iris, facial**
- **Access card readers, locks**
- **Weapons/metal detectors**
- **CCTV, smart cameras integrated with building and alarm systems**
- **CBRN sensors at air intakes**

Biometric hand scanner



UNPROTECTED BUILDING

PROTECTED BUILDING

CBRN sensors

BUILDING SECURITY:
Design-Technology-Operations

- **Owner's policies and procedures**
- **Prepare for fire drills, exiting, power outage, hostages, shootings**
- **Create flexible areas for trauma victims**
- **Plan business recovery and continuity**

9/11/01 Hospital Treatment in converted cafeteria
Photo: NYS Dept of Health, NYU Downtown Hospital

TRANSPARENT SECURITY

- Invisible to the eye
- Integrates design, technology, operations
- Minimize look of an armed camp
- Eliminate eyesores
- Owners, law enforcement determine when, where visible security is needed

Lower Manhattan, NYC
Photo: Mark Ginsberg, FAIA

UK Photo

LAYERED DEFENSE FOR SITE AND BUILDING SECURITY

1. Site perimeter
2. Building setbacks
3. Building envelope
4. Building systems
5. Lobbies
6. Access points
7. Safe interior areas
8. Safe havens

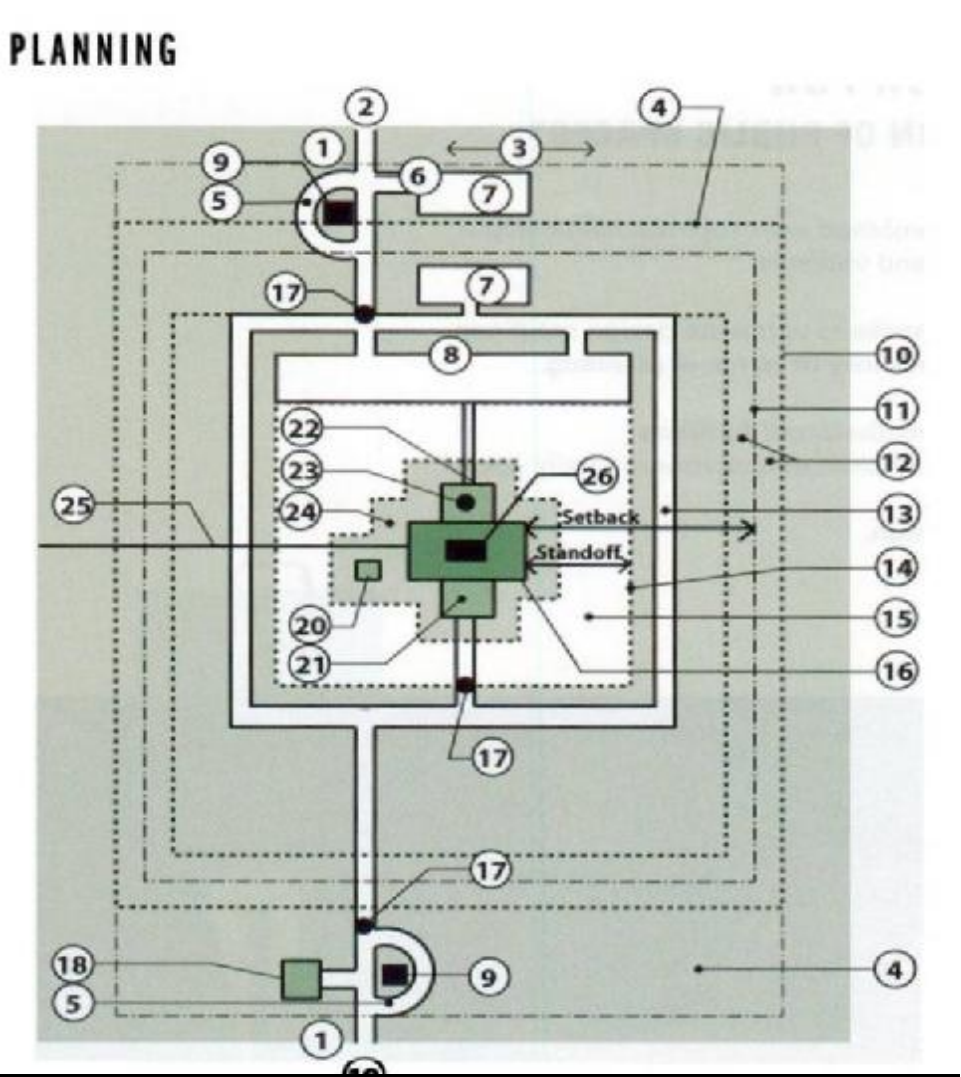


Image: RTKL

ACHIEVING TRANSPARENT SECURITY

1. **Master Planning**
2. **Site planning, landscape design**
3. **Building Envelope: window systems, glazing types**
4. **Building Systems-MEP, HVAC, Fire Protection, Structural**
5. **Redundant systems**

Freedom Tower Plaza, NYC
SOM and Peter Walker & Partners
Photo: Silverstein Properties

ACHIEVING TRANSPARENT SECURITY

6. Interior Planning: lobbies, circulation
7. Technology
8. Operations: Policies, disaster planning
9. CPTED: Crime Prevention Through Environmental Design
10. Life Safety Codes, Agency Guidelines, Industry Standards

Union Station, Metro Station, DC

TOP 10 SECURITY COSTS
(Not ranked by magnitude)

1. Perimeter security
2. Road improvements
3. Vehicle standoff
4. Site & bldg access
5. Building systems
6. Exterior wall systems
7. Windows & glazing
8. Structural systems
9. Technology
10. Equipment

Set priorities: What you risk reveals what you value.

BALANCING SECURITY COSTS

- ***Design*: Initial capital costs**
- ***Technology*: One time purchase and maintenance**
- ***Operations*: ongoing 24/7/365 security personnel, administrators, salaries**

- **Owners must balance cost, investment, efficiency**
- **Life cycle cost analysis**

CODES AND STANDARDS

- No U.S. security code for private sector
- Industry guidelines, best practices, case studies, agency recommendations
- NIST Report: egress, materials, emergency response, design
- NYC Building Code, amended Post-9/11

WTC under construction, 1960s

R&D: SECURITY MATERIALS

Items of Interest

- Exterior building envelope
- Glass curtain wall
- Metal panels
- Blast windows
- Site elements
- Bollards
- Egress technology
- CBRN sensors
- Air handling systems
- Emergency response
- NIST Study issues

Desirable Qualities

- Blast and fire resistant
- Wind resistant
- Water resistant
- Shatter resistant
- Transparent
- Energy efficient
- Cost efficient and easy to produce, use, maintain
- Affordable to purchase
- Sustainable
- Track global research

CASE STUDIES

All projects have been vetted and cleared

BUREAU OF OVERSEAS BUILDINGS OPERATIONS

1. The New London Embassy

GENERAL SERVICES ADMINISTRATION

2. U.S. Land Port of Entry, Calais, Maine
3. FBI Regional Field Office, Houston, Texas
4. U.S. Federal Courthouse, Cedar Rapids, Iowa
5. U.S. Food and Drug Administration Headquarters Consolidation, Silver Spring, Maryland

U.S. ARMY CORPS OF ENGINEERS

6. Washington Headquarters Services – Pentagon South, Alexandria, Virginia

THE NEW LONDON EMBASSY

This public information has been reviewed by OBO

London, United Kingdom

U.S. DEPARTMENT OF STATE
BUREAU OF OVERSEAS BUILDINGS OPERATIONS

Architect - KieranTimberlake
Landscape Architect - OLIN
Structural/Blast Engineer - Weidlinger Associates, Inc.
Sustainability/MEP/Fire Protection/ Civil- ARUP
Workplace Design - Gensler
Cost Consulting - Davis Langdon
Technical Security – Sako & Associates

DESIGN GOALS
London Embassy

- Welcoming
- Secure
- Timeless
- Transparency
- Openness
- Sustainable
- Energy efficient
- Iconic building
- Quality workplace

SITE – Urban Park along the Thames River
London Embassy at Nine Elms

- 50+ sites analyzed
- Chosen site required smaller footprint, taller building
- Honors English tradition of urban parks/gardens
- Grading, walks, seating
- Pond, planting, trees
- Park open to all

SECURITY
London Embassy

- Meets all required security standards
- No perimeter walls or fencing
- No visible bollards
- Landscape design achieves site security goals
- Building exterior integrates blast resistant glazing and solar shading

ENERGY EFFICIENCY
London Embassy

- High performance building envelope
- Daylight and shaded interiors
- Photovoltaics convert solar radiation to energy
- Pressurized air pockets insulate glazing from thermal transfer
- Significant reduction in energy consumption compared to most London office buildings

SUSTAINABILITY
London Embassy

- LEED Platinum
- Long term financial benefits
- Carbon footprint lowered by reduced energy use and costs
- Many strategies considered
- Only viable solutions used, with greatest fiscal and green benefits
- Open views

THE DIPLOMACY OF ART
London Embassy

- Public art visible at main entry
- Art placed at major public spaces and outside as part of landscape and paths
- ‘Light art’ wraps exterior wall behind colonnade
- Main lobby to have stone wall inscribed with names of prior U.S. ambassadors

PROJECT TIMELINE
London Embassy

- Design competition: one year
- Design team selected: February 2010
- Design and construction: five years
- Ground breaking: 2013 (anticipated)
- Completion: 2017 (anticipated)

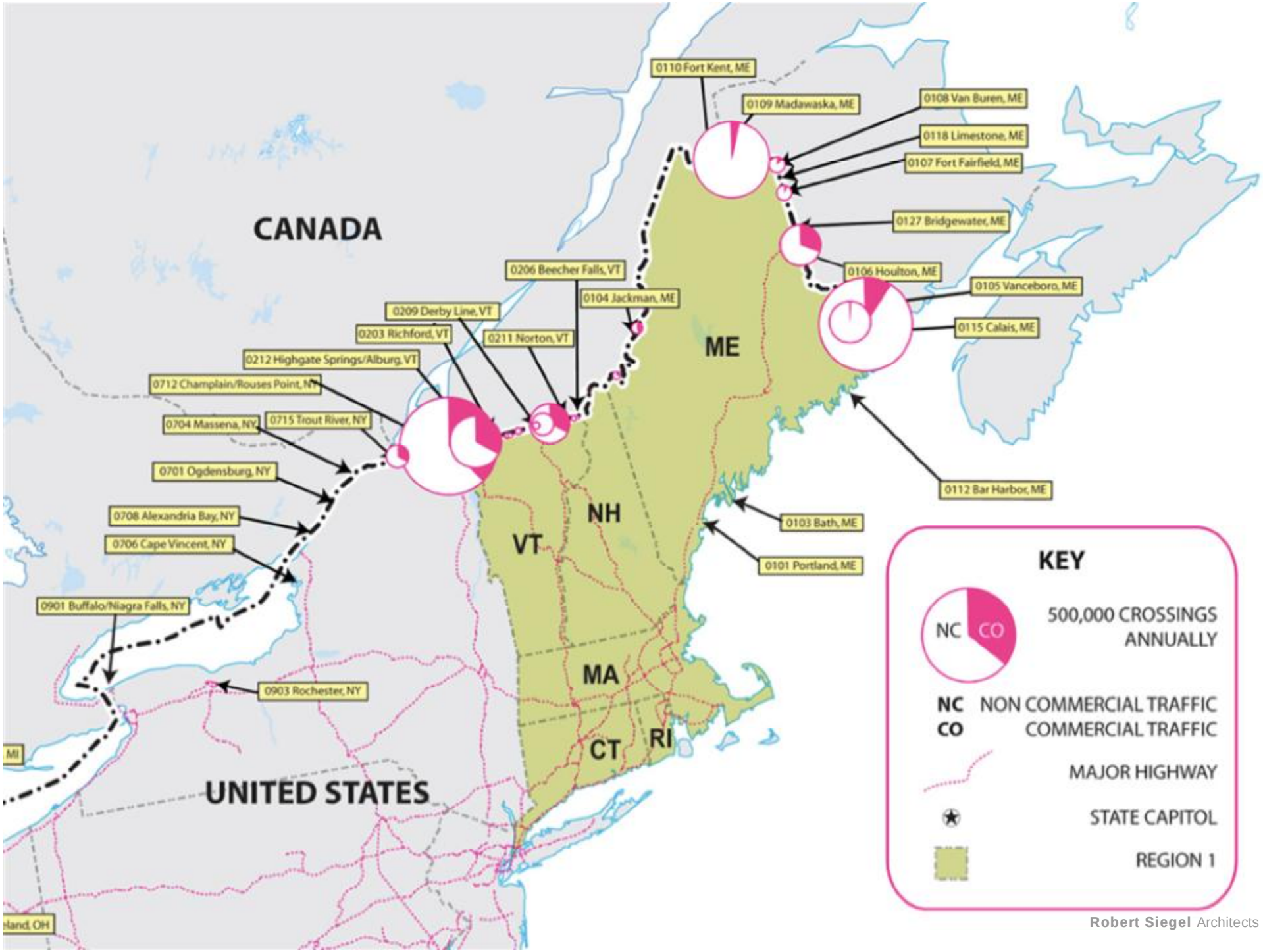
U. S. LAND PORT OF ENTRY

Calais, Maine

Opened November 23, 2009

GENERAL SERVICES ADMINISTRATION

Architect: Robert Siegel Architects
Transportation, Civil, Building Engineering: ARUP
Façade Consulting: Front
Landscape Architecture: Sasaki
LEED and Commissioning: SMRT
Cost Estimating: Pete & Company
Construction Manager: Ryan Companies US, Inc.

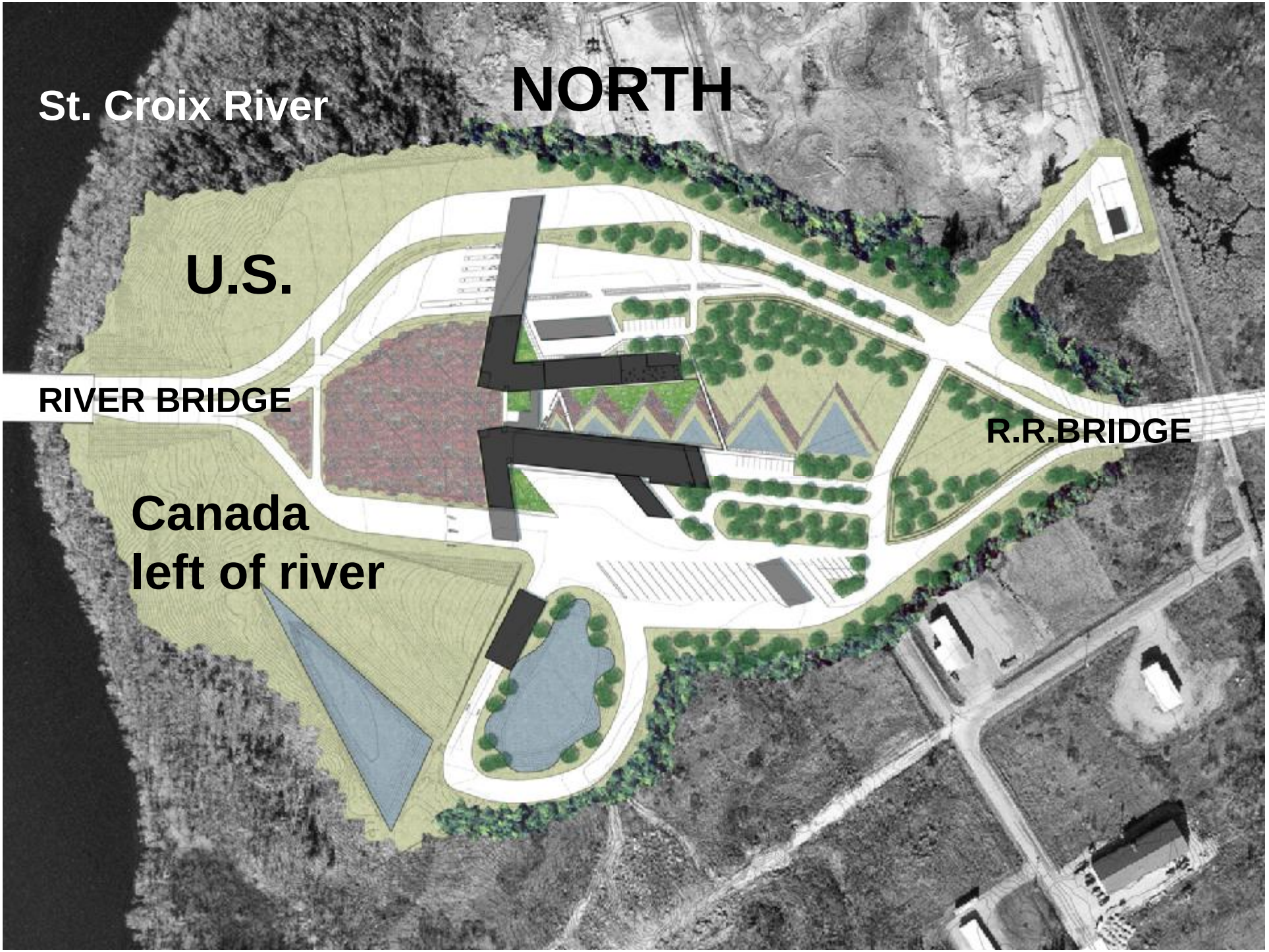

CANADA
UNITED STATES
0110 Fort Kent, ME
0109 Madawaska, ME
0108 Van Buren, ME
0118 Limestone, ME
0107 Fort Fairfield, ME
0127 Bridgewater, ME
0106 Houlton, ME
0105 Vanceboro, ME
0115 Calais, ME
0206 Beecher Falls, VT
0104 Jackman, ME
0209 Derby Line, VT
0203 Richford, VT
0211 Norton, VT
0212 Highgate Springs/Alburg, VT
0712 Champlain/Rouses Point, NY
0704 Massena, NY
0715 Trout River, NY
0701 Ogdensburg, NY
0708 Alexandria Bay, NY
0706 Cape Vincent, NY
0901 Buffalo/Niagra Falls, NY
0903 Rochester, NY
0112 Bar Harbor, ME
0103 Bath, ME
0101 Portland, ME
ME
NH
VT
MA
CT
RI
KEY
NC
CO
500,000 CROSSINGS ANNUALLY
NC NON COMMERCIAL TRAFFIC
CO COMMERCIAL TRAFFIC
MAJOR HIGHWAY
STATE CAPITOL
REGION 1

Primary Inspection

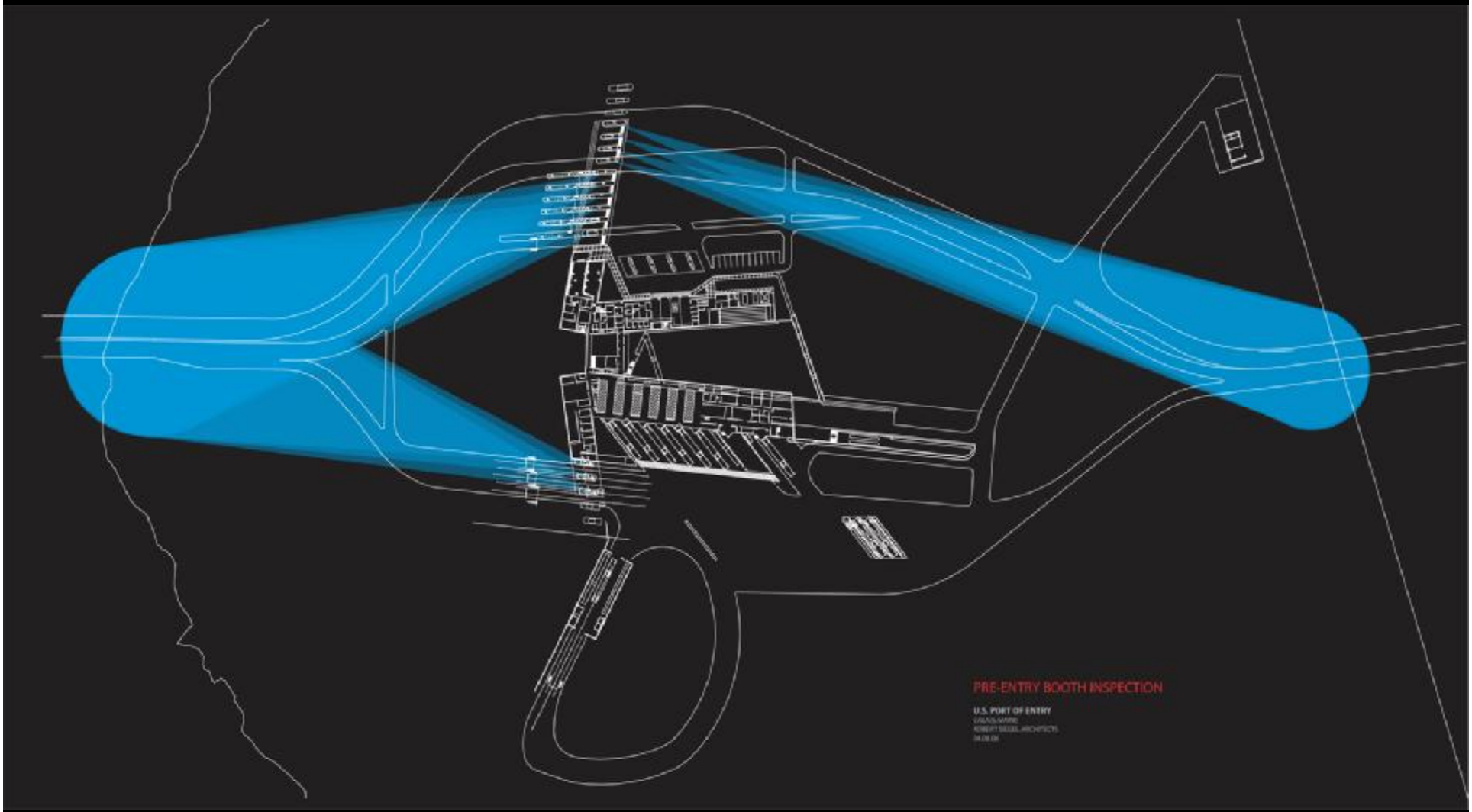
Secondary Inspection

Secondary Inspection

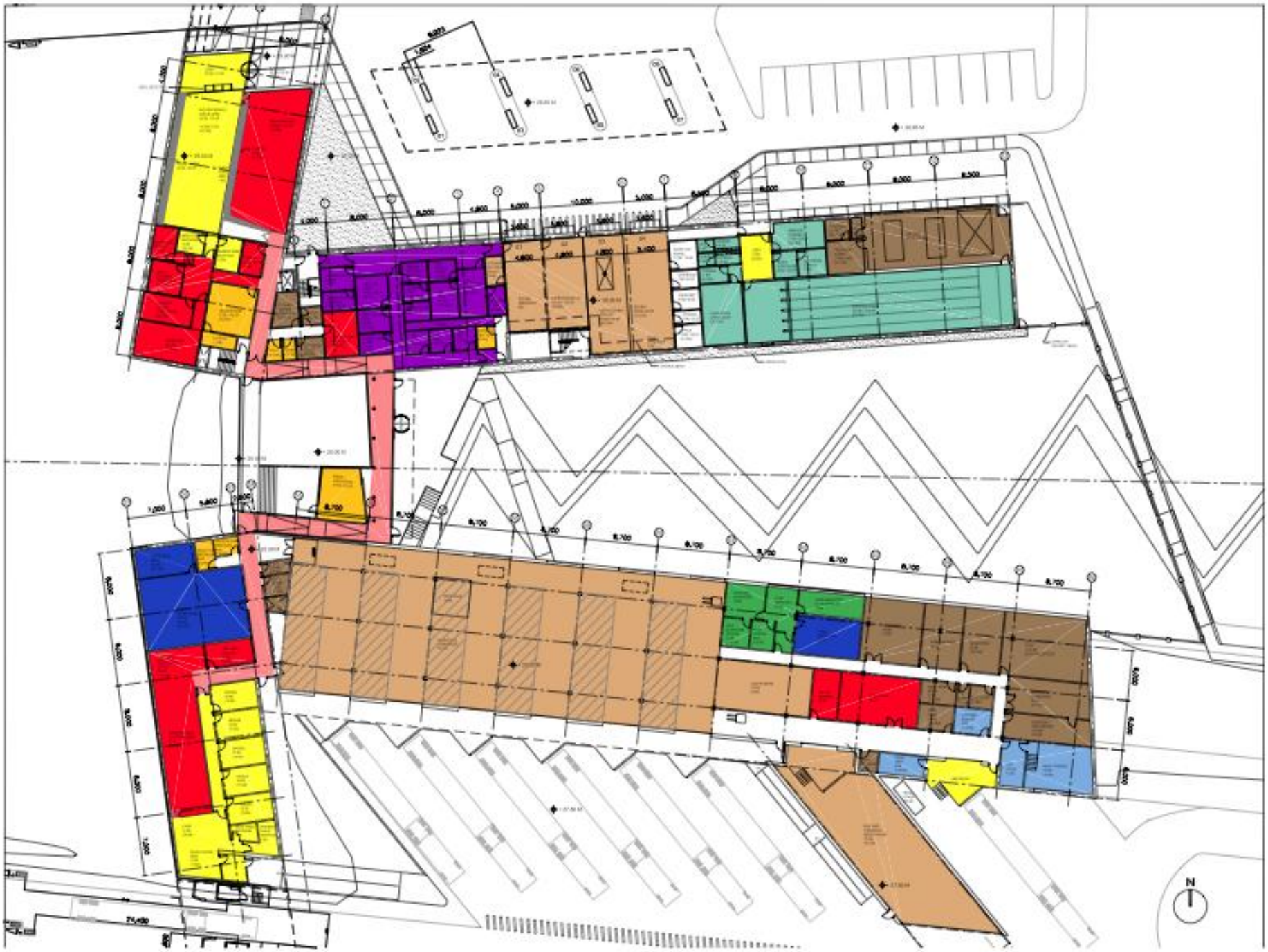
Robert Siegel Architects


St. Croix River
NORTH
U.S.
RIVER BRIDGE
R.R.BRIDGE
Canada
left of river

Surveillance

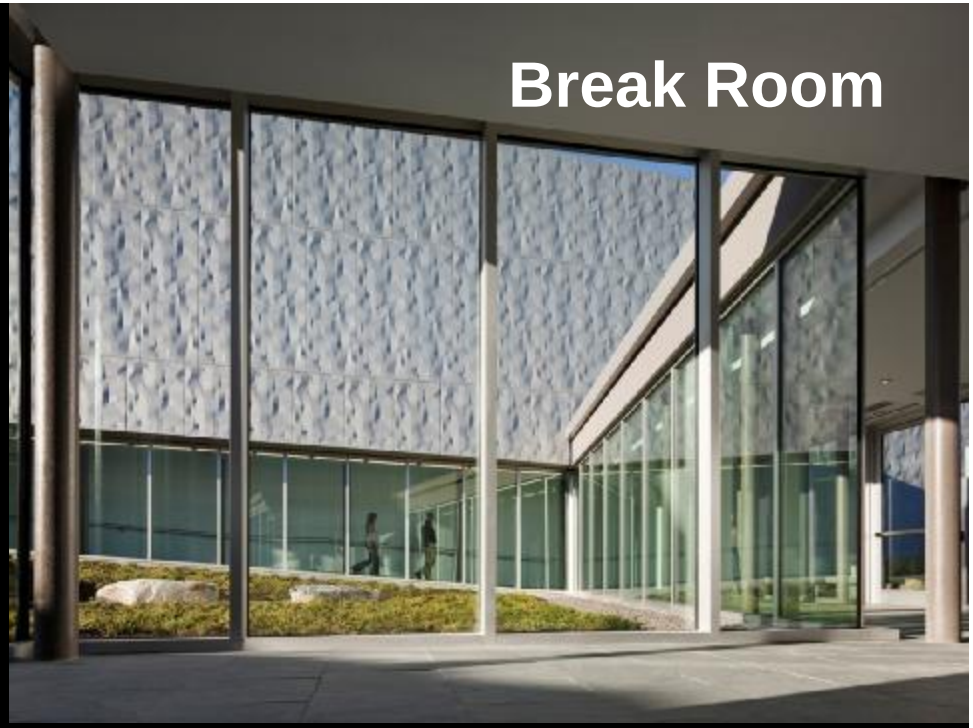


Primary Inspection Booths



SECURITY
LPOE Calais

- Welcoming but secure
- Open but closed
- Safe and secure border
- Aluminum mesh skin is a protective barrier for surveillance-transparent from inside, opaque from outside
- Concealed courtyard for employees and officers
- Includes most demanding DHS requirements at border stations



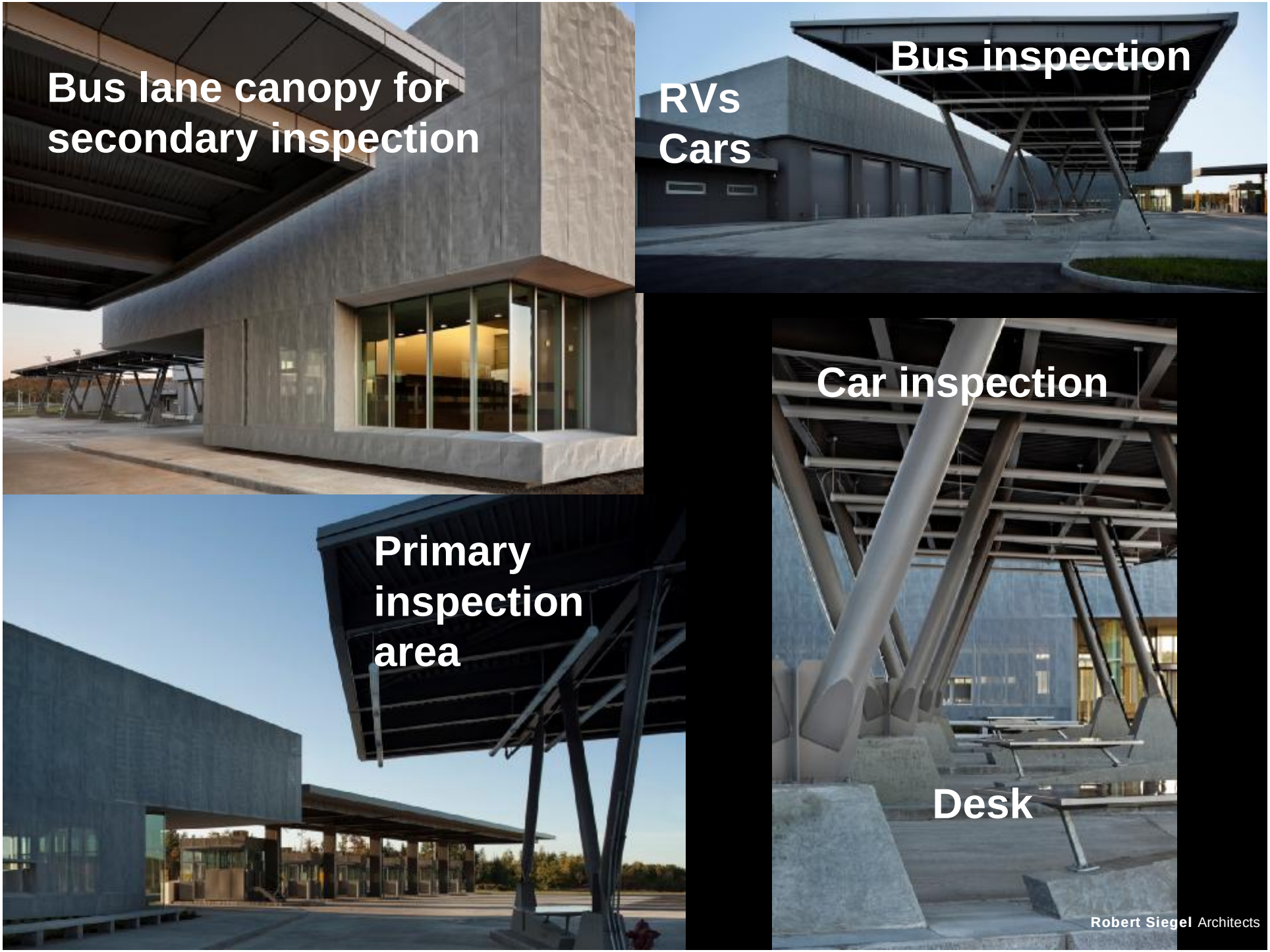
Non-commercial traffic left **Commercial traffic right**

View from Canada into the U.S.

Robert Siegel Architects

Below:
Enclosed secure courtyard for employees, handicap accessible
Covered parking at left

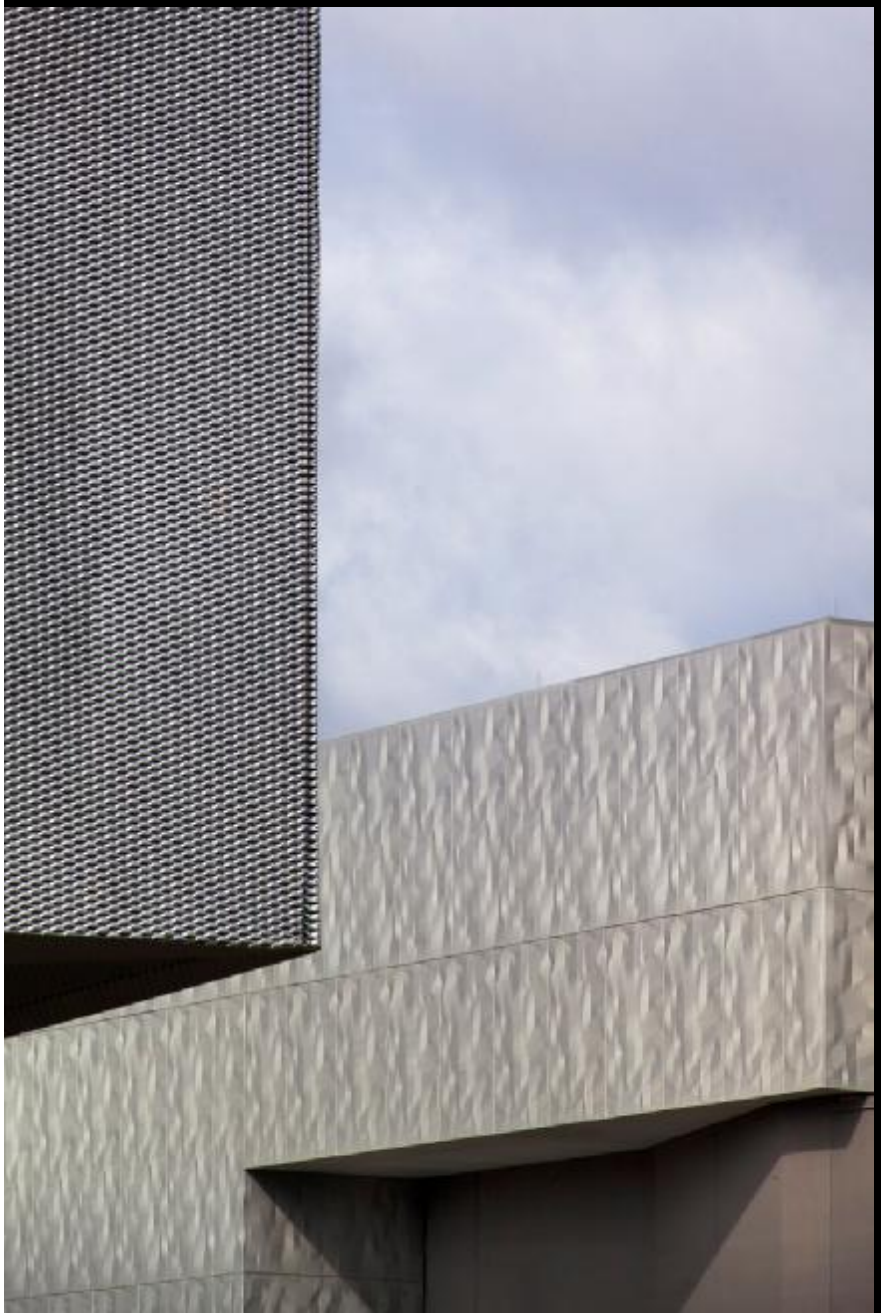
Above:
Lightweight mesh stamped panels, 10 ft x 40 in

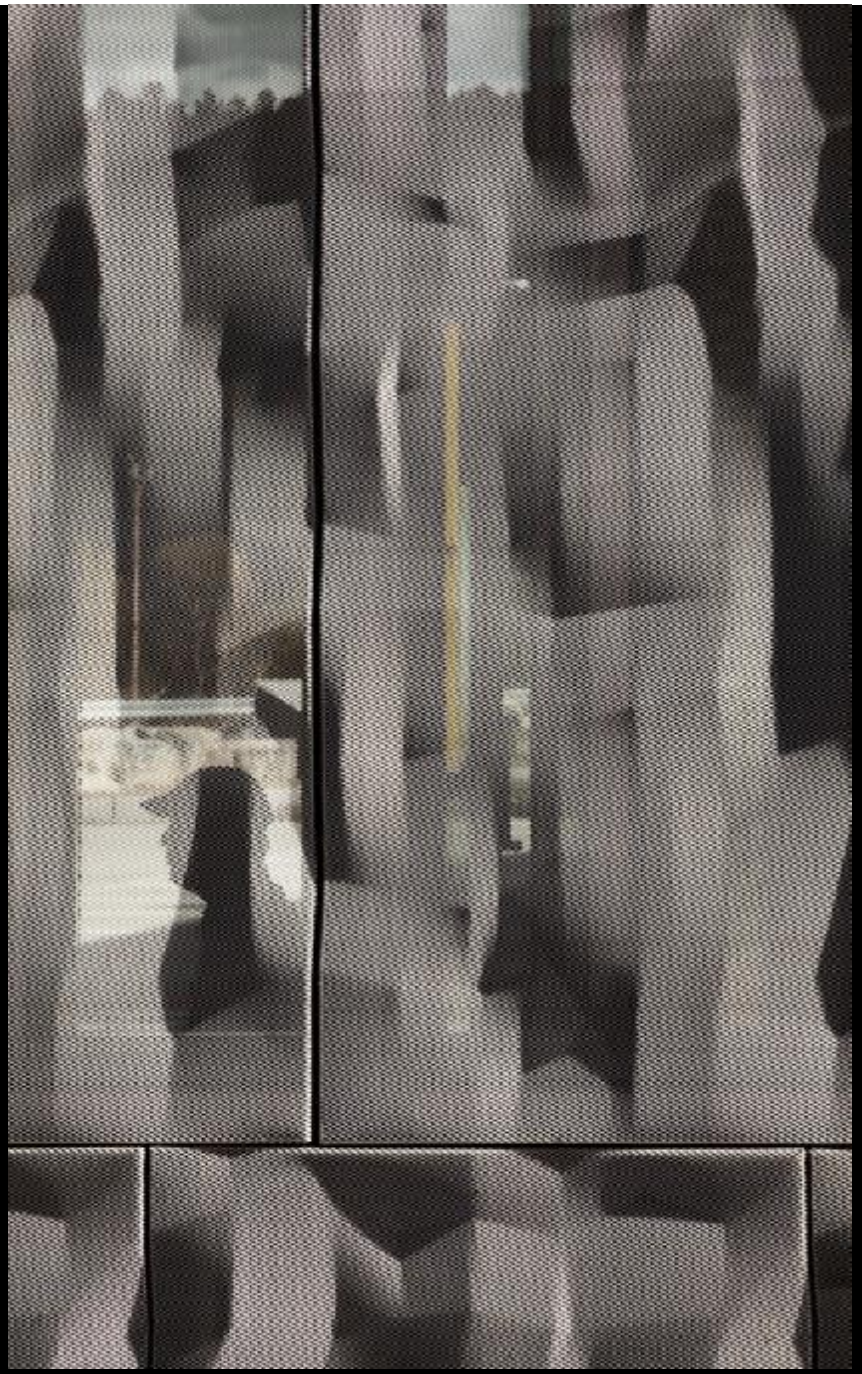

Bus lane canopy for secondary inspection
Bus inspection
RVs
Cars
Car inspection
Primary inspection area
Desk
Robert Siegel Architects

Below:
Warehouse at left is above covered employee parking

Above and right:
Boulders from site excavation in secure courtyard are a regional Maine motif

Texture reflects landscape





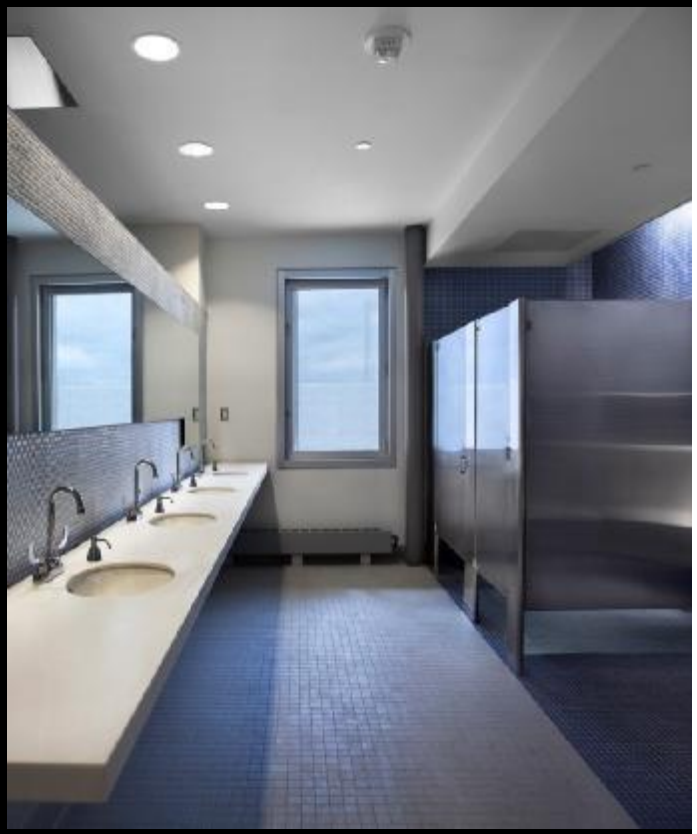
Light changes color of panels

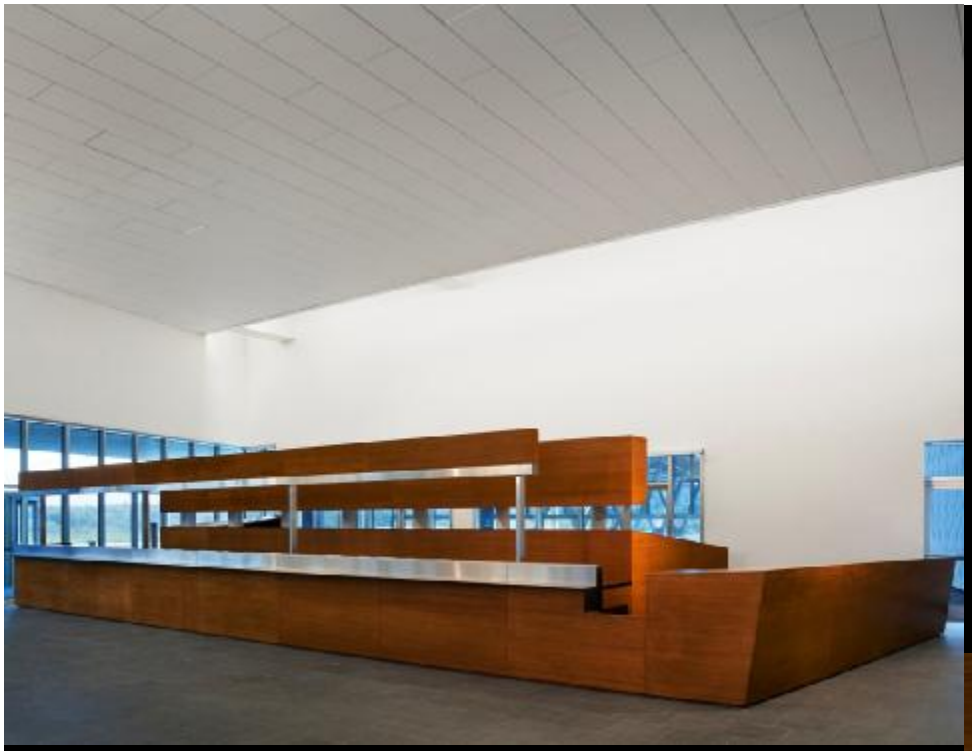
Public art moves with the wind like a flock of birds

Robert Siegel Architects

SUSTAINABILITY
LPOE Calais

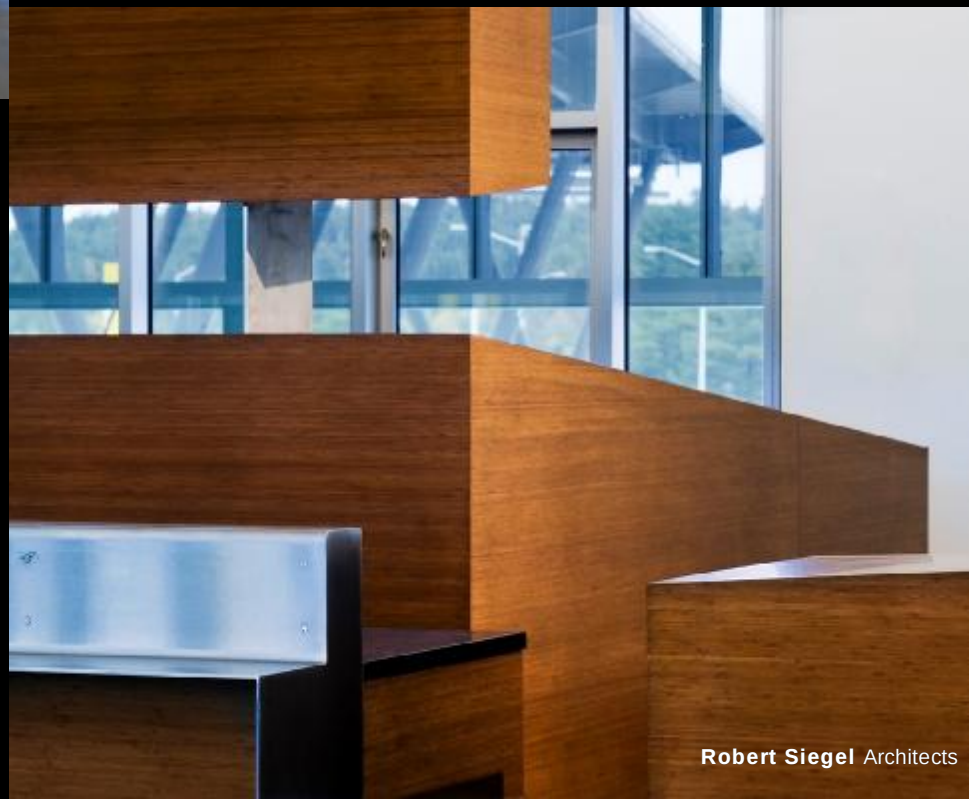
- 90% of rainfall to be treated
- Tempered microclimate by siting
- Sheltered courtyard buffers noise and pollution from cars
- Clean supply air filtered through vegetated courtyard
- Low VOC and recycled materials
- Low maintenance native plants
- Dual flush toilets, waterless urinals
- Water efficient fixtures reduce potable water by 40%
- Drought resistant plants, zero irrigation water required



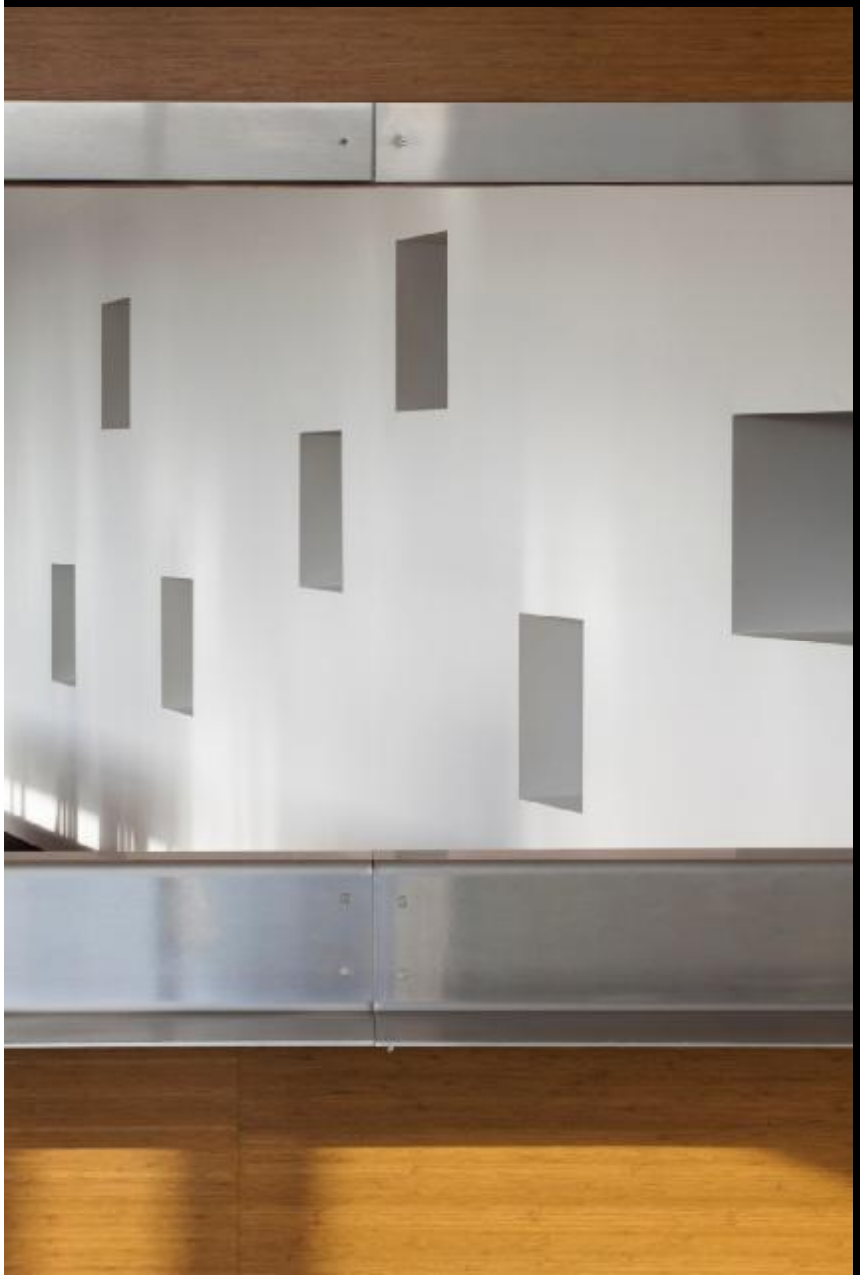


Below:
Transaction counter non-commercial vehicles
•Officer desks not visible behind panel
•Work counter lower left

Above: Officer work area
•Duck and cover Kevlar
•Local slate flooring
•Bamboo counter

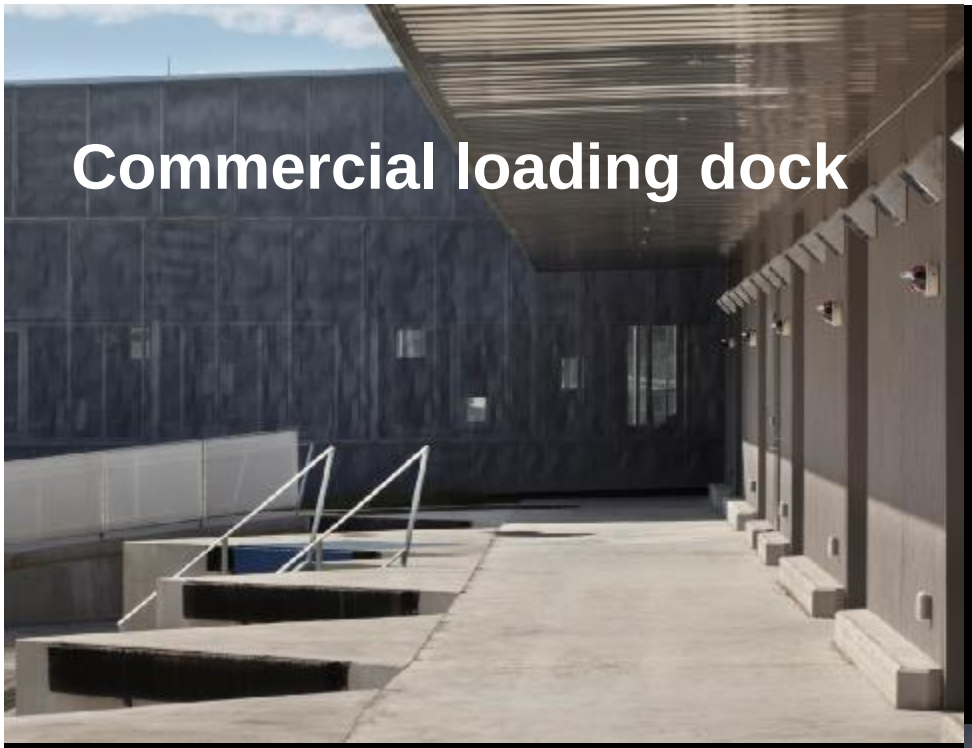


Windows from work area to loading offer line of sight



Stair rail detail

Commercial loading dock



Warehouse line of sight

ENERGY EFFICIENCY
LPOE Calais

- Natural light provided for every occupied space
- Aluminum windows with high performance glazing
- Reduced electrical use by day-lighting, efficient fixtures and metal screen
- LPOE Calais is 14% more energy efficient than standard border station

Break room

FBI REGIONAL FIELD OFFICE

Houston, Texas

GENERAL SERVICES ADMINISTRATION

Lead Designer:
Lawrence W. Speck, FAIA, PageSoutherlandPage

Architect/MEP Engineer:
Leo A Daly/LAN+PageSoutherlandPage, A Joint Venture

SECURITY ELEMENTS
FBI Regional Field Office

- Blast resistant design
- Standoff to prevent VBIEDs
- Landscaped berms
- Security entry points
- Avoid progressive collapse
- Concrete bunker, anodized aluminum panels and green glass exoskeleton
- Punched windows and exoskeleton passed mock-up bomb tests
- Hurricane Ike, high winds, flying debris, no damage

Concrete walls + second skin, punched windows

MATERIALS
FBI Regional Field Office

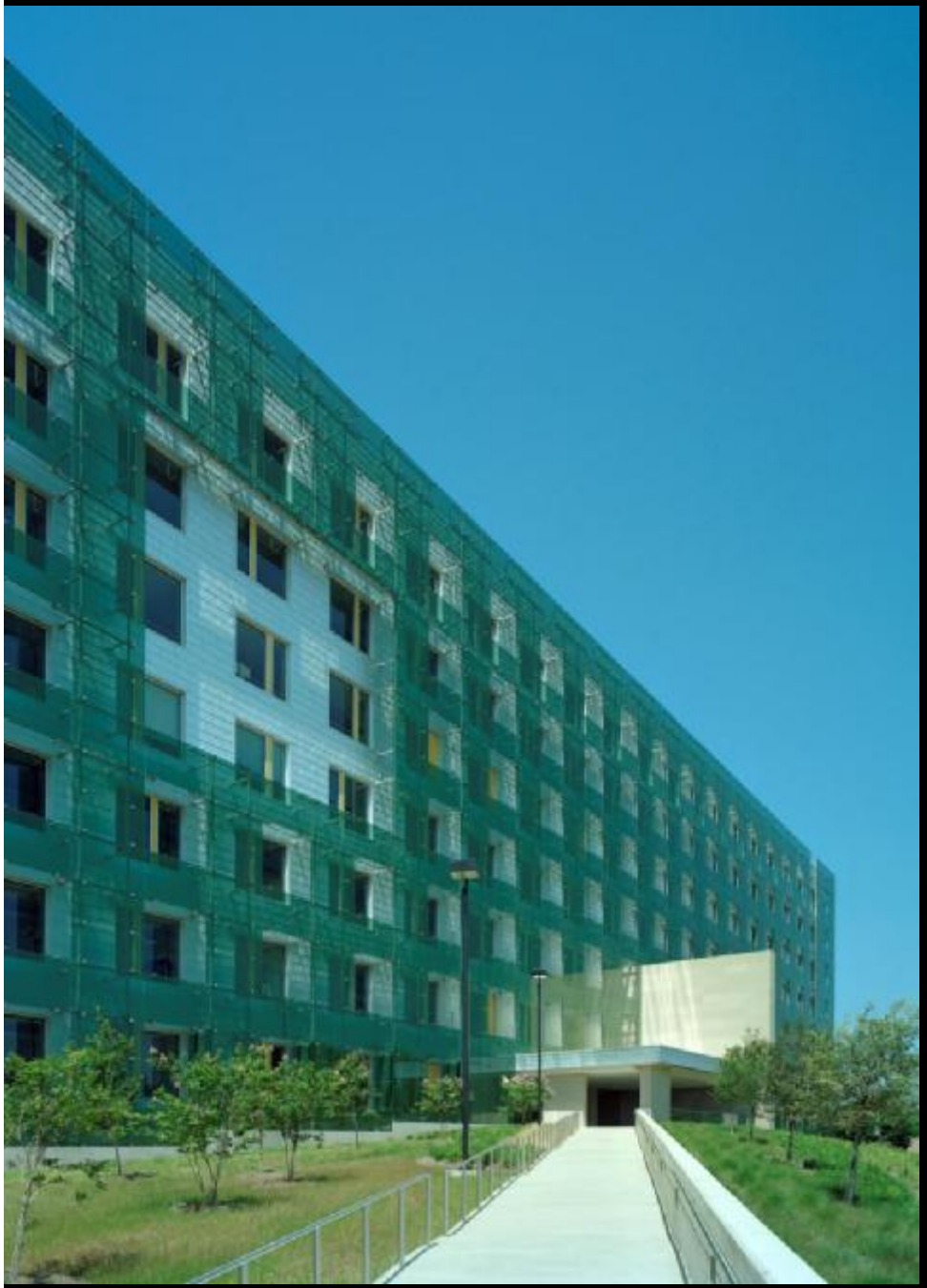
- High performance skin
- Metal frame and concrete walls carries a second skin to provide shade
- Fritted laminated glass is away from thermal wall
- Space between skins reduces A/C loads
- Aluminum shingles reflect heat

Swales and berms minimize erosion

ENERGY EFFICIENCY
FBI Regional Field Office

- Daylighting by design
- Narrow plan broad face to north and south
- Oversized windows
- High performance glass
- High insulation values
- Energy recovery units
- Efficient under-floor HVAC systems

Daylighting and views



Covered parking, bicycle storage

SUSTAINABILITY
FBI Regional Field Office

- Targeted for LEED
- Water efficient plumbing fixtures
- Rainwater harvesting
- Cooling tower water recycling
- Many recycled and local materials
- Indoor air quality: CO2 monitoring, low VOCs
- Screenwall system allows for future photovoltaics

All work areas with daylighting and views

Safe and healthy workplace

- Site is near mass transit
- Covered parking reduces heat island effect

- Existing trees preserved
- Drought-hardy landscaping

U.S. FEDERAL COURTHOUSE

Cedar Rapids, Iowa
Groundbreaking April 20, 2009

GENERAL SERVICES ADMINISTRATION

Lead Designer:
William Rawn Associates, Architects, Inc.
Architect of Record: OPN Architects
Structural Engineer: LeMessurier Consultants
Blast Consultant: Hinman Consulting Engineers
Curtainwall Consultant: Heitmann & Associates, Inc.
MEP Engineer: KJWW Engineering Consultants
Construction Manager: Ryan Companies US, Inc.

SECURITY Cedar Rapids Federal Courthouse

- Open and transparent
- Courtroom entrance visible through glass
- Designed to avoid progressive collapse

GSA

William Rawn Associates, Architects, Inc. | OPN

SECURITY AND ENERGY
Cedar Rapids Federal Courthouse

Raised Site:

- **Removes building from floodplain**
- **Retaining wall is security wall**
- **Minimal bollards**
- **Blast-resistant curtainwall faces north to minimize heat gain**

GSA

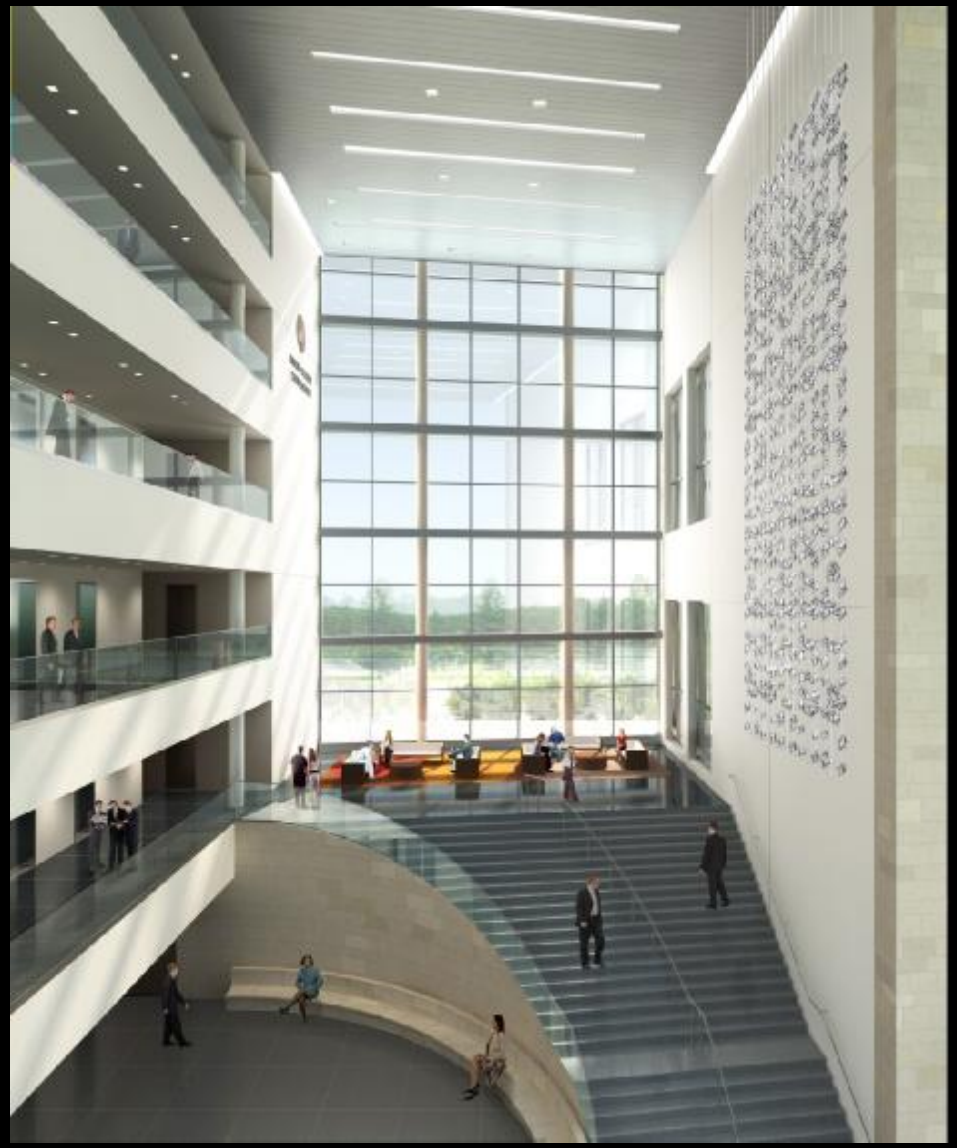
William Rawn Associates, Architects, Inc. | OPN

SUSTAINABLE DESIGN

Cedar Rapids Federal Courthouse

LEED Silver

- 20% Energy Reduction
- Waterside Economizer
- Outside Air Energy Recovery
- High Performance Envelope
- Efficient Light Fixtures
- 30% Water Reduction
- No Irrigation
- Daylight Harvesting in Public Spaces



Rendering © Doegoe

Central Atrium

SUSTAINABILITY

Cedar Rapids Federal Courthouse LEED Silver

- Daylighting in courtrooms and offices
- Isolated outside air system for Marshal's Spaces
- Construction waste recycling

GSA

William Rawn Associates, Architects, Inc. | OPN

U.S. FOOD & DRUG ADMINISTRATION HEADQUARTERS CONSOLIDATION

White Oak Campus, Silver Spring, MD

GENERAL SERVICES ADMINISTRATION

Architect / Engineer: KlingStubbins in association with RTKL

Landscape Architect: Sasaki Associates

Naval Ordinance Lab, 1946

SECURITY
FDA Headquarters

- Site access: vetting of visitor and deliveries

- Setbacks
- Vehicle barriers in landscape design

- Perimeter access for employee and visitor vetting at primary lobbies

- Green Zone: free movement within campus perimeter

Central campus monitoring


FDA Master Plan, 2009

SECURITY ELEMENTS
FDA Headquarters

- Outer-inner perimeter
- Vehicle access points
- Stand-off distance

- Pedestrian access
- Gatehouses and lobbies
- Fences and gates

- Limited visitor access
- Separate parking and visitors entry
- Screening





ENERGY EFFICIENCY
FDA Headquarters

- Efficient building envelopes and shading
- Waste heat recovery from co-gen plant for HVAC, hot water, chilled water, and domestic hot water
- Mixed mode ventilation systems and operable windows
- Energy recovery systems and under-floor air distribution systems

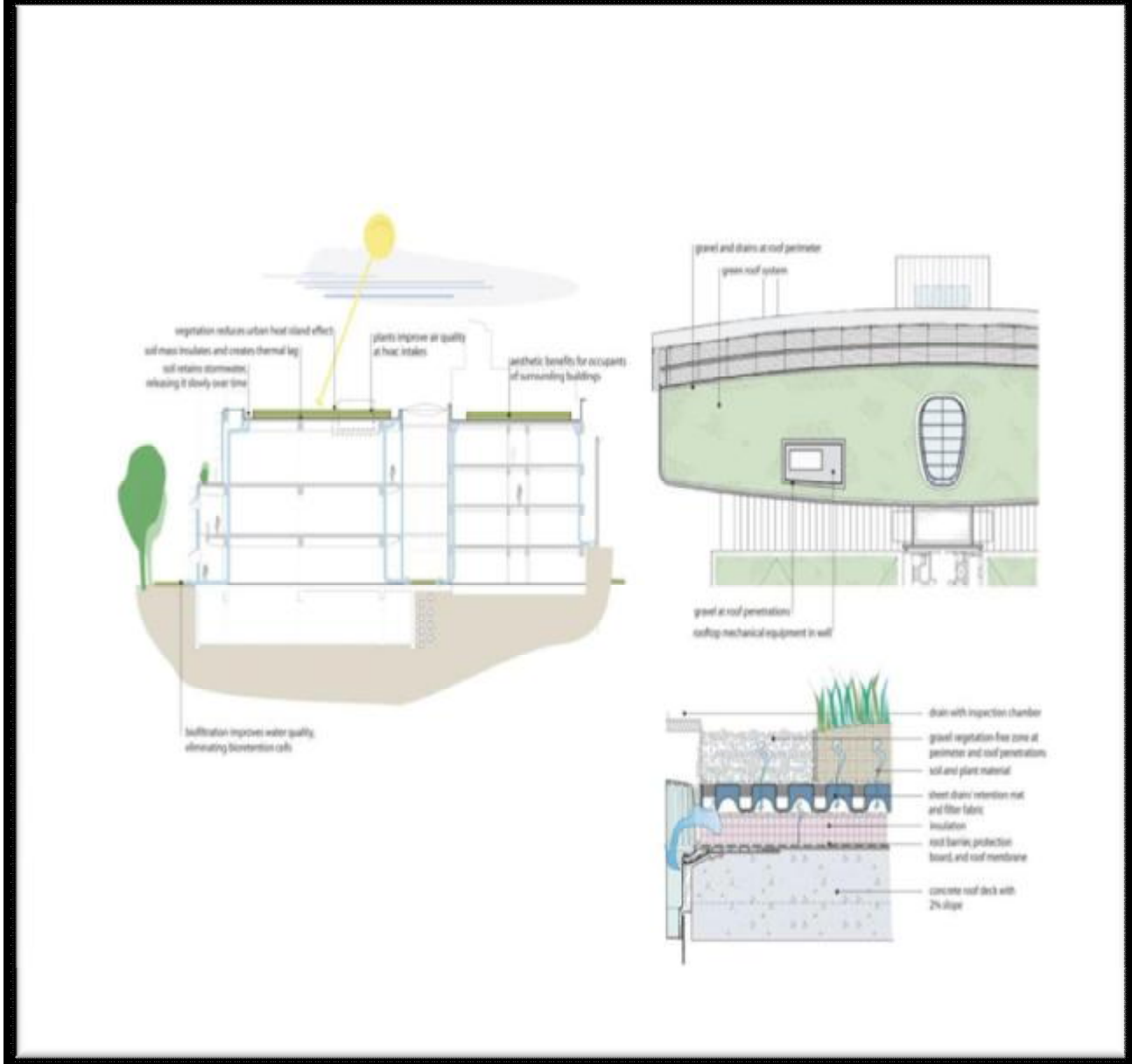
ENERGY

FDA Headquarters

- Infrastructure
- Co-generation
- Dept of Energy: Energy Savings Performance Contract (ESPC)

SUSTAINABILITY
FDA Headquarters

- **LEED Silver and Gold: New buildings**
- **Suburban campus has transportation plan**
- **Retain natural site elements**
- **Minimize building and parking footprints**
- **Landscaped courtyards and commons**
- **Re-vegetation, native species**
- **Green roofs**
- **96% recycling rate for demolition activities**


vegetation reduces urban heat island effect
soil mass insulates and creates thermal lag
soil retains stormwater, releasing it slowly over time
plants improve air quality at hvac intakes
aesthetic benefits for occupants of surrounding buildings
biofiltration improves water quality, eliminating bioretention cells
gravel and drains at roof perimeter
green roof system
gravel at roof penetrations
rooftop mechanical equipment in well
drain with inspection chamber
gravel vegetation free zone at perimeter and roof penetrations
soil and plant material
sheet drainz retention mat and filter fabric
insulation
root barrier, protection board, and roof membrane
concrete roof deck with 2% slope

Green Roof

WASHINGTON HEADQUARTERS SERVICES PENTAGON SOUTH

This public information has been cleared

Alexandria, Virginia

U.S. ARMY CORPS OF ENGINEERS

Architect - HKS, P.C.

Associate Architect - Wisnewski Blair & Associates, Ltd.

Structural Engineer - Cagley & Associates

Mechanical/Plumbing Engineer - Southland Industries

Electrical Engineer - M.C. Dean

Civil Engineer - Walter L. Phillips, Inc.

Geotechnical Engineer - GeoConcepts Engineering, Inc.

Blast Engineer - Weidlinger Associates, Inc.

SECURITY ELEMENTS
Washington Headquarters Services

- Medium protection level for medium threat level
- Protect against VBIEDs
- Blast resistant design
- Glazing and cladding
- CPTED site development
- Clear and easy access
- Define open spaces
- Walls and acoustics (STC) for internal security
- Evaluated location of emergency generators and fuel tanks

Suburban commercial development with limited setbacks

DESIGN
Washington Headquarters Services

Smart wall construction has permanent power and data poles in grid for wall placement options

Flexibility for furniture, permanent walls, and Sensitive Compartmented Information Facility (SCIF) areas

SUSTAINABILITY
Washington Headquarters Services

- **Gold LEED rating sought**
- **Strux Fiber reduces steel, labor, cost for reinforcing**
- **Closed water system (no make-up water) with non-chemical water treatment uses power to clean cooling water**

ENERGY EFFICIENCY
Washington Headquarters Services

- Limited site did not allow for various siting options
- High performing solar glass offsets limited site choices
- Glazing and cladding

Goal to reduce energy consumption

SUMMARY

Benefits of SEE Integration

- Safe, secure, healthy workplaces
- Opportunity for INNOVATION
- Life cycle cost savings
- Best value for taxpayers
- Minimize environmental impact
- Energy savings
- Use local goods, services, jobs
- Good example for generations
- Design Excellence in public sector reflects on who we are as a society

THANK YOU

Safe, Secure, and Sustainable Facilities

May 13, 2010

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