Planning for the Future in a Changing Environment

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STATE OF NEW YORK PUBLIC HEALTH AND HEALTH PLANNING COUNCIL
Ad Hoc Advisory Committee on Environmental and Construction Standards

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Planning for the Future in a Changing Environments

1609 SHORELINE
1836 SHORELINE
2013 SHORELINE

NYU Langone Medical Center
CAMPUS TRANSFORMATION
Tisch Elevators and Lobby Expansion

Four new passenger elevators
Expanded and renovated lobby
Family space, conference and consult rooms on the inpatient floors
Electrical and IT risers

STATUS: Complete
CAMPUS TRANSFORMATION
Emergency Department

20,000 sf renovation, 3,400 sf new construction
Separate ambulatory and ambulance entries
Dedicated pediatric experience
28 exam/treatment positions
Trauma/resuscitation room & 3 advanced triage rooms
Disposition Lounge w X-ray, ultrasound, and CT Scanner

STATUS: In Construction
CAMPUS TRANSFORMATION
Energy Building

71,000 SF facility on FDR Drive, east of Tisch Hospital

8 MW Cogeneration Plant with standby boilers

7.5 MW Emergency Power Plant for Tisch Hospital and Energy Building

Campus High Tension Electric Service

Radiation Oncology

Loading dock facility

STATUS: In Construction
CAMPUS TRANSFORMATION
Kimmel

800,000 SF clinical facility on 34th Street and 1st Avenue

32 ORs and procedure rooms, serving a mix of in- and outpatients

11 inpatient floors (374 beds) split about equally between acute and ICU

Single-bedded, same-handed rooms

Children’s Hospital within a Hospital

Clean docks, materials management, and central sterile processing dept.

Public Spaces:
- Plaza & Lobby
- Roof Terrace and Café
- Conference Center

STATUS: Design Complete
CAMPUS TRANSFORMATION
Science Building

365,000 SF research facility on 30th Street and FDR Drive

12,000-14,000 cage central vivarium
3000 cage satellite vivarium

10 research floors

1 shared research core floor

Loading docks serving all campus vivaria.

Public Spaces:
• Lobby and access to Alumni Courtyard
• Roof Terrace and Cafeteria
• Conference Center

STATUS: In Design
SITE CONDITIONS
FEMA Advisory Map

FIRM ELEVATION
(NAVD 88)
1% EL: 8.9
0.2% EL: 10.9

PROJECT DATUM
(BPMD)
10.35
9.25

ADVISORY BASE FLOOD ELEVATION
(NAVD 88)
1% EL: 12.0
0.2% EL: 16.0

PROJECT DATUM
(BPMD)
10.35
14.35
Approx. 14-foot Storm Surge at the Battery (MLLW) = 9.6’ Manhattan Datum
SITE CONDITIONS

Floor Elevations

- 20.0' First Floor (First Avenue Entrance)
- 16.35' Highest ABFE 0.2% + 2' Freeboard
- 14.35' Highest ABFE 0.2%
- 12.35' Highest ABFE 1% + 2' Freeboard
- 10.35' Highest ABFE 1%
- 9.5' Sandy Interior High Water
- 8.0' Ground Floor
- 7.25' Base Flood Elevation 1% (OLD)

All elevations are BPMD = NAVD - 1.65 ft

GROUND FLOOR

- CELLAR, - 4'-0"
  (SMILOW SUB-CELLAR - 18'-0")
CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions
1. COGENERATION
Existing Power Systems

Con Edison Service
1. COGENERATION
Proposed Power Systems

- Natural gas is burned to generate 8 megawatts of power
- Can be run in “island mode” to serve all essential loads, including air-conditioning in patient areas
- Medium tension distribution across campus; transformers provided at each building
- Steam is generated as a by-product to satisfy entire campus load
- Back-up boilers run on both gas and oil
- All components to be located above the DFE
1. COGENERATION
Existing Normal Mode

- Con Ed Steam
  - Heating
  - Cooling
  - Sterilization

- Con Ed Power
  - Normal Power Loads

- Oil
  - Emergency Generators
  - Automatic Transfer Switch (ATS) in normal position
  - Emergency Power Loads
1. COGENERATION
Existing Emergency Mode

Con Ed Steam → Heating
Cooling
Sterilization

Con Ed Power → Normal Power Loads

Oil → Emergency Generators

Emergency Generators → Automatic Transfer Switch (ATS) in normal position

Automatic Transfer Switch (ATS) in normal position → Emergency Power Loads
1. COGENERATION
Planned Emergency Mode (Initial 1-3 hours)
1. COGENERATION
Planned “Island Mode” (after 1-3 hours)
CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions
2. ENHANCED CAMPUS REDUNDANCY
IT Systems

- Two points of entrance
- Two Telecommunications Equipment Rooms (TER)
- Diverse and redundant distribution pathways
- Each TER served from two POE
- Each building served from both TERs
- All critical equipment above the DFE
2. ENHANCED CAMPUS REDUNDANCY

Chilled Water

- All plants feed a central campus loop at the rooftop level
- Chiller plants on emergency power
- Chiller plants can be powered indefinitely from cogen in “island mode”
- Steam chillers provide additional diversity
2. ENHANCED CAMPUS REDUNDANCY

Fire Communications

Fire command centers below the Design Flood Elevation to report back to the Skirball station accessible from First Avenue.

- Fire Command Center Above the DFE (First Floor)
- Fire Command Center Below the DFE (Ground Floor)
- Normal FD Access
- FD Access Point in Flood Conditions
CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions
SITE CONDITIONS
FEMA Advisory Map

ADVISORY BASE FLOOD ELEVATION (NAVD)

1% EL: 12.0
0.2% EL: 16.0

PROJECT DATUM (BPMD)

10.35
14.35

DESIGN FLOOD ELEVATION:

0.2% EL + Freeboard

15.35’ – 16.35’
3. PROTECT CAMPUS PERIMETER

Flood Wall

- Develop a campus flood wall system up to 500-yr advisory elevation
- Build in up to two feet of freeboard as feasible
- Upgrade walls and slabs for increased hydrostatic pressure
3. PROTECT CAMPUS PERIMETER
Flood Wall

- Upgrade walls and slabs as required to resist increased hydrostatic pressure
3. PROTECT CAMPUS PERIMETER
Flood Wall

1. Raise sills where possible
2. Provide flood gates as entrances
3. Reinforce existing walls

Pre-storm Design

Post-storm Design
3. PROTECT CAMPUS PERIMETER
Flood Gates

A. Demountable

- Storage and training required
- Labor intensive to erect and demount
- Requires more time in advance of storm
- Poor installation can result in failure
- Staging and erection of material may conflict with other storm preparations, especially at loading docks

B. In-place

- No storage required—can’t be lost
- Can be regularly tested with less disruption to normal operations
- Can be implemented later in the storm and demounted more quickly
- More reliable if maintained properly
- More expensive
- Can be active or passive
3. PROTECT CAMPUS PERIMETER

Flood Gates

For large areas of storefront glazing, consider vertically-rising flood walls.
3. PROTECT CAMPUS PERIMETER

Other Considerations

- Back-flow prevention on storm and sanitary connections
- Consider pressure-rated piping below the Design Flood Elevation
- Assume some level of infiltration in any dry-flood-proofed condition
- Develop a pumping plan and provide emergency power
CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions
4. ELEVATE CRITICAL INFRASTRUCTURE

New Buildings

- All systems to be located above the DFE unless prohibited by code
- No below-grade space in Kimmel or Energy Building
- Ground floor used for building access, storage, and parking
- Where systems cannot be elevated by code (fuel oil) provide secondary protection (vault within a vault)
- Fuel pumps and generators to be inside the building and accessible for maintenance during flood conditions
4. ELEVATE CRITICAL INFRASTRUCTURE

Tisch Hospital—Pre-Storm Plan

- Assess feasibility of elevating equipment
- Emergency power transfer switches and distribution are highest priority
- Normal power and HVAC systems that serve areas below the DFE may remain low
- Where systems cannot be elevated, protect in place with additional flood barriers and pumping
4. ELEVATE CRITICAL INFRASTRUCTURE

Tisch Hospital—Post-Storm Plan

Tisch Systems to be Elevated:
- Normal Power
- Steam
- Domestic Water Pumps & Heaters
- IT
CAMPUS RESILIENCY STRATEGIES

1. Cogeneration: On-site Heat and Power Generation
2. Enhance System Redundancy
3. Protect the Campus Perimeter
4. Elevate Critical Infrastructure
5. Relocate Critical Patient Care and Support Functions
5. RELOCATE CRITICAL PROGRAMS

Existing Buildings

a. Radiation Oncology (to 2nd Floor of Energy Building)
b. Inpatient MRI (to 2nd Floor of Tisch)
c. Outpatient MRI (to offsite facility, 38th Street)
5. RELOCATE CRITICAL PROGRAMS

Existing Buildings

Where a program cannot be elevated:

• Rely on campus flood wall
• Provide additional localized protection
• Plan for pumping
• Develop an emergency operation plan to continue essential services in the event of a failure

Cafeteria (Back-up Patient Meal Kitchen)