

THE PORT AUTHORITY OF NY & NJ

**Engineering Department
Quality Assurance Division**

TENANT CONSTRUCTION REVIEW MANUAL



December 2015

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This Manual presents the technical criteria to be followed by Tenants, and their Architectural and Engineering consultants, for construction work undertaken by a Tenant at Port Authority (PA) facilities. These technical criteria are in addition to other requirements contained in the lease agreement between the Port Authority and the Tenant. This Manual also covers the Port Authority Engineering Department's scope-of-review of the design documents (plans, specifications, calculations and other documents) submitted by Tenants in connection with proposed construction or alterations. It shall not be deemed to imply that there will not be additional reviews by other Port Authority Departments.

The Design Standards Unit of the Engineering Department's Quality Assurance Division will review the Tenant Construction/Alteration Application submitted by the Tenant in accordance with the criteria contained in this Manual. The responsibility for Architectural and Engineering design shall remain with the Tenant's Architect or Engineer (A/E) of Record. The Construction Design Standards Unit will not impose design solutions but will only comment on the design presented.

Reviews will not address the aesthetic or functional aspects of the design.

Construction documents for Tenant construction or alterations will be reviewed for compliance with all applicable Codes and Port Authority Technical Standards. In the absence of a specific code provision, this Manual sets forth the applicable standards to be followed by Tenants except as may otherwise be required. All design documents shall reflect the existing construction as well as the proposed work in order to determine compatibility with existing facility conditions. In this regard, a list of all reference documents and guidelines which the Tenant has obtained from the PA facility Tenant Liaison Office, and which affect the design, shall be included in the Tenant's construction document submission. If the review process will be aided by the inclusion of these reference documents, the documents should also be included in the submission.

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- I. All proposed Tenant construction shall be submitted for review, in completed form, accompanied by a "Tenant Construction or Alteration Application," Form PA531, which shall be provided to the Tenant by the appropriate Port Authority line department.

The PA line department shall forward all Tenant submittals to the Engineering Quality Assurance Division for review.

- II. The design documents, such as drawings, reports, computations and specifications, required in connection with the proposed construction, shall be submitted with the Tenant Construction or Alteration Application. Existing construction shall be properly identified on the drawings. The design documents shall be sealed and signed by the Architect or Engineer of Record licensed to practice in the State in which the proposed construction is to be performed. The Architect/Engineer indicated on the Application shall be considered the Architect or Engineer (A/E) of Record. The required number of sets of drawings may be minimized if an electronic file (compact disc) of the drawings is included in the submission. The formatting and other requirements for the electronic file can be obtained from the PA facility Tenant Liaison Office.

Where other consultants have been acknowledged by the A/E of Record, either in the Tenant Alteration Application or on the drawings, said consultants may seal and sign the documents they have prepared.

The A/E of Record is responsible for assuring that the documents prepared by other consultants are properly coordinated.

Where the Tenant retains two or more independently functioning consultants, they each become an A/E of Record for their respective scope of work. Each consultant will be required to submit a separate Tenant Alteration Application, and each consultant shall seal and sign their respective documents.

A signed and sealed statement from the A/E of Record certifying compliance with the New York City Energy Conservation Code shall be submitted with the Tenant Construction or Alteration Application for construction projects in all Port Authority facilities within New York City.

Responsibility for design or code compliance shall not be delegated to contractors.

- III.** All revisions to previously submitted documents shall be properly identified, and shall be accompanied by a brief description of the revisions.
- IV.** All voluntarily installed fire protection systems, including, but not limited to sprinklers, alarms, etc., shall comply with the provisions of the applicable Building Codes for such systems.
- V.** Fire protection plans, as described in article 109 of Title 28 of the Administrative Code of the City of New York (New York City Construction Codes), shall be required along with other design documents for construction projects at all Port Authority facilities within New York City. After approval of the project for construction, and before a Permit to Occupy or Use is issued, the Tenant shall submit one (1) copy of these plans to the Manager of the Facility where the project is located, one (1) copy to the Inspection and Safety Division of the Operations Services Department and two (2) copies to the Quality Assurance Division of the Engineering Department.
- VI.** In accordance with the policy of the Port Authority, the Tenant shall comply with the provisions of all federal, state, municipal, local and departmental laws, ordinances, rules, regulations and orders that may affect the construction or alteration. Where stricter requirements, stipulated in this Manual, apply, they shall be followed. The Tenant, or designated agents, shall not apply for any variance, license, waiver, or permit from any municipal or governmental agency in the name of or on behalf of the Port Authority.
- VII.** All tenant construction or alteration projects are required to adhere to the Port Authority's Sustainable Design Policy. Details of the policy and the Sustainable Design Guidelines can be obtained from the PA facilities Tenant Liaison Office.
- VIII.** All tenant construction or alteration projects are required to adhere to the Port Authority's Roadway Access Management Guidelines. Details of the policy and guidelines can be obtained from the PA facilities Tenant Liaison Office. A traffic impact analysis shall be prepared if there is an increase in existing traffic volumes generated by the site, a change to site access, or change to traffic operations. A concept planning meeting shall be scheduled with PA traffic engineers to determine the scope of traffic analysis/study.
- IX.** All landscape work at the airports that are within the scope of a TAA shall comply with Attachment LS1 in Section 18 of this Manual.
- X.** The Attachments in Section 18 of this Manual are supplementary to the technical sections and shall be part of the requirements.

I. GENERAL

The construction documents, such as drawings, reports, computations, and specifications, required for the proposed construction or alteration project shall comply with the applicable codes, regulations and standards listed below and any additional regulations and standards listed in the respective technical sections of this Manual.

II. CODES AND REGULATIONS**A. New York City:**

1. New York City Administrative Code, Title 28
2. New York City Construction Codes and their Reference Standards and Appendices. The New York City Construction Codes include:

New York City Building Code
New York City Mechanical Code
New York City Plumbing Code
New York City Fuel Gas Code

3. New York City Electrical Code
4. New York City Energy Conservation Code
5. New York City Fire Code and Directives
6. New York City Health Code
7. Rules of the City of New York:

Title 1, Department of Buildings
Title 2, Board of Standards and Appeals (BS&A)
Title 3, Fire Department
Title 24, Department of Health
8. New York City Local Laws
9. New York State Multiple Dwelling Laws (Hotels)

10. New York State Labor Laws
 11. Directives and Memoranda of the Department of Buildings
- B. New Jersey:
1. New Jersey Uniform Construction Code (NJUCC), its bulletins and the sub-codes with their Supplements and Reference Standards
 2. New Jersey Uniform Fire Code
 3. New Jersey Administrative Code - Title 7, Environmental Protection Laws
 4. Applicable regulations of the NJ Department of Environmental Protection
- C. New York State:
1. New York State Uniform Fire Prevention and Building Code which includes the following:
 - Building Code of New York State (BCNYS)
 - Mechanical Code of New York State (MCNYS)
 - Plumbing Code of New York State (PCNYS)
 - Fuel Gas Code of New York State (PCNYS)
 - Fire Code of New York State (FCNYS)
 - Existing Building Code of New York State (EBCNYS)
 - Property Maintenance Code of New York State (PMCCNYS)
 2. Energy Conservation Construction Code of New York State
 3. New York State Multiple Dwelling Laws (Hotels)
- D. All PA Facilities:
1. Americans with Disabilities Act (ADA)
 2. Applicable Flood Control/Regulations
 3. Federal Occupational Safety and Health Administration (OSHA) Regulations
 4. Applicable regulations of the U.S. and local Environmental Protection Agency

5. Applicable regulations of the local municipal water supply, gas utility, and sanitary sewer governing agencies

E. All Airports:

1. Federal Aviation Regulations – Title 147 Part 139 Certification of Airports Subpart D – Operations

III. **STANDARDS**

The latest editions of the following standards shall be used unless an earlier edition is referenced in the applicable construction codes:

AASHTO American Association of State Highway and
Transportation Officials

ANSI/EIA/TIA- Structural Standards for Steel Antenna Towers and
222-E Antenna Supporting Structures

AREMA American Railway Engineering and Maintenance-of-
Way Association

NFPA National Fire Protection Association:

24 Installation of Private Fire Service Mains and Their
Appurtenances

25 Standard for Inspection, Testing, and Maintenance of
Water-Based Fire Protection Systems

75 Protection of Electronic Computer/Data Processing
Equipment

130 Standard for Fixed Guide-way Transit and
Passenger Rail Systems

407 Aircraft Fuel Servicing

409 Aircraft Hangars

415 Airport Terminal Buildings, Fueling Ramp Drainage,
and Loading Walkways

502 Road Tunnels, Bridges, and Other Limited Access
Highways

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I. GENERAL

At the Tenant's request, a Conceptual Review will be performed to provide comments on the preliminary design. These reviews will inform the consultants of established design criteria, pre-existing conditions that determine code compliance, and Port Authority requirements affecting the proposed work. The conceptual review shall be limited to fundamental concepts and items related to the criteria in this Manual that may significantly affect the design. The review will not address aesthetics or functional design.

Submitted conceptual plans shall indicate conformance to the applicable codes and design criteria.

II. SCOPE OF REVIEW

The scope of the Conceptual Review includes the following items:

- A. Occupancy group and construction classification of the new, altered, and adjusted areas.
- B. Fire protection of spaces in the building as it applies to ratings of interior separations, shafts, exterior walls, and sprinkler requirements.
- C. Egress: Occupant load and adequacy of egress shall be established or the Tenant's Architect/Engineer may list the sections of the applicable Code on which the design is based. New Tenant egress scheme(s) shall be coordinated with existing conditions.
- D. Special structural conditions, including foundations.
- E. Special or unusual mechanical or electrical design affecting environmental, energy, or power requirements.
- F. Deviations from Code requirements.

III. PORT AUTHORITY DESIGN CRITERIA

See the subsequent Technical Sections of this Manual for specific criteria.

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I. GENERAL

The scope of the architectural review shall comprise compliance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and Port Authority design criteria listed below.

II. PORT AUTHORITY DESIGN CRITERIA**A. General:**

1. Conveyor belting shall be flame resistant. When subjected to a flame test in accordance with ASTM D378, the duration of flame shall not exceed an average of one minute after removal of the applied flame (after-flame time) and the duration of afterglow shall not exceed an average of three minutes. Test results shall be submitted for review.
2. Storage under canopies (such as at cargo buildings) shall be considered as storage occupancy group S-2, low hazard.
3. Baggage handling spaces in the airports shall be classified as storage occupancy group S-2, low hazard.
4. For Interior Plastic Sign Standard, see Section 18, Attachment A1.
5. For marking of transparent glass doors and fixed adjacent glass sidelights, see Section 18, Attachment A-2.
6. Conveyor openings in fire rated construction shall be protected with fire shutters with the appropriate fire protection rating. Fire shutters shall be provided with positive means to ensure the prevention of obstructions interfering with the closing of fire shutters. These fire shutters shall be integrated with:
 - a. Smoke detectors provided on each side of the wall and located in accordance with NFPA 80 and 72, and the manufacturer's listing, in order to actuate the motorized shutters and the alarm system

- b. Leading edge or electric eye devices to permit the passage of an obstruction on the conveyor by retraction of the fire shutter
- c. Emergency power for the operation of the rated shutter(s), as well as for an adequate portion of the conveyors, to enable the passage of obstructions at the rated shutter(s)
- d. Stoppage of the conveyors
- e. Operation of other smoke and heat detectors within the fire zone shall also actuate these shutters

For openings in walls with fire resistance rating of 2 hours or less, a system of water spray nozzles may be used in lieu of fire shutters. At least four nozzles shall be provided on each side of the opening to give complete coverage of the opening. Nozzles shall be controlled by an automatic valve actuated by a heat detector. Nozzles shall be located at an angle not more than thirty degrees between the centerline of nozzle discharge and a line perpendicular to the plane of the opening. The water discharge rates shall be at least three gallons per square foot per minute.

- 7. Where spaces are provided with grilled openings for entrance and exiting, a safe means of egress shall be provided for the employees who may stay inside the space after the grille is closed, consisting of:
 - a. A door in compliance with code requirements; or
 - b. An approved device that will open the grille from inside

B. Airports:

1. All Airports:

- a. The means of egress for passenger terminal buildings shall be designed for an occupant load consisting of the sum of the passengers (100% capacity of aircraft), meeters and greeters, and employees, based on maximum anticipated flight schedules (such as holidays or other seasonal peaks), and a two (2) hour delay of flights. This number shall not be less than the occupant load computed based on the maximum floor area allowances per occupant in the code. Consideration shall be given to locations of concentrated crowding, rather than assuming uniform distribution of occupants over the entire building.
- b. In passenger terminal buildings, concessions serving the public that are open to the public spaces shall be considered as part of the public space (Assembly Occupancy). Storage space belonging to concessions shall be enclosed as required by Code. Also, adjacent concession areas shall be separated from each other as required by Code for different tenancies.
- c. For aircraft loading walkways, and for protection of buildings from ramp-side fuel spill fires, see Section 13 of this Manual.
- d. Building walls and over-hangs adjacent to aircraft fuel pipeline surge suppressors shall have a fire rating depending on their distance 'd' as a radius from the surge suppressor:

d > 25 feet; fire rating = 0

d > 10 feet; fire rating = 2 hours

d < 10 feet; fire rating = 4 hours

2. LaGuardia Airport, Existing Central Terminal Building (Disregard after it is replaced by the new terminal under LGA Redevelopment Program):
 - a. The main building conforms to construction classification 1B of 1968 Building Code of the City of New York.
 - b. The fingers are unprotected steel construction, classification 1E of the 1968 Building Code of the City of New York, separated from the main building with fire shutters, and are further subdivided into fire areas.
 - c. On the third (3rd) floor of the Terminal Building, a Safe Area, in compliance with Article 8 of the 1968 Building Code of the City of New York, constitutes part of the overall means of egress from the floor. The Safe Area consists of the central east-west corridor together with the public areas at the termination of the connectors from the parking garage.

III. DETAILS OF ARCHITECTURAL REVIEW

The following are representative of items reviewed:

- A. Use and occupancy classification of building and spaces, building height and area, separation of occupancies, construction type and fire-resistance rating of building elements, compatibility of proposed construction with existing systems.
- B. Requirements of sprinklers, standpipes, smoke detectors, fire alarms, and exit signs
- C. Accessibility to persons with physical disabilities.
- D. Fire protection of building components and finishes (includes documentation verifying that all materials and equipment used are of an approved type)
- E. Egress, establishing occupant load and existing capacity, including door and hardware requirement
- F. Verification of strength of all glass subject to human impact, and the requirement for markings
- G. Provision of plumbing fixtures (toilets, lavatories, drinking fountains, etc.)

- H. Protection of airport terminal buildings from fires at ramp-side potential fuel spill points (PFSP). See Section 13 of this Manual.
- I. Compliance with PA Standards and Specifications governing the Flammability of interior plastic signs. See Section 18, Attachment A1.

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I. GENERAL

- A. The scope of the structural review shall comprise compliance with the applicable Codes, regulations, and standards listed in Section 3 of this Manual, and the design criteria listed below.
- B. Computations shall be submitted with the structural plans.

II. PORT AUTHORITY DESIGN CRITERIA

- A. Drilled-in adhesive anchors shall not be permitted for fastening to concrete in overhead applications. When drilled-in anchors are subject to tension loads, drilled-in undercut anchors shall be used. When tension load is less than 500 lbs and is not subject to vibration or impact load, heavy duty drilled-in expansion anchors may be used.
- B. In the existing LaGuardia Airport Central Terminal Building, concrete anchors or attachments to the steel decking are not permitted for connection of hangers for ducts, utilities, ceilings, bracings, signage and other miscellaneous loads in areas where the floor is constructed of non-structural concrete fill over cellular decking (See Section 18, Attachment S3 for locations). All such loads in these areas shall be directly supported from the existing structural floor framing or supplementary framing shall be provided to transfer the loads to the existing framing members.
- C. Floors in certain areas of the Port Authority Bus Terminal South Wing are of lightweight low strength concrete construction. (See Section 18, Attachment S4 for locations). Concrete anchors are not permitted in these lightweight slabs for the attachment of hangers for supporting ducts, utilities, ceilings, and other miscellaneous loads. These loads shall be supported directly from floor beams or supplementary framing connected to the floor beams.

In areas where concrete inserts are permitted, only approved type stainless steel anchors rated for shock and vibration loads and elevated temperature shall be used.

D. Ceilings:

1. Inaccessible Heavyweight Ceiling Design Standards - See Section 18, Attachment S1
2. Suspended Lightweight Ceiling Design Criteria - See Section 18, Attachment S2.

E. Vehicular Traffic:

1. Elevated roadways shall be designed for all loadings, including seismic effects, in accordance with the AASHTO "Standard Specifications for Highway Bridges" and the relevant State DOT Standards.
2. The loading for the departure and arrival ramps servicing airport passenger terminals shall be HS 20-44 AASHTO highway loading. All other ramps servicing cargo facilities or road overpasses shall be designed for HS 25 AASHTO highway loading.

F. Signs and Luminaires:

1. Highway signs and luminaires shall conform to the AASHTO (American Association of State Highway and Transportation Officials) Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals.
2. Exterior signs adjacent to vehicular traffic such as streets, highways, trains and light rail vehicles or open terrain shall be designed in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals. All other exterior signs shall be designed as per the applicable local building code.
3. Interior signs located in the entrance lobbies, entrance vestibules or boarding platforms of transportation terminals shall be designed for an incidental wind gust pressure of 15 psf. All other interior signs shall be designed for a minimum lateral pressure of 5 psf.
4. Interior signs shall also be designed for earthquake loads as per the applicable local building code.
5. All signs (exterior or interior) which require routine cleaning or servicing(i.e., variable message, internally lighted, etc.), whether or not specifically designed for a servicing device, shall be designed for all anticipated additional loads, but not less than a

100-lb concentrated horizontal load and a 300 –lb concentrated vertical load applied at the point of assumed or most eccentric loading. The additional concentrated loads shall be applied in combination with the sign dead load (not concurrent with wind or earthquake loads).

- G. Aircraft loading walkways (Airports) design loads and the worse case load combinations shall be as prescribed in NFPA 415, Chapter 6.

III. DETAILS OF STRUCTURAL REVIEW

The following are representative of items reviewed:

- A. The design calculations shall include but not be limited to:
1. Design criteria and applicable Codes
 2. Reference Standards
 3. Design loads, including wind, seismic, and other forces
 4. Allowable soil bearing capacity
 5. Pile type and capacity
 6. Design of connections other than AISC standard framed or seated beam connections
 7. Location and details of expansion joints
 8. Bracing systems and moment-resisting frames
 9. Deflections and drift
 10. Ponding and snow drift analysis
 11. Investigation of superimposed loads from new construction on existing structure and foundation
 12. Investigation of existing structural system and foundations under additional loads due to alterations
 13. Where it has been established that post-construction settlements of foundations are to be monitored, the monitoring program, the limits of differential settlement that the structure can tolerate, and the necessary adjustments shall be submitted for review.

B. Drawings shall include, but not be limited to, the following Information:

1. Applicable Code and Reference Standard
2. Materials
3. Design live loads, wind, seismic, and other forces
4. Limits and details of any removals
5. Location and details of expansion joints
6. Machinery, equipment, and other concentrated loads in excess of 1000 lbs., including footprints or support layout(s)
7. Allowable soil bearing capacity
8. Pile type, capacity, and minimum tip elevation
9. Accumulated design load for columns at each level for dead and live loads
10. Stress diagram(s) for trusses
11. Datum and ground water elevations
12. Typical moment connection details
13. Details of non-standard connections
14. Construction sequence

C. Specifications shall include, but not be limited to:

1. The scope of work and materials required for the construction or alteration
2. Limitations and restrictions due to the existing conditions and/or requirements for the methods of construction or staging

I. GENERAL

The geotechnical review shall be for compliance with the applicable codes, regulations and standards listed in Section 3 of this Manual, and the design criteria listed below. The review shall include, but not limited to, an evaluation of the geotechnical site investigation and foundation design report, drawings, design calculations and analyses, and specifications to verify that the foundations, earthworks, and underground construction are appropriate for the subsurface conditions and the proposed/planned structure(s) to be supported. In the absence of definitive code requirements, PA standards and established practice shall govern.

II. PORT AUTHORITY DESIGN CRITERIA

The minimum frost depth shall be three (3) feet.

III. PORT AUTHORITY STANDARDS

A. The following PA Standard Specifications shall be used for Tenant projects:

1. Steel Pipe Piles
2. Steel H Piles
3. Timber Piles
4. Monotube Piles
5. Drilled Minipiles
6. Pile Coating for Steel Piling
7. Zinc Rich Coat Tar Epoxy Coating System for Steel Sheet Piling
8. Pile Load Tests (Static Axial, Lateral, and Tensile)
9. Dynamic Pile Testing
10. Steel Sheet Piling
11. Caissons (Drilled Shafts)

12. Aggregate Base Course
13. Open Graded Aggregate Base Course
14. Excavation, Backfilling, and Filling
15. Instrumentation for Settlement and Groundwater Observations
16. Soil Erosion and Sediment Control
17. Dewatering
18. Rock Excavation
19. Pre-stressed Soil and Rock Anchors
20. Rock Dowels
21. Rock Excavation
22. Pressure Grouting

IV. DETAILS OF GEOTECHNICAL REVIEW

The following are of the typical items to be reviewed:

A. Geotechnical Site Investigation and Foundation Design Report:

The report shall be signed and sealed by a registered professional engineer and shall include the applicable items listed below:

1. A description of the proposed structures and underground construction.
2. Results of geotechnical site investigation, including test borings, laboratory tests, cone penetration tests, standard penetration tests; and review of previous data obtained from the Port Authority or others for similar construction on or near the site.
3. A plan showing the locations of test borings, test pts, and/or test pits
4. Soil profiles and boring logs
5. Datum, ground water elevations, and applicable flood protection elevations

6. Description of foundation system(s) or planned/proposed ground improvement methodology
7. Results of geotechnical evaluations of the site-specific subsurface conditions, including interpretation of test borings, laboratory test results, and the available subsurface data.
8. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; the effects of adjacent loads, and impacts to the adjacent foundations, structures, and utilities.
9. Expected total and differential settlement
10. Pile and pier foundation recommendations and allowable capacities
11. Special design and construction provisions for footings or foundations founded on treated soils, as necessary
12. Requirements for compacted fill material properties and testing
13. Sub-grade Soil Modulus (CBR, MR, K)

B. Calculations and analyses for the applicable items listed below:

1. Estimates of settlement resulting from the proposed construction at the construction and adjacent sites (structures, pavement, utilities)
2. Analyses for the design of sand drains, surcharging, deep compaction or other ground improvement methods
3. Where it has been established that post-construction settlement of foundations must be monitored, the instrumentation and monitoring program shall be submitted for review. Also, see Section 6, III.A.13 of this Manual.
4. Stability analyses for earth slopes, embankments, grade changes, and deep excavations, both during and at the completion of construction

5. Analysis of dewatering and seepage control measures
6. Design of earth and rock anchors, and sockets
7. Allowable bearing capacities of shallow foundations
8. Deep foundation requirements including types, allowable capacities (axial compressive, lateral, and tensile), group action, down drag load, seismic load, minimum tip penetration elevation, driving hammer type, minimum transferred energy, and driving resistance for driven piles
9. Seismic and liquefaction analysis, when required. Site specific analyses may be submitted, provided they incorporate ground motions derived from a seismic hazard analysis that has been reviewed and approved by the PA
10. Analysis of impacts on adjacent properties or utilities
11. Design and analyses of earth retaining structures

I. GENERAL

The scope of Civil Engineering review shall comprise conformance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and other guidelines established in this section. The items to be reviewed will include proposed paving, sanitary sewer system, storm sewer system, gas utility, cold water domestic and fire protection distribution system construction whenever they are placed in areas outside of the leasehold.

Additionally, any proposed construction that connects to or impacts upon Port Authority utility systems or affects another Tenant, regardless of whether it is within the leasehold area, shall conform to Port Authority Civil Standard Details, Specifications, and Design Guidelines, included in Section 18, Attachments C1, C2 and C3, respectively.

In certain cases as noted herein, use of the Standard Details, Specifications, and the Design Guidelines is required. When not required, the tenants may choose to use these in lieu of developing their own designs. The Standard Details, Specifications, and the Design Guidelines will be provided by the Port Authority Engineering Department's Quality Assurance Division, when required for a specific tenant project and requested through the facility Tenant Liaison Office.

The portions of the sanitary, water utilities, and storm sewers that service or will service more than one Tenant's leasehold (or premises) are hereinafter referred to as "for common service" sections of the respective utility.

II. PORT AUTHORITY DESIGN CRITERIA AND STANDARDS**A. General:**

All site work outside the lease line shall conform to the appropriate Port Authority Civil Standard Details, Specifications and Design Guidelines. See Section 18, Attachments C1, C2, and C3.

1. At all aviation facilities, the latest edition of the Federal Aviation Administration (FAA) Advisory Circulars, including but not limited to the following, shall be used:

FAA-AC150/5300-13	Airport Design
FAA-AC150/5320-5	Surface Drainage Design
FAA-AC150/5320-6	Airport Pavement Design and Evaluation
FAA-AC150/5340-1	Standards for Airport Markings
FAA-AC150/5370-13	Off-Peak Construction of Airport Pavements using Hot-Mix Asphalt

2. At all aviation facilities, the latest edition of the Federal Aviation Regulations (FAR), including but not limited to the following, shall be used:

139.305	Paved Areas
139.309	Safety Areas
139.311	Markings, signs and lighting
139.341	Identifying, marking and lighting construction and other unserviceable areas
139.335	Public Protection

B. Paving:

1. General:

- a. Pavement shall be designed using a recognized procedure.
- b. Sidewalks outside of the lease line shall conform to the latest PA Standard Detail Number 062.021 A&B and Americans with Disabilities Act guidelines.

2. Aviation Facilities:

- a. Paving of taxiways, taxi lanes, or aprons to be constructed within Public Aircraft Facility (PAF) areas, or in areas to be used by more than one Tenant, shall conform to the latest PA Standard Details Number 062.001 or 062.004 or the latest FAA Advisory Circular, whichever results in the thicker pavement. Design calculations shall be submitted for review and approval
- b. Paving within the Tenant's lease line should be designed in accordance with the latest FAA Advisory Circular.

- c. Stabilization pavement shall be required wherever a blast from the aircraft may cause erosion of soil. Stabilization pavement shall conform to the latest PA Standard Detail Number 062.001 or 062.004 or with the latest FAA Advisory Circular, whichever results in thicker pavement.
- d. Roadway pavements outside of the lease line shall conform to the latest PA Standard Details Number 062.001 or 062.004 or the latest AASHTO guide whichever results in the thicker pavement. Design calculations shall be submitted for review and approval.

C. Storm Sewer:

1. General:

- a. Hydrologic and Hydraulic design shall conform to the Civil Design Guidelines or an approved alternative method. See Section 18, Attachment C3, Section 3.6.
- b. Common service storm sewers shall be properly supported as per PA Standard Detail Number 041.001, or 066.002, or as determined by ASCE Manual No. 77 methods.
- c. Verify that new and existing pipes can withstand the heaviest vehicle loads.

2. Aviation Facilities:

- a. Surface drainage of airport aprons shall comply with the National Fire Protection Association (NFPA) Standards 407, 409, 415, and Section 13 herein.
- b. At the aircraft fueling ramps, fuel storage areas, and fuel truck parking areas, drainage inlets shall be equipped with vapor trap hoods. The hoods shall provide a minimum of 12 inches of water seal.
- c. Common service storm sewer appurtenances and pipes shall be designed to withstand the heaviest anticipated aircraft or vehicle load. PA Standard Detail Numbers 010.010, 020.013 and 20.014 shall be used wherever appropriate.

3. Port/Commerce Facilities:

Sewer appurtenances and pipes within the Tenant's lease line shall be designed to withstand the heaviest anticipated container, container handling equipment, or vehicular load. PA Standard Detail Numbers 010.014 and 020.021 shall be used wherever appropriate. Submit computations for review and approval.

D. Sanitary Sewers:

1. General:

- a. Hydraulic Design shall conform to Section 3.8 of the Civil Design Guidelines. See Section 18, Attachment C3.
- b. In New York City, for all proposed Tenant's sanitary sewer connections made to the city sewer off PA property, the Tenant shall be required to apply directly to the appropriate City Department for approval and a note to that effect shall appear on the drawings.
- c. Sanitary sewers shall be properly supported as per PA Standard Detail Numbers 043.001, or 066.001, or as determined by ASCE Manual No. 60 methods.
- d. Verify that new and existing pipes can withstand the heaviest vehicle loads.

2. Aviation Facilities:

Common service sanitary sewer appurtenances and pipes shall be designed to withstand the heaviest anticipated aircraft or vehicular load. PA Standard Details shall be used wherever appropriate.

3. Port/Commerce Facilities:

Sewer appurtenances and pipes within the Tenant's lease line shall be designed to withstand the heaviest anticipated container, container handling equipment or vehicular load. PA Standard Detail Number 010.014 shall be used wherever appropriate.

E. Exterior Water Distribution Systems:

1. General:

- a. Coldwater Distribution systems shall be designed in accordance with Section 3.7 of the Engineering Design Guidelines - Civil. See Section 18, Attachment C3.
 - b. The coldwater distribution system pipes and appurtenances are interconnected to the facility-wide cold water distribution systems and are for common service, and must conform to the requirements of the local municipal water authority. Port Authority Standards and Specifications are in compliance with these requirements and shall be utilized.
 - c. All coldwater distribution system pipes and appurtenances shall be designed to withstand the heaviest anticipated aircraft, container, container handling equipment or vehicle load.
 - d. All coldwater distribution system pipes shall either have a minimum cover of 4'-0", or be heat traced and insulated.
 - e. Pipe protection shall conform to the requirements of the Civil Design Guidelines. See Section 18, Attachment C3.
 - f. Fire hydrants shall be spaced in accordance with the National Fire Protection Association Standards and Guides, and local municipality requirements, but in no case shall any part of a building's periphery be more than 300 feet from a hydrant.
 - g. Shut off valves shall be used at the point of connection wherever a proposed main is to be added to the existing distribution system.
 - h. All fire hydrants shall be connected to the supply main through a valved connection.
 - i. All curb and street valves shall be provided with a valve box meeting the requirements of the local municipal water authority.
 - j. All water distribution pipes and appurtenances shall be restrained against thrust forces. Thrust blocks are not permitted.
2. Port/Commerce Facilities:
- a. Hydrant spacing shall conform to NFPA (maximum 300 feet, 150 feet at dead ends) except where PA Operations

Services has approved a greater spacing in container yards.

- b. In container yards, every effort shall be made to locate valves where they will not be obstructed by grounded containers.
- c. Where a hydrant is more than 50 feet from the main or where the valve at the main is not in an aisle, provide valves at both the main and the hydrant.
- d. In Port Newark and the Elizabeth PA Marine Terminal, provide additional joint restraint from the valve to the hydrant in accordance with the latest version PA Standard Detail 030.015. The joint restraints shall be of a type that can be removed and restored without cutting the pipe.

F. Gas Utilities:

Gas service piping design and installation shall conform to the standards and requirements of the utility company whose jurisdiction covers the area in which the construction takes place. Verification of this conformance shall be submitted.

G. Security Fence:

PA Standard Detail Number 090.011 and Standard Specification Section 02831 or 02832 shall be used for security fencing.

III. **DETAILS OF CIVIL REVIEW**

The following are representative of details reviewed:

A. Design Computations:

- 1. Pavement: Design procedure, service life, design vehicle and volume of traffic, structural design
- 2. Drainage: Hydrologic and hydraulic design
- 3. Sanitary Sewers: Design flow and hydraulic design
- 4. Water Supply: Design demands, residual pressure, hydraulic design, and thrust restraint
- 5. Computations showing the structural capacity of new and existing utility service lines and appurtenances to support new loads, signed and sealed by the Professional Engineer licensed to practice in the State where the work is to be performed.

6. The PA Engineering Department shall be informed of the water demand and sewer load during the earliest stages of design.

B. Plans:

1. Location and site plan with lease lines, showing all the coordinates
2. All areas to be paved and pavement details
3. All underground utility service lines (proposed and existing). The Design Consultant shall survey and show the existing utilities on the plans. These will not be delegated to the contractor during construction.
4. Details for all proposed utility service lines and appurtenances
5. Whenever an existing utility service line is to be interrupted by specified work, a note requiring advance notification to facility operations personnel shall appear on the drawings.
6. Security fence detail and location

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I. GENERAL

The scope of the electrical review encompasses an examination of the design drawings, specifications, and computations for compliance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and Port Authority design criteria listed below.

II. PORT AUTHORITY DESIGN CRITERIA**A. General:**

1. Electrical power shall be purchased from the PA for tenancies in the following facilities:

World Trade Center
JFK Airport
LGA Airport
Teleport
Bathgate Industrial Park
Port Authority Bus Terminal

At JFK, terminal building tenant power distribution systems shall be based on second contingency conditions of the PA 5 kV services.

All metering wiring shall be shown on the drawings where power is purchased from the PA.

2. Construction over existing duct banks and manholes shall not be permitted. Existing duct banks which fall within the footprint of the structure shall be relocated prior to commencing construction. Verify that existing duct banks to be relocated do not have asbestos conduits.
3. Manholes shall not be installed within the footprint of a structure.
4. Exploded-view drawings of existing and proposed electrical manholes in which the tenant performs any work shall be submitted for review.

5. PVC conduits shall not be used within buildings. PVC conduits and PVC insulation for wiring other than that for communications systems or remote control, signaling, or power limited circuits shall not be used in the Lincoln, Holland and PATH tunnels.
6. The minimum size underground conduit for power and communication systems shall be 2 inches. Provide a minimum of 25% spare conduits but not less than 2 spare conduits in each duct bank.
7. All underground duct banks shall be concrete encased and installed 2'-6" minimum below finished grade. The design and installation shall conform to PA standard detail for duct bank design. See Section 18, Attachment E1.
8. Conduits shall enter and leave manholes through the short-side walls, perpendicular to the walls. A drawing with tablet information showing each proposed manhole and its duct bank layout that is to be used for the power and communication systems shall be provided for all projects.
9. Shop drawings of medium voltage or service entrance switchgear shall be submitted for PA approval in advance of fabrication. The PA may request to participate in the factory inspection of the switchgear.
10. The Port Authority staff shall have exclusive 24/7 access to all areas, equipment, and raceways associated with Port Authority systems without effecting tenant operations.
11. The maximum separation between manholes shall not exceed 450 feet. Duct banks shall be sloped towards the manholes to provide adequate drainage.
12. Conduits from manholes, hand holes, or duct banks into buildings or remote equipment locations shall be changed to rigid steel prior to emerging from below grade.
13. Duct banks installed under vehicular roadways or other areas (parking lots, etc.) where trucks or other heavy equipment travel shall be concrete encased with high early strength concrete that has a six hour design compressive strength of 2000 psi.

B. Medium Voltage Power System, JFK and LGA Airports:

1. Medium voltage (over 600 volts) switchgear, transformers, and splicing chambers, that are installed indoors, shall be installed in electrical vaults.
2. The incoming service shall be designed with a minimum of two (2) feeders (except as described in Section 'A -1' above), with automatic switch-over operation. The service shall be either:
 - a. Primary Selective
 - b. Secondary Selective
 - c. Primary and Secondary
 - d. Selective Spot Network
3. Primary selective switchgear shall be arranged with a mechanically interlocked tie switch to allow one feeder to supply the entire load. Medium voltage switchgear shall be as manufactured by the S&C Company.
4. Each incoming service switch shall be provided with a grounding switch, arranged to ground the incoming feeder (line side of switch). Mechanical interlocks shall be provided to prevent closing the grounding switch if the feeder is energized. Kirk Key Interlocking System shall be provided for the incoming equipment (Load Interrupter Switch(es), Grounding Switch(es), Low Voltage Main Breaker(s) in compliance with the "Interlocking and the Grounding" procedures at a specific airport and specific application. The interrupting rating shall be 270MVA for JFK International Airport and LaGuardia Airport.
5. All incoming feeders shall be copper conductor, EPR insulated, Flat Strap Cable (FSC), in accordance with PA Standard Specification, Section entitled, Wires, Cables, Splices, Terminations (Medium Voltage: 601 volts – 34,500 volts inclusive). The main feeder size shall be 500 kcmil or 750 kcmil, as determined by the PA. The minimum tap size shall be 4/0 AWG. Cables shall be manufactured by a factory approved by Con Edison.
6. For indoor installations, transformers shall be dry type, vacuum pressure impregnated. For outdoor locations, transformers shall be cast coil construction (primary and secondary). Cast coil transformers fed by vacuum breakers on the primary shall be evaluated to determine the requirement of snubbers to protect the transformer. Submit calculations for PA approval.

7. The tenant's drawings shall include a complete one-line diagram showing all primary connections, switching and interlocks; power sources, routing and feeder designations; size and type of feeder and conduit; KVA rating; types and voltages of all transformers; and all load data in justification of the amount of power requested. The load letter shall be prepared and submitted to PA in the format similar to utility company letters and should provide a breakdown of major types of loads, indicate the largest motor load, total anticipated demand, etc.
8. Shop drawing and/or catalog cuts for the medium voltage cables, splices, and terminations shall be submitted for approval.
9. PA specifications for the medium voltage installation shall be used.
10. A short circuit current calculation and coordination study for the proposed power system shall be submitted for review.
11. Each incoming service shall be provided with required PA approved metering current transformers (CT's) and potential transformers (PT's). The CT's and PT's shall be connected to the primary side of the incoming feeders.
12. Dual power sources with automatic transfer from both incoming feeders' metering PT's shall be provided for the totalizer.
13. Provide a fire-treated plywood backer board for mounting the required meter plans and other metering devices including conduits, fittings, and wires for the installation of PA meters and totalizer. Metering equipment to be installed outdoors shall have a NEMA Type 3R enclosure. Meters and totalizer will be provided by PA, and shall be installed by the Tenant.
14. Underground conduits to be used for the medium voltage power distribution system shall be concrete encased fiberglass reinforced epoxy (FRE). Minimum conduit size shall be five-inch. Provide twenty percent spare (empty) conduits, but not less than two in each duct bank. Duct banks of alternate feeders shall be separated by a minimum of twenty feet and terminated in separate manholes.
15. Between manholes in the medium voltage power system, the total bending radius for underground duct banks shall not exceed 90 degrees and shall utilize wide sweeps.

16. Calculations of maximum pulling tension for all medium voltage cable to be installed into the underground duct banks shall be submitted for review.
 17. All manholes shall be designed as per PA standards. See Section 18, Attachment E1. Size of manhole shall be determined based on the number and size of cables, wires, and conduits allowed. For areas where a PA standard manhole is not appropriate, submit a proposed manhole design including all dimensions and design calculations for review.
- C. Network Protector Compartments, Transformer Vaults, and Bus Rooms:
1. Roofs and floors shall be constructed of reinforced concrete with a minimum thickness of 6 inches. Exposed metal decking shall not be allowed in transformer vault and network protector compartment ceilings. The compartment or vault shall be designed as a waterproof structure if any part of it is external to the building. There shall be no penetrations through the ceiling of any kind.
 2. Walls shall be constructed of 8-inch concrete block with voids filled with cement mortar. Two fire rated (three hour) steel doors shall be provided for each compartment or vault. One door shall open to a public corridor or lobby and shall be fire rated and accessible at all times. The other shall open to the adjacent compartment or vault. Reinforcement bars shall clear all conduits into the network protector compartment by at least 4 inches.
 3. Building steel shall clear all conduit and bus openings by at least 8 inches in order to prevent induced heat build-up in the steel members. All steel shall be encased with a minimum of 2 inches of concrete. Nothing shall be installed above the network bus. No conduits, wires, pipes, ducts, etc. shall enter or pass through the vault or compartment that are not specifically required for the operation of the vault. All ducts entering the network protector compartment shall be non-metallic.
 4. Aspiration type smoke detectors shall be provided for the network compartment. The smoke detection equipment shall be located outside of the compartment and only the aspiration tube shall enter the compartment to allow maintenance to be performed without entering the compartment.
 5. Forced air ventilation shall be installed and maintained including controls and alarms. All ventilation exhaust for transformer

vaults shall be discharged directly to outside air. Ventilation opening to interior spaces shall have three hour rated fire dampers.

6. Separation of network compartment from associated transformer vaults shall not exceed twenty-five feet.
7. Each network protector shall be installed in a separate compartment.

D. Port Authority Bus Terminal: See Section 18, Attachment E2.

E. Electrical Systems for Tenants at Port Authority owned and operated buildings:

1. General:
 - a. Design, fabrication, installation, and performance of the work shall comply with the manufacturer's recommendation, applicable codes, and all applicable provisions of this Manual.
 - b. All tenancies shall be metered.
 - c. All Port Authority tenant circuit power wiring shall emanate from the Port Authority electrical closets/rooms. These closets/rooms shall be available in each building on a floor-by-floor basis. Electrical closets/rooms shall contain distribution panel boards for lighting and receptacle outlet circuits and for all other related electrical equipment circuits.
 - d. Local switch control for tenant lighting is permitted and is installed in many areas as an energy conservation measure. Tenants are encouraged to provide such switching at their own expense, especially full floor tenants who are metered electrically and can realize energy savings by using local switch control.
 - e. Ground rods shall be copper, $\frac{3}{4}$ " diameter, and ten feet long. Ground cables shall be soft-drawn copper, Class 'B' stranding and connected to the ground rods by exothermal welds.
 - f. Electrical closets shall have 2-duplex receptacles (one on an emergency power circuit and the other on a normal power circuit).

- g. No splices or joints shall be permitted in either feeders or branches except at outlets or accessible terminal, splice or junction boxes.
- h. All convenience type receptacles shall be of the grounding type.
- i. All motors ½ HP and above shall be rated three phase 460 Volts.
- j. All conduit runs shall contain an insulated ground wire, sized in accordance with the Code.
- k. All wiring for power, lighting, and control shall be in conduit. Conduits located in mechanical spaces, electrical rooms, encased in concrete, or at any locations subject to physical damage, shall be threaded rigid galvanized steel. Minimum conduit size shall be ¾”.
- l. Unless otherwise specified, all conduits shall be installed concealed in finished areas.
- m. Minimum conductor size for power wiring shall be #12 AWG.
- n. All wires shall be identified by circuits in all cabinets, boxes, wiring troughs and other enclosures, and at all terminal points, i.e., receptacle, etc.
- o. Top entries of conduits into electrical enclosures located in areas subject to water or condensation shall not be permitted.
- p. For areas designated for demolition, disconnect from the power source and remove all existing electrical devices, lighting fixtures, and associated conduit and wiring, etc., unless noted as existing to remain. All abandoned conduit and wiring shall be removed back to the overcurrent device serving the demolished circuit.

2. Electrical Power Distribution Equipment:

- a. Low voltage switchgear shall be metal enclosed. Low voltage (below 600 V) power circuit breaker switchgear built in accordance with ANSI/IEEE Standards C37.20 shall have copper buses and shall have as a minimum the following meters: volts, amperes (phase to phase and phase to neutral), frequency, ampere demand

(one/phase and one average three phase), kilowatts hours, kilowatt demand, power factor, harmonic load content and (percent (THD), and be UL listed.

- b. Panelboards shall have a main circuit breaker, 100% neutral bus, ground bus, copper buses, bolt-on type line circuit breakers, and be UL listed. Each panelboard shall contain at least 25% additional space for future circuits. Single pole breakers shall not be ganged to form multi-pole breakers and 'Series' rated equipment shall not be acceptable.
- c. Where a high concentration (60% or more) of harmonics creating loads (PCs, laser printers, electronic ballasts, VSD's, UPS's, or other similar type equipment) relative to other non-harmonic loads is anticipated, the following shall be provided: full size individual branch circuit neutrals, 200% panelboard neutrals, 'K' rated transformers, separate dedicated circuits for printers and PC's.
- d. Major electrical equipment, such as switchgear, transformers, motor control centers, and control panels shall have integral ground buses connected to the station ground grid at two diagonally opposite locations.
- e. Electrical panels, motors and other equipment, where required, shall be grounded utilizing an insulated ground wire connected in accordance with the manufacturer's recommendations. All clamps, connectors and other hardware used with the grounding system shall be made of copper.

F. Electronics and Radio Systems:

- 1. PA Public Safety Radio Systems: Any tenant construction involving interior space modifications or building/terminal expansions shall modify the existing Port Authority Public Safety in-building radio antenna system. New buildings shall install new in-building antenna systems. The system typically consists of RF booster based signal regeneration and a suitable in-building antenna system to provide 97% coverage reliability. Submittals shall include complete design details and calculations subject to approval. Such antenna systems shall not be integrated with common carrier wireless communications systems.

2. Wireless Communications Systems:
 - a. Tenant unlicensed wireless systems design shall be identified with the operating frequencies, the height and locations of antennas, the antenna effective radiated power, and the associated equipment. Interference issues shall be coordinated.
 - b. Tenant licensed wireless systems design shall be identified with the operating frequencies, the height and locations of antennas, the antenna effective radiated power, RF interference study and the associated equipment. Outdoor radiation shall be submitted with coverage maps. Wireless systems shall not interfere with PA radio systems.
3. Command and Control Centers: Emergency communications capability with the Port Authority Public Safety shall be incorporated in tenant command and control centers. Critical alarms shall be relayed to the Port Authority Public Safety through the Tenant's security reporting mechanism.
4. Airport Intrusion Detection System: Any tenant alterations or new construction introducing changes to boundaries between airside and landside spaces shall include supplementary changes to the PA Perimeter Intrusion Detection System.
5. Public Address System: Any tenant public address system coverage shall remain within the designated tenant space and operate at lower volume levels relative to surrounding PA public address system.

III. DETAILS OF ELECTRICAL REVIEW

The following are representative of items reviewed:

- A. The power distribution system (feeders, switchgear, transformers, panels and over-current protective devices), including coordination of plans regarding connections and available capacities with PA utilities. A one-line diagram giving source identification, conductor types and sizes, connected and demand loads, basis of source capacity, voltage drop, and adequacy of over-current protection shall be presented. Characteristics of special loads, e.g., large motor loads, shall be detailed. Key- and mechanical- interlocks shall be shown, identifying operational procedures for energizing, de-energizing and grounding of medium voltage equipment.

- B. Obstruction, envelopment or elimination of electrical ducts, vaults, manholes, and hand-holes by new construction.
- C. All materials and apparatus shall have been tested and approved for the proposed use by the agency or testing laboratory recognized in the relevant jurisdiction. See Section 14 of this Manual.
- D. Coordination with other trades such as:
 - 1. Architectural: Place of assembly lighting; electric door locks; exit signs; egress lighting; fire stopping
 - 2. Structural: Suspension of lighting fixtures; weight of storage batteries
 - 3. Mechanical: Ventilation and cooling of electrical rooms; diffusion of battery gases; fire and smoke detection for air handling systems
 - 4. Environmental: PCB removal
 - 5. Civil: Underground utilities
- E. Wiring methods (conductors and raceways)
- F. Grounding, including system grounding of derived systems such as transformers and generators
- G. Communications wiring with regard to radiation, electromagnetic interference, electrical safety, and fire hazards
- H. Signal wiring and emergency power for fire alarm and detection systems
- I. Emergency power for lighting, exit lights and signs, Life Safety Equipment (HVAC & Smoke Purge) and opening protective
- J. Alarm, detection, and visible and audible alerting devices. See Section 12 of this Manual.
- K. Physical safety, such as clearances around equipment, and exit provisions from within electric rooms
- L. Telephone installation shall not have any components in common with the power or lighting installation
- M. The coordination of fire detection and fire suppression provisions with designs for open wiring such as in computer rooms and raised floors.

- N. Transformers and capacitors that are PCB-contaminated or PCB-filled shall be identified.
- O. Any operation, including repairs, that can possibly cause PCB to spill, must be coordinated with the Facility Manager.
 - 1. The tenants shall comply with the requirements of the applicable state and city environmental protection regulations.
 - 2. Toxic Substance Control Act (Federal)
- P. Energy conservation

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I. GENERAL

The scope of the mechanical review will be for compliance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and Port Authority design criteria listed below, and will include the installation and alteration of service equipment and systems.

The following is a representative list of systems reviewed:

- A. Heating, ventilating, air conditioning, and refrigeration (HVAC)
- B. Smoke control and purge systems
- C. Fire suppression systems and controls
- D. Handling and storage of gases or fluids that are volatile, combustible, flammable, toxic, or corrosive
- E. Pressure vessels, fired and unfired
- F. Industrial processes. bulk storage and distribution of fuel and gases (glycol, LPG, LNG, etc.)
- G. Airport fuel distribution systems
- H. Energy conservation
- I. Water recovery processes
- J. Control of methane under buildings
- K. Cargo handling equipment (ETV, etc.)
- L. Emergency generators, fuel tanks, and piping

II. STANDARDS

ANSI	American National Standards Institute:
B-30.13	Storage/Retrieval (S/R) Machines and Associated Equipment
B-31.1	Power Piping
B-31.3	Process Piping
B-31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids
B-31.9	Building Services Piping
API	American Petroleum Institute:
5L	Steel Line Pipe
600 Series	For Pumps, Valves, etc.
1104	Welding of Pipelines and Related Facilities
ASHRAE	Applicable Standards
ASME	Boiler and Pressure Vessel Code
PEI	Petroleum Equipment Institute - Recommended Practices for Installation of Underground Liquid Storage Systems
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association

III. PORT AUTHORITY DESIGN CRITERIA

- A. Airports Aircraft Fueling Service:
1. Work affecting the airport fuel distribution system shall be coordinated with the existing airport system for compatibility, surge pressure safety, and system design check. Depending on the nature of the modification, surge pressure calculations may be required.
 2. All automatic control valves shall be performance tested in compliance with the PA Engineering Department's initial contract requirements for the airport fuel systems.
 3. Valving at fuel storage tank connections and at truck loading racks, beneath surge suppressors or hydrant valves shall be constructed with supplemental fire rated safety stop valves. These safety stop valves shall be closed by fusible link action upon exposure to fire, and shall conform to UL or API Fire Tested Valve Safety Standards.

4. For the protection of building walls around pressure surge suppressors, see Section 5.II.B.1.d of this Manual.
 5. For the protection of the ramp drainage inlets, see Section 8.II.C.2.c of this Manual.
- B. Port Authority Bus Terminal: See Section 18, Attachment M1 for HVAC Design Criteria.
- C. General:

PVC piping shall not be used above ground within buildings.

IV. DETAILS OF MECHANICAL REVIEW

The following are representative of items reviewed:

- A. General system design:
1. Coordination of all new work with existing conditions
 2. Materials, operating and safety controls, equipment approval
 3. New controls interface with existing control system
 4. Requirements for system and equipment testing and inspection
- B. Specific System Design:
1. HVAC:
 - a. Shaft requirements for pipes and air ducts
 - b. Fire/smoke dampers at ducts through rated walls, partitions, smoke barriers, and floors
 - c. Installation details for fire dampers or fire/smoke dampers to stay in place if a duct is disrupted. (See SMACNA Fire, Smoke, and Radiation Damper Installation Guide for HVAC systems)
 - d. Fire detector and smoke detector requirements for fan system's shut down of associated fans, close fire/smoke dampers automatically, and transmit a signal to the local and central fire alarm control systems
 - e. Fire resistive insulation materials

- f. Air filters in ventilating systems
 - g. Ventilation calculations
 - h. Smoke control systems
 - i. Post fire smoke purge system (for NYC only)
- 2. Fuel storage and piping
- 3. Commercial type cooking/equipment: Grease ducts, extractors, insulation, fixed pipe fire extinguishing systems in hoods and ducts
- 4. Noise and vibration control
- 5. Energy Conservation: Building envelope analysis, design criteria, and thermal performance of component systems
- 6. Bulk storage of liquids and gases: Tanks, piping, supports, anchorage, clearances, electrical grounding, Fire Department regulations, and leak detection
- 7. Battery Charging Spaces:
 - a. The components of the charging system shall be approved in accordance with the requirements outlined in Section 14 entitled "Materials and Equipment Approval and Inspection" of this Manual where the system is to be located.
 - b. An adequate ventilation (exhaust) system shall be designed to prevent the accumulation of an explosive mixture of gases in the battery room under the worst conditions of battery and/or charger failure.

I. GENERAL

The scope of the plumbing review shall include the installation of and alteration to the following systems, in accordance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and Port Authority design criteria listed below.

- A. Water supply and distribution
- B. Sanitary and storm drainage and disposal
- C. Backflow Preventers
- D. Industrial wastes
- E. Compressed air, vacuum and natural gas piping

II. STANDARDS

- A. National Sanitation Foundation approval for Kitchen equipment
- B. See Section 3 of this Manual

III. PORT AUTHORITY DESIGN CRITERIA

- A. General:
 - 1. PVC piping shall not be used above ground within buildings.
 - 2. Clamps for no-hub piping shall be those manufactured by Clamp-all Corp, Huskey SD series 4000 or approved equal.
 - 3. All hub-less pipes shall be anchored at each side of hub and at five (5) foot intervals.
 - 4. In demolition work, unused piping shall not be abandoned in place. Piping shall be removed back to source or point of discharge, and the resulting openings plugged and sealed. Such work shall be shown on the drawings.
 - 5. Oil separator effluents shall be discharged into the sanitary sewer system.

6. Toilet rooms with two or more plumbing fixtures shall be provided with floor drains.
- B. Port Authority Bus Terminal: See Section 18, Attachment M2 for Plumbing and Fire Protection Design Criteria.

IV. DETAILS OF PLUMBING REVIEW

The following are representative of items reviewed:

- A. Load calculations, complete layout and riser diagrams.
- B. Existing conditions and systems shall be shown in sufficient detail to enable the review of proposed alterations.
- C. Specifications for materials, equipment, fixtures, insulation, installation, procedures, etc.
- D. The following is a partial list of items to be shown in the plumbing design documents:
 1. Floor plans showing the location, layout and spacing of all plumbing fixtures, the summation of plumbing loads; the size, location, and material for all building sewers and drains, and the soil, waste, vent, water, compressed air, vacuum and natural gas distribution piping
 2. Riser diagrams showing:
 - a. Story heights
 - b. All plumbing fixtures with diagrammatic arrangement of their connections to soil, waste, and vent piping
 - c. Fixture units and all soil, waste, and vent stacks from the point of connection with the building drain to their termination above the roof
 - d. All leader and storm water piping from the point of connection with the building drain to the roof drain with the corresponding square footage
 - e. All potable and non-potable water from the point of connection within the building to the fixtures and/or equipment
 - f. Natural gas, vacuum, and compressed air
 3. All appurtenant equipment with access, including but not limited to: pumps, ejectors, waste tanks, meters, backflow preventers, irrigation systems, oil and grease interceptors, main control valves, and piping shall be indicated clearly on the plans.

I. GENERAL

The scope of the review shall include the design of various fire detection, alarm, and suppression systems for compliance with the applicable codes, regulations, and standards listed in Section 3 of this Manual, and Port Authority design criteria listed below.

II. PORT AUTHORITY DESIGN CRITERIA

- A. The National Fire Protection Association Standards (NFPA) and other referenced standards may be used for work in areas not covered by applicable municipal codes, subject to review and approval by the Port Authority.
- B. In baggage handling areas at the airports, concealed conveyor spaces inaccessible to firefighting equipment shall be provided with a sprinkler system above the conveyor assembly. Spaces over all types of ceilings are considered inaccessible.
- C. Schedule 40 piping shall be used for all sprinkler systems.
- D. Fire standpipe hose shall be approved 100% synthetic single jacket fire hose.
- E. Fire Alarms:
 - 1. The tenant fire alarm systems serving the areas outside of the Port Authority responsibility shall be interconnected with the Port Authority base building or facility wide fire protection system.
 - 2. The tenant fire alarm systems shall be designed to control all systems and equipment installed by the tenant and shall be fully integrated into the building or complex fire protection system to support HVAC, smoke purge, and life safety fire response procedures.

The fire alarm system annunciation and communication between the Port Authority and the tenant fire alarm system shall satisfy the following requirements:

- a. The tenant's fire alarm panel shall be of the same manufacturer as the Port Authority base building fire alarm system.
 - b. The tenant shall engage the Port Authority's fire alarm system maintenance contractor to furnish and install the interface connection to the Port Authority's fire alarm system.
 - c. The Port Authority's fire alarm system maintenance contractor shall be responsible for coordinating his work with the PA facility Tenant Liaison Office.
 - d. The tenant shall provide all conduit, wiring, and interconnections.
 - e. The tenant's fire alarm system shall transmit all addressable points to the Port Authority's fire alarm system in order to provide the complete status of all alarms, supervisory and trouble signals.
 - f. The audible and visual devices in the tenant's leasehold shall be fully integrated with the Port Authority base building system and work in conjunction with Port Authority audible and visual devices so that all devices in a fire zone are activated simultaneously.
3. General System requirements:
- a. The tenant's fire alarm system shall be fully addressable and comply with all requirements for installation as identified by applicable codes and standards. A fully addressable fire alarm system shall be able to clearly identify the type of alarm, the location of origin, and the status of the system and device.
 - b. The tenant's fire alarm system must be compatible with and able to extend the Port Authority base building voice evacuation system.
 - c. The fire alarm system shall consist of class and style signaling line circuits, notification appliance circuits, and initiating device circuits per the applicable code. The entire fire alarm system and each major component such as zones, loops, circuits, panel components, power supplies, etc. shall have a minimum of 20% spare capacity.

- d. All fire alarm conduits shall have a #10 AWG ground wire.
 - e. Field wiring for initiation and/or notification circuits or loops shall be installed in dedicated conduits, pull box, or enclosure.
 - 4. All fire alarm signals shall be transmitted to a central station monitoring system by approved methods. Facility specific requirements must be included in signal transmission.
 - 5. Any additions, alterations, replacements, or new installations of any fire detection, suppression, or signaling system at an existing PA facility shall require the complete fire alarm system to conform to the latest edition of the municipal building and fire codes.
- F. For Port Authority Bus Terminal, see Section 18, Attachments M1 and E2 for smoke and fire detection requirements.

III. DETAILS OF FIRE PROTECTION REVIEW

The following are representative of items reviewed:

A. Fire Standpipe:

- 1. Floor plans showing the location and size of all risers, cross-connections, hose station (cabinet/racks), valves, siamese connections, source of water supply, piping, and other essential features of the system.
- 2. Riser diagrams showing the essential features of the system and indicating on the risers: riser control valves, cross-connections, hose valves, siamese connections, tanks, pumps, sources of water supply, pipe sizes, capacities, floor heights, zone pressures, and other essential data and features of the system.
- 3. The available water pressure at the top and bottom floors of each zone, and at each floor where the weight of pipe fitting changes, shall be shown on the riser diagram.

B. Sprinkler/Fire Extinguishing System:

- 1. All sprinkler work submitted for review shall include the following:
 - a. A key plan identifying location of valve assembly

controlling the sprinkler system protecting the area in the scope.

- b. Existing available flow rates and pressures, which will form the basis of the hydraulic calculations.
 - c. Background shall indicate all column numbers, room names, ceiling heights and soffit conditions.
 - d. The location and size of water supplies and the location, spacing, number, and type of sprinklers to be used, with approximate location and size of all feed mains, risers, riser control valves, control valves, siamese connections, and other essential features of the system.
 - e. A diagram showing the proposed sprinkler system in relation to principal construction features of the building, such as its size, walls, columns, and partitions, and such other information as may be necessary for the evaluation of the system.
 - f. The location, number, and type of any electrical or automatic devices to be used in the system.
 - g. The available water pressure at the top and bottom floors of each zone shall be shown on the riser diagram.
 - h. Plans for sprinkler systems must provide all information and data required by NFPA including water-sources, supply pressure, number and type of sprinklers (manufacturer, model, etc.), fire department connections, hazard classification, alarm devices and supervisory connections.
 - i. Hydraulic calculations with all pertinent information as required by NFPA 13. Hydraulic calculations shall be submitted for all work involving new systems, upgrade of existing sprinkler system design demands, existing system alterations of over 20 sprinkler heads, or changes to existing systems that affect design remote locations.
2. Other fire suppression systems: Plans for water mist, chemical or gaseous fire suppression systems shall contain the type of extinguishing agent and number and size of agent containers; size, length, and type of all piping; number and location of all fusible links or detectors and the temperature setting.

C. Fire Alarm and Detection System:

Construction documents for fire alarm system shall include the following:

1. Fire alarm riser diagram showing all fire alarm devices indicated on the floor plans, class and style of circuits, and levels of survivability. The riser diagram shall show interface of fire safety control functions.
2. Floor plans showing location of all alarm-initiating devices; notification appliances, including candela ratings for visible alarm notification appliances; location of fire command center; fire alarm control units; transponders and notification power supplies; location of remote annunciators; location of all primary, secondary and local source of power, conduits and wiring sizes; sequence of operation for the fire alarm system in a matrix format.

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I. GENERAL

The following are minimum guidelines for the design of protective measures to reduce the hazard of a ramp-side fuel fire. Codes and regulations listed in Section 3 of this Manual, where applicable, shall serve as the minimum design criteria.

II. STANDARDS

The National Fire Protection Association (NFPA) standards shall be used, where applicable. The following are representative NFPA standards to be used for Terminal Buildings, Satellites, Fingers, Aircraft Loading Walkways, etc., in conjunction with PA design criteria (see paragraph III for Design Criteria):

- A. NFPA 407: Aircraft Fuel Servicing - Proximity of vent and fill points to air intake points on the building and the proximity of the building to fueling hydrants, cabinets, and pits.
- B. NFPA 415 — Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways:
 - 1. Special provisions for below-grade areas to be protected from fuel and vapor penetration
 - 2. Distance and protection of heating and ventilation openings on the building, and openings to certain mechanical rooms, from points of potential fuel or vapor release
 - 3. Exit doors discharging onto ramps shall be marked "EMERGENCY EXIT ONLY"
 - 4. Protection of window glass when potential fuel spill points (pfsp) are within 100 feet
 - 5. Proximity of aircraft fueling ramp drainage points to structures and ramp gradients
 - 6. Aircraft loading walkways

III. PORT AUTHORITY DESIGN CRITERIA

- A. See Section 18, Attachment RFS1 for airport rampside clearances.
- B. Terminal Buildings, Satellites, and Fingers:

The exterior walls of the building shall be protected as follows:

- 1. There shall be no potential fuel spill points (pfsp) such as fueling hydrants, catch basins, fuel tank fill connections, etc., within 50 feet of the building.

Exception:

Aircraft may be positioned with a minimum distance of 25 feet from the building to the aircraft fuel system vents or fuel tank openings provided that there are no combustion and ventilation air-intake to any boiler, heater, or incinerator room within 50 feet of the vent or tank openings. Exit doors or exit stairs opening onto the apron within 50 feet of pfsp must be protected by a full height radiation barrier.

- 2. Large areas of window glass, covering more than 50% of a wall, which has a distance of less than 100 feet from a pfsp, shall be protected by means of an automatic system of water curtain or fire shutters activated by an appropriate fire detection system.

Note:

In determining the above percentages, only that portion of the wall not backed by the building's structural components should be included. Also, the distance from the pfsp shall be measured horizontally to the center of the wall.

- C. Aircraft Loading Walkways:

- 1. The design shall provide a safe exit route from the aircraft for a period of at least five (5) minutes under severe fire exposure conditions, equivalent to a free-burning jet fuel spill fire, in compliance with NFPA 415. The Engineer of Record shall certify compliance in writing and submit the test reports and computations as defined in NFPA 415 to demonstrate compliance.
- 2. Walkways shall comply with the following criteria:
 - a. A maximum travel length of 150 feet. Portions exceeding 150 feet shall be designed as part of the terminal building.

- b. A minimum width of 44 inches or the width of the aircraft door being served, whichever is larger.
- c. Non-slip floor covering
- d. Emergency lighting.
- e. Light diffusers of plastic material shall be of an approved type for exits, or wired glass shall be used.
- f. Structural integrity of the walkway under the fire conditions. For structural criteria, see Section 6 of this Manual.
- g. Integrity of flexible closures, slat curtains, and miscellaneous seals with weather-stripping curtain with respect to smoke penetration through cracks and openings shall be established.

Particular attention must be paid to the following details:

- i) There shall be no direct path for flame or smoke between the exterior and the interior of the walkway.
 - ii) The junctures of bridge components, such as hinge pins and slat curtains, shall be covered or sealed with appropriate fire resistant material.
 - h. The positive pressure ventilation fan shall be of sufficient capacity to provide and maintain a positive pressure throughout the walkway, and shall be automatically activated anytime that an aircraft is at the walkway.
- 3. The door opening into the walkway shall have an electrical interlock to prevent opening until the walkway is engaged with the aircraft.
 - 4. The aircraft loading walkway shall not be located over any drainage outlets.
 - 5. The electrical installation shall comply with the applicable requirements of the National Electrical Code, particularly with the Hazard requirements; i.e., presence of flammable vapors from aircraft fueling, venting, and storage points.
 - 6. The hydraulic and electrical system for the walkway shall be demonstrated to be fail-safe.

I. GENERAL

The purpose of this section is to outline:

- A. The requirements for acceptance (approval) of materials, assemblies, forms, methods of construction, and the intended use of equipment.
- B. The requirements for inspection of materials, assemblies, and construction.

II. NEW YORK CITY

- A. Approval/Acceptance of Materials, Equipment, etc.:
 - 1. Construction documents shall identify all materials proposed to be used, including identification of the test method to which they conform, and where applicable, supporting information or test data attesting to such conformance shall be submitted.
 - 2. No material, assemblies, forms, method of construction, equipment, machinery, and devices, which are regulated by the provisions of the code, will be acceptable for the intended use unless:
 - a. It is tested, and approved by the New York Department of Buildings Office of Technical Certification and Research (OTCR) for use in accordance with the specific provisions of the codes and rules of the New York City Department of Buildings.
 - b. Or, previously approved by the New York City Board of Standards and Appeals (BS&A) or by the former Materials and Equipment Acceptance (MEA) Division of the New York City Department of Buildings.
 - c. Complete test data and OTCR or MEA or BS&A resolutions of approval shall be submitted along with other documents. Manufacturers' or distributors' letters are not acceptable. See Article 113 of Chapter 1 of Title 28 of the Administrative Code of the City of New York for specific requirements.

B. Special Inspection:

1. All items subject to "special and progress inspection," as provided in the code shall be listed on the title sheet of the construction documents, or the sheet immediately following. See Administrative Code of the City of New York, Section 28 - 104.7.7.
2. All materials, equipment, and construction designated by the Code for "special or progress inspection" shall be inspected and/or tested by a special inspection agency registered with the New York City Department of Buildings and employ special inspectors with the required qualifications.

III. NEW JERSEY

A. Approval/Acceptance of Materials, Equipment, etc.:

1. Acceptance of materials, assemblies, equipment, forms, methods of construction, etc., shall be based on certified test reports from approved agencies. See Building, Mechanical and other sub-codes of New Jersey Uniform Construction Code (NJUCC).
2. See NJUCC, Section 5:23-4.26 for certification of building elements, such as trusses, firewalls, fire separation walls, wall panels, pre-stressed/pre-fabricated floor or roof panels and pre-engineered structural frames.

B. Special Inspection (New Jersey Uniform Construction Code Section 5:23-2.20):

1. All "special inspections" required by the Code shall be performed by an established and recognized agency approved to perform such inspections, and retained by the tenant or the responsible person in charge of work acting as the tenant's agent.
2. All items subject to "special inspection" shall be listed on the title sheet of the plans, or the sheet immediately following.

IV. NEW YORK STATE

A. Approval/Acceptance of Materials, Equipment, etc.:

1. Acceptance of materials, assemblies, equipment, forms, methods of construction, etc., shall be based on certified test

reports from approved agencies. See Building Code of New York State, Chapter 17.

B. Special Inspection (Building Code of New York State):

1. The tenant or the registered design professional of record in responsible charge acting as the tenant's agent shall employ one or more special inspectors (with minimum qualifications, as per the Building Code of the State of New York, Table 1704.1) to provide inspections for items that are designated by the Code for "special inspection."
2. All items subject to "special inspection" shall be listed on the title sheet of the plans, or the sheet immediately following.

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I. GENERAL

The scope of the environmental review shall include asbestos and lead paint inspections and abatement plans, universal waste surveys and disposal plans, soil excavation management plans, dewatering plans, subsurface investigations, waste identification and disposal plans, site remediation, underground storage tank installation, testing, repair or removal; air emission sources, environmental regulatory permits approvals and notifications, and storm water management. Documents will be reviewed for compliance with applicable codes, regulations and standards.

The following types of documents shall also be submitted to the Port Authority:

- A. Survey Reports
- B. Environmental Management Plan
- C. Subsurface Investigation Reports and Remedial Action Reports
- D. Permit Applications and Regulatory Approval Request letters and Notifications
- E. Contract Drawings and Specifications
- F. All official correspondences with regulatory agencies

II. RULES, REGULATIONS, AND PROGRAMS

The following federal, state and local environmental laws, regulations, and programs, as applicable, shall be complied with:

- A. Federal:
 - 1. Clean Air Act
 - 2. Clean Water Act, including Underground Storage Tank and Spill Regulations
 - 3. Federal Insecticide, Fungicide, and Rodenticide Act
 - 4. Noise Control Act

5. Occupational Safety and Health Act
 6. Resource Conservation and Recovery Act
 7. Toxic Substances Control Act
 8. National Environmental Policy Act
- B. New York City:
1. Administrative Code of the City of New York
 2. Asbestos Control Program
 3. Department of Sanitation Codes
- C. New York State:
1. New York State Department of Environmental Conservation Programs
 2. New York State Environmental Quality Review Act
- D. New Jersey State:
1. New Jersey Administrative Code
 2. Industrial Site Recovery Act (ISRA)
 3. NJ Department of Environmental Protection Program
 4. New Jersey Soil Conservation Districts

III. STANDARDS

- A. Port Authority Standard Specifications for Asbestos Removal
- B. Port Authority Standard Specifications for Lead-based Paint Removal
- C. American Petroleum Institute Guidelines

IV. DETAILS OF ENVIRONMENTAL REVIEW

The following are representative of items reviewed:

- A. Survey Reports:

1. Asbestos Survey Report – Tenants are required to survey the project area (structures and utilities) for the presence of asbestos using a firm licensed inspector by the NY State Department of Labor (NYSDOL) or the NJ Department of Community Affairs (NJDCA) to perform such work in the respective states. The individual from the licensed firm shall possess the required certificates to perform such tasks. The tenant will submit a copy of the Asbestos Survey Report with the Asbestos Certification Form PA 3677. The form must be signed and sealed by the Architect/Engineer of Record (A/EOR), licensed to practice in the respective state.

The Form PA-3677 requires the survey to identify one of three asbestos situations:

- a. No asbestos containing material is present – Part One
- b. Asbestos is present but will not be disturbed – Part Two
- c. Asbestos is present and requires abatement – Asbestos Project – Part Three. Complete form PA 3678: Asbestos Abatement Permit Application.

The survey report shall include name of firm completing survey, copy of state license, copies employee certifications performing survey, copies of laboratory certifications, copies of laboratory chain of custody forms, detailed plan showing location of the survey areas., laboratory report of sample results and summary table listing all suspect material sampled, quantity of each suspect material identified as homogenous, sample number(s) associated with each suspect homogenous material, test results and condition of all asbestos containing material.

2. Lead Paint Survey Report: Perform a survey to determine if structures impacted under the proposed project are coated with lead containing paint. If no survey is completed, it shall be assumed that paint impacted during the proposed construction contains lead. Contract documents shall be prepared in accordance with all applicable regulations for the disturbance and /or abatement of structures coated with lead containing paint.
3. Universal/Hazardous Survey Report: Perform a survey to identify all universal hazardous waste (not including excavated material) to be removed from the site as part of the proposed project. The report shall be signed by the A/EOR or by an executive of a firm that is qualified to perform such work.

Qualifications can be demonstrated by providing documentation of at least 5 years of experience completing similar surveys.

B. Environmental Management Plan: (Modify to suit project scope and complexity)

1. General
 - a. Site Location and Project Background
 - b. Site Geology and Groundwater Conditions
 - c. Project Organization and Team Responsibilities
 - d. Health and Safety
2. Proposed Redevelopment
 - a. Project Description
 - b. Key Project Documents
 - c. Provide summary and reference contract drawings or provide figures.
3. Areas of Environmental Concern: Petroleum/chemical storage areas, reported spill locations, ground surface staining, etc.
4. Permits
5. Management of Excavated Soils
 - a. Soil Screening Methods
 - b. Material Excavation
 - c. Soil Stockpiling Segregation Criteria
 - d. Stockpile Methods
 - e. Materials Load Out
 - f. Materials Transported Off-Site for Temporary Storage
 - g. Sampling Procedures
 - h. Field Procedures
 - i. Materials Transport for Off-Site Disposal
 - j. Re-use of Excavated Materials

Identify the quantity of soil to be excavated and the estimated amount of excess soil to be removed off site. All excavated soil shall be segregated. Provide method of screening soils for segregation. Soil that exhibits evidence of contamination including, but not limited to, staining and odors, shall be segregated from other soil and cannot be reused as backfill in

the area from which it was excavated. Provide locations of soil stockpiles, details of impoundment constructions, locations of nearest catch basins and required protection, and dust control measures. Tire washing station prior to the exit from the work site and street sweeping equipment may be required to maintain clean streets adjacent to the work area.

Excavated soil is considered historic fill/contaminated non-hazardous. It shall be beneficially reused off-site as restricted fill and shall not be re-used as topsoil or final cover. The soil shall be re-used only at sites that are regulated by a state agency (e.g., brownfield, landfill) and have a material acceptance protocol for soil or permit approved by that State Agency. The approved protocol shall include application forms, certification forms, sampling requirements and allowable concentration limits for all regulated parameters. The approved protocol shall be included as an appendix to the EMP with State Regulatory Agency's approval letter for the protocol. Disposal or reuse facilities permitted to accept "clean fill" only are not acceptable.

Include name of the laboratory to perform sampling and analysis, and copies of the laboratory's required licenses and certifications. A sampling plan shall be submitted to the Port Authority for approval. The Port Authority shall be notified 48 hours in advance of any sampling activity.

Prior to removal of soil offsite, tenant shall submit a summary table of soil sampling results comparing it to the respective acceptance protocol for each analyzed parameter along with the letter of acceptance from the disposal facility reference the laboratory report reviewed. An electronic copy of the complete laboratory report shall be submitted to the Port Authority with the summary table.

Copies of transporter permits shall be included or submitted to the Port Authority two weeks prior to the scheduled removal of material off site. The tenant shall notify the Port Authority 48 hours prior to the removal of any material offsite. All material removed from site to a disposal/reuse/recycling facility must be manifested to include information detailing the type and quantity of material being transported, referenced laboratory report, name of transporter and driver, destination facility name, address and phone number. Copies of manifest signed by the driver and destination facility must be submitted to the Port Authority within 72 hrs of material being removed off-site.

A final soil management report in an electronic pdf-format shall be submitted to the Port Authority at the completion of soil removal activities. The report shall include laboratory reports, laboratory certifications and licenses, executed manifests, soil manifest log (listing of manifest numbers, soil quantity and destination facility), sampling results summary, destination facility(s) required documentation, and transporter permits.

6. Dewatering

- a. Type of Dewatering Activities
- b. Method of Dewatering
- c. Proposed Treatment of Dewatering Fluids
- d. Contingency Plan

Dewatering plan shall be submitted to the Port Authority for approval. The plan shall include, dewatering locations, treatment system details (including pump sizes), dewatering rates, dewatering schedules and hours of operation, "Best Management Practices" to minimize pollutants, and discharge locations.

For minor dewatering requirements, recharging effluent on site to groundwater through infiltration trenches, injection wells or other methods may be permissible. Such dewatering shall not impact adjacent areas and must cease if any flooding or ponding occurs.

Influence from dewatering operations shall be restricted to the area of excavation.

Effluent from dewatering operations shall not exhibit any odor or visual evidence of contamination or suspended solids.

Prior to discharge, tenant must demonstrate to the satisfaction of the Port Authority that the effluent from the dewatering system will comply with facility permit requirements, state issued permit or regulations. This may require analytical testing of effluent.

Tenant is responsible to determine if state or local permits are required for dewatering. If permits are required, the Port Authority shall receive a copy of the permit prior to commencement of any dewatering operations.

7. Implementation of Stormwater Pollution Protection Plan

- a. SWPP Implementation
- b. Site Inspections
- c. Reporting and Recordkeeping

The tenant is responsible for the preparation of SWPPP in NY and NJPDES General Stormwater Permit in NJ, when required, in accordance with state regulations. The plans shall include drawings and specifications detailing the protection of catch basin, stormwater runoff to adjacent areas, schedule for site inspections, reporting and recordkeeping requirements. If area to be disturbed is less than regulatory thresholds to require the aforementioned permits, the tenant shall include best management practices to achieve the intended objectives of the State stormwater requirements.

8. Spill Contingency Plan

The tenant shall prepare and submit a Spill Contingency Plan if storing chemical and petroleum products on site. The plan shall include the following:

- a. Best Management Practices
- b. Spill Containment Methods
- c. Spill Response
- d. Spill Cleanup
- e. Equipment Decontamination

9. Additional Site Management Activities

- a. Backfill
- b. Dust Control
- c. Air Monitoring
- d. Security

Provide the quantity of backfill, name, address, and phone number of supplier, certification of clean fill and a minimum of one soil sample for every 5,000 yds. of backfill delivered to the site. The sample shall be taken from the soil delivered to the site and shall be analyzed for priority pollutants.

10. Training Procedures

11. Documentation and Reporting

C. Asbestos Contract Drawings

The tenant shall prepare an asbestos abatement design to be included with the project's TAA application. The design shall include contract drawings signed by a licensed professional engineer, and specifications prepared in accordance with Port Authority Standard Specifications 02081 for Asbestos Removal and Disposal. In New York the licensed professional engineer preparing the asbestos abatement documents shall also possess a valid Asbestos Project Designer Certification issued by the NYSDOL. Asbestos removal specifications shall include detail work procedures for the removal and disposal of each type of asbestos containing material identified for removal. The contract drawings shall identify all areas of asbestos abatement activity, types and locations of asbestos to be removed, details of the required containment structure, location and design of decontamination facilities, utility locations to support abatement activity, waste routes, waste storage locations, support structures for work platforms, negative air requirements including number, size and type of units, exhaust locations, emergency exits and phasing of abatement work.

I. GENERAL

The scope of the corrosion control/cathodic protection review includes an examination of the cathodic protection, coatings and other related systems design drawings, specifications, and computations for all metallic structures exposed to underground, marine, or atmospheric environment, (including atmospherically exposed reinforced concrete) in regard to their compliance with the codes, standards, and Port Authority Design Criteria.

II. RULES AND REGULATIONS**A. Federal:**

1. Environmental Protection Agency: 40 CRF, Parts 280 and 281
2. Department of Transportation: Title 49, Parts 191, 192, 193, and 195

B. New York:

New York State Department of Environmental Conservation: 6NYCRR Parts 612, 613, and 614

C. New Jersey:

New Jersey Department of Environmental Protection: N.J.A.C. 7:14B.

III. STANDARDS

- A. NACE International Standards: RP 0169, RP0193, and RP 0285
- B. ASTM Standards: G3, G4, G5, G51, G57, G97, and G102

IV. PORT AUTHORITY DESIGN CRITERIA

- A. The design of all corrosion control/cathodic protection systems shall be performed by a NACE International ("NACE") certified Corrosion specialist or cathodic protection specialist.
- B. The cathodic protection systems shall be compatible with the existing systems at the PA facilities.

- C. The design of the systems shall take into account the presence of stray currents and their impact on existing and proposed structures, and the impact of connecting structures into existing cathodically protected structures. All tenant hydrant fueling systems shall be electrically isolated from the PA fueling mains.
- D. The design shall take into account the monitoring requirements for compliance with the respective state agencies and federal regulations for corrosion control. Provisions shall be made to allow the effectiveness of all installed dielectric isolation devices (flange isolation kits, etc.) to be tested periodically without the need for confined space entry into vaults, etc.
- E. In New York, all cathodic protection systems shall be registered with the "Greater New York Corrosion Committee," and in New Jersey, all cathodic protection systems shall be registered with the "New Jersey Committee on Corrosion.
- F. All cathodic protection system designs and commissioning tests for fuel storage facilities in New Jersey shall be performed by an individual certified by the State of New Jersey as a corrosion specialist, in accordance with the requirements of Subchapter 13 of N.J.A.C. 7:14B of the New Jersey Department of Environmental Protection rules for underground storage tank facilities.
- G. All cathodic protection systems shall be energized and tested by a NACE certified corrosion specialist or cathodic protection specialist. A report shall be prepared and submitted to the Port Authority. The report shall document all settings, protection levels, and the impact of stray currents on all nearby structures. Recommendations for mitigation of said interference effects shall be included.
- H. Where proposed utility pipelines will run in proximity (within 100 feet) of DC-powered traction systems, provisions shall be incorporated into the design of the structures to measure the effects of stray currents on those structures.

V. DETAILS OF CORROSION CONTROL/ CATHODIC PROTECTION REVIEW

The following are representative of items reviewed:

- A. Calculations and reports shall include, but not be limited to, the following:
 - 1. Result of a risk assessment of new utilities to be constructed, taking into account the risk factors associated with a failure of the structure, including public safety, interruption of facility

operations, and cost of repairs/replacement of the utility structures

2. For fuel transfer pipelines and aboveground storage, citation of the specific regulatory requirements for corrosion protection that apply to that facility or structure
3. Where fuel storage facilities in New Jersey are involved, certification of individual and firm by the New Jersey Department of Environmental Protection shall be provided for review
4. Results of a corrosion site investigation, including soil resistivity testing, chemical analysis of soil samples at proposed structure depth, and stray current testing. Also, a review of previous data and corrosion control designs by the Port Authority or others, with conclusions regarding how to best coordinate proposed and existing systems
5. Cathodic protection design basis including design life assumptions, maintenance requirements, current density assumptions and other extraordinary factors that would impact on system performance and/or life. If proposed structures are to be connected to existing structures that are cathodically protected, the impact on the existing cathodic protection system by the interconnection shall be considered. The proposed approach to the incorporation of the new structure(s) into the existing cathodic protection system shall be clearly laid out, including procedures to evaluate the effectiveness of the overall cathodic protection system both prior to and after the interconnection of the structures
6. Evaluation of alternative system materials and installation configurations and consideration of the life cycle cost of each alternative
7. Consideration of stray current effects on existing structures in the area of the proposed structures, and provision of test facilities to allow for the testing of the severity of those effects on the structures to allow for 1) additional mitigation of the stray current or, 2) report of the significant stray current that require maintenance of the transit system's stray current control provisions designed to keep stray current generation to a tolerable level
8. Evaluation of requirements for electrical bonding continuity

B. Plans shall include, but not be limited to:

1. Location and plot plan with lease lines, showing all the coordinates
2. All underground utility service lines (proposed and existing).
3. Plan of all cathodic protection system components, interconnections, test station locations
4. Details of all systems components, including but not limited to anodes, junction boxes, rectifiers, test facilities, remote monitoring facilities, and stray current monitoring and control provisions.
5. Locations where new structures are to be electrically isolated from existing structures to maintain efficient cathodic protection current distribution characteristics
6. Electrical bonding continuity requirements for mechanically joined pipelines

C. Specifications shall include, but not limited to:

1. The scope of work and materials required for the construction of the proposed cathodic protection systems
2. Qualifications for the installation contractor and the cathodic protection specialty contractor, including the appropriate certified corrosion specialist
3. Specialized installation methods to be used to install an effective and reliable cathodic protection system
4. Testing and monitoring requirements for the systems to insure the proper operation of both new and existing systems for the life of the system. The test procedures for documentation of the effectiveness of the existing cathodic protection system shall be clearly indicated, along with requirements to document that the combined system is effective in meeting NACE criteria for cathodic protection after the new system is installed and energized
5. Testing requirements to evaluate the stray current interference effects of new cathodic protection systems on any other underground metallic structures, and to recommend the required mitigative measures. Also requirements to measure the effects of stray current on the new structures

I. GENERAL

The scope of the traffic review shall comprise an examination of the design drawings and specifications for compliance with the latest applicable standards and a review of traffic studies analyzing the operational characteristics of the site with regard to vehicular and pedestrian movements. All permanent and temporary traffic control devices, as defined in the FHWA Manual on Uniform Traffic Control Devices, shall be reviewed by the Port Authority. The Port Authority shall also review the following:

- A. Roadside safety devices(guide rails, traffic barriers, impact attenuators)
- B. Roadway access changes and modifications
- C. Changes in traffic demand and operations
- D. Maintenance of traffic for work zone protection
- E. Construction staging

II. STANDARDS

- A. Federal – Applicable to all facilities:
 - 1. Federal Highway Administration (FHWA):
 - a. Manual on Uniform Traffic Control Devices (MUTCD)
 - b. Traffic Control Devices Handbook (TCDH)
 - c. Railroad-Highway Grade Crossing Handbook
 - 2. Transportation Research Board (TRB):
Highway Capacity Manual
 - 3. American Association of State Highway and Transportation Officials (AASHTO):

- a. A Policy on Geometric Design of Highways and Streets.
 - b. Roadside Design Guide
 - c. Standard Specifications for Highway Bridges
 - d. LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
 - e. Guide for the Development of Bicycle Facilities
- 4. Institute of Transportation Engineers (ITE):
 - a. Traffic Engineering Handbook.
 - b. Trip Generation
 - c. Urban Street Geometric Design Handbook
 - d. Manual of Transportation Engineering Studies
- 5. American Traffic Safety Service Association (ATSSA):
 - a. Quality Guidelines for Work Zone Traffic Control Devices
- 6. Americans with Disabilities Act (ADA):
 - a. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG)
 - b. Public Right-of-Way Accessibility Guidelines (PROWAG)
- B. New York:

Highway Design Manual, New York State Department of Transportation (NYSDOT)
- C. New Jersey:

Design Manual – Roadway, New Jersey Department of Transportation (NJDOT)
- D. Port Authority of NY & NJ (PANYNJ):
 - 1. Port Authority Roadway Access Management Guidelines
 - 2. Traffic Engineering Design Guidelines

3. Traffic Engineering Standard Details.
4. Traffic Engineering Specifications
5. Port Authority Bicycle Master Plan
6. Division 1 Maintenance of Traffic Specification

Note: The traffic standard details and other Port Authority standards listed in this section will be provided by the Port Authority Engineering Department's Quality Assurance Division, when required for a specific tenant project and requested through the facility Tenant Liaison Office.

III. DETAILS OF TRAFFIC ENGINEERING REVIEW

A. Traffic Studies:

1. Tenant/applicant shall submit a traffic impact analysis if there is an increase in existing traffic volume generated by the site, a change to site access, or a change to traffic operations. The traffic impact analysis shall follow guidelines identified in of the Port Authority Roadway Access Management Guidelines. A team conceptual planning meeting shall be scheduled to determine the scope of the traffic analysis/study. Submit the minutes of the planning meeting.
2. Submit any transportation or parking studies developed to support tenant construction.
3. Traffic capacity analysis (to determine the 'Level of Service (LOS) of all elements of the roadway system (roadways, weaving sections, signalized and un-signalized intersections, pedestrian crosswalks and walkways) shall be equal to or better than LOS "C/D" as defined in the Transportation Research Board Highway Capacity Manual.
4. The scope of work associated with the application shall incorporate the results and recommendations of any approved analyses and studies.

B. Maintenance of Traffic and Work Area Protection (temporary traffic controls associated with work zones):

1. Plans shall include drawings which depict properly designed temporary traffic control devices wherever a work zone occupies or interferes with the normal operation of:
 - a. Any active roadway, ramp, bridge, or tunnel which carries vehicular and/or pedestrian traffic.
 - b. Any portion of any parking lot or garage area, driveway, access way, trucking terminal or yard, or loading dock area where there are vehicle and/or pedestrian movements.
 - c. Any sidewalk, walkway, concourse, hallway, plaza, doorway, station area or platform, stairway, moving stairway, or elevator where pedestrians have access.
2. Contract documents shall specify 'duration of contract' and 'hours of work'. Based on these parameters, temporary traffic control devices shall comply with all applicable standards.
3. Plans shall indicate where temporary traffic control devices conflict with any permanent control devices, and shall indicate the appropriate action to be taken with the affected permanent devices (i.e., to be removed, relocated, covered, etc.). Notes shall include a provision that any items negatively impacted during construction shall be replaced by the tenant to the satisfaction of the PA at no cost to the PA.
4. Contract documents shall specify the precautions required to protect vehicles and/or pedestrians from dust, fragments, construction particles, effects of spraying, and excessive noise generated by the work operations.
5. Where required, according to the applicable code(s)/standard(s), in conjunction with the temporary control devices, the appropriate lighting devices shall be incorporated in the design.
6. Where required, contract documents shall specify the extent of "flagger operations", to include confirmation of appropriate training, as specified in the Federal MUTCD, Part VI, Temporary Traffic Control.
7. Contract documents shall specify extent of 'daily' and 'end of contract' removal of temporary control devices and include restoration to their original condition and location of any permanent traffic control devices affected during the course of the work.

C. Permanent Traffic Control Devices:

1. Tenant/applicant shall have checked all existing traffic control devices for deficiencies or missing items, and any found, as such, prior to or as a result of the work of the contract, shall be replaced or upgraded.
2. All new and/or existing traffic control devices shall have been checked for visibility and adequate sight distance(s) in daytime and nighttime, also accounting for seasonal variations, such as restrictions caused by growth of vegetation.
3. All new and existing installations shall have been analyzed for the need to incorporate appropriate roadside traffic barriers (e.g., guide rail and concrete barrier) in the design.
4. With regard to coordination with electrical engineering, wherever required, the permanent traffic control devices and adjacent project areas shall have been designed with illumination levels which meet code standards.
5. All traffic signals and Intelligent Transportation System construction must be inspected by the Port Authority Traffic Engineering via a "Turn on Inspection" as well as a "Final Inspection". These checklists will be provided at the beginning of construction.
6. Drawings shall include all pedestrian and vehicular way finding sign layouts.

D. Coordination with other Trades:

1. The traffic design shall be coordinated with other engineering disciplines, particularly civil, structural, and electrical.

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The following attachments in this section include requirements that are supplementary to the requirements in the technical sections of this Manual and are to be complied with.

A1	Standards for Interior Plastic Signs
A2	Marking of Transparent Glass Doors and Fixed Adjacent Glass Sidelights
S1	Inaccessible Heavyweight Ceiling Design Standards
S2	Suspended Lightweight Ceilings Design Criteria
S3	LaGuardia Airport – Central Terminal Building - Non-structural Concrete Fill Over Cellular Steel Decking
S4	Port Authority Bus Terminal – Lightweight Concrete Slab Areas
C1	Index of Civil Standard Details
C2	Index of Standard Civil Specifications
C3	Index of Civil Design Guidelines
E1	Electrical Manhole and Ductbank Details
E2	Port Authority Bus Terminal – Electrical Design Criteria
M1	Port Authority Bus Terminal – HVAC Design Criteria
M2	Port Authority Bus Terminal – Plumbing & Fire Protection Design Criteria
RFS1	Airport Rampside Clearances
LS1	Landscape Architectural Design at Airports

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1.0 General: The provisions of this specification shall govern the design and use of interior plastic signs and panels in both New York & New Jersey.

2.0 Definitions, symbols and notations: The following definitions, symbols and notations shall apply to the provisions of this standard (units in parenthesis are for the variable described):

A_S (ft²) = Allowable sign facing area

L (ft) = The length along the ceiling of a ceiling sign

P_w (ft) = Minimum distance between an egress path and a sign.
Distance can be passage width or height

t (inches) = Thickness of sign facing material(s)

V_C (ft³) = Volume of space or room in which the sign is located

Ceiling sign: A ceiling mounted sign with its top located within one foot of the ceiling and its bottom located five feet or higher above the floor.

Interior plastic sign: A sign, located within a structure, which has a facing which is constructed of plastic.

Multiple-faced sign: A sign with more than one exposed face.

Sign: Any fabricated sign or display structure, including its structure, consisting of any letter, figure, character, mark, point, plane, marquee sign, design, poster, pictorial, picture, stroke, stripe, line, trademark, reading matter or illuminating device, which is constructed, attached, erected, fastened or manufactured in any manner whatsoever so that the same shall be used for the attraction of the public to any place, subject, person, firm, corporation, public performance, article, machine, or merchandise whatsoever, and displayed in any manner for recognized advertising purposes.

Sign facing: The display portion of a sign.

Single-faced sign: A sign with display on one face only.

Volume of Space or Room (V_C): The volume between physical barriers which may limit the movement of fire products (e.g., fire doors in cross corridor partitions). The space shall have a maximum average length to width ratio of 4:1. If the ratio exceeds 4:1, the length of four times the average width shall be

used for volume calculation. The volume of a compartment with a ratio exceeding 4:1 shall be calculated by the following equation:

$$4 \times (\text{average width of compartment})^2 \times \text{height.}$$

- 3.0 Flame Spread Rating:** All plastic sign facings shall have a flame-spread rating, determined by ASTM E84, not greater than 200.

Exception: Materials less than 1/28-inch in thickness shall comply with the criteria in NFPA 701, "Fire Tests for Flame Propagation of Textiles and Films."

- 4.0 Allowable Sign Facing Area:** The area of an individual plastic sign facing shall not exceed the limitations established in paragraph 4.1 through paragraph 4.6, or as calculated in accordance with the Appendix to this standard. The maximum area of all signs in a space shall not exceed 20 percent of the aggregate wall and ceiling area of the space. For multiple-faced signs, the calculated allowable area is the total area of all faces of all signs within separation distances specified in paragraph 4.7. Signs which are separated by less than the minimum sign separation distance as given in paragraph 4.7, shall be considered a single sign.

Exception: The area of an individual plastic sign facing is not limited where the portion of the building, where the sign is located, is equipped with an automatic sprinkler system. However, the 20 percent limitation, in the paragraph above, shall apply.

- 4.1 Polymethylmethacrylate (PMMA) (e.g., Acrylic, Plexiglass, Lucite) Sign Materials:** The allowable area of a PMMA sign facing shall be determined from the following equation.

$$A_s = 0.00034 \cdot \frac{V_c}{t} \quad \left| \text{for } t \leq 0.46 \text{ inch} \right.$$
$$A_s = 0.000745 \cdot V_c \quad \left| \text{for } t > 0.46 \text{ inch} \right.$$

Example: Given a space (room or compartment) 50' long by 40' wide with a 10' high ceiling, how large a PMMA (acrylic) sign facing is allowable if PMMA is 0.25" thick?

$$A_s = 0.00034 \cdot \frac{(50)(40)(10)}{0.25} = \frac{6.8}{0.25} = 27.2 \text{ sq.ft.}$$

- 4.2 Polycarbonate (e.g., GE Lexan S100) Sheet Sign Material:** The allowable area of a polycarbonate sign facing shall be determined from the following equation:

$$A_s = 0.00031 \cdot V_c$$

- 4.3 Polyethylene Teraphthalate (PET) (e.g., IMPET 300) Sign Material:** The allowable area of a PET sign facing shall be determined from the following equation:

$$A_s = 0.0000759 \cdot \frac{V_c}{t} \quad | \text{ for } t \leq 0.41 \text{ inch}$$

$$A_s = 0.000185 \cdot V_c \quad | \text{ for } t > 0.41 \text{ inch}$$

- 4.4 Duratrans - Glossy Sign Facing Material:** The allowable area of a Duratrans sign facing shall be determined from the following equation:

$$A_s = 0.000046 \cdot \frac{V_c}{t} \quad | \text{ for } t \leq 0.043 \text{ inch}$$

$$A_s = 0.00108 \cdot V_c \quad | \text{ for } t > 0.043 \text{ inch}$$

- 4.5 Duratrans Matte Finish Sign Facing Material:** The allowable area of a Duratrans matte finish sign facing shall be determined from the following equation:

$$A_s = 0.0000224 \cdot \frac{V_c}{t} \quad | \text{ for } t \leq 0.0576 \text{ inch}$$

$$A_s = 0.000389 \cdot V_c \quad | \text{ for } t > 0.0576 \text{ inch}$$

- 4.6 Other Plastic Sign Materials:** The allowable area of a sign facing constructed from a plastic material not listed in paragraphs 4.1 through 4.5, or from composites of plastics, shall be determined in accordance with the Appendix to this standard. The method in the Appendix may also be used for plastics listed in paragraphs 4.1 through 4.5.

- 4.7 Sign Separation Distances:** The minimum separation distance between any two individual signs shall be in accordance with paragraphs 4.7.1., 4.7.2, and 4.7.3. Signs located less than the minimum sign separation distances apart shall be considered as one sign for allowable sign facing area.

Exception: Sign separation distances do not apply where the signs are located in a space equipped with an automatic sprinkler system.

- 4.7.1 Single-Faced Sign Separation Distances:** The minimum separation distance between two adjacent signs with a single side of sign facing shall be 6 feet.

4.7.2 Multiple-Faced Sign Separation Distances: The minimum separation distance between two signs with multiple faces on different planes shall be 13 feet.

4.7.3 Ceiling Sign Separation Distances: Signs greater than 10 feet in length and one foot in height shall have a minimum separation distance of 10 feet, except as noted in 4.7.2. Other signs shall conform to Sections 4.7.1.

4.8 Minimum Dead End Passage Width for Signs: Minimum passage width applies to dead end corridors and rooms having means of egress in locations requiring an occupant to pass by a sign. The minimum passage width shall be 20 feet in locations where an occupant must pass a single-faced sign, and 28 feet in locations where an occupant must pass a multiple-faced sign to exit. The minimum passage width (P_w) is defined as the minimum distance between an egress path and a sign, i.e., the closest an occupant will be to the sign during egress. The minimum passage width or height (for ceiling signs) where an occupant must pass by a sign which is perpendicular to the occupants path of travel shall be calculated from the following equation:

$$P_w = 0.00255 \cdot L^{3.654} \quad | \quad \text{for } L \geq 2 \text{ ft}$$

Exception: There is no restriction for signs less than 4 square feet in area and ceiling signs less than 2 feet long.

Appendix to Attachment A1

Calculation of Allowable Sign Area for Signs of Any Plastic Material or Composite of Plastics.

A.1 Definitions, symbols and notations: The following definitions, symbols and notations shall apply to the provisions of this Appendix (units in parenthesis are for the variable described):

A_S (ft ²) =	Allowable sign facing area.
A_1 (ft ²) =	Initial allowable sign facing area based on Figure A-1.
A_2 (ft ²) =	Corrected allowable sign area based on the time to burn through a sign.
$\Delta H_{c,40}$ (kJ/kg) =	Heat of combustion for an incident heat flux of 40 kW/m ² .
L (ft) =	The length along the ceiling of a ceiling sign.
\dot{m}''_{40} (kg/s-m ²) =	The average specimen mass loss rate of the fuel per unit area with a radiant flux exposure of 40 kW/m ² . Mass loss rate shall be determined in accordance with average horizontal specimen mass loss rate in ASTM E- 1354.
P_w (ft) =	Minimum distance between an egress path and a sign. Distance can be passage width or height.
t_b (sec) =	Time to burn through a specimen, used to correct allowable areas for thin signs.
t (inches) =	Thickness of sign facing material(s).
V_c (ft ³) =	Volume of space or room in which the sign is located.
$\sigma_{m,40}$ (m ² /kg) =	Specific extinction area, on a mass loss basis for an incident heat flux of 40 kW/m ² .
ρ (kg/m ³) =	Density of sign material.
SP (1/s) =	Smoke production factor used to determine uncorrected sign area based on volume.

A.2 All plastic sign facings shall meet the flame spread rating criteria specified in paragraph 3.0. All test results and material properties used in the calculations must be submitted.

A.3 The allowable area of a sign facing constructed from plastic materials shall be determined in accordance with the following procedure. The procedure is applicable for all plastic materials including those listed in paragraphs 4.1 - 4.5.

1. Obtain the sample mass density ρ , in kg/m³.
2. Obtain the following from ASTM E 1354:
 - a) The average specimen mass loss rate per unit area for an incident heat flux of 40 kW/m² (\dot{m}''_{40}).
 - b) The average specific extinction area for an incident heat flux of 40 kW/m² ($\sigma_{m,40}$).
 - c) The average effective sample heat of combustion for an incident heat flux of 40 kW/m² ($\Delta H_{C,40}$).

3. Calculate the material's smoke production factor (SP):

$$SP = \sigma_{m,40} \cdot \dot{m}''_{40}$$

4. Using Figure A-1 and the appropriate values of SP and V_C , estimate the value of A_1 .
5. The initial corrected allowable area of a combustible sign facing (A_2) based on the thickness of the material shall be calculated using the following formulas:

$$A_2 = \frac{600}{t_b} \cdot A_1$$

where t_b is determined by the following formula:

$$t_b = 0.0254 \cdot \frac{\rho \cdot t}{\dot{m}''_{40}}$$

Exception: If t_b is greater than 600, then a corrected area is not required, i.e., $A_2 = A_1$.

6. The final allowable area of a combustible sign facing (A_S) based on the heat release rate properties of the combustible materials shall be calculated using the following formula:

$$A_s = \frac{452}{\dot{m}_{40}'' \cdot \Delta H_{c,40}} \cdot A_2$$

Exception: If $\dot{m}_{40}'' \cdot \Delta H_{c,40}$ is less than 452.0 kW/m², a corrected area is

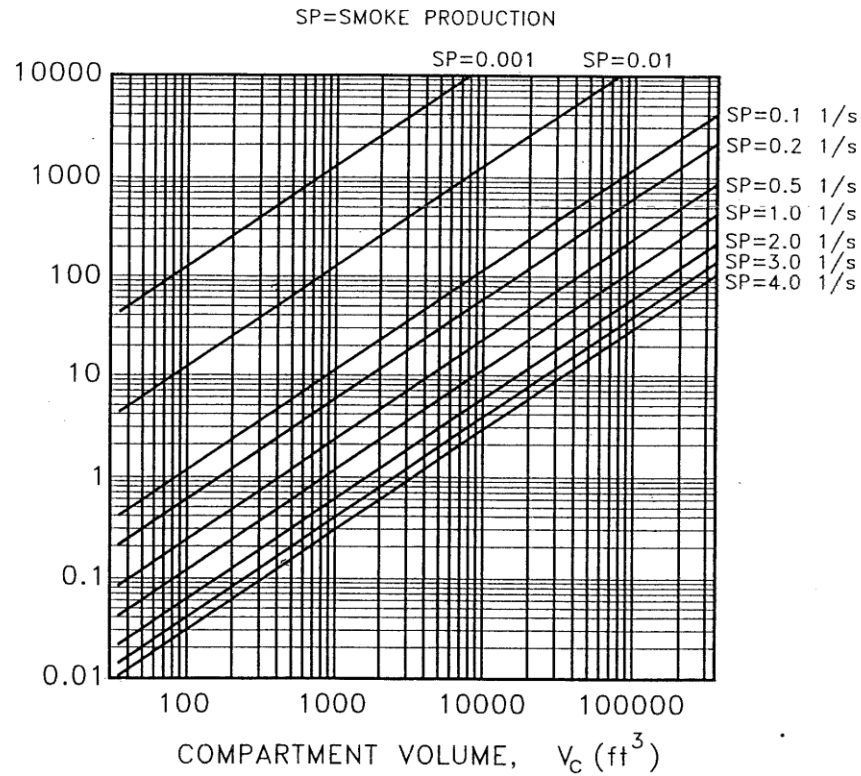


Figure A-1

Allowable Sign Area as a Function of the Smoke Production and Room Volume

not required, i.e., $A_s = A_2$.

7. Allowable facing area of composite sign materials shall be determined in the same fashion as signs with single materials. Material properties of the composite sign (\dot{m}''_{40} , σ_m , ΔH_c , ρ) shall be a weighted average of each component mass material. For example, material properties of a composite with two materials shall be determined via where 1 and 2 refer to materials number one and two.

$$\dot{m}''_{40} = \frac{\text{mass}_1}{\text{mass total}} \cdot \dot{m}''_{40,1} + \frac{\text{mass}_2}{\text{mass total}} \cdot \dot{m}''_{40,2}$$

$$\sigma_m = \frac{\text{mass}_1}{\text{mass total}} \cdot \sigma_{m,1} + \frac{\text{mass}_2}{\text{mass total}} \cdot \sigma_{m,2}$$

$$\Delta H_c = \frac{\text{mass}_1}{\text{mass total}} \cdot \Delta H_{c,1} + \frac{\text{mass}_2}{\text{mass total}} \cdot \Delta H_{c,2}$$

$$\rho = \frac{\text{mass}_1}{\text{mass total}} \cdot \rho_1 + \frac{\text{mass}_2}{\text{mass total}} \cdot \rho_2$$

1.0 General.

These rules are identical to New York City Board of Standards and Appeals Rule 4-02 and shall be applicable to all new construction at Port Authority facilities, both in New York and New Jersey.

2.0 Definitions.

Sidelights. Fixed panels of transparent glass which form part of or are immediately adjacent to and within six feet horizontally of the vertical edge of an opening in which transparent glass doors are located. For purposes of this section, a sidelight shall consist of transparent glass in which the transparent area above a reference line 18 inches above the adjacent ground, floor or equivalent surface is 80 percent or more of the remaining area of the panel above such reference line.

Transparent glass. Material predominantly ceramic in character which is not opaque and through which objects lying beyond are clearly visible. For the purpose of this section, rigid transparent plastic material shall be construed as transparent glass.

Transparent glass door. A door, manually or power actuated, fabricated of transparent glass, in which the transparent area above a reference line 18 inches above the bottom edge of the door is 80 percent or more of the remaining area of the door above such reference line

Transparent safety glazing materials. Materials which will clearly transmit light and also minimize the possibility of cutting or piercing injuries resulting from breakage of the material. Materials covered by this definition include laminated glass, tempered glass (also known as heat-treated glass, heat-toughened glass, case hardened glass or chemically tempered glass), wired glass, and rigid plastic.

3.0 Requirements.

1. Transparent glass doors and fixed adjacent transparent glass sidelights shall be marked in two areas on the glass surface thereof.

2. Fixed adjacent transparent glass sidelights 20 inches or less in width with opaque stiles at least one and three-quarters inches in width shall be exempt from the marking requirements.
3. Where the ground, floor, or equivalent surface area in the path of approach to a fixed adjacent transparent glass sidelight from either side for a minimum distance of three feet from such sidelight is so arranged, constructed or designed as to deter persons from approaching such sidelight or a permanent barrier is installed in the path of approach, the sidelight shall be exempt from this requirement.
4. Decorative pools, horticultural planting or similar installations shall be considered as indicating that the ground, floor, or equivalent surface area is not a path of approach. Planters, benches and similar barriers which are securely fastened to the floor or wall to prevent their removal shall be considered as blocking the path of approach provided they shall be not less than 18 inches in height from the ground, floor or equivalent surface and extend across at least 2/3 of the total width of the glazed area of the sidelight.
5. Fixed adjacent transparent glass sidelights which are supported by opaque sill and wall construction of at least 18 inches above the ground, floor, or equivalent surface immediately adjacent shall be exempt from the marking requirements.
6. Display windows in any establishment, building or structure which fall within the definition of a sidelight shall be exempt from the marking requirements if the top of the supporting sill and wall construction is not less than 18 inches above the ground, floor or equivalent surface immediately adjacent and the interior area is occupied with merchandise or similar displays to clearly indicate to the public that it is not a means of ingress or egress.

4.0 Marking Locations.

1. One such area shall be located at least 30 inches but not more than 36 inches and the other at least 60 inches but not more than 66 inches above the ground, floor or equivalent surface below the door or sidelight. The use of horizontal separation bars, muntin bars, or equivalent at least one and one-half inches in vertical dimension that extend across the total width of the glazed area and are located at least 40 inches but not more than 50 inches above the bottom of the door or sidelight is permitted in lieu of markings.
2. The marking design shall be at least four inches in diameter if circular or four inches in its least dimension if elliptical or polygonal, or shall be at least 12 inches in horizontal dimension if the marking is less than four inches in its least dimension. In no event shall the

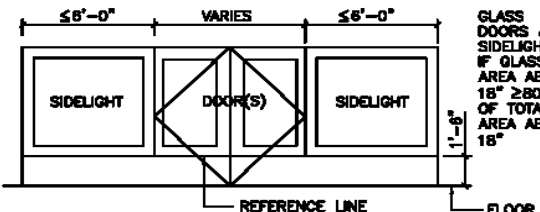
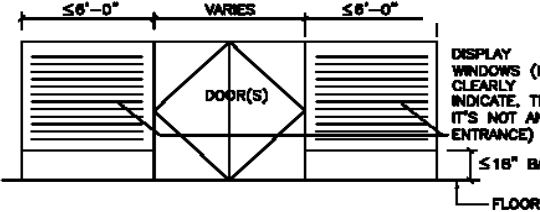
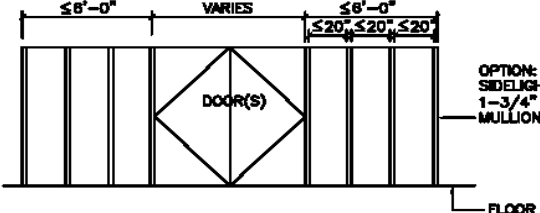
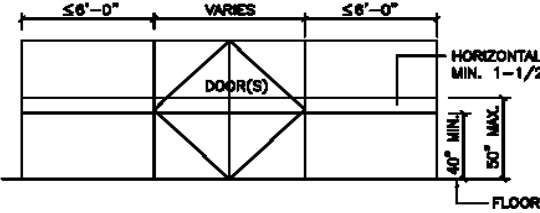
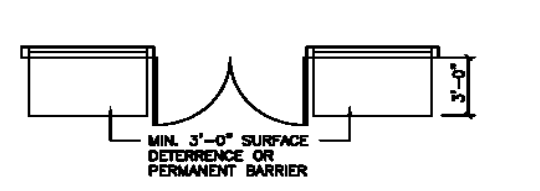
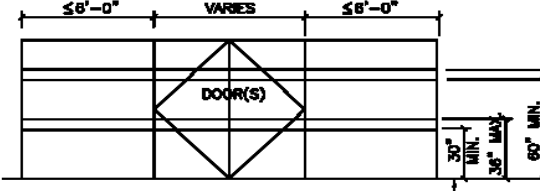
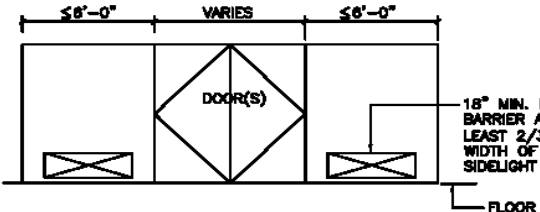
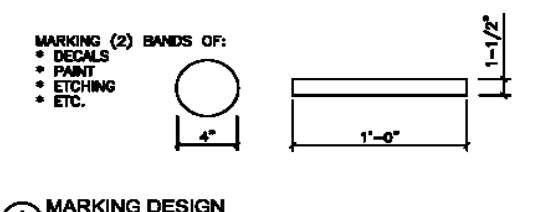
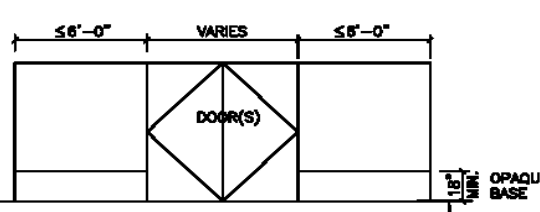
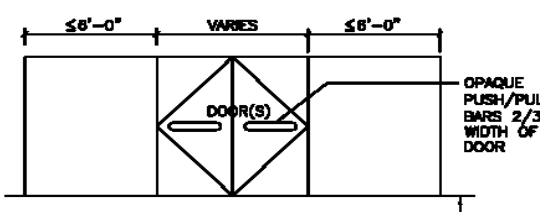

vertical dimension of any marking including lettering be less than one and one-half inches in height.

In addition to horizontal muntin bars, separation bars or equivalent, any of the following methods may be used to alert persons to the presence of transparent glass doors and fixed adjacent transparent glass sidelights in their path of movement:

- i) Chemical etching.
- ii) Sand blasting.
- iii) Adhesive strips not less than one and one-half inches in vertical dimension extending across at least two-thirds of the total glazed area.
- iv) Decals.
- v) Paint, gilding, or other opaque marking materials.
- vi) Opaque door pulls or push bars extending across at least two-thirds of the total width of the glazed area.

5.0 Replacement and New Installations.

1. Any transparent glazing material used for replacement in existing transparent glass doors shall be transparent safety glazing material. Transparent safety glazing material shall be used in all new transparent glass door installations. The manufacturer's permanent identification mark denoting safety-glazing materials shall be visible on the glass after installation of the door.
2. Replacement of fixed adjacent transparent glass sidelights shall be of transparent safety glazing material or annealed glass at least one-half inch in thickness. New fixed adjacent transparent glass sidelights shall be of transparent safety glazing material or annealed glass at least one-half inch in thickness. The manufacturer's permanent identification mark denoting safety glazing material shall be visible on the glass after installation of the sidelight.

 <p>A DEFINITION SECTION 2.0</p>	 <p>F DISPLAY WINDOWS SECTION 3.0.6</p>
 <p>B SIDELIGHTS WIDTH SECTION 3.0.2</p>	 <p>G MUNTIN BARS OR EQUIVALENT SECTION 4.0.1</p>
 <p>C SURFACE DETERRENCE SECTION 3.0.3</p>	 <p>H MARKING LOCATION SECTION 4.0.1</p>
 <p>D BARRIERS SECTION 3.0.4</p>	 <p>I MARKING DESIGN SECTION 4.0.2</p>
 <p>E SIDELIGHT SILLS SECTION 3.0.5</p>	 <p>J OPAQUE PULLS OR PUSH BARS SECTION 4.0.2.VI</p>
 <p>THE PORT AUTHORITY OF NY & NJ</p>	<p>MARKING OF GLASS DOORS & FIXED SIDELIGHTS</p>

INACCESSIBLE HEAVYWEIGHT CEILING DESIGN STANDARDS

DESIGN CRITERIA FOR INACCESSIBLE HEAVYWEIGHT CEILINGS

I. LOADING

THIS CEILING DESIGN STANDARD APPLIES TO ALL INACCESSIBLE CEILINGS WITH A DEAD LOAD GREATER THAN 4 PSF. FOR INACCESSIBLE CEILING SYSTEMS OTHER THAN CEMENT PLASTER OR GYPSUM PLASTER, THE DESIGNER SHALL FOLLOW ALL THE REQUIREMENTS OF CEMENT PLASTER OR GYPSUM PLASTER CEILING BASED ON THE DESIGN DEAD LOAD OF THE CEILING SYSTEM.

I. LOADING:

- A. DEAD LOAD: CEILING DESIGN DEAD LOAD SHALL BE: CEMENT PLASTER: LARGER OF 15 PSF OR ACTUAL CEILING WEIGHT GYPSUM PLASTER: LARGER OF 10 PSF OR ACTUAL CEILING WEIGHT ALL OTHER CEILING SYSTEMS: LARGER OF 15 PSF OR ACTUAL CEILING WEIGHT.
- B. LIVE LOAD (LL): 200LBS CONCENTRATED LOAD (MIN).
- C. WIND LOAD (W): (EXTERIOR CEILINGS ONLY) MINIMUM LOAD SHALL BE:
 - a. UP TO 50 FT. CEILING HEIGHT: 30 PSF POSITIVE PRESSURE OR 20 PSF SUCTION NORMAL TO SURFACE.
 - b. HIGHER THAN 50 FT.: USE WIND FORCES IN ACCORDANCE WITH THE APPLICABLE CODES, REGULATIONS AND STANDARDS.
 - c. EACH CEILING PANEL SHALL BE CAPABLE OF RESISTING A LATERAL WIND FORCE OF 2.5 PSF OR 0.5 PERCENT OF THE POSITIVE WIND PRESSURE, WHICHEVER IS GREATER, ACTING PARALLEL TO THE CEILING SURFACE.
- D. LOADING COMBINATIONS: LOAD COMBINATIONS SHALL BE IN ACCORDANCE WITH THE APPLICABLE CODES, REGULATIONS AND STANDARDS.

MINIMUM SIZE OF CARRYING CHANNEL
FOR INTERIOR INACCESSIBLE
CEMENT PLASTER CEILINGS

TABLE "IP"						
"W" AVERAGE	"S"	3'-6"	3'-9"	4'-0"	4'-3"	4'-6"
3'-1"	1 1/2" C.R. - 475LBS/ 1000 L.F.					
3'-3"						
3'-9"		1 1/2" CHANNEL (HOT ROLLED) MINIMUM WEIGHT = 1120LBS./1000 L.F.				
4'-0"						
4'-2"					2" CHANNEL (HOT ROLLED) MINIMUM WEIGHT = 1260LBS./1000 L.F.	
4'-6"						
SIZES, SPANS AND SPACINGS SHOWN ARE FOR CEILING SYSTEMS WITH A DEAD LOAD = 15 PSF.						

SIZES, SPANS AND SPACINGS SHOWN ARE FOR
CEILING SYSTEMS WITH A DEAD LOAD = 15 PSF.

II. MATERIALS

- A. IN ADDITION TO THE MATERIALS SPECIFIED IN SECTION IX THE FOLLOWING MATERIAL SPECIFICATIONS SHALL BE FOLLOWED:
 1. PLASTER: ASTM C828-81 AND ANSI A42.2.
 2. SURFACE APPLIED BONDING AGENTS FOR EXTERIOR PLASTERING: ASTM C932-80.
 3. LATH: ASTM C847 AND ANSI A42.3.
- B. THE FOLLOWING MATERIALS SHALL NOT BE USED:
 1. METAL DECK TABS AND HOOKS.
 2. POWER ACTUATED FASTENERS.
 3. WIRE HANGERS.
 4. STOVE BOLTS.
- C. THE CONTRACTOR SHALL BE REQUIRED TO SUBMIT CATALOG CUTS, SAMPLES, LAYOUT DRAWINGS AND DETAILS OF ALL COMPONENTS OF CEILING SUPPORT SYSTEM FOR THE ENGINEER'S APPROVAL PRIOR TO STARTING OF ANY WORK IN THE FIELD.

MINIMUM SIZE OF CARRYING CHANNEL FOR
INTERIOR INACCESSIBLE GYPSUM PLASTER CEILINGS

TABLE "IG"						
"W" AVERAGE	"S"	3'-6"	3'-9"	4'-0"	4'-3"	4'-6"
2'-9"		1 1/2" CHANNEL (COLD ROLLED) MINIMUM WEIGHT = 475LBS/1000 L.F.				
3'-0"						
3'-6"						
4'-0"					1 1/2" CHANNEL (HOT ROLLED) MINIMUM WEIGHT = 1120LBS/1000 L.F.	
4'-6"						

SIZES, SPANS AND SPACINGS SHOWN ARE FOR
CEILING SYSTEMS WITH A DEAD LOAD = 10 PSF.

SIZES, SPANS AND SPACINGS SHOWN ARE FOR
CEILING SYSTEMS WITH A DEAD LOAD = 10 PSF.

III. JOINTS

- A. CONTROL JOINTS:
MAXIMUM LENGTH OF CEILING PANEL BETWEEN CONTROL JOINTS SHALL BE 40 FT. AND MAXIMUM AREA OF THE PANEL SHALL BE 1600 SQ.FT.
- B. EXPANSION JOINTS:
LOCATION AND SIZE OF CEILING EXPANSION JOINTS SHALL MATCH BUILDING EXPANSION JOINTS. EXPANSION JOINTS ARE ALSO REQUIRED WHERE CEILING CHANGES DIRECTION.

MINIMUM SIZE OF CARRYING CHANNEL
FOR EXTERIOR INACCESSIBLE PLASTER CEILINGS

TABLE "EP"							
"W" AVERAGE	"S"	3'-0"	3'-3"	3'-6"	3'-9"	4'-0"	4'-6"
2'-1"							
2'-4"		1 1/2" CHANNEL (HOT ROLLED) MINIMUM WEIGHT = 1120LBS/1000 L.F.					
2'-6"							
2'-8"				2" CHANNEL (HOT ROLLED) MINIMUM WEIGHT = 1260LBS/1000LBS L.F.			
3'-1"							
3'-6"							
4'-0"						2 1/2" CHANNEL (HOT ROLLED) MINIMUM WT. 2270LBS/1000 L.F.	
SIZES, SPANS AND SPACINGS SHOWN ARE FOR A CEILING SYSTEM WITH A 15 PSF DEAD LOAD + 20 PSF WIND SUCION.							

SIZES, SPANS AND SPACINGS SHOWN ARE FOR A CEILING SYSTEM WITH A
15 PSF DEAD LOAD + 20 PSF WIND SUCTION.



THE PORT AUTHORITY OF NY & NJ

INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS
FOR CEILINGS WITH A DL GREATER THAN 4PSF
DESIGN CRITERIA

ATTACHMENT
S1

SHEET
1 OF 8

IV. DESIGN OF CEILING COMPONENTS

CEILING COMPONENT	DESIGN PARAMETER	INTERIOR CEMENT PLASTER CEILINGS	INTERIOR GYPSUM PLASTER CEILINGS	EXTERIOR CEMENT PLASTER SOFFITS	MATERIALS AND COATINGS	NOTES
WIRE TIES	MAXIMUM SPACING MINIMUM SIZE	6 INCHES 16 GAGE	6 INCHES 16 GAGE	6 INCHES 16 GAGE	STAINLESS STEEL AISI TYPE 304 OR MONEL METAL	g. MIN. DOUBLE LOOP AROUND LATH AND CHANNEL WITH MIN. THREE TWISTED TURNS. b. IN LIEU OF WIRE TIES, BSA* OR ICBO** APPROVED CLIPS MAY BE USED.
FURRING CHANNEL	MAXIMUM SPAN (DIM. W) MAXIMUM SPACING (DIM. F) MINIMUM SIZE	4'-6" 1'-6" 1 1/2" COLD ROLLED CHANNEL (475LBS/1000 LF.)	4'-6" 1'-6" 1 1/2" COLD ROLLED CHANNEL (475LBS/1000 LF.)	4'-6" 1'-6" 1 1/2" COLD ROLLED CHANNEL (475LBS/1000 LF.)	HOT ROLLED ASTM A36 OR COLD ROLLED CHANNELS, GALVANIZED FOR EXTERIOR AND PAINTED FOR INTERIOR.	g. MAX. DEFLECTION < SPAN/360. b. FURRING CHANNELS AND EDGE CASING BEADS SHALL BE INTERRUPTED AT CONTROL AND EXPANSION JOINTS. c. EDGE CASING BEAD AND EDGE BEAM SHALL NOT BE USED AS SUPPORT FOR CEILING. d. WHERE LIGHT FIXTURE OPENING REQUIRES CUTTING OF 1 1/2" CHANNELS. e. WHERE LIGHT FIXTURE OPENING REQUIRES CUTTING OF MORE THAN ONE FURRING CHANNEL, USE CARRYING CHANNELS AND HANGERS ON EACH SIDE OF THE OPENING. f. FURRING CHANNEL SPICES SHALL BE AS SHOWN ON SHEET 5.
CARRYING CHANNEL	SPACING (DIM. W AVG.) SPAN (DIM. S) SIZE	TABLE 'IP'	TABLE 'IG'	TABLE 'EP'	HOT ROLLED ASTM A36 OR COLD ROLLED CHANNELS, GALVANIZED FOR EXTERIOR AND PAINTED FOR INTERIOR.	g. MAX. DEFLECTION < SPAN/360. b. CARRYING CHANNELS SHALL BE INTERRUPTED AT CONTROL AND EXPANSION JOINTS. c. CARRYING CHANNELS SHALL NOT BE INTERRUPTED FOR LIGHT FIXTURE OPENINGS. d. CARRYING CHANNEL SPICES SHALL BE AS SHOWN ON SHEET 5.
FURRING CHANNEL TO CARRYING CHANNEL CONNECTION	MINIMUM SIZE	MIN. 3 LOOPS OF 16 GAGE WIRE OR 1 1/2" X 1 1/2" X 1/4" X 2 1/2" LONG WITH 3/8" A307 BOLTS	MIN. 3 LOOPS OF 16 GAGE WIRE OR 1 1/2" X 1 1/2" X 1/4" X 2 1/2" LONG WITH 3/8" A307 BOLTS	MIN. 3 LOOPS OF 16 GAGE WIRE OR 1 1/2" X 1 1/2" X 1/4" X 2 1/2" LONG WITH 3/8" A307 BOLTS (GALVANIZED)	HOT ROLLED ASTM A36 OR COLD ROLLED CHANNELS, GALVANIZED FOR EXTERIOR AND PAINTED FOR INTERIOR.	SEE DETAIL C FOR TYPICAL DETAIL. BOLTS MAY BE SUBSTITUTED WITH CLIPS APPROVED BY BSA* OR ICBO**.
HANGER CONNECTIONS	MINIMUM SIZE	ONE 3/8" BOLT	ONE 3/8" BOLT	ONE 3/8" BOLT	A307 BOLTS, NUTS AND LOCK WASHER (GALVANIZED)	SEE DETAILS A AND B TYPICAL DETAILS.
HANGER	MINIMUM SIZE MAXIMUM SPACING	1 1/2" X 1/4" STRAP 4'-6" O.C. EACH WAY ACTUAL SPACING DEPENDS ON CARRYING CHANNEL SIZE-SEE TABLE IP	1 1/2" X 1/4" STRAP 4'-6" O.C. EACH WAY ACTUAL SPACING DEPENDS ON CARRYING CHANNEL SIZE-SEE TABLE IG	1 1/2" X 1 1/2" X 1/4" STRAP 4'-6" O.C. EACH WAY ACTUAL SPACING DEPENDS ON CARRYING CHANNEL SIZE-SEE TABLE EP	HOT ROLLED ASTM A36 STEEL GALVANIZED FOR EXTERIOR AND PAINTED FOR INTERIOR	FOR CONNECTION TO STRUCTURE SEE SHEETS 6, 7 AND 8. a. HANGER SPICES SHALL HAVE A MINIMUM OF 2-3/8" BOLTS WITH NUTS AND LOCK WASHERS b. HANGER SHALL BE PLUMB. c. MINIMUM THICKNESS OF STEEL MEMBERS FOR EXTERIOR SOFFITS SHALL BE 1/4".
BRACING		NONE REQUIRED	NONE REQUIRED	MIN. TWO BRACES IN EACH DIRECTION PER PANEL		SEE SECTIONS S2 AND S3 ON SHEET 4.

NOTE: IN CASES WHERE ACTUAL LOADS ARE HIGHER THAN SPECIFIED UNDER LOADING (SHEET S1) DESIGN SHALL BE PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE CODES, STANDARDS AND REGULATIONS.

* BOARD OF STANDARDS AND APPEALS NEW YORK CITY (BSA)

** INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

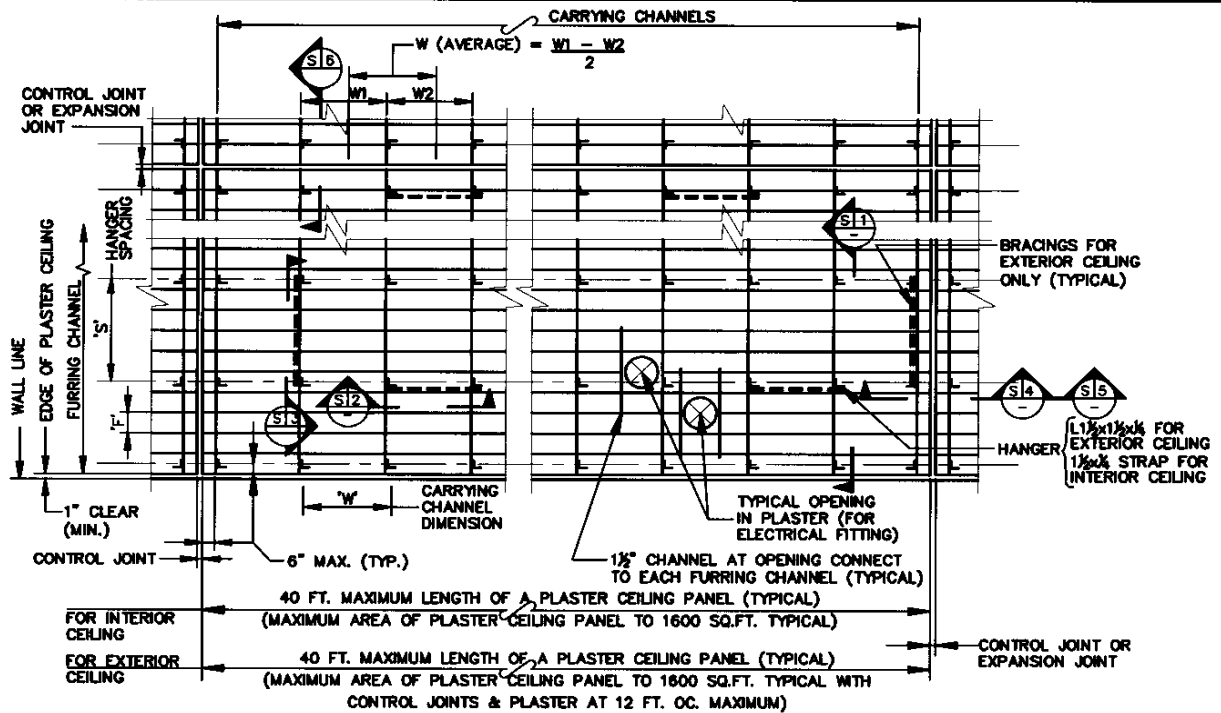


THE PORT AUTHORITY OF NY & NJ

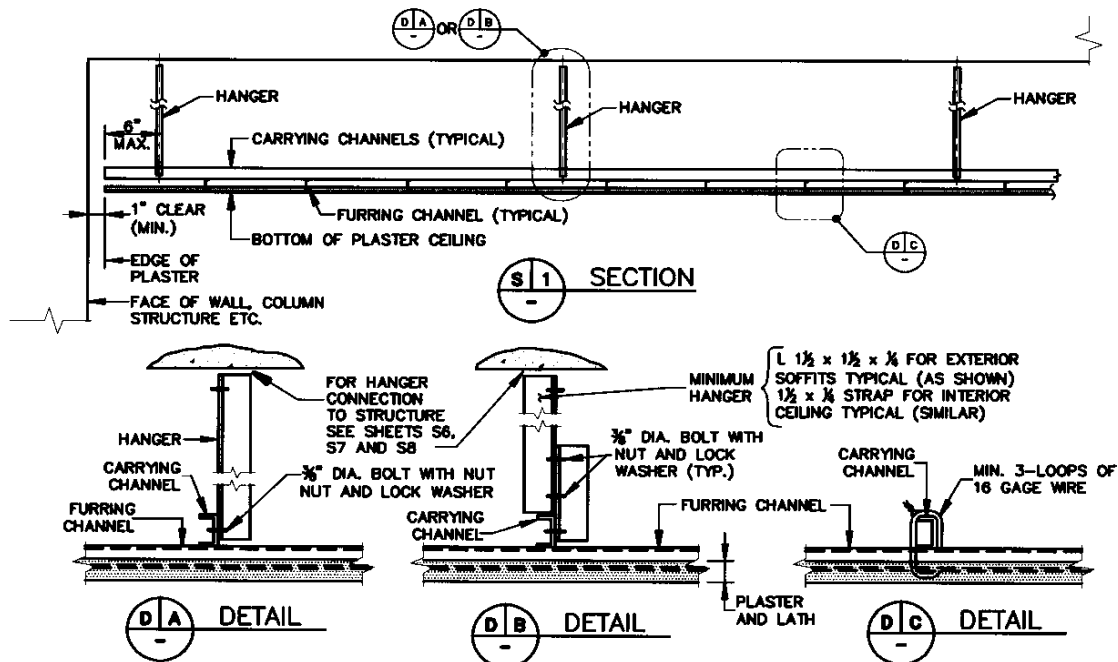
INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS
FOR CEILINGS WITH A DL GREATER THAN 4PSF
DESIGN CRITERIA (CONTINUED)

ATTACHMENT
S1

SHEET
2 OF 8



TYPICAL PLAN - EXTERIOR (INACCESSIBLE) PLASTER SOFFIT (SHOWN)
TYPICAL PLAN - INTERIOR (INACCESSIBLE) PLASTER CEILING (SIMILAR)

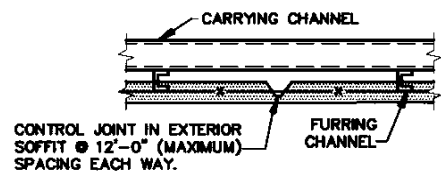
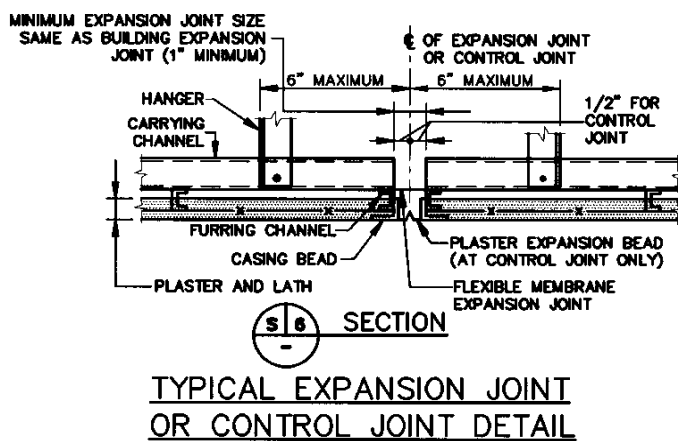
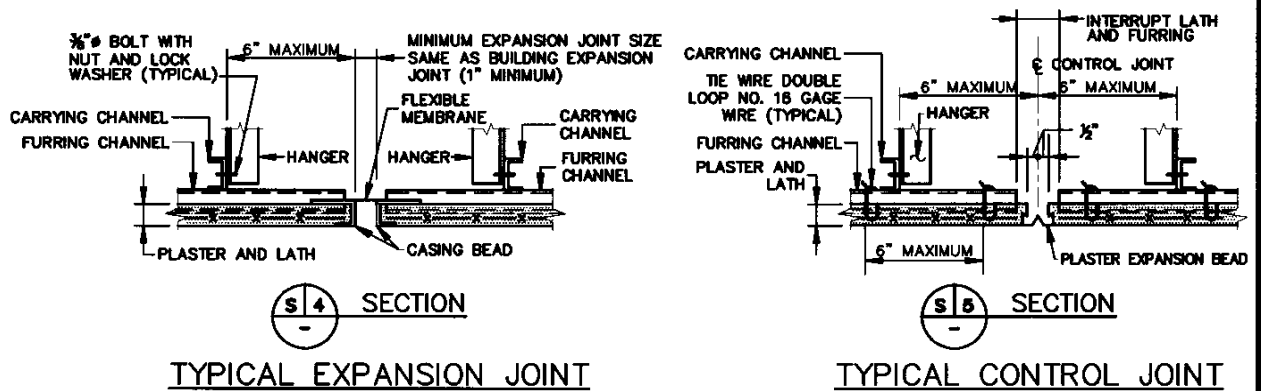
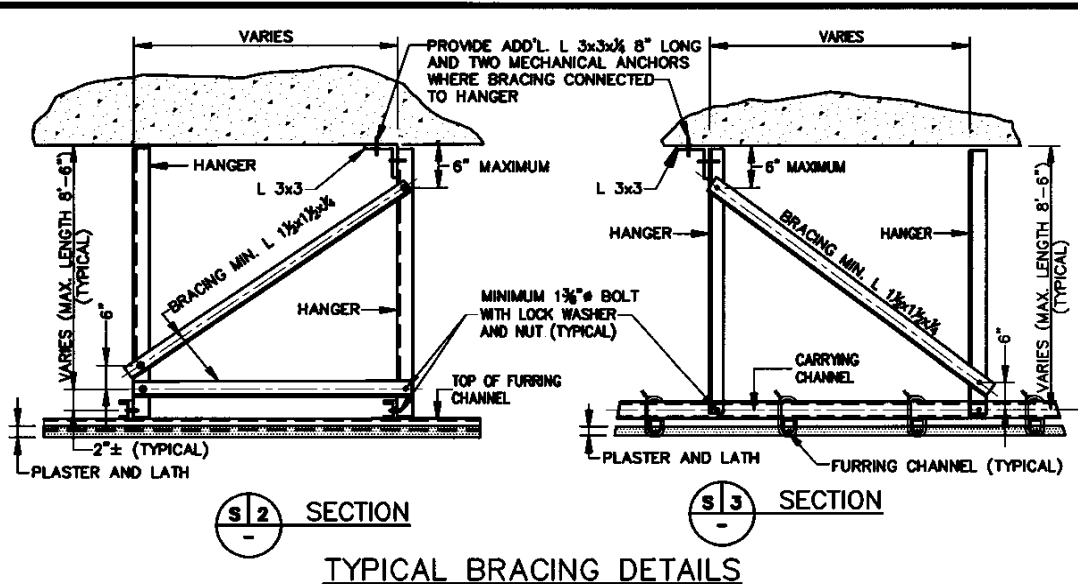


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**INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS**
 FOR CEILINGS WITH A DL GREATER THAN 4PSF
 TYPICAL DETAILS 1

ATTACHMENT
S1

SHEET
3 OF 8



TYPICAL CONTROL JOINT
DETAIL IN PLASTER



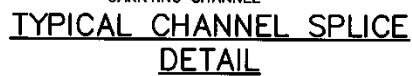
THE PORT AUTHORITY OF NY & NJ

INACCESSIBLE HEAVYWEIGHT CEILING DESIGN STANDARDS

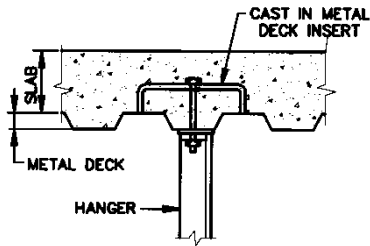
FOR CEILINGS WITH A DL GREATER THAN 4PSF
TYPICAL DETAILS 2

ATTACHMENT
S1

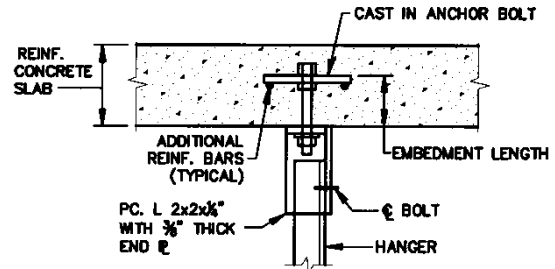
SHEET
4 OF 8



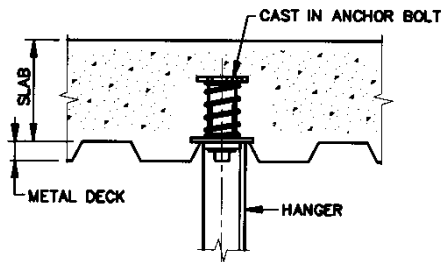
TYPICAL DETAILS FOR HANGER CONNECTION TO STRUCTURE



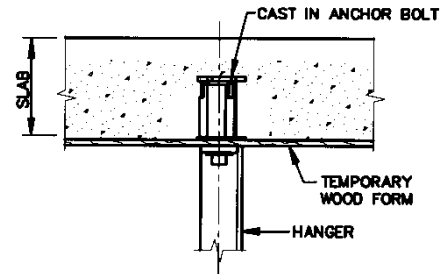
DETAIL - D
IN CONCRETE SLAB
OVER METAL DECK



DETAIL - E
CAST IN ANCHOR BOLT IN
CONCRETE SLAB



DETAIL - F
CAST IN ANCHOR BOLT IN
CONCRETE SLAB
(OVER METAL DECK)



DETAIL - G
INSERT IN CONCRETE SLAB
(OVER TEMPORARY WOOD FORM)



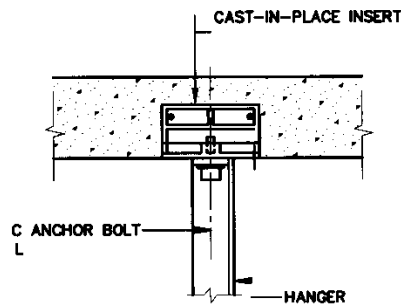
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**INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS**
FOR CEILINGS WITH A DL GREATER THAN 4PSF
TYPICAL CONNECTIONS TO STRUCTURE 1

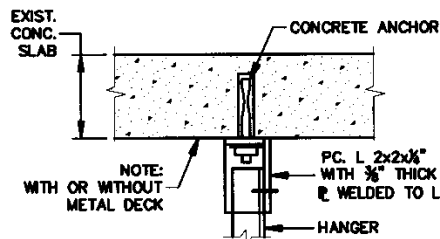
ATTACHMENT
S1

SHEET
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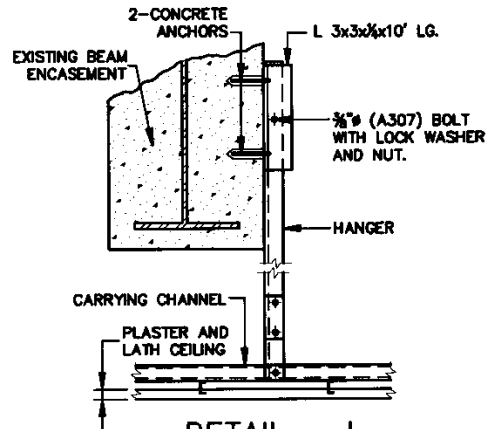
TYPICAL DETAILS FOR HANGER CONNECTION TO STRUCTURE (CONT.)



DETAIL - H
INSERT IN CONCRETE SLAB



DETAIL - J
CONCRETE ANCHOR IN SLAB



DETAIL - I
CONCRETE ANCHORS IN ENCASED STEEL BEAM

CONNECTION TO STRUCTURE—MATERIALS ACCEPTABLE ANCHORAGE DEVICES

NEW CONSTRUCTION —WITH METAL DECKING:

1. DETAIL D: CAST IN METAL DECK INSERT.
 - a. ZINC COATED ADJUSTABLE METAL DECK CEILING BOLT TYPE B3019 AS MANUFACTURED BY COOPER B-LINE. INSTALL BEARING PLATE ON TOP OF DECK RIBS.
 - b. METAL DECK HANGER AS MANUFACTURED BY ANVL INTERNATIONAL, TYPE A, B OR C. PLATE SHALL BEAR ON TOP OF DECK RIBS AS SHOWN.
 - c. AN APPROVED EQUAL. ANCHOR MUST BE DESIGNED SUCH THAT THE ALLOWABLE ANCHOR LOADING IS BASED ON A F.O.S. OF 4.0. ANCHOR CAPACITY SHALL BE GREATER THAN THE ALLOWABLE CAPACITY OF THE CONNECTING ROD, BASED ON A36 STEEL.
2. DETAIL F: HILTI HCL-MO CAST IN ANCHORS. 1/4", 3/8", OR 1/2". LARGER SIZES NOT ACCEPTABLE.
3. AN APPROVED EQUAL. ANCHOR MUST BE DESIGNED SUCH THAT THE ALLOWABLE ANCHOR LOADING IS BASED ON A F.O.S. OF 4.0, ANCHOR ALLOWABLE LOAD SHALL BE GREATER THAN THE HANGER ALLOWABLE LOAD, BASED ON A36 THREADED ROD.

NEW CONSTRUCTION —WITHOUT METAL DECKING:

1. CAST IN ANCHOR BOLT
 - A. DETAIL E: REQUIREMENT: MIN. 3/8" THICK PLATE, WITH NUT TOP AND BOTTOM. ADDITIONAL REINFORCEMENT AS SHOWN IN DETAIL.
 - B. DETAIL G: HILTI HCL-WF 1/4", 3/8", OR 1/2" WOOD FORM APPLICATIONS LARGER SIZES NOT ACCEPTABLE.
 - C. AN APPROVED EQUAL. ANCHOR MUST BE DESIGNED SUCH THAT THE ALLOWABLE ANCHOR LOADING IS BASED ON A F.O.S. OF 4.0, ANCHOR ALLOWABLE LOAD SHALL BE GREATER THAN THE HANGER ALLOWABLE LOAD, BASED ON A36 THREADED ROD.

2. DETAIL H: CHANNEL TYPE INSERT IN CONCRETE SLAB
 - A. UNISTRUT P3200 SERIES, P3300 SERIES, OR M24 (SPOT)
 - B. B-LINE B2505
 - C. AN APPROVED EQUAL

EXISTING CONSTRUCTION —WITH OR WITHOUT METAL DECKING:

1. DETAILS I AND J: CONCRETE ANCHORS

NOTE: FOR CONDITIONS WITH METAL DECKING, INSTALL AT TOP OF FLUTE WHERE FEASIBLE. DETAIL J IS NOT APPLICABLE FOR LIGHTWEIGHT CONCRETE SLABS.

 - A. HILTI HSL, HSLB, OR HDA UNDERCUT ANCHOR.
 - B. LIEBIG SAFETY BOLT, SUPERPLUS UNDERCUT ANCHOR.
 - C. AN APPROVED EQUAL MECHANICAL ANCHOR RATED FOR OVERHEAD, VIBRATION LOADING.
2. DETAILS K, L, M AND N: STEEL SUBFRAMING

REQUIREMENT: DESIGN IN ACCORDANCE WITH AISC OR AISI (COLD FORM APPLICATIONS)



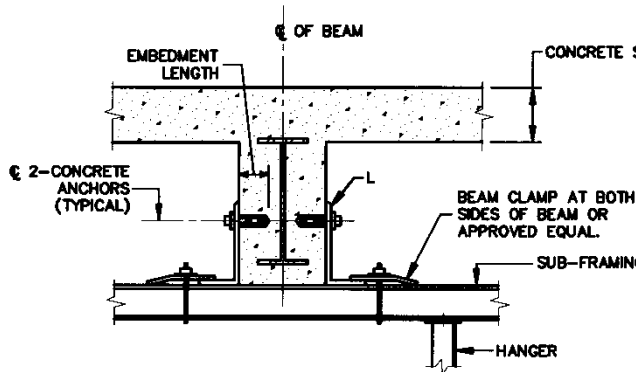
THE PORT AUTHORITY OF NY & NJ

**INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS**
FOR CEILINGS WITH A DL GREATER THAN 4PSF
TYPICAL CONNECTIONS TO STRUCTURE 2

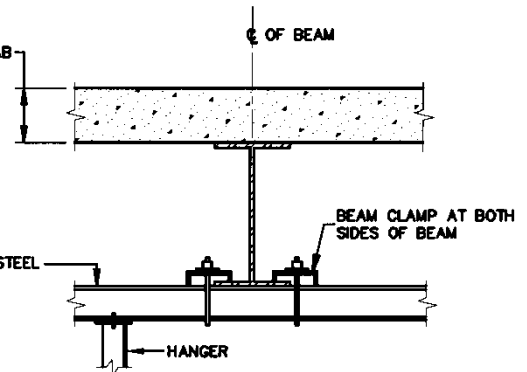
ATTACHMENT
S1

SHEET
7 OF 8

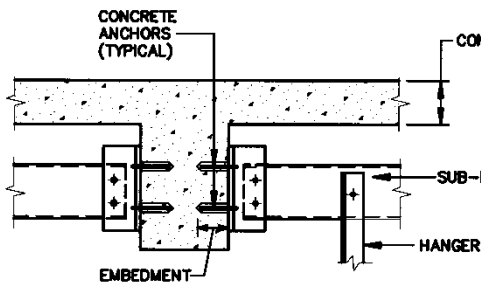
TYPICAL DETAILS FOR HANGER CONNECTION TO STRUCTURE



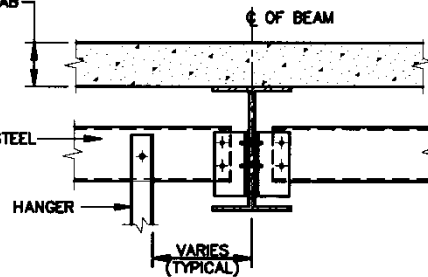
DETAIL - K
SUBFRAMING AT ENCASED BEAM



DETAIL - L
SUBFRAMING CLAMPED TO
STEEL BEAM



DETAIL - M
SUBFRAMING AT CONCRETE BEAM



DETAIL - N
SUBFRAMING CONNECTED
TO STEEL BEAM



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**INACCESSIBLE HEAVYWEIGHT
CEILING DESIGN STANDARDS**
FOR CEILINGS WITH A DL GREATER THAN 4PSF
TYPICAL CONNECTIONS TO STRUCTURE 3

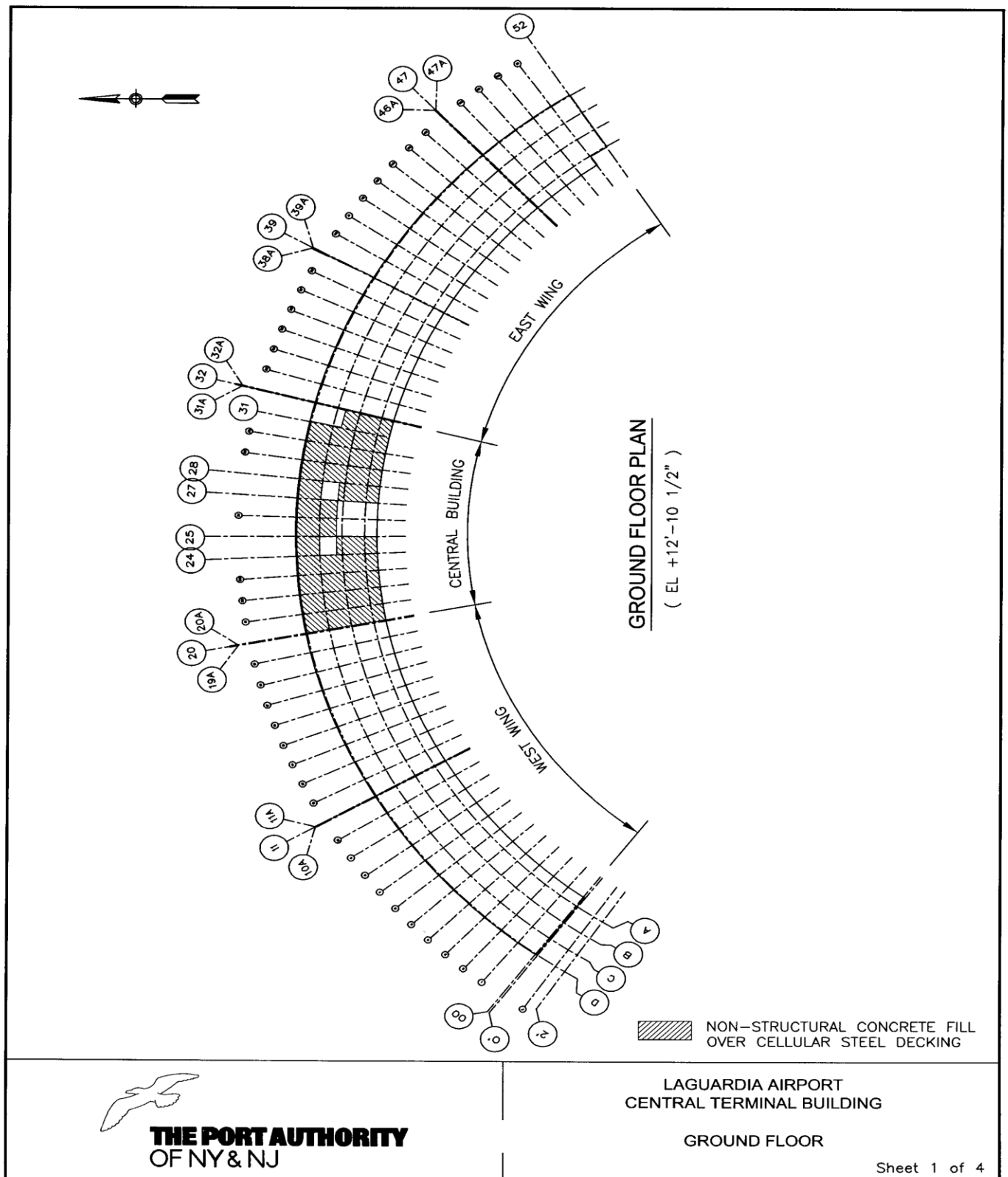
ATTACHMENT
S1

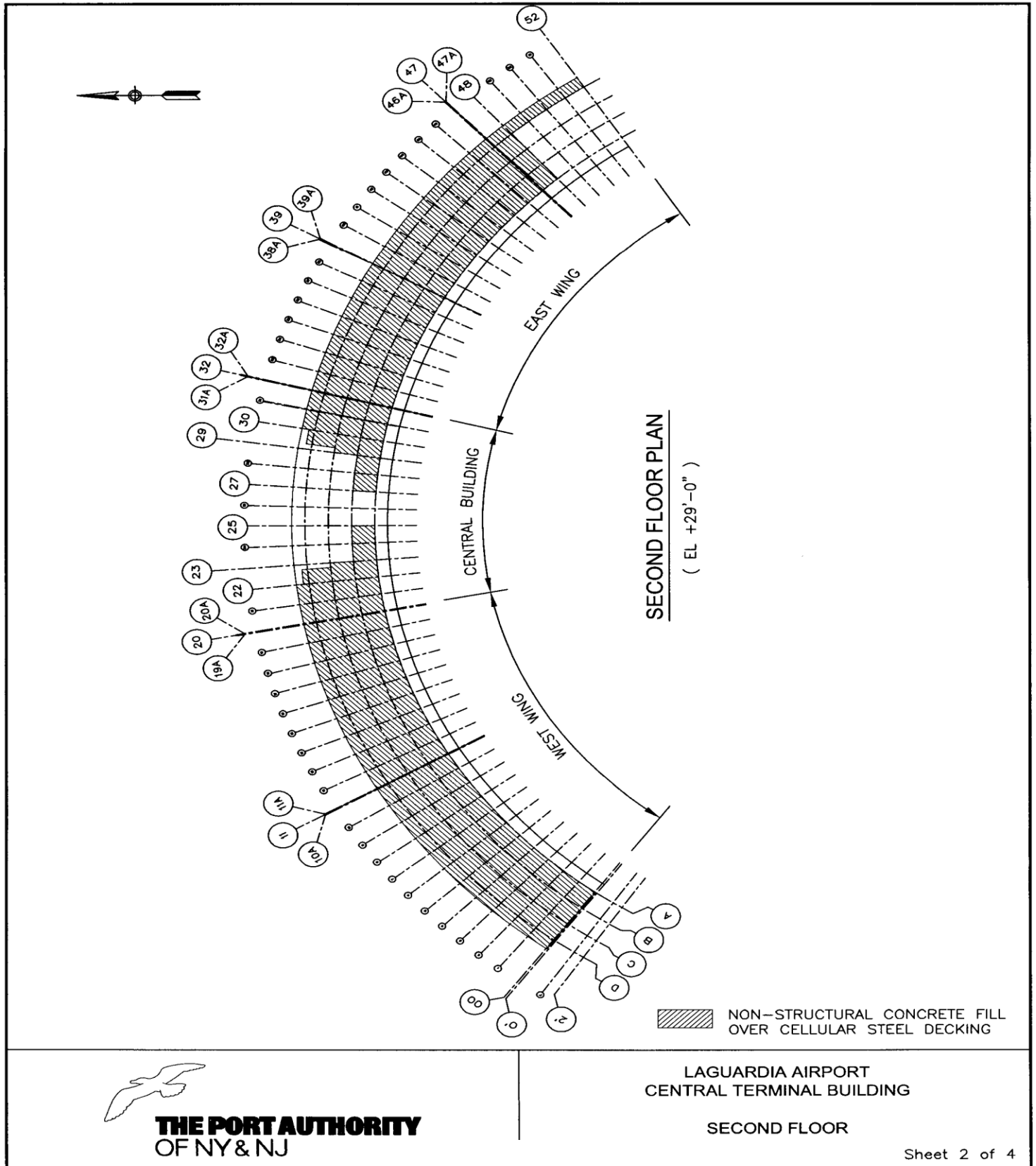
SHEET
8 OF 8

The design and installation of all ceiling suspension systems for acoustical tile and lay in panels weighing less than 4 lbs., shall comply with the following Port Authority criteria, in addition to the applicable requirements in the building codes:

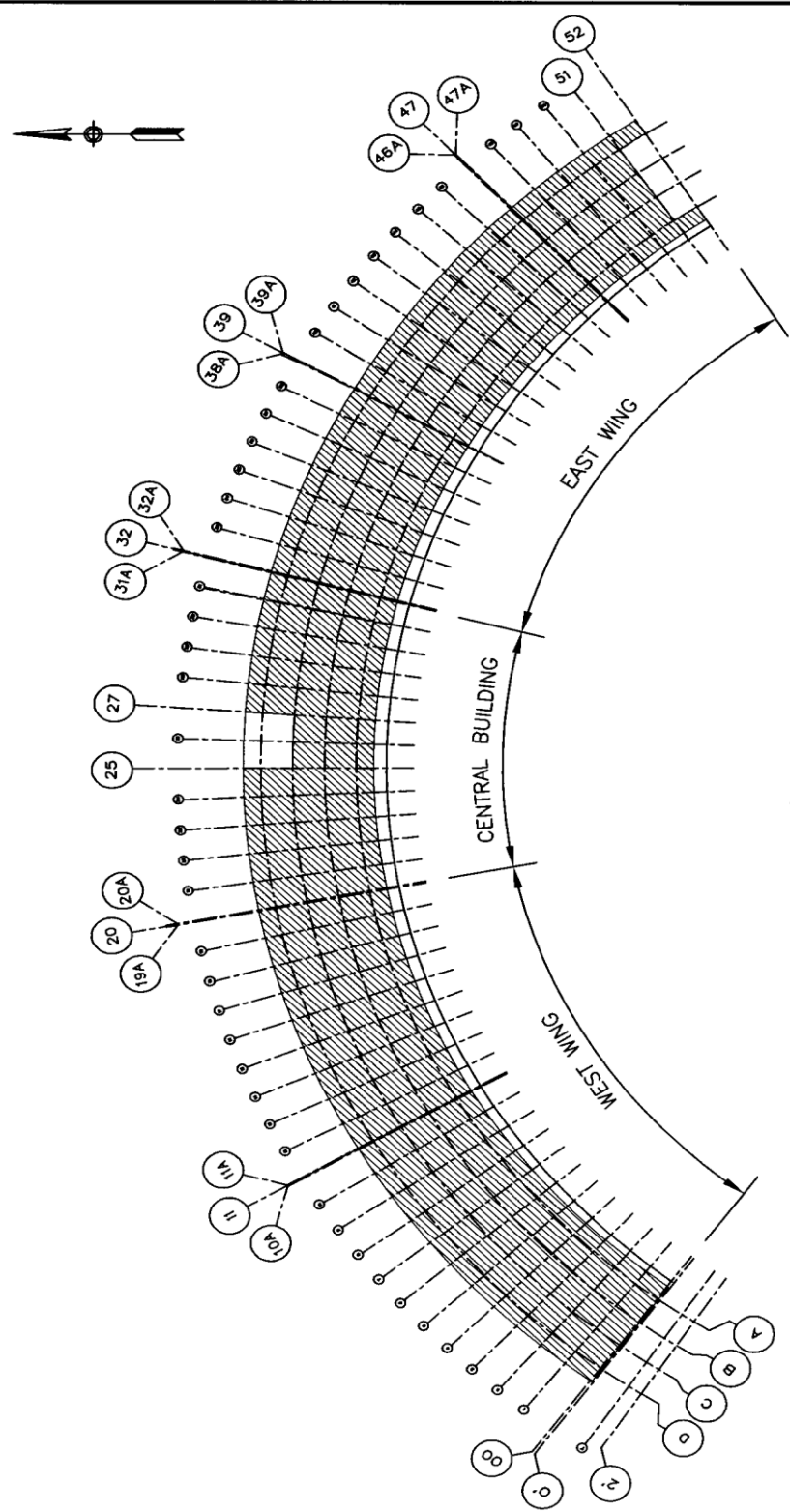
1. Integral metal deck hanger tabs and non-piercing type tabs shall not be used for top hanger connection.
2. The hanger and its connections shall be capable of supporting the total suspended load with a minimum factor of safety of four.

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S3-2



THIRD FLOOR PLAN
(EL +45'-0")

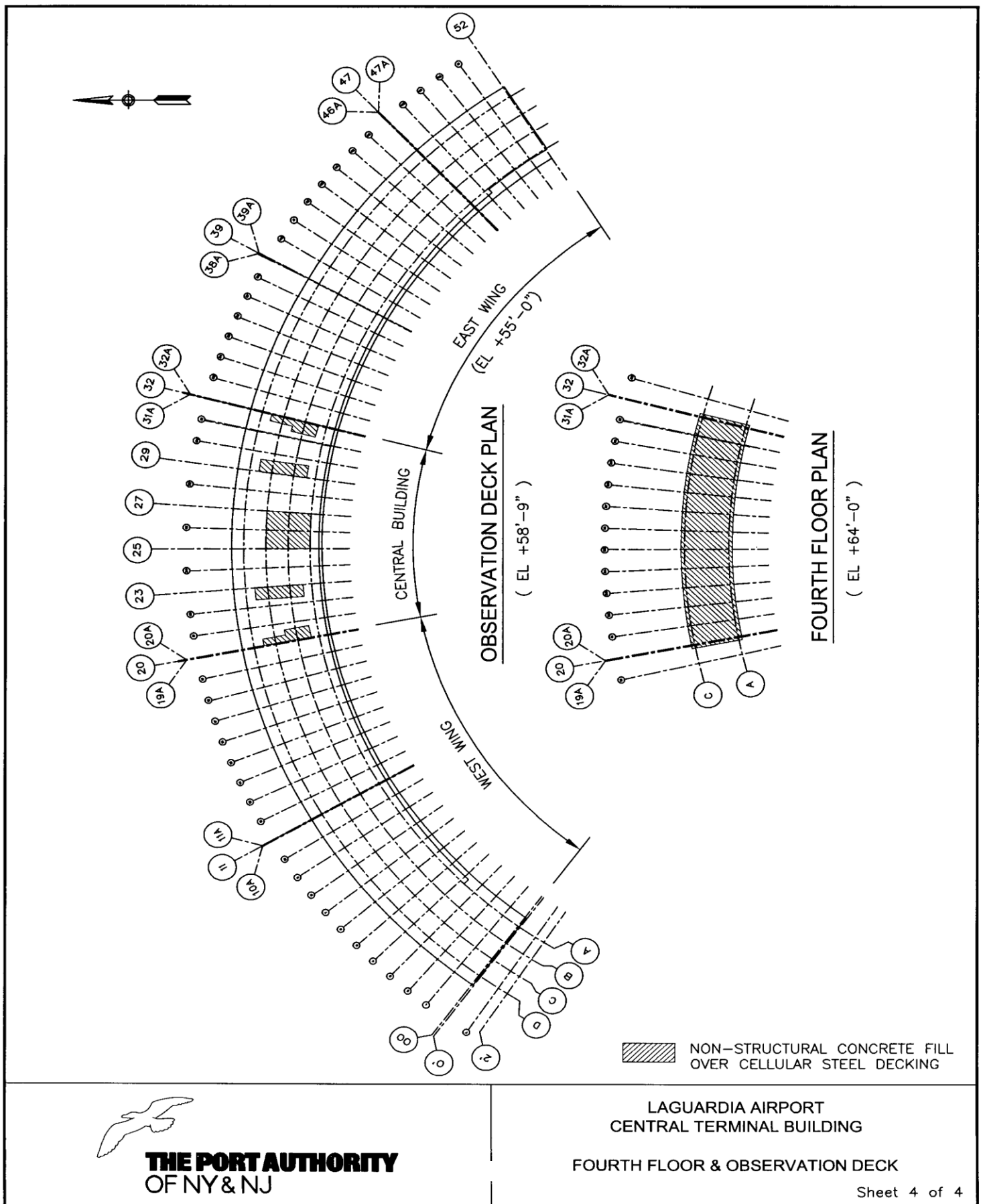
 NON-STRUCTURAL CONCRETE FILL
OVER CELLULAR STEEL DECKING



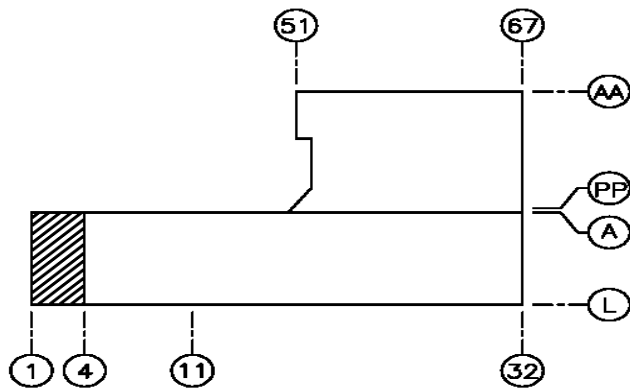
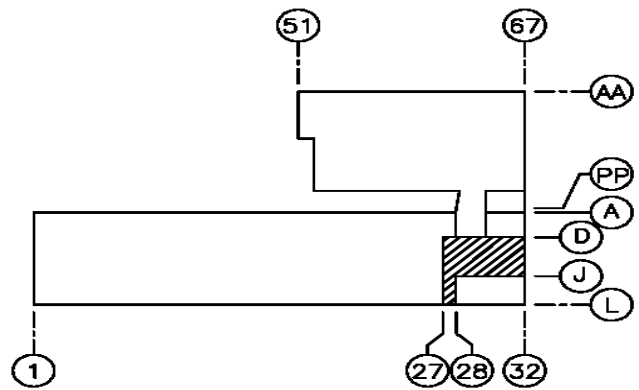
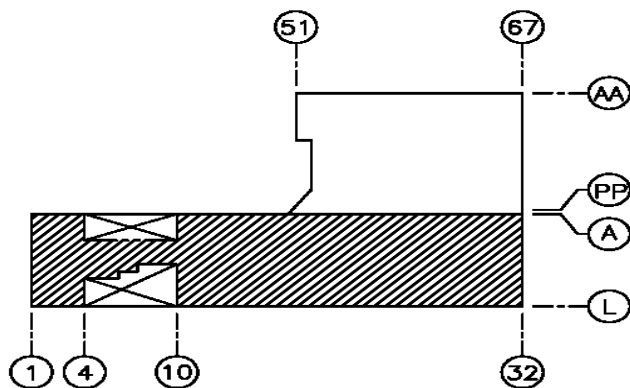
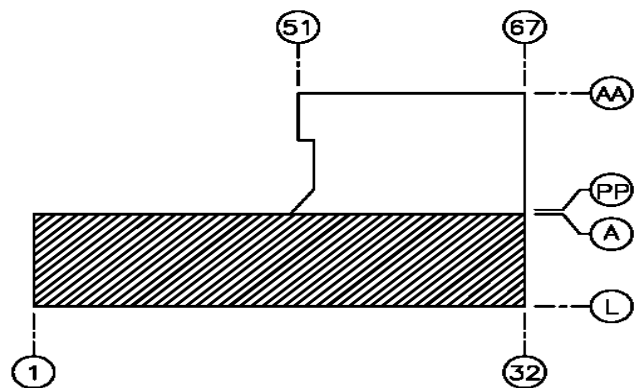
**THE PORT AUTHORITY
OF NY & NJ**

LAGUARDIA AIRPORT
CENTRAL TERMINAL BUILDING

THIRD FLOOR



S3-4

LOWER BUS LEVELSUBWAY MEZZANINEMAIN CONCOURSESUBURBAN CONCOURSE**NOTE:**

INDICATES LIGHTWEIGHT LOW STRENGTH CONCRETE FLOOR SLABS.
CONCRETE ANCHORS ARE NOT PERMITTED IN THESE SLABS FOR
SUPPORTING DUCTS, UTILITIES, CEILINGS AND OTHER
MISCELLANEOUS LOADS.

**THE PORT AUTHORITY
OF NY & NJ**



PORT AUTHORITY BUS TERMINAL
LIGHTWEIGHT CONCRETE SLAB AREAS

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<u>NUMBER</u>	<u>TITLE</u>
010.010-A	MANHOLE-AIRCRAFT (1 of 2)
010.010-B	MANHOLE-AIRCRAFT (2 of 2)
010.011	MANHOLE TYPE II PRE-CAST
010.012	SUBSURFACE DRAINS
010.013	MANHOLE TYPE "A" PRE-CAST
010.014-A	MANHOLE TYPE I (1 of 2)
010.014-B	MANHOLE TYPE I (2 of 2)
010.020	ADJUSTMENT OF MANHOLE 6" OR MORE
010.021	ADJUSTMENT OF MANHOLE AND CATCH BASIN 6" OR LESS
011.002	MANHOLE FRAME AND COVER-AIRCRAFT TYPE
011.003	AIRCRAFT MANHOLE SILT BUCKET
011.004	MANHOLE FRAME AND COVER
011.005	MANHOLE SILT BUCKET
020.001	STORM SEWER INLET
020.011	CATCH BASIN TYPE II CAST IN-PLACE
020.012	CATCH BASIN TYPE II PRE-CAST
020.013	CATCH BASIN TYPE III
020.014	HEAVY DUTY GRATING FOR RUNWAYS, TAXIWAYS, SAFETY AREAS AND APRONS
020.015	VAPOR TIGHT TRAP
020.019	CATCH BASIN TYPE IV CAST IN-PLACE
020.020	CATCH BASIN TYPE IV PRE-CAST
020.021	CATCH BASIN TYPE A PRECAST
025.001	MANHOLE STEP DETAIL
025.002	PROTECTIVE CONCRETE SLAB
030.011	LOW PRESSURE FIRE HYDRANT CONNECTION
030.012	LOW PRESSURE FIRE HYDRANT CONNECTION (ROD AND BANDS)
030.013	HIGH PRESSURE FIRE HYDRANT CONNECTION
030.014	HIGH PRESSURE FIRE HYDRANT CONNECTION (ROD AND BANDS)
030.015	FIRE HYDRANT CONNECTION-PN/EPMT
030.020	WATER PIPE RESTRAINED LENGTHS FOR MAINS
030.021	WATER MAIN CROSSING BELOW OBSTRUCTION
030.023	WATER PIPE RODDING LENGTHS FOR MAINS
030.024	FOUR-SECTION BAND AND ROD ASSEMBLY DETAILS
030.025	PIPE RODDING THRU WATERPROOF WALLS
030.026	FOUR-SECTION BAND AND RODDING ASSEMBLY FOR VALVES IN MAINS

ATTACHMENT C1 (continued)

<u>NUMBER</u>	<u>TITLE</u>
030.026	FOUR-SECTION BAND AND ARODDING ASSEMBLY FOR VALVES IN MAINS
030.044	DOMESTIC WATER SERVICE 1" TO 2" SIZES
030.050	REINFORCED CONCRETE ENCASEMENT FOR PIPES
041.001	STORM SEWER CRADLE
043.001	SANITARY SEWER CRADLE
043.002	PIPE JOINT DETAIL AT SANITARY MANHOLES
043.004	PIPE CLEANOUT DETAIL
050.013	VALVE SKIRT AND FOUNDATION OVER TAPPING VALVES
050.014	VALVE SKIRT AND FOUNDATION DETAIL
050.017	VALVE BOX-TYPE NJ
050.018	VALVE BOX-TYPE NY
050.019	FRAME AND COVER FOR SHIP SERVICE BOX (H2O LOADING)
050.022-A	16 INCH HORIZONTAL GATE VALVE- IN PIT (1 of 2)
050.022-B	PIPING LAYOUT (16 INCH VALVE CHAMBER) (2 of 2)
060.003-A	END OF CURB TREATMENT (1 of 3)
060.003-B	CURB TO HEADER TRANSITION (2 of 3)
060.003-C	CONCRETE CURB DETAILS (3 of 3)
060.003-D	INSTALL CONCRETE CURB IN EXISTING PAVEMENT
060.003E	CONCRETE ISLAND CURB TRANSITION DETAIL
060.004	STEEL FACE CURB-TYPE SF
060.005	RIGID BASED PAVEMENT RESTORATION
060.006	FLEXIBLE PAVEMENT RESTORATION
061.001	CONCRETE DOLLY PAD
062.001	FLEXIBLE PAVEMENT SECTIONS-LGA
062.003	LIME CEMENT FLYASH PAVEMENT SECTIONS
062.004	FLEXIBLE PAVEMENT SECTIONS-JFK/EWR
062.010	PORTS-MARINE TERMINAL PAVEMENT SECTIONS
062.011	STONE SHOULDER
062.012	PAVEMENT MEETING EXISTING PAVEMENT
062.013	PAVEMENT MEETING EXISTING FILL (ROADWAY)
062.014	PAVEMENT MEETING EXISTING FILL (PARKING LOT)
062.015	KEYWAY DETAIL
062.016	END AND CONTINUATION OF OVERLAY PAVING DETAIL FOR RUNWAYS AND TAXIWAYS
062.020	SIDEWALK DETAIL
062.021A	SIDEWALK CURB RAMP DETAILS (1 of 4)
062.021B	SIDEWALK DETECTABLE WARNING SURFACE DETAILS (2 of 4)
062.021-C	SIDEWALK CURB RAMP DETAILS (3 of 4)
062.021-D	SIDEWALK CURB RAMP DETAILS (4 of 4)
062.022	DROP CURB AND DRIVEWAY DETAILS
065.001	PAY LINES FOR TRENCH EXCAVATION
066.001	BEDDING DETAIL
066.002	BEDDING DETAIL (STORM)
070.076	SURVEY MARKER-TYPE 2
081.001	PARKING METER STANDARDS

ATTACHMENT C1 (continued)

<u>NUMBER</u>	<u>TITLE</u>
082.001	DETAIL OF RAILROAD TRACK IN OPEN PAVED AREAS
082.002	TRACKS IN UNPAVED AREAS
082.003	PAVEMENT AT CRANE RAIL-TYPE I
082.004	PAVEMENT AT CRANE RAIL-TYPE II
082.005	RUBBER RAILSEAL DETAIL
082.006	RUBBER RAILROAD CROSSING DETAIL
082.007	TRACKS BETWEEN DISTRIBUTION BUILDINGS
089.001	SETTLEMENT PLATES-TYPES 1 AND 2
090.001	PIEGUARD SPACING DETAILS
090.002	PIEGUARD WITH FOOTING
090.003	PIEGUARD WITH FOOTING (HEAVY DUTY)
090.004	STANDARD STEEL HYDRANT FENDER
090.005	PIEGUARD FOR BUS PARKING AREAS
090.010	METALLIC COATED CHAIN LINK FENCE-EWR
090.011	METALLIC COATED STEEL CHAIN LINK FENCE
090.012	8' HIGH PVC COATED CHAIL LINLK FENCE-1" MESH
090.013	GALVANIZED STEEL CHAIN LINK FENCE (STANDARD SECURITY)
090.014	GALVANIZED STEEL CHAIN LINK FENCE (MEDIUM SECURITY)
090.015	GALVANIZED STEEL CHAIN LINK FENCE (HIGH SECURITY)
090.016	BURIED CHAIN LINK FABRIC
090.017	FENCE "T" EXTENSION AT WHARF
090.020	TEMPORARY SEDIMENT BARRIER
090.030	PRE-CAST CONCRETE BUMPER AND TIMBER BUMPER
090.031	TIMBER BARRICADE-TYPE 1

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<u>SPEC. NO.</u>	<u>TITLE</u>
02073	CUTTING PATCHING AND REMOVAL (N 10-30-96).PDF
02150	SLABJACKING OF CONCRETE SLABS (N 2-3-97).PDF
02221	EXCAVATION BACKFILLING AND FILLING (N 12-28-98).PDF
02222	EXCAVATION BACKFILLING AND FILLING (NARROWSCOPE) (N 2-28-02).PDF
02231	AGGREGATE BASE COURSE (P 10-19-95).PDF
02241	LIME-CEMENT-FLYASH STABILIZED FILL SAND BASE (A 6-30-88).PDF
02274	GEOTEXTILES (N 4-11-02)).PDF
02452	RAILROAD TRACKWORK (OTHER THAN PATH RAIL TRANSIT) (N 1-17-96).PDF
02453	OPEN AREA TRACKWORK (PATH RAIL TRANSIT) (P 12-19-95).PDF
02464	BRIDGE TIE REPLACEMENT (N 1-16-96).PDF
02465	RAILROAD TIE REPLACEMENT (N 1-17-96).PDF
02466	BALLAST SURFACE AND ALIGN TRACK (N 10-30-96).PDF
02501	SILANE SEALER (N 6-6-00).PDF
02503	MAGNESIUM PHOSPHATE CONCRETE PATCHING (A).PDF
02506	CONCRETE PAVEMENT PATCHING (N 4-30-98).PDF
02507	PAVEMENT CRACK SEALING (N 2-3-97).PDF
02510	PORTLAND CEMENT CONCRETE PAVING (FAA) (N 4-8-99).PDF
02512	FIBROUS CONCRETE OVERLAY PAVEMENT (A REVISED 12-11-89).PDF
02514	ASPHALT CONCRETE BASE COURSE PAVING (N 8-1-94).PDF
02519	POLYMER CONCRETE PAVEMENT (N 12-19-95).PDF
02545	AERONAUTICAL PAVEMENT GROOVING AND REGROOVING (N 6-12-96).PDF
02551	ASPHALT CONCRETE PAVING (N 1-7-04).PDF
02555	ASPHALT BOND COAT (N 10-5-95).PDF
02557	COAL TAR EPOXY SEALCOAT (N 2-10-97).PDF
02561	APHALT CONCRETE PAVING (FAA) (A 1-31-05).PDF
02563	LATEX MODIFIED ASPHALT CONCRETE PAVING WITH BLENDED BITUMEN (FAA) (N 4-24-97).PDF
02564	ASPHALT CONCRETE PAVING WITH BLENDED BITUMEN (FAA) (N 4-24-97).PDF
02566	ASPHALT CONCRETE DRAINAGE MIX (N 8-9-96).PDF

ATTACHMENT C2 (continued)

<u>SPEC. NO.</u>	<u>TITLE</u>
02567	ASPHALT CONCRETE PAVING MEMBRANE (FAA) (N 8-9-96).PDF
02569	RUBBERIZED COAL TAR EMULSION SEALCOAT (N 2-3-97).PDF
02570	KERF CUTS FOR DRAINAGE (N 10-30-96).PDF
02571	KERF CUTS FOR ELECTRICAL CONDUITS (N 10-30-96).PDF
02574	ABRASIVE BLASTING OF PAVEMENTS (N 10-30-96).PDF
02575	PAVEMENT MILLING (N 10-30-96).PDF
02576	GRIT TAR SLURRY SEALCOAT (N 2-3-97).PDF
02577	LATEX MODIFIED CONCRETE (P 3-18-03).PDF
02578	PAVEMENT JOINT SEALING (P 3-20-03).PDF
02579	EMULSIFIED ASPHALT SLURRY SEALCOAT (N 10-30-96).PDF
02610	EXTERIOR SANITARY SEWER SYSTEM (P 12-14-95).PDF
02664	EXTERIOR WATER SUPPLY - DUCTILE IRON PIPE FOR CITY OF NEWARK- NJ FACILITIES (A 5-1705).PDF
02665	EXTERIOR WATER SUPPLY SYSTEM - DUCTILE IRON PIPE FOR NEW YORK FACILITIES (N 4-18-02).PDF
02666	EXTERIOR WATER SUPPLY - DUCTILE IRON PIPE FOR CITY OF ELIZABETH - NJ FACILITIES (A 5-1705).PDF
02667	EXTERIOR WATER SUPPLY - DUCTILE IRON PIPE FOR JERSEY CITY -NJ FACILITIES (N 11-27-00).PDF
02668	EXTERIOR WATER SUPPLY SYSTEM - STEEL PIPE NEW YORK FACILITIES (P 10-10-95).PDF
02711	SUBDRAINAGE SYSTEM (N 7-7-99).PDF
02720	MANHOLES AND DRAINAGE STRUCTURES (N 04-18-02).PDF
02721	STORM DRAINAGE SYSTEM (INFILTRATION-EXFILTRATION TESTING REQUIRED) (N 7-30-99).PDF
02722	STORM DRAINAGE SYSTEM (INFILTRATION-EXFILTRATION TESTING NOT REQUIRED) (N 7-30-99).PDF
02765	CLEANING STORM DRAINAGE AND SANITARY SEWER SYSTEMS (N 2-3-97).PDF
02831	PVC - COATED STEEL CHAIN LINK FENCE AND GATES (A-10-02-06).PDF
02832	METALLIC - COATED STEEL CHAIN LINK FENCE AND GATES (A 10-02-06).PDF
02837	STEEL ORNAMENTAL PICKET FENCE AND GATES (N 1-21-98).PDF
03100	CONCRETE FORMWORK (P 9-29-95).PDF
03200	CONCRETE REINFORCEMENT (P 9-29-95).PDF
03301	PORTLAND CONCRETE CEMENT - LONG FORM2.PDF
03302	PORTLAND CEMENT CONCRETE (SHORT FORM) (A 01-12-06)
03303	PLACEMENT OF PORTLAND CEMENT CONC (SHORT FORM) (A 01-12-06)
03740	ACRYLIC CONCRETE SEALER (P).PDF

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- 3.6.4 STANDARD METHOD
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4.2.4 PAVEMENT SMOOTHNESS AND GRADING NOTES

4.2.4.1 NOTES THAT SHOULD NOT BE

4.3 SPECIFICATIONS

5.0 REFERENCE MATERIALS

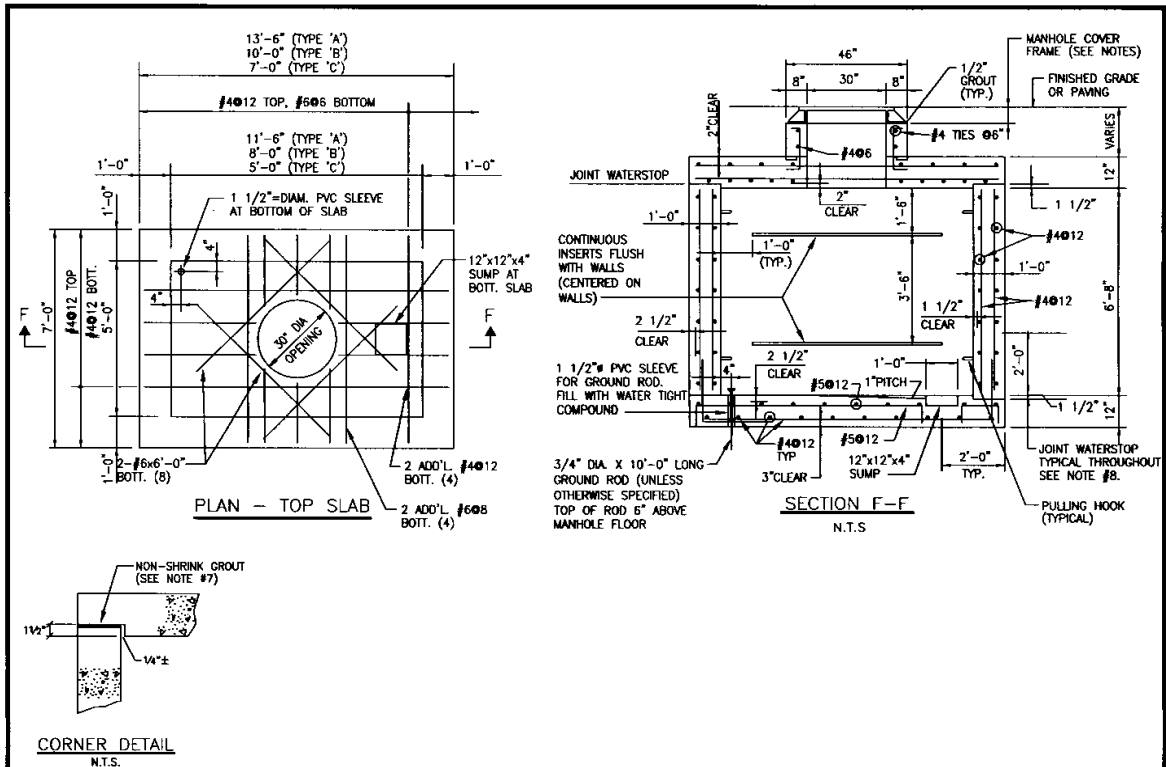
5.1 ALIGNMENT AND GRADING

5.1.1 GEOMETRIC DESIGN

5.1.2 SANITARY SEWERS

5.1.3 STORMWATER DRAINAGE

5.1.4 WATER SUPPLY



NOTES

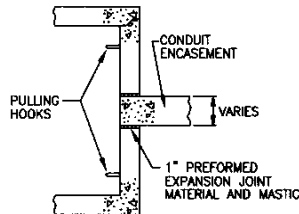
1. MANHOLE FRAMES AND COVERS RATED TO SUPPORT HS25-44 TRUCK LOADS SHALL BE CAST IRON. COVER SHALL HAVE STAINLESS STEEL BOLTS (TYPE 304) AND NON-PENETRATING PICKHOLES. FOR COVER MARKINGS SEE DETAILS ON THIS DRAWING. MANHOLE FRAME AND COVER SHALL BE CAMPBELL FOUNDRY #1012 OR APPROVED EQUAL.
- MANHOLE FRAMES RATED TO SUPPORT AIRCRAFT LOADS SHALL BE DUCTILE IRON. MANHOLE COVERS RATED TO SUPPORT AIRCRAFT LOADS SHALL BE DUCTILE IRON. COVER SHALL HAVE STAINLESS STEEL BOLTS (TYPE 304) AND NON-PENETRATING PICKHOLES. FOR COVER MARKINGS SEE DETAILS ON THIS DRAWING. MANHOLE FRAME AND COVER SHALL BE CAMPBELL FOUNDRY #1511 OR APPROVED EQUAL.
2. MINIMUM SPLICE LENGTHS REQUIRED FOR REINFORCING BARS:
#4 BAR 1'-4"; #5 BAR 1'-8"; #6 BAR 2'-0"
3. REINFORCING BARS SHALL BE ASTM A-615 GRADE 60.
4. ALL PRE-CAST CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF P.A. SPECIFICATION SECTION 03420. CONCRETE SHALL BE HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS.
5. WHEN THE HEIGHT OF THE COLLAR THAT SUPPORTS THE MANHOLE COVER IS LESS THAN 4 INCHES, A SINGLE COURSE OF SOLID CONCRETE MASONRY MAY BE USED TO SUPPORT THE COVER. IF MASONRY IS USED, MASONRY SHALL BE 3 5/8" WIDE x 7 5/8" LONG x HEIGHT OF COLLAR. IF THE COLLAR IS GREATER THAN 4 INCHES HIGH, THE COLLAR SHALL BE POURED IN PLACE CONCRETE.
6. ALL CAST-IN-PLACE CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF P.A. SPECIFICATION SECTIONS 03302 AND 03303 WITH A 28 DAY DESIGN COMPRESSIVE STRENGTH OF 4000 PSI. IN ADDITION WHERE SPECIFICALLY CALLED FOR ON THE PLANS, VERY HIGH EARLY STRENGTH CONCRETE SHALL HAVE A SIX HOUR DESIGN COMPRESSIVE STRENGTH OF 2000 PSI. THE CONTRACTOR HAS THE OPTION OF PRECASTING THE COMPONENTS OF THE MANHOLE. HOWEVER, THE REINFORCEMENT SHOWN ON THESE SHEETS IS THE MINIMUM THAT SHALL BE PROVIDED. SUBMIT DETAILS TO THE ENGINEER.
7. GROUT SHALL BE NON-SHRINK, NON-METALLIC GROUT IN CONFORMANCE WITH ASTM C1107, GRADE C. USE ONE OF THE FOLLOWING, OR AN APPROVED EQUAL:
1. "MASTERFLOW 928" AS MANUFACTURED BY MASTER BUILDERS
 2. "FIVE STAR GROUT" AS MANUFACTURED BY FIVE STAR PRODUCTS, INC.
 3. "EUCO NS GROUT" AS MANUFACTURED BY THE EUCOLD CHEMICAL COMPANY.
8. WATERSTOP:
- FOR CAST-IN-PLACE CONCRETE, WATERSTOP SHALL BE ONE OF THE FOLLOWING:
1. "SWELLSEAL JOINT" AS MANUFACTURED BY DENEFF CONSTRUCTION CHEMICALS, INC., WALLER, TX.
 2. "HYDROTITE-CJ-1020" AS MANUFACTURED BY GREENSTREAK, ST. LOUIS, MO.
 3. "ADEKA ULTRA SEAL MC-2010MC" AS DISTRIBUTED BY OCM, INC. CHICAGO, ILLINOIS
9. IF AN ORGANIC SOIL LAYER IS ENCOUNTERED AT THE BOTTOM OF THE EXCAVATION FOR THE MANHOLE, THE MINIMUM OF 3 FEET OF OVER EXCAVATION OF THE SOIL LAYER SHALL BE REQUIRED. REPLACEMENT SHALL BE WITH 1-12 MATERIAL IN ACCORDANCE WITH P.A. SPECIFICATION SECTION 02221.
10. DUCT BANKS SHALL PENETRATE THE NARROW WALLS OF A MANHOLE ONLY.
11. CONDITIONS SHALL BE TERMINATED WITH END BELL FLUSH WITH INSIDE WALL.

**THE PORT AUTHORITY** OF NY & NJ

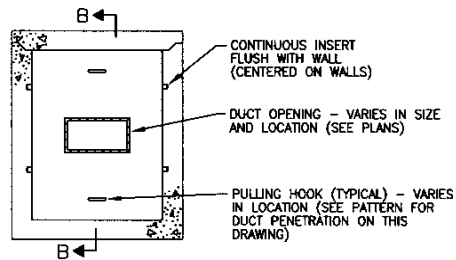
ELECTRICAL MANHOLE

ATTACHMENT E1

SHEET
E1



SECTION B-B



ELEVATION

TYPICAL DETAIL OF WINDOW & SIDING
CONNECTION FOR DUCT
 N.T.S.

NOTES

1. DUCT BANKS SHALL PENETRATE THE NARROW WALLS OF A MANHOLE ONLY.
2. CONDUITS SHALL BE TERMINATED WITH END BELL FLUSH WITH INSIDE WALL.
3. INSERTS SHALL BE HOT DIPPED GALVANIZED STEEL UNISTRUT, (GALVANIZED IN ACCORDANCE WITH ASTM A123 AND A153,) SERIES P-3200, OR APPROVED EQUAL, COMPLETE WITH END CAPS OF SIMILAR MATERIAL AND FINISHED WITH PLASTIC COATED FILLER.

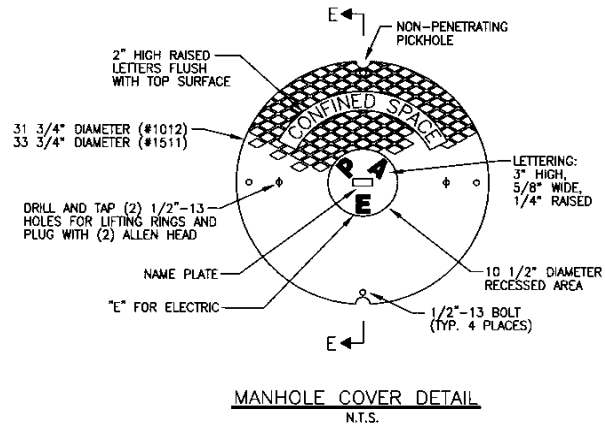
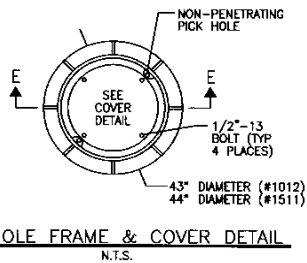
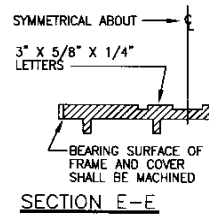
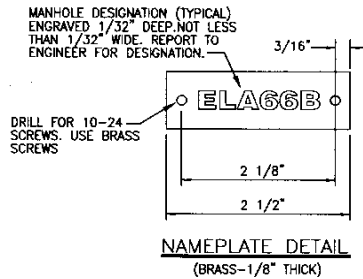


THE PORT AUTHORITY OF NY & NJ

**WINDOW & SIDING
 CONNECTION FOR DUCTS**

ATTACHMENT E2

**SHEET
 E2**



NOTES

- MANHOLE FRAMES AND COVERS RATED TO SUPPORT HS25-44 TRUCK LOADS SHALL BE CAST IRON. COVER SHALL HAVE STAINLESS STEEL BOLTS (TYPE 304) AND NON-PENETRATING PICKHOLES. FOR COVER MARKINGS SEE DETAILS ON THIS DRAWING. MANHOLE FRAME AND COVER SHALL BE CAMPBELL FOUNDRY #1012 OR APPROVED EQUAL.
- MANHOLE FRAMES RATED TO SUPPORT AIRCRAFT LOADS SHALL BE DUCTILE IRON. MANHOLE COVERS RATED TO SUPPORT AIRCRAFT LOADS SHALL BE DUCTILE IRON. COVER SHALL HAVE STAINLESS STEEL BOLTS (TYPE 304) AND NON-PENETRATING PICKHOLES. FOR COVER MARKINGS SEE DETAILS ON THIS DRAWING. MANHOLE FRAME AND COVER SHALL BE CAMPBELL FOUNDRY #1511 OR APPROVED EQUAL.
- WHEN THE HEIGHT OF THE COLLAR THAT SUPPORTS THE MANHOLE COVER IS LESS THAN 4 INCHES, A SINGLE COURSE OF SOLID CONCRETE MASONRY MAY BE USED TO SUPPORT THE COVER. IF MASONRY IS USED, MASONRY SHALL BE 3 5/8" WIDE x 7 5/8" LONG x HEIGHT OF COLLAR. IF THE COLLAR IS GREATER THAN 4 INCHES HIGH, THE COLLAR SHALL BE POURED IN PLACE CONCRETE.

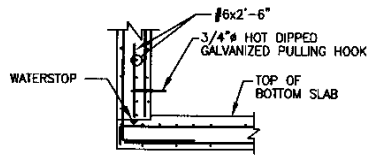
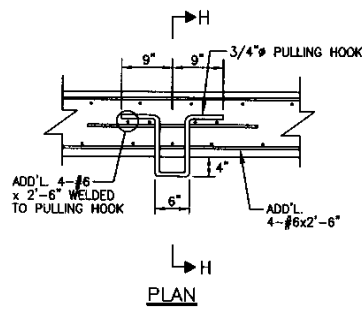


THE PORT AUTHORITY OF NY & NJ

FRAME AND COVER

ATTACHMENT E1

SHEET
E3



SECTION H-H

TYPICAL DETAIL OF
PULLING HOOK
N.T.S.

NOTES

1. PULLING HOOK SHALL BE ASTM A36 STEEL, HOT DIPPED GALVANIZED IN ACCORDANCE WITH ASTM A153. STEEL SHALL BE WELDED TO REINFORCING. WELDED AREA SHALL BE PREPARED AND CLEANED IN ACCORDANCE WITH SECTION 09910 PART 3.01E AND 3.02F.4 AND SHALL BE PAINTED WITH GALVANIZING ZINC RICH REPAIR PAINT IN ACCORDANCE WITH ASTM A780.



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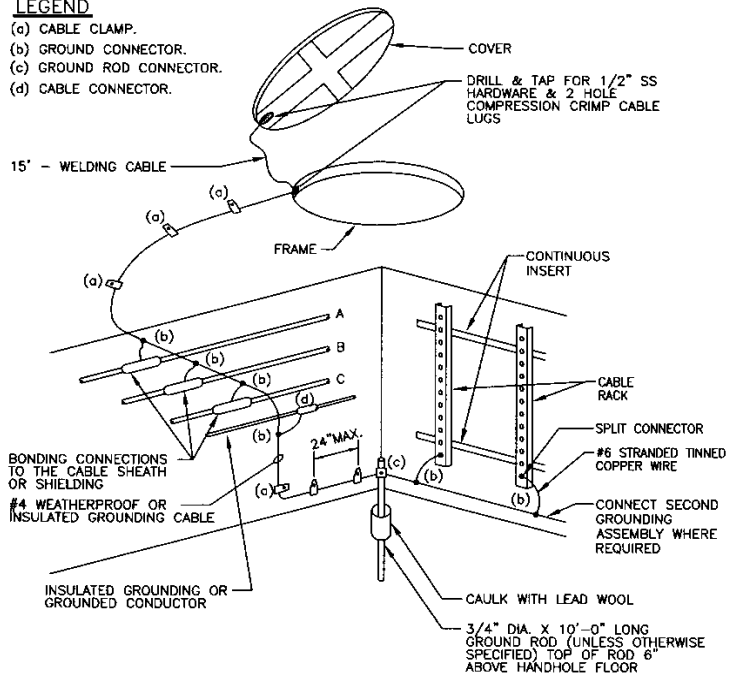
PULLING HOOK

ATTACHMENT E1

SHEET
E4

LEGEND

- (a) CABLE CLAMP.
- (b) GROUND CONNECTOR.
- (c) GROUND ROD CONNECTOR.
- (d) CABLE CONNECTOR.



GROUNDING OF ELECTRICAL MANHOLES
N.T.S

NOTE

1. PAINT ALL GROUND CONNECTIONS WITH ASPHALT BASE PAINT.

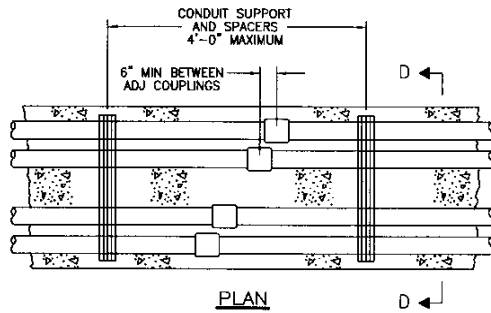


THE PORT AUTHORITY OF NY & NJ

GROUNDING ASSEMBLY

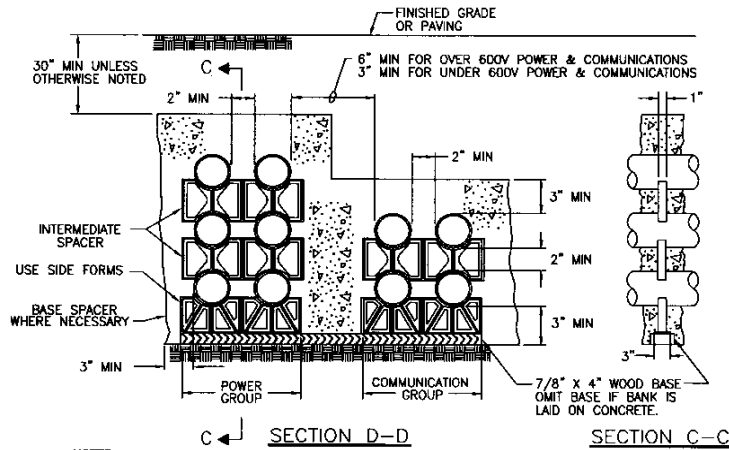
ATTACHMENT E1

**SHEET
E5**



NOTES

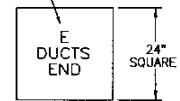
1. DUCTS UNDER VEHICULAR ROADWAYS OR OTHER AREAS (PARKING LOTS, RUNWAYS, TAXIWAYS, ETC.) WHERE TRUCKS, AIRCRAFT OR OTHER HEAVY EQUIPMENT TRAVEL SHALL BE CONCRETE ENCASED WITH VERY HIGH EARLY STRENGTH CONCRETE THAT HAS A SIX HOUR DESIGN COMPRESSIVE STRENGTH OF 2000 PSI. CONCRETE SHALL CONFORM TO THE REQUIREMENTS OF PA SPECIFICATION SECTION 03302.



NOTES:

1. FOR SIZE AND NUMBER OF CONDUITS AS WELL AS DUCTBANK FORMATION, SEE PLANS.
2. COMMUNICATIONS CONDUIT GROUP SHALL BE SEPARATED FROM THE POWER GROUP ON EITHER LEFT OR RIGHT SIDE AS SHOWN ON PLANS.

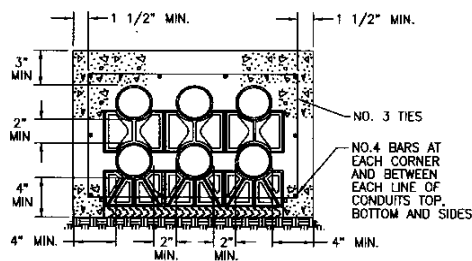
E FOR POWER DUCTS
C FOR COMMUNICATION DUCTS
E AND *C* FOR A COMBINATION OF SUCH DUCTS, WHICHEVER IS APPLICABLE



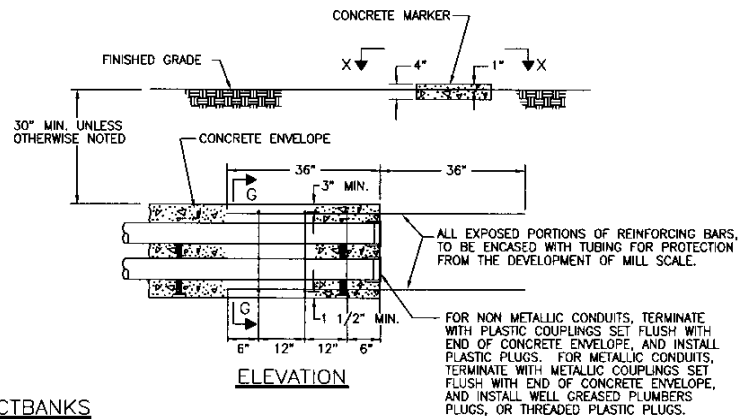
LETTERS SHALL BE 4" x 3" WITH A STROKE 1/2" WIDE

PLAN X-X

DUCTBANK DETAILS - TYPICAL ARRANGEMENT



DEAD-ENDING DUCTBANKS



THE PORT AUTHORITY OF NY & NJ

DUCT BANK DETAILS

ATTACHMENT E1

SHEET
E6

A. ELECTRICAL SERVICE OPTIONS**1. Rent Inclusion:**

Tenant shall finish and install a 265/460 or 208/120 volt feeder in a conduit sized for the anticipated tenant load, from the Bus Terminal point of electrical distribution to the perimeter of the leasehold, and terminate in a junction box. All electrical distribution, step-down transformers, wiring, panels, boxes, and lighting shall be provided by the tenant.

2. Metered Service:

Tenant shall furnish and install a conduit sized for the anticipated tenant load, and terminate in a junction box. Install the conduit from the 265/460 or 208/120 volt tenant switchboard to the perimeter of the leasehold. All electrical distribution, step-down transformers, wiring, panels, boxes, and lighting shall be provided by the tenant. The tenant shall be required to furnish and install a 200A, 3 phase, 7 point bypass meter pan whenever a metering system does not exist for a location, or when the existing meter pan is not sufficient for the tenant's load.

B. TELEPHONE SERVICE

An empty conduit shall be installed by the Tenant from the Bus Terminal point of telephone distribution to the perimeter of the leasehold.

C. CONDUITS AND CONDUCTORS**1. Conduits**

- a. Minimum conduit size shall be 3/4-inch.
- b. Maximum EMT size shall be two (2) inches.
- c. All outdoor exposed conduit shall be rigid galvanized steel.
- d. PVC conduits shall not be installed in any indoor area.

2. Conductors

- a. General

Minimum wire size for power shall be #12 AWG copper.

b. Fire Alarm

All fire alarm cables shall be New York City approved, shielded, twisted pair #14 AWG, solid copper, 200-degree C, 600V, except control circuits shall be unshielded.

D. GROUNDING

1. Whenever a grounding conductor is required (including feeders to motor loads greater than 1/8-horsepower), a separate ground wire shall be installed.
2. Ground-fault protection shall be provided for all receptacles and equipment located near running water, such as electrical water coolers.

E. TENANT FIRE ALARM SYSTEM

1. General

- a. The design of tenant fire alarm systems shall comply with the City of New York Building and Electrical Codes, and shall be compatible with the existing Bus Terminal fire alarm system.
- b. The tenant fire alarm system shall utilize both automatic and manual initiating (detection) devices and audible and visual notification (signaling) appliances.
 - i. Systems shall utilize either conventional or multiplex technologies. The use of addressable/intelligent systems is required.
 - ii. In cases where microprocessor software programmable systems are utilized a fully functional and manufacturers licensed copy of the software program, Manuals and accessories shall be provided to the Authority as part of the system.
 - iii. In all cases the occupants of the facility shall be able to clearly hear, and as required, clearly see the system alarm signal(s).
 - iv. All system components (Detectors, Signals, Modules, etc.) shall be UL Listed and cross listed for use with the system control panel.

- c. Power to the smoke detection and fire alarm equipment shall be taken via fused cutouts connected to the line terminals of the nearest emergency electrical panel.
2. The tenant fire alarm system shall be fully compatible with the existing Bus Terminal System.

F. HVAC SMOKE DETECTORS

1. The tenant shall provide smoke detectors in the HVAC systems which have been listed by Underwriters Laboratories, and approved by the New York City Building Department. Detectors shall sense products of combustion. Detectors shall not be subject to an alarm due to the rapid change of humidity.

G. AREA SMOKE DETECTORS

The Tenant shall provide smoke detector over each leasehold entrance to the public corridor.

H. LOCAL CONTROL PANEL AND EMERGENCY POWER SUPPLY

1. The local control panel shall be fully compatible with the Bus Terminal fire alarm system.
2. Emergency power supply for local control panel shall have a back-up battery supply system of ample capacity and approved by the PA.
3. The local control panel shall be wired with provisions for tie-in with the building's fire alarm system. Tenant shall provide conduit and wire to the nearest point of connection to the building fire alarm system. Terminations to the building fire alarm system shall be performed by the PA.
4. All "tenant-required" sprinkler alarms shall be wired to addressable device adapter modules as manufactured by Cerberus.

I. EMERGENCY SMOKE PURGE MANUAL PULL STATION

1. The tenant shall install a manual pull station with break glass rod, provided with an engraved nameplate with the legend "EMERGENCY SMOKE PURGE".
2. For Smoke Purge Activation, See Section 18, Attachment M1.

J. SPRINKLER ALARMS

Sprinkler alarms have been provided by the Port Authority. However, should the tenant require his own internal alarm, he must conform to the Section titled "Local Control Panel and Emergency Panel Supply."

The following Design Criteria shall be used to properly size and design tenant HVAC and smoke purge systems to meet the Port Authority (PA) Standards for the Bus Terminal.

A. GENERAL

1. The tenant HVAC systems are to be designed so that conditioned air is not taken from air conditioned public spaces.
2. The tenant shall provide complete automatic temperature controls to control the space conditions in his area.
3. Chilled water will be shut down during the winter season.
4. Heating hot water for HVAC will be shut down during the summer season.
5. Steam for HVAC will not be provided during the summer season.
6. A time clock shall be provided for off-hours A.C. shutdown by the tenant.
7. The tenant shall furnish and install automatic dampers for temperature control and smoke purge requirements.

B. OUTSIDE AIR

A duct will provide each leasehold with outside air, filtered and preheated to 37°F minimum, if required. The final design criteria for the use of outside air shall be:

- | | | |
|----|--|---------------------------------|
| 1. | Minimum | 0.30 cfm/sf |
| 2. | Maximum | 1.2 cfm/sf |
| 3. | Supply Pressure at connection to PA duct | Not less than 0.00 inches water |

C. SPILL AIR

A spill air duct connection will be provided for each leasehold not having direct access to spill air discharge louvers, allowing for the carrying away and discharge of spill air directly to the outdoors.

Spill air CFM should equal outside air CFM less any local exhaust, and an exfiltration allowance of approximately 10% of supply air quantity.

Return or spill air fan shall be sized to satisfy the smoke purge Requirements, as described hereinafter under Smoke Purging; otherwise, a separate smoke purge system, including a dedicated smoke purge exhaust fan, shall be provided by the Tenant.

D. CHILLED WATER

Valved supply and return connections will be provided by the PA with a cooling capacity as follows: To maintain leasehold at 78°F, 50% RH, with 0.30 cfm/sf outside air at 91°F DB, 75°F WB, 6 watts/sf electrical load, 50 sf/person occupancy, plus solar exposure and transmission heat gain, where such exists.

Chilled water temperature: Supply is 45°F, return is 60°F. Available pressure differential between supply and return is 12 psi, and working pressure is 125 psig. The Control valve shall be two-way modulating type and valve operations shall be sized to shut the valve against a 50 psig differential. Tenant shall provide the drain piping necessary to carry the cooling coil condensate from his A/C equipment, for spillage into tenant's own drain facility.

E. STEAM (SOUTH WING ONLY)

A valved connection for steam will be provided by the PA with 15 psig at the point of connection. A valved connection at the PA's condensate return line will also be provided by the PA for connection by the Tenant.

F. HEATING HOT WATER (NORTH WING ONLY)

Valved supply and return connections will be provided by the PA as follows:

To provide heating capacity for the tenant HVAC system such that a leasehold is maintained at 70 °F indoor temperature, with 5°F outdoor.

Heating hot water range is 180°F supply 140°F return.

Available pressure differential between supply and return is 6 psi, working pressure is 125 psf. Control valve shall be two-way modulating type, and valve operator shall be sized to shut the valve against a 50 psig differential pressure.

A baseboard radiation heating system is provided for leasehold(s) exposed to the outdoors, sized to maintain a 50°F minimum leasehold, with 5°F outdoors, when the tenant HVAC system is not operating.

G. SMOKE PURGING

1. Fan Capacity:

The Tenant shall install a new exhaust fan to provide exhaust at a minimum of 1.5 cfm/sf or 6 air changes per hour, whichever is greater, for a store with a closed storefront, or a minimum 200 FPM velocity through an open storefront leading to the public areas, when the smoke purge is automatically or manually activated.

2. Equipment:

- a. The entire smoke purge system, including exhaust fan, damper, discharge louver, duct connection to outdoors, etc., shall be furnished and installed by the tenant.
- b. Where applicable, and if adequate size is available, the existing spill air duct may be utilized as a smoke purge exhaust duct. Connection to existing spill air duct shall be provided by the tenant.

3. When the return air fan is used for smoke purge, the tenant shall provide all necessary motorized dampers in spill and return air ducts.

4. Concourse-to-Tenant Space Make-up Air Transfer Duct:

The tenant shall provide transfer duct with motorized fire damper, to permit flow of make-up air from the concourse to the tenant space during smoke purge operation.

H. TEMPERED OUTSIDE AIR SUPPLY

A capped connection is provided from a tempered (37°F) air duct, located in the concourse ceiling. Tenant shall furnish and install all ductwork from this connection to his A/C equipment.

I. ELECTRICAL WIRING

Refer to Section 18, Attachment E2 for electrical wiring requirements for HVAC.

J. SMOKE DETECTORS

1. The tenant shall provide smoke detectors in the return air duct, as well as downstream of the filters in the air handling unit supply duct. In addition, the tenant shall provide area smoke detectors on the basis of a minimum of one (1) area detector per 900 sf. For requirements of duct and area smoke detector, refer to Section 18, Attachment E2.
2. HVAC and Area Smoke Detectors shall:
 - a. Provide an audio-visual signal at the Local Control Panel, specified herein in Section 18, Attachment E2.
 - b. Activate the smoke purge mode of the tenant's A.C. system.

K. HVAC CONTROL - SMOKE PURGE MODE

1. Automatic Smoke Purge Cycle:

Upon activation of an HVAC or area smoke detector, an alarm shall be initiated, the supply air fan shall stop, the outside air and return air dampers shall close, the spill air damper shall open fully, and the return air fan, if designated as a smoke purge fan, shall keep running; otherwise, it shall also stop, and the dedicated smoke purge fan shall start, bypassing all other controls.

In the event that activation of the area smoke detector(s) occurs at night when the A.C. system is off, the return air fan, if designated as a smoke purge fan, or the dedicated smoke purge fan shall start, and the dampers shall be positioned as described above.

2. Manual Smoke Purge Cycle:

- a. Local manual control shall originate from the local control panel, specified in Section 18, Attachment E2.
- b. Provision shall also be made for accomplishing the tenant's smoke purge cycle remote-manually from the manual pull station, specified herein in Section 18, Attachment E2.

L. LOCAL CONTROL PANEL AND EMERGENCY POWER SUPPLY

For requirements for the local control panel, and for the emergency power supply to the local control panel, refer to Section 18, Attachment E2.

M. MANUAL PULL STATION/BREAK GLASS EMERGENCY SWITCH (TENANT SPACES)

Install a manual pull station with break glass rod. For requirements, refer to Section 18, Attachment E2.

N. KITCHEN EXHAUST

Tenants requiring kitchen exhaust systems shall provide New York City approved hoods, ductwork, grease/vapor removal devices, and fire extinguishing equipment.

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The following Design Criteria shall be used to properly size and design tenant plumbing and fire protection systems to meet the Port Authority (PA) Standards for the Bus Terminal.

A. GENERAL

1. Control valves shall be located in spaces immediately accessible to PA staff at all times.
2. Hangers shall be supported from building steel framing members. Where none are available, miscellaneous steel supports between building framing members shall be provided.
3. When shutdowns of existing systems become necessary, the Contractor shall notify the Port Authority Engineer who will make the necessary arrangements required for the shutdown. Notification of any planned shutdown shall be made to the Port Authority Engineer at least 72 hours in advance.

B. PLUMBING

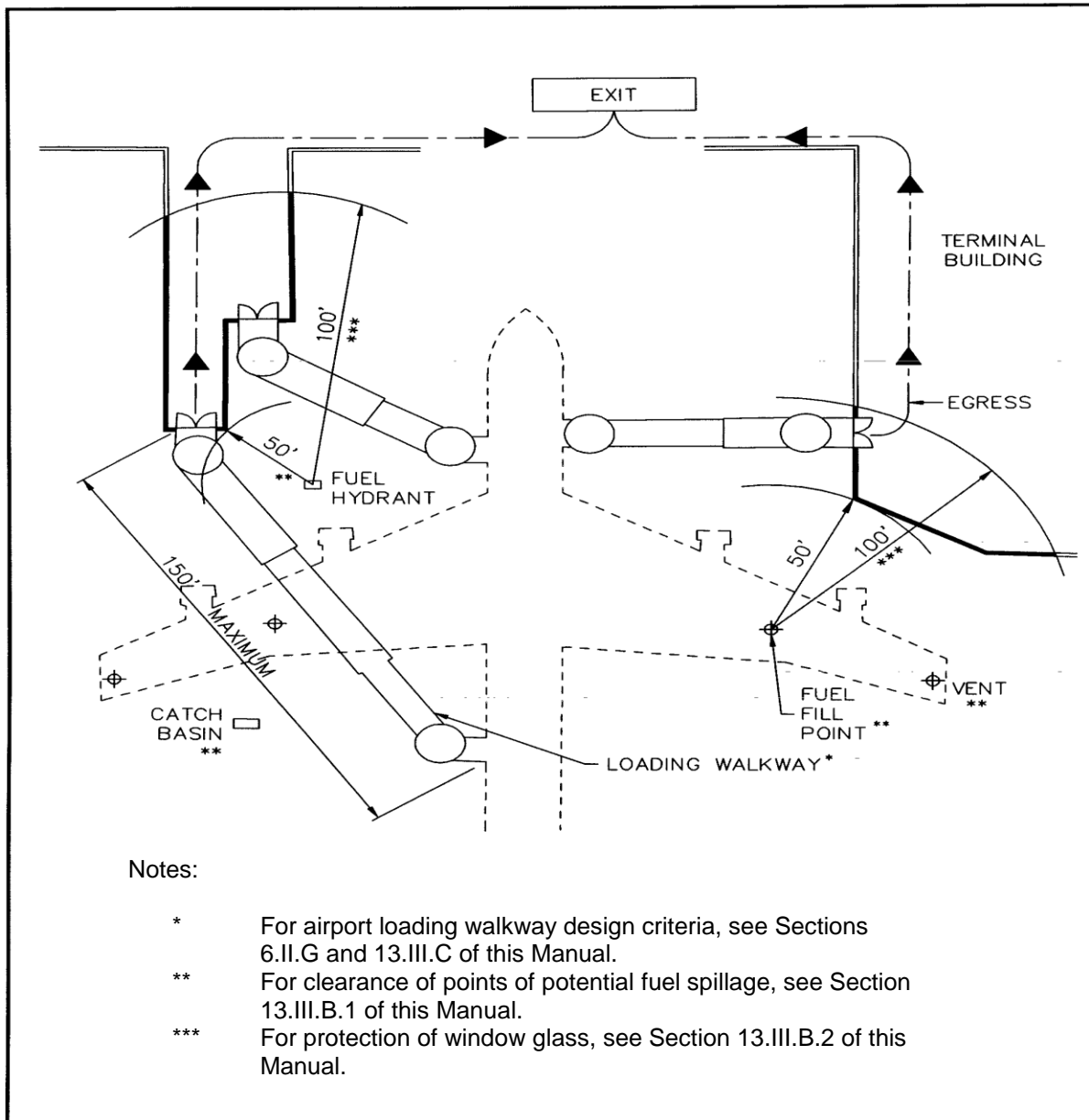
1. All sanitary piping 4 in. and larger shall be service weight cast iron "No-Hub" with couplings consisting of a neoprene gasket and stainless steel clamp assembly. Couplings shall be "Clamp-All" or manufactured by Clamp-All Corporation, or "Husky" SD Series 4000, as manufactured by Anaheim Foundry Company.
2. Support "No-Hub" cast iron piping at 5'-0" intervals and on each side of each coupling assembly.

C. FIRE PROTECTION

All tenant spaces shall be sprinklered.

1. Sprinkler systems shall be hydraulically designed. A pipe schedule design may be used only for minor renovation work that doesn't change the number of heads and relocates only a few existing sprinkler heads.
2. All sprinkler piping shall be standard weight, Schedule 40 black steel pipe. All dry and pre-action sprinkler system piping and fittings shall be galvanized.

3. Victaulic fittings are not permitted to be used for size 2-1/2 in. and under unless otherwise approved.
4. Supervised valves shall be installed with tamper switches.



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The following criteria shall govern the landscape architectural design at the airports.

A. GENERAL

The goal is to provide a quality landscape environment that complements the design elements (roadways, signage, exits and entrances to frontages and parking facilities and residual open space) serving the airport patron while providing a minimum of attractants to birds,

In order to achieve this goal a successful landscape must satisfy these objectives:

1. A design that is approved by the FAA/USDA Wildlife Damage Control Division.
2. A design that is incorporated into an area suitable for vigorous plant growth and maintenance.
3. A design that includes a sustainable form of irrigation.
4. A design that includes under a separate, stand-alone landscape contract that requires a minimum two-year maintenance follow up by the installing Contractor, who shall have as his superintendent over the entire installation and maintenance a State Certified Arborist knowledgeable and experienced in this type of Work.
5. A landscape design least likely to attract birds should have the following qualities:
 - a. Avoid plant material and design features that provide birds with a source of food, water, cover and spatial domain.
 - b. Canopy trees should be planted in linear rows, canopies spaced 15-20 feet apart at maturity. Adjacent canopies should never be touching.
 - c. Shrubs and small trees should be used moderately and not be planted under or directly adjacent to canopy trees.
 - d. Shrub beds should be small in size and discontinuous.
 - e. Flowering ornamental trees should be limited in quantity.

- f. Groundcover should be well-manicured, healthy, dense, moderately tall lawn, a fruitless low growing groundcover, gravel or bark mulch.
- g. All plants should be planted at the same size and time.

B. PLANT MATERIAL

1. Trees:

Trees shall be selected that meet the following criteria:

- a. To withstand pollution and tough urban environments
- b. To tolerate wind and drought
- c. To tolerate excessive road de-icing salts and salt laced prevailing winds
- d. To be unattractive to birds as a food source and meet FAA approval
- e. To be unattractive to birds as a roosting site and meet FAA approval
- f. To be primarily deciduous, since evergreen trees are an ideal bird habitat
- g. To have interesting flowers, fall color, size, shape or habit
- h. To be obtainable on the commercial market

Sample List:

Gleditsia triacanthos 'Halka'
Moraine Honeylocust
Quercus phellos
Willow Oak
Zelkova serrata
Japanese Zelkova

2. Ornamental trees:

Ornamental trees shall meet the same criteria as trees

Sample List:

Chioanthus virginicus

Fringe Tree
Cornus x Ruth Ellen
Stellar White Dogwood
Koelreuteria paniculata
Golden Rain Tree
Malus Spring Snow (Fruitless)
Spring Snow Crabapple
Parrotia persica
Persian Parrotia
Syringa reticulata 'Ivory Silk'
Ivory Silk Lilac

3. Shrubs and groundcover:

Shrubs and groundcovers shall meet the same criteria as trees.

Abelia x grandiflora
Diervilla lonicera 'Copper'
Diervilla sessilifolia 'cool Splash'
Glossy Abelia
Bush Honeysuckle
Forsythia x 'Goldtide'
Goldtide Forsythia
Hamamelis 'Arnold Promise'
Arnold Promise Witchhazel
Hydrangea paniculata 'Limelight'
Limelight Hydrangea
Hydrangea quercifolia
Oakleaf Hydrangea
Itea virginica 'Henry Garnet'
Itea
Juniperus chinensis sargentii
Sargent's Chinese Juniper
Spiraea nipponica 'Snowmound'
Snowmound Spirea
Syringa meyeri 'Palibin'
Lilac
Taxus x media wardii
Ward's Yew
Weigela florida 'Red Prince'
Purple Leaf Weigela

4. Seasonal display:

Caryopteris x clandonensis 'Blue Mist'
Blue Mist Caryopteris
Echinacea purpurea 'Magnus'
Magnus Purple Coneflower

Eupatorium purpureum 'Big Umbrella'
Big Umbrella Joe Pye Weed
Eupatorium purpureum 'Gateway'
Gateway Joe Pye Weed
Hemerocallis 'Happy Returns'
Happy returns Daylily
Hemerocallis 'Stella de Oro'
Stella de Oro Daylily
Nepeta faassenii 'Walkers Low'
Walkers Low Catmint
Pennisetum alopecuroides "Cassian"
Cassian Fountain Grass
Rudebeckia fulgida 'Goldsturm'
Black-eyed Susan
Sedum x 'Autumn Joy'
Autumn Joy Sedum
Stachys byzantina 'Helene von Stein'
Lambs Ear

5. Bulbs

Daffodil x 'Ice Follies'
Ice Follies Daffodil
Daffodil x 'King Alfred'
King Alfred Daffodil

6. Lawn

Select cultivars that can thrive on low nutrient, low water availability and that are "95% endophyte enhanced" variety.

C. STANDARDS

1. Federal Aviation Administration (FAA) AC 15/5200-33B – Hazardous Wildlife Attractants on or near Airports, August 28, 2007
2. USDA- Asian Long Horned Beetle Quarantine and Regulations
3. American Standard For Nursery Stock, ANSI Z60.1-2014, AmericanHort
4. Airport Certification Manual (ACM) compliant