Elevator Modernization – Summary of Scope of Work
(As of 11/1/2000)

Shuttle Elevators

Removal of existing equipment, designing, fabricating, delivering and installing an operating overlay prior to ordering full modernization.

Removal of existing equipment, designing, fabricating, delivering and installing a complete modernized elevator.

Remove existing motor generator, design, deliver and install new silicone controlled rectifier (SCR) power conversion units.

Design, fabricate, deliver and install revised emergency power operation line starter selection.

Removal of existing hall call fixture and designing, fabricating, delivering, and installing of a new hall call fixture.

Removal of existing hall lanterns and designing, fabricating, delivering and installing of new hall lanterns.

Removal of existing jamb markers and designing, fabricating, delivering and installing of new jamb markers.

Design, fabricate, deliver and install new car to lobby (CTL) key switch with updated wiring changes.

Local Elevators

Removal of existing equipment, designing, fabricating, delivering and installing an operating overlay prior to ordering full modernization.

Removal of existing equipment, designing, fabricating, delivering and installing a complete modernized elevator including SCR drives and microprocessor based controllers.

Design, fabricate, deliver and install new car to lobby (CTL) key switch with updated wiring changes.

Design, fabricate, deliver and install revised emergency power operation line starter selection.

Removal of existing hall call fixture and designing, fabricating, delivering and installing of a new hall call fixture.

Removal of existing hall lanterns and designing, fabricating, delivering and installing of new hall lanterns.

Removal of existing jamb markers and designing, fabricating, delivering and installing of new jamb markers.

Freight Elevators

Removal of existing equipment, designing, fabricating, delivering and installing an operating overlay prior to ordering full modernization.

Removal of existing equipment, designing, fabricating, delivering and installing a complete modernized elevator including SCR drives and microprocessor based controllers.

Removal of existing door protective devices and designing, fabricating, delivering and installing of door protective devices.

Provide new freight elevator hall lanterns at each landing served. This includes designing, fabricating, delivering and installing new hall lanterns.

Removal of existing jamb markers and designing, fabricating, delivering and installing of new jamb markers.

Status of WTC Elevator Modernization Program
(as of 11/1/2000)

	1 WTC		
	Complete	In Progress	Future
Local	56	3	13
Low-Rise	0	0	8
High-Rise	6	0	7
Freight	2	0	4

	2 WTC		
	Complete	In Progress	Future
Local	37	2	33
Low-Rise	0	0	8
High-Rise	6	2	5
Freight	1	0	5

	4 WTC		
	Complete	In Progress	Future
Local	11	0	1
Freight	0	0	2

	5 WTC		
	Complete	In Progress	Future
Local	7	1	1
Freight	0	0	2

	SUBGRADE		
	Complete	In Progress	Future
	0	0	15

SUB-GRADE ELEVATORS

ELEVATORS SERVING SUB-GRADE ONLY

ELEVATOR	FLOORS SERVED
K2	Front: B1 Rear: B4, B5, B6
K1	1, B1
FE5	B1-B3
FE8	43-44
J4	1, B1
FE1	B2, B1, 1
FE2	B2, B1, 1
FE3	B1, 1, 2-9
FE4	B1, 1, 2-9

ELEVATORS SERVING SUB-GRADE IN ADDITION TO OTHER FLOORS

ONE WORLD TRADE CENTER

ELEVATOR NUMBERS 50, 7, 49, 17, 48, 5, ARMOR CAR, ALL "J" CARS, 36, 41, 42, 47, 35, 30, 29, 24.

TWO WORLD TRADE CENTER

ELEVATOR NUMBERS 50, 7, 49, 17, 48, 5, ARMOR CAR, ALL "K" CARS, 36, 41, 42, 47, 35, 30, 29, 24.

TENANT ELEVATORS AND ESCALATORS

FIVE WORLD TRADE CENTER

UNIT TYPE	UNIT NUMBER	FLOORS SERVED	# OF UNITS
ESCALATOR	CSE 1 AND CSE 2	2 TO 3AND 3 TO 2	2
ESCALATOR	NONE	1 TO 2, 2-3 AND 3-2	3
HYDRAULIC ELEVATOR	BORDERS BOOK STORE	1,2,3	1

FOUR WORLD TRADE CENTER

UNIT TYPE	UNIT NUMBER	FLOORS SERVED	# OF UNITS
ELEVATOR	1 AND 2	1, 3, 4, 5 6	2
ELEVATOR	SWISS BANK	NOT AVAILABLE	1

RETAIL ESCALATORS

We have been informed by the Vertical Transportation Department of the Port Authority of NY and NJ that these units incur unusually high maintenance costs due to high traffic volume and also due to the fact that these escalators are used to transport handcarts and other wheeled carriages.

ONE WORLD TRADE CENTER

NONE

TWO WORLD TRADE CENTER

NONE

FOUR WORLD TRADE CENTER

ESCALATORS NEAR LIBERTY STREET BETWEEN HSBC ATM AND NEWS STANDS (2 UNITS) (E14 AND E15)

ESCALATORS BETWEEN AU BON PAIN (E17 AND E18), VICTORIA'S SECRET AND BATH AND BODY WORKS

FIVE WORLD TRADE CENTER

CONCOURSE TO PLAZA (E19 AND E20)

ESCALATORS BETWEEN NINE WEST AND TOURNEAU STORES (2 UNITS) (E1 AND E2)

ESCALATORS TO SIX WORLD TRADE CENTER NEXT TO CHOICE COURIER (2 UNITS)

ELEVATOR MAINTENANCE

We performed a visual inspection of the 21 pre-selected elevators and a few escalators in buildings One, Two, Four, and Five World Trade Center, we have gathered that the equipment has to be closely monitored by the Vertical Transportation Department of the World Trade Department. We have also reviewed maintenance evaluation reports submitted by an independent third party based upon their field observations. These reports indicate deficiency items mostly related to house keeping, some of which remain to be corrected. The indications on the third party reports in reference to the preventive maintenance practices range from "acceptable" to "marginally acceptable" with "definite room for improvement in the area of housekeeping". Nevertheless, it appears from the correspondence we observed and during our general discussions that a great deal of close monitoring and follow up from the Vertical Transportation Department is required for the elevator maintenance company to respond to schedule requests as well as perform preventive maintenance. We understand that the elevator company does not inform the PA about any past problems or future repairs that need to be scheduled as a result of which the problems persist.

Additionally, we reviewed the maintenance callback sheets listed previously after which we performed a visual inspection of additional machine rooms in One World Trade Center and Two World Trade Center. This field visit revealed a large amount of rouged cables and bad machine bearings. The rouged cables are contributing largely to the amount of dust and dirt in the machine room, on the machine room equipment and secondary equipment. This condition will most likely cause contact failures, electrical shorts and other potential hazards to the equipment and its workers. There was a significant amount of bad machine bearings observed which are causing noise and vibration in the machines. If this is not corrected soon more serious damage will be caused to the hoist machines.

It was also noted that a few elevators had temporary jumpers on the controller, which is not a generally accepted practice in the elevator industry and could be potentially dangerous.

The following section describes some of the significant deficiencies that we observed all of which are covered under the full-service maintenance contract in effect.

SIGNIFICANT MAINTENANCE ITEMS

ONE WORLD TRADE CENTER

Major Maintenance Items:

1. Excessive dust in all machine rooms observed
2. Rouged cables on Elevators 74, 1, 4, 66, 58, and 60
3. Cables with breaks on Elevators 63 and 64

4. Defective machine bearings on Elevators 72, 46 and 61

Other Maintenance Items:

Elevators Nos. 63 - 68:
Elevator No. 63 - Many breaks in cables.
Elevator No. 64 - Many breaks in cables.
Elevator No. 65 - Relevels many times, Cables are filthy
Elevator No. 66 - Slightly rouging of hoist cables.
Elevator No. 68 - Excessive carbon dust in hoist motor.

Elevators Nos. 57 - 62:
Elevator No. 58 - Cables have excessive rouging - all in machine.
Elevator No. 59 - Carbon dust excessive in hoist machine.
Elevator No. 60 - Rouge in cables
Elevator No. 61 - Vibration in main bearing and excessive carbon dust in machine.

Elevators Nos. 49, 69 - 74:
Elevator No. 49 - Four temporary jumpers on controller. Large amount of dust in hoist machine and motor.
Elevator No. 69 - Excessive rouge dust in hoist machine.
Elevator No. 72 - Bad main bearing - whole machine rocks.
Elevator No. 73 - Rouge dust around and in internal brake.
Elevator No. 74 - Excessive cable rouge - all over and in machine.
Rouge on Machine room floor.

Elevator No. 16 - Cable has broken lay. Secondary rouged cables - rouge all over machine room. We were informed that one of the hoist cables broke, started untwisting and came in contact with metal causing a spark, which started a fire in secondary. Elevator shut down for repairs.

Elevator No. 74 - Cables rouged - Rouge all over machine room.

Elevator No. 72 - Bad main bearing - machine rocks.

Elevator No. 1 - Excessive cable rouging condition and excessive oil on brake pads.

Elevator No. 4 - Excessive cable rouge.

Elevator No. 46 - Bad main bearing and cables are rouged.

TWO WORLD TRADE CENTER

Major Maintenance Items:

1. Rouged cables on Elevators 8, 9, 63-68 ,72, 2, 7, K5, 26 and 28.
2. Bad machine bearings on Elevators 11, 56, 73 and 26
2. Excessive dust in machine room.

Other Maintenance Items:

Elevators Nos. 1-5:
No. 1 Elevator - Carbon dust in hoist motor - cables rouged all over. Oil on brake pads.
No. 2 Elevator - Cables rouged all over - Pie Plate Selector very noisy.

Elevators Nos. 6, 7, 50 and 99: Carbon dust in all hoist motors
No. 6 Elevator - Oil on brake pads.
No. 7 Elevator - Rouged cables caused excessive rouge deposits all over machine.
No. 49 Elevator - Jumper on controller, rouge all in controller, carbon dust excess in hoist motor.

Elevators Nos. 12 - 17: Dust in all machines
Elevator No. 16 - Excess carbon dust in hoist motor & rouge on drive sheaves.
Elevator No. 14 - Car oil seepage in main bearing sheave side

Elevators Nos. K3 - K5:
Elevator No. K5 - Rouge on cables - Not bad.

Elevators Nos. 24-29:
Elevator No. 26 - Bad main bearing and cable rouging.
Elevator No. 28 - Cable have rouging - rouge in hoist machine.
Elevator No. 27 - Rouge dust in hoist machine.

Low Rise Shuttles
Elevator No. 8B - Cables rouged causing rouge all over machine room.
Elevator No. 9B - Cables rouged causing rouge all over machine room.
Elevator No. 10B - Low Brushes and rouge all over machine room.
Elevator No. 11B - Bad main bearing and rouge all over machine room.

Elevators Nos. 51 - 56:
Elevator No. 56 - Bad main bearing

Elevators Nos. 57 - 62:
Elevator No. 62 – Full size hoist motor brushes are not in contact with commutator. Many brushes are low.

Elevators Nos. 63 - 68:
Elevator No. 63 - Cables rouged.
Elevator No. 64 - Cables rouged.
Elevator No. 65 - Cables rouged.
Elevator No. 66 - Cables rouged causing rouge all over hoist machine.
Elevator No. 67 - Cables rouged causing rouge all over hoist machine.
Elevator No. 68 - Cables rouged all over, and oil leak in main bearing.

Secondary – There are thick amounts of rouge all over. Generator copper shavings inside and carbon excessive

Elevators Nos. 69 - 74:
Elevator No. 72 - Car cables rouged; rouge all over machine room.
Elevator No. 73 - Main bearing real bad, whole machine shakes.

MAINTENANCE ITEMS

The two OCC Deck reports show many long outstanding maintenance items, some dating as far back as March 2000. This is indicative of poor response from the elevator company.

CALLBACKS

The following charts summarize the callback information that was provided to us as indicated in item #6 under the list of documents reviewed.

A review of the charts will indicate an excessive amount of callbacks on both old units and new units. Although all callbacks may not be attributed to poor maintenance, they are a good indicator of preventive maintenance and while difficult to eliminate totally, can be minimized with a good maintenance program in place. The excessive callbacks shown on the charts for some units are especially unacceptable on the modernized elevators. (The average number of callbacks (>2 only) for new units (for 15 months) is 5.75 for One World Trade Center and 3.45 for Two World Trade Center). As per one of the major elevator manufacturers and installers, an acceptable shutdown frequency for a controller related problem would be one per year per elevator.

ELEVATORS WITH >2 CALLBACKS

MONTH	ONE WORLD TRADE CENTER			TWO WORLD TRADE CENTER		
	OLD UNITS	NEW UNITS	TOTAL	OLD UNITS	NEW UNITS	TOTAL
Apr-99	73	9	82	48	3	51
May-99	45	13	58	58	14	72
Jun-99	58	22	80	34	13	47
Aug-99	29	20	49	17	10	27
Sep-99	20	29	49	36	14	50
Nov-99	34	46	80	40	14	54
Jan-00	21	9	30	32	10	42
Feb-00	34	15	49	18	16	34
Mar-00	34	37	71	51	10	61
Apr-00	16	29	45	31	18	49
May-00	30	25	55	29	6	35
Jul-00	25	37	62	29	6	35
Aug-00	25	14	39	29	7	36
Sep-00	6	21	27	21	4	25
Oct-00	17	42	59	44	7	51
TOTAL	467	368	835	517	152	669

TOTAL UNITS WITH >2 CALLBACKS		
	ONE WORLD TRADE CENTER	TWO WORLD TRADE CENTER
Apr-99	15	10
May-99	11	14
Jun-99	18	11
Aug-99	11	7
Sep-99	8	11
Nov-99	17	14
Jan-00	9	10
Feb-00	13	7
Mar-00	17	12
Apr-00	8	13
May-00	13	10
Jul-00	10	12
Aug-00	11	8
Sep-00	7	5
Oct-00	13	11

SECTION V – EXISTING PROPERTY DESCRIPTIONS & CONDITIONS

A. Overall Project

Building Type	Commercial Office Building
Built-Circa	1971
Certificate of Occupancy	A Certificate of Occupancy has not been issued by the City of New York because property owned by the Port Authority is not subject to the Building Code of the City of New York. We have observed "Permits to Use or Occupy" issued by the Port Authority for specific work, notably the October 10, 1997, Permit issued following completion of repairs following the 1993 bombing, but the Port Authority did not routinely issue the equivalent of a Base Building Occupancy Certificate until January 1992. In addition, in December 1995, the Port Authority (PA) started an optional "Self Certification" program for alteration work by tenants. The PA has issued "Consent to Occupy" for specific work under this program.
Story Height	12' 0" typical office story 14' 0" at sky lobbies 14' at 43rd and 16' at 67th floors 28' (2-story) at mechanical equipment rooms (MER)
Number of Stories	110 stories plus 6-subgrade levels
Building Height	The overall building height from lobby level to the roof level is reported at 1,368'.
Total Sq. Ft. (Bldg. Area)	42, 900 gsf (gross sq. ft.) footprint calculated 4,761,416 gsf (1968 REBNY) 4,468,634 gsf (as remeasured by REBNY 1987 Guideline 4,358,604 rsf May 31, 2000 (Rent Roll Sq. Ft.)

General Breakdown of Floor Uses

Floors	Predominate Uses
110	Elevator Machine Room, Tank Rooms, Broadcasters
108-109	Mechanical Equipment, Elevator Machine Room
106-107	Restaurant (Windows on the World)
79-105	Offices
78	Sky lobby Floor, Offices
77	Offices, Elevator Pits
75-76	Mechanical Equipment
45-74	Offices
44	Sky Lobby, PA Kitchen, Offices
43	Port Authority Cafeteria, Elevator Pits
41-42	Mechanical Equipment, Elevator Machine Rooms
9-40	Offices
7-8	Mechanical Equipment
3-6	Core Area, Locker Rooms
Plaza	Main Entrance Mezzanine from the Plaza
Lobby	Main Entrance Lobby from Concourse
B-1	Truck Dock Access, Storage and Maintenance Subcontractors, Elevator Pits
B-2	Storage and Maintenance Subcontractors, Elevator Pits, Parking Access
B-3	Storage and Maintenance Subcontractors, Parking Access
B-4	Storage and Maintenance Subcontractors, Parking Access
B-5	Mechanical Equipment
B-6	Mechanical Equipment, Elevator Machine Room

Special Features

The building is the tallest building in New York City and among the tallest in the World. The roof contains the main antenna for all, but 1, New York City television broadcasting stations. Office space is column free, with up to 60' spans between the core and facade. The Windows on the World restaurant occupying the 107th story provides spectacular views of New York City and its harbor, including overlooking the Statue of Liberty. This facility has 2 restaurants, and 4 banquet rooms. Enclosed connections to the World Financial Center and an on-site Marriott Hotel are provided.

Design Team

Architects	Minoru Yamasaki & Associates Emory Roth & Sons, P.C.
Slurry Wall	Port Authority
Structural Engineer	Skilling-Helle-Christiansen-Robertson
Mechanical Engineer	Jaros Baum & Bolles
Electrical Engineer	Joseph Loring & Associates

Recent Renovations

Sprinkler installation for LL 5/73 compliance
Fire alarm system modernization
Approximately 65% elevator system modernization including cabs, controllers, SCRs, ADA control panels.
Electric Power Upgrade -1999
Chilled water risers
Condenser water upgrade

B. Project Condition

Overview

The building maintenance is supervised by the Port Authority who retains a service contractor (ABM) to perform routine and special maintenance of equipment in common areas through a consolidated performance base contract. The Port Authority retains consultants to prepare evaluation reports on the major systems in the building.

Structure

Where they could be seen, the building's structural elements appeared free from signs of distress, deterioration, or building settlement. Structural Integrity Inspections (SII) have been performed by Leslie E Robertson Associates (LERA) and other engineering firms on many of the structural components of all the buildings in the World Trade Center. These SII reports are available in the Data Room. Deficiencies typically noted are rusting conditions in the steel columns in the elevator shafts, missing fireproofing, and occasional floor coring damage.

LERA recommends that the analysis of wind acceleration measurements be continued to monitor the dynamic behavior of the structure. They note that the 30-year-old visco-elastic dampers on the floor open web trusses have a finite life and must continue be monitored.

Visco-elastic dampers located at each floor joist at the connection to the perimeter columns dampen the sway motion. Sample dampers are tested every 5 years, most recently in 1996. It is reported that approximately 12 dampers are kept in stock for replacement.

Building Exterior

The building facade appears in good condition with no reported leaks. The facade is regularly inspected and repaired on an on-going 5-year cycle, with 10% of facade monitored by LERA to insure quality control. Structural Integrity Inspection reports are issued annually to the Port Authority. Recent SII reports note that the window gasketing is starting to exhibit age related deterioration. Wet sealing (sealant placed over gasket) is anticipated within 10 years.

The clear lacquer-coated anodized aluminum column covers exhibit finish color variations between panels.

Roofs

The main roof is the original membrane (reportedly asphalt felt built-up system) and is protected by 2" of rigid insulation and a 5" concrete overlay. The concrete topping is displaying age- and exposure-related deterioration, and a top coating is anticipated within the next 5 years.

Interiors

Multi-tenant floor common area finishes are typically average quality and are adequately maintained. Corridor carpets are reportedly 2 years old. Elevator vestibules are good durable quality. Most corridors have concealed spline acoustic ceiling tiles and many are displaying age- and usage-related wear, and replacement should be anticipated. Most toilet rooms are original durable finishes, with localized repairs for cracked tile or damaged tile required as ordinary maintenance. A capital program was initiated to upgrade multi-tenanted corridors and toilet rooms. Approximately 6 floors have been completed.

The 3 stair exit shafts typically display age- and usage-related wear and require floor repainting. Photo-luminescent paint stripes in stairs should be retained. The nosings on Stair B (wide stair) are bent outward in isolated locations and require repair. This condition occurs in both Towers.

Mechanical equipment floors (108, 41, B-6) require floor repainting, which is planned under the PA's Spit and Polish Program.

Vertical Transportation

The elevators appear adequately designed and are maintained under service contract. Passenger cabs were recently renovated, including cab interiors, ADA accessible front panels, and non-contact cab door safety edges. Escalators have been modernized with start/stop switches, comb plate switches, demarcation lights, caution signs, controlled descent devices, and remote monitoring systems.

Approximately 65% of the elevator equipment has been modernized with another 3% in progress. The remaining equipment has exceeded its functional useful life expectancy and continuing modernization is planned over the next few years (2004).

HVAC

The mechanical systems are adequately designed, using brand-name equipment, which provides adequate cooling for the office areas. To allow for the expanded substations in the 41st and 75th floor MERs, 4 AHUs were removed and new AHUs were installed. The original freeze protection system for the AHUs and reheat system for the heating hot water system have been abandoned in place, and consideration should be given to removal of the equipment for these systems. On the 108th MER, as a result of year-round cooling demands, a new freeze protection system has been installed. This system includes 2 circulating pumps and a heat exchanger that will circulate chilled water to all of the AHUs in this MER, instead of each AHU having its own pump. The same work will be performed in the remaining MERs over the next 5 years. The equipment has been well maintained, nearly all of the equipment is original (30 years old), and has or will exceed its published service life over the next 10 years, and replacement should be anticipated. A recent capital program to update the HVAC air-handling equipment has effectively increased the anticipated service life of the equipment. Equipment or component maintenance and repair is performed as part of the ABM service contract.

Plumbing

The plumbing systems appear to be in generally good condition, and are reportedly functioning satisfactorily. There have recently been problems with the failure of water hammer arrestors and leaks (see the Executive Summary). Although in operation, replacement of pumps, and water heaters should be anticipated over the next 10 years. Equipment or component maintenance and repair are performed as part of the ABM service contract.

Electrical

An adequate 10 watts/sq. ft. is provided from the 25th floor through the 105th floor. Six-watts/sq. ft. is available in the remaining areas of this Tower.

Life Safety

The life safety systems appear to meet code requirements for modern hi-rise office buildings. The building has completed sprinkler installation for compliance with LL5/73, and is in process of installing a Class "E" fire alarm system. Signoffs from the Port Authority should be furnished.

Property Maintenance

The in-house maintenance is performed by a service firm retained by the Port Authority. Electrical, HVAC, and general maintenance is performed under the terms of a performance based service contract by ABM Engineering with oversight by the Port Authority World Trade Department's Building Services Management Division. In general, maintenance appears to be adequate. Housekeeping deficiencies were noted in stairwells and service areas. Some mechanical equipment room floor slabs require refinishing. Exposed rooftop ferrous metals require better maintenance.

Accessibility

The building's entrances and elevators (except Express Elevators 18 and 19) are substantially ADA compliant. Toilet rooms on multi-tenanted floors are typically (75% estimated) non-ADA compliant. A program of upgrading was started 2 years ago. ADA compliance on most full tenant floors is reportedly the responsibility of the tenant under terms of the lease.

Violation Status

As stated in the Offering Memorandum, "The Port Authority is a municipal corporate instrumentality and political subdivision of the States of New York and New Jersey which provides transportation, terminal, and other facilities of commerce within the Port District. As such, in connection with the Transaction, the PA will continue to maintain exclusive jurisdiction with respect to certain administrative and governmental matters involving the Complex, including compliance with building, environmental, fire and health codes." The New York City Department of Buildings has indicated that they do not maintain any records of violations for this property. A request for a Property Profile Overview for this block and lot number yields no records. The Fire Department provides normal fire fighting and a life safety service to the facility. A Memorandum of Understanding exists between the Port Authority and the Fire Department in which the Fire Department performs regular inspections and directly notifies the Port Authority Fire and Life Safety group of deficiencies to be corrected. Under a protocol with the New York City Fire Department, Port Authority Police personnel investigate certain fire alarms at the World Trade Center rather than transmitting such alarms to the New York City Fire Department.

C. Site

Site information for all of the buildings is included within the Executive Summary section.

D. Building Description

1. Structure

Foundation

The foundation of 1 WTC is situated within a common 6-level deep (70') subgrade space (2 WTC, 3 WTC, 6 WTC), which is enclosed by 3' thick concrete cut-off walls installed by the slurry trench method.

Drawings indicate the Tower foundation under the building's columns consists of steel bearing plates and 2-way steel grillage placed on concrete leveling fill bearing on 40 tsf capacity bed rock, located under the B-6 cellar level.

Slab-on-Grade

Level B-6 floor slabs are concrete slab-on-grade placed over porous fill on bedrock.

Superstructure

The building structure is steel built-up box-shaped columns at the exterior perimeter, and box-shaped or wide-flange columns at the central core area. Columns are 10' o/c at the base and tree outward into 3' 4" spacing up the full height of the building. Structural steel spandrel girders are installed between the columns. Doubled, 29" deep, open web joists spaced at 6' 8" o/c span from core to the exterior columns. Exterior columns between the open web joists are stabilized by 2 diagonal angle braces cast into the slab and attached to the adjacent trusses.

The Tower columns, girder, and floor joists are fire protected with spray-on fireproofing. Basement area steel girders and beams are typically encased in concrete.

The roof structure is referred to as The Crown and it serves to stabilize the exterior columns. It is formed with structural steel trusses for rigidity. Identified lead paint may require future abatement. The interior section of the roof slopes up above the perimeter roof level.

Lateral wind loads are resisted by the 207' square hollow tube effect created by the rigidity of the closely spaced exterior columns and rigid spandrel girders connecting the columns. Wind sway movements on the top story reportedly approach 3'. Visco-elastic dampers located at each floor joist at the connection to the perimeter columns dampen the sway motion. Sample dampers are tested every 5 years. Replacements are available in-house.

Floors

The typical office story floor has 1 1/2" deep metal form deck, with cellular raceways for electrical and communication wiring, and 4" lightweight concrete slab with steel reinforcement. The typical floor core area, and the basement slabs are 4 1/2" normal weight reinforced concrete slab acting compositely with beams and girders.

The roof is reinforced concrete slab.

Other

There is a 360' television transmission mast on the roof of Tower I. The transmission mast is guy-wired into the rigid truss framed roof. The mast is automatically heated from the building steam system to avoid low temperature brittleness. Special maintenance procedures are required.

Design Loads

The following live loads are noted on the drawings or in the Structural Integrity Reports or PA Design Guidelines:

Area	Live Load (psf)
Roof	40 psf
Office	100 psf* including partitions
Stairs and Public Areas	100
Mechanical	75
Wind	Wind tunnel
Seismic	Not applicable

* Reducible

Condition

Where not concealed by building finishes, the building structure appears to be in good overall condition. There is no apparent movement or settlement in foundations. Interior slabs appear in good condition. Basement areas under the Tower were dry.

Structural Integrity Inspections (SII) of various structural systems have been performed on a regular basis by Leslie E Robertson Associates (LERA) and other engineering firms. Deficiencies typically noted are rusting conditions in the steel columns in the elevator shafts, missing fireproofing, and occasional floor coring damage. The most recent SII recommended repairs are underway.

Visco-elastic dampers located at each floor joist at the connection to the perimeter columns dampen the sway motion. Sample dampers are tested every 5 years, most recently in 1996. It is reported that approximately 2 dozen dampers are kept in stock for replacement.

LERA strongly recommends that the analysis of wind acceleration measurements be continued, to monitor the dynamic behavior of the structure. They note that the 30-year-old visco-elastic dampers on the floor open web trusses have a finite life and must continue to be monitored.

2. Exterior

Walls

The building has a square shape, 207' 2" on each side. The facade of the building extends up 1,368' from Lobby Level to the roof. The exterior columns are projecting, and are spaced 10' o/c from Plaza Level to the 6th story, where each column transitions to 3 columns, spaced at 3' 4" o/c. Columns are covered with rectangular-shaped anodized aluminum column covers, with built-in window washing tracks. Spandrel panels between windows are black colored, painted aluminum.

The 110th story facade slopes inward, and extends above the roof level to form the roof parapet.

Windows

Fixed glazed vision glass fits between the column covers (approximately 1' 10" wide and 7' 8" high.). The glass is single pane. Window treatments include venetian blinds.

Window Cleaning Equipment

There is a window-washing rig that rides on rooftop tracks that extend around the roof perimeter. There is also a movable platform that lowers the rig from the roof rails into the interior garage on the 110th floor. A special rig to access the Tower's corners is on site and installation is beginning. It is expected to be in use by next year.

The rig operator can lower the robotic window washing apparatus, or the manned scaffold platform. Stainless steel tracks for the robotic window washing apparatus and manned platform are built into the facade column covers.

Doors

There is a main drive-up entrance at West Street with a large polished stainless steel clad canopy (with multi skylights and mini-spot lighting). This entrance enters into the lobby level vestibule. The entrance has 2 revolving doors, 3 pairs of swing doors, and 1 pair of automatic sliding doors for persons with disabilities.

The entrance to the building at Plaza Level is located facing toward the east. There are 2 revolving doors and 2 pairs of swing doors at this location. There are 2 additional sets of doors on the north and south sides that provide egress to the Plaza, and 1 additional set on the north side that egresses to a bridge to the Plaza.

Revolving doors and swing doors are set between exterior columns, with overhead glazed fixed transoms. All doors have polished stainless steel framing.

Thermal Insulation

Spandrel panels have rigid insulation on the internal face.

Weatherproofing Sealants

There is elastomeric sealant at the juncture of vertical column cover sections. There is rubber gasket glazing for the glass vision panels and glass spandrel panels.

Expansion/Control Joints

Facade expansion joints were not observed, but the column cover system has many components with elastomeric sealants and its expansion and contraction is self-relieving.

Other

The close spaced columnar design of the exterior facade is dictated by structural considerations due to the unique extreme height of the building and the requirement for column-free interior tenant space.

Condition

The building facade appears in good condition with no reported leaks. The facade is regularly inspected and repaired on an on-going 5-year cycle, with 10% of facade monitored by LERA to insure quality control. Structural Integrity Investigation reports are issued annually to the Port Authority. Recent reports note that the window gasketing is starting to exhibit age-related deterioration, and wet sealing is anticipated within 10 years.

The lacquer coated anodized aluminum column covers exhibit finish variations between panels.

Heitmann & Associates Curtain Wall Evaluation is Attachment 9.

3. Roof

Roof Area	The main roof is above the top (110th) story of the building. There is also roofing at the parking area for the window-washing rig on the 110th floor. The exterior walls of the 110th story step back for air intake louvers. The mechanical rooms on the 108th, 75th, 41st, and 7th stories step back 6' to conceal the louvers, and have roofing systems. The roof contains the main antenna for all but 1 UHF New York City television broadcasting stations.
System	The main roof is the original membrane (reportedly asphalt felt built-up system) and is protected by 2" of rigid insulation and a 5" concrete overlay. Setback roofs appear similarly constructed. The setback concrete surfaces were covered with traffic deck membrane in 1995 due to leaks, and reportedly corrected the condition.
Decking	The roof deck is reinforced concrete. The roof slab is sloped up above the central core area of the building.
Drainage	The roofs have internal roof drains.
Parapets/Copings	There is a 3' inward sloping perimeter parapet wall adjacent to the window washing rig tracks. The parapet is the exposed steel facade framing and attached aluminum facade panels.
Flashing	All flashings are flashing membrane extended up and under metal cap flashing set in reglets in concrete curbs.
Expansion Joints	None observed
Penetrations and Equipment Mounting	Penetration flashings are concealed under the concrete topping.
Access	The roof is accessed from the 110th story vestibule, which opens to an exterior stair to the roof.
Skylights	There are no skylights.
Bonds/Warranties	All warranties are expired.

Condition

The main roof, although the original membrane, is protected by a 5" thick concrete overlay, and a large portion is pitched. The roof reportedly does not leak, and should last beyond 10 years. The concrete overlay is displaying age- and exposure-related deterioration, and a top coating is anticipated within the next 5 years.

The concrete fill at the exterior walkways at the mechanical equipment room setbacks has been resurfaced with a waterproof traffic deck, and reportedly does not leak.

4. Interior Construction and Finishes

Lobby Areas

The lobby is the spacious full size of the 207' 2" square floor plate with 6-story high exterior glazed wall and architectural-shaped ceilings visible through the large curved atrium-type openings in the Plaza Level mezzanine 16' above the lobby. The center portion of the lobby contains the rectangular core (87' x 135') which is dedicated to the multiple banks of elevators. Glass paneled railings and security turnstiles with encoded card readers control access to the core elevator system.

The lobby has granite paneled floors with recessed carpeting, 6-story high marble core walls and pilasters with polished stainless steel reflective panels, and marble-faced exterior columns with glass vision lites. Elevator hoist way doors and trim are polished stainless steel. The lobby ceiling is suspended wire lath and plaster, with abutting 15' x 29' rectangular-shaped, concave panels, with ceiling-mounted decorative crystal lens lighting fixtures in each panel. The panels are separated by 7 1/2" plaster trough borders. The ceiling is suspended 9' below the 7th floor, and has catwalks for access. The light bulbs used to be changed from above the hung ceiling, but now are changed by lift.

The east side of the lobby is accessed from the mall concourse, through 14 polished stainless steel-framed, glazed revolving doors with fixed glazed transoms above that fit between the Tower's 10' o/c columns. There are also 2 sets of automatic sliding doors leading to the concourse. The rear of the lobby has a glazed vestibule system at West Street with 2 revolving exterior vestibule doors and 3 pairs of swing doors. This vestibule also has a set of automatic doors for persons with disabilities.

There is a vestibule entrance on the north face of the lobby with 2 sets of escalators and 1 set of stairs that provides access to the Customs building and the bridge across to the World Financial Center. There are 3 elevators ("J" bank) adjacent to the north wall of the lobby that serve the below Grade B-1 to B-6 levels (Tower and all subgrade spaces, including garage access). There is an entrance to the Marriott Hotel on the south wall of the lobby.

There is a marble-faced visitors' counter along the north wall of the lobby, with recessed carpet flooring. A plan is currently in progress for replacement of this carpet and the carpet in the mezzanine of the lobby to meet the test requirements prescribed by the NYC Code. The fire command station is also in the lobby.

The Plaza Level mezzanine above the lobby has a curved atrium type opening on each side of the long dimension (E-W) of the core, extending the full length of the core and 2/3's the 60' wide span on each side of the core. The floors of the Plaza Level mezzanine are granite and the walls are marble.

The Plaza Level mezzanine is accessed from the Plaza on the east face through a pair of revolving doors fitting between the building's 10' o/c aluminum clad columns. There are also 2 pairs of swing doors.

There is a pair of escalators that lead from the lobby to the Plaza Level Mezzanine.

Sky Lobbies

The middle and upper zone elevator systems are served by express elevators running from the main lobby to the sky lobbies at the 44th and 78th stories, where transfers to local service occurs. These lobbies are finished with marble-bordered carpeted floors, verde marble walls, and arched plaster ceilings with chandeliers. Each sky lobby has a pair of escalators leading to the floor above and a pair of escalators leading to the floor below.

Core Corridors

The 87' wide x 135' long central core below the 44th floor sky lobby contains the 4 banks of 6 passenger elevators, all express elevators, freight elevators (49, 50, 17, 5, 6, 7) 3 stair exits, 1 men's and 2 women's toilet rooms, ventilation shafts, electric closets, telephone closets and janitor's closets. Above the 47th floor the core shrinks due to the elimination of the low zone express elevators. Above the 81st floor the core shrinks again, due to the elimination of the high zone express elevators.

Each floor has a "T"-shaped corridor, which accesses 1 bank of 6 passenger elevators, 3 freight elevators (2 freight on upper zone), 3 stair exits, and the toilet and utility rooms. Floors 24, 32, 61, 67, have 2 banks of 6 elevators serving these floors. Multi-tenanted corridor finishes are carpet, rubber base, painted walls, and suspended acoustic tile ceilings. Full floor tenants have individualized good-grade elevator lobby finishes and corridor finishes. Some single-tenanted floors have elevator vestibule access to exits restricted by locked office doors which reportedly operate on a fail safe fire alarm door release system.

Exterior columns have vermiculite plaster surfaces for fire rating purposes.

Tenant Offices

The tenant finishes are typically carpeted floors, vinyl base, painted walls, and suspended lay-in acoustic ceilings with recessed fluorescent fixtures. Some tenants have higher quality finishes.

Rest Rooms

There is typically 1 men's toilet room and 2 women's toilet rooms on each office floor, depending on the elevator shaft layout at a particular story. The toilet rooms have ceramic tile floors, base, and walls, and lay-in suspended acoustic ceilings with downlights. Toilet partitions are ceiling-mounted painted steel. Most toilet rooms observed have the original ceramic tile finishes. Reportedly, 6 floors have been upgraded.

Exits

There are 3 interior exit stairs that serve all office floors. Stairs have painted concrete floors (with photo-luminescent paint directional stripes), painted steel stringer stairs with concrete-filled steel pan treads and intermediate level platforms, painted walls, and painted ceilings. Doors are locked from the stair shaft side, with reentry at every 4th story. One stair exits into the lobby which has egress to West Street and the 2 other stairs exit into the Plaza Level mezzanine which has egress to the exterior Plaza through swing doors on faces of the building.

Sound Insulation

Carpets and suspended acoustic ceilings help to control noise transmission within the building.

Doors

Stair exit doors are self-closing hollow metal fire-rated.

Other

The B-1 level is used mainly for moving freight from the loading docks into the core elevator areas for dispersal throughout the building. It is a raw space with painted floors and walls, and bare ceilings with exposed mechanical services.

The B-2-B-4 areas are primarily used for construction and building maintenance offices, lockers, and storage. There are some tenant storage spaces. Finishes are VCT floors, painted block walls, and suspended ceilings.

Levels B-5 and B-6 house the mechanical equipment for the lower section of the building and for the PATH. Finishes are painted floors, walls, and bare concrete ceilings.

The Windows on the World restaurant occupying the 107th story provides spectacular views of the New York City and its harbor, including overlooking the Statue of Liberty. This luxury facility has 2 restaurants, and 4 banquet rooms. A full kitchen is located on the floor below and an elevator (#99) connects the 2 floors. Toilet rooms are ADA compliant

Freight elevator vestibules have VCT floors, rubber base, painted walls and suspended ceilings.

Condition

Multi-tenant floor common area finishes are typically average quality and are adequately maintained. Corridor carpets are reportedly 2 years old. Elevator vestibules are good durable quality. Most corridors have original concealed spline acoustic ceiling tiles and many are displaying age- and usage-related wear, and replacement should be anticipated. Most toilet rooms are original durable finishes, with localized repairs for cracked tile or damaged tile required, as ordinary maintenance. A capital program was initiated to upgrade multi-tenanted corridors and toilet rooms. Approximately 6 floors have been completed.

Ceramic tile base and wall tile in some toilet rooms was observed to be damaged or cracked, and should be repaired as part of ordinary maintenance.

The 3 stair exit shafts typically display age- and usage-related wear and require floor repainting. Photo-luminescent paint stripes in stairs should be retained. The nosings on Stair B (wide stair) are bent outward in isolated locations in both Towers and require repair.

Lobby and sky lobby finishes are good quality. Structural Integrity Inspection 24 (Data Room List), dated May 1, 1998, recommended additional hangers be installed in the suspended lobby ceiling, which were reportedly installed.

Mechanical equipment floors (108, 41, B-6) require floor repainting, which is planned to be done under the PA's Spit and Polish Program.

5. Vertical Transportation

Overview

There are 72 local stop passenger elevators and 19 shuttle stop passenger elevators serving the above-lobby floors. There are 2 express elevators serving Windows on the World on the 106th and 107th floor. There are 3 elevators ("J" bank) adjacent to the north wall of the lobby that serve the below-grade B-1 to B-6 levels (Tower and all subgrade spaces, especially garage access). The vertical transportation system is divided into 3 vertical zones serviced from the main lobby and the 2 sky lobbies, which are at the 44th and 78th floors. There are 8 shuttle elevators traveling from the lobby to the 44th floor sky lobby and 11 shuttle elevators traveling from the lobby to the 78th floor sky lobby. The main lobby and the sky lobbies each access 4 banks (A, B, C, D) of 6 passenger cars which provide local service to portions of their respective zones. Each local bank of 6 elevators serves approximately 8 stories. The local service stacking design and the 2 sky lobbies, minimize core size and keep floor areas relatively constant in size. Wind sway detectors, located on the 108th floor, automatically activate controllers to decrease elevator speeds during high wind sway conditions.

There are 8 service elevators serving the building, some of which also perform dual function as passenger elevators.

There is one set of escalators serving the Lobby Level to the Plaza Level. There are two pairs of escalators on each sky lobby floor, serving the floor below. Some lobbies also serve the floor above and below the sky lobby.

Cabs

Local service passenger cabs have carpeted floors, porcelain enamel wall panels with a narrow band of exposed marble at rail height, brushed stainless steel front panels, and brushed stainless steel center-opening single-speed elevator doors. The cabs have been updated to ADA compliance.

Express service passenger cabs have carpeted floors, marble wall panels, brushed stainless steel front panels, and brushed stainless steel center-opening double speed elevator doors. The mid-rise car controls have been updated to ADA compliance. Two upper zone car controls (18 and 19) have not been updated.

Maintenance

Maintenance is by full-service contract with Ace Elevator Company. In addition, Port Authority personnel oversee the service contractor's work by conducting regular maintenance inspections.

Inspections

The 5-year test tags are current.

Condition

A representative sampling was observed.

The elevators and escalators appear adequately designed and are maintained under service contract with Ace Elevator Company. The PA performs maintenance Quality Assurance inspections.

Approximately 65% of the original elevator equipment has been modernized with another 3% in progress. Modernization of the balance is either ongoing or planned for prior to the 2nd quarter of 2004. Escalators have been modernized with start/stop switches, comb plate switches, demarcation lights, caution signs, controlled descent devices, and remote monitoring systems.

Two high zone express elevators (18 and 19) require ADA car panels.

The ropes on Car 99 are rusted and require replacement.

For detailed elevator information and description of equipment, refer to Attachment 6, prepared by BOCA Group International.

6. HVAC

Overall Systems

Heating and cooling for the building are provided by central station air handling units (AHUs) and perimeter induction units (PIUs), all utilizing pneumatic controls.

Heat

Medium pressure steam, supplied from the central steam station, goes through pressure reducing stations located in the 108th, 75th, 41st, 7th floors, and B-6 Level mechanical equipment rooms (MERs). The low-pressure steam is piped to coils in AHUs, which supply interior spaces and PIUs on the floors.

Low-pressure steam is also piped to shell and tube heat exchangers in all MERs to produce secondary heating hot water, which is pumped to coils in the PIUs.

Additional heat is supplied by steam unit heaters located in mechanical spaces.

Heat Exchangers

Two shell and tube units for the condenser water system
Two plate and frame units for the condenser water system

Twenty-six shell and tube units for the secondary heating hot water/chilled water system

Air Conditioning

Chilled water from the central plant is supplied to coils in the AHUs and secondary chilled water is supplied to the PIUs. Each PIU has one coil which is used for both heating hot water and chilled water.

A looped condenser water system is available for tenants' supplementary water-cooled air conditioning units.

Pumps

Four 1,400-gpm, 150-hp condenser water pumps
One 40-hp condenser water pump

For Floors 9 - 24:
Four 40-hp, 890 gpm secondary water pumps, 2 standby

For Floors 25 - 58:
Two 40-hp, 580 gpm secondary water pumps, 1 standby
Four 40-hp, 745 gpm secondary water pumps, 2 standby
Two 40-hp, 990 gpm secondary water pumps, 1 standby

For Floors 59 - 74:
Two 40-hp, 580 gpm secondary water pumps, 1 standby
Four 40-hp, 745 gpm secondary water pumps, 2 standby
Two 40-hp, 990 gpm secondary water pumps, 1 standby

For Floors 92 - 105
Two 40-hp, 580 gpm secondary water pumps, 1 standby
Two 40-hp, 745 gpm secondary water pumps, 1 standby

For Floors 106 - 107
Two 7.5-hp, 245 gpm secondary water pumps, 1 standby

Two duplex steam condensate pumps

Air Handling Units

There are 8 AHUs located in the B-6 Level MER, rated at 13,000 to 38,000 cfm with 15 hp to 40 hp motors, that supply the loading dock, PATH areas, and other subgrade levels.

Fourteen central AHUs, located in the 7th floor MER, rated from 14,200 to 79,000 cfm with 15 hp to 100 hp motors, supply conditioned air to interior spaces and the PIUs.

Sixteen central AHUs, located in the 41st floor MER, rated from 6,000 to 95,000 cfm with 10 hp to 125 hp motors, supply conditioned air to interior spaces and the PIUs.

Eighteen central AHUs, located in the 75th floor MER, rated from 10,000 to 98,000 cfm with 10 hp to 150 hp motors, supply conditioned air to interior spaces and the PIUs.

Sixteen central AHUs, located in the 108th floor MER, rated from 10,000 to 91,000 cfm with 10 hp to 150 hp motors, supply conditioned air to interior spaces and the PIUs.

One AHU with a steam coil, located on the 110th floor, is used for the antenna heating system.

Fans

Toilet, AHU return air, kitchen, and mechanical room exhaust fans are installed.

Condition

The mechanical systems are adequately designed, using brand-name equipment, which provides adequate cooling for the office areas. To allow for the expanded substations in the 41st and 75th floor MERs, 4 AHUs were removed and new AHUs were installed. The original freeze protection system for the AHUs and reheat system for the heating hot water system have been abandoned in place, and consideration should be given to removal of the equipment for these systems. On the 108th MER, as a result of year round cooling demands, a new freeze protection system has been installed. This system includes 2 circulating pumps and a heat exchanger that will circulate chilled water to all of the AHUs in this MER, instead of each AHU having its own pump. The same work will be performed in the remaining MERs over the next 5 years. The equipment has been well maintained, nearly all of the equipment is original (30 years old), and has or will exceed its published service life over the next 10 years, and replacement should be anticipated. A recent capital program to update the HVAC air-handling equipment has effectively increased the anticipated service life of the equipment. Equipment or component maintenance and repair is performed as part of the ABM service contract.

7. Plumbing

Storm and Sanitary Sewers

Roof storm water is collected by roof drains and conveyed by internal leaders to the building's storm sewer.

Sanitary waste flows by gravity to the building's sewer.

Water Service

Metered city water, with a backflow preventer, enters a pump room on the B-1 Level and goes to Pump Station (PS) 1 which serves the B-1 Level up to the 41st floor. On the 7th floor MER, the water goes through a pressure reducing station and is supplied up to the 24th floor. Floors 25 - 41 are fed directly by PS1. On the 41st floor MER the water goes to PS2 which supplies Floors 41 - 75, and a pressure reducing station before going to Floors 41- 58. Floors 59 - 75 are fed directly by PS2. PS3, located in the 75th floor MER, supplies Floors 75 - 108. In the 108th floor MER the water goes through a pressure reducing station and is supplied to Floors 75 - 92. Floors 93 - 108 are fed directly by PS3.

Water Pipe Material

Copper supply piping was observed.

Domestic Water Heaters

Domestic hot water is provided by steam/water pre-heat tanks, steam/hot water heaters, and electric water heaters located in the 7th, 41st, 75th, and 108th MERs.

Pumps

One 60-hp, 292 gpm domestic water pump on the B-1 level supplying the 41st floor MER

Three 100-hp, 530 gpm domestic water pumps on the B-1 Level supplying the 41st floor MER

One 40-hp, 239 gpm domestic water pump in the 41st floor MER supplying the 75th floor MER

Three 75-hp, 477 gpm domestic water pumps in the 41st floor MER supplying the 75th floor MER.

One 40-hp, 239 gpm domestic water pump in the 75th floor MER supplying the 108th floor MER

Three 75-hp, 424 gpm domestic water pumps in the 75th floor MER supplying the 108th floor MER.

Four 7.5 hp circulating pumps are installed for the water heaters.
Eight 1.5 hp circulating pumps are installed for the water heaters.

Toilet Rooms

There are 2 sets of women's and 1 men's toilet rooms on each typical office floor.

Condition

There have recently been problems with the failure of water hammer arrestors and leaks (see the Executive Summary). Although in operation, replacement of pumps and water heaters should be anticipated over the next 10 years. Equipment or component maintenance and repair is performed as part of the ABM service contract.

8. Electrical

Main Service

The Primary Distribution Center (PDC) on the B-3 Level supplies 13.8 kV primary electrical service to 10 electrical sub-stations in 1 WTC. There is 1 substation on the B-1 Level, 2 substations, on the 7th, 41st, and 75th floor MERs, and 3 substations on the 108th floor MER. Each substation is served by four 13.8-kV high voltage feeders which is steeped down to 480/277 volts. The substations on the B-1 Level and 7th floor MER and the 2 on the 108th floor MER each have 2 switchboards with 4,000-ampere main breakers. The substations on the 41st and 75th floor MERs and the remaining substation on the 108th floor MER each have 4 switchboards that are in a tie bus configuration. Normal power is distributed to the tenants through 120/208-volt and 277/480-volt bus ducts located in 2 electric closets on each floor.

Capacity

An adequate 10 watts/sq. ft. is provided from the 25th floor through the 105th floor. Six watts/sq. ft. is available in the remaining areas of this Tower.

Wiring

Copper and aluminum wiring, with mechanical connectors, was observed between disconnect switches on bus duct risers and power panels.

Emergency Power

Six generators, located in the central plant, supply emergency power for lighting, elevators, and the life safety system. Power is distributed throughout the Tower through one electric closet on each floor. Certain select feeders are backed up by the tertiary power substation originating from PSE&G via the PATH system. Tenant stand-by power is provided from a central plant located on the roof of 5 WTC. The power is distributed through two 13.8-kV feeders to 3 substations located in MERs on the 41st, 108th and 109th floors.

Lighting

Recessed, surface- and wall-mounted, and suspended fluorescent fixtures, and wall-mounted incandescent fixtures provide interior building lighting.

Other

Four telephone/communication closets are located on each typical office floor.

A closed circuit television (CCTV) system is installed.

Condition

The electrical systems are functioning satisfactorily. The electrical system is infrared scanned on a regular basis.

9. Life Safety

Sprinklers

The office floors of the building have been retrofitted with sprinklers, except for electric and telephone closets, most toilet rooms, the main lobby, and the B-6 Level MER. A sprinkler riser control room is located on each floor, with branch lines for the floors sprinklers and flow and tamper switches.

Fire Standpipe

A standpipe riser, with a fire hose rack on each floor, is installed in each stairway.

Fire Pumps

A 100-hp, 1,500 gpm electric pump located on Level 294 supplies sprinklers on Levels B-1 and 310

A 30-hp, 500 gpm, electric pump in the 108th floor MER supplies sprinklers on Floors 99 and 110

Standpipe/fire hose racks are supplied by:

300-hp, 750-gpm electric fire pumps on Level 294 and in the 7th, 41st, and 75th floor MERs

Tanks

5,000 gal. rectangular steel fire reserve tank, located on the 110th floor, for the standpipe risers

5,000-gal. rectangular steel fire reserve tank, located in the 75th and 41st floor MERs, and on the 20th floor

10,000-gal. rectangular steel fire reserve tank, located on the 110th floor, for the sprinklers on Floors 33 - 108

Fire Alarm System

A Sieman's Cerebrus Pyrotronics MXL fire alarm system is installed with control and annunciator panels, manual pull stations, alarms, audio/visual alarms, strobe lights, flow and tamper switches, fire warden telephones, and smoke detectors.

Fire Extinguishers — Fire extinguisher cabinets are located in each stair on each floor and in the MERs.

Emergency Lighting — Fluorescent fixtures, with battery back-up, are located in the stairs, and all elevators in the complex have 2-hour battery back-up lighting. Selected fixtures are connected to emergency circuits.

Exit Lighting — Illuminated exit signs are provided which are connected to emergency circuits.

GFIs — Installed in some toilet rooms.

Condition — The life safety systems are typical for a Class "A" office building and meet the New York City Code. A new fire alarm system is currently being installed. Some of the toilet rooms have electrical outlets without ground fault interruption (GFI) protection, which is recommended.

10. Energy Conservation

General — The building was constructed with certain energy conserving features such as insulated walls and roofing, and SCR drives on the elevators. The elevator relay controllers are being replaced with microprocessors. Most of the lighting fixtures use energy saving fluorescent lamps and electronic ballasts.

Energy Management — The building does not have an energy management system.

11. ADA Compliance

Overview — For the purpose of this report, a general review of the property has been conducted to determine basic compliance with Title III of the federally-enacted ADA, dated July 26, 1990. Under the ADA, buildings initially occupied after January 26, 1993 (or building areas altered after January 26, 1992), are required to comply with ADA Accessibility Guidelines (ADAAG). Projects, with areas of public accommodation, constructed prior to this date are required to comply forthwith, to the extent it is "readily achievable." Provisions in the Act require Owners of existing properties with public accommodations to identify barriers for physically disabled persons, that exist on the site or in buildings. The barriers should be systematically removed according to a given set of priorities, the degree allowed by structural feasibility, and the financial resources available. The obligation to remove barriers is a continuing one.

The ADA sets forth "recommended priorities for public accommodations" to be accessible to the disabled. In general, the three priorities are as follows:

1. Access from public sidewalks, parking, or public transportation to a building entrance;
2. Access to any areas of goods and services that are made available to the public; and,
3. Access to rest room facilities.

During our tour of the project, we noted the following:

The building's primary entrance is from West Street into the Tower lobby through automatic power operated entrance doors. The path to the elevators is accessible. The Concourse entrance also has 2 sets of automatic doors.

The Plaza Level main entrance has 2 sets of swing doors, without automatic door opening hardware. Provide door-opening hardware on 1 set of swing doors to make the entrance accessible.

The banks of local elevators and mid-zone express elevators are equipped with car control panels that comply substantially with ADAAG. Two upper zone elevators (19 and 19) are not equipped with complying car controls.

Some (approximately 25%) toilet rooms have had upgrades for ADA requirements, but in most rooms observed, there were noncompliant items such as lack of full size ADA toilet stalls, and ADA compliant urinals. ADA compliance on most full tenant floors is reportedly the responsibility of the tenant under terms of the lease.

12. Code Compliance

Applicable Code	1968 NYC Building Code as Administered by the Port Authority of New York and New Jersey
Building Construction Classification	Class1-B - noncombustible, fire-protected, retrofitted with sprinklers in accordance with Local Law 5/1973
Occupancy Type	Group E - Business

Violations Record

As stated in the Offering Memorandum, "The Port Authority is a municipal corporate instrumentality and political subdivision of the States of New York and New Jersey which provides transportation, terminal, and other facilities of commerce within the Port District. As such, in connection with the Transaction, the PA will continue to maintain exclusive jurisdiction with respect to certain administrative and governmental matters involving the Complex, including compliance with building, environmental, fire and health codes." The New York City Department of Buildings has indicated that they do not maintain any records of violations for this property. A request for a Property Profile Overview for this block and lot number yields no records. The Fire Department provides normal fire fighting and a life safety service to the facility. A Memorandum of Understanding exists between the Port Authority and the Fire Department in which the Fire Department performs regular inspections and directly notifies the Port Authority Fire and Life Safety group of deficiencies to be corrected. Under a protocol with the New York City Fire Department, Port Authority Police personnel investigate certain fire alarms at the World Trade Center rather than transmitting such alarms to the New York City Fire Department.

Certificate of Occupancy

A Certificate of Occupancy has not been issued by the City of New York because property owned by the Port Authority is not subject to the Building Code of the City of New York. We have observed "Permits to Use or Occupy" issued by the Port Authority for specific work, notably the October 10, 1997, Permit issued following completion of repairs following the 1993 bombing, but the Port Authority did not routinely issue the equivalent of a Base Building Occupancy Certificate until January 1992. In addition, in December 1995, the Port Authority started an optional "Professional Self-Certification" program for alteration work by tenants. The PA has issued "Consent to Occupy" certificates for specific work under this program.

E. Recommendations

We have prepared a listing of items that will require action within the next 10-year period. **Immediate** expenditures indicate deficiencies which are in violation of codes, which pose a danger to public safety, or which, if left uncorrected, will lead to further deterioration of the property or significantly impact marketability or habitability. **Recommended** work, not required by agencies or codes, which, in our opinion, represents expenditures that should be made in the context of the prudent management of the property is also listed. These items should be undertaken on a priority basis. Items have been divided into 1- to 5-year and 6- to 10-year time frames.

	IMMEDIATE (0 - 1 YR.)	FUTURE (1 - 5 YRS.)	FUTURE (6- 10 YRS.)
General			
1. The net lessee must continue installation of the new fire alarm system and phased implementation of Local Law 5 and 16 requirements. It is reported that the FDNY has approved this approach.	*X*	*X*	*X*
Structure			
2. Structural Integrity Inspection (SII) reports have been performed on an ongoing basis by Leslie E Robertson Associates (LERA) and other engineering firms, on many of the structural components of all WTC buildings. Deficiencies typically noted are rusting conditions in the steel columns in the elevator shafts, missing fireproofing, and occasional floor coring damage. Reportedly, the deficiencies noted in the most recent reports (i.e., SII 73 Data Room List) are being corrected.	*X*	-	-

	IMMEDIATE (0 - 1 YR.)	FUTURE (1 - 5 YRS.)	FUTURE (6- 10 YRS.)
3. Visco-elastic dampers located at each floor joist at the connection to the perimeter columns dampen the building's sway motion. Sample dampers are tested every 5 years, the most recent in 1996 (SII 51, Data Room List). Retesting is due this year. Availability of replacement dampers must be ascertained. Responsibility for ultimately replacing these units should be clarified. Reportedly 2 dozen spares are available.	*X*	-	-
4. LERA strongly recommends (SII 72, Data Room List) that the analysis of wind acceleration measurements be continued, to monitor the dynamic behavior of the structure. They note that the 30-year-old visco-elastic dampers on the floor open web trusses have a finite life and must be monitored.	*X*	-	-
Exterior			
5. Recent SII reports note that the window gasketing is starting to exhibit age-related deterioration. The need for a phased program of wet sealing the gaskets should be anticipated.	-	-	*X*
6. The clear lacquered-coated anodized aluminum column covers exhibit finish tinting variations between panels. This does not affect the physical performance of the column covers. Cleaning of the facade is recommended.	-	-	*X*

	IMMEDIATE (0 - 1 YR.)	FUTURE (1 - 5 YRS.)	FUTURE (6- 10 YRS.)
Roof			
7. The concrete topping is displaying age- and exposure-related deterioration, and a top coating is anticipated within the next 5 years.	-	X	-
Interiors			
8. The floors of the 3 stair exit shafts typically display age- and usage-related wear and require repainting.	X	X	-
9. Mechanical equipment floors (110, B-6) require floor repainting, which is planned to be done under the PA's Spit and Polish Program.	X	-	-
10. Ceramic tile base and wall tile in some toilet rooms was observed to be damaged or cracked, and should be repaired as part of ordinary maintenance.	-	-	-
11. The steel pan stair tread nosings on Stair B (wide stair) are bent outward in isolated locations and require repair.	X	-	-
12. Replacement of 12" x 12" concealed spline corridor ceilings on multi-tenant floors is anticipated. A capital program was initiated to upgrade multi-tenanted corridors and toilet rooms. Approximately 6 floors have been completed.	-	X	-

	IMMEDIATE (0 - 1 YR.)	FUTURE (1 - 5 YRS.)	FUTURE (6- 10 YRS.)
13. Lobby and sky lobby finishes are good quality. SII 24 (Data Room list), dated May 1, 1998, recommended additional hangers be installed in the suspended lobby ceiling, which were reportedly installed.	-	-	-
Vertical Transportation			
14. Approximately 65% of the original elevator equipment has been modernized. Modernization of the balance is anticipated.	-	X	-
15. The ropes on Car 99 are rusted and require replacement. Work should be performed under the existing service contract.	X	-	-
HVAC			
16. Considering the age (30 years) of most of the mechanical equipment, ongoing phased replacement of components should be expected to continue over the next 10 years. This required maintenance is currently accomplished under the terms of the service contract with ABM.	X	X	X
17. Consideration should be given to removal of the pumps and bases, piping, heat exchangers, and valves related to the chilled water freeze protection and hot water reheat systems no longer in use.	-	X	-
18. HVAC distribution system rehabilitation and capacity upgrades are budgeted over the next 5 years.	-	X	-

	IMMEDIATE (0 - 1 YR.)	FUTURE (1 - 5 YRS.)	FUTURE (6- 10 YRS.)
19. Installation of a new freeze protection system is budgeted over the next 5 years .	-	X	-
20. Upgrades to the HVAC controls and smoke management systems is budgeted over the next 5 years.	-	X	-
Plumbing			
21. Replacement or refurbishment of the various pumps and water heaters should be anticipated over the next 10 years as the equipment reaches the limits of service life. This required maintenance is currently accomplished under the terms of the service contract with ABM.	X	X	X
22. Phased replacement of water hammer arrestors is necessary.	X	X	X
Electrical			
23. An electrical capacity upgrade in Zone 3 is budgeted over the next year.	-	X	-
Life Safety			
24. Replace unprotected electrical outlets with GFI protected outlets in all toilet rooms.	X	-	-
25. Fire alarm system upgrades and office space security systems are budgeted over the next 2 years in PA and tenant areas.	-	X	X

ADA

During our tour of the project, we noted the following areas that do not appear to meet the requirements of ADAAG and suggest that these features be added when feasible or when areas are renovated.

1. Some (25% approximately) toilet rooms on multi-tenanted floors have had upgrades for ADA requirements, but in most rooms observed, there were noncompliant items such as lack of full size ADA toilet stalls and ADA compliant urinals. ADA compliance on most full tenant floors is reportedly the responsibility of the tenant under terms of the lease.

2. 2 Upper Zone elevators (18 and 19) are not equipped with complying car controls.

3. Provide automatic door opening hardware on 1 set of swing doors at the Plaza Level entrance.