

APPENDIX E

HUDSON RIVER PARK TRUST
STRUCTURAL DESIGN GUIDELINES
(OCTOBER 2001)

Hudson River Park Trust

Hudson River Park

Structural Design
Guidelines

REV B



Hudson River Park Trust

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Hudson River Park
Structural Design Guidelines

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APPENDICES**APPENDIX A
PIER LOADS**

1. INTRODUCTION

These guidelines have been prepared to establish structural design criteria and standards applicable to the whole of Hudson River Park, with the exception of Segment 4.

Design criteria for Segment 4 have been reviewed in compiling the Guidelines. In certain instances these guidelines differ from what has been applied in Segment 4.

2. STANDARDS AND CODES

2.1 General

The primary code applicable is the New York City Building Code (1999 Edition), except in specific areas where the Trust may direct that the latest New York State Building Code will apply.

2.1.1 Other Codes and Standards:

- NYC Fire Prevention Code
- NYC Local Laws
- Directives and Memoranda of the NYCBD
- Rules of the Board of Standards & Appeals
- NFPA where referenced by applicable codes
- The Americans With Disabilities Act (ADA)
- Occupational Safety and Health Administration (OSHA) Code of Federal Regulations - 29CFR 1919

2.2 Site Flood Conditions

Flood Hazard Areas are located on the Flood Insurance Rate Map contained in the NYCBC (RS 4-4). The design requirements for minimizing flood damage are given in Subchapter 4, Article 10 of the NYCDB and are referenced in FEMA 102/May 1986 Design Standards. Waterfront structures shall be designed to survive a 100 year flood and a Level 3 hurricane.

2.3 Structural

Design and construction shall be in accordance with the latest edition of the following (The applicable publication year is noted. Copies of these documents are kept in the Project Office for reference):

- New York City Building Code (1999 Edition), except in specific areas where the Trust may direct that the latest New York State Building Code will apply.
- Piers and marine structures shall be designed in accordance with the Department of the Army, Waterways Experiment Station, Corps of Engineers "Shore Protection Manual" (Volumes 1 and 2), 1984

- Pier Structures shall be designed for the most stringent of the above standards and also AASHTO - Standard Specifications for Highway Bridges (1996).
- Design of Coastal Revetments, Seawalls and Bulkheads. ACOE Publication EM 1110-2-1614, 1995
- British Standards Institute BS 6349.
- American Concrete Institute – Building Code Requirements for Reinforced Concrete. ACI 318 – 1999
- Precast Concrete Institute (PCI) - Recommended Practice for Design, Manufacture and Installation of Pre-stressed Concrete Piling; Prestressed Concrete Piling Interaction Diagrams.
- Structural Steel: AISC Steel Construction Manual (LRFD 2nd Edition or ASD 9th Edition)
- Stainless Steel: ASCE Standard – Specification for the Design of Cold-Formed Stainless Steel Structural Members – ANSI/ASCE-8-90.
- Aluminium: The Aluminium Association – Aluminium Design Manual (6th Edition, 1994) .
- Timber: National Design Specification for Wood Construction.
- Welding:
 - Steel: A.W.S. Structural Welding Code-Steel D1.1 - 1996.
 - Aluminium: A.W.S Structural Welding Code – Aluminium D1.2 - 1997
 - Stainless Steel: Welding of Stainless Steel –Nickel Development Institute (NIDI) - 1996
- Masonry: Building Code Requirements for Masonry Structure ACI-530 and ACI-531 for Concrete Masonry Structures.
- NAVFAC (Design Manual) DM-7.1 - Soil Mechanics.
- NAVFAC (Design Manual) DM-7.2 – Foundation and Soil Structures.
- ASCE Standard ANSIASCE-7-98. “Minimum Design Loads for Buildings and Other Structures”.
- AWWA (American Wood-Preservers' Association) standards:
 - C 1-00 - All Timber Products, Pressure Treatment
 - C 2-00 -Lumber, Timbers, Bridge Ties and Mine Ties, Pressure Treatment
 - C 18-99 -Material in Marine Construction, Pressure Treatment
 - P 5-00 - Waterborne Preservatives
 - P 13-95 - Creosote
 - M 4-98 - Care of Pressure-Treated Wood Products

- ASTM Standards:
 - A 36-00 Specification for Carbon Structural Steel
 - A 153-00 Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 - A 185-97 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - A 193-01 Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
 - A 194-01 Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
 - A 307-00 Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
 - A 325-00 Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - A 416-99 Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
 - A 490-00 Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric)
 - A 500-01 Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 - A 572-00 Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
 - A 615-01 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - A 653-00 Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot -Dip Process
 - A 706-01 Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
 - A 775-01 Specification for Epoxy-Coated Reinforcing Steel Bars
 - A 884-01 Specification for Epoxy- Coated Steel Wire and Welded Wire Fabric for Reinforcement
 - A 924-99 Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
 - A 992-00 Specification for Steel for Structural Shapes For Use in Building Framing
- B 221-00 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods and Wire, Profiles and Tubes
- C 33-01 Specification for Concrete Aggregates
- C 62-01 Specification for Building Brick
- C 90-01 Specification for Loadbearing Concrete Masonry Units

- C 150-00 Specification for Portland Cement
- C 260-00 Specification for Air-Entraining Admixtures for Concrete
- C 476-01 Specification for Grout for Masonry
- C 857-95 Practice for Minimum Structural Design Loading for Underground Precast Utility Structures
- C 902-01 Specification for Pedestrian and Light Traffic Paving Brick
- D 25-99 Specification for Round Timber Piles
- D 1751-99 Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
- D 1760-99 Specification for Pressure Treatment of Timber Products
- D 6109-97 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber

2.4 References

- Eldridge "Tide and Pilot Book" 1996
- American Petroleum Institute. "Recommended Practice for Planning, Designing, and Constructing Fixed Offshore Platforms – Working Stress Design"
- "Design of Highway Bridges" – R. M Barker and J.A. Puckett, 1997
- Tidal Data published by NOAA, date 10/28/85, for period 1960 – 1978
- "Breakwaters, Jetties, Bulkheads & Seawalls" – Pile Buck Inc. - 1992
- Naval Facilities Command, Military Handbooks:
 - Piers and Wharves MIL-HDBK-1025/1
 - Harbors DM 26.1
 - Coastal Protection DM 26.2

3. MATERIALS

The material properties to be used for design shall be as follows:

3.1 Reinforced Concrete

Cast-in-place Concrete and Non-Prestressed Precast Concrete:

- For all piers and structures subject to marine environment, minimum $f_c' = 5000$ psi, normal weight concrete with Type II or Type II A cement to conform to ASTM C150. Water cement ratio (by weight) shall not be greater than 0.4. All exposed concrete shall be air-entrained and comply with ASTM C 260, with 5% to 8% air content. Admixtures containing chloride ions are prohibited. Aggregates shall conform to ASTM C33. Concrete shall be mixed and transported in accordance with ACI 318, 304, 301.

- High quality concrete with adequate thickness and cover shall be specified to provide 50-year life in marine environment. In chloride environment, consideration should be given to cement with at least 25% fly ash or 65% blast furnace slag.
- Reinforcing bars shall conform to ASTM A 615 Grade 60 $F_y = 60$ ksi. Consideration should be given to epoxy coating to comply with ASTM A 775. Protect coating from damage in accordance with the Specification. All damaged areas of epoxy coating shall be re-coated and cured to the satisfaction of the Owner's Representative prior to concrete encasement. Welding of ASTM A 615 reinforcing bars is prohibited.
- Reinforcing to be welded shall be approved by the Owner's Representative and conform to ASTM A 706. Welding shall conform to the requirements of AWS D1.4 – Structural Welding Code for Reinforcing Steel. Welding electrodes for reinforcing steel shall be E90XX unless otherwise noted.
- Welded wire fabric shall conform to ASTM A 185 and shall have an ultimate tensile strength of 70 ksi, epoxy coated to comply with ASTM A 884.
- All finished surfaces shall be smooth troweled, unless otherwise noted on the Design Drawings.
- Pouring new concrete against existing concrete: clean and roughen existing concrete surface, just prior to concrete pouring, coat existing concrete with Sikadur 32 high-mod bonding agent or approved equivalent applied in accordance with manufacturer's instructions.
- Premolded expansion joint filler for concrete shall be bituminous type and shall be preformed in accordance with ASTM D1751.

3.2 Precast Prestressed Concrete:

- Minimum $f_c' = 6000$ psi.
- Tendons shall be low relaxation 7-wire strand conform to ASTM A 416, Grade 270.
- 4 Tendon release shall not take place until the concrete strength exceeds 4000 psi.
- All surfaces shall be smooth finish, corners shall not be chamfered unless otherwise noted.
- Submit calculations to the owner's representative for review prior to ordering.
- The location and detail of lifting devices for the precast prestressed member shall be determined by the contractor, considering all loads imparted during transporting, handling and installation. All lifting devices shall be removed and concrete patched with epoxy grout as required after installation.

3.3 Structural Steel

- Shapes and Bars shall be ASTM A 572 and A 992 Grade 50 with $F_y = 50$ ksi and $F_u = 65$ ksi, unless otherwise noted. Plates shall be ASTM A 36, with $F_y = 36$ ksi and $F_u = 58$ ksi, unless otherwise noted.
- Pipes shall be ASTM A 500 type B, with $F_y = 42$ ksi and $F_u = 58$ ksi.
- Tubes shall be ASTM A 500 type B, with $F_y = 46$ ksi and $F_u = 58$ ksi.

- Bolts shall be High Strength Bolts ASTM A 325 or ASTM A 490 (for buildings only) or ASTM A 193 with hardened nuts and washers, galvanized in accordance with ASTM A 153.
- Anchor bolts shall be ASTM A 307 or ASTM A193 or, for buildings, ASTM A 325 or ASTM A 490. Threaded fasteners shall be ASTM A 36, ASTM A193 or ASTM A 572 Grade 50.
- Welding electrodes shall be E70XX with the exception of welding to existing steel, where investigation shall be directed to determine the type of the existing base metals, its weldability and the filler metals to be used. Field welding is not permitted unless otherwise noted or unless approved in advance by owner's representative.
- Metal deck shall conform to ASTM A 653, $F_y=33$ ksi. Minimum 18 gage, hot-dip galvanized with minimum G115 for severe exposure conditions.
- All structural steel, bolts, hardware, etc., shall be galvanized in accordance with ASTM A 153. Chase all threads after galvanizing.

3.4 Treated Timber Fender Piles

- All treated timber piles shall be 12" minimum diameter, measured 3 ft from butts. Minimum compressive strength $F'_c = 1000$ psi
- Timber piles shall be either Douglas Fir Larch or Southern Pine conforming to AWWA C1, C2 and C18 and shall be pressure impregnated with a preservative in accordance with AWWA P5, P13 and M4 and AASHTO M133.
- Mechanical fasteners in wood shall be hot-dip galvanized in accordance with ASTM A 153.

3.5 Masonry

- Concrete block for load bearing masonry construction shall be Type 1 moisture controlled units (Grade N-I) that meets the requirements of ASTM C 90, minimum $f'_m = 1200$ psi.
- Brick for masonry construction shall be Grade SW and conform to requirements of ASTM C 62.
- Brick for use as paving material to support pedestrian and light vehicular traffic shall be Class SX Type I and conform to requirements of ASTM C 902.
- Reinforcing steel used in the masonry construction shall conform to ASTM A 615 Grade 60.
- Mortar: the ingredients used in making mortar shall conform to the mortar specified in AASHTO Articles 14.2.3 and 14.4.2.
- Grout for filling voids in hollow masonry units shall conform to ASTM C 476, or the requirements of AASHTO Section 8 or Section 14.2.3. Admixture shall be used only when specified or approved by the owner's representative.

3.6 Aluminium

Aluminium shall be Alloy 6061-T6 in accordance with ASTM B221. Properties and tension tests are required.

3.7 Structural Timber

- Structural timber design and construction shall comply with the American Institute of Timber Construction Manual, second edition.
- All structural timber to be either douglas fir-larch or southern pine and shall be visually graded by authorized agency in accordance with ASTM D 245 and bears the official grade mark. Design values for the graded lumber shall comply with the applicable provisions of "National Design Specification for Wood Construction" by the American Forest and Paper Association (AF & PA).
- All structural timber shall be pressure treated with preservative materials and solutions in accordance with AWPA C1, C2 and C18 and a preservative in accordance with AWPA P5, P13 and M4 and AASHTO M133.
- Timber chocks and wales, diagonal bracing and low water bracing will be douglas fir-larch or southern yellow pine, Commercial Grade No. 2, treated per AWPA C2 with preservative treatment by pressure process (salt water use) with waterborne preservatives. Minimum retention of Chromated Copper Arsenate (CCA) 2.5 lb/cf. Commercial No. 2 timber will have the following minimum characteristics: Boards: Extreme fiber bending $F_b = 1,200$ psi Modulus of elasticity $E = 1,600$ ksi. Hardware will be ASTM A307, galvanized per ASTM A153. All bolts will include ogee washers and hex nuts. Hardware connections on outboard faces of fender piles and on chocks will be countersunk.

3.8 Timber Bearing Piles & Timber Pile Caps

- Timber bearing piles and timber pile caps will be Demarara Greenheart. The minimum diameter of these piles shall be 12", when measured 3 feet from the butt. Pile cap beams will be 12"x 12"(rough).
- Greenheart will have the following minimum characteristics:

Air- dried	
Modulus of Elasticity	3,100 ksi
Modulus of Rupture	17,900 psi
Bending Stress (allow)	3,800 psi
Compression Parallel to Grain (allow)	3,000 psi
Shear Parallel to Grain	380 psi

3.9 Recycled Plastic

- Subject to approval by HRPT and Department of Building Services Waterfront Permits Unit, materials for structural joist, girders, columns, and fender piles may be based on the use of acceptable quality recycled plastic lumber shapes which comply with ASTM D6109-97 Flexural Secant modulus @ 1% strain > 350,000 psi; and flexural stress @ 3% strain > 2,500 psi.
- Materials for decking shall be based on the use of acceptable quality recycled plastic lumber shapes which comply with ASTM D6109-97 having a minimum flexural secant modulus @ 1% strain 70,000 psi, and a flexural stress at 3% strain > 1,500 psi.
- Exposed surfaces of plastic lumher shall be non-skid.

- All fasteners for decking shall be stainless steel #10 square drive countersunk decking screws.

3.10 Backfill

Backfill or fill material shall conform with the requirements of the Project Specifications.

Design of structures and paving supported on such fill shall be in accordance with AASHTO (1996).

4. LOADS

4.1 Vertical loads

- Self-weight of structure.
- No increase in the historic load-bearing capacities of piers is permitted. Loads for which existing piers have been designed are given in Appendix A.
- New and re-built piers shall be designed for the superimposed dead loads applicable at the pier and for a live load of 100 pounds per square foot in public areas. To provide for future use adaptability, piers should generally be designed for a superimposed dead plus live load equal to 350 pounds per square foot, but not exceeding the historic loads. Design loads must be clearly stated on the drawings.
- Maximum vehicle loads will generally be H20 as defined in accordance with AASHTO, with 15% impact. Vehicles will be excluded from grating areas, unless otherwise noted.
- In locations directed by the New York City Planning Bureau, a fire truck must be accommodated, with allowance of up to 30% overstress, with the following maximum loads and dimensions:

Total Weight	68 000 pounds
Length between axles	37' 9"
Rear Axle Weight	48,000 pounds
Vehicle Width	8' 0"

- Minimum live loads and dead loads to be applied when designing underground monolithic or sectional precast concrete utility structures shall conform to ASTM C 857.

4.2 Wind

Basic Wind Speed 110 MPH, Exposure C. Wind pressure shall be in accordance with ANSI/ASCE 7-98: Minimum Design Loads for Buildings and Other Structures, with an importance factor = 1.00.

4.3 Seismic Acceleration Coefficient $A = 0.15$

- Response Modification Factor R shall be in accordance with AASHTO Division I-A - Seismic Design Section 3.7.
- Site Coefficient S shall be in accordance with NYC Building Code section 27- 675 and its Reference Standard RS-9-6.

4.4 Snow

Ground Snow Loading (P_f) = 30 psf (drift and partial snow loads to be considered, where applicable).

Combination of snow load and snow clearing vehicle to be considered where applicable.

4.5 Temperature: (AASHTO)

Steel structures: 0 degrees to 120 degrees Fahrenheit.

Concrete structures: Temperature Rise: 30 degrees Fahrenheit.

Temperature Fall: 40 degrees Fahrenheit

4.6 Soil Pressure

Earth pressures shall be determined in accordance with AASHTO (1996), Division 1, Section 3.20.

4.7 Lateral loads on curbs, guardrail and vehicle barriers

Curbs, guardrails and vehicle barriers shall comply with AASHTO (1996) requirements. Railings should be designed for loads specified in the NYC Building Code.

4.8 Piers and Marine Structures

Piers and marine structures shall also be designed in accordance with the recommended procedures for such structures and for the following conditions:

4.8.1 Wind

Wind conditions defined in 4.2 shall apply.

4.8.2 Current

Design for actual anticipated current conditions at the particular pier, with a minimum current velocity of 1.5 knots (2.5 ft/sec)

4.8.3 Wave Conditions

- Average Wave Height $H = 3.0$ feet
- Average Wave Length $L = 65$ feet
- Average Wave Period $T = 3.5$ seconds

- Extreme Conditions

Southerly

- Fetch = 6.5 nautical miles
- Significant Wave Height = 10.0 feet
- Wave Period = 5.4 sec
- Wavelength = 218 feet

Westerly

- Fetch = 0.75 nautical miles
- Significant Wave Height = 3.4 feet
- Wave Period = 2.6 sec
- Wavelength = 106 feet

4.8.4 Ice

Ice Thickness: 8 inches

Design shall be for both static (crushing at structure sides) and dynamic (flowing) conditions and shall be in accordance with Design of Highway Bridges, Barker and Puckett, 1997, pp. 180-190

Ice Abrasion (side) $F_a = 0.11 * F$

4.8.5 Vessel Loads

Berthing

Piers and bulkheads at which vessels will berth shall be designed for berthing loads to be determined based on BS 6349 – Part 4, using an approach velocity of 1.5 to 2.0 knots and an angle of approach of 15 and 10 degrees respectively, as measured from the longitudinal axis of the pier. The vessel size to be designed for shall be determined from the actual conditions applicable to the pier.

Mooring Loads

Mooring loads will be determined based on wind, wave and current loads. Winds will be applied from all possible directions. The analyses will include the elastic properties of the selected fender and the elasticity of the mooring lines.

4.8.6 Loading Combinations

The specified loads shall be considered in various combinations in accordance with the following table from the Military Handbook, MIL-HDBK-1025/1, Section 3.4, Load Combinations:

	Service Load Design								
Load Combination:	S1	S2	S3	S4	S5	S6	S7	S8	S9

Service Load Design

Dead* (including superimposed dead load)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Live(Concentrated)+Impact or Live(Uniform)	1.0	0.1	1.0	1.0		1.0	**	1.0	
Buoyancy	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Vessel Berthing		1.0							
Current			1.0	1.0	1.0	1.0			1.0
Earth Pressure	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Earthquake							1.0		
Wind on Structure			0.3		1.0	0.3			1.0
Wind on Vessel			0.3		1.0	0.3			
Creep/Rib Shortening+Shrinkage+ Temperature				1.0	1.0	1.0			
Ice + Minimum Temperature								1.0	1.0
% Allowable Stress	100	100	125	125	140	140	133	140	150

Load Factor Design

Load Combination:	U1	U2	U3	U4	U5	U6	U7	U8	U9
Dead* (including superimposed dead load)	1.3	1.3	1.3	1.3	1.25	1.25	1.3	1.3	1.2
Live(Concentrated)+Impact or Live(Uniform)	1.7	0.17	1.3	1.3		1.25	**	1.3	
Buoyancy	1.3	1.3	1.3	1.3	1.25	1.25	1.3	1.3	1.2
Vessel Berthing		1.7							
Current			1.3	1.3	1.25	1.25			1.2
Earth Pressure	1.3	1.3	1.3	1.3	1.25	1.25	1.3	1.3	1.2
Earthquake							1.3		
Wind on Structure			0.3		1.25	0.3			1.2
Wind on Vessel			0.3		1.25	0.3			
Creep/Rib Shortening+Shrinkage+ Temperature				1.3	1.25	1.25			

Load Factor Design

Ice + Minimum Temperature 1.3 1.2

* 0.90 of dead load only (excluding superimposed dead load) for checking members for minimum axial load and maximum moment.

** 0.0, 0.10, or 0.20, depending on the live load assumed to be acting on pier for earthquake Load calculations. See Earthquake Loads, paragraph 3.3.4, MIL-HDBK-1025/1.

5. SERVICEABILITY CRITERIA**5.1 Tidal Effects**

Piers and bulkheads, including elevations, get downs, gangways, etc shall be designed to accommodate the applicable tidal data.

The following tidal data is published by NOAA (10/28/85) for Battery Park City (elevations in feet, referenced to Borough of Manhattan Highway Datum). For other locations designers should refer to the actual published data (See Reference in 2.4).

Tidal Data: Battery Park City

	Borough President of Manhattan Highway Datum	National Geodetic Vertical Datum of 1929 (NGVD'29)	MLLW Datum
100 yr. Flood, Level 3 Hurricane	+7.25	+10.00	+11.88
Highest Observed (9/12/60)	+5.60	+8.35	+10.23
Mean High High Water	+0.49	+3.24	+5.12
Mean High Water	+0.15	+2.90	+4.78
Manhattan Highway Datum	0.00	+2.75	+4.63
NGVD of 1929	-2.75	0.00	+1.88
Mean Low Water	-4.41	-1.66	+0.22
Mean Low Low Water	-4.63	-1.88	0.00
Lowest Observed (2/2/76)	-8.70	-5.95	-4.07

Northeaster of December 11, 1992 reached +7.68 above NGVD.

All elevations are in feet.

Elevations on the plans refer to the Borough of Manhattan Highway Datum.

The following design water levels shall apply, based on Manhattan Borough Datum:

- Extreme High Water +5.60 feet
- Mean High Water +0.15 feet
- Mean Low Water -4.41 feet
- Extreme Low Water -8.71 feet

5.2 Durability

All structures and their materials shall be designed for a 50-year service life, during which minimal maintenance or inspection will be required under normal use.

5.3 Deflection Criteria

Deflection of pier structures shall be limited as follows:

$$\Delta_{cdl} + \Delta_{sdl} + \Delta_{ll} - \text{Camber} < L / 180$$

$$\Delta_{ll} < L / 240 \text{ or } 1", \text{ whichever is smaller.}$$

where;

Δ_{cdl} = Construction dead load deflection,

Δ_{sdl} = Superimposed dead load deflection

Δ_{ll} = Live load deflection

L = Beam span. For cantilevers use twice the cantilever length.

The lateral deflection of new structures shall be limited as follows:

$$\Delta_{Wind} < h / 500$$

$$\Delta_{Seismic} < h / 250$$

h = height of pier (calculated from the theoretical point of fixity).

APPENDIX A

PIER LOADS

A1. PIER LOADS

PIER	ORIGINAL DESIGN LOAD PER ACOE (1) (psf)	CURRENT LOAD CAPACITY PER HRPT (2) (psf)	COMMENT BASED ON MASTER PLAN	
25		468	Pier to be reconstructed	
26		483	Pier to be reconstructed	
32		464	New get down + ecological pier	
40		508	Future redevelopment	
42			Pier to be reconstructed	One pier has been deleted - refer to Segment 4 drgs
45		468	Pier to be reconstructed	
46		468	Pier to be reconstructed	
51			Pier to be reconstructed	
52	None	Not inspected	Repair substructure	
53	None		Fire boat station - no work	
54		468	Part replace, part repair	
57			Part repair	
61	500		Chelsea Pier - no work	
62			Repair substructure	
63		356	Pier to be reconstructed	
64	None	468	Part replace, part repair	
66		Not inspected	Pile field - pier to be reconstructed	
72		Not rated	Pile field with getdown	
78	None		Ferry Terminal - no work	
81	500		World Yacht - no work	
83	500		Circle Line - no work	
84		415	Pier to be reconstructed	
86	None		Intrepid Pier - No work	
88	500 (lower)+100(2nd)+50(roof)		Passenger ship terminal - No work	
90	500		Passenger ship terminal - No work	
92	500		Passenger ship terminal - No work	
94	650		Conference Center - no work	
96	400		Boat launch- existing pile field	

Hudson River Park
Structural Design Guidelines

PIER	ORIGINAL DESIGN LOAD PER ACOE (1) (psf)	CURRENT LOAD CAPACITY PER HRPT (2) (psf)	COMMENT BASED ON MASTER PLAN
97	400	110 - unusual config.	Pier to be reconstructed
98	500		Con Edison Pier - no work

NOTE:

- (1) U.S Army Corps of Engineers. Port Series No. 5, Revised 1999, 'The Port of New York, NY and NJ and Ports on Long Island, NY
- (2) HRPT e-mail, per Goodkind and O'Dea inspection reports. Current pier load ratings (only for piers to be totally or partially re-built) to be totally or partially re-built)