DESIGN GUIDELINES

NEW DEVELOPMENT AREA
BOSTON NAVAL SHIPYARD AT CHARLESTOWN

JUNE 1978

BOSTON REDEVELOPMENT AUTHORITY
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BOSTON NAVAL SHIPYARD AT CHARLESTOWN
NEW DEVELOPMENT AREA - DESIGN GUIDELINES

IV. PROPOSED DEVELOPMENT

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1C, 2C, 3D, 3G, 3J, 4C, 4D,
2A
2B, 2B'
3A,
3B, 3B'
3C, 3C'
3E, 3H
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3I
4A
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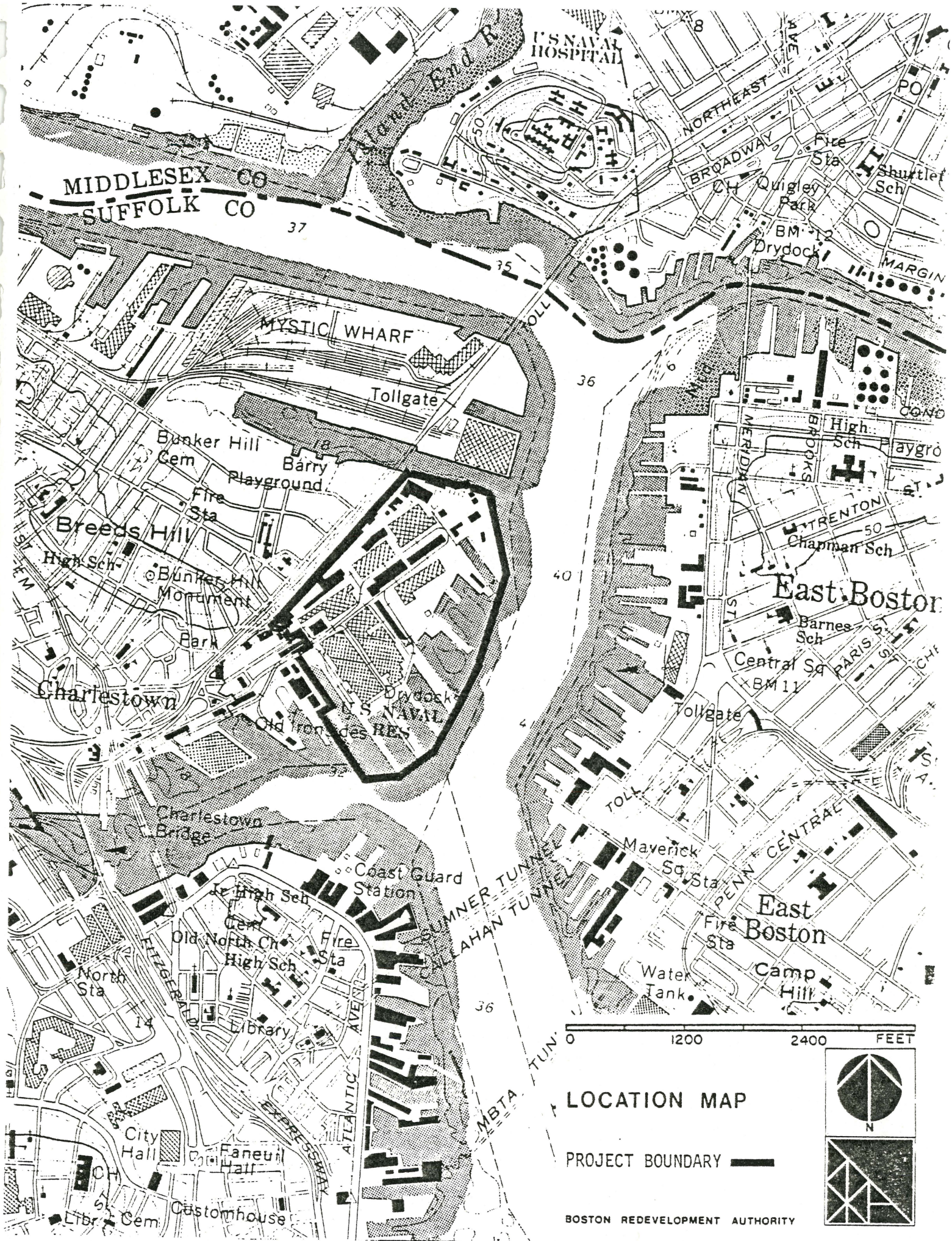
B. Preservation Brief One, The Cleaning and Waterproof Coating of Masonry Buildings (OAHP/NPS)

C. Preservation Brief Two, Repointing Mortar Joints in Historic Brick Buildings (OAHP/NPS)

INTRODUCTION

The project being undertaken by the Boston Redevelopment Authority includes approximately 105 acres of surplus land, buildings, piers, drydocks and water on the site of the former Boston Naval Shipyard at Charlestown. Recognizing the historical, architectural and locational value of the site, specific planning and design controls have been established to guide the implementation of a mixed-use development program that will include residential, commercial, institutional, recreational and light manufacturing uses.

For implementation purposes, the site has been divided into three areas:
(A) Historic Monument Transfer Area, (B) Public Park and (C) New Development Area. Whereas previous reports have specifically addressed guidelines for the Transfer Area and the Public Park, the intent of this document is to summarize the design guidelines and controls that have been established for the New Development Ares.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SUFFOLK CO
U S NAVAL HOSPITAL
Inland Emd R
NORTHEAST
BROADWAY
Fire Sta
Quigley Park
Shurtlef Sch
BM 12
Drydock
MARGIN
MYSTIC WHARF
Tollgate
TOLL
Bunker Hill Cem
Barry Playground
Fire Sta
Breeds Hill
High Sch
Bunker Hill Monument
Park
Charlestown
Drydock
U S NAVAL RES
Old Iron Sides
MERIDIAN
BROOKS
High Sch
Playgrd
TRENTON
Chapman Sch
East Boston
Barnes Sch
Central Sq
PARIS ST
BM 11
Tollgate
Charlestown Bridge
Coast Guard Station
Jr High Sch
Cem
Old North Ch
High Sch
Fire Sta
SUMNER TUNNEL
CALLAHAN TUNNEL
Maverick Sq Sta
PENN CENTRAL
East Boston
Fire Sta
Water Tank
Camp Hill
North Sta
FITZGERALD
Library
ATLANTIC AVE
EXPRESSWAY
City Hall
Faneuil Hall
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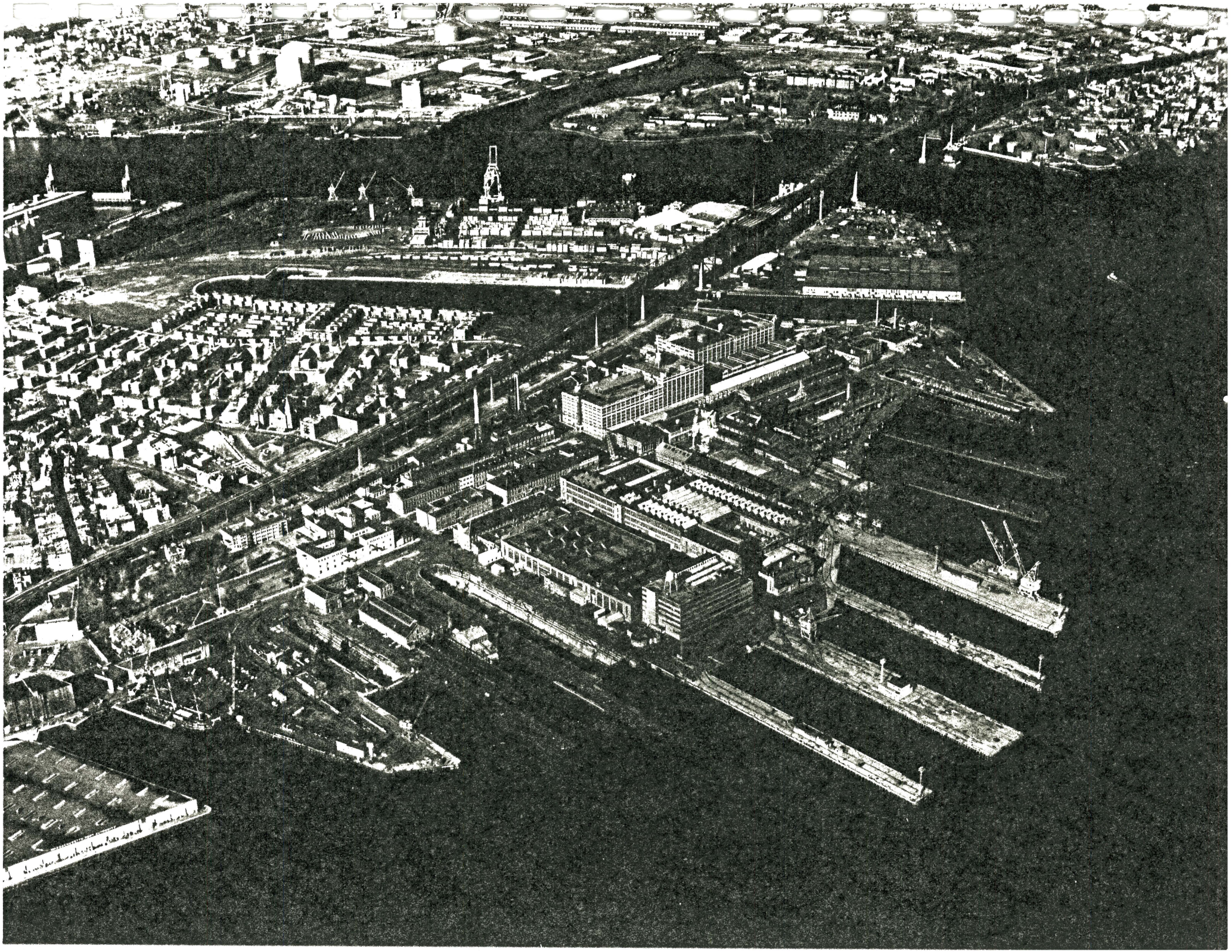
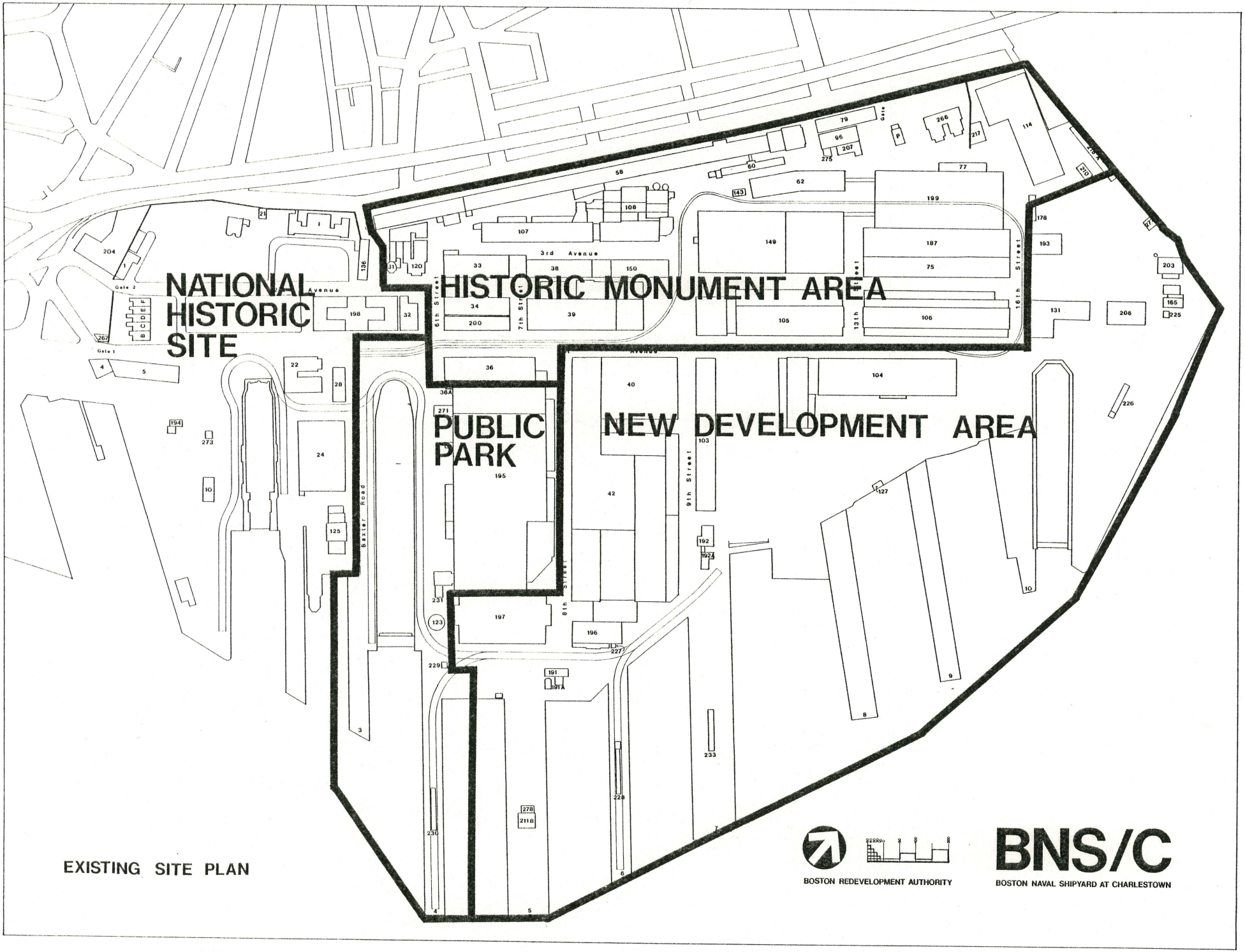
LOCATION MAP
PROJECT BOUNDARY
BOSTON REDEVELOPMENT AUTHORITY





EXISTING SITE PLAN

BOSTON REDEVELOPMENT AUTHORITY

BNS/C

BOSTON NAVAL SHIPYARD AT CHARLESTOWN

1

I. EXISTING CONDITIONS AND HISTORY

A. DESCRIPTION OF THE PROPERTY

1. The Boston Naval Shipyard is located on the eastern waterfront of the Charlestown section of the City of Boston, which is situated to the north of the downtown and is bounded by the Charles River, the Inner Harbor, the Mystic River, and the Tobin Bridge.

2. The New Development Area occupies a total of 58.4 acres. (Land - 29.2, Piers - 9.0, Drydock - 1.2, and Water - 19.0).

3. Buildings, structures and improvements.

   The twenty-four buildings, as well as the piers, shipways and drydock which comprise the New Development Area of the Shipyard, represent a variety of building types and dates, including some of the more monumental spaces. The principal buildings, from an architectural perspective are being rehabilitated for residential use. A complete listing of the buildings, structures and improvements is attached.

B. SIGNIFICANCE

A National Historic Landmark, listed in the National Register of Historic Places, the Boston Naval Shipyard at Charlestown is significant in a variety of contexts. The Shipyard's historical significance lies in its connections with the Revolutionary War and the establishment of the U.S. Navy, its role in the building and maintenance of many important ships of the fleet, and its contributions to industrial technology. The Shipyard is also a coherent urban environment, with buildings and structures which are architecturally significant.

1. HISTORY

The Yard developed on the southeasterly shore of Charlestown between what was known as "Wapping's" and "Moulton's Point" where the British had landed for the assault on the Patriots in the famous 1775 Battle of Bunker Hill. On this marshy shore and across the Charles River in Boston were several shipyards and private wharves. It was the close of the 18th century and the local shipbuilding industry was becoming revitalized after a period of decline during the Revolutionary era. The re-emergence of American shipping, in fact, had contributed to the need to establish a navy. But even before the U.S. Navy Department was created in the Spring of 1797, a resolve from the Naval Committee of the House of Representatives recommended

BUILDING	DATE	NAVY DESIGNATION	DIMENSIONS	TREATMENT	PROPOSED USE
40	1863-4	Ship Repair Central Tool	228' x 181'	Retain Facade	Parking Structure
42	1856 1917	Machine Shop	285' x 700'	Retain (partial demo)	Residential
103	1901	Ship Repair, Sheet Metal Shop	60' x 450'	Retain	Residential
104	1901	Shipfitter's Shop	110' x 206'	Retain	Residential, Recreational
104-A	1939	Shipfitter's Shop	106' x 424'	Demolish	---
131	1910	Flammable Storehse.	110' x 182'	Demolish	---
165	----	Gas Storage	70' x 70'	Demolish	---
178	----	Lumber Storage	20' x 80'	Demolish	---
191 191-A	1939 1948	Pump House	21' x 68'	Demolish	---
192 192-A	----	Sub-Station	40' x 100'	Demolish	---
193	----	Scrap Storage	65' x 100'	Demolish	---
196	1939	Ship Repair	64' x 153'	Demolish (retain foundation)	Open Space
197	1941	Ship Repair	134' x 255'	Retain	Residential, Commercial Parking

BUILDING	DATE	NAVY DESIGNATION	DIMENSIONS	TREATMENT	PROPOSED USE
203	----	Incinerator	48' x 77'	Demolish	---
211B	----	Shipfitter's Shop	50' x 50'	Demolish	---
225	----	Pump Station	16' x 18'	Demolish	---
226	----	Sub-Station	15' x 96'	Demolish	---
227	----	Pumphouse	16' x 18'	Demolish	---
228	1956	Service	12' x 96'	Retain	Marina Service
232	----	Pumphouse	16' x 18'	Demolish	---
233	1958	Service	14' x 110'	Demolish	---
277	----	Storage	30' x 30'	Demolish	---
278	----	Substation	20' x 40'	Demolish	---

STRUCTURES	DATE	NAVY DESIGNATION	DIMENSIONS	TREATMENT	PROPOSED USE
Drydock 5	1942	Drydock	101' x 633'	Retain	Marina
Pier 5	1941	Pier	126' x 660'	Retain	Residential
Pier 6	1956	Pier	60' x 610'	Retain	Marina
Pier 7	1958	Pier	130' x 770'	Retain	Residential
Pier 8	c. 1910	Pier	80' x 630'	Retain	Marina
Pier 9	c. 1910	Pier	65' x 680'	Demolish	---
Pier 10	c. 1910	Pier	100' x 500'	Demolish	---
Pier 11	1956	Pier	72' x 685'	Retain	Hotel Residential
Shipway 1	c. 1920	Shipway	100' x 200'	Retain	Residential
Shipway 2	c. 1945	Shipway	100' x 250'	Retain	Residential

that an appropriation be made for the establishment of a government dockyard. The existence of active shipyards made the Charlestown site a logical location for such a dockyard, and three years later, in the Spring of 1800, Secretary of the Navy, Benjamin Stoddard, proposed the purchase of land at Boston for such a purpose. Later that year, 43 acres of land and mudflats were purchased at Charlestown for a sum of $39,214.

The yards which were set up along the eastern seaboard during the opening years of the 19th century were not intended to be defense stations but were rather intended for shipbuilding and repair. Thus, even though an 1818 survey of Boston Harbor found it to be an "extraordinary natural means of defense", the Navy Commissioners did not recommend the establishment of a "great national depot and rendevous at Boston" but a drydock to facilitate ship repair work.

During the 1820's, the Shipyard substantially increased its buildings and facilities. In 1827, Congress declared that examination of the Yard must be completed before any further improvements were made. The resultant plan was issued in the Summer of 1823, and continued to be in effect until 1880 when a new plan was created.

Among the ships constructed at Charlestown were the "Boston" (1799), and the "Independence" (1814), a 74-gun considered to be "the finest and heaviest frigate-built vessel of her time." One of the most famous ships constructed at the Yard was the "Merrimac" (1854-55), which was converted into an ironclad after its seizure by the Confederate forces during the Civil War and was renamed the "Virginia." It was sunk after the well-known encounter with the Union ironclad "Monitor" at Hampton Roads.

During the Civil War, the shipbuilding and repairing capacity of the dockyard increased enormously. Between 1861 and 1865, 39 ships were constructed, 43 ships were equipped, and countless numbers repaired at the Yard. In 1874, the "Intrepid," the first iron torpedo boat was launched.

During the early 20th century, the Shipyard's efforts went to building non-warship vessels, namely tugs, derricks, and oilers. However, in World War I, the Yard was primarily used as the chief center for the North Atlantic. World War II witnessed the peak of the Yard's productivity: 165 ships over 100 feet long were built (three times more than the total of all previous years) and hundreds of smaller craft and thousands of boats were repaired. Production time, including laying of the keel to the launch, averaged six months for ships such as destroyer escorts.

One of the most important 20th century ships constructed at the Yard, the 1,395 ton Farragut class destroyer, MacDonough, launched in 1934, will be best remembered along with the U.S.S. Mayrant, the vessel that accepted the surrender of the Japanese at Marcus Island and the U.S.S. Gwin, an escort carrier on the mission to bomb Tokyo.

Post-war activity at Charlestown and the South Boston Naval Annex involved submarine construction and many conversions of ships for guided missile and anti-submarine duty. Altogether, about 300 warships have been built at the Yard.

The Charlestown Shipyard has been the site of several unique facilities since its inception. Commandant Bainbridge, in 1813, suggested that "shiphouses" be constructed to build ships undercover, thereby protecting them from the elements and speeding production. The idea proved so successful that it was copied in other shipyards in this country and abroad. These shiphouses were located near the existing shipways and were removed in 1901. In 1815, Bainbridge established a naval training school of officers at the Yard that became a parent institution for Annapolis. In the next decade, Drydock #1 was begun (1827) and is one of the two oldest drydocks in the country. Ironically, "Constitution" was both its first and last occupant. In 1836, the 1,350 foot long Ropewalk was constructed. This granite structure provided all of the rope requirements of the Navy for the last 135 years -- production ceasing only in the past decade. The original Building 42, a U-shaped complex opening toward the harbor, was designed by Joseph E. Billings who succeeded Alexander Parris as Chief Civil Engineer, and was known as the Steam Engineering Building. In 1926, A.M. Leahy and C.G. Lutts invented what is known as the "Die-lock chain," became the Navy's standard chain, manufactured in the Forge and Chain Shop (building 105).

2. ARCHITECTURAL CHARACTER

The Shipyard structures illustrate many building types and several phases of 19th and 20th century architectural styles. Early 19th century residential examples exist as well as later industrial buildings and World War II "temporary" shed structures. Many are of architectural merit, and some are of very great significance. The construction dates fall roughly into five periods, which generally coincide with major wars of the two centuries. As well as illustrating popular building styles, the Shipyard structures exhibit the increasing size and capacity of industrial structures permitted by changes in technology.

The oldest and some of the most significant structures in the Navy Yard are located within the 30 acre portion of the Yard authorized by Congress in 1974 to be a part of the Boston National Historical Park. These buildings will be retained and restored by the National Park Service for purposes related to the interpretation, administration and maintenance of the park and U.S.S. Constitution. The Navy will continue to retain responsibility for staffing and maintaining the historic ship.

The 30 acre portion of the Shipyard which has been transferred to the City for historic monument purposes also includes many important structures, including buildings which reflect all the major stylistic developments in the Yard and the evolution of technology. Building types range from the three story, oblong granite style to vast, squared, multi-story facilities built of steel and reinforced concrete.

Among the most significant buildings in the Shipyard is a group of three structures built to house the functions associated with the making of rope and cordage. These structures, and particularly the Ropewalk itself, are unique in this country. Only one other ropewalk exists and that is a wood frame building, and much altered. The Ropewalk complex produced all of the Navy's rope for almost 135 years. At its peak, the facility manufactured 2,500 tons of rope per year.

Two other structures stand out for their individual merit. These are the Forge and Chain Shop, building 105, where the Die-lock Anchor Chain was manufactured. The other is the octagonal Muster House, building 31, which is an unusual architectural form.

The remaining structures, while in some cases especially noteworthy for use or architect, can be most easily described by class or type. One class of buildings consists of the large oblong granite shops and storehouses built during the middle of the 19th century on an alignment parallel to the longitudinal axis of the Shipyard. Collectively, their arrangement, as the result of the 1828 plan, was the predominant influence on the rest of the Shipyard during the 19th century. They are fine examples of what is known as the Boston Granite Style, characterized by similar concepts of proportion, logic, and simplicity, and influenced by the Greek Revival mode. Standard features include three stories with a peaked roof and regularly spaced double hung window sash of small proportions. This single building type was used for both storehouses and manufacturing shops in the 19th century, whereas the early 20th century distinguished between these functions, producing an open, loft-type building for manufacturing purposes.

The second category of buildings in the Shipyard consists of the loft-type shops, built of brick with consistent functional and stylistic characteristics. Produced during a period of activity between 1899-1905, these include four buildings clustered together near the northeastern end of the Shipyard as well as others found in various locations in the Yard. While a few of the brick shops retain features of the Romanesque style, most display characteristics of the Neo Classical Revival style popular at the turn of the century.

World Wars I and II produced the largest buildings in the Shipyard. Reinforced concrete construction was introduced into the Shipyard in 1918 in a ten story warehouse (#149) and was used repeatedly in massive lofts and warehouses produced during the heightened activity of the second World War.

3. URBAN DESIGN FEATURES

Since its creation in the 1820's there has always been a master plan for the Shipyard which exhibits a rectilinear regularity that is still very apparent in spite of numerous accretions. There are common features in all these plans which still exist; notably the strong grid of the streets and their distinct containment by the buildings.

The original plan, indeed all the plans, show a layout for the southwesterly portion of the Shipyard that is substantially unchanged. The greatest area of growth and change has occurred in that portion currently being redeveloped. The principal street - Second Avenue, originally called Main Avenue until the filling operations created more area and First Avenue became the primary street - have traditionally organized the movement and appearance of the Yard. The first plan by Alexander Parris proposed large quadrangular granite buildings facing on Second (Main) Avenue and the waterfront: only the front quarter of the first building remains (Building 34), its continuation block by First Avenue. Subsequent plans include a street grid surrounding granite storehouses (like Building 33) that eventually covered the area between First Avenue and the Ropewalk and stretched to the seawall (present 16th Street). A large portion of this area was rebuilt during the 20th century when the concrete buildings like 149 and 199 obliterated the grid and replaced the granite sheds and lofts. Only Building 75 remains of the granite buildings from this phase.

The area between First Avenue and the water has consistently been developed as rectilinear buildings perpendicular to the main axis and separated by the cross

streets. Again, the increased scale of the World War II buildings obliterated some of this pattern. However, the current plan for the yard recaptures much of the original scheme. As the seawall was absorbed by landfill and the piers were enlarged, the contact with the water diminished and the inland isolation of the "granite district" grew.

The major growth periods are apparent in the design and materials of the buildings - the granite 1820's, the brick and granite mid-century, the brick shops of the 1870's and the large steel and concrete 20th century warehouses - even though the general layout is consistent. The materials of the ground plane have been modernized and the amount of planting has been decreased. However the general quality of hard surface punctuated with green spaces remains. The tree lined streets of the turn-of-the-century have been replaced by the World War II additions and much of the landscaped area has been paved. The current master plan will recapture these features and the resultant pedestrian quality of most of the Shipyard.

2

II. GENERAL GUIDELINES

A. OBJECTIVES AND PHILOSOPHY

Changes will occur in the Boston Naval Shipyard. The function which created the character of the site no longer exists and cannot be duplicated. In order for the resource to remain, it must be adapted to new uses. The task is to retain as much as possible of the form, character and "flavor" of the Shipyard while equipping it for a new and useful life.

In the physical treatment of the Shipyard, it is the intent of the Boston Redevelopment Authority to neither re-create the appearance of an earlier time period nor to expunge all evidence of the area's industrial past. The origins and significance of the Shipyard provide the basis of decisions on what existing elements should be retained. They also offer precedents for solutions to contemporary design problems associated with economic revitalization of the site.

Design plans for the Shipyard must, above all, provide a theoretical rationale for proposed action. It is expected that proposals for buildings in the Shipyard will exhibit an understanding of the evolution of the buildings and the site, and will provide a theoretical basis for future changes.

B. GENERAL SHIPYARD GUIDELINES

These guidelines establish the essential patterns of development for the entire site. Buildings to be retained and parcels for new development are identified, as well as the pedestrian and open space network, vehicular access and significant visual linkages.

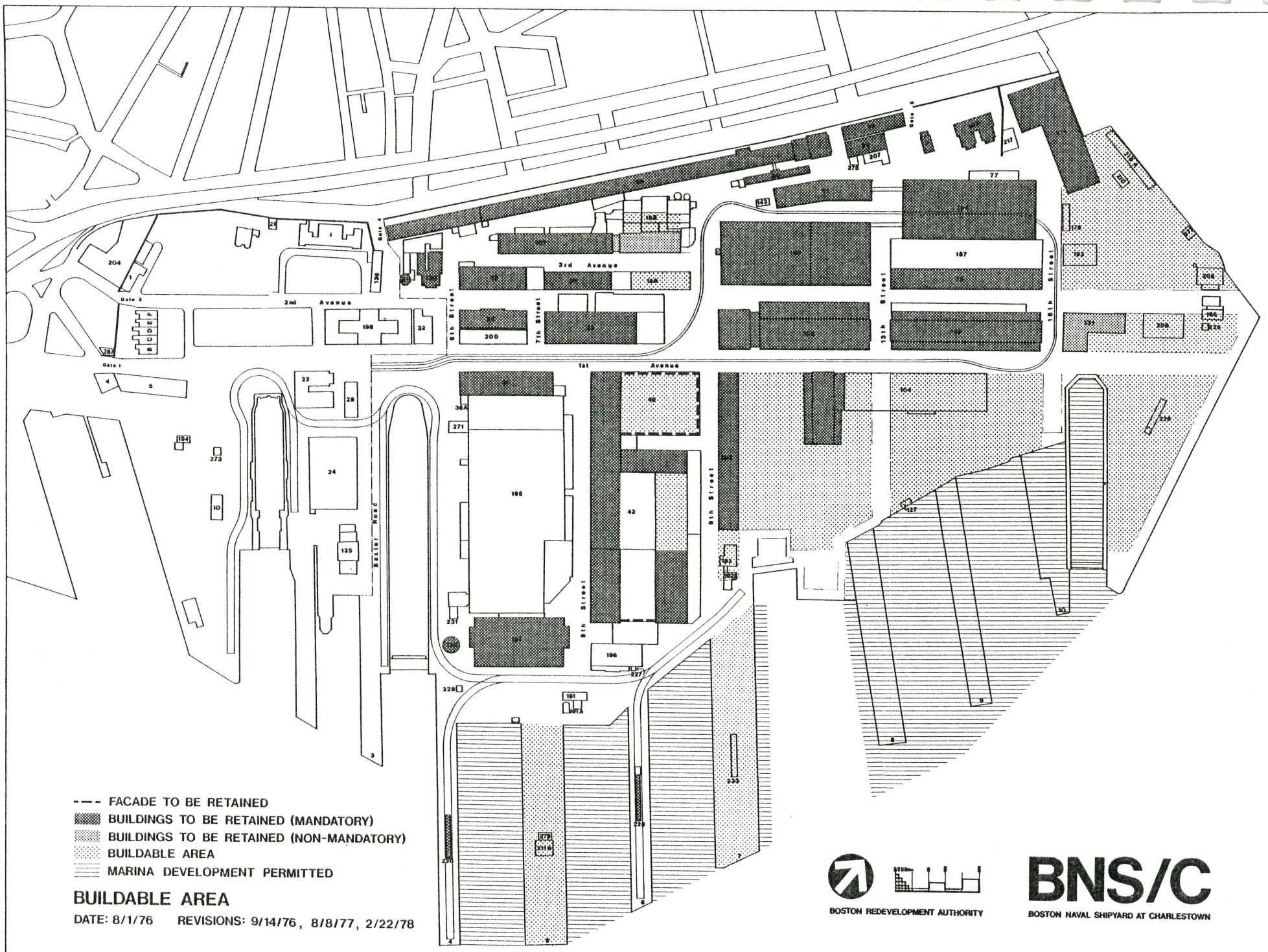
1. BUILDABLE AREA (See Map)

This map identifies all buildings that must be retained (mandatory) and those that may be demolished (non-mandatory) if it can be demonstrated that adaptive reuse of the structure is not feasible.

In addition, parcels for new development are identified. These parcels are subject to specific controls contained in Section III.

2. PEDESTRIAN AND OPEN SYSTEM (See Map)

Pedestrian pathways were established to create logical routes from origins to destinations which are significant to the public at-large. These pathways should offer facilities and amenities for lingering and browsing, for meeting people and being met, and for simply enjoying the passing scene.



BUILDABLE AREA

DATE: 8/1/76 REVISIONS: 9/14/76, 8/8/77, 2/22/78

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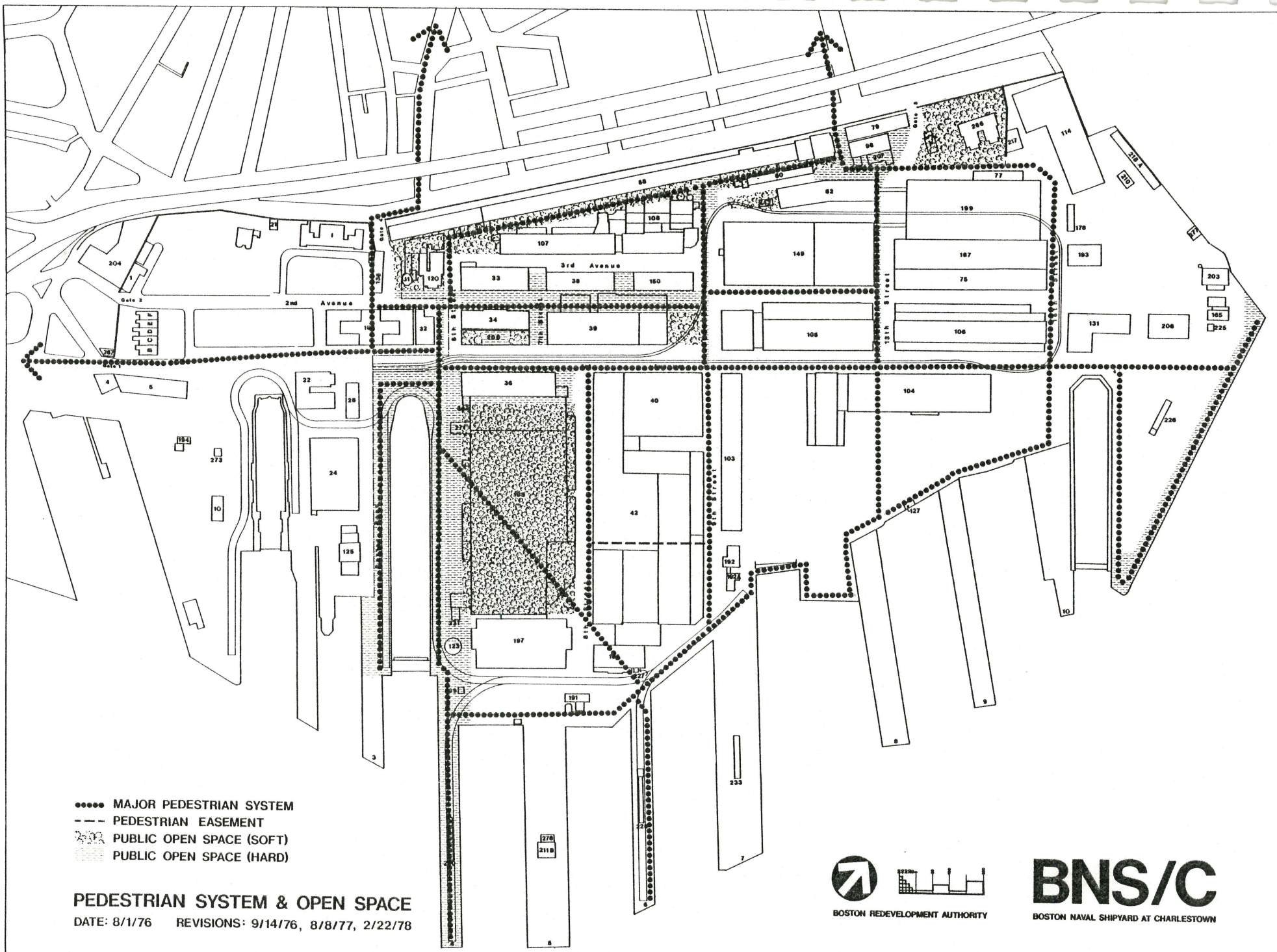
MAJOR PEDESTRIAN SYSTEM
PEDESTRIAN EASEMENT
PUBLIC OPEN SPACE (SOFT)
PUBLIC OPEN SPACE (HARD)
PEDESTRIAN SYSTEM & OPEN SPACE
DATE: 8/1/76 REVISIONS: 9/14/76, 8/8/77, 2/22/78
BOSTON REDEVELOPMENT AUTHORITY
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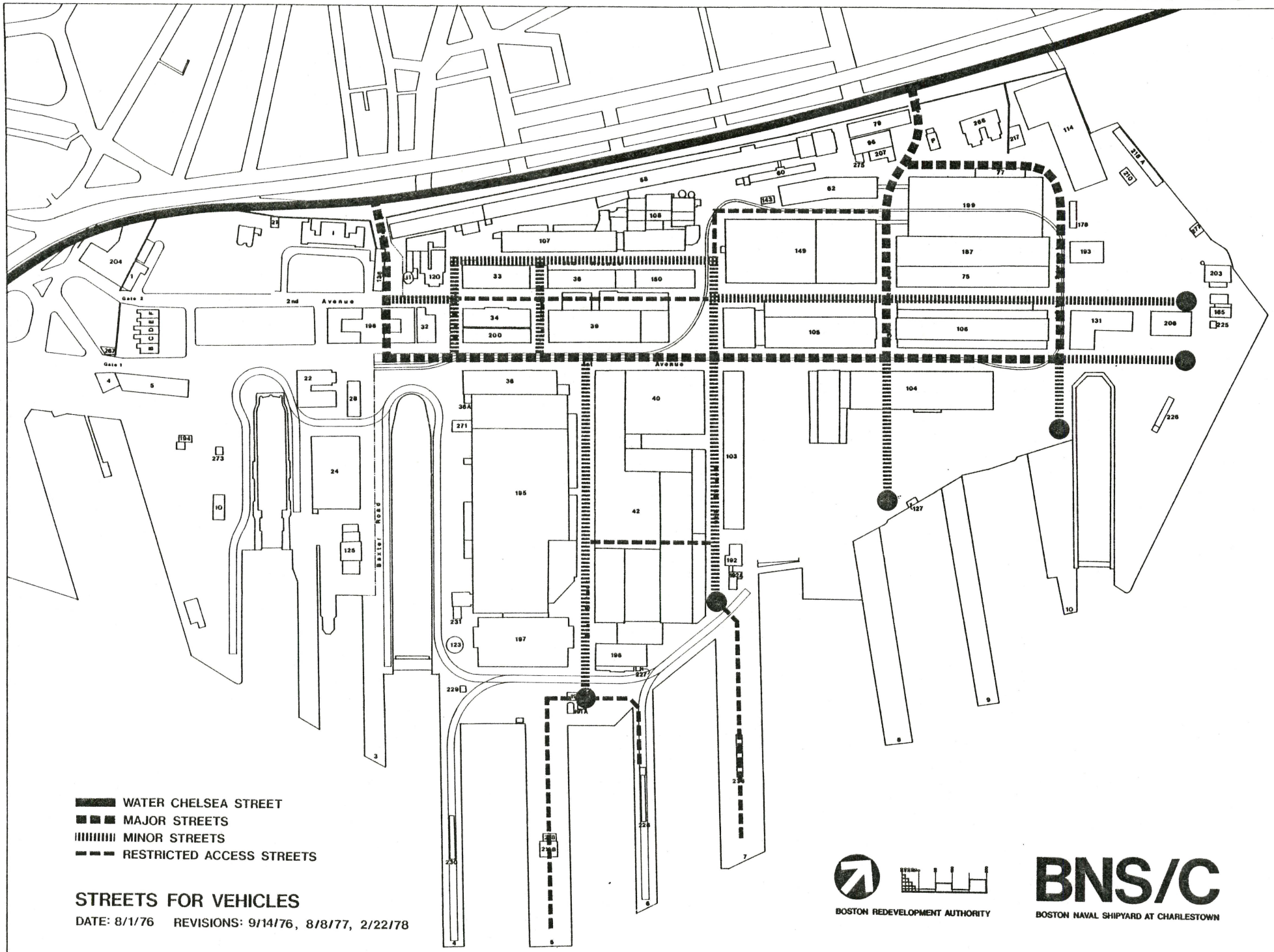
BOSTON NAVAL SHIPYARD AT CHARLESTOWN
3rd Avenue
2nd Avenue
Gate 2
6th Street
7th Street
12th Street



STREETS FOR VEHICLES

DATE: 8/1/76 REVISIONS: 9/14/76, 8/8/77, 2/22/78

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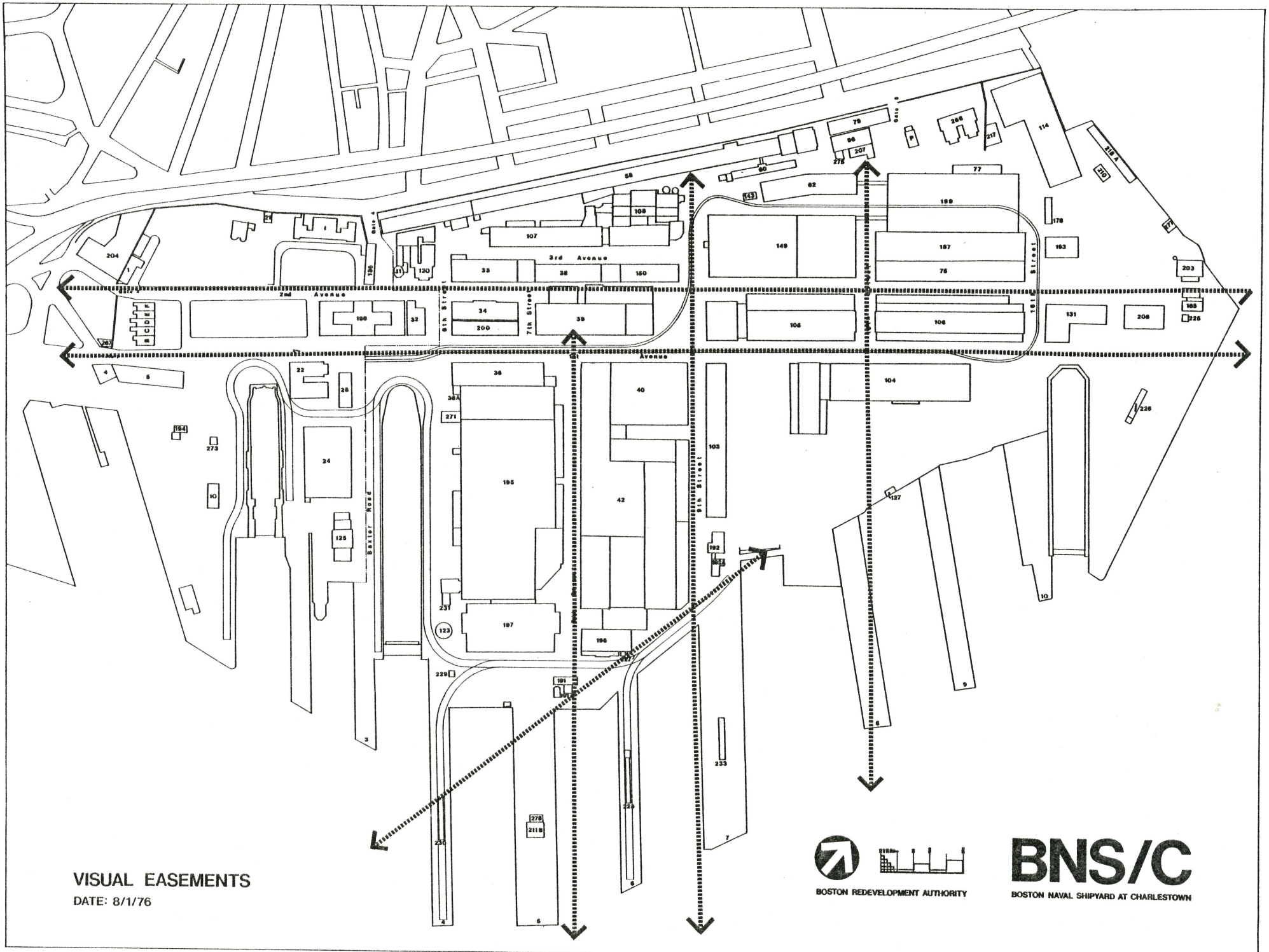
BOSTON NAVAL SHIPYARD AT CHARLESTOWN


2nd Avenue
3rd Avenue
5th Avenue
6th Street
7th Street
9th Street
10th Street
Baxter Road
Gate 4
Gate 5
CIDER
VISUAL EASEMENTS
DATE: 8/1/76
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BOSTON NAVAL SHIPYARD AT CHARLESTOWN

The key elements of the open space system are (1) the Shipyard Park (2) Flirtation Walk and Second Avenue in the Historic Transfer Area and (3) the pedestrian easement, Pier 6 and the Shipways in the New Development Area.

3. STREETS FOR VEHICLES (See Map)

Three categories of streets have been established within the Shipyard to provide clear and adequate access for automobiles, buses, and service vehicles. Major streets carry the bulk of the traffic to an from the Yard at Gates Four and Five and along First Avenue. Minor streets are primarily residential in character with cul-de-sacs designed to preserve a major portion of the water's edge for pedestrian activity.

A third type of street is primarily pedestrian oriented and designed to provide only limited vehicular access for housing and marina uses.

4. VISUAL EASEMENTS (See Map)

Axial views which survive from the historical building pattern of the Shipyard and those which shall be re-established are identified on this map.

C. EXTERIOR BUILDING AND SITE GUIDELINES

1. EXISTING BUILDINGS

The guidelines in this section apply to all existing buildings to be retained in the New Development Area. Specific controls are contained in Section III. Compliance with the provisions of both sections is necessary.

Omissions should not be construed as prohibition of a design that will, in fact, enhance the integrity of the building.

The guidelines and specific controls are intended to specify particular prohibitions or actions to enhance or protect the architectural integrity of the buildings during renovation. They are not concerned with code or safety requirements as such, but their stipulations are expected to affect the actual design or location of solutions which result from these requirements.

In no instance are these guidelines intended to create a situation which endangers public safety. However, it is expected that code and safety requirements will be met in a manner which also respects the requirements of these guidelines.

(a) DESIGN APPROACH

In general, the design approach to buildings in the Shipyard should begin with the premise that exterior alteration will be minimized. The facades of most buildings in the Shipyard are reasonably intact. Where changes have occurred, careful evaluation has been made as to the nature of the changes. Modifications to a building which have taken place over time are a part of the history of that building and may be significant.

New additions or alterations should not disrupt the essential form and integrity of historic property. They should be compatible with the size, scale, color, material and character of the existing buildings and their environment. They should be contemporary in design, not imitative of an earlier style or period of architecture. Most important, new additions or alterations should be done in such a way that if they were to be removed in the future, the essential form and integrity of the building and environment would be unimpaired. Proposed changes which are easily reversed are far less serious and more acceptable to the Boston Redevelopment Authority than those which irrevocably alter or destroy a resource.

In general, it is preferable to retain and repair deteriorated materials or architectural features rather than to remove or replace them. When it is necessary to replace such materials or features, replacement should be based on physical evidence, or evidence contained in documents such as plans and photographs indicating the appearance and other characteristics of the materials or features being replaced. New materials used in replacement should, to the greatest extent possible, match the materials being replaced in physical properties, design, color, texture and other visual qualities.

(b) THE TREATMENT OF MASONRY

Cleaning and Waterproof Coating

The selection of a suitable method of cleaning masonry is affected by the type of masonry to be treated and the type of material to be removed. Different cleaning techniques are required for different types of buildings. For this reason, it is essential that careful analysis be made of the conditions to be dealt with, and test patches of tech-

niques under consideration be carried out in inconspicous locations on the building to be cleaned. These tests will be reviewed and approved by the BRA.

In general, the gentlest method applicable to the task should be chosen. Under no circumstances will exterior brick be sandblasted. This technique changes the structural and visual quality of masonry and accelerates deterioration. Waterproofing or water repellant coatings will not be applied to masonry, unless required to solve a specific problem. Such coatings can accelerate deterioration. Only with specific approval from the BRA will painted granite be sandblasted.

Included in this document is a monograph entitled "Preservation Briefs #1, the Cleaning and Waterproof Coating of Masonry Buildings" prepared by the National Park Service. The development team should be fully familiar with this monograph before embarking on any project involving the potential cleaning or waterproof coating of masonry in the Shipyard.

Materials

Whenever possible, original masonry and mortar should be retained. Masonry materials used to repair or replace a surface will match the primary existing material (not a patched area) in color, shape, surface texture and finishing technique. The bonding pattern and method of installation will also be consistent with existing masonry. It should not be assumed that cleaning old masonry and treating new masonry is an acceptable method of making them match. This is not generally a satisfactory solution.

Specifications and samples of materials will be submitted to the BRA for approval. Consultants expert in masonry conservation, including sources of materials, are available to assist in this process.

Joints and Mortar

Before re-pointing or replacing a masonry surface, careful analysis of the composition of joints and the methods used in striking them is needed.

In situations where entire facades are to be re-pointed or replaced and there is physical evidence of the original mortar used, the mortar used in the

new work should match the original in color, texture and physical properties. Where only a portion of a wall is to be repaired, the mortar and joints should match existing material, whether or not original.

Patching Masonry Units

Patching a masonry unit, such as a brownstone sill or lintel, will not be allowed. Where severe deterioration has taken place preventing the retention of damaged material, replacement will be required as discussed elsewhere. Where specialized problems exist, expert technical assistance should be obtained. Minor infractions to the material will be tolerated.

Paint on Masonry

Granite surfaces will not be painted. Consideration should be given to painting brick surfaces only when there is evidence that this treatment was used at a significant point in the history of the building. Colors will be submitted, along with a rationale for their selection, to the BRA for review and approval.

Developers are encouraged to retain painted signs and symbols evocative of the previous use of a building where such signs and symbols would not confuse or offend the public.

(c) FACADE OPENINGS

Openings

No new openings will be allowed in facades of buildings without the approval of the Boston Redevelopment Authority.

Original door and window openings will be retained. Door and window openings will be neither enlarged nor reduced to fit stock window sash or doors, air conditioners, or for any other reason.

Existing openings which are to be closed will be closed in such a way as to allow them to be opened again in the future. Where appropriate, they will appear to be covered by shutters or other closing devices historically suitable to the building.

Windows and Doors

Whenever possible, original window elements such as sash, lintels, sills, architraves, shutters and other decorations and hardware will be repaired as neces-

sary and retained. When replacement of materials or elements is necessary, it should be based on physical or documentary evidence of the previous appearance of such materials or elements.

Similarly, original doorway elements including doors, pediments, hoods, architraves, steps and hardware will be retained whenever possible. If replacement is necessary, it should be done on the basis of physical or documentary evidence.

Doors, which are the element most often modified in the Shipyard, may be retained as is, or restored to an earlier appearance. Or, if neither of these approaches is feasible or acceptable, the door can be set-in no less than 18 inches from the facade plane of the building and constructed in such a way as to be as transparent as possible.

Colors of Sash, Framing, Doors

It is always good practice to select colors on the basis of physical or documentary evidence of colors used previously in the history of a building. Alternatively, colors used on window sash, and window and door framing in the brick shops designed in the Neo Classical Revival styles may be light stone colors - soft grey or beige. Colors used on sash and framing in the granite buildings should be deep shades of grey or brown, or matte black.

Door colors should be subdued, natural tones unless there is physical and documentary evidence to the contrary.

(d) ROOF AND CORNICE

Roof Shape, Openings

It is important to preserve the integrity of the basic shapes of roofs of buildings in the Shipyard, particularly if they are seen from public ways. Non-original openings in roofs shall be in accordance with the following conditions:

(1) skylights

No portion of a skylight will project more than eight inches from the plane of the roof. The structure of the skylight will be rectilinear and parallel to the roof plane. The color of the framing material will approximate the

principal color of the roof. Glass should be dark in color. Windows designed to be operable and moved in the plane of the roof (such as Velux) should be considered.

(2) recessed decks

Recesses may be cut into the plane of the roof in order to provide for glass and decks. A recess should be located so that a vertical from its lower edge to the finished floor level measures 3'0" and from its upper edge 8'0". The roof will be continuous around and below the recess.

The material and/or color of the structure that is visible should match that of the trim on the main facade. Flashing will be designed to be as visually minimal as possible.

Skylights, dormers and other roof appendages which were original to the building but are no longer present may be restored to their original appearance.

Roof Materials

Whenever possible, the original roof covering will be retained, which can involve removal and replacement if required.

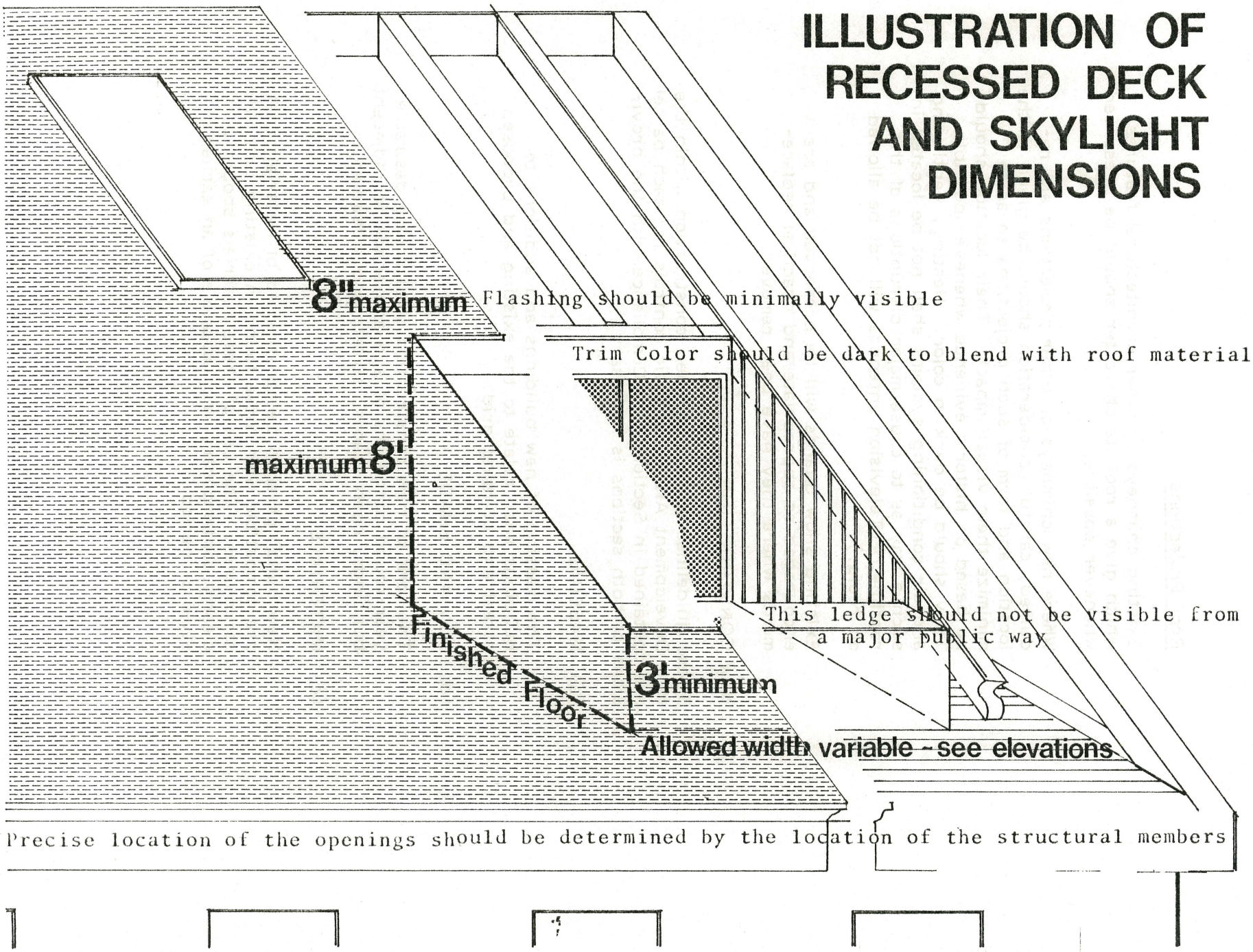
Where replacement materials are permitted the new materials will match the original in color, size, shape, texture and installation details.

Cornice

Cornice details will be preserved, replaced or repaired to match the original cornice except as otherwise approved by the BRA. Altered cornice lines may be retained. If an existing alteration is to be removed, the original cornice will be restored. (If the roof form is affected by such action, it also will be restored to its original shape and structure and is subject to other standards pertaining to roofs.)

Gutters and downspouts will be copper or an approved factory dark colored factory or field finished material.

ILLUSTRATION OF RECESSED DECK AND SKYLIGHT DIMENSIONS



Roof Projections

Existing chimneys or other architectural features which give a roof its character should be preserved whenever possible.

Where new chimneys or other projections are required, careful consideration should be given to the location and form of such projections so as to minimize their visual impact. Their location should be based on historic evidence whenever possible. They should be dark in color. Heating, ventilating and air conditioning systems shall not be located in such a way as to cause major disruptions of the roofline. (Television antennas will not be allowed on roofs.)

Existing snow guards will be preserved and are encouraged as appropriate and practical replacements where they have been removed.

2. NEW CONSTRUCTION

These guidelines apply to all new construction within the New Development Area. Specific controls for each parcel are contained in Section III. Compliance with the provisions of both sections is necessary.

(a) MASSING

The massing of new buildings and additions to buildings shall relate to the existing and proposed street and building grid.

(b) SUN AND SHADE

The form of new construction shall create desirable year-round conditions of sun and shade for adjacent buildings, open spaces, streets and sidewalks.

(c) MATERIALS

New buildings shall be constructed of materials that are compatible with those found in existing Shipyard structures. The use of these materials should be clearly contemporary, not imitative of an earlier style or period.

3. SITE DEVELOPMENT

(a) PEDESTRIAN WALKWAYS

The pattern of pedestrian movement shall be extended by providing public walkways at the ground level in the private realm. Areas bordering pedestrian routes should be as diverse as possible in terms of activity and pedestrian amenity.

(b) PUBLIC OPEN SPACE

The site shall be developed to create a variety of open spaces at ground level, well connected to each other by views and walkways.

(c) SERVICING

Provide loading and servicing areas which are systematically well-connected to the pattern of streets and open spaces, so as to cause the least amount of disruption to present and anticipated pedestrian and vehicular traffic.

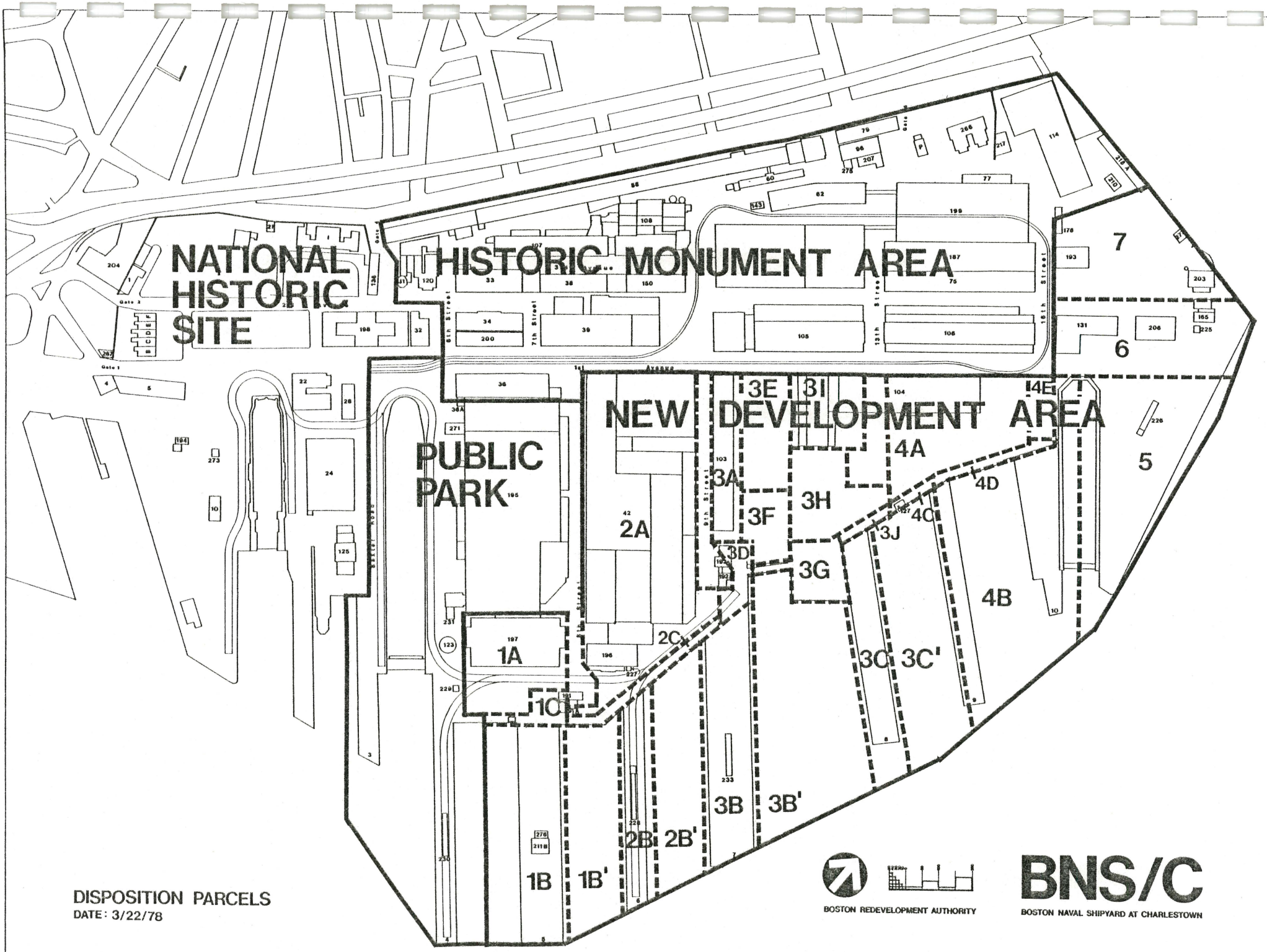
(d) PARKING

Parking shall be provided to satisfy the demand generated by the proposed uses for each development parcel.

(e) SIGNS

Signs shall be considered an integral part of the architecture and must be in conformance with "The Boston Sign Code."

3



DISPOSITION PARCELS
DATE: 3/22/78

BOSTON REDEVELOPMENT AUTHORITY

BNS/C
BOSTON NAVAL SHIPYARD AT CHARLESTOWN

III. PARCEL CONTROLS

PARCEL 1A

1. SITE DATA

(a) LOCATION

On the southerly edge of the Shipyard Park; adjacent to the Harbor, piers and Drydock Two.

(b) PARCEL AREA

Approximately 1.6 acres.

(c) EXISTING STRUCTURES

Building 197:
A seven-story building constructed in 1941 as a ship repair shop with steel frame, concrete floors, brick spandrels and steel industrial sash.

2. PERMITTED USES

GROUND LEVEL - commercial, restaurant and parking.

UPPER LEVELS - residential.

A restaurant may be located on the roof level.

3. PARCEL CONTROLS

(a) EXISTING BUILDING

Shall be retained. The steel industrial sash may be removed, but the essential planar and horizontal quality of the facade shall be retained.

(b) ADDITIONS

A three-story addition of not more than 35' in height and 70' in depth will be allowed along the southerly side of the building.

A one-story roof-top restaurant will be allowed. The addition shall be set back from the existing face of the building on all sides so it will not increase the shadow impact on the park or alter the visual integrity of the building.

(c) ACCESS

Vehicular access shall be via Eighth Street with all servicing to be provided within the building.

(d) PARKING

Enclosed parking shall be provided within the building to satisfy the demand generated by the proposed uses.

(e) MATERIALS

The additions shall be constructed of materials which (1) are compatible with those of the existing building and (2) reinforce the visual distinctiveness of the additions.

Acceptable materials include concrete, masonry, metal and glass.

(f) GROUND LEVEL

Special consideration shall be given to the design of the ground level to ensure that a range of public amenities are provided; including, but not limited to (1) restaurant with a capability for outdoor dining and (2) visually interesting commercial/ retail activities.

PARCEL 1B

1. SITE DATA

(a) LOCATION

Pier Five

(b) PARCEL AREA

Approximately 2.0 acres of pier and 1.5 acres of water.

(c) EXISTING STRUCTURES

Pier Five was constructed in 1941 of end-bearing, jacketed H piles with concrete decking.

211B - Shipfitters shop and 278 an electrical substation.

2. PERMITTED USES

Residential.

Marina use may be permitted only if it can be demonstrated by the developer that residential use is not feasible.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Pier Five shall be retained.
Buildings 211B and 278 may be demolished.

(b) HEIGHT

The height of new construction shall not exceed 2½ stories or 35 feet.

(c) PARKING

A minimum of one space of covered parking shall be provided for each unit.

(d) PUBLIC SPACE

The end of the pier shall remain open and consistent with privacy and security requirements detailed in the disposition agreement developed for use by the public.

(e) ACCESS

Vehicular access shall be via a restricted access roadway connecting to the Eighth Street cul-de-sac.

(f) MATERIALS

New construction shall be concrete, masonry, metal and glass.

PARCELS 1C, 2C, 3D, 3G, 3J, 4C, 4D, 4E

1. SITE DATA

(a) LOCATION

Along the water's edge between Pier 4 and Drydock 5.

(b) PARCEL AREA

Approximately 2.3 acres.

(c) EXISTING STRUCTURES

Shipways bridge and deck.

2. PERMITTED USES

Public open space easement.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

The shipways bridge and deck shall be retained and restored.

(b) ACCESS

Vehicular access shall be restricted to those portions of the easement necessary to provide limited access directly across the easement to the piers.

(c) MATERIALS

The waterfront promenade shall be paved primarily of granite with edge protection constructed of granite bollards and chain or metal railing.

(d) LIGHTING

Continuous exposed lamp lighting shall be provided along the entire length of the promenade. The fixtures shall be similar to those used in the Shipyard Park.

(e) FURNISHINGS

Benches and planters shall be provided intermittently along the length of the promenade.

PARCEL 2A

1. SITE DATA

(a) LOCATION

Between Eighth and Ninth Streets, First Avenue and the Seawall.

(b) PARCEL AREA

Approximately 6.4 acres of land.

(c) EXISTING STRUCTURES

Building 40 is a two-story structure built in 1863-4 as a heavy hammer house and rolling mill of steel, concrete and brick masonry.

Building 42 is a three-story complex of structures built between 1856 and 1917 as a machine shop. The structures are steel frame and concrete frame with brick masonry, wood and steel sash.

Building 196 is a two-story structure built in 1939 as a ship repair shop with steel structure, and brick masonry walls.

2. PERMITTED USES

Residential, convenience commercial, and public open space.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Building 40 - The facade shall be retained and restored, and the original roof line and monitor restored along First Avenue and Ninth Street.

Buildings 42-A,42-C, 42-E, 42-N and 42-S shall be retained. The remaining additions may be demolished.

The first level of the facade link between 42A and 42C shall be retained.

Building 196 may be demolished except for the concrete foundation wall which shall be incorporated into the landscape plan.

(b) ADDITIONS

No additions will be allowed which increase the height or alter the integrity of the existing massing as seen from the public way.

(c) PARKING

Parking shall be provided within the existing walls of Building 40. The quantity shall be sufficient to satisfy the demand generated by the proposed uses.

(d) ACCESS

Vehicular access to the parking garage shall be via Ninth Street and the two existing openings in the East facade of Building 40.

A limited access roadway for resident drop-off shall be located between Buildings 42A and 42S, connecting Eighth Street and Ninth Street.

(e) PUBLIC EASEMENTS AND OPEN SPACE

A visual and pedestrian easement shall be maintained between Eighth and Ninth Streets along the limited access roadway noted above.

The plaza between Building 42 and the seawall shall be developed for use as public open space.

PARCEL 2B, 1B', 2B'

1. SITE DATA

(a) LOCATION

Pier Six

(b) PARCEL AREA

Approximately 0.9 acres of Pier, and 4.6 acres of water.

(c) EXISTING STRUCTURES

Pier Six was constructed in 1956 with end-bearing concrete filled steel pipe piles and a concrete deck.

Building 228 is a two-story structure with steel frame, masonry walls and steel industrial sash.

2. PERMITTED USES

Marina related back-up facilities and parking.

Residential use may be permitted if it can be demonstrated that residential use is not feasible on Pier Five.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Pier Six and Building 228 shall be retained.

(b) PARKING

Not more than 50 parking spaces may be provided on the pier for marina-related use.

(c) PUBLIC EASEMENT

Public pedestrian access shall be provided along the entire length of the Pier and a space, not less than 3,600 square feet, shall be provided at the end of the Pier for public use.

(d) ACCESS

Vehicular access to the Pier shall be via a restricted access roadway connecting to the Eighth Street cul-de-sac.

PARCEL 3A, 3E, 3F, 3H, 3I

1. SITE DATA

(a) LOCATION

Between Ninth and Thirteenth Streets, First Avenue and the water.

(b) PARCEL AREA

Approximately 5.2 acres of land.

(c) EXISTING STRUCTURES

Building 103 is a three-story building constructed in 1901 as a ship repair shop. Structure is concrete frame with brick masonry and wood sash.

Building 104 is a complex of two structures built in 1901 and 1939 respectively, as a ship fitters shop. The old (west) portion is steel frame, brick masonry with wood sash. The new (east) portion is steel frame, brick masonry and fiber-glass.

Shipways Number One is a concrete incline ramp built in 1920.

Shipways Number Two is a concrete incline ramp built in 1945.

2. PERMITTED USES

Residential recreation and parking.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Building 103 shall be retained and restored for residential use.

Building 104 (west section) shall be retained for residential and recreational use.

Shipways Ramps One and Two shall be retained and reused as bearing for new construction.

Building 104 (east section) shall be demolished.

(b) AREAS FOR NEW CONSTRUCTION

New construction will be allowed on the elevated portion of the Shipways ramps and between Building 104 (old section) and Thirteenth Street.

(c) HEIGHT

The height of new construction in the shipway area shall not exceed 50 feet and west of 104 (old section) 30 feet.

(d) ACCESS

Vehicular access to the site and the parking structure shall be via Thirteenth Street

(e) PARKING

Sufficient covered parking shall be provided to satisfy the demand generated by the proposed uses.

(f) MATERIALS

New construction shall be concrete, masonry, metal and glass.

PARCEL 3B

1. SITE DATA

(a) LOCATION

Pier Seven

(b) PARCEL AREA

Approximately 2.4 acres of pier and 0.6 acres of water.

(c) EXISTING STRUCTURES

Pier Seven was constructed in 1958 with end-bearing concrete filled steel pipe piles and a concrete deck.

Building 233 is a two-story structure with steel frame, masonry walls and steel industrial sash.

2. PERMITTED USES

Residential

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Pier Seven shall be retained. Building 233 may be demolished.

NOTE: Controls (b)-(f) for Parcel 1B also apply to Parcel 3B.

PARCEL 3C, 3B', 4B'

1. SITE DATA

(a) LOCATION

Pier Eight

(b) PARCEL AREA

Approximately 1.3 acres of Pier and 8.3 acres of water.

(c) EXISTING STRUCTURES

Pier Eight was constructed in 1910 with wood piles and wood deck.

2. PERMITTED USES

Marina and parking.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Pier Eight will be retained if feasible.

(b) PARKING

Parking may be provided on the pier for marina-related use. The quantity and location of the parking must be approved by the BRA.

(c) ACCESS

Vehicular access shall be via a restricted access roadway connecting to the Thirteenth Street cul-de-sac.

PARCEL 4A

1. SITE DATA

(a) LOCATION

Between thirteenth and Sixteenth Streets, First Avenue and the water.

(b) PARCEL AREA

Approximately 2.9 acres of land.

(c) EXISTING STRUCTURES

Building 104 (see Parcel 31).

2. PERMITTED USES

Residential, ground floor commercial, professional office and parking.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

The eastern portion of Building 104 shall be demolished.

(b) HEIGHT

The height of new construction shall not exceed 110 feet. The location of the 110 foot elements shall be limited to locations parallel to Thirteenth and Sixteenth Streets and perpendicular to First Avenue.

The height along the remainder of First Avenue shall not exceed 60 feet.

The height along the southerly edge shall not exceed 2½ stories (30 feet).

NOTE: An effort will be made to amend the Urban Renewal Plan so that the maximum height limit may be increased for the eastern portion of this parcel. If that effort is successful, the FAR established on the basis of the existing controls shall remain constant, the height of the eastern element shall be increased and the height of the western element shall be reduced by an equal amount.

(c) ACCESS

Vehicular access to the site shall be via Thirteenth and Sixteenth Streets.

(d) PARKING

Sufficient covered parking shall be provided to satisfy the demand generated by the proposed uses.

(e) Materials

New construction shall be concrete, masonry, metal and glass.

PARCEL 4B

1. SITE DATA

(a LOCATION

Pier Nine, Pier Ten and Dry Dock Five.

(b) PARCEL AREA

Approximately 2.0 acres of Pier, 0.7 acres of drydock and 6.7 acres of water.

(c) EXISTING STRUCTURES

Pier Nine was constructed with wood piles and wood deck.

Pier Ten was constructed with wood piles and wood deck.

Dry Dock Five was constructed in 1942 of concrete with steel sheeting.

2. PERMITTED USES

Marina

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Piers Nine and Ten shall be demolished. Dry Dock Five shall be retained, repaired and remain flooded.

PARCEL 5

1. SITE DATA

(a) LOCATION

Dry Dock Five and Pier Eleven area.

(b) PARCEL AREA

Approximately 1.8 acres of land, 1.1 acres of pier, 0.7 acres of dry dock and 0.5 acres of water.

(c) EXISTING STRUCTURES

Dry Dock Five was constructed in 1942 of concrete with steel sheeting.

Pier Eleven was constructed in 1956 with end-bearing concrete filled steel pipe piles and a concrete deck.

Building 226 is a one-story structure with steel frame, masonry walls and steel industrial sash.

2. PERMITTED USES

Hotel, Residential, Marina and Parking.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

Dry Dock Five shall be retained, repaired and remain flooded.

Pier Eleven shall be retained.

Building 266 may be demolished.

(b) HEIGHT

The maximum height of new construction shall be 110 feet, unless the Urban Renewal Plan is amended to allow increased height on this parcel.

(c) PARKING

Enclosed parking shall be provided on the site to satisfy the demand generated by the proposed uses.

(d) PUBLIC EASEMENT

Continuous public pedestrian access shall be provided along the entire length of the Dry Dock and water's edge.

(e) MATERIALS

New construction shall be concrete, masonry, metal and glass.

(f) ACCESS

Vehicular access shall be via an extension of First Avenue.

PARCEL 6

1. SITE DATA

(a) LOCATION

East of Sixteenth Street, between First and Second Avenue.

(b) PARCEL AREA

Approximately 2.3 acres of land and 0.3 acres of pier.

(c) EXISTING STRUCTURES

Building 131 is a three-story concrete and brick masonry structure.

Building 165 is a two-story concrete and brick masonry structure.

Building 206 is a two-story wood frame building constructed in 1942 as an office.

Building 225 is one-story concrete and masonry building.

2. PERMITTED USES

Hotel, Residential and Parking.

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

All existing structures may be demolished.

NOTE: Controls (b)-(f) for Parcel 5 also apply to Parcel 6.

PARCEL 7

1. SITE DATA

(a) LOCATION

East of Sixteenth Street between Second Avenue and Building 114.

(b) PARCEL AREA

Approximately 2.7 acres of land.

(c) EXISTING STRUCTURES

Building 178 is a one-story wood frame wood storage shed.

Building 193 is a two-story concrete and brick masonry scrap salvage building.

Building 203 is a two-story incinerator with steel and concrete frame and clad with sheet metal.

Building 277 is a one-story gas storage shed.

2. PERMITTED USES

Light Industrial

3. PARCEL CONTROLS

(a) EXISTING STRUCTURES

All existing structures may be demolished.

(b) HEIGHT

The maximum height of new construction shall be 35 feet.

(c) PARKING

Parking shall be provided to satisfy the demand generated by the proposed uses.

(d) ACCESS

Vehicular access shall be via Sixteenth Street.

(e) MATERIALS

New buildings shall be constructed of materials which are compatible with those of adjoining existing or proposed structures.

4

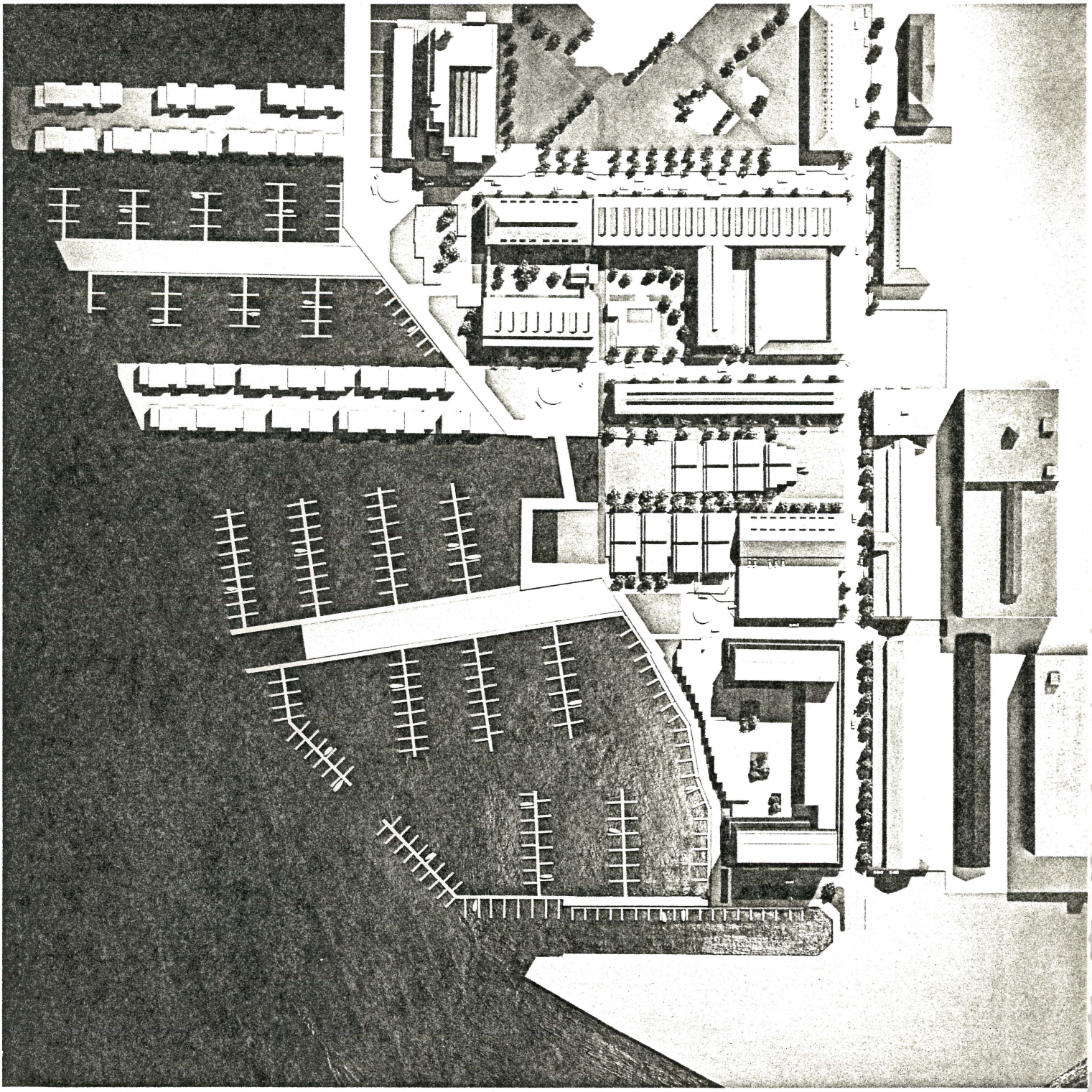
BOSTON NAVAL SHIPYARD AT CHARLESTOWN
NEW DEVELOPMENT AREA
PROPOSED DEVELOPMENT

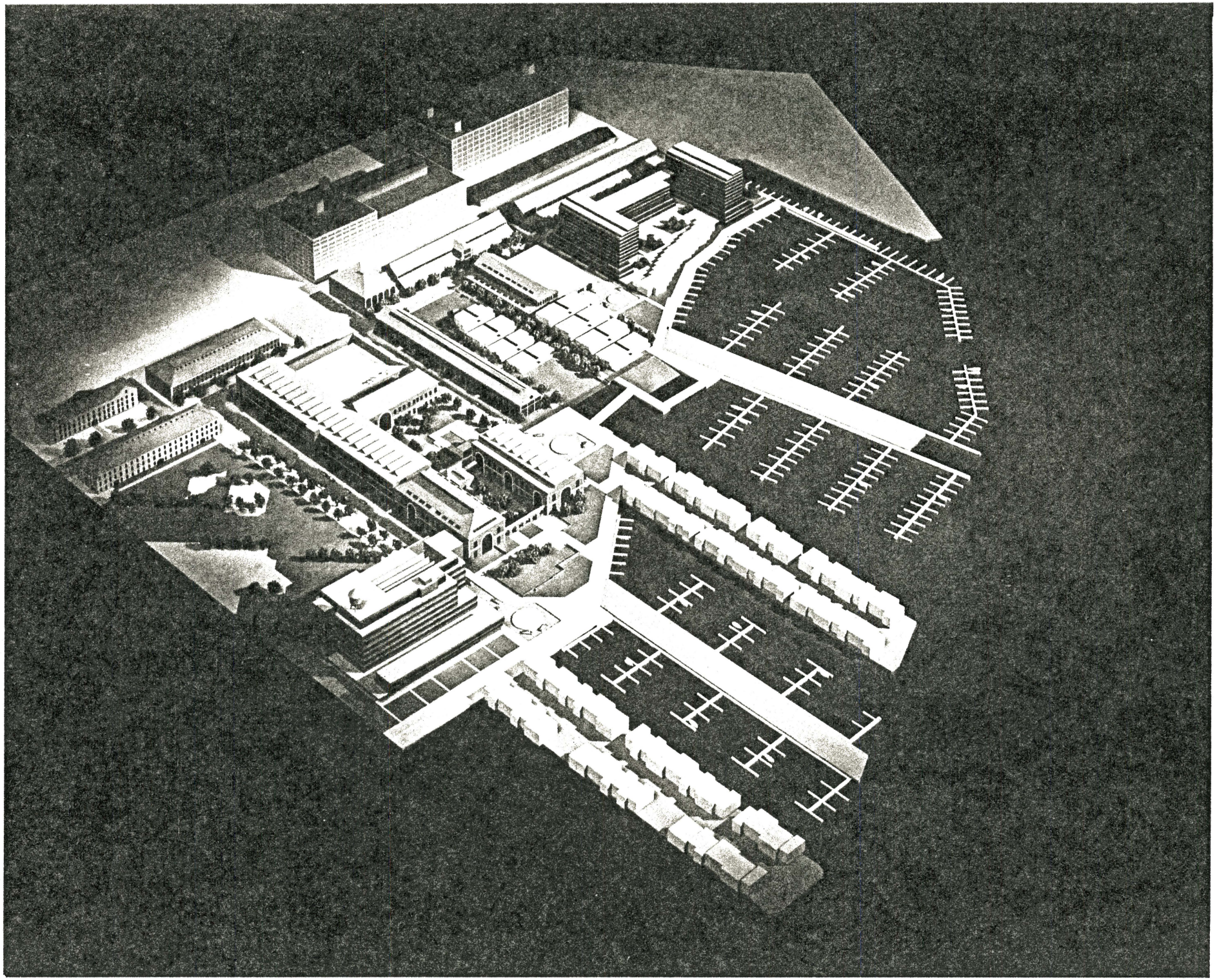
INTRODUCTION

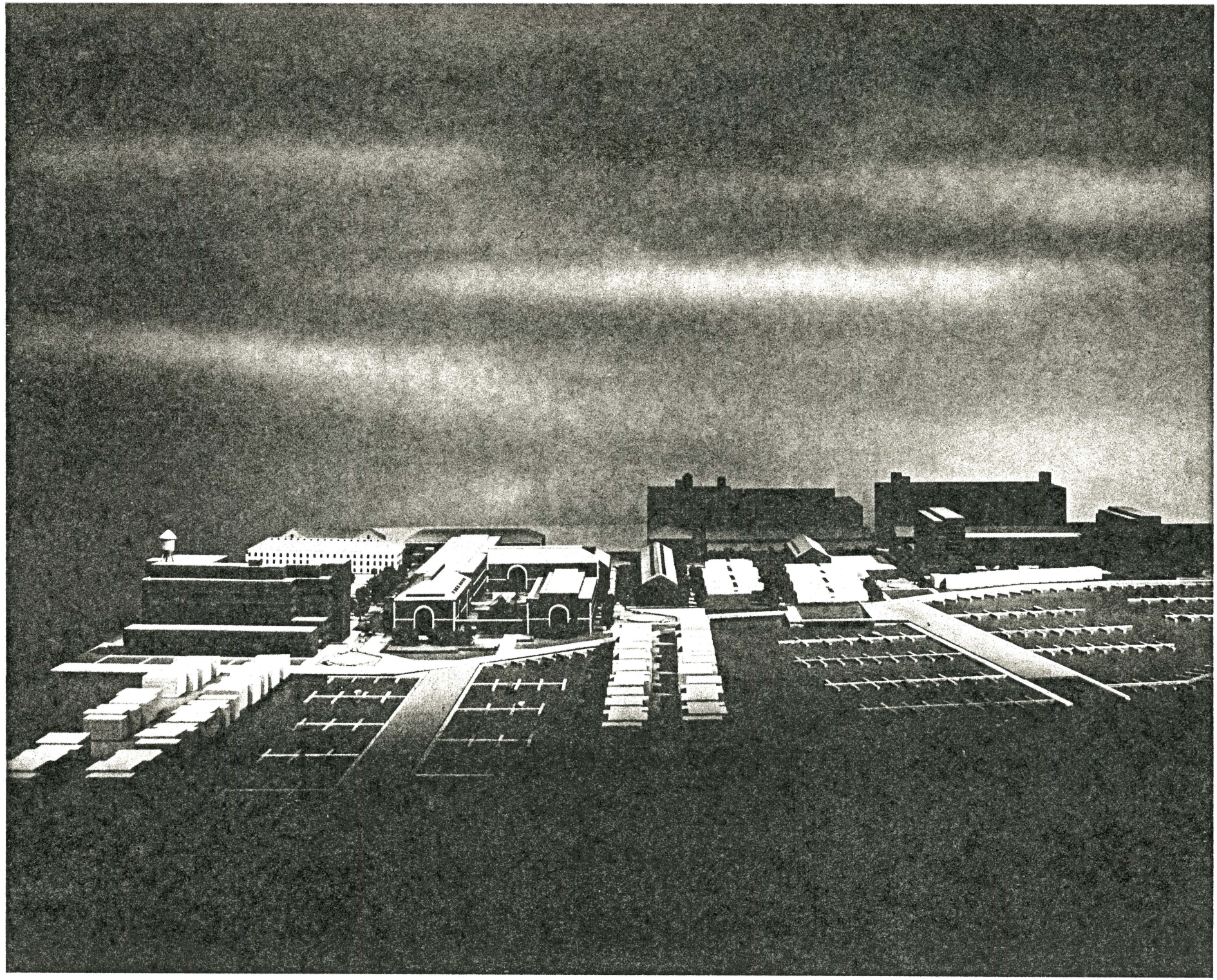
The proposed development of the parcels in the Navy Yard will be carried out over a period of 6-10 years. The physical improvements will be phased with construction beginning from the National Park and City Park at the south end of the yard, easterly in the sequence of parcel numbering.

Uses will include over 1,200 housing units of various types together with commercial, recreational, office, in incidental support uses.

The following is a parcel-by-parcel description of the proposed development.







ANDERSON NOTTER FINEGOLD INC.

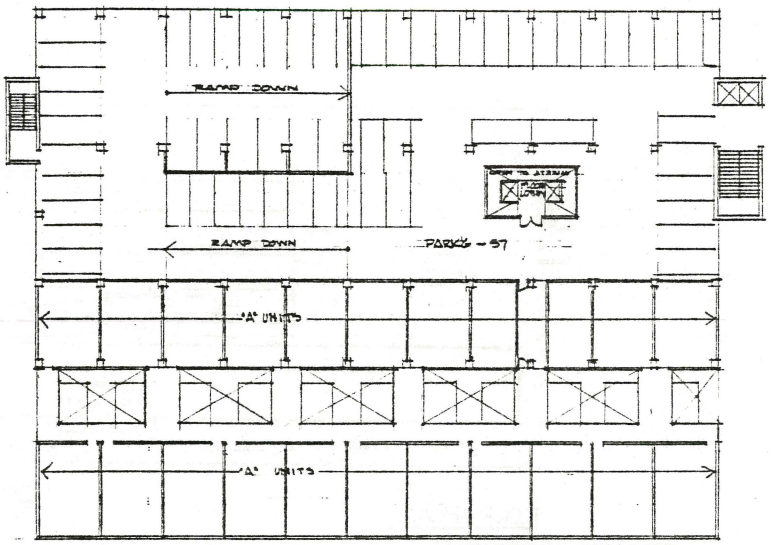
INDEX BY PARCELS

PARCEL 1A

EXISTING STRUCTURE TO REMAIN - BUILDING 197

PROPOSED USE - 132 Residential Units
5,000 S.F. Restaurant
17,000 S.F. Retail Rental
158 Interior Parking Spaces

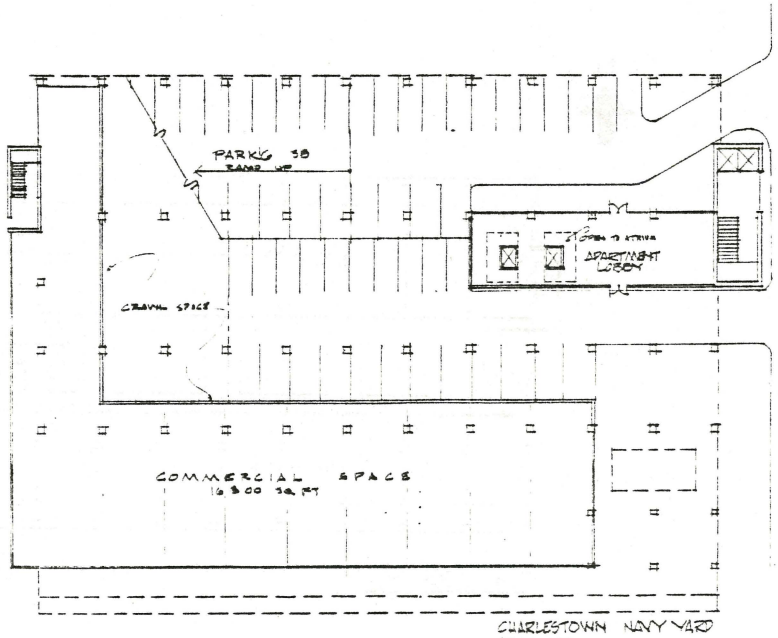
The development of this parcel includes the reuse of Building 197 (Parcel 1A) to the south of the City Park and west of 8th Street. The proposal for Building 197 consists of adaptive reuse as housing with a 3-story addition proposed on the south side connecting to the existing structure to be built on existing foundations presently supporting a crane rail system. The work envisioned involves the cutting of a light well in the center of the structure which is extremely deep to accommodate the new housing use providing light and air to the interior. Parking levels will be constructed within the building in the volume of the ground level which is currently open space with a ceiling height of 40 feet. The housing will require the removal of the industrial glazing between the concrete and masonry spandrilles. Current plans call for new interior walls constructed between the existing wall, leaving private balconies for the remaining units. This wall will be of dark modular paneling and glass, so as not to interfere with the clarity of the existing facade.



CHARLESTOWN NAVY YARD
BLDG 197 -
1/16" = 1'-0"

3RD FLOOR PLAN

N



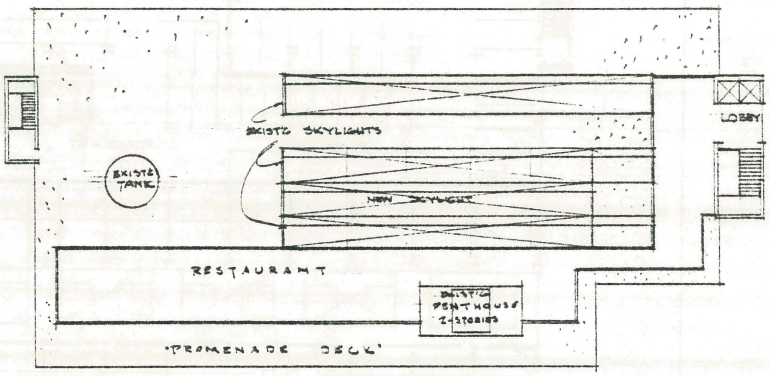
CHARLESTOWN NAVY YARD
BLDG 197 -
1/16" = 1'-0"

1ST FLOOR PLAN

CHARLESTOWN NAVY YARD
BLDG 197

DATE
SCALE 0 5 10 20 FT
PROJECT NUMBER 462.01.01

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114



CHARLESTOWN NAVY YARD
BLDG 197
1/16" = 1'-0"

ROOF PLAN

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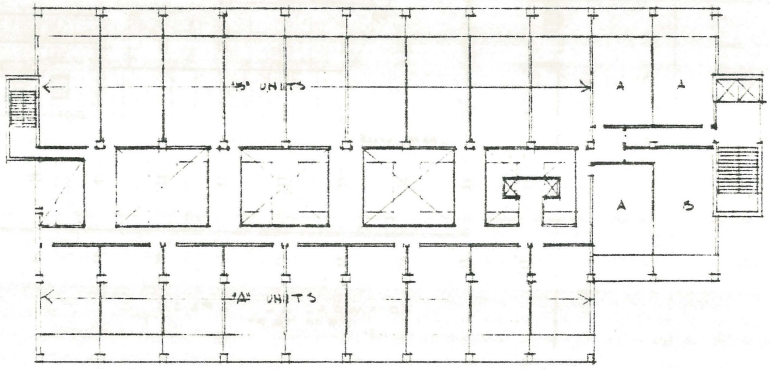


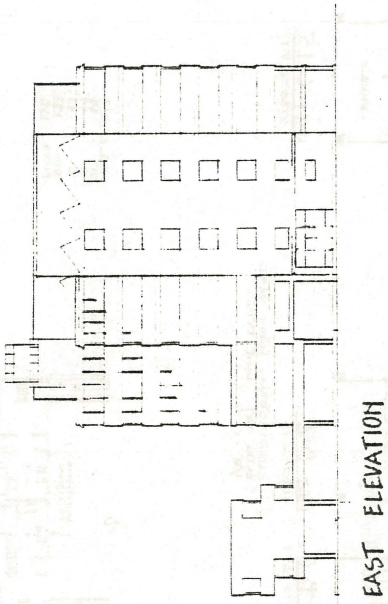
CHARLESTOWN NAVY YARD
BLDG 197
1/16" = 1'-0"

7TH FLOOR PLAN

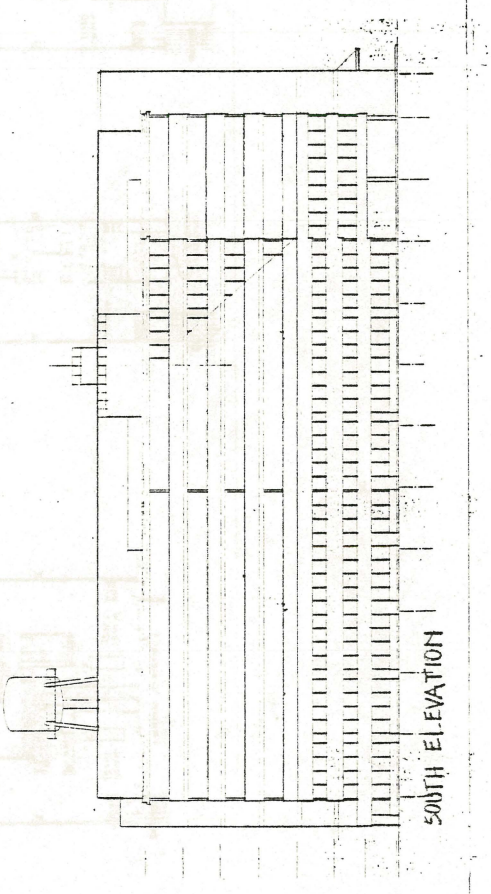
CHARLESTOWN NAVY YARD
BLDG 197

DATE
SCALE 0 5 10 20 FT
PROJECT NUMBER 462.01.01

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114



EAST ELEVATION



SOUTH ELEVATION

CHARLESTOWN NAVY YARD

BLDG 197

DATE

SCALE 1" = 10' - 0"

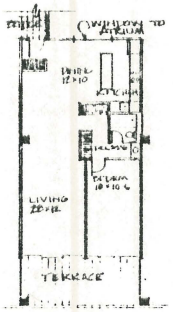
PROJECT NUMBER

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N.. Boston. Ma. 02114

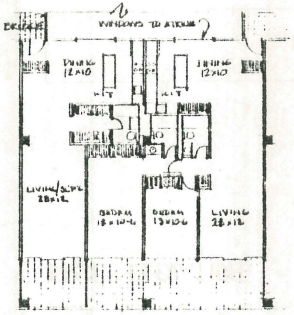
CHARLESTOWN NAVY YARD
BLDG 197

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N. Boston, Ma. 02114

DATE
PROJECT NUMBER
SCALE 3/32" = 1'-0" UNIT PLANS
3/16" = 1'-0" SECTION



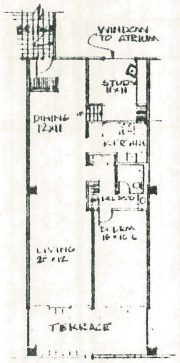
UNIT B-1
900 SQ.FT.



UNIT B-0
670 SQ FT

UNIT B-2
1130 SQ FT

CHARLESTOWN NAVY YARD
BLDG 197 UNIT TYPES
1/8" = 1'-0"



UNIT C-1.5
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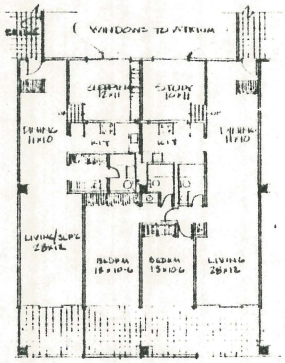

UNIT C-0.5
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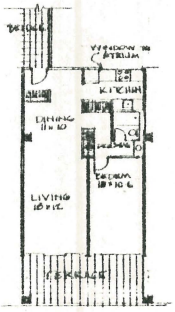
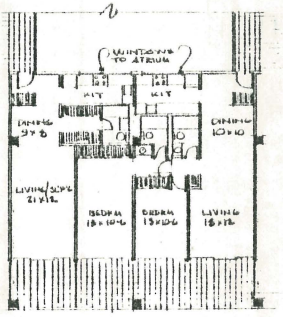
UNIT C-2.5
1260 SQ FT

CHARLESTOWN NAVY YARD
BLDG 197 UNIT TYPES
1/8" = 1'-0"



UNIT A-1
775 SQ.FT.

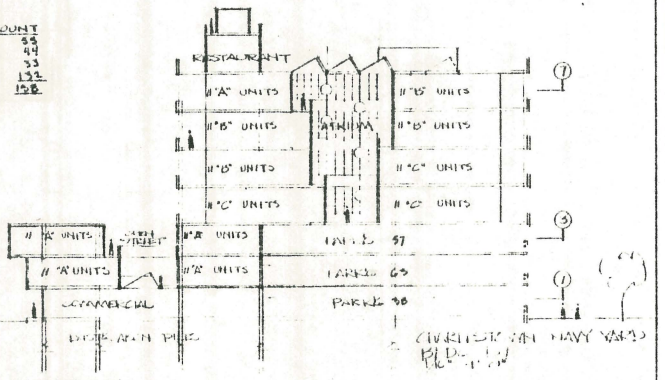


UNIT A-0
550 SQ FT

UNIT A-2
1000 SQ FT

CHARLESTOWN NAVY YARD
BLDG 197 UNIT TYPES
1/8" = 1'-0"

UNIT COUNT	
"A"	55
"B"	44
"C"	33
TOTAL	132
PARKG	156



SECTION

CHARLESTOWN NAVY YARD
BLDG 197
1/8" = 1'-0"

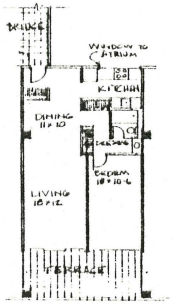
CHARLESTOWN NAVY YARD
BLDG 197

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114

DATE

PROJECT NUMBER

SCALE 1/8" = 1'-0"



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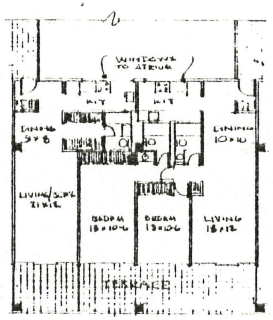
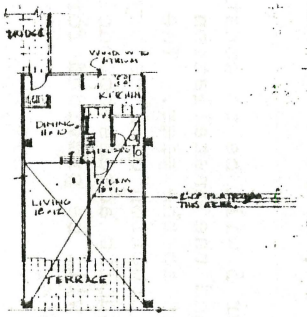


UNIT A-0
550 SQ FT

UNIT A-2
1000 SQ FT

CHARLESTOWN NAVY YARD
BLDG 197 UNIT TYPES
1/8" = 1'-0"



UNIT A-1
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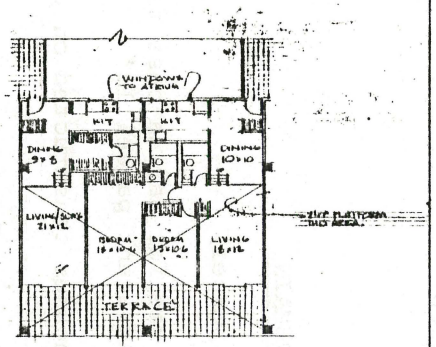


UNIT A-0
550 SQ FT

UNIT A-2
1000 SQ FT

CHARLESTOWN NAVY YARD
BLDG 197 UNIT TYPES
1/8" = 1'-0"

PLATFORM ALTERNATE

PARCEL 1B, 1B'

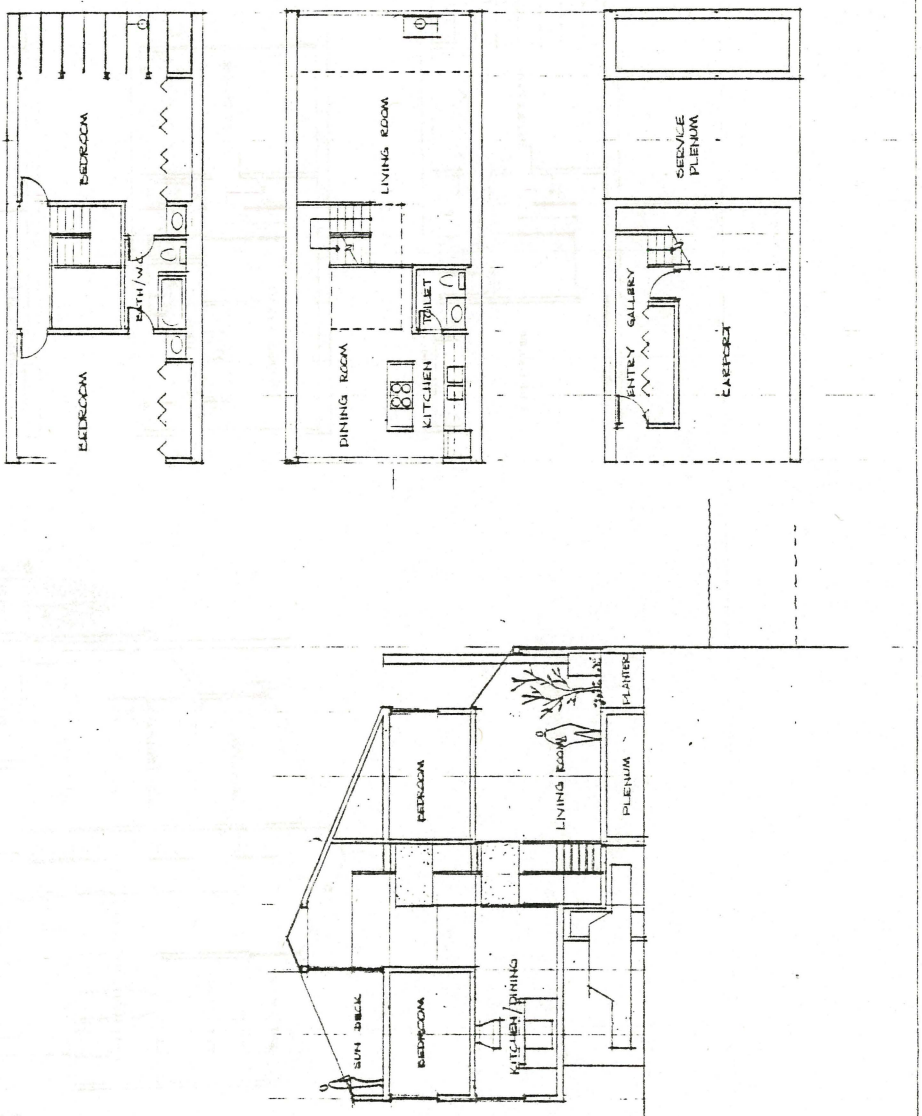
EXISTING STRUCTURE TO REMAIN

1B - Pier #5
1B' - None (water parcel)

PROPOSED USE - Interim use for marina base facility and marina in conjunction with adjacent parcel 1B'.

ULTIMATE USE - 62 townhouses constructed on pier with 62 garage parking spaces.

The initial work on Pier 5 will be to construct marina facilities with related services and the installation of anchored floating slips for boats adjacent to the pier. The ultimate plan for the pier calls for the construction of 2½-story townhouse units along the edges maintaining public access to public open space at the end. Enclosed garages will be provided for each unit with vehicular access from the pier.

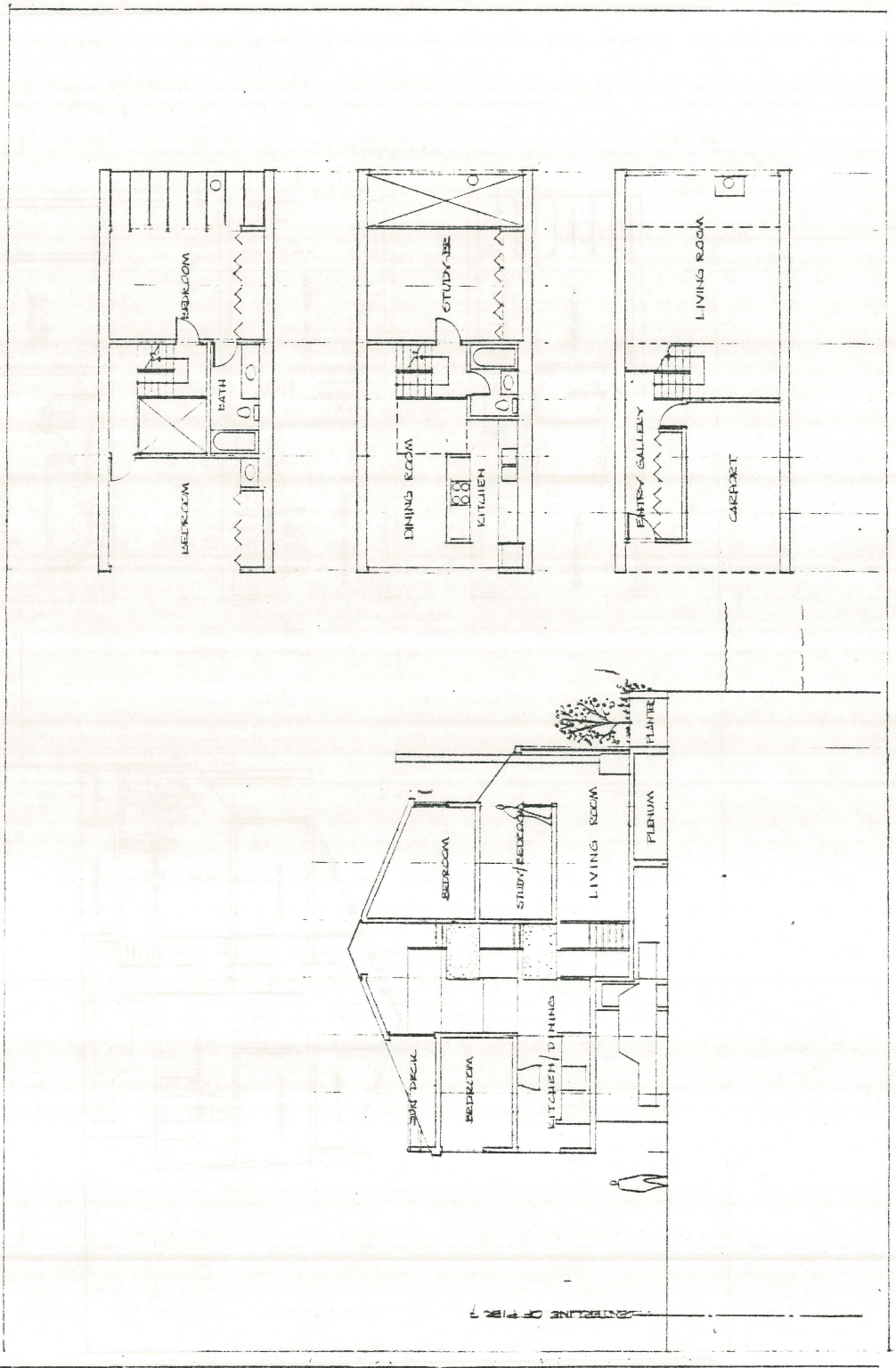


CHARLESTOWN NAVY YARD

TOWNHOUSES

DATE:
SCALE 0 5FT
PROJECT NUMBER: 462-01-01

ANDERSON NOTTER ASSOCIATES INC. 77 Washington St. N., Boston, Ma. 02114

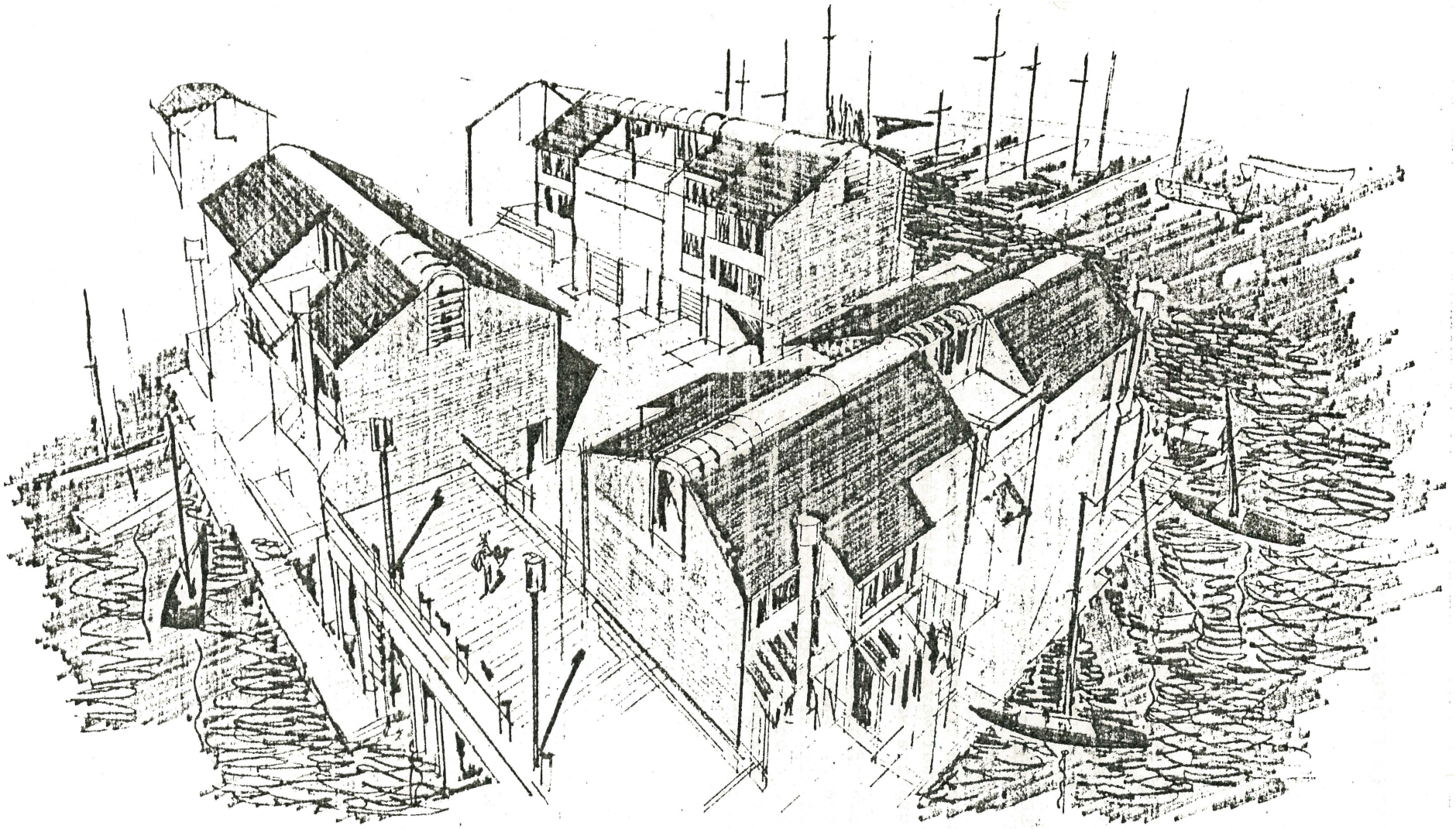


CHARLESTOWN NAVY YARD

TOWNHOUSES

DATE
SCALE 6FT
PROJECT NUMBER 462.01.01

ANDERSON NOTTER ASSOCIATES INC. 77 Washington St. N., Boston, Ma. 02114



PARCEL 1C
2C
3D
3G
3J
4C
4D

Existing structures to remain - shipway bridge and pier structure in Parcel 3G only.

PROPOSED USE - Public open space

Ground plan treatment for public spaces includes construction of concrete walkways with granite feature strips, and the construction of a granite walk at the water's edge.

The edge of the water will be bounded by a line of bollards linked with chain. Exposed lamp lighting will mark the edge. Fixtures will be similar to those proposed by the City Park. Shielded down lights and other site furniture will be used in other public areas similar in appearance to those proposed for areas constructed under public contract in order to maintain the continuity throughout the yard.

PARCEL 2A

STRUCTURES TO REMAIN - Portions of Building 42 and Building 40
Foundations of Building 196

PROPOSED USE - 368 housing units and parking structure for 362 cars

This parcel will be developed with construction of adaptive reuse of Buildings 40 and 42 (Parcel 2A), between 8th and 9th Streets and First Avenue on the water. This proposed work has already been reviewed and accepted by the Massachusetts Historical Commission and the National Advisory Council for Historic Preservation under requirements by the Federal Department of Housing and Urban Development, which will provide a federally guaranteed mortgage for the work (copies of applications and approval correspondence are available).

Ground plan treatment includes construction of concrete walkways with granite feature strips, and substantial areas planted with grass, shrubs and trees. Planted areas will be built over existing paved surfaces with connected edges of bench height. Only minor excavation will be necessary to facilitate drainage. It is proposed to leave portions of the structure and walls from the main buildings and sheds which will be removed.

PARCEL 2B, 2B'

EXISTING STRUCTURES TO REMAIN - 2B Pier 6 - Building 228
2B' Water Parcel

PROPOSED USE - Marina base facility and marina in conjunction with Parcel 2B'.

- Deck parking for marina use

The work on Pier 6 will be to construct marina facilities with related services housed in the existing structure on the pier and the installation of anchored floating slips for boats next to the pier.

PARCEL 3A

EXISTING STRUCTURES TO REMAIN - Building 103

PROPOSED USE - 102 housing units and incidental support uses

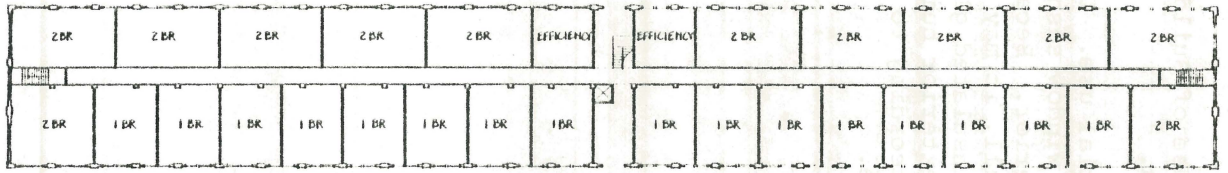
The development of this parcel includes the reuse of Building 103, located between 9th Street and the shipway area.

Building 103 will also be converted to residential use. Current plans call for the restoration of the existing window sash and glazing with the installation of storm sash on the interior. Because of the damage to the windows on the building's east wall, it may be necessary to replace windows. Replacement will be with insulated glazing in new metal sash. The only major change to the exterior building will be the construction of balconies on the roof according to BRA guidelines with no projections beyond the roof plane.

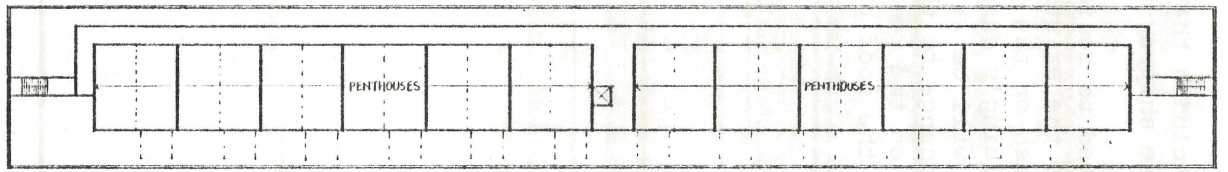
CHARLESTOWN NAVY YARD
BLDG 105

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N. Boston, Ma. 02114

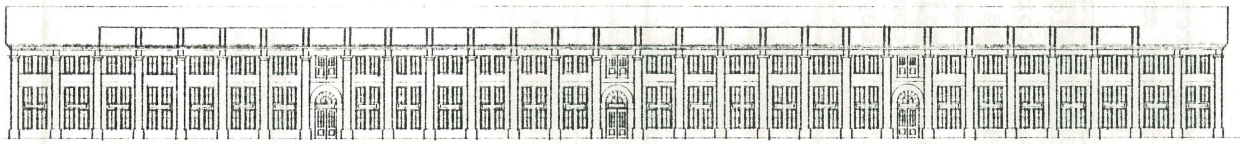
DATE
PROJECT NUMBER
SCALE: 1/8" = 1'-0" PLANS & ELEV.
1/16" = 1'-0" SITE PLAN



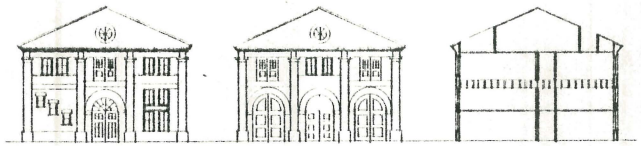
TYPICAL FLOOR PLAN



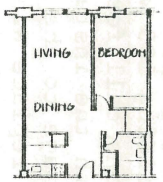
PENTHOUSE PLAN



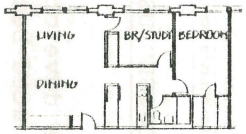
NE & SW



NW SE SECTION



TYP 1BR UNIT



TYP 2BR UNIT

PARCEL 3B, 3B'

EXISTING STRUCTURES TO REMAIN - 3B - Pier 7, Building 233 (1st Phase only)
3B' - Water Parcel

PROPOSED USE - Interim use for marina base facility and marina in conjunction with adjacent Parcel 3B'.

ULTIMATE USE - 70 Townhouses constructed on Pier 7; garage parking spaces.

The initial work on Pier 7 will be to construct marina facilities with related services housed in the existing structure on the pier and the installation of anchored floating slips for boats next to the pier. A number of tennis courts will be built on Pier 7. The ultimate plans for the pier call for the demolition of Building 233 and the construction of 2½-story townhouse units along the edges of the pier maintaining public access to public open space at the end. Enclosed garages will be provided for each unit with vehicular access from the pier.

PARCEL 3C, 3C'

EXISTING STRUCTURES TO REMAIN - 3C - Pier 8
- 3C' - Water parcel

PROPOSED USES - Marina base facility and marina in conjunction with Parcel 3C' and adjacent water parcel. Deck parking for marina use.

The work on Pier 7 will be to construct marina facilities with related services on the pier, and the installation of anchored floating slips for boats next to the pier.

PARCELS 3E, 3H

EXISTING STRUCTURE TO REMAIN - Shipway - super structure
- Portion #1 and #2

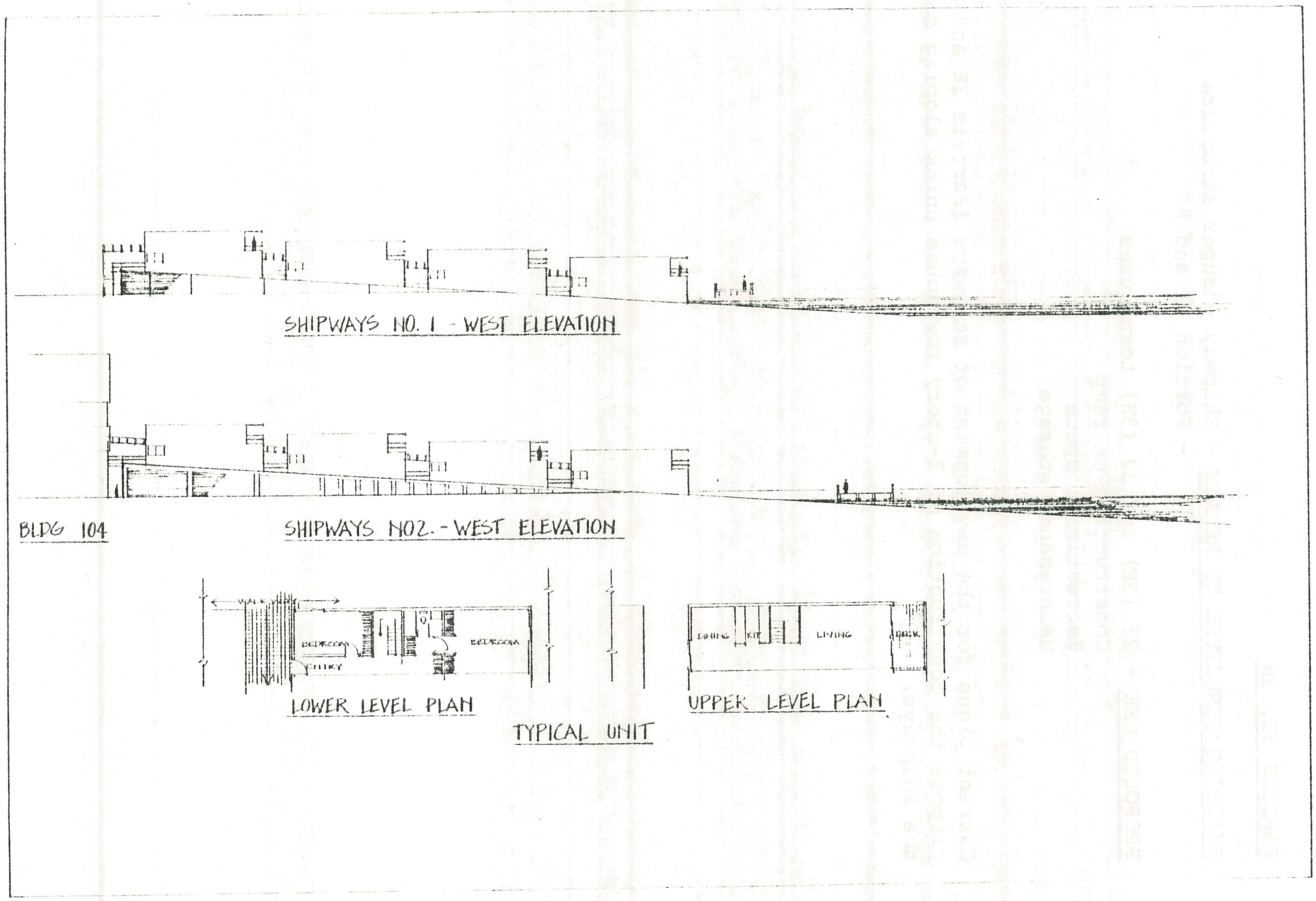
PROPOSED USE - 25 (3E) and 32 (3H) townhouses
Construction on ramp
Recreational space
Maintenance storage

Current plans for the development of shipways (Parcels 3E and 3H) propose the construction of 2-story townhouse units sloping down the shipways.

CHARLESTOWN NAVY YARD
SHIPWAYS

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N. Boston, Ma. 02114

DATE
PROJECT NUMBER 462.01.01
SCALE 0 5 10 20FT



PARCEL 3F

The development of Parcel 3F will consist of removing the filled rubble and concrete balast retaining wall reopening the lower portion of shipway #7 to the water. The parcel will be used as public open space.

PARCEL 3I

EXISTING STRUCTURES TO REMAIN - Building 104 (original building)

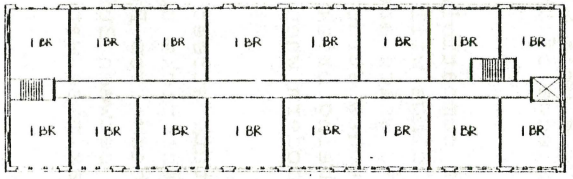
PROPOSED USES - 48 housing units and recreation space in Building 104
parking garage for 200 cars.

The new industrial shed portion of Building 104 extending from the original building to 16th Street will be removed to allow the extension of 13th Street to the water. The older portion of Building 104 will be converted to apartments and recreation use. The portion of the building damaged by explosions will be repaired, and the windows replaced with new insulated glazing and metal sash to meet State Code energy conservation requirements. New balconies will be cut in the roof similar to those proposed for Building 103. The easterly facade on First Avenue will be reconstructed to restore the symmetrical appearance of the building. A 3-level parking ramp will be built between Building 104 and the new 13th Street to provide spaces for residents of Buildings 103 and 104, and the shipway townhouses.

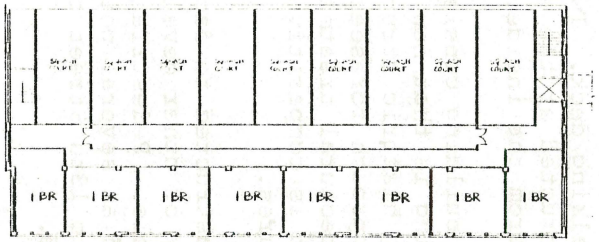
CHARLESTOWN NAVY YARD
BLDG 104

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N. Boston, Ma. 02114

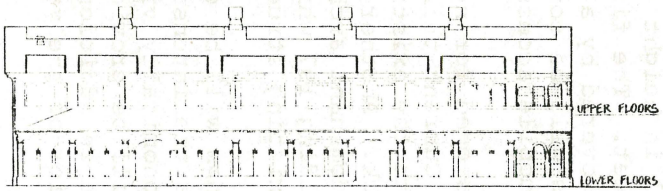
DATE
PROJECT NUMBER
SCALE
SHEET OF



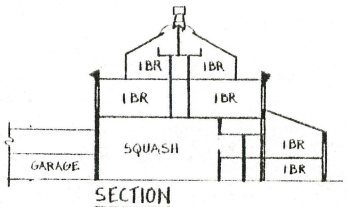
TYPICAL UPPER FLOOR PLAN



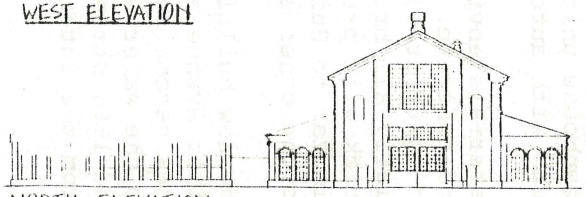
TYPICAL LOWER FLOOR PLAN



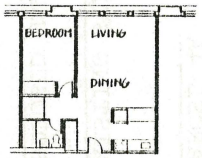
WEST ELEVATION



SECTION



NORTH ELEVATION



TYPICAL 1BR PLAN

PARCEL 4A

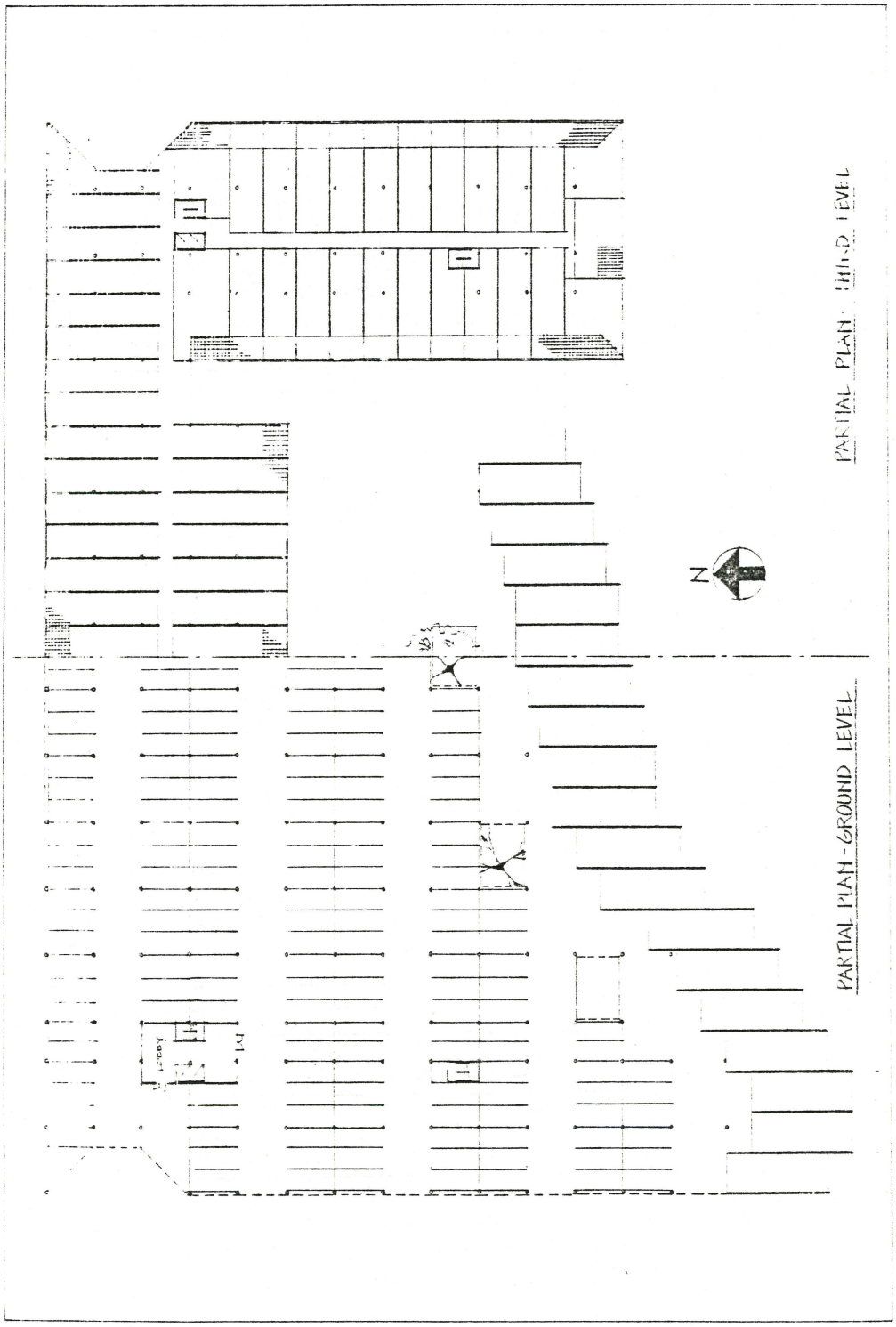
EXISTING STRUCTURES TO REMAIN - None

PROPOSED USE - 376 apartments, 18 townhouses with 339 car garage

The development will consist of new housing construction between 13th and 16th Streets. This will consist of two 13-story apartment blocks, 110 feet above existing ground, lined on First Avenue by a 6-story structure equal in height and similar in profile to Building 106 across the street. The first floor of these structures will be a parking level covered by a walking deck. Two-and-a-half story townhouse units will be constructed at the south edge of the parking deck with automobile access from the inside.

Materials envisioned for new building consist of compatible brick and concrete. Current thinking is that new buildings will be concrete to contrast with the existing historic structures which are substantially all brick. Another approach foresees the new structures of brick with predominant architectural treatment being brick spandrilles similar to Building 197 which is comparitively modern when compared to the other existing structures.

The new buildings will be constructed to facilitate street uses on First Avenue as the intensity of other development picks up and such uses become economically viable. Pedestrian access from First Avenue to the water will be provided at several points between Building 103 and 16th Street in addition to 13th Street to maximize water contact from the interior of the yard.

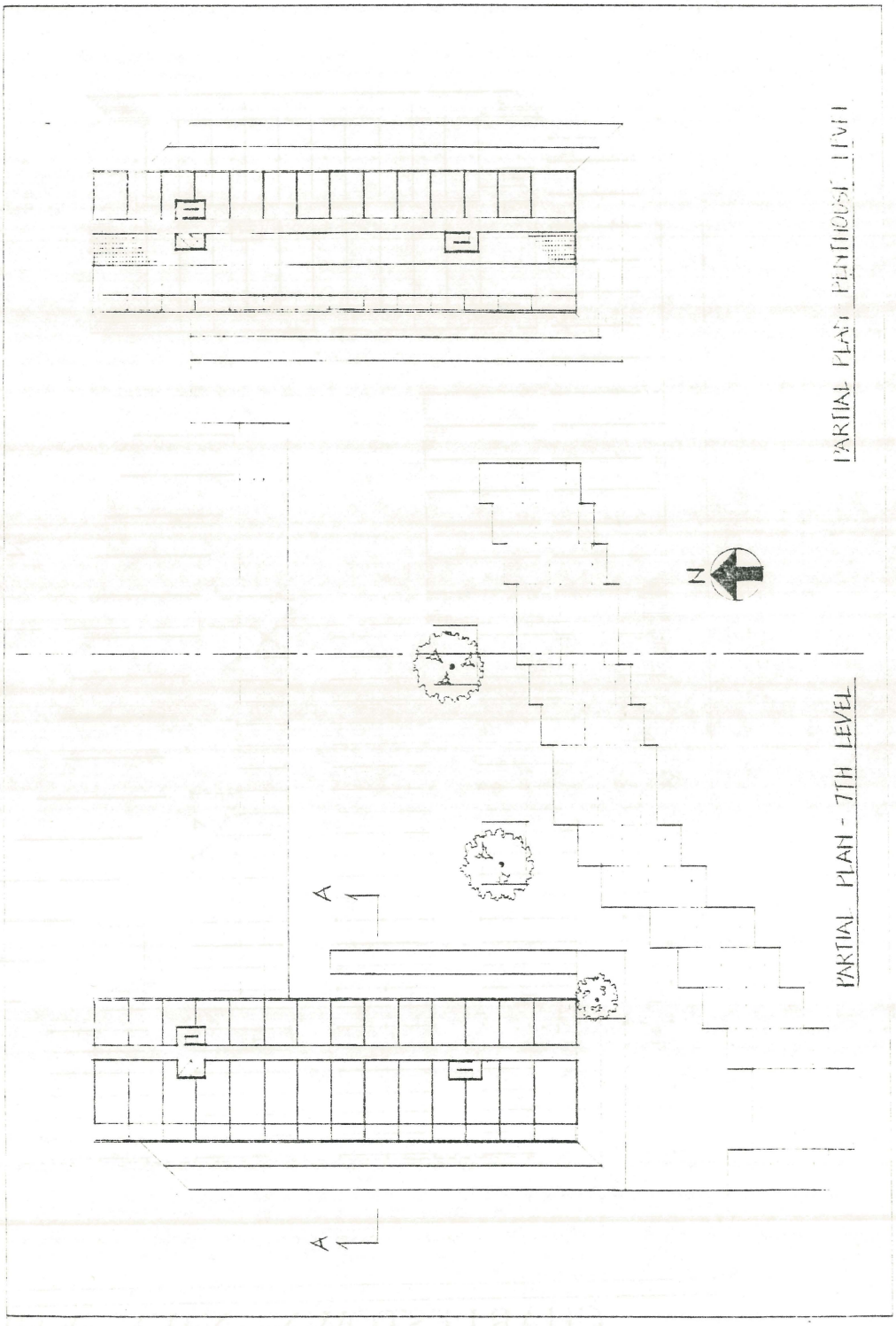


CHARLESTOWN NAVY YARD

PARCEL 4

DATE SCALE 1" = 32'-0"
PROJECT NUMBER 463.01.01

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114

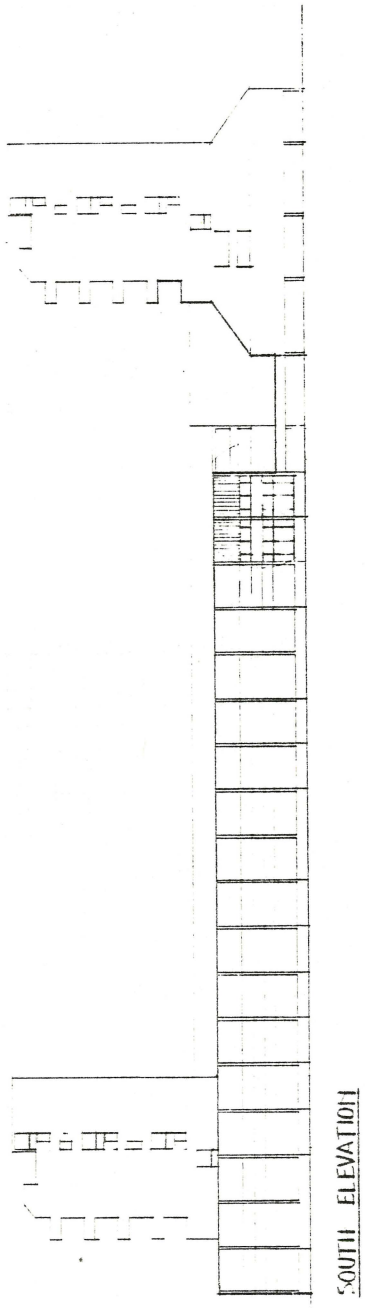


CHARLESTOWN NAVY YARD

PARCEL 4

DATE
SCALE 1" = 10'-0"
PROJECT NUMBER 462.01.01

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114



SOUTH ELEVATION

CHARLESTOWN NAVY YARD

PARCEL 4

DATE
PROJECT NUMBER 852.01.01

SCALE 1" = 40'-0"

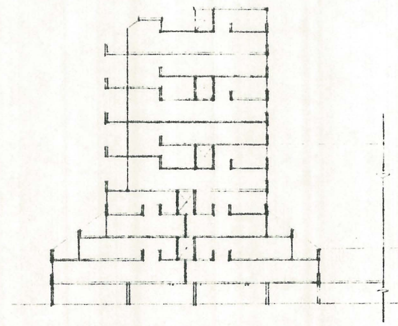
ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114

CHARLESTOWN NAVY YARD

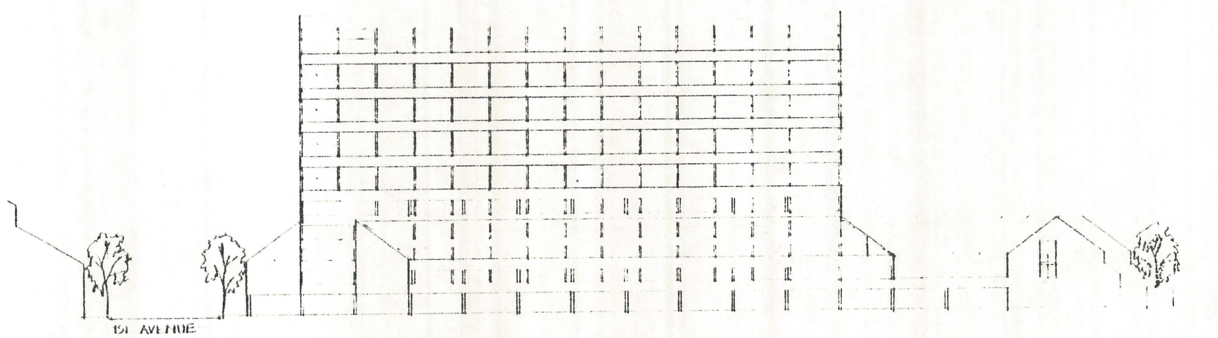
PARCEL 4

ANDERSON NOTTER FINEGOLD, INC. 77 Washington St. N., Boston, Ma. 02114

DATE
PROJECT NUMBER
SCALE



SECTION AA



WEST ELEVATION

PARCEL 4B, 4B'

EXISTING STRUCTURE TO REMAIN - Structural wall of Drydock #5

PROPOSED USE - Marina serviced from Parcel 3C

Development of this water parcel will consist of installation of anchored floating slips for boats accessible from a walkway constructed on top of the Drydock #5 wall and from Pier 8 in Parcel 3C.

PARCEL 4E

This parcel will be developed as a private dead end street for access to Parcel 4A.

5

URBAN DESIGN DEPARTMENT June, 1967

Technical guide number fifteen, "Design Review in Urban Renewal", published by the Urban Renewal Administration, Washington, D. C., explains in detail the design review process. Quoting from the bulletin's introduction:

"Design advice and guidance made available to Redevelopers as part of the review process, coupled with the review itself, serves to co-ordinate individual efforts and realize the best possibilities inherent in each project. Better architecture and site planning are the most obvious results of these procedures; but benefits accrue in other ways, too: In overall visual harmony and in achieving the broad functional and livability objectives of fine urban design.

All redevelopment proposals for the Boston Redevelopment Authority's Disposition Parcels will be subject to design review and approval by the Authority prior to and subsequent to the execution of the Disposition Agreement. This review will evaluate the quality and appropriateness of the proposal on the basis of the design objectives stated in the Plan and in the special land use and building requirements stated in more detailed and refined Development Objectives and Controls prepared for this site. In addition, reference will be made during design review to the Illustrative Site Plan and other site plan and design studies prepared by the Authority Staff. All such studies shall be made available to the Redeveloper.

This review may be conducted by the Authority and its Staff, or at the discretion of the Authority, a qualified independent review panel may be selected to make design evaluations and recommendations to the Authority. The Staff member responsible for maintaining liaison with the Redeveloper's Architect will be the Director of Urban Design or a designated alternate. Formal required submissions shall be made to the Authority through the Director of Community Development.

It is expected that a continuous contact will be maintained between the Redeveloper's Architect and the Department of Urban Design during the design and working drawing process and that reasonable requests for progress prints in addition to those required below will be met at any time.

Required submission will occur at four stages in the preparation of the redevelopment proposal. Additional informal reviews at the request of either the Redeveloper or the Urban Design Staff are encouraged. A time schedule for the required submissions will be agreed upon on or before the time of execution of the Land Disposition Agreement and will be set forth therein or in a separate document. It is the intention of the Urban Design Staff that once approval has been given of a submission stage, further review will be limited to consideration of a development or refinement of previous approved submission or to new elements which were not present in previous submissions.

Since most housing submissions will also involve Federal Housing Authority review, Authority submission stages 2, 3, and 4 correspond to FHA requirements except that our emphasis is on the Urban Design aspect of the proposal. In addition, perspective drawings or a model of presentation quality are required in stage 3.

At the point where all required elements of a stage have been submitted, the Director of Urban Design will send a letter to the Redeveloper's Architect indicating either that the design submission has been reviewed and found satisfactory, or that further work is required before such approval can be given.

The four formal stages of submission follow:

1/ SCHEMATIC DESIGN

This review is intended to secure agreement on and approval of the basic design concept prior to extensive work by the Redeveloper's Architect. The Authority does not encourage submission of more than the following, which it feels is sufficient to describe the proposal.

a/ Site plan at any appropriate scale (1" = 100' and 1" = 40' are preferred scales); emphasizing general relationships of proposed and existing buildings, walls and open space, including that mutually defined by buildings on adjacent parcels and across streets. The general location of walks, driveways, parking, service areas, roads and major landscape features in addition to the buildings should be shown. Pedestrian and vehicular flow through the parcel and to adjacent areas shall be shown. Where relevant, site sections showing height relationships with proposed and adjacent buildings shall be provided.

b/ Building plans, elevations, and sections at any appropriate scale, showing organization of functions and spaces. These drawings need not be more detailed than sufficient to indicate general architectural character and proposed finish materials.

c/ Study model at 1" = 100' (minimum) is suggested, and may be required. However, this is not a presentation model such as that mentioned in Submission 3. Adjacent buildings, streets & buildings across streets should be included.

d/ All sketches, diagrams, and other materials relevant to the proposal which were used by the architect during his initial study and which will help to clarify the architect's problem and his solution to it.

e/ Written statement of proposal including: Tentative number of living units; type of building (row house, elevator apartment, etc.); size distribution of units (by number of bedrooms); number of parking spaces; community or supporting facilities provided; principal building materials; estimated rents, or carrying charges.

f/ Proposed time schedule for the following submissions and estimated construction time.

Upon approval by the Authority of the SCHEMATIC DESIGN, the following submission is required:

2/ DESIGN DEVELOPMENT

This review is intended to secure agreement on and approval of the final design prior to extensive and detailed work on the preliminary working drawings.

This submission may correspond to the Required Application Exhibits for Federal Housing Authority Mortgage. A copy of Federal Housing Authority Application for Mortgage Insurance, Form 2013, and tentative Outline Specification, Form 2435, should be included in this submission.

a/ Site Plan development of 1. a. at 1" = 40' minimum (or as determined after approval of SCHEMATIC DESIGN). Phasing possibilities, if any, shall be shown. Proposed site grading, including typical existing and proposed grades at parcel lines shall be shown. Those areas of the site proposed to be developed "by others" or easements to be provided for others shall be clearly indicated. All dimensions which may become critical from the point of view of zoning shall be indicated. Adjacent buildings, streets and buildings across streets must be indicated.

b/ Site sections at 1" = 40' (minimum) showing vertical relationships in addition to those shown above.

c/ Building plans, elevations, and sections developed from those of 1b. and in addition, plans and elevations of each living unit at ¼" = 1'-0".

d/ Study model, development of 1c. at 1" = 100' (minimum).

e/ Written statement of proposal including: Number of living units; type of building (row house, elevator apartment, etc.); size distribution of units (by number of bedrooms); number of parking spaces; community or supporting facilities provided; structural system and principal building materials; estimated costs, rents, and operating expenses.

f/ Perspective sketch, showing general architectural character.

g/ Time schedule for the following submission.

Upon approval by the Authority of the DESIGN DEVELOPMENT, the following submission is required:

3/ PRELIMINARY WORKING DRAWINGS AND OUTLINE SPECIFICATIONS

This review is intended to secure agreement on and approval of the character and scope of the proposal completely.

This submission should correspond to the Federal Housing Authority Required Exhibit of Preliminary Working Drawings. A copy of Form 2013 and Form 2435 (Outline Specifications) should be included in this submission.

a/ Site plan(s) developed in sufficient detail to describe the character and scope of the proposal completely. Without limiting the generality of this requirement, the site plan shall indicate in addition to that required in 1a. and 2a. all landscaping and site development details including walls, fences, planting, outdoor lighting, street furniture, and ground surface materials; bounding streets; points of vehicular and pedestrian access; number and type of parking facilities; utility lines and connections; existing and proposed grading and drainage; indication of proposed new paving, planting and lighting to be done by the City; existing and proposed right-of-way development and/or easements to remain. Work to be done by others should be fully described and the responsible party properly identified.

b/ Building plans (including the roof) elevations, and sections in greater detail than required in 2c. developed in sufficient detail and at large enough scale to show all materials and assemblies comprising the buildings. All exposed mechanical equipment and vents should appear on elevations and roof plans.

c/ Outline specifications for materials and methods of construction.

d/ Eye-level perspective sketches and/or model showing architectural and Urban Design character of the proposed project. A rendered site plan showing all adjacent ; proposed and existing structures and streets must be submitted. All sketches, models, and other presentation materials must be an accurate representation of the proposal.

e/ Expanded statement of DESIGN DEVELOPMENT, 2e., including the following: Major building dimensions and gross area of buildings, size of each unit in square feet, floor area ratio, useable open space per unit, proposed division of work between Redeveloper and public agencies; proposed financial plan. Where variances, waivers or deviations from existing City, State, or Federal regulations are proposed, they shall be listed and progress toward obtaining such variances shall be stated.

f/ Time schedule for the following submission.

Upon approval by the Authority of PRELIMINARY WORKING DRAWINGS AND OUTLINE SPECIFICATIONS, the following submission is required:

4/ FINAL WORKING DRAWINGS AND SPECIFICATIONS

This review is intended to secure final agreement on and approval of the contract documents and the complete proposal.

a/ Complete site plans for the final parcel development to working drawing level of detail. These drawings, upon approval, will serve as a basic co-ordination drawing indicating scope of work and responsibilities to be performed by others.

b/ Complete working drawings and specifications ready for bidding.

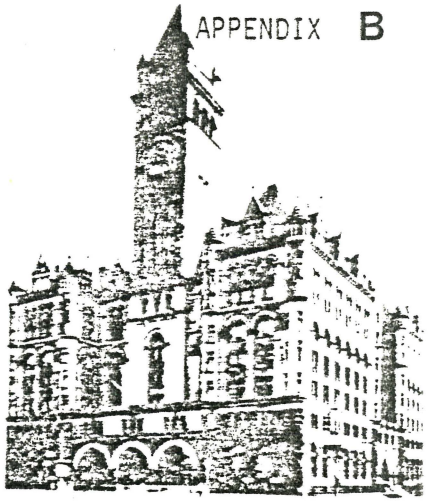
c/ Statement of proposal, indicating differences, if any, from 3e.

d/ Time schedule for construction of this project.

e/ Detailed financial plan including costs, rents, and operation.

Once FINAL WORKING DRAWINGS AND SPECIFICATIONS have been approved and construction started, the only items subject to an additional review will be requests for change orders in the construction. The Redeveloper is strictly required to construct the project in accordance with all details of the approved drawings. Permission to make changes from such approved drawings must be requested by the Redeveloper in writing to the Director of Urban Design who, in turn, will reply in writing, giving his approval or disapproval of the changes. No changes in the work are to be undertaken until such approval has been obtained.

1 PRESERVATION BRIEFS



The Cleaning and Waterproof Coating of Masonry Buildings

Robert C. Mack, A.I.A.

Interagency Historic Architectural Services Program

Office of Archeology and Historic Preservation National Park Service

The inappropriate cleaning and waterproofing of masonry buildings is a major cause of deterioration of the Nation's historic resources. While both treatments may be appropriate in some cases, they may cause serious deterioration in others. The purpose of this leaflet is to provide guidance on the techniques of cleaning and waterproofing, and to explain the consequences of their inappropriate use.

Why Clean?

The reasons for cleaning any building must be considered carefully before arriving at a decision to clean.

- Is the cleaning being done to improve the appearance of the building or to make it look new? The so-called "dirt" actually may be weathered masonry, not accumulated deposits; a portion of the masonry itself thus will be removed if a "clean" appearance is desired.
- Is there any evidence that dirt and pollutants are having a harmful effect on the masonry? Improper cleaning can accelerate the deteriorating effect of pollutants.
- Is the cleaning an effort to "get your project started" and improve public relations? Cleaning may help local groups with short term fund raising, yet cause long term damage to the building.

These concerns may lead to the conclusion that cleaning is not desirable—at least not until further study is made of the building, its environment and possible cleaning methods.

What Is The Dirt?

The general nature and source of dirt on a building must be determined in order to remove it in the most effective, yet least harmful, manner. Soot and smoke, for example, may require a different method of cleaning than oil stains or bird droppings. The "dirt" also may be a weathered or discolored portion of the masonry itself rather than extraneous materials. Removal of part of the masonry thus would be required to obtain a "clean" appearance, leading to loss of detail and gradual erosion of the masonry. Other common cleaning problems include metal stains such as rust or copper stains, and organic matter such as the tendrils left on the masonry after removal of ivy. The source of dirt, such as coal soot, may no longer be a factor in planning for longer term maintenance, or it may be a continuing source of problems. Full evaluation of dirt and its effect on the building may require one or several kinds of expertise: consultants may include building conservators, geologists, chemists, and preservation architects. Other sources of local experience or information may include building owners in the area, loc universities, the State Historic Preservation Officer, and th AIA State Preservation Coordinator.

If the proposed cleaning is to remove paint, it important in each case to learn whether or not exposed bric is historically appropriate. Many buildings were painted a the time of construction or shortly thereafter; retention c the paint, therefore, may be more appropriate historicall than exposing the brick, in spite of current attitudes abou "natural" brick. Even in cases where unpainted masonry appropriate, the retention of the paint may be more practic than removal in terms of long range preservation of th masonry. In some cases, however, removal of the paint ma be desirable. For example, the old paint layers may hav built up to such an extent that removal is necessary prior t repainting. It is essential, however, that research on the pair type, color, and layering be completed on the entire buildin before removal.

What Is The Construction Of The Building?

The construction of the building must be considered i developing a cleaning program because inappropriate cleanin can have a corrosive effect on both the masonry and th other building materials.

Incorrectly chosen cleaning products can cause damagin chemical reactions with the masonry itself. For example, th effect of acidic cleaners on marble and limestone generally recognized. Other masonry products also are subject t adverse chemical reactions with incompatible cleanin products. Thorough understanding of the physical an chemical properties of the masonry can help you avoid th inadvertent selection of damaging cleaning materials.

Other building materials also may be affected by th cleaning process; some chemicals, for example, may have corrosive effect on paint or glass. The portions of buildin elements most vulnerable to deterioration may not be visibl such as embedded ends of iron window bars. Other totall unseen items, such as iron cramps or ties which hold th masonry to the structural frame, also may be subject t corrosion from the use of chemicals or even from plain wate (Fig. 1). The only way to prevent problems in these cases to study the building construction in detail and evaluat proposed cleaning methods with this information in mind.

Previous treatments of the building and its surrounding also should be evaluated, if known. Earlier waterproofin applications may make cleaning difficult. Repairs may hav been stained to match the building, and cleaning may mak

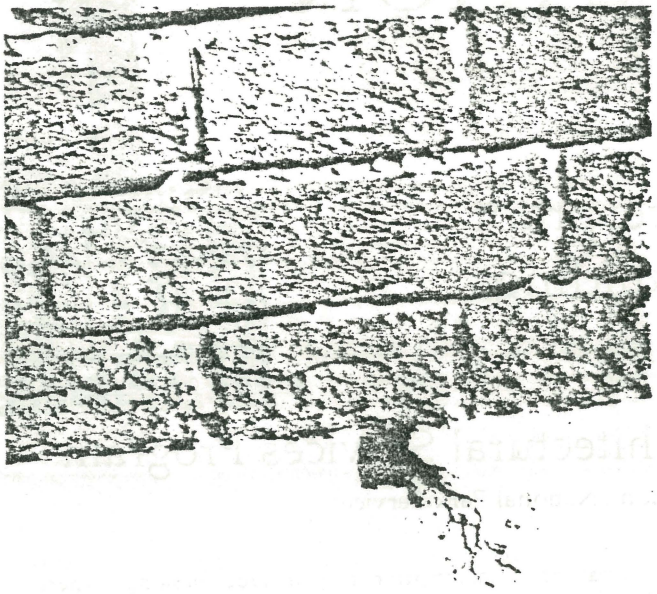


Figure 1. The iron anchor shown here originally was hidden from view. An increase in volume due to rusting created internal pressures on the stone and brick, causing spalling. Careful study of the building construction can result in the identification of these potential problem areas and they can be taken into consideration while planning a cleaning project.

these differences apparent. Salts or other snow removal chemicals used near the building may have dissolved and been absorbed into the masonry, causing potentially serious problems of spalling or efflorescence. Techniques for overcoming each of these problems should be considered prior to the selection of a cleaning method.

Types Of Cleaning

Cleaning methods generally are divided into three major groups: water, chemical, and mechanical (abrasive). Water methods soften the dirt and rinse the deposits from the surface. Chemical cleaners react with the dirt and/or masonry to hasten the removal process; the deposits, reaction products and excess chemicals then are rinsed away with water. Mechanical methods include grit blasting (usually sand blasting), grinders, and sanding discs, which remove the dirt by abrasion and usually are followed by a water rinse. Problems related to each of these cleaning methods will be discussed later in this leaflet.

Planning A Cleaning Project

Once the existing conditions have been evaluated, including the type of dirt and the building materials, planning for the cleaning project can begin.

Environmental concerns: The potential effect of each proposed method of cleaning should be evaluated carefully. Chemical cleaners, even though dilute, may damage trees, shrubs, grass, and plants. Animal life, ranging from domestic pets to song birds to earth worms, also may be affected by the run-off. In addition, mechanical methods can produce hazards through the creation of airborne dust.

The proposed cleaning project also may cause property damage. Wind drift, for example, may carry cleaning

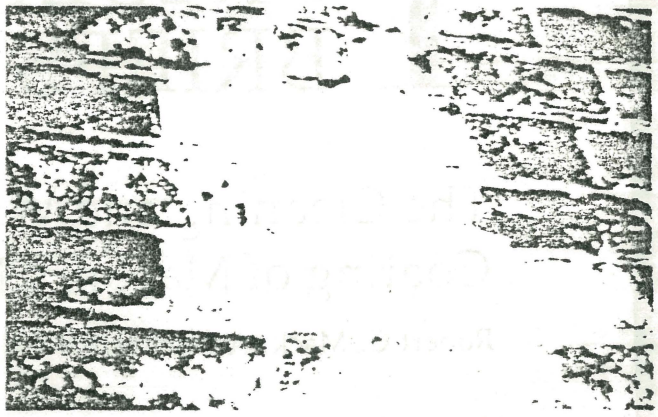


Figure 2. The white deposits are efflorescence, soluble salts deposited on the surface of the masonry. These salts usually originate in the masonry or mortar, migrate from the ground below through capillary action, or are brought in by air pollution. The salts also may be the result of chemical reactions resulting from selection of an improper cleaner.

chemicals onto nearby automobiles, causing etching of the glass or spotting of the paint finish. Similarly, airborne dust can enter surrounding buildings, and excess water can collect in nearby yards and basements.

Personal safety: The potential health dangers of each method proposed for the cleaning project must be considered, and the dangers must be avoided. Both acidic and alkaline chemical cleaners can cause serious injury to cleaning operators and passers-by; injuries can be caused by chemicals in both liquid and vapor forms. Mechanical methods cause dust which can pose a serious health hazard, particularly if the abrasive or the masonry contain silica. Steam cleaning has serious hazards because of high temperatures.

Testing cleaning methods: Several potentially useful cleaning methods should be tested prior to selecting the one for use on the building. The simplest and least dangerous methods should be included–as well as those more complicated. All too often simple methods, such as a low pressure water wash, are not even considered, yet they frequently are effective, safe, and least expensive. Water of slightly higher pressure or with a mild non-ionic detergent additive also may be effective. It is worth repeating that these methods should be tested prior to considering harsher methods; they are safer for the building, safer for the environment, and less expensive.

The level of cleanliness desired also should be determined prior to selection of a cleaning method. Obviously, the intent of cleaning is to remove most of the dirt. A "brand new" appearance, however, may be inappropriate for an older building, and may require an overly harsh cleaning method. It may be wise, therefore, to determine a lower level of acceptable cleaning. The precise amount of residual dirt considered acceptable would depend upon the type of masonry and local conditions.

Cleaning tests, whether using simple or complex methods, should be applied to an area of sufficient size to give a true indication of effectiveness. The test patch should include at least a square yard, and, with large stones, should include several stones and mortar joints. It should be remembered that a single building may have several types of masonry materials and similar materials may have different surface finishes; each of these differing areas should be tested separately. *The results of the tests may well indicate that several methods of cleaning should be used on a single building.*

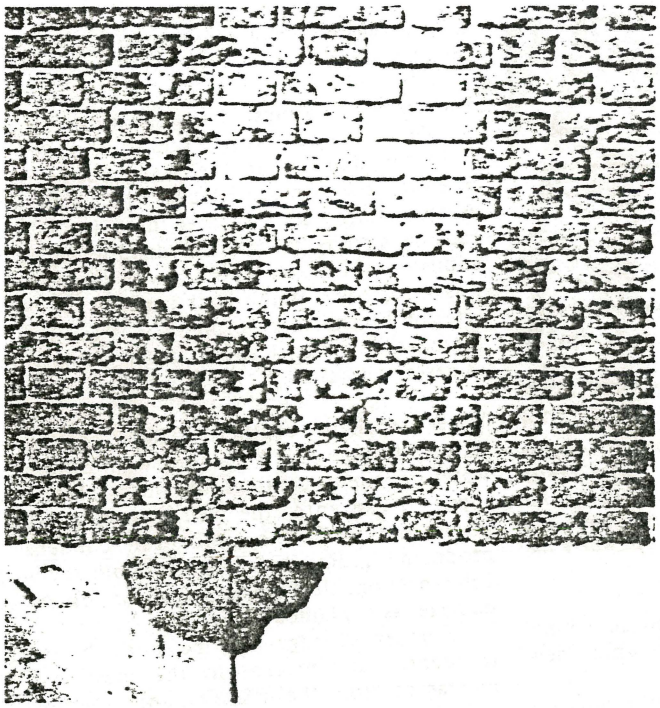


Figure 3. The hazy appearance of a portion of the brick is caused by a residue resulting from cleaning. This film occurred in spite of thorough rinsing. Test patches such as this should always be allowed to weather prior to continuing with the cleaning.

The cleaning budget should include money to pay for these tests. Usually contractors are more willing to conduct a variety of tests if they are reimbursed for their time and materials, particularly if the tests include methods with which the contractor is not familiar.

When feasible, test areas should be allowed to weather for an extended period prior to evaluation. A waiting period of a full year is not unreasonable in order to expose the masonry to a full range of seasons. For any building which is considered historically important, the delay is insignificant compared to the potential damage and disfigurement which may arise from use of an incompletely tested method (Figs. 2-5).

Potential Problems Of Cleaning

Water Cleaning: Water cleaning methods include: (1) low pressure wash over an extended period, (2) moderate to high pressure wash, and (3) steam. Bristle brushes frequently are used to supplement the water wash. All joints, including mortar and sealants, must be sound in order to minimize water penetration to the interior.

Porous masonry may absorb excess amounts of water during the cleaning process and cause damage within the wall or on interior surfaces. Normally, however, water penetrates only part way through even moderately absorbant masonry materials.

Excess water also can bring soluble salts from within the masonry to the surface, forming efflorescences (Fig. 2); in dry climates, the water may evaporate inside the masonry, leaving the salts slightly in back of the surface. The damage which can be caused by soluble salts is explained in more detail later in this leaflet. Efflorescence usually can be traced to a source other than a single water wash.

Another source of surface disfigurement is chemicals such as iron and copper in the water supply; even "soft" water may contain deleterious amounts of these chemicals. Water methods cannot be used during periods of cold

Figure 4. Sandblasting has rounded the corners of this marble capita and pitted the formerly smooth surface. Not only is the stone harme visually, the increased roughness of the surface also will collect ne dirt more quickly than smooth stone.

weather because water within the masonry can freeze causing spalling and cracking. Since a wall may take over a week to dry after cleaning, no water cleaning should be permitted for several days prior to the first average frost date, or even earlier if local forecasts predict cold weather.

In spite of these potential problems, water methods generally are the simplest to carry out, the safest for the building and the environment, and the least expensive.

Chemical cleaning: Since most chemical cleaners are water based, they have many of the potential problems of plain water. Additional problems of chemical cleaning agents have been mentioned in the discussion of environmental concerns.

Chemical cleaners have other problems as well. Some types of masonry are subject to direct attack by cleaning chemicals. Marble and limestone, for example, are dissolved easily by acidic cleaners, even in dilute forms. Another problem may be a change in the color of the masonry caused by the chemicals, not by removal of dirt; the cleaner also may leave a hazy residue in spite of heavy rinsing (Fig. 3). In addition, chemicals can react with components of mortar, stone, or brick to create soluble salts which can form efflorescences, as mentioned earlier. Historic brick buildings are particularly susceptible to damage from hydrochloric (muriatic) acid, although it is, unfortunately, widely used on these structures.

Mechanical cleaning: Grit blasters, grinders, and sanding discs all operate by *abrading the dirt off the surface* of the masonry, rather than reacting with the dirt and masonry as in water and chemical methods. Since the abrasives do not differentiate between the dirt and the masonry, *some erosion of the masonry surface is inevitable with mechanical methods, especially blasting.* Although a skilled operator can minimize this erosion, some erosion will still take place. In the case of brick, soft stone, detailed carvings, or polished surfaces, even minimal erosion is unacceptable (Figs. 4 and 5). Brick, a fired product, is hardest on the outside where the temperatures were highest; the loss of this "skin" of the brick exposes the softer inner portion to more rapid deterioration. Abrasion of intricate details causes a rounding of sharp corners and other loss of delicate features, while abrasion of polished surfaces removes the polished quality of stone. Mechanical methods, therefore, should never be used on these surfaces and should be used with extreme caution on others.

Grit blasting, unfortunately, still is widely used in spite of these serious effects. In most cases, blasting will leave

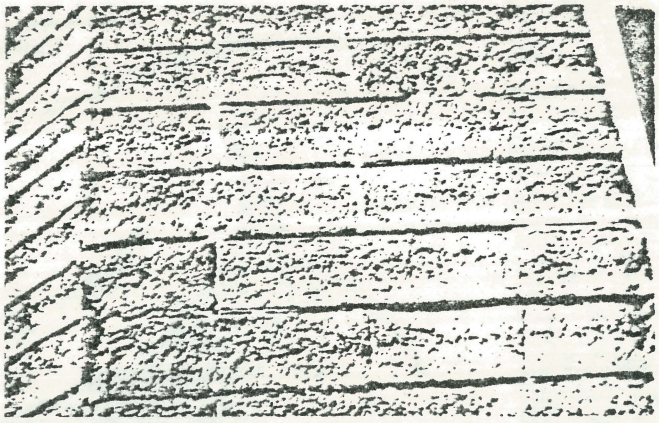


Figure 5. This brickwork was sandblasted to remove paint. Note the severe erosion which has occurred, especially in the softer center sections of this "hard burned" late 19th-century brick. Although this is a severe example, the same problem of increased roughness and porosity will occur even on more skillfully performed jobs where the effect is less evident visually.

minute pits on the surface of the masonry. This additional roughness actually increases the surface area on which new dirt can settle and on which pollutants can react.

Mortar joints, especially those with lime mortar, also can be eroded by mechanical cleaning. In some cases, the damage may be visual, such as loss of joint detail or increased joint shadows. Joints constitute a significant portion of the masonry surface (up to 20% in a brick wall) so this change should not be considered insignificant. In other cases, however, the erosion of the mortar joint may permit increased water penetration, leading to the necessity for complete repointing.

Other problems of mechanical methods have been mentioned in the discussion of project planning. In addition, wet blasting or water rinses can create the potential hazards of water methods.

Problems Of Water Repellent And Waterproof Coatings

Is waterproofing necessary? Coatings frequently are applied to historic buildings without concern for the requirement or the consequences of the coating. Most historic buildings have survived for years without coatings, so why are they needed now? Water penetration to the interior usually is not caused by porous masonry but by deteriorated gutters and downspouts, deteriorated mortar, capillary moisture from the ground (rising damp), or condensation. Coatings will not solve these problems. In the case of rising damp, in fact, the coatings will allow the water to go even higher because of the retarded rate of evaporation. The claim also is made that coatings keep dirt and pollutants from collecting on the surface of the building thus reducing the requirement for future cleaning. While this at times may be true, at other times the coatings actually retain the dirt more than uncoated masonry. More important, however, is the fact that these coatings can cause greater deterioration of the masonry than that caused by pollution, so the treatment may be worse than the problem one is attempting to solve.

Types of coatings: Masonry coatings are of two types: water*proof* coatings and water *repellent* coatings. Waterproof coatings seal the surface from liquid water and from water vapor; they usually are opaque, such as bituminous coatings and some paints. Water repellents keep liquid water from penetrating the surface but allow water vapor to enter and leave through the "pores" of the masonry. They usually are transparent, such as the silicone coatings, although they may change the reflective property of the masonry, thus changing the appearance.

Waterproof coatings: These coatings usually do not cause problems as long as they exclude *all* water from the masonry. If water does enter the wall, however, the coating can intensify the damage because the water will not be able to escape. During cold weather this water in the wall can freeze, causing serious mechanical disruption, such as spalling. In addition, the water eventually will get out by the path of least resistence. If this path is toward the interior, damage to interior finishes can result; if it is toward exterior cracks in the coating, it can lead to damage from the build-up of salts as described below.

Water repellent coatings: These coatings also can cause serious damage, but by a somewhat different mechanism. As water repellent coatings do not seal the surface to water vapor, it can enter the wall as well as leave the wall. Once inside the wall, the vapor can condense at cold spots, producing liquid water. Water within the wall, whether from condensation, leaking gutters, or other sources, can do damage, as explained earlier.

Further damage can be done by soluble salts. Salts frequently are present in the masonry, either from the mortar or from the masonry units themselves. Liquid water can dissolve these salts and carry them toward the surface. If the water is permitted to come to the surface, efflorescences appear upon evaporation. These are unsightly but usually are easily removed; they often are washed away by the simple action of the rain.

The presence of a water repellent coating, however, prevents the water and dissolved salts from coming completely to the surface. The salts then are deposited slightly behind the surface of the masonry as the water evaporates through the pores. Over time, the salt crystals will grow and will develop substantial pressures which will spall the masonry, detaching it at the depth of crystal growth. This build-up may take several years to cause problems.

Test patches for coatings generally do not allow an adequate evaluation of the treatment, because water may enter and leave through the surrounding untreated areas, thus flushing away the salt build-up. In addition, salt deposits may not cause visible damage for several years, well after the patch has been evaluated.

This is not to suggest that there is never a use for water repellents or waterproofings. Sandblasted brick, for example, may have become so porous that paint or some type of coating is essential. In other cases, the damage being caused by local pollution may be greater than the potential damage from the coatings. Generally, coatings are not necessary, however, unless there is a specific problem which they will help to solve. If the problem occurs on only a portion of the masonry, it probably is best to treat only the problem area rather than the entire building. Extreme exposures such as parapets, for example, or portions of the building subject to driving rains can be treated more effectively and less expensively than the entire building.

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This publication has been prepared in response to Executive Order 11593, "Protection and Enhancement of the Cultural Environment," which directs the Secretary of the Interior to ". . . develop and make available to Federal agencies and State and local governments information concerning professional methods and techniques for preserving, improving, restoring and maintaining historic properties." It has been written by Robert C. Mack, AIA, Architect, Interagency Historic Architectural Services Program, Office of Archeology and Historic Preservation, National Park Service, U.S. Department of the Interior, Washington, D.C. 20240, November 1975.

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2 PRESERVATION BRIEFS

Repointing Mortar Joints in Historic Brick Buildings

Robert C. Mack, A.I.A.

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Office of Archeology and Historic Preservation National Park Service

Repointing, also known as "tuck pointing" or simply "pointing," is the process of removing deteriorated mortar from the joints of a masonry wall and replacing it with new mortar. The selection of improper techniques or materials in the repointing of historic buildings not only can alter the visual aspects of a building but also can lead to further deterioration of the masonry. The purpose of this leaflet is to provide general guidance on the methods and materials for the repointing of historic brick buildings, for the benefit of building owners, architects and craftsmen.

Identifying The Problems

The decision to repoint usually is related to some perceptible problem, such as falling mortar, loose bricks or damp walls. The actual cause of the problem, however, may be unrelated to the visible effects, and for this reason *the services of an architect or preservation consultant should be obtained at the earliest planning stages to prevent both visual and physical damage to the building.*

The first step in planning a repointing project is to ascertain the true causes of problems which need attention. If the reason for repointing is to stop water penetration, the consultant should thoroughly investigate all possible sources of water. Damp walls may be caused by leaks from parapets, flashing, or roofs, and such leaks may show up some distance below in the masonry walls. Another source is rising capillary moisture which can cause dampness several feet above the ground. In either of these cases, repointing the outer masonry wall will not cure the problem. Similarly, if open joints or loose bricks are caused by foundation settlement or deterioration of materials, such structural problems should be corrected before beginning masonry work. After such an investigation, the consultant can inform the owner of necessary remedial actions and their costs, possibly including additional technical advice from foundation or soil engineers.

Logistical planning: It is important to recognize that repointing will be an expensive and time-consuming task due to the large amount of handwork and special materials required. Work cannot begin immediately, because research is required and some materials such as handmade bricks may have a long delivery time. Scaffolding will be in place for an extended period, possibly interfering with normal circulation patterns. The owner should remember that many communities will require a building permit before work can begin.

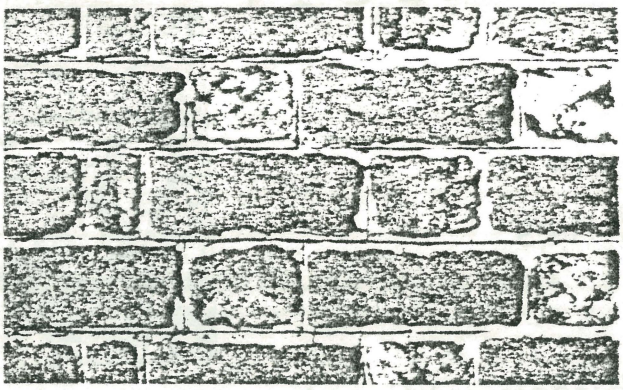
The architect/consultant also must recognize logistical considerations and the relationship of the repointing to other proposed work. For example, if paint is to be removed or gutters replaced, it may be logistically advisable to conduct research relating to these items before beginning to repoint. If water penetration is to be corrected, the repointing work probably should come early in the preservation project; if the building is watertight, it may be better to wait until after completion of exterior cleaning so that the existing and new mortars will weather simultaneously. Related projects, such as installing downspouts or painting (possibly separate contracts) should be scheduled to avoid conflict with the repointing work but at the same time to take maximum advantage of the scaffolding. Contractors should be made aware of these various architectural and logistical relationships in the early stages of project planning.

Research

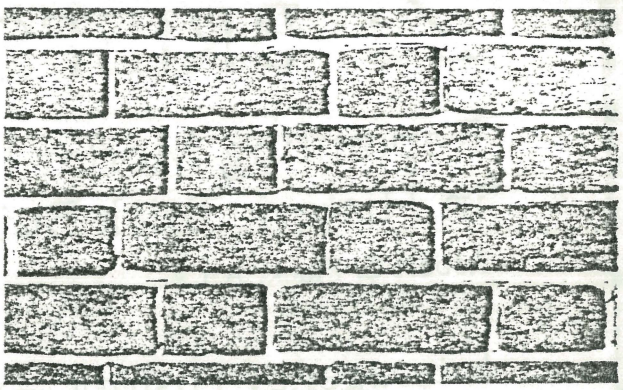
The repointing work will possibly involve analysis not only of the mortar but also of the bricks and the techniques originally used in striking the joints.

Mortar study or analysis is necessary if the repointing mortar is to match the original mortar in color, texture, and other properties. The identification of the major constituents is relatively simple; it may be possible to arrive at an approximation of the mortar's composition by observation (using low magnification) of an unweathered sample. (A more accurate method for performing this analysis is presented by E. Blaine Cliver in "Tests for the Analysis of Mortar Samples" in the *Bulletin* of the Association for Preservation Technology, Volume VI, Number 1, 1974. This article describes a methodology for separating a mortar sample into its various components.) Once the constituents have been separated and identified, the sand can be examined for the range of color, size and shape of the grains. Other insoluble materials also should be identified for inclusion in the repointing mortar.

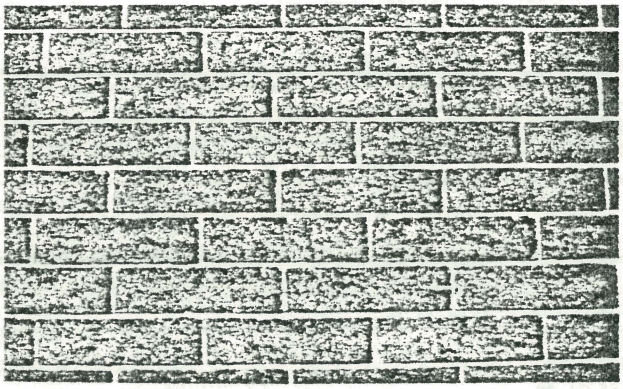
Pointing styles and the methods of producing them should be studied. (Fig. 1) It is important to examine both the horizontal and the vertical joints to determine which were struck first and whether they are the same style. Some buildings, for example, have horizontal joints which were tooled concave while the vertical joints were finished flush with the surface of the brick, then stained to match the



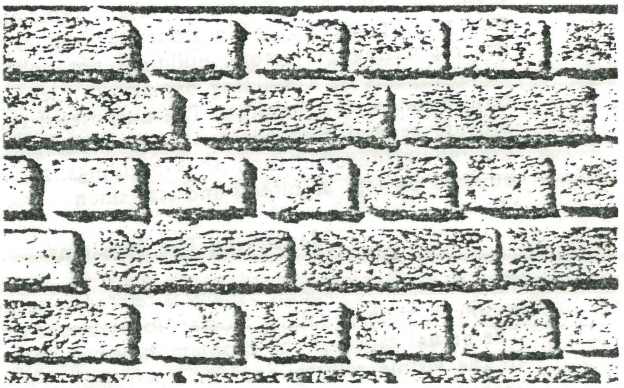
A. Colonial grapevine joint, Flemish bond.
ca. 1720.



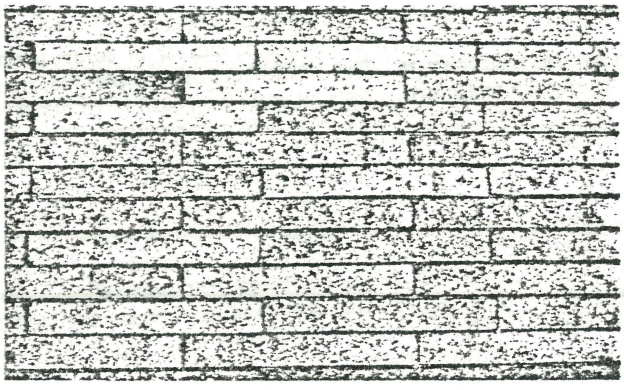
B. Beaded joint, Flemish bond.
ca. 1809.



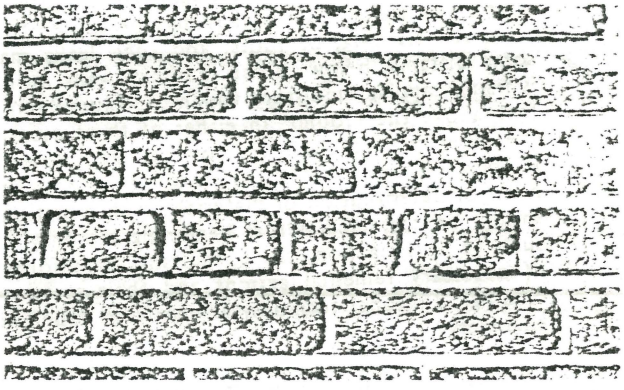
C. Flush joint, common bond.
mid-19th century.



D. Raked joint, English bond.
early 20th century.



E. Flush joint, one-third running bond.
early 20th century.



F. Concave joint, common bond.
early 20th century.

Figure 1. A variety of joint types and brick bonding patterns are illustrated here. Note the difference in uniformity of the bricks in A and B, which are handmade, and those from C through F, which are machinemade. It is evident in A, B, and F that the vertical joints were struck before the horizontal joints. Also note in B and E that the vertical joints are narrower than the horizontals.

brick, creating the illusion of horizontal bands. This technique was used extensively in late 19th and early 20th century architecture.

Bricks should be studied so that any replacements which may be necessary will match the originals. Within a wall there may be a surprisingly wide range of colors, textures, and even sizes. Replacement bricks should match this range rather than a specific brick. Potential sources for replacement bricks should be considered at the first stages because of the length of time required for the manufacture of special bricks. It may be possible to obtain suitable bricks from salvage building materials suppliers, or, if of comparable hardness and color, bricks may be moved from unexposed areas in the building to exposed areas.

Planning The Work

Properties of mortar: In general, repointing mortars should match the original mortar in constituent composition and proportions as well as in color and texture. The importance of matching the composition frequently is overlooked, yet this match is necessary if the new and old mortars are to have the same physical characteristics.

It is a common error to assume that hardness or high strength is a measure of durability. Stresses within a wall caused by expansion and contraction or by settlement must be accommodated in some manner; in a masonry wall these stresses should be relieved by the mortar rather than the brick. A mortar which is stronger and harder than the masonry units will not "give," thus causing the stresses to be relieved by the masonry units, usually in the form of cracking and spalling. (Fig. 2) Uneven movement in the masonry also can break the bond between the mortar and the brick, opening hairline cracks to water penetration. Mortars with a high percentage of portland cement can have the above described deleterious effects. Additional information on this problem is contained in *Studies of Stone-Setting Mortars: Building Materials and Structures Report 139*, published by the National Bureau of Standards in 1953. Porous mortar permits water within the wall to migrate and escape. Mortar with a high cement content does not permit this movement, and the water trapped within the wall may be subjected to freeze-thaw cycles which can spall soft, older brick.

"Workability" or plasticity of the mortar also is important. The new mortar should have both cohesive and adhesive qualities to make complete physical contact with the masonry and old mortar.

It should have the maximum amount of sand consistent with such workability to help reduce shrinkage while drying. The mortar must not be sticky or gummy and must handle readily on the pointing tool. Finally, the newly applied mortar must have good water retention to resist rapid loss of water through absorption by the brick or old mortar while setting.

Advantages of using high lime mortar: These facts lead to the conclusion that a high lime mortar generally is best for most historic structures, even those originally constructed with cement mortars. High lime mortar is soft and porous, and has the lowest volume change due to climatic condition. In addition, lime mortar is slightly soluble in water and able to self-seal small cracks and voids that may develop. In this phenomenon, a slight amount of the mortar dissolves in rain water and is precipitated in the void during the drying process, thus sealing the crack. Even straight lime mortar is more durable than generally recognized as long as the wall is protected from water penetration with sound roofing, gutters, flashing, etc. A small amount of white portland cement may be desirable, however, to accelerate setting.

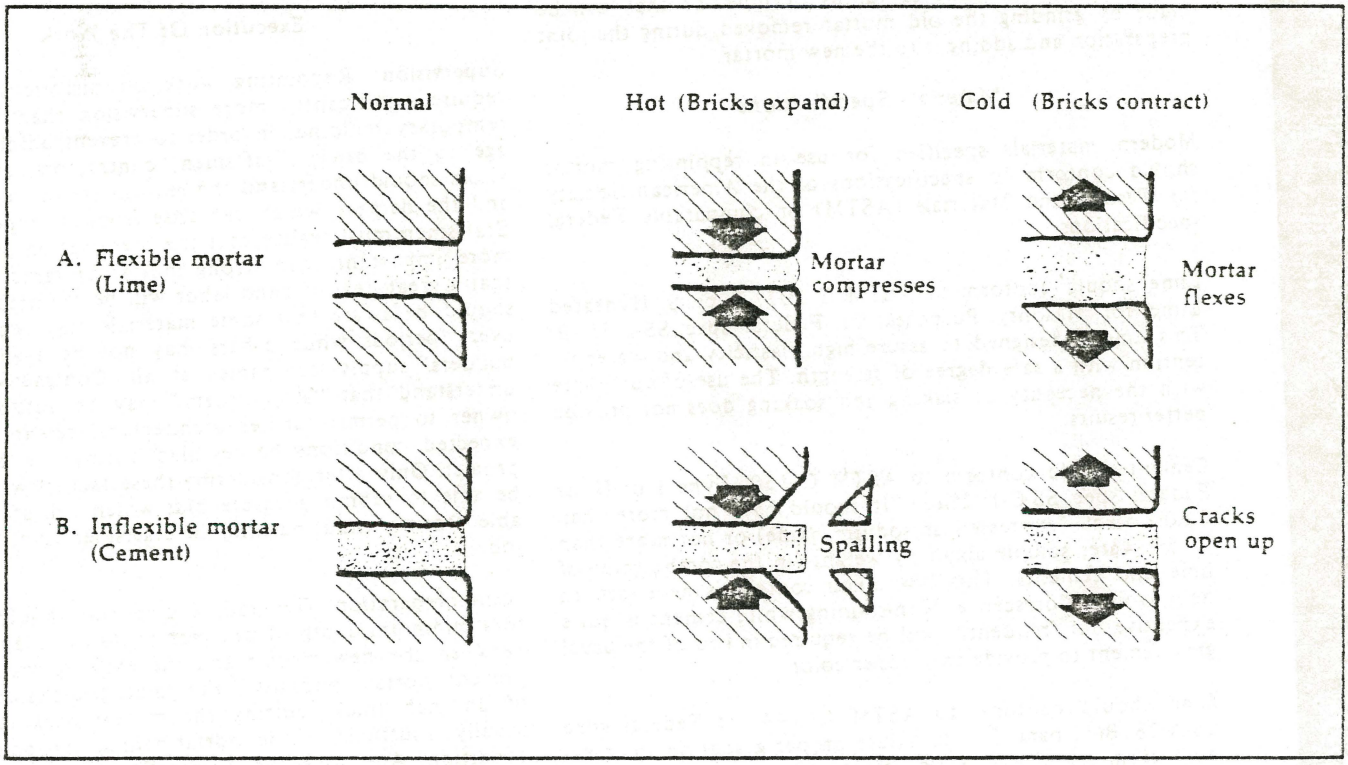


Figure 2. Diagrammatic sketches showing effects of temperature change upon masonry. Flexible mortar (A) expands and contracts with temperature changes. Bricks bonded by inflexible mortar (B) tend to spall at the edges (the area of greatest stress) in hot weather and separate from the mortar when it is cold. This latter condition opens cracks, permitting the entry of water and causing additional deterioration. Adapted from Maintenance of Old Buildings, *Document D10; National Swedish Institute for Building Research, Stockholm, 1975.*

Even if the building originally was constructed with cement mortar, it usually is best to use a high lime mortar rather than match the original. High lime mortar will reduce potential stresses at the edges of the masonry and also help minimize shrinkage, which leads to hairline cracking.

Matching color and texture: Although the use of proper materials and techniques will give a watertight job, appearance is also important. Both color and texture most often can be matched through the careful selection of lime and sand or other aggregates. Every reasonable effort should be made to use these natural sources of color and texture in matching the mortar. If the original sand borrow pit is no longer available, the masonry contractor may know of similar sand available in the region.

If it is not possible to obtain a proper match through the use of natural materials, it may be necessary to use a mortar pigment. Of course, some late 19th and early 20th century mortars contained such colors. These pigments are available as a separate ingredient or already mixed with mortar cement and lime; the premixed mortars usually are not suitable for use on older structures due to the high portland cement content. Only chemically pure mineral oxides that are alkaliproof and sun-fast should be used; natural earths have low tinting values, organically based colors fade in direct sunlight, and carbon black dissolves out of mortars which are not impervious to moisture.

Texture of the mortar also affects the visual characteristics. Modern mortars are finely ground and thus present a uniform texture as well as color; early mortars were not as finely ground, however, and may contain lumps of oyster shell or incompletely burned lime. The size, color, and composition of these lumps should be determined as part of the mortar analysis, and they should be duplicated in the repointing mortar. These particles can be duplicated in kind with new oyster shells or lumps of lime, or they can be made by grinding the old mortar removed during the joint preparation and adding it to the new mortar.

Materials Specifications

Modern materials specified for use in repointing mortar should conform to specifications of the American Society for Testing and Materials (ASTM) or comparable Federal specifications.

Lime should conform to ASTM C 207, Type S, Hydrated Lime for Masonry Purposes, or Federal spec SS-L-351B. This lime is designed to assure high plasticity and water retention with a safe degree of strength. The use of quicklime with the necessity of slaking and soaking does not provide better results.

Cement should conform to ASTM C 150, Type I or II, or Federal spec SS-C-192G(3). It should have not more than 0.60% alkali (expressed as sodium oxide) or not more than 0.15% water soluble alkali by weight (in the combination of lime and cement). This low alkali contenf is necessary to help avoid efflorescence. Non-staining white cement is quite expensive but frequently will be required in lieu of the usual grey cement to provide the proper color.

Sand should conform to ASTM C 144, or Federal spec SS-A-281B(1) para. 3.1, to assure proper gradation and freedom from impurities. Sand color, size, and texture should match the original as closely as possible to provide the proper visual characteristics without other additives. A sample of the sand is necessary for comparison to the original, and should be approved by the consultant before beginning repointing work.

Water should be clean and free from deleterious amounts of acids, alkalies, or organic materials.

Special additives will require writing new specifications for each project. If possible, suggested sources for the special materials should be included. For example, crushed oyster shells frequently can be obtained in a variety of sizes from poultry supply dealers.

Mortar mix: As mentioned previously, the new mortar usually should match the existing mortar as closely as possible, and the best way to insure a match is through careful analysis of the existing mortar. If an accurate chemical match of the original mortar is not feasible, or if the original mortar is too hard for repointing work, the following mixes may provide a *starting point for the development of a mortar which is visually and physically acceptable*. If the original mortar was nearly all lime and sand, try by starting with the following mix:

1 bag hydrated lime
¼ bag white portland cement
3 cubic feet of sand to match the original

If the mortar originally contained cement, or for extreme weather exposures such as parapet walls, try:

1 to 1½ bags hydrated lime
1 bag portland cement
5 to 6½ cubic feet of sand

Keep in mind that the above mixes are only given to suggest the basic range of lime-to-cement ratios. It is likely they will require modification or additional constituents before they produce a mortar that matches the visual and physical character of the original.

Execution Of The Work

Supervision: Repointing work on historic structures will require significantly more supervision than work on contemporary buildings in order to prevent unintentional damage to the brick. Craftsmen, contractors, and job supervisors should understand the reasons for the repointing work and the damage which can arise from improper techniques. Craftsmen must realize that the preservation of the bricks is more important than strong mortar or rapid progress, and that a great deal of hand labor will be required. Contractors should be aware that some materials may require long delivery periods while others may not be available through builders' supply companies at all. Contractors must also understand that "stop orders" may be authorized by the owner to permit further architectural research should unexpected conditions be revealed during the course of the project. Only after considering these factors will contractors be able to submit accurate bids which will afford a reasonable profit without pushing the craftsmen to produce a hasty job.

Joint preparation: Generally old mortar should be cut out to a minimum depth of one inch to insure an adequate bond between the new mortar and the existing masonry and to prevent mortar "popouts." For joints less than three-eighths of an inch thick, cutting the mortar back one-half inch usually is sufficient if the mortar behind that point is in good condition. Any loose or disintegrated mortar beyond this minimum depth should be removed (Fig. 3). Unless the mason is unusually skilled and extremely careful, the use of power tools for mortar removal inevitably will damage the brick. (Fig. 4) Damage to the edges of the brick will significantly affect the character of the brickwork. In addition, absorption of water is increased since the softer inside of the

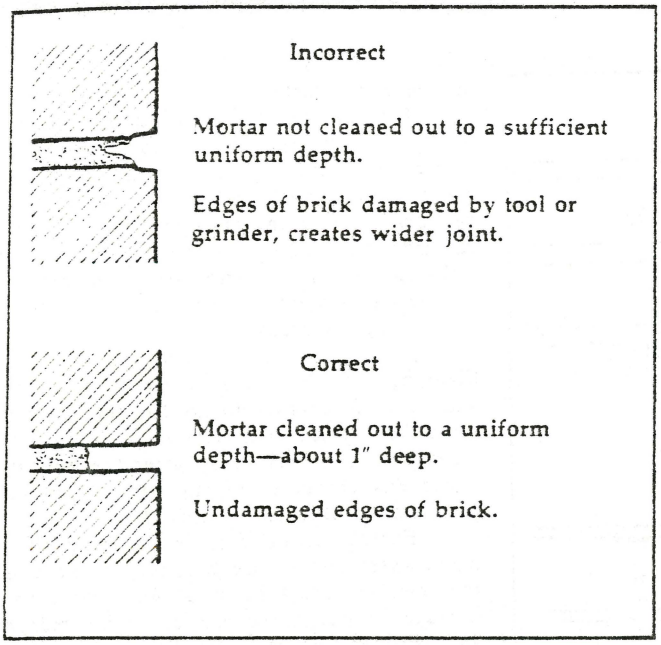


Figure 3. Comparison of incorrect and correct preparation of mortar joints for repointing.

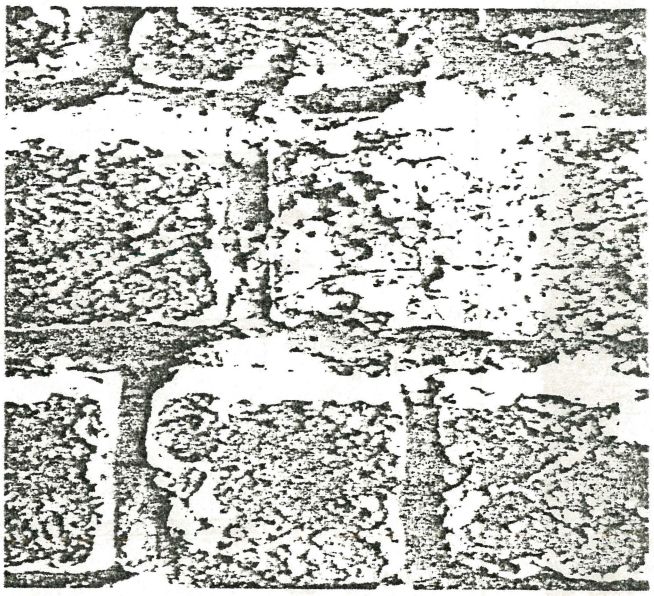


Figure 4. The damage to the edges and corners of these bricks was caused by using a power grinder in cleaning the joints. Extensive hand work is required to prevent damage to the bricks during joint preparation.

brick is no longer protected by the hard burned outer surface. Where joints are uniform and fairly wide, and the bricks were machinemade with straight edges, it may be possible to use a grinder. A test patch will establish the feasibility of using a grinder. *If there is any chance of damage to the masonry occurring, however, hand methods should be used exclusively.* Although hand work is slower, it is easier to control and is less likely to cause irreversible damage.

The mortar should be removed cleanly from the brick leaving square corners at the back of the cut. Before pointing is started all loose particles should be removed from the joint with a jet of air. The masonry and old mortar should be wetted at the time of repointing but no excess water should be present.

Mortar preparation: Mortars should be mixed thoroughly to obtain uniformity of both visual and physical characteristics. Dry ingredients should be mixed before adding the water. The mixture should be pre-hydrated to help prevent shrinkage on drying. To pre-hydrate the mortar, sufficient water is added to the dry mix to make a damp, stiff mortar. After one to two hours the mortar is remixed with additional water to give the desired consistency.

The use of anti-freeze compounds during cold weather is not recommended. Their effectiveness with high lime mortars is questionable. Furthermore, they may contain salts which would be a source of later efflorescence. A better practice is to heat the water and sand, with care taken to prevent scorching of the sand. The masonry then should be protected from freezing.

The use of air entraining agents also is discouraged. These agents are used with concrete to resist frost action and increase plasticity. The air which these agents incorporate into mortar, however, has a detrimental effect on both bond and strength of repointing mortar. Air entraining agents are considered unnecessary in high lime mortars because of their natural plasticity. Air entrainment of 10 to 16 percent, however, may be desirable in areas of extreme exposure where high strength mortars are used.

Use of bonding agents: The use of chemical agents to increase the bond of the new mortar to the old mortar and masonry units should be avoided. These agents generally are unnecessary and can be harmful.

If the joint is properly prepared and moistened prior to placing the new mortar and if the mortar is properly prepared and applied, there will be a good bond between the new mortar and the adjacent surfaces; chemical agents will not significantly improve this bond. If chemical agents are used, there may be a tendency to neglect proper joint preparation in the thought that the agent will make adequate bonding. In actuality, deteriorated mortar or dirt may remain in the joint, and bonding to these materials will not keep the mortar from coming loose. *Chemical agents cannot substitute for adequate joint preparation and proper mortar mixing.* In addition, some of the chemical agent inevitably will become smeared on the exposed face of the masonry and, due to the nature of the material, its removal will be difficult. This situation is especially likely on walls with thin mortar joints.

Filling the joints: Where existing mortar has been removed (or has fallen out) to a depth greater than one inch, these deeper places should be filled first, compacting new mortar in several layers. Once this has been completed, the back of the entire joint may be filled by applying approximately one-fourth inch of mortar and packing and back corners of the joint. This application may extend for several feet. As soon as the applied mortar has reached thumb print hardness, another layer of mortar of approximately the same thickness may be applied. Several layers will be needed to fill the joint flush with the outer surface of the brick. It is important to allow each layer time to lose much of the water and become stiff before the next layer is applied.

The rate of stiffening can be controlled by dampening the brick and old mortar before beginning to fill the joint. Free water or excessive dampness in the joint must be avoided; too much water will delay the tooling or cause excess shrinkage. If the joint is too dry, water will be absorbed from the mortar before it is properly set, thus reducing bond strength and increasing the probability of leaks.

When the final layer of mortar is thumb print hard, the joint is tooled in a manner to match the appearance of the old mortar. Tooling the finished joint at the right stage of firmness is important for uniform color. If finished while too

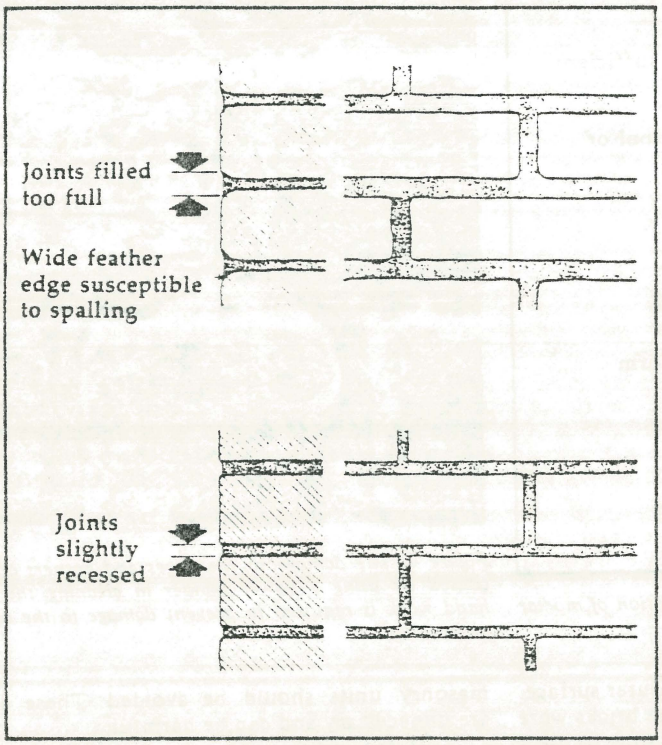


Figure 5. Comparison of visual effect of full mortar joints vs. slightly recessed joints. Filling joints too full hides the actual joint thickness and changes the character of the original brickwork.

soft, the color will be lighter than expected and hairline shrinkage cracks are likely to occur. If tooled when too hard, there may be dark streaks called tool burning, and good closure of the mortar against the brick will not be achieved.

If the old bricks have worn, rounded corners, it usually is best to *recess the final mortar surface slightly* to avoid leaving a joint which is visually wider than the actual historical appearance; it also will avoid creation of a large, thin featheredge which is easily damaged, thus admitting water. (Figs. 5 and 6)

Following tooling, it frequently is necessary to remove excess mortar from the edge of the joint by brushing with a bristle brush. The lower portion of the brickwork shown in the title block photograph has been brushed while the middle area has not. (Also see discussion on cleaning below.)

"Aging" the new mortar: Even with the best efforts at matching original mortar color, texture, and materials, there usually will be a visible difference between the old work and the new, partly because the new mortar has been matched to the unweathered portions of the original mortars. Another reason for a slight mismatch may be that the mortar sand may be more exposed in the old mortar due to the slight erosion of the lime or cement. Several methods of treatment have been attempted in an effort to overcome these differences. As with all work, however, any proposed treatment should be carefully considered and tested prior to implementation.

One method of aging the new mortar is a light brushing with a stiff natural brush immediately after tooling. This brushing will roughen the surface slightly, thus producing a weathered look.

Another relatively safe treatment is to fine spray the mortar with low pressure water after completion of tooling. This spray will wash away part of the cement and lime before it is fully hardened, leaving the grains of sand more exposed on the outer surface of the joint as in natural weathering.

Efforts to artifically stain the new mortar may give an initial color match but can cause the new and old mortars to change color at a different rate during the natural aging process. In addition, the mixtures used to stain the mortar may be dangerous to the masonry; some mixtures, for example, can introduce salts into the masonry which then can cause efflorescence. If the mortars have been properly matched, the best treatment for surface color differences is to let the mortars age naturally.

Cleaning: *If repointing work is carefully executed, there will be little excess mortar to clean from the walls.* A conscientious mason will remove most extraneous mortar particles with a bristle brush after the mortar dries but before it hardens. Hardened mortar can be removed with a wooden paddle or, if necessary, a chisel.

Further cleaning is best accomplished with the use of plain water and bristle brushes. If chemicals must be used, the selection must be made with extreme caution to avoid damage to *either the mortar or the masonry*. Selection of an improper cleaner can lead to deterioration of the masonry units or the mortar, mortar smear, and efflorescence. *The use of acid or any agent containing acid should be a last resort*, for acid can destroy the featheredge closure between the finished mortar joint and the brick. Chemical solutions should be used only once and should be flushed freely with plain water to remove all traces of the chemicals.

Several precautions should be taken when cleaning with plain water or with cleaning solutions. The mortar should be fully hardened before cleaning; usually thirty days is sufficient, depending upon weather or exposure. Test cleaning should be conducted on a small section before proceeding with the rest of the building. Both the area to be cleaned and the wall below should be *presoaked with water*. Cleaning the walls of excess mortar should begin at the top and work to the bottom. As the cleaning proceeds, it is important to flush the area with water. Stiff natural brushes should be used for all surfaces except glazed or polished surfaces, for which only soft cloths should be used.

New construction "bloom" or efflorescence occasionally appears within the first few months after repointing and generally disappears through the normal process of weathering. If efflorescence is not removed by natural processes, the safest way to remove it is by dry brushing with bristle brushes followed with a brief water rinse. Chemical cleaners, especially muriatic acid, should be avoided in the removal of efflorescence since the chemicals can create additional salts which may lead to added efflorescence.

Further information on cleaning is contained in Preservation Briefs: No. 1, "The Cleaning and Waterproof Coating of Masonry Buildings," available from the Interagency Historic Architectural Services Program, Office of Archeology and Historic Preservation, National Park Service, Washington, D.C. 20240.

Summary

For the owner: It is important for the owner or administrator of an historic building to be aware that repointing is likely to be a slow and expensive project. Schedules for both the repointing work and other activities will require careful coordination in order to avoid unanticipated conflicts. The work cannot be rushed or overly economized if the building is to retain the proper visual characteristics and if the job is to be durable and watertight.

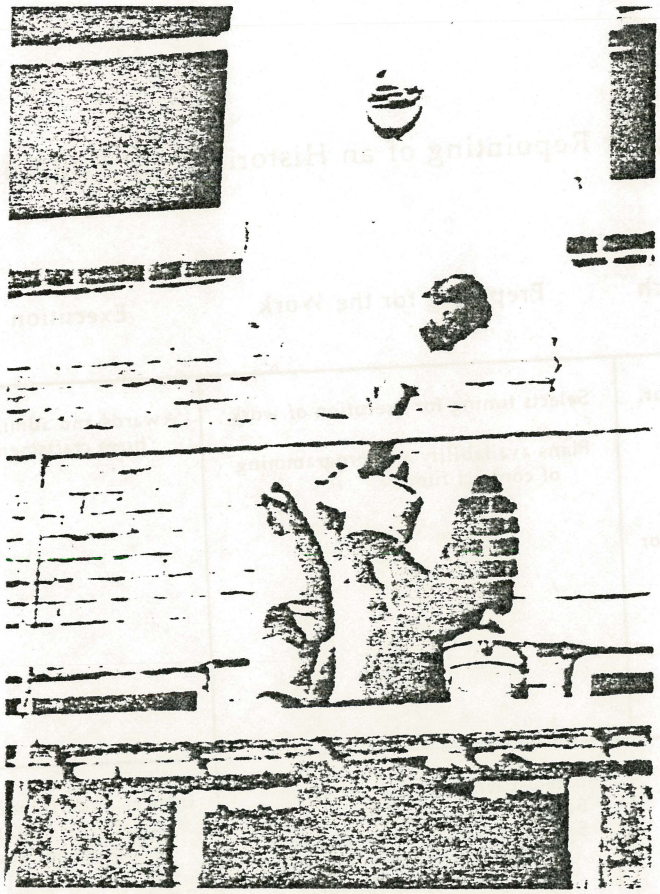


Figure 6. This photograph shows the significant visual changes which can result from improper repointing procedures. Note the increased thickness of the joints, the color variation, and the difference in the method of tooling, all noticeable even from a distance.

For the architect/consultant: The architect must assist the owner with planning for the logistical problems relating to research and construction. The architect also must realize that older buildings have special problems not usually encountered in modern construction, so extra research will be required, and other than standard materials and procedures will need to be specified. The qualifications of potential contractors must be carefully evaluated based on previous experience with historic structures, and the contractor must be given special instructions prior to starting the work.

For the contractor/craftsman: The requirement for large amounts of slow handwork must be recognized if the contractor is to submit a bid which will reflect these expensive methods. The contractor must explain the special nature of the project to the craftsmen so they will not rush the project. Understanding the potential problems will not only help the contractor in evaluating the project but will also help the masons to understand the reasons that specific methods should or should not be used.

While careful preservation, restoration and maintenance can hold back deterioration, it is important to understand that repointing work probably will not last the life of the structure. Nevertheless, if the first mortar joint has proved durable for many years, careful repointing should also have a long life. Additional repointing jobs can be undertaken as needed without altering structural soundness and original appearance.

Information for this brief was based in part upon:

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Brick Institute of America. "Cleaning Clay Products Masonry," *Technical Notes on Brick Construction*, Number 20 (revised), 1964.

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Cliver, E. Blaine. "Tests for the Analysis of Mortar Samples," *Bulletin* of the Association for Preservation Technology Volume VI, Number 1, 1974, pp. 68–73.

Connor, C.C. and W.E. Okerson. "Recent Disintegration of Mortar in Brick Wall," *ASTM Proceedings*, Volume 57, 1957.

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The line illustrations for this brief were prepared by Robert C. Mack and David W. Look, Interagency Historic Architectural Services Program; and the photographs are by Calder Loth, Architectural Historian.

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Planning for Repointing of an Historic Brick Building

	Early Planning and Research	Preparing for the Work	Execution of the Work
Owner	Notes problems: Leaks, loose mortar, visible cracks, etc. Contacts consultant architect Considers problems: High expense due to hand methods and time for work; traffic and circulation problems; scaffolding in place for extended periods Considers alternative approaches explained by consultant architect	Selects timing for execution of work Plans availability and programming of contract funds	Awards and administers contract, or hires craftsmen (if by day labor)
Architect	Identifies true cause of problem Identifies additional consultants required Presents technical aspects of problem to the owner along with possible alternatives and probable costs Recognizes logistical considerations: Research; test panels; brick manufacture Conducts research: Mortar analysis (material types and proportions, sand color); craft techniques (bond patterns, joint types); special materials Identifies potential problems from use of improper materials and techniques Advises whether work should be done by contract, day labor or with owner's maintenance personnel	Prepares specifications Scope of work Selection of materials: ASTM or Federal Specs when available but special specs for some materials Joint preparation: Permitted and excluded tools; method of tool use; method of joint preparation Mortar application: Method of mortar application; replacement of loose brick or stone; joint tooling; "aging" Cleaning repointed surface Evaluates past preservation work of potential contractors or craftsmen	Insures understanding of contract objectives and unusual conditions by contractor and or craftsmen Provides close supervision, especially during earliest phases of work Prepares change orders as needed Keeps close watch for hidden historical evidence as well as unrecognized deterioration
Craftsman		Possible early involvement: Assists in preparing tests samples or panels to help consultant in final selection of methods and materials Assists in locating special materials Recognizes potential logistical problems, large amounts of hand work, etc., in preparation of bid	Coordinates repointing with other related work Executes work in accordance with plans and specifications Understands that stop orders may be issued to facilitate detailed investigation or recording of previously concealed conditions or architectural features

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