Floyd Bennett Field,
Hangars 1 and 2,
Historic Structure Report

Kings County, New York

Prepared for

Transcontinental Gas Pipe Line, LLC

and the

National Park Service

Prepared by

URS Corporation
437 High Street
Burlington, New Jersey

August 2013

ADMINISTRATIVE DATA

Hangars 1 and 2, located in Floyd Bennett Field, Brooklyn, New York, are two of eight original airplane hangars along Flatbush Avenue that were constructed in 1931. These eight hangars are collectively known as Hangar Row. Floyd Bennett Field is part of Gateway National Recreation Area, which is owned by the National Park Service. Since they were first constructed, Hangars 1 and 2 have evolved through additions and modifications, including construction of lean-tos on both hangars and an infill building between the hangars during the WPA era. Over the course of research for this project, it was discovered that a wood-framed monitor structure in the former light court of the WPA Infill had been constructed during World War II. This circumstance is unique to the hangars at Hangar Row. The hangars have been vacant for several years, with the exception of periodic storage of NPS and concessionaire property. Degradation of the roof and windows has exposed the interior of the structures to the elements. Consequently, Hangars 1 and 2 are in poor condition.

Hangars 1 and 2 are contributing resources within the Floyd Bennett Field Historic District, which is listed on the National Register of Historic Places. The National Register nomination was updated and accepted in 2011 to include an extended period of significance of 1928–1945. The period of significance for Hangars 1 and 2 is the same. Hangars 1 and 2 have been assigned LCS # 0028271 and NY SHPO # 04701.0089003 and 04701.0089004.

This historic structure report (HSR) is a documentation and planning document in advance of an adaptive reuse project proposed at Hangars 1 and 2. A potential lease agreement is being considered for the hangars. The proposed adaptive reuse project will be in keeping with *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings*, specifically *The Standards for Rehabilitation* and *The Guidelines for Rehabilitating Historic Structures.*

Repositories visited for this document include the Gateway National Recreation Area headquarters museum collection, Fort Wadsworth, Staten Island, New York; City of New York Municipal Archives, Department of Records and Information Services; National Archives and Records Administration, College Park, Maryland; National Park Service, Denver Service Center, Technical Information Center, Denver, Colorado; and the Cradle of Aviation Museum, Garden City, Long Island, New York.

Acknowledgements

The help and guidance of several people has made the creation of this historic structure report thorough and informed. At Gateway National Recreation Area, Marilou Ehrler provided architectural and cultural resource guidance throughout the project. Ricky O'Neill provided valuable information about the history, function, and maintenance of the hangars. David Taft, David Avrin, David Uschold, Mike Finken, and Carol Whipple offered NPS guidance and oversight for the project, and Felice Ciccione generously provided assistance in research of the Gateway National Recreation Area collection.

TABLE OF CONTENTS

Administrative Data i
List of Figures iv
List of Photographs vi
List of Tables xiii

Part 1 – Developmental History

1.1 Hangars 1 and 2 Timeline 1.1.1
1.2 Historic Background and Context 1.2.1
A Brief History of Barren Island, Site of Floyd Bennett Field, 1800–1920 ..... 1.2.1
The Development of Commercial Aviation in America 1.2.4
Early Air Fields in the New York Metropolitan Area 1.2.6
The Creation of Floyd Bennett Field 1.2.10
Aviation Events and Hangar Operations at Municipal Airport No. 1, 1928–1941 ..... 1.2.11
Naval Air Station New York: Wartime Activities, 1941–1945 ..... 1.2.27
Post-War Military and Civilian Use of NAS New York, 1946–1972 ..... 1.2.30
Floyd Bennett Field Becomes Part of the Gateway National Recreation Area, 1972–Present 1.2.34
1.3 Chronology of Development and Use 1.3.1
1.4 Physical Description of Hangars 1 and 2 ..... 1.4.1
Hangar 1 ..... 1.4.5
Hangar 1 Lean-to 1.4.15
Hangar 2 ..... 1.4.45
Hangar 2 Lean-to 1.4.55
WPA Infill 1.4.62
1.5 Hangars 1 and 2 Character-Defining Features 1.5.1
Definition and Discussion of Character-Defining Features 1.5.1
Site and Exterior Features 1.5.2
Interior Features 1.5.8
1.6 Conditions Assessment 1.6.1.1
1.6.1 Civil 1.6.1.1
Water System 1.6.1.1
Hydrants and Post Indicator Valves (PIV) Evaluation 1.6.1.3
Wastewater Treatment 1.6.1.4
Motor Vehicle Access and Pedestrian Access 1.6.1.4
1.6.2 Site 1.6.2.1
Physical Description 1.6.2.1
Existing Conditions 1.6.2.5
Site Drainage Evaluation 1.6.2.6
Storm Sewer Evaluation 1.6.2.6
1.6.3 Architecture 1.6.3.1
Exterior Envelope 1.6.3.1
Building Interior: Hangar 1 ..... 1.6.3.3
Building Interior: Hangar 1 Lean-to 1.6.3.7
Building Interior: Hangar 2 ..... 1.6.3.10
Building Interior: Hangar 2 Lean-to 1.6.3.12
Building Interior: WPA Infill 1.6.3.13

TABLE OF CONTENTS (CONT'D)

1.6.4 Structural 1.6.4.1
Hangar 1 ..... 1.6.4.1
Hangar 1 Lean-to 1.6.4.2
Hangar 2 ..... 1.6.4.3
Hangar 2 Lean-to 1.6.4.5
WPA Infill 1.6.4.6
1.6.5 Mechanical, Electrical, and Plumbing 1.6.5.1
Mechanical Description and Condition 1.6.5.1
Electrical Description and Condition 1.6.5.2
Plumbing Description and Condition 1.6.5.4

Part 2 – Treatment and Use

2.1 Treatment Recommendations 2.1.1
Exterior Features 2.1.1
Interior Features 2.1.9
2.2 Code Analysis 2.2.1
Original Building Code 2.2.1
Applicable Code 2.2.1
Fire-Resistant Construction 2.2.1
Egress 2.2.3
ADA 2.2.3
Mechanical, Electrical, Plumbing, and Fire Suppression (Sprinkler) Systems 2.2.4

Appendices

A Bibliography

B Additional Photographs for Section 1.4 – Physical Description of Hangars 1 and 2

C Additional Photographs for Section 1.6 – Conditions Assessment

C.1 – Architecture

C.2 – Structural

C.3 – Mechanical, Electrical, and Plumbing

D Archival Documents

E Material Analysis

LIST OF FIGURES

Figure		Page
1.1.1	Proposed hangar configuration in 1928	1.1.2
1.2.1	Barren Island, as it appeared in 1818	1.2.2
1.2.2	Location of project area on USGS Brooklyn 15-minute quadrangle, 1897	1.2.3
1.2.3	Paul Rizzo dropped 8,000 leaflets when he moved to Floyd Bennett Field on May 18, 1931	1.2.5
1.2.4	Area within original property boundary filled in 1928–1929 to create Floyd Bennett Field	1.2.12
1.2.5	Appearance of Floyd Bennett Field when it opened in 1931	1.2.15
1.2.6	Crowds at Floyd Bennett Field greeting Howard Hughes in 1938	1.2.18
1.2.7	Navy training planes outside Hangar 1, late 1930s	1.2.19
1.2.8	Navy training plane flying above Hangars 1 and 2, late 1930s	1.2.19
1.2.9	Erickson & Remmert, Hangar 6, 1930s	1.2.19
1.2.10	Clarence D. Chamberlin's Hangar 4, 1930s	1.2.20
1.2.11	Layout of Naval Air Reserve Aviation Base and Naval Air Station, New York, at Floyd Bennett Field	1.2.25
1.2.12	Personnel of Naval Air Station New York, 1944	1.2.29
1.2.13	2230th Air Force Reserve in Hangar 1, 1950s	1.2.30
1.3.1	Original Hangars, 1931	1.3.4
1.3.2	Original Hangar Plans, 1931	1.3.5
1.3.3	Original Exterior Elevations, 1931	1.3.6
1.3.4	WPA Era, 1937-1941	1.3.7
1.3.5	World War II Era, 1941-1945	1.3.8
1.3.6	Post-war Era, 1946-1963	1.3.9
1.3.7	Army Tenancy, 1968-1972	1.3.10
1.3.8	Existing Conditions, 2013	1.3.11
1.3.9	Existing Plan, Level 1	1.3.12
1.3.10	Existing Plan, Level 2	1.3.13
1.3.11	Existing Exterior Elevations	1.3.14
1.3.12	Hangar 1 Chronology	1.3.15
1.3.13	Hangar 1 Chronology - Perspective Views	1.3.16
1.3.14	Hangar 2 Chronology	1.3.17
1.3.15	Hangar 2 Chronology - Perspective Views	1.3.18
1.3.16	WPA Infill Chronology	1.3.19
1.3.17	Hangar 1 Lean-to Chronology	1.3.20

LIST OF FIGURES (CONT'D)

Figure		Page
1.3.18	Hangar 2 Lean-to Chronology	1.3.21
1.3.19a	1929 Hangar Plans	1.3.22
1.3.19b	1929 Hangar Plans	1.3.23
1.3.20a	1936 Hangar 1 Lean-to Plans	1.3.24
1.3.20b	1936 Hangar 1 Lean-to Plans	1.3.25
1.3.21	1946 Hangar 2 Floor Plan	1.3.26
1.3.22	1964 Hangars 1 and 2 Repairs	1.3.27
1.4.1	Hangar 1 Floor Plan	1.4.14
1.4.2	Hangar 1 Lean-to (Bldg. 8), 1st Floor, North	1.4.39
1.4.3	Hangar 1 Lean-to (Bldg. 8), 1st Floor, Central	1.4.40
1.4.4	Hangar 1 Lean-to (Bldg. 8), 1st Floor, South	1.4.41
1.4.5	Hangar 1 Lean-to (Bldg. 8), 2nd Floor, North	1.4.42
1.4.6	Hangar 1 Lean-to (Bldg. 8), 2nd Floor, Central	1.4.43
1.4.7	Hangar 1 Lean-to (Bldg. 8), 2nd Floor, South	1.4.44
1.4.8	Hangar 2 Floor Plan	1.4.54
1.4.9	Hangar 2 Lean-to (Bldg. 10), North	1.4.59
1.4.10	Hangar 2 Lean-to (Bldg. 10), Central	1.4.60
1.4.11	Hangar 2 Lean-to (Bldg. 10), South	1.4.61
1.4.12	WPA Infill (Bldg. 3), 1st Floor, North	1.4.86
1.4.13	WPA Infill (Bldg. 3), 1st Floor, Central	1.4.87
1.4.14	WPA Infill (Bldg. 3), 1st Floor, South	1.4.88
1.4.15	WPA Infill (Bldg. 3), Mezzanine, Central	1.4.89
1.4.16	WPA Infill (Bldg. 3), 2nd Floor, North	1.4.90
1.4.17	WPA Infill (Bldg. 3), 2nd Floor/Roof, Central	1.4.91
1.4.18	WPA Infill (Bldg. 3), 2nd Floor, South	1.4.92
1.5.1	Character-Defining Feature – Steel Sash Windows	1.5.12
1.5.2	Character-Defining Feature – Hangar Doors	1.5.13
1.5.3	Character-Defining Feature – Graphics	1.5.14
1.6.1.1	Existing site utility compilation map	1.6.1.2
1.6.2.1	Site plan	1.6.2.2
1.6.2.2	Location map	1.6.2.3
1.6.2.3	USGS topographic map of Coney Island, New York-New Jersey	1.6.2.7
1.6.2.4	FEMA FIRM map 3604970359F	1.6.2.8
2.2.1	Code Analysis	2.2.2

LIST OF PHOTOGRAPHS

Photograph **Page**

1.4.1 General view of hangar complex, south façade 1.4.2
1.4.2 General eastward view along south elevation, showing WPA Infill façade 1.4.2
1.4.3 View of post indicator valve dating to the WPA Infill construction campaign, during which fire suppression features were added to the hangars 1.4.4
1.4.4 Exterior view of east (airfield) elevation, showing roof patching and wall failure due to missing flashing 1.4.5
1.4.5 Exterior view of north façade 1.4.5
1.4.6 Exterior view of hangar doors and corrugated copper gable at north-south center line 1.4.6
1.4.7 Interior view of Hangar 1, looking southwest towards the WPA Infill 1.4.7
1.4.8 Standardized system for the manufacture and specification of horizontal pivoted windows 1.4.8
1.4.9 View of east wall at northernmost bay, showing doorway and Type 44141 steel sash window 1.4.9
1.4.10 Elevation of east wall at third bay, showing steel sash windows at clerestories above ... 1.4.10
1.4.11 Detail view of steel fire alarm box affixed to the east elevation brick wall 1.4.11
1.4.12 View of west wall, showing the steel rack assembly at the third bay 1.4.12
1.4.13 View of north façade and northeast corner of Hangar 1 Lean-to 1.4.15
1.4.14 Detail view along parapet line to north 1.4.16
1.4.15 View of south façade, with bay window visible to the east 1.4.16
1.4.16 View of northern end of corridor (Foyer 8-A) 1.4.18
1.4.17 View south down length of Foyer 8-A, with exterior wall to left and the ubiquitous partial-height panelized partitions to right 1.4.19
1.4.18 View up stairs to the second floor, north end 1.4.21
1.4.19 View of north wall (hangar pocket) and adjacent stair to second floor, plaster over brick 1.4.22
1.4.20 View of south wall showing infilled opening to Room 8-112 ..... 1.4.22
1.4.21 View to north at Room 8-112, showing hollow clay tile (terra cotta block) wall, plastered and painted 1.4.23
1.4.22 View towards southwest showing furred-over steel sash window (center right) and entrance to latrine beyond (center left) 1.4.23
1.4.23 Detail view of partial-height panel partition wall showing original finish and Army tenancy uniform name tag 1.4.24
1.4.24 View towards east in Latrine 8-111, showing steel toilet partitions and cast-iron sinks 1.4.25

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.4.25 Detail view of rectangular mosaic floor tile at Latrine 8-111, near radiator at west wall 1.4.25
1.4.26 View of toilets and steel pennant along north wall, Latrine 8-110 (small latrine) 1.4.26
1.4.27 View west towards hangar showing entrances to 8-109 (right) and 8-108 (left) 1.4.27
1.4.28 Detail view at panel partition showing 52nd Army Artillery unit crest painted on glass pane, backlighted for emphasis 1.4.27
1.4.29 Detail view of battened partition framing around earlier radiator at west wall 1.4.28
1.4.30 View of electrical panel 1.4.28
1.4.31 Detail view of early chain-hung porcelain enamel fluorescent light fixture, dating to the period of significance 1.4.28
1.4.32 View of partial-height post-war partition with painted remnant of unidentified Army artillery insignia 1.4.29
1.4.33 View to the south showing wood frame partition wall 1.4.29
1.4.34 Detail view of east wall showing later partition (right) framing into earlier plastered hollow clay tile wall (left) 1.4.30
1.4.35 Room 8-105, view west towards hangar, showing infilled door (left) and ghost wall 1.4.31
1.4.36 Detail view showing later cast-iron sprinkler pipe penetration through earlier steel sash window pane, low clerestory at the second floor 1.4.32
1.4.37 View of south stair showing former exterior wall, face brick, and flashing line 1.4.33
1.4.38 View of east (corridor) wall showing steel mesh screen blocking doorway 1.4.34
1.4.39 Corridor view south showing supplementary steel gate at entrance to Room 8-202 ..... 1.4.34
1.4.40 View to east showing infilled door to deck over first-floor bay window 1.4.35
1.4.41 Typical view of asbestos tile in second-floor spaces 1.4.35
1.4.42 View to west showing parachute tower at right 1.4.36
1.4.43 View of north wall showing partial-height ceramic tile and infilled door opening to Room 8-209 beyond 1.4.37
1.4.44 View to northeast of supply room built in corner created by hangar door pocket and stair (to left) 1.4.38
1.4.45 Exterior view of south hangar door pocket and parapet, including copper flashing 1.4.45
1.4.46 Exterior view of north-facing hangar doors and corrugated copper fascia 1.4.45
1.4.47 Exterior façade of east end of hangar doors (north side) and corrugated copper gable 1.4.46
1.4.48 Exterior detail view of original porcelain enamel sconce fixture at corrugated copper gable 1.4.46
1.4.49 View to the south showing remnant tongue-and-groove roof planking prior to removal 1.4.47

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.4.50 Exterior view towards the east over the roof with the WPA Infill, monitor structure, and Hangar 1 visible 1.4.47
1.4.51 General view to the south, showing infill (east) wall, roof trusses, galvanized partition, and south hangar doors in distance 1.4.48
1.4.52 Detail view of trusswork and clerestories at southwest corner 1.4.48
1.4.53 View west of first (southernmost) bay, showing south hangar door pocket, west elevation, and kalamein door to lean-to spaces 1.4.49
1.4.54 View of west wall at third bay from the south, showing steel sash window 1.4.49
1.4.55 View east through vehicle-size opening into infill passageway (Room 3-110) 1.4.51
1.4.56 View at south hangar doors, east end, showing different width doors 1.4.52
1.4.57 Detail view at southeast corner showing hangar door tracks at truss level 1.4.52
1.4.58 View at truss level showing original heater unit and associated wooden catwalk 1.4.52
1.4.59 View at truss level showing monitor structure and galvanized partition 1.4.53
1.4.60 View to southeast showing east wall, hangar floor slab with door tracks, and south opening to the Maintenance Bay (Room 3-106) in the WPA Infill 1.4.53
1.4.61 Exterior view of north façade 1.4.55
1.4.62 Exterior view of brick/parapet deterioration at west exterior elevation (from Flatbush Avenue) 1.4.55
1.4.63 Exterior view of southwest corner of Hangar 2 Lean-to, showing additional curved coping lines at the long elevation 1.4.56
1.4.64 View of west wall showing original electrical panel and multi-pane steel sash windows (Type 64181) overlooking Flatbush Avenue 1.4.56
1.4.65 View of west (exterior) wall with plaster on hollow clay tile 1.4.56
1.4.66 Detail view of the extant porcelain enamel pendant fixture at the southeast corner 1.4.57
1.4.67 View towards west wall showing entrances to latrines 1.4.57
1.4.68 The centrally located WPA Infill, although a later addition, is seamlessly integrated with the earlier hangars and helps define the interior courtyard 1.4.62
1.4.69 Exterior detail of deteriorated top of Hangar 2 east wall, which also serves as the WPA Infill's west wall 1.4.62
1.4.70 Brick wall failure at WPA Infill, first floor 1.4.63
1.4.71 Partial exterior view, north façade of the WPA Infill 1.4.64
1.4.72 "Jelly jar" fixture enclosed in a protective bronze cage 1.4.65
1.4.73 Reverse view of parapet condition at north façade, looking north towards Hangars 3 and 4 and the Ryan Visitor Center beyond 1.4.66
1.4.74 General view of roof at the southern section, looking east 1.4.66

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.4.75 In a view to the northwest from high above the southeast corner of Hangar 1, the wood-frame construction of the monitor structure is evident 1.4.67
1.4.76 Wide view of northern section, showing passageway (3-110) and adjacent Flight Supply Room (3-112) 1.4.68
1.4.77 Sprinkler Room, view to the south, showing fire suppression manifold 1.4.69
1.4.78 Northeast stairwell, at the first floor, looking south, showing highly deteriorated steel steps 1.4.70
1.4.79 Motor Pool Office, view to the north 1.4.70
1.4.80 Detail view of pendant-mounted porcelain enamel fixture 1.4.71
1.4.81 Detail view of pivoting steel sash window in the passageway 1.4.72
1.4.82 View north towards entrance to Tech Supply Office (Room 3-109) 1.4.73
1.4.83 General view to the west of the Tech Supply Room, shown flooded after heavy rains 1.4.73
1.4.84 View of southwest corner showing concrete block wall meeting earlier brick wall 1.4.74
1.4.85 View of west wall showing original iron-flecked brick, painted over with gray 1.4.74
1.4.86 View to the northeast showing curved steel hoisting beam traversing the L-shaped Maintenance Bay 1.4.75
1.4.87 View to southwest showing later concrete block wall and area above one-story latrine 1.4.76
1.4.88 View to the southeast inside Room 3-101 ..... 1.4.77
1.4.89 Detail of basal flange at utility sink, suspended above the concrete slab-on-grade, reveals depth of missing floor 1.4.77
1.4.90 View to the south of the first-floor latrine 1.4.77
1.4.91 General view of the mezzanine, towards the southeast 1.4.78
1.4.92 View of the "WOMEN" signage found under several layers of sodden debris 1.4.79
1.4.93 View to south taken in Foyer 3-B, showing former exterior door to courtyard, now the monitor classroom, beyond 1.4.80
1.4.94 View to the north showing a Type 43181 steel sash window 1.4.80
1.4.95 View to west in Latrine 3-211 showing shower stalls 1.4.81
1.4.96 View to south of former exterior steel sash window, Type 42140 ..... 1.4.81
1.4.97 Detail view of tool control board found abandoned in Latrine 3-212 ..... 1.4.81
1.4.98 View to the north showing steel sash windows 1.4.82
1.4.99 View to northwest, showing Hangar 2 steel sash windows beyond deteriorated wood-stud wall 1.4.82
1.4.100 View north in interstitial space between monitor structure (right) and Hangar 2 (left) 1.4.84
1.4.101 View east towards stairwell door, with south exterior wall to right 1.4.85

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.5.1 Hangars 1 and 2, north façade 1.5.3
1.5.2 Hangar 1, south façade, parapet 1.5.4
1.5.3 Hangar 2, north façade 1.5.4
1.5.4 WPA Infill, south façade 1.5.5
1.5.5 Hangar 1, south façade, brick detail 1.5.5
1.5.6 WPA Infill, north façade, lintel 1.5.6
1.5.7 Hangar 2, view to the southeast 1.5.6
1.5.8 Hangar 2, south façade, gable 1.5.6
1.5.9 WPA Infill, south stairwell, metal sash 1.5.7
1.5.10 Hangar 1, bottom door roller, north façade 1.5.7
1.5.11 Pilot door, Hangar 2 ..... 1.5.7
1.5.12 Hangar 1, east elevation 1.5.8
1.5.13 Hangar 2, view to the south 1.5.8
1.5.14 Exposed masonry and steel construction contributes to the sense of scale and utility 1.5.9
1.5.15 Hangar 2 catwalk with steam heat unit visible 1.5.9
1.5.16 WPA Infill, ceiling 1.5.9
1.5.17 Hangar 1, west wall 1.5.9
1.5.18 Hangar 1 Lean-to, door opening with transom 1.5.10
1.5.19 Hangar 2, view to the east, light fixtures 1.5.10
1.5.20 Plaster and painted finishes on the WPA Infill south stairwell remain largely intact 1.5.11
1.5.21 Hangar 1, east wall, painted brick stenciled sign 1.5.11
1.6.1.1 Hydrant 11, located at the south corner of Hangar 2 ..... 1.6.1.3
1.6.1.2 Hydrant 12, located approximately 130 linear feet from the southeast corner of Hangar 1 ..... 1.6.1.3
1.6.1.3 Hydrant 14, located 20 linear feet northwest of Building 30 (sewage pump house) and approximately 130 linear feet southeast of Building 3 ..... 1.6.1.3
1.6.1.4 Hydrant 16, located just east of the utility tunnel, adjacent to Hangar 1 ..... 1.6.1.3
1.6.1.5 Post Indicator Valve 1, dated 1936, located 8 feet from the northeast corner of Building 10 ..... 1.6.1.3
1.6.1.6 Post Indicator Valve 2, located north of Building 26, just near the center of the structure 1.6.1.3
1.6.2.1 General view of hangar site, looking west 1.6.2.1
1.6.2.2 Detail view of asphalt pavers 1.6.2.1

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.6.2.3 Detail view of hydrant at southwest corner, adjacent to the south façade of Hangar 2 Lean-to 1.6.2.4
1.6.2.4 View west of the hangars from the large community garden located due east 1.6.2.5
1.6.2.5 View to the southwest of the "dope shop" and other utility buildings south of the hangars, also built during the period of significance 1.6.2.5
1.6.2.6 Detail view of significant-period manhole located south of Hangar 1 ..... 1.6.2.5
1.6.3.1 WPA Infill, west pilaster, south façade 1.6.3.2
1.6.3.2 Hangar 1, south window, east elevation 1.6.3.3
1.6.3.3 Hangar 1 Lean-to, south façade 1.6.3.3
1.6.3.4 Hangar 1, east wall 1.6.3.4
1.6.3.5 Hangar 1, west wall 1.6.3.5
1.6.3.6 The bay holds three five-pane windows 1.6.3.7
1.6.3.7 Hangar 1 Lean-to, Room 8-209, east wall 1.6.3.8
1.6.3.8 Hangar 1 Lean-to, first floor 1.6.3.9
1.6.3.9 Hangar 2, north interior elevation 1.6.3.11
1.6.3.10 Hangar 2, east wall 1.6.3.11
1.6.3.11 Hangar 2, view to the north 1.6.3.12
1.6.3.12 WPA Infill, Room 3-205 ..... 1.6.3.17
1.6.4.1 Typical roof trusses and wood decking of Hangar 1 ..... 1.6.4.1
1.6.4.2 Slab settlement of floor of Hangar 1, adjacent to the WPA Infill 1.6.4.2
1.6.4.3 Surficial corrosion of the steel roof framing of Hangar 1 Lean-to 1.6.4.2
1.6.4.4 Deteriorated concrete slab of the second floor of Hangar 1 Lean-to, with exposed reinforcement 1.6.4.2
1.6.4.5 Deteriorated brick masonry of the exterior wall and pilaster at the northeastern corner of Hangar 1 Lean-to 1.6.4.3
1.6.4.6 Deteriorated brick masonry of the exterior wall on the east façade of Hangar 1 Lean-to, at the Admiral's Tower 1.6.4.3
1.6.4.7 Surficial corrosion of roof trusses of Hangar 2 ..... 1.6.4.4
1.6.4.8 Severe corrosion at bases of main columns of Hangar 2 ..... 1.6.4.4
1.6.4.9 Deteriorated framing at pilaster caps of Hangar 2 ..... 1.6.4.4
1.6.4.10 Slab settlement against south doors of Hangar 2 ..... 1.6.4.4
1.6.4.11 Roof deck and framing of Hangar 2 Lean-to, as viewed from below 1.6.4.5
1.6.4.12 Exterior brick deterioration and displacement of Hangar 2 Lean-to at west façade 1.6.4.5
1.6.4.13 Deteriorated wood roof framing of original two-story sections of the WPA Infill 1.6.4.6

LIST OF PHOTOGRAPHS (CONT'D)

Photograph **Page**

1.6.4.14 Representative framing of upper floor of the WPA Infill 1.6.4.6
1.6.4.15 Representative framing of original courtyard roof of the WPA Infill, with the wood floor overbuild seen through the original skylight opening 1.6.4.7
1.6.4.16 Deteriorated wood floor decking of the mezzanine floor of the WPA Infill, with wood floor joists on steel girders 1.6.4.7
1.6.4.17 Brick deterioration and settlements on the original upper courtyard façade of the WPA Infill, second floor 1.6.4.8
1.6.4.18 Brick cracking and settlements at a doorway in the interior masonry wall of the WPA Infill, first floor 1.6.4.8
1.6.5.1 Hangar 1 unit heater, view looking up 1.6.5.1
1.6.5.2 Hangar 2 steam-distribution piping, view looking up 1.6.5.1
1.6.5.3 Typical steam radiator 1.6.5.1
1.6.5.4 WPA Infill steam unit heater 1.6.5.1
1.6.5.5 Hangar 1 communications cabinet 1.6.5.2
1.6.5.6 Hangar 1 disconnects for mechanical units 1.6.5.2
1.6.5.7 Hangar 1 Lean-to multi-section panelboard 1.6.5.2
1.6.5.8 Hangar 2 large disconnect interior 1.6.5.3
1.6.5.9 Hangar 2 Lean-to panelboards 1.6.5.3
1.6.5.10 View of existing lavatory and existing water heater in Hangar 1 Lean-to 1.6.5.4
1.6.5.11 Piping below second-floor plumbing fixtures in WPA Infill 1.6.5.5
1.6.5.12 Fire service water feed from site is 12 inches in the WPA Infill 1.6.5.5
1.6.5.13 View looking up at underside of roof showing sprinkler mains and branch lines in Hangar 1 ..... 1.6.5.5

LIST OF TABLES

Table		Page
1.2.1	Naval Air Station, New York, Military and Non-Military Units	1.2.31
1.2.2	Naval Aviation Squadrons Stationed at NAS New York during World War II	1.2.32

PART 1 – DEVELOPMENTAL HISTORY

1.1 HANGARS 1 AND 2 TIMELINE

1928

January 30: Department of Docks finalized conceptual plan for the proposed airport. It featured two runways, hangars lining Flatbush Avenue, and a seaplane base on Jamaica Bay.

February 2: City approved a rectangular 387-acre site on north side of Barren Island for the municipal airport.

May 1928–mid-1929: Hydraulic filling and grading of airport site.

Fall: Detailed plan of airport included 14 hangars with attached lean-tos set back approximately 500 feet from the edge of the runway (Figure 1.1.1). (Note: Only eight hangars were built to reduce costs).

October: New airport named for Floyd Bennett, navigator and pilot who died on April 25, 1928 while heroically rescuing stranded aviators in Canada.

1929

January: Contract awarded for field preparation and runway construction.

Construction drawings prepared for eight hangar foundations, sliding hangar doors, and hangar floors.

December: $1,540,000 allotted for the construction of eight hangars; also for asphalt paving and drainage system.

Construction bids advertised for construction of eight hangars. Specifications included a 200-foot concrete apron along hangar fronts. Estimated cost was $1,051,000.

1930

January: Contract let for hangar construction.

June 26: Floyd Bennett's widow and Rear Admiral Richard E. Byrd participated in initial dedication ceremony attended by 5,000 spectators and broadcast live on nationwide radio. Airport opened for emergency landings only. Eight hangars were under construction.

July: Negotiations underway for future use of Floyd Bennett Field hangars, including the Naval Reserve Air Service, the aviation units of the National Guard and the Police Department, and the NYC Board of Education to add aeronautics to the public school curriculum.

1931

January–August: Contracts completed for plumbing, heating, paving, electric light, and power for the Administration Building, hangar complex, and field.

Annual rent charged at Hangar 1 to the following for plane storage: Arthur C. Bussy; Frank Jaster; Morgan Oil Company; Pennsylvania Air Transport Company; and Andrew Stennis.

May 23: Formal opening of Floyd Bennett Field attended by 25,000 spectators. Army Air Corps and National Guard send 672 planes over the field to demonstrate combat tactics.

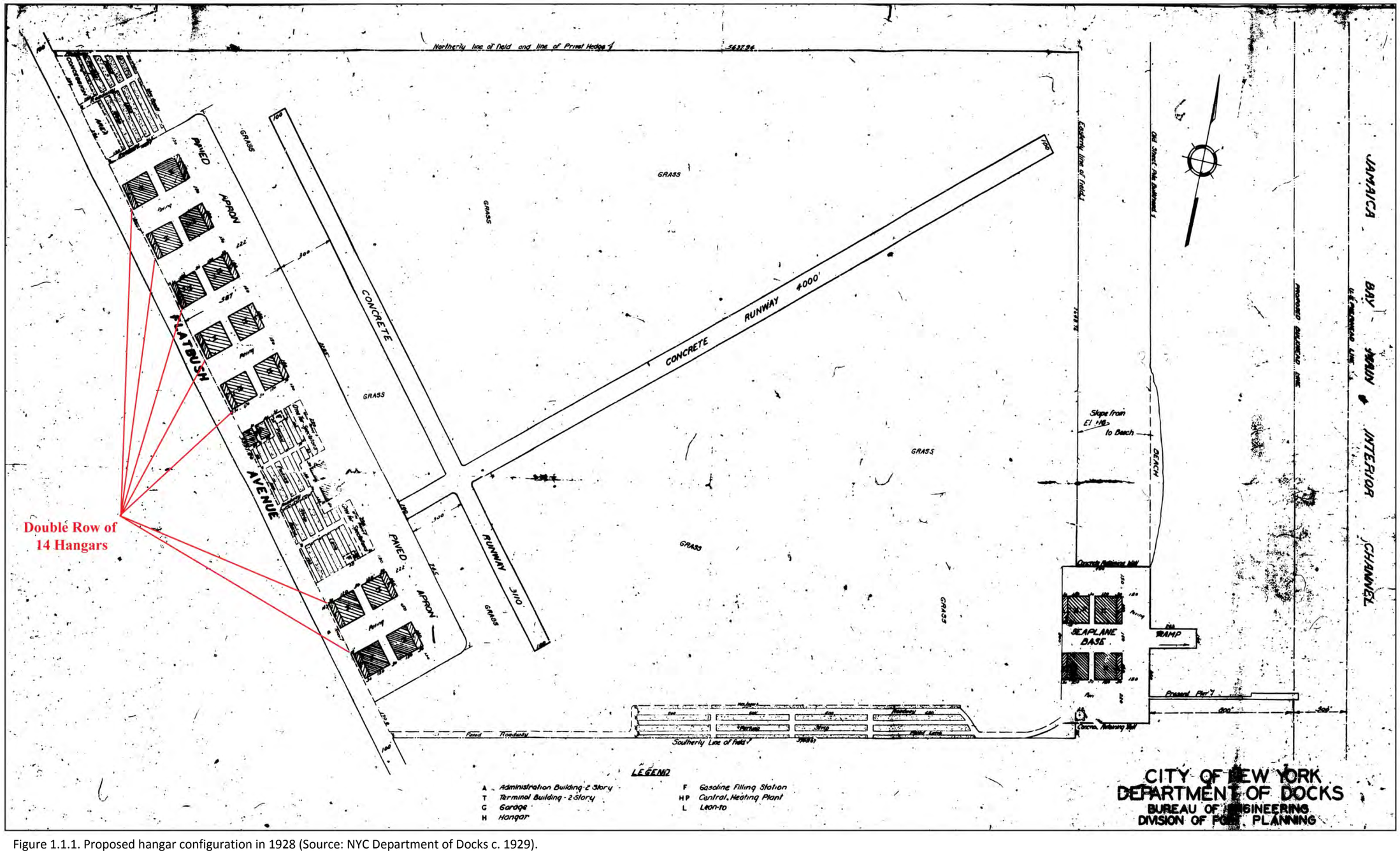


Figure 1.1.1. Proposed hangar configuration in 1928 (Source: NYC Department of Docks c. 1929).

May 30: U.S. Navy began occupation of Hangar 5 for its Naval Aviation Reserve Base, consisting of one Marine and two Navy squadrons.

1932

$12,000 spent to repair hangar roofs.

Department of Docks prepared the Hangar 1 Lean-to for occupancy by the Air Service Division of NYC Police Department by laying a 6-inch concrete floor and installing partitions, plumbing, and lighting.

1933

September2: The first fatal accident on Floyd Bennett Field. Famed Italian aviator, Francesco De Pinedo, crashed upon takeoff near the Administration Building and burst into flames in front of several hundred horrified spectators and newsreel cameras. The plane's wreckage was taken to Hangar 2 for examination

1934

All hangars were completely repainted, inside and out.

1935

July: A unit of the Coast Guard flying service moved from Salem, Massachusetts, to Floyd Bennett Field. Hangar 1 occupied by the Coast Guard and NYC Police Aviation. Hangar 2 used for storage of field supplies.

October: Docks Department ordered the Naval Reserve aviation unit to vacate its base (in Hangars 1 and 5) by November 17.

July 10, 1935–June 30, 1936: Rent charged at Hangar 1 to U.S. Coast Guard for storage of plane.

November 15–24, 1935: Rent charged at Hangar 1 to George C. Pomeroy for plane storage.

December 1935–January 1936: Rent charged at Hangar 1 to George C. Pomeroy for plane storage.

1936

Works Progress Administration (WPA) laborers added a second floor to the one-story lean-to at Hangar 1, for use by the Navy.

May: U.S. government leased Hangar 5 for Marine Corps Reserve unit.

June: O. J. Whitney, Inc., switched operations from the Administration Building to Hangar 2. Whitney was a plane dealer and outfitter.

1937

WPA constructed a shop building (50 x 150 feet), now known as the WPA Infill, between Hangars 1 and 2 with a large-sized dormitory on each end of the second floor. Sprinkler system installed in each of the eight hangars and lean-tos and four shop buildings.

October 1, 1937: O. J. Whitney, Inc., leased Hangar 2.

July 1937–June 1938: Rent charged at Hangar 1 to Commandant, 3rd Naval District for U.S. Naval and Marine Base operating from Hangar 1 and Building A.

May 1937–April 1938: Rent charged at Hangar 2 to O. J. Whitney, Inc.

1938

June: Coast Guard opened their base on east side of Floyd Bennett Field.

July 1938–June 1939: Rent charged at Hangar 1 to Commandant, 3rd Naval District for hangar, metal building, and small shack.

May–October 1938: Rent charged at Hangar 2 to O. J. Whitney, Inc.

1939

January–April 1939: Rent charged at Hangar 2 to North Beach Air Service, Inc.

July: Marine Reserve Scouting Squadron 2 was based in Hangar 1.

September: War broke out in Europe. Bombers assembled in West Coast plants were flown into Floyd Bennett Field for disassembly, crating, and shipment aboard freighters to England throughout the war.

October: LaGuardia Field in Queens opened as mail, passenger, and freight air terminal. Floyd Bennett Field became auxiliary airport.

November: U.S. Navy announced it would immediately begin construction of a "neutrality patrol headquarters" (seaplane base) adjoining Floyd Bennett Field.

1940

Navy built Hangars A and B on east side of airfield.

September: Navy offered to buy Floyd Bennett Field. Hangars 1 and 2 occupied by the Naval Reserve Aviation Base. Remaining hangars occupied by flying schools, private fliers, and six major airlines.

1941

March: NYC leased site at Floyd Bennett Field to Naval Reserve Aviation Base for construction of a student pilot barracks directly adjacent to Hangars 1 and 2.

April: Navy completed construction of base at Floyd Bennett Field.

April 26: Navy leased entire 387-acre Floyd Bennett Field together with the hangars and equipment. Private flying schools and other non-military occupants given 30 days to vacate.

May 26: Lease for Floyd Bennett Field officially turned over to the Navy and it became United States Naval Air Station, New York. Naval workmen painted "U.S. Navy" in large letters on hangars. Navy Reserve squadrons remained in Hangars 1 and 2.

June 2: Naval Air Station, New York, commissioned.

August: Planning began for new airport in Idlewild section of Queens (JFK Airport) to make up for loss of Floyd Bennett Field.

December 7: United States entered the war. Construction of Idlewild Airport put on hold.

1943

December: Floyd Bennett Field became the eastern terminus for Naval Air Transport Service's transcontinental route and connecting point for north-south flights.

1946

July: NAS New York reorganized for its new mission as a Naval Air Reserve Training Station.

August: NYC started negotiations with Navy to open Floyd Bennett Field to commercial aviation to relieve overburdened LaGuardia Field.

1947

January 17: Aviation Bureau of the NYC Police Department shifted its base from Miller Field, Staten Island, to Hangar 8 at Floyd Bennett Field.

June 1: Port Authority took over New York City's airports. LaGuardia Field became LaGuardia Airport.

September: Negotiations between Navy and Port Authority for commercial use of Floyd Bennett Field broke down. New Naval Reserve Volunteer Aviation Unit commissioned at Floyd Bennett Field.

1948

January: Air National Guard established base for two bombardment squadrons and two groups at Floyd Bennett Field.

June 1: Naval Air Transport Service and Air Transport Service of Air Force Transport Command consolidated to form the Military Air Transport Service under the command of the U.S. Air Force.

July 1: Idlewild Airport (later renamed JFK) opened.

1949

Air Force Reserve Training Center at Mitchel Field, Garden City, Long Island, moved to Floyd Bennett Field.

1954

The New York Air National Guard expanded its footprint at Floyd Bennett Field by carrying out a major rehabilitation program.

1972

Naval Air Station New York decommissioned. National Park Service acquired Floyd Bennett Field with the establishment of the Gateway National Recreation Area.

1.2 Historic Background and Context

A Brief History of Barren Island, Site of Floyd Bennett Field, 1800–1920

Floyd Bennett Field occupies a tract of land created during the dredging and filling of the tidal estuary around Barren Island during the 1910s through 1930s. The name Barren Island is a corruption of *Beeren Eylant*, Dutch for "Bears Island." With its 30 acres of upland and 70 acres of salt meadow, it was one of the largest islands in Jamaica Bay and one of the few with sufficient upland area to sustain permanent homes. It was easily accessible from the mainland at low tide, being separated only by a shallow stream (Black 1981:14, 18).

Early Historic Occupation

Barren Island had no permanent inhabitants until around 1800. The island's first buildings are illustrated on a topographical map of western Long Island drawn in 1818; Barren Island, covered in sedge and cedars, is depicted with two structures owned by Nicholas Dooley (Lofs 1818) (Figure 1.2.1). The structure on the eastern side of the island was an inn that supplied food and drink to passing fishermen and sportsmen. On the western side of the island, Dooley built a house for his family. Nicholas Dooley and his wife were the only inhabitants of Barren Island in 1807, when they found a three-year-old girl abandoned in the marsh. They adopted the girl and named her Julia Ann. When she had grown up, Julia Ann's resemblance to her real mother was so striking that she was soon identified as the kidnapped daughter of a well-known New York City couple and the family was reunited (*New York Times* [*NYT*], May 17, 1880).

John Johnson took over Dooley's Inn in 1830. By that time, a few other families of fishermen had chosen to make their home on Barren Island. The inn continued in business as late as 1860. The Dooley house was still standing in 1880 (Black 1981:18; Lofs 1818; Panamerican Consultants, Inc. 2003:4–40).

Barren Island Community

Barren Island's industrial era began in the 1850s with the construction of two fertilizer plants (Figure 1.2.2). New York City had embarked on a public-health program that included ridding itself of businesses that produced noxious fumes. Dead animals and offal were shipped from New York City and Brooklyn to the Barren Island fertilizer plants as raw material. Inevitably, these industries regarded Barren Island's surrounding wetlands as an ideal location for dumping unwanted waste material. A succession of fertilizer and fish-oil plants were built along the eastern and southern shores of Barren Island. Large garbage-processing plants joined them. As many as 26 companies had facilities on Barren Island between 1859 and 1934, but no more than seven or eight operated at any one time (Black 1981:19, 30–31, 38; Miller 1998:80–94).

Brooklynites living near Jamaica Bay were fed up with the nuisance of Barren Island smells. The *Brooklyn Union* newspaper succinctly described Barren Island in 1876 as "a place of swamps, some hills, fertilizing factories, and bad odors" (*Brooklyn Union*, September 4, 1876). The apex of industrial and residential development on Barren Island occurred in the first two decades of the twentieth century. Large areas of former wetlands were filled to accommodate the growing settlement of workers, many of whom were Italian or Polish immigrants. The population topped out at 1,500. Half the island's inhabitants were day laborers. The remainder possessed skilled factory jobs or provided the services needed to make Barren Island a self-sustaining community with stores, saloons, hotels, a public school, and its own police force.



Figure 1.2.1. Barren Island, as it appeared in 1818 (Source: Lofs 1818).



Figure 1.2.2. Location of project area on USGS Brooklyn 15-minute quadrangle, 1897.

Barren Island had two churches, a Reformed Protestant church and Sacred Heart Roman Catholic Church, the latter established in 1900 and closed in 1942 (Desmond 2008; Gasero 2000). All of the industrial, residential, institutional, and commercial buildings associated with the Barren Island community were located in an area corresponding with the southern side of the current site of Floyd Bennett Field, more than 300 feet distant from the sites of Hangars 1 and 2 (Black 1981:36–40, 75–76).

In 1914, the Brooklyn Ash Removal Company—incinerator operators—found a way to put their waste management rivals on Barren Island out of business. Brooklyn Ash used their political influence to get the Board of Estimate to ban garbage disposal anywhere in Jamaica Bay. Brooklyn Ash not only controlled the city's dry refuse, but was also a powerful real-estate developer, using its ash byproduct to fill in the Brooklyn shorefront. The New York City Health Department initiated court proceedings against several Barren Island companies to shut down operations. Despite the wartime need for the grease and nitroglycerine produced at the Barren Island plants, the state outlawed the processing of wet garbage anywhere in the vicinity of Jamaica Bay in 1917. By 1920, only two refuse plants were still in operation on a limited scale. The animal-rendering plants were also winding down operations as the number of horses declined sharply with the advent of machine-powered transportation. The Barren Island community began a mass exodus. The last refuse plant closed in 1934. Most of the island came under the jurisdiction of the New York City Parks Department. In 1936, Robert Moses, the powerful commissioner of the parks department, evicted the residents of the Barren Island community so that he could build the Marine Park Bridge. Some holdouts moved to the privately owned tract of Thomas White, occupying 51 acres on the southern shore. The islanders remained until 1942, when the federal government purchased the tract for military purposes (Black 1981:30–31, 33, 38, 40; Miller 1998:80–94; New York City, Bureau of City Chamberlin 1916:112,342).

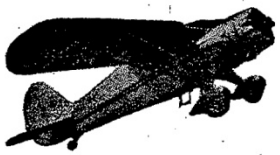
The Development of Commercial Aviation in America

World War I provided the impetus for the first major growth in aviation of any kind throughout the world. Airplanes began as a means to scout enemy positions and evolved into an offensive weapon by war's end. Conditions in post-war Europe were ripe for the development of commercial aviation. A damaged surface transportation system impeded travel, while thousands of military aircraft sat idle and ready to use.

In contrast, America had an efficient train system and not as many surplus warplanes. Former war pilots bought up whatever surplus planes they could find and made their living roaming through America entertaining crowds with daredevil stunt flying. Some pilots found work with the U.S. Post Office Department, which entered the airmail business in the early 1920s and maintained its own fleet of airplanes. Other pilots became aviation entrepreneurs who launched fixed-base operations to satisfy a niche market for leisure travel. They bought or leased airfields with sheds, acquired an airplane or two, and contracted to fly passengers to particular destinations. The Barren Island Airport fit into this category. A former stunt pilot, Paul Rizzo, established the airport in the early 1920s; it had a shop, a hangar, and a couple of unpaved runways just off Flatbush Avenue (Davies 1964:39–55; Rizzo [1931]) (Figure 1.2.3).

The construction of new airfields corresponded to the development of commercial aviation, particularly airmail service, during the 1920s. Post Office pilots required fuel, shelter, repairs, and mail-handling facilities. At the end of World War I, there were only 115 permanent airfields in the United States. Most had only gravel or grass runways. The first municipal airport in the country was opened at Atlantic City, New Jersey, in May 1919. By 1929, when Floyd Bennett Field was under construction, the United States

Attention
You Air-Minded Folks



If you are contemplating taking an aeroplane ride today, or any other day, consult the **RIZZO FLYING SERVICE.** Former operator and owner of the Barren Island Airport (more than a decade ago) first airport in the heart of Brooklyn.

Buy your flight tickets at the red booth marked **RIZZO FLYING SERVICE** or from one of our authorized flight agents. Prices $1.50, $2.50 and $5.00.

P. S. — NO OTHER AGENTS SELL TICKETS FOR THE ABOVE SERVICE.

SPECIAL FLIGHTS

Why not take advantage of the Special Flight Tours listed below. If interested put a circle around the trip that you desire to make and fill in the blank below, then give this circular to one of our agents or to the pilot.

Round trip to:	Price per passenger	Round trip to:	Price per passenger
Atlantic City	$10.00	Albany	15.00
Asbury Park	5.00	Peekskill, N. Y.	6.00
Philadelphia	10.00	Bear Mountain	6.50
Catskill Mountains	12.00	Milford, Pa.	10.00
Monticello	10.00	Saratoga, etc.	Price on request

All other points ..... Price on request

Name .....

Address .....

Phone .....

Reservations for (number) ..... Passengers

Approximate date you wish to make this flight .....

Base: FLOYD BENNETT FIELD — BROOKLYN, N. Y.

Phone SKidmore 4-3372 ESplanade 7-2692

Figure 1.2.3. Paul Rizzo dropped 8,000 leaflets when he moved to Floyd Bennett Field on May 18, 1931 (Source: Cradle of Aviation Museum, Garden City, Long Island).

had 425 municipal airports, 415 private and commercial fields, 304 intermediate fields established as pilot rest stops on airmail routes, 63 U.S. Army fields, 17 Navy fields, 340 emergency fields, and 942 airports in the planning stage. Despite the economic upheaval of the Great Depression, air transport companies continued to increase their air miles. The federal airways system was being developed to encompass 25,000 miles of airways equipped with navigation aids for day and night flying. This airway system included three transcontinental routes: between New York and San Francisco; between New York and Los Angeles; and between New York and San Diego (*Brooklyn Daily Eagle,* November 29, 1931:D10; *NYT*, January 31, 1929:14; Roseberry 1966:227–228).

Early Air Fields in the New York Metropolitan Area

A number of military and civilian airfields were established in the New York area in the period before and during which Floyd Bennett Field operated as New York's municipal airport. Floyd Bennett Field's distance to the heart of New York City's business district, Times Square, was a critical factor in its commercial success or failure. All of the following airfields were located within 25 miles of Times Square.

Governor's Island Army Airfield was an unpaved runway in New York Harbor. It was used for the first time in 1909 for takeoff and landing when Wilbur Wright flew around the Statue of Liberty. Aviation pioneer Glenn Curtiss landed on the island in May 1910 to complete a flight from Albany, thereby winning a $10,000 prize. A monument on Governor's Island commemorates the men and women who flew solo to and from Governor's Island between 1909 and 1916. The runway was not officially closed until the 1960s (Freeman 2012).

The Navy's first air station was established in 1914 in Pensacola, Florida. Seven seaplane patrol bases were set up at points along the Atlantic Coast during World War I. Several military airfields were established in the New York City area during World War I (1914–1918). The Hempstead Plains Field near Garden City, Long Island, was actually two airfields separated by a 15-foot-high bluff. Begun in 1911, the airfields were taken over by the Army in 1917. The east field became Roosevelt Field and the west field was named Curtiss Field. A British dirigible landed at Roosevelt Field in 1919 after the first east-to-west nonstop transatlantic flight, but the field is most famous for Charles Lindbergh's takeoff in 1927. Curtiss Field was associated with the Curtiss Aeroplane and Motor Company. Hangars and other buildings were lined up on the west and north sides of the 100-acre rectangular grass field. In contrast, Roosevelt Field had three 2,000-foot asphalt runways and a large number of hangars along the west and north sides of the field. Roosevelt field was closed in 1935 and turned into an automobile race track appropriately named Roosevelt Raceway. Curtiss Field was renamed Roosevelt Field. It was commissioned as Naval Air Facility Roosevelt in 1943. Aircraft were delivered to the field from nearby factories and prepared for shipment, primarily to Great Britain. At the height of the airfield's activity during World War II, NAF Roosevelt had three asphalt runways, six large hangars, numerous small hangars, and other service buildings. Commercial aviation returned to Roosevelt Field after the war, but the airport closed down in 1951 (Freeman 2012).

Rockaway Naval Air Station, located a mile southeast of Floyd Bennett Field in Jacob Riis Park on the Rockaway Peninsula, was operational from 1917–1930. It was one of the Navy's original air stations and was used as an advanced training facility for Navy aviators. The Navy constructed over 80 buildings and several large hangars on the 96-acre station. It was the base for seaplanes, dirigibles, and balloons. Rockaway NAS was the starting point for three flying boats on the first transatlantic crossing in 1919. The Navy's air operations at Rockaway went into sharp decline after the war's end. The city of New York began negotiations to acquire the base property. All but nine of the air station's structures were demolished after the transfer took effect in 1930. In the 1930s, the Navy established eight reserve air

bases throughout the country, at which candidates were given primary flight training. Graduates completed pilot training in Pensacola. These reserve air bases were located at Squantum, Massachusetts; Miami, Florida; Grosse Ile, Michigan; Glenview, Illinois; Minneapolis, Minnesota; St. Louis, Missouri; Oakland, California; and Floyd Bennett Field. These reserve bases were generally located at municipal or commercial airports with basic facilities to house and maintain training aircraft. Each of these reserve bases became full-fledged air stations during World War II (Bureau of Yards and Docks 1947:226–227).

Mitchel Field, another central Long Island military airfield, began as Aviation Field #2 in 1917. Renamed Mitchel Field in 1918, it continued to grow after the end of World War I and underwent major construction episodes in 1929–1932 and 1939–1945. During World War II, when Mitchel Field was the base for two squadrons of fighter planes, it had four concrete runways and 11 hangars. The largest hangars were 200-x-110-foot brick and metal structures. Beginning in 1947, Mitchel Field served as the headquarters for the Continental Air Command and was designated as Mitchel Air Force Base. The base was shut down and turned over to Nassau County in the 1960s (Freeman 2012). Nassau County Community College now covers much of the site and the Cradle of Aviation Museum occupies the hangars.

In 1919, construction began on Miller Army Airfield, New Dorp, Staten Island. Its primary mission was to assist the Coast Artillery in the defense of New York Harbor. It had two sod runways, seaplane ramps, and four hangars. It was completed in July 1921 at a cost of $1,350,000. In 1923, the New York National Guard's 102nd Observation Squadron moved from Long Island's Mitchel Field to Miller Field. This unit remained at Miller Field through the 1930s. Miller Field was closed in 1970. The property was transferred to the National Park Service and became part of the newly established Gateway National Recreation Area in 1974 (Freeman 2012).

Commercial aviation's big boost arrived in 1927 in the form of Charles Lindbergh, a 25-year-old airmail pilot, who became the first person to successfully fly nonstop between New York and Paris—3,600 miles—thereby winning the $25,000 Orteig prize. The feat was made more sensational because he flew solo, taking off from Roosevelt Airfield on Long Island and landing in Paris 33 hours later. For years the world's most renowned aviators had chased this prize and set speed and distance records in the process. By 1927, three strong contenders were preparing aircraft for the first nonstop transatlantic flight—Commander Richard E. Byrd, Clarence Chamberlin, and Charles Lindbergh. The frontrunner was Commander Byrd, who had flown over the North Pole with pilot and navigator Floyd Bennett in 1925. His plane was damaged during a test flight. Byrd's delayed flight allowed Lindbergh to emerge victorious and become an international hero.

Up until 1927, America had produced only 30 airliners with a total seating capacity for 200 passengers. Charles Lindbergh and the other early aviators boosted the public's confidence in air travel and opened up the floodgates of capital investment. By the end of 1927, applications for pilot's licenses in the United States had increased by 300%, the number of licensed aircraft had risen by 400%, and, most notably, United States airline passengers had increased from 5,782 in 1926 to 173,405 in 1929—a 3,000% increase (Solberg 1979:65–72;X Prize Foundation 2011).

During the 1920s, small private airfields began to appear in the countryside around New York City, advertising their convenient distance to midtown Manhattan. Lindbergh's flight in May was quickly followed by other pioneer aviators who pushed the envelope on speed, distance, and endurance. Many of these record-breaking flights began or ended at Floyd Bennett Field, whetting the American appetite

for aviation while dramatically pointing out the immediate possibilities of transatlantic commercial flights.

The Curtiss-Wright Company purchased a 200-acre property on Flushing Bay in Jackson Heights, Queens, in the 1920s. The company opened the Glenn H. Curtiss Airport in 1928 to service both land and sea planes. It had three gravel runways, the longest measuring 2,300 feet, and three 120-foot-wide hangars. More than 70 airplanes were based at the airport. The New York City Police Department operated an aviation unit for patrol and rescue out of the airport. The airport was also the home of the Curtiss-Wright Flying Service, with scheduled flights to Floyd Bennett Field, Newark, Atlantic City, and Philadelphia in 1931–1932. After 1935, the airport was renamed North Beach Airport. The North Beach Air Service, a tenant of the airport, had a flying school, two hangars, and a luncheonette. North Beach expanded in 1937–1939 and became New York City's second municipal airport, known as LaGuardia Field. Named for New York City Mayor, Fiorello LaGuardia, the field officially became "LaGuardia Airport" in 1953 (Freeman 2012).

In 1929, real-estate developer E. H. Holmes built an airport on 220 acres in Jackson Heights, Queens. It had two hangars, an office, and two gravel runways, measuring 3,000 and 2,800 feet. The airport attracted 100,000 spectators on the second day of its operation. It became the site of the first scheduled airline flight from New York City when Eastern Air Express began a two-day run to Miami in late 1929. Aviation attracted a great number of spectators but not nearly enough passengers to be profitable. In April 1930, flights from Holmes Airport were offered for $1 in an experiment to determine whether fear or cost was the deciding factor in the reticence of the general public to passenger travel. About 3,000 people paid $1 for a short plane ride, proving that the public would be willing to fly to their destination if the price was right. Goodyear erected a blimp hangar on Holmes Airport in 1931 and conducted sightseeing trips of New York City. The blimp provided the world's first aerial traffic reports. Holmes Airport tried unsuccessfully to prevent the development of its neighbor, North Beach Airport. Holmes Airport closed down in 1940 (Freeman 2012; *New York Evening Post,* April 21, 1930:11).

Flushing Airport in Flushing, Queens, opened in 1927 as Speed's Airport. It was named for its owner, Anthony "Speed" Hanzlick, who ran Speed's Flying Service. The 300-acre airport had three 80-x-60-foot metal hangars and a few small service buildings at the edge of a grass field. It also lost business when North Beach Airport expanded, but managed to survive. By 1937, Flushing Airport had four clay runways, the longest being 3,000 feet. During World War II, Flushing Airport, like many small commercial airfields, was the base for the Civil Air Patrol. Goodyear blimps used Flushing Airport from the mid-1960s to the mid-1970s. The airport closed in 1984 (Freeman 2012).

Rogers Airport opened in Valley Stream, Long Island, in 1928. About a year later, the Curtiss-Wright Company purchased it. In 1929, Curtiss Airport became the home of the Ninety-Nines, an international organization of female pilots whose first president was Amelia Earhart. The Naval Reserve Aviation Base was located here until transferred to Floyd Bennett Field in 1935. The Great Depression killed off much of the commercial business at the airport, but it survived because aircraft companies in Central Long Island needed access to an airfield. The Columbia Aircraft Company and the Grumman Aircraft Company used Curtiss Airfield. There were three asphalt runways and six cinder block and wood hangars along the west side of the airport, the largest measuring 266 x 123 feet. The airport was abandoned by 1949 (Freeman 2012).

In May 1940, Harry Gordon opened Rockaway Airport in Edgemere, Queens. He ran Gordon Air Service. In 1942, the Army ordered the closing of all privately operated airfields within 200 miles of the coast.

The military took over Rockaway Airport for use as an auxiliary airfield to Floyd Bennett Field (New York NAS). After World War II, the airport resumed commercial operations, but it closed down in the late 1950s (Freeman 2012).

Staten Island had three commercial airports in operation before World War II. Donovan Hughes Airport on Richmond Avenue in Springville opened in 1926. Commercial flying ceased during World War II, but the airport was reopened in 1945. It was turned into an automobile racetrack in 1949. Staten Island Airport opened in 1941 as the largest privately owned commercial airfield in the five boroughs. It had more than 250 acres of land close to Hughes Airport. Staten Island Airport reopened after World War II with two hard surface runways and five steel hangars. The airport advertised itself as being 40 minutes from Times Square. Parts of the airport's property were sold off during the 1950s for a drive-in movie and shopping center. The airport remained open until 1964 and is now the site of the Staten Island Mall. In 1941, John Cosgrove opened Richmond County Airport in Travis. The grass airfield was designed for use by students and commercial flyers. The airport closed in 1955.

In New Jersey, several airports developed near the state's large urban centers and not far from the business center of New York. Newark, New Jersey, began plans for its own municipal airport. Construction was started in late 1927 and the Newark Municipal Airport opened its passenger airline service on October 1, 1928. Immediately, it became the primary commercial landing field in the metropolitan area and, shortly after, the terminus of all of the airmail business that came into New York. In 1930, before Floyd Bennett Field had opened, Newark Airport had three airmail lines, three passenger lines with the prospect of a fourth, and a good flying service (Blakemore and Linck 1981:3–5, 236; Lyman 1930:XX6; *NYT,* September 25, 1928:30; Solberg 1979: 31).

The Jersey City Airport opened in 1929 at Droyer's Point on Newark Bay with both land and seaplane facilities. It was a popular airport for famed early aviators such as Ruth Nichols and Clarence Chamberlin. The latter established the Chamberlin Flying Service in Jersey City in 1931 to sell and service the Chamberlin planes he had manufactured at the Jersey City Airport since 1929. The airport was shut down in 1935 after Jersey City Mayor Frank Hague chose the site for a Works Progress Administration (WPA)–funded sports stadium. The Westfield Airport Corporation opened Westfield Airport on Lake Avenue in Clark Township in October 1928. It had three sodded runways and two hangars. Newark Air Service ran a flying school at both Newark Metropolitan Airport and Westfield Airport. The field closed in the 1950s and was supplanted by a housing development. Murchio Airport, just outside Paterson, began operations by 1930. It had a grass field with three metal hangars and a combination flight office and restaurant. The airport closed in the 1950s and became a housing development (*NYT*, May 9, 1929; *NYT*, April 9, 1931; *NYT*, September 26, 1935:18).

The level stretch of lowland that bordered the Hackensack meadows attracted aviation pioneers. Frederick Kuhnert, a florist and inventor, created an airfield in 1910 in what would later become Teterboro. Up to 2,000 onlookers paid admission to watch early aviators perform exhibitions at the Kuhnert Aerodrome. A tornado destroyed the airfield in 1912, but six years later it became site of the Wittemann-Lewis Aircraft Company. The company had a contract with the U.S. Post Office to convert surplus Army aircraft for the newly created airmail service. In 1919, a post office test pilot became the first person to fly mail from coast to coast in a four-day flight from Teterboro to the west coast. Anthony Fokker, a Dutch aircraft designer, took over the Wittemann's aircraft assembly hangars in 1924. His company, Atlantic Aircraft Corporation, produced the trimotor monoplanes that dominated the aviation world. Thanks to the proximity of aircraft and engine manufacturers, Teterboro Airport was the

destination for many of the world's most famous aviators of the 1920s and 1930s. The Bendix Aviation Corporation arrived in 1937 to breathe new life into the airport (Reilly 1983: 2–9).

The Port Authority of New York & New Jersey purchased Teterboro in 1949 and leased it out to aviation firms to operate. In the post-war era, many businesses with headquarters and branch offices in New York and northern New Jersey began using Teterboro Airport as the base for company airplanes. It continues to be a popular airport for private and corporate aircraft and is the oldest operating airport in the New York City area. Since 1972, Teterboro Airport has been the home of the Aviation Hall of Fame of New Jersey (Reilly 1983:2–9; 19).

The Creation of Floyd Bennett Field

The availability of numerous small private airfields in the metropolitan area helped mask New York City's growing need for a municipal airport that could accommodate commercial traffic. In addition, the city was grappling with other transportation issues, concerning steamship and railroad growth and the advent of the automobile. Lobbying efforts to build a municipal airport began in 1925. However, no action was taken until 1927, when the Port of New York Authority and the federal government became involved in the issue. Secretary of Commerce Herbert Hoover appointed a fact-finding committee on suitable airport facilities for the New York District. The committee—made up of 23 government, commercial, and industrial representatives—submitted its report on November 29, 1927. It recommended six primary and four secondary areas for landing fields in New Jersey and New York (Kaufman 1952:145, 150–151).

In March 1929, the *New York Times* commented that the movement for commercial aviation had gotten underway in 1926, had shown remarkable vigor in 1927, had swept across the United States in 1928, and seemed ready to go far in 1929. Newark Airport officially became an airmail terminal on February 17, 1929 (*NYT,* February 18, 1929:12). Competition was already in the works when the New York Air Terminals Incorporated (a company affiliated with leading airplane manufacturing and transport companies) obtained the title to 743 acres in the Hackensack meadowlands of Secaucus, only a 12-minute motor vehicle trip to New York City by way of the Holland Tunnel. The proposed airport would have a direct connection with the Erie and Lackawanna Railroads. This was the site originally favored by the New York Chamber of Commerce and other business associations, but nothing ever came of it. Throughout the country, railroad and steamship lines cognizant of the future implications of commercial aviation were preparing to coordinate travel and freight services between air, land, and sea (*NYT*, March 6, 1929:28).

The Mayor's Committee on Airports and Aviation Program for the City of New York was organized in 1929. Mayor Jimmy Walker outlined the need to plan the construction of several airports in the very near future. The committee's job was to formulate a program that would keep New York City in step with the rapid progress being made in commercial aviation. The first order of business was a report on the progress of construction at Floyd Bennett Field. Dock Commissioner Michael Cosgrove and Arthur S. Tuttle, consulting engineer for the Board of Estimate, reported that the field would be ready for grass later in the year. They also reported that seven or eight substantial aviation companies, including the Curtiss Flying Service, had applied for hangars. Tuttle admitted that "aviation was changing so fast that it was difficult to keep pace with its growth" (*NYT*, April 5, 1929:12).

Between 1927 and 1930, a number of prominent planners offered their ideas on how best to plan for a municipal airport. Most agreed that airports should be built as close to city centers as possible and

ample means of access should be provided. Many planners and civic and business leaders viewed municipal airports as part of the metropolitan transportation system and centers of economic development (Bednarek 2001:127–129).

New York City officials quickly selected Barren Island as the site for New York's municipal airport. The city already owned the property and, further, it would enhance development plans for Jamaica Bay—on which, by 1927, $100,000,000 had already been spent for improvements. Clarence Chamberlin provided the final seal of approval. He noted the absence of obstructions, the advantageous weather conditions, and the versatility of a field with a gently sloping natural beach that could accommodate both landplanes and seaplanes. New York's municipal airfield was named for famed American aviator Floyd Bennett, who died in 1928 performing a rescue mission shortly before construction began (Blakemore and Linck 1981:9, 25–26).

Not everyone agreed with the selection of Barren Island as the site for a municipal airport. In January 1929, Colonel Benjamin F. Castle, a banker and former Army Air Service officer, went on the radio and gave newspaper interviews criticizing the planned airfield as too far out of the way for commercial aviation (*NYT*, January 19, 1929:20). Even the individuals who supported the construction of Floyd Bennett Field urged that additional airfields be constructed throughout the metropolitan area; i.e., New York Harbor, Brooklyn, and the Bronx. Clarence Chamberlin, New York City's aviation advisor, answered those criticizing the choice of Barren Island—the new airport would be the best in the metropolitan area. It was easily found from the air and safe for fliers. No high buildings were nearby and no smoke obscured it by day or night (*NYT*, January 31, 1929:14).

Aviation Events and Hangar Operations at Municipal Airport No. 1, 1928–1941

Construction

The sponsors of Floyd Bennett Field believed the airport's construction would bring a surge in real-estate value and commercial development along Flatbush Avenue. Clarence Chamberlin was very confident that an airmail contract at Floyd Bennett Field was inevitable. He suggested that the city build pneumatic tubes from the airport to the Brooklyn Post Office and other post offices in preparation. His progress report mentioned that the dredged sand had been covered with topsoil and seeding was underway. The concrete runways were under construction and the opening was planned for the spring of 1930 (*NYT*, October 27, 1929:RE2) (Figure 1.2.4).

The Department of Docks was put in charge of the airport's construction. Clarence Chamberlin credited Docks Department Chief Engineer Traugott F. Keller and Assistant Engineer Captain William Lansing Jr. with devoting all their spare time and energy to the engineering of Floyd Bennett Field (*NYT*, February 9, 1929:9).

Traugott F. Keller was a native of Brooklyn who had joined the Docks Department upon his graduation from the West Point Military Academy in 1902. He became the department's chief engineer in 1918. William Lansing Jr. was a Yale graduate and had been an engineer for the Southern Pacific Railroad Company before joining the Docks Department around 1900. He served in France during World War I as a captain in the U.S. Army Corps of Engineers. Lansing was put in charge of a large dock building project on Staten Island. Keller was regarded as one of the greatest dock engineers in the world and spearheaded the $300 million improvements to Jamaica Bay. These two civil engineers brought their lengthy experience in landfilling to the creation of Floyd Bennett Field. In 1931, Traugott F. Keller

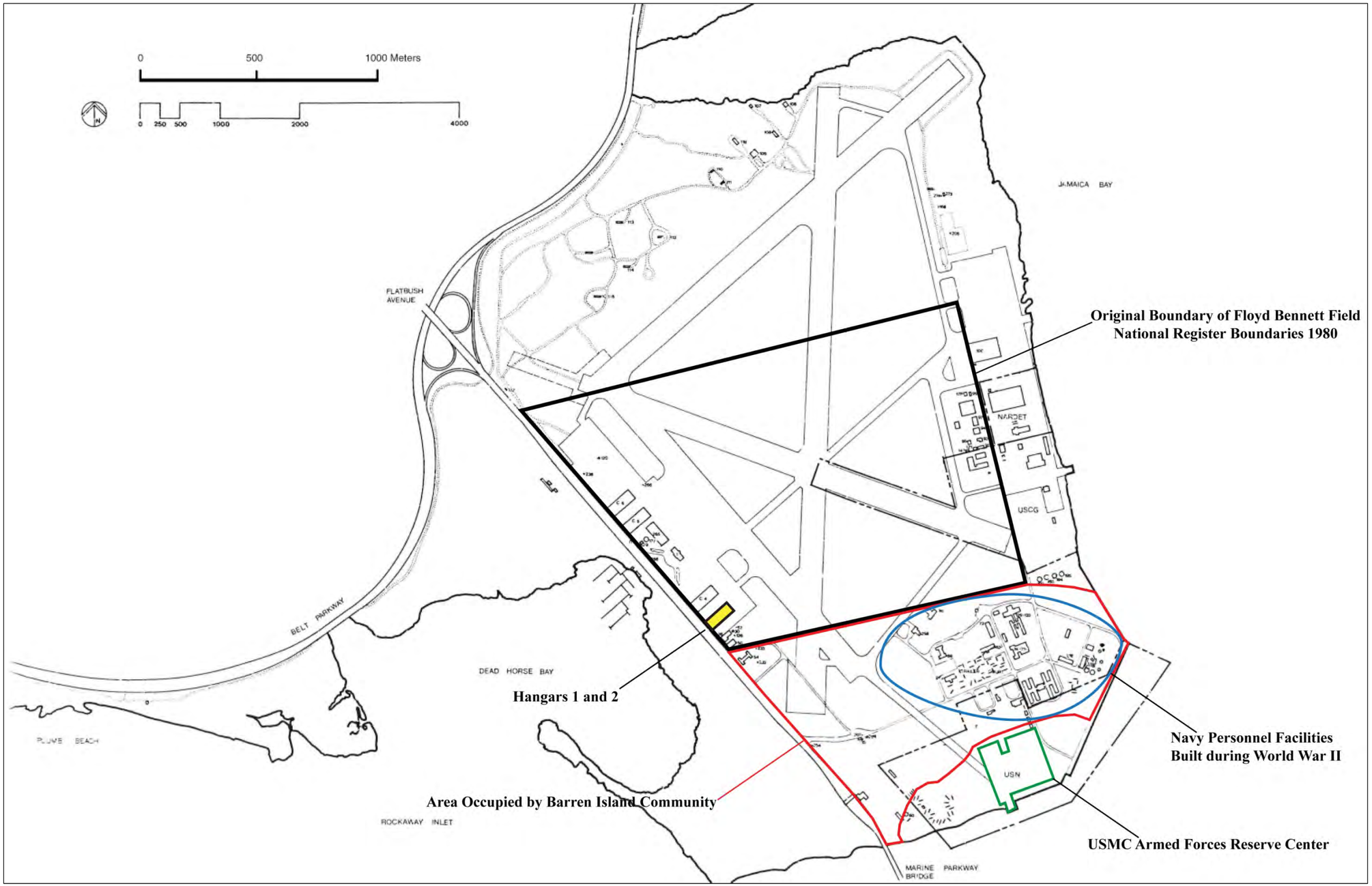


Figure 1.2.4. Area within original property boundary filled in 1928–1929 to create Floyd Bennett Field (Source: NYC Department of Docks, circa 1932 and 1935).

became the star witness in a city-wide corruption probe. On the morning of July 10, Keller was either pushed or threw himself under a subway train (*Brooklyn Daily Eagle,* July 10, 1931:3; *NYT,* January 4, 1900:10; *NYT,* March 22, 1939:29).

Construction began in May 1928, when a contract for hydraulic filling and grading was awarded to R. A. Perry of New York. The contract specified that the area to be filled between the Jamaica Bay Main Interior Channel and Flatbush Avenue would create about 350 acres of land. The Mill Basin Channel and the Jamaica Bay Main Interior Channel were dredged and the sand used to cover Barren Island to suitable airport height. The first contract was completed in May 1929; however, having realized the elevation of the new land would not be high enough, a supplementary contract had been awarded in late 1928 to raise the field to a height of 16 feet above mean low tide (Blakemore and Linck 1981:13, 75).

The hydraulic fill base was completed in June 1929 and John L. Walsh of the Northport Sand & Gravel Company immediately set to work putting down a layer of clay subsoil, between four and six inches deep, and a layer of topsoil, between three and 11 inches deep. The airfield was fertilized and seeded, and a privet hedge was planted along the northern edge of the field to prevent sand from blowing over the field. The contract also called for Walsh to build reinforced concrete runways, designed to be the best in the country. These first two runways were initially 50 feet wide. Another contractor widened them to 100 feet. One runway ran parallel to Flatbush Avenue for 3,110 feet. A second, perpendicular runway was 4,000 feet in length. Strips of packed gravel were laid alongside the runways to act as drainage and provide a firm shoulder (Blakemore and Linck 1981: 78–79, 93).

In December 1929, the Board of Estimate voted $1,540,000 for the construction of the first eight hangars at Floyd Bennett Field. Plans called for the hangars to be built with lean-tos adjoining Flatbush Avenue. Asphalt paving was to be laid between them and a drainage system installed. Construction work on the airfield began in 1928. Two concrete runways were completed early in 1929. Both runways were 100 feet wide; the length of one was 4,000 feet and the other was 3,200 feet (*NYT*, December 17, 1929:24).

Bids for the construction of eight huge brick and steel hangars at Floyd Bennett Field were advertised in late December 1929, just two months after the stock market crash that plunged the nation into the Great Depression. The specifications included the provision for a 200-foot concrete apron extending along the east side of the half-mile row of hangars. Up to this date, the city had appropriated $3,000,000 for the new airport, dredged 387 acres, and filled about 300 acres covered with top soil. Between 100 and 150 acres were seeded. The concrete runways were two-thirds finished. A landing area outside of the concrete runways was ready for use in good weather (*NYT*, December 23, 1929:4).

In January 1930, 22 contractors submitted bids to construct the eight hangars on Floyd Bennett Field, known as Contract No. 1967. This contract included nine items: hangar foundations; subsoil structures; structural steel framing; covering for steel framing; paving; sliding hangar doors; hangar floors; concrete apron and gutter trough; and paving, glazing, and finishing. The engineers estimated the cost of constructing the hangars would be $1,051,000. The bids ranged from a low of $1,083,000 by the Woodcrest Construction Company to a high of $1,643,280 by the De Riso Brothers. The contract was awarded to the Woodcrest Construction Company for their bid price of $1,083,000 (NYC Department of Docks [1930]:90). Construction of the hangars and shops required 2,000 tons of structural steel. It was estimated that the hangars would take nine months to construct; in fact, it took 18 months to complete the hangars. The eight hangars could accommodate 250 planes. Seaplane ramps were constructed on

the east side of the airfield for the proposed seaplane base. Nothing further was done on this side of the field until the Coast Guard established a seaplane base here in 1937 (Blakemore and Linck 1981:13–25, 97–98; *NYT*, January 8, 1930:55, January 10, 1930:35).

The Woodcrest Construction Company was a well-connected engineering and contracting firm founded by civil engineers Joseph J. Elkin and William Goldsmith in 1928. They had worked in both the private and public sectors. Goldsmith was the public works commissioner for the city of Yonkers in 1926. Their firm was awarded numerous municipal projects around New York City, including reconstruction work on the Triborough, Queensborough, Williamsburgh, and George Washington Bridges and new construction on the Queens Midtown Tunnel. Their offices were located in the Grand Central Terminal (Leonard 1922:506; *NYT*, October 9, 1928:12; *NYT*, August 18, 1977:24).

The General Electric Company was awarded the contract to construct the airport landing equipment, including the lighted "NYC" and north arrow on the hangar roofs. Claude Neon Lights Incorporated furnished the neon-lighting equipment. The equipment included a landing field tee (a large T-shaped weather vane that indicated wind direction) and a system of red and green lights to be used for code signal flashing, as well as 36 neon corner markers showing the four corners of each of the eight hangars and the Administration Building (*Wall Street Journal* [*WSJ*], May 20, 1931:5).

The Sperry Gyroscope Company of Brooklyn installed the most up-to-date floodlight system available in 1931. Floodlights were installed on the hangars and the Administration Building. The most important floodlight units were housed in two brick towers designated as Buildings No. 39 and No. 40, both 28 feet tall and 14 feet square (Blakemore and Linck 1981:99, 117–118). Floyd Bennett Field could boast that it had the latest in air traffic control devices (*NYT*, May 17, 1931:33).

Rear Admiral Richard E. Byrd, accompanied by other members of the Byrd Antarctic Expedition, formally dedicated Floyd Bennett Field on June 26, 1930. Floyd Bennett, a Brooklyn aviator, flew with Byrd across the North Pole in 1926. The dedication was attended by 5,000 spectators (*NYT*, June 26, 1930:3, June 27, 1930:30).

In July 1930, a newspaper article recounted the battle with the elements that contractors faced in filling the field to a level just below that of Flatbush Avenue. A hedge on the north side of the field was replaced by a board fence to keep sand from choking out the sprouting grass. The construction of the row of eight "up-to-date" brick and steel hangars was underway. These hangars included repair and service rooms equipped for overhauling and rigging planes. Hangar space would be available for at least 100 planes and the hangars were large enough to house the biggest airliners. Plans were already going forward to build two hangars for a seaplane base on the Jamaica Bay side of the airfield. Planners envisioned arriving passengers transferring to seaplanes to take them directly to the financial district or midtown Manhattan. The official opening of the airport was set for the spring of 1931. The Docks Department had received 30 applications for hangar space at Floyd Bennett Field by the spring of 1930. Negotiations were already underway to include the Naval Reserve Air Service, the National Guard, and the Police Department among the occupants of the hangars. The New York City Board of Education was also negotiating the acquisition of a hangar at the field so that it could add aeronautics to the public school curriculum (*Brooklyn Daily Eagle,* March 20, 1930:17; Lyman 1930:XX6).

Opening Day

Floyd Bennett Field opened to commercial aviation on May 23, 1931, with 25,000 spectators in attendance (*NYT*, February 16, 1931:14) (Figure 1.2.5). The field had not been used before that date

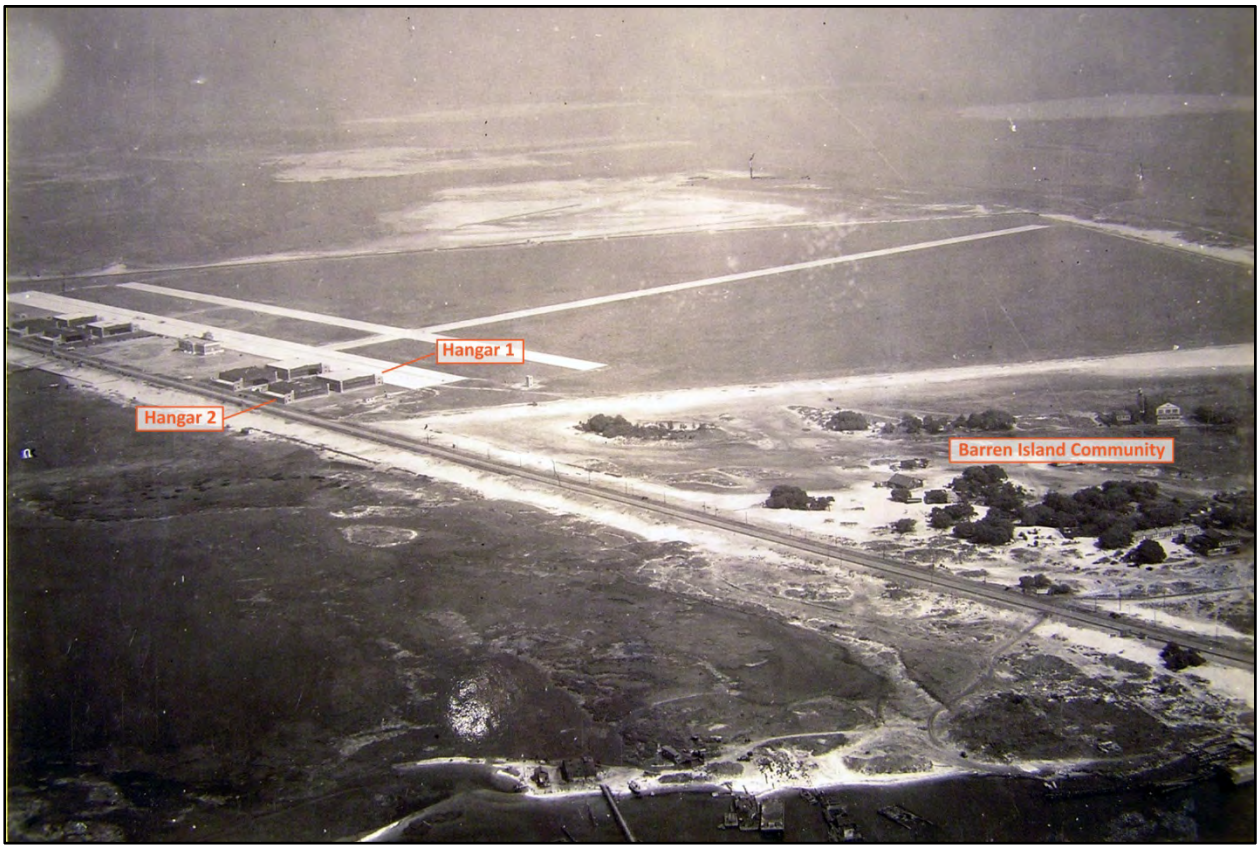


Figure 1.2.5. Appearance of Floyd Bennett Field when it opened in 1931 (Source: NARA RG 80G #1034812).

except for emergency landings. A strong west wind whistled through the windsocks on top of the eight newly completed hangars and the half-finished Administration Building. The National Broadcasting Company (NBC) broadcasted the ceremonies to a nationwide audience. To celebrate the opening, the largest aviation force ever mustered from the Army Air Corps and National Guard—672 planes—demonstrated combat tactics of bombardment, attack, and pursuit in the skies over lower Manhattan. The airborne armada then formed over the Rockaway peninsula and flew over Floyd Bennett Field at an altitude of 600 feet and performed a simulated bombing run, dogfight, and aerial acrobatics (*Boston Globe*, March 15, 1931:A18; Lyman 1931:128).

Floyd Bennett Field vs. Newark Metropolitan Airport

The new airport's supporters were counting on the establishment of a seaplane taxi service to remove any apprehensions about Floyd Bennett Field's distance to Manhattan. In the meantime, they proudly pointed out the features that made it one of the best in the world. It had the highest airport rating, Class A1A. The two reinforced concrete runways could accommodate the largest of the nation's air transport planes or the fastest racing airplanes in any wind. The airport was able to communicate directly with the Police, Fire, and Post Office Departments via a teletype machine. The Administration Building had a meteorological staff, ticket offices, a post office, and a radio room. Representatives from the federal departments of public health, immigration, and customs were stationed at the field, although only passengers from Canada were using Floyd Bennett Field as a port of entry (Kieran 1931:128).

Politicians, merchants, and civic leaders lobbied hard for the postmaster general to transfer the airmail base from Newark to Floyd Bennett Field (*NYT*, December 6, 1934:15). Three days after Floyd Bennett Field was dedicated, the U.S. Post Office announced that Charleston, South Carolina, was tentatively chosen as the transatlantic airmail terminal because of the better year-round weather conditions. New York merchants vowed to fight this decision (*NYT*, May 26, 1931:18). They felt New York City was the best choice because of its great natural harbor and its splendid new municipal airport. New York City boasted that due to prevailing wind conditions, Floyd Bennett Field was frequently fog and smoke free and thus easily visible from the air, while Newark and other metropolitan airports were hidden. Also, New York was the business, financial, and transportation center of the country, and New York City was the destination or clearing house of much of the transatlantic mail (Lyman 1931:XX8).

By the end of 1931, Floyd Bennett Field was battling Newark Airport for air terminal supremacy. In its favor, Floyd Bennett Field was a $4,500,000 airport at which topographical conditions and construction compared well with any airport in the world, but its isolated position and lack of adequate transit facilities between the field and the business section of the city made it of little commercial value for regular scheduled operation. City officials refused to appropriate sufficient money and support to establish communication and transit unless backed by public opinion; airline operators refused to bear with the inadequate transit and patronize the city's airport. In addition, airline operators and the Post Office Department had made capital investments on terminal equipment at Newark. Floyd Bennett Field did not offer a great enough inducement to transfer operations (Kieran 1931:XX211).

In 1933, Newark Airport was the busiest airport in the world, with 120,000 airline passengers, 1,500,000 pounds of mail, and 425,000 pounds of express shipments. The airport clocked 19,232 landings. In its two years of operation, Floyd Bennett Field had become the second busiest airport in the nation. The only airline passengers, mail, and express moving through Floyd Bennett Field, however, were from planes diverted from Newark Airport. The flying services at Floyd Bennett Field were used by 18,241 people and the airfield had 71,542 landings during 1933 (NYC Department of Docks [1934]; Wrenn 2002:16). Supporters believed Floyd Bennett Field would achieve its full potential in the near future. It

was the best equipped dual air and seaplane airport in the country and would be an ideal terminus when regular transatlantic aviation service was established in the near future. Floyd Bennett Field surpassed Newark Airport when it came to experimental and pioneering flying. Transoceanic flights continued to be made, and an estimated 797,000 spectators visited Floyd Bennett Field in 1933 to see the planes and pilots (Figure 1.2.6). It was the starting point for the transcontinental derby, in which pilots raced between coasts to much acclaim. Thousands of spectators became passengers and took short hops operated by the flying services based at the airport. When renowned aviators were not around, spectators could watch the Naval Reserve planes perform aerial acrobatics (Lyman 1933:XX6; NYC Department of Docks [1933]:10).

Military Tenants

The first official occupants of Floyd Bennett Field were eight Navy planes from the Naval Reserve aviation field at Valley Stream, Long Island. The Navy pilots inspected the field, the runways, and the eight hangars. Peter J. Brady, chairman of the Mayor's Committee on Aviation, was the airport's first manager. He offered the facilities at Floyd Bennett Field to the Navy. Naval Reserve Aviation Base, Floyd Bennett Field, was established at Hangar 5 on June 1, 1931, under the command of Lieutenant Richard N. Whitehead. The reserve unit consisted of two squadrons, each with three aviation divisions. In addition to the naval squadrons, a Marine Corps reserve squadron was organized in 1931 that consisted of 18 commissioned officer pilots and 60 enlisted men (*NYT*, May 24, 1931:1, July 2, 1931:54).

This reserve unit had been based in 15 dilapidated buildings on Rockaway Point until 1929, when the Bureau of Aeronautics in Washington decided to abandon the naval aviation base. The Curtiss Airport at Valley Stream was just about completed then, and the Curtiss-Wright Company quickly offered training facilities to the reservists. The newly opened Floyd Bennett Field offered facilities for seaplane and flying-boat training. In addition to flight training, the unit held ground school classes for enlisted men on aviation engines, parachutes, structure and rigging, and radio operation and maintenance. The primary purpose of the reserve unit was to keep men flight ready in case of a national emergency. The secondary purpose was to qualify men interested in naval or marine aviation to be pilots or mechanics. This type of flight training was open to college graduates selected by a board and then enlisted into the reserves. After finishing the qualification flights satisfactorily, enlisted men were transferred to Pensacola for advanced training exactly like that of the regular Navy pilots. When their Pensacola training was completed, they were commissioned ensigns in the Naval Reserve or 2nd lieutenants in the Marine Corps Reserve and then assigned a year of active duty with the fleet after they rejoined their reserve squadrons. The Naval Air Reserve base was equipped with machinery that could completely overhaul planes and engines; there were 16 planes in commission (Lyman 1931:125).

In October 1935, the New York City Dock Department ordered the Naval Reserve Aviation unit to vacate its base by November 17. The unit had rented the field for $1 per year by a permit from the city which was in force until June 30, 1936; the city revoked this permit. The eviction might have been in reaction to the final ruling by the Post Office Department that Newark Metropolitan Airport would continue to be the airmail terminal for the New York area (Lyman 1935:XX8).

Plans were under way for the Naval Air Reserve to move the unit from Hangar 5 to Hangar 1, where the Air Service Division of the New York City Police Department had been headquartered since 1932 (NYC Department of Docks [1933]:50). An appropriation of more than $100,000 was earmarked to improve and enlarge facilities on Floyd Bennett Field for this purpose. It is unclear whether the reserve base was ever evicted. A unit of the Coast Guard that had been based at Salem, Massachusetts, moved to Floyd Bennett Field in 1935 and rented Hangar 1 (*NYT*, July 14, 1935:N2).

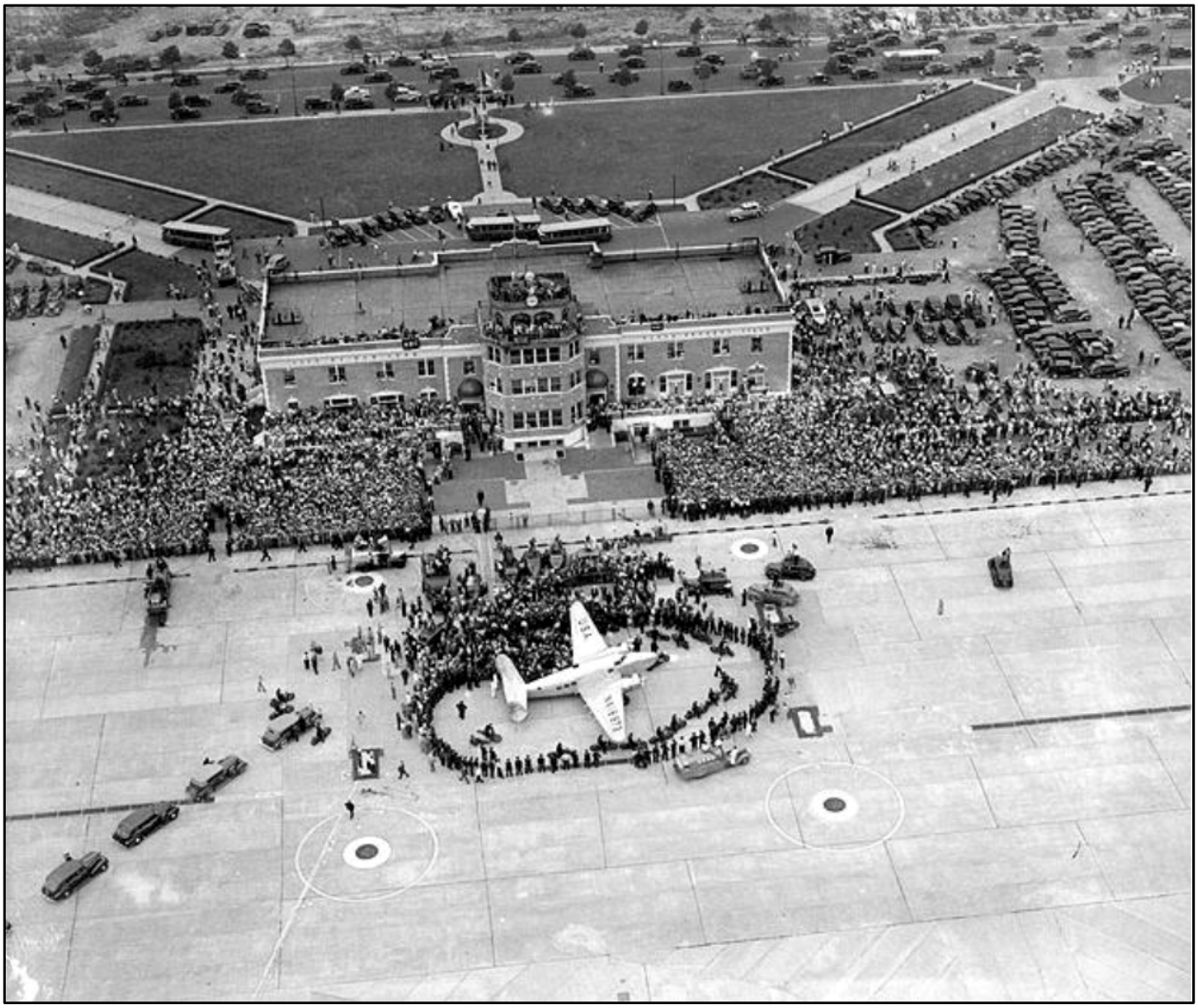


Figure 1.2.6. Crowds at Floyd Bennett Field greeting Howard Hughes in 1938 (Source: National Air and Space Museum).



Figure 1.2.7. Navy training planes outside Hangar 1, late 1930s (Source: GATE Museum Collection #30293).



Figure 1.2.8. Navy training plane flying above Hangars 1 and 2, late 1930s (Source: GATE Museum Collection #19008).

Photographs taken in the late 1930s show the Navy as occupants of Hangars 1 and 2 (Figures 1.2.7 and 1.2.8). Prior to the Navy's occupation, Hangar 2 was used to store materials for the airfield (Sloane 1935). In May 1936, the U.S. Marine Corps occupied Hangar 5 under a lease taken by the United States government at a rental of $1 per year (*NYT*, May 14, 1936:27).

Fifteen planes were stationed in the three reserve squadrons at Floyd Bennett Field, having a total of 40 officers and 180 enlisted men. In addition, three officers and 24 station keepers were on constant active duty at Floyd Bennett Field. An estimated 1,000 Navy planes had visited Floyd Bennett Field in the first four years the base was established there (*NYT*, October 20, 1935:21; Cleveland 1933:XX6). In July 1939, officials of the Marine Reserve Scouting Squadron 2, based in Hangar 1 at Floyd Bennett Field, announced that enlistment rolls were open for six young college men who were considering aviation flight training in a year or two (*NYT*, July 24, 1939:3).

In January 1936, Floyd Bennett Field became the principal base of the Coast Guard on this section of the Atlantic Coast under a 50-year lease at $1 per year. Under the Coast Guard's plan, all rescue and patrol operations of its planes were to be carried out from Floyd Bennett Field in conjunction with cutters based at Stapleton, Staten Island. The Coast Guard planned to base eight airplanes at Floyd Bennett Field and to spend about $250,000 in building hangars, repair shops, and ramps. Transcontinental & Western Air—renamed Trans World Airline (TWA) in 1946—and the Eastern Air Transport Company objected to military flying at the same field they wanted to use for commercial transport. The Coast Guard contended that their operations did not constitute military flying and would not interfere with commercial transport operations (*NYT*, January 9, 1936:17). In June 1938, the Coast Guard officially opened their base at Floyd Bennett Field (*NYT*, June 18, 1938:17).



Figure 1.2.9. Erickson & Remmert, Hangar 6, 1930s (Source: National Air and Space Museum #1329211).

Commercial Tenants

Edward L. Erickson, president of Erickson & Remmert, was the first commercial hangar operator at Floyd Bennett Field, occupying Hangar 6 (*NYT*, May 30, 1937:137) (Figure 1.2.9). Paul Rizzo, operator of the

Barren Island Airport, also installed his flying service in one of the new airport hangars in 1931 (Rizzo 1931). In February 1932, Clarence D. Chamberlin announced that a school for airplane pilots and mechanics would begin at Floyd Bennett Field. Chamberlin arranged with the Dock Department to lease Hangar 4 (Figure 1.2.10). He had recently been completing record-making flights with his diesel-motored Lockheed monoplane. He expected this plane would receive the first commercial license for a diesel plane; the license made the plane eligible for carrying passengers (*NYT*, February 27, 1932:20). Chamberlin organized and operated a unique flying school at Floyd Bennett Field, in which his faculty was largely made up of well-known transatlantic fliers. The Chamberlin Air Service leased a hangar at Floyd Bennett Field. He had three planes available for advanced flight training and for charter work. He had also acquired a seaplane landing on Manhattan and intended to operate both a charter and regular seaplane service between Floyd Bennett Field, Manhattan, and other nearby points. Chamberlin's school offered training in both land and seaplane flying. In addition to flying instruction, Chamberlin's school taught rigging and repair of planes and engines (*NYT*, May 1, 1932:XX6).



Figure 1.2.10. Clarence D. Chamberlin's Hangar 4, 1930s (Source: National Air and Space Museum #1329211).

On September 3, 1931, the Curtiss-Wright Flying Service inaugurated hourly air ferry service from Glenn H. Curtiss Airport at North Beach in Queens (site of LaGuardia Airport) to Newark Metropolitan Airport via Floyd Bennett Field. This service connected New York City travelers with six or seven airlines operating out of Newark Airport. Curtiss-Wright charged a $2 fare between any two airports and $5 for a circuit of all three fields. Sightseeing flights were also offered (*NYT*, September 4, 1931:21; *WSJ*, September 1, 1931:2).

On December 2, 1932, it was announced that air express service between New York and Los Angeles on a daily schedule of less than 18 hours would begin on December 12 with a fleet of special windowless planes, each carrying half a ton of goods in sealed compartments. The newly formed Air Express Corporation negotiated with Floyd Bennett Field as the eastern terminus, if satisfactory arrangements could be made for heating hangars and broadcasting Department of Commerce weather reports. The western terminus was United Airport in Burbank (*NYT*, December 2, 1932:23).

In 1931, the Nyad Aviation School occupied Hangar 6, while the United Air Services Aviation School was located in Hangar 3. The Empire Flying Service offered "school, sales, service and storage" in Hangar 4 in 1931. Another charter and air taxi service was Viair. In July 1935, the flying service took space in Hangar 3 and office space in the Administration Building. It flew to Cape Cod, Newport, New Bedford, and the Hamptons. It did not stay in business more than a year (*Brooklyn Daily Eagle,* November 29, 1931:D10; *NYT*, July 14, 1935:N2).

In October 1934, the postmaster general was close to making a final decision regarding the transfer of the airmail terminal from Newark to Floyd Bennett Field. Airline companies began negotiations to move their operations to the Brooklyn airfield. New Jersey's governor went on the offensive, bringing President Roosevelt into the conflict. New York City thought the prize was in its grasp when TWA agreed to be the first to shift its operating base. To accommodate this transfer, unfinished hangars at the end of the field were completed and a heating system added. It was planned that a seaplane taxi or shuttle

service would take passengers from the new seaplane ramps at the foot of Wall Street and the foot of 31st Street and the East River to Floyd Bennett Field in seven minutes. Floyd Bennett Field's manager hoped to raise funds to build a rail spur from the airport to the Long Island Railroad. He envisioned checking one's luggage in Pennsylvania Station in midtown Manhattan and arriving by train at the airport 12 minutes later—a system that is still enviable 75 years later. On December 6, 1934, the Post Office Department announced it would not approve the shift of Newark's airmail terminal to the New York City Municipal Airport. The airlines remained at Newark Airport (*NYT*, October 16, 1934:25, November 18, 1934:N1; NYT, December 7, 1934:2). The following year, TWA announced plans to begin operating passenger service from both Floyd Bennett Field and Newark Airport in the spring of 1936. The airline felt air traffic from Brooklyn and Long Island warranted the service. When hangar facilities and the new passenger tunnel were completed at Floyd Bennett Field, TWA wanted to experiment with flying passengers between Brooklyn and the 31st Street Skyport on the East River (*NYT*, November 28, 1935:38).

The Army Air Corps

In February 1934, the executive headquarters for handling airmail by the Army Air Corps in the Eastern zone was transferred from Newark Airport to Floyd Bennett Field. The reason given was that facilities for the commanding officer, Major B. Q. Jones, and his staff were inadequate at Newark. The airmail itself was flown to and from Newark Airport. The federal government temporarily leased Floyd Bennett Field from the city at $1 a year. The headquarters staff included 25 officers and 30–40 enlisted men who quartered at Floyd Bennett Field. Hangar 7 was assigned to the Air Corps. The airmail was carried in Army planes for a few months in 1934. Airmail contracts with the airlines were annulled after a congressional investigation into allegations of favoritism, political payoffs, and influence peddling in the heavily subsidized airmail contracts with major airlines. The Post Office and President Roosevelt immediately turned to the Air Corps, who were caught unprepared in carrying out such a mission. The Army airmen had no familiarity with the airmail routes or night flying. Pilots in the mid-1930s had no ground control, radar, inertial navigation devices, or operational non-visual landing systems. Instrument flying was in its infancy; radio navigation and communication equipment were just appearing, but were both limited in range and reliability. Major accidents and fatalities were connected with airmail activities and the public outcry grew louder. The Air Corps flew its last mail run on June 1 and commercial airmail flights resumed. The government rebid the airmail contracts in the spring. In order to bid on the contracts, former carriers were forced to reorganize, which entailed a separation of manufacturing operations from the airlines and some cosmetic company name changes. The airmail subsidy rates were reduced, and U.S. commercial aviation improved and prospered (*NYT*, February 17, 1934:6; Werrell 2010:15–24).

North Beach Airport (LaGuardia)

Fiorello H. LaGuardia took office as the mayor of New York City on January 1, 1934. He lobbied Washington for aid to modernize the city's air transportation terminals. LaGuardia easily raised $12,000,000 for construction of hangars, terminal buildings, and runways at Floyd Bennett Field. Mayor LaGuardia signed a lease for North Beach Airport two days after Floyd Bennett Field was barred from becoming an airmail terminal (Lyman 1934:XX7). He obtained another $22,000,000 to expand North Beach Airport on Flushing Bay (now known as LaGuardia Airport). LaGuardia launched into a campaign to force the four large air lines—American Air Lines, Eastern Air Lines, Transcontinental and Western Air (TWA), and United Air Lines—to move off Newark Airport. He had to justify the expenditure of millions of taxpayer dollars for New York City airports by drumming up business for them. In 1938, LaGuardia

announced that American Airlines and the city had come to an agreement over a 10-year lease on a hangar at North Beach. Airlines not carrying mail would stop at North Beach, and those with mail would continue to use Newark because the Post Office had refused to move its airmail terminal from Newark to North Beach. LaGuardia, not satisfied with this situation, wanted American Airlines to transfer their business headquarters and maintenance shops from Chicago Airport to the North Beach Airport. New York City had tried to induce this transfer by offering to build American Airlines a hangar at North Beach. With the start of work at North Beach, Mayor LaGuardia had given up trying to get the airlines to use Floyd Bennett Field. Although equipped with all the facilities that could make it a fine airline terminal, Floyd Bennett Field was relegated for use as a training, sport, and air charter flying field (*Chicago Daily Tribune*, September 2, 1938:7).

North Beach Airport had 137 acres and another 40 acres would be added via filling. It was a 25-minute drive from midtown Manhattan. When the Triborough Bridge and parkways were completed, the airport would have a direct highway connection to upper Manhattan, the Bronx and Westchester County, and northern Queens County. The Hoover committee of seven years before had urged the creation of several airports to serve the metropolitan area, so the development of an airport in northern Queens was another step in that plan. Mayor LaGuardia, still banking on the transfer of the airmail and airlines from Newark to New York, knew that Floyd Bennett Field, without additional hangars, did not have adequate accommodations. Plans for North Beach Airport included the construction of very long runways and full modernization of the field. Under the terms of the lease, New York City was required to spend at least $60,000 annually in improvements. New York City leased North Beach Airport as a supplementary airport to Floyd Bennett Field (Lyman 1934:XX7). It was dedicated in January 1935 as "Municipal Airport 2" and leased with an option to buy for $1,500,000. All private plane operators were transferred to Floyd Bennett Field from Municipal Airport 2, while the main access highway, the Grand Central Parkway, was under construction and landfilling to enlarge the landing field was carried out. When the construction was completed at LaGuardia Field in 1939, otherwise known as the New York Municipal Airport, it became a huge commercial success. Newark Metropolitan Airport had begun renovations, but could not keep up with the state-of-the-art airport in Queens (*NYT*, January 6, 1935:N1).

Works Progress Administration at Floyd Bennett Field

In the mid-1930s, the WPA added two more runways that could support landings by big, heavily laden, long-distance transport planes. More than 2,700 WPA workers expanded the runway, taxiway, and apron system; built a new boiler house; and improved landscaping around the Administration Building (*Skyscrapers*, May 20, 1966:6). Another WPA construction project was the "T-shaped" passenger-loading tunnel that connected the Administration Building to the aircraft parking area. The WPA built four airplane turntables near the tunnel entrances that sped up the arrival and departure process. Besides the extensive construction program that added many new buildings to the service area, the WPA was responsible for fundamentally modernizing the airfield. A new perimeter fence was installed, along with landscaping, roads, and sidewalks. More importantly, storm drains were built throughout the runway area. When the runways and drains were completed, the airfield was graded. Concrete sewer lines, water mains, storm drains, and manholes were built throughout the service area (Blakemore and Linck 1981:127, 135–140). In November 1934, it was reported that the most modern radio aids to blind landing were being installed at Floyd Bennett Field (Cleveland 1934:XX7).

John Walter Wood, in his 1940 survey of American airports, discussed Floyd Bennett Field's advantages and disadvantages. On the plus side, Floyd Bennett had unusually clear air approaches from all

directions, a large and protected body of water alongside the airport suitable for the operation of flying boats, and airport-owned land on the north set aside for future expansion. Its greatest disadvantage was that as the terminal airport for the metropolitan area, it took too long to reach the airport from the center of Manhattan, a 13-mile road trip. Wood also criticized the lack of a comprehensive airport design that coordinated land and seaplane service.

National Defense

On November 27, 1939, the Navy announced that it would begin work immediately on setting up a "neutrality patrol headquarters" at the Coast Guard base on Floyd Bennett Field. The purpose of the patrol was to prevent any belligerent nation from entering U.S. territorial waters or violating the rules of neutrality (*The Sun*, November 28, 1939:2). A squadron of seaplane bombers was transferred from the Caribbean to augment the base's patrol over local ocean lanes. Navy bombers began to use Floyd Bennett Field as a base for mid-ocean patrols (Perlmutter 1941:XX5).

In October 1939, five Lockheed reconnaissance bombers, part of a fleet ordered by Great Britain before World War II began, were flown to Floyd Bennett Field for disassembly and crating preparatory for shipment overseas. Four similar bombers had previously been flown to Floyd Bennett Field from the West Coast aircraft plant, disassembled, and crated in two of the old hangars rented by the Blue Fries Corporation, then loaded onto barges and floated to an ocean-going freighter. The crated bombers could not leave the United States until Congress acted on the president's request for a repeal of the arms embargo. The original order included 50 more planes of this type to be sent to Floyd Bennett Field and more orders for American-made aircraft soon arrived (*NYT*, October 29, 1939:35; Perlmutter 1941:XX5).

By 1941, bombers bound for Great Britain were being crated at the rate of 30 per week. When a plane arrived at Floyd Bennett Field, the gas tank was emptied and the motor run dry. Experienced workmen then dismantled the craft, removing wings, stabilizers, rudders, elevators, and propellers. Wooden cases were constructed for the dismantled parts while protective coats of grease were applied to the fuselage and engines to enable them to withstand the corrosive ocean voyage. The assembled parts were then hauled to barges in Jamaica Bay on the outskirts of the airport and transported to freighters standing by in undisclosed parts of New York Harbor (*NYT*, March 30, 1941:XX4).

America's own arsenal was also undergoing rapid expansion during this period. The Navy had 1,000 airplanes on the eve of its first major aircraft procurement in 1938. A congressional report later that year emphasized the need for additional shore facilities for aircraft. The Hepburn base program was authorized in 1939 to oversee the expansion of existing air stations and the creation of new ones. The Navy began building up its system of reserve air bases in the fall of 1940 (Bureau of Yards and Docks 1947:228, 232).

Civil Aviation Administration officials estimated that only 31 of the nation's 1,824 civilian airports in 1940 were capable of handling modern military aircraft. Floyd Bennett Field ranked high on the list. The municipal airport had not been the commercial success its backers had expected; inexorably, military functions had assumed more importance to the airport's operation. The Coast Guard had one of its largest air stations at Floyd Bennett Field and the Naval Air Reserves occupied two hangars. Intermittently, Navy and city officials met to discuss the complete militarization of the field.

One of the impediments to militarization was the estimated valuation of the airport at $15,000,000; another was the growing importance of Floyd Bennett Field as an auxiliary airline terminal to LaGuardia

Airport, in operation since the beginning of 1940. Commercial airliners were making regular landings and takeoffs in Brooklyn when the Queens airport was closed in by weather. Air traffic at LaGuardia was fast approaching the saturation point. Runways were being lengthened, radio beams tested, and lighting improved to make it conform to commercial aviation standards present at LaGuardia Airport. Opening of the Belt Parkway (1940–1941) made it only a 30-minute drive between the two municipal fields (*NYT*, August 6, 1940:37, April 2, 1940:19).

Floyd Bennett Field's managers could at last look forward to the steadily increasing presence of passenger planes. The civilian air-training program had become very important to Floyd Bennett Field. About 150 college students were enrolled in five aviation schools at the field participating in a Civil Aeronautics Board–sponsored civil air project. An additional 200 civilians were taking private flying instruction. There were no private fields nearby that could handle such an extensive training program (Perlmutter 1940:119).

In July 1940, American Export Airlines announced the start of a weekly transatlantic airmail service to neutral Portugal in preparation for nonstop passenger flights in the record time of 20 hours by September 1941. American Export Airlines maintained hangar space and offices at Floyd Bennett Field. Passenger terminal facilities were available at LaGuardia, but no hangars. American Export Airlines had a meteorological staff at Floyd Bennett Field gathering ocean weather reports from the company's ships at sea, as well as full maintenance and flight crews (*NYT*, July 17, 1940:23).

In early January 1940, the Navy Department undertook another step in the slow conversion of Floyd Bennett Field into an unofficial military air base. The Navy was given 16.4 acres fronting Jamaica Bay to build a long-envisioned nucleus for a naval flying base in New York City. The project included landfilling and the construction of a seaplane ramp and a boat landing. The Navy constructed two large hangars (A and B) with lean-tos for workshops and offices. The base would be manned by approximately 400 officers and enlisted men. When the project was completed late in 1940, Floyd Bennett Field would have two Navy, two Naval Reserve, and one Coast Guard hangar, making the field a flight center for approximately 1,000 resident and visiting military men (Bureau of Yards and Docks 1940; *NYT,* January 24, 1940:3; *NYT*, April 14, 1940:XX4).

Although the Naval Reserve was operated as a separate entity, there was close coordination between the regular and reserve forces. The reserve program at Floyd Bennett Field, commanded by Lieutenant Commander Donald F. Smith, was gradually expanding. In 1940, the reserve base had 20 planes in use, quartered in two hangars. A resident detachment of eight officers and 47 enlisted men were entrusted with training classes of 15 college men each month as the first step in becoming Navy pilots. Before the end of the year, training classes were stepped up to 50 students per month. In addition to the students, 200 reserve officers and 400 enlisted men received service training. Commander Smith wanted to lease two additional hangars that housed the Police Department's air patrol planes and aviation school (*NYT*, August 6, 1940:37; Perlmutter 1940:148; *The Sun*, September 7, 1940:9).

In March 1941, the Board of Estimate leased a site at Floyd Bennett Field to the Naval Reserve Aviation Base for the construction of a $100,000 student fliers' barracks. The new barracks were built directly adjacent to the Naval Reserve hangars 1 and 2. The barracks were large enough to take care of the ever-increasing number of youths flocking to Floyd Bennett Field for pilot instruction (*NYT*, March 16, 1941:XX5) (Figure 1.2.11).

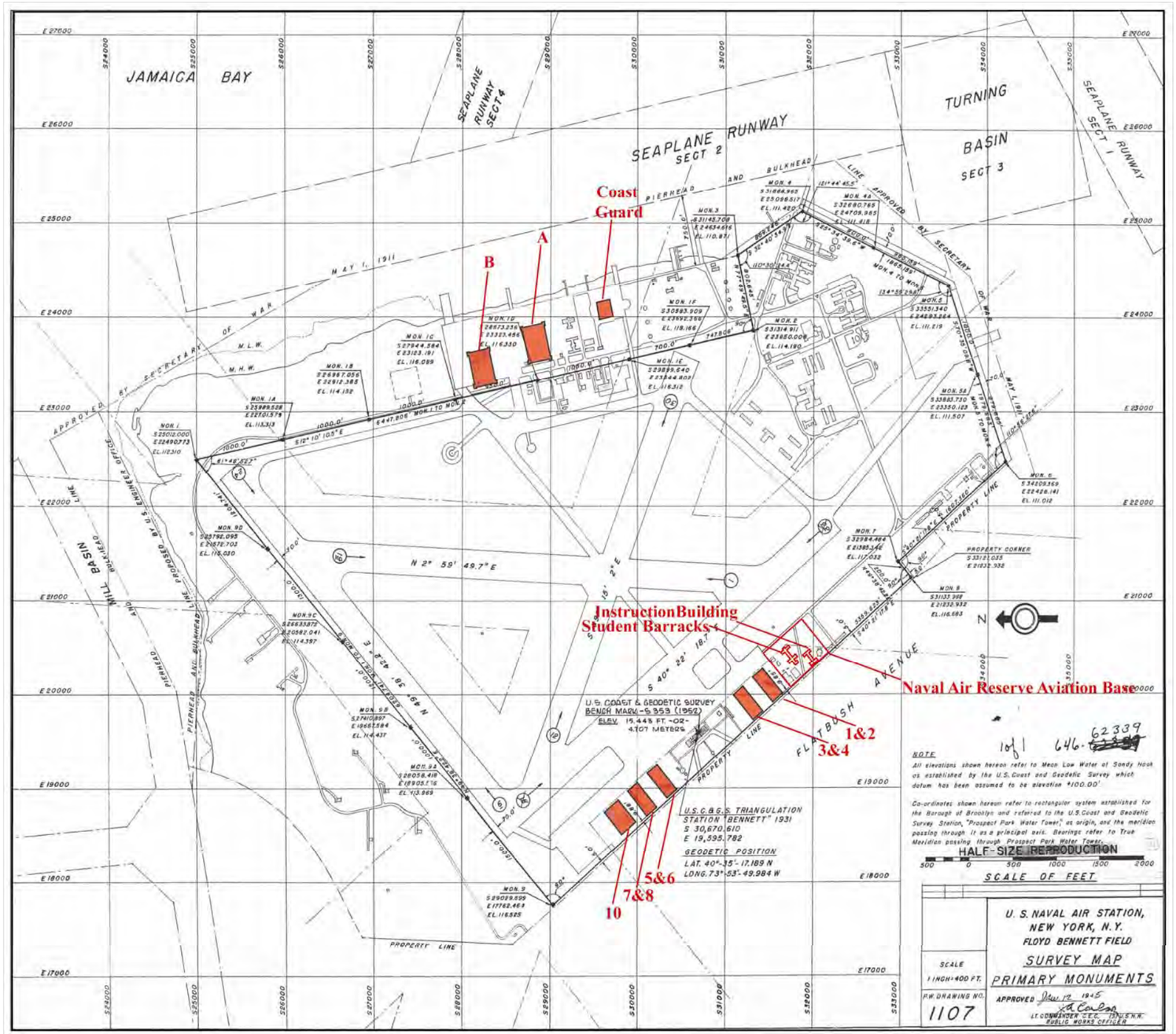


Figure 1.2.11. Layout of Naval Air Reserve Aviation Base and Naval Air Station, New York, at Floyd Bennett Field (Source: Department of the Navy 1945).

The Navy and private interests vied for precedence in the arena of national defense. The flying schools, aviation repair shops, and other "nonscheduled" enterprises at Floyd Bennett Field maintained that they were important for national defense. They employed nearly 500 men and insisted that this airport was the only flying field in the country that could be used for their particular "preparedness" chores. They pointed out that the hangars were obsolete for housing bombers and other large military aircraft. Seven flying schools (including Deane Flying School, Flying Service, Inc., Eagle Air Service, Ed Lund Flying School, Joe Alta Flying School, and Floyd Bennett Flying School) were based at Floyd Bennett Field, and to move them would cost the program the largest single pool of trained pilots in the country. The flying schools contended that they produced nine eligible entrants for the Navy's advanced course at Pensacola to every one turned out by the Naval Reserve base at Floyd Bennett Field. For example, the East Coast Flying School in Hangar 6 took young men between the ages of 18 and 26 who had two years of college and were in good health as candidates to see if they qualified for free courses in pilot training under a Civil Aeronautics Administration program. The courses included 72 hours of ground school instruction at a local college and 35–40 hours of flight instruction (*Brooklyn Eagle,* October 23, 1940:11; *NYT*, March 20, 1941:17).

The Blue Fries Corporation argued that Floyd Bennett Field was the only large airport in the Port of New York at which huge crated bombers could be moved directly from hangar to waterfront. The crates were too large to move through the street or by rail. If the Navy deal went through, the private operators, including six major airlines, would have 30 days to clear out. A public hearing was held on November 14 to discuss a proposal from the airlines to lease "necessary space" at Floyd Bennett Field for 10 years from October 1, 1940, making the airport a naval base with a secondary use as an overflow landing field for LaGuardia (Hewens 1940:163).

The defense program had brought about the acute shortage of airport facilities in the New York City area for private plane owners, flying schools, and nonscheduled passenger services. Overcrowding at Roosevelt Field had resulted in a ban against primary instruction. The expanded Navy program and crating operations at Floyd Bennett Field forced private plane owners and school operators to vacate the airport and find storage for more than 250 planes. Civilian groups lobbied for the Navy to take over Newark Airport, where activities had greatly diminished since the transfer of the major airlines to LaGuardia Field in 1939 (*Brooklyn Eagle*, October 23, 1940:11; Perlmutter 1941:XX5).

Negotiations between New York City and the Navy concerning the sale of Floyd Bennett Field did not go well. With the national defense program in full swing, the Navy was anxious enough to institute condemnation proceedings. The city countered by offering to lease the airfield to the Navy. The Navy negotiated for an eight-year lease at $50,000 a year, but asked Congress for authority to condemn the property if the international crisis should become desperate enough to make federal ownership desirable. The entire 387 acres of Floyd Bennett Field, together with the hangars and equipment, was taken over by the U.S. Navy as part of the national defense program. Operators of the private flying schools were notified to vacate the premises on or before May 26, 1941. Alta Flying Service and East Coast Flying School left Floyd Bennett Field after 10 years of operation and built their own new airport, "Queens Airport," a 54-acre tract of sand in the Idlewild section of Queens—the future home of John F. Kennedy Airport (*NYT*, July 13, 1941:XX10).

The transfer marked the end of more than a year of negotiations between New York City and the Navy. The rights of commercial airlines entitling them to use the field as an emergency landing place were respected. Secretary of the Navy Frank Knox announced on April 23 that the reserve aviation zone at Floyd Bennett Field, covering an area of 62,050 square feet, had been officially designated as part of the

naval air station. The Naval Aviation Reserve unit and the Coast Guard unit remained at the field after the Navy took over. The Blue Fries Corporation's crating work was allowed to continue in the same two hangars, since the company was operating under the provisions of the lend-lease act. Another hangar was occupied by American Export Airlines, subletting facilities to schools, shops, and the New York Police Department, which based two planes at the field (*NYT*, April 27, 1941:1, 34).

On May 20, 1941, the Navy began razing several sheet iron and wooden temporary buildings directly in the rear of Hangars 1 and 2 to clear the site for the new reserve student pilots barracks (*NYT*, May 21, 1941:10). The Naval Reserve unit remained in Hangars 1 and 2. The reserve unit's commander, Donald F. Smith, became the first commander of the Naval Air Station (*NYT*, May 25, 1941:XX6).

Floyd Bennett Field was closed to commercial air traffic on May 26, 1941. One week later, on June 2, Naval Air Station New York was commissioned (Blakemore and Linck 1981:53–59). Thousands of spectators attended the ceremony. It retained the name of Floyd Bennett Field for the runway (*War Diary*, NAS Floyd Bennett, April 9, 1942). At the outset, the Navy took over the four hangars that had been occupied by private flying schools, the city police aviation unit, the American Export Line, and other companies. The Navy planned to expand its training program threefold, with enough facilities to train nearly 1,000 students each month. At first, the Navy proposed building a brick wall along Flatbush Avenue, but the WPA put up a barbed-wire fence instead. Guards were posted to keep all the curious at a distance (*NYT*, May 4, 1941:XX4).

The Navy undertook an extensive new construction program as soon as their lease began in the summer of 1941 as part of the country's overall defense program. Three of the four runways were widened to 300 feet and lengthened to 5,000 feet. An additional runway was constructed on the northern part of the field, and taxiway sand roads were extended. The Navy installed a state-of-the-art runway lighting system that aided night and poor-visibility landings. A new radio approach system was also installed on the field. The seaplane base on the eastern side of the field was expanded. High-explosive magazines were built on the northern side of the field. The former site of the Barren Island community, immediately south of the municipal airport boundary fence, became the location for the Navy's housing, classrooms, dining-recreation facilities, and maintenance area. This area is now the headquarters of the Jamaica Bay unit (Blakemore and Linck 1981:63, 156) (see Figure 1.2.4).

Naval Air Station New York: Wartime Activities, 1941–1945

Just days before America entered World War II, the Navy submitted an offer of $9,750,000 to buy Floyd Bennett Field, the adjacent city-owned property on Barren Island, and the privately owned Barren Island property of Thomas White, whose family had owned one of the fertilizer factories. The deal was accepted and the airfield formally became Navy property on February 18, 1942. This takeover brought about an immediate eviction of the last residents of the Barren Island community (Blakemore and Linck 1981:60).

The Navy acquired about 500 acres north and south of the field. An expansive construction program was necessary in order to convert the civilian airfield into a wartime naval air station that could maintain six patrol squadrons, one inshore patrol squadron, and one carrier air group (Bureau of Yards and Docks 1947:233). The main construction contract was let 10 days after America entered World War II. Construction included the dredging of two seaplane runways; a new seaplane hangar; widening and lengthening of the runways; and adding a new runway. New utility lines were installed that reached out beyond the older service area along Flatbush Avenue into new activity areas along the south, east, and

north sides of the field. Water and sanitary sewer mains were already in place along the line that had once been the southern property line of Floyd Bennett Field. A new electrical cable skirted the perimeter of the new runway system. The expansion of the runway system also necessitated an expansion of the field drainage system.

The mission of the new station was to 1) maintain and operate a base for naval aircraft units, providing hangar storage and operation facilities for land and seaplanes; 2) to provide facilities for housing, messing, berthing, and supply; 3) to receive, store, and equip aircraft from factories as designated by the Bureau of Aeronautics for squadron operation; to ferry from factory to station, to service and equip, and ferry from station to their final destination; and 4) to provide facilities for the Naval Reserve Aviation Base (*Skyscrapers*, May 20, 1966:7).

By 1945, Naval Air Station (NAS) New York had expanded to 1,288 acres with 12 hangars, four 5,000-foot runways, and could accommodate 6,500 personnel (Figure 1.2.12). All hangar spaces were in active use to capacity or reserved for directed activities of the commander of the Eastern Sea Frontier. Floyd Bennett Field was the home port for numerous patrol squadrons that protected shipping lanes, attacked enemy submarines, and provided escort for convoys. In 1942, the Naval Reserve Aviation Base was headquartered in Hangar 5. The reserve base continued its cadet flight training and probably remained in Hangars 1 and 2 (Blakemore and Linck1981:71–73, 165–167; Bureau of Yards and Docks 1947:233; *War Diary*, NAS Floyd Bennett, BUAERO:265).

During its wartime peak in 1944, NAS New York had 3,000 naval personnel and nearly 1,000 civilians (*Skyscrapers*, May 20, 1966:7). When the siren sounded "General Quarters" (a signal to prepare for battle or danger) at Floyd Bennett Field, plane crews immediately began to empty the hangars and disperse aircraft about the field. Hose lines were run out in the empty hangars. The transportation department sent various mobile units to strategic areas on the runways. Machine guns and anti-aircraft guns were manned. Rifle companies surrounded the hangars. Men in charge of the airplanes on the field took cover in foxholes dug in front of the Administration Building. All civilian personnel were evacuated from the field. During the war, stirrup pumps and boxes of sand were distributed throughout the hangars and other buildings in preparation for an attack and resulting fire (*War Diary*, NAS Floyd Bennett Field, April 2, 1942).

One of the reasons that NAS New York became the Navy's most active wartime air station in the country was the presence of the Naval Air Ferry Command and its squadrons. The Navy established the Naval Air Transportation Service, or NATS, in the week following the attack on Pearl Harbor in December 1941. The Naval Air Ferry Command, an air wing of NATS, originated as the Aircraft Delivery Unit with a staff of 10 reserve pilots at Floyd Bennett Field in 1941. Pilots drove to local aircraft factories and ferried planes back to the field in their spare time in the evenings or on weekends. The Aircraft Delivery Unit became the Ferry Command on December 1, 1943. By 1944, the command had 1,000 pilots who ferried planes to different parts of the country or sometimes overseas and returned with battle-worn planes in need of factory repair. Ferry service units were established in airports along the ferry routes to keep the aircraft well maintained (Floyd Bennett Field Task Force).

The command had four ferry squadrons designated VRF-1 through 4. The command included servicing and repair detachments at about 20 airfields around the country. VRF-1, the largest squadron the Navy ever established, was formed from the Engineering Division of the predecessor Aircraft Delivery Unit. Floyd Bennett Field was the base for Ferry Squadrons VRF-1 and VRF-4 and Service Squadron VRS-1. The



Figure 1.2.12. Personnel of Naval Air Station New York, 1944 (Source: GATE Museum Collection #13495).

Ferry Command and squadrons were housed in Hangars 9, 10, and B. By December 1943, air traffic at NAS New York was so congested that the Ferry Command moved its training detachment to NAS Willow Grove, outside Philadelphia. On June 1, 1944, an Aircraft Commissioning Unit was established at Floyd Bennett Field to manage the airplanes flying in from the factories and perform technical checks and installation of equipment and armament. The Aircraft Delivery Units and the Ferry Command delivered nearly 100,000 Navy aircraft during the war (Floyd Bennett Field Task Force). See Table 1.2.1 for a list of units active at NAS NY and Table 1.2.2 for an overview of squadrons stationed at NAS NY.

Post-War Military and Civilian Use of NAS New York, 1946–1972

On January 1, 1946, with the cessation of wartime activities, the station was placed in a reduced operational status. On July 1, 1946, the base came under the Naval Air Reserve Training Command. Its mission became focused on training reserves (for both the Navy and Marines), operating the air station, and recruitment. In August 1946, it was announced that Floyd Bennett Field would soon open to commercial air traffic. Major airlines serving New York City noted substantial increases in traffic at North Beach (LaGuardia) airport. Idlewild (JFK) airport was not yet completed. The Navy and New York City could not reach an agreement, ending the last chance for commercial aviation at Floyd Bennett Field (Tobin 1947).

Floyd Bennett Field's military functions ebbed and flowed according to the political situation in the world at large. Naval activities were focused on the southern and eastern sides of the field. Between 1952 and 1968, nine Naval Reserve Patrol Squadrons were formed and based at NAS New York. Their primary mission during the Cold War was antisubmarine warfare training and immediate fleet mobilization (Roberts 2000:782). The Naval Air Station continued to be the setting for many record-breaking flights. One of the few significant investments in the immediate post-war period was the installation of a new instrument approach system on the field (Blakemore and Linck 1981:71–73, 165–167). The New York City Air Police leased Hangar 4 and its lean-to from the Navy beginning in 1948, eventually expanding into Hangar 3. The Police Department occupied Hangars 3 and 4 until 1972. The U.S. Coast Guard naturally occupied areas of NAS New York close to Jamaica Bay (Blakemore and Linck 1981:71–73, 165–167; Bureau of Yards and Docks 1956; *Long Island Star Journal,* August 26, 1946:2; *Skyscrapers*, May 20, 1966:8).



Figure 1.2.13. 2230th Air Force Reserve in Hangar 1, 1950s (Source: GATE Museum Collection #30288).

In 1950, the U.S. Navy granted the U.S. Air Force permission to base U.S. Air Force Reserve and Air National Guard units at Floyd Bennett Field. The Air Force agreed to reimburse the Navy for all utilities and services. In addition, the Air Force was responsible for all maintenance and repairs of the land and facilities used exclusively by them. Costs were shared on facilities used jointly. The Air Force was granted exclusive rights to 37 buildings on Floyd Bennett Field, including Hangars 1 and 2, with their adjacent lean-tos and the WPA Infill building between them (Department of the U.S. Navy 1950). The Air National Guard occupied the area of Hangar Row north of the Administration Building (Ryan Center), while the 2230th Air Force Reserve occupied the area of Hangar Row to the south (Figure 1.2.13).

Table 1.2.1 Naval Air Station, New York
Military and Non-Military Units*

April 1945
Naval Air Station
Naval Air Bases, Third Naval District
Overseas Air Cargo Terminal
Marine Barracks
Coast Guard Air Station
Naval Air Transport Service (NATS), Ferry Wing, Headquarters
NATS, Air Ferry Squadron One
NATS, Air Ferry Squadron Four
NATS, Air Ferry Service Squadron One, Headquarters
NATS, Detachments, Air Ferry Service Squadron One
NATS, Detachment, Air Transport Squadron Three
Detachment, Headquarters Squadron Nine
Scout Observation Service, Unit 2
Patrol Bombing Squadron 73
Patrol Bombing Squadron 126
Patrol Bombing Squadron 132
Patrol Bombing Squadron 143
Utility Squadron 15
Air Control, Eastern Sea Frontier
Ships Salvage Unit
Com3, Annex, Officer Messenger Mail Center

1946
Naval Air Station
Naval Air Bases, Third Naval District
Coast Guard Air Station
NATS, Ferry Wing, Headquarters
NATS, Air Ferry Squadron One
NATS, Air Ferry Service Squadron One, Headquarters
NATS, Detachments, Air Ferry Service Squadron One
NATS, Detachment, Air Transport Squadron Three
Detachment, Headquarters Squadron Five
Patrol Bombing Squadron 104
Patrol Bombing Squadron 101
Patrol Bombing Squadron 111
Decommissioned Ship Detail
Com3, Annex, Officer Messenger Mail Center

*Source: General BUAER Correspondence, Enclosure A (1946)

Table 1.2.2 Naval Aviation Squadrons Stationed at NAS New York during World War II*

SQUADRON	DATES AT STATION	MISSION
VP-51/71	8 April 1941 – 17 December 1941	Convoy protection & antisubmarine warfare patrols in northern offshore shipping lanes.
VP-82	15 August 1941 – 15 October 1941	Antisubmarine warfare & search tactics training.
VB-128	17 May 1943 – 23 August 1943	Convoy protection
VP-203	25 September 1943 – 4 October 1943	Antisubmarine warfare & convoy escort.
VB-147	23 October 1943 – 25 January 1944	Patrol convoy approaches to NY Harbor.
VB-126	Dec. 1943 – 10 Jan. 1945 21 May 1945 – 27 June 1945	Unspecified. Squadron disestablished 27 June 1945.
VP-73	16 January 1944 – 30 May 1945	Convoy protection & antisubmarine patrols off East Coast.
VPB-132	1 February 1945 – 25 May 1945 Squadron disestablished 30 May 1945 at NAS Quonset Pt., RI.	Antisubmarine warfare sweeps & patrols over convoy lanes leading into NY Harbor.
VPB-143	28 April 1945 – 19 May 1945	Unspecified.
VPB-111	24 November 1945 – 23 May 1946	Many wartime personnel discharged. New crews trained.
VPB-104	26 December 1945 – 8 April 1946	[Same as above]
VRF-1	1 December 1943 – November 1945	Ferry battle-worn aircraft to factory & fly new & refurbished aircraft to bases world-wide.
VRF-4	1 December 1943 – November 1945	Ditto
VRS-1	1 December 1943 – November 1945	Maintain aircraft along ferry routes.

Key: VB (Bombing Squadron)
VP (Patrol Squadron)
VPB (Patrol Bombing Squadron)
VRF (Ferry Squadron)
VRS (Ferry Service Squadron)

*Sources: Roberts 2000 & Floyd Bennett Field Task Force 2011

The U.S. Air Force was formed as a separate branch of the military in 1947. Initially plans were made to merge the Air National Guard and the Air Force Reserve (AFR) forces. Vocal opposition by the National Guard led to legislation that confirmed its separate existence. The same legislation, the Army and Air Force Authorization Act of 1949, established the Air Force Reserve as an equal component of the Air Force. The Air Force Reserve program under the control of the Air Force's Continental Air Command was to operate 23 flight-training centers that would train 25 Air Force Reserve combat wings. Floyd Bennett Field, the only Air Force Reserve training center in the New York area, was classified as the 2230th Air Reserve Flying Center. It supported the 63rd Troop Carrier Wing, composed of four squadrons that flew transport aircraft. The Air Force Reserve program was less than two years old when 146,683 citizen airmen were recalled to active service in the Korean War. The personnel and equipment of the 63rd Troop Carrier Wing were sent to Japan. After the Korean War, the 63rd Troop Carrier Wing was reactivated at an airport in Oklahoma. Air Force Reserve Troop Carrier Wings, later Airlift Wings, continued to be operated out of Floyd Bennett Field (Cantwell 1997:71–76, 115, 147).

In November 1946, the New York National Guard was reestablished to serve as both a federal and state military force. The experience of World War II coupled with the development of aerial weaponry required a peace-time force capable of countering air-borne attacks on civil localities. The U.S. War Department allotted 57,372 men to the ground force units and another 4,536 men to the air units. Federal aid was used in the construction of the required training facilities. Initially, air units were organized at Mitchel Field, on Long Island, Syracuse, and Niagara Falls. Additional air units were established at Schenectady, Rochester, and Floyd Bennett Field (N.Y., Adjutant General 1947:73–74, 77).

The 52nd Fighter Wing of the New York National Guard was activated in 1947 and headquartered at Mitchel Field. The wing was part of the Eastern Air Defense Force from 1947 until 1968. The wing included the 106th Light Bombardment Group headquartered at Floyd Bennett Field. The group consisted of the 102nd and 114th Light Bombardment Squadrons and their attached utility, weather, and service detachments (N.Y., Adjutant General 1948:60; *Brooklyn Eagle*, February 15, 1947:3; Ravenstein 1984:85). New York Air National Guard units stationed at Floyd Bennett Field were mobilized into federal service March 1, 1951 until December 1, 1952 during the Korean War. When the 106th Light Bombardment Group was assigned to Strategic Air Command and relocated to California, the New York Air National Guard activated a unit at Floyd Bennett Field (8102nd Air Base Squadron) to continue military training and maintain the state's aircraft. More subordinate units were added to the 106th, prompting its redesignation as a bombardment wing. In 1954, the New York Air National Guard expanded its footprint at Floyd Bennett Field by carrying out a major rehabilitation program. Construction activities included electrical alterations, heating system work, an overhaul of the vacuum pumps, rehabilitation of the fire protective system, and repairs to Hangars 5, 6, 7, and 8—including the infill buildings "C" and "D"—and Hangars 9 and 10. A paint and dope storage building was also constructed, as well as floodlighting and a security fence installed (N.Y., Chief of Staff 1953:133; 1954:91; 1955:86, 116).

In 1957, the 106th Bombardment Wing converted into a jet-equipped fighter-interceptor wing. The following year, the 106th was redesignated as the 106th Aeromedical Transport Group, with accompanying changes in mission, aircraft, and organization. The new transport group was comprised of the 102nd Aeromedical Transport Squadron, a dispensary and an air base squadron at Floyd Bennett Field staffed by 640 officers and airmen, including medical personnel (N.Y., Chief of Staff 1958:9; 1959:104, 106).

Cold War events in 1961 triggered a second activation of the New York Air National Guard into federal service (N.Y., Chief of Staff 1962:50). In 1964, a new 106th Air Transport Wing was created with headquarters at Floyd Bennett Field to administer the activities of Air Guard transport units in Brooklyn, White Plains, and Schenectady. The transport wing participated in airlift missions to Vietnam and other locations around the globe. The 106th Air Transport Wing converted to a new mission and new aircraft in 1970. The 106th became an air refueling wing and relocated their base from Floyd Bennett Field to the former United States Air Force Base in Suffolk County, Long Island (N.Y., Chief of Staff 1965:111; 1971:24).

The 52nd Army Antiaircraft (AAA) Brigade took over the antiaircraft defense of New York City from the 102nd AAA Brigade of the New York National Guard in 1952. Brigade headquarters was located at Fort Wadsworth on Staten Island, New York. Their arsenal included NIKE, the first operational antiaircraft missile system deployed by the United States in 1953. The 52nd AAA Brigade was composed of two groups that were subdivided into battalions. Each battalion had four firing batteries. These batteries established positions that formed concentric circles around the metropolitan area. A temporary allocation was given to the 52nd Army Antiaircraft Brigade stationed in an area at the extreme southern end of NAS New York (Morel 1957:19; Tarrant 1952:43).

The Army Air Defense system was created to combat the perceived threat of the Soviet Union and their efforts to design long-range bomber aircraft during the early years of the Cold War. By the late 1950s, the Soviets had switched their focus to the development of intercontinental ballistic missiles (ICBMs), making the antiaircraft defense system less critical. American defense dollars were funneled into the development of American ICBMs and a missile defense program. NIKE and other antiaircraft units were steadily reduced beginning in the mid-1960s (Bender 2004).

In 1960, NAS New York supported the following activities and units: Office of the Commander Naval Air Bases, 3rd Naval District; Marine Air Reserve training detachment; Ground Control Approach Unit 14; Second Air Force National Guard Base Detachment; Air National Guard 106th Aero Medical Transport Group; U.S. Coast Guard Air Station; New York City Air Police; training and administration of reserves; and naval air station. Naval aviation units included antisubmarine squadrons, patrol squadrons, an attack squadron, and transport squadrons. The station also included a Marine Air Reserve group; Marine fighter squadrons; a Marine helicopter squadron; air training units; and Bureau of Aeronautics Reserve training units. In all, the station was the base for 221 officers and 1,625 enlisted men. On regularly scheduled weekends, over 3,000 Navy and Marine Corps reservists used the facilities at Floyd Bennett Field to maintain top operating proficiency (Bureau of Yards and Docks 1956; *Skyscrapers*, May 20, 1966:7). America's withdrawal from Vietnam touched off a massive military demobilization. NAS New York was decommissioned in 1971 (Blakemore and Linck 1981:71–73, 165–167).

Floyd Bennett Field Becomes Part of the Gateway National Recreation Area, 1972–Present

The Navy's decision to close NAS New York in the late 1960s stirred debate among public and private entities regarding various alternative uses. The city of New York felt Floyd Bennett Field and Hangar Row would make a fine general aviation airport. The state of New York viewed the airport as open land ideal for housing. Planners saw enough space for a "balanced community" that could include 45,000 apartments for 180,000 people with work places, shopping, and recreation. The proponents with the plan to have Floyd Bennett Field be part of a new national seashore park prevailed (Haitch 1972:A1; Shipler 1970:33).

Congress established the Gateway National Recreation Area on October 27, 1972. Twelve hundred acres of NAS New York was transferred to the Department of the Interior. The Navy retained approximately 10 acres surrounding Hangar A and Tylunas Hall as the Naval Air Reserve Detachment, New York (NARDET NY). The Army took over approximately 100 acres at the south end of the field along Rockaway Inlet. Coast Guard Air Station Brooklyn retained its 10-acre site on Jamaica Bay and acquired additional property on the south and east parts of the field (Cody and Auwaerter 2009:168–169).

The Navy decommissioned NARDET NY in circa 1983. The Coast Guard Air Station was decommissioned in 1998. The parcels were transferred to the Department of the Interior and leased to the Department of Sanitation and the Aviation Unit of the New York City Police Department, respectively. The Department of Defense retained the parcel on Rockaway Inlet for use as an Armed Forces Reserve Center. Since 1997, the facility has been a Marine Corps Reserve Center (Cody and Auwaerter 2009:169–170).

The National Park Service opened Floyd Bennett Field to visitors in 1974. The focus was on developing recreational uses and natural resource conservation. The originally constructed Municipal Airport portion of Floyd Bennett Field was listed on the National Register in 1981. In 2010, new documentation was prepared that expanded the existing Floyd Bennett Field National Register district boundaries. The period of significance was revised to incorporate the World War II period when Floyd Bennett Field served as NAS New York, 1941–1945 (Kierstead 2010) (see Figure 1.2.4); the original period of significance covered the years between the airport's dedication in 1931 and its transfer to the Navy in 1941. In keeping with the general management plan, efforts were directed at the adaptive reuse of Hangar Row and demolishing buildings built after 1941. The hangars remained largely vacant. Improvements were initiated in the mid-1990s after the Police Department had moved out of their hangars (Cody and Auwaerter 2009:173–174). The first major adaptive reuse of the hangars was the Aviator Sports complex. In 2003–2006, Hangars 5, 6, 7, and 8 were redeveloped into a recreation complex.

Hangars 1 and 2 have been occupied by the National Park Service and others, even if only for storage, since the National Park Service assumed ownership in 1972. Big Apple Circus occupied the hangars in the 1980s. Floyd Bennett Field was one of the three stops of the very first tour made by Big Apple Circus in the summer of 1980. The circus, founded in 1977, used Floyd Bennett Field as their winter quarters (Binder 2013:127; *NYT,* August 9, 1989:B1). They built their sets inside the hangars and replaced the lights in Hangar 1. The hangars became a backdrop for events such as the Irish Festival, Octoberfest, plays, and various avant garde happenings. Movies and commercials were sometimes filmed there. After Operation Desert Storm ended in 1991, surplus vehicles were stored in Hangars 1 and 2. Other items stored in the hangars include guardrails, go-karts, toys, and Government Services Administration surplus (Ricky O'Neill, Facility Manager, Gateway National Recreation Area, Jamaica Bay Unit, Floyd Bennett Field, personal communication 2011).

1.3 CHRONOLOGY OF DEVELOPMENT AND USE

Construction of Hangars 1 and 2 at Floyd Bennett Field was initiated in 1930 and completed in 1931. Since they were first constructed, Hangars 1 and 2 have evolved through multiple additions and modifications. These changes include the construction of a Works Progress Administration (WPA) Infill section connecting the two hangars, the addition of a second story to Hangar 1 Lean-to, and the early 1940s construction of the wood-framed monitor structure above the WPA Infill building. In addition to these modifications, less permanent changes were made over the years in the forms of offices and other partitions in the lean-tos. This section focuses on the major and minor physical changes made to the hangars throughout their history. Section 1.4 provides a detailed room-by-room account of the buildings, spaces, and conditions within the hangar complex. While the current section provides an overview of notable physical changes in the hangar complex during its history, Section 1.4 provides details on the architectural features and conditions present today, the building materials used, and the construction techniques employed for the building.

The 1979 historic structure report for Floyd Bennett Field addresses the construction history of the site as a whole (Blakemore and Linck 1979). The purpose of this current report is to examine and explain details specific to Hangars 1 and 2. A series of comprehensive drawings depicting changes to the hangars and support buildings has been created and is included in this section of the HSR. The drawings are based upon physical investigation of the complex, as well as archival research.

As originally built in 1931, two freestanding airplane hangars labeled Hangar 1 and Hangar 2 were constructed. They were separated by a 50-foot alley between the west elevation of Hangar 1 and the east elevation of Hangar 2. The layout of the complex and of the hangars was symmetrical. Window openings containing steel frames and steel sash were located along the full length of the hangar elevations facing the open 50-foot alley, allowing ample light to enter the large hangar spaces. Single-story lean-tos used for office and workshop space were attached to the east elevation of Hangar 1 and the west elevation of Hangar 2 (referred to here as Hangar 1 Lean-to and Hangar 2 Lean-to). Twelve aluminum sliding doors, each 22 feet high and 10 feet wide, dominated the north and south façades of the hangars and allowed ample clearance for airplanes stored and maintained in the main spaces of the hangars. Soon after construction, a contract was awarded to the General Electric Company for landing equipment, including the fabrication and installation of the initials “NYC” on the roof of Hangar 2. Flood lighting was also installed at the corners of the hangars. The gable ends of the hangars, sheathed with corrugated copper, were painted with the lettering “City of New York/Floyd Bennett Field.” The signs would later change to reflect the occupancy of the hangars (Figures 1.3.1–1.3.3, 1.3.12–1.3.15, and Figures 1.3.19a–1.3.19b).

Like the hangars, the one-story lean-tos were constructed of steel framing and masonry cladding with tar and gravel roofing. The raised parapets of the lean-tos’ north and south façades were used to contain the pockets for the hangar door panels. Intended as support spaces for the hangars, the lean-tos were originally designed with unfinished dirt floors, and the doorways between hangar and lean-to were left open to allow for ease of passage between the structures. Offices were installed approximately a year later when, in 1932, the Division of Port Planning, Bureau of Engineering, was tasked with grading the sand within Hangar 1 Lean-to and covering it with a 6-inch concrete floor. This work was in preparation for the “installation of partitions, plumbing, light, etc. by the Police Department for occupancy of their Air Police Division” (NYC Department of Docks Annual Reports 1932: 46–47). Plans from 1932 of the lean-tos corroborate the installation of partitions in Hangar 1 (NYC Department

of Docks, Contract Drawing 2061-A). Later that year, the Air Police Division took up occupancy in the space (Blakemore and Linck 1981:50) (Figures 1.3.1–1.3.3, 1.3.12–1.3.15, and 1.3.17–1.3.18).

Between 1936 and 1937, in preparation for expansion of the Naval Reserve Aviation Base, the WPA designed an infill building between Hangars 1 and 2 (referred to here as the WPA Infill). Correspondence cited in the 1979 HSR (Blakemore and Linck 1979:136) enumerates several intended uses for the new infill space, including dormitories on each end of the second level, storage space, and a plane overhaul shop. The exterior of the infill included materials, windows, and detailing that matched the hangars, with masonry walls several wythes thick on the north and south façade elevations. An open court between the north and south end of the infill building featured skylights to allow daylight into the workshops on the first story. The window openings along the interior side elevations were filled in with common brick. Cased, vehicle-sized openings were constructed within these walls to facilitate passage through the space (Figures 1.3.4, 1.3.12–1.3.16).

During the same period, also in preparation for occupancy by the Navy, a second story was added to Hangar 1 Lean-to (Figures 1.3.4, 1.3.12, 1.3.17, 1.3.20a, and 1.3.20b). Photographic evidence in the 1979 HSR (NARA # 69-N-7721-D) indicates that construction was underway by late October of 1935, and was complete by September of 1937 (NARA #69-N-8999). The additional space was used to train cadets in the preflight school. The project also involved reconfiguring the office space on the first level. The bay window was added to the first level of Hangar 1 Lean-to during this time (Figures 1.3.17, 1.3.20a, and 1.3.20b). Little mention is made in documentation of alterations to Hangar 2 Lean-to, and the current floor plan suggests that little of note or permanence has impacted the space since 1931. The corrugated copper fascia of Hangar 1 was painted with new "Navy" signs during this period, as well.

During World War II, the Navy tenancy of the complex also expanded to Hangar 2. Signs on the copper fascia of Hangar 2 reflected the U.S. Navy occupancy. In addition, "Navy" was added to the roof of Hangar 1 during the World War II period (Figures 1.3.5 and 1.3.18). The most notable change to the complex during the war was the construction of a wood-framed monitor structure in the former light court of the WPA Infill. It is likely that this structure was constructed prior to 1944 to be used as a classroom. A historic aerial photograph from 1944 clearly shows the addition on the roof (Department of the Navy 1944). Physical evidence suggests it is tied in laterally to the hangars on either side.

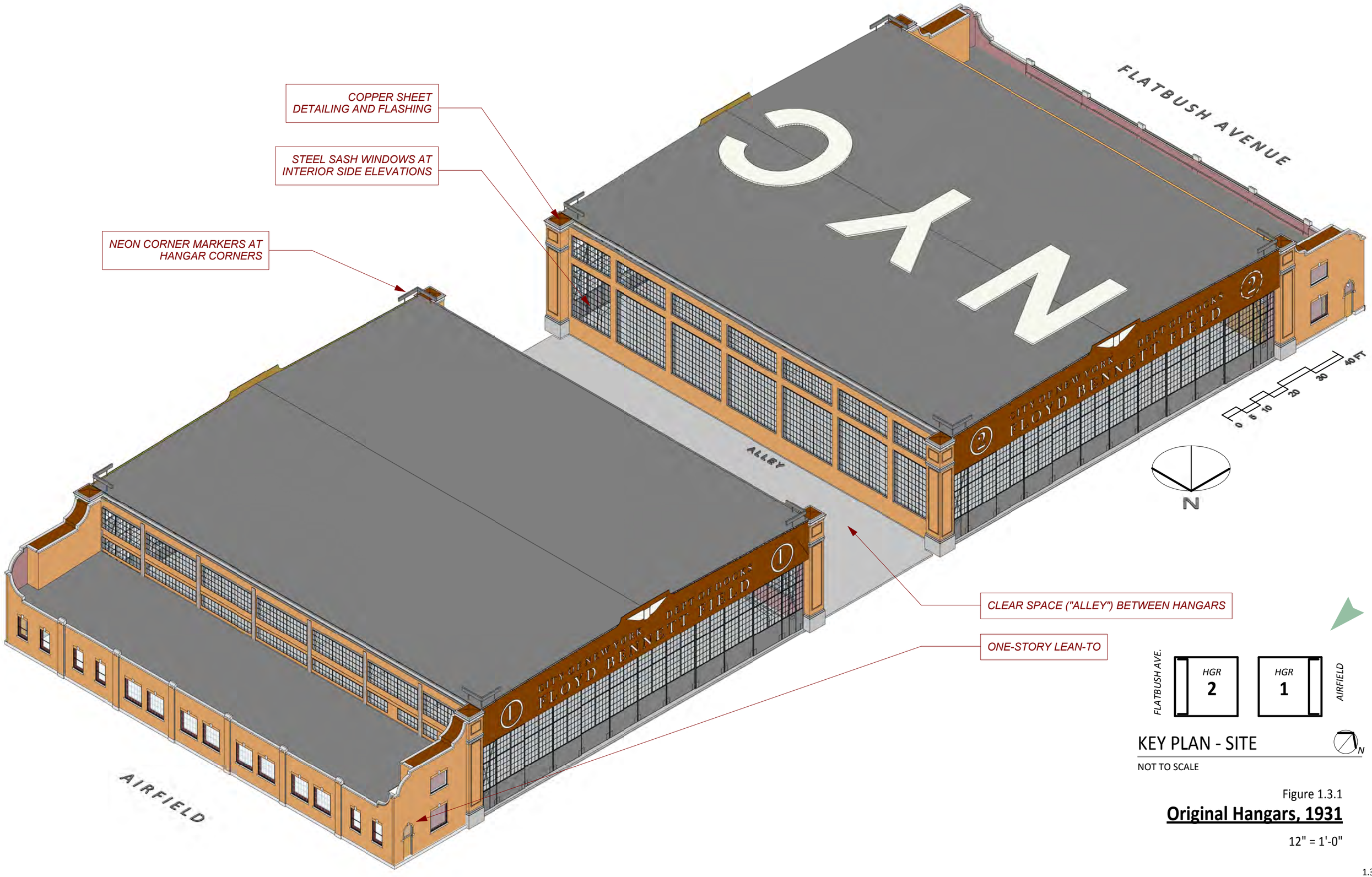
The theory that little change was made to Hangar 1 Lean-to is supported by a drawing from April 4, 1946 (Figure 1.3.21). Additionally, correspondence from this period indicates that a maintenance campaign was underway at the base. However, in the very specific paperwork found over the course of research for this HSR, no maintenance or new projects are referred to for Hangars 1 and 2 (RG 71) at the time. Thus, because no alterations were scheduled for the buildings, it is likely that the drawing—recorded as Public Works Drawing Number 1227—reflects the building as constructed. The drawing, entitled "U.S. Naval Air Station, New York, NY, (Floyd Bennett Field)," presents floor plans of "Hangar 2 (Building No. 9), Lean-to (Building No. 10), & Building 'A' (No. 3)." The layout of Hangar 2 Lean-to was very similar to the current floor plan. Ghostlines on the walls of the lean-to as it stands today are consistent with the 1946 plan, in which the space is labeled "machine shop." No major changes between 1946 and 2011 are apparent in Hangar 2.

In the WPA Infill, as drawn in 1946, the labyrinth of partitions on the first level are similar to the current configuration, although the placement and use of space on the north half of the floor differs slightly, with partitions used to divide "Engineering" on the west side from "Carburetor Shop," "Storage," and

"Receiving" to the east. On the WPA Infill's second level, the 1946 drawing shows classrooms, an electric shop, and restrooms in the northern section, with dormitories and restrooms to the south. Dividing these two spaces is a floor of quarry tile, interspersed with nine skylights to allow light into the instrument shop and office space below on the mezzanine level (Figures 1.3.4, 1.3.16, and 1.3.21).

A 1950 photograph shows the "U.S. Air Force Reserve" painted on the copper fascia of Hanger 1 (see Figure 1.2.12). In 1956, new heaters were installed in the hangars. These heaters remain in the ceilings of the hangars today. Partition changes were made throughout the WPA Infill and the lean-tos during this post-war period. During the Navy's continued use of the building, office partitions were put into place during this period, as 1964 as-built drawings illustrate (Figure 1.3.22).

Minor changes are evident in the hangars from the late 1960s and early 1970s. Hangar 1 was re-roofed during this period and "Army" was painted on the copper fascia of Hangars 1 and 2. The "Navy" letters were removed from the roof of Hangar 1 and "NYC" letters were removed from the roof of Hangar 2 (Figure 1.3.7). Once the NPS assumed ownership of the hangars, no structural changes, additions, or renovations were made to Hangar 1, Hangar 2, Hangar 1 Lean-to, Hangar 2 Lean-to, or the WPA Infill, with the exception of installation of a chain link fence between Hangar 1 and Hangar 3. Additional fencing was also added to protect the public from falling brick at the northwest corner of Hangar 1.



KEY PLAN - SITE

NOT TO SCALE

Figure 1.3.1

Original Hangars, 1931

12" = 1'-0"

(project north)

N

1.3.3

1

POCKET TO RECEIVE HANGAR DOORS (TYPICAL OF 4)

HANGAR DOOR TRACKS IN FLOOR

HANGAR DOOR STACKING AREA (TYPICAL OF 4)

FLATBUSH AVENUE

1.3.3 5

3 1.3.3

1.3.3 2

4 1.3.3

AIRFIELD

CONCRETE-PAVED OPEN SPACE (ALLEY)

HANGAR 2 LEAN-TO BLDG. 10

HANGAR 2 BLDG. 9

6

1.3.3

HANGAR 1 BLDG. 7

HANGAR 1 LEAN-TO BLDG. 8

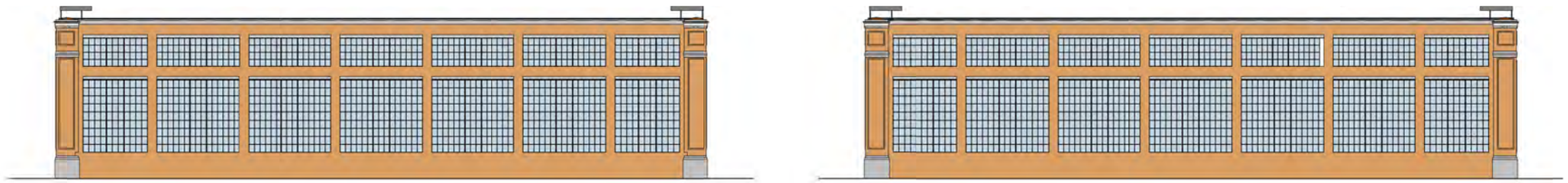
Figure 1.3.2

Original Hangar Plans, 1931

1" = 30'-0"

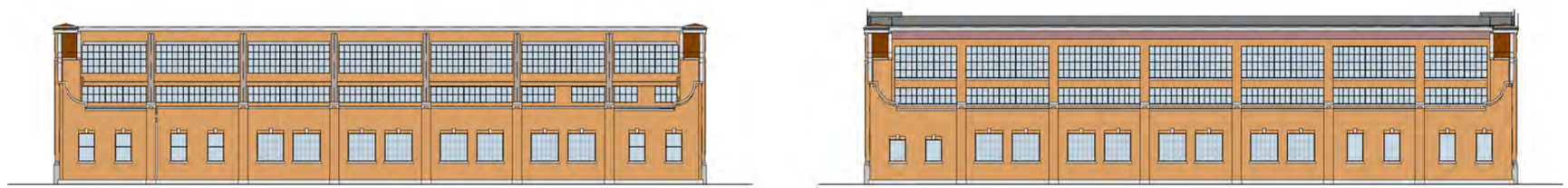


1 Hangars 1 & 2, North Elevation, 1931
Scale: 1" = 30'-0"



2 Hangar 1, West Elevation, 1931
Scale: 1" = 30'-0"

3 Hangar 2, East Elevation, 1931
Scale: 1" = 30'-0"



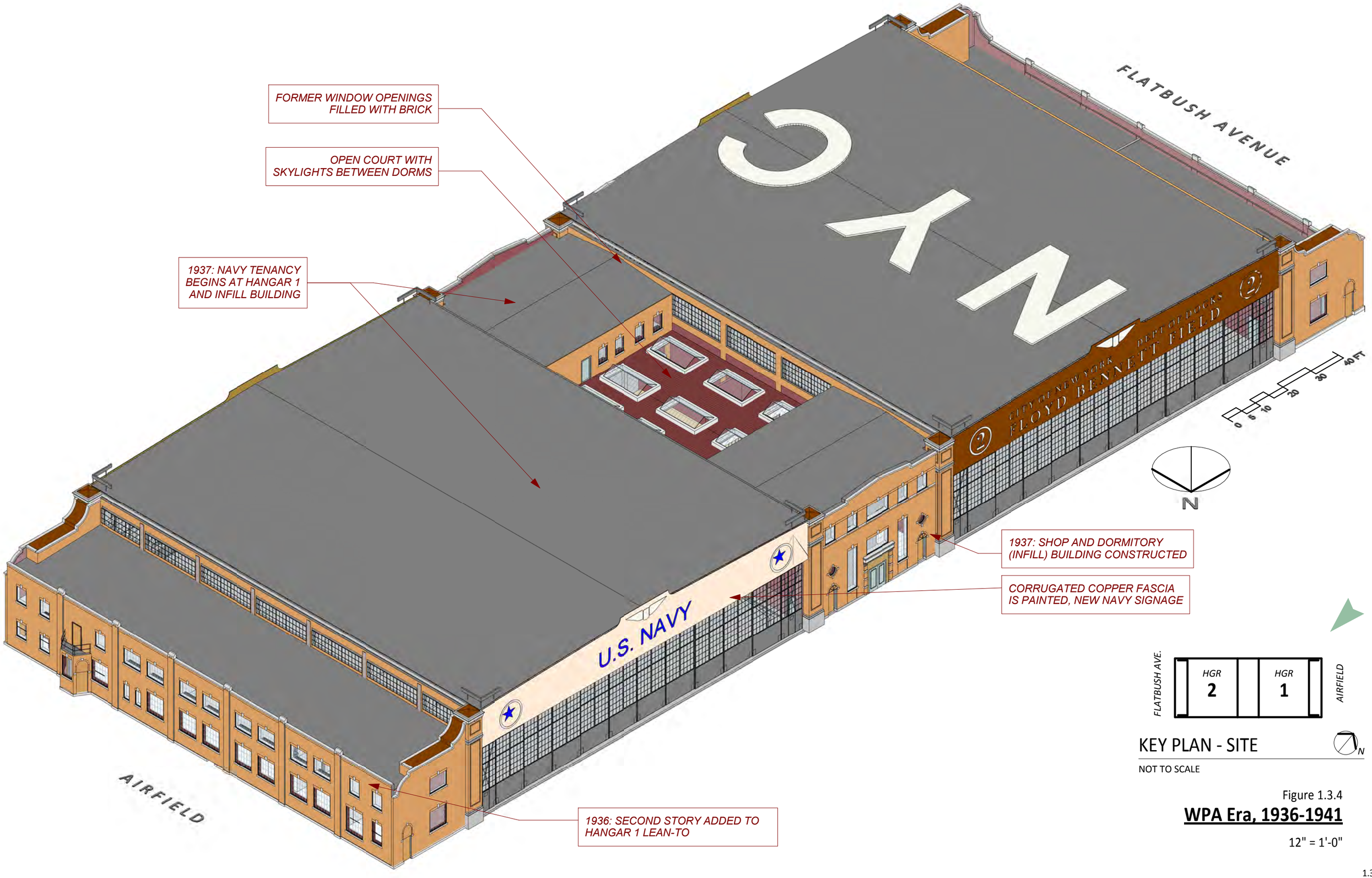
4 Hangar 1, East Elevation, 1931
Scale: 1" = 30'-0"

5 Hangar 2, West Elevation, 1931
Scale: 1" = 30'-0"



6 Hangars 1 & 2, South Elevation, 1931
Scale: 1" = 30'-0"

Figure 1.3.3
Original Exterior Elevations, 1931
1" = 30'-0"



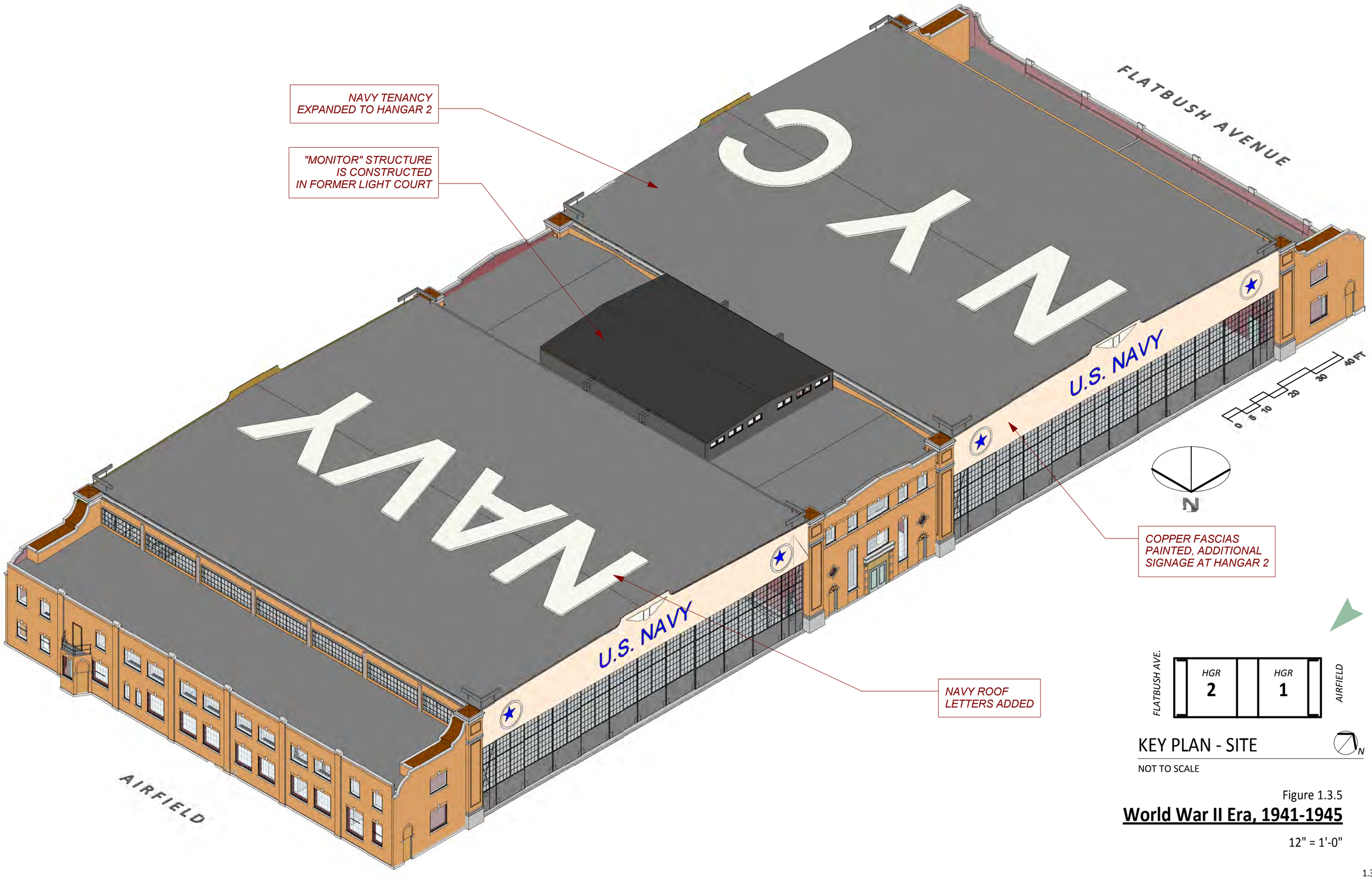
KEY PLAN - SITE

NOT TO SCALE

Figure 1.3.4

WPA Era, 1936-1941

12" = 1'-0"



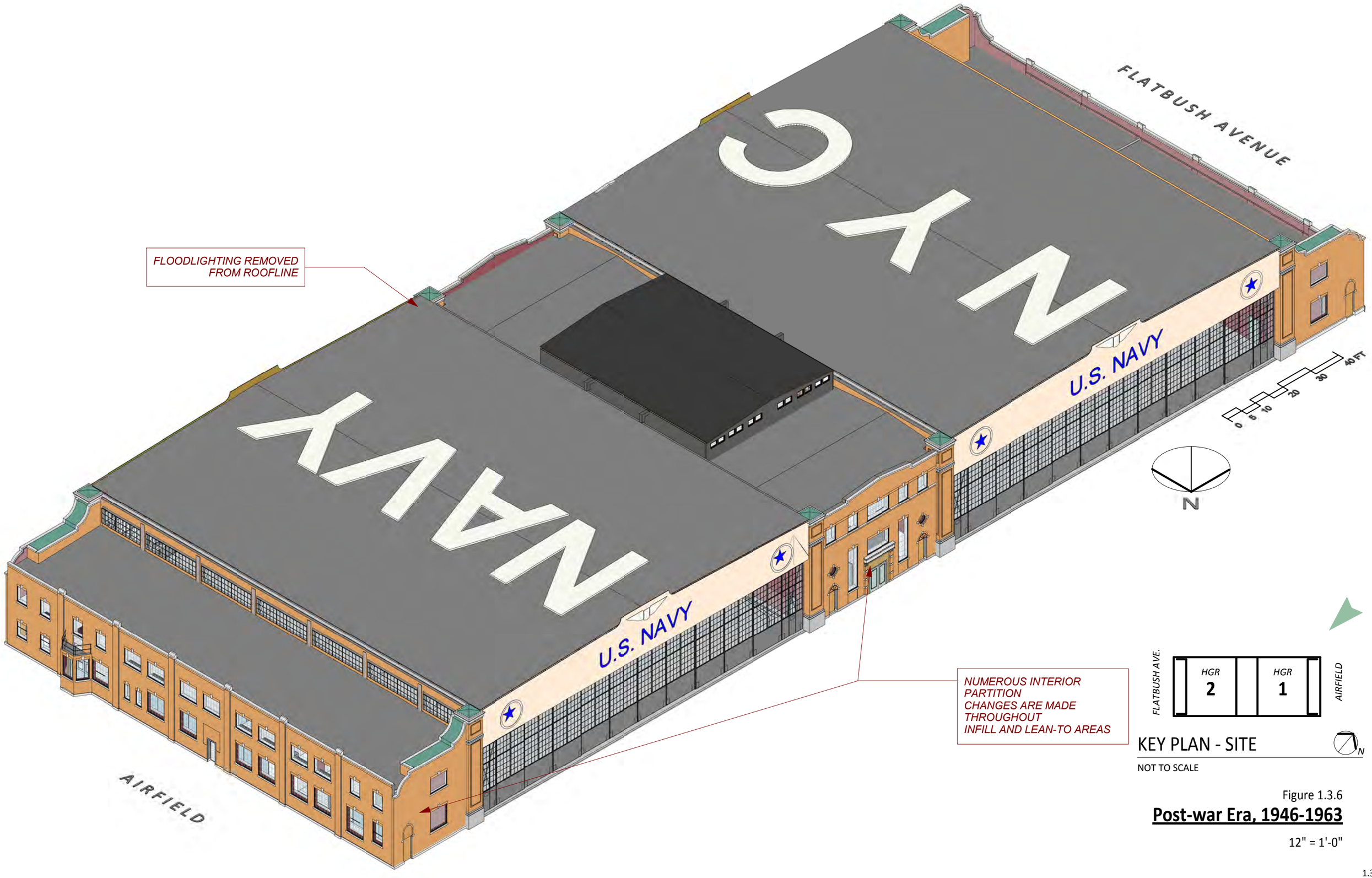
KEY PLAN - SITE

NOT TO SCALE

Figure 1.3.5

World War II Era, 1941-1945

12" = 1'-0"



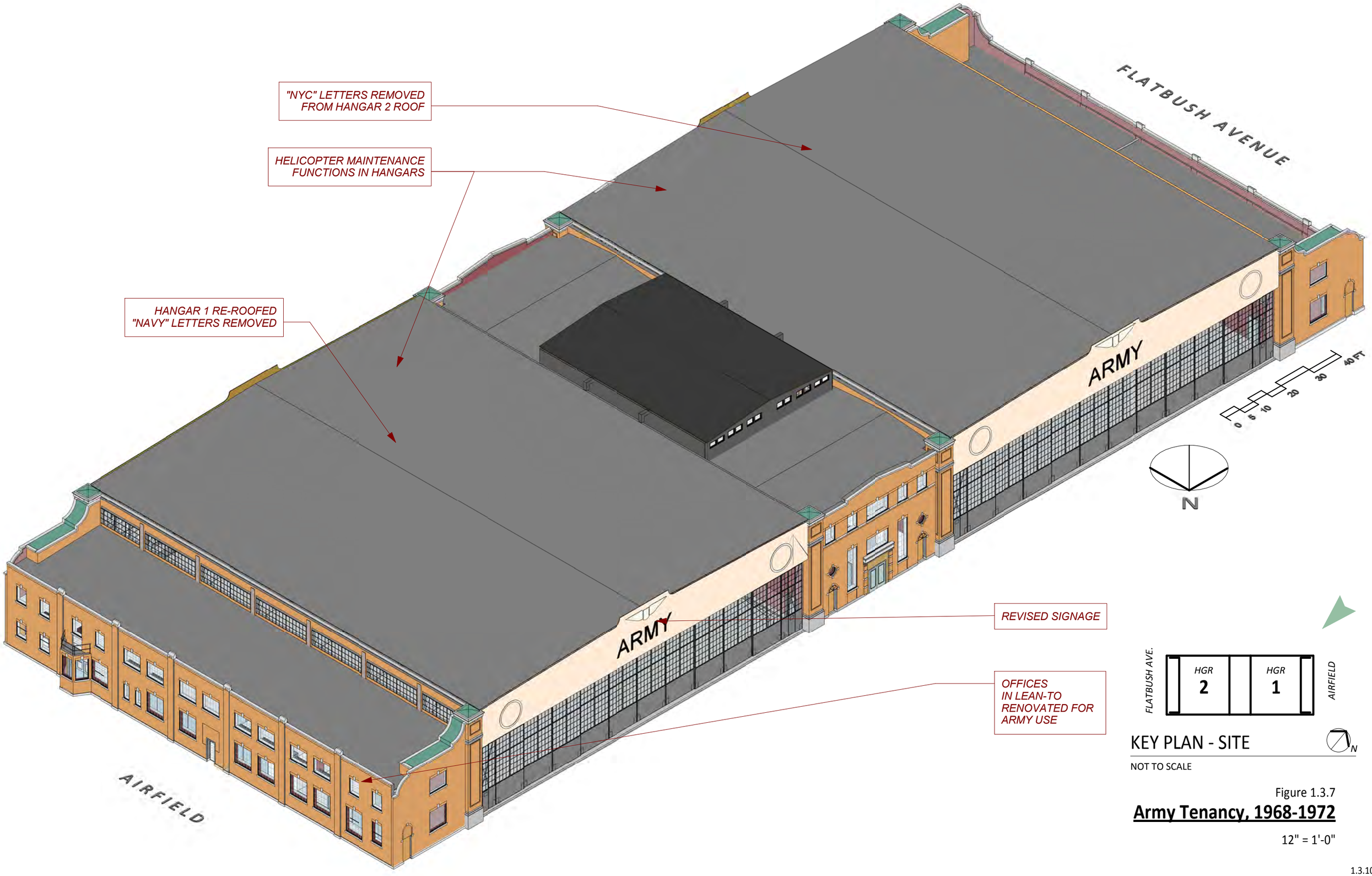
KEY PLAN - SITE

NOT TO SCALE

Figure 1.3.6

Post-war Era, 1946-1963

12" = 1'-0"



KEY PLAN - SITE

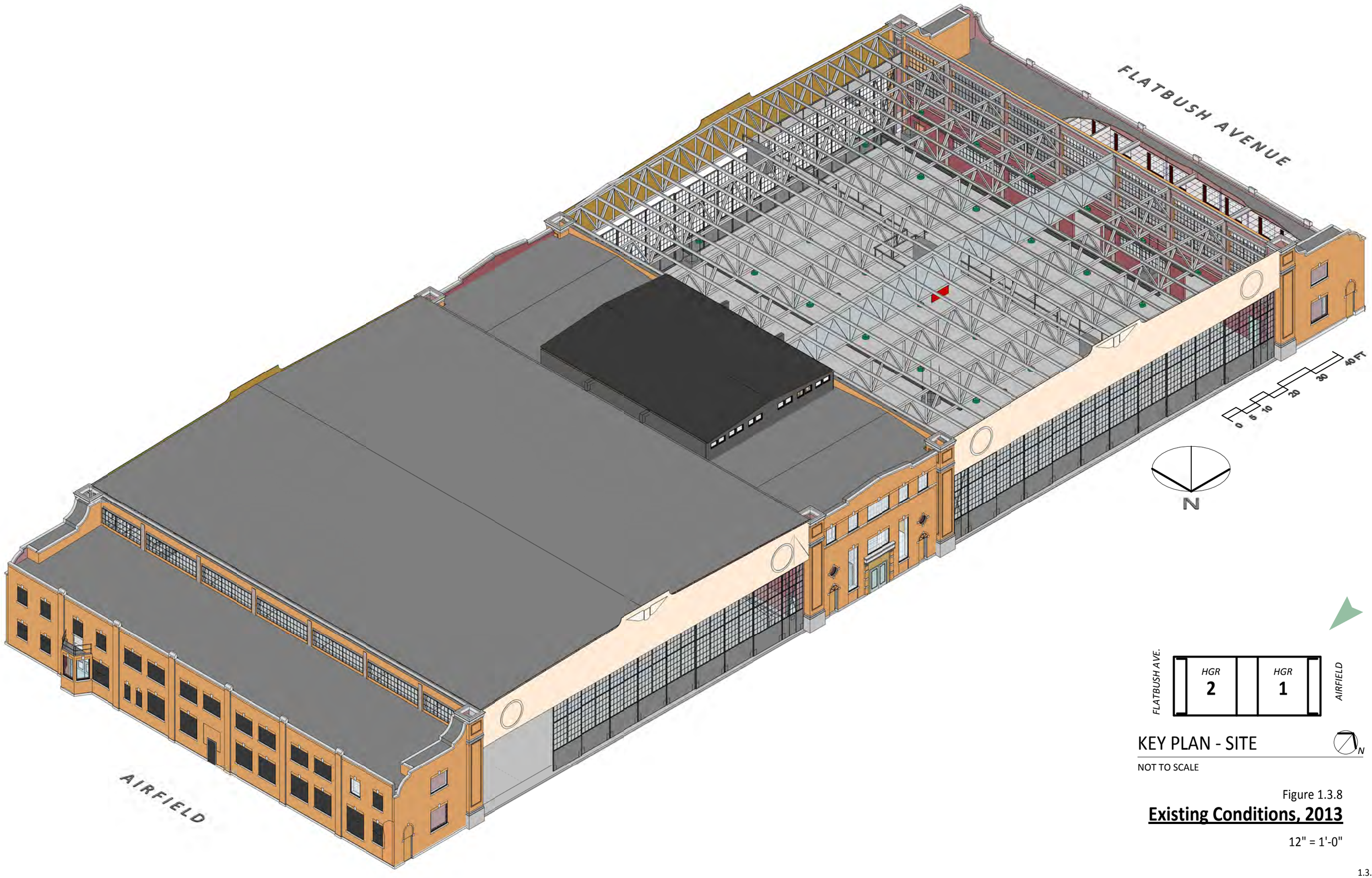
N

NOT TO SCALE

Figure 1.3.7

Army Tenancy, 1968-1972

12" = 1'-0"



KEY PLAN - SITE

NOT TO SCALE

Figure 1.3.8

Existing Conditions, 2013

12" = 1'-0"

(project north)

N

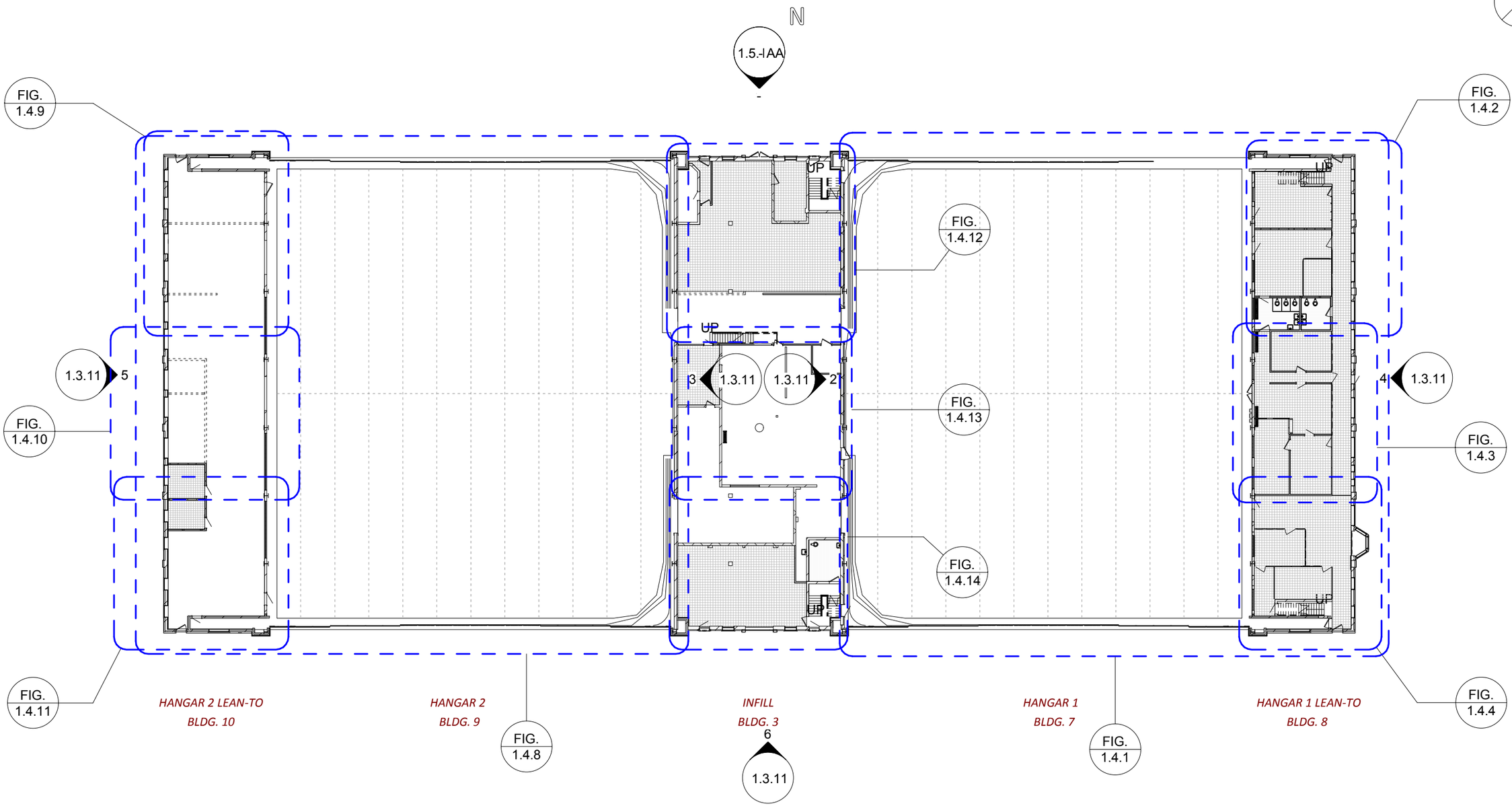


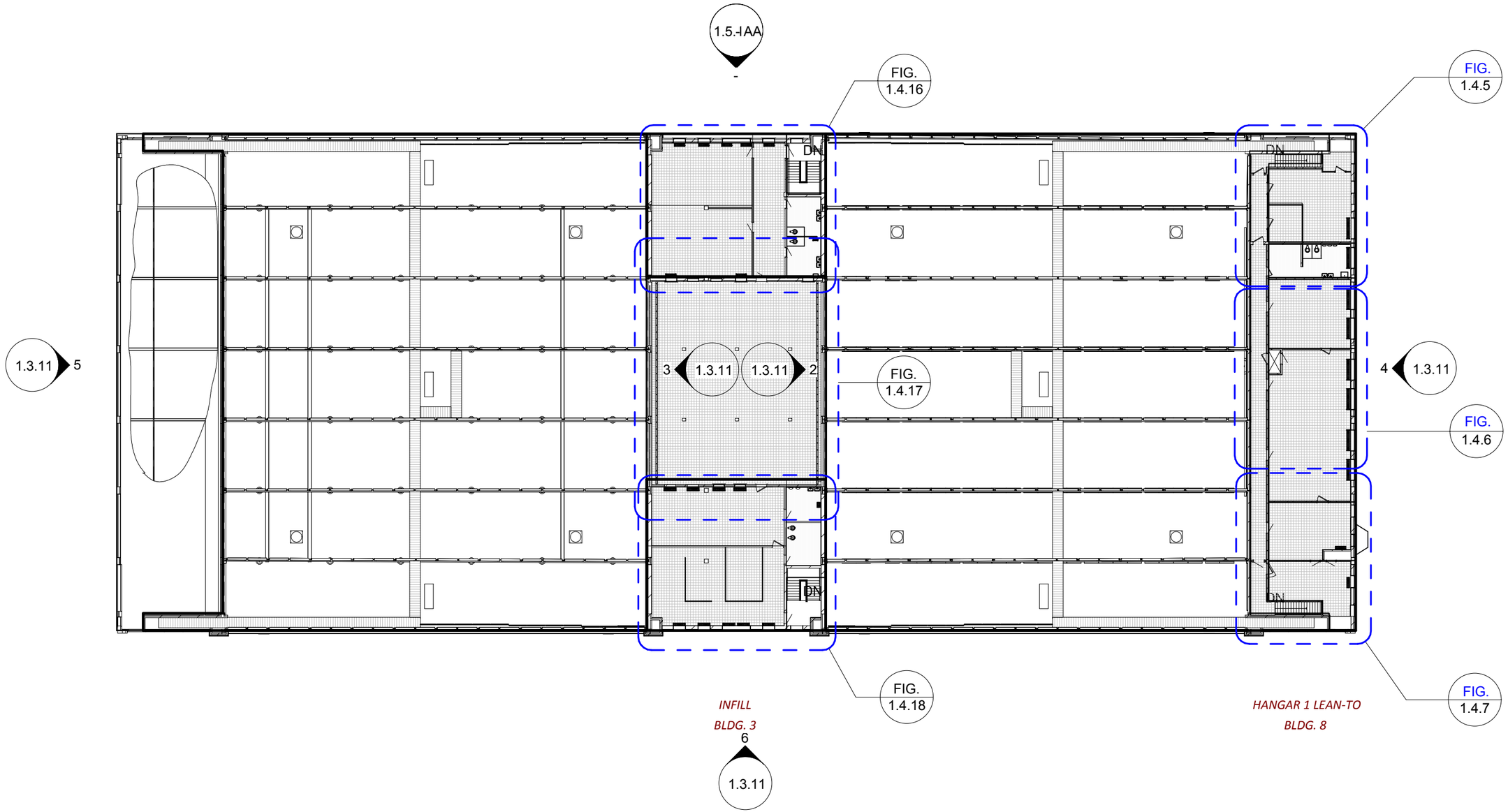
Figure 1.3.9

Existing Plan, Level 1

1" = 30'-0"

(project north)

N

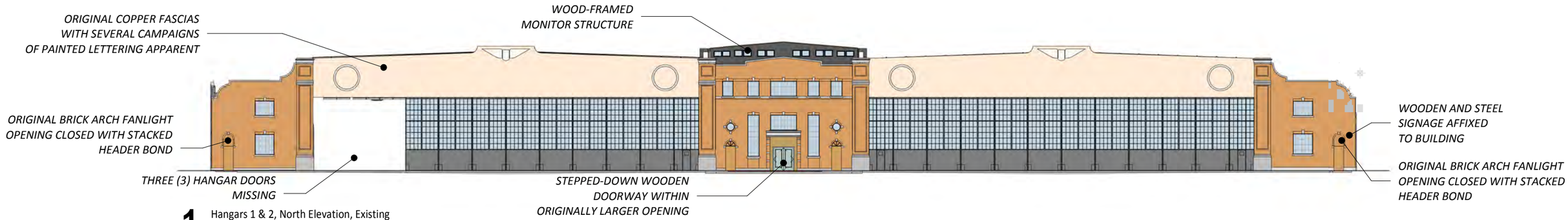


VIEW IS AT TRUSS LEVEL IN HANGARS,
LEVEL 2 AT INFILL AND HANGAR 2 LEAN-TO

Figure 1.3.10

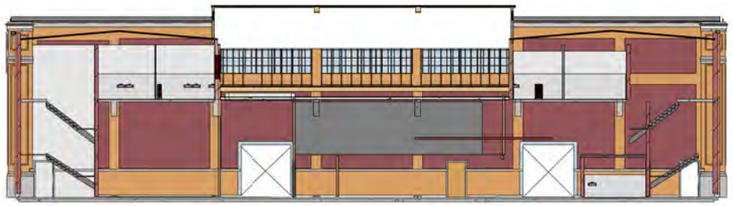
Existing Plan, Level 2

1" = 30'-0"



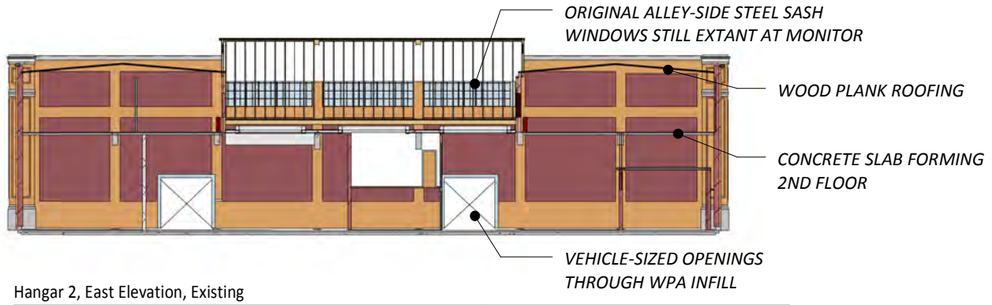
1 Hangars 1 & 2, North Elevation, Existing

Scale: 1" = 30'-0"



2 Hangar 1, West Elevation, Existing (Section at Infill)

Scale: 1" = 30'-0"



3 Hangar 2, East Elevation, Existing

Scale: 1" = 30'-0"



4 Hangar 2, East (Runway) Elevation, Existing

Scale: 1" = 30'-0"



5 Hangar 2, West (Flatbush) Elevation, Existing

Scale: 1" = 30'-0"



6 Hangars 1 & 2, South Elevation, Existing

Scale: 1" = 30'-0"

Figure 1.3.11

Existing Exterior Elevations

1" = 30'-0"

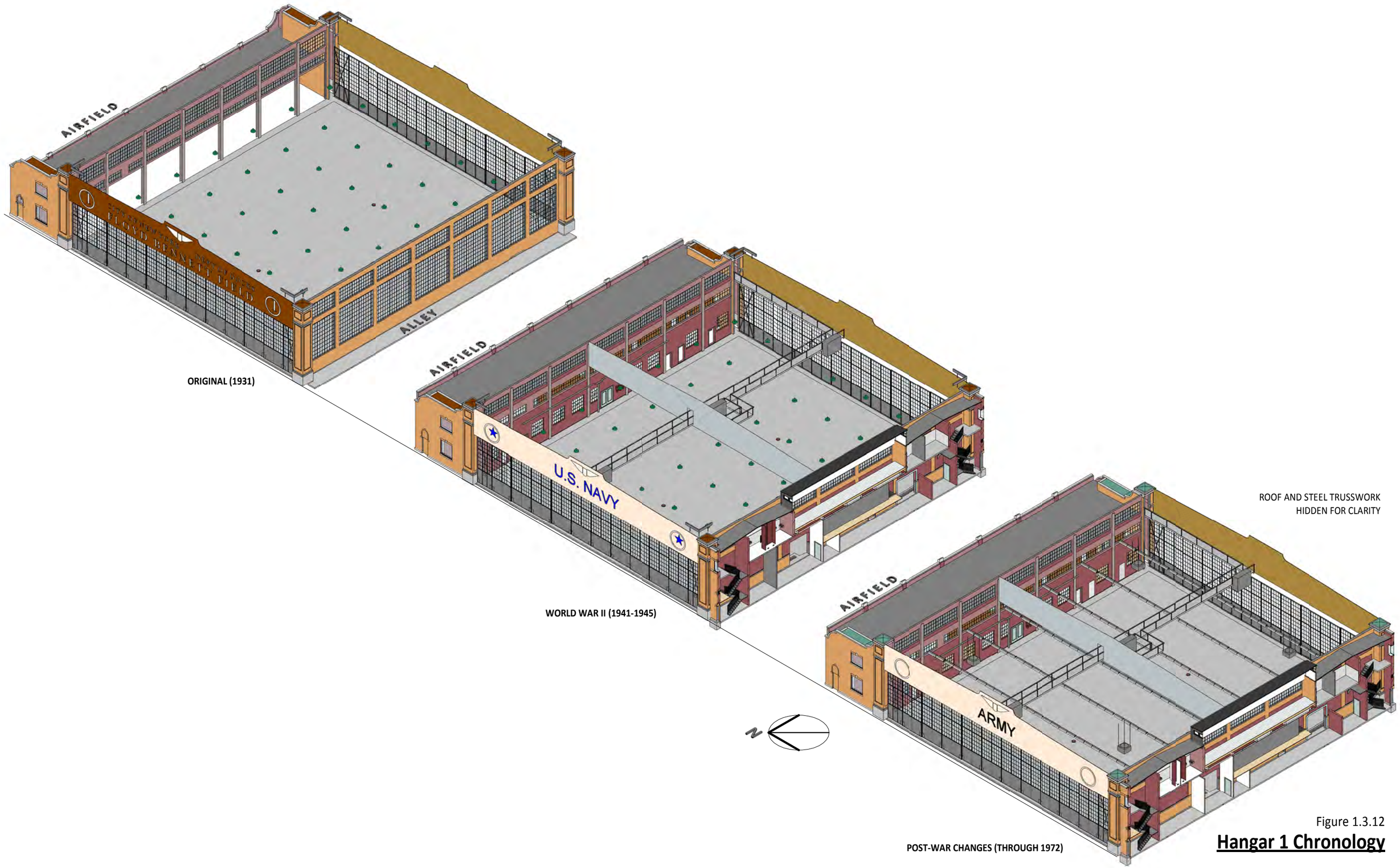
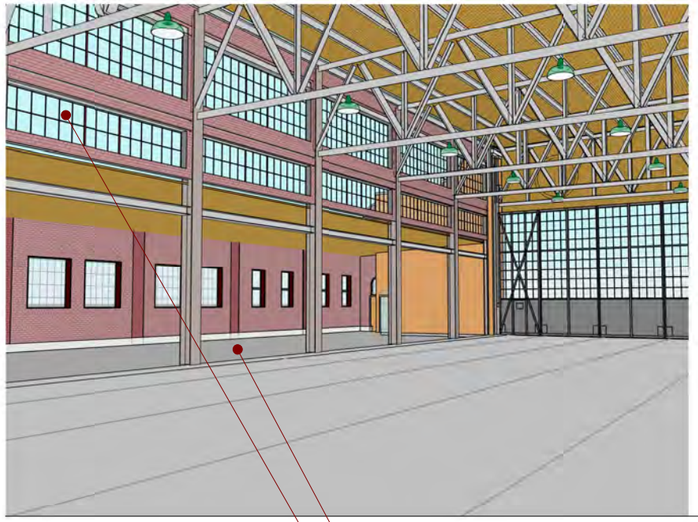


Figure 1.3.12

Hangar 1 Chronology

ORIGINAL (1931)



EARTHEN FLOOR

WINDOWS TO EXTERIOR

WPA (1937)



DAYLIGHT REDUCED BY ADDITION OF LEVEL 2

BRICK WALL PARTITION ADDED

STEAM HEATING, OTHER SYSTEMS ADDED

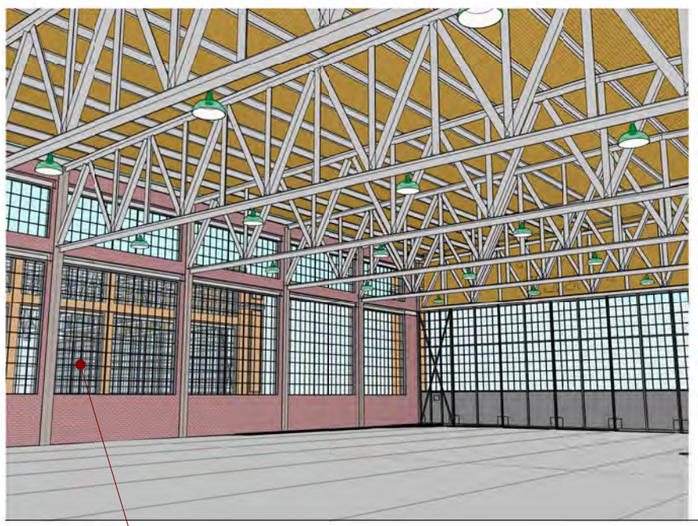
WWII THROUGH POST-WAR



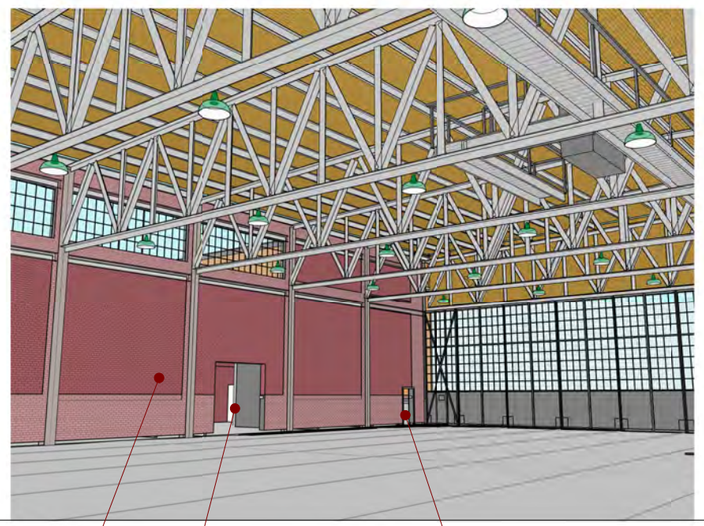
SMOKE/FIRE PARTITION

SOME WINDOWS COVERED FROM INSIDE LEAN-TO

NEW UNIT HEATERS ADDED 1956



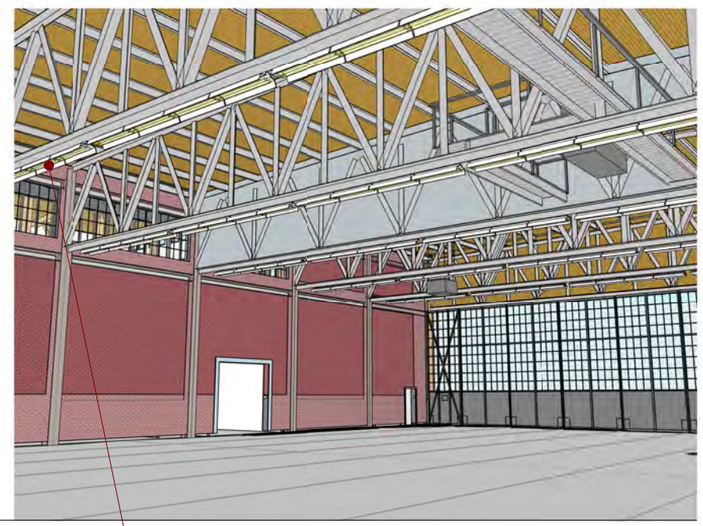
EXPANSIVE GLASS FACADES TOWARD "ALLEY" SEPARATING ORIGINAL HANGARS



FORMER GLASS INFILLED WITH BRICK

VEHICLE-SIZED PASSAGEWAYS BETWEEN HANGARS

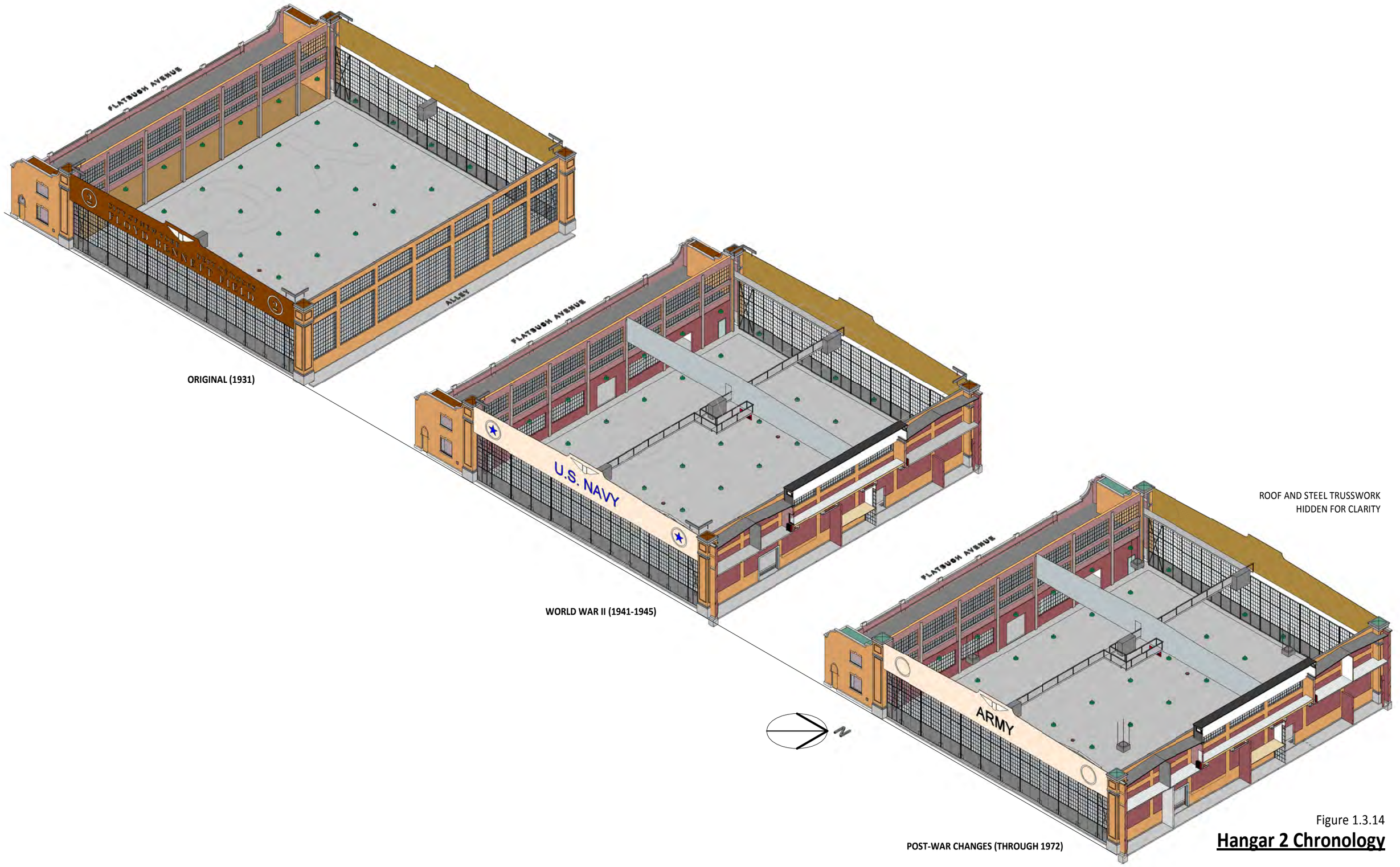
DOORS INTO INFILL SPACES



LIGHT FIXTURES REPLACED WITH LINEAR FLUORESCENT UNITS

Figure 1.3.13

Hangar 1 Chronology - Perspective Views



ORIGINAL (1931)

WORLD WAR II (1941-1945)

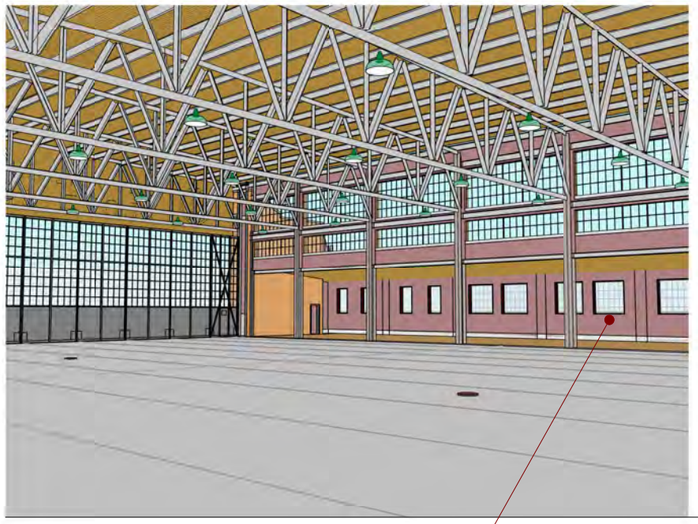
ROOF AND STEEL TRUSSWORK
HIDDEN FOR CLARITY

POST-WAR CHANGES (THROUGH 1972)

Figure 1.3.14

Hangar 2 Chronology

ORIGINAL (1931)



OPEN TO LEAN-TO SPACE

WPA (1937)



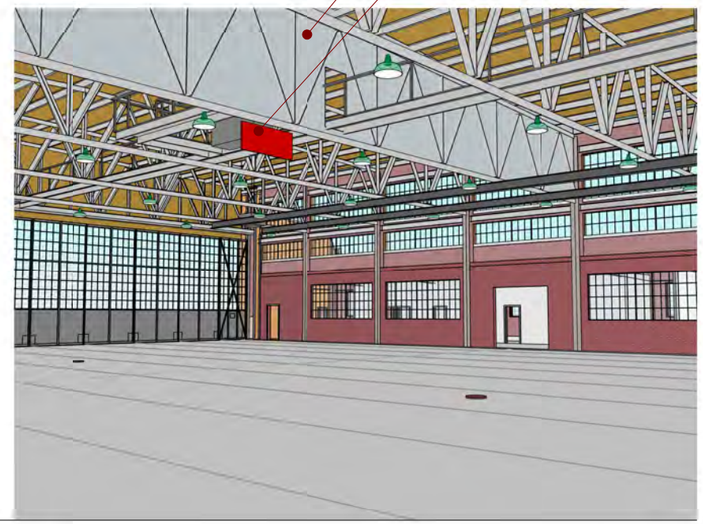
STEAM HEATERS ADDED

CATWALK TO SERVICE HEATERS

STEAM HEATING, SPRINKLERS ADDED

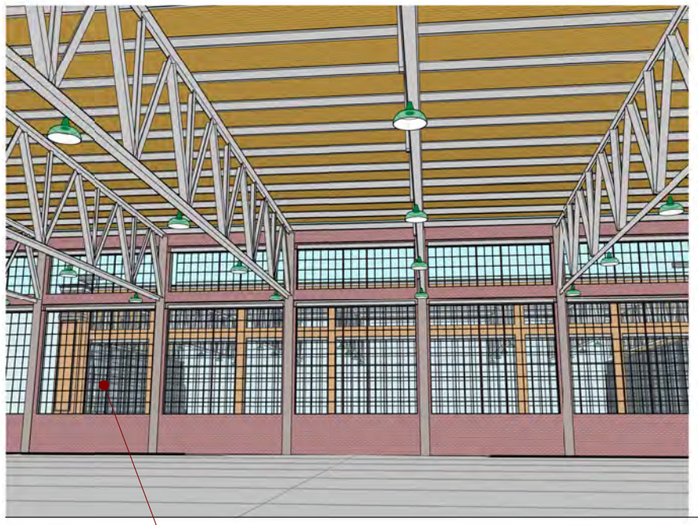
BRICK WALL CLOSES OFF LEAN-TO SPACES

WWII THROUGH POST-WAR

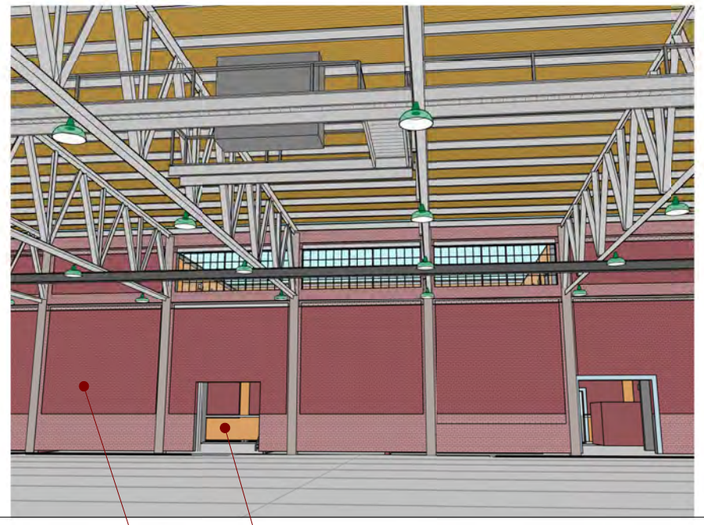


SMOKE/FIRE PARTITION

SMOKING SIGNAGE



EXPANSIVE GLASS FACADES TOWARD INTERIOR TARMAC SEPARATING ORIGINAL HANGARS



PASSAGEWAYS INTRODUCED BETWEEN HANGARS

FORMER GLASS AREAS FILLED WITH BRICK DURING INFILL CONSTRUCTION

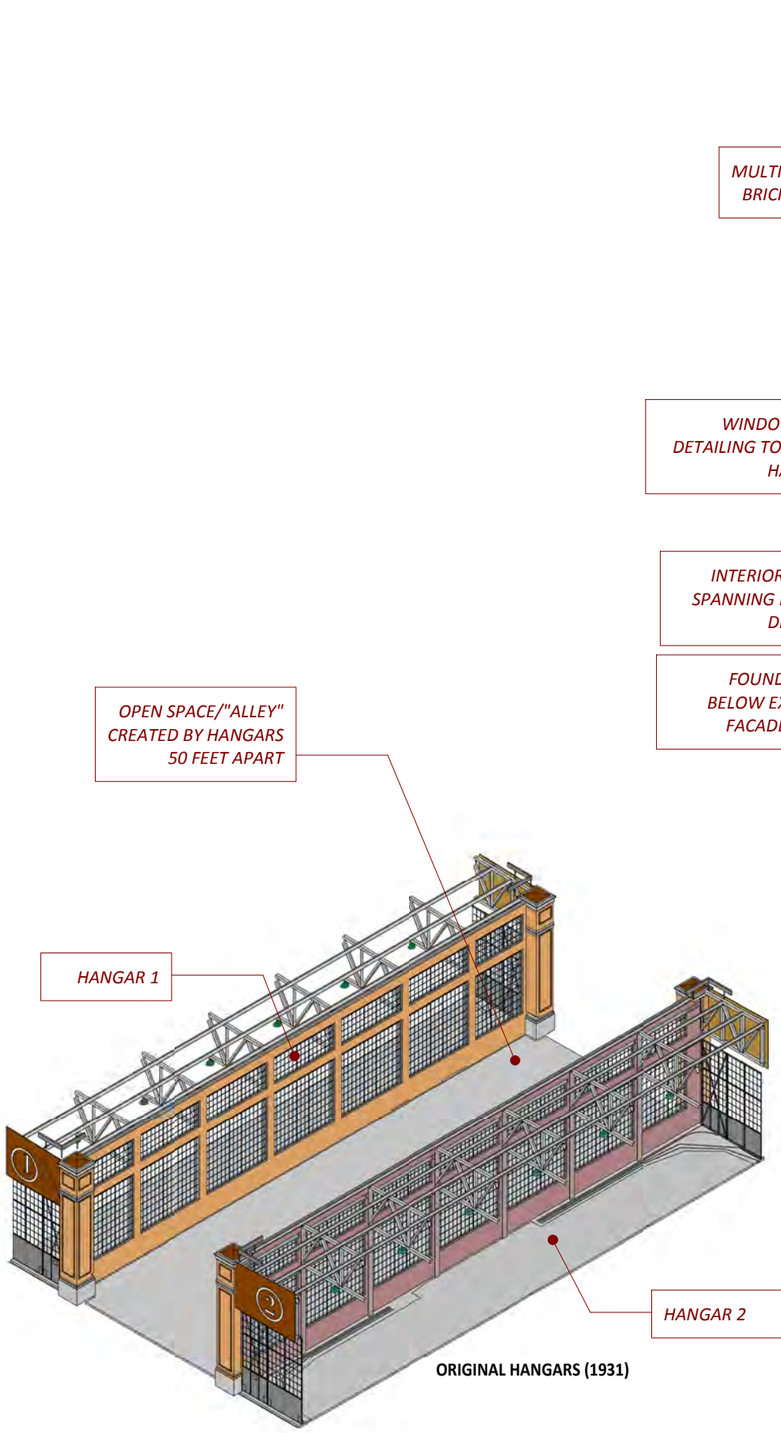
EXISTING CONDITIONS

ROOF COMPLETELY DETERIORATED/REMOVED

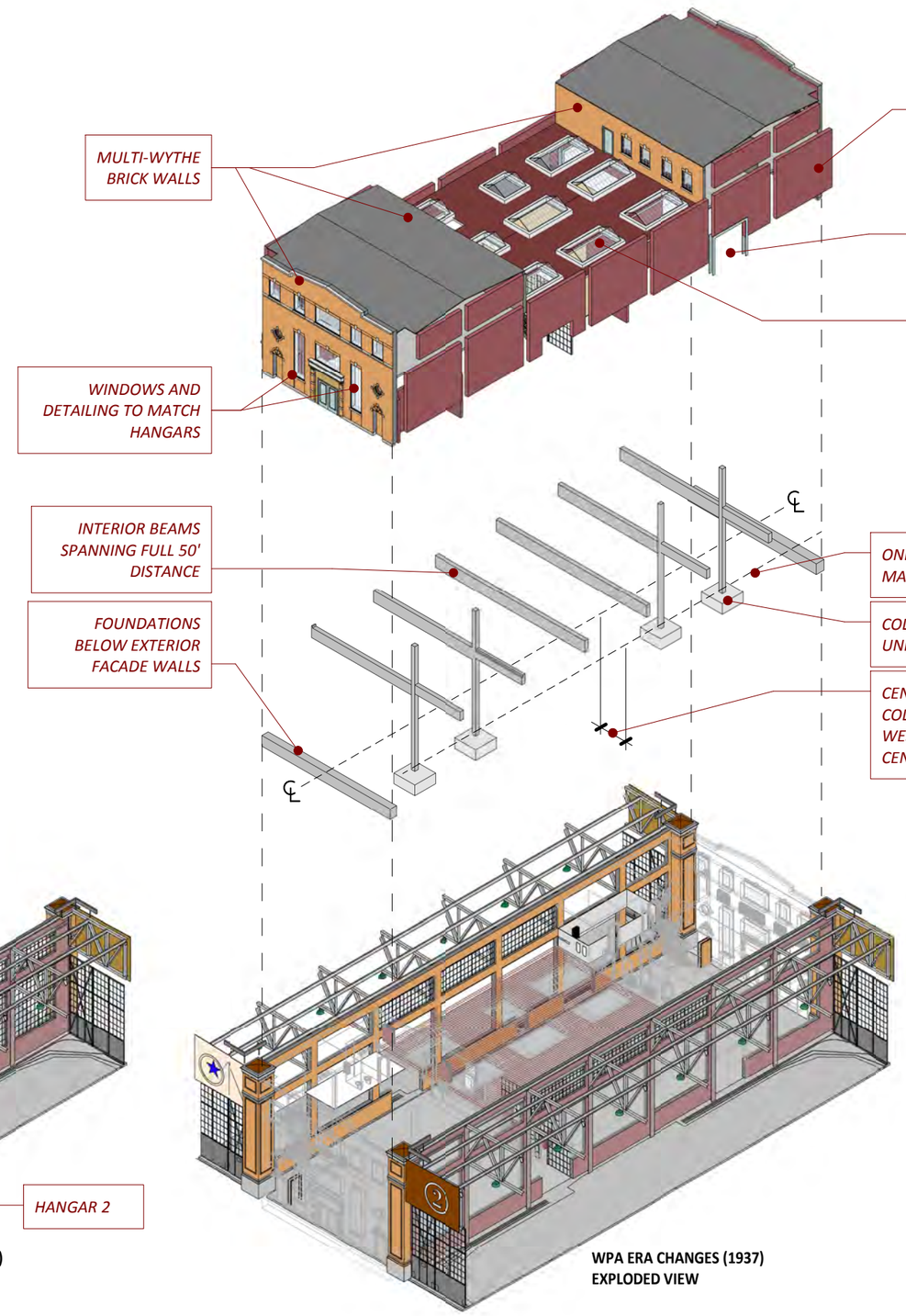
ORIGINAL LIGHT FIXTURES EXTANT IN THIS HANGAR

Figure 1.3.15

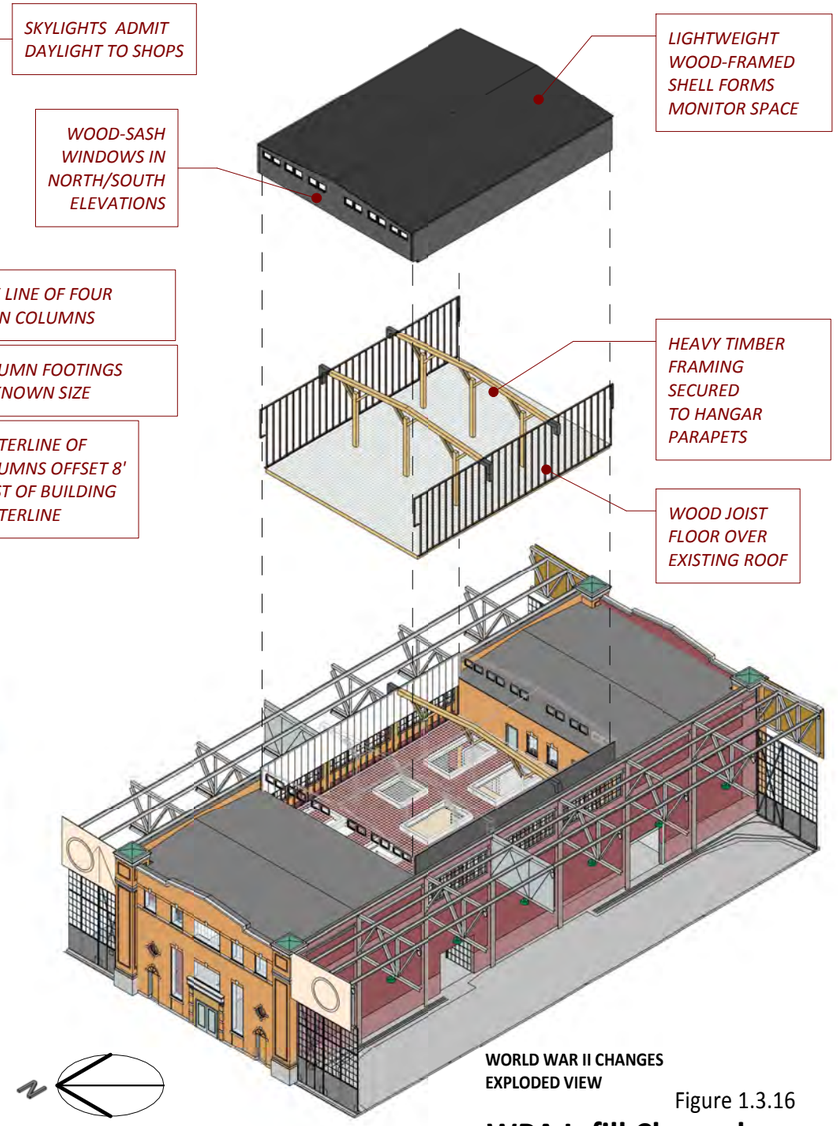
Hangar 2 Chronology - Perspective Views



ORIGINAL HANGARS (1931)



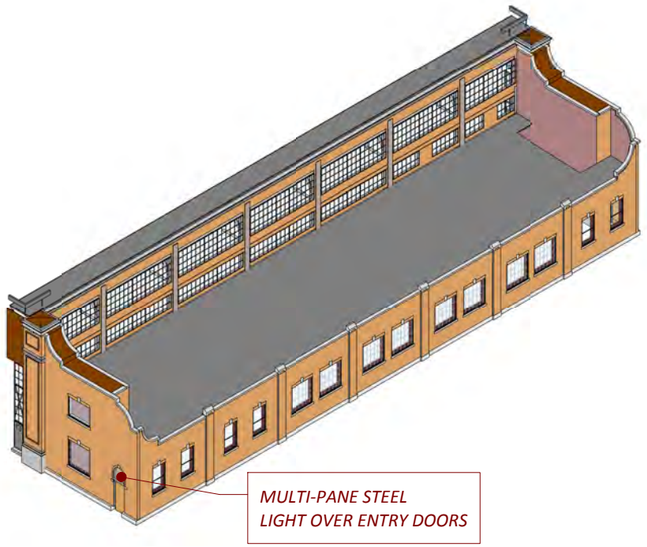
WPA ERA CHANGES (1937)
EXPLODED VIEW



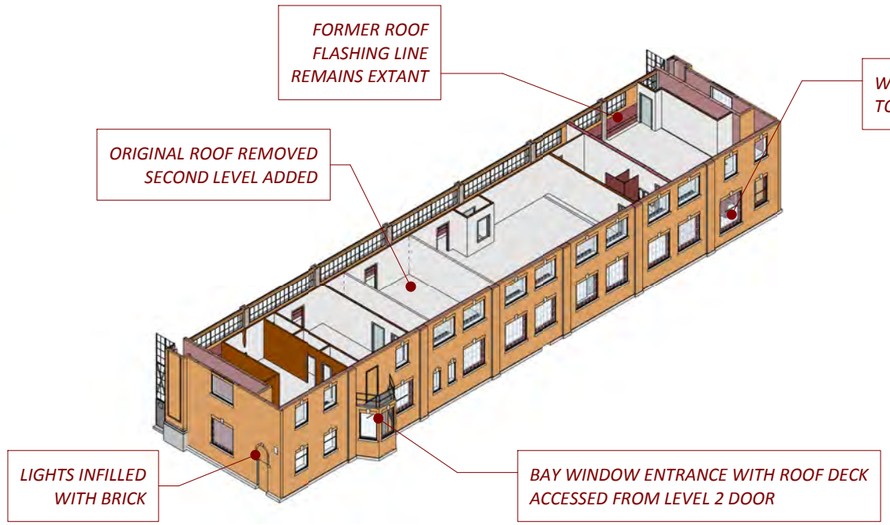
WORLD WAR II CHANGES
EXPLODED VIEW

Figure 1.3.16

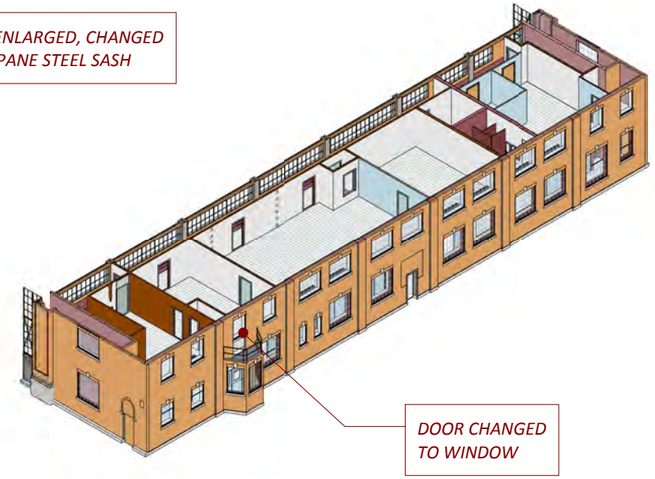
WPA Infill Chronology



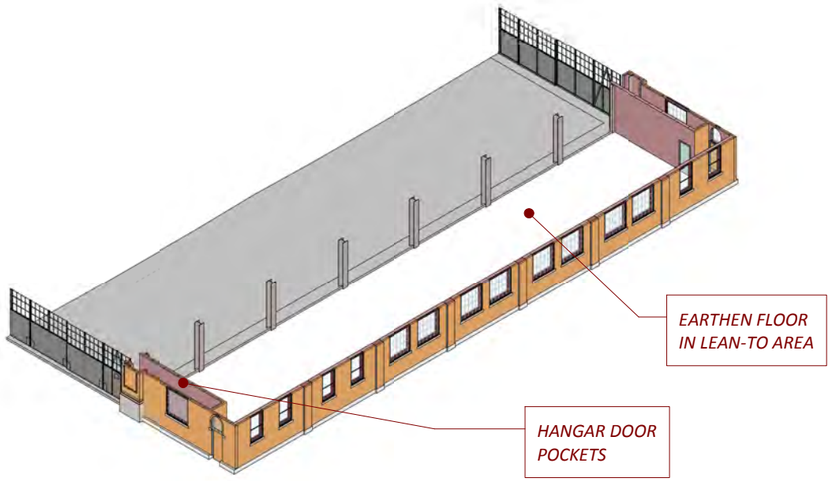
ORIGINAL (1931)



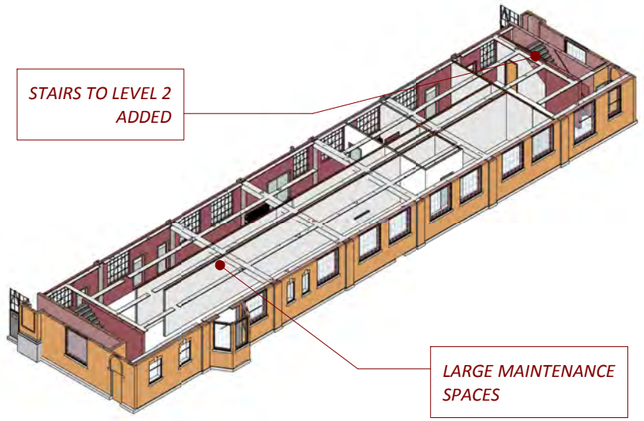
WPA CHANGES (1936-1940)



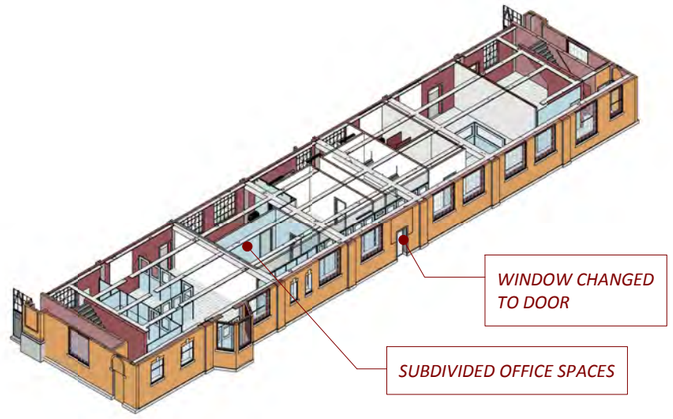
POST-WAR CHANGES (THROUGH 1972)



ORIGINAL (1931)



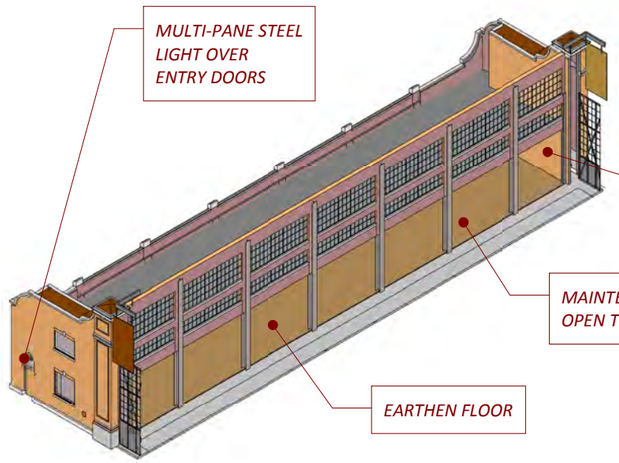
WPA CHANGES (1937-1940)



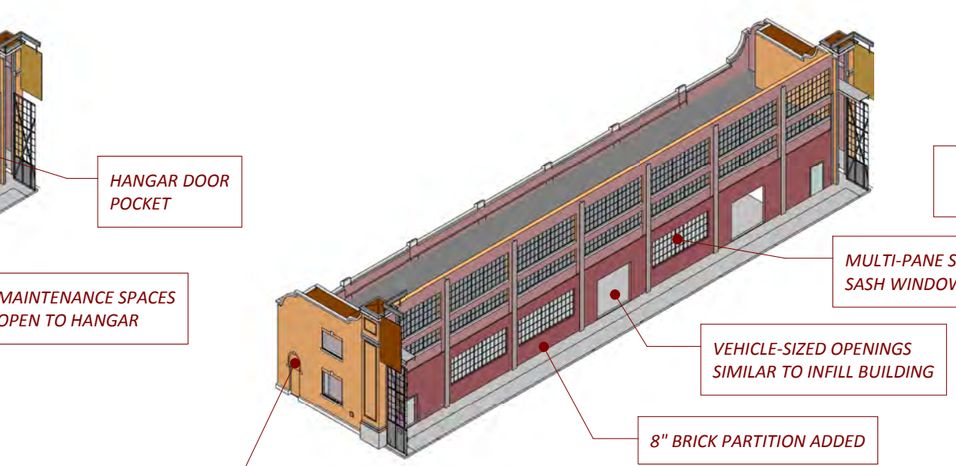
POST-WAR CHANGES (THROUGH 1972)

Figure 1.3.17

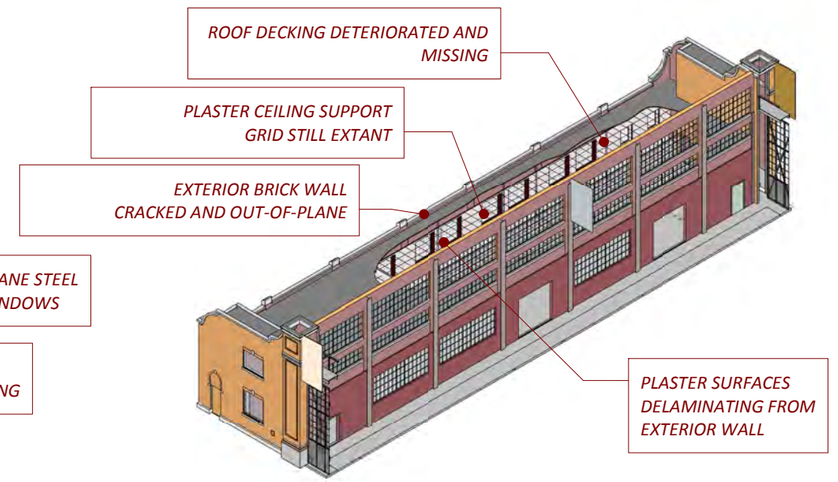
Hangar 1 Lean-to Chronology



ORIGINAL (1931)



WPA CHANGES (1937-1940)

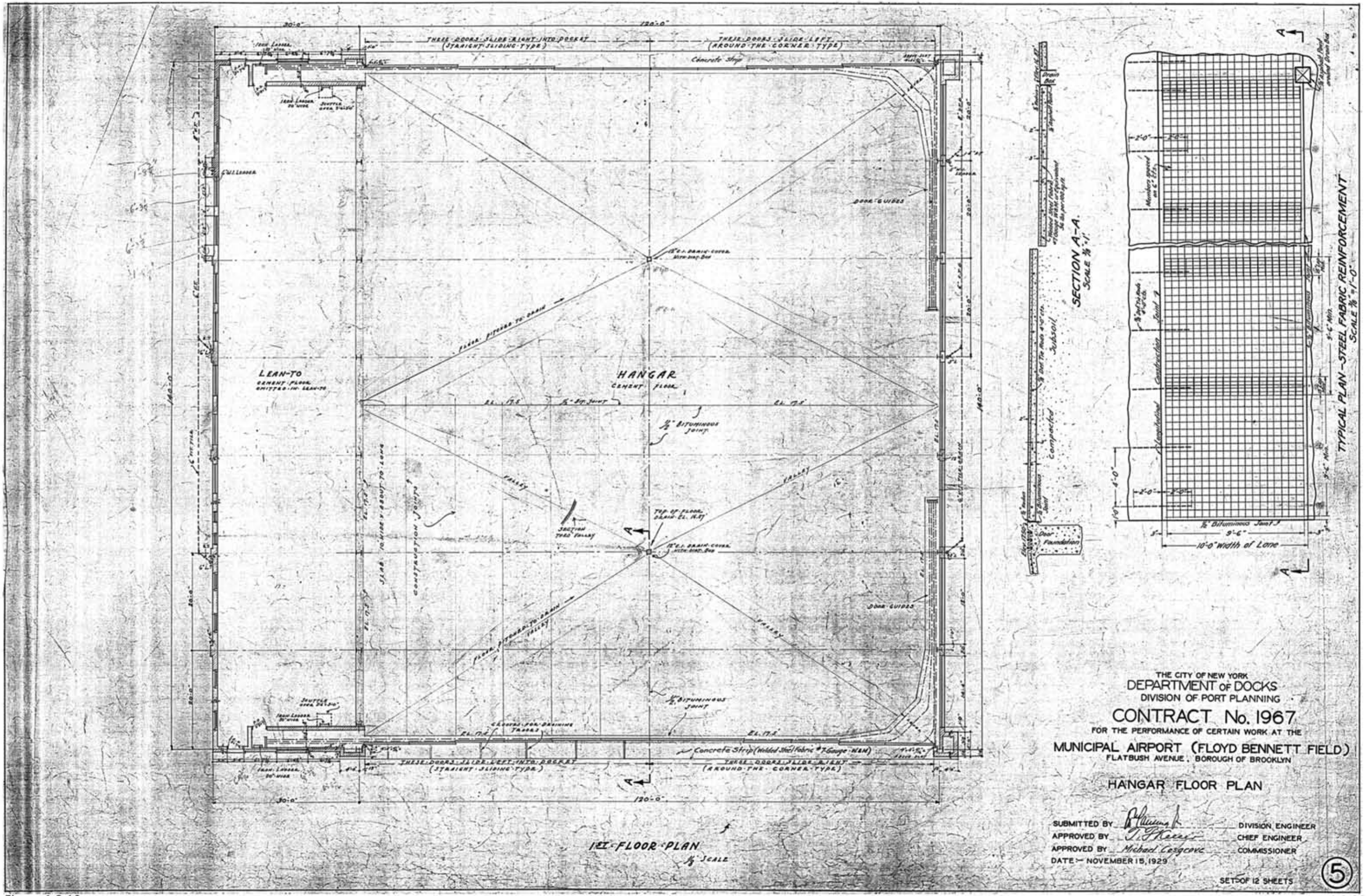


EXISTING CONDITIONS (THROUGH 2013)

N

Figure 1.3.18

Hangar 2 Lean-to Chronology



SECTION A-A.
SCALE ⅜"=1'

TYPICAL PLAN - STEEL FABRIC REINFORCEMENT
SCALE ⅜"=1'-0"

THE CITY OF NEW YORK
DEPARTMENT OF DOCKS
DIVISION OF PORT PLANNING

CONTRACT No. 1967

FOR THE PERFORMANCE OF CERTAIN WORK AT THE

MUNICIPAL AIRPORT (FLOYD BENNETT FIELD)

FLATBUSH AVENUE, BOROUGH OF BROOKLYN

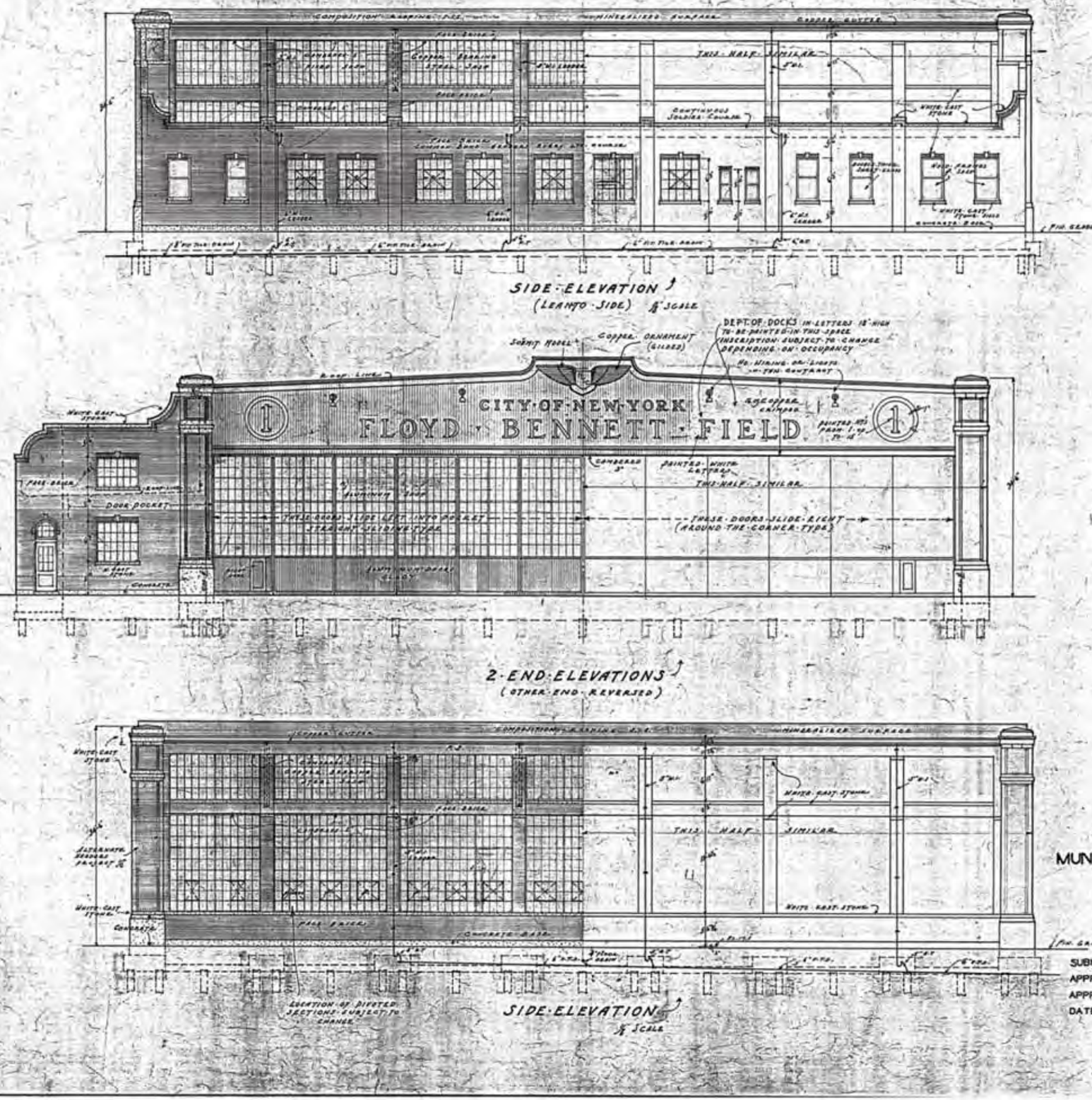
HANGAR FLOOR PLAN

SUBMITTED BY _____ DIVISION ENGINEER
APPROVED BY _____ CHIEF ENGINEER
APPROVED BY Michael Cosgrove COMMISSIONER
DATE — NOVEMBER 15, 1929

SET OF 12 SHEETS

5

Figure 1.3.19a



THE CITY OF NEW YORK
DEPARTMENT OF DOCKS
DIVISION OF PORT PLANNING

CONTRACT No. 1967

FOR THE PERFORMANCE OF CERTAIN WORK AT THE

MUNICIPAL AIRPORT (FLOYD BENNETT FIELD)
FLATBUSH AVENUE, BOROUGH OF BROOKLYN

HANGAR ELEVATIONS

SUBMITTED BY _____ DIVISION ENGINEER
APPROVED BY _____ CHIEF ENGINEER
APPROVED BY Michael Corsi _____ COMMISSIONER
DATE — NOVEMBER 15 1929

SET OF 12 SHEETS (6)

Figure 1.3.19b

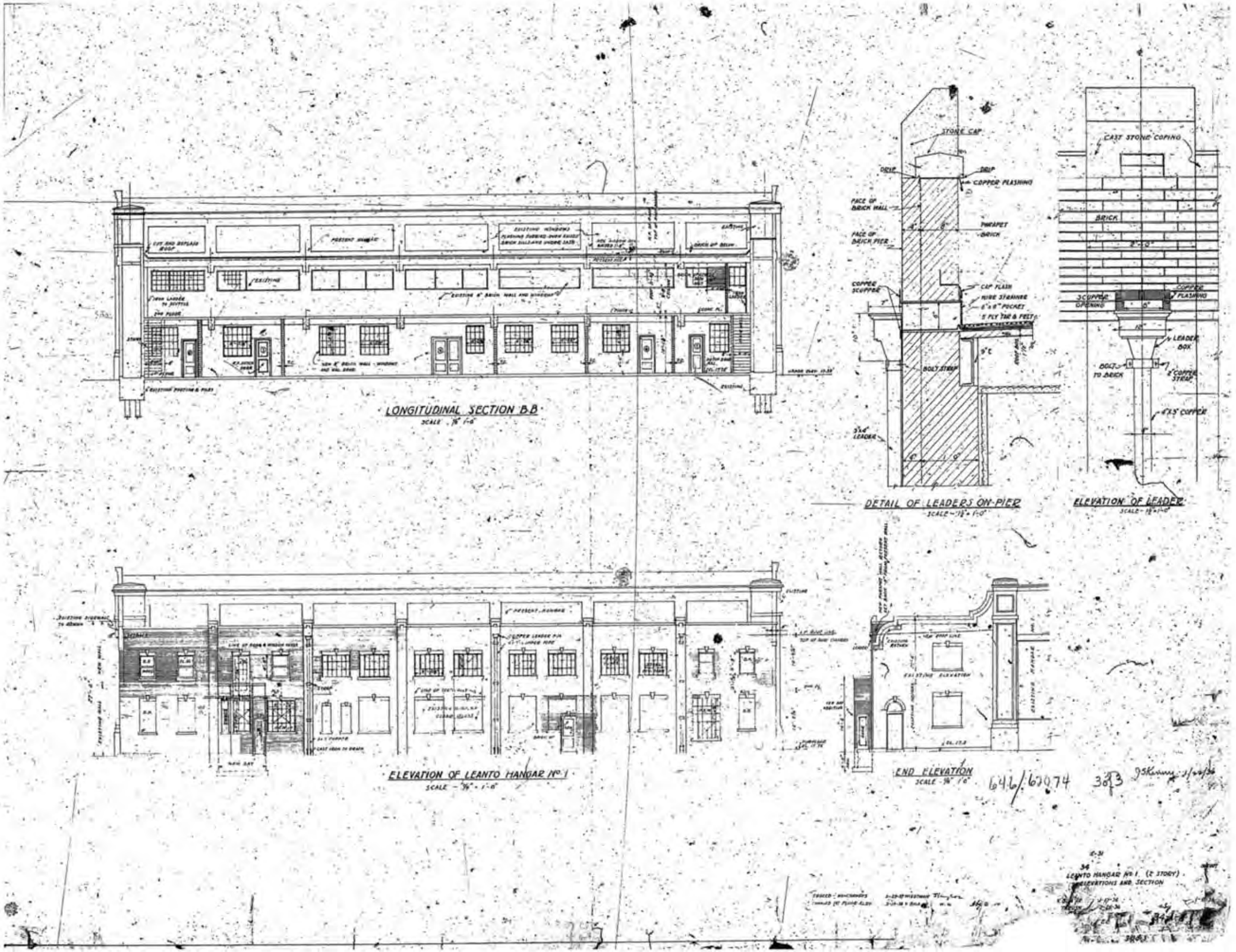
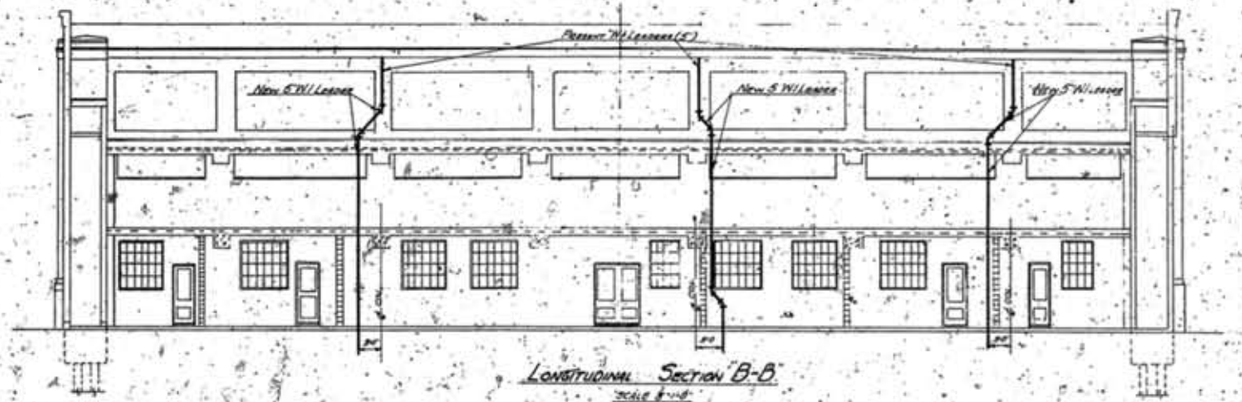
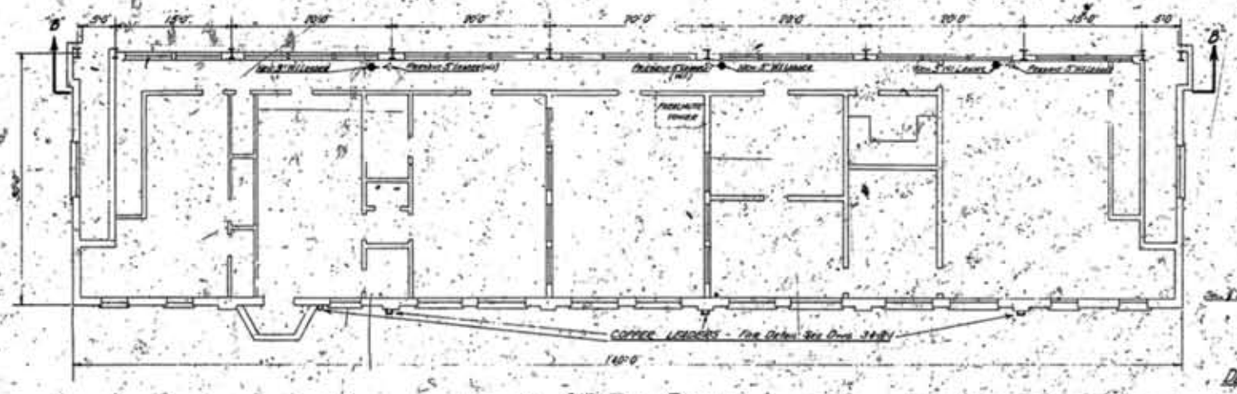


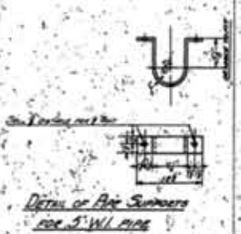
Figure 1.3.20a

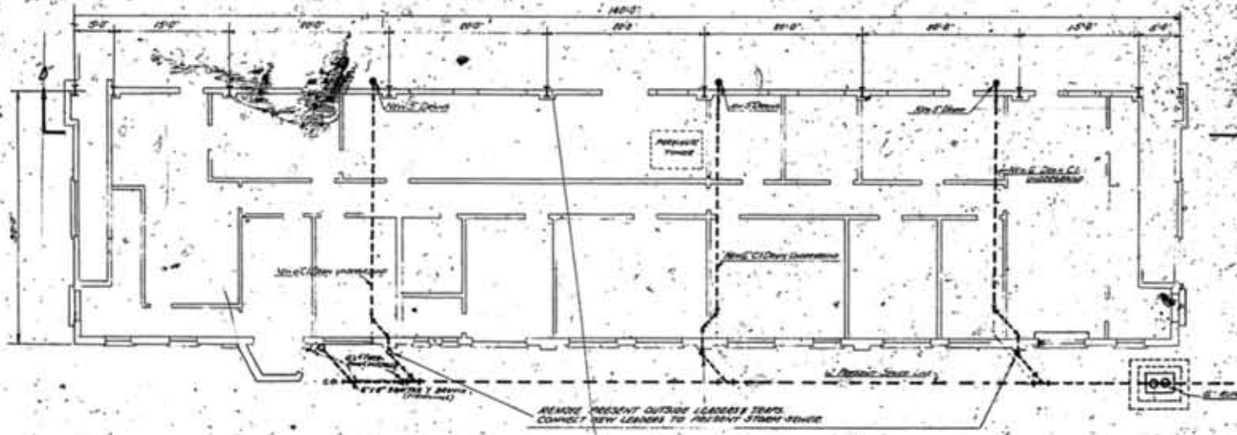


Longitudinal Section "B-B"
Scale 1/16"=1'-0"

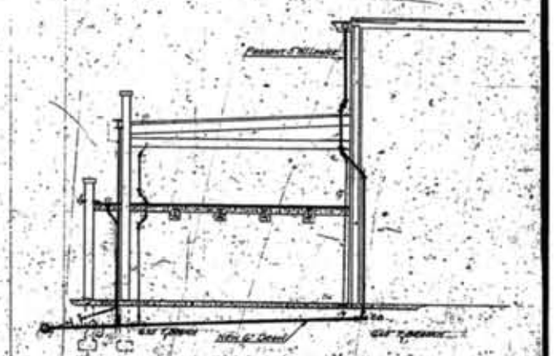


2nd Floor Plan
Scale 1/16"=1'-0"





First Floor Plan



Cross Section Thru Bay

List of Material

Item	Unit Qty.	Description	Remarks
1	3	5"C.I. Roof Leader Connection	ORD.
2	40	45° Short Turn 5"C.I. Screwed Ext. Gutter	ORD.
3	3	45° Short Turn 5"C.I. Screwed Ext. Gutter	ORD.
4	1	6"x5" C.I. Reducer	ORD.
5	6	W.I. Expansion Joint Sleeve Bands	ORD.
6	1	6"x5" Screwed T. Branches	ORD.
7	4	6" C.I. Caped Sewer	ORD.
8	15	Lengths 6" Spigot Hub C.I. Sewer Pipe	ORD.
9	5	Lengths 6" Double Hub C.I. Sewer Pipe	ORD.
10	4	Lengths 10'-0" 5" W.I. E.H. Galv. Pipe	Double Pressure Pipe ORD.
11	2 Bbls.	Lead	Spare
12	40 lbs.	Yarn	Spare
13	6	Lengths 10'-0" 5" E.H. Plain Iron Leader	ORD.
14	50	5" Approved	ORD.
15	50	5"-13 Sq. No. Galv. Iron Sleeve - 5" Long	ORD.
16	50	5"-13 Hex. Hd. Iron Nuts	ORD.
17	50	5" Std. Iron Washers	ORD.
18	1	5"C.I. Roof Leader Connection	ORD.
19	1	6"x5" Cleated Hood Increaser	ORD.
20	1	6" Spigot Hub Y Branch	ORD.
21	4	6" C.I. 1/8 Bends	ORD.
22	1	5"C.I. Sanitary T. Inlet, Spigot Bends	ORD.
23	1	6" Running Trap with Double Hub	ORD.
24	1	Lengths 10'-0" 5" W.I. E.H. Galv. Pipe	ORD.
25	4	Lengths 6" Spigot Hub C.I. Soil Pipe	ORD.
26	16	5" Std. W.I. Galv. Nipples 6 1/2" Lg.	ORD.
27	2	5" Std. W.I. Galv. Nipples - 5" Lg.	ORD.
28	2	5" E.H. I.B. Ferrule	ORD.
29	1	5"x5" C.I. Coupling	ORD.
30	1	Sheet Lead 5'-6" Wide x 8'-0" Lg.	ORD.
31	3	6" C.I. Running Traps "Double and Light" Approved Type	ORD.

646/62074 283
Detail Previous Prints

Floyd Bennett Airport
Brooklyn, N.Y.

34
Roof Drainage
For Leaders - Sheet No. 1 - Main Building

5" Leaders Relocated 3-19-37

Drawn H.G.B. 10-10-36
Traced H.G.B. 10-10-36
Checked [illegible]
Lines Checked 11-24-36

34-M-11 X

Figure 1.3.20b

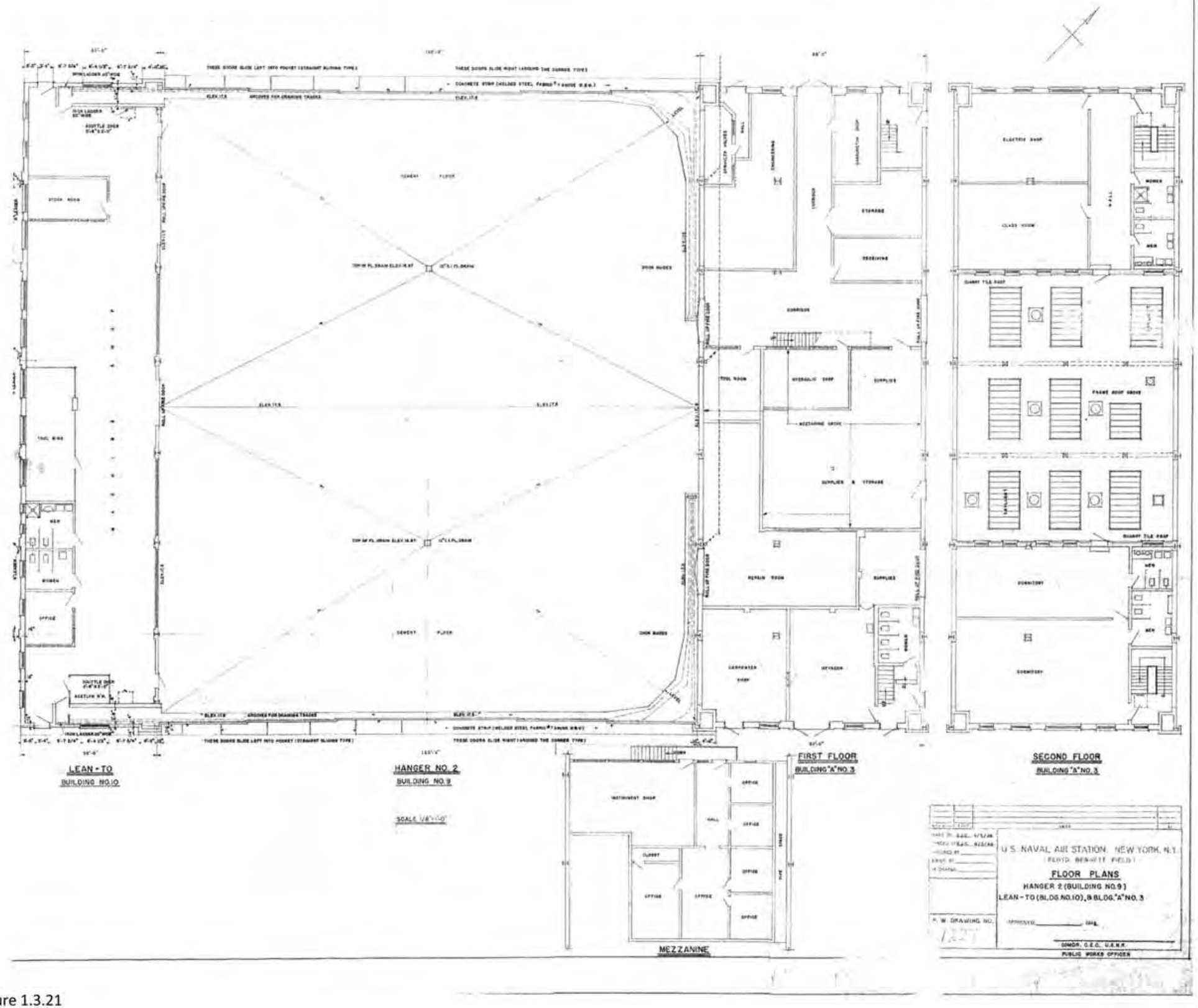

LEAN - TO
BUILDING NO.10
HANGER NO. 2
BUILDING NO.9
SCALE 1/8"=1'-0"
MEZZANINE
FIRST FLOOR
BUILDING "A" NO. 3
SECOND FLOOR
BUILDING "A" NO. 3
U.S. NAVAL AIR STATION, NEW YORK, N.Y.
(FLOYD BENNETT FIELD)
FLOOR PLANS
HANGER 2 (BUILDING NO.9)
LEAN - TO (BLDG.NO.10), & BLDG."A" NO. 3

Figure 1.3.21

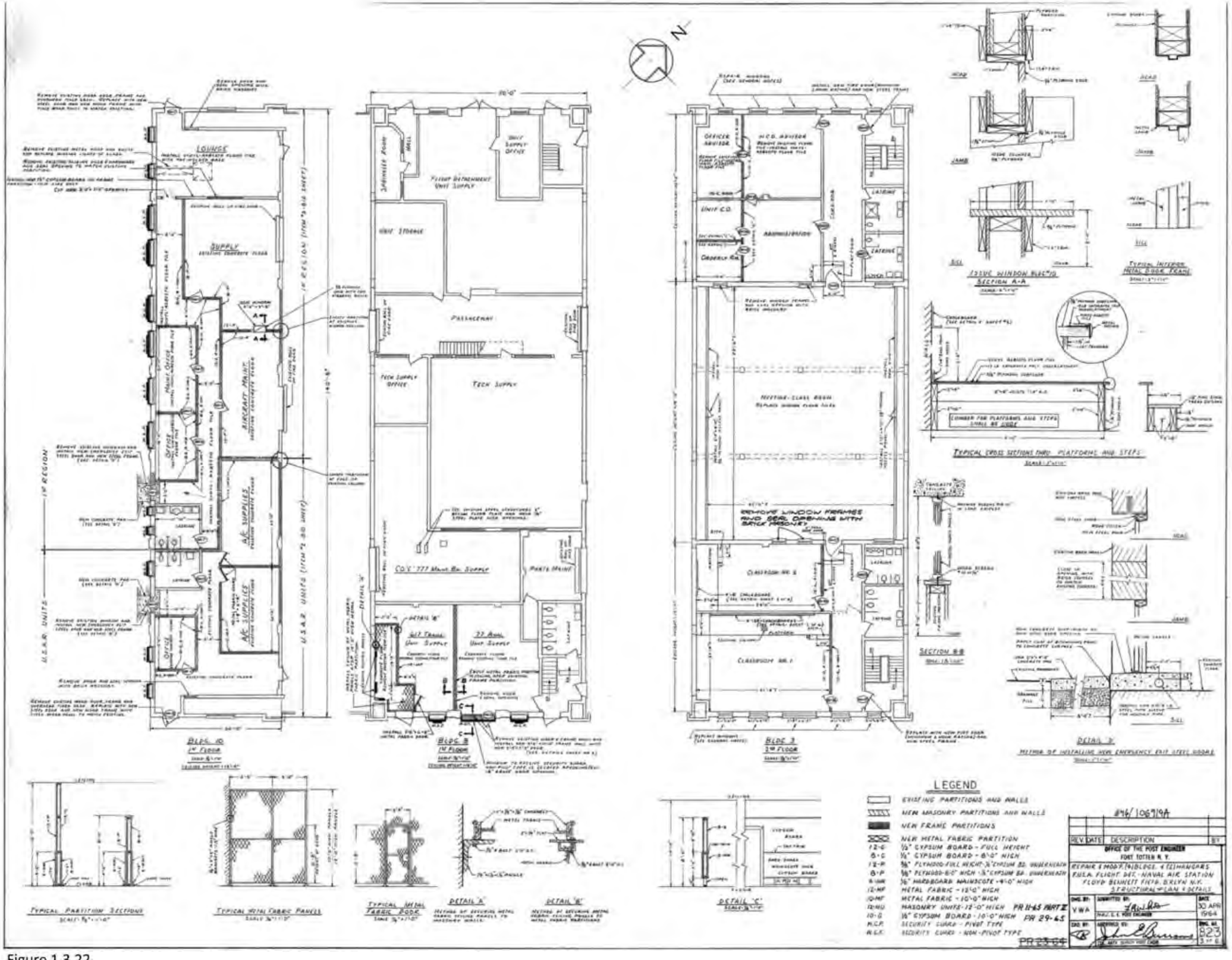

LOUNGE
SUPPLY
AIRCRAFT MAINT.
OFFICE
A/C SUPPLIES
A/C SUPPLIES
OFFICE
1st REGION
U.S.A.R. UNITS (ITEM 2 OF 80 UNITS)
BLDG. 10
1st FLOOR
Flight Detachment Unit Supply
Unit Storage
Passageway
Tech Supply Office
Tech Supply
C.O.'s 777 Maint. Bn. Supply
Parts Maint.
Unit Supply Office
77 Armd. Unit Supply
BLDG. 8
1st FLOOR
N
OFFICER ADVISOR
N.C.O. ADVISOR
UNIT C.O.
ADMINISTRATION
CLASSROOM NO. 2
CLASSROOM NO. 1
REMOVE WINDOW FRAMES AND SASH OPENING WITH BRICK MASONRY
BLDG. 3
2nd FLOOR
ISSUE WINDOW ELEC'TG
SECTION A-A
Typical Interior Metal Door Frame
TYPICAL CROSS SECTIONS THRU PLATFORMS AND STEPS
SECTION B-B
DETAIL 'D'
METHOD OF INSTALLING NEW EMERGENCY EXIT STEEL DOORS
Typical Partition Sections
Typical Metal Fabric Fences
Typical Metal Fabric Door
DETAIL 'A'
DETAIL 'B'
DETAIL 'C'
LEGEND
EXISTING PARTITIONS AND WALLS
NEW MASONRY PARTITIONS AND WALLS
NEW FRAME PARTITIONS
NEW METAL FABRIC PARTITION
12-G ½" GYPSUM BOARD - FULL HEIGHT
6-G ½" GYPSUM BOARD - 6'-0" HIGH
12-P ⅜" PLYWOOD-FULL HEIGHT-½" GYPSUM BD. UNDERNEATH
6-P ⅜" PLYWOOD-6'-0" HIGH - ½" GYPSUM BD. UNDERNEATH
6-HB ¼" HARDBOARD WAINSCOTE-4'-0" HIGH
12-MF METAL FABRIC - 12'-0" HIGH
10-MF METAL FABRIC - 10'-0" HIGH
12-MU MASONRY UNITS-12'-0" HIGH PR 11-65 PART 2
10-G ½" GYPSUM BOARD - 10'-0" HIGH PR 29-65
H.C.P. SECURITY GUARD - PIVOT TYPE
H.C.F. SECURITY GUARD - NON-PIVOT TYPE
PR 23-64
846/10619A
REV DATE DESCRIPTION BY
OFFICE OF THE POST ENGINEER
FORT TOTTEN N. Y.
REPAIR & MODIFY BLDGS. 4 TEL HANGARS
BULK. FLIGHT DET. NAVAL AIR STATION
FLOYD BENNETT FIELD, BKLYN N.Y.
STRUCTURAL PLAN & DETAILS
DWG BY: V.W.A.
SUBMITTED BY:
ASST. C.E. POST ENGINEER
DATE: 30 APR 1964
DWG NO. 823
3 OF 6
APPROVED BY:
POST ENGINEER

Figure 1.3.22

1.4 PHYSICAL DESCRIPTION OF HANGARS 1 AND 2

Hangars 1 and 2, including their adjacent lean-tos and the WPA Infill building between them, make up the southernmost hangar complex in the National Register–designated Historic Hangar Row. The hangar complex is located approximately 900 feet to the south of the Administration Building (now restored and reopened to the public as the Ryan Visitor Center). Other contemporary hangar complexes include Hangars 3 and 4, immediately to the north, and Hangar Complexes 5/6 and 7/8, now combined into the Aviator Sports and Recreation facility to the north of the Ryan Visitor Center.

The site is located within the Jamaica Bay Unit portion of the Gateway National Recreation Area, Floyd Bennett Field, on Flatbush Avenue in Brooklyn, New York. Hangers 1 and 2 are directly surrounded by unoccupied buildings to the south, Flatbush Avenue to the west, Hangars 3 and 4 to the north, and a parking lot consisting of asphalt paving block with overgrown areas and former runways to the east. The hangars are currently unoccupied, and the site is generally marked by an expansive openness and wind-blown silence.

In the immediate vicinity of the hangars (within 100 feet), the only permanent site features are fire hydrants and post indicator valve (PIV) stanchions, which are located at strategic positions around the building's perimeter. This fire suppression infrastructure dates to the period of significance. Bollards, both modern and historic, protect some of the fire suppression stanchions.

The adjacent site paving to the north, east, and south consists of 5-inch x 12-inch asphalt block, laid in either parallel or diagonal configurations. A narrow, overgrown space separates the western extent of the hangars from the Flatbush Avenue fence; extant or historic paving in this area could not be determined. Extensive areas of the original paving block zones have been resurfaced subsequent to the period of significance with additional asphalt; however, in most cases, the original paving blocks are discernible below these more recent layers. In some areas, asphalt paving blocks have been completely removed in favor of the continuous asphalt paving.

Within the network of pavers and asphalt topping are located several manholes, drain grates, and access convers for utility trenches and drainage. The cast-iron covers exhibit customized markings and notations unique to Floyd Bennett Field, and date to the period of significance. Other site elements are the Flatbush Avenue street trees to the west of the Hangars, several of which appear to date to the period of significance, and the non-significant, temporary chain-link fencing and concrete barriers situated at west-facing access points to prevent trespassing at this hangar complex.

One hundred and fifty feet of open space separates Hangars 1 and 2 from Hangars 3 and 4 to the north. The subject area consists of two original aircraft hangar buildings, integral lean-to buildings, and the WPA Infill later constructed between the hangars, as well as surrounding paving. Hangar 1 lies to the east (airfield side) and Hangar 2 lies to the west (Flatbush Avenue side). Each of the hangars has a lean-to structure providing maintenance, utility, and office space. The WPA Infill is a large two-story utility, dormitory, and office building. Interior passage between the hangars is made possible by passageways within the infill.

The hangars are 120 feet running east-west and 140 feet deep (Photograph 1.4.1). The lean-tos, attached to and contiguous with the east side of Hangar 1 and the west side of Hangar 2, are 30 feet in width and also 140 feet deep. The WPA Infill spans the former 50-foot gap between the hangars, and shares the same 140-foot depth (Photograph 1.4.2).



Photograph 1.4.1. General view of hangar complex, south elevation.



Photograph 1.4.2. General eastward view along south elevation, showing WPA Infill façade.

The architectural style of the hangars is consistent with other factory or utility buildings in early-twentieth-century America. This is a style marked at the exterior by expanses of brick and modern multi-paned steel sash/wireglass windows. The building incorporates a mix of decorative elements, including pediments, pilasters, quoining, round windows, arches, and the like. Special attention is also given to masonry detailing; iron-flecked reddish/orange glazed brick is laid in common bond, with header rows every sixth course. The brick masonry is embellished with rowlock brick and other ornamental patterning, and is further augmented by cast-stone courses and copings. This is in stark contrast to the interior, where almost no ornamental features at all are in evidence, and exposed steel, common brick, and reinforced concrete dominate the materials palette. A network of utility piping and mechanical equipment strongly reinforces the utilitarian character of the space.

This relationship between a "contextual" public face and a "practical" interior closely parallels the pre-war factory work of Albert Kahn and other architects, who pioneered the introduction of larger factory buildings within an architecturally established urban context. This modestly ornamented architectural expression is strongly indicative of the hangars' period of construction, as post-war industrial infrastructure very quickly dispensed with such accoutrements. (This can even be demonstrated at Floyd Bennett Field, where the surviving post-war Hangar B located across the field is largely utilitarian in exterior design.)

The dominant exterior expression of the north and south façades is the expanse of aluminum-framed hangar doors, which are filled with glass panes sized to match those of the windows in the building's clerestories. Viewed from the east or west, the elevations are a proportional mix of windows and brick wall, dominated by seven bays with simple pilasters, which support the steel beams of the roof structure (Hangar 2 Lean-to) and the second floor (Hangar 1 Lean-to), respectively. The hangars' relationship to the lean-tos is accomplished through graduated step-downs and arcs in the cast-stone parapet along the short elevation of the lean-tos, beginning from the 35-foot-high hangar pilasters. The complex's steel windows are fixed sash with interior panes framed to pivot open in most cases. Exterior window openings are generally ornamented with a cast-stone sill, flat soldier course arches, and prominent cast-stone keystones.

Throughout this HSR, both the north and south elevations of Hangars 1 and 2 will be referred to as "façades." Although most buildings are designed to have only one architectural front, the north and south sides of Hangars 1 and 2 are almost identical in design. This is in contrast with the adjacent

Hangars 3 and 4, which have markedly different north and south elevations due to variation in the WPA Infill elevations.

Along Hangar Row, the WPA Infill elevations facing inward towards the Administration Building, easily visible to airport visitors, were richly ornamented. These are the north façade of Hangars 3 and 4 and the south façade of Hangars 5 and 6 (now the Aviator Sports and Events Center). The WPA Infills at both of these façades feature sculptural cast-stone elements depicting wings and "N.Y.C." The opposite WPA Infill elevations (south elevation of Hangars 3 and 4 and north elevation of Hangars 5 and 6) were completely unadorned, lower in height and clearly inferior.

A different condition exists at Hangars 1 and 2, the subject of this report. While not as richly ornamented as the north façade of Hangars 3 and 4, both the north and south WPA Infill façades are architecturally developed far in excess of utilitarian requirements. A possible interpretation would be that the WPA-era architects equalized the façades to account for the orientation towards (and partial view from) the Administration Building to the north, as well as the view of the south façade as seen from Flatbush Avenue, as it was the first façade encountered from the south for Hangar Row as a whole. Hangars 7 and 8 share this equalized condition at the north end of Hangar Row.

The floors in Hangars 1 and 2 are 6-inch cast-in-place concrete slabs on grade, pitched towards area drainage along the north-south centerlines. The slabs have regular joints at 10-foot intervals running east-west, and are divided once north-south. At the interior perimeter, surrounding the pitched slabs, is a separate concrete curb of varying width that accommodates the tracks for the hangar doors and matches the floor elevation of the lean-tos and infill. This perimeter curb is higher in elevation than both the interior slab and the exterior paving, and slopes at the north and south hangar door façades to the exterior paving level, serving as a berm which sheds fluids and debris in both directions. This appears to prevent flooding into the hangar and spillage out of the hangar. The raised and sloped curb also appears to prevent excess fouling of the hangar tracks.

The lean-to floors were originally left unfinished as earthen floors, but contract drawings dated 1931 show the addition of a 6-inch cinder concrete slab, built at an elevation to match the perimeter curb of the main hangar spaces. The infill used the original open alley (the concrete apron between Hangars 1 and 2) as its finish flooring. In some areas, wooden sleepers and wood finish flooring was laid over the original concrete. Floor slabs at Level 2 of Hangar 1 Lean-to, along with Level 2 of the WPA Infill, are cast-in-place reinforced concrete. Roofing throughout the complex, where extant, is built-up roofing, laid over insulation and 8-inch wooden tongue-and-groove planking. The planking is secured to wooden nailers bolted to the structural steel purlins fastened to the top members of the steel trusses. There are several roof penetrations and openings for access and ventilation purposes. Copper gutters and scuppers, combined with wrought-iron drainpipes and leaders, drained water from the roof. Flashing throughout was copper.

Contributing site features (in addition to the open space surrounding the hangar complex) include original asphalt paving block, fire hydrants, post indicator valves, mature trees, and several original cast-iron manhole covers stamped with "Floyd Bennett Field" and "Department of Docks" (Photograph 1.4.3). There is additionally a geodetic survey monument embedded in the concrete base of Hangar 2's northwest pier.

Detailed physical descriptions of the various complex buildings and their interior spaces follow in separate sections below. These descriptions are meant to be used in conjunction with the plans,

elevations, and three-dimensional graphics presented elsewhere in this report. All areas of the hangar complex were photographed and measured, including all interior elevations and notable details. A limited selection of these photographs have been included as part of this narrative to augment the physical descriptions and drawings; the locations of these photos are noted with arrowed numbers on the floor plans. The entire catalog of photos, in excess of 2,000 images (including about 15–20 photographs per each interior space), is included on a CD bound with the HSR.



Photograph 1.4.3. View of post indicator valve dating to the WPA Infill construction campaign, during which fire suppression features were added to the hangars. Site elements including paving and manhole covers are important contributing elements.

Hangar 1 (Figure 1.4.1)

Exterior

The hangars have two main elevations, to the north and south. Per discussion in the previous section, both of these elevations will be referred to as façades, as they both serve as major architectural fronts for the complex.



Photograph 1.4.4. Exterior view of east (airfield) elevation, showing roof patching and wall failure due to missing flashing. Note extensive vegetative growth.

At Hangar 1, the original west elevation is now the interior wall at the WPA Infill. The east elevation is dominated by Hangar 1 Lean-to, discussed in a subsequent section. There is a clerestory of east windows above the roof-line of the lean-to, admitting light into the main hangar space (Photograph 1.4.4; Photographs B.1 and B.2, see Appendix B).

North Façade

Hangar Doors. The north façade of Hangar 1 is composed primarily of aluminum alloy hangar doors, over which is extended the main low-slope gable end of the hangar (Photograph 1.4.5).

The nine existing hangar doors are of two widths, with a narrow door at the western end and eight wider doors in the remaining positions. Three easternmost doors, including one narrow door and two wider doors, are missing; originally, this façade had 12 doors. The narrow doors have pilot doors for entry directly into the hangar and are X-braced for additional strength. The doors on the east side retract in-line into an in-line hangar door pocket at the adjacent lean-to (Photograph B.3); the doors on the west side retract by turning 90 degrees along the interior west wall of this hangar. With all hangar doors fully retracted, a full-width, clear-span opening is created.



Photograph 1.4.5. Exterior view of north façade.

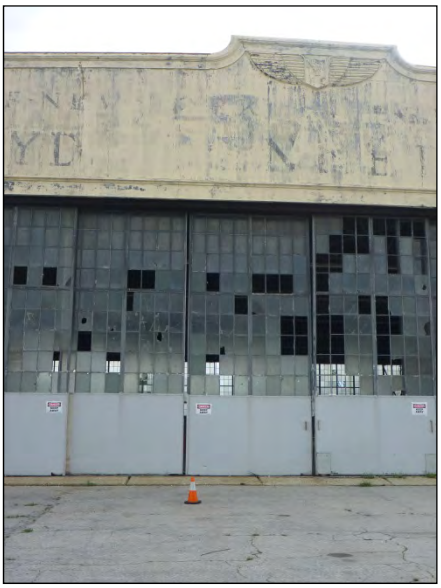
The hangar doors run on three sets of steel tracks, embedded in the concrete below and suspended overhead from the steel roof structure. These multiple tracks allow the doors to be stored in three stacks. Each hangar door panel has two spring-adjusted caster wheels at its base and two additional caster wheels at its top. The hangar doors are manually operated, possibly because of their lightweight construction. With the exception of the steel wheels, all components of the hangar doors are aluminum channels, panels, or struts, including the window sash. At the end doors, the lateral bracing and pilot door are steel.

Each hangar door is approximately 22 feet, 6 inches in height, with window sash above a 6-foot, 6-inch datum and opaque aluminum panels below. In a typical door (i.e., non-end units), there are four main

sub-frames of sash, with two 4-x-4-foot sub-frames above two 4-x-5-foot sub-frames. Each sub-frame is subdivided into multiple 14-x-20-inch lights by narrow aluminum muntins. At the atypical end doors, the area of glass sash is divided into six sub-frames, with three 2-x-4 sub-frames over three 2-x-5 sub-frames. Many of the wireglass lights in the hangar doors are cracked, broken, or missing. It is evident that some lights have been replaced with non-period glass panes, but others appear to be original. The glazing putty has largely failed.

The three easternmost hangar doors are believed to be among those located in the "discard pile" of hangar doors found in Hangar 2, most of which are from the unrelated Aviator Complex rehabilitation during the mid-2000s. Many components of the extant doors are loose and deteriorated. Seals, thresholds, fasteners, and gaskets are in poor or non-existent condition, which causes the doors to clatter and shake markedly during windy conditions.

Gable End. The low-slope gable end (or fascia) above the doors is the second major component of the north façade. The gable end's size is determined by the trusses beyond it, for which it serves as an end cap. The gable is composed of horizontally oriented wood planking fastened to the northernmost steel truss, which appears to be the same type and dimension as wood planking used for the roof. The gable is finished at the exterior with corrugated 16-gauge copper sheeting, lain vertically in 32-inch-wide sheets. A raised copper emblem is at the high point of the gable, depicting "N.Y.C." on a shield flanked by two wings. Raised copper medallions exist at the easternmost and westernmost extremes of the gable, originally serving to frame the hangar number. The copper sheathing has a cornice and lower molding which appears to define a frieze. This frieze is coated with several coats of beige paint, with impressions of black lettering from previous tenancies still discernible (Photograph 1.4.6). Sconce light fixtures are extant across the length of the gables, mounted approximately 12 inches below the formed copper cornice. These fixtures are simple, downward-facing, bowl-shaped reflectors standing off the fascia on rigid stems with additional diagonal brackets. Each gable originally included four such sconces, evenly distributed on either side of the winged emblem. These fixtures at Hangar 1 are later replacements which extend twice as far as the originals still found at Hangar 2. Their date of installation is unclear and requires further study. At the north-facing gable, there are two sconces at the left (east) and two towards the right (west). At the south-facing gable, there are two on the left (west) and only one at the right (east).



Photograph 1.4.6. Exterior view of hangar doors and corrugated copper gable at north-south center line. Note remnants of earlier signage.

Framing Elements. The hangar doors and gable above it are terminated at either end by decorative brick and cast-stone pilasters, originally capped with copper. The bases of the pilasters are concrete. At Hangar 1, the east pilaster is continuous with the north façade of the lean-to.

South Façade

The south façade of the hangar is similar to the north façade, with similar features. All of the hangar doors are extant on this façade, and are similar in configuration to the north façade; two narrower end

doors with X-bracing and pilot doors flank 10 wider doors. One of the wider doors suffered the loss of a window frame during Hurricane Sandy in late 2012.

Roof. The Hangar 1 roof was designed with a north-south center ridge formed by the sloping top chords of the structural steel roof trusses. The roof slopes from the ridge toward its east and west edges, which were originally designed with continuous copper gutters and flashing along the building elevations. The north and south sides of the roof are bordered by formed steel parapets, which are the upper termination of the copper-sheathed gable end. The height of the parapet line is several inches above the adjacent roof.

The built-up roof consists of 1¼-inch-thick, 8-inch-wide wood tongue-and-groove planking, topped with a layer of insulation and sealed with tar. The wood planking, oriented east-west, is nailed to 3-inch-square wood nailers running north-south. These nailers run continuously along the 4-x-10-inch steel purlin channels spanning the east-west steel trusses at 6 feet on center, and are regularly through-bolted to the channels. The underside of the wood planking, visible from the hangar floor below, was originally painted off-white and later coated with a metallic silver finish. At Hangar 2, the planking is missing in most areas. The nailers and purlins are largely intact.

Interior

The interior of the hangar is a single, clear-span space, which is the most significant characteristic of its architecture. This vast space is formed by an assemblage of trusswork and bracing overhead, enclosed by opposing brick walls (to the east and west) and the row of hangar doors (to the north and south). The space is scaled by human-scale doors in the brick walls and pilot doors in the hangar doors. A network of utility pipes and valves, combined with overhead heaters, a catwalk, and exposed steel bracing, add an important secondary level of architectural interest (Photograph 1.4.7).



Photograph 1.4.7. Interior view of Hangar 1, looking southwest towards the WPA Infill.

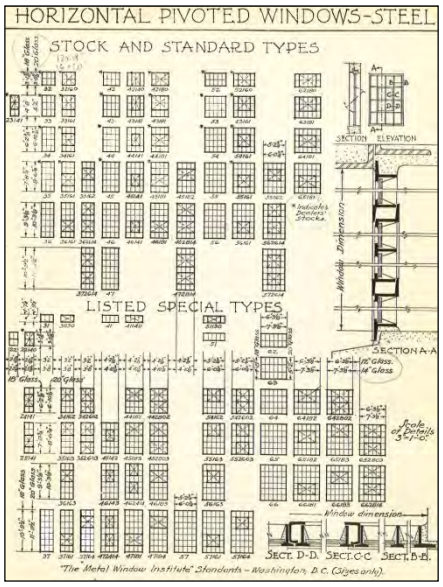
East Interior Elevation

The east-facing elevation of the interior is common "JJJ" molded brick, with expanses of steel sash window. "JJJ" stands for Juan Jacinto Jova of the Hudson River Valley. JJJ brick was used during the WPA Infill building campaign of 1937 and at the second floor of the adjacent Hangar 1 Lean-to, suggesting that this dividing wall between the main hangar bay and Hangar 1 Lean-to was completed during the same period (i.e., six years after the hangar itself). The brickwork above the first horizontal steel girt (approximately 14 feet, 6 inches above the floor level) is part of the original exterior enclosure of the hangar and thus older than the brickwork below it.

The elevation is divided into three distinct levels: the various entrances and windows into the first level of the lean-to, topped by more continuous rows of steel windows at the second (low clerestory) and roof (high clerestory) levels. The brick and glass are divided into regular bays by the exposed steel columns supporting the roof trusses. The second-level steel windows were originally exterior, but were later enclosed by the construction of the adjacent lean-to's second floor.

The steel sash windows along the length of this elevation differ in size, configuration, and geometry. Most early-twentieth-century steel sash windows hosted ¼-inch wireglass panes with four standard dimensions, 12 or 14 inches wide by 18 or 20 inches tall. The hangar complex uses all of these sizes, with the larger size more common in the hangars and the smaller size typical at the lean-tos. The panes were vertically oriented within the window (shorter side as horizontal). The windows could be specified with or without pivoting sash. Nearly identical steel sash windows based on this system were built on tens of thousands of pre–World War II industrial and institutional buildings, particularly in the Northeast and industrial Midwest.

In the 1930s, contemporary with the construction period of the hangars, the Metal Window Institute (abbreviated within this document as "MWI") published a directory of standard steel window sizes to clarify orders and ease specification (Photograph 1.4.8). This reference system was so universally accepted that it was included in contemporary editions of *Architectural Graphic Standards* (Ramsey and Sleeper), the ultimate reference source in a typical architectural office both then and now. Each window type was given a two- or five-digit number (occasionally six). The first digit was the number of columns (panes running horizontally), while the second digit was the number of rows (panes running vertically)—e.g., a fixed sash window with three columns and five rows of panes (regardless of pane size) was a type 35.



Photograph 1.4.8. Standardized system for the manufacture and specification of horizontal pivoted windows (Source: Architectural Graphic Standards 1936).

If a window featured a pivoting sash, it was given a five-digit number. The first two digits were still columns and rows. The third digit, either 1 or 2, was the number of pivoting sashes, usually only one. The fourth digit represented the number of individual panes within the pivot (which was always centered within the fixed sash). This digit was usually 4, 6, or 8, which would represent a 2-x-2, 3-x-3, or 4-x-2 pivot sash, respectively. The fifth digit indicated the number of fixed rows below the pivoting sash, typically 1 or 2. Hence, a 2-x-2 pivoting sash centrally located in a 4-x-4 window would be MWI Type 44141 (i.e., four columns, four rows, one pivot, four panes in pivot, one row below the pivot). A sixth number could occur if the third number was 2 (signifying two pivots). The sixth number indicated the number of rows below the second pivot (including the first pivot). Thus, two 4-x-2 pivots in a 6-x-5 window was MWI Type 652803 (i.e., six columns, five rows, two pivots, eight panes per pivot, zero rows below the first pivot, and three rows below the second pivot, counting the rows in the first pivot).

Using this standardized system, it was (and indeed remains) possible to describe dozens of different configurations efficiently and without confusion (and to ensure potential vendors understood the scope of the work). In describing the steel sash windows at the hangar complex, this HSR will use the MWI system in combination with other information to document the historic window design. The system will also be adopted in discussing the windows in the hangar doors, which also use 14-x-20-inch panes within an aluminum framework.

The brick walls separating the main hangar space from the adjacent lean-to (at Level 1) and the exterior (at Level 2) is two-wythes (8 inches) thick. The upper portion is faced with "FALLSTON" iron-flecked brick

at the exterior (and now at the interior, at the second level). The remainder of the upper portion and all of the lower portion is of common brick, manufactured by "SSB CO." and "JJJ," respectively. The "SSB CO." (Sutton & Suderly Brick of Coeymans, New York) common brick, along with "ROAH HOOK," was used during the original hangar building campaign of 1931. The lower portion of the wall (below the first structural girt) was built later than the upper part (that portion exposed to the exterior) and was built using the JJJ brick. Because this was the brick supplier used for the WPA Infill and Hangar 1 Lean-to (second floor addition) building campaigns, it is reasonable to infer that the lean-to was divided from the main hangar bay during the 1937–1938 time period. Thus, the doors, windows, and other equipment mounted on or in this wall were installed at least six years after the original hangars were completed. At the east interior elevation, the 1937–1938 construction of the adjacent lean-to's second floor turned the formerly exterior low clerestory windows into interior windows, and also caused the removal of the lower row of panes at the high clerestory, leaving only three rows (compare to the west elevation of Hangar 2, which has four rows of panes). Finally, the newer windows at the main level portion of the brick wall universally carry 12-x-18-inch panes, as opposed to the typical (but not universal) 14-x-20-inch panes above at the clerestories.



Photograph 1.4.9. View of east wall at northernmost bay, showing doorway and Type 44141 steel sash window. A steel support column is to the right of the door; note stenciling and paint marks.

Starting at the left (north end), the configuration of windows and doors in the seven east bays will be described as follows. In the first bay (at the northeast corner), is one 4-x-4 steel sash window with a 2-x-2 pivoting sash and 12-x-18-inch panes (MWI Type 44141) and a doorway entering Room 8-114 of the lean-to (Photograph 1.4.9). The door is missing; the remaining profiled frame is painted steel. All of the profiled steel frames in the hangar complex are of the same design and all show remnants of dark green paint. This and other doors were built in flat arch masonry openings. Mortised bronze hinges are still extant on the hangar side of the right jamb, making this a right-hand reverse door. Based on surviving doors in other areas, this was likely a single-panel kalamein door. The various panes of the steel window, as is typical at this elevation, are a combination of original wireglass, broken or cracked original wireglass, replacement wireglass, and damaged or cracked replacement wireglass. Flanking the window are two vertical red-painted stripes presumably indicating locations of fire suppression devices or equipment. Above the door is a painted, stenciled sign indicating the width and height of the hangar.

At the low clerestory are two steel sash windows, each separated by a brick infill. The steel windows at the low clerestory are original to the 1931 hangar campaign and typical, but the brick infill was added in 1937–1938 along with the second level construction to accommodate a transitional door at the west corridor serving the new floor. Each of the windows are MWI Type 42 (or two rows of four), 14-x-20-inch panes. At the high clerestory of the first bay are three steel windows separated by two steel mullions. The two outer windows have 14-x-20-inch panes, while the central window has 12-x-20-inch panes. This is a typical arrangement at the high clerestory throughout the hangar complex, dictated by the requirements of the column spacing and the limited variety (either 12 or 14 inches wide) of stock factory windows. The flanking windows have pivots and appear to be MWI Type 43180. This is a non-standard

MWI type, since the bottom rows of what were originally MWI Type 44181 windows (notably still extant at Hangar 2) were infilled with brick to build the lean-to's second floor. As such, these nonstandard types are important evidence of later modifications. Per MWI standards, a 4-x-2 sash in a three-row window would have been in the top two rows (i.e., MWI Type 43181), not the bottom two rows. Similarly, the center 12-x-20-inch paned window was originally MWI Type 34, but since 1937 has been MWI Type 33. Note finally that the first and last bay of the east elevation (Hangar 1) and west elevation (Hangar 2) are about 4 feet narrower to accommodate the adjacent hangar pockets. The remaining five central bays are more typical, as their clerestory windows span most of the 20-foot distance between structural columns.

At the second bay, from left to right, is another steel-framed doorway, also missing its door and additionally boarded up with plywood. A steel sash window to the right is MWI Type 64181, or a 4-x-2 (8-pane) pivoting sash set within a 6-x-4 window. The panes in the upper right-hand corner have been removed to accommodate a wooden frame for an exhaust port, now missing. At the low clerestory, two MWI Type 62 windows flank a central brick infill, which replaced an original Type 32 window when the lean-to second floor was built (another intra-corridor door is beyond). At the second bay's high clerestory is a typical three-window configuration divided by two steel mullions, again with the bottom row of panes removed. In this more typical bay, the central window is MWI Type 33 (a cut-down Type 34) with 12-x-20-inch panes, and the flanking pivoting units are MWI Type 63180 (a cut-down Type 64181) with 14-x-20-inch panes.

The third bay does not have a doorway (Photograph 1.4.10). At the main level, it features two MWI Type 64181 pivoting windows symmetrically flanking a wide brick division. The center two panes of the right window's top row are missing, as is the muntin between them. The low clerestory holds its original 1931 configuration of two Type 62 windows flanking a central Type 32 window. The windows are separated by steel mullions. The central window is built with 12-x-20-inch panes, and the flanking pair is built with 14-x-20-inch panes. The high clerestory is identical to that of the second bay, with a Type 33 (12-x-20-inch) flanked by a pair of Type 63180 (14-x-20-inch) windows.



Photograph 1.4.10. Elevation of east wall at third bay, showing steel sash windows at clerestories above. Two Type 64181 windows are at the main floor.

The fourth bay features a centrally located kalamein double single-recessed-panel door into the lean-to beyond. The doorway is within a flat arch masonry door opening with a profiled steel door surround. These are out-swinging (reverse) doors set on mortised hinges with push-plate hardware. The south door is off of its hinges and located within the adjacent room. To the left of the double door is a MWI Type 44141 steel window. A main steam service pipe riser is located immediately in front of this window. To the right side of the double door are switches controlling the three steam heating units set within the hangar trusswork. The location of these control units on the 1937–1938 wall and the alternately sourced steel supporting the heaters themselves (discussed in the Hangar 2 section) strongly suggest that the original 1931 hangars were not heated. At the low and high clerestories above are the typical Hangar 1 configurations of Type 62-32-62 and Type 63180-33-63180, respectively.

The fifth bay is similar to the third, with two MWI Type 64181 windows at the main level. The clerestories above feature the typical Type 62-32-62 and Type 63180-33-63180, respectively. Along with the typical gray paint at the approximate sill level and below, there is a yellow, vertically oriented painted square surrounded by a thinner black-painted line.

The sixth bay has a kalamein doorway at the extreme left, missing its door. To the right are another doorway closed off with concrete and another Type 64181 window at the far right (Photograph B.4). The window has a partial insect screen on the upper portion of its pivot sash. The upper clerestories are Type 62-32-62 and Type 63180-33-63180.

The seventh and final bay, like the first, includes the 4-foot-wide hangar pocket door at the end. At the main level, there is a blocked up doorway left of center, and another Type 64181 window to the right. Like other bays, there are red fire safety graphics and a yellow rectangle with black surround. At the low clerestory is a unique Type 42-32-42 steel window configuration, topped by a Type 43180-33-43180, due to the narrower wall (Photograph B.5).

In addition to the brick, steel windows, and doorways, the east elevation is marked by a variety of sprinklers, steam risers, pipes, conduits, panel boxes, and other utility equipment (Photograph 1.4.11). These various utilitarian components combine to give an important historic sense of the utilitarian use of the space, and further contribute to an understanding of the functioning and purpose of such a specific-use building (see Photograph B.6).



Photograph 1.4.11. Detail view of steel fire alarm box affixed to the east elevation brick wall. Note adjacent painted graphics.

Additional details found on the east elevation include remnants of painted areas (in red, black, or yellow) and stenciled letters indicating voltages, clearances, and other reference or directional information.

West Interior Elevation

The west-facing elevation is similar to the east-elevation in its palette of materials, but differs in important ways. Originally, this elevation was built with great expanses of steel sash window facing into the area separating Hangar 1 from Hangar 2 (now replaced by the WPA Infill). All of the steel sash windows were replaced by brick, excepting only the three bays of windows at the high clerestory, which originally faced the courtyard area on the infill's second floor. New entryways were introduced into the wall, allowing access into the stairwells of the infill, as well as larger openings allowing passage of aircraft parts and/or vehicles into and between the buildings.

The three central bays of windows at the high clerestory are identical. Each of them have two outer MWI Types 64 (14 x 20 inch) flanking a central Type 34 (12 x 20 inch), with two steel mullions dividing the windows. The windows rest on a continuous cast-stone sill, itself bearing on a rowlock brick course set on a steel beam. Because they have been largely protected from trespass and the weather, they are in relatively good condition. Note that these windows of the former inward facing elevation's high clerestory do not have pivots.

There are far fewer door and other openings in the west elevation. Beginning at the southernmost column bay, the elevation will be described from left to right.

At the first column bay is a kalamein door in a kalamein frame, permitting entrance into the southeast stairwell of the WPA Infill. On the door is stenciled "5 ENG." The door is 36 inches wide and 84 inches tall, with two panels approximately 2/3 over 1/3. The remainder of the elevation is brick with deteriorated white paint and some evidence of vegetative growth, typical at this elevation. The steel girt formerly separating the high clerestory from the main floor windows remains extant at this and all west elevation bays.

At the second bay is an uncased 10-foot-square vehicle-sized opening. Steel corner guards are located at the corners. The third bay is spanned by a large steel rack assembly, approximately 8 feet above the floor, which is connected to the columns on either side (Photograph 1.4.12). Located within the third bay is another kalamein door in a kalamein frame, at 44 inches wide by 84 inches tall, permitting entry into the Tech Supply Room (3-108) of the WPA Infill. The only extant hardware is a simple pull handle on the hangar side and a push plate opposite. The door operation is right-hand reverse.



Photograph 1.4.12. View of west wall, showing the steel rack assembly at the third bay. Note the vehicle-sized opening to the south (left).

At the fourth bay are several telephone wiring panels of varying dates, the earliest of which may date from the period of significance.

The fifth bay is dominated by the 10-foot-square vehicle-sized opening marking the eastern end of Passageway 3-110 through the WPA Infill. The opening is protected by steel corner guards 4 feet in height, now rusted.

The sixth bay is almost featureless, excepting a minor run of surface-mounted conduit.

The seventh and final bay incorporates the doorway into the northeast stairwell of the WPA Infill. The frame and door were kalamein; only the hinge stile remains intact. The door is 36 inches wide by 82 inches tall. The operation from the hangar is right-handed. Two mortised hinges are mounted to the north jamb.

The west elevation is similar to and consistent with the east elevation regarding the importance of the various piping and conduit in establishing a complete architectural impression.

A recently added utility sink wash area is located at the south end of the west elevation, featuring a PVC drainpipe exiting the hangar at grade and expelling its contents directly onto the south exterior tarmac.

North and South Interior Elevations

The remaining elevations are established by the interiors of the rolling hangar doors. There are no finish surfaces on the interior of the doors, revealing their construction with aluminum alloy members. Some of the doors are marked with "No Smoking" and other spray-painted or stenciled signage.

Ceiling

The ceiling of the main hangar space is exposed to the roof decking above. Above the line of the hangar doors, this space is filled with steel trusswork supporting the roof. There are eight steel trusses spaced at 20 feet on center. The first and last truss support the framework defining the gable ends of the hangars. The trusses are modified Warren trusses with cambered top chords and supplementary vertical web members. The web members of each truss are paired 6-inch ledger angles. Lateral X-bracing, laid horizontally between the trusses, is present in the first and last bays adjacent to the gable ends. Additional diagonal bracing is found along the brick elevations east and west. Several extant mill marks show that Pencoyd Iron Works in Pennsylvania, which went defunct by 1940, produced the steel.

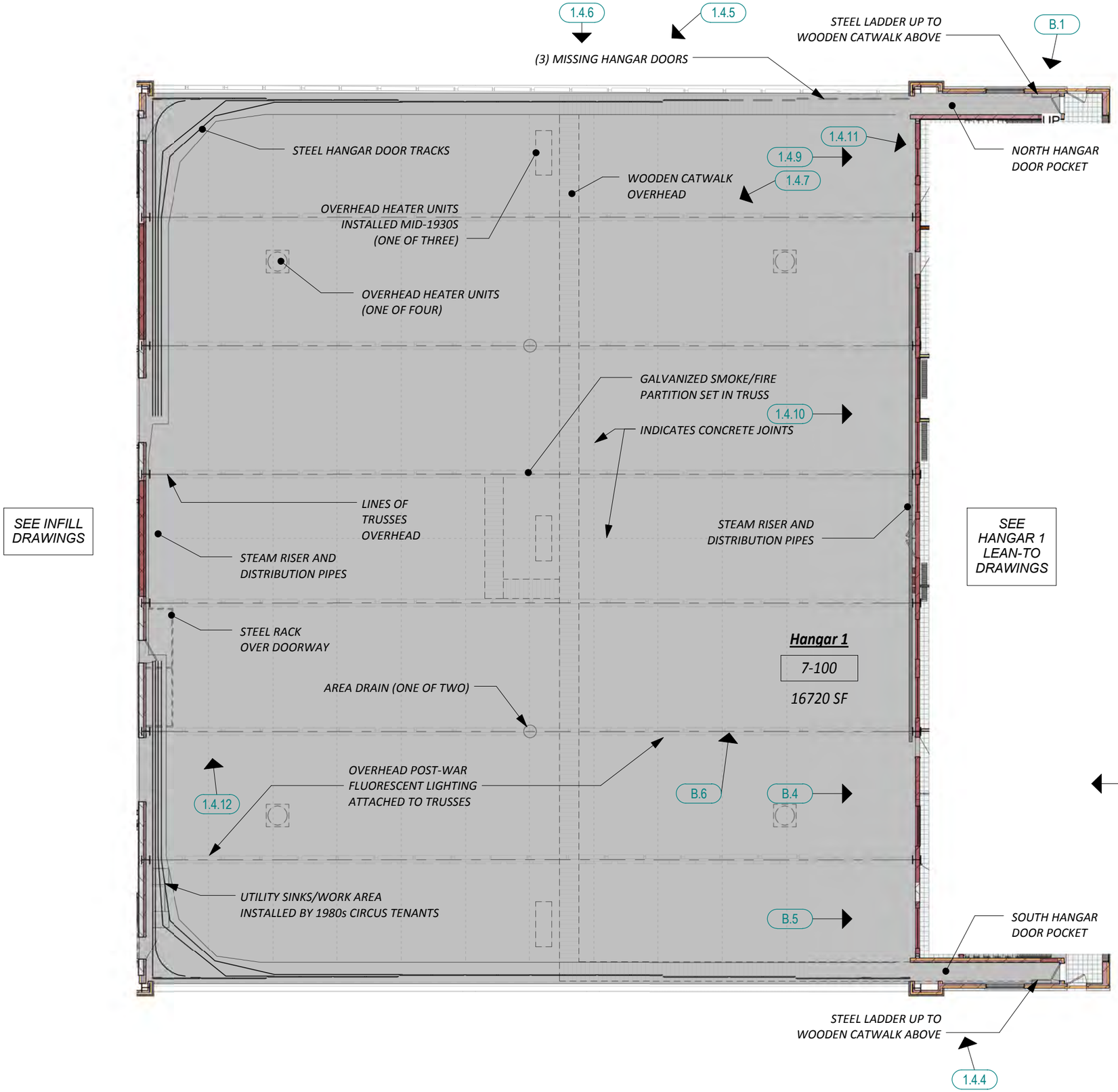
The trusswork supports three 9-inch-deep steel beams used as hoisting rails, which are tied perpendicularly to the trusses, spanning north-south. These beams hold extant mill markings from Tennessee Coal, Iron, and Railroad Company, a subsidiary of U.S. Steel which operated independently in Ensley, Alabama, until 1952.

Additional elements include the sprinkler and gas piping, plumbing, conduits, and a wooden catwalk allowing access to three WPA-era steam heaters distributed evenly at the north, south, and center of the hangar. The catwalk is 34 inches wide, with 4-inch planks resting on 10-inch beams. The top of the catwalk is 25 feet above the hangar's concrete floor. The wooden railings are 36 inches high, with vertical balusters every 5 feet.

There are four later steam unit heaters, smaller in size, which are evenly distributed in the four quadrants composing the main space. A galvanized sheet metal smoke/fire partition, fastened to a central truss, separates the ceiling space at mid-hangar. Post-war linear fluorescent troffer-type light fixtures are secured to the bottom member of the trusses.

Floor

As described in the introductory text to section 1.4, the floor of the hangar is cast-in-place concrete, with control joints laid approximately every 10 feet running east-west across the hangar, and one additional joint north-south through the hangar centerline, creating 24 continuously poured slabs of approximately 65 feet long by 10 feet wide. The floor is sloped to two area drains located along the north-south center line of the hangar. At the hangar doors on the north and south façades, steel rails are cast into the raised curb, which is further crowned to allow positive drainage and perhaps prevent fuel spillage from moving inside/outside the hangar perimeter. At the northwest and southwest corners, these rails curve 90 degrees to position the retracted hangar doors inboard of the west wall of the hangar. Rubber and steel bumpers prevent the hangar doors from overtraveling the rails. The interior floor area is sloped to two area drains located along the north-south center line of the hangar.



SEE INFILL DRAWINGS

SEE HANGAR 1 LEAN-TO DRAWINGS

(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"

4 1.3.11



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Aircraft hangar, workshop, storage.

GENERAL NOTES:

Fair to poor condition.

Figure 1.4.1

Hangar 1 Floor Plan

Scale: 1/16" = 1'-0"

Hangar 1 Lean-to

Exterior

The exterior façades of Hangar 1 Lean-to, built along with the main hangar, are continuous in both design and construction with the main hangar. The composition of iron-flecked glazed "FALLSTON CONTINENTAL" face brick, cast-stone trim, and multi-paned steel sash windows is typical to the entire complex.

North Façade

The north façade of Hangar 1 Lean-to consists of typical glazed brick masonry with a human-scale entry door and two steel sash windows. The steel sash windows are an MWI Type 63 mounted over a Type 64, both with 12-x-18-inch panes and no pivoting sash. Both windows have a flat soldier-course brick arch and a central cast-stone keystone. The windows admit daylight into the hangar door retraction pocket immediately behind it. The façade features a curved parapet stepping down from the high point established by the adjacent Hangar 1 pilaster. A painted wooden board identifies the lean-to's building number "8." A concrete stoop is positioned in front of the entry doorway, with evidence of a post-war canopy once mounted overhead. The window fanlight over the door, encircled by a brick header arch, has been filled in with stack-bond header brick within the arch, and running-bond brick below (Photograph 1.4.13). Based on historic photographs, infill of this fanlight (and the three similar ones around the complex) occurred before World War II, during the period of significance.



Photograph 1.4.13. View of north façade and northeast corner of Hangar 1 Lean-to. Note failing brick wall.

East Elevation

The east elevation of Hangar 1 Lean-to is two stories, the second level having been added in 1936–1937. The elevation is populated by two rows of windows, including multi-pane steel sash, wood double-hung, horizontal steel casement, and post-war aluminum types. Configuration and types of windows will be described in detail for the appropriate interior rooms. Steel lintels are crowned with a flat soldier-course brick arch and a central cast-stone keystone. Sills are cast stone (Photograph B.7). The keystone at the southernmost window at the first floor is missing.

A bay window is located at the southern end of the elevation, above which is a balcony enclosed in a two-line pipe railing, once accessible from the second floor. A locally produced flagpole mount is secured to the center of the railing. The north-facing window at the bay window shows evidence of having replaced an earlier doorway, as brick patching extends below it to the concrete slab. An adjacent tree stump, measuring 28 inches in diameter, indicates that the doorway was closed at an early date. A copper drainage box, hexagonal in form, is still extant at the intersection of the bay with the east wall aligned with the roof of the bay.

There are two instances of previous window removal/enlargement, including the introduction of a doorway at mid-elevation. The steel sash window originally at this location was removed and the remaining opening was mostly filled with running bond, iron-flecked brick. Interestingly, the flat-brick arch head was reconfigured to remove the keystone, which was then reintroduced above the new door in a slightly different material. The location of the former head is now a continuous soldier course with no keystone. The brick infill itself has a perimeter course of rowlock, which appears to be a decorative element and not necessary to simply infill the opening. There is a rectangular, rusted steel sign affixed between the first and second floor windows at this bay. The sign is not legible. The second major modification occurred at the northernmost bay, where a larger steel sash window was introduced at the left (southern) window.



Photograph 1.4.14. Detail view along parapet line to north. Note cast-stone coping, copper flashing, and cast-stone ornaments.

The continuous brick façade is interrupted at regular 20-foot intervals by pilasters aligned with the steel support columns. These pilasters are crowned by cast-stone ornaments. Copper scuppers in the pilasters drain the roof into copper leaders (no longer extant) at the first, third, and fifth column lines from the north (Photograph 1.4.14; Photograph B.8). There are three roof-mounted floodlight fixtures of modern (circa 1980s) design situated on the roof at the north, middle, and south of the eastern parapet. Only the southern fixture still has an intact luminaire.

There is an interesting variation in the keystones at this eastern elevation. The keystones that appear to be part of the original building campaign (i.e., at unmodified locations at the first floor) are of a distinctly whiter tone, and have without exception suffered delamination of their exterior faces. Those keystones at the second floor (and the ones over the first-floor bay windows, the mid-elevation door, and the two windows in the northernmost bay) are grayer and have suffered almost no deterioration. This suggests that the construction campaign beginning in 1937 used keystones made with a different cast-stone (i.e., concrete) mixture. As a result, this keystone variation helps to confirm the construction chronology of the lean-to.



Photograph 1.4.15. View of south façade, with bay window visible to the east. Deterioration of coping is visible above the hangar pocket.

South Façade

The south façade is similar to the north façade (Photograph 1.4.15). The arched brick opening above the exterior entry door has been filled with stack-bond header courses of matching iron-flecked brick. A low-rise planter created with two courses of concrete block fronts the façade.

Roof. The roofing type of Hangar 1 Lean-to is built-up roofing laid over tongue-and-groove planking, consistent with the remainder of the complex. The roof slope, determined by the underlying structural steel, slopes down in one direction towards the airfield (east) side parapet, where copper scuppers (discussed above) direct the water to subgrade drainage. At the west side, the roof is flashed into Hangar 1 within the area of the original second clerestory, which resulted in the modification of the clerestory to remove the lowest row of window panes (more fully discussed for Hangar 1).

The roof has access openings positioned over both the north and south stair landings. Hatches are no longer extant. There are also several other roof penetrations for ductwork and exhaust fans, including over the parachute tower (Room 8-213) and the second-floor showers and toilets (Rooms 8-207 and 8-206). The roof (planking and roofing) has failed in multiple locations, with large areas of daylight plainly visible along Foyer 8-D and above Room 8-203. This deterioration has advanced considerably over the course of the HSR investigation, most dramatically after Hurricane Sandy. Standing water and/or ice on the second floor was observed on multiple visits, with corresponding uncontrolled drainage and water damage impacts to conditions on the first floor.

Interior, Level 1 (see Figures 1.4.3, 1.4.4, and 1.4.5)

The interior of Hangar 1 Lean-to is accessible from both the main hangar space and also from doors in the north, east, and south elevations. The first-floor spaces are organized along an eastern corridor, which extends from the north entrance door to the south entrance door. During the military tenancies, this was known as Foyer 8-A. The second-floor spaces are reversed along the north-south axis, organized along a western corridor adjacent to windows facing into the main hangar space. The second-floor corridor is Foyer 8-D. Near the conclusion of HSR documentation, during the emergency tenancy of Hangar 1 after Hurricane Sandy, the several doorways between Hangar 1 and Hangar 1 Lean-to were boarded with plywood.

First-Floor Corridor (Foyer 8-A)

Foyer 8-A is a corridor that runs the length of and along the east side of the lean-to, from north to south. Its eastern elevation is populated by exterior windows and a doorway.

The north end of the corridor is small and dominated by the doorway to the exterior. The door is a solid core, staved lumber door with sheet metal (kalamein) cladding. This door holds a cylinder lockset with a bronze knob and steel rose plate, along with a separate bronze deadbolt, and is left-handed from the exterior. The staved lumber door is deteriorated, exposing the interior construction, and has been removed from its hinges. The wood-cased doorframe accommodates another door, which is missing. This second door appears to have been left-handed from the interior. The remainder of the north elevation is finished in gypsum board furred-off of the original plaster wall behind. It is painted light-blue below mid-wall, with white paint above. There is a duplex switch located to the right (east) of the doorway.

The east elevation of the foyer will be described from north to south. The majority of the windows are boarded from the exterior. There are typically two openings in each of the seven column bays running the north-south length of the lean-to.

At the first (northernmost) column bay, the left window is a steel casement window consisting of five horizontal lights and two operable sashes. The lowest light operates as an inward-projecting hopper window, while the second and third lights from the top operate in tandem as a pivot. Three of the five

glass panes are missing. Based on the identical window designs, this window appears to be part of the renovation campaign that added the bay window entrance at the opposite end of the corridor and occurred during the period of significance. The window opening itself, however, dates to the original hangar construction, when it was occupied by a steel sash window, based on historic photographs. A compact steam radiator is mounted to the wall directly below the window. The valve on this and most other radiators is manufactured by Dunham-Bush. The second opening in the first bay is a much larger opening. The size of the opening suggests it was a steel sash window; there is a partial remnant of a steel sash window in the vicinity, which is six panes in width and two panes high. This 6-x-2 remnant was likely part of a larger 6-x-5 (MWI Type 64181) window fitted to an opening enlarged after the initial construction campaign. The brick at the jambs has been chipped back. Three rusted lintels carrying the three wythes of brick are exposed at the window head. The wall finishes in the first bay are remnants of plaster applied directly to the brick substrate.

Attached to the skim-coated ceiling are two single-tube, surface-mounted fluorescent fixtures oriented lengthwise north-south along the corridor and aligned with the two window openings. The conduit servicing the fixtures is also surface-mounted, winding around the concrete beam encasements forming the second level above. This is a typical condition down the length of this corridor. Both fixtures are badly rusted but intact. This type of single-tube fixture, seen repeatedly within the lean-to, appears to be among the oldest fluorescent type fixtures within the hangar complex. Fluorescent lighting fixtures were debuted to the public at the 1939 World's Fair held in Queens; it is conceivable that this is one of the earliest field examples of this technology. There is evidence of previous incandescent lighting in the form of circular recessed mounting boxes visible behind the linear fluorescents, which suggests that the fluorescents were part of a very early renovation campaign, possibly contemporary with the addition of the second story.



Photograph 1.4.16. View of northern end of corridor (Foyer 8-A). Note larger window at first bay beyond scaling stick. The door visible in distance is the exterior door on the north façade.

The second bay holds two identically sized steel sash windows. Using the MWI system presented in detail in the Hangar 1 discussion, these are both Type 64181 windows (i.e., six panes wide, four panes tall, one pivoting sash of eight panes, with one fixed row of panes below the sash). An upper right muntin is missing at the second window. The wall finishes were originally plaster on brick, but later furred out with wood sleepers over the plaster and gypsum board sheathing, adding another 2 inches to the wall thickness. Ten-inch-deep wood trim was added to the window surrounds during this renovation campaign to accommodate the added wall thickness, typically throughout the corridor. These gypsum and wood trim finishes are highly deteriorated, with large areas missing and falling from the wall along the length of the corridor (Photograph 1.4.16).

The second bay is notable for the unique instance (at the first story) of a finished ceiling, which was framed down in wood from the bottom of the concrete slab above and finished with plaster on steel lath. This finished ceiling extends several feet into the adjacent room 8-112 to the west, crossing the west wall of Foyer 8-A and ending in approximate alignment with the partial-height partition wall enclosing 8-113. A utility pipe running east-west between the two windows has additionally been enclosed within wood trim, also an unusual instance. These early renovations suggest the room was used as an office and not a utility or maintenance space.

The third bay, directly opposite Latrine 8-110, also holds two Type 64181 steel sash windows. The south brick jamb of the southernmost of the pair has been chipped away. Finishes are plaster on brick with the later furred-out gypsum sheathing discussed above. Some areas have been replaced or augmented with painted plywood. Vegetation is penetrating the building in this area. Two single-tube fluorescent light fixtures are at the ceiling; the northernmost one has dislocated from its mount and is suspended in midair.



Photograph 1.4.17. View south down length of Foyer 8-A, with exterior wall to left and the ubiquitous partial-height panelized partitions to right. Note collapsing finishes. The furred wall has since collapsed farther towards the west (right).

The fourth bay features an exterior flat-arch doorway to the left and another steel sash window at the right. The iron-flecked exterior face-brick turns the corner of the doorway and is present at the jambs forming the rough opening, in which are several instances of recessed wood blocking to receive fasteners for the missing frame. The door is also missing. The rough opening is 40 inches wide by 84 inches tall, which implies a 36-x-80-inch door leaf (see discussion at east exterior elevation for additional information about the door). The wood-furred gypsum finishes and the associated wood trim at the opening has collapsed, crossing the corridor completely and leaning on the partition wall to the west (Photograph 1.4.17). The steel sash window to the right (south) of the door is another Type 64181 unit. Finish colors are light blue below sill height and white above. Another compact wall-hung radiator is wall-mounted below the window.

The fifth bay has three openings. The first opening is another Type 64181 steel sash window with the typical later wood trim. The south half of the bay is occupied by a pair of two small vertical window openings. The existing wooden window units are of undetermined age and, due to their simplified construction, possibly constructed onsite and subsequent to the period of significance. The single-tube fluorescent fixtures are missing at the ceiling, but there is evidence of their previous existence in the form of rust stains and impressions. Separating the fifth bay from the (expanded) sixth bay beyond is a 4-x-8-foot gate, constructed as an expanded metal frame, which separated the north portion of the corridor from the southern end of the lean-to, but has now collapsed in solidarity with the surrounding finishes.

The sixth column bay of the corridor is contiguous with the much larger adjacent space 8-105, which extends to the hangar wall at the west side of the lean-to. At the east elevation are another steel sash window opening to the left and a tri-partite bay window to the right. The Type 64181 steel sash window is completely dislocated from its opening and lying on the floor of the corridor, with a previous plywood board still attached to it. Another plywood board has closed off the remaining rough opening in the brick wall (this second board was itself removed or dislodged after Hurricane Sandy). The bay window to the right has three horizontally oriented steel casement windows with five panes each. The bottom sash is an inward-projecting hopper; the second and third panes down are combined as a pivoting sash. These windows are identical in design to the window at the extreme northern end of Foyer 8-A, described above. Most of the panes are shattered and the frame has several layers of paint and surface rust throughout. The windows are 42 inches wide and 72 inches high; the sill and head locations match those of the adjacent steel sash windows. The northernmost window opening of this bay was formerly a doorway, and has a later campaign of common brick closing off the area below the window.

The space enclosed by the projecting bay window is divided from the corridor with a partial height, panelized partition system, identical in design to the system used in several other locations at this floor and at the WPA Infill. The partition is painted light blue at the bottom half and white above. There is no evidence of lighting directly above the corridor at this bay, although there are several nearby fluorescent lighting fixtures, discussed for Room 8-105.

The seventh column bay also has two openings in the east elevation. The left window is another steel horizontal casement window with the two operating vents, seen also at the first and sixth bays. The window opening has been stepped down at the right jamb by a single vertical course of brick stretchers. The surrounding gypsum furring and wood trim has fallen from the wall as a complete assembly and is supported from further collapse by an overhead sprinkler line. There is a pair of twinned thin radiators below the first window, with an American valve. The final window in the east elevation, the second window unit in this bay, is another horizontal steel casement window, giving a total of six of these type windows in this elevation (three at the bay window, the remainder in the first and seventh column bays). At the ceiling are two additional single-tube, surface-mounted fluorescent light fixtures with surface-mounted conduit.

The south elevation is dominated by the doorway to the exterior. Finishes surrounding the doorway are consistent with those at the north and east elevations, with original plaster furred out with a later gypsum board/wood trim finish. There are two light switches to the left of the doorway. One of them is recessed into the furred-out wall; the second switch is painted red and surface-mounted to the trim at the doorway's left jamb. There is a lamp base on rigid conduit which appears to have been pushed back into the building from the exterior before the doorway was closed with plywood board. There is a "FIRE EXIT" paperboard sign mounted over the doorway.

The west elevation of Foyer 8-A is generally composed of the various first-floor rooms fronting this corridor. At the extreme south end of the west elevation, immediately perpendicular to the south exterior door, is an original access door to the hangar pocket beyond that has been enclosed in later gypsum board sheathing, now partially removed. This access door is a wooden, two-panel door (with recessed panels) measuring 31 inches wide by 84 inches high with a single cylinder lockset. This door appears to date to the original hangar construction, and is similar in style and execution (but not size) to the south exterior door of the Hangar 2 Lean-to at the opposite end of the complex.

The seventh bay continues to the north with the concrete access stair to the floor above, composed of 19 risers to the second level. The stair enclosure is framed in brick, consistent with that at the north end of the lean-to. A continuous steel hand rail is located along the left side of the stairway. Finishes are plaster applied directly to the brick substrate, which varies between common brick and the (formerly exterior) iron-flecked face brick above the original roof line of the single-story lean-to. The corridor-end of the brick wall separating the stair and the adjacent Room 8-103 is cased with finish wood trim. The remainders of the seventh bay and the sixth bay consist of several runs of the 8-foot-high partial-height partitions which form the outlines of Rooms 8-102, 8-103, and 8-104.

The west elevation at the fifth bay is formed by a line of partial-height partition panels which run northward to the wall enclosing Latrine 8-110, terminating at a piece of vertical wood trim. This line of panels contains two doorways within its system, permitting entry into Room 8-107 and Foyer 8-B (the narrow hall dividing Room 8-109 and Room 8-108). Both doors are missing. The doorways are 32-x-80-inches, with a small fixed single-light transom closing the 8-foot distance. The doorway at Foyer 8-B is aligned with the exterior door in the east elevation.

The partition panel system is closed to the concrete ceiling above by a wood-frame partition with wire mesh screening attached to the corridor side, an assembly which is deeper (4 inches nominal) than the partition system on which it rests (2 inches nominal). Several glass panels are shattered and a lower wood panel is missing. The exact date of the partition panel system could not be determined, but it appears to be post-war in design. However, its construction out of wood does suggest an early post-war date, as office partitions of this type were more commonly executed in steel throughout the 1950s and 1960s.

At the third bay, the west elevation consists of the plaster finish at the wall for Latrine 8-110. The doorway into the latrine is trimmed in wood, with a three-panel wood door. The uppermost panel is an intact pane of translucent privacy glass in a starburst pattern. The door is 30 inches wide and 78 inches high. The door hardware is missing at the corridor, but a brass cylinder knob is present at the latrine side. The door is a right-hand door from the corridor, with two hinges at the north side of the doorway. At the reverse (latrine) side of the door is a row of four steel hooks set above the glass panel along the door's top rail. The rails enclosing each recessed panel are distinctively router-rounded at the corners of the panel, a design seen in several other locations, which appears consistent with the 1937–1938 building campaign.

The west elevation at the second bay, enclosing Rooms 8-113 and 8-112 to the west, is another segment of the partial-height partition panel system. Uniquely, in this instance the doorway permitting entry into Room 8-112 holds an extant door leaf. This door is a three-panel door, 34 x 80 inches, with two hinges and featuring the router-rounded perimeter at the recessed panels. The top panel is missing and may have been either glass or wood. The doorway shows evidence of a previous three-hinge door mounted on the opposite jamb, indicating that the present door is not the first door in this location.



Photograph 1.4.18. View up stairs to the second floor, north end.

The west elevation at the first bay is the wood-framed batten board (fiberboard) paneling enclosing Room 8-114 to the west. The northern portion of the first bay, mirroring the opposite end of the corridor, accommodates the 19-riser concrete stair rising to the second floor above (Photograph 1.4.18). A pipe rail is extant at the right side of the stair. Each step incorporates a 4-inch steel safety tread. The door to the hangar pocket is presumably hidden by the furred gypsum board finishes that exist to the right of the stair immediately perpendicular to the north elevation.

Room 8-114 (First Room South of Northern Stairs)

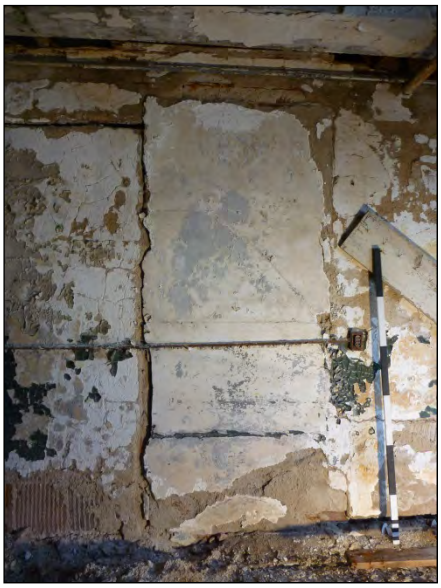
The room is entered directly from the hangar through a profiled steel doorframe, which is of a style found elsewhere along the wall separating the lean-to from the main hangar bay, as well as in corresponding locations at Hangar 2. The door is missing from its frame. The former door was right-handed and the south side of the frame holds three bronze mortise hinges. There is half of a highly deteriorated door within the room. It cannot be determined if this is the wooden core for the kalamein door or an unrelated object.

The north interior elevation is dominated by the stair run to the second level (Photograph 1.4.19). The stair enclosure is built with JJJ brick, consistent with the 1937–1938 building campaign for the WPA Infill and the second floor of the lean-to. Two surface-mounted outlets are located at the left (west) portion of the wall, which is serviced by surface-mounted conduit. At the east (right) end of the wall is another surface-mounted conduit ending in a switch at mid-wall. The wall is plaster laid directly over the brick substrate. The bottom half of the plaster (below mid-wall) is painted dark green; the area above is painted white. The paint is largely deteriorated. There is evidence of a goldenrod yellow paint underneath, matching finishes in Rooms 8-112 and 8-106.



Photograph 1.4.19. View of north wall (hangar pocket) and adjacent stair to second floor, plaster over brick.

The east elevation is a wooden wall divided into a portion at door height, with a wood-stud and panel wall closing the top third of the height to the bottom of the second floor slab. The third panel in the upper portion is a wooden louver panel with several slats missing. The wall is painted similarly to the north wall, with dark green to mid-height and areas of light blue and white above. At the left (north) end of this elevation is a doorway leading to the adjacent corridor (Foyer 8-A). The 30-inch-wide by 80-inch-tall wood door has two recessed panels and is hung on two steel hinges. Faintly visible on the door is painted stenciling indicating "MAINTENANCE." The door has two mortised hinges and is missing the doorknob.



Photograph 1.4.20. View of south wall showing infilled opening to Room 8-112.

The south wall is plaster laid directly over fluted hollow terra cotta tile and includes a WPA-era door opening that has been closed with steel-lath plaster over wood studs (Photograph 1.4.20). There are two electrical outlets mounted about 4 feet off the floor level, again with surface-mounted conduit. This patched door opening is a remnant of the former north-south central corridor through the lean-to (original layout from the WPA-era), confirmed by additional ghost markings in Room 8-112 and consistent with period drawings. Dark green paint is evident below mid-wall, again over an earlier goldenrod yellow finish.

The west elevation allows passage to Hangar 1 beyond, and consists of plaster-finished brick-masonry with a steel sash window and a radiator mounted over the door. The radiator extends partially over the steel sash window to the north (right). The steel sash window has 16 standard factory lights, with the four central lights forming a pivoting sash and the remainder fixed, or MWI Type 44141. There is an insect screen assembly built into the pivoting sash. The doorway from Hangar 1 is 36 x 80 inches, with a profiled steel frame. The door is missing. The finish is plaster over brick. As is typical, the rear flange of the steel column supporting the hangar superstructure is exposed to view at the interior of the room. It projects +/- 2 inches beyond the plaster surface.

The ceiling is exposed concrete, painted with white paint or skimmed with white plaster, which is typical for most of the main floor at the first story of Hangar 1 Lean-to. There are four pendant-hung fluorescent light fixtures dating to the period of significance. Three of the fixtures are aligned with the door entrance along the north part of the ceiling; one is located in the northwest corner in the area not occupied by the stair enclosure. Each of the fixtures is the same type, pendant-mounted to the ceiling with twinned pendants terminating in a decorative base-plate and holding three tubes each in a pronounced arc. There are decorative cast aluminum end-plates depicting a central acanthus leaf. The fixture closest to the door has one cap intact; the other three have both caps intact. They are likely located at connection boxes designed for earlier incandescent fixtures. The floor is vinyl asbestos tile over original wood finish flooring.



Photograph 1.4.21. View to north at Room 8-112, showing hollow clay tile (terra cotta block) wall, plastered and painted.

Rooms 8-112 and 8-113

Room 8-113 is the southeast corner of Room 8-112, and separation is maintained by a partial-height wooden and glass partition. Originally finished in a stained wood veneer, the partition is painted white over gray (Photograph B.9).

The north wall is the hollow terra cotta tile wall bordering Room 8-114 and is also finished with plaster. The patched door opening is also apparent. The wall was initially painted with goldenrod yellow paint and subsequently painted with a combination of white paint over gray (Photograph 1.4.21).

The east elevation is a partial-height wood and glass partition that extends along much of the eastern corridor. The partition is painted light blue, consistent with instances of this partition type throughout level one of Hangar 1 Lean-to. The partial-height partition is closed to the ceiling above by a wood-framed wire-mesh partition. The partition holds an in-swinging door at the northern end, discussed at Foyer 8-A.



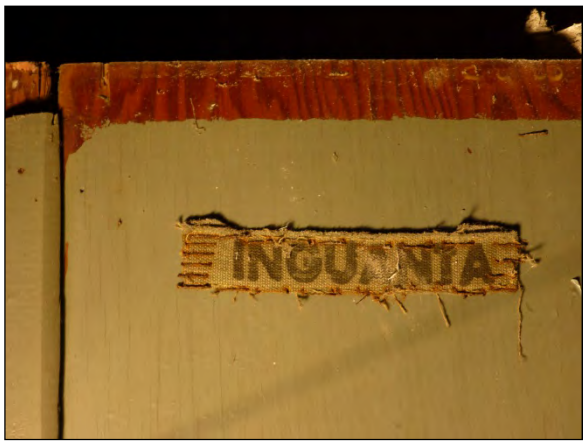
Photograph 1.4.22. View towards southwest showing furred-over steel sash window (center right) and entrance to latrine beyond (center left).

The south elevation is the wall separating Room 8-112 from the latrines (toilet rooms) (Photograph 1.4.22). This wall is a wood-stud partition formerly finished with gypsum panels, of which a few remain extant. The opposite side of the same wall, plainly visible through the deteriorated gypsum board, at the adjacent latrines, is plaster over steel lath. A door to Room 8-111 is located at the western end of the wall. The wall extends below the level of the floor slab (possibly pre-dating it) and is penetrated by piping from the level above. There are two surface-mounted electrical convenience outlets and a telephone cable junction box mounted to the wall. There are inconsistent areas of brick and hollow terra cotta tile patching at the top of the wall, closing it to the

concrete floor slab above. The wall framing turns horizontal at the ceiling to close the 8 inches of space between the wall and the nearby east-west concrete-encased beam supporting the second floor. This ceiling finish does not continue north of the beam.

The west elevation towards the main hangar space is plaster over brick. An existing doorway into the hangar has been closed with plywood, and the door is missing. The doorframe is profiled steel and accommodates a 36-x-84-inch door.

The existing steel sash window opening has been furred over with a gypsum board wall. Most of the wall was originally painted goldenrod yellow, consistent with the north elevation. Subsequent paint colors include gray and black, including a black-painted panel with yellow stenciling showing "SPECIAL TOOLS" and "UH1H." (The UH-1H is a type of Bell UH-1 "Huey" helicopter introduced in 1959 and used extensively by the Army during the 1960s.) A field-assembled pipe radiator has been installed over the door and extends south across the majority of the furred-over window. Other such pipe radiator assemblies are present in the WPA Infill's monitor structure vicinity, suggesting the possibility of a coincident building campaign for the furred-over steel sash window here and at the adjacent latrine.



Photograph 1.4.23. Detail view of partial-height panel partition wall showing original finish and Army tenancy uniform name tag.

The ceiling is exposed concrete to the west, with remnants of a steel lath plaster board ceiling to the east, which continues into the corridor, Foyer 8-A. There are four pendant-mounted fluorescent fixtures overhead, originally of the same acanthus-leaf plate design found in 8-114 to the north. These fixtures are significantly more deteriorated, with the northeast fixture consisting of only a rusted backing plate. Two of the fixtures, those west towards the hangar bay, are mounted to the concrete slab overhead. The other two, of the same design, are mounted to the finished ceiling portion towards the east.

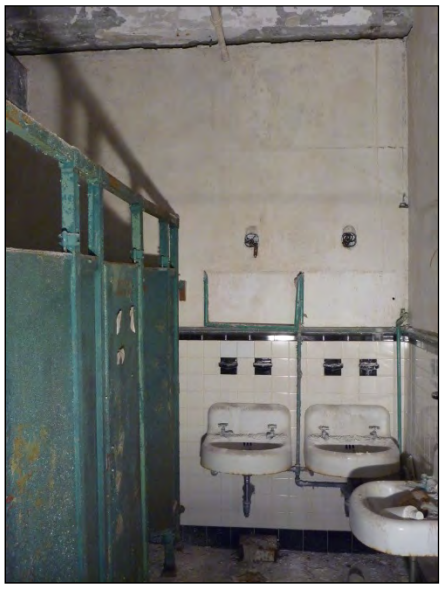
The floor is vinyl asbestos tile, a blend of light and dark gray, over finish wood flooring.

The west wall of Room 8-113 (the partial-partition separating it from Foyer 8-A) has an Army tenancy uniform nametag stapled to it, reading "INGUANTA" (Photograph 1.4.23). This and other elements physically attached to the building were left in place by the HSR team. The south wall, adjacent to Latrine 8-112, has remnants of telephone equipment mounted on it.

Portions of the ceiling along the north wall of this room are plaster on steel lath, with small wood-trimmed openings to allow access to the cleanout plugs of the drain traps servicing the Level 2 toilet room above.

Room 8-111 (Latrine)

This latrine, one of two contiguous such spaces, consists of three toilet stalls along the northern wall, sinks along the east and south walls, and a furred-over steel sash window at the south wall, below which is a thin steam radiator (Photograph 1.4.24). Two doorways enter into the latrine, at the western ends of the north and south walls. The north doorway is cased in wood and is 30 inches wide by 78 inches tall.



Photograph 1.4.24. View towards east in Latrine 8-111, showing steel toilet partitions and cast-iron sinks. Latrine 8-110 is on the opposite side of the wall.

There are electrical switches on both sides of this doorway. The three-panel south door is also 30 x 78 inches, with round-routed perimeter trim at the panels. The top panel is a later infill, possibly replacing an earlier glass panel. The lockset is a cylinder (non-mortised), with only the exterior bronze knob extant. There is one electrical switch to the left side of the door with a plastic (Bakelite) faceplate. This particular design of outlet plate is seen in other finished spaces within the hangar complex, including the WPA Infill.

The north, east, and south walls are steel-lath plaster on wood stud, finished with partial-height tile. The south wall is the brick hangar wall, also finished with plaster and tile to match. The ceramic wall tile is a field of 4-inch-square white tiles, with a 2-inch bullnose cap accent band of black tile at the mid-wall and a base of 4-x-6-inch black tile, oriented lengthwise. The mosaic floor tile is a repeated pattern of a single 1-inch-square black accent tile surrounded by a pinwheel of four 1-x-2-inch rectangular white tiles (Photograph 1.4.25). Above each of the three sinks, a pair of specially designed black tiles is set into the field, providing a soap dish and a cup-holder. There are also recessed electrical boxes set within the plaster finish above the sinks. No sconces or lighting fixtures are present at the wall. The water piping serving the sinks is exposed and located immediately above the black bullnose accent band of the ceramic wall tile.



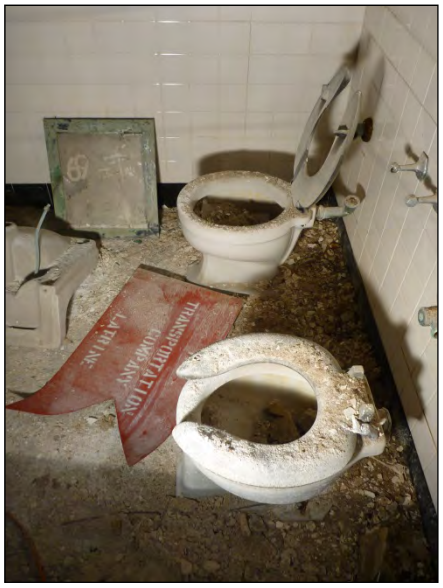
Photograph 1.4.25. Detail view of rectangular mosaic floor tile at Latrine 8-111, near radiator at west wall. Latrine 8-110 shares this pattern.

The three cast-iron, porcelain enameled sinks show a manufacturing date of 1934 and are painted turquoise at the exposed cast-iron undersides. The blue-green-painted steel toilet partitions and vitreous china toilets are generally consistent with construction during the period of significance, and are similar in design to those found at the second floor above and at the WPA Infill. The westernmost stall is wider than the two easternmost stalls. “AUTHORIZED SMOKING AREA” is stenciled with orange spray-paint on the toilet partition doors. There are locations for two wall-hung urinals, no longer extant, at the south wall immediately left of the south door. One of the urinals was found detached within the room.

The ceiling is exposed skim-coated concrete with a run of galvanized exhaust ductwork running east-west along the northern wall, serving this latrine and the adjacent Latrine 8-110 to the east. A rectangular exhaust grille is centrally located in the ductwork. The ductwork runs west to the steel sash window at the west wall and is exhausted to the hangar space beyond through a plywood assembly occupying the two upper right panes of the window. There is a centrally mounted exposed single-bulb pendant on an 18-inch rod to a decorative ceiling-mounted base. The finish appears to be a light bronze alloy, with a decorative bell enclosing the ceramic lamp socket. The base is painted over in white.

Room 8-110 (Latrine)

This latrine is entered from the corridor (Foyer 8-A) to the west. The finishes are consistent with Room 8-111, including the partial height ceramic tile wall and square mosaic tile. The sinks are vitreous china and dated later (September 1952) than those in Room 8-111. One sink is intact at the west wall, while the other is loose on the floor. A mounting location for the second sink, with extant steel bracket, is located directly north (right) of the first. There are no extant toilet partitions in this room, or evidence thereof, but two toilets remain along the north wall separated by one extant paper holder. A steel pennant-like sign reading "TRANSPORTATION COMPANY LATRINE" was found on the floor in this room. This sign is painted red with white stenciling (Photograph 1.4.26). The north wall is plaster over steel lath, which is exposed from Room 8-112 on the opposite side of the wall.



Photograph 1.4.26. View of toilets and steel pennant along north wall, Latrine 8-110 (small latrine).

The east wall of this latrine includes the entry door from Foyer 8-A, which has a translucent light. This door is fully described in the Foyer 8-A discussion below. A small radiator is positioned to the north (left) of the door at floor level.

At the ceiling, there is a centrally mounted exposed single-bulb pendant on an 18-inch rod to a decorative ceiling-mounted base. The finish appears to be a light bronze alloy, with a decorative bell enclosing the ceramic lamp socket. This is the same fixture type described in Latrine 8-111, but in better condition. At the east side of the ceiling is a large steam service line penetrating the room north-south.

The west wall, in addition to the two sinks, has two recessed electrical boxes located within the plasterwork. There is evidence of a wooden mirror frame between the electrical boxes. Fixtures are missing. Additional items are a centrally mounted paper towel dispenser and, at the upper right corner, a 12-inch-square exhaust grille with a field of square openings, which is connected through the wall to the ductwork spanning Latrine 8-111 from east to west and exhausting into Hangar 1 through the steel sash window.

Foyer 8-C

This corridor begins at the southern door of Room 8-111 and extends to Foyer 8-B and Room 8-108 at the approximate north/south mid-point of Level 1. The north elevation is the door entering Latrine 8-111. Fiberboard panels sheath the surrounding wood-stud wall. The west elevation consists of a steel sash window facing into the main hangar space, with a squat but long radiator below it (Photograph B.10). The brick wall is finished with plaster and shows remnants of yellow and subsequent gray and light blue coats of paint. The east wall, separating the corridor from Room 8-109, is a wood-stud partition sheathed with gypsum board. This wall is painted white over light blue. The southern end of Foyer 8-C leads into Foyer 8-B (to the east) and Room 8-108 (to the south).

Foyer 8-B

This narrow corridor connects Foyer 8-A (the easternmost, main corridor along the east exterior wall) to Foyer 8-C and the adjacent double door entrance into the main hangar space. It is also aligned with the

single exterior door in the east exterior wall (Photograph B.11). This corridor is framed in wood stud with gypsum board and plywood sheathing. A doorframe, missing its door, connects to Foyer 8-A (Photograph 1.4.27).

There is a large, ceiling-hung fluorescent light fixture overhead, oriented along the length of the hall. This is a troffer-type fixture with space for four tubes, and appears to be a post-war design.



Photograph 1.4.27. View west towards hangar showing entrances to 8-109 (right) and 8-108 (left).

Room 8-109

This room is entered from Foyer 8-A through a single doorway centered in its southern wall, featuring a three-panel door with four lights (Photograph B.12). This paneled door is divided into two, with the top half featuring two-over-two lights divided by wood muntins, and the lower half featuring three horizontal recessed panels. The doorframe is wood with multiple coats of paint. The door is 32 inches wide by 78 inches tall. A bronze cylinder doorknob and bronze hinges are intact. The west and south walls of the room are wood stud with gypsum and/or plywood sheathing.



Photograph 1.4.28. Detail view at panel partition showing 52nd Army Artillery unit crest painted on glass pane, backlighted for emphasis.

The north wall is partially sheathed with plywood panels to mid-height over the older stud wall forming the southern partition of the latrines, which is finished in steel lath plaster. The eastern wall is the typical partial-height wood and glass partition (closed at the top with wire-mesh partition) separating this room from the corridor (Photograph B.13). The southernmost glass panel of this same wall depicts a painted Army unit crest of the 52nd Army Artillery (Photograph 1.4.28). The paint finish at the trim and doors was originally light blue, with later coats of sky blue, gray, and white (Photograph B.14).

A 1940s-era wall-mounted telephone set was found in the southeast corner of this room, lying on the floor and adjacent to telephone wiring junction boxes. This object was submitted to the NPS for curatorial review.

The ceiling is exposed concrete, originally skim-coated white, exposed to the second-floor slab above. The floor is vinyl asbestos tile over wood finish flooring. There are two chain-hung fluorescent lighting fixtures in the room. The fixtures are a troffer design with three tubes each. The troffers are well rusted and appear to be of post-war design.

Room 8-108

This is the most centrally located space of Level 1 of the lean-to, featuring several connections to adjacent rooms/corridors. In the post-war era, this room was originally entered from Foyer 8-A to the north. The northern wall of this room is a wood-stud partition. The western wall was formerly a wood-

stud partition wall, later removed, so that the western wall is now the brick wall of the main hangar space. Through this brick wall are a set of metal-clad (kalamein) fire doors, representing the largest opening from the main hangar space into the lean-to. These doors each have a single-panel design created by a raised molding attached to the door's surface. Immediately south of these doors is a radiator, half of which extends into Room 8-106 to the south (Photograph 1.4.29), indicating that the wall dividing rooms 8-108 and 8-106 was added later. The brick is finished with plaster and painted with yellow and, subsequently, white.



Photograph 1.4.29. Detail view of battened partition framing around earlier radiator at west wall. Profiled steel frame of double-door is visible at right.



Photograph 1.4.30. View of electrical panel. Note conduit runs extending down below slab and upward to the second floor.

There are two walls bordering this room to the south. The first is a wood-stud partition which includes a small wood-trimmed window into Room 8-106. The second wall, farther south, is a wood-stud wall separating this room from Room 8-107, through which a doorway exists. The sheathing panels composing this wall are trimmed with batten. Bridging the distance between the two southern walls is a hollow terra cotta tile (and partially brick) wall, faced in plaster. Set into this wall, and facing east, is a large black-painted electrical panel featuring swinging steel access doors (Photograph 1.4.30). Major conduit runs are visible entering the panel from below the first floor slab and extending up into the second level of Hangar 1 Lean-to. The electrical panel has exposed copper runs and extant fuses, and appears to remain at least partially functional. On the inside of one of the access doors is a typewritten circuit directory.

The east wall is the typical post-war, partial-height partition, originally light blue but subsequently painted gray and then white. The northernmost glass panel in this partition wall, although broken, shows partial extant painted stenciling reading "52D AR," consistent with a tenancy by the 52nd Army Artillery, whose unit crest is painted on the corridor side of the partition wall enclosing Room 8-109 (Photograph B.15). A wire-mesh closure partition, consistent with the rest of the western elevation of Foyer 8-A, closes the partition to the slab overhead.

The ceiling of Room 8-108 is the typical exposed concrete, skim-coated white, with the notable exception of an early porcelain enamel fluorescent light fixture (unique to the entire complex) hung by chains (Photograph 1.4.31). Additional ceiling-mounted chains, missing the associated light fixtures,



Photograph 1.4.31. Detail view of early chain-hung porcelain enamel fluorescent light fixture, dating to the period of significance.

are found in the immediate vicinity. Another fluorescent light fixture—a later, open finned type—is flush mounted to the concrete ceiling immediately east of the main hangar wall, and also extends into Room 8-106 in a similar manner to the radiator directly below it, establishing the partition wall as a probable later addition (Photograph B.16).

The floor of this room appears to be vinyl asbestos tile in most areas, but is obscured by extensive debris and deteriorated finishes.

Room 8-107



Photograph 1.4.32. View of partial-height post-war partition with painted remnant of unidentified Army artillery insignia.

The northern wall of this room is the wood-stud framed, plywood sheathed partition found elsewhere in the immediate vicinity. The wall is closed to the exposed concrete ceiling above with a wire-mesh partition, which is faced on the interior by gypsum panels consistent with panels found in the WPA Infill's monitor structure, suggesting concurrent post-war construction (Photograph B.17).

The east wall is the partial-height wood and glass partition found nearly continuously along Foyer 8-A. One of the glass panels features a faded painted insignia similar to those of other Army Artillery units responsible for the deployment of NIKE anti-missile batteries during the Army occupancy (Photograph 1.4.32).

The south wall is wood frame, formerly sheathed with gypsum and plywood. A post-war-era drinking fountain was located along this wall and found loose in the room (Photograph 1.4.33). Its previous location is established by the remnant base and piping connections.

The west wall is a plywood-sheathed stud wall, separating this room from the adjacent Room 8-106. As in other areas, this sheathing is trimmed with narrow wood battens at the joints. A wooden door connects the two rooms.

Floor and ceiling are consistent with the other Level 1 spaces. Chains hanging from the exposed concrete slab suggest the earlier presence of porcelain enamel fluorescent fixtures, as still extant in Room 8-108.



Photograph 1.4.33. View to the south showing wood-frame partition wall. Drinking fountain base is left of center.

Room 8-106

The east wall of this room is composed of two segments. To the north is a hollow terra cotta tile wall framing the electrical panel discussed in Room 8-108; to the south, the majority of this wall is

a wood-stud partition sheathed with plywood (Photograph 1.4.34). Several penciled phone numbers and names of unknown date are scrawled on the wall immediately south of the door. These would most likely date to the Army occupancy of the complex.

The south wall is a wood-stud partition, formerly sheathed with gypsum, fiber, or plywood panels. The west wall, the brick wall separating the lean-to from the main hangar space, has remnants of plaster finish consistent with the goldenrod yellow paint later covered by white over light blue found in spaces to the north (Photograph B.18). This wall features two of the pivoting steel sash windows described in the Hangar 1 discussion. A radiator is located below the southernmost window. The north stud wall contains a small window described in Room 8-108, but was not otherwise accessible due to debris in this area.



Photograph 1.4.34. Detail view of east wall showing later partition (right) framing into earlier plastered hollow clay tile wall (left). Note original yellow paint later covered with white over blue.

The typically exposed concrete skim-coated ceiling of this room shows evidence of two fluorescent troffer-type fixtures, with only the chains remaining; these were oriented north-south.

Room 8-105

The spaces south of, and including, Room 8-105 were apparently originally a single space, as the enclosing post-war partial-height partitions around Rooms 8-102, 8-103, and 8-104 are not “closed” to the bottom of slab above with additional wire-mesh partitions, as is found in spaces to the north. The regular arrangement of ceiling-mounted fluorescent fixtures on the ceiling above these several spaces confirms their original contiguity. There are nine of these fixtures, oriented north-south, of yet another distinct type. These fixtures are surface-mounted directly to the slab above, and consist of two tubes separated by a steel baffle. The ends are capped by plainly decorated steel decorative plates. The fixtures are evenly distributed, three to each north-south bay, extending to the south stair enclosure. The fixtures at the northwest corner are in poor condition and have fallen from their mounts. The remaining fixtures are rusted but in place.

The northern wall of Room 8-105 is the wood-stud partition enclosing Rooms 8-106 and 8-107. There is extant telephone equipment mounted to the lower portion of the wall adjacent to Room 8-107. Immediately to the right (east) is a framed window opening, possibly for a reception or security checkpoint. At the easternmost end of this wall, across Foyer 8-A, is the remnant of a steel-mesh gate, creating a formerly secure area north of this line (Photograph B.19).

There is no partition between the corridor (Foyer 8-A) and the eastern portion of Room 8-105. The eastern wall of the room is thus the exterior wall of the lean-to, including the bay window projecting eastward. There is a small remnant of post-war partition wall enclosing some of the bay window, a small space designated as Room 8-101 on some existing plans (Photograph B.20). This bay window was originally built to serve as a small vestibule for an entrance door added during the WPA era, which was subsequently replaced by a third window. The bay window is finished with painted plywood panels, whereas the remainder of the eastern elevation is plaster over brick.



Photograph 1.4.35. Room 8-105, view west towards hangar, showing infilled door (left) and ghost wall. Note the linear fluorescent fixture hanging in foreground.

The southern extents of Room 8-105 are bordered by the post-war partitions forming the rooms to the south.

The west wall is the brick wall separating Hangar 1 Lean-to from Hangar 1. An infilled doorway is present immediately south of an existing opening. There is additionally evidence of a former partition wall between the two doors, framing off a space accessible directly from the hangar floor (Photograph 1.4.35).

During the course of the HSR documentation, this room suffered additional deterioration due to increased decay of the lean-to roof and through the actions of emergency tenants that occupied Hangar 1 during the aftermath of Hurricane Sandy. This includes the accumulation of additional trash/debris, the removal of a board from an exterior window that allowed more weather to enter the building, the collapse of the adjacent office partitions forming Room 8-104, and additional water damage due to the accelerated failure of the second floor roof, above.

Rooms 8-102, 8-103, and 8-104

These three spaces are formed by the partial height post-war partitions that form the western wall of Foyer 8-A at the rest of Level 1. The partitions have several coats of paint, including graffiti and artwork dating as late as the early 1980s tenancy of the Big Apple Circus. Along with Room 8-105, this area suffered additional damage during the HSR period, including the collapse of the partition enclosing Room 8-104. It is not clear if the damage was directly caused by temporary tenants or was the final result of the continued process of deterioration.

The west wall of Rooms 8-104 and 8-102 is the plaster finished brick wall separating Hangar 1 Lean-to from the main hangar space. The steel sash window in Room 8-104 is furred over with gypsum board, to which a 1960s-era wall-mounted black rotary telephone is attached. The housing of the telephone is missing. The steel sash window in Room 8-102 is in its original configuration, not modified or trimmed. There is a radiator below this window.

At the southeast corner of Room 8-102, below the brick stair enclosure above, is a small closet. The doorway to this closet is kalamein-framed, and accommodates a 30-x-80-inch door. There is a wooden single-panel door of this size lying in Room 8-102. An additional door found in Room 8-102 is a two-panel door divided 2/3 by 1/3. This recessed panel door is of wood construction and measures 36 x 84 inches.

Ceiling-mounted light fixtures in these spaces are described for Room 8-105 above.

Interior, Level 2 (see Figures 1.4.6, 1.4.7, and 1.4.8)

Level 2 was added to the lean-to in the late Depression years, prior to World War II. It is organized with a single corridor (Foyer 8-D) along the western wall (the wall separating the lean-to from the main

hangar space). It has also experienced fewer layout changes since its original construction. The occupiable spaces are arranged on the east side of this corridor and accessed therefrom; there are also connections directly between most of the spaces. Most of the partitions are hollow terra cotta tile finished on both sides with plaster. The doors from the main corridor dating to the period of significance are typically wood, with glass transoms above. Each transom is wood and glass, forming three divided lights, with hopper (bottom-hinged) operation.

Another notable difference between the second floor and the first floor is the suspended plaster ceiling present throughout most of Level 2, which along with other evidence suggests an original lower-intensity use as offices or storage spaces, in contrast with the high-intensity maintenance and utility spaces at Level 1.

Foyer 8-D

The west elevation of Foyer 8-D consists of the (formerly exterior) wall enclosing the main hangar space, subsequently finished with plaster to create an interior architectural treatment. The deterioration of this plaster has revealed the formerly exterior iron-flecked face brick, a copper flashing line below it, and the common brick below this. The copper flashing line, formerly where the original roof intersected the main hangar wall, occurs at approximately 48 inches above the second-floor level. The steel hangar columns are also evident; a wythe of brick enclosing the steel hangar columns was chipped away to create a continuous flat surface for the new interior finishes, which effectively concealed the steel. This is different than the treatment at Level 1, where the steel column flange was left exposed in all spaces. Finally, this eastern elevation is dominated by a largely continuous row of steel sash windows, interspersed at intervals by the main steel support columns for Hangar 1, as well as penetrations for utility piping added later (Photograph 1.4.36).



Photograph 1.4.36. Detail view showing later cast-iron sprinkler pipe penetration through earlier steel sash window pane, low clerestory at the second floor. These were once exterior windows.

The east wall is, with limited exception, mostly hollow terra cotta tile wall finished with plaster. Finished wood doorways with operable wood and glass hopper transoms give entry into the several occupiable rooms. Each of the transom-type doorways have two-paneled doors, with recessed panels divided 2/3 over 1/3. There are a total of five transomed doorways on the second floor: four doors into rooms and one corridor door at the north end, discussed below. The doors are 36 x 84 inches, and the transom is a hopper panel divided into three-lights divided by wood muntins. One doorway permits entrance into Room 8-205; the next two permit entry into the combined Rooms 8-205 and 8-204; and a final doorway allows access to Room 8-202. All of the doors are right-hand doors.

In the central bay, outside of Room 8-203, a small 12-circuit panel is recessed into the east wall. The panel was manufactured by Cole Electric Products of Long Island City, New York. This is the same manufacturer as the larger electric panels at the first floor of the lean-to, below, and at Hangar 2 Lean-to.

At the north end of the corridor, the walls enclosing Rooms 8-208 and 8-209 are post-war wood stud and plywood, suggesting that the northern end of the corridor was once a larger open space extending from the western (hangar) wall to the eastern (lean-to) exterior wall. The reason for the inconsistency of this space with the remainder of Level 2 has not been established.

The corridor is laid with a deep brown vinyl asbestos tile over the original wood finish flooring. The ceiling is plaster over wire lath, suspended by a steel grid.

The ceiling of the corridor is steel lath plaster, with one single-tube fluorescent fixture (typical) per bay, although there are two at the central bay. This is the same fixture type found surface mounted to the concrete slab in Foyer 8-A on the first floor. A main sprinkler line runs near the ceiling at the hangar-side windows. The line is supplied by a pipe penetrating one of the glass panes in the steel sash windows, connecting it back to the riser in the main hangar bay.

The north and south ends of the corridor end at the stairs, which turn east down to Level 1. The stairs are enclosed with plastered brick wall from Level 1 to the Level 2 floor slab, and plastered hollow terra cotta tile from the Level 2 floor slab to the ceiling. The north elevation of the north stair (and south elevation of the south stair) consists of the former exterior walls of the door retraction pockets, plastered directly over the original iron-flecked face brick to create an interior finished surface (Photograph 1.4.37). There is a single-tube fluorescent fixture at the steel lath plaster ceiling of the stairwell, identical to those in Foyer 8-A on the first floor.



Photograph 1.4.37. View of south stair showing former exterior wall, face brick, and flashing line.

There are three intermediate doors along the corridor: one at the southern end, in line with the partition wall between Rooms 8-201 and 8-202, and two at the northern end. The northernmost door permits entry into the north stair, while the third and final door is aligned with the thick brick wall separating the Level 2 latrine from Rooms 8-208 and 8-209. The northernmost door is a kalamein left-hand door and swings into the stairwell landing. The door is 36 inches wide by 84 inches high and is enframed by a profiled steel frame identical in design to those on the first-floor hangar-side elevation. Hardware is intact and consists of a mortised bronze lockset with a thumbturn bolt. Three hinges are located at the west jamb. The next hall door to the south, exactly one bay south, is also 36 x 84 inches, but of wood construction with a three-light transom panel above. This door is identical to several others at room entries down the length of the corridor.

At the southern end of the corridor, immediately adjacent and perpendicular to the door at Room 8-201, is a profiled steel frame missing its door. There are three large, mortised bronze barrel hinges, each 5½ inches long, at the west jamb at the stair side, making this a left-hand reverse door as approached from the stair landing.

Above the stair landing at the end of the corridor is an access opening to the roof above. The hatch is missing, consistent with the opening at the north stair. There is a light switch at the top of the stair at the north wall.

Room 8-201



Photograph 1.4.38. View of east (corridor) wall showing steel mesh screen blocking doorway. Note transaction window cut into the kalamein door.

This is the southernmost room of Level 2. Its most distinctive quality is the evidence for secure storage, with a steel-mesh panel blocking after-hours access through the corridor door at the west wall (Photograph 1.4.38) and similar wire-mesh extant over the windows. As such, this room may have served as an armory, supply space, or for storage of sensitive documents, accessed only through 8-202 to the north.

The north elevation is a hollow terra cotta tile wall finished with plaster. Two wood doorways are located in the eastern half—one permitting entry into Room 8-202 and the other opening into a small closet adjacent to the east exterior wall of the lean-to. Both are 30 x 84 inches. The east wall features two window openings with wooden double-hung windows, the northernmost of which is displaced. The window openings are trimmed with wood. The southernmost (right) window is closed with a steel mesh panel, presumably for security. Another steel panel for the second window is loose within the room.

The south elevation is windowless and is formed by the walls enclosing the hangar door retraction pocket. The east wall includes the blocked door and is of hollow terra cotta tile construction. Plaster finishes are found throughout, painted white over gray/light blue. At the former exterior brick enclosing the hangar door pocket, plaster was applied directly to the brick.

The west elevation contains the corridor doorway, which is of fireproof construction, with a profiled steel frame and kalamein door. The door is 36 x 80 inches. The door is a left-hand door from the corridor. A rusted steel knob is extant at the corridor. ASO #7, Room Number 1, is indicated on a panel. A roughly 24-inch-square opening has been cut out of the upper panel of the door, apparently to serve as a transaction window. There is a light switch to the left of the door.

The ceiling is steel lath plaster.



Photograph 1.4.39. Corridor view south showing supplementary steel gate at entrance to Room 8-202. Note the transomed wood doorway. Low clerestory windows are at right.

Room 8-202

This room's ultimate use appears to have been as a companion room to Room 8-201, as it has an exterior steel-mesh gate providing extra security from the corridor (Photograph 1.4.39).

The room's north wall is plaster over hollow terra cotta tile and contains a door opening to Room 8-203 beyond. There is evidence of a previous door opening hard against the east (exterior) wall, since infilled with wood stud and plaster.



Photograph 1.4.40. View to east showing infilled door to deck over first-floor bay window. Note radiator at bottom right.

The east (exterior wall) accommodates two windows, both of them early 1960s aluminum replacements. These doors are similar in design to the horizontal aluminum windows noted at the first story. Each window has three horizontal glass panes, with no apparent operating sash. The southernmost window exists in a previously larger, door-sized opening since infilled with concrete block and sailor-course brick to sill level (Photograph 1.4.40). Evidence of a door dating to the original construction of Level 2 includes iron-flecked face brick jambs and the necessary gaps in brickwork to accommodate nailing blocks for the doorframe. This former door would have provided access to the roof of the first-floor bay window, suggesting an additional observational or review function for this added bay element. As described above, the roof of the bay has an extant guardrail, suggesting it was indeed used as an occupiable terrace or deck.

The south wall of Room 8-202 is the wall adjacent to Room 8-201, and thus incorporates the bump-out for the supply closet and the doorway connecting the two rooms. There is a radiator aligned with the displaced wall for the closet, an unusual original condition supporting the existence of an original exterior door through the now-adjacent window.

The west wall, also composed of plastered hollow terra cotta tile, includes the entrance door from the corridor. The southern end of the west elevation consists of a former door opening infilled with a wood-stud patch. The existing entry door, apparently dating to the second floor's original construction date, has been modified with a steel-mesh gate. The transom has been closed with wood.

There is a black-painted chair rail at mid-height around the perimeter of the room.

The ceiling is plaster with adhered post-war acoustic 12-inch ceiling tiles. There are four ceiling-mounted fluorescent light fixtures, all plainly designed rectangular three-tube fixtures identical to those found and described for Room 8-205 (below). The fixtures are oriented east-west, aligned with the room's long dimension. The floor is vinyl asbestos tile over wood, which is typical to all the second-floor spaces (Photograph 1.4.41).



Photograph 1.4.41. Typical view of asbestos tile in second-floor spaces. This type of post-war floor finish is found throughout Hangar 1 Lean-to and the WPA Infill.

Room 8-203 (and Room 8-204)

This large existing room was once at least two separate rooms, as evidenced by remnants of previous partitions (Photograph B.21). The southern portion is 8-203, while the northern portion is 8-204. A parachute tower connecting through a slab opening down to Level 1 is enclosed at the northwest corner

of the room. This vertical facility was likely used for drying or storage of parachutes through the World War II era. The former parachute tower was later partially repurposed as a utility chase, containing exhaust ductwork for the Level 1 toilet room spaces, and is accessed via steel doors from both the corridor (Foyer 8-D) and inside the room (Photograph 1.4.42; Photograph B.22). The 36-x-60-inch doors are kalamein, set within kalamein frames. The access door sills are set approximately 36 inches above the second-floor level, preventing accidental entry into the shaft.



Photograph 1.4.42. View to west showing parachute tower at right. Foyer 8-D is visible beyond the doorways.

The north elevation of the room incorporates the parachute tower enclosure at the west end and a door permitting passage to Room 8-205 at the east. The north wall is a stud wall with plywood sheathing similar to some construction on Level 1, suggesting it is somewhat later than the hollow terra cotta tile partitions found in most locations on Level 2.

The east (exterior wall) elevation accommodates four steel sash windows extending across two structural bays, and is finished with plaster over brick. All of the windows are MWI Type 63141 (12 x 18 inches) or six panes wide, three panes tall, with an eight-pane pivoting sash located in the top two rows. Only the third window is within the frame, with the other three lying on the floor; all four windows require complete rebuilding or replacement. There are radiators below the two center windows. A scrap of newspaper used as a gap-filler between the ceiling and the east wall was dated to October 1940.

The south wall, adjacent to Room 8-202, is plaster over hollow terra cotta tile, with an infilled wood-stud patch at a former door opening and another existing door to the west. The door is 36 inches wide by 80 inches tall and paneled with 2/3 over 1/3.

The west wall incorporates the two transomed doorways leading to the corridor. A U.S. Army Reserve sticker is visible to the right of the northern doorway, inside the room, partially painted over with light blue paint. Also to the right of the door is an approximately 6-x-8-inch electrical device at which several electrical connections are made. A rotating ceramic switch is incorporated into the device's face, suggestive of a timer. The purpose of the device is unknown. There is also a standard light switch to the right of the door. At the second, southernmost door is another recessed light switch box, but missing its switch.

Paint finishes throughout are light blue with areas of gray to mid-height, consistent with the other Level 2 spaces.

The ceiling is steel lath plaster, with large areas of decay towards the south due to roof failure. There are eight fluorescent light fixtures, each of which are the plainly designed rectangular three-tube fixtures identical to those found and described for Room 8-205. Most of the fixtures are oriented north-south, except those fixtures aligned with the third window, which run east-west. In the ceiling directly in front of the north doorway is an exhaust grille and shaft to a rooftop exhaust fan above.

Room 8-205

The north wall is double-wythe brick with plaster finish and separates this room from the toilet/shower rooms to the north. A former door opening is at the eastern end of the wall, infilled with doubled wood studs (Photograph B.23). The east wall is plaster over brick and accommodates two steel sash windows. The steel sash windows are six panes wide by three panes high, with an eight-pane pivoting sash, equating to an MWI Type 63181 (12-x-18-inch pane) window. This is a typical window at the eastern elevation of the second floor of the lean-to. A wide, low radiator with a SARCO valve is located below the right-hand (south) window.

The south wall is a battened plywood wall adjacent to Room 8-203/8-204, with a wooden doorway permitting passage thereto. The wood paneled door is 30 inches wide by 80 inches tall. The top half is one panel while the bottom half is divided into three horizontal panels. A bronze cylinder locket is extant. The door is a right-hand door with two hinges leading into Room 8-204. The western end of the south wall is hollow terra cotta tile with plaster finish, adjacent to the parachute tower/utility chase.

The west wall holds the transomed doorway permitting entrance from the corridor. The door is off its hinges and located within the room. A panel attached to the top half of the door (at the corridor side) has "Maj. P. Eppelco" written on it, as well as a U.S. Army Reserve sticker dated April 1964. A stenciled number, AS07 (or ASO7), is also painted on the panel.

The room has a chair rail around the perimeter. Paint colors are typical with other rooms on Level 2, including light blue, sky blue, and gray.

The ceiling is steel lath plaster. Four three-tube fluorescent fixtures are located at the ceiling, oriented east-west. These fixtures are plainly designed with a rectangular base and no troffer or decorative panels. The tubes are simply exposed to view. Additional instances of this fixture are found in the rooms to the south. Immediately in front of the door is a 1½-x-2½-foot exhaust grille leading to a roof exhaust fan.

Rooms 8-206 and 8-207 (Latrine and Shower Room)

Room 8-206 (latrine) has subway-style running bond tiles to mid-height, crowned by a black accent course and black tile base, with the remainder of the wall finished in plaster. Three urinals and two toilets with steel partitions are along the north wall. The steel partitions, while similar to those at the first floor, incorporate a modestly decorative pitched gable profile along the top rails. The urinals are full-height (floor-discharge) and made of vitreous china, and installed on a 4-inch raised platform to accommodate drain piping. A former door opening has been infilled at the western end of the wall; tile has been carefully matched but appears to be a later addition (Photograph 1.4.43).



Photograph 1.4.43. View of north wall showing partial-height ceramic tile and infilled door opening to Room 8-209 beyond.

The east wall accommodates a steel sash window, which has fallen completely free of the wall and lies in the center of the room. The window is MWI Type 63181 (12 x 18 inches). The south wall has a

deep porcelain enamel cast-iron sink at the eastern end (located at the wood-stud infill) and two additional porcelain enamel cast-iron sinks with 1934 manufacturing dates. A gas-fired hot water heater is west of the sinks, which appears to date much later than the period of significance.

The floor is hexagonal white mosaic tile with black accents, which is a unique type within the hangar complex. A single floor drain is located centrally in front of the toilet stalls. The ceiling is steel lath plaster with a recessed, centrally located electrical box but no extant fixture.

The Shower Room, located west of the latrine, is reached through an uncased opening in the brick wall dividing the two rooms. This room has a 4-inch concrete slab ceiling, lower than that of the adjacent latrine and corridor. Unique to the complex, this concrete slab serves as a "lid" to the shower room, resting on the four perimeter masonry walls of this nearly square space. The purpose of this slab above, creating an apparently protective enclosure, has not been determined. The original steel lath plaster ceiling has been visibly removed to permit the construction of this lower ceiling. The concrete lid is penetrated at the southeast corner by a galvanized steel chase leading to an exhaust fan above the roof level. A simple, plainly detailed, single-bulb exposed incandescent fixture is centrally located within the ceiling.



Photograph 1.4.44. View to northeast of supply room built in corner created by hangar door pocket and stair (to left). Note decorative fluorescent light fixture partially visible at upper right.

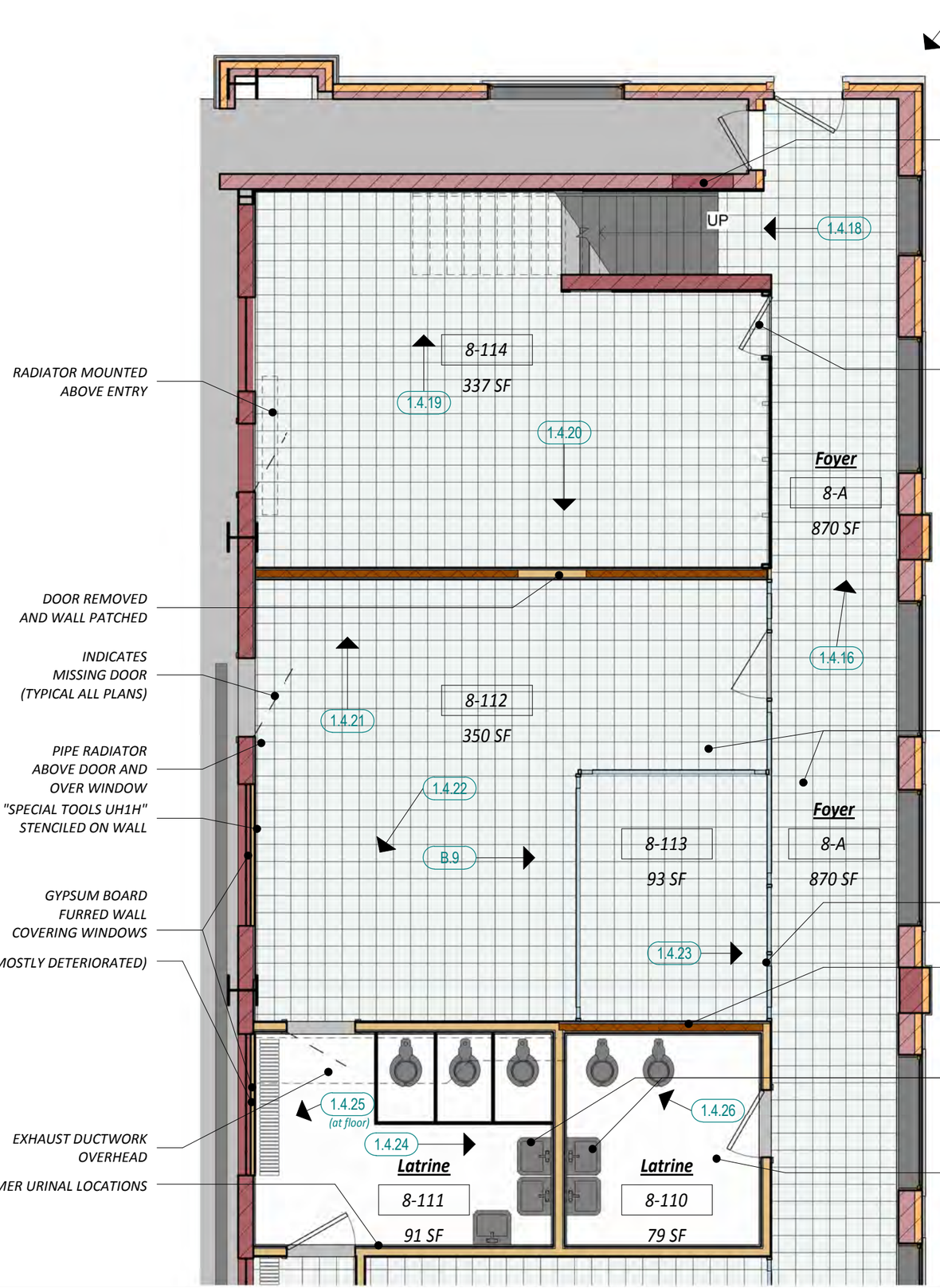
The room holds two steel shower stalls dating from the post-war era, which have deteriorated and are in several pieces. There is evidence of earlier shower-type connections on the east wall. Associated plumbing is extant but disconnected. At the west wall, towards the corridor, a small electrical transformer is visible behind a wire mesh grille, purpose unknown.

The doorway to the hallway has a kalamein doorframe and holds a single-panel wood door missing its hardware. The door is 30 inches wide by 84 inches tall. There is an electrical switch on the wall to the right of the door inside the shower room—unusual, as this is the hinge side of the in-swinging left-hand door.

Rooms 8-208, 8-209, and 8-210

These three rooms comprise the northern end of Level 2 and are enclosed by post-war wood-stud partitions sheathed with battened plywood (Photographs B.24, B.25, and B.26). Room 8-208 (designated as Room 7) is roughly the southwest quadrant of Room 8-209 (Room 8). Room 8-210 is a small supply area at the extreme northeast corner of Level 2, separated from Room 8-209 by a door and windowed partition (Photograph 1.4.44). Within the supply area, the exterior face brick of the originally exterior hangar pocket is visible, with areas of deteriorating direct-applied plaster (Photograph B.27).

The ceiling in Rooms 8-208 and 8-209 has three pendant-mounted linear fluorescent fixtures identical to those three-tube units found on the first floor in Room 8-114 and 8-112, featuring decorative acanthus leaf panels at the ends.



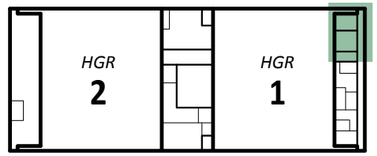
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, offices.

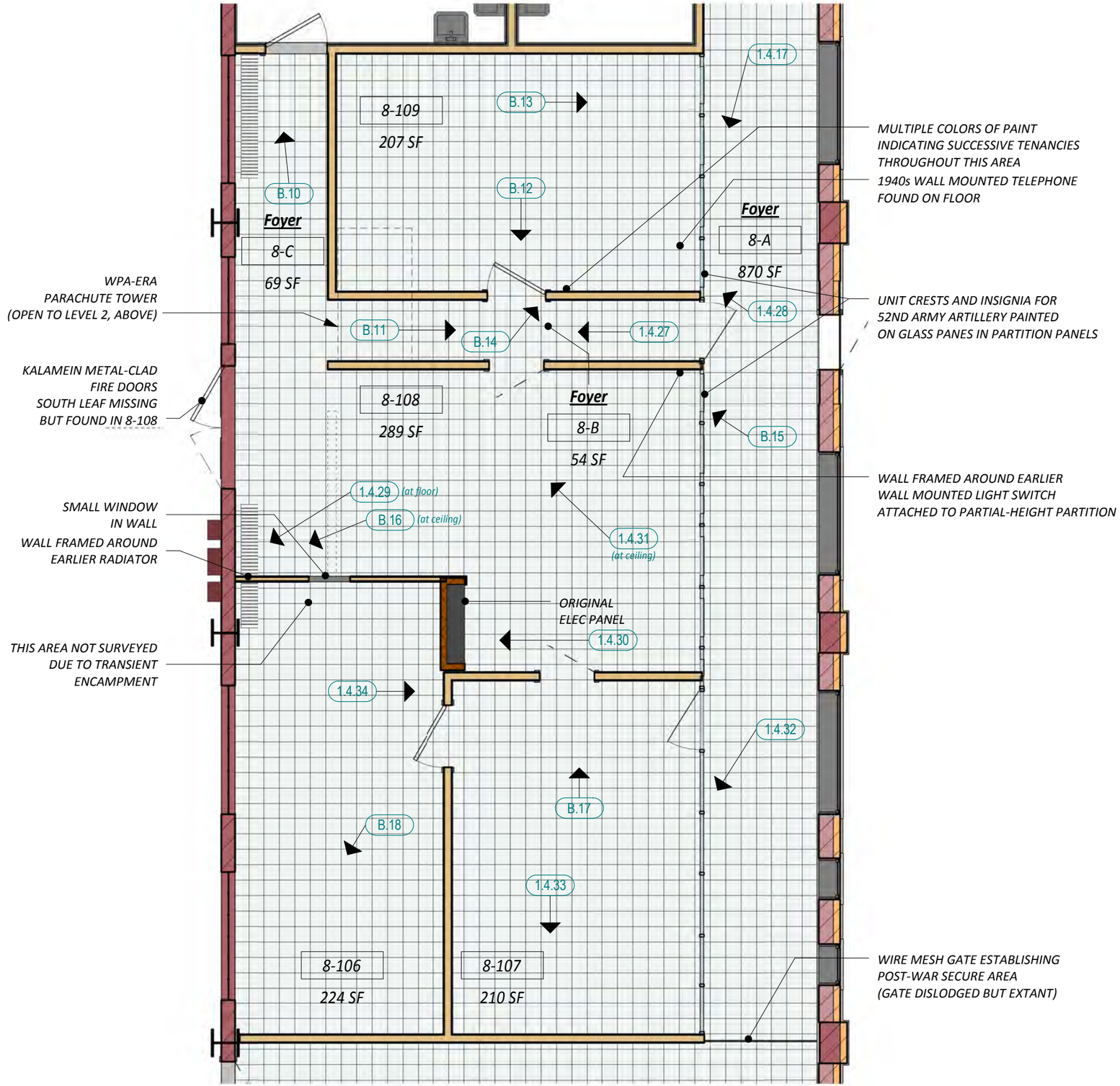
GENERAL NOTES:

Fair to poor condition.

Figure 1.4.2

Hangar 1 Lean-to (Bldg. 8), 1st Floor, North

As indicated



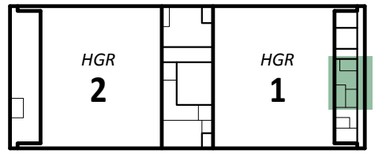
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, offices, secure area.

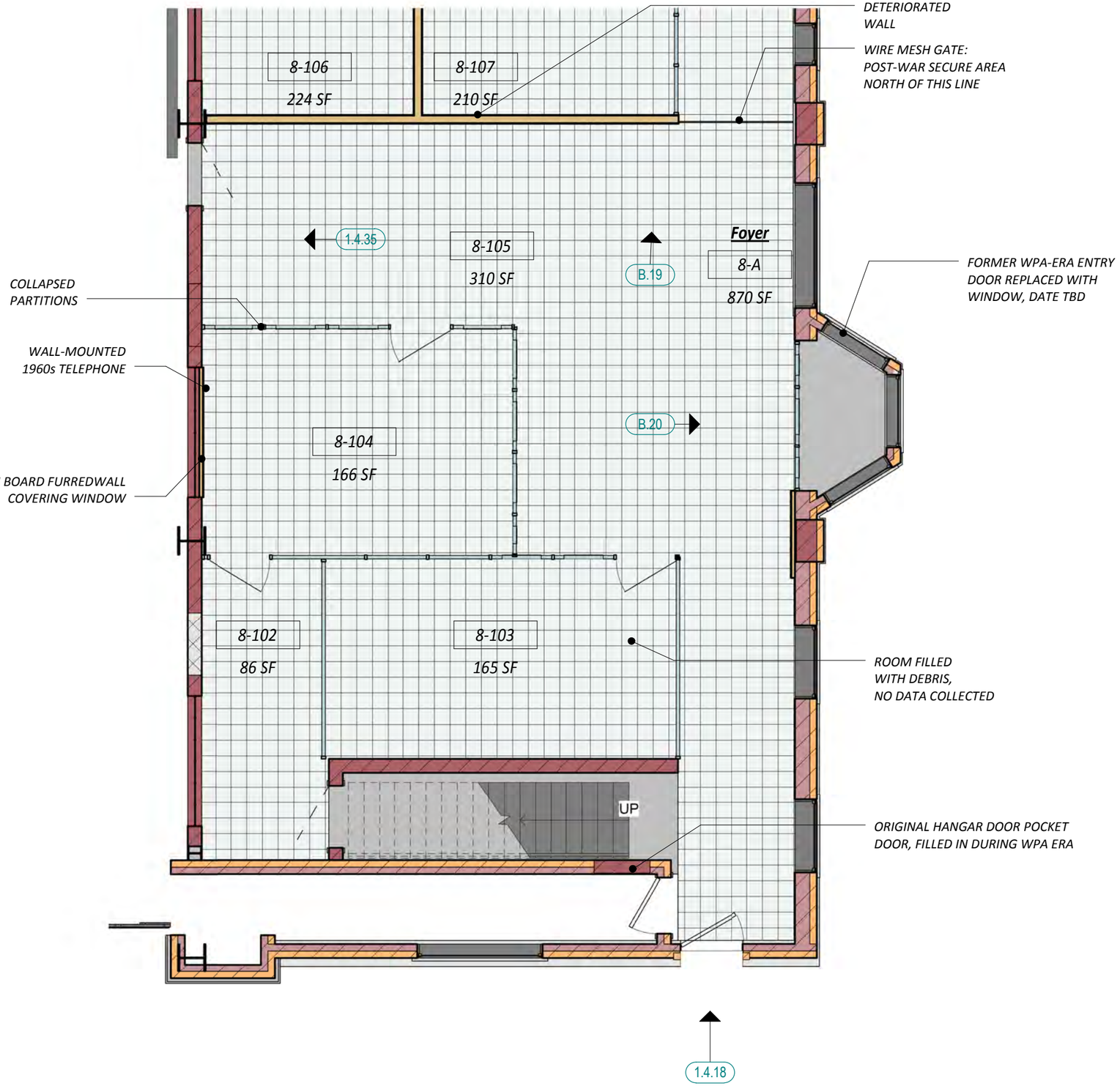
GENERAL NOTES:

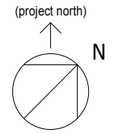
Poor condition.

Figure 1.4.3

Hangar 1 Lean-to (Bldg. 8),1st Floor, Central

As indicated

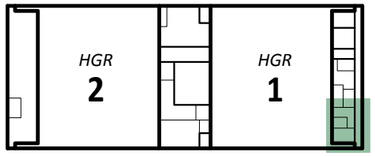




1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, offices.

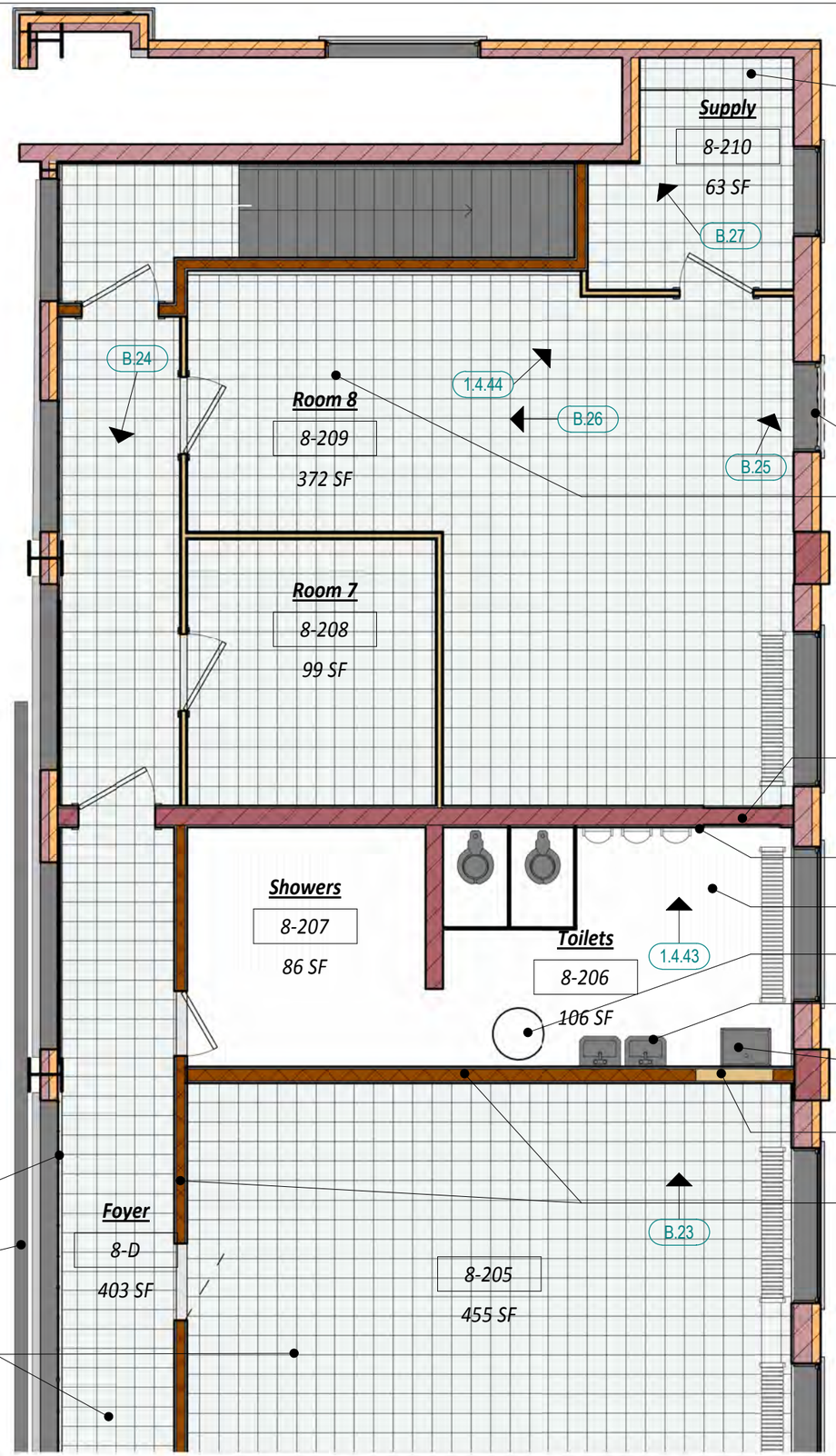
GENERAL NOTES:

Poor condition.

Figure 1.4.4

Hangar 1 Lean-to (Bldg. 8), 1st Floor, South

As indicated



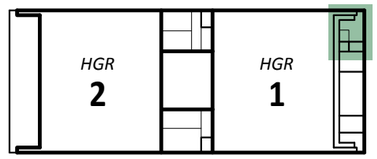
(project north)

N

1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Classroom, offices.

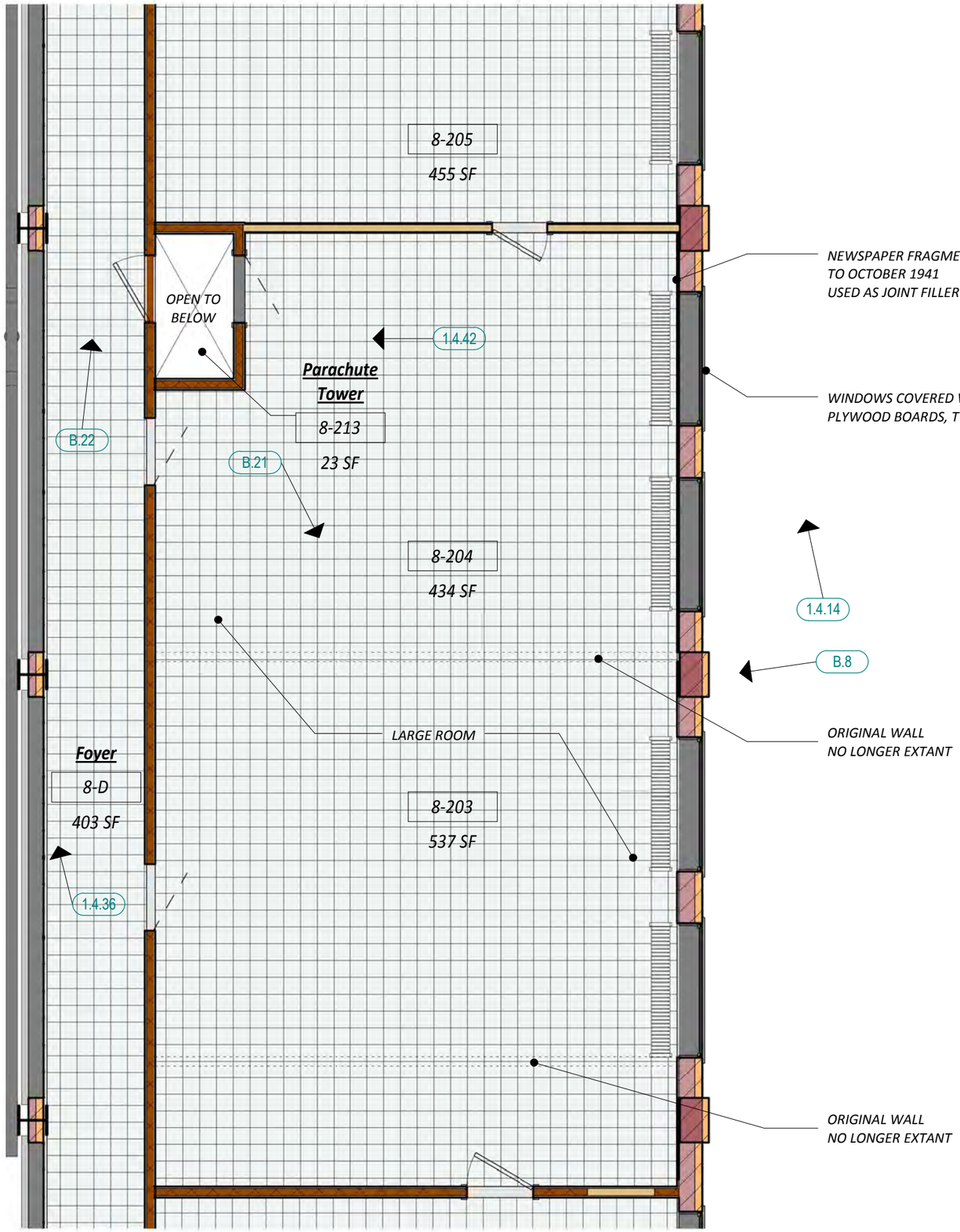
GENERAL NOTES:

Fair to poor condition.

Figure 1.4.5

Hangar 1 Lean-to (Bldg. 8), 2nd Floor, North

As indicated



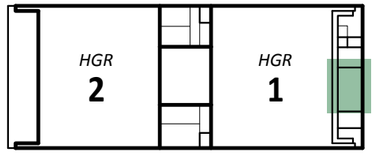
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Offices.

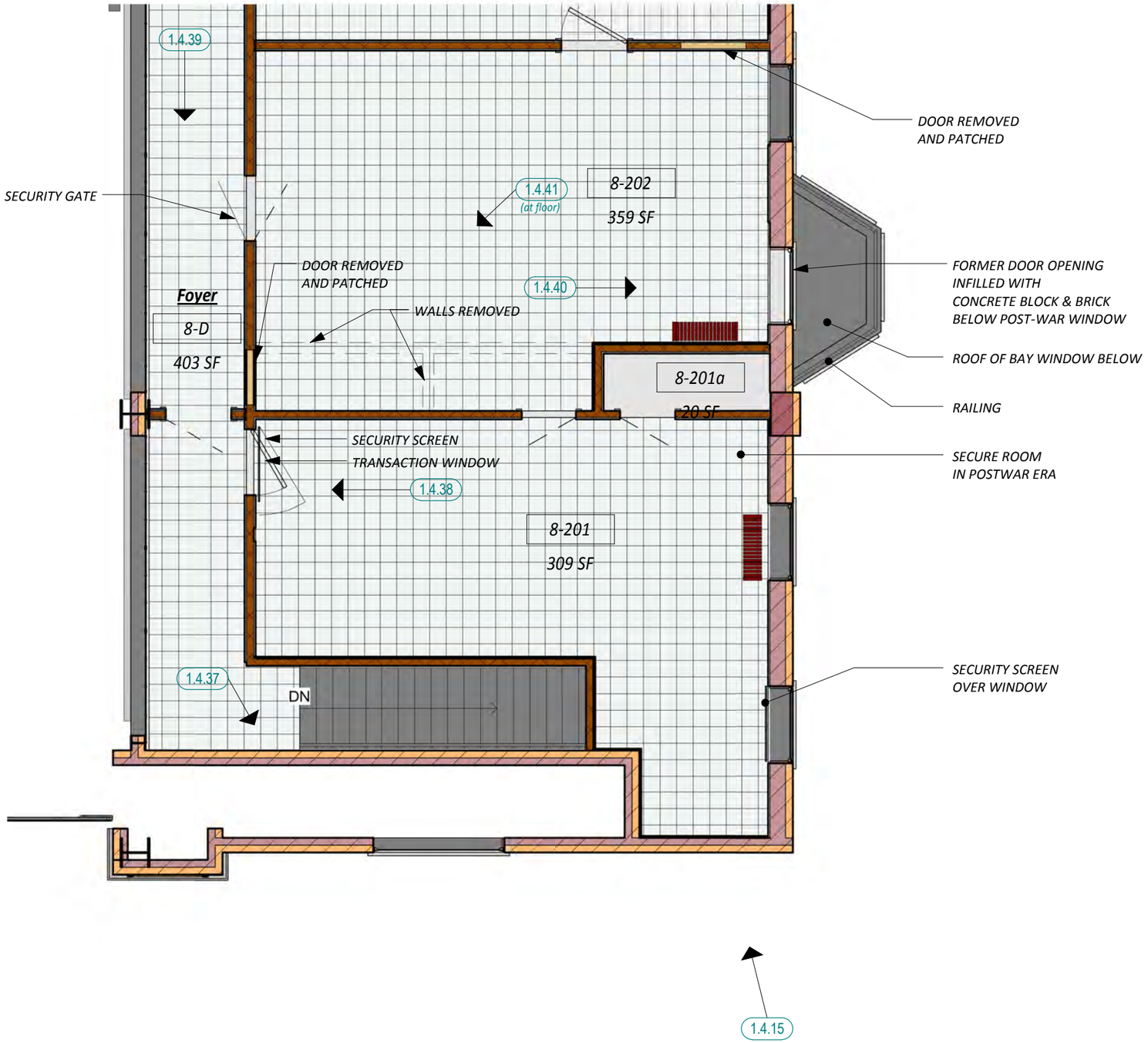
GENERAL NOTES:

Mostly original WPA-era construction, poor condition

Figure 1.4.6

Hangar 1 Lean-to (Bldg. 8), 2nd Floor, Central

As indicated



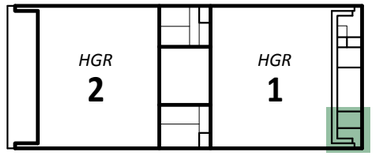
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Offices, Secure area (armory?)

GENERAL NOTES:

Fair to poor condition.

Figure 1.4.7

Hangar 1 Lean-to (Bldg. 8), 2nd Floor, South

As indicated

Hangar 2 (see Figure 1.4.2)

Exterior

The hangars have two main façades, to the north and south. At Hangar 2, the original east elevation is now the interior wall at the WPA Infill. The west elevation is dominated by Hangar 2 Lean-to, discussed in a subsequent section. There are two rows of west-facing clerestory windows above the roof-line of the lean-to, admitting light into the main hangar space.

North Façade



Photograph 1.4.45. Exterior view of south hangar door pocket and parapet, including copper flashing. Note graffiti.

Hangar Doors. The north façade of Hangar 2 is composed primarily of aluminum alloy hangar doors, over which is extended the main low-slope gable end of the hangar. As at Hangar 1, the 12 doors are of two widths, with two narrow doors at the edges and 10 wider doors in the remaining positions. The narrow doors contain pilot doors for entry directly into the hangar. The doors on the east side retract in-line to a hangar pocket aligned with the adjacent lean-to; the doors on the west side retract by turning 90 degrees along the interior west wall of this hangar (Photograph 1.4.45). With all hangar doors fully retracted, a full-width, clear-span opening is created.

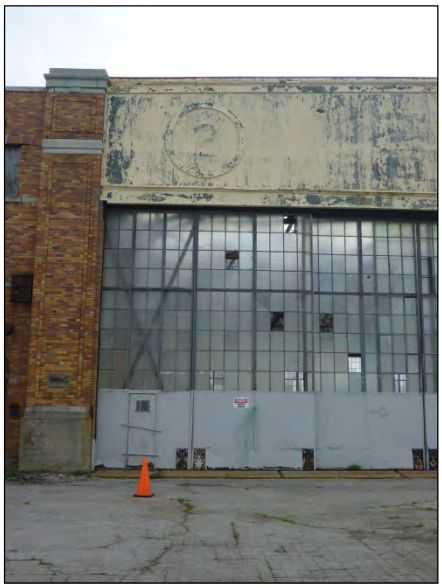
The hangar doors run on three sets of steel tracks, which allow the doors to be stored in three stacks. The tracks are embedded in the concrete below and suspended overhead from the steel roof structure. Each hangar door panel has two spring-adjusted caster wheels at its base and two additional caster wheels at its top. The hangar doors are manually operated.



Photograph 1.4.46. Exterior view of north-facing hangar doors and corrugated copper fascia.

Many of the wireglass lights in the hangar doors are cracked, broken, or missing. It is evident that some lights have been replaced with non-period glass panes, but others appear to be original. The glazing putty has largely failed. Many components of the doors are loose and deteriorated. Seals, thresholds, fasteners, and gaskets are in poor or non-existent condition, which causes the doors to clatter and shake markedly during windy conditions.

Gable End. The low-slope gable end above the doors is the second major component of the north façade (Photograph 1.4.46). The gable's size is determined by the trusses beyond it, for which it serves as an end cap. The gable is composed of wood planking fastened to the northernmost steel truss. The gable is finished with corrugated 16-gauge copper sheeting at the exterior, originally laid in sheets. A raised copper emblem is at the high



Photograph 1.4.47. Exterior façade of east end of hangar doors (north side) and corrugated copper gable. Note remnant of "2" in circle medallion.

point of the gable, depicting "N.Y.C." on a shield flanked by two wings. Raised copper medallions exist at the easternmost and westernmost extremes of the gable, originally serving to enframe the hangar number (Photograph 1.4.47).

The copper is coated with several coats of beige paint, with impressions of black lettering from previous tenancies still discernible.

Original sconce light fixtures are extant across the length of the gable (Photograph 1.4.48), mounted approximately 12 inches below the formed copper cornice. These fixtures are simple, downward-facing, bowl-shaped reflectors standing off the fascia on rigid steel pipe stems. The reflector is porcelain enamel, consistent with original fixtures at the interior, and is 9 inches in diameter at the base and 9 inches tall. Each gable originally included four such sconces, evenly distributed on either side of the winged emblem. At the north-facing gable, there is one sconce at the left (east) and two towards the right (west). At the south-facing gable, only the two sconces at the right (east) side are extant. There is a remnant stem in the inward position on the left (west) side, missing the bell housing and fixture base.



Photograph 1.4.48. Exterior detail view of original porcelain enamel sconce fixture at corrugated copper gable.

Framing Elements. The hangar doors and low-slope gable end above it are terminated at either end by decorative brick and cast-stone pilasters, originally capped with copper (Photograph B.28). The bases of the pilasters are concrete. At Hangar 2, the west pilaster is continuous with the north façade of the lean-to.

South Façade

The south façade of the hangar is similar to the north façade, with similar features. All 12 hangar doors are extant, including the end units. The lower panel on the third hangar door (counted from Flatbush Avenue eastward) has discernible ghosted signage reading "CAUTION PROPELLERS," which has been overpainted during a recent maintenance campaign. This signage dates to the period of significance.

Roof

The Hangar 2 roof was designed with a north-south center ridge formed by the sloping top chords of the structural steel roof trusses. The roof slopes from the ridge toward its east and west edges, which were originally designed with continuous gutters along the building elevations. The north and south sides of the roof are bordered by formed steel parapets, integrated with the copper sheathing.

The hangar's roof, no longer extant, consisted of 1¼-inch-thick, 8-inch-wide wood tongue-and-groove planking, topped with a layer of insulation and sealed with built-up roofing, in turn sealed with tar and



Photograph 1.4.49. View to the south showing remnant tongue-and-groove roof planking prior to removal. Monitor structure visible at left.

gravel (Photographs 1.4.49 and 1.4.50; Photographs B.29 and B.30). The wood planking, oriented east-west, was nailed to 3-inch-square wood nailers running north-south. These nailers run continuously along the 4-x-10-inch steel purlin channels spanning the east-west steel trusses at 6 feet on center, and are regularly through-bolted to the channels. The underside of the wood planking, visible from the hangar floor below, was originally painted off-white and later coated with a metallic silver finish. The purpose of this reflective finish has not been determined. The nailers and purlins are largely intact, but the remaining roof materials are missing or highly deteriorated, allowing rain, snow, and wind to penetrate fully into the hangar interior.

An important character-defining feature of Hangar 2, removed during the 1960s, were large "NYC" letters supported by copper-flashed wooden blocks, extending from north to south across nearly the entire length of the ridgeline.



Photograph 1.4.50. Exterior view towards the east over the roof with the WPA Infill, monitor structure, and Hangar 1 visible.

Large sections of deteriorated roofing were removed at the commencement of the HSR documentation for safety purposes. As part of this removal, the HSR team was tasked with fully documenting the roof. As a result, the level of detail described in the roof and steelwork for Hangar 2 exceeds that of Hangar 1.

Also found during the roof documentation was a stout wooden pole, approximately 3 feet in diameter and 14 feet, 6 inches in length, crowned by a brass fitting with three holes in a triangular configuration. This object, perhaps a flagpole or halyard device of some type, was lying loose across the roof steel in the approximate center of the roof. No obvious building fitting or connection base was observed. This object, like others, has been temporarily tagged and stored in Hangar 1 for NPS inspection. Near the conclusion of the HSR documentation, and after the emergency tenancy of Hangar 1—in the aftermath of Hurricane Sandy—this pole was found across the tarmac immediately in front of Hangar 3. It appeared to have been purposely moved out of Hangar 1, along with other objects stored therein. The HSR team moved the pole back to Hangar 1 Lean-to, at the northern end of Foyer 8-A. Many other objects last stored in the center of Hangar 1 have not been accounted for by the HSR team and may have been collected by the NPS.

Interior

The interior of the hangar is a single clear span, which is the most significant characteristic of its architecture. This vast space is formed by an assemblage of steel trusswork overhead framed by opposing brick walls (to the east and west) and the row of hangar doors (to the north and south). The original manufacturer of the trusswork steel is Pencoyd of Pennsylvania, denoted by mill markings on

several members. This manufacturer ended operations during the Great Depression. It can be assumed that the steel in Hangar 1 was manufactured by the same concern, but this has not been established through field observation.

This main hangar space is scaled by human-scale doors in the brick walls and hangar doors. A network of utility pipes and valves—combined with overhead heaters, a catwalk, and exposed steel bracing—add an important secondary level of architectural interest (Photograph 1.4.51; Photographs B.31 and B.32). The heater mounts are composed of miscellaneous steel sections, apparently original to the location, some of which bear mill stamps from Bethlehem Steel. Although not confirmed, the use of a different steel source for this purpose implies that the steam heaters were added in a subsequent contract to the initial building campaign. The brass valves at the heaters were manufactured by Jenkins Brothers, a New York City manufacturer.



Photograph 1.4.51. General view to the south, showing infill (east) wall, roof trusses, galvanized partition, and south hangar doors in distance.



Photograph 1.4.52. Detail view of trusswork and clerestories at southwest corner. Note steel beam hoist rail suspended from truss, installed later.

Two additional steel beams, manufactured by Tennessee Steel, are attached to the bottom of the trusswork. It is likely that these beams were used as hoisting rails, similar to the curved steel hoisting rail in the WPA Infill (Photograph 1.4.52). These elements are also likely to date to a later campaign within the period of significance.

West Elevation (towards Flatbush Avenue)

The west-facing elevation of the interior is common brick, with expanses of steel sash window. It is divided into three distinct levels: the various entrances and windows into the first level of the lean-to, topped by more continuous rows of steel windows at the second (low, or first clerestory) and roof (high, or second clerestory) levels. The brick and glass is divided into regular bays by the exposed steel columns supporting the roof trusses. The low clerestory windows, unlike those of Hangar 1, remain exterior windows, as Hangar 2 Lean-to has always been a single-story structure. See additional discussion about steel sash window configuration in the physical description of Hangar 1.

The brick wall separating the main hangar space from the adjacent lean-to (at the main level) and the exterior (at the clerestories) is two-wythes (8 inches) thick. The upper portion is faced with “FALLSTON CONTINENTAL” iron-flecked brick at the exterior. The remainder of the upper portion and the entire lower portion is common brick, manufactured by “SSB CO.” and “DOLAN,” respectively. The “SSB CO.” (Sutton & Suderly Brick of Coeymans, New York) common brick, along with “ROAH HOOK,” was used during the original hangar building campaign of 1931. The lower portion of the wall (below the first structural girt) was built later than the upper part (the portion exposed to the exterior)

using the "DOLAN" branded brick. This main floor portion of wall is set about 4 inches inward towards the hangar to accommodate the original steel beam (which carries the weight of the upper portion of the brick) at about 14 feet, 6 inches elevation. Research indicates that Dolan brick was manufactured by the Dunn & Dolan Brick Company of Staten Island, now the site of the former Fresh Kills landfill.

Thus, as in Hangar 1, the main floor portion of the west wall (including the various windows, doors, and equipment built into or attached to it) was built subsequent to the hangar itself. Based on the disparity in the brick manufacturer used, it can also be dated either subsequent to or prior to the construction of the WPA Infill, the second floor of Hangar 1 Lean-to, and the main floor dividing wall between Hangar 1 and its lean-to. The atypical layout of the main floor steel sash windows here, different than the "punched" window approach in Hangar 1, supports the conclusion that this wall comes from either the first campaign of post-original brick construction or the last. Further research will be required to determine the answer. From left to right (i.e., south to north) along the west elevation, each bay will be described.



Photograph 1.4.53. View west of first (southernmost) bay, showing south hangar door pocket, west elevation, and kalamein door to lean-to spaces.

The first bay contains the south hangar pocket, reducing the width of the brick wall (Photograph 1.4.53). The main floor features a single right-hand reverse single-panel kalamein door (36 inches wide by 84 inches high) within a profiled steel frame with a steel threshold, positioned left of center. The door has deteriorated over the course of HSR documentation and is now reduced to a remnant stile at the hinge jamb, with the remainder of the door collapsed to the concrete hangar floor. The door is of single-panel design, formed by a raised molding at the door's surface.

At the low clerestory is a typical tripartite steel window configuration. Here exists a pair of MWI Type 42 (14-x-20-inch) windows flanking a central MWI Type 32 (12-x-20-inch) window. As elsewhere, the three are separated by two steel mullions. At the high clerestory, resting on the typical cast-stone sill over a rowlock brick course set on 12-inch steel girder, is a tripartite Type 44181 (14-x-20-inch)-Type 34 (12-x-20-inch)-Type 44181 (14-x-20-inch) window, or two wider pivoting windows flanking a thinner fixed one. All of the clerestory panes are intact and appear original.



Photograph 1.4.54. View of west wall at third bay from the south, showing steel sash window. Note red paint stripe over window, and unusually thin panes at center unit.

The second bay in the west elevation features the first instance of tripartite main floor windows, as distinct from the tripartite windows typically found at the clerestories (Photograph 1.4.54). The windows involved, separated by two steel mullions, are an MWI Type 64, a Type 24, and another Type 64. The central Type 24 merits special attention: while the panes are 20 inches high, they are only 10 inches

wide—a non-standard configuration. Because the Type 24 window is only two panes wide, the mullions framing it do not align with those at the low and high clerestories above. The flanking Type 64 windows have 14-x-20-inch panes, presenting a sharp contrast to the central window's narrow lights. A number of electrical control panels are mounted to the brick wall at the lower left corner of this window, partially obscuring the bottom row. The low and high clerestories feature the original unmodified 1931 windows. At the low clerestory are two Type 62 windows at 14 x 20 inches flanking a central Type 32 at 12 x 20 inches. This trio of windows rests on a cast-stone sill and is bolted to a 12-inch steel beam above by a series of ledger angles, a typical installation at the low clerestory. Finally, the high clerestory features two pivoting Type 64181 (14-x-20-inch) windows flanking a central fixed Type 34 (12 x 20 inches). Note that these high clerestory windows are four panes tall, as distinct from the cut-down windows at Hangar 1 high clerestory, which were reduced to three panes to permit the second floor lean-to to be built. As at the low clerestory, this trio of windows is divided by steel mullions, bears on a cast-stone sill, and is anchored to another 12-inch steel beam above. All of the clerestory panes are intact and appear original. Some of the panes at the main floor have suffered damage from vandalism.

The third bay is nearly identical to the second, with tri-partite window assemblies at all three levels. The main floor contains a Type 64-24-64, again with the narrow 10-inch center panes. The extreme right column of panes at the right Type 64 is overpainted with vertical red striping, presumably indicating the presence of fire response or suppression equipment, no longer extant. The low and high clerestories feature the typical Type 62-32-62 and Type 64181-34-64181 tripartite arrangements. The vast majority of the panes at the clerestory appear intact. Several of the panes at the main floor windows have suffered vandalism.

The fourth bay features an uncased vehicle-sized opening at the main floor. This opening is surrounded by an overhead coiling door that has been damaged beyond repair. To the right of this opening are three identical steel control boxes for the blower unit heaters in the trusswork above, manufactured by Square D of Detroit. The low and high clerestories feature the typical Type 62-32-62 and Type 64181-34-64181 tripartite arrangements. A vertical run of mechanical piping descends in the center of the bay and enters the ceiling plenum of the adjacent lean-to immediately above the overhead coiling door. Additionally, the three control units for the overhead steam heaters are mounted to the brick wall to the right of the opening. Further examination of these two mechanical components may provide insight into the construction sequence of the Dolan brick (main floor) wall. The majority of the panes at the clerestory windows appear original and intact.

The fifth bay, continuing towards the north, is identical in most ways to the second and third bays, with tri-partite window assemblies at all three levels. The main floor contains a Type 64-24-64, with narrow center panes at the Type 24. The extreme fifth column of panes at the left of Type 64 is overpainted with very faded vertical red striping, presumably indicating the presence of fire response or suppression equipment, no longer extant. The low and high clerestories feature the typical Type 62-32-62 and Type 64181-34-64181 tripartite arrangements. The majority of the panes at the clerestory appear intact. Several of the panes in the main floor windows have suffered damage from vandalism.

The sixth bay, in turn, is nearly identical to the fourth bay, with another vehicle-sized opening at the main floor (Photograph B.33). There is evidence of an overhead coiling door in this location, but it is no longer extant. The opening is uncased. The low and high clerestories feature the typical Type 62-32-62 and Type 64181-34-64181 tripartite arrangements. All of the panes appear to be original and intact.

The seventh and final bay accommodates the hangar pocket at the northern (right) end. Also present is a left-hand reverse (outswinging) kalamein door, measuring 36 inches wide by 84 inches tall, with a profiled steel frame. The profile matches those found at other steel frames at Hangar 1 and the WPA Infill. The door's extant hardware is limited to a bronze escutcheon plate on the hangar side. There is a bank of switches to the left of the door, along with faded red fire safety painting. The tripartite windows at the clerestory above are identical to the first (southernmost) bay, with Type 42-32-42 at the low clerestory and Type 44181-34-44181 at the high clerestory.

In addition to the brick and steel windows, the east elevation is marked by a variety of sprinklers, steam risers, pipes, conduits, panel boxes, and other utility equipment. These various utilitarian components combine to give an important historic sense of the utilitarian use of the space, and further contribute an understanding of the functioning and purpose of such a specific-use building.

Additional details found on the west elevation include remnants of painted areas (in red, black, or yellow) and stenciled letters indicating voltages, clearances, and other reference or directional information.

East Elevation (towards the WPA Infill)



Photograph 1.4.55. View east through vehicle-size opening into infill passageway (Room 3-110). Porcelain enamel incandescent fixtures can be seen at the trusses.

The east-facing elevation is similar to the west-elevation in its palette of materials, but differs in important ways. Originally, this elevation was built with great expanses of steel sash window facing into the area separating Hangar 2 from Hangar 1 (now replaced by the WPA Infill). All of the steel sash windows were replaced by brick, excepting only the three bays of windows at the clerestory, which originally faced on to the courtyard area on the infill's second floor. New entryways were introduced into the wall, allowing access into the stairwells of the infill, as well as larger openings allowing passage of aircraft parts and/or vehicles into and between the buildings (Photograph 1.4.55; Photograph B.34). The wall is three-wythe, 12½-inch-thick brick. The vehicle-sized openings are cased in wood. Although no evidence for a similar condition was found in this hangar complex, at Hangar 3 a corresponding vehicle-sized opening is infilled with a pair of 10-foot-tall kalamein doors, one leaf of which incorporated a single human-scale door. This construction at Hangar 3 seems to date to the period of significance, and it appears likely that the wood casing at Hangars 1 and 2 held a similar set of swinging doors preceding the current 1960s-era overhead coiling doors.

The east elevation is similar to and consistent with the west elevation, regarding the importance of the various piping and conduit in establishing a complete architectural impression.

North and South Interior Elevations

The remaining elevations are established by the interiors of the hangar doors. There are no finish surfaces on the interior of the doors, revealing their construction with aluminum alloy members. Some

of the doors are marked with "No Smoking" and other spray-painted or stenciled signage (Photograph 1.4.56).



Photograph 1.4.56. View at south hangar doors, east end, showing different width doors. The narrow end door at left includes a pilot door and lateral bracing.

Ceiling

The ceiling of the main hangar space is exposed to the roof decking above. Above the line of the hangar doors, this space is filled with steel trusswork supporting the roof. There are eight steel trusses spaced at 20 feet on center. The first and last truss support the framework defining the gable ends of the hangars. The trusses are modified Warren trusses with cambered top chords and supplementary vertical web members. The web members of each truss are paired 6-inch ledger angles. Lateral X-bracing, laid horizontally between the trusses, is present in the first and last bays adjacent to the gable ends. Additional diagonal bracing is found along the brick elevations east and west. Several extant mill marks show that the steel was produced by Pencoyd Iron Works in Pennsylvania, which went defunct by 1940.

The trusswork supports three 9-inch-deep steel beams used as hoisting rails, which are tied perpendicularly to the trusses, spanning north-south. These beams hold extant mill markings from Tennessee Coal, Iron, and Railroad Company, a subsidiary of U.S. Steel that operated independently in Ensley, Alabama, until 1952.



Photograph 1.4.57. Detail view at southeast corner showing hangar door tracks at truss level.



Photograph 1.4.58. View at truss level showing original heater unit and associated wooden catwalk.

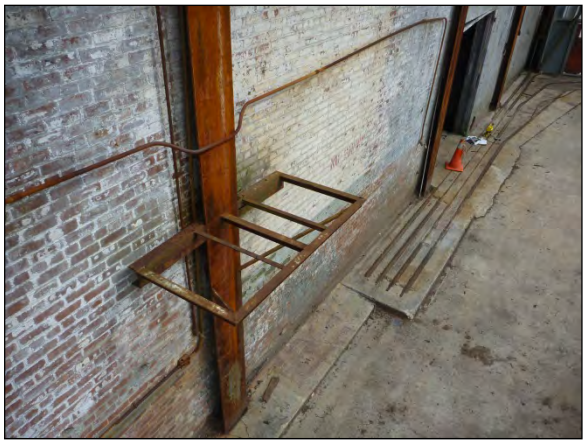
Additional elements include the sprinkler and gas piping, plumbing, conduits, and a wooden catwalk allowing access to three WPA-era steam heaters distributed evenly at the north, south, and center of the hangar (Photographs 1.4.57 and 1.4.58). There are four later steam unit-heaters, smaller in size, which are evenly distributed in the four quadrants composing the main space. A galvanized sheet metal smoke/fire partition, fastened to a central truss, separates the ceiling space at mid-hangar (Photograph 1.4.59). The unusual wooden construction of the catwalk suggests that it may be a World War II–era structure (see additional information regarding war-related wood construction in the discussion of the WPA Infill's monitor structure).

Hangar 2 is unique among the eight hangars along Hangar Row for the extant original light fixtures at both the exterior (the sconces at the fascia, described above) and interior areas. Within the hangar, 36 original porcelain enamel, green-shaded incandescent light fixtures are secured to the bottom member of the trusses. Six fixtures are evenly distributed across the length of each truss. Each fixture is 18 inches in diameter at the base and 12 inches tall to the point of attachment at the truss. Given their inaccessibility, many of the fixtures are still fitted with large Edison-base glass bulbs (Type PS) dating to the last active tenancy, if not earlier. The fixtures are in varying condition, but because of their simple design appear in general to be good candidates for rehabilitation.



Photograph 1.4.59. View at truss level showing monitor structure and galvanized partition.

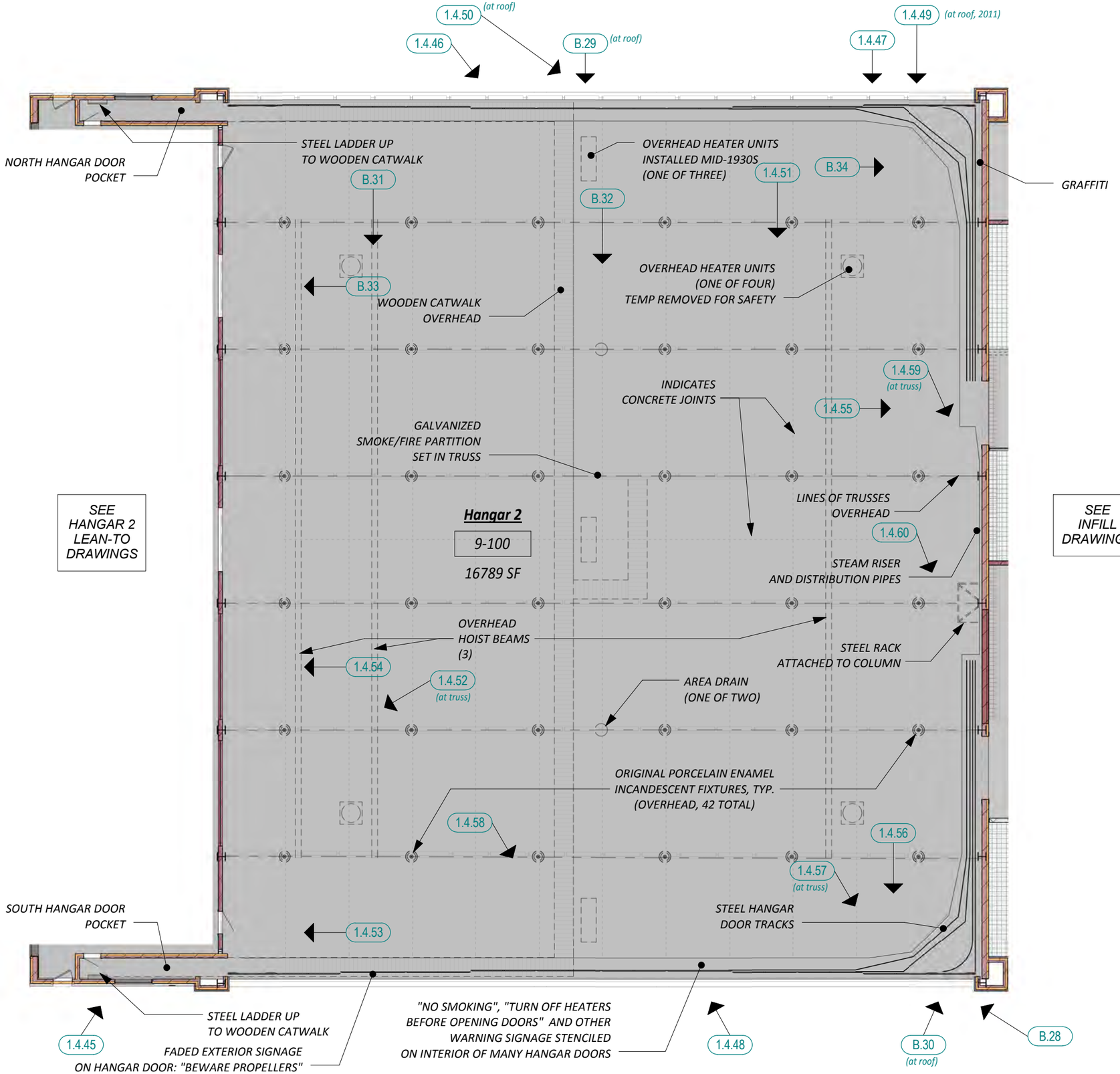
A signboard stating "NO SMOKING OR OPEN FLAMES IN THIS HANGAR" is suspended from the approximate center of the trusswork. The sign appears to have been locally manufactured from the top panel of a packing crate. It has not yet been possible to date the sign to a specific era. Closer measurement and inspection of the signboard may yield further information. The sign, or one predating it, may be contemporary with the adjacent galvanized metal partition separating the trusswork space from north to south. This metal partition is speculated to be related to fire or smoke safety.



Photograph 1.4.60. View to southeast showing east wall, hangar floor slab with door tracks, and south opening to the Maintenance Bay (Room 3-106) in the WPA Infill.

Floor

The floor of the hangar is cast-in-place concrete, with control joints approximately every 10 feet running east-west across the hangar. Other features of the floor, including the perimeter curb, are analogous to those described at Hangar 1. The floor is sloped to two area drains located along the north-south center line of the hangar. At the hangar doors, steel rails are cast into the floor. At the northwest and southwest corners, these rails curve 90 degrees to position the retracted hangar doors inboard of the west wall of the hangar (Photograph 1.4.60). Rubber and steel bumpers prevent the hangar doors from overtraveling the rails.



SEE HANGAR 2 LEAN-TO DRAWINGS

SEE INFILL DRAWINGS

(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Aircraft hangar, storage.

GENERAL NOTES:

Roof missing. Poor condition.

Figure 1.4.8

Hangar 2 Floor Plan

Scale: 1/16" = 1'-0"

Hangar 2 Lean-to

Hangar 2 Lean-to is a one-story structure attached to and contiguous with Hangar 2. It is currently composed of one large interior space with two small toilet rooms, although evidence of additional rooms and partitions are found in remnant wall markings and record drawings.

The exterior is consistent with that of Hangar 1 Lean-to, including glazed face brick and typical openings. The north façade includes an entry door with a rowlock course fanlight, now bricked in with running bond matching the surrounding masonry. Wood and steel signage is affixed to the façade (Photograph 1.4.61). The wooden sign, depicting a painted "10" for the building number, is to the right of the door entrance and is 12 inches high by 18 inches wide. The rusted steel sign above it, considerably larger, is not legible.



Photograph 1.4.61. Exterior view of north façade. Fanlight over door was once steel sash glass, bricked in at an early date. Note building number designation at far right.

The windows, consistent with those at the other lean-to short façades, are a steel sash Type 63 over a Type 64 with 12-x-18-inch panes. The windows are crowned with flat-arch soldier-courses incorporating a central cast-stone keystone.

The west elevation, along Flatbush Avenue, reflects the original design of the lean-tos, absent the changes incorporated at Hangar 1 Lean-to with the addition of its second level. The elevation is divided into seven 20-foot-wide bays that are marked by embedded brick pilasters and reflect the locations of the interior hangar columns. The windows are headed by steel lintels and soldier-course flat arches, with centered cast-stone keystones. Sills are cast stone. A cast-stone coping, interrupted by cast-stone ornaments above the brick pilasters, completes the elevation (Photograph 1.4.62). The west wall is 16 inches thick, with one wythe of iron-flecked "FALLSTON CONTINENTAL" face brick backed by three wythes of "ROAH HOOK" molded common brick. Roah Hook brick was used during the original building campaign. The interior elevation is finished with 2-inch hollow clay tile and another inch of finish plaster, for a final thickness of 19 inches.



Photograph 1.4.62. Exterior view of brick/parapet deterioration at west exterior elevation (from Flatbush Avenue).

An important feature retained in Hangar 2 Lean-to is a matched set of west-facing curved copings and step-downs, oriented 90 degrees from and forming the trailing edge of the hangar door pocket ornamentation (Photograph 1.4.63). At Hangar 1 Lean-to, these features were removed during the construction of the second floor.



Photograph 1.4.63. Exterior view of southwest corner of Hangar 2 Lean-to, showing additional curved coping lines at the long elevation. Note brick cracking and displacement.

The interior west wall is finished with plaster, furred off of the exterior brick wall with hollow clay tile back-up. The plaster has been finished with white-over-gray paint, and shows several wall remnants no longer extant.

At the first (northernmost) bay of the west elevation are two six-over-six wooden windows with a single-operating sash. These are modern replacements with aluminum tube sash guides and no counterweight/pulley system. The second, third, and fourth bays each feature two steel sash windows of MWI Type 64181, 12-x-18-inch pane size. At the transition from the fourth to the fifth bay is a Cole-manufactured circuit panel board. This is the same supplier as the panel board on Hangar 1 Lean-to's first floor. The circuit directory lists drill presses, radio shop, saws, hangar blowers, milling machines, shaper machines, a power shear, lathes, and buffing, grinding, and welding devices (Photograph 1.4.64).



Photograph 1.4.64. View of west wall showing original electrical panel and multi-pane steel sash windows (Type 64181) overlooking Flatbush Avenue. At the left is the wall enclosing the North Latrine.

The latrines, described below, transition from the fifth bay to the sixth bay. There are three additional modern six-over-six wood window replacements, one at the left (south) side of the sixth bay and two at the seventh and southernmost bay.

Because a second floor was not added to this lean-to, the original south- and north-door openings into the hangar pockets are still extant; at Hangar 1 Lean-to, these pockets were closed in (and the doors relocated to the perpendicular wall) to accommodate the stairs (Photograph 1.4.65). The existing openings are cased in wood to accommodate 30-inch doors, which are missing. Two vehicle-size openings and three bays accommodating steel sash windows populate the brick wall separating the lean-to from the main hangar space to the east. Kalamein doors are found at the north and south ends of the east elevation. These openings are more fully described in the Hangar 2 discussion, above.



Photograph 1.4.65. View of west (exterior) wall with plaster on hollow clay tile. "ROAH HOOK" brick core is visible at deteriorated area to right. Ceiling remnant above is plaster on steel lath. Brick wall to left encloses south hangar door pocket. Note also the modern replacement six-over-six windows.

The door permitting passage to the exterior at the north façade is a modern steel gray-painted door with a small 12-inch-square wireglass light. The door is 36 inches wide and 84 inches tall. Above the door is a running brick bond infill in what was previously a fanlight.

At the south façade, the exterior door is a six-panel wood door. A fanlight is located above a blocked-out wood panel portion dividing the fanlight from the door. The door has a

mortised bronze lockset with a thumbturn latch, and measures 36 inches wide by 80 inches high. The door is right-hand in operation from the exterior, with hinges on the interior left (east jamb). The panels are recessed.

The ceiling was originally plaster on suspended steel-lath. The plaster and most of the lath has completely disintegrated due to the fully compromised roof overhead, excepting the southern third of the lean-to (Photographs B.35 and B.36), where the ceiling condition is merely poor. Hung from the ceiling at the northern end of the lean-to, just to the north of the large vehicle-sized opening, is an overhead steel track for a sliding partition. There is one pendant-mounted porcelain enamel fixture, dating to the period of significance, at the southern end of the space adjacent to the hangar windows (Photograph 1.4.66). There is an access portal through the ceiling to the roof at the southeast corner.



Photograph 1.4.66. Detail view of the extant porcelain enamel pendant fixture at the southeast corner. The design is similar to those found elsewhere in the complex.

The floor is concrete, but shows evidence of previous finish flooring. There is an access hatch in the floor in the extreme southeast corner of the lean-to space, covered by a steel plate. It appears to provide access to steam and utility piping below grade.



Photograph 1.4.67. View towards west wall showing entrances to latrines. Note evidence of missing partition wall, as well as misaligned paint areas.

The latrines, located at the south end of the interior, are finished in partial-height ceramic tile and plaster. There is evidence of a partition separating the area in front (east) of the toilet rooms, and mismatched paint lines, suggesting different occupancies and layouts (Photograph 1.4.67). The latrine floors are composed of red quarry tile closely matching that found on the WPA-era courtyard roof separating the second-floor spaces at the WPA Infill.

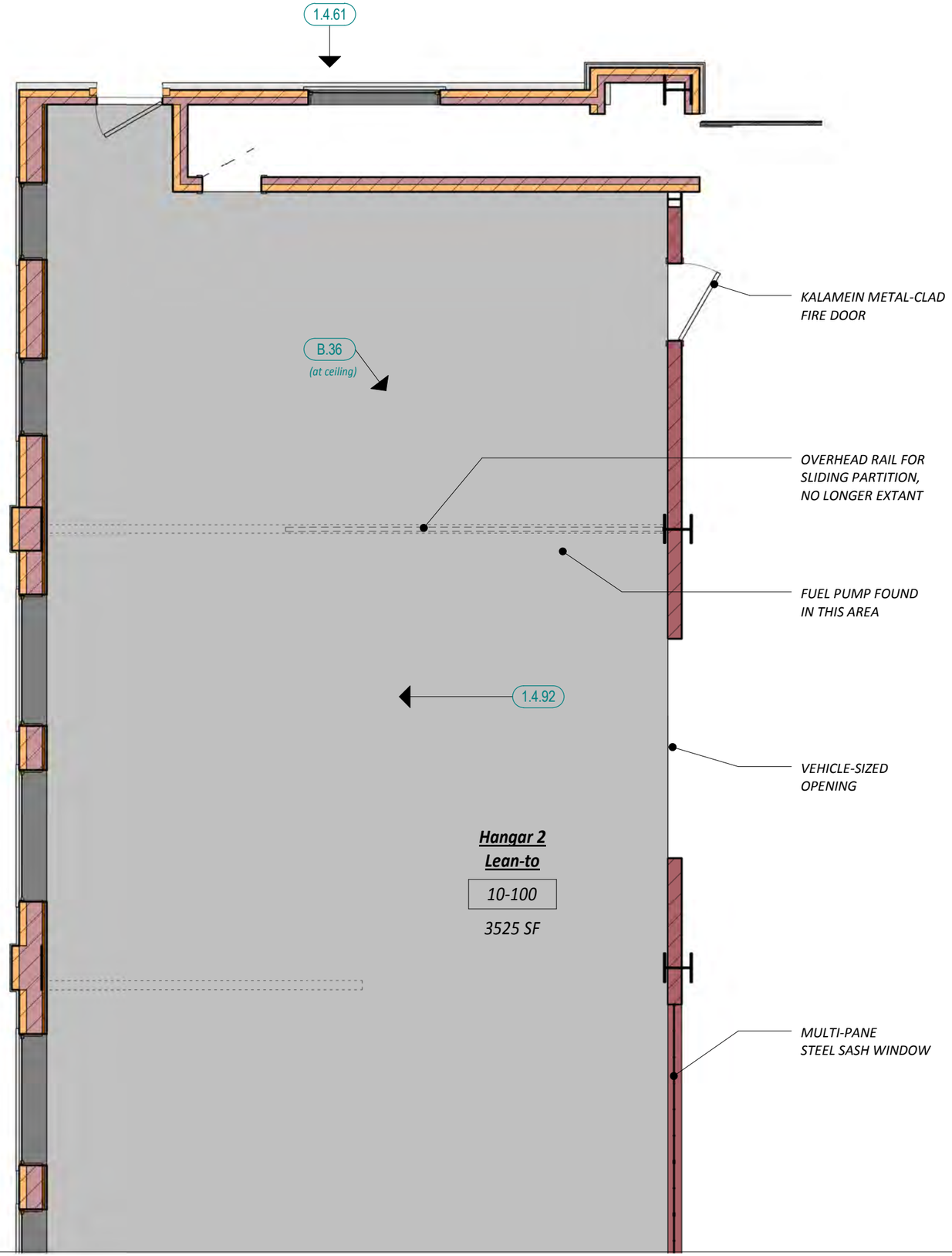
At the north latrine, Room 10-106, the west (Flatbush) elevation holds two narrow wooden windows, which are of modern construction similar to the six-over-six windows elsewhere at this wall. Each of the two sashes here are divided horizontally, giving two lights each, four lights total. A slate enclosed shower stall, 1 inch thick, is extant in the northwest corner of the room. It is conceivable, given the likely WPA-era construction date for these latrines, that these types of slate-enclosed showers were originally also found in the Shower Room (Room 8-207) on the second story of Hangar 1 Lean-to. Immediately adjacent to the right (east) of the shower is a single floor-drain urinal.

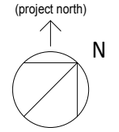
The doorway in the east wall is framed in wood and is 12 inches deep; the 30-x-84-inch door is missing. Wall finishes in this wall include a 6-foot-high perimeter of ceramic wall tile over plaster. The field is

composed of 4-inch-square white tile with a light yellow accent band towards the top. A light blue bullnose accent band crowns the tile. The ceiling has a central ceramic, single-bulb fixture with a pull-string.

The south latrine (Room 10-105) is largely empty. There are two toilet connections along the west wall, but the fixtures are missing. Above the toilets is another modern replacement wood six-over-six window. At the north wall, in the northeast corner, is a mounting location for a sink, also missing. A recessed convenience outlet is located to the right.

The finished tile walls have 4-inch-square, buff-colored tile at the four bottom rows, with the remainder of the tile field constructed with 4-inch light yellow square tiles. The tile ends in a white corniced accent tile, at approximately 4 feet high. The tile finish at the north wall rises another 2 feet to a height consistent with the tile at the adjacent latrine.

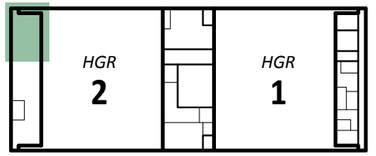




1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, Fueling.

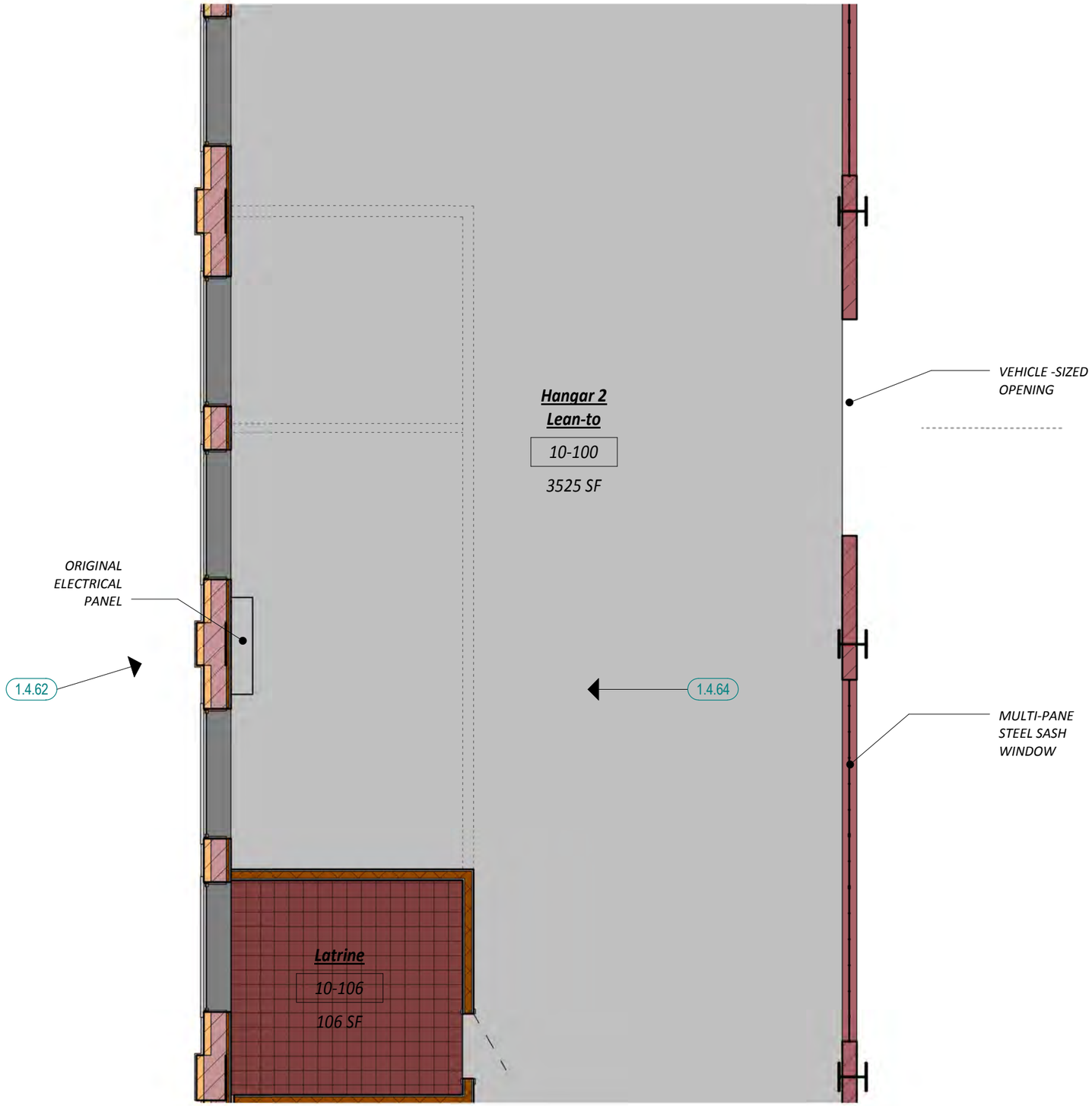
GENERAL NOTES:

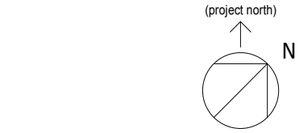
Gutted to concrete floor. Roof almost completely deteriorated.

Figure 1.4.9

Hangar 2 Lean-to (Bldg. 10), North

As indicated

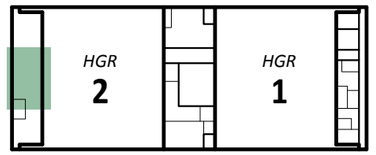




- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, utility, storage.

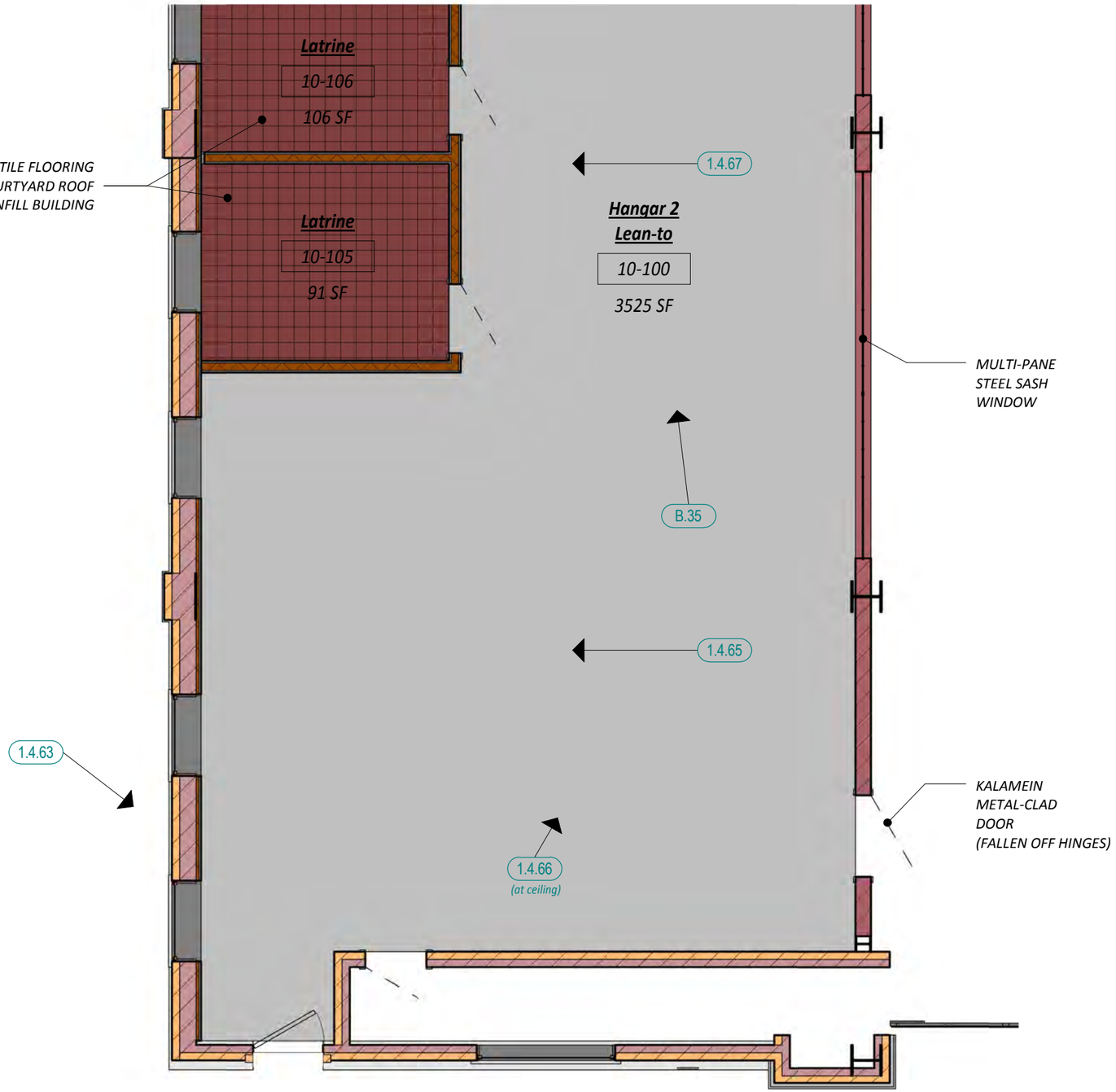
GENERAL NOTES:

Gutted to concrete floor, roof largely deteriorated, some existing plaster ceiling.

Figure 1.4.10

Hangar 2 Lean-to (Bldg. 10), Central

As indicated



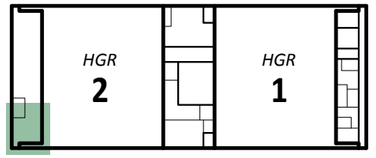
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance, utility.

GENERAL NOTES:

Gutted to concrete floor, some plaster ceiling intact. Poor condition.

Figure 1.4.11

Hangar 2 Lean-to (Bldg. 10), South

As indicated

WPA Infill

The WPA Infill is a two-story, steel-framed, and brick-bearing wall structure which filled a former 50-foot alley between Hangars 1 and 2. It was completed in 1937 by teams of WPA laborers, only six years after the hangars themselves. The building appears to have been built on top of the existing alley separating the hangars, with only minimal intervention for new footings at the interior columns and the exterior façades (i.e., north and south façades). The WPA Infill, like the hangars, is 140 feet along its long axis and has an internal mezzanine.



Photograph 1.4.68. The centrally located WPA Infill, although a later addition, is seamlessly integrated with the earlier hangars and helps define the interior courtyard. View of the north façade.

The WPA Infill's interior was itself modified several times in subsequent decades, most dramatically by the insertion of yet another infill (the monitor structure) on top of its own former second-level exterior courtyard. The exterior (north and south) façades of the infill are largely original with minor exceptions.

The building's massing closely parallels that of the enclosing hangars. It rises no higher than the hangars (with the later exception of the monitor structure), and is part of a continuous "streetwall" established by the hangar low-slope gable ends, hangar doors, and lean-tos at the north and south long façades. It shares the same architectural expression as the hangars, including a mix of orange-toned iron-flecked brick and Art Deco–inspired stone detailing. It plays a key role in defining the large open space between the adjacent hangar complex, along with the opposite infill and associated Hangars 3 and 4 (Photograph 1.4.68).

The WPA Infill style is consistent with, and a logical extension of, the early-twentieth-century industrial character of the hangars themselves.



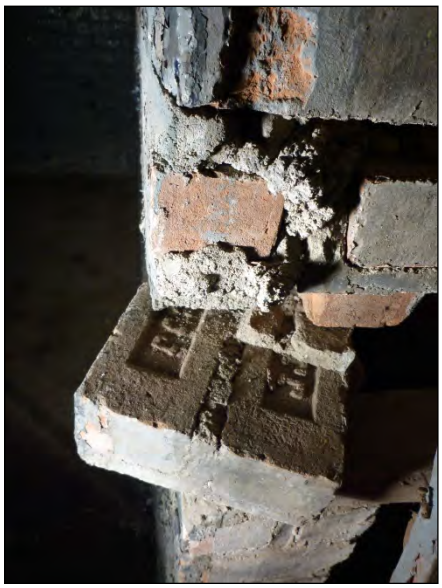
Photograph 1.4.69. Exterior detail of deteriorated top of Hangar 2 east wall, which also serves as the WPA Infill's west wall. The hangar is to the left.

Because of its peculiar location and unique typology, the WPA Infill has some special properties. The east and west walls of the infill are the original west and east (respectively) walls of the adjacent hangars, the former inward-facing glass expanses of which were removed and patched with brick (Photograph 1.4.69). The structural framing of the infill is similarly reliant on the hangars; there is only one row of columns bearing at grade along the infill's long axis, and the transverse axis steel beams are framed into the adjacent hangar columns. The infill's row of columns is itself offset several feet west of the north-south centerline of the infill, presumably to avoid bearing on the below-grade utility trenches built along with the original hangars and situated on the north-south centerline separating them. One important implication of these conditions is the fact that neither of the hangars can be removed (or significantly modified) without removing (or significantly modifying)

the infill as well, since it is dependent upon the hangars for both its exterior envelope and structural support. It is also likely that the lateral support for the infill is directly dependent on the roof trusses and other bracing steel of the hangars (beyond the immediately adjacent column line). As such, to an undetermined extent, the hangar steel in its entirety serves to absorb the lateral loads of the infill, since this load cannot be immediately brought to ground. This loading situation was only compounded with the post-war addition of the wooden monitor structure, which in its current waterlogged state has added considerable weight to the support structure.

The steel girders and beams used in the WPA Infill were manufactured by Phoenix Iron Works, based on mill markings observed in a few locations where ceiling and roof finishes have decayed. Founded in 1790, this manufacturer was located in Phoenixville, Pennsylvania. Production at the original facility ended in 1984.

The current architectural condition of the WPA Infill is almost uniformly poor. The inconsistent quality of its construction by WPA forces, combined with a poor foundation—as well as decades of neglect and vandalism—have reduced much of the building to near ruin. The loss of copper flashing and other roof protectives have been particularly catastrophic, allowing deep and continuous water penetration throughout the entire building. Until recently, two 8-inch caliper trees were growing at the parapet line. Many other types of vegetation continue to thrive at the roof, sending their roots into the building envelope. Most of the masonry walls are out-of-plane, with several exhibiting very large cracks and gaps (Photograph 1.4.70). The majority of interior plaster finishes are destroyed, nearly all the original wood floors have rotted to form a type of mulch, most doors have gone missing, and any exposed and untreated metal has suffered corrosion. Among the only reasonably sound building elements, fortunately, are the reinforced concrete slabs and steel structure, the latter of which appears to have been coated with silvery anti-corrosion paint, in contrast with the red lead coating used on the earlier hangar steel.



Photograph 1.4.70. Brick wall failure at WPA Infill, first floor. Note “JJJ” type brick, used throughout the building.

The interior plan of the WPA Infill is logically arranged. Access from the adjacent main hangar floors is accomplished via several doors, in addition to two vehicle-sized entrances on each side. These large 10-foot-square openings are aligned on opposite sides of the infill, allowing passage of large equipment between hangars. Originally flanking these transverse passageways were a variety of work and shop spaces. The shop spaces at the north and south ends of the infill were also accessible through three doors in each of the exterior façades of the infill. There is a mezzanine level between Levels 1 and 2, existing roughly in the center of the building. At the second floor, only the northern and southern portions were originally enclosed; they were separated by an exterior courtyard roof laid in quarry tile and featuring several large curb-mounted skylights, which gave additional illumination to the shop spaces below. The later wood-framed monitor structure was added in the center during the World War II era.

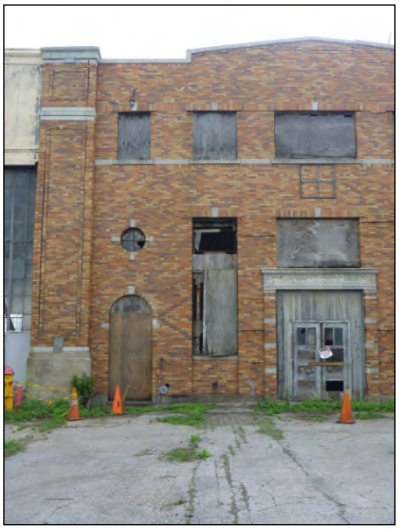
As a descriptive device for this report, the infill has been divided into a “northern section,” which includes the northern passageway and areas north, up to and including the north exterior façade; a

"southern section," which includes the (former) southern passageway/Maintenance Bay and areas up to and including the south exterior façade; and a "central section," which includes those spaces between the two transverse passageways (this third area is dominated by the mezzanine and monitor spaces). These are somewhat arbitrary distinctions which serve only to ease orientation within this report, and do not necessarily reflect period use or understandings of the building.

Exterior

North Façade

The north exterior façade is largely original historic fabric dating to the construction of the WPA Infill. It is a four-wythe, 16-inch-thick brick masonry wall with cast-stone accent bands. The tops of the walls terminate as parapets with cast-stone copings. The exterior facing wythe is "FALLSTON CONTINENTAL" face-brick, with back-up wythes of "JJJ" molded common brick. JJJ manufactured common brick was used during the WPA Infill construction campaign, and also appears on the second floor of Hangar 1 Lean-to. Three doorways and several windows populate the façade, which is crowned by a pedimented roof and trimmed with cast stone (Photograph 1.4.71). According to the earlier HSR produced for hangar row, façades facing toward the Administration Building were considered the primary façades of the four infill buildings; in the hangar complexes closest to the Administration Building, significantly more stone detail work can be found. This façade, however, is not substantially different than the south exterior façade. Additional discussion regarding the façade designations can be found at the beginning of Section 1.4.



Photograph 1.4.71. Partial exterior view, north façade of the WPA Infill.

The windows are steel sash punched into the brick walls with a flat brick rowlock arch and central cast-stone keystone, consistent with the precedent at the earlier lean-to elevations. All panes on the WPA Infill exterior are 12 x 18 inches. At the second (top) level, a central steel sash window is flanked by a pair of smaller steel sash windows to each side. The central window is actually a tripartite window, with three discrete steel windows separated by steel mullions. Per the MWI system described in the Hangar 1 discussion, this set of three is a combined Type 23141-33161-23141 (i.e., two windows at two panes wide by three panes tall, flanking an inner window of three panes wide and three panes tall, with all three windows featuring operating pivot sash at the top two rows of panes and one fixed row below).

Continuing outward from the central tripartite window, on either side, is a 12-light Type 43181 followed by a 9-light Type 33161, again with pivots. The leftmost Type 33161 window is located at the northeast stairwell.

The double-height first floor features one of the more ambitious architectural compositions at the hangar complex. A central doorway formed by stone-banded brick pilasters dominates the main floor and is crowned by a substantial cast-stone entablature.

The central door has apparently been framed down from its formerly larger extents with vertical beadboard panels to form a smaller secondary doorway, accommodating a thin pair (each leaf 30 inches wide x 80 inches tall) of paneled double doors, each featuring paired wireglass lights over three horizontal panels. This modification could not be definitively dated, although it appears to come from

(or shortly after) the period of significance based on the choice of materials and rail-and-stile construction. Given the ad-hoc nature of the assembly, it is conceivable that the revised wooden doorway was locally produced by onsite skilled labor. This doorway, and the one at the opposite south façade, have an extant kalamein frame, indicating that the original full-size doors were probably kalamein.

Bearing directly on the central doorway entablature is another tripartite Type 23141-33161-23141, identical in configuration to the unit above on the second floor. This is flanked on either side by a custom Type 482826 window, which may be two Type 44182 windows mounted on top of each other. This is a 148-inch-high 32-light window with two 8-light pivots, four panes wide by eight panes high. These two monumental windows extend from a 4-foot, 6-inch sill at the first floor to end in alignment with the central window over the doorway.



Photograph 1.4.72. "Jelly jar" fixture enclosed in a protective bronze cage. This example is located at the second floor of the south façade.

Finally, the façade is completed at the outward edges by a matching set of doors crowned with fanlights in a circular rowlock arch and subsequently topped with a separate oxeye window. The oxeye is a custom 27-inch-diameter crossed steel sash window surrounded by four evenly spaced limestone keys. The top edge of the top key is aligned with the arch of the central and tall windows. The left (east) oxeye is located within the northeast stairwell, as is the door below it, providing access to the exterior. The fanlights over the doors resemble steel sash, but are actually kalamein frames, composed of wood clad with galvanized metal. The door at the left of the façade (towards the east) is 44 inches wide by 82 inches high. Three large barrel hinges, 6 inches long, are on the outside, making this a left-hand reverse (outswinging) door.

There are two "jelly jar" fixtures, dating to the period of significance, located at the second floor of the north façade (Photograph 1.4.72). At this location, they are located just above the keystones of the flanking steel sash windows. A row of three alarm bells is situated above the right (west) doorway. Another, larger alarm bell is within a steel and expanded metal enclosure above the other three.

All of the windows in the north façade are in poor repair, with most covered by plywood boards.

South Façade

The south exterior façade is similar to the north exterior façade, despite its orientation facing away from the Administration Building. This may be because of its visibility from the public way (i.e., Flatbush Avenue) as the southernmost of all the infill buildings. The configuration and size of the south façade's doors and windows is identical to that of the north, and in similarly poor condition (Photograph B.37).

The south exterior façade is largely original historic fabric dating to the initial construction of the WPA Infill. Three of the jelly jar sconces are found over the second-floor windows. The escutcheon plates at the stem connections overlap by half on the adjacent window keystones, suggesting a post-original installation. The fixtures appear to date to the original period. There is another alarm bell mounted in a steel enclosure above the westward (left) door, below the round oxeye window.



Photograph 1.4.73. Reverse view of parapet condition at north façade, looking north towards Hangars 3 and 4 and the Ryan Visitor Center beyond.

The parapet wall forming the pediment is leaning inward, likely due to compromised mortar and subsequent freeze/thaw cycles acting inconsistently on either side of the wall. The parapet is coped with cast stone (Photograph 1.4.73).

Roof

The low-slope roof of the original WPA Infill covers the northern and southern sections only (Photograph 1.4.74). The roof is built-up roofing over southern longleaf pine planks and shortleaf pine joists, with drainage directed away from the courtyard and exterior façades. The interior courtyard, discussed below, was subsequently enclosed with a wood-framed monitor structure to create a classroom space. Some areas of the roof decking have failed, especially at the building line abutting the hangars, allowing roof materials, bricks, and debris to penetrate into the interior of the building. Roof access openings previously protected by covers have been open for an undetermined but lengthy period of time measured in decades, accelerating building decay in these areas.

The remaining roofing is in fair to poor condition. Much of the original copper flashing is missing.



Photograph 1.4.74. General view of roof at the southern section, looking east. The monitor structure appears at far left. The pioneer tree is a paper birch (*Betula papyrifera*), and is causing severe damage to the building envelope. Other nearby vegetation includes wild roses and various native grasses. Note the roof slopes for drainage towards the courtyard (left) and façade (right).

Courtyard

The courtyard is formed at the north and south ends by the formerly exterior elevations of two inward-facing brick walls. These walls are supported by the second-floor structural steel girders and do not extend to the ground. Each of the walls has one door and several window openings, some of which have been infilled with brick. At the east and west elevations, the courtyard is enclosed by the formerly exterior walls of Hangars 1 and 2, respectively. These elevations still hold original steel sash wireglass window units in excellent condition, due to their protection by the monitor structure, discussed below. These six steel sash windows are the best surviving examples of windows from the hangars' original construction campaign.

The former roof surface separating the northern and southern sections is laid in quarry tile and once featured several skylights. These skylights have been removed, and the associated concrete curbs ground down in several places, to permit the installation of the monitor structure. These changes are discussed further in the monitor structure discussion below.

The original quarry tile roof still exists below the monitor structure flooring and appears to be in fair condition, although it is subject to flooding and standing water. The floor joists of the monitor structure bear on wood sleepers laid perpendicular to the roof slope, which appears to interfere with proper drainage.

Monitor Structure

The monitor structure is a heavy-timber supported, wood-framed structure built within the exterior courtyard separating the northern and southern sections. It projects several feet above the plane of the original infill roof, permitting the capture of daylight through north- and south-facing rows of monitor structure windows. The roof is supported by six 12-x-9-inch heavy-timber columns, which feature diagonal bracing at the top to accommodate lateral loading.

The monitor structure is tied into hangars on either side at the roof line, and relies on the WPA Infill for gravity loads only; in fact, it appears that the monitor structure is not positively fastened to the infill at all, but just resting on the former courtyard roof deck, discussed above (Photograph 1.4.75).

The exterior elevations of the monitor structure are constructed of asphalt paper and insulation mechanically attached to the subframing. Wood windows dominate the north and south façades.

The monitor structure is unique within the context of Hangar Row. Although its interior is sheathed with post-war sheetrock and fiberglass insulation (which can be dated through review of advertisements in trade publications), aerial photography unequivocally shows that the monitor structure was completed during World War II, placing it squarely within the period of significance. Further investigation has shown that the monitor structure was likely built in two campaigns, originally as a rough wooden enclosure during World War II, and then later finished with gypsum board and insulation.



Photograph 1.4.75. In a view to the northwest from high above the southeast corner of Hangar 1, the wood-frame construction of the monitor structure is evident. The structure is laterally tied to the hangars within the rusted steel enclosures visible at center and lower left. All exterior sheathing has deteriorated at the monitor structure's east elevation. Note also the extant beacon fixture, part of Hangar 1.

The ad-hoc and unusual design of the monitor structure, at least in comparison to the remainder of the steel-framed hangar complex, is likely indicative of its hasty construction for increased wartime space demands. As early as 1942, Albert Kahn and other leading industrial architects were regularly building new factories and wartime facilities out of wood and concrete only, due to the critical materials status of steel (which was largely redirected to armament production). Even steel sash windows, formerly the default window system, were redesigned for execution in wood and dubbed "Victory Sash." During the war, entire hangars and factories were built with heavy-timber trusses and extremely limited use of steel. It is thus very likely that the monitor structure is a rare surviving example of this unique period, and indicative of both the intense space demands of the war effort and the extraordinary shortcuts taken to build needed facilities.

See additional discussion under *Second Floor, Central Section*, below.

Interior

First Floor, Northern Section, see Figure 1.4.12

Flight Supply Room (Room 3-112). The northern section, first floor, of the WPA Infill is dominated by the cavernous Flight Supply Room (Photograph 1.4.76). This room is accessed directly from the east-west passageway to the south, or from the entry door in the exterior façade to the north. Finishes are minimal, with the far east and west walls featuring brick (former exterior brick of the hangars combined with patch brick used to infill the former hangar windows). Plaster finishes are extant on the north (exterior façade) brick wall. The concrete block walls of the Motor Pool Room extend into the space at the northeast. The Sprinkler Room and its associated hall are partitioned off at the northwest corner with brick and wood-stud walls, respectively. The southeast corner of the room contains a wooden platform, set at approximately half the height of the room and presumably for storage. The floor was originally wooden, laid on wooden sleepers apparently set upon the original concrete slab (alley) dividing the hangars. A partition wall of wood and batten board construction extended from east to west, dividing the room from the passageway. A building support column is located west of the center of the space. It is speculated that the infill structural centerline was moved off-center to avoid bearing on the utility trenches running on the north-south centerline, equidistant between the original hangars. The reinforced concrete ceiling is unfinished.



Photograph 1.4.76. Wide view of northern section, showing passageway (3-110) and adjacent Flight Supply Room (3-112). Note former skylight openings which have been closed off (visible at upper right).

The Flight Supply Room dates to the WPA Infill's initial construction, but has been diminished in footprint by the concrete block enclosure forming the Motor Pool Room (3-113), which was added after the period of significance. Other modifications include the addition of the Sprinkler Hall and its associated partition, and the closing off of the southern extent of the room with the batten board partition.

The overall condition of the Flight Supply Room is poor. The interior walls of the WPA Infill were likely built without footings or foundations directly on the concrete slab (part of which may date to the original construction campaign of the hangars) that paved the alley between the two hangar buildings. As a result, there has been considerable settlement of these walls, resulting in numerous large cracks across the extents of the various masonry partitions. The brick wall surrounding the Sprinkler Room is in particularly poor condition, with loose and dislodged bricks. The wood floor finish of the room is also largely disintegrated, having rotted into a soil-like mixture. Selective removal of this layer has revealed what appears to be the original concrete alley in good condition below.

The reinforced concrete ceiling is spalled in a few locations, revealing rusted reinforcing. Where rainwater has penetrated the slab, lime stalactites have formed. This is especially pronounced along the concrete-encased beams, as they are at a lower level than the slab itself.

There is evidence of eight chain-hung fluorescent light fixtures, hung approximately 8 feet down from the second floor slab. One of these, a troffer-type fixture, is extant at the western side of the room, towards Hangar 2. Three gas unit heaters are also located at the ceiling.



Photograph 1.4.77. Sprinkler Room, view to the south, showing fire suppression manifold.

Sprinkler Room and Associated Hall (Rooms 3-114 and 3-115). Located at the northwestern corner of the infill first floor, the Sprinkler Room is a small space devoted entirely to housing an enormous sprinkler manifold feeding the various hangar spaces to the east and west (Photograph 1.4.77). The room has a concrete slab floor, through which the incoming sprinkler main rises from a presumed trench belowground. The main then divides into two branches extending north and south for a short distance, before rising again as four separate mains serving different zones of Hangars 1 and 2 and the WPA Infill. The sprinkler manifold assembly is of heavy industrial-grade steel construction with components visibly dated 1936 and 1937. Some access hatches and valves are disconnected, frozen, or open, but the assembly still maintains a high degree of architectural and historic integrity.

The west wall is simply the former exterior brick wall of Hangar 2, with its combination of orange, brown, and yellow iron-flecked face brick and the "patch" brick installed in the former steel sash window openings at the time of the WPA Infill's construction. The north wall is the unfinished interior side of the exterior façade brick wall. The east and south walls, connected by an angled portion, are composed of brick rising to approximately 12 feet high. An entry door and steel sash window are located in the east wall of the Sprinkler Room and connect to the adjacent Sprinkler Hall, a wood-stud partition enclosure restricting access to the westernmost exterior door in the northern façade of the WPA Infill. The floor of the Sprinkler Hall is wood, consistent with the larger Flight Supply Room, of which it was formerly a part.

The condition of the Sprinkler Room is fair, while the condition of the Sprinkler Hall is poor. The east and south brick walls of the Sprinkler Room exhibit considerable settlement and cracking, with some dislodged and loose brick and broken mortar. The Sprinkler Hall enclosure is missing its former south wall, and the remaining east wall is missing large areas of gypsum board. The floor of the Sprinkler Hall is deteriorated in the same manner as the balance of the wood floor throughout this section.

The Sprinkler Room proper is consistent with the infill's original construction date, while the Sprinkler Hall may be of World War II or later construction. The spaces have been in continuous use as a sprinkler room.

The most significant feature of these two spaces is the sprinkler manifold assembly.

Northeast Stairwell (Room 3-2). The Northeast Stairwell is located at the northeast corner of the WPA Infill and can be accessed only from the north exterior façade or from the interior of Hangar 1. The stairwell is of steel construction, with four flights of stairs landing on three intermediate reinforced concrete landings. The middle landing aligns with the circular oxeye windows in the north exterior façade, while the secondary landings are windowless.

The stairwell enclosure is constructed of 8-inch brick with plaster finish. The brick manufacturer is JJJ, which is consistent with original period construction elsewhere in the WPA Infill, as well as the second floor of Hangar 1 Lean-to. There are two locations for ceiling-recessed light fixtures at the intermediate landings; only the one at the first landing is extant. This is a ceramic Edison-bulb base.

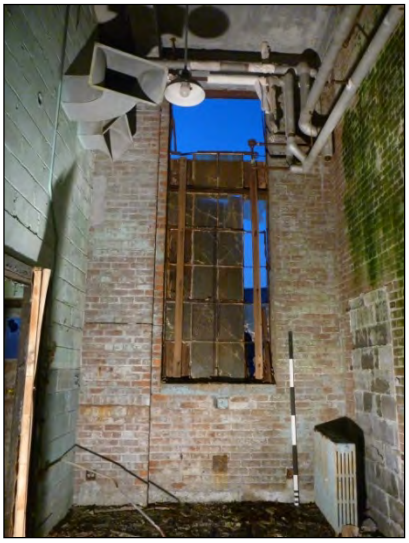


Photograph 1.4.78. Northeast stairwell, at the first floor, looking south, showing highly deteriorated steel steps. Temporary wood ramps have since been installed.

The condition of the Northeast Stairwell is poor (Photograph 1.4.78). All of the metal stair treads have corroded away from their fastening points on their associated stringers and fallen to the base of the stairwell. Access to areas above has been provided by temporary wooden ramps. Wall and ceiling finishes are fair to poor, with some degradation and numerous cracks. The concrete landings are in good condition.

The Northeast Stairwell is part of the original construction of the WPA Infill.

Motor Pool Office (Room 3-113). The Motor Pool Office is located immediately west of the Northeast Stairwell, just east of the main north entrance door through the exterior façade. The room is enclosed from the larger adjacent Flight Supply Room by its south and west walls composed of concrete masonry units. The east wall of the Motor Pool Room is the exposed brick wall of the Northeast Stairwell. The north wall is the back side of the north exterior façade of the WPA Infill, finished with plaster.



Photograph 1.4.79. Motor Pool Office, view to the north. The Type 482826 window dominates the elevation. Note closed doorway to stairwell at right and original porcelain enamel pendant fixture overhead.

The tall MWI Type 482826 window to the exterior is centrally located in this elevation, and is in poor condition with several missing or damaged panes and deteriorated sash members. The floor consists of wood sleepers on what appears to be the concrete alley topped with oak finish flooring, consistent with the flooring in the Flight Supply Room. The wood flooring is topped with two layers of green vinyl asbestos tile from a post-war renovation campaign. There is also access to a pipe trench at the southeast corner of the room. The ceiling of the Motor Pool Room is exposed to the bottom of the reinforced concrete slab above. Ductwork penetrates the west concrete masonry unit (concrete block) wall at a high level, ending in terminal spouts. Additional elements include a porcelain enamel pendant light fixture (dating to the period of significance) still hung from the ceiling slab above at the northwest corner and an extant radiator disconnected from its original location (Photograph 1.4.79; Photograph B.38). The light fixture predates the creation of the Motor Pool Office, in which it is now enclosed. The door to the room is intact, with “MOTOR POOL” stenciled in spray paint across the top stile.

Based on the type of masonry used to enclose the Motor Pool Room, it is believed to be a late post-war addition to the building

(Photograph B.39). The appearance and design of the galvanized metal ductwork also support this later construction date.

First Floor, Central Section, see Figure 1.4.13

Passageway (Room 3-110). The central section of the first floor begins with the passageway, which permits direct passage between Hangars 1 and 2. The passageway was divided from the Flight Supply Room at a date after the WPA Infill's original construction, as the wood-stud/batten board partition is consistent with others known to be from World War II or a later period. Another building support column, located approximately at the 1/3 point of the 50-foot distance between Hangars 1 and 2 (closer to Hangar 2), is aligned with the north extent of the passageway. Pipes installed to service the heating needs of the later monitor structure can be seen along the north wall of the passageway. The ceiling (the bottom of the second floor reinforced concrete slab) was initially outfitted with skylights, as was the entire open courtyard area between the northern and southern sections of the second floor, above. These skylights and other openings in the reinforced concrete roof slab have been filled in with gypsum or fiberboard inserts on wood framing. The ceiling plane is otherwise dominated by the concrete enclosures for the various steel beams supporting the second floor. There are three porcelain enamel light fixtures dating to the period of significance, mounted on approximately 6-foot pendants along the length of the corridor ceiling (Photograph 1.4.80).



Photograph 1.4.80. Detail view of pendant-mounted porcelain enamel fixture.

The south wall of the passageway consists of several entrances to former work spaces and supply rooms, and is dominated by an exposed metal stair providing access to the adjacent infill mezzanine via a wood-decked landing about 9 feet above first-floor level. The elevation of this wall contains several expanses of steel sash windows, particularly towards the west and Hangar 2. At the east and west ends, the passageway leads to 10-foot-square openings closed off with metal roll-up doors. Through these openings are the main floors of Hangars 1 and 2. These vehicle-sized openings are believed to have once accommodated a 10-foot-tall pair of swinging kalamein doors (inset with a small human-scale door), based on a surviving example at Hangar 3 (not a subject of this HSR).

The raised concrete floor of the passageway is in good condition, while the ceiling (reinforced concrete structural slab) is mostly sound. There are some areas of spalling and cracking, as well as lime stalactites formed where water has penetrated the slab for long periods.

The north wall that formerly divided the passageway from the Flight Supply Room is only extant at its eastern end. The various service pipes (including steam heating and sprinkler pipes) are rusted but extant. At the south wall, the metal stair is in fair to poor condition, with the top landing exhibiting loose plywood decking and holes.

The passageway area dates to the original construction period of the WPA Infill, although it may not have been partitioned from the Flight Supply Room until a later date (still undetermined).

The south elevation of the passageway is populated by a variety of openings, including two doors and several steel sash windows. These windows are misaligned, oriented 90 or 180 degrees, and cut-down at

some edges, suggesting that they were salvaged from elsewhere and relocated to this elevation as a convenience during the WPA building campaign. This theory is buttressed by an analysis of the size and geometry of the steel sash windows. The windows hold panes of 14-x-20-inch wireglass, a standard stock size of the era found throughout the hangar complex. However, all of the steel sash windows in this elevation have at least five rows of vertically oriented panes (Photograph 1.4.81). No other area of the complex now extant has more than *four* rows. Additionally, the steel sash window at the upper right (mezzanine level) of the elevation has a pivoting sash window located hard against the top edge, an atypical condition. Closer inspection of this edge reveals evidence of a cut to the steel, indicating that there was at least one other row above it, for a minimum of six rows.



Photograph 1.4.81. Detail view of pivoting steel sash window in the passageway. This was likely a Type 66181 from the hangar elevations, cut at the bottom and then installed upside-down by WPA crews.

Another window, behind the stair rising to the mezzanine level, is oriented 90 degrees from its initial position, with the long dimension lying horizontal instead of vertical. The orientation of the wire mesh inside the glass panels supports this conclusion (Photograph B.41). The window is currently a Type 26 (two panes wide by six panes long). Further inspection has revealed that the steel sash is also cut along its long edge (at the top), meaning the window was previously at least a Type 36 (i.e., at least one more vertical row of panes) before its 90-degree reorientation.

Based on the above analysis, these windows are likely from the now-demolished inward-facing elevations of the hangars that existed prior to 1937 and were infilled with brick during the WPA Infill construction campaign. These elevations, based on historic photographs (see Figure 1.2.10 and others), featured a nearly continuous expanse of steel sash windows with as many as six rows before interruption by an intermediate structural girt—two more rows than any other part of the complex. The lowest bay of each inward-facing elevation was fitted with a pair of Type 66181 windows (two-row, four-over-four pivot sash within a six-by-six window), flanking a central Type 36 window (three panes wide by six panes high), consistent with the windows now located in this passageway wall.

It appears that these few windows were salvaged during the demolition and reused within the new WPA Infill building. As such, these particular steel windows are (1) older than the wall they are part of; (2) older, in fact, than the entire WPA Infill; and (3) extraordinarily unique surviving historic fabric from the original interior-facing elevations, with the ability to yield further building information previously believed lost since 1937. Paint samples taken from the sash of these windows indicate their original color was likely a dark green.

Tech Supply Office (Room 3-109). The Tech Supply Office is a small room beneath the mezzanine level at the northwest corner of the central section. This room is enclosed by 8-inch brick walls at the south and east, by the original Hangar 2 exterior wall at the west, and by batten board stud wall construction to the north. The north wall divides the Tech Supply Office from the adjacent passageway to the north, and features steel sash windows reused from the original hangar elevations (Photograph B.40), as described above. The east wall features a door opening to the adjacent Tech Supply Room. The south

wall opens into the Maintenance Bay. The floor of the Tech Supply Office is vinyl asbestos tile over earlier wood flooring. The ceiling is fiberboard.



Photograph 1.4.82. View north towards entrance to Tech Supply Office (Room 3-109). Some areas have been temporarily sealed due to presence of asbestos-containing materials.

The condition of the Tech Supply Office is poor. The east and south brick walls have settled and developed major cracks, with some bricks dislodged at openings (Photograph 1.4.82; see also Photograph 1.4.70). This brick was manufactured by Hudson Valley brickmaker JJJ, consistent with areas identified as dating to the original construction campaign of the WPA Infill. All doors are missing. The fiberboard ceiling has fallen in most areas, revealing the steel frame support for the mezzanine level above.

The Tech Supply Office is apparently an original room to the WPA Infill.

Tech Supply Room (Room 3-108). The Tech Supply Room is a large room constituting most of the central and northeast portions of the central section. The room is enclosed at the east by the formerly exterior brick wall of Hangar 1.

At the south, a brick partition separates the space from the Parts Maintenance Room and Maintenance Bay, from east to west (Photograph 1.4.83). A steel sash window of similar construction to those extant at the hangars is set in this partition, between this room and the Maintenance Bay (3-106) beyond. The panes in this steel sash window are horizontally oriented, signifying that this window segment was originally elsewhere, as steel sash was almost universally installed vertically. The window has 18 panes at 12 x 20 inches each, arranged in a three wide by six high configuration. Based again on historic photographs, and as described in detail for the passageway (Room 3-110), this Type 36 window would have likely come from one of the inward-facing elevations fronting the former space between the two hangars, which is the only place that windows with six rows once existed. Based on the 12-inch width, and precedent observed throughout the complex, this is a surviving example of the central fixed window in a typical tripartite configuration used at multiple column bays. There is some evidence of cutting at the top of this now horizontal sash, which would have been fastened to a vertical steel mullion in its original installation.



Photograph 1.4.83. General view to the west of the Tech Supply Room, shown flooded after heavy rains. The steel framed ceiling supports the mezzanine above. Note horizontally-oriented steel sash window to the south (left).

To the left (east) of this window is another opening, but filled by wooden shelving. Based on the identical width and height, this opening may have previously held another Type 36 window. A post-war concrete block wall to the south, dividing the Maintenance Bay (3-106) and Parts Maintenance (3-107), would have required the removal of this window and possible replacement with the current shelving.

The west wall is 8-inch brick and divides the Tech Supply Room from the Maintenance Bay's north wing and the Tech Supply Office, respectively, from south to north. A steam radiator is located along this wall, in addition to two additional radiators below the steel sash window at the south.

At the north wall, a wood-stud batten board wall features two door openings and a high transaction counter with a wooden hatch. The metal mezzanine stair in the passageway leads to a deck directly above the north entrance to this room. The floor of the Tech Supply Room is the exposed, formerly exterior concrete alley separating the hangar buildings. A manhole is prominently situated in the westerly portion of this room, on the centerline of the overall WPA Infill, equidistant from the hangars on either side. The steel manhole cover is stamped with a 1936 date at its center. The low ceiling was originally finished in fiberboard, but the steel framing for the mezzanine is visually prominent. Two 8-foot-long post-war fluorescent light fixtures are fixed to overhead beams, oriented east-west.

The condition of the Tech Supply Room is fair. The fiberboard ceiling is bowed and fallen in large areas, exposing the steel framing for the mezzanine above. The enclosing walls exhibit similar cracking and settlement as those found in other interior walls of the WPA Infill, but to a lesser extent. The concrete slab floor is cracked but serviceable.

The Tech Supply Room is an original room to the WPA Infill, although the arrangement of its interior partitions and subdivisions may have changed in as yet undetermined ways.



Photograph 1.4.84. View of southwest corner showing concrete block wall meeting earlier brick wall. Vehicle-sized opening to Hangar 2 is at right.

Maintenance Bay (Room 3-106). The Maintenance Bay is an L-shaped space located at the southwest corner of the central section, extending to the north and to the east. It is a double-height space, rising past the level of the infill to the bottom of the second floor slab above. The Maintenance Bay originally encompassed the Parts Maintenance Room (Room 3-107), described below. The easternmost and south walls of the Maintenance Bay are composed of painted concrete block (Photograph 1.4.84).



Photograph 1.4.85. View of west wall showing original iron-flecked brick, painted over with gray. The brick above mid-height is infill brick within the former steel sash window openings. This view is just north (right of) the vehicle-sized opening.

The west wall of the Maintenance Bay features a 10-foot-square opening to the main floor of Hangar 2 at its southern extent, and is composed of the former exterior wall of Hangar 2 for the northerly remainder, where it meets the north wall. Iron-flecked orange-toned brick (originally Hangar 2's exterior east elevation) is still plainly visible beneath a layer of gray paint (Photograph 1.4.85). This north wall is 8-inch brick with a doorway opening at the eastern end and divides the Maintenance Bay from the Tech Supply Office, described above. The adjacent east wall is also 8-inch brick and divides this room from the adjacent Tech Supply Room. An extant multi-pane steel sash window permits views into the Tech Supply Room to the north. There is evidence of another such opening

to the east, extending into the current Room 3-107 and likely infilled during construction of the east concrete block wall (Photograph B.42). There is no door connection between the now-existing Maintenance Bay and the Tech Supply Room, although there is access between the Parts Maintenance Room and the Tech Supply Room, described below.

The ceiling space is dominated by a curved steel hoisting beam suspended from the second-floor slab. This beam begins in the northerly ell and curves into the easterly ell. It continues through the (apparently) later constructed easternmost concrete block wall and ends in the adjacent Parts Maintenance space (Photograph 1.4.86).



Photograph 1.4.86. View to the northeast showing curved steel hoisting beam traversing the L-shaped Maintenance Bay. The hoist rail, constructed before the war, is continuous through the concrete block wall at right, added later. Note also the ceiling-mounted gas unit heater, typical of several installations.

The ceiling is otherwise marked by the concrete-enclosed steel beams exposed from below, as well as a large opening for the former skylight directly above the northerly ell. This opening is now closed off by the exposed wooden joist floor of the monitor structure atop the infill's second floor (Photograph B.43). The concrete floor of the Maintenance Bay features maintenance trenches in both the northerly and easterly ells. There are four steam radiators extant at the east and west walls of the northerly ell, along with numerous other pipes and conduits throughout. There is a ceiling-mounted gas-fired heater at the southwest corner of the Maintenance Bay that is identical to a unit mounted in the now-separated Parts Maintenance Room adjacent to Hangar 1.

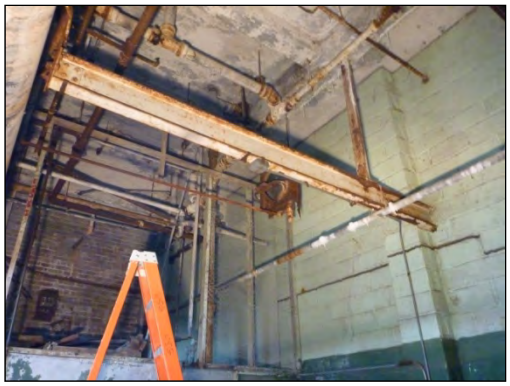
The condition of the Maintenance Bay is fair. The most deteriorated area is the 8-inch brick wall separating the Maintenance Bay from the Tech Supply Office, which has begun to shed brick at the doorway opening between the two spaces. The ceiling of the Maintenance Bay shows considerable evidence of water penetration, including rust spots and lime stalactites. The overhead hoist beam, as well as most of the metal infrastructure throughout, is rusted.

The Maintenance Bay is original to the WPA Infill, but has been greatly reduced in size. It is likely that the original exterior alley was removed and reconstructed in this area to accommodate the installation of the maintenance trenches. The original Maintenance Bay space spanned the entire passage between the two hangars.

The most significant feature is the surviving curved steel overhead hoist beam, which is directly associated with the original use of the space.

Parts Maintenance Room (Room 3-107). The Parts Maintenance Room, located along the eastern side of the WPA Infill directly adjacent to and east of the Maintenance Bay, is closely associated with the Maintenance Bay described above. It is accessed directly from Hangar 1 through one of four 10-foot-square openings into the WPA Infill. The west wall of this room is concrete block, through which the overhead hoisting beam extends and then terminates in the ceiling space above (Photograph 1.4.87). The north wall is 8-inch brick and opens into the Tech Supply Room to the north. The east wall is the

former exterior wall of Hangar 1, and the south wall is a half-height brick wall. At the top of this half-height wall is an attic area located above the latrine to the south, bounded by some woven wire wood-stud partitions, largely deteriorated. A small alcove opens into the Parts Maintenance Room at the southwest corner of the space. This alcove includes a deep sink. The floor is concrete throughout, but is depressed 4 inches from the adjacent floor slab of the hangar. This finding, combined with the observation that the sink in the alcove has a mounting plate hovering 4 inches above the floor, shows that this space was once decked with finish flooring. There is no remnant, suggesting the flooring was purposefully removed and has not simply deteriorated.



Photograph 1.4.87. View to southwest showing later concrete block wall and area above one-story latrine. Hoist rail in upper foreground is the other end of the rail shown in Photograph 1.4.86.

The condition of the Parts Maintenance Room is fair. There are some cracks in the masonry walls, and the exposed steel hoisting rail and pipework are rusted.

First Floor, Southern Section, see Figure 1.4.14

Room 3-101. This double-height room is similar in nature to the Flight Supply Room (3-112) at the northern end of the infill. It is bordered by a concrete block wall to the north, separating it from Rooms 3-106 (the Maintenance Bay) and 3-105. The northeast corner is occupied by a plywood-sheathed wood wall bump-out for the adjacent Room 3-104, a utility sink alcove. The south and southeast walls are the interior brick walls of the south façade and Stair 3-1, respectively. The central monumental doorway has a kalamein surround, but has been crudely closed with plywood signboards dating from the 1982 circus tenancy. There is evidence of a large wooden transom panel in the upper quarter of the doorway, divided at the center by a single vertical mullion. The doorway to the right (west) has a rough opening of 48 inches, with no doorframe or door present.

The west wall is the former exterior brick wall of Hangar 2. There are several pieces of electrical equipment arrayed along this wall. A large panel box at the left (rated for 208 volts and manufactured by Gallagher Electric Manufacturing Company of Brooklyn) is serviced by several dozen face-mounted conduits running up the west wall. Several work spaces—including lathe, hydraulic, prop, and electrical and carpenter shops—are listed in an attached circuit index. To the right of the circuit panel is an enormous main service cut-off switch. There is an additional Edison-base fuse panel attached to the north face of what was originally the southeastern pilaster of Hangar 2, at the southeastern corner of the room, perpendicularly adjacent to the Gallagher panel.

The east wall is the brick wall of the stair enclosure. The door between the southeast stairwell and this room is 36 x 82 inches and of atypical wood construction, with an opening in the top half. A door closer and a single steel rose plate for a cylinder lock are present; this does not appear to be the original door.

The floor of this room is vinyl asbestos tile over the original wood finish flooring. This earlier flooring was laid over sleepers with cementitious deadening over a concrete base slab. The layers of finish flooring have thoroughly deteriorated, allowing the sleepers to “read” through the pulverized debris (Photograph 1.4.88).



Photograph 1.4.88. View to the southeast inside Room 3-101. Seen in raking light, the pulverized tile and wood finish flooring has clearly revealed the construction of the sub-flooring. Door leads to the adjacent southeast stairwell.

The ceiling is the exposed concrete slab of the second floor above. No lighting is extant, but several ceiling-hung chains are present, which likely held fluorescent troffer-type fixtures consistent with those at the Flight Supply Room. Two gas unit heaters are at opposite east-west ends of the room; the eastern unit has a cowl fitted to it and would have directed the heat down directly below it.

Before the addition of several post-war partitions, this room was contiguous with the Maintenance Bay (Room 3-106), the Parts Maintenance Room (3-107), and the utility sink alcove (3-104).

Utility Sink Alcove (Room 3-104). This small rectangular alcove was carved out of the much larger space of Room 3-101 in the late post-war era. It features a utility sink on its east wall. The sink's basal flange is currently suspended 4 inches above the concrete floor below it, indicating the former presence of wood finish flooring, as remains extant in Room 3-101 (Photograph 1.4.89; see also Photograph 1.4.88).



Photograph 1.4.89. Detail of basal flange at utility sink, suspended above the concrete slab-on-grade, reveals depth of missing floor.

Latrine (Room 3-105). This latrine is accessed directly from Stairway 3-1 to the south. It is finished in plaster and ceramic tile similar to the latrines in Hangar 1 Lean-to. The flooring is a combination of white hexagonal mosaic floor tile with black accents (identical to the latrine on the second floor of Hangar 1 Lean-to), but here surrounded by a unique perimeter of three rows of white 4-inch-square quarry tile. The ceramic wall tile, rising to mid-wall, is all-white with a white bullnose accent at the top and white tile base. Several areas of tile are missing.



Photograph 1.4.90. View to the south of the first-floor latrine.

There is evidence of earlier steel toilet partitions, no longer extant. Five toilets were arrayed along the west elevation, of which only one remains at the north end. This toilet, unique in that it has a residential-style tank, is partitioned off by a single wooden toilet partition, which appears to date to the circus tenancy in the 1980s. A single cast-iron porcelain sink remains attached to the east wall, although there is a mounting bracket for another to its right. A collapsed plank of wood, serving as a convenience shelf, has dislocated from the wall over the sinks (Photograph 1.4.90).

The ceiling is painted concrete, matching the walls. There are two horizontal ceiling-mounted radiators located at the northern end of the room. There is also one single-tube fluorescent fixture identical to those found along Foyer 8-A in Hangar 1 Lean-to. A circular recessed electrical junction box for a previous fixture is visible behind it.

The wooden door entering the latrine from the stairwell is paneled, with a large (3/4) panel above a smaller horizontal louver panel (1/4).

Southeast Stairwell (Room 3-1)

The southeast stair is in most respects the mirror opposite of the northeast stair. The former steel flights between concrete landings have rusted away, leaving only remnants of 10-inch steel stringers and associated ½-inch square balusters, 6 inches on center, combined in a simple steel railing system. Plaster wall finishes are typical throughout the stairwell. The ceiling at the first landing has a ceramic base, exposed incandescent bulb fixture. The second landing, coincident with the exterior oxeye window, has a recessed electrical box in the ceiling but is missing a fixture. The third concrete landing shares the same steel lath plaster ceiling as the top landing, which is at the underside of the framed roof. An unsecured access hatch permits access to the roof via an extant steel ladder. Access to second-floor Room 3-201 is westerly through a doorway missing its door.

Mezzanine, see Figure 1.4.15

The mezzanine level, situated only 9 feet above the first level, is reached via a steel open-tread stair in the passageway (Room 3-110). The mezzanine is directly below the former roof courtyard above, and the original skylight openings are still in evidence at the exposed concrete ceiling, similar to conditions at the adjacent passageway and in Room 3-106.

The mezzanine shows evidence of earlier division, with locker areas in each section, but only one wall of post-war panel partitions (identical to the style used in Hangar 1 Lean-to) remains extant. Steel lockers are located along the east and west walls (Photograph 1.4.91). A deteriorated fiberboard sign (approximately 9 x 30 inches) indicating “WOMEN” was found amidst the mezzanine’s rubble in the approximate center of the room, suggesting that the division of the mezzanine allowed for separate men’s and women’s changing areas consistent with the gender separations created in the second-floor latrines (Photograph 1.4.92). Two utility spaces are accessed from the mezzanine: a storage closet to the west and a pipe chase area to the east.



Photograph 1.4.91. General view of the mezzanine, towards the southeast. Note rows of extant steel lockers at left. Because the flooring is highly deteriorated, plywood panels have been laid in the room to allow survey activities to be completed.

Flooring is vinyl asbestos tile over wood sub-flooring. The flooring throughout the mezzanine is treacherous, with several open holes revealing the Tech Supply Room immediately below.

The mezzanine floor is divided by a separate system of exposed steel beams and minor support columns and brick bearing walls independent of the remainder of the WPA Infill, which is framed by larger concrete-encased girders.

There are three extant ceiling-mounted fluorescent light fixtures. Another pendant type, not seen elsewhere in the complex, holds four tubes in a small arc, with cast aluminum end panels featuring a raised diamond design (Photograph B.44). Another instance of this fixture was found loose within the room. There is additionally a chain-mounted troffer type fluorescent fixture, likely of post-war vintage, also found loose within the room.



Photograph 1.4.92. View of the "WOMEN" signage found under several layers of sodden debris.

Second Floor, Northern Section, see Figure 1.4.16

Stair Landing. The stair landing at the second floor terminates the northeast stairwell. It is defined by a steel sash window at the north (exterior-facing) wall and plaster finishes on brick throughout. The ceiling has an opening to the roof at its northeast corner, which has been open to the elements for an extended period of time. A steel access ladder up through the roof opening remains in place. The floor is reinforced concrete without additional finishes. A door opening to the west permits entry into the northern section. A steel railing separates the landing edge from the stairwell beyond. This railing consists of a round metal handrail and simple square balusters.

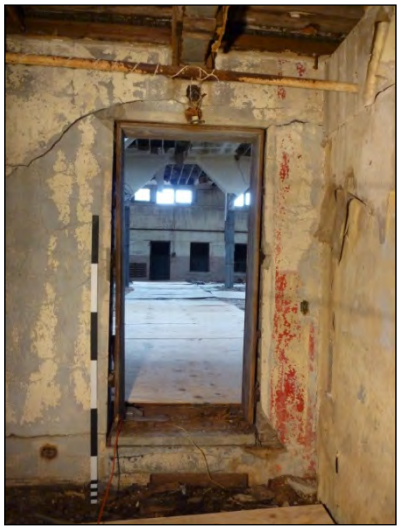
The overall condition of the stair landing is fair to poor. The steel stairs leading up to the top landing have corroded and fallen to the first floor below, necessitating the installation of a temporary wooden structure to access this level. Plaster finishes are largely intact with moderate degradation and cracking, but in poorer condition at the window surround. The ceiling is in fair condition at the southern extents, but in very poor condition at the northeast corner in the vicinity of the roof opening, where the wooden roof decking has begun to fail and buckle. The steel beams supporting the roof are visible in this area and appear sound, with very minimal corrosion. A mill marking on the silver-painted beam gives the manufacturer as "Phoenix USA." This likely refers to Phoenix Iron Works in Phoenix, Pennsylvania. The factory closed in the 1980s and is now part of the National Register–listed Phoenixville Historic District.

The window at the top landing is inoperable and corroded, with cracked/missing wireglass lights. The door at the corridor is missing.

Corridor (Foyer 3-B). A 9-foot-wide corridor extending north-south along the eastern part of the northern section is accessed immediately adjacent to the top stair landing. This corridor leads to a door at the south end with access beyond to the former outdoor courtyard, now a post-war wooden structure infill (monitor structure).

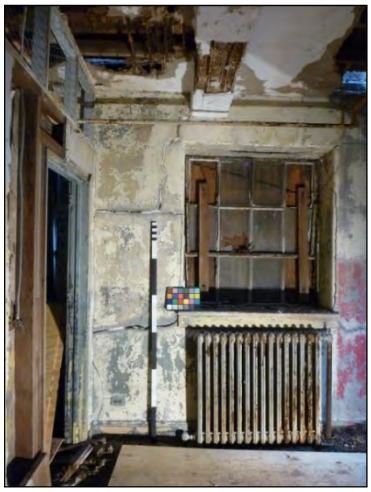
Along the east elevation, the corridor is formed by the brick and plaster wall of the stairwell at the northeast corner, then by a hollow clay tile and plaster partition to the south wall. At the south is a 12½-inch exterior brick wall with a plaster finish. The southern elevation consists of a door entry to the

classroom beyond; the door sill is raised 1½ feet above the level of the second floor, bringing it even with the raised floor of the monitor structure (Photograph 1.4.93). At the west is a wooden stud and gypsum-board wall, capped by a chicken wire transom. At the north is the exterior wall of the WPA Infill, finished with plaster and punctuated by a steel sash window (Photograph 1.4.94). The ceiling is plaster finish on metal lath, and the floor is wood laid on sub-flooring and sleepers, with a layer of cinder concrete interlaid over the reinforced concrete floor slab below.



Photograph 1.4.93. View to south taken in Foyer 3-B, showing former exterior door to courtyard, now the monitor classroom, beyond. Note unusual rise at door threshold. Steps are no longer extant.

The condition of the corridor is fair to poor. Large areas of the ceiling are deteriorated or missing, and the plaster finishes at the east wall are cracked. The gypsum-board finish at the west wall is missing in large areas. The door at the south elevation is missing, while the steel sash window at the north elevation is extant but in poor condition. The wooden floor is almost completely deteriorated.



Photograph 1.4.94. View to the north showing a Type 43181 steel sash window. Entry to the northeast stair is at right, dormitories to left.

A single, central ceiling-mounted metal light fixture accommodates a single exposed bulb and is of plain period design, painted white to match adjacent ceiling surfaces. A notable feature of the corridor is the apparent fact that it did not exist prior to the installation of the wood-stud partition, which created a smaller and subdivided dormitory space to the west. Originally the north section dormitory was accessed directly from the stairwell. It is possible that this post-war subdivision was coincident with the partitioning of the latrine, discussed next.

Latrine (Room 3-212, North Latrine, and Room 3-211, South Latrine). The latrine is partitioned from the corridor with a hollow clay tile and plaster wall, suggesting that it is contemporary with the original construction campaign for the WPA Infill. This date is supported by plumbing fixtures, which are dated (via underbasin manufacturing marks) to 1934. Four extant vitreous china sinks (removed from the wall) are dated 1936 and manufactured by General Ceramics Company. The toilet partitions are steel and are the same “gabled” design used in Hangar 1 Lean-to (second floor) and at the mirrored latrines in the southern section of the WPA Infill.

The existing latrine has been divided into two halves. The partition is a thin assembly of wood stud and gypsum board. Originally this was one toilet room with two toilet stalls, two urinals, four sinks, and two showers. The room was subdivided so that one toilet stall and two sinks were on each side of the partition (Photograph B.45). The sinks were mounted to the east wall in two pairs, and the toilets arrayed against the west wall. The urinals are in the southwest corner along the south wall. A second entrance from the corridor was created through one of the existing shower stalls at the northern limit of the room (Photograph 1.4.95; Photograph B.46). It appears that the room was partitioned to permit

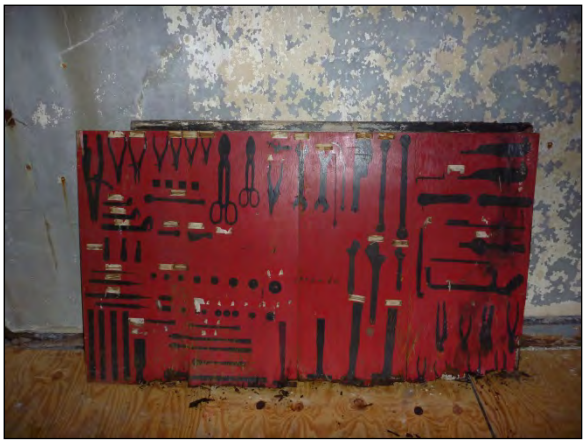
accommodation for women at the North Latrine, an analysis supported by the location of the urinals in the South Latrine. A two-row, four-over-four steel sash window with central four-light pivot (MWI Standard Type 42140) is located in the south elevation, formerly opening into the roof/courtyard to the south. This window was boarded closed after construction of the monitor structure (Photograph 1.4.96). A tool control board of undetermined date, likely associated with the Army tenancy in the 1960s, was found in the latrine (Photograph 1.4.97). Tin snips, sheet metal hammers, files, pliers, and hacksaws are among the tools indicated. It is not believed that this was the original location for the board.



Photograph 1.4.95. View to west in Latrine 3-211 showing shower stalls. The stall on the right has been converted to an entryway from the adjacent corridor



Photograph 1.4.96. View to south of former exterior steel sash window, Type 42140. Note roof failure at upper left, which is adjacent to Hangar 1 wall.



Photograph 1.4.97. Detail view of tool control board found abandoned in Latrine 3-212.

The walls and shower stalls are finished in white 4-inch-square ceramic tile, to mid-height typically and full-height at the shower stalls. The flooring is hexagonal white mosaic floor tile with no accents, a unique finish to the hangar complex. The ceiling-mounted light fixture accommodates a single exposed bulb and is of plain period design.

The condition of the room is poor. The ceramic tile is loose and falling from the wall. The ceiling, and roof above it, has failed catastrophically in the southeast corner of the room, allowing bricks and other roof debris to tumble into the space. The original steel toilet partitions are intact but corroded. The original wall-mounted sinks are present but have been dislodged from their original locations. The urinals are in place but are cracked and crazed. Both corridor doors are missing. Because of the advanced deterioration of the roof at the easterly connection with Hangar 1, steel beams are visible. The beams appear to be in good condition. Surrounding wooden roof planking marked “SPA” and indicated as southern longleaf pine is also visible in several areas where the ceiling has fallen away.

The most notable feature of the room is the modification made for women’s use, particularly the unusual use of the existing shower stall to create a new entrance. Based on the World War II–era date for the construction of the monitor structure (built with similar wood framing and early gypsum board),

it seems conceivable that the various modifications to accommodate women were done during the personnel shortage of World War II, when women were accepted into classifications previously open only to male service members. This has not been confirmed with subsequent historical research.

Dormitory Rooms, Rooms 3-210 (North) and 3-207 (South). To the west of the corridor are the dormitory spaces, which originally constituted the entirety of the northern section (excluding the latrine), but were later partitioned off and made smaller by the post-war installation of wood-stud partitions. The dormitory space is divided roughly in half by a partition in line with the major building support column (Photograph B.47). To the north, at the building's exterior elevation, are three openings for steel sash windows, all still extant (Photograph 1.4.98). Radiators are located below the windows. The floor finish consists of the original wood flooring covered by a post-war application of vinyl asbestos tile. There are no extant lighting fixtures.



Photograph 1.4.98. View to the north showing steel sash windows. Note tripartite configuration at right. Wall construction is plaster on four wythes of brick.

The condition of the dormitory rooms is very poor. The ceiling and roof above have failed in the northwest corner, allowing debris and precipitation to enter the room. The original plaster finishes at the perimeter are cracked, falling, and degraded in numerous locations. The post-war wood-stud/gypsum-board partition has fully collapsed between the building column and the western wall of the room, but is still intact between the building column and the eastern (corridor) wall. Both doors into the space are missing. The steel sash windows are rusted and inoperable with cracked lights. The former wood flooring is very moist and highly deteriorated, and the vinyl asbestos tile layer above it is largely loose and missing (Photograph B.48).



Photograph 1.4.99. View to northwest, showing Hangar 2 steel sash windows beyond deteriorated wood-stud wall.

The most notable feature of the room is its later partitioning, presumably to accommodate women.

Second Floor, Central Section, see Figure 1.4.17

Monitor Structure (Meeting/Classroom Room 3-205). This room is a World War II–era addition. Six 12-x-9-inch heavy-timber columns support the wood-framed roof (Photograph 1.4.99 and Photograph B.49). Full-height, gypsum-sheathed, windowless wood-stud walls (dating to the post-war era) constitute the east and west elevations, whereas the original exterior brick walls constitute the majority of the north and south elevations, with no additional finish materials added, excepting a coat of paint.

The structure was originally built with only the single perimeter stem wall (that portion of the monitor structure facing the exterior and resting on the surrounding complex) around all four

sides and no additional interior partitions or finishes. The east and west stem walls actually bear on the main hangar copper gutter (not the hangar roof itself), a detail which could only be considered highly provisionary. At the east stem wall (at Hangar 1), the copper gutter has collapsed due to neglect, and the stem wall has sagged into a catenary arch. The stem walls to the north and south rest more appropriately on the 8-inch-thick brick wall forming the former courtyard-enclosing walls of the WPA Infill. These walls, distinct from the east/west walls, feature paired wooden, single-sash casement windows, which bring light into the space. Curiously, these windows appear to date to the original wartime construction campaign, during an era when blackout drills were common.

The interior full-height walls now extant at the east and west hangar elevations were placed on top of earlier wood flooring and set in about 24 inches from the hangar walls. The original World War II–era flooring extends past this point into the "interstitial space" between the full-height partition and the brick wall of the hangar, where it would not be required if the interior full-height wall were original. This renovation probably occurred in the early 1950s, based on analysis of materials discussed below. Thus, it appears that the purpose (and associated occupancy/use) of the structure went through at least two iterations.

Further evidence supports a 1950s-era construction campaign in this room. Discrete steel straps were found bracing the stem-walls to the roof at the four corners, which apparently replaced earlier (and more prominent) diagonal wood bracing, the painted ghosts of which remain evident at regular intervals in the roof joisting running perpendicular to the north and south stem walls. The removal of the interfering wood bracing would have permitted the installation of a continuous gypsum board ceiling.

The floor diaphragm is composed of nominal 2-inch-wide joists arrayed 16 inches on center and oriented east-west. The joists are 10 inches deep at the hangar walls, but were "sistered" to 12-inch-deep joists spanning the center of the space to accommodate the V-shaped slope configuration of the original quarry tile roof. The joists bear on north-south sleepers measuring 4 inches square. The wood flooring throughout, due to long-term water inundation, is treacherous and in many areas will not support any loads whatsoever. This is particularly hazardous over the skylight openings, which were never filled.

The 4-inch skylight curbs still exist below the floor, although several of them have been crudely chipped down to accommodate the passage of joists. Threaded steel bolts once used to secure the skylight frames, embedded in the curb and vertically projecting 6–8 inches above it, remain extant in multiple locations, indicating the haste at which the skylights were demolished to permit construction of the floor.

Four field-assembled pipe radiators, built with eight 2-inch pipe runs in varying widths, are arrayed against the brick walls. These are similar to the assembly found on the west wall of Room 8-112 in Hangar 1 Lean-to, and are serviced with steam pipe runs from below. Field evidence indicates that this heating apparatus was installed during the second (1950s) construction campaign, contemporary with the installation of the interior finishes and insulation. The gypsum sheathing is an early type, no later than 1953, with labeling similar to examples found on the first floor of Hangar 1 Lean-to. The Owens-Corning brand fiberglass batt insulation is yellow and not pink, which dates it between 1952 and 1955, additionally confirmed in comparing the labeling to period advertisements in trade publications.

Because of the deterioration of the post-war interior full-height partition, three bays of steel sash windows are now apparent at the east and west (behind the deteriorated wood-framed walls) and are

the former exterior windows of the original hangars once fronting the WPA Infill's roof courtyard. These are the last remaining in-situ remnants of the hangars' former inward-facing façades of glass; i.e., the predominantly glass elevations facing on to the concrete alley (Photograph 1.4.100; Photograph B.50).

Approximately the top third of the north and south elevations is a wood-framed partition containing several wooden windows, forming the monitor structure windows and permitting additional light into the space (Photograph B.51). Floor finish is wood sub-flooring with reddish/pink vinyl asbestos tile; the floor joists bear directly on the still-extant quarry-tiled roof (Photograph 1.4.100). Because of the additional joisting required to create a level floor diaphragm atop the existing sloped roof, the floor of this room is raised 1½ feet with respect to the original WPA-era rooms to the north and south.



Photograph 1.4.100. View north in interstitial space between monitor structure (right) and Hangar 2 (left). Note extant quarry tile roof of the original WPA Infill courtyard.

There is some evidence of ceiling-mounted fixtures, including ceiling-mounted convenience outlets, but no extant lighting fixtures. The ceiling is now the exposed wood joists of the roof deck above, but was previously finished in gypsum board. The finished ceiling height was approximately 16 feet above the floor. The roof itself is of low-slope pitched configuration, sloping towards the east and west with a central ridgeline running north-south. The roof is wood framed with diagonal tongue-and-groove planking and remnants of mechanically adhered roofing membrane. The roof structure is composed of north-south wood joists with lateral cross-bracing.

The HSR team could not reach a conclusion as to the original purpose of the room. Although the room is known to have been used for administrative and classroom purposes after its 1950s renovation, its true function during World War II remains a mystery of considerable importance to developing the full historical narrative of the hangar complex. Because it was apparently uninsulated and unheated during the wartime period of significance, it is speculated that the facility could have served an additional storage-related need. However, its location at the top of the building (accessible only through pilot dormitories) would not have been convenient to the supply needs of aircraft technicians. The room's ample volume (greater than in any other rooms, excepting the main hangars themselves) and the wartime provision for natural lighting are additional factors which must be considered in establishing its original purpose.

The weight of this "temporary" structure, not anticipated by the original hangar complex architects, has had obvious effects on the permanent structure of the WPA Infill, including multiple lateral cracks in the brick walls to the north and south. This condition has been exacerbated due to the failure of its exterior envelope, adding significant moisture weight to the wood framing and increasing the loading. The HSR team recommends that the monitor structure be documented to HABS (Historic American Building Survey) standards in order to fully record this unique structure, particularly in the event that a structural engineer recommends its removal as part of a rehabilitation. In such an event, it is also recommended that several representative portions be preserved for future study and/or interpretation of World War II–era construction expediencies.

Second Floor, Southern Section, see Figure 1.4.18

Room 3-201 (Classroom No. 1). Classroom No. 1 is the southernmost space on the second floor of the WPA Infill. Wall finishes are plaster over brick and hollow clay tile. The ceiling is plaster over steel lath containing five post-war pendant mounted eggcrate linear-fluorescent light fixtures with four tubes each. The floor is wood laid over sleepers with cementitious deadening, identical to the floor type at the northern section of the second floor.



Photograph 1.4.101. View east towards stairwell door, with south exterior wall to right. Note temporary partitions at left. An egg-crate fluorescent fixture is seen overhead.

There are two doorways in the east wall. The southernmost entry leads into the southeast stairwell. The northern door leads into the Latrine Room 3-203. There is a cased opening in the north elevation permitting passage into Classroom No. 2, and beyond it, the monitor structure (Photograph 1.4.101).

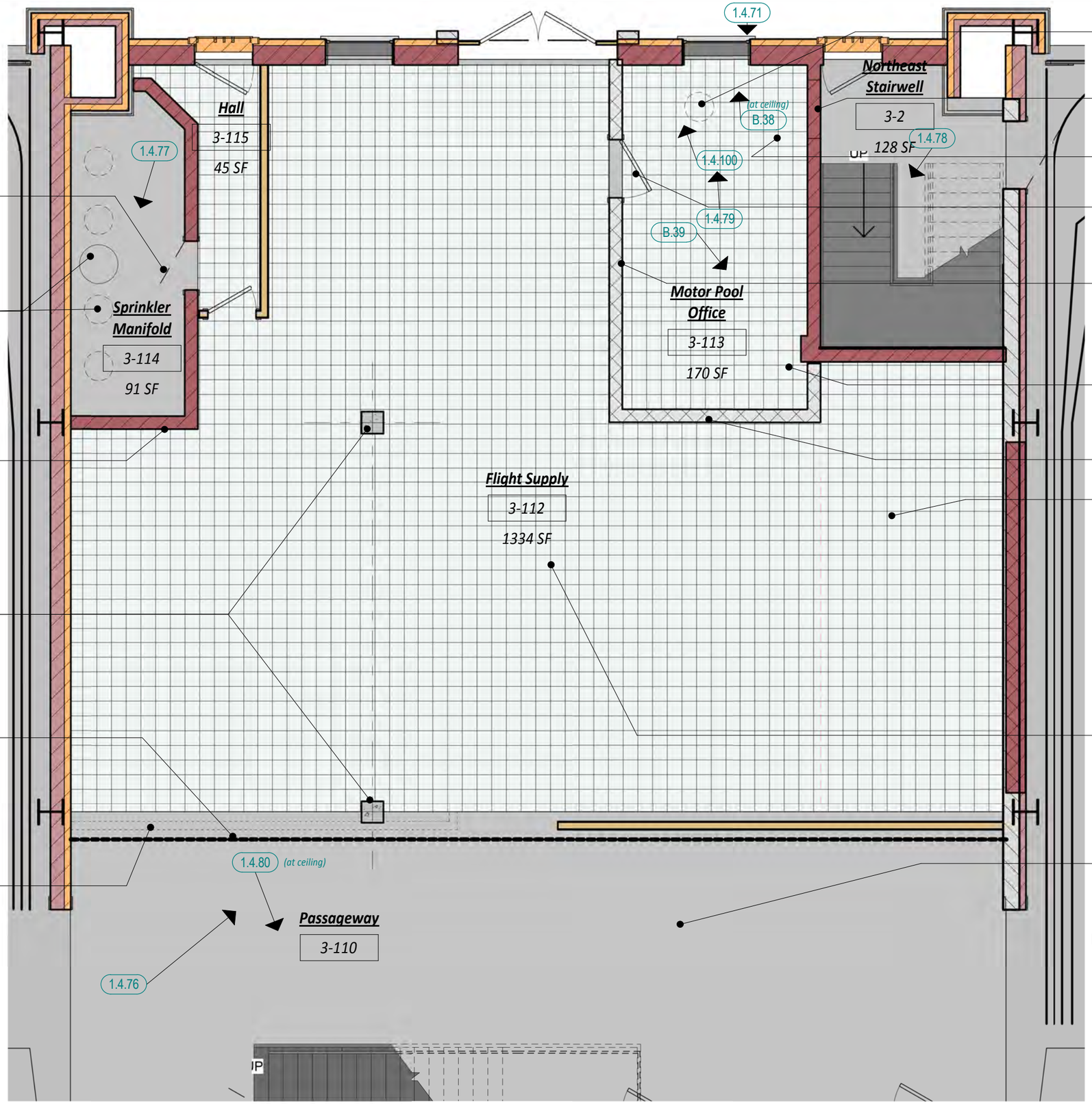
The south elevation, which features several exterior windows, is populated by steam radiators below each window. The room has several plywood partitions crudely erected on thin wood framing. Furniture marked “CAP” (Civil Air Patrol), dating to the late 1960s, remains in several places (Photograph B.52). Evidence was found indicating use of this space for community education (including driver training) through 1974.

Room 3-202 (Classroom No. 2). Classroom No. 2 is consistent with Classroom No. 1, with plaster finished brick and hollow clay tile walls. The north interior elevation of this room is the exterior brick wall separating the southern section of the second floor from the monitor structure. Three egg-crate fluorescent lighting fixtures, oriented north-south and consistent with those in Room 3-201, are mounted to the steel lath plaster ceiling (Photograph B.53).

Rooms 3-203 and 3-204 (South and North Latrines). These latrines share similar features and chronological changes with the latrines at the northern section of the second floor—including a later wood-framed partition and a new 80-inch wood-cased doorway entrance through a previously existing shower stall at the southwest corner. Urinals are at the north end in Room 3-204, with sink locations along the east wall and toilets along the west. The walls are finished in white 4-inch-square ceramic tile rising to mid-height; the shower stalls are finished completely with the same tile. The flooring in this latrine is terrazzo, which is unique within the hangar complex.

The doorway to Latrine 3-204 (the northernmost portion) holds a 30-x-84-inch door which is off its hinges and located within the room. This would have been the original entrance to the earlier larger room. It is a paneled door (one large panel above a smaller horizontal panel at the bottom) and has steel knobs on a mortised lockset. The north brick wall, bordering the monitor structure, holds a Type 42140 steel sash window.

Room 3-203 is accessed directly from Room 3-201; Room 3-204 is accessed from Room 3-202.



DOOR MISSING TYPICAL ALL PLANS

MAIN SPRINKLER RISER AND MANIFOLD COMPONENTS DATED 1936

LARGE SETTLEMENT CRACKS IN BRICK WALL

OFF-CENTER COLUMN LINE AT INFILL BLDG. POSSIBLY DUE TO PREVIOUSLY EXISTING STORM DRAIN/TRENCH ALONG CENTERLINE BETWEEN HANGARS SEE FIGURE 1.4.13

INFILL EXTERIOR BUILDING LINE AT 2ND FLOOR, ABOVE

LINE OF FORMER PARTITION (NO LONGER EXTANT), TYPICAL ALL PLANS

PORCELAIN ENAMEL LIGHT FIXTURE OVERHEAD

INFILLED DOORWAY

POST-WAR VINYL ASBESTOS TILE

'MOTOR POOL' STENCILED ON DOOR

GRAFFITI

WOOD FLOOR COLLAPSING INTO TRENCH BELOW

POST-WAR CONCRETE BLOCK WALLS

LARGE WOOD-FRAMED STORAGE PLATFORM (OVERHEAD) POST-WAR CONSTRUCTION

WOOD FLOORING ORIGINALLY LAID OVER CONCRETE TARMAC COMPLETELY DETERIORATED

PASSAGEWAY: LATER CONCRETE FLOOR OVER ORIGINAL "ALLEY"

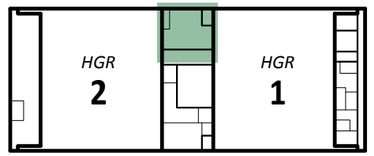
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Office, Supply, Utility

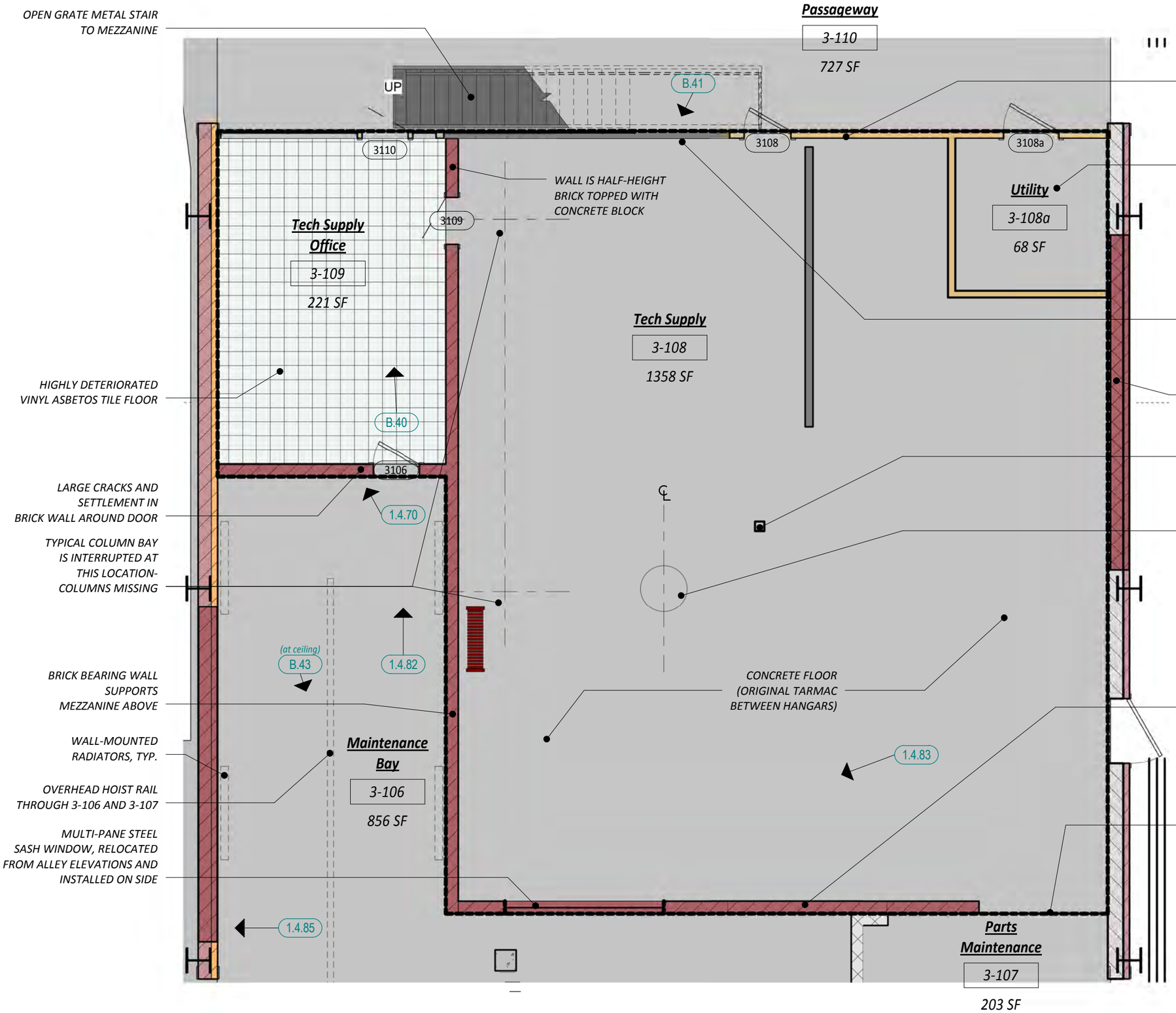
GENERAL NOTES:

Indications of significant settlement, numerous wall cracks

Figure 1.4.12

WPA Infill (Bldg. 3), 1st Floor, North

As indicated



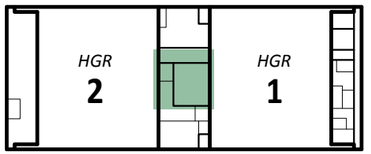
(project north)

N

1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Office, Supply, Maintenance

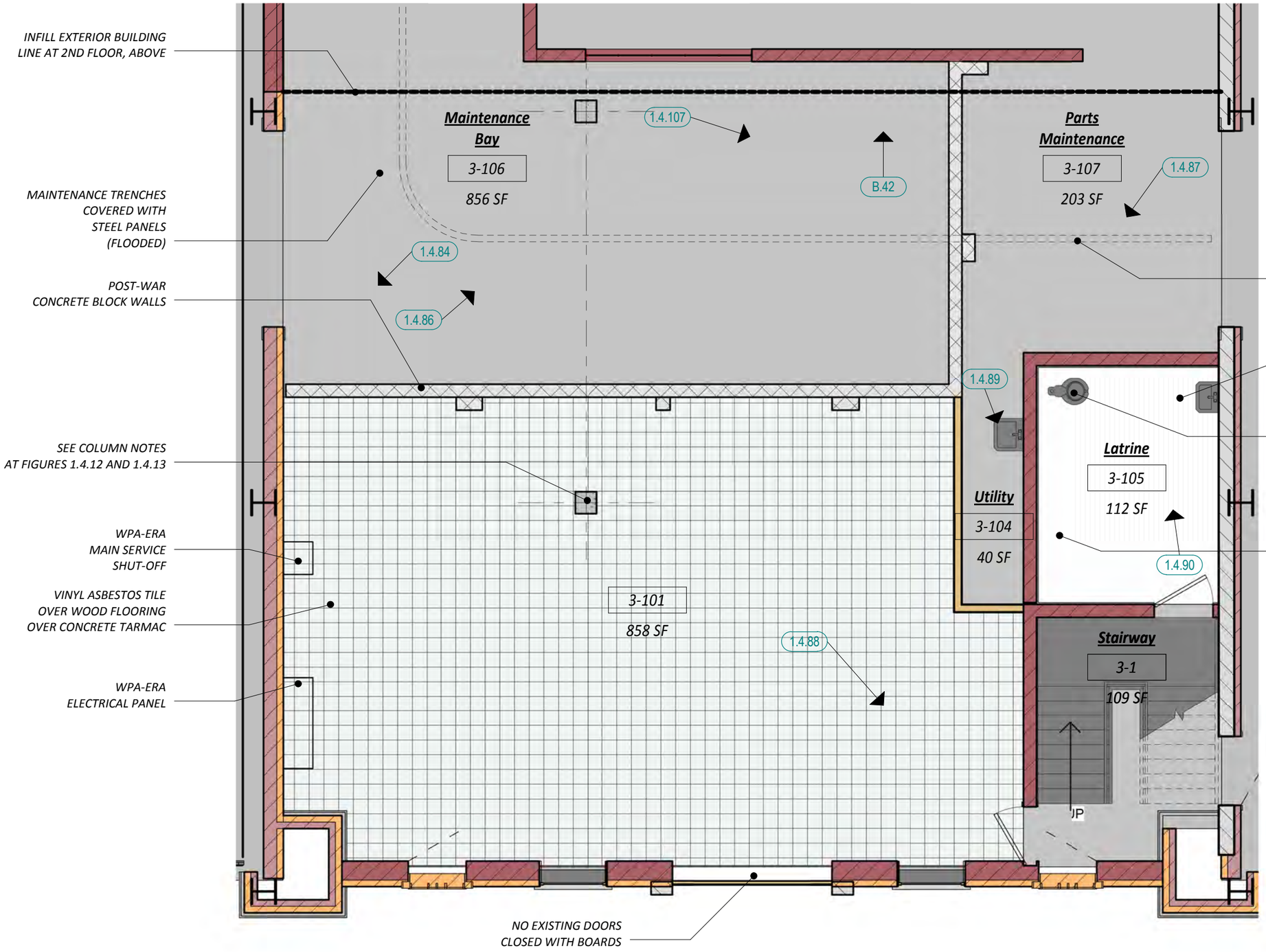
GENERAL NOTES:

Minimal Finishes, Utilitarian, Fair Condition

Figure 1.4.13

WPA Infill (Bldg. 3), 1st Floor, Central

As indicated



(project north)

N

1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 1ST FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Maintenance and Utility.

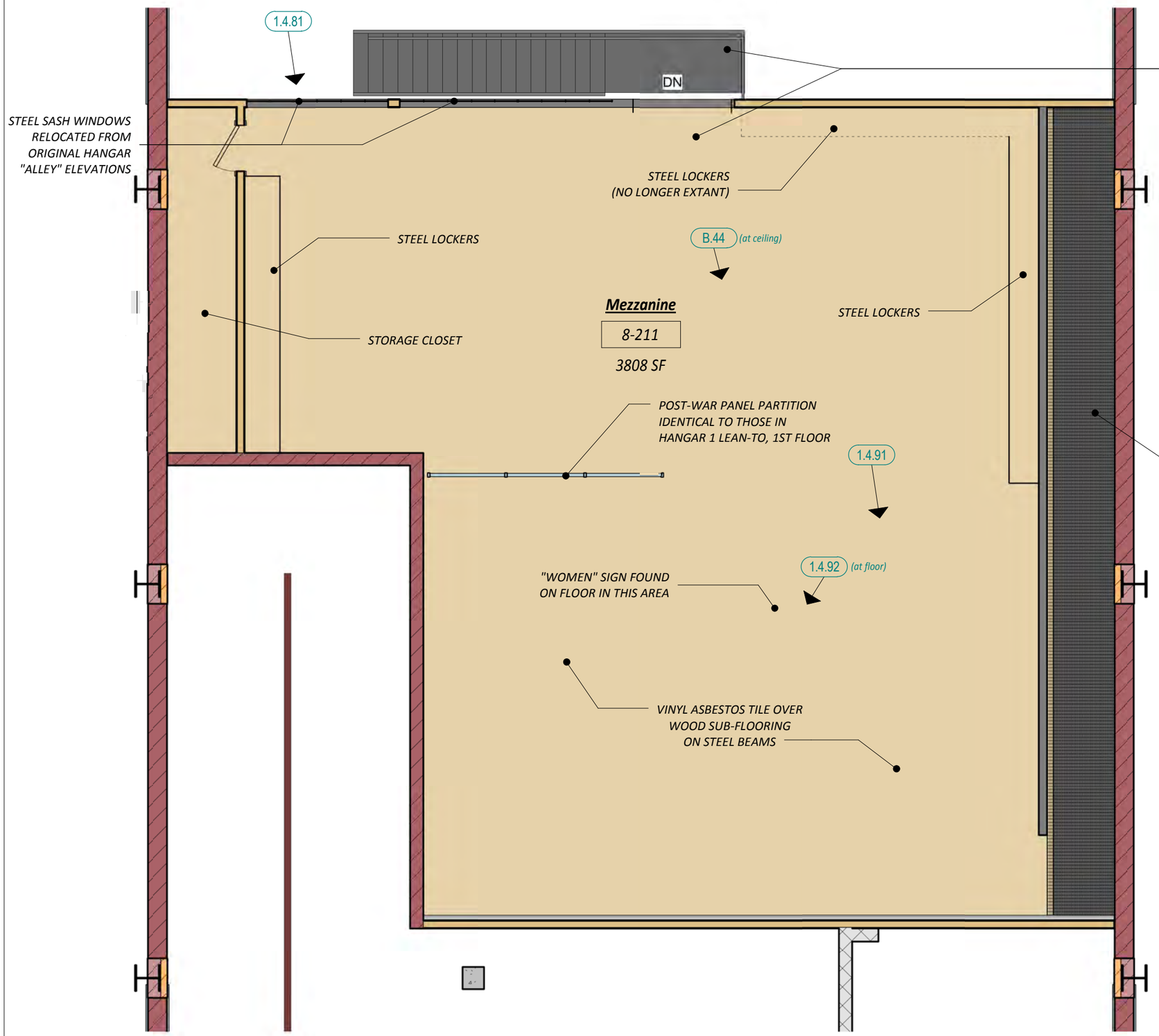
GENERAL NOTES:

Flooring in 3-101 crushed.

Figure 1.4.14

WPA Infill (Bldg. 3), 1st Floor, South

As indicated



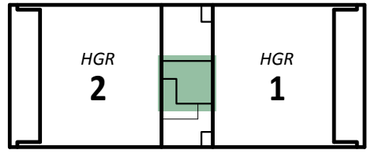
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - MEZZANINE

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Storage, Lockers

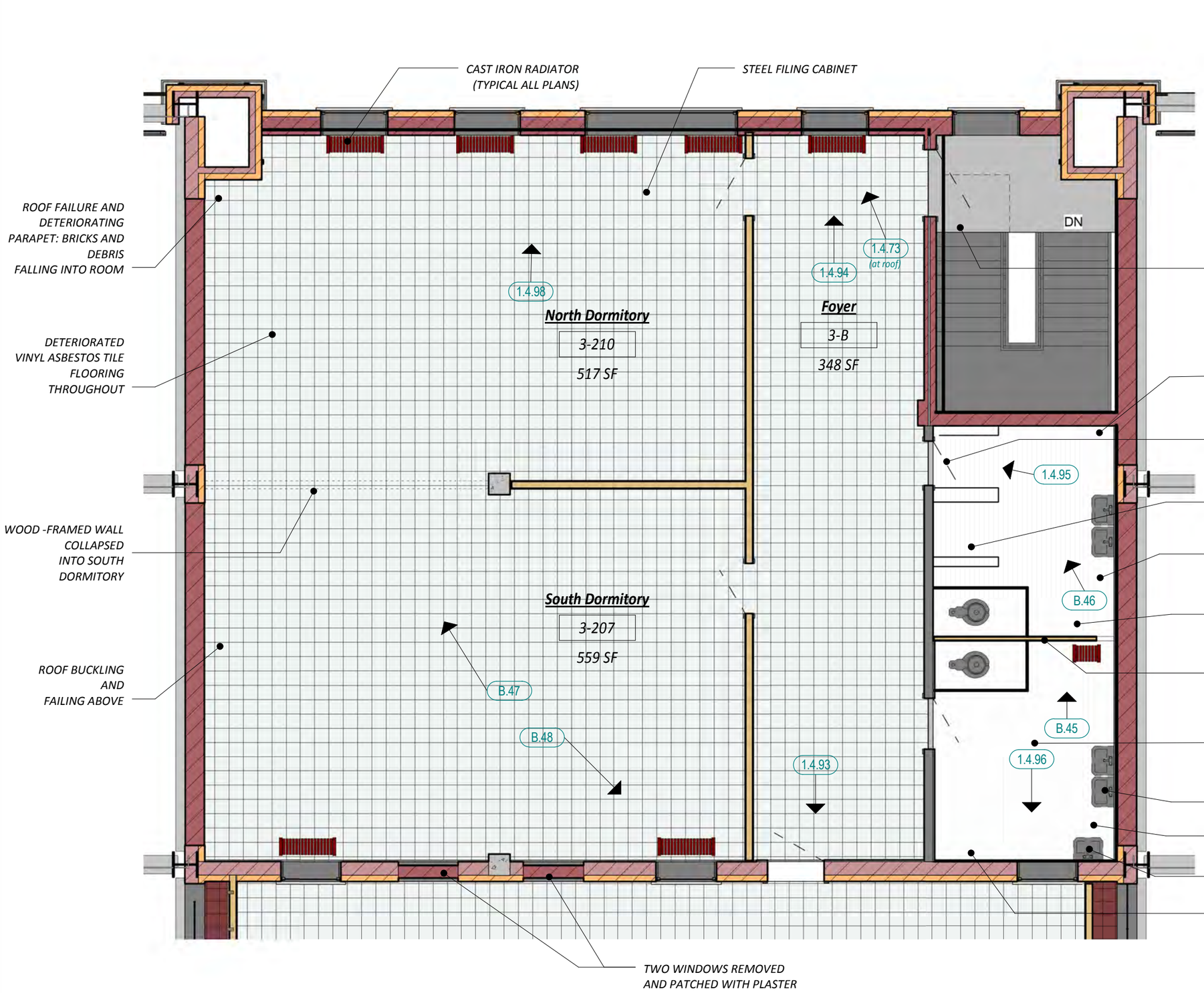
GENERAL NOTES:

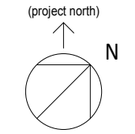
Fair condition.

Figure 1.4.15

WPA Infill (Bldg. 3), Mezzanine, Central

As indicated

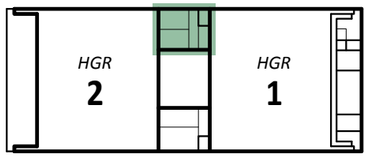




1" PLASTER FINISH
2" GYPSUM FURRING
2" PLYWOOD FURRING
4" BOARD/BATTEN
4" HOLLOW CLAY TILE (HCT)
5" PLASTER ON STUDS
6" PLASTER ON HCT
8" PLASTER ON HCT
8" BRICK/FACEBRICK
8" BRICK (1931)
8" BRICK (1937-1938)
8" CONCRETE BLOCK (CMU)
12" BRICK/FACEBRICK
16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Dormitories, offices.

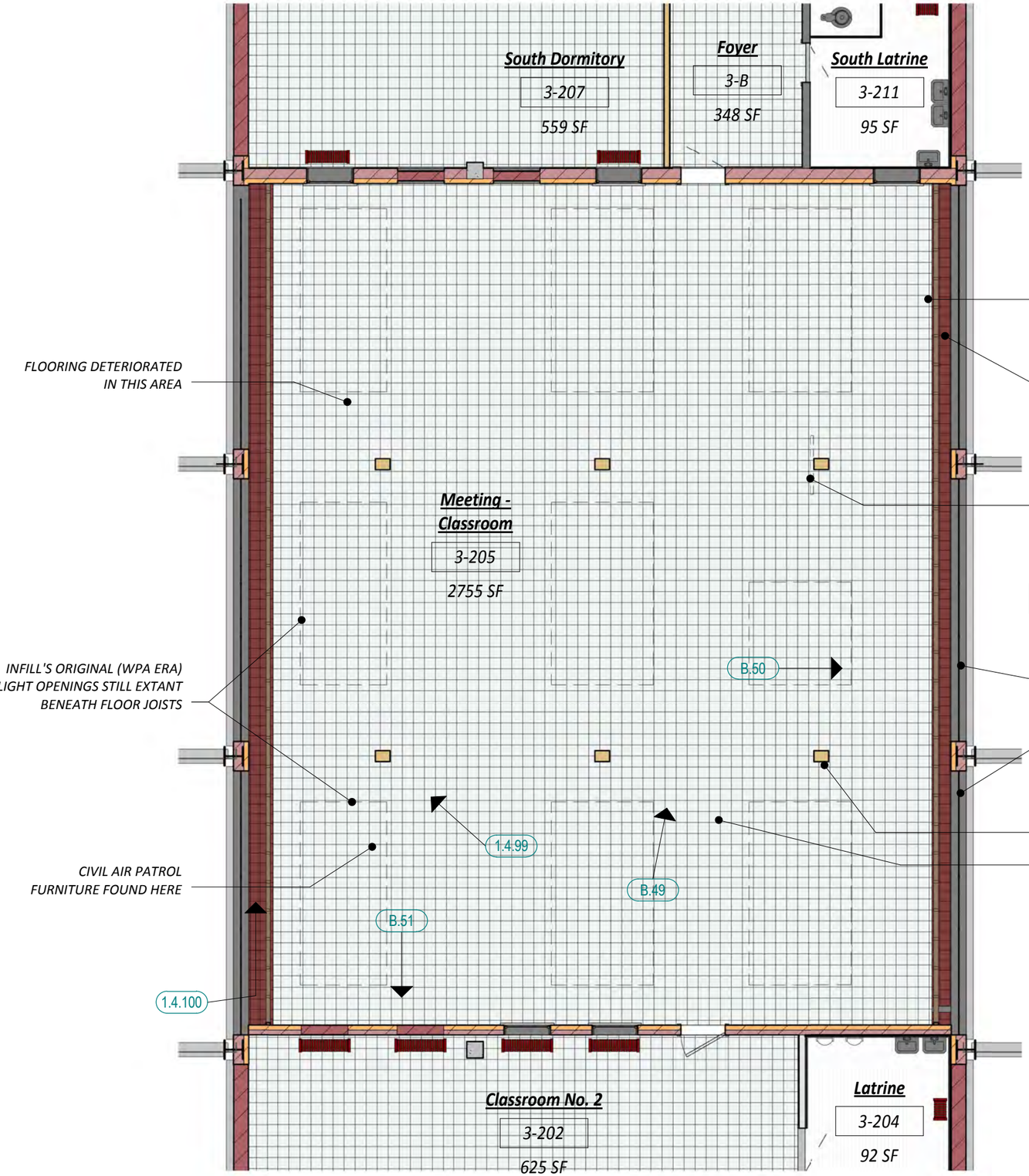
GENERAL NOTES:

Poor condition, roof failure at multiple points.

Figure 1.4.16

WPA Infill (Bldg. 3), 2nd Floor, North

As indicated



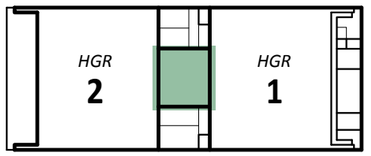
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Classroom, office, recreation. Original use unknown.

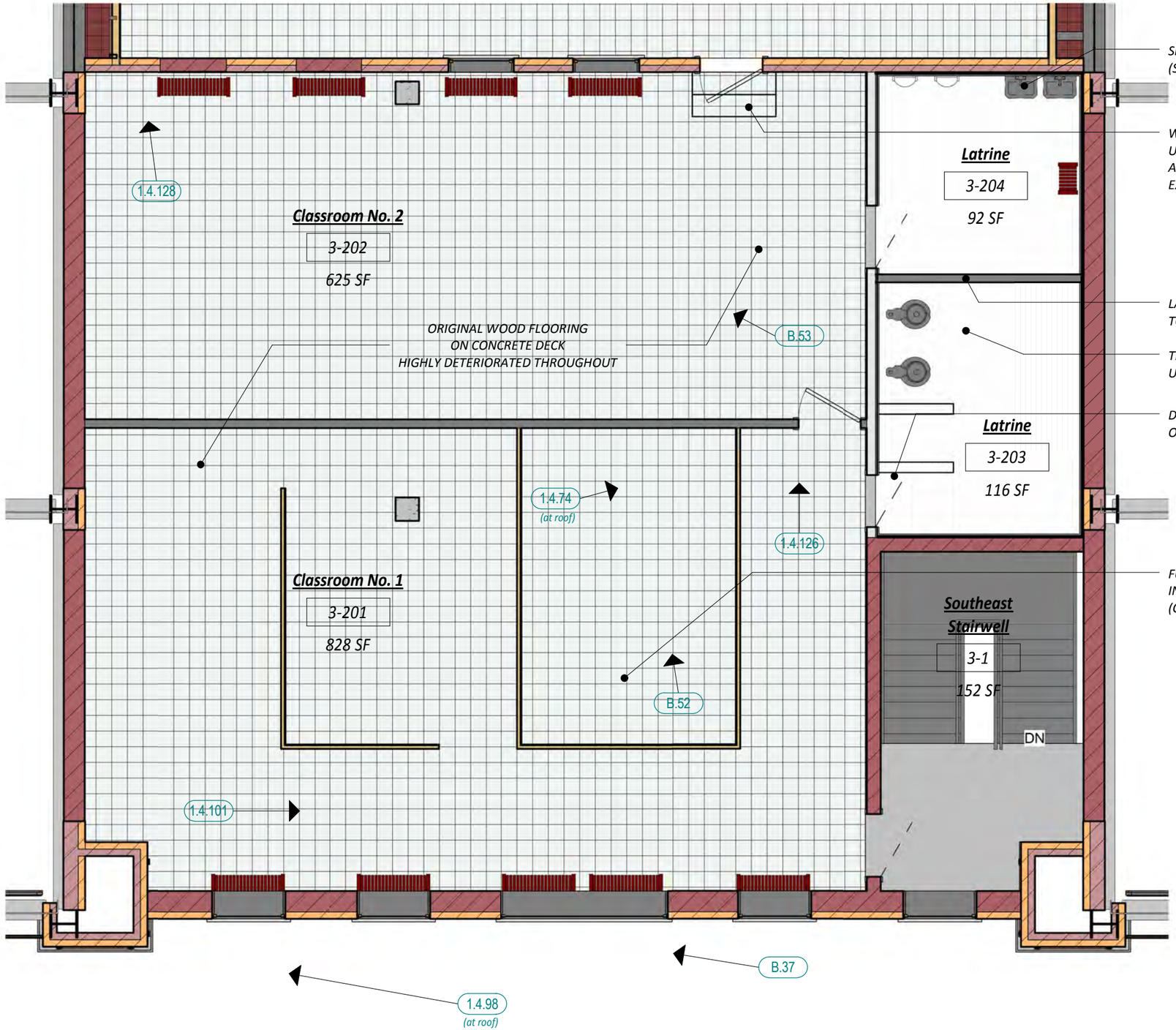
GENERAL NOTES:

World War II-era frame construction, poor condition.

Figure 1.4.17

WPA Infill (Bldg. 3), 2nd Floor/Roof, Central

Scale: 1/8" = 1'-0"



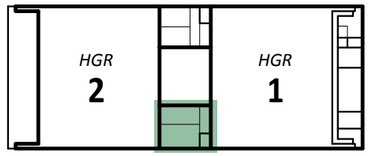
(project north)

N

- 1" PLASTER FINISH
- 2" GYPSUM FURRING
- 2" PLYWOOD FURRING
- 4" BOARD/BATTEN
- 4" HOLLOW CLAY TILE (HCT)
- 5" PLASTER ON STUDS
- 6" PLASTER ON HCT
- 8" PLASTER ON HCT
- 8" BRICK/FACEBRICK
- 8" BRICK (1931)
- 8" BRICK (1937-1938)
- 8" CONCRETE BLOCK (CMU)
- 12" BRICK/FACEBRICK
- 16" BRICK/FACEBRICK

WALL TYPES

Scale: 3/16" = 1'-0"



KEY PLAN - 2ND FLOOR

NOT TO SCALE

XX photograph reference

HISTORIC USES:

Classrooms and Office.

GENERAL NOTES:

Poor condition with roof failure above.

Figure 1.4.18

WPA Infill (Bldg. 3), 2nd Floor, South

As indicated

1.5 HANGARS 1 AND 2 CHARACTER-DEFINING FEATURES

Definition and Discussion of Character-Defining Features

The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings provides guidelines and methodology for the discussion of character-defining features, as does *Preservation Brief 17: Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character* by Lee Nelson; and *Preservation Brief 18: Rehabilitating Interiors in Historic Buildings: Identifying and Preserving Character-Defining Elements* by H. Ward Jandl. The character-defining features in Hangars 1 and 2 should be carefully considered prior to and throughout any design and construction process undertaken in the buildings, including any rehabilitation projects.

Character-defining features are those which best connote a structure's purpose and use over time. The evolution of exterior and interior spaces, selection of materials, and application of finishes are all components that, when taken as a whole, express the historic identity and character of a structure. No treatment should be chosen without first carefully considering its impact on the character-defining features and on the significance of the building as a whole.

The Secretary of Interior's standards for the treatment of historic properties emphasize the protection of a historic structure's defining characteristics in items one, two, five, six, and nine of the standards for rehabilitation:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale and proportion, and massing to protect the integrity of the property and its environment.

The standards explicitly advocate for the least degree of intervention possible when working with historic structures or sites. The replacement of features which may reasonably be repaired is strongly discouraged. Further, the standards caution that the cumulative effect of minor repairs can be as detrimental to the character of a site as more obvious alterations, such as removal of an original feature.

The preservation of architectural character is also discussed extensively in Preservation Brief 17. According to the document, character "refers to all those visual aspects and physical features that comprise the appearance of every historic building." The document states that "character-defining

elements include the overall shape of the building, its materials, craftsmanship, decorative details, interior space, and features, as well as the various aspects of its site and environment." Preservation Brief 17 cautions against removal of character-defining materials, features, and spaces, all of which contribute to the visual character of a building or site, lest the integrity of the building as a whole be diminished.

Period of Significance

The period of significance is also of great importance in the determination of character-defining features. The period of significance for Hangar Row, including Hangars 1 and 2, begins in 1928 with construction of the civil airport. The period of significance ends in 1945, when use of the airfield shifted from a vital "home front" military installation dedicated to the testing and delivery of aircraft to an Air Reserve training facility. Character-defining features for the site are within the period of significance.

Prior Documentation of Floyd Bennett Field Hangar Row Character-Defining Features

In 2001, the Gateway National Recreation Area, Jamaica Bay Unit, compiled a report entitled *Character-Defining Features: Floyd Bennett Field Hangar Row.* The goal of the document was to identify the character-defining features of Hangar Row in order to provide a rationale for maintaining these features, and for preserving their original integrity (NPS 2001: 7). The document emphasizes the hangars and Administration Building of Floyd Bennett Field as an ensemble or group of buildings unified by way of their shared characteristics. While some interior features are represented in the document, most of the identified character-defining features are located in exterior spaces and on the exterior of the buildings. As stated in the 2001 report, it was "not meant to be the final word in directing work, but [was] meant to provide preliminary guidance for proposal development" (NPS 2001: 11).

Hangars 1 and 2 Character-Defining Features

The list of character-defining features compiled for the current HSR draws on the resources and guidelines used for the 2001 document, and reflects consideration of the overall Hangar Row context. Unlike its predecessor, though, this report offers a thorough inventory of character-defining features specific only to Hangars 1 and 2, the lean-tos, and the WPA Infill. These features are often significant both as a component in Hangar Row and as separate freestanding structures. By presenting a comprehensive discussion of exterior and interior elements specific to Hangars 1 and 2, many of which are also common to Hangar Row, the character-defining features in this HSR are intended to be systematically and carefully reflected upon before the National Park Service determines any course of action for the buildings.

Site and Exterior Features

Site and Building Symmetry

The Ryan Visitor Center is the focal point of Hangar Row, flanked by two pairs of two hangars to the north and south. Hangars 1 and 2 and their ancillary structures are symmetrically arranged within the airfield and mirror Hangars 3 and 4. The north and south façades are identical to one another, with retractable hangar doors and low-slope gables sheathed in copper. Neither elevation was designed as the dominant face of the building, and so both north and south can be referred to as a façade. The east and west ends of the building represent the secondary elevations, and differ only in the inclusion of a second level on Hangar 1 Lean-to. A central north/south axis evenly divides the hangars through the

WPA Infill. Like the hangars, the north and south façades of the WPA Infill are also nearly identical. Brick piers, detailed with cast stone and concrete bases, offer a vertical contrast to horizontal elements and emphasize interior and exterior divisions of space within the buildings.

Style and Massing

The shape of Hangars 1 and 2 is consistent with the three other hangar buildings on the site, and is primarily a function of building use. The WPA Infill is shorter than the adjacent hangars. Horizontal openings that span the full façades of the hangars allows for easy entry of airplanes into the hangar. The east and west elevations contain the lean-tos and face the runway and Flatbush Avenue.

The institutional Art Deco style of Hangars 1 and 2 reflects popular architectural design and detailing of the time. The hangars and supporting buildings are massed to create a long, low, rectangular shape on the landscape, which contributes to the symmetrical design of Hangar Row (Photograph 1.5.1).



Photograph 1.5.1. Hangars 1 and 2, north façade. The horizontal bands created by the roofline and hangar doors accentuate the long, low massing of the building.

Monitor Structure

The monitor structure is a unique aspect of Hangars 1 and 2 and is visible only from nearby rooftop locations and other raised vantage points. Its construction history, type, configuration, and material choice make it a significant character-defining feature of this complex.

The monitor structure is located at the top of the WPA infill, straddling the former courtyard separating the infill's north and south wings at the second floor. It is a wood-framed structure with heavy timber columns and rests on the infill's existing structural second floor, in the location originally occupied by large skylights. The monitor structure roof, pitched to the east and west, is framed into the adjacent hangars, and rises a few feet above the roof line of the original hangars—hence its name. No additional structural reinforcement was added to the WPA infill to accommodate the mass of the monitor structure. The exterior elevations of the monitor structure are constructed of asphalt paper and insulation mechanically attached to wooden subframing. Wood windows populate the north and south façades. The interior character is dominated by the timber columns and the wood-framed walls, floor, and ceiling (exposed underside of the roof).

Based on field evidence and period photos, the monitor structure was built during World War II to address an urgent need for more space. Wood construction was heavily favored during this era, to preserve metals for critical wartime needs. During World War II, thousands of temporary wooden structures were built on federal military installations worldwide, including barracks, hangars, factories, and workshops. Most of these facilities were replaced with permanent facilities after the war, or were simply razed.

Because of the monitor structure's construction material and minimal engineering, it appears to be a temporary structure which survives today because of its careful integration into the larger complex. In

addition to its unique contribution to the roofline of this hangar complex, the monitor structure is a significant reminder of the exigencies of wartime construction and urgent programming needs during the building's period of significance.

Paving and Landscaping

Rectangular asphalt pavers, while interspersed with extensive asphalt patching material, appear to be original to the site. The pavers are arranged in a variegated pattern in the immediate area of the hangars.



Photograph 1.5.2. Hangar 1, south façade, parapet. Parapets continue the roofline and conceal the lower height of the lean-tos.

An irregular row of mature London Planetrees growing on the east side of Flatbush Avenue appears to be original, according to historic photographs from 1935.

Roof and Roof Features, including Steel Access Ladders

Brick and cast-stone parapets define the roof of the hangars, lean-tos, and WPA Infill, and accentuate the horizontality of the buildings as a whole (Photograph 1.5.2). On the east and west elevations, the lower roofline of the lean-tos—punctuated with regularly spaced pilasters and detailed with cast stone—allows a view to the steel-framed clerestory windows.

Exterior Site Elements

Hydrants and Post Indicator Valves

On the exterior of the building, fire suppression infrastructure includes one post indicator valve dated 1935 and two fire hydrants dating to the period of significance; all are cast iron (see Photograph 1.4.3).

Manholes, Access Covers, and Grilles

Manholes, access covers, and grilles are located within the pavers on the site. Their designs are unique to Floyd Bennett Field. The oldest, located south of Hangar 1, is marked "FLOYD BENNETT AIRFIELD" at the top of the circle and "DEPARTMENT OF DOCKS N.Y.C." below. A similar cover is labeled "FLOYD BENNETT FIELD" and "DEPARTMENT OF DOCKS." A bronze U.S. Coast & Geodetic Survey benchmark is permanently affixed within the concrete base of Hangar 2's west brick pilaster (Photograph 1.5.3)



Photograph 1.5.3. Hangar 2, north façade. This U.S. Coast and Geodetic Survey benchmark is not to be disturbed, as clearly indicated on its face.

WPA Infill Façades



Photograph 1.5.4. WPA Infill, south façade. The WPA Infill is a showplace for the variety of window openings used in the design of the hangars.

The north and south infill façades of Hangars 1 and 2 are identical to one another, with the exception of three circular utilities mounted above the west door of the north façade. The façades are less ornate than the south façade of the WPA Infill for Hangars 3 and 4. Decorative cast stone adorns the central door opening, with inserts in the surround and a decorative lintel. The remaining window and door openings are punctuated with cast-stone keystones and the window openings have cast-stone sills. Rectangular and round openings on the façades are symmetrically positioned (Photograph 1.5.4).

Pilasters

The brick pilasters with concrete bases and cast-stone detailing are positioned at the outer corners of the hangars and the WPA Infill. They provide contrast to the otherwise low horizontality of the building form.

Building Materials

Brick

The brick is distinctive in that it is iron-flecked and its color is orange, yellow, and brown in varying shades. The brick exterior walls of the hangars are laid in common bond with a header course at every sixth vertical row. Soldier coursing defines the parapet and window lintels. Brick in rowlock coursing is laid in square and rectangular patterns to accentuate the massing of the pilasters (Photograph 1.5.5).



Photograph 1.5.5. Hangar 1, south façade, brick detail. The exterior envelope is constructed of iron-flecked brick in shades of brown, orange, and yellow.

Cast Stone

Long rectangular slabs of white cast stone serve as coping on the parapet, as sills to the punched window openings, and a course of cast stone is laid between concrete and brick in the pilasters. The central doorways of the north and south façades consist of brick with cast-stone inserts, and the lintels are capped with decorative cast stone. Individual blocks of cast stone are used as keystones above and around the windows (Photographs 1.5.6 and 1.5.7).



Photograph 1.5.6. WPA Infill, north façade, lintel. Cast-stone lintel and inserts accent the central entrance on this façade.



Photograph 1.5.7. Hangar 2, view to the southeast. Cast-stone accents punctuate unique architectural details.

Copper (including Flashing and Cladding)

Copper was the preferred material for roof flashing and should be retained. Painted and crimped 16-gauge copper sheet defines the low-slope gable on the north and south hangar façades. Originally unfinished, the current paint color matches the color of the cast-stone trim. The copper sheet is decorated with a central raised wing emblem flanked by two raised circular medallions (Photograph 1.5.8).



Photograph 1.5.8. Hangar 2, south façade, gable. Raised copper detailing adorns the hangar gables.

Concrete

Concrete supports the eight pilasters placed at the corners of the building that define the WPA Infill.

Aluminum

The hangar doors are notable not only for their shape but for the aluminum used in their construction. Their texture and color offer a distinct contrast to the palette used on the remainder of the building.

Wireglass

Wireglass is used in the metal window sash and in the panes of the hangar doors. Its color, texture, and design are in keeping with the utilitarian function of the hangars.

Window Openings

There are several different types of window openings throughout the hangars (see Photograph 1.5.4). A detailed description of each of these is presented in Section 1.6.3. Each type of opening is an expression of the industrial use and style of the hangars and is of intrinsic value to the overall design of the building.

When seen as a whole, the windows impart a distinctive look to the building in regard to patterns, materials, and use.

Rectangular

Simple punched openings for metal and wood windows on the exterior masonry envelope of the building are detailed with brick soldier coursing at the lintels, as well as cast-stone keystones and sills.

Round

Round windows on the north and south façades of the infill space are circled with rowlock brick and quartered by four cast-stone blocks.



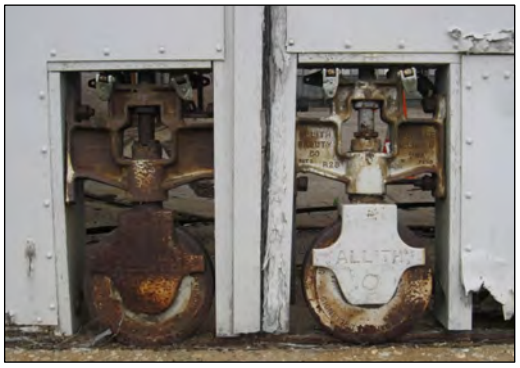
Photograph 1.5.9. WPA Infill, south stairwell, metal sash.

Clerestory

A rowlock course defines the lintel of the clerestory windows above the lean-tos.

Metal Sash (Figure 1.5.1)

Steel, multi-pane sash, rectangular and circular in shape, are used to allow light into the hangars, offices, and workshops throughout the interior and exterior of the building. Painted finishes have faded, eroded, or spalled off with corroded metal over time (Photograph 1.5.9).



Photograph 1.5.10. Hangar 1, bottom door roller, north façade. The hangar doors and hardware are specific to a building of this type and era.

Door Openings, Doors, and Elements



Photograph 1.5.11. Pilot door, Hangar 2. Pilot doors allow access to the hangars without full retraction of hangar panels.

Hangar Doors (including Eight with Pilot Doors; Figure 1.5.2)

The north and south façades of the hangars are dominated by hangar doors of glass and aluminum alloy, which extend from ground to gable and retract by sliding on a system of steel tracks. Each opening is designed to contain 12 panels. The doors and related appurtenances—including tracks, rollers, stops, glass, and storage pockets—speak to the use and purpose of the space. The tracks remain functional and the pockets are integral to the design of the hangars (Photograph 1.5.10).

Metal, human-scale doors at the east and west ends of the hangar door panels were installed to allow ease of access into the hangars without retraction of the panels themselves, and are a feature unique to a structure of this type. The exterior face of each door is painted to match the hangar door panels and the interior is painted red. Each door holds a single glass pane (Photograph 1.5.11).

Exterior Human-Scale Door Openings and Doors

The door openings throughout the exterior are rectangular. Each single-width, human-scale exterior door opening is capped by an arched transom. The arches are outlined with rowlock brick, along with cast-stone keystones and archsprings. The openings were originally filled with multi-pane steel sash lights. The west transom on the north façade of the WPA Infill is intact. Both transoms of Hangar 1 Lean-to and the transom on the south façade of Hangar 2 Lean-to are filled in with brick. Like the exterior window openings, both double and single exterior human-scale door openings are accented with cast stone (see Photograph 1.5.6).



Photograph 1.5.12. Hangar 1, east elevation. This projecting bay is not original to the building and is unique to Hangar 1.

Projections

Bay Window

A single-story, three-window, bay projection on the east elevation of Hangar 1 was installed in 1936–1937 in preparation for Navy occupancy. Originally constructed with two windows and one door, the bay is unique to Hangar 1 (Photograph 1.5.12). Its current configuration includes three horizontally oriented steel casement windows with five panes each. The bottom sash is an inward-projecting hopper and the second and third panes down combine to form a pivoting sash. The exterior window openings and balcony are trimmed with cast stone.

Exterior Lighting and Landing Signs

Floodlights were installed on the building in 1931 by the Sperry Gyroscope Company of Brooklyn; airport landing equipment, including the lighted "NYC" and north arrow on the hangar roofs, was provided by the General Electric Company. Claude Neon Lights Incorporated furnished neon corner markers showing the four corners of the hangars (see Figure 1.2.13). Painted signs on the roof of the hangars served to identify the structures to incoming aircrafts. While these features are no longer in place, they were integral to the function of the buildings and can be considered character-defining.



Photograph 1.5.13. Hangar 2, view to the south. The expansive hangar spaces were designed to serve the specific function of airplane maintenance and storage.

Interior Features

Use and Arrangement of Space

Hangars 1 and 2 were constructed for storage and service of aircraft and, as such, their interior configuration has never been partitioned or in any way diminished. With its high exposed ceilings and open bays, the function of the building defines the form of the space. The WPA Infill and lean-tos were constructed as ancillary spaces and their interior design has adapted to accommodate tenant needs throughout the history of the complex (Photograph 1.5.13).

Exposed Masonry

The expansive mass of the hangars is emphasized by the exposed masonry walls, as well as the other unornamented elements. The resulting effect is a sense of utility on a large scale (Photograph 1.5.14).

Exposed Steel Construction

The exposed steel trusswork, steel beam supports, and hoisting rails of Hangars 1 and 2 emphasize the utility of the interior space's open span (see Photograph 1.5.14). Mill markings, which indicate the manufacture of the steel members, lend further significance to these features.



Photograph 1.5.14. Exposed masonry and steel construction contributes to the sense of scale and utility.

Exposed Roof Planking

The exposed roof decking of Hangar 1, supported by steel trusswork, emphasizes the extreme functionality of the space. This material was originally painted off-white and was later coated with a silver metallic finish.

Wooden Catwalks and Steel Access Ladders

The simple and unadorned wooden catwalks in Hangars 1 and 2 were constructed to allow access to the ceiling WPA-era steam heating units (Photograph 1.5.15). Steel access ladders serve an equally utilitarian purpose.



Photograph 1.5.15. Hangar 2 catwalk with steam heat unit visible.

Cast-in-Place Concrete Floors

The floors of Hangars 1 and 2 are cast-in-place concrete slabs with control joints approximately every 10 feet. The floors slope slightly to two area drains, and steel rails are cast into the concrete to accommodate the hangar doors.



Photograph 1.5.16. WPA Infill, ceiling. The cast-in-place concrete floor of Level 2 serves as the ceiling for Level 1.



Photograph 1.5.17. Hangar 1, west wall. Kalamein doors were selected primarily for function, although raised trim suggests an interest in architectural form, as well.

In Hangar 1 Lean-to's second level—and the second level of the WPA Infill—the cast-in-place concrete floors serve as a concrete ceiling for Level 1 below (Photograph 1.5.16). The concrete-encased beams and support columns carrying these floors are also character-defining within the structures. The exposed concrete of the lean-to had a plaster skim coat that is now largely deteriorated. It is unclear whether this was original or added later as the space was converted for office use.

Kalamein Doors

Kalamein doors were used in the original construction of the complex for the practical purpose of fire protection; however, molding and trim profiles suggest an interest in form and style (Photograph 1.5.17).

Wood Panel Doors with Transoms, Level 2 of Hangar 1 Lean-to

The wood panel doors of Hangar 1 Lean-to's second level allow entrance to office, classroom, latrine, and shower spaces. The doors are topped with three-pane glass transoms (Photograph 1.5.18).



Photograph 1.5.18. Hangar 1 Lean-to, door opening with transom. Detached three-panel wood door is visible at right.

Exposed Mechanical, Electrical, Plumbing, and Fire Suppression Systems (including Conduit and Piping)

Mechanical, electrical, plumbing (MEP), and fire suppression systems are exposed in the hangars for optimum access, as well as to express the functional intent of the space. Original MEP equipment remains affixed, if inoperable, throughout the interior of the hangars, lean-tos, and the WPA Infill. Utility boxes, fixtures, conduit and wiring, and hardware integral to the function of these systems are exposed throughout the site and in the buildings, contributing to the character of the spaces.

Steam heaters, piping, and radiators remain in place throughout the buildings (see Photograph 1.5.15). An electrical panel on the west wall of Room 3-101 in the WPA Infill retains the original circuit index and room labels are clearly marked. The electricity is turned off throughout the building for safety purposes, but original wiring remains. A sprinkler manifold intended to service the entire building is located in Room 3-114 of the WPA Infill. The industrial grade steel assembly is clearly dated 1936–1936 and, while no longer functional, retains a high degree of architectural and historic integrity. The building does not have a functioning plumbing system, although plumbing fixtures remain in place in some areas. All drainage piping is hub and spigot cast iron.

Five dry pipe valves correspond to the five zones of the building (Hangars 1 and 2, Hangars 1 and 2 Lean-tos, and the WPA Infill), and fire hose valves are fed from the local zone's sprinkler piping. There are no sprinklers on the second level of the WPA Infill. The equipment is within the period of significance of the buildings (see Photographs 1.6.2.3 and 1.6.5.12). Alarm mechanisms, found throughout the buildings, are also character-defining (see Photograph 1.4.11).



Photograph 1.5.19. Hangar 2, view to the east, light fixtures. Catwalk, period light fixtures, and an original sign remain in place in the hangar.

Period Light Fixtures

The original pendant porcelain enamel light fixtures remain in place in Hangar 2, many fitted with the appropriate bulb style. On the mezzanine level of the WPA Infill and in Hangar 1 Lean-to, fluorescent light fixtures with Art Deco detailing indicate an attention to detail that contrasts other, more function-driven aspects in the space (Photograph 1.5.19).

Painted Finishes (including Painted Plaster at WPA Infill Stairways)

Finishes throughout the interior spaces are in colors and tones consistent with the military branches that occupied the spaces. Finishes emphasize architectural features and reflect the symmetry and



Photograph 1.5.20. Plaster and painted finishes on the WPA Infill south stairwell remain largely intact.

spatial order of the complex. Traces of painted finishes on the plaster of the WPA Infill reveal meticulous attention to aesthetics in the workspace (Photograph 1.5.20).

Plasterwork

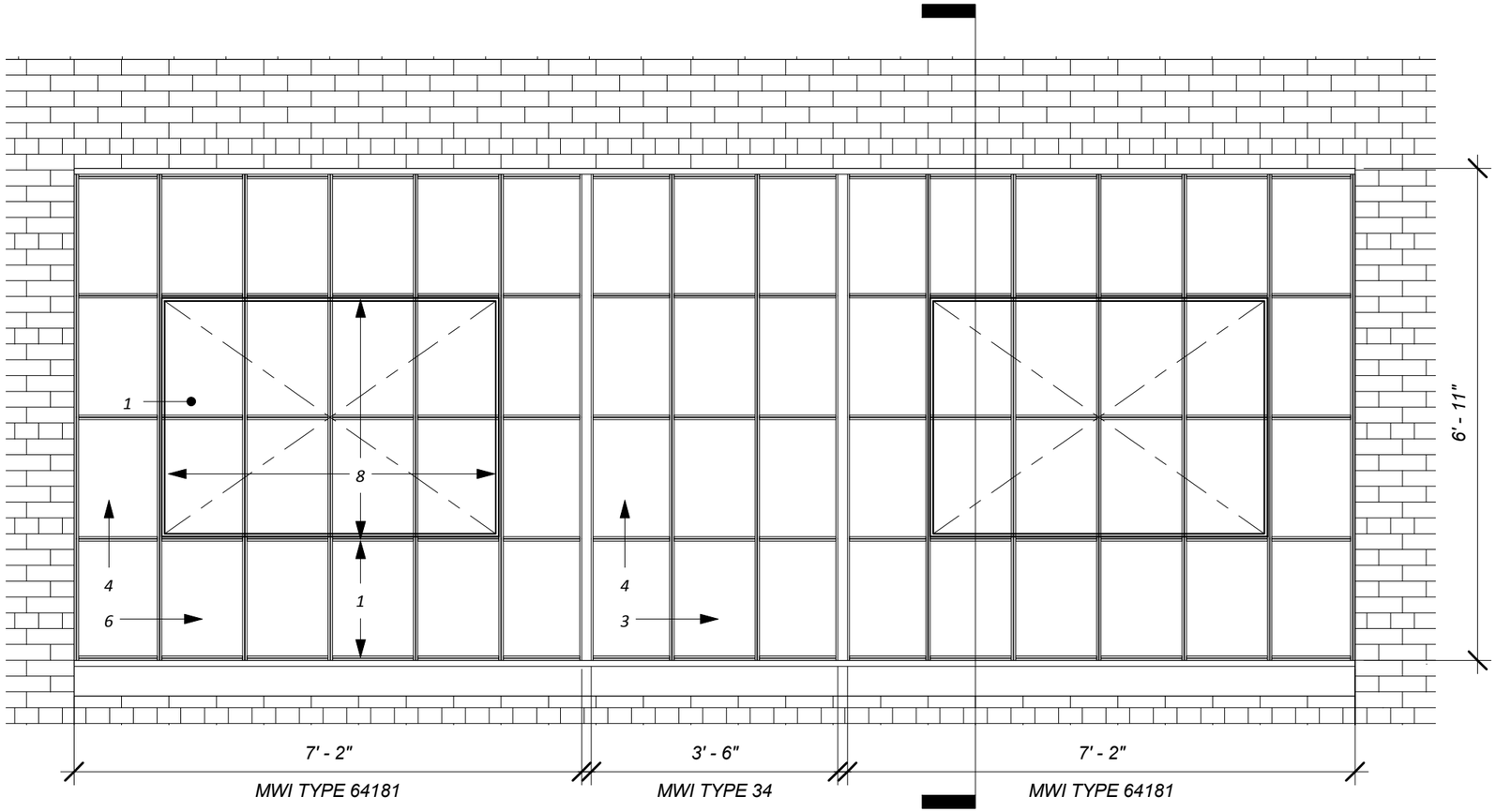
The walls and ceiling of the north and south WPA Infill stairways exhibit an intact example of plasterwork within the building. The work exhibits a high level of craftsmanship and a concern for detail that are unexpected, given the function-focused surroundings (see Photograph 1.5.20).

Graphics (Figure 1.5.3)

Lettering, numbers, and instructional signs painted directly on the walls of the building, or on wood and metal plates suspended from hooks or nails, are found throughout the hangars. Font style, color, and design of the signs are unique to the era in which they were applied, as is the subject matter (Photograph 1.5.21).

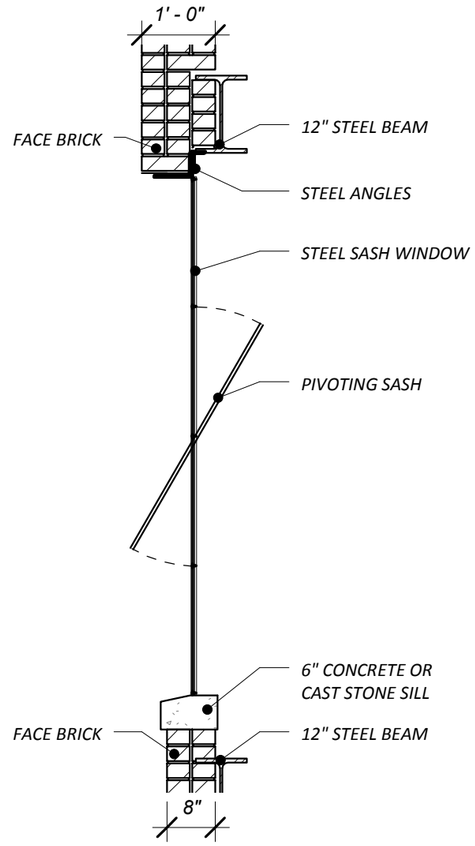


Photograph 1.5.21. Hangar 1, east wall, painted brick stenciled sign. Directional, descriptive, or use-related signs remain in place throughout the hangars and secondary spaces.



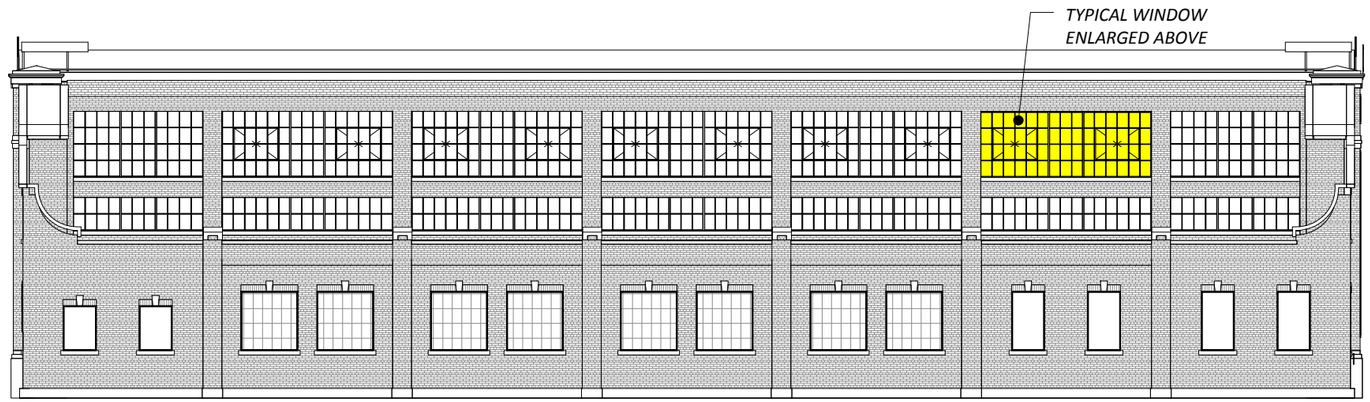
TYPICAL STEEL SASH WINDOW - HIGH CLERESTORY - "TRIPARTITE" DESIGN

Scale: 1/2" = 1'-0"



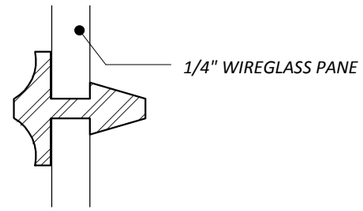
TYPICAL STEEL SASH SECTION, WITH PIVOT

Scale: 1/2" = 1'-0"



TYPICAL SIDE ELEVATION, HANGAR 1 BEFORE 1937/HANGAR 2 THROUGH PRESENT DAY

Scale: 1/16" = 1'-0"



TYPICAL STEEL MUNTIN DETAIL (FULL SCALE)

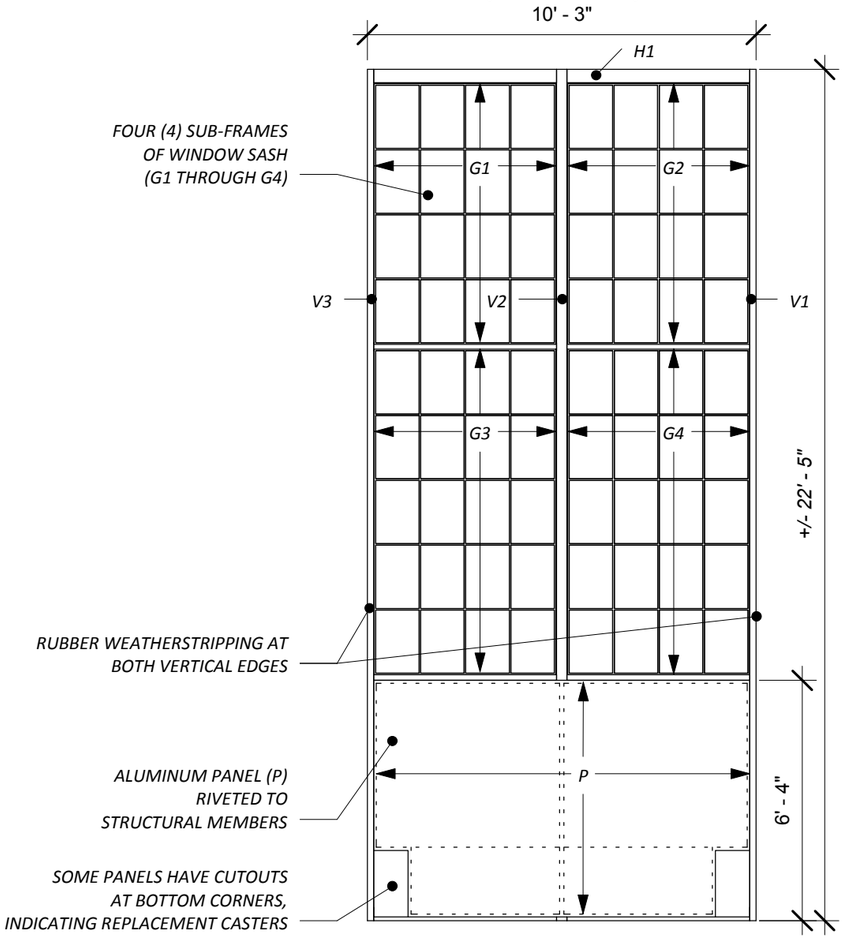
Scale: 12" = 1'-0"

Figure 1.5.1

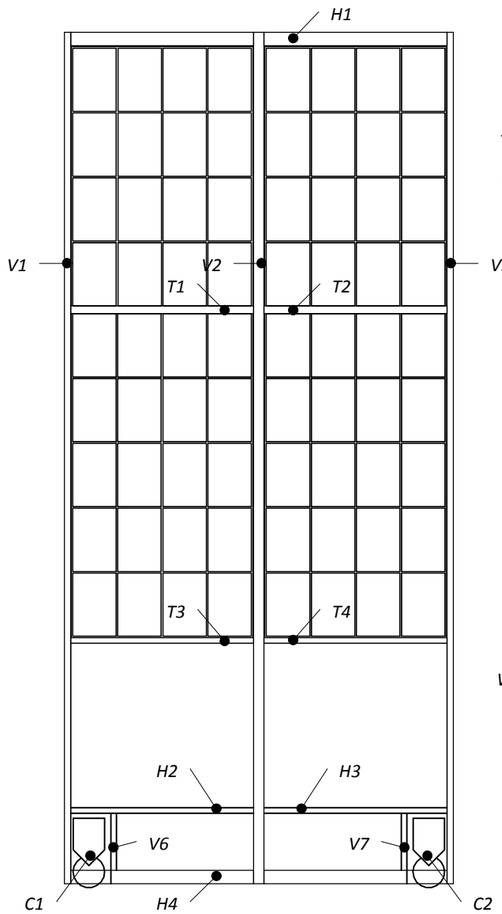
Character-Defining Feature - Steel Sash Windows

As indicated

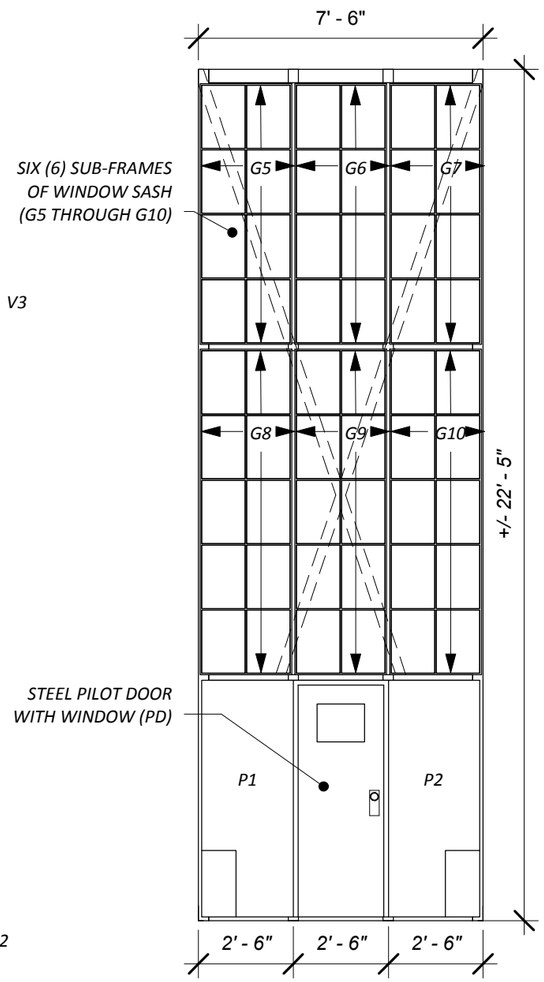
STANDARD DOOR (EXTERIOR)



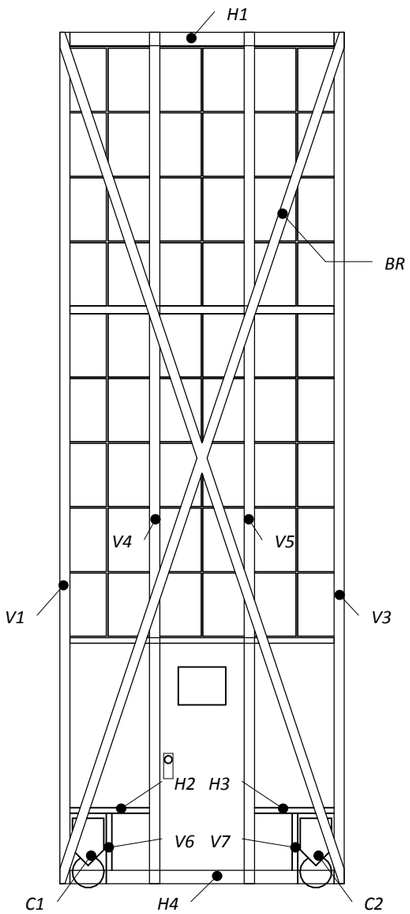
STANDARD DOOR (INTERIOR)



END DOOR (EXTERIOR)



END DOOR (INTERIOR)



LEGEND: HANGAR DOOR COMPONENTS

STRUCTURAL MEMBERS

V1	1 3/'4" X 5" ALUMINUM CHANNEL
V2	3" X 5" ALUMINUM H-SECTION
V3	1 3/4" X 5" ALUMINUM CHANNEL
V4*	1 3/4" X 5" ALUMINUM CHANNEL
V5*	1 3/4" X 5" ALUMINUM CHANNEL
H1	1 3/4" X 5" ALUMINUM CHANNEL
H2	1 3/4" X 5" ALUMINUM CHANNEL
H3	1 3/4" X 5" ALUMINUM CHANNEL
H4	1 3/4" X 5" ALUMINUM CHANNEL
BR*	STEEL CROSS-BRACING
T1-T4	2" X 2" ALUMINUM T-SECTIONS

GLAZING SUB-FRAMES (SEEN FROM EXTERIOR)

G1	TOP LEFT PANEL 4 X 4 STANDARD (2 X 4*)
G2	TOP RIGHT PANEL 4 X 4 STD, (2 X 4*)
G3	BOTTOM LEFT PANEL 4 X 5 STD, (2 X 5*)
G4	BOTTOM RIGHT PANEL 4 X 5 STD, (2 X 5*)
G5-G7*	TOP PANELS AT END DOOR (2 X 4)
G8-G10*	BOTTOM PANELS AT END DOOR (2 X 5)

OTHER MAJOR COMPONENTS

P	1/4" THICK ALUMINUM PANEL (AT STD DOORS)
P1*	PANEL TO LEFT OF PILOT DOOR
P2*	PANEL TO RIGHT OF PILOT DOOR
C1	LEFT CASTER (SEEN FROM INTERIOR)
C2	RIGHT CASTER (SEEN FROM INTERIOR)
PD*	STEEL PILOT DOOR
*	APPLIES TO END DOORS ONLY

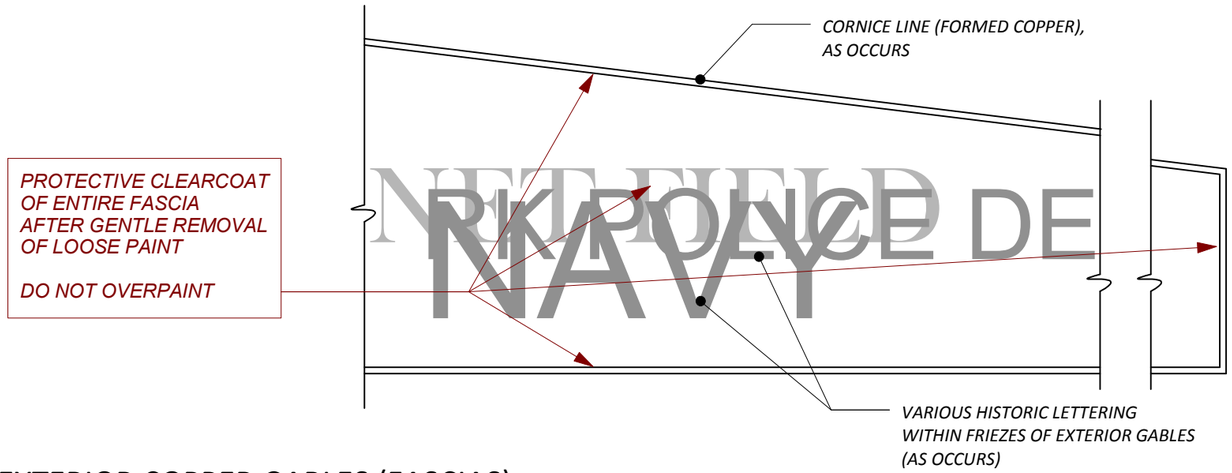
SUGGESTED LABELING OF HANGAR DOOR COMPONENTS IS PROVIDED TO AID IN DOCUMENTATION AND TRACKING DURING REHABILITATION, AND TO LABEL ELEMENTS FOR SALVAGE FROM EXISTING STOCKPILE.

H4 (BOTTOM CHANNEL) AND V1/V3 (SIDE CHANNELS) ARE THE MOST LIKELY ELEMENTS TO REQUIRE REPLACEMENT DUE TO ADVANCED CORROSION.

Figure 1.5.2

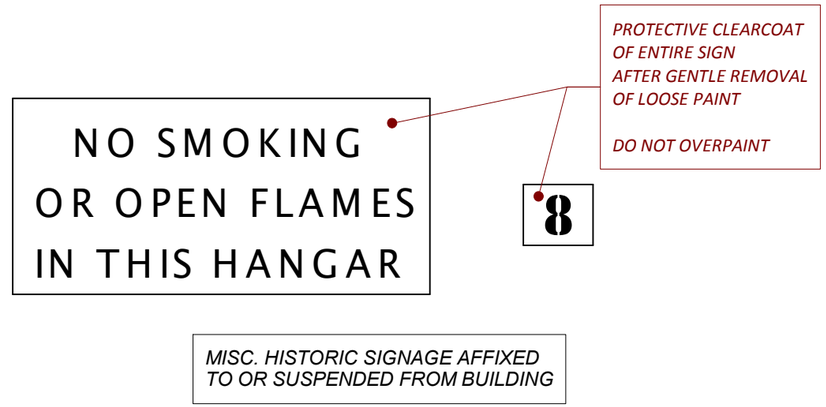
Character-Defining Feature - Hangar Doors

1/4" = 1'-0"



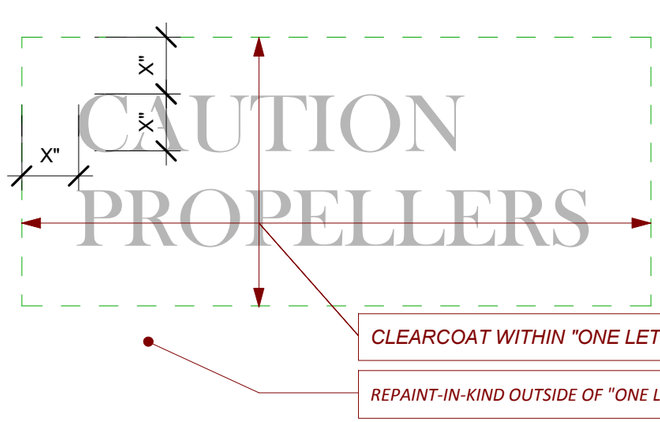
EXTERIOR COPPER GABLES (FASCIAS)

Scale: 1/4" = 1'-0"



DISCRETE SIGNAGE

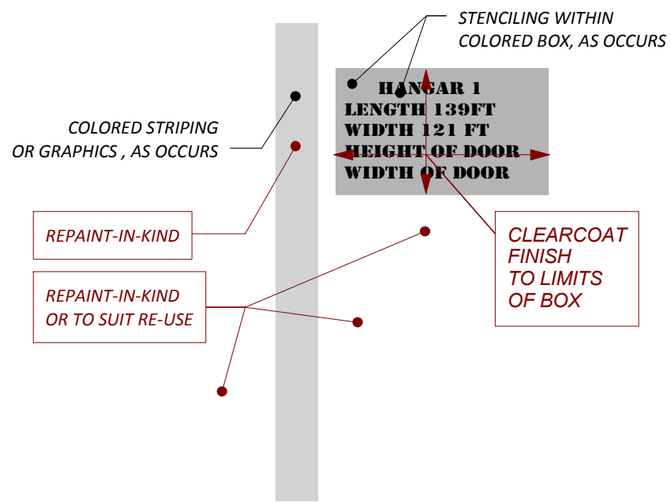
Scale: 1/4" = 1'-0"



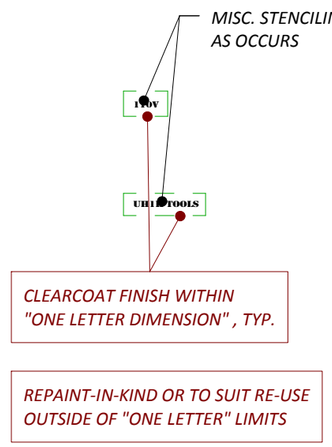
E.G., EXTERIOR OF HANGAR 2 DOORS, SOUTH SIDE



E.G., INTERIOR OF HANGAR DOORS, MANY LOCATIONS



E.G., INTERIOR BRICK WALLS IN HANGARS



MANY LOCATIONS

OTHER STENCILED/PAINTED TEXT & GRAPHICS

Scale: 1/4" = 1'-0"

Figure 1.5.3

Character-Defining Feature - Graphics

1/4" = 1'-0"

1.6.1 CONDITION ASSESSMENT: CIVIL

A thorough investigation of existing utilities for Floyd Bennett Field was conducted through available record mapping and field verification. Record mappings utilized ranged from April 1943 through May 1995. For a compilation of existing utilities on site, please refer to the existing site utility compilation map (Figure 1.6.1.1).

Water, sanitary sewer, and storm utilities that presently serve the site run parallel with an existing utility tunnel located under the WPA Infill between Hangers 1 and 2. The utility tunnel, built along with the original hangers in 1930, is approximately 4 feet wide. This width was estimated by onsite field measurements dated January 13, 2012, along with map records. The vault was constructed with the purpose of housing steam supply and return piping. The tunnel runs north-south and under the WPA Infill. The steam lines are no longer in use, but the water, sewer, and storm utilities within the corridor provide service to other buildings on Floyd Bennett Field.

The site is serviced by municipal sanitary and water. Record mapping denotes an existing 18-inch sanitary sewer collection main running just west of the utility tunnel and flowing via gravity north to south. The existing water main located to the west of the sanitary sewer main is shown to be 8 inches. Existing telecommunication lines are shown running along the utility tunnel to the east. The National Park Service has stated that they do not know if existing telecommunication lines are active. Additional exploration will be necessary to determine the status of these lines.

Water System

Record mapping depicts water supply to the site and surrounding areas within the Floyd Bennett Field property via a tap off of an existing 12-inch water main located within the median along Flatbush Avenue. The existing 12-inch tap from Flatbush Avenue enters an existing meter vault onsite just south of Building 50 and then continues as a 12-inch distribution water main to several buildings on the Floyd Bennett Field property. Record maps indicate that the existing 12-inch water main branches off the 12-inch distribution water main and heads north going into/under the Sewage Pump House (Building 30). Directly opposite, an 8-inch water main exits the Sewage Pump House heading northwest and parallels the utility tunnel through the infill buildings between Hangars 1 and 2 and Hangars 3 and 4. Record maps indicate an existing 12-inch water main between the Electrical Building and the Sewage Pump House, as well as an existing water main, with size unknown, between Building 26 and the Sewage Pump House; however, in both cases, ground-penetrating radar was unable to locate the water mains.

The domestic and fire suppression water main notation are interchanged throughout record mapping. It is believed that a separate fire loop does not exist and that domestic and fire lines are not separated. It is to be assumed that all water mains and hydrants are live and that all water pump, booster, and lift stations are dead.

The water supply system for Floyd Bennett Field was installed as galvanized steel pipe in 1930. The NPS has noted that existing water service onsite is not in good condition; however, survey and additional subsurface field investigation would be required to verify the condition and diameter of the water system.

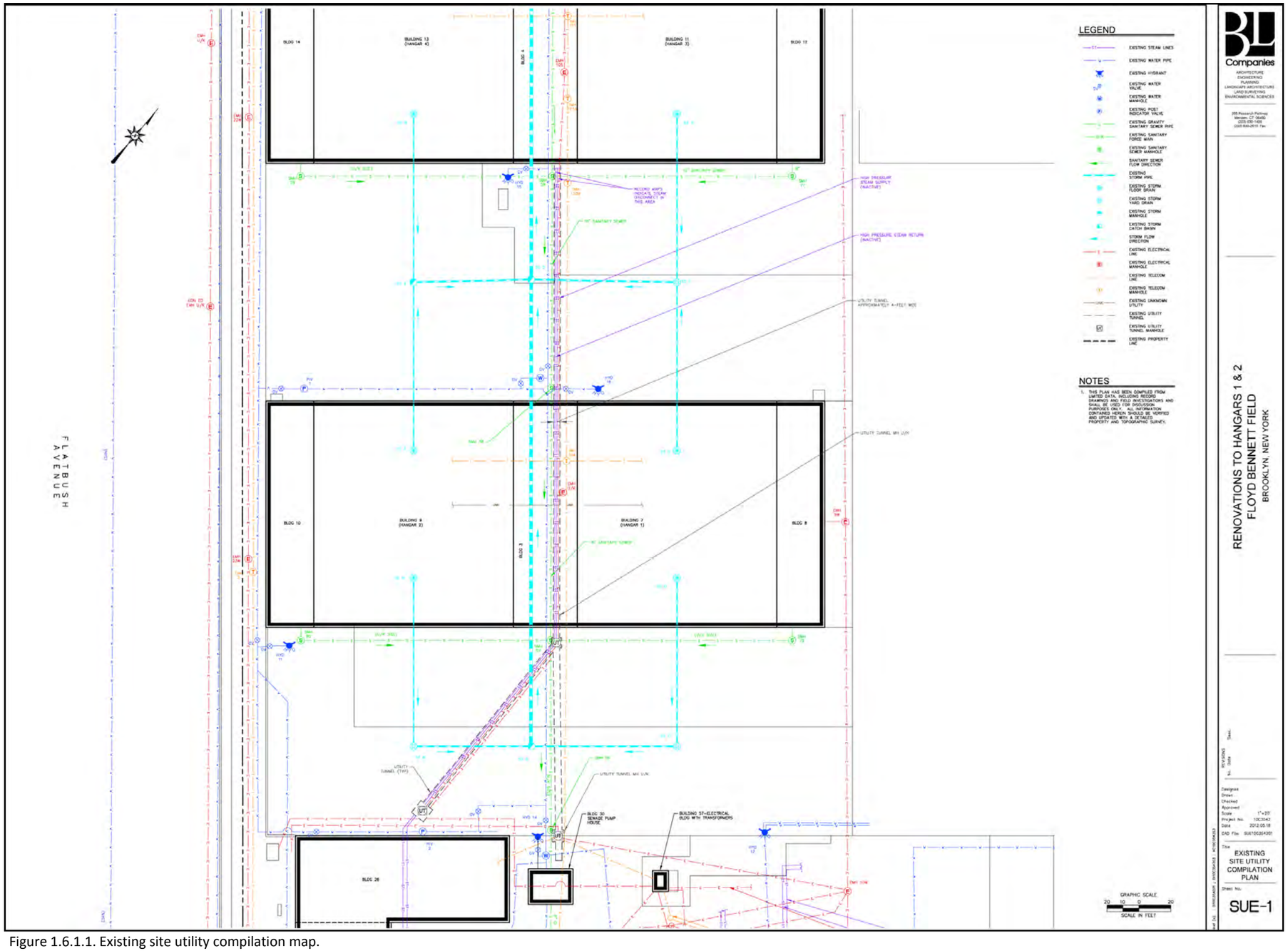


Figure 1.6.1.1. Existing site utility compilation map.

Hydrants and Post Indicator Valves (PIV) Evaluation

Record mapping and field research have confirmed the existence of five hydrants and two post indicator valves (PIVs) within the vicinity of Hangars 1 and 2 (Photographs 1.6.1.1–1.6.1.7). In general, the hydrants appear to be in fair condition; however, NPS staff noted that flows from these hydrants may be reduced due to buildup along the walls of the water main feeding the hydrants.



Photograph 1.6.1.1. Hydrant 11, located at the south corner of Hangar 2.



Photograph 1.6.1.2. Hydrant 12, located approximately 130 linear feet from the southeast corner of Hangar 1.



Photograph 1.6.1.3. Hydrant 14, located 20 linear feet northwest of Building 30 (Sewage Pump House) and approximately 130 linear feet southeast of Building 3.



Photograph 1.6.1.4. Hydrant 16, located just east of the utility tunnel, adjacent to Hangar 1.



Photograph 1.6.1.5. Post Indicator Valve 1, dated 1936, located 8 feet from the northeast corner of Building 10.



Photograph 1.6.1.6. Post Indicator Valve 2, located north of Building 26, just near the center of the structure.

Hydrants 11 and 16 and PIV 1 (as seen in Figure 1.6.1.1) are located immediately adjacent to Hangars 1 and 2 and appear to be fed from a 12-inch water main running parallel with Flatbush Avenue between the street and buildings. This 12-inch water main branches off south of Building 50, bringing water into Floyd Bennett Field. The branch provides service to several buildings south of Hangars 1 and 2 and continues north, paralleling the utility tunnel and running under the infill building between Hangars 1 and 2 and Hangars 3 and 4.

A study of available record drawings indicates that fire and domestic water may have been separated at one time, but have since been combined, as noted above.

Figure 1.6.1.1 shows hydrants and PIVs located within the vicinity of Hangars 1 and 2.

Wastewater Treatment

Record mapping indicates an existing 18-inch sanitary sewer main flowing via gravity northwest to southeast onsite. This existing system parallels the utility tunnels through the infill buildings (Buildings 3 and 4) and collects sewage from buildings to the north and west. The 18-inch sewer also serves as a collection line for sanitary discharge pipe from Hangers 1 through 4. Upon field investigation, the existing sanitary sewer structures were filled with water and, therefore, directional upstream and downstream pipe segments were not able to be verified. As a result, survey verification and additional subsurface field investigation would be required to determine the pipe diameter, invert elevation, and condition.

Following its departure from Hanger 1, the existing 18-inch sanitary sewer continues to flow southeast via gravity south approximately 160 feet until it enters, per record, the sanitary sewer pump house. Record mapping showed the effluent being pumped through a sanitary force main directed east to outfall off the eastern shoreline; however, that is not the present-day case. Today, effluent is pumped through a sanitary force main and directed east; however, prior to its original outfall off the eastern shore, the sanitary sewer was rerouted south, where it discharges to a city manhole in Jamaica Bay. It is here where the effluent enters the city system and is subsequently treated.

Motor Vehicle Access and Pedestrian Access

Floyd Bennett Field can be accessed either by car, mass transit, or on foot. Flatbush Avenue is a four-lane median divided roadway with sidewalks in each direction that provides vehicular and pedestrian access to Floyd Bennett Field. Access to Hangers 1 and 2 is currently prohibited to the public and is fenced for safety purposes.

Per the NYC Department of Transportation, Flatbush Avenue was last resurfaced in 2008 and is considered at this time a protection roadway. The roadway is in good condition and will not be evaluated for another resurfacing until three years from now, or if an unexpected maintenance issue should arise.

Floyd Bennet Field has ample parking space. Parking improvements, north of Hangers 1 and 2, were included in the recent design of the Ryan Visitor Center, as well as the Aviator Sports and Recreation Complex. The area surrounding Hangers 1 and 2 to the south, north, and east consist of asphalt paving block with overgrown areas.

1.6.2 CONDITION ASSESSMENT: SITE

The site is located within the Jamaica Bay Unit portion of the Gateway National Recreation Area, Floyd Bennett Field, on Flatbush Avenue in Brooklyn, New York. The site is centered on aviation Hangars 1 and 2 located on the southwest portion of Floyd Bennett Field, immediately adjacent to Flatbush Avenue, and the area of approximately 100 feet surrounding the 52,500-square-foot building within Floyd Bennett Field (Figures 1.6.2.1 and 1.6.2.2). Hangers 1 and 2 are directly surrounded by unoccupied buildings to the south, Flatbush Avenue to the west, Hangars 3 and 4 to the north, and a parking lot consisting of asphalt paving block with overgrown areas and former runways to the east. The site was zoned in the M-1 Manufacturing District prior to becoming part of the Gateway National Recreational Area in 1972. Hangers 1 and 2 are currently unoccupied.

Physical Description



Photograph 1.6.2.1. General view of hangar site, looking west. Aside from light traffic on Flatbush Avenue, the site is typically quiet. Hangars 1 and 2 are at the left, Hangars 3 and 4 at right.

The site is notable for its expansive openness, with no visual or physical barriers or construction, excepting hydrants and post indicator valve (PIV) stanchions (Photograph 1.6.2.1). The finish surface is rectangular asphalt pavers, mostly covered with patching and overlayment by subsequent asphalt (Photograph 1.6.2.2). Most of the extant pavers appear original to the site. Immediately in front of the hangar door façades, the 5-x-12-inch pavers are oriented east-west, with the long direction parallel to the hangar doors. This field of pavers is framed by a pair of diagonal lines, each consisting of two rows of pavers, which converge on a drain cover located approximately 50 feet distant. Outside of these two bounding rows of pavers, and extending in front of the WPA Infill, the pavers are oriented north-south.

Located within the network of pavers are several manholes, drain grates, at-grade concrete curbing, and access covers convenient to utility trenches and mechanical piping below grade (see Section 1.6.1). The circular cast-iron covers are customized to Floyd Bennett Field and date to the period of significance. There are several different designs. In the first and oldest type, “FLOYD BENNETT AIRPORT” is circled over a central field of squared drain holes, with “DEPARTMENT OF DOCKS, N.Y.C.” circling the bottom. There is only one extant example of this oldest type, located south of Hangar 1 at the apex of the south façade’s diagonal bounding rows of pavers. A very similar type of drain cover shows “FLOYD BENNETT FIELD” over a central field of more rectangular drain holes combined with four circular drain holes, with “DEPARTMENT OF DOCKS” circling the bottom in the same font as the earlier type.



Photograph 1.6.2.2. Detail view of asphalt pavers.

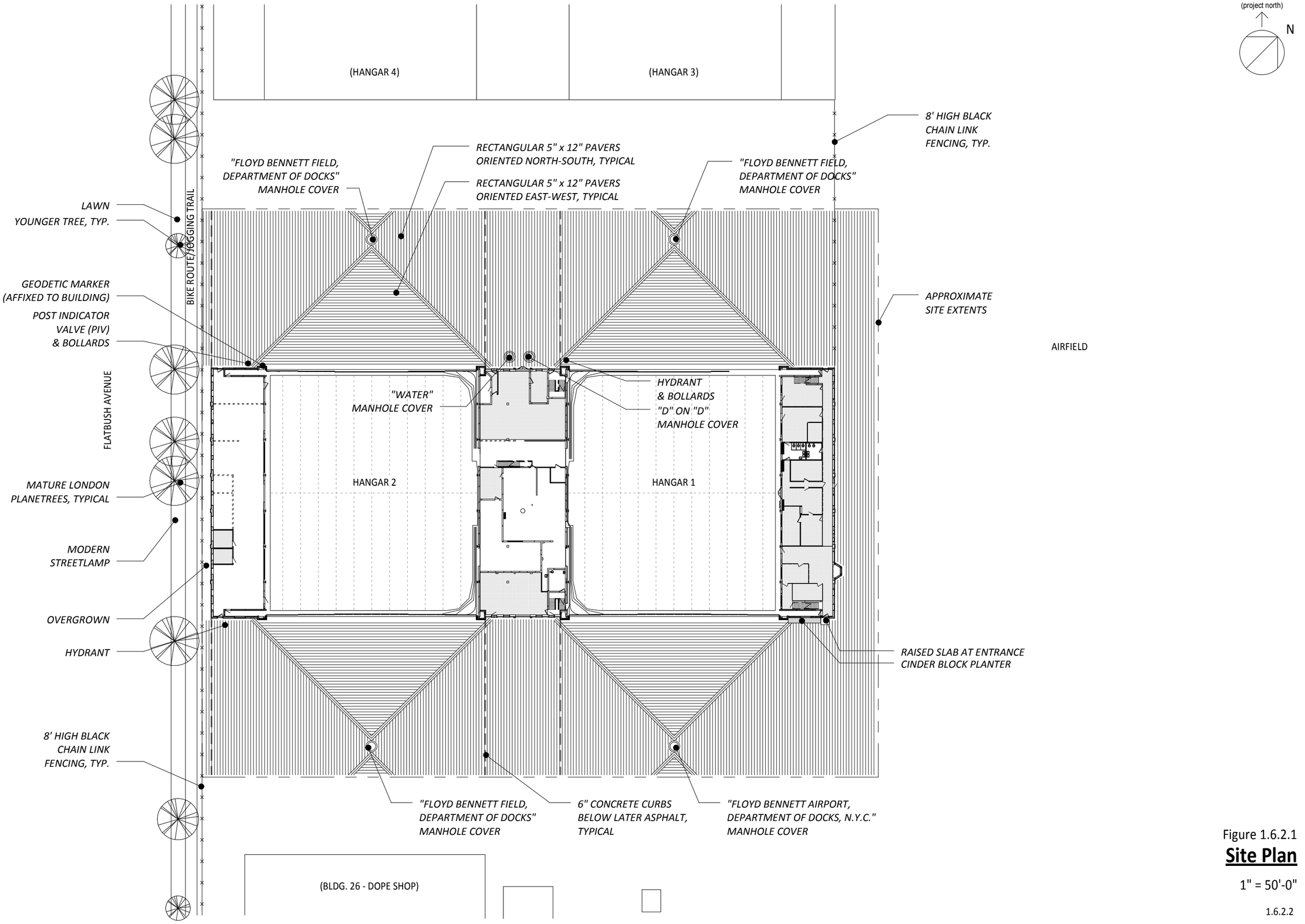


Figure 1.6.2.1

Site Plan

1" = 50'-0"



Figure 1.6.2.2. Location map.

Note that the second type replaces "AIRPORT" with "FIELD" and deletes the "N.Y.C." There are three examples of this second type, at the apexes of the bounding rows of pavers in front of the other three elevations.



Photograph 1.6.2.3. Detail view of hydrant at southwest corner, adjacent to the south façade of Hangar 2 Lean-to.

Another type of manhole, for access purposes, has two overlaid "D"s in the center (i.e., Department of Docks), circled with "FLOYD BENNETT" at the top and "FIELD" at the bottom. A fourth type indicates "WATER" across a central horizontal panel, with a radiating geometric design. A fifth type has a central circled cross surrounded by a field of raised squares with no notation.

There are three instances of historic period cast-iron site fire suppression infrastructure. There is one PIV, dated 1935. This unit and the hydrants are found within 6 feet of the north and south façades, and are protected by steel bollards from the period of significance and later. On the north side, there is a hydrant in front of the WPA Infill, near its intersection with Hangar 1. There is additionally a PIV at the northwest corner in front of Hangar 2 Lean-to. At the south side, there is one hydrant at the southwest corner in front of Hangar 2 Lean-to, unprotected by bollards. This hydrant has a manufacturer's insignia cast into it, which is currently illegible due to the multiple paint layers (Photograph 1.6.2.3).

At Hangar 2's northwest corner, a bronze, 3-inch-diameter U.S. Coast and Geodetic Survey monument is vertically and permanently placed within the concrete base of the west brick pilaster framing the hangar doors. Several layers of circular lettering, starting from the outside, read "U.S. COAST AND GEODETIC SURVEY BENCH MARK, ELEV FEET ABOVE MEAN SEA LEVEL" and "$250 FINE OR IMPRISONMENT FOR DISTURBING THIS MARK." A horizontal line is indicated across the center. Above this line is the identifying number O 353 and below it is a date of 1952. The elevation is either illegible or was never inscribed, as there is a blank space between "ELEV" and "FEET."

No extant site lighting was observed. According to NPS personnel interviewed in April 2012, the two formed concrete streetlamps found stored in Hangar 2 at the beginning of HSR documentation were original fixtures from the area. Based on historic photos, it seems likely that these would have been arrayed along Flatbush Avenue. There were no significant vertical elements in the paved area surrounding the hangars. NPS staff reportedly removed these streetlamps from temporary storage in Hangar 1 in late 2011.

An irregular row of London Planetrees (*Platanus x acerifolia*) runs down the east side of Flatbush Avenue directly adjacent to the west end of the hangar complex. Based on historic photographs from the earliest days of the facility, the surviving mature specimens (>18 inches caliber) appear to date to the original 1930s construction campaign and should be considered as elements from the period of significance.

A small, cinder-block-bordered planting bed exists at the southeast corner of the complex directly in front of Hangar 1 Lean-to's southern façade. Based on the haphazard nature of construction, it was



Photograph 1.6.2.4. View west of the hangars from the large community garden located due east.



Photograph 1.6.2.5. View to the southwest of the "dope shop" and other utility buildings south of the hangars, also built during the period of significance.

likely constructed by building tenants subsequent to the period of significance; this has not been confirmed. The planter appears to harbor a mix of undetermined native and legacy plantings.

Experientially, the site boasts wide views of the airfield area (and community garden) to the east (Photograph 1.6.2.4), the significant-period "dope shop" facility and modern toilet facility to the south (Photograph 1.6.2.5), Flatbush Avenue to the west, and Hangars 3 and 4 across the tarmac to the north. During the period of significance, the site was usually occupied by anywhere from one to several dozen aircraft and maintenance vehicles, based on period photographs. Aural conditions would have been moderate to noisy, with aircraft engines powering up and down, propellers whirring, and conversations between maintenance workers at all hours of the day. It is likely that noise from the various machine and repair shops within the hangars would have also been discernible from the surrounding site.

Within the context of the site elements, the manholes (due to their customized nature), the rectangular paving blocks (and their corresponding layout), the fire suppression equipment (as they are dated 1935), and the mature trees along Flatbush Avenue are significant contributing elements and are considered character-defining features.

Existing Conditions

The manholes are intact and remain serviceable, but access covers and grilles for some of the underground utility encasements are dislodged or missing in some cases. Some of the lettering on the manholes has been worn down by traffic, but is still clearly legible (Photograph 1.6.2.6). It is recommended that the NPS take steps to fully secure these manhole covers, given their value and the relative ease with which they can be removed from their unprotected locations.

The fire suppression equipment (hydrants and PIVs) have received many coats of paint, but appear to be in-service.



Photograph 1.6.2.6. Detail view of significant-period manhole located south of Hangar 1.

The existing mature trees appear to be relatively healthy, but a trained arborist should inspect them.

Currently, the site is windblown and quiet, with light traffic noise from Flatbush Avenue and occasional flyovers from JFK-bound aircraft.

Site Drainage Evaluation

According to the USGS topographic map of Coney Island, New York-New Jersey, 7.5-minute United States Geological Survey (USGS) Quadrangle, the site is relatively flat with a minor westerly slope. The approximate average elevation is 15 feet above mean sea level with an approximate groundwater elevation 6 to 8 feet below ground surface. Based on surrounding topography, groundwater in the site is expected to flow west and hydraulically up gradient sites are presumed to be east of the site. Floyd Bennett Field is located on a peninsula in Jamaica Bay; therefore, the site is hydraulically disconnected from any sites located east, south, or west of Floyd Bennett Field (Figure 1.6.2.3).

The site is depicted in an otherwise protected area (OPA) flood area on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for New York, New York (map number 3604970359F). Based on the FEMA FIRM Map, the 100-year base flood elevation is 10.0 feet. Floyd Bennett Field is depicted with a sea wall protecting the western, southern, and eastern boundaries of the peninsula. The limit of the floodplain line is outside of the site, south of Flatbush Avenue (Figure 1.6.2.4).

Storm Sewer Evaluation

The roofs of Hangers 1 and 2 were designed to pitch runoff toward the northeast and southwest. The rainwater from the roofs is collected via exterior storm leaders and conveyed to the underground site storm piping. The existing roof leaders (three on each side of the roof) were originally 5-inch-diameter cast iron; however, these were replaced with galvanized steel leaders of the same diameter during the 1980 repairs/renovations. The roof leaders of Hanger 1 exhibit varying degrees of damage and deterioration, while the roof leaders of Hanger 2 remain in the same condition; however, these are no longer utilized, as the gutter system is no longer extant.

The storm runoff from the site is collected from a network of existing galvanized roof leaders, parking lot grate inlets, and area drains located within the two hangers. The collected storm runoff is then conveyed through an existing 24-inch storm pipe that runs parallel to the existing utility tunnel located underneath Hangers 1 and 2. The existing storm drain network at Hangers 1 and 2 flows via gravity northwest and connects downstream to a larger storm pipe, which outlets into Deep Creek/Dead Horse Bay.

The outfall locations and downstream connections of the existing roof leaders along the northeast and southwest exterior walls have remained a challenge due to the deterioration of the pipes, overgrowth, and water backup. Survey will be necessary to ensure pipe connectivity.



Figure 1.6.2.3. USGS topographic map of Coney Island, New York-New Jersey.

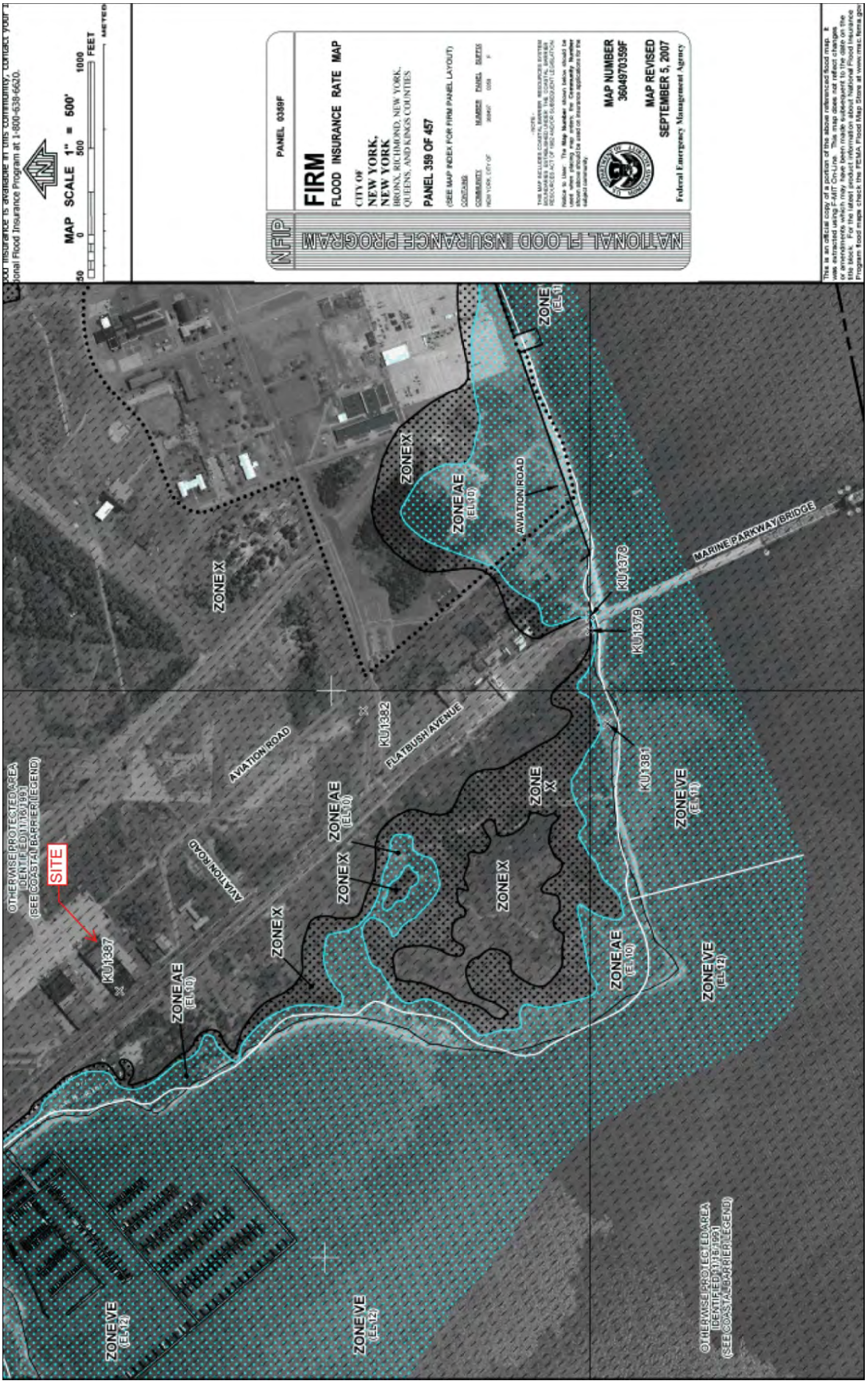


Figure 1.6.2.4. FEMA FIRM map 3604970359F.

1.6.3 CONDITION ASSESSMENT: ARCHITECTURE

The site consists of Hangar 1 and Hangar 1 Lean-to, Hangar 2 and Hangar 2 Lean-to, and the two-level WPA Infill building constructed in 1937 in the alley between Hangars 1 and 2.

Exterior Envelope

Roof and Flashing

The exterior roofing elements and flashing of Hangars 1 and 2 are in extremely poor condition, as evidenced by the heavy water infiltration in the interior spaces of the building. Spot repairs to the built-up asphalt roof over Hangar 1 in 1980 are over 30 years old and offer minimal protection. The wood planking appears to be in fair condition with areas of damage caused by failure of the built-up roof above. The built-up asphalt roof protecting Hangar 1 Lean-to warrants replacement. The surface has large areas of loss and erosion, and much of the flashing is displaced or missing. The flashing that remains is highly patinated and in moderate-to-poor condition.

Approximately 95% of the tongue-and-groove roof planking, insulation, and tar and gravel surfacing on Hangar 2 was either missing at the beginning of the project or was removed due to safety concerns prompted by the deteriorated condition. The system was extensively photodocumented prior to removal, and small areas that remained intact were left in place for future reference. The steel truss system that remains in place is in far better condition than the roof it supported. Paint loss and consequent rusting of the metal is moderate (Photograph C.1.1, see Appendix C.1). The roof of Hangar 2 Lean-to has failed, allowing heavy water staining to permeate the exposed underside of the wood roof decking that remains intact over the structure (Photograph C.1.2).

The built-up asphalt roofing of the WPA Infill shelters the northern and southern sections of the building. Large areas of loss to this material, and open seams throughout the surface, have left the pine planking exposed and permit direct access for rainwater. The central section of the infill is capped with a monitor structure (Room 3-205). The sides of this structure are faced with asphalt paper and insulation over framing. The roof of the monitor structure is built-up asphalt roofing and has failed, particularly at the interface with the adjacent hangars (Photograph C.1.3). The monitor structure is unique to Hangars 1 and 2 in Hangar Row and is described at length in Section 1.4.

The failure of the roofing system has severely compromised the parapet walls around the perimeter of the roof. Sheets of original copper flashing are missing and the exposed wooden planking beneath is deteriorating as a result. Cast-stone coping is displaced, cracked, spalled, or no longer extant. Brick and cast-stone mortar joints have failed or are failing (Photograph C.1.4). This combination of conditions within the roofing system allows large volumes of water to enter the building, both accelerating and perpetuating the cycle of failure and loss. At the building line between the hangars and the WPA Infill, building material and debris have dropped into the building.

Copper gutters and scuppers, and wrought-iron drainpipes and leaders, are missing or detached throughout the building. The exposed or adjacent masonry is in an advanced state of deterioration as a result. Copper copings are corroded, and flashing is detached from the substrate. Sealant loss, open seams, and missing hardware negate any protection the flashing was intended to offer.

The low-slope gable ends of the hangars are sheathed with 16-gauge crimped copper that has been painted in several campaigns. Large areas of paint loss and paint failure are evident (Photograph C.1.5), but the metal itself is in fair condition. No sheets of copper are missing from the gable ends. Torn or damaged metal is visible at the interface of copper and masonry elements to a minor degree. Some nails have popped, leaving small points of minor corrosion. The monitor structure relies upon the gutter and flashing system for support, and has greatly diminished the stability of these elements. The gutter and flashing on the east side of the WPA Infill has collapsed. Water freely enters at this failure site, contributing to failure of the floor system, as well. Ad hoc construction methods such as this are found throughout the space and increase the instability of the monitor structure.

Foundation

The building's exposed concrete foundation appears to be in good condition, as is the concrete at the base of the pilasters. Typical conditions include moderate spalling, surface loss, cracks, efflorescence at cracks, and staining. The two central pilasters of the north and south façades, which define the corners of the infill space, are more fine-grained and of a darker color than the remaining columns. With the exception of some efflorescence at surface cracks, these, too, are in good condition.

Walls

The walls of the exterior of the hangar complex are made of brick and cast stone. A thorough assessment of the structural stability of the building exterior is included in the structural description and condition section of this report.



Photograph 1.6.3.1. WPA Infill, west pilaster, south façade. Vertical cracking in the pilaster spans mortar joints, brick units, and cast stone.

The variegated brick of the exterior masonry walls is in good condition and mortar joints that have not been affected by structural loss are sound; however, the entire exterior system of brick and mortar is failing due to steel corrosion and consequent deterioration mechanisms. Water entry at the tops of masonry walls, and throughout the envelope, has allowed corrosion to attack steel framing, resulting in failure of mortar joints, cracking, and loss of masonry units. Large vertical cracks travel the pilasters (Photograph 1.6.3.1). A large section of brick has detached and fallen at the northeast corner of the east elevation (Photograph C.1.6). The parapet wall of the WPA Infill, which forms the pediment, is leaning inward, likely due to compromised mortar and subsequent freeze/thaw cycles acting inconsistently on either side of the wall.

Cast-stone trim and coping punctuate the exterior envelope of the hangar complex. Water entry at the parapet and structural displacement of the brick has also resulted in loss and spalling. Runoff from ferrous and copper elements has discolored the surface of the stone.

Windows and Window Openings

Corrosion and distortion of the steel sash within the window openings has caused horizontal cracking of the mortar and displacement of the brick at most of the window lintels. Corrosion has also caused the cast-stone sills to crack and spall (Photograph 1.6.3.2). In instances where the window is in close proximity to a cast-stone parapet, movement cracks begin at the cracked lintel and travel diagonally through the mortar, resulting in a network of cracks that threaten the stability of the wall. Movement cracking is also evident from the haunch and curve of the arched openings (Photograph 1.6.3.3).



Photograph 1.6.3.2. Hangar 1, south window, east elevation. Two vertical cracks in the center of the cast-stone sill are due to movement caused by corroded steel within the masonry framing.



Photograph 1.6.3.3. Hangar 1 Lean-to, south façade. Movement cracking is evident from the haunch and curve of the arched openings.

The few exterior steel window frames and sash that remain exposed on the exterior of the building are corroded. There is no protective coating on the steel windows. Glass is missing and glazing putty is brittle or lost. Windows on the north and south façades are not sealed with plywood, nor are the oxeye windows of the WPA Infill. The exterior clerestory windows of Hangars 1's east elevation and Hangar 2's west elevation are not sealed. The remaining exterior window openings are sealed with plywood. Condition of the windows is detailed below in the discussion of the interior spaces of Hangar 1, Hangar 1 Lean-to, Hangar 2, Hangar 2 Lean-to, and the WPA Infill.

Doors and Door Openings

Doors, including hangar and pilot doors, are discussed below in their respective sections.

Building Interior: Hangar 1

Walls and Ceilings

The east and west elevations of Hangar 1 are brick, with large steel sash throughout. The brick and mortar walls all hold at least one coat of faded, flaking, or delaminated paint. The hangars have undergone several renovation campaigns in which windows were removed or relocated. Areas of loss were infilled with brick or cement block and, while clearly discernible from the original construction, the openings are in no worse condition than the surrounding walls.

Failure of the roofing system at the junction of Hangar 1 and the WPA Infill has caused mortar loss, brick deterioration, biological growth, and heavy staining inside the building (Photograph C.1.7). An area of severe mortar loss and brick deterioration is located on the northern edge of the west wall, caused by a large quantity of road salt piled here for an extended period of time.

The north and south façades of the hangar consist of full-height hangar doors. Above the doors is a low slope gable composed of solid panels of 16-gauge crimped copper sheeting supported by wood planking. Visual inspection indicates that the wooden planking is in fair condition. The sheet copper is not corroded, although surface paint is flaking. Some minor tears and holes in the copper are visible on the surface.

The hangar ceiling consists of metal trusses supporting the roof decking, sheathing, and built-up roofing systems. The interior steel framing is intact and in stable condition with few areas of advanced corrosion. Visual inspection of the interior wood decking reveals large areas of deterioration due to ongoing water infiltration, a process accelerated by the poor condition of the exterior roofing material. A repair is evident along the full length of the west edge of the hangar, as well as at several points on the east edge, where the interior roof decking has been replaced. Loss and detachment of flashing and gutters throughout the exterior of the structure contributes to and has exacerbated this condition.

Windows and Window Openings

A detailed description of windows and window openings, including configuration and measurements, is presented in Section 1.4 of the HSR.

There are two windows in the north wall of the hangar door pocket, and two windows on the south wall of the south door pocket. The steel sash windows are an MWI Type 63 mounted over a Type 64, both with 12-x-18-inch panes and no pivoting sash. The metal is corroded but intact. Windows within Hangar 1 are located on the east and west walls of the space.

The windows on the first level of the east wall are in generally poor condition and the glass is badly stained with salts and rust. The metal frame is corroded and the hardware functions minimally, if at all. Located at the height of Hangar 1 Lean-to's second level are steel multi-pane fixed windows set into the masonry of the building's walls. The condition of these windows is corroded and uniformly poor.



Photograph 1.6.3.4. Hangar 1, east wall. Water infiltration and paint loss has caused moderate to heavy rusting of the steel sash throughout the hangar.

Finally, there are continuous clerestory windows, the header of which is equal with the top of the hangar doors. The primary condition of note on the steel sash is corrosion. Water infiltration and paint loss has allowed for moderate to heavy rusting of the steel sash throughout the hangar (Photograph 1.6.3.4). This condition, in turn, has resulted in diminished operability of the windows at best or complete failure of the system at worst. Original window panes were wireglass, much of which has broken over time and been replaced with similar wired material or with wireless glass. The glass is cracked, stained, or etched in most of the windows and approximately 15% of the windows are no longer extant.

The windows are set into the masonry walls, which are compromised by their proximity to the corroding metal of the sash, but remain intact overall. Staining, spalls, and crumbling mortar are evident at the window openings.

Doors and Door Openings

The standard height doors, doorframes, and trim within the hangar are steel over wood. Original drawings specify kalamein doors for construction.

There is a single flat-arch door set in a metal frame in the east wall of both the north and south hangar door pockets. The north pocket holds a kalamein door with a single recessed panel. The door is in poor condition with severe corrosion at the lower rail due to moisture. The painted finish is flaking and peeling. The hardware is missing from the door, although the outline of the doorplate is visible and holds holes intended for the doorknob and locks. Two hinges hold the door in its unadorned metal frame.

The kalamein door in the south hangar pocket has two recessed vertical panels. The door itself is in moderate to poor condition, with the most severe area of loss at the strikeplate. Much of the painted finish has peeled and flaked, and there are several indentations on the center rail. The ghost of the doorplate is visible, although no hardware is present. The door is held to the unadorned metal frame with three barrel hinges. The door originally led into the south end of the lean-to's east corridor, but the opening has been covered with gypsum board.

There are three human-scale door openings on the interior east wall of Hangar 1. The south opening is trimmed with corroded metal and is set in a flat masonry arch. The barrels of the hinges are in place, but the door and all hardware are missing. There is a flat-arch masonry double-door opening in the center of the hangar's east wall (Photograph C.1.8). The corroded metal holds only one door, which consists of a single recessed panel defined by raised trim. The door is hung on three hinges and the push plate is in place on the hangar side of the door. The south doorframe set in the east hangar wall is metal. There are two hinges attached to the flat-arch masonry opening and no door in the frame.

There are three human-scale doorways and two rolldown doorways on the interior west wall of Hangar 1. The south doorway leads to the south stairwell of the WPA Infill. The flat arch opening is surrounded with a profiled metal frame, and is fitted with a kalamein door with two recessed vertical panels. The metal of the door and frame are sound, although much of the paint has peeled or faded. The number "5" is stenciled on the door in yellow paint. The door swings on two hinges, but the doorknob and locking hardware are no longer extant (Photograph 1.6.3.5).



Photograph 1.6.3.5. Hangar 1, west wall. Door leads into south stairwell of the WPA Infill.

The human-scale doorway approximately centered in the west wall of the hangar leads into Room 3-108, the Tech Supply Room. The flat-arch masonry opening holds a profiled metal surround and a four-hinged swinging door accented with raised trim to define the recessed single panel. The door is in fair condition with severe warping in the lower, unhinged corner due to corrosion. The door handle and push plate are intact.

The north doorway of the west wall leads into the north stairway. The flat-arch masonry opening is trimmed with a profiled metal frame. Barrel hinges hold the wooden stile to the jamb; however, the remainder of the door is missing.

The north rolldown doorway leads into the passageway between Hangars 1 and 2. The opening is missing its frame. The panel door, constructed of corrugated metal, and the housing into which it retracts remain at the lintel, but do not appear operable. The south rolldown doorway leads into Room 3-107 of the WPA Infill. Metal tracks on which the corrugated panel is intended to travel remain in place.

Hangar Doors and Tracks

The north and south façades of the hangar consist of 12 full-height hangar doors. At the east and west end of each hangar opening is a door composed of nine rows of six glass panes. These end doors also hold a pilot door centered under the two middle columns of glass panes. The 10 remaining hangar doors each hold nine rows of eight glass panes. Typical conditions include exfoliation and corrosion of aluminum hardware, warping and deterioration of the panels, flaking paint, and failed glazing putty. The result of these conditions is a poor seal that allows for considerable rattling of the doors during windy conditions, which has in turn led to the loss of many glass panes. Approximately 65% of the glass—including the original wireglass, the replacement wireglass, and clear glass—is broken or missing. The spring-adjusted caster wheels at the base of the doors are in fair condition. NPS staff reports that the doors are functional with some effort.

The three east hangar doors are missing from the north façade of Hangar 1, and with it a pilot door built into the hangar door. The metal tracks on which the doors are intended to travel are set into the concrete. At several points, the tracks have buckled and detached due to delamination and spall. The top guide rails are moderately rusted.

The interior face of the northwest pilot door in Hangar 1 is in fair condition with loss due to corrosion at the base. Two wooden planks bolted into the doorframe hold the door closed. The glass is missing from the single light. The doorknob remains in place. There is no northeast pilot door. The southeast pilot door is in poor condition with a large gap at the base and a jagged opening at the west corner of the light. Three hinges hold the door to the frame, but neither the doorknob nor the lock remains. The glass is broken but in place and the number “7” is stenciled on the interior surface in yellow paint. The southwest door is in similar condition. A “7” is stenciled in yellow on the surface of this door, as well.

Floor

The concrete floor of Hangar 1 is in good condition visually, although pronounced settlement of the slabs and some cracking indicate that there has been considerable structural movement over time.

Finishes and Signage

Few of the painted finishes of Hangar 1 are in good condition, although traces of several color campaigns are apparent. In addition to the numbers stenciled on the doors, signage and stenciled lettering and numbers from all eras of the hangar's history are visible, if barely, on the walls, on metal and wood signs, and on partitions in the space.

Building Interior: Hangar 1 Lean-to

Hangar 1 Lean-to is a two-level masonry structure extending the width of Hangar 1. The second level was added in 1937. The exterior of Hangar 1 Lean-to is addressed in the overall discussion of the hangar envelope. The interior space—including interior partitions, floors, and finishes—was unfinished for several years.

Walls and Ceiling

Initially, the walls separating Hangar 1 Lean-to from Hangar 1 consisted of three wythes of brick. When Hangar 1 Lean-to was converted to office space, individual rooms were created with walls of plaster over terracotta. The walls on the east elevation of Hangar 1 Lean-to, into which the steel window frames are set, are also plaster over terracotta and brick. Excessive moisture in the building has caused the plaster to flake, crack, and delaminate. The exposed browncoat is extremely friable. The plaster over brick on the north and south façades has also failed. The terracotta beneath the plaster is sound (Photograph C.1.9). Partition walls installed in later campaigns are wood and gypsum board and are in poor condition.

Ceilings in Hangar 1 Lean-to are plastered wire lathe over steel support beams. Water infiltration has led to corrosion of the lathe and detachment of the plaster. Ceilings on the first and second floors of the building are in consistently poor condition (Photograph C.1.10).

Windows and Window Openings

Water entry has heavily compromised the windows in Hangar 1 Lean-to; most have detached completely from the wood and plaster framing. Glass is missing and there is little trace of a painted finish. Glazing putty, where still intact, is brittle. Metal sash and frames are corroded and in poor condition. Wood windows and frames are deteriorated due to water entry, and painted finishes have peeled.



Photograph 1.6.3.6. The bay holds three five-pane windows.

The bay construction opposite Room 8-105 consists of metal sash set in a wood frame. Each projecting sash holds five rectangular panes, many of which are broken or missing (Photograph 1.6.3.6). The wood framing is in poor condition due to water entry and the metal sash is largely corroded. One partition panel spans the opening of the bay, and the northern window was originally a door.

On the second floor, interior windows along the west elevation of the lean-to are in moderate condition, although ongoing water infiltration is a concern. Metal sash at the top of the north and south stairs are four-over-four and are in fair condition. As described in the previous discussion of Hangar 1, the metal sash set into the plaster masonry of the second floor's west wall are arranged in a pattern of six-over-two and four-over-two panels. The sash are fixed and are in moderate condition. Corrosion of the metal sash caused by water entry has hastened the deterioration of the plaster walls.

Windows along the east elevation are exposed to the elements and are in poor condition overall. Room 8-209 includes one opening designed to hold a wooden window. Sash weights and rollers remain in the jamb, but the sash is no longer present. The metal window in this room is typical, in design and condition, of the metal windows along this elevation. It consists of an outer frame of fixed panels surrounding a pivoting panel in which two rows of four glass panes are contained. There are a total of 18 lights in the frame. The condition of the metal is extremely poor. The stiles are largely deteriorated due to corrosion.



Photograph 1.6.3.7. Hangar 1 Lean-to, Room 8-209, east wall. Sashweights remain in the wooden frame of a double-hung window opening.

The sash is missing from Room 8-206. Room 8-205 holds two original metal sash in a masonry frame. In Room 8-204, the window is missing from the north opening. The south opening in this room holds only remnants of the original sash. Little remains due to advance corrosion. The sash in Room 8-203 are no longer in their openings.

In Room 8-202, two windows and aluminum frames hold three horizontal projecting sash. In Room 8-201, there are two window openings. The wooden frames of the one-over-one, double-hung windows are missing, as are the sash. The sashweights, chains, and pulleys remain in the wooden frame (Photograph 1.6.3.7).

Doors and Door Openings

Doors in the wall between Hangar 1 and Hangar 1 Lean-to are discussed above.

The north façade door leading into Hangar 1 Lean-to is in poor condition. It has detached from its hinges and from its wooden frame due to high winds on the field. The wood core is exposed, and the metal sheet with which it was likely surfaced is no longer extant. The doorknob and locking hardware remain in place. The doorway in the south façade of Hangar 1 Lean-to is capped with an arch intended to accommodate a fanlight. The door and light are missing. Paint is peeling from both the outer metal frame and the wooden trim pieces used to trim out the door.

On the first floor of Hangar 1 Lean-to, there are three doors that may date to the earliest lean-to renovation. The first is a metal, single panel, two-hinged door with no other hardware. Two metal hinges hold it to the metal frame. It is located at the end of Room 8-102 and closes off the space used as a closet under the south stairwell. Two early wooden doors lead into Room 8-111. The south door is designed with one glass panel over two wooden panels and retains its hardware. It is attached in the frame with two hinges. The north door into the space is no longer extant.

The remaining doors on the first floor of Hangar 1 Lean-to are located within partition walls to connect the warren of offices installed during one of the post-war renovations. The doors that remain are three-panel, some with an opening that once held a square window and some with a makeshift transom light above. Paint is peeling from the doors and the panels are split or warped.

The second-floor corridor of Hangar 1 Lean-to is defined not only by the windows along the west wall, but by the doors set in the east wall of the space. These openings are topped with three-light transoms, but the doors are largely missing.

At the north end of the corridor, a flat-arch masonry door opening holds a profiled kalamein door that is detailed with a single recessed panel. Most of the paint is missing from the door, but both the doorknob and the thumbturn are intact. A rusted metal push bar is bolted to the door. The door is held to the rusted frame with three hinges.

At the south end of the corridor, a flat-arch masonry opening holds a corroded metal frame. The door is missing. The flat-arch opening leading to Room 8-209 holds a wooden frame in which a door with a single vertical glass pane and two horizontal wood panels is set. The door leading to Room 8-207 is not attached to the wooden frame, but leans against the wall in the shower room. The wooden door is composed of two vertical recessed panels. Several layers of paint are visible due to severe peeling.

The opening to the parachute tower consists of a metal frame and kalamein door. The single recessed panel door leans against the wall of the corridor. It is one of two metal doors on the east wall of the second floor.

At the south end of the corridor, a metal door and frame lead into Room 8-201. The doorframe is severely corroded and the paint is flaking. The kalamein door is also in poor condition, although an escutcheon and the doorlock remain in place. There is no transom above this door.

Floors

The floor of Hangar 1 Lean-to was unfinished until offices were installed in the space. The current flooring system of linoleum tile over wood decking has been damaged via water and rot. Fallen plaster obscures cracked and displaced linoleum tile (Photograph 1.6.3.8). Tile floors in the bathroom spaces are covered with rubble and fallen plaster, but are in surprisingly good condition with no evidence of cracks or failed grout.



Photograph 1.6.3.8. Hangar 1 Lean-to, first floor. Photograph illustrates typical condition of floors in Hangar 1 Lean-to. Crushed linoleum tile is obscured by fallen plaster and debris.

Finishes and Signage

Traces of painted finishes are found on wood, plaster, brick, and metal throughout Hangar 1 Lean-to, on both original surfaces and on later additions, such as the wooden partitions that form post-war era office spaces. Most paint is flaking and peeling due to age or has eroded due to constant exposure to moisture. Similarly, ghosts of faded signage can be found on the remaining wall surfaces of the space, and telephone numbers and notes remain on partition walls in rooms used as offices.

Building Interior: Hangar 2

Walls and Ceiling

The east and west elevations of Hangar 2 are brick, with large steel sash at the clerestory level on the east elevation and multi-pane steel pivot sash at three levels on the west elevation. There are also several roller door openings on the east and west elevation's first stories. Full-height aluminum alloy hangar doors dominate the north and south façades. Every masonry wall has been treated with at least one coat of paint. The brick and mortar is in similar condition or slightly better than that of Hangar 1.

The steel roof truss system remains intact in Hangar 2 and is in fair condition, with moderate corrosion and paint loss. All but a few traces of roof decking, sheathing boards, and surface roofing material have been removed. These remnants indicate that the roof was well beyond its useful lifespan at the time of removal, with deteriorated roof decking and sheathing, as well as a brittle and eroded built-up roofing surface.

Windows and Window Openings

A detailed description of windows and window openings, including configuration and measurements, is presented in Section 1.4 of the HSR. There are two windows in the north wall of Hangar 2's north door pocket and two in the wall of the south hangar door pocket. The windows are not boarded over with plywood. The windows on the lower level are fixed steel sash and are in moderate condition. The metal sash on the second level are also fixed and, like the sash below, the metal is corroded but intact.

There are three large windows in the west wall of the hangar, set into the masonry walls. The fixed metal frames hold four rows of 14 glass panes, for a total of 56 panes in each window. The windows are similar in condition to Hangar 1. Hardware does not function well, but the metal is only moderately corroded. The wireglass is in moderate condition, as well, with staining, breakage, and salt damage on approximately 20% of the panes.

The second band of windows on the west elevation feature fixed metal sash set in the masonry wall. The north and south grouping is arranged in two rows of four panes, then three, then four. There are five sets of windows in the wall arranged in a grouping of two rows of six, two rows of three, and two rows of six. Thus, each window opening holds 28 glass panes. The north and south windows on the second floor vary slightly and are arranged in two rows of four, then three, then four.

The top level of windows on the wall consist of five openings that hold four rows of six, four rows of three, and four rows of six; those with four rows of six hold a pivoting central panel. The north and south windows are arranged in a pattern of four, then three, then four. The two middle rows form a pivoting panel.

The configuration is repeated on the east wall, and the condition is similar.

Doors and Door Openings

There are two human-scale doors in the west wall of Hangar 2. There is an unadorned flat panel metal door set in a flat-arch metal jamb on the north end of the wall. This door shows traces of past paint layers, the outline and nail holes of a rectangular sign that was once in place, and ghosts of stenciled

letters. The hinges remain on the door, as does an escutcheon for the doorknob. Neither the doorknob nor the lock above remains in place. There is moderate rust and corrosion on the door. The sill plate is severely corroded to the point of delamination, which inhibits the degree to which the door can close. On the south end of the wall, a kalamein door is held to its metal frame by a single hinge. The door is a single recessed panel with profiled moulding. There is no hardware on the door, although the holes for lock and doorknob remain in place. All paint has peeled, there is corrosion and metal staining at the top and base of the door, and the seams have split. Corrosion on the profiled frame is severe.

There are two roller door openings in the east wall of Hangar 1. The doorframe surrounding these openings is in moderate condition. The housing and hardware for both doors is very rusty. Unlike the north door, the closing mechanism of the southern door is mounted on the hangar side of the doorframe. Neither door was accessible at the time of inspection.

Hangar Doors and Tracks



Photograph 1.6.3.9. Hangar 2, north interior elevation. The panels at the base of the hangar doors are severely deteriorated.

Both the north and south façades of Hangar 2 hold 12 hangar doors. There are two pilot doors set in the east and west panels of the south façade, and two pilot doors at the east and west ends of the north façade. The condition of the hangar doors is similar to that of Hangar 1. Hardware and beams exhibit exfoliation corrosion, distortion, and pitting. Door panels are warped and pitted, and the paint is flaking and peeling. Door panels and fastening plates at the base of the doors have deteriorated significantly, leaving gaps in the bottoms of the doors (Photograph 1.6.3.9). The doors rattle in the wind, resulting in the loss of a great deal of original and replacement glass panels. The glazing putty is brittle. The upper support rails are somewhat rusted, and the tracks in the concrete are delaminated and spalling due to heavy corrosion, as are the doorstops (Photograph 1.6.3.10).

The exterior faces of the pilot doors are fair, with the greatest detriment to the condition being corrosion at the top and base of the doors. The interior surface of the northwest door was not accessible for inspection. The northeast pilot door is in poor condition. The bottom of the door is ragged with corrosion. The wireglass light is unbroken. A doorpull is in place on the interior face of the door. The southeast door is pocked with corrosion and the doorplate is in place, although the knob and lock are missing. The southwest pilot door of Hangar 2 is in poor condition. Two 2-x-4 wooden members have been bolted to the door surround for security purposes. The door knob remains in place on the door. There is a large gap between the door and the frame at the top, and some loss due to corrosion at the base.



Photograph 1.6.3.10. Hangar 2, east wall. Hangar stops and tracks are severely corroded. Floor settlement is also apparent in this image.

Floors

The cement floor of Hangar 2 is in good condition, with the exception of considerable settling of the slabs. Some cracking is also present (see Photograph 1.6.3.10).

Finishes and Signage

It appears that most surfaces were painted in Hangar 2. Few of the painted finishes are in good condition, although traces of several color campaigns are apparent. Signage from all eras of the hangar's history is visible throughout the hangar (Photograph 1.6.3.11).



Photograph 1.6.3.11. Hangar 2, view to the north. Signage throughout the hangar traces the history and use of the space. This photograph also offers a view of the period lighting and of the catwalk used to access the overhead heaters in the space.

Building Interior: Hangar 2 Lean-to

Walls and Ceiling

The north and south walls of Hangar 2 Lean-to are painted brick and are in fair condition, with areas of heavy biological growth due to excessive moisture in the space. The wall between the lean-to and Hangar 2 is also painted brick and is in fair condition. The west wall of the building is plaster over brick and hollow terracotta tile. There is one large area of plaster loss beneath the window line on the south half of the wall. On the north half of the wall, there is a network of deep cracking in the plaster. The cracks travel lintel to lintel and sill to sill (Photograph C.1.11). At the base of the north half of the west wall, a large area of loss reveals a layering system of exterior brick, terracotta block, and interior plaster (Photograph C.1.12).

Unlike Hangar 1 Lean-to, Hangar 2 Lean-to is an open space. There is a build-out in the center of the west wall for two restrooms; otherwise, no interior masonry or gypsum walls remain from previous building use, although ghostlines are visible on the painted walls.

Lathe and plaster on the ceiling has fallen in many areas, revealing corroded supports, deteriorated roof decking, and tatters of mineralized surface coating. There is a large hole in the northern portion of the roof (Photograph C.1.13).

Windows and Window Openings

The windows of Hangar 2 Lean-to's west wall appear to be in fair condition, but the openings are subject to the same movement cracks and plaster loss found at other locations in the complex. The northernmost of these windows is located in Room 10-105. In Room 10-106, the latrine, two wooden two-over-two, double-hung sash are set into wooden frames. The window sills are in poor condition and open at the joints due to water and consequent deterioration. It is likely that these two windows were installed at the time latrines were constructed within the lean-to.

There are seven metal sash windows on the west wall of the space. The condition of these windows is similar to that of the sash in Hangar 1 Lean-to. The metal is severely corroded and many of the glass

panes are missing. The plaster in which the windows are set is severely cracked and is detaching from the brick substrate. While the painted finishes are visible and even intact on the sash, corrosion is also a presence on the windows. The glazing is brittle and hardware is seized with rust. Around the window openings (as mentioned in the discussion of the lean-to walls) there are cracks at every sill and lintel that have resulted in plaster buckling and loss. There is staining on the glass panes.

Two double-hung, six-over-six wooden windows are located on the north end of the west wall. The windows are of the same design as their counterparts on the south half of the west wall and are in similar condition.

Doors and Door Openings

Two original doors remain in this space. A single flat panel, unadorned metal door with a single light—located at the west end of the north wall of the lean-to—is mildly corroded, but is otherwise sound. The backplate remains in place, but the doorknob and thumbturn are missing. The door is set in a flat masonry arch and surrounded by a wooden jamb. The original opening, designed to accommodate a taller door and fanlight, has been infilled with bricks.

On the west corner of the south wall in Hangar 2 Lean-to, a six-panel wooden door is set in a flat-arch masonry surround. The bottom two panels of the door are split and partially missing. The space, intended for a taller door, is partially filled with plywood. The fanlight that tops the door remains in place and is in fair condition, although two of the four segmented lights are missing. Paint on the door and fanlight is flaking and peeling (Photograph C.1.14)

Floors

The concrete floor of Hangar 2 Lean-to is in fair condition, although considerable settlement is apparent in the alignment of the slabs.

Finishes and Signage

Finishes on masonry are fading, flaking, and peeling. Signs painted directly on the masonry walls throughout the building's use are faded or partially covered with overpaint.

Building Interior: WPA Infill

Construction of and alterations to the WPA Infill between Hangars 1 and 2 began soon after the original hangars were built, and were ongoing over the course of the building's history. The space includes two stories and a mezzanine level. Stairwells are located in the northeast and southeast corners of the infill. Steel framing and concrete slabs support the second floor of the building. A wood-framed monitor structure has been constructed within the former courtyard on the second floor. This structure has considerably increased the load carried by the roof and framing of the WPA Infill and is discussed extensively in Section 1.4. The WPA Infill is a maze of machine shops, utility access points, dormitories, and office space. There is a broad range of construction materials present, many of which have been impacted by the excessive moisture and extended water infiltration in the space.

The current condition of the WPA Infill is almost uniformly poor. The inconsistent quality of its construction by WPA forces, combined with a poor foundation and decades of neglect and vandalism,

have reduced much of the building to near ruin. The loss of copper flashing and other roof protectives have been particularly catastrophic, allowing deep and continuous water penetration throughout the entire building. Until recently, two 8-inch caliper trees were growing at the parapet line. Most of the masonry walls are out-of-plane, with several exhibiting very large cracks and gaps. The majority of interior plaster finishes are destroyed, nearly all the original wood floors have rotted to mulch, most doors have gone missing, and any exposed and untreated metal has suffered corrosion. Among the only reasonably sound building elements, fortunately, are the reinforced concrete slabs and steel structure, the latter of which seems to have been coated with anti-corrosion paints.

Walls and Ceiling

The walls of the WPA Infill consist of several materials, including brick, terracotta, plaster, concrete, concrete masonry units, and gypsum board. The interior walls of the WPA Infill were likely built, without footings or foundations, directly on the concrete once separating the two hangar buildings. As a result, there has been considerable settlement of these walls, resulting in numerous large cracks across the extents of the various masonry partitions. Additional damage has been incurred by the excessive amounts of water that channel into the space via the failed roofing material and leaking or missing flashing.

In the north and south stairwells, the cement plaster over brick is largely intact with moderate degradation and cracking, but in poorer condition at the window surrounds. The ceiling is in fair condition at the southern extents, but in very poor condition at the northeast corner in the vicinity of the roof opening, where the wooden roof decking has begun to fail and buckle. Distinctive painted finishes remain on many of the walls. The steel beams supporting the roof are visible in this area and appear sound, with very minimal corrosion. A mill marking on the beam gives the manufacturer as "Phoenix USA."

Typical conditions caused by settlement are apparent on the east and south brick walls of the Sprinkler Room (3-114), which exhibit considerable settlement and cracking, with some dislodged and loose brick and broken mortar (Photograph C.1.15). The east and south brick walls of the Tech Supply Office have settled and developed major cracks, as well, with some bricks dislodged at openings. This brick was manufactured by Hudson Valley brickmaker JJJ (Juan Jacinto Jova*)*, consistent with areas identified as dating to the original construction date of the WPA Infill.

The south wall of the passageway through the WPA Infill, between Hangars 1 and 2, is partially constructed of metal sash repurposed from Hangar 1 or 2 (Photograph C.1.16). Four rows of six sash each are west of the entrance to the room, and a sidelight, four sash high, flanks the west side of the door. Like the hangar's glass panes, these measure 14 x 20 inches. The metal is coated with flaking paint, but is not corroded. The glass is painted and several panes are broken.

Plaster was used extensively throughout the WPA Infill and much of it is failing. For example, in Room 3-202 on the south half of the second floor, plaster applied directly to brick has completely detached (Photograph C.1.17). In the dormitory, the original plaster finishes at the perimeter are cracked, falling, and degraded in numerous locations due to water infiltration. In addition to surface cracks in the plaster throughout the infill, heavy cracking traces the outline of underlying corroding steel members within the walls and at window openings. Water infiltration in the skylight of the north stairwell has caused the plaster of the opening to crack and buckle (Photograph C.1.18).

Concrete masonry units were installed on the first floor of the WPA Infill under at least one renovation campaign and are present in the walls of the Motor Pool Office and the Maintenance Bay. These walls are in fair condition, with the notable exception of deep and significant step cracking from movement (Photograph C.1.19).

Gypsum board was used and has failed due to moisture in the central space of the second floor. This material was also used for office partitions and is in moderate condition. In the dormitory rooms, the post-war wood-stud/gypsum-board partition has fully collapsed between the building column and the western wall of the room, but is still intact between the building column and the eastern (corridor) wall.

The current WPA Infill roof covers the north and south ends of the building, the first parts to be constructed, as well as Room 3-205, the central meeting space renovated as a classroom prior to 1946. Heavy water infiltration on the north and south ends of the WPA Infill has caused the steel support beams to corrode. Wooden framing was installed around the steel support beams to serve as nailers for wire lathe. The wood has deteriorated and the wire lathe to which the plaster was keyed has rusted, resulting in falling plaster (Photograph C.1.20). Ceiling rafters and wood decking exhibit many areas of advanced water staining and deterioration.

In the east wall of Room 3-205, water entry is evident at the junctions of the WPA Infill and the adjacent hangars (Photograph C.1.21). Gutters located at this interface are detached from fascia, allowing water to enter the building freely. Consequently, mortar joints of the unprotected brick walls are failing and biological growth is advanced. The flooring has failed, as have the walls.

In the Flight Supply Room, the reinforced concrete ceiling is spalled in a few locations, revealing rusted reinforcing bars. Where rainwater has penetrated the slab, lime stalactites have formed. This condition is especially pronounced along the concrete-encased beams, as they are at a lower level than the slab itself. The concrete ceiling of the mezzanine is in fair condition, although stalactites of calcium carbonate indicate ongoing water infiltration (Photograph C.1.22). The ceiling of the Maintenance Bay (Room 3-106) shows considerable evidence of water penetration, including rust spots and lime stalactites. The overhead hoist beam, as well as most of the metal infrastructure throughout, is rusted.

In the second floor corridor (Foyer 3-B), large areas of the ceiling are deteriorated or missing. The condition of the latrines (Room 3-212, North Latrine, and Room 3-211, South Latrine) is poor. Catastrophic failure in the ceiling and roof in the southeast corner of the room has allowed bricks and other roof debris to tumble into the space. Because of the advanced deterioration of the roof at the easterly connection with Hangar 1, a steel beam with a mill marking of “Phoenix USA” is visible. The beam appears to be in good condition. Surrounding wooden roof decking marked “SPA” is also visible in several areas where the ceiling has fallen away. The condition of the dormitory (Rooms 3-210 [north] and 3-207 [south]) is poor. The ceiling and roof above it have failed in the northwest corner, allowing debris and precipitation to enter the room.

Windows and Window Openings

Steel multi-pane sash and framing in the south and north interior elevations are in poor condition due to water infiltration and corrosion. There is severe spalling of the surrounding plaster, wood, and steel of the openings.

The north and south façades of the WPA Infill feature rectangular and oxeye windows (see Photograph 1.5.6). The openings are boarded closed, but the windows remain and are visible from the interior of the

building. The arrangement of windows on the WPA Infill's north and south façades are the same, and the conditions of spalling and corrosion are typical for both elevations (Photograph C.1.23). On the south interior elevation window, six glass panes were removed to accommodate the hardware used to attach the protective plywood.

The windows of the north and south façade's second level are accessible for assessment inside the building. A metal window with pivoting sash is set in the masonry wall at the top of both stairwells. Within the north dormitory space of the north side of the WPA Infill (Room 3-210), and in Classroom No. 1 (3-201) of the south side of the infill, there are three windows. The center window arrangement is the largest and holds a central panel with three rows of three glass panes. The typical condition of the windows is poor. Many of the panes are broken or missing. Paint is peeling and the glazing putty is brittle and detached. The metal is corroding and the hardware is largely non-functioning. Plaster in which the frames are set is cracked, as well, exposing the interior framework to deterioration.

Doors and Door Openings

Doors installed during the original construction phase of the WPA Infill are kalamein and are set on metal frames within masonry openings. All are flat arch, with the exception of the four human-scale doors into original spaces within the WPA Infill, which are constructed of metal with metal frames. Doors in spaces constructed during the post-war era are wooden with wooden frames. The typical condition of the metal doors and frames includes corrosion of the doorframes, inoperable hardware, and peeling or faded paint. Wooden doors and frames are in worse condition than those made of metal. Many of the wooden doors have detached from their frames due to failure of the rail and hinges. In other locations, doorframes have detached from masonry openings, causing detachment of both the frames and the doors.

The main entry to the WPA Infill is centered in the north wall of the Flight Supply Room. The doors are not original and were made smaller with the addition of material traditionally used for wainscotting. The paired wooden doors, set in a flat-arch wooden frame, are in poor condition. The west door of the pair consists of two side-by-side glass panes over three recessed rectangular wooden panels. The lowest panel is missing. The plywood used to seal this door is splintered or missing. The east door of the pair, also wood, is boarded with plywood, as well. The doorframe is in poor condition. Slide locks and chain pulls remain in place on the west door, but are not operable.

On the south façade, the central, flat-arch, double entry doors consist of several pieces of plywood that appear to be constructed of scenery and advertising used during the era of the Big Apple Circus (see Photograph C.1.23). No original hardware remains. The original metal of the door remains within the masonry opening and is in fair condition, although most of the paint has peeled.

There is an exterior door opening with a fanlight in the north façade, at the base of the WPA Infill's north stairwell. The opening is secured with plywood. The metal doorframe is in poor condition. "FIRE ESCAPE" is partially visible in red stenciling on the door header; the door is missing. The door and fanlight in the south interior elevation of the south stairwell are also missing; however, the doorframe is wood rather than metal. Pointing is missing from the brick of the fanlight surround.

A door in the west wall of the south stairwell leads into Room 3-101. The door is wood and was designed to hold a large glass panel, missing, over a single panel. The door is held in its metal frame with two

hinges. At the top of the north stair, the doorway leading to the foyer (Room 3-B) is metal; there is no door present. At the top of the south stair, the doorway leading to the classroom (Room 3-201) is corroded metal and, again, the door is not present.

The three-panel wooden door to the Motor Pool (Room 3-113) is intact, with "MOTOR POOL" stenciled in spray paint across the top stile. The single panel door to Room 3-114, the sprinkler manifold, is metal with metal trim and is in fair condition. The west and center door leading from the passageway into the Tech Supply Office and Tech Supply Room are wooden with wooden frames. The east door, which leads into the Utility Room (8-212), is secured with a metal grate. Doors in the latrines on the second floor are wood panel within wood frames. The two openings in the east wall of the foyer on the second floor are framed with wood. The doors are missing. The five-panel, swinging wooden door leading into Room 3-203 and the two-panel wooden door to Room 3-203 are detached from their frames. The opening leading from the foyer into Room 3-205 is framed with wood. There is no door. The door leading from Classroom No. 2 into Room 3-205 is wood, as well, and is attached by two hinges to the wood frame.

Floor



Photograph 1.6.3.12. WPA Infill, Room 3-205. Water has severely damaged the floor in the space.

Original floor finishes in the WPA Infill include hardwood, linoleum tile, and ceramic tile. Travel across the floors is somewhat treacherous, particularly in the mezzanine, where sheathing boards and the joists intended to support them are severely deteriorated. In the north and south stairwells, all of the metal stair treads have corroded away from their fastening points on their associated stringers and fallen to the base of the stairwell. Temporary wooden ramps have provided access to areas above.

The wood floor finish of the Flight Supply Room (3-112) is typical of the wooden floors throughout this space. The floor is largely disintegrated, with crushed linoleum tile on top of deteriorated wood. Selective removal of this layer reveals the concrete slab in good condition below. In the mezzanine, the support joists are soft, as are the layers of linoleum tile and underlayment. On the second level of the WPA Infill, linoleum tile is degrading to dust and water has caused the wooden underlayment to soften and rot. In the monitor structure, collapse of the gutters and has caused severe damage to the floor. The floor is particularly damaged due to heavy waterfall directly through the roof onto the floor of the space (Photograph 1.6.3.12).

Finishes and Signage

Painted finishes remain on plaster, brick, cement block, metal, and wood where moisture has not permeated the space. Paint in these areas is peeling or faded. In areas where moisture has been consistently problematic, peeling, flaking, and erosion of the surface is advanced. Faded signs and indicators of previous use of the space remain in place throughout the WPA Infill (Photograph C.1.24).

1.6.4 CONDITION ASSESSMENT: STRUCTURAL

Hangar 1

Roof

The structure for Hangar 1 is a structural steel framed roof, with open-web structural steel trusses spaced at 20 feet on centers, spanning the 120-foot-wide hangar. The trusses are braced with horizontal steel angles at the bottom chord, at the top chord with horizontal diagonal rods at the hangar door bays and the center bay, and have diagonal bridging at 1/5 points along the truss. Steel channel purlins with wood nailers spaced at 6 feet on centers run between the trusses and support the wood roof decking (Photograph 1.6.4.1). The trusses are supported by steel columns that are partially embedded in multi-wythe brick masonry walls, which separate the hangar from the adjacent lean-to to the west, and from the WPA Infill to the east. The majority of the roof decking is in good condition, with only isolated areas of water infiltration and deterioration. Areas of previous decking replacement were observed, as identified by the up-painted wood. Water infiltration appears to be confined to the decking along the interior wall between the hangar and the WPA Infill. The structural steel roof framing is generally in good condition and exhibits signs of moderate corrosion. The main steel columns appear in fair condition, with areas of significant corrosion at the bases.



Photograph 1.6.4.1. Typical roof trusses and wood decking of Hangar 1.

Perimeter Walls

Hangar 1 is bound by hangar doors on the north and south sides, and by brick masonry infill walls on the eastern lean-to and the western WPA Infill. There are brick masonry pilasters at the four corners of the hangar, which bound the gable end trusses over the doors. These pilasters are in poor condition, with severe mortar deterioration and cracking throughout. It is believed that the infill walls were originally steel-framed with glass panels that were replaced with brick walls during later construction. The infill wall between Hangar 1 and its lean-to is triple-wythe (12-inch-thick) brick for the first 14 feet in height and double-wythe (8 inches thick) upward, bounded by the original structural steel columns and wall girts. The infill wall between Hangar 1 and the WPA Infill is constant-thickness triple-wythe (12-inch-thick) brick bounded by the original structural steel columns and wall girts. Openings were accomplished by concrete header beams. These walls exhibit moisture infiltration and mildew accumulation, but do not show significant signs of deterioration (Photograph C.2.1). Significant corrosion is visible in the horizontal girts and sag rods embedded in the masonry adjacent to the WPA Infill, which is likely due to water infiltration. Minor corrosion of steel lintels was observed at various window and door openings, but does not appear to have affected the masonry at these locations.

Slabs and Foundations

The building side walls, consisting of the shared interior walls with the eastern lean-to and the western WPA Infill, rest on concrete grade beams believed to be pile-supported. The formerly operable sliding

hangar doors ride on concrete grade beams believed to be pile-supported. The concrete floor slab does not appear to be supported on piles, and is in fair condition, with some settlement of sections observed. One significant slab settlement has occurred at mid-depth of the hangar against the wall adjacent to the WPA Infill, with approximately 6 inches of differential movement from the adjacent slab section (Photograph 1.6.4.2).



Photograph 1.6.4.2. Slab settlement of floor of Hangar 1, adjacent to the WPA Infill.

Hangar 1 Lean-to

Roof



Photograph 1.6.4.3. Surficial corrosion of the steel roof framing of Hangar 1 Lean-to.

The roof structure of the two-story Hangar 1 Lean-to consists of wood roof decking on steel channel purlins spaced at 6 feet on centers spanning to structural steel girders spaced at 20 feet on centers (corresponding to the column bays of Hangar 1) (Photograph C.2.2). The girders frame to the main columns on the hangar side, and bear on the exterior brick masonry walls. Approximately 20% of the wood roof decking has deteriorated and collapsed, with most of the debris residing on the second floor. The remaining decking is partially exposed to the elements, and has significant deterioration. Major water infiltration has occurred in this area of the building. The structural steel framing is visible in certain locations where the plaster ceiling has fallen, and is in fair condition, with signs of moderate corrosion (Photograph 1.6.4.3). It appears that the majority of the roof structural steel has not suffered significant section loss at this time, based on the visual inspection.

Upper Floor

The floor construction appears to be a reinforced concrete slab spanning between concrete-encased steel beams spaced approximately 7 feet, 6 inches on centers. These beams are supported by concrete-encased steel girders spanning from the main hangar columns to the outside brick masonry bearing walls. There are areas of exposed corroding reinforcement, as viewed from the underside of the slab (Photograph 1.6.4.4), and some areas of spalled concrete that exposes the structural steel beams. There is a fair amount of water infiltration to this area, and a large amount of debris throughout.



Photograph 1.6.4.4. Deteriorated concrete slab of the second floor of Hangar 1 Lean-to, with exposed reinforcement.

Exterior Walls

The exterior walls are multi-wythe brick masonry with exterior pilasters spaced at 20 feet on centers, corresponding to the roof girder locations. These walls are covered with a plaster finish assembly that is

in poor condition, with cracking and distortions throughout. Structural inspection of the interior side of the brick masonry is limited due to this finish. The exterior brick masonry bearing walls are in poor condition, with severe cracking and displacement visible on the exterior face throughout (Photographs 1.6.4.5 and 1.6.4.6; Photographs C.2.3, C.2.4, and C.2.5). Steel angle lintels over openings also exhibit significant corrosion, and have shifted out of place. The bottom portion of the outer wythe of one of the pilasters in the northeast corner has fallen, exposing the end of the steel floor girder. In the same area, the outer face of the brick has separated and fallen.



Photograph 1.6.4.5. Deteriorated brick masonry of the exterior wall and pilaster at the northeastern corner of Hangar 1 Lean-to. Note the exposed end of the steel floor girder at the pilaster location.

Slabs and Foundations

The building exterior walls (along with the shared interior wall with Hangar 1) rest on concrete grade beams believed to be pile-supported. The visible portion of the concrete floor slab is in fair condition, with the remainder covered with debris of deteriorated finishes.



Photograph 1.6.4.6. Deteriorated brick masonry of the exterior wall on the east façade of Hangar 1 Lean-to, at the Admiral's Tower.

Hangar 2

Roof

The structure for Hangar 2 is a structural steel framed roof, with open-web structural steel trusses spaced at 20 feet on centers, spanning the 120-foot-wide hangar. The trusses are braced with horizontal steel angles at the bottom chord, at the top chord with horizontal diagonal rods at the hangar door bays and the center bay, and have diagonal bridging at 1/5 points along the truss. Steel channel purlins with wood nailers spaced at 6 feet on centers run between the trusses and support the former wood roof decking. The trusses are supported by steel columns that are partially embedded in multi-wythe brick masonry walls, which separate the hangar from the adjacent Hangar 2 Lean-to to the west and from the WPA Infill to the east. The majority of the roof decking has severely deteriorated and collapsed, which has since been cleared from the site. Major water infiltration has occurred in this area of the building. The structural steel roof framing is exposed to the weather, and exhibits signs of moderate corrosion, specifically on the columns (Photographs 1.6.4.7 and 1.6.4.8).



Photograph 1.6.4.7. Surficial corrosion of roof trusses of Hangar 2.



Photograph 1.6.4.8. Severe corrosion at bases of main columns of Hangar 2.

Perimeter Walls



Photograph 1.6.4.9. Deteriorated framing at pilaster caps of Hangar 2.

Hangar 2 is bound by hangar doors on the north and south sides, and by brick masonry infill walls on the Hangar 2 Lean-to to the west and the WPA Infill to the east. There are brick masonry pilasters at the four corners of the hangar, which bound the gable end trusses over the doors. These pilasters are in poor condition, with severe mortar deterioration and cracking throughout (Photograph 1.6.4.9; Photograph C.2.6). It is believed that the infill walls were originally steel-framed with glass panels that were replaced with brick walls during later construction. The infill wall between Hangar 2 and its lean-to is double-wythe (8-inch-thick) brick bounded by the original structural steel columns and wall girts. The infill wall between Hangar 2 and the WPA Infill is triple-wythe (12-inch-thick) brick bounded by the original structural steel columns and wall girts. Openings were accomplished by concrete header beams. These walls exhibit moisture infiltration and mildew accumulation, but do not show significant signs of deterioration. Moderate corrosion is visible in the horizontal girts and sag rods embedded in the masonry adjacent to the WPA Infill, which is likely due to water infiltration. Minor corrosion of steel lintels was observed at various window and door openings, but does not appear to have affected the masonry at these locations.



Photograph 1.6.4.10. Slab settlement against south doors of Hangar 2.

Slabs and Foundations

The building side walls, consisting of the shared interior walls with the western lean-to and the eastern WPA Infill, rest on concrete grade beams believed to be pile-supported. The formerly operable sliding hangar doors ride on concrete grade beams believed to be pile-supported. The concrete floor slab does not appear to be supported on piles, and is in fair condition, with some settlement of sections observed (Photograph 1.6.4.10).

Hangar 2 Lean-to

Roof



Photograph 1.6.4.11. Roof deck and framing of Hangar 2 Lean-to, as viewed from below.

The roof structure of the one-story Hangar 2 Lean-to is wood roof decking on steel channel purlins spaced at 6 feet on centers spanning to structural steel girders spaced at 20 feet on centers (corresponding to the column bays of Hangar 2). The girders frame to the main steel hangar columns on the hangar side, and bear on the exterior brick masonry walls along Flatbush Avenue. Approximately 30% of the wood roof decking has deteriorated and collapsed, with most of the debris residing on the floor slab (Photograph 1.6.4.11; Photograph C.2.7). The remaining decking is partially exposed to the elements and has significant deterioration. Major water infiltration has occurred in this area of the building. The structural steel framing is in fair condition, with signs of moderate corrosion in isolated areas. It appears that the majority of the steel has not suffered significant section loss at this time.

Exterior Walls



Photograph 1.6.4.12. Exterior brick deterioration and displacement of Hangar 2 Lean-to at west façade.

The exterior walls are multi-wythe brick masonry with exterior pilasters spaced at 20 feet on centers, corresponding to the roof girder locations. These walls are covered with a plaster finish assembly that is in poor condition, with cracking and distortions throughout. Structural inspection of the interior side of the brick masonry is limited due to this finish. The exterior brick masonry bearing walls are in poor condition, with severe cracking and displacement visible on the exterior face throughout (Photograph 1.6.4.12; Photograph C.2.8). Steel angle lintels over openings also exhibit significant corrosion and have shifted out of place. The parapet along Flatbush Avenue above the roof has suffered severe mortar deterioration due to water infiltration, and is leaning inward due to thermal expansion and contraction.

Slabs and Foundations

The building exterior walls, along with the shared interior wall with Hangar 2, rest on concrete grade beams believed to be pile-supported. The concrete floor slab does not appear to be supported on piles, and is in fair condition, with the some settlement of sections observed.

WPA Infill

The structure for the WPA Infill—between Hangars 1 and 2—appears to have been constructed in at least two different timeframes. The original construction appears to be two stories on the north and south ends, with a roof plaza in the center. Subsequent construction appears to have added a wood-framed second floor infill to the roof plaza area in the center of this portion of the building.

Roof



Photograph 1.6.4.13. Deteriorated wood roof framing of original two-story sections of the WPA Infill.

The roof framing for the original two-story sections is comprised of wood roof decking on 2-x-4-inch wood joists spaced at 16 inches on centers spanning to plaster-encased structural steel beams spaced at approximately 8 feet on centers, which are supported by plaster-encased structural steel girders spaced at 20 feet on centers (corresponding to the main column bays of the adjacent Hangars 1 and 2) (Photograph 1.6.4.13; Photograph C.2.9). The girders frame to these main columns in the hangar walls, with an intermediate interior plaster-encased structural steel column, offset several feet west of the north-south centerline of the infill. This was likely done to avoid conflicts with the existing utilities in this area. The majority of the wood roof decking has significant moisture infiltration and deterioration, with a large percentage of the plaster ceiling debris residing on the second floor. Major water infiltration has occurred in this area of the building. The structural steel framing is visible in isolated locations where the plaster ceiling has fallen, and is in fair condition, with signs of moderate corrosion. It appears that the majority of the roof structural steel has not suffered significant section loss at this time.

The roof framing of the subsequent courtyard infill is comprised of wood roof decking on 2-x-12-inch wood joists spaced at 16 inches on centers. The wood joists span to 10-x-10-inch timber girders supported by three interior 10-x-12-inch timber columns that bear on the girders below (Photograph C.2.10). Wood diagonals form knee braces at the column-to-girder joints, providing lateral resistance for the structure. At the east and west boundaries of this roof area, the timber girders are supported by stub columns that reside directly over the main steel columns of the hangars. At the north and south boundaries of this roof area, the roof framing is supported on a wood knee wall that sits on the former brick exterior wall. The roof framing is in fair condition with isolated areas of deterioration from water infiltration.



Photograph 1.6.4.14. Representative framing of upper floor of the WPA Infill.

Upper Floor

The floor construction of the original second floors of the WPA Infill appears to be reinforced concrete slabs spanning between plaster-encased steel beams spaced approximately 8 feet, 4 inches on centers. Plaster-encased steel girders spanning from the main hangar columns to an interior plaster-encased steel column support these beams (Photograph 1.6.4.14). Major



Photograph 1.6.4.15. Representative framing of original courtyard roof of the WPA Infill, with the wood floor overbuild seen through the original skylight opening.

water infiltration has occurred in this area of the building. During several site investigations, water has been observed pouring out of cracks in the plaster encasement in several locations. Moderate corrosion of the structural steel framing has occurred in the exposed isolated areas (Photograph 1.6.4.15), and is anticipated to occur in other areas. This cannot be confirmed, due to the concealment by the plaster encasement. The location of the cracks in the plaster encasement is likely an indication of column settlements, and corresponds to the settlements observed in the structure above.

The floor construction in the subsequent courtyard infill is comprised of 2-x-10-inch wood joists framed over the former roof structure (Photograph C.2.11). The former roof structure appears to be concrete slabs spanning to concrete-encased steel beams spaced approximately 7 feet, 6 inches on centers supported by large concrete-encased steel girders that clear-span the infill and frame into the main hangar columns on each side. Major water infiltration has occurred in this area of the building, particularly at the perimeter walls of the former courtyard above. Deterioration of areas of the wood floor overbuild was observed.

Mezzanine Floor



Photograph 1.6.4.16. Deteriorated wood floor decking of the mezzanine floor of the WPA Infill, with wood floor joists on steel girders.

The low mezzanine floor in the center of the WPA Infill is framed by wood floor decking between 2-x-4-inch joists at 14 inches on centers, supported by structural steel beams and girders framing to steel columns (Photograph 1.6.4.16). The steel framing is exposed from below in this area, and is in fair condition with only moderate corrosion. No significant section loss in the steel members has been observed in this area. Some of the fiberboard ceiling which covered the wood floor framing has deteriorated and collapsed, allowing a view of the underside of the decking in some areas. The decking that was visible has significant water infiltration and is in poor condition. The remainder of the wood framing is not visible, due to the ceiling finish. In the corridor against the Hangar 1 wall, the floor is comprised of metal bar grating on the structural steel framing, which exhibits moderate corrosion due to the water infiltration in this area.

Masonry Walls

The exterior walls at the north and south ends of the WPA Infill are multi-wythe brick masonry with stone accent bands, and act as bearing walls for the roof and floor framing in this area. There are several window and door openings, either severely damaged or temporarily covered with plywood,

which is allowing major water infiltration into this area of the building. The exterior brick masonry bearing walls are in poor condition, with severe cracking and displacement visible on the exterior face throughout (Photograph C.2.12). Steel angle lintels over openings exhibit significant corrosion, and have shifted due to thermal expansion and contraction of moisture. At the subsequent second floor infill of the former courtyard, there are multi-wythe brick masonry walls that created the former exterior walls for the courtyard, with door and window openings to the original second floor space. Some of these window openings have been infilled with brick (Photograph 1.6.4.17). These masonry walls are supported by the girder line below, and do not extend to the ground. Major water infiltration has occurred in these masonry walls, with significant deterioration, cracking, and settlements. It appears that the columns that support the girders and these masonry walls have settled, creating significant distortions and cracking within the brick masonry.



Photograph 1.6.4.17. Brick deterioration and settlements on the original upper courtyard façade of the WPA Infill, second floor.

Within this portion of the building, there are interior masonry walls that vary in age and materials. Brick masonry forms the stairwells on either end, and was also used to form the perimeter of the space below the central mezzanine, as well as some secondary spaces such as restrooms and mechanical rooms. These walls are in fair to poor condition, with significant settlements observed in the western side of the center area (Photograph 1.6.4.18). At some later date to the original WPA Infill construction, concrete masonry unit (CMU) walls appear to have been built on the first floor as a separation of former spaces, and were likely constructed on the existing floor slab. These CMU partition walls exhibit significant cracking and displacements, likely due to settlements in the floor (Photographs C.2.13 and C.2.14).



Photograph 1.6.4.18. Brick cracking and settlements at a doorway in the interior masonry wall of the WPA Infill, first floor.

Slabs and Foundations

The exterior façades of the WPA Infill are founded on concrete grade beams, and while there is significant cracking and displacement within the brick masonry, there does not appear to be evidence of vertical settlements in this wall. Construction documentation for this area is limited, but some drawings indicate that this foundation line is pile-supported. There are settlements observed in some interior masonry walls that indicate possible corresponding settlements in the foundations. There are also observed settlements in the floor slabs. A possible cause is that the interior wall and column supports are not founded on piles, or that these foundations have failed from being overloaded. Since the perimeter of this structure is founded on piles, the differential settlements would be noticeable.

1.6.5 CONDITIONS ASSESSMENT: MECHANICAL, ELECTRICAL, AND PLUMBING

Typically, the MEP systems in Hangars 1 and 2 have not been maintained, have been exposed to the weather for many years, and are beyond their useful life. During rehabilitation of the hangar, a new electrical system including power distribution, lighting, fire alarm, and exit signage will be required. New heating, cooling, and plumbing systems will also be required.



Photograph 1.6.5.1. Hangar 1 unit heater, view looking up.

Mechanical Description and Condition

The heating systems for the hangars consist of steam radiators and steam unit heaters; steam is distributed via piping throughout. The two 6-inch steam mains for Hangars 1 and 2 come up from underground adjacent to the WPA Infill walls and branch out to their respective hangars and lean-tos.



Photograph 1.6.5.2. Hangar 2 steam-distribution piping, view looking up.

Hangars 1 and 2

Heating for the hangar bay is provided from steam unit heaters (Photograph 1.6.5.1; Photograph C.3.1, see Appendix C.3) suspended from the overhead steel and served via steam piping (Photograph 1.6.5.2; Photographs C.3.2 and C.3.3). The piping and heaters are in poor condition.

Hangars 1 and 2 Lean-tos



Photograph 1.6.5.3. Typical steam radiator.

Heating for the lean-tos is provided from steam radiators (Photograph 1.6.5.3) and steam unit heaters via steam piping. The piping and heaters are in poor condition.

There is some abandoned ductwork running vertically in a shaft with no branches. The ductwork is in very poor condition.

WPA Infill

The WPA Infill was heated by steam radiators (Photograph C.3.4) and steam unit heaters via steam piping (Photograph 1.6.5.4). What appears to be the condensate receiver/pump package is located in a room via a hatch below the floor (Photograph C.3.5). The piping, heaters, and condensate pumps are in poor condition.



Photograph 1.6.5.4. WPA Infill steam unit heater.

There is some abandoned ductwork running vertically in the walls with no branches. The ductwork is in very poor condition.

Electrical Description and Condition

Hangar 1

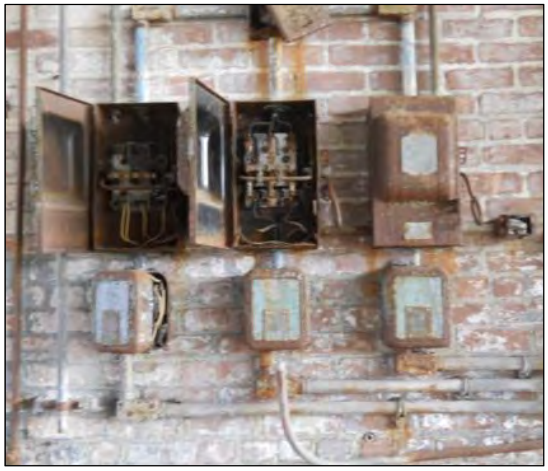


Photograph 1.6.5.5. Hangar 1 communications cabinet.

As elsewhere, the electrical equipment has been exposed to the weather. The equipment intended for interior locations has become rusted and weather worn.

A communications cabinet is on the west wall (Photograph 1.6.5.5). The cover has been removed, and it is apparent that the distribution circuits have been disconnected. The cabinet enclosure and cover have substantial rust. There is a 4-inch conduit adjacent to this cabinet running up from the floor slab that is likely the communications service raceway into this structure. It is undetermined if this equipment is active.

On the east wall, there are three disconnect switches with contactors serving mechanical units (Photograph 1.6.5.6). The disconnect switches are significantly corroded, and the labels with their ratings are not legible. It has not been determined whether these units are energized.



Photograph 1.6.5.6. Hangar 1 disconnects for mechanical units.

Electrical branch circuit distribution includes metallic and nonmetallic conduits. The metallic conduits are significantly rusted, and the nonmetallic conduits show signs of decay due to weather exposure. Wiring devices and light fixtures are either missing or are significantly corroded.

There are some abandoned fire alarm devices in very poor condition and, as noted above, the equipment intended for interior locations has become rusted and weather worn.

Hangar 1 Lean-to

The electrical equipment here has also been exposed to the weather; the equipment intended for interior locations has become rusted and weather worn.

Within the lean-to, there is a large multi-section panelboard with a significantly rusted enclosure (Photograph 1.6.5.7). Due to their deterioration, the labels with the panelboard ratings are not legible. The panelboard cover doors are secured closed by plastic tie-wraps. It is likely that the electrical service to this structure enters at this panelboard.



Photograph 1.6.5.7. Hangar 1 Lean-to multi-section panelboard.

Electrical branch circuit distribution includes metallic and nonmetallic conduits. The metallic conduits are significantly rusted, and the nonmetallic conduits show signs of decay due to weather exposure. Wiring devices and light fixtures are either missing or are significantly corroded.

Hangar 2

Given that much of the building envelope has deteriorated, the electrical equipment has been exposed to the weather. As such, the equipment intended for interior locations has become rusted and weather worn.



Photograph 1.6.5.8. Hangar 2 large disconnect interior.

On the west wall are several disconnect switches (Photograph C.3.6). The disconnect switches are significantly corroded and the labels with their ratings are not legible (Photograph C.3.7). The largest disconnect is open and the fuses have been removed (Photograph 1.6.5.8). The disconnect interior has been exposed to the weather, and the conductor insulation appears to be deteriorating. Conductor insulation does not appear to be a rubber-based material, and may include asbestos.

Adjacent to the disconnect switches is a pull box with a 4-inch conduit that runs down into the slab and a 4-inch conduit that runs up to the roof structure, across Hangar 2, and into the WPA Infill space. It is undetermined if these units are energized.

Three disconnect switches with contactors serving mechanical units are on the west wall. The disconnect switches are significantly corroded, and the labels with their ratings are not legible. It is undetermined if these units are energized.

A communication cabinet is on the east wall (Photograph C.3.8). The cover has been removed, and it is apparent that the distribution circuits have been disconnected. The cabinet enclosure and cover have substantial rust.

Electrical branch circuit distribution includes metallic and nonmetallic conduits. The metallic conduits are significantly rusted, and the nonmetallic conduits show signs of decay due to weather exposure. Wiring devices and light fixtures are either missing or are significantly corroded.

There are some abandoned fire alarm devices in very poor condition and, as noted above, the equipment intended for interior locations has become rusted and weather worn.



Photograph 1.6.5.9. Hangar 2 Lean-to panelboards.

Hangar 2 Lean-to

Again, much of the building envelope has deteriorated, and the electrical equipment has been exposed to the weather. As such, the equipment intended for interior locations has become rusted and weather worn.

There is a large panelboard adjacent to a smaller panelboard on the west wall (Photograph 1.6.5.9). Both enclosures are significantly rusted and both panelboards are missing interior components. Due to

their deterioration, the labels with the panelboard ratings are not legible. It is undetermined if these two units are energized.

Electrical branch circuit distribution includes metallic and nonmetallic conduits. The metallic conduits are significantly rusted, and the nonmetallic conduits show signs of decay due to weather exposure. Wiring devices and light fixtures are either missing or are significantly corroded.

WPA Infill

Due to deterioration in the building envelope, the electrical equipment has been exposed to the weather. As noted above, the equipment intended for interior locations has become rusted and weather worn.

On the west wall of the south section, there is a large panelboard that appears to be served by the 4-inch conduit at the disconnect switches in Hangar 2.

Electrical branch circuit distribution includes metallic and nonmetallic conduits. The metallic conduits are significantly rusted, and the nonmetallic conduits show signs of decay due to weather exposure. Wiring devices and light fixtures are either missing or are significantly corroded.

There are some abandoned fire alarm devices in very poor condition and, as noted above, the equipment intended for interior locations has become rusted and weather worn.

Building Exterior

Several exterior luminaires are located on the north and south façades of Hangars 1 and 2 above the hangar doors, and at the north and south façades of the WPA Infill. These luminaires are damaged, deteriorated, or missing. Perimeter survey of this structure did not identify a location of where or how the electrical and communications services are derived.

Plumbing Description and Condition



Photograph 1.6.5.10. View of existing lavatory and existing water heater in Hangar 1 Lean-to. This lavatory is among the fixtures in the best condition.

All drainage piping is hub and spigot cast iron. Domestic water piping is galvanized steel. Piping is beyond its useful life, and much of it has been frozen and cracked open.

The hangar roofs are pitched to the east and west. They drain onto the lean-tos and the WPA Infill. Exterior storm leaders on the lean-tos drain rainwater to underground site piping. Storm water piping for the WPA Infill was not visible within the building and is likely concealed within the walls.

Abandoned toilet rooms exist at the lean-tos and the WPA Infill. Existing plumbing fixtures are in very poor condition or missing completely. An abandoned hot water heater is extant at the second floor of the Hangar 1 Lean-to (Photograph 1.6.5.10). Two service sinks are located at the south end of the west wall of Hangar 2 (Photograph C.3.9).

Exposed piping throughout exhibits visible corrosion in the form of rust (Photograph 1.6.5.11).



Photograph 1.6.5.11. Piping below second-floor plumbing fixtures in WPA Infill.

Fire Suppression Systems

The fire suppression systems are dry pipe automatic sprinklers throughout the building. There are five 6-inch dry pipe valves (Photograph 1.6.5.12; Photograph C.3.10), corresponding to the five zones: Hangar 1 Lean-to combined with the north side of Hangar 1; south side of Hangar 1; WPA Infill; south side of Hangar 2; and the north side of Hangar 2 combined with the Hangar 2 Lean-to. All dry pipe valves are dated 1938. Pipe sizing is by pipe schedule, and the pipe material is steel (Photographs C.3.11 and C.3.12; Photograph 1.6.5.13). All piping joints are threaded.



Photograph 1.6.5.12. Fire service water feed from site is 12 inches in the WPA Infill. The feed then splits to five 6-inch dry pipe valves. Note that the dry pipe valve cover is open, therefore out of service.

The building contains sprinklers in approximately 85% of its spaces. Sprinklers are missing most notably at the second floor center of the WPA Infill.



Photograph 1.6.5.13. View looking up at underside of roof showing sprinkler mains and branch lines in Hangar 1.

Site fire hydrants exist on the southwest corner and the north side of the WPA Infill. A post indicating valve is located on the site at the west corner of the building, but its purpose is unknown.

Fire hose valves are also within the facility, being fed from the local zone's fire sprinkler piping.

The condition of piping, fire sprinklers, and valves is very poor. Sprinklers are beyond their NFPA 13 service life. It is possible that obsolete piping, valves, and sprinklers could be abandoned in place. If desired, a couple of sprinklers and a dry pipe valve could be salvaged for historical display purposes only. The equipment manufacturer is Reliable, which is still in existence in the New York City area. All fire suppression equipment should be replaced with new components if the building is to be retained.

Fire water service enters the building in the west corner of the WPA Infill.

PART 2 – TREATMENT AND USE

2.1 TREATMENT RECOMMENDATIONS

The following treatment recommendations for the character-defining features of Hangars 1 and 2 and their auxiliary structures have been prepared in keeping with *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings*. Character-defining features are identified within a historic structure based upon the historical use of the structure, as well as the period of significance. They are the components which best portray the building's use over time and through history. In the case of Hangars 1 and 2, their utilitarian function is their salient characteristic and has guided identification of the structure's character-defining features. The period of significance begins in 1928 with their construction on the site, and ends in 1945 when use of the airfield shifted from a military installation to an Air Reserve Training facility.

Once a building's character-defining features have been established, the Secretary of the Interior's guidelines clearly outline the appropriate methodology for rehabilitation by calling for minimal deviation from the original use of the building, and retention of as much original material as possible. Deteriorated features are to be repaired rather than replaced, and new additions may not destroy original character-defining features, spaces, materials, or finishes. This directive includes those repairs which are intended to meet health and safety code requirements. The least degree of intervention possible is called for in all aspects of the rehabilitation process, and the cumulative impact of the rehabilitation is not to diminish the integrity of the building as a whole.

The treatment recommendations presented in this document adhere firmly to the guidelines and are intended to inform the rehabilitation of Hangars 1 and 2, regardless of the specific use that is ultimately determined for the site. The advantages and disadvantages of each treatment recommendation are presented in accordance with *The Secretary of Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings.* Given the extent of repairs and the degree of replacement required for the continued use of this building, the most appropriate standards and guidelines for this site are the *Standards for Rehabilitation* and the *Guidelines for Rehabilitating Historic Buildings.*

Exterior Features

Site and Building Symmetry

Retain current building arrangement and symmetry. Remove recent additions that detract from building symmetry, such as black fencing (installed to protect the public from falling masonry) and traffic barriers on the east side of Hangar 1.

- **Advantages**: Treatment is consistent with historical representation of building. If falling masonry is addressed, the fence is no longer necessary.
- **Disadvantages**: Retention of original site and building symmetry may limit options for future use of the building.

Style and Massing

Retain current building style and massing.

- **Advantages**: Treatment is consistent with historical appearance of the building.
- **Disadvantages**: Retention of historically appropriate style and massing may be costly compared to other treatments.

Monitor Structure

The monitor structure is a feature unique to Hangars 1 and 2 and was installed within the period of significance. It rests on the infill's existing structural second floor and while it is integrated into the surrounding buildings, additional structural support to accommodate its mass was never provided. The roof system, floor, and wood-framed walls are severely deteriorated. Due both to the structurally deficient design and to its poor condition, it is recommended that the monitor structure be disassembled after thorough documentation, with every attempt made to save as much of the framing system as possible. If the monitor structure is to be fully reconstructed, new structural supports should be installed to secure the lower floors, and new materials should be used for the structure itself to provide optimal stabilization. Original elements may be incorporated into the design, provided that they are intact and will not diminish structural stability.

- **Advantages**: Treatment records construction methodology and retains original material while removing safety hazard presented by current condition of this feature. Treatment provides for retention of original building appearance during the period of significance.
- **Disadvantages**: Removal of the monitor structure will alter the appearance of the hangars and result in loss of original material. This approach deviates from rehabilitation guidelines and implements reconstruction guidelines. If funding does not become available, it will result in the loss of a substantial character-defining feature.

Paving and Landscaping

Repair paving by replacing patched areas with material that matches the original material.

Consult early photographs, drawings, and specifications where available to determine and replicate original vegetation plan. Remove modern fencing and return site to period of significance appearance.

- **Advantages**: Improves appearance of site and surroundings, while maintaining the appearance of the site during the period of significance.
- **Disadvantages**: None.

Roof and Roof Features, including Steel Access Ladders

100% replacement of current deteriorated roof with a modified bitumen roofing system featuring a granular surface. Replace flashing, cast stone, and rain-management features where necessary with material and craftsmanship to match existing. Repair and reattach extant steel access ladders.

- **Advantages**: Re-establishment, to as full extent as possible, of original asphalt roll roof design, while providing multiple-layer protection, as well as fire and uplift resistance.
- **Disadvantages**: Treatment will result in some loss of original material.

Exterior Site Elements

Hydrants and Post Indicator Valves

Disconnect existing fire suppression system from fire water service and cap piping. Remove any loose paint and/or powdered rust. Secure any loose components in place and provide seismic bracing/support, as required.

- **Advantages:** Treatment results in no loss of original materials or workmanship, and protects against further corrosion.
- **Disadvantages:** Signs indicating that existing system is not functional will be required. Ongoing maintenance of protective finish is necessary.

Drain Grates and Access Covers

Determine function of areas beneath access covers and grates. Secure any loose elements and maintain in place.

- **Advantages:** Treatment results in no loss of original materials or workmanship.
- **Disadvantages:** Routine maintenance is necessary, albeit minimal.

WPA Infill Façades

Repair damaged elements of façade including broken or missing glass, damaged brick, and damaged or missing cast stone. Deconstruct exterior walls to reveal damaged structural supports only if necessary, using the least invasive methods possible to achieve structural stabilization. Use materials to match existing, including replacement brick and mortar. Replacement brick should match original in size, shade, texture, and sheen. Repoint with appropriate mortar.

- **Advantages**: Repairs will stabilize structure and retain historic appearance.
- **Disadvantages**: Cost of repair is greater than replacement.

Pilasters

Repair cracks, both surficial and structural. Obtain replacement brick that matches original material. Replacement brick should match original in size, shade, texture, and sheen. Repoint with appropriate mortar. Repair spalling and cracked concrete. Clean all exposed surfaces using acceptable methods.

- **Advantages**: Treatment will stabilize structure and improve appearance.
- **Disadvantages**: May result in some loss of original material.

Building Materials

Brick

The exterior brickwork can be selectively repointed, selectively replaced with salvaged brick, or selectively replaced with replacement brick. Areas of removal and replacement should occur around rusting steel lintels and wherever the façade shows evidence of brick dislocation, including bowing, cracking, and separation of brick courses.

Repointing should be performed per the guidelines in the current version of *Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings*.

Where brick must be removed from the façade, or where brick has already fallen, such brick should be collected and salvaged. Any remaining mortar should be removed via the gentlest means possible. Salvaged brick should be carefully stacked and stored for reuse during construction.

For replacement bricks, a minimum of five different shades/colors of iron-flecked brick should be sourced. Hudson River Valley brick suppliers should be preferred, since this was the documented source of the original brick. Replacement brick should match original in material, texture, and method of production (wire-cut). As well as size, shade, texture, and sheen. Replacement bricks should be submitted to the NPS and the New York State Historic Preservation Officer for approval, including the construction of mock-ups adjacent to original brickwork.

When laying brick in replacement areas, the new brick should be field mixed with salvaged brick to reduce the appearance disparity between old and new brickwork. There should be no unused salvaged brick at the conclusion of construction. Unused replacement brick should be carefully stored for use on subsequent Hangar Row maintenance tasks and rehabilitation projects.

Any cleaning of existing brick should be limited to gentle water washes and mild detergents, as specified by the project's historic architect and architectural conservator. No sand-, grit-, or media-blasting shall be performed on any masonry, stone, or concrete surface.

- **Advantages**: Minimizes removal of original material and retains integrity of workmanship.
- **Disadvantages**: Inadequately matched brick, craftsmanship, and mortar may result in visual discontinuity of repair.

Cast Stone

Cast stone is found at copings, sills, lintels, and column bases. Most cast stone should be retained in place, even when exhibiting deterioration or isolated spalling. Weathered cast stone exhibits a patina of age and does not require large-scale replacement, unless severe cement matrix problems or rusting reinforcement bars have caused extensive scaling or spalling. Small areas of damage should be repaired with mortar composites or left alone.

Drilled holes, mechanically damaged corners, and occasional spalls from rusting reinforcement bars and anchorage are repairable conditions that do not warrant the replacement of cast stone.

Cast-stone elements being retained should be gently cleaned with an alkaline pre-wash/acid afterwash chemical cleaning system used to clean limestone and other calcareous natural stones. No sand-, grit-, or media-blasting shall be performed on any masonry, stone, or concrete surface.

Because of the thin, dense mortar joints found in cast-stone installations, repointing should be done only if necessary and only by skilled masons to avoid chipping the edges of cast-stone units. Repointing should be performed per the guidelines in the current version of *Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings*.

Cast-stone repair and replacement should be performed per the guidelines in the current version of *Preservation Brief 42: The Maintenance, Repair and Replacement of Historic Cast Stone*.

Components should be patched or repaired where possible, while missing and severely damaged and/or deteriorated components are to be replaced in kind.

- **Advantages**: Minimizes removal of original material and retains integrity of workmanship.
- **Disadvantages**: Variation in craftsmanship or material may result in a poorly integrated repair.

Copper, including Flashing and Cladding

Copper Fascia above Hangar Doors

There are four extant copper fascias above the hangar door elevations, facing north and south at each hangar. These fascias are composed of original 16-gauge fluted coppers sheeting over vertical wood planking. Starting during World War II, the originally exposed copper sheeting was subsequently painted over through numerous military and civilian tenancies. Fading and erosion of the several paint layers has revealed a palimpsest of lettering and signage that is a strong character-defining feature of the hangars.

Repairs should address all open seams and joints in order to provide a weather-tight assembly. The formed copper emblem and raised medallion circles, along with any loose copper sheeting, should be reattached to the planking using the least intrusive means available. Maximum preservation of the original copper should be prioritized. High-quality brass or copper fasteners should be used for this purpose to prevent galvanic corrosion and staining. Existing dents, imperfections, creases, or superficial cracks in the copper elements should not provoke their replacement.

The faded and overlapping beige paint with black lettering should be stabilized, preserved in place, and left exposed to public view. If this is not feasible due to ongoing deterioration or technical limitations, the layers should be thoroughly documented through photography, x-radiography and other non-invasive methods, and then protected by a temporary coating which could feasibly be removed in the future, once again revealing the prior paint layers without damage.

If the temporary coating is required to be opaque, it should be a color match to the existing color. New lettering or an attempt to restore earlier signage should not be undertaken.

- **Advantages**: Minimal loss of original material, design, and workmanship.
- **Disadvantages**: Replacement is a less expensive alternative.

Aluminum

Repair aluminum windows where possible. If deterioration is beyond repair, replacement will match in design and profile.

- **Advantages**: Minimizes loss of original material. Matches original where possible.
- **Disadvantages:** Both repair and replacement are expensive.

Wireglass

Repair metal sash and reinstall glazing putty to secure existing wireglass. Extant wireglass panes, excepting those panes that are broken or missing, should be replaced in their original positions and orientations. Where original wireglass has been replaced, retain replacement glass panes. In openings where glass has been lost, replace with wireglass to match original.

- **Advantages**: Stabilizes and retains existing glass. Does not require replacement of non-wired glass and assures that new material will match original.
- **Disadvantages**: Wireglass to match historic material may be expensive.

Window Openings

Openings in which rusted structural elements have caused cracking, deterioration, and loss to the adjacent masonry should be carefully disassembled. Once the source of the condition has been identified and rectified, the openings should be repaired and reassembled.

- **Advantages**: Arrests deterioration and retains feature and configurations of façades and elevations.
- **Disadvantages**: Results in some loss of original masonry and metal.

Metal Sash

Preservation of the metal windows should be guided by *Preservation Brief 13: The Repair and Thermal Upgrading of Historic Steel Windows.*

The steel sash factory windows, and their original wireglass panes, are strong character-defining elements of the hangars. These windows are standard early-twentieth-century units, with stock 12-x-18-inch and 14-x-20-inch sash modules common on many such installations. Replacement parts and sash is in some cases still available from original manufacturers or distributors. The existing units range in condition from very good (e.g., at the monitor structure) to fair (most areas) to poor/missing (e.g., along the airfield elevation of Hangar 1 Lean-to, where several units lie in ruins on the adjacent interior floor.)

Steel windows in good to very good condition, with surrounding masonry in good condition, should be gently cleaned and repainted in situ. Windows with pivoting sash should be lubricated and maintained. Paint color selection should be consistent with that identified through field testing by a preservation laboratory.

Steel windows in fair condition (and steel windows in good to very good condition, but adjacent to deteriorating masonry or rusted lintels) should be carefully removed from their openings and rehabilitated in a controlled shop environment. Glass panes should be marked as to orientation and location before removal for later repositioning. Steel corrosion should be properly treated, highly deteriorated (i.e., rusted-through) members should be replaced in kind with new or salvaged members (see below), and the unit should be repainted. The extant wireglass panes, excepting those panes which are broken or missing, should be replaced in their original positions and orientations. Missing or broken panes should be replaced in kind.

Steel windows in poor, highly deteriorated condition, or those that are presumed missing, should be replaced in kind using sash of the same material, extrusion geometry, size, and operational

characteristics. Efforts should be made to salvage steel muntins, frames, or hardware from windows designated for replacement to be used as material to rehabilitate other windows.

If required or desirable for energy efficiency or fire resistance, supplementary glass panels should be attached to the interior of the steel windows. Such panels should be easily removable (without special tools or instructions) to permit periodic maintenance and cleaning by custodial personnel. Note that the addition of such panels will necessarily limit the pivoting function of these windows.

Steel windows in fair condition (or good condition but adjacent to deteriorating masonry or rusted lintels) should be carefully removed from their openings and rehabilitated in a controlled shop environment.

Highly deteriorated (i.e., rusted-through) members should be replaced in kind with salvaged or new members. All metal sash should be repainted.

- **Advantages:** Retains original material where possible.
- **Disadvantages:** Removal of sash from openings may result in damage to surrounding material.

Door Openings, Doors, and Elements

Openings

Openings in which rusted structural elements have caused cracking, deterioration, and loss should be carefully disassembled. Once the source of the condition has been identified and rectified, the openings should be reassembled.

- **Advantages:** Arrests deterioration. Retains features and configurations of façades and elevations.
- **Disadvantages:** Results in some loss of original material.

Hangar Doors (including Eight with Pilot Doors)

The hangar doors were assembled from a collection of discrete components, including aluminum channels, solid panels, windowed panels, steel casters, and related bolts and rivets. The end doors at each hangar elevation have narrower doors with cross-bracing and a pilot door.

All of the in-situ hangar doors were determined to be feasible candidates for rehabilitation. Because of the bolted-together construction of these units, it is possible to rehabilitate them by replacing in kind only those components which exhibit serious deterioration using a kit of parts established for this purpose. In most cases, the deteriorated components are the lower aluminum channels, the outer vertical channels, and/or the steel caster wheels. Components exhibiting only minor areas of deterioration, or superficial damage/dents, should not be replaced. Some, if not all, doors will need to be removed from the tracks and rebuilt horizontally in a controlled shop environment. Doors should be carefully marked, tracked, and returned to their original locations. It is recommended that a small hangar door rebuild facility be located onsite to prevent these critically important historic elements from leaving the immediate area. Missing door leafs at the north side of hangar are to be replaced in kind.

Glass panes in the hangar doors should be replaced in kind only if broken or missing. Original wireglass and previous replacement panes should remain in their current locations. All glass should be properly recaulked to prevent vibration and movement.

Weatherstripping should be reinstalled on all doors.

The three missing hangar doors (Hangar 1, north elevation) can be identified among the doors found piled in Hangar 2 (most of these doors, according to the NPS, are from the inward-facing elevations at the hangars now forming the Aviator Complex). Based on NPS approval, it is recommended that some needed replacement components can be retrieved from the severely deteriorated doors in this salvage pile, as many of these units are beyond feasible repair.

Repair existing doors and weather seals. Replace missing glazing in kind. Repair bottom tracks where possible and selectively replace severely deteriorated portions in kind. Repair overhead guide rails. Repair operational components. Replace missing door leafs at the north side of hangar in kind.

Pilot doors are severely deteriorated and do not provide security to the building. Since they do not perform their function, they should be replaced with materials and design to match existing. Doors should be photographed prior to removal.

- **Advantages:** Treatment of the hangar doors minimizes loss of original design, material, and workmanship, while returning functionality to the doors.
- **Disadvantages:** Repair of the bottom rail necessitates replacement of several existing concrete grade beams. Repair will also disturb concrete slab floors. Treatment of the pilot doors will result in the loss of original material.

Exterior Human-Scale Door Openings and Doors

Replace all doors and frames using original photographs and drawings for guidance. Photodocument all doors prior to removal. Doors should be code compliant. Code compliant operational hardware is also to be installed.

- **Advantages:** Retention of original appearance, assured security of the building, and adherence to code compliance.
- **Disadvantages:** Loss of original material.

Projections

Bay Window

This feature incorporates many of the elements found on other areas of the building and is to be addressed using the same treatment philosophy and methodology. Selectively remove brick from damaged areas, with care taken to preserve as much original material as possible. Perform structural repairs to steel supports as necessary. Repair aluminum sash and replace broken glass. Repoint brick with appropriate mortar once repairs are complete.

- **Advantages:** Increased structural stability of the feature and improved appearance.
- **Disadvantages:** Repair will result in loss of some original brick and mortar.

Interior Features

Use and Arrangement of Space

Retain current or compatible use of space. Retain current arrangement of space, with large open area in Hangars 1 and 2 and a division of space within Hangar 1 Lean-to and Hangar 2 Lean-to. Unoccupied areas are to be stabilized. Structural instability of monitor structure may warrant its removal.

- **Advantages:** Treatment retains historic appearance of building interior.
- **Disadvantages:** Limits the use of the building. Stabilizes, rather than rehabilitates, unused spaces, which are currently in poor condition. May result in loss of the monitor structure, which is unique to Hangars 1 and 2.

Exposed Masonry

As with exterior masonry, interior brickwork can be selectively repointed, selectively replaced with salvaged brick, or selectively replaced with replacement brick. Areas of removal and replacement should occur around rusting steel lintels and wherever the façade shows evidence of brick dislocation, including bowing, cracking, and separation of brick courses.

Repointing should be performed per the guidelines in the current version of *Preservation Brief 2: Repointing Mortar Joints in Historic Masonry Buildings*. Deteriorated and damaged areas should be cleaned, repaired, and repointed. Replacement brick should match original in size, shade, texture, and sheen. Repoint with appropriate mortar.

- **Advantages:** Minimal loss of original materials and workmanship; treatment ensures structural integrity.
- **Disadvantages:** Achievement of an acceptable match may be challenging, but is necessary.

Exposed Steel Construction

Structural steel elements are in sound condition with some areas of mild corrosion. It does not appear that the stability of the building is in jeopardy. Should further investigation reveal the need for repair, augmentation or upgrading of individual members is permissible. X-ray photography may be determined necessary in areas of great uncertainty.

Restoration of painted coatings may be undertaken by first removing spall and corrosion using mild mechanical methods, followed by application of a protective coating system compatible with existing coatings. Significantly deteriorated portions of columns may be selectively replaced with paint then applied to the new portions.

- **Advantages:** Minimal loss of original design, material, and workmanship. Protects steel from future corrosion.
- **Disadvantages:** The expense of this treatment may be greater than full replacement of damaged elements.

Exposed Roof Planking

The Standards and Guidelines for Rehabilitation specify in-kind replacement of deteriorated or missing areas of the existing tongue-and-groove roof planking. However, the extent of roof deterioration

observed on Hangar 1 and the lack of a roof on Hangar 2 inspire a strong recommendation of replacement for the entire roof system with fire-retardant treated wood. The roof coating should be built-up or modified bitumen, which most closely approximates the historic materiality of the roof.

- **Advantages:** Treatment replicates the original roof design and addresses restrictions on combustible materials.
- **Disadvantages:** This treatment will result in the loss of original material.

Wooden Catwalks and Steel Access Ladders

Repair and/or replace damaged portions of catwalk and coat entire assembly with intumescent paint.

Remove corrosion from steel access ladders and return to original finish. Repair and reattach as necessary.

- **Advantages:** Minimal loss of original design, materials, and workmanship.
- **Disadvantages:** Expense.

Cast-in-Place Concrete

Concrete throughout the building is in fair condition, although some areas of severe spalling and loss must be addressed. Where replacement is necessary, duplication of historic materials and detailing should be as exact as possible to assure a repair that is functionally and aesthetically acceptable. Work should be guided by *Preservation Brief 15: Preservation of Historic Concrete*, as well as the technical standards of the American Concrete Institute. Testing is recommended to assure compatible replacement material. The most recent version of all preservation briefs and preservation technical notes mentioned in this HSR can be found at http://www.nps.gov/tps/how-to-preserve/briefs.htm. Hard copies can be ordered at http://www.nps.gov/tps/education/sale-pubs.htm.

Where settlement of the interior concrete floors has occurred, causes should be determined and repairs should address only the damaged sections. The same is true of concrete header beams and at the pile-supported concrete grade beams into which hangar tracks are set. Deterioration mechanisms, including moisture ingress and corrosion of metal reinforcement, are to be identified and mitigated, with retention of as much original material as possible.

- **Advantages:** Treatment retains as much of original material as possible.
- **Disadvantages:** Expense.

Kalamein Doors

Human-scale metal doors are located in the east and west walls of Hangar 1. Door frames consist of formed steel over wood. A number of door openings at the east wall were in-filled with concrete masonry units or brick during adjacent lean-to renovations. Two metal overhead coiling doors exist at the west wall. Rolling hangar doors, addressed as part of the *Exterior Envelope: Hangar 1*, make up a large percentage of the north and south walls.

Retention of original material to the extent possible is desirable; however, code compliance may require replacement of doors, frames, and hardware. Where replacement is necessary, all original material is to be photodocumented prior to removal. Original doors will be stored as directed by the NPS.

- **Advantages:** This treatment calls for minimal replacement to minimize the loss of original design, materials, and workmanship. Treatment will result in code-compliant doors that meet functional performance criteria and are visually compatible with the original doors.
- **Disadvantages:** Loss of original material is likely.

Wood Panel Doors with Transoms, Level 2 of Lean-to 1

Retention of original material to the extent possible is desirable; however, code compliance may require replacement of doors, frames, and hardware. Where replacement is necessary, all original material is to be photodocumented prior to removal. Original doors will be stored as directed by the NPS.

- **Advantages:** This treatment calls for minimal replacement to minimize the loss of original design, materials, and workmanship. Treatment will result in code-compliant doors that meet functional performance criteria and are visually compatible with the original doors.
- **Disadvantages:** Loss of original material is likely.

Exposed Mechanical, Electrical, Plumbing, and Fire Suppression Systems (including Conduit and Piping)

Rehabilitation guidelines do not require the retention of every component of the exposed mechanical, electrical, plumbing, and fire suppression systems within the building. However, having been identified as character-defining features, it is recommended that significant and representative elements from each of the systems be identified and remain in place. Where possible and feasible, usable elements should be integrated into new systems. Existing chases and shafts should be used for installation of new systems. New systems are to be selected and installed in such a way that the original fabric of the building is neither damaged nor destroyed.

Mechanical

Identify representative or stylistically significant elements to be retained. Where necessary, remove any loose paint and/or powdered rust from retained elements. Disconnect and remove existing dormant control wiring. Disconnect existing radiators and cap piping. Provide seismic bracing/support as required. Install new heating system. Where possible, integrate original elements into new systems.

- **Advantages:** Minimizes loss of original materials and workmanship. Protects against further corrosion. Ensures compliance with seismic code requirements.
- **Disadvantages:** Loss of original systems.

Electrical Conduit and Electrical Panels

Identify representative or stylistically significant elements to be retained. Remove any loose paint and/or powdered rust from retained elements Remove existing dormant wiring and cap conduit at power source. Install new conduit and wiring to suit building function. Deactivate historic electrical panels (at first floor) and remove existing dormant wiring. Install new electrical service, panels, and power distribution at new location on first floor. Where possible, integrate original elements into new systems.

- **Advantages:** No loss of original materials or workmanship. Protects existing conduit from further corrosion.
- **Disadvantages:** Time consuming and shifts status of these features from functional to superfluous. Installation of operable wires is required. Requires ongoing maintenance of protective finishes.

Plumbing

Identify representative or stylistically significant elements to be retained. Remove any corrosion and/or powdered rust from retained elements. Disconnect and cap existing water and drain lines. Repair and clean existing damaged fixtures. Cap piping where existing fixtures are missing. Where possible, incorporate original elements into new plumbing system. Provide seismic bracing/support as required.

- **Advantages:** No loss of existing original materials and workmanship. Protects piping from further corrosion.
- **Disadvantages:** Time consuming. Shifts status of these features from functional to superfluous. Installation of operable plumbing is required. Requires signs to indicate that fixtures are not functional. Requires ongoing maintenance of protective finishes.

Interior Fire Suppression System

Identify representative or stylistically significant elements to be retained. Remove any corrosion and/or powdered rust from retained elements. Disconnect existing fire suppression system from fire water service and cap piping. Where possible, incorporate original elements into new fire suppression system. Provide seismic bracing/support as required.

- **Advantages:** Treatment minimizes loss of original materials and workmanship, and protects against further corrosion.
- **Disadvantages:** Time consuming. Shifts status of these features from functional to superfluous. Installation of operable plumbing is required. Requires signs to indicate that fixtures are not functional. Requires ongoing maintenance of protective finishes.

Period Light Fixtures

There are two general types of significant light fixtures at the hangars. These are (1) the still extant incandescent pendant and sconce fixtures dating to the original construction campaigns and (2) early World War II–era fluorescent light fixtures found throughout the complex, but primarily in Hangar 1 Lean-to. In many cases, the fluorescent lighting replaced the original fixtures during the first 10 years of occupancy.

The incandescent light fixtures, especially the vertically mounted external sconces and the porcelain enamel pendant fixtures (in Hangar 2 and elsewhere), should be rehabilitated for reuse, as feasible. The simple design of these fixtures lends itself to the acceptance of new wiring and bulb sockets. If additional lighting is required, complementary fixtures should be supplementary to the retention and reuse of the originals. Should the historic light fixtures not be feasible for rehabilitation, they should be stabilized and preserved in place without disturbance.

The fluorescent light fixtures should be stabilized in place as necessary, since they are unlikely to be serviceable and/or practical for reuse.

- **Advantages:** Treatment retains original appearance and function of features.
- **Disadvantages:** Expense.

Painted Finishes, including Painted Plaster at WPA Infill Stairways

Prime and paint surfaces as necessary with intent of creating sound finish coat, while retaining as much original material as possible. Select new paint that is compatible with existing, and retain as much stylistic detailing as possible.

- **Advantages:** Addresses deteriorated surface coatings. Retains original finishes in the event that further investigation is required.
- **Disadvantages:** Patinated appearance is lost in favor of stabilized coatings and improved appearance.

Plasterwork

Remove existing damaged portions of plaster in rectangular sections. Install gypsum board to patch affected areas, followed by a plaster skim coat.

- **Advantages:** Matches appearance of original plaster.
- **Disadvantages:** May require more than one layer of gypsum board to align face of gypsum board with existing plaster.

Graphics

Retain original graphics and signs in place where possible. Signs that are not attached to the building may be removed if they are believed to be in jeopardy and stored with the NPS curator. Faded graphics are not to be inpainted but are to be left intact.

- **Advantages:** Treatment recommendation retains original graphics.
- **Disadvantages:** The potential for further deterioration is not addressed.

2.2 CODE ANALYSIS

Original Building Code

While New York City first instituted rudimentary building safety (fire) codes as early as 1850, it was not until 1938 that the city issued the first modern building code. This 1938 code was in effect until the late 1960s, when it was replaced by the 1968 code.

Hangars 1 and 2, originally constructed by the city, would not have been subject to the 1938 code, as both the original and WPA-era construction campaigns preceded its enactment. By World War II, the hangars were under federal control, which has generally been the case since that time.

Applicable Code

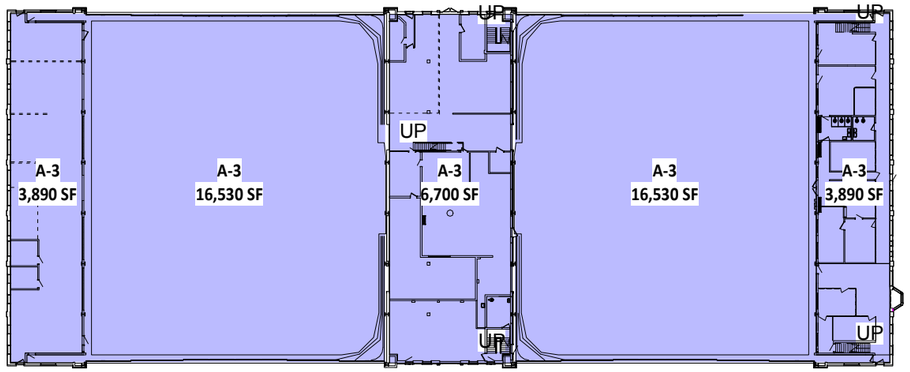
This HSR analyzes a potential rehabilitation of the hangars per the most recent edition of the International Building Code (IBC), which is the current code used for buildings on federal government property.

Because the hangars are unlikely to be rehabilitated successfully as aircraft hangars, the code analysis will instead consider a hypothetical, generalized rehabilitation for a museum use. Such a use is consistent with a major mission of the National Park Service, which is the interpretation of historic sites. This use is also found at Hangar Row in the recently rehabilitated visitor center. This hypothetical proposed use would expand the museum capacity of Gateway National Recreation Area by featuring displays of historic aircraft, collection artifacts, and/or the recreation of historic maintenance spaces in order to interpret the experience of pre-1945 civilian and military operations at the rehabilitated facility.

Per the current IBC, a museum use would likely be classified as an assembly occupancy (Group A-3). A mixed occupancy with some office use (Group B) would be even more realistic, given the need for some associated administrative space in support of hypothetical museum operations. A possible scenario showing a museum use is illustrated on Figure 2.2.1, where all areas have been assigned A-3, with the exceptions of the second floor of the Hangar 1 Lean-to and the WPA Infill mezzanine, which have been assigned B. This division roughly reproduces the former division between office and maintenance/crew spaces discussed in previous sections. In the remainder of the code analysis, we will discuss in general terms the upgrades necessary to accommodate the mixed and separated A-3/B use.

Fire-Resistant Construction

Per the IBC, the hangars would be classified under IBC construction type I-B, which would require the structural frame, bearing walls, and floor slabs to meet a two-hour fire-resistance rating. Based on the observed compositions of these components, it appears that the existing concrete floor slabs and masonry walls throughout would achieve this rating without additional modification. Fire-stopping and UL-rated assemblies would have to be added in existing and new areas of pipe penetration, as would fire dampers where mechanical ducts run through rated assemblies. The mezzanine floor would not meet a two-hour fire rating and would need to be modified or replaced.



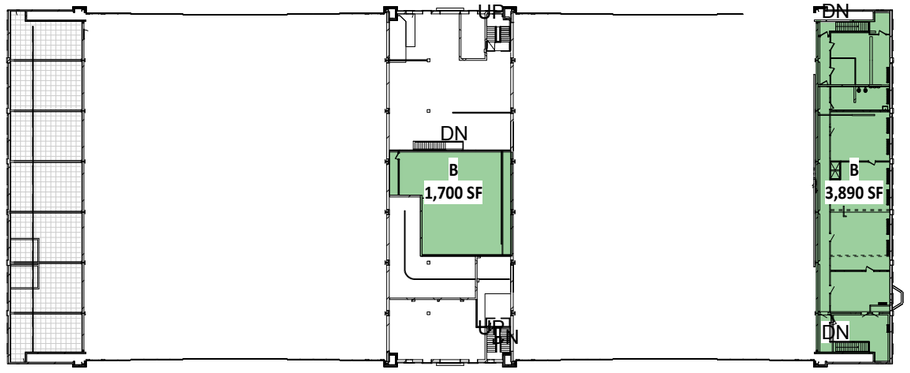
LEVEL 1

NOT TO SCALE

LEVEL 1

Use	Area	SF	Occ	Req Exit width*
Assembly (A-3) (15 net)	Hangar 2 Lean-to	3,890	259	39"
	Hangar 2	16,530	1,102	165"
	Infill Level 1	6,700	447	67"
	Hangar 1	16,530	1,102	165"
	Hangar 1 Lean-to	3,890	259	39"
Business (B) (100 gross)	N/A			

*Occupant Load x 0.15, total cumulative width of all exit doors, min 32" each



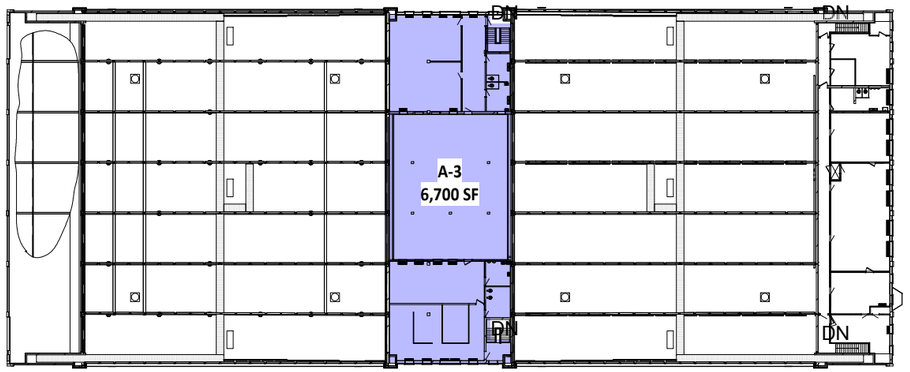
INFILL MEZZANINE & HANGAR 1 LEAN-TO LEVEL 2

NOT TO SCALE

INFILL MEZZANINE & HANGAR 1 LEAN-TO LEVEL 2

Use	Area	SF	Occ	Req Exit width*
Assembly (A-3) (15 net)	N/A			
Business (B) (100 gross)	Infill Mezzanine	1,700	17	32"
	Hangar 1 Lean-to	3,890	39	32"

*Occupant Load x 0.15, total cumulative width of all exit doors, min 32" each



INFILL LEVEL 2

NOT TO SCALE

INFILL LEVEL 2

Use	Area	SF	Occ	Req Exit width*
Assembly (A-3) (15 net)	Infill Level 2	6,700	447	67"
Business (B) (100 gross)	N/A			

*Occupant Load x 0.15, total cumulative width of all exit doors, min 32" each

(project north)

N

ASSUMPTIONS

Hypothetical proposed use:
Museum with office space

Mixed occupancy:
A-3/B

Construction Type: I-B
2-hour fire resistance required for structural elements

Figure 2.2.1

Code Analysis

1" = 60'-0"

The exposed steel columns and trusswork supporting the main hangar bays would have to be protected with additional materials to achieve a two-hour fire rating. Such protection is typically achieved through enclosure in concrete or gypsum board, spraying with fiber-reinforced cementitious materials, or applications of intumescent (heat-expansive) coatings. Based on the proposed reuse of the hangars as an interpretive museum, it would be most appropriate to use intumescent coatings to achieve this rating, as they would preserve the original expression of the exposed steel.

Egress

The hangar would have been initially designed for a limited number of technicians and pilots working in the main hangar spaces, and perhaps double or triple the number of occupants in offices and shops located in the lean-tos and the WPA Infill. These occupants had several paths out of the building, depending on the location. Occupants located in the hangars could exit directly through the open hangar doors or, when closed, the pilot doors. Occupants located in the adjacent shops at the Hangar 1 and Hangar 2 Lean-tos could exit north or south through exterior doors. Occupants located on the second stories of Hangar 1 Lean-to and the WPA Infill could exit through either north or south stairwells protected by kalamein fire doors and fireproof (e.g., brick with plaster) construction. Only the occupants of the infill mezzanine were limited to one exit route—the single unenclosed stair run leading down to Level 1. Because this was only one room, this may have been acceptable, given contemporary practice.

To meet IBC means-of-egress requirements for the hypothetical use, it was necessary to generate approximate occupancy counts for the various spaces (see Figure 2.2.1). These counts are based on area per Table 1004.1.1 of the IBC. Because a mixed museum/office use generates higher occupancy counts than a maintenance or utility use, additional means of egress would be necessary from the main hangar bays, as the sliding hangar doors would presumably be closed. Such egress could be achieved by establishing a horizontal exit through the walls separating the lean-to from the main hangar bays, if these walls were to be upgraded to two-hour rated walls.

ADA

In addition to meeting the standards of the IBC, a hypothetical museum rehabilitation of the hangars would be required to meet ADA requirements for a public building. Because of the early date and subsequent military uses of the hangars, little thought has gone into making the hangars accessible for those with disabilities. Some of the major modifications likely to be necessary for compliance would include:

- Elevator to the upper floors of Hangar 1 Lean-to and the WPA Infill.
- Reconfiguration of toilet rooms to accommodate a 60-inch turning circle in at least one stall, as well as a minimum 36-inch-wide approach.
- Lowering/replacement of at least one sink and one toilet in each toilet room, with appropriate ADA-compliant fixtures and drain pipe protection.
- Additional accessible toilet rooms.
- Modification of raised thresholds at doorways (e.g., between main hangar bays and lean-tos).
- Ramps to meet raised thresholds at exterior entrances to lean-tos.
- Directional, room, and egress plan signage in braille.
- Replacement of door hardware.

Mechanical, Electrical, Plumbing, and Fire Suppression (Sprinkler) Systems

As described in earlier sections, particularly 1.6.5, the current status of the mechanical, electrical, plumbing, and fire suppression systems is largely inoperable. To comply with the requirements of the IBC for a hypothetical museum occupancy, major modifications would include:

- Replacement of heating, ventilation, and air conditioning (HVAC) systems throughout.
- Replacement of electrical power and lighting systems throughout.
- Replacement of plumbing supply and drainage systems throughout.
- Provision of new toilets, urinals, and water fountains for increased occupant load.
- Replacement of fire suppression (sprinkler) systems throughout all spaces.

Appendix A: Bibliography

Electronic Documents

Bender, Donald E.
2004 The Nike Missile System: A Concise Historical Overview. Electronic document, http://alpha.fdu.edu/~bender/N-view.html, accessed November 19, 2012.

Desmond, Tim
2008 Roman Catholic Churches of Brooklyn, N.Y. Electronic document, http://mysite.verizon.net/timdesmond/files/churches.htm, accessed November 2011.

Floyd Bennett Field Task Force
2011 Naval Air Ferry Command 1943-1945. Electronic document, http://kerdrill.tripod.com/id6.html, accessed November 16, 2011.

Freeman, Paul
2012 Abandoned & Little-known Airfields. Electronic document, www.airfields-freeman.com, accessed February 17, 2012.

Gasero, Russell L., compiler
2000 Chronological List of Congregations, 1628-2000. Electronic document, http://images.rca.org/docs/archives/chronocongregations.pdf, accessed February 15, 2012.

U.S. Navy
2011 OPNAV Notice 05400 for fiscal year 1960. Electronic document, http://www.vpnavy.com/misc_13/opnav05400_02_10mar2007.gif, accessed November 16, 2011.

Wrenn, Tony P.
2002 *General History of the Jamaica Bay, Breezy Point and Staten Island Units, Gateway National Recreation Area, New York, New York.* Originally prepared in 1975. Electronically reproduced, formatted and edited, www.nps.gov/history/history/online_books_gate_WrennReport.pdf, accessed November 16, 2011.

X Prize Foundation
2011 Incentivized Competition Heritage, 1900s: Breakthroughs in Aviation. Electronic document, http://www.xprize.org/x-prizes/incentivized-competition-heritage, accessed November 16, 2011.

Manuscripts

Bureau of Aeronautics
1925-47 General BUAER Correspondence, Folder NA68, Box 497, Records of the Bureau of Aeronautics, Record Group 72; National Archives at College Park, College Park, Maryland.

Bureau of Yards and Docks

1940 Lease between Commissioner of Docks, City of New York and The United States of America, Contract NOd-1347.
[Lease dated February 8, 1940 for a 715,000 square foot parcel (16.4 acres) adjoining the Coast Guard Air Station on which to build a seaplane base]; Brooklyn C33 to BR.2; Box No. 835; Naval Property Case Files, 1941-1958; Records of the Bureau of Yards and Docks, Record Group 71; National Archives at College Park, College Park, MD.

1941-58 General Correspondence, Naval Property Case Files, Brooklyn Folder: File W333-5 toBR-5&6; Box No. 826; Naval Property Case Files, 1941-1958; Records of the Office of the Bureau of Yards and Docks, Record Group 71; National Archives at College Park, College Park, MD.

Department of Docks

1928-41 Department of Docks, Annual Reports. Department of Records and Information Services, City of New York Municipal Archives.

Department of the U.S. Navy

1950 Joint use agreement between the Department of the U.S. Navy and U.S. Air Force for Naval Air Station (Floyd Bennett Field), New York, dated March 31, 1950. File W333-5 to BR-5&6; Box No. 826; Naval Property Case Files, 1941-1958; Records of the Office of the Bureau of Yards and Docks, Record Group 71; National Archives at College Park, College Park, MD.

Rizzo, Paul

n.d. Correspondence and ephemera related to his flying service. Floyd Bennett Field File, Cradle of Aviation Museum, Garden City, Long Island, New York.

Tobin, Austin J., Executive Director, Port of New York Authority. Letter sent to Rear Admiral John J. Manning, Chief, Bureau of Yards and Docks regarding the negotiations to use Floyd Bennett Field as a civil aviation air terminal, dated July 10, 1947. Brooklyn W33-5 to BR-5 & 6; Box No. 826; Naval Property Case Files, 1941-1958; Records of the Bureau of Yards and Docks, Record Group 71; National Archives at College Park, College Park, MD.

War Diary, NAS Floyd Bennett

1942 2 April 1942; World War II War Diaries, compiled 12/07/1941-12/31/1945; File NA68/A12-1, 10/EOM/1bd, Serial #10,018, Records of the Office of the Chief of Naval Operations, Record Group 38; National Archives at College Park, College Park, Maryland.

9 April 1942; World War II War Diaries, compiled 12/07/1941-12/31/1945; File NA68/A12-1, Serial #10,027, Records of the Office of the Chief of Naval Operations, Record Group 38; National Archives at College Park, College Park, Maryland.

1942; World War II War Diaries, compiled 12/07/1941-12/31/1945; File: Personal Interviews made by BUAERO, Mar to Oct, 1942, page 265, Records of the Office of the Chief of Naval Operations, Record Group 38; National Archives at College Park, College Park, Maryland.

Maps, Plans, and Photographs

Lofs, Charles
1818 *Topographical Survey of the Western Part of Long Island exhibiting the Routes by which an Enemy may approach (sic) the City of New York from the Atlantic Ocean*. Commenced by Order of B.[rigadier] General J. G. Swift-October 1818. National Archives Records Administration Record Group 77b, Headquarters Map File D41.

M. Paul Friedberg and Partners, Hardy Holzman Pfeiffer Associates, Edwards and Kelcey, Inc., and Trans Urban East Organization
1980 *Floyd Bennett Field, Gateway National Recreation Area, Environmental Inventory and Prelimary Land-use Plan.* Map No. 16.

New York City, Department of Docks
c. 1929 *Layout of Municipal Airport, Floyd Bennett Field, Flatbush Avenue, Borough of Brooklyn*. NPS Drawing No. 646/41929A.

1935 *Location of Runways, Floyd Bennett Field, Brooklyn, New York.* WPA Project No. 234-F-34.

Sanborn Map Company
1930 *Insurance Maps of Brooklyn, New York.* Volume 19. Sheet #82.

Sloane, Eric
1935 *Ye Mappe of Floyd Bennett.* On file at the Cradle of Aviation Museum, Garden City, Long Island, New York.

U.S. Department of the Navy
1944 Photograph No. 291508, "Aerial of NAS, N.Y.," December 17, 1944; Records of the Department of the Navy, Record Group 80G; Still Pictures Branch, National Archives at College Park, Maryland.

1945 "U.S. Naval Air Station, New York, N.Y., Floyd Bennett Field, Survey Map, Primary Monuments." Plan #646-62339, NPS Technical Information Center, Denver Service Center, Denver, Colorado.

1952 "Master Shore Station Development Plan, Part II, Section 1, Missions And Functions, 1 December 1952. On file at NPS Gateway NRA Headquarters (Building 210), Fort Wadsworth, Staten Island, New York.

1956 "Master Shore Station Development Plan, Part III, Section 2, General Development Plan, Existing & Planned Peacetime (Conditions As Of 30 June 1956)"[Cartographic Record]; Naval Property Case Files, 1941-58; File Brooklyn W33-5-BR8; Records of the Bureau of Yards and Docks, Record Group 71; National Archives at College Park, College Park, Maryland.

United States Geological Survey
1897 *Brooklyn.* USGS 15 minute quadrangle. Electronic document, http://store.usgs.gov, accessed October 31, 2011.

Newspaper and Journal Articles

Boston Globe
1931 "Mighty Air Force To Take Part In Mimic Warfare In May," 15 March:A18.

Brooklyn Daily Eagle
1930 "Thirty Seek Space In Floyd Bennett Field Hangars," 20 March:17.

1931 "Vause To Take Keller's Place In Pier Grilling," 12 July:1.

1931 Aviation advertisements, 29 November:D10.

1940 "Floyd Bennett Civilians Unite To Forestall Navy Purchase," 23 October:11.

1947 "Order Guard Units Activated at Once," 15 February:3.

Brooklyn Union
1876 "Barren Island," 4 September.

Chicago Daily Tribune
1938 "New York Pours 40 Million Into City Air Fields," 2 September:7.

Cleveland, Reginald M.
1933 "Contact" [aviation column]. *New York Times,* 29 October:XX6.

1934 "Contact" [aviation column]. *New York Times,* 25 November:XX7.

Haitch, Richard
1972 Airport, Housing Project or National Park? *New York Times,* 28 May:A1.

Hewens, Francis
1940 Storm Over City Field. *New York Times,* 10 November:163.

Kieran, Leo A.
1931 Municipal Airport Is Ready. *New York Times,* 17 May:128.

Kiernan, Leo A.
1931 Find Airport Inaccessible: Airline Operators Urge Better Transit Facilities to Floyd Bennett Field – Weather Good There. *New York Times,* 6 December:XX211.

Long Island Star Journal (Long Island City, New York)
1946 "City May Buy Bennett Field," 26 August:2.

Lyman, Lauren D.
1930 Floyd Bennett Field Grows From Sand Waste. *New York Times,* 20 July:XX6.

1931 Air Armada To "Attack" City. *New York Times,* 17 May:128.

1931 Ocean Airways Next. *New York Times,* 12 July:XX8.

1931 Fly A Year With Safety. *New York Times,* 18 October:125.

1933 City Airport Has Future. *New York Times,* 13 August:XX6.

1934 City Raises Airline Bid. *New York Times,* 9 December:XX7.

1935 Better Base For Newark. *New York Times,* 1 September:XX8.

Miller, Benjamin
1998 "Fat of the Land: New York's Waste – Garbage", *Social Research*, [quarterly journal of the New School for Social Research] 65(1):75-99.

New York Evening Post
1930 "$1 Air Rides Sell Fast," 21 April:11.

New York Times (NYT)
1880 "A Woman's Romantic History," 17 May:2.

1910 "More Increases Of Salaries," 4 January:10.

1928 "Fast Planes To Cut Mail Run To Coast," 25 September:30.

1928 "$390,000 More Graft Traced To Philips," 9 October:12.

1929 "Calls Bennett Field Failure As An Airport," 19 January:20.

1929 "Suggests Airport By 'Fill' In Harbor," 31 January:14.

1929 "Chamberlin Defends Floyd Bennett Field," 9 February:9.

1929 "Air Mail Terminal At Newark Opened," 18 February:12.

1929 "Expanding Aviation," 6 March:28.

1929 "More City Airports Urged By Walker," 5 April:12.

1929 "Jersey City Leases Ground For Airport," 9 May:19.

1929 "Airport To Aid Flatbush," 27 October:RE2.

1929 "City Votes $1,540,000 For Airport Hangars," 17 December:24.

1929 "City Ready To Build Airport Hangars," 23 December:4.

1930 "Airport Bids Are Opened," 8 January:55.

1930 "Structural Steel Dull," 10 January:35.

1930 "Byrd Will Dedicate City Airport Today," 26 June:3.

1930 "Byrd Dedicates Bennett Air Field," 27 June:30.

1931 "City To Dedicate Airport On May 23," 16 February:14.

1931 "Chamberlin Is Sales Head," 9 April:13.

1931 "Navy Pilots Thrill Crowd By Stunts," 17 May:33.

1931 "Air Show Dedicates Floyd Bennett Field," 24 May:1.

1931 "Merchants To Press Fight For Mail Port," 26 May:18.

1931 "Naval Orders," 2 July:54.

1931 "Plane 'Ferry' Service Links City's Airports," 4 September:21.

1932 "Plans Air Pilot School," 27 February:20.

1932 "Transatlantic Fliers Join Hands On Staff Of New School Of Aviation," 1 May:XX6.

1932 "Air Express Line To Coast Open Soon," 2 December:23.

1934 "Air Mail Offices Put In Brooklyn," 17 February:6.

1934 "Airline To Shift To Bennett Field," 16 October:25.

1934 "City Airport Wins TWA As A Tenant," 18 November:N1.

1934 "Nine In The House Ask Airport Shift," 6 December:15.

1934 "Air Mail Terminal In City Is Barred," 7 December:2.

1935 "Expanded Air Facilities Pledged By Mayor At Airport Dedication," 6 January:N1.

1935 "Airline Moves Base Here," 14 July:N2.

1935 "Jersey City To Get WPA Stadium Fund," 26 September:18.

1935 "Reserve Aviators Ousted From Base," 20 October:21.

1935 "City's Air Field To Be Used By T.W.A.," 28 November:38.

1936 "Coast Guard Goes To Bennett Field," 9 January:17.

1936 "New Fund Speeds Free Trade Zone," 14 May:27.

1937 "To Handle Small Plane," 30 May:137.

1938 "Coast Guard Opens New Air Base Here," 18 June:17.

1939 "William Lansing," 22 March:29.

1939 "Marines Seek Would-Be Fliers," 24 July:3.

1939 "Getting Ready To Ship American Bombers To England," 29 October:35.

1940 "Text of Mayor's Message Submitting His Executive Budget To Estimate Board," 2 April:19.

1940 "Navy Base Takes Shape," 14 April:XX4.

1940 "New Ocean Airline Speeds Up Plans," 17 July:23.

1940 "Navy May Acquire Brooklyn Airport," 6 August:37.

1941 "Accent On War Flying," 16 March:XX5.

1941 "Free Flying Courses Offered," 20 March:17.

1941 "Bombers Crated For Britain," 30 March:XX4.

1941 "Navy Closing Deal For A Great Base At Bennett Field," 27 April:1, 34.

1941 "Navy Base To Expand," 4 May:XX4.

1941 "Changes In Navy Field," 25 May:XX6.

1941 "500 Navy Men Move Into Bennett Field," 27 May:25.

1941 "From Lot To Airport," 13 July:XX10.

1977 "William Goldsmith, 93, Of Engineering Concern," 18 August:24.

Perlmutter, Emanuel
1940 "Navy Pushes Base In City," 7 January:148.

1940 "Navy Eyes N.Y. Field," 18 August:119.

1941 "City Lacks Field Space," 16 February:XX5.

1941 "Make Field Air Station," 6 April:XX5.

Shipler, David
1970 1-Billion State Development Plan For Bennett Field Scored by City. *New York Times,* 25 May:33.

Skyscrapers [US Naval Air Station New York]
1966 "Change of Hands: The Beginning," 20 May:6.

The Sun [Baltimore, Maryland]
1939 "To Build Air-Defense Base At Brooklyn," 28 November:2.

1940 "U.S. Navy Seeks To Purchase Floyd Bennett Field For Base," 7 September:9.

Wall Street Journal (WSJ)
1931 "N.Y. Airport Lighting," 20 May:5.

1931 "Curtiss-Wright Service," 1 September:2.

Werrell, Kenneth P.
2010 "Fiasco" Revisited: The Air Corps & the 1934 Air Mail Episode. *Air Power History* 57 (1):12-29.

Wolff, Craig
1989 4 Chinese Acrobats Vanish as Interpreter Seeks Asylum: Acrobats Vanish Days Before Return to China. *New York Times,* 9 August:B1.

Published Sources

Bednarek, Janet R. Daly
2001 *America's Airports: Airfield Development, 1918-1947.* Texas A & M University Press, College Station, Texas.

Binder, Paul
2013 *Never Quote The Weather To A Sea Lion: And Other Uncommon Tales from the Founder of the Big Apple Circus.* AuthorHouse, Bloomington, IN.

Black, Frederick R.
1981 *Jamaica Bay: A History. Gateway National Recreation Area, New York, New Jersey*. Cultural Resource Management Study No. 3. Prepared for the Division of Cultural Resources, North Atlantic Regional Office, National Park Service, U.S. Department of Interior, Washington, D.C. [Reformatted and edited by James L. Brown in 1996-1997].

Blakemore, Porter R. and Dana C. Linck
1979 *Historic Structures Report, Historical Data Section, Archeological Data Section, Floyd Bennett Field, Gateway National Recreation Area, Volume 1*. U.S., Department of the Interior, National Park Service, Denver Service Center, Mid-Atlantic/North Atlantic Team, Branch of Historic Preservation, Denver, Colorado.

Bureau of Yards and Docks, Department of the Navy
1947 *Building the Navy's Bases in World War II. History of the Bureau of Yards and Docks and the Civil Engineer Corps. Volume I.* United States Government Printing Office, Washington, D.C.

Cantwell, Gerald T.
1997 *Citizen Airmen: A History of the Air Force Reserve, 1946-1994.* Air Force History and Museum Program.

Cody, Sarah K. and John Auwaerter
2009 *Cultural Landscape Report For Floyd Bennett Field, Gateway National Recreation Area, Brooklyn, New York: Site History. Existing Conditions. Analysis And Evaluation.* Olmstead Center for Landscape Preservation, National Park Service, Boston, Massachusetts.

Davies, R. E. G.
1964 *A History of the World's Airlines.* Oxford University Press, London.

Kaufman, Herbert
1952 *Gotham in the Air Age.* Harcourt, Brace and Company, Inc., New York.

Kierstead, Mathew A. (PAL)
2010 Floyd Bennett Field/U.S. Naval Air Station, New York Historic District National Register of Historic Places Registration Form.

Leonard, John William
1922 *Who's Who In Engineering: A Biographical Dictionary Of Contemporaries, 1922-1923.* John W. Leonard Corporation, Brooklyn, New York.

Morel, John E., First Lieutenant, Artillery
1957 Helicopter Operation In Congested Areas, *Army Aviation Digest,* Vol. 3, No. 1:18-21.

New York City, Bureau of City Chamberlain
1916 *New York City's Administrative Progress, 1914-1916: A Survey of Various Departments Under the Jurisdiction of the Mayor*. Henry Brubre, Chamberlain, City of New York, May, 1916.

New York City, Department of Docks
1930 *Fifty-Eighth Annual Report of the Department of Docks of the City of New York. For the Year Ending December 31, 1929.*

1933 *Sixty-First Annual Report of the Department of Docks of the city of New York*. *For the Year Ending December 31, 1932.*

New York State, Adjutant General
1947 *Annual Report of the Adjutant General For the Year 1946.* New York State Legislative Document (1947) No. 31.

1948 *Annual Report of the Adjutant General For the Year 1947.* New York State Legislative Document (1948) No. 55.

New York State, Chief of Staff
1950 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1949.*

1953 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1952.*

1954 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1953.*

1955 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1954.*

1958 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1957.*

1959 *Annual Report of the Chief of Staff to the Governor for the Division of Military and Naval Affairs For the Year 1958.*

1962 *Annual Report 1961. Division of Military & Naval Affairs: New York Army National Guard, New York Naval Militia, New York Air National Guard, New York Guard.*

1965 *Annual Report 1964. Division of Military and Naval Affairs.*

1971 *1970 Annual Report of the Division of Miltary and Naval Affairs.*

Panamerican Consultants, Inc.
2003 *Final Report. Cultural Resources Baseline Study, Jamaica Bay Ecosystem Restoration Project, Kings, Queens and Nassau Counties, New York.* Prepared for Northern Ecological Associates, Inc., Portland, Maine, under contract to the U. S. Army Corps of Engineers, New York District, Environmental Analysis Branch, New York, New York.

Ramsay, Charles George and Harold Reeve Sleeper,
1941 *Architectural Graphic Standards, Third Edition*, John Wiley & Sons, Inc.: New York.

Ravenstein, Charles A.
1984 *Air Force Combat Wings: Lineage and Honors Histories, 1947-1977.* Office of Air Force History, United States Air Force, Washington, DC.

Reilly, H. V. Pat
1983 *A Pictorial History of Teterboro Airport, 1918 to 1983.* Aviation Hall of Fame of New Jersey, Teterboro, New Jersey.

Roberts, Michael D.
2000 *Dictionary of American Naval Aviation Squadrons. Volume 2. The History of VP, VPB, VP(HL) and VP(AM) Squadrons.* Naval Historical Center, Department of the Navy, Washington, D.C.

Roseberry, C. R.
1966 *The Challenging Skies: The Colorful Story of Aviation's Most Exciting Years, 1919-1939.* Doubleday & Company, Inc., Garden City, New York.

Solberg, Carl
1979 *Conquest of the Skies: A History of Commercial Aviation in America.* Little, Brown and Company, Boston.

Tarrant, Legare K., Brigadier General
1952 52d AAA Brigade, Ft. Wadsworth, N.Y., *Antiaircraft Journal,* September-October:43

Wood, John Walter
1940 *Airports: Some Elements of Design And Future Development.* Coward-McCann Inc., New York.

Appendix B: Additional Photographs for Section 1.4 – Physical Description of Hangars 1 and 2

LIST OF PHOTOGRAPHS

Photograph **Page**

B.1 Exterior view across hangar pocket to south, showing east exterior elevation and clerestory B.1
B.2 Exterior roof-level view showing brick deterioration around clerestory windows B.1
B.3 Exterior roof-level view showing hangar pocket and associated flashing to second-floor roof B.2
B.4 Elevation of east wall looking up towards exposed roof planking showing infilled door B.3
B.5 Elevation of east wall at southernmost bay, showing infilled door and south hangar door pocket B.4
B.6 General view of east interior wall, looking north B.5
B.7 Exterior view of boarded window at east elevation, showing cracking in brickwork B.6
B.8 Exterior roof-level detail view of through-wall copper scupper at east elevation B.6
B.9 View to east showing entrance to Room 8-113 ..... B.7
B.10 View to the north showing entry to latrine and hangar window to left B.8
B.11 View east towards later exterior door B.9
B.12 View of south wall showing entry door B.10
B.13 View to east showing partial-height partition B.11
B.14 Detail view of multiple paint layers at wood door frame B.12
B.15 Detail view of glass pane showing "52D AR" painted stenciling B.12
B.16 Detail view of post-war battened partition framing around earlier fin-type linear fluorescent fixture at west wall B.13
B.17 View towards north showing battened plywood partition topped with gypsum sheathing B.13
B.18 View to southwest showing steel multi-paned hangar window and post-war wood-stud partition B.14
B.19 View north towards secure area, showing wood stud wall and partial-height partitions along corridor B.15
B.20 View east towards bay window, showing plywood and plaster wall finishes and remnant of partial-height partition enclosing bay B.16
B.21 General view of Rooms 8-203 and 8-204 with parachute tower in far right corner B.17
B.22 View north along corridor showing utility chase at immediate right B.18
B.23 View of north wall showing infilled door to latrine within hollow clay tile partition B.19
B.24 View towards south showing post-war partition walls and mid-corridor doors B.20
B.25 Detail view of window opening, showing wall construction B.21
B.26 View west towards corridor entrance, showing wood-framed plywood wall B.21
B.27 View to northwest of formerly exterior iron-flecked brick plastered for interior finish B.22

LIST OF PHOTOGRAPHS

Photograph **Page**

B.28 Exterior detail view of southeast pilaster, showing brick detailing and cast-stone accents B.23
B.29 Exterior view of roof framing, looking south along centerline B.23
B.30 Exterior detail view of deteriorated top of hangar east wall at the WPA Infill B.24
B.31 General view to the south showing south hangar doors and west wall B.25
B.32 General view to the south along north-south centerline B.26
B.33 View of northernmost vehicle-sized opening in west wall, showing interior of lean-to beyond B.27
B.34 Elevation view of east (infill) brick wall, showing steel hangar door tracks and existing graffiti B.27
B.35 Interior view of Hangar 2 Lean-to, looking north B.28
B.36 Upward view towards west side of Hangar 2, seen through the deteriorated ceiling and roof of the lean-to B.28
B.37 Exterior view at south façade, showing sconce fixture from the period of significance and brick displacement at window heads B.29
B.38 Overhead detail view showing extant porcelain enamel incandescent light fixture, near 3-113 and north wall B.29
B.39 View towards southeast showing concrete block wall meeting original brick stair wall B.30
B.40 View to northwest showing multi-paned glass and passageway (Room 3-110) beyond B.30
B.41 Detail view at top of “Type 26” window mounted horizontally (i.e., rotated 90 degrees) in the passageway (3-110) elevation B.31
B.42 View at eastern end of Maintenance Bay, looking north B.31
B.43 Overhead view showing former skylight opening covered by wooden monitor structure B.32
B.44 Decorative pendant fluorescent lighting fixture, four-bulb capacity B.32
B.45 View to north showing partition wall separating the formerly larger latrine into two smaller latrines separated by gender B.33
B.46 View to northwest showing shower stalls B.34
B.47 General view towards northwest showing post-war sheathed wall at far right ending at the concrete building column B.35
B.48 View to southeast towards corridor B.35
B.49 General view to northeast showing heavy timber columns and surrounding wood-frame construction B.36
B.50 View east, showing lightweight wood framing and a gypsum board sheathing B.37
B.51 View south of former exterior wall showing bricked-in openings and severe cracking in wall B.38

LIST OF PHOTOGRAPHS

Photograph **Page**

B.52 View of wood flooring in Room 3-201 ..... B.39
B.53 General view to northwest at Room 3-202, showing formerly exterior windows out to courtyard (now monitor structure) B.39



Photograph B.1 Exterior view across hangar pocket to south, showing east exterior elevation and clerestory.



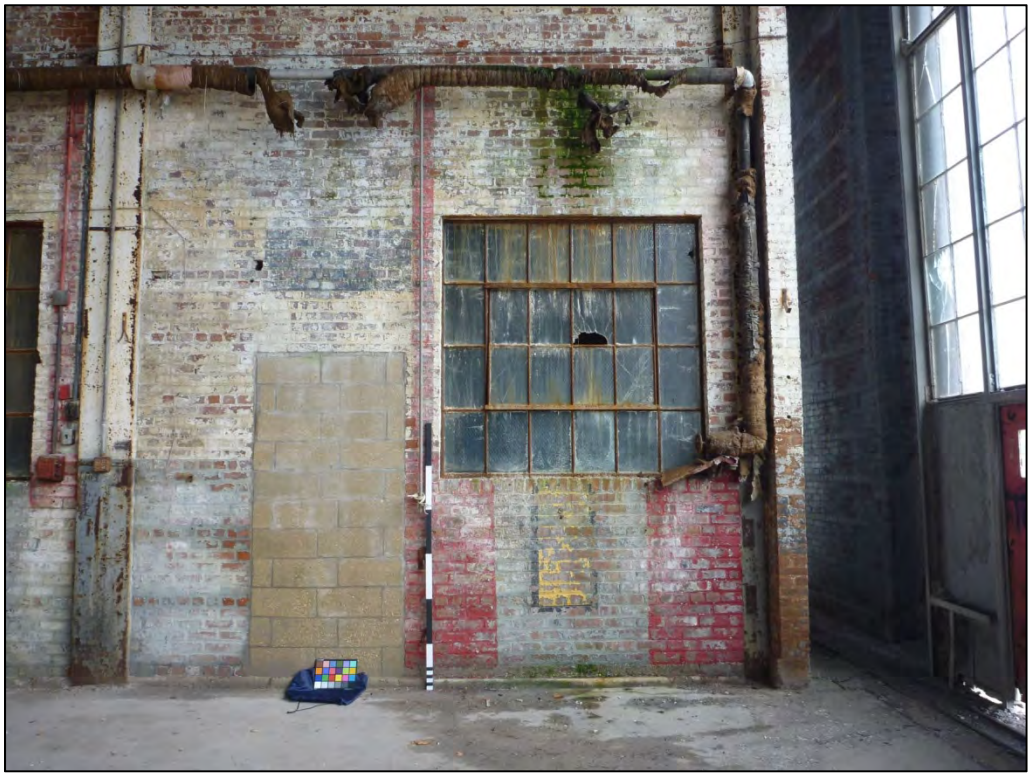
Photograph B.2 Exterior roof-level view showing brick deterioration around clerestory windows.



Photograph B.3 Exterior roof-level view showing hangar pocket and associated flashing to second-floor roof.



Photograph B.4 Elevation of east wall looking up towards exposed roof planking showing infilled door.



Photograph B.5 Elevation of east wall at southernmost bay, showing infilled door and south hangar door pocket.



Photograph B.6 General view of east interior wall, looking north. Note missing hangar doors.



Photograph B.7. Exterior view of boarded window at east elevation, showing cracking in brickwork.



Photograph B.8. Exterior roof-level detail view of through-wall copper scupper at east elevation.



Photograph B.9. View to east showing entrance to Room 8-113.



Photograph B.10. View to the north showing entry to latrine and hangar window to left.



Photograph B.11. View east towards later exterior door.



Photograph B.12. View of south wall showing entry door.



Photograph B.13. View to east showing partial-height partition.



Photograph B.14 Detail view of multiple paint layers at wood door frame.



Photograph B.15. Detail view of glass pane showing "52D AR" painted stenciling.



Photograph B.16. Detail view of post-war battened partition framing around earlier fin-type linear fluorescent fixture at west wall.



Photograph B.17. View towards north showing battened plywood partition topped with gypsum sheathing.



Photograph B.18. View to southwest showing steel multi-paned hangar window and post-war wood-stud partition.



Photograph B.19. View north towards secure area, showing wood stud wall and partial-height partitions along corridor. Note dislodged steel mesh gate at far right.



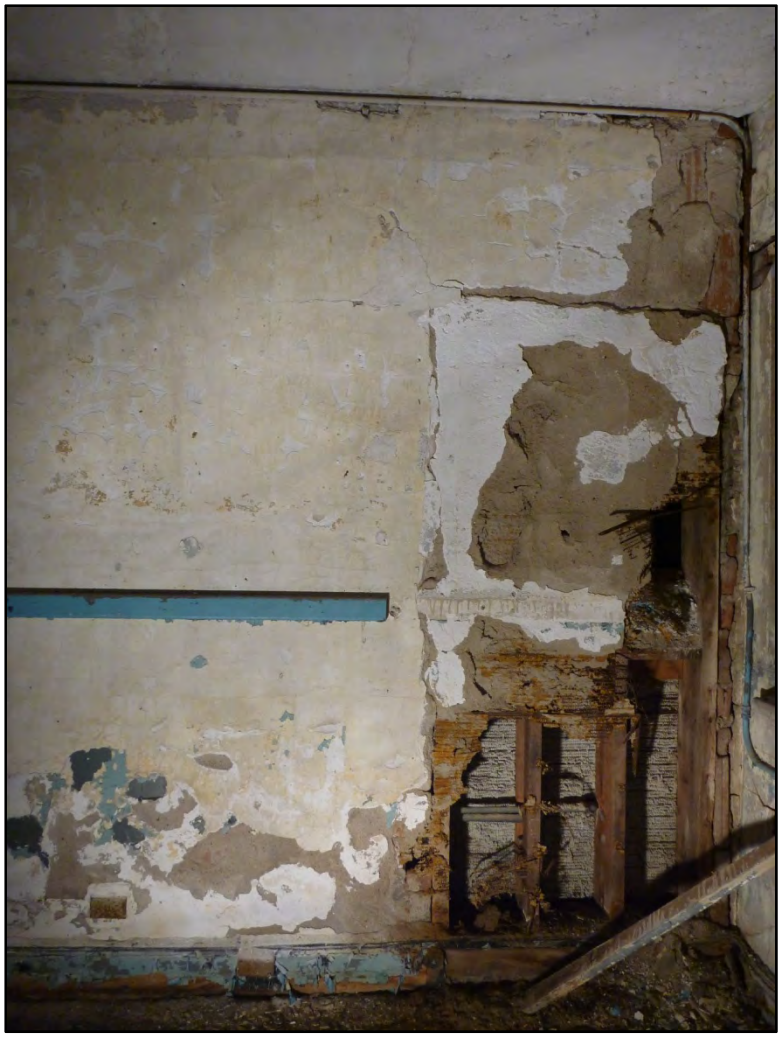
Photograph B.20. View east towards bay window, showing plywood and plaster wall finishes and remnant of partial-height partition enclosing bay.



Photograph B.21. General view of Rooms 8-203 and 8-204 with parachute tower in far right corner.



Photograph B.22. View north along corridor showing utility chase at immediate right.



Photograph B.23. View of north wall showing infilled door to latrine within hollow clay tile partition.



Photograph B.24. View towards south showing post-war partition walls and mid-corridor doors.



Photograph B.25. Detail view of window opening, showing wall construction.



Photograph B.26. View west towards corridor entrance, showing wood-framed plywood wall. Note ornamental linear fluorescent light fixture.



Photograph B.27. View to northwest of formerly exterior iron-flecked brick plastered for interior finish. Wall encloses hangar door pocket.



Photograph B.28. Exterior detail view of southeast pilaster, showing brick detailing and cast-stone accents. Copper sheathing is missing from wood-framed pyramidal cap, exposing interior of pilaster to weather.



Photograph B.29. Exterior view of roof framing, looking south along centerline.



Photograph B.30. Exterior detail view of deteriorated top of hangar east wall at the WPA Infill.



Photograph B.31. General view to the south showing south hangar doors and west wall.



Photograph B.32. General view to the south along north-south centerline. Wooden catwalk and sprinkler piping is visible.



Photograph B.33. View of northernmost vehicle-sized opening in west wall, showing interior of lean-to beyond.



Photograph B.34. Elevation view of east (infill) brick wall, showing steel hangar door tracks and existing graffiti.



Photograph B.35. Interior view of Hangar 2 Lean-to, looking north. Hangar 2 is towards the right. Latrines are visible at extreme left.



Photograph B.36. Upward view towards west side of Hangar 2, seen through the deteriorated ceiling and roof of the lean-to.



Photograph B.37. Exterior view at south façade, showing sconce fixture from the period of significance and brick displacement at window heads.



Photograph B.38. Overhead detail view showing extant porcelain enamel incandescent light fixture, near 3-113 and north wall. Note rusted steel lintels at window head (and lack of window).



Photograph B.39. View towards southeast showing concrete block wall meeting original brick stair wall. Brick manufacturer for WPA–era brick was JJJ.



Photograph B.40. View to northwest showing multi-paned glass and passageway (Room 3-110) beyond.



Photograph B.41. Detail view at top of "Type 26" window mounted horizontally (i.e., rotated 90 degrees) in the passageway (3-110) elevation. Note cut sash in center of photo, typical of entire "top" side.



Photograph B.42. View at eastern end of Maintenance Bay, looking north. Note rotated Type 36 window to left, and (partial) infilled window opening to right.



Photograph B.43. Overhead view showing former skylight opening covered by wooden monitor structure. Hoist rail also visible in foreground. Note the typical network of mechanical and utility piping.



Photograph B.44. Decorative pendant fluorescent lighting fixture, four-bulb capacity. Temporary lighting was installed for survey purposes.



Photograph B.45. View to north showing partition wall separating the formerly larger latrine into two smaller latrines separated by gender. The wall at right is the plastered and tiled former west exterior wall of Hangar 1. A steel toilet partition is visible at left.



Photograph B.46. View to northwest showing shower stalls. The stall on the right has been converted to an entryway from the adjacent corridor.



Photograph B.47. General view towards northwest showing the post-war sheathed wall at far right ending at the concrete building column. Note daylight entering through roof holes at the far corner.



Photograph B.48. View to southeast towards corridor. Monitor classroom is visible through empty window opening above radiator. Note ladder beyond for scale.



Photograph B.49. General view to northeast showing heavy timber columns and surrounding wood-frame construction. Note gypsum board finishes.



Photograph B.50. View east, showing lightweight wood framing and a gypsum board sheathing. Former exterior window of Hangar 1 is beyond. Note structural connection to Hangar 1 at roofline. (See Photograph 1.4.75 for reverse exterior view of this area.)



Photograph B.51. View south of former exterior wall showing bricked-in openings and severe cracking in wall. Radiant piping is installed in front of wall. Note wood-framed monitor windows and wall above.



Photograph B.52. View of wood flooring in Room 3-201. Note Civil Air Patrol desk.



Photograph B.53. General view to northwest at Room 3-202, showing formerly exterior windows out to courtyard (now monitor structure). Note the west two units have been filled-in.

Appendix C.1: Conditions Assessment – Architecture

LIST OF PHOTOGRAPHS

Photograph **Page**

C.1.1 Hangar 2 roof steel truss system C.1.1
C.1.2 Hangar 2 Lean-to roof, view to the southwest C.1.1
C.1.3 WPA Infill monitor structure roof, south façade C.1.2
C.1.4 Hangar 1 roof, view to the west C.1.2
C.1.5 Hangar 2, south façade, copper sheet detail C.1.3
C.1.6 Hangar 1, east elevation, brick detail C.1.4
C.1.7 Hangar 1, west wall, water damage C.1.5
C.1.8 Hangar 1, east wall, kalamein door C.1.6
C.1.9 Hangar 1 Lean-to, Room 8-114, north wall C.1.7
C.1.10 Hangar 1 Lean-to, Room 8-108, water damage C.1.8
C.1.11 Hangar 2 Lean-to, west wall C.1.9
C.1.12 Hangar 2 Lean-to, west wall C.1.9
C.1.13 Hangar 2 Lean-to, roof failure, view to the northwest C.1.10
C.1.14 Hangar 2 Lean-to, south wall, exterior door C.1.11
C.1.15 WPA Infill, Sprinkler Room, east wall C.1.12
C.1.16 WPA Infill, passageway, west end of south wall C.1.13
C.1.17 WPA Infill, Room 3-202, west wall C.1.14
C.1.18 WPA Infill, north stairwell, skylight C.1.14
C.1.19 WPA Infill, Room 3-113, west wall C.1.15
C.1.20 WPA Infill, Room 3-210, north dormitory ceiling C.1.15
C.1.21 WPA Infill, Room 3-205, east wall C.1.16
C.1.22 Mezzanine ceiling C.1.17
C.1.23 WPA Infill, south façade, missing doors C.1.18
C.1.24 WPA Infill, west wall, signage C.1.19



Photograph C.1.1. Hangar 2 roof steel truss system. The roof's steel truss supports are in fair condition with moderate paint loss at worst.



Photograph C.1.2. Hangar 2 Lean-to roof, view to the southwest. The built-up roof and framing below has failed.



Photograph C.1.3. WPA Infill monitor structure roof, south façade. The siding and roof of the monitor structure roof over the center of the infill is in poor condition.



Photograph C.1.4. Hangar 1 roof, view to the west. The parapet is severely compromised by the condition of the roof. Deteriorated or missing roofing material and detached flashing have allowed excessive water damage to the cast-stone coping, the masonry, and the building interior.



Photograph C.1.5. Hangar 2, south façade, copper sheet detail. Popped nails and flaking paint expose the copper metal sheet to corrosion.



Photograph C.1.6. Hangar 1, east elevation, brick detail. A large section of brick has detached and fallen at the northeast corner of the east elevation.



Photograph C.1.7. Hangar 1, west wall, water damage. Water infiltration above the masonry wall has caused biological growth and staining.



Photograph C.1.8. Hangar 1, east wall, kalamein door. One of two kalamein doors remains in its severely corroded frame. The single panel swing door retains little of its painted finish.



Photograph C.1.9. Hangar 1 Lean-to, Room 8-114, north wall. Partition walls in Hangar 1 Lean-to are plaster over terracotta. The finish coat of plaster has failed due to moisture, exposing the friable browncoat over terracotta tile.



Photograph C.1.10. Hangar 1 Lean-to, Room 8-108, water damage. Water infiltration has damaged the roof decking, corroded the wire lathe, and caused collapse of the plaster ceiling.



Photograph C.1.11. Hangar 2 Lean-to, west wall. Corrosion of the metal window frames has caused deep cracks that travel from sill to sill and criss-cross the plaster walls.



Photograph C.1.12. Hangar 2 Lean-to, west wall. Loss of wall plaster reveals the construction of the wall cavity.



Photograph C.1.13. Hangar 2 Lean-to, roof failure, view to the northwest. The roof system is severely compromised in the space.



Photograph C.1.14. Hangar 2 Lean-to, south wall, exterior door. Interior surface of exterior door exhibits paint loss and deterioration of wood members. The door is not original to the opening.



Photograph C.1.15. WPA Infill, Sprinkler Room, east wall. Movement has caused separation within the joints of the brick wall.



Photograph C.1.16. WPA Infill, passageway, west end of south wall. This repurposed window was originally located in one of the hangars.



Photograph C.1.17. WPA Infill, Room 3-202, west wall. A large section of plaster, applied directly to the underlying brick, has collapsed.



Photograph C.1.18. WPA Infill, north stairwell, skylight. Plaster within the skylight opening is cracking and buckling. The roofing system is also visible in this image.



Photograph C.1.19. WPA Infill, Room 3-113, west wall. Deep cracks in the joints between concrete masonry units are due to movement and settlement in the space.



Photograph C.1.20. WPA Infill, Room 3-210, north dormitory ceiling. Water infiltration has caused deterioration of wood nailers and corrosion of wire mesh, resulting in plaster loss.



Photograph C.1.21. WPA Infill, Room 3-205, east wall. Failed gypsum board walls reveal the roofing system at the juncture of Hangar 1 and the WPA Infill. The floor is awash in debris as a result.



Photograph C.1.22. Mezzanine ceiling. Stalactites on concrete support beams indicate ingoing water infiltration. An opening in the ceiling reveals the support system of the monitor structure above.



Photograph C.1.23. WPA Infill, south façade, missing doors. Original doors have been replaced with several pieces of plywood. The original metal jamb remains in the masonry opening.



Photograph C.1.24. WPA Infill, west wall, signage. Signs such as this one are found throughout the spaces of the infill

Appendix C.2: Conditions Assessment – Structural

LIST OF PHOTOGRAPHS

Photograph **Page**

C.2.1 Evidence of water infiltration on masonry wall of Hangar 1, adjacent to the WPA Infill ... C.2.1
C.2.2 Representative roof framing of Hangar 1 Lean-to ... C.2.1
C.2.3 Deteriorated brick masonry of the exterior wall above the roof of Hangar 1 Lean-to ... C.2.2
C.2.4 Deteriorated brick masonry of the exterior wall on the north façade of Hangar 1 Lean-to ... C.2.2
C.2.5 Deteriorated brick masonry of the exterior wall on the south façade of Hangar 1 Lean-to ... C.2.3
C.2.6 Exterior brick deterioration at pilasters of Hangar 2 ... C.2.3
C.2.7 Roof deterioration of Hangar 2 Lean-to, as viewed from above ... C.2.4
C.2.8 Exterior brick deterioration of Hangar 2 Lean-to at north façade ... C.2.5
C.2.9 Representative roof framing of original two-story sections of the WPA Infill ... C.2.6
C.2.10 Representative roof framing of subsequent upper courtyard infill of the WPA Infill ... C.2.6
C.2.11 View of the joist bay of the wood floor overbuild in the WPA Infill, with sleepers set on the original tiled courtyard roof ... C.2.7
C.2.12 Exterior brick deterioration on the north façade of the WPA Infill ... C.2.7
C.2.13 Brick cracking and settlements in the interior masonry wall of the WPA Infill, first floor ... C.2.8
C.2.14 CMU cracking and settlements in the interior masonry wall of the WPA Infill, first floor ... C.2.8



Photograph C.2.1. Evidence of water infiltration on masonry wall of Hangar 1, adjacent to the WPA Infill.



Photograph C.2.2. Representative roof framing of Hangar 1 Lean-to.



Photograph C.2.3. Deteriorated brick masonry of the exterior wall above the roof of Hangar 1 Lean-to.



Photograph C.2.4. Deteriorated brick masonry of the exterior wall on the north façade of Hangar 1 Lean-to.



Photograph C.2.5. Deteriorated brick masonry of the exterior wall on the south façade of Hangar 1 Lean-to.



Photograph C.2.6. Exterior brick deterioration at pilasters of Hangar 2.



Photograph C.2.7. Roof deterioration of Hangar 2 Lean-to, as viewed from above.



Photograph C.2.8. Exterior brick deterioration of Hangar 2 Lean-to at north façade.



Photograph C.2.9. Representative roof framing of original two-story sections of the WPA Infill.



Photograph C.2.10. Representative roof framing of subsequent upper courtyard infill of the WPA Infill.



Photograph C.2.11. View of the joist bay of the wood floor overbuild in the WPA Infill, with sleepers set on the original tiled courtyard roof.



Photograph C.2.12. Exterior brick deterioration on the north façade of the WPA Infill.



Photograph C.2.13. Brick cracking and settlements in the interior masonry wall of the WPA Infill, first floor.



Photograph C.2.14. CMU cracking and settlements in the interior masonry wall of the WPA Infill, first floor.

Appendix C.3: Conditions Assessment – Mechanical, Electrical, and Plumbing

LIST OF PHOTOGRAPHS

Photograph **Page**

C.3.1 Hangar 2 unit heater, view looking up C.3.1
C.3.2 Hangar 1 steam going down, view looking at east interior elevation of Hangar 1 ..... C.3.1
C.3.3 Hangar 2 steam going down, view looking at west interior elevation of Hangar 2 ..... C.3.2
C.3.4 WPA steam pipe style radiator C.3.2
C.3.5 Condensate receiver in WPA Infill, view looking down into pit C.3.3
C.3.6 Hangar 2 disconnects for mechanical units C.3.3
C.3.7 Hangar 2 deteriorated enclosure at disconnect for mechanical unit C.3.4
C.3.8 Hangar 2 communications cabinet C.3.4
C.3.9 Existing service sinks in Hangar 1 ..... C.3.5
C.3.10 Zone 3 dry pipe valve in the WPA Infill C.3.6
C.3.11 View showing fire suppression main and branch line in WPA Infill C.3.7
C.3.12 Fire sprinkler branch line and sprinklers exposed to the weather in Hangar 2 ..... C.3.7



Photograph C.3.1. Hangar 2 unit heater, view looking up.



Photograph C.3.2. Hangar 1 steam going down, view looking at east interior elevation of Hangar 1.



Photograph C.3.3. Hangar 2 steam going down, view looking at west interior elevation of Hangar 2.



Photograph C.3.4. WPA steam pipe style radiator.



Photograph C.3.5. Condensate receiver in WPA Infill, view looking down into pit.



Photograph C.3.6. Hangar 2 disconnects for mechanical units.



Photograph C.3.7. Hangar 2 deteriorated enclosure at disconnect for mechanical unit.



Photograph C.3.8. Hangar 2 communications cabinet.



Photograph C.3.9. Existing service sinks in Hangar 1.



Photograph C.3.10. Zone 3 dry pipe valve in the WPA Infill. Notice bolts are missing, therefore valve is out of service; what appears to be a retard chamber in the upper right has been split open.



Photograph C.3.11. View showing fire suppression main and branch line in WPA Infill.



Photograph C.3.12. Fire sprinkler branch line and sprinklers exposed to the weather in Hangar 2. The large pipes and valves are not fire suppression piping.

Appendix D: Archival Documents

Character Defining Features



Floyd Bennett Field Hangar Row

Character Defining Features



Floyd Bennett Field Hangar Row
National Park Service
Gateway National Recreation Area
Jamaica Bay Unit
July 2001

Table of Contents 5

Introduction - Purpose 6
Introduction - History 8
Introduction - Site Map 9

Character Defining Features - General 10
Character Defining Features - Shape 12
Character Defining Features - Roof and Roof Features 13
Character Defining Features - Openings 14
Character Defining Features - Projections 16
Character Defining Features - Trim & Secondary Features 17
Character Defining Features - Materials 18
Character Defining Features - Setting 19
Character Defining Features - Materials at Close Range 20
Character Defining Features - Craft Details - Cast Stone 21
Character Defining Features - Craft Details - Brick 22
Character Defining Features - Craft Details - Sheet Metal 23
Character Defining Features - Craft Details - Signage 24
Character Defining Features - Interior Spaces 26

Hangar 1 - 2 Infill Elevations 28
Hangar 3 - 4 Infill Elevations 29
Hangar 5 - 6 Infill Elevations 30
Hangar 7 - 8 Infill Elevations 31

Appendix
The Secretary's Standards for Rehabilitation 33
Bibliography 36
Photo Credits 37



Floyd Bennett Field Hangar Row is a significant part of the first municipal airport in New York City. Located along Flatbush Avenue in Brooklyn, Floyd Bennett Field is currently part of the Jamaica Bay Unit of Gateway National Recreation Area, administered by the National Park Service (NPS).

The National Park Service, an agency within the Department of the Interior, is our nation's lead conservation agency for cultural resources. As such it is responsible for ensuring that America's cultural resources are carefully identified, evaluated, documented, registered, preserved, and interpreted in order to protect and preserve valued historic and cultural resources for future generations. To accomplish this goal, the National Park Service is seeking Park Partners to stabilize, repair, rehabilitate and maintain the historic hangar structures in compliance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*:

1. *A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.*
2. *The historic character of a property shall be retained and preserved. The removal of historic materials or alteration of features and spaces that characterize a property shall be avoided.*
3. *Each property shall be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.*
4. *Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.*

5. *Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.*
6. *Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.*
7. *Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.*
8. *Significant archeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.*
9. *New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.*
10. *New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.*

The *Standards* embody two important goals: 1) the preservation of historic materials and, 2) the preservation of a building's distinguishing character. Character refers to all the specific visual aspects and physical features that comprise the appearance of a building. Character-defining elements include the overall shape of the building, the materials used, craftsmanship, decorative details, interior spaces and features, and the various aspects of the site.

The purpose of this document is to identify the Character Defining Features of the hangars and provide the rationale for maintaining these features (and the historic material) and preserving their original integrity. Integrity refers to the unimpaired, intact condition of the original features and the buildings as a whole. The historical importance of the structures which comprise Hangar Row, as well as their relationship with the other structures in the Floyd Bennett Field Historic District, must be fully considered before any work is undertaken in this area. This document strives to provide the context for any work considered.

The structures of Hangar Row have, to a large extent, maintained their integrity since construction:

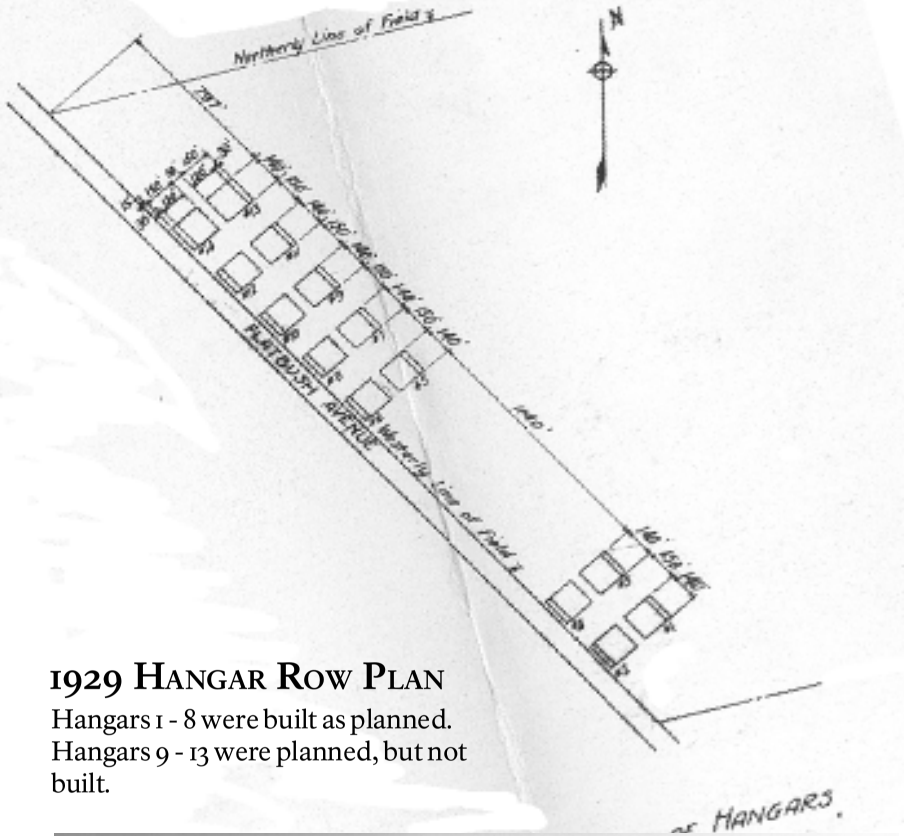
- Exterior faces have changed little, but suffer from age and deterioration;
- Spaces surrounding the hangars and the main interior spaces in the hangars have remained largely intact;
- Secondary interior spaces have experienced various degrees of deterioration.

The following information systematically identifies the character defining features of the Hangar Row structures and includes treatment considerations to underscore the necessity of maintaining the integrity of these features in order to preserve the unique historic character of the hangars.

Floyd Bennett Field Historic District , located within the Jamaica Bay Unit of Gateway National Recreation Area, has remained virtually unchanged in appearance since its period of significance: 1931-1946. (Gateway NRA is considering an expansion of this time frame - restoration work should identify the time period of any existing material that is proposed to be altered). The efforts of its planners to follow the 1928 Department of Commerce guidelines for airport construction are readily apparent. Not only are the hangars and support buildings arranged linearly to one side of the runways as directed, they are also easily accessible from Flatbush Avenue, a major highway which passes directly behind them.

Floyd Bennett Field was the first municipal airport in New York City, constructed between 1928 and 1931 by the City Department of Docks. Following the opening of Idlewild (JFK) Airport in 1939, Bennett Field was closed to commercial use and eventually conveyed to the U. S. Navy in 1941. The Navy enlarged the airport from 387 acres to 1,288 acres and continued to operate at the field until 1971, when the Naval Air Reserve Training detachment took over. Floyd Bennett Field was acquired by the National Park Service with the establishment of Gateway National Recreation Area in 1972.

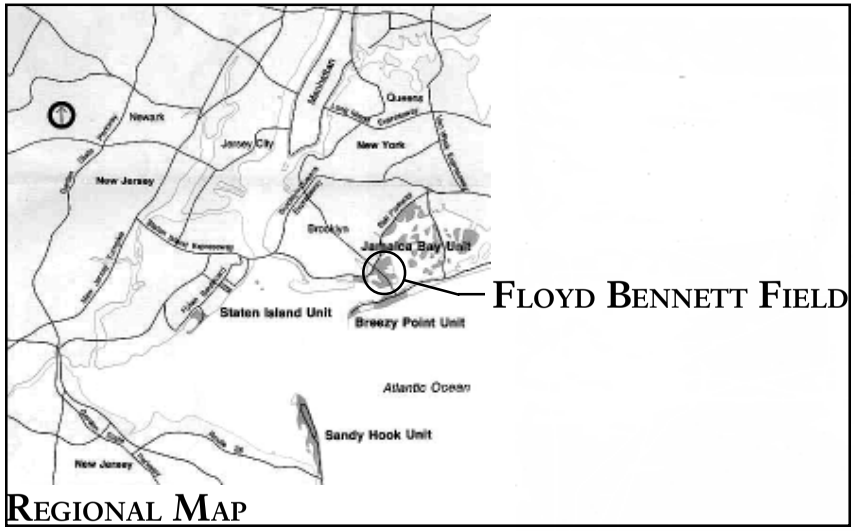
The historic structures, constructed between 1928-1931 and added onto and remodeled between 1936-1938, include eight hangars with attached service wings. An early Hangar Row plan (above, right) shows seven pairs of hangars. The hangars on the runway side are spaced fifty feet from their reflected twin on the Flatbush Avenue side, and every pair is spaced one hundred fifty feet from the next pair. The existing hangars include Numbers 1 - 8 as shown on the plan.



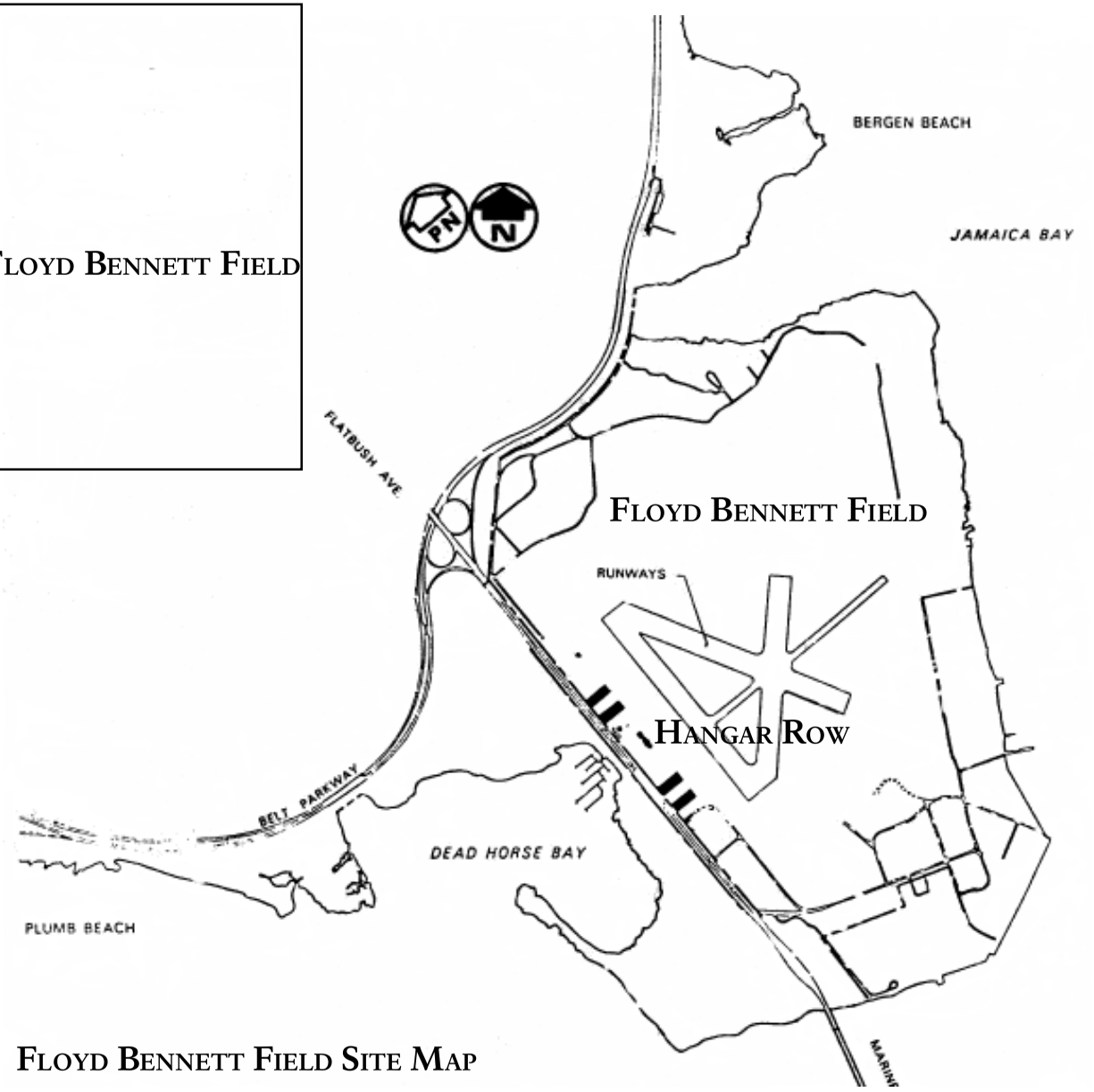
1929 HANGAR ROW PLAN
Hangars 1 - 8 were built as planned. Hangars 9 - 13 were planned, but not built.



NORTH ELEVATION OF HANGARS 3 & 4
Photograph looking north from Ryan Visitor Center control tower, ca. 1935. Note open space between Hangars 3 & 4.



REGIONAL MAP



FLOYD BENNETT FIELD SITE MAP



Character Defining Features

Hangar Row has certain distinguishing characteristics that must be identified and preserved in order to maintain its historic nature. The original site was developed with a clear and defined purpose as the first municipal airfield for New York City. The buildings are related in size, material and architectural style to both their era of construction and the technology of aviation of that time. The site grew over many decades, with successive buildings added based on need and advancements in aviation technology. Structures remain arranged around open spaces consisting of runways, taxiways and aircraft holding areas, with buildings defining the edges. What was created and still exists at Floyd Bennett Field is an ensemble, or grouping of buildings that are totally integrated with each other and with a sparsely-landscaped open space.

An understanding of the historic character of this area is necessary when planning adaptive-reuse/rehabilitation projects at Floyd Bennett Field. All rehabilitation work planned for the Floyd Bennett Field Historic District must meet the *Secretary's Standards and Guidelines for Rehabilitation*.

A character-defining feature is a specific architectural element or building component of original (historic) material that helps to give the building its *visual character*. These items are individual components that, when taken together, define the age, architectural style, or previous use of the building.

The first steps in rehabilitation are to identify, retain, and preserve the character-defining features. Protecting and maintaining the historic material is the second step. If the physical condition warrants additional work, repairing is recommended. If historic materials have deteriorated beyond repair, replacement in kind should be the final approach.

Any materials removed from the buildings are to be identified in the planning phases for conservation and curation by Gateway NRA.

Building rehabilitation will include meeting accessibility requirements, health and safety code requirements, and retrofitting measures to conserve energy. Although this work is quite often an important aspect of rehabilitation projects, and is assessed for its potential negative impact on the building's historic character, it is usually not a part of the overall process of protecting or repairing character-defining features. In the process of meeting code and energy requirements, particular care must betaken not to radically change, obscure, damage, or destroy historic fabric. Refer to Preservation Briefs #32, *Making Historic Properties Accessible,* for additional information.

The process of rehabilitation may result in changes to the historic buildings and landscape. By identifying and maintaining the most important features, it is possible to preserve the historic character of both the architecture and the landscape, and still allow for new uses. The following pages are not meant to be the final word in directing work, but are meant to provide preliminary guidance for proposal development. They are organized as follows:

OVERALL VISUAL ASPECTS
- Shape
- Roof and Roof Features
- Openings
- Projections
- Trim and Secondary Features
- Materials
- Setting

VISUAL CHARACTER AT CLOSE RANGE
- Material at Close Range (Color and Texture)
- Craft Details

VISUAL CHARACTER OF INTERIOR SPACES
- Individual Spaces
- Related Spaces and Sequences of Spaces
- Interior Features
- Surface Finishes and Materials
- Exposed Structure

The eight existing hangars were erected between 1929 and 1931 as separate structures (see page 19 for plan). Each was comprised of a large hangar with a lean-to attached on either the east or west side, opposite of its reflected twin. A 1936-38 WPA project paired the reflected twins with an infill structure resulting in the present symmetrical appearance of four buildings.

SHAPE OF BUILDINGS

The four existing hangar structures are virtually identical; each has two main elevations with the hangar doors facing north and south, and two subordinate elevations with lean-to's facing east and west. The main elevations are symmetrical about an axis running north/south through the center of the infill structure.

The main elevations (north and south) are dominated by the sliding hangar doors which can be retracted to fully open each end of the hangar space. The painted, copper-clad low-sloped gable above the hangar doors presents a strong, flat horizontal element supported on each end by brick piers with cast stone trim. The solid panels on the bottom of the hangar doors ground this portion of the composition when fully closed.

Treatment Consideration:
Retain the low horizontality and symmetry of the structures.

Retain the existing shapes.



NORTH ELEVATION OF HANGARS 3 & 4

ROOF AND ROOF FEATURES

The roofs of the hangars, lean-tos and infill are concealed behind parapets, leaving the coping on top of the wall to define the shape of the building.

Steel roof access ladders on hangar sides and at infills are the only element to extend above the parapet line.

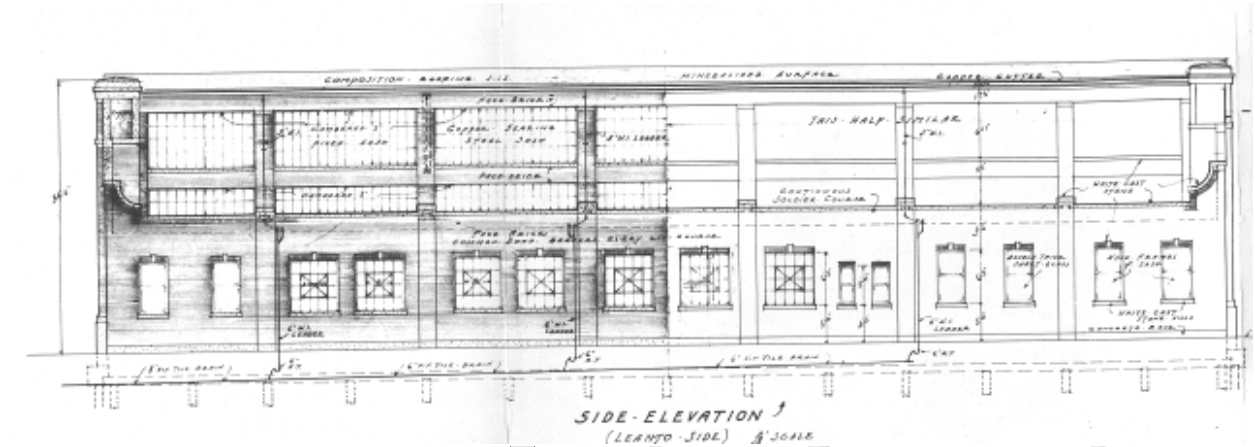
Treatment Consideration:
Maintain the parapet heights. Any roof height changes should not compete with the parapets.

Replacement roofing materials to be concealed behind parapets.

Retain or replace in kind access ladders in present locations and configurations.



EAST ELEVATION OF HANGAR 5



TYPICAL LEAN-TO ELEVATION - 1929 DRAWINGS

HANGAR DOORS

The main elevations (north and south) of the hangars are dominated by the two hangar door openings. Each hangar space has 12 sliding doors on each end which fully retract for an opening that spans from brick pier to brick pier, ground to steel roof structure above.



Treatment Consideration:
These doors should be retained in their present configuration and should be repaired and restored, or, if historic materials have deteriorated beyond repair, replaced in kind.

WINDOWS

Windows are: either punched rectangular openings in the brick walls for wood double-hung or steel sash windows; or they span from pier to pier with steel sash clerestory windows for the hangars above the lean-tos.



Treatment Consideration:
Maintain existing window opening shapes and sizes. Do not create additional openings.

Retain and repair existing windows, or, if historic materials have deteriorated beyond repair, replace to match existing frame materials and configuration. Insulated glass should be used as replacement to improve energy use efficiency. (See Appendix).

WINDOWS

Round windows are on the south face of the infill between Hangars 1 & 2.





Treatment Consideration:
Maintain existing window opening shapes and sizes. Do not create additional openings.

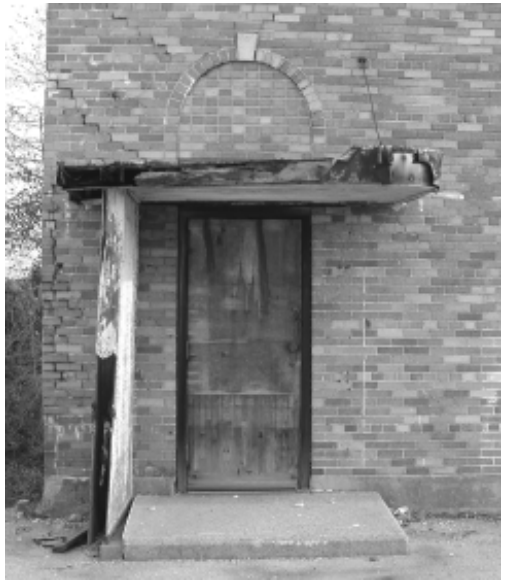
Retain and repair existing windows, or, if historic materials have deteriorated beyond repair, replace to match existing frame materials and configuration. Insulated glass should be used as replacement to improve energy use efficiency. (See Appendix).

DOORS

Door openings are punched into the brick walls with rectangular or arched top openings.







Treatment Consideration:
Maintain existing door opening shapes and sizes. Retain and repair, if necessary, original doors. Replace non-historic doors with doors of appropriate period style. Do not create additional openings.

BAY

The east elevation of Hangar 2, (see plan on p.19), has a small single story bay projection which included a door opening that was converted to a window (opposite side), and a pipe guardrail at roof.

Treatment Consideration:
This projection should be retained and be rehabilitated.



BAY

The east elevation of Hangar 8 has a single story bay projection with articulated parapet. This runway-side projection is unique to the lean-tos and has characteristics matching the lean-tos and hangers.

Treatment Consideration:
This projection should be retained and be rehabilitated.



CANOPY

Canopies have been added over some of the doors on the lean-tos.

Treatment Consideration:
These projections are in poor condition and are not original to the building - they should be removed.



CANOPY

The south elevation of the infill between Hangars 5 & 6 has an inappropriate entrance projection attached to the main entrance.

Treatment Consideration:
The materials and form of this projection do not match the rest of the building and this projection should be removed.



CAST STONE COPING

Light colored cast stone is used for coping trim at southwest corner of the lean-to at Hangar 1. A continuous brick soldier course is below cast stone coping.



Treatment Consideration:
Cast stone should be retained and repaired as required, and, if historic materials have deteriorated beyond repair, replaced to match existing.

CAST STONE TRIM

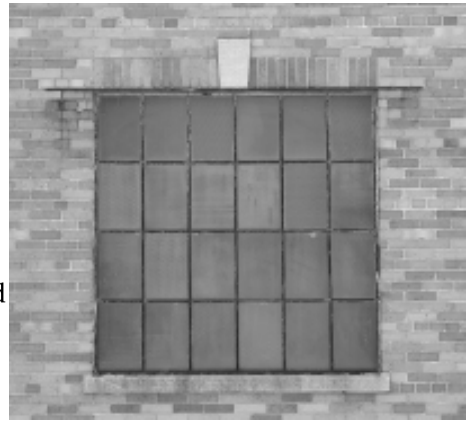
The trim consists of cast stone coping, sills, keystones, brick arch springstones, and door lintel at the north elevation infill between Hangars 1&2. The masonry piers have cast stone trim at base, near top and cap to define top of pier.



Treatment Consideration:
Cast stone should be retained and repaired as required, and, if historic materials have deteriorated beyond repair, replaced to match existing.

WINDOW TRIM

Cast stone keystone is used to punctuate the center of the brick soldier course at window head. Cast stone window sills accentuate the bottom of opening.



Treatment Consideration:
Cast stone should be retained and repaired as required, and, if historic materials have deteriorated beyond repair, replaced to match existing.

COPPER CLADDING

The copper sheet metal is painted to match color of cast stone above hangar doors.



Treatment Consideration:
Copper to be retained and painted to match cast stone color. Replace missing copper to match existing.



HANGAR ELEVATION MATERIALS

The lean-tos and the central service infill wing are brick with cast stone trim. The gable spanning above the hangar doors is crimped copper sheet metal, painted to match the cast stone color. The hangar doors have an aluminum panel base with a glazed top which reinforce the appearance of a long, low building.

INFILL ELEVATIONS

The Hangar 5 & 6 central service infill wing is brick with cast stone trim and ornamentation. The existing windows are steel sash with wire glass. The entrance has metal clad panel doors.



Treatment Consideration:
Retain all materials as originally used in hangars.

SYMMETRY AND SPACE

The hangars of Hangar Row are sited symmetrically relative to the Ryan Visitor Center, as shown on the plan (right). The elevations of Hangars 5 & 6 and 3 & 4 which face each other have the most ornamental infills and are separated by a vast open space.

Treatment Consideration:

The space between the Ryan Visitor Center and the hangars should remain open and undeveloped to emphasize the Visitor Center as the focal point.

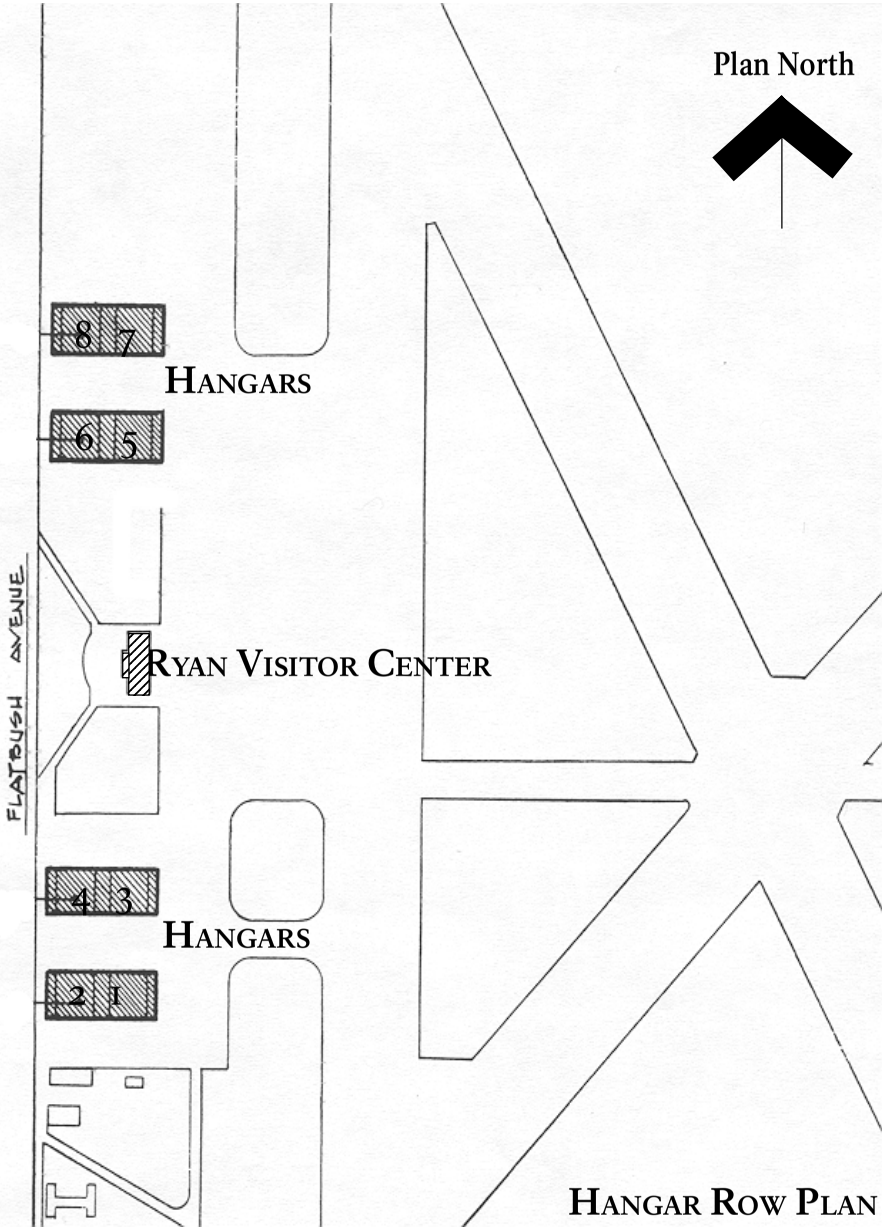
The concrete surfaces should be retained and repaired as required.



The hangar groups are also sited symmetrically with relation to each other. The south elevation of Hangars 3 & 4 and the north elevation of Hangars 1 & 2 face each other, as do the south elevation of Hangars 7 & 8 and the north elevation of Hangars 5 & 6.

Treatment Consideration:

The preferred treatment is to retain the existing open space between the hangar structures. Any proposed infill of this space should be inset to respect the clear separation of these structures.



HANGAR ROW PLAN



BRICK

Multicolored brick is laid in a running bond with a header course every sixth course vertically.

Treatment Consideration:
Retain brick color, course pattern and mortar color and texture.



CONCRETE PIER BASE

The piers have a concrete base with cast stone course below the brick.

Treatment Consideration:
Retain materials in present placement.



CAST STONE AND COPPER COPING

Cast stone is used for the coping at top of walls and piers with copper roofing used over piers and hangar door pockets.

Treatment Consideration:
Retain cast stone and copper coping or replace to match existing as required.



CAST STONE SPANDRELS

A cast stone decorative spandrel panel is located above the entrance door on north elevation of Hangars 3 & 4 infill.

Treatment Consideration:
Retain decorative cast stone spandrels and other elements. Repair existing as required - do not replace.



CAST STONE TRIM

Cast stone decorative pilaster capitals are on the north elevation of Hangars 3 & 4 infill and south elevation of Hangars 5 & 6 infill. A cast stone band above runs from pier to pier.

Treatment Consideration:
Retain cast stone trim or replace to match existing as required.



CAST STONE COPINGS & CAST IRON CONDUCTORS

Cast stone was used for copings on lean-to parapets and for pier caps. Cast-iron roof conductors, leader heads and scuppers are exposed at lean-tos.

Treatment Consideration:
Retain cast stone elements and exposed conductors, leader heads and scuppers, repair or replace in kind as required.



CAST STONE DECORATIVE TRIM

Cast stone is used for decorative elements - propeller emblem, spandrel panels, door fame trim and pilaster capitals - on infill elevations facing the Ryan Center.

Treatment Consideration:

Retain cast stone decorative elements. Repair as required.







Cast stone propeller emblem (above), flanking spandrel panel detail (left), and door fame trim with spandrel panel (far left).



BRICK AT PIER BASE
Brick steps out to define piers.

Treatment Consideration:
Retain brick relief.



BRICK COURSING
The brick is laid in a continuous soldier course below the coping. The brick steps out to define a frame on main piers.

Treatment Consideration:
Retain coursing below coping and for frames.



BRICK
Brick is laid in rowlock course at door transom arch with an inset cast stone keystone and arch-spring.

Treatment Consideration:
Retain course pattern and relationship to cast



BRICK AT PIER BASE
Brick steps out to define piers and frame in pier.

Treatment Consideration:
Retain brick relief.



SHEET METAL DECORATIVE TRIM

Copper sheet metal is used for decorative elements: wing emblem with "NYC" legend at hangar gables, formed profile caps on gables, and raised circle outlines for painted number designations. Copper sheet metal also used for wall above window openings on Hangar 7 lean-to bay (photo left).

Treatment Consideration:

Retain copper sheet metal decorative elements. Repair as required or replace in kind.

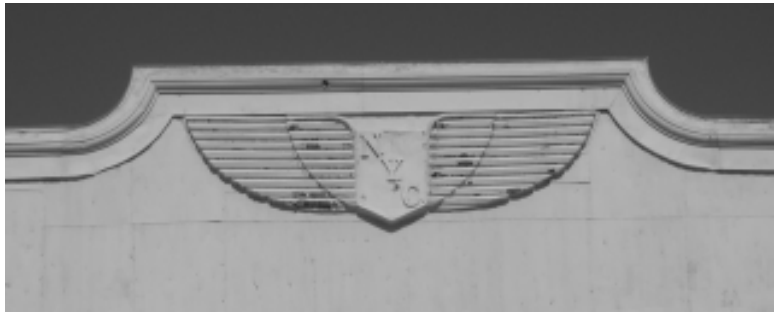
SHEET METAL WINDOW OPENING LINTEL

Copper sheet metal was also used for wall above window openings on Hangar 7 lean-to bay. This surface was also used for signage purposes.



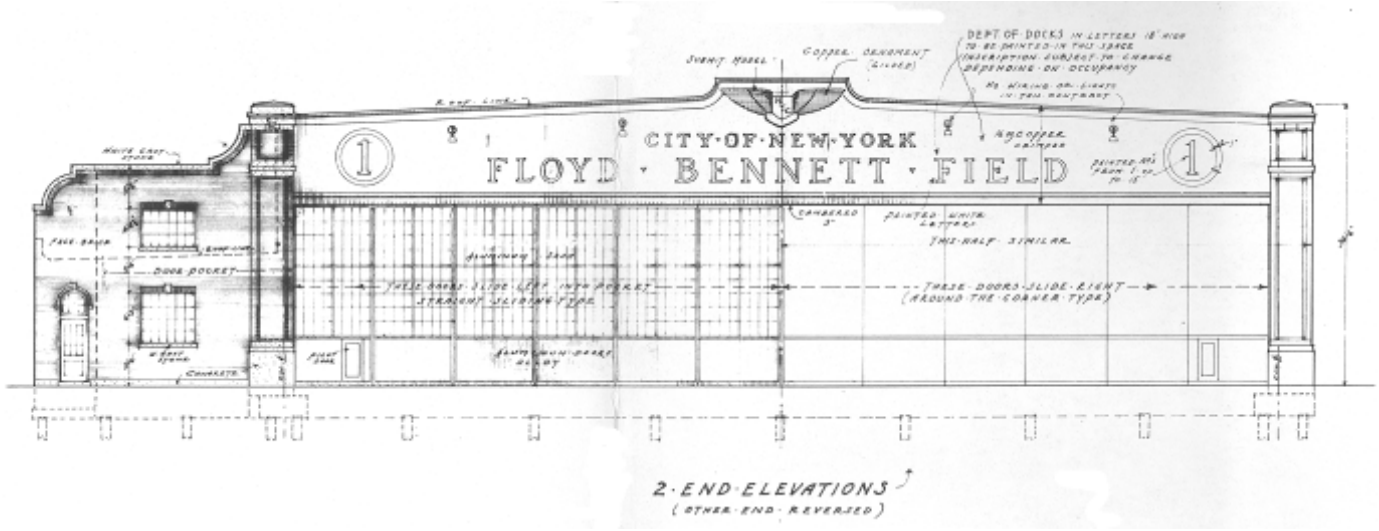
SHEET METAL RAISED CIRCLE

Two raised-profile copper sheet metal circles are on each hangar door gable and were used for hangar identification signage purposes.



SHEET METAL EMBLEM

Formed copper sheet metal wing emblem with "NYC" legend at each hangar door gable and to articulate the coping of the parapet above. Building plans of 1929 specified the wing emblem to be gilded.


CITY·OF·NEW·YORK
FLOYD · BENNETT · FIELD
1
1
2·END·ELEVATIONS
(OTHER·END·REVERSED)


UNITED AIR SERVICES

SIGNAGE

Signage generally consisted of painted letters on a building surface. The photo of Hangar 3 (lower photo p.24) shows painted letters on the copper sheet metal of the hangar door gable. The copper surface appears to be unpainted and is in the dark brown phase of the patination process. The warning signage in the photo to the right is painted letters on a hangar door panel of Hangar 5. The information signs below are painted on brick of "Hamgar #1" and Hangar #5 interiors.

Treatment Consideration:
Restore signage to hangar gables. Preserve signage on hangar doors and hangar interiors.







MAIN SPACE

The main interior building spaces are the hangars, formerly used for airplane storage. Each hangar space end has fully-retractable aluminum and glass doors and the two adjacent sides are of brick and steel structure with steel framed clerestory windows. The steel truss roof structure is completely exposed, as is the wood roof deck.

Treatment Consideration:
Retain hangar main space and elements in whole. Any changes to the space should be set within the space without affecting the existing hangar structure.



INTERIOR OF HANGAR 7 LOOKING NORTHEAST

Hangar 1-2 Infill Elevations



North Elevation

The north and south elevations of the Hangar 1 & 2 infill are virtually identical. The north elevation faces the south elevation of Hangars 3 & 4. A cast stone belt course runs continuous between piers and is aligned with the top of the hangar doors. A center pair of doors is framed by brick piers with cast stone inserts and a decorative lintel. Windows flanking the center doors are one-and-a-half stories high. Side doors with arched transoms have circle windows above.



South Elevation

The south elevation of the infill faces the maintenance garage and is the first full elevation visible to northbound traffic on Flatbush Avenue.



NORTH ELEVATION

The highly decorative north elevation of the Hangar 3 & 4 infill faces the open space in front of the Ryan Visitor Center. The height of the coping above the cast stone propeller emblem matches the height of the flanking pier caps with the flat coping resting below the pier cast stone caps. The belt course is aligned with the pier belt courses. The top of the windows match the hangar door tops.



SOUTH ELEVATION

The south elevation faces Hangars 1 & 2 and is considerably simpler than the north infill elevation.

Hangar 5 - 6 Infill Elevations



North Elevation

The north Hangar 5 & 6 infill elevation faces Hangars 7 & 8 and is similar to the north infill elevation of Hangars 7 & 8. The top of the upper windows are aligned with the top of the hangar doors. The top of the transom above the pair of doors is aligned with the top of the lower windows. The cast stone is used economically on this facades, for window sills, keystones and coping.



South Elevation

The highly decorative south elevation is nearly identical to the north elevation of Hangars 3 & 4 and also faces the open space in front of the Ryan Visitor Center. The height of the coping above the cast stone propeller emblem matches the height of the flanking pier caps with the flat coping resting below the pier cast stone caps. The belt course is aligned with the pier belt courses. The top of the windows match the hangar door tops. The spandrel panels on this infill are plain and smaller than on 3 & 4.



NORTH ELEVATION

The north and south Hangar 7 & 8 infill elevations are virtually identical with the exception of door placement. This north elevation is the first facade seen travelling southbound on Flatbush Avenue. The top of the upper windows are aligned with the top of the hangar doors. The top of the transom above the pair of doors is aligned with the top of the lower windows. The cast stone is used economically on these facades, for window sills, keystones and coping.



SOUTH ELEVATION

The south elevation faces Hangars 5 & 6.

Appendix



Adaptive use: a use for a structure or landscape other than its historic use, normally entailing some modification of the structure or landscape (see also rehabilitation).

Association: the relationship between a historic event, activity, or person and a cultural resource. Association is one of the seven aspects of integrity.

Building: an enclosed structure with walls and a roof, consciously created to serve some residential, industrial, commercial, agricultural, or other human use.

Character-defining feature: a prominent or distinctive aspect, quality, or characteristic of a historic property that contributes significantly to its physical character. Structures, objects, vegetation, spatial relationships, views, furnishings, decorative details, and materials may be such features.

Design: the combination of elements that create the form, plan, space, structure, and style of a historic property. Design is one of the seven aspects of integrity.

Feature (historic): (1) a prominent or distinctive aspect, quality, or characteristic of a historic property; and (2) a historic property.

Feeling: a property's expression of the aesthetic or historic sense of a particular period of time. Feeling is one of the seven aspects of integrity.

Historic character: the sum of all visual aspects, features, materials, and spaces associated with a property's history.

Historical significance: the meaning or value ascribed to a structure, landscape, object, or site based on the National Register of Historic Places criteria for evaluation. The quality of significance is present in resources that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of persons significant in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded, or may be likely to yield, information im portant in prehistory or history.

Integrity: the authenticity of a property's historic identity, evidenced by the survival of physical characteristics that existed during its historic or prehistoric period; the extent to which a property retains its historic appearance. According National Register of Historic Places criteria, there are seven aspects of integrity:

1. Location – the place where the historic property was constructed or the place where the historic event occurred;

2. Design – the combination of elements that create the form, plan, space, structure, and style of a property;

3. Setting – the physical environment of a historic property;

4. Materials - the physical elements that were combined or de posited during a particular period of time and in a particular pattern or configuration to form a historic property;

5. Workmanship – the physical evidence of the crafts of a par ticular culture or people during any given period in history or prehistory.

6. Feeling – a property's expression of the aesthetic or historic sense of a particular period of time.

7. Association – the direct link between an important historic event or person and a historic property.

Location: the place where the historic property was constructed or the place where the historic event(s) occurred. Location is one the seven aspects of integrity.

Materials: the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property. Materials is one of the seven aspects of integrity.

Mitigation: minimizing or lessening effects to cultural resources in the course of a project or plan. If considered and worked into a plan or project in its early stages, mitigating measures treat no adverse effect or adverse effect determinations. When effects on cultural resources can't be avoided, typical mitigation measures may include:

- Limiting the magnitude of the undertaking;
- Modifying the undertaking through redesign, reorientation of construction on the project site; or similar changes;
- Repairing, rehabilitating, or restoring affected cultural resources in accordance with the Secretary of the Interior's standards and guidelines;
- Documenting (drawings, photographs, histories) buildings and structures that must be destroyed or substantially altered.
- Recovering and recording archeological information and materials.

Period of significance: the span of time in which a property attained the significance for which it meets National Register of Historic Places criteria.

Preservation: the act or process of applying measures to sustain the existing form, integrity, and material of a historic structure, landscape or object. Work may include preliminary measures to protect and stabilize the property, but generally focuses upon the ongoing preservation maintenance and repair of historic materials and features rather than extensive replacement and new work. For historic structures exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.

Rehabilitation: the act or process of making possible an efficient compatible use for a historic structure or landscape through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural and architectural values.

Repair: action to correct deteriorated, damaged, or faulty materials or features of a structure or landscape.

Restoration: (1) the act or process of accurately depicting the form, features, and character of a historic structure, landscape, or object as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period; (2) the resulting structure, landscape, or object.

Setting: the physical environment of a historic property; the character of the place in which the property played its historical role. Setting is one of the seven aspects of integrity.

Significance: see ***historical significance***.

Stabilization: interventive treatment action taken to increase the stability or durability of an object when preventive conservation measures fail to decrease its rate of deterioration to an acceptable level or when it has deteriorated so far that its existence is jeopardized.

Structure: a constructed work, usually immovable by nature or design, consciously created to serve some human activity. Examples are buildings of various kinds, monuments, dams, roads, railroad tracks, canals, millraces, bridges, tunnels, locomotives, nautical vessels, stockades, forts and associated earthworks, Indian mounds, ruins, fences, and outdoor sculpture. In the National Register of Historic Places program "structure" is limited to functional constructions other than buildings.

Workmanship: the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory. Workmanship is one of the seven aspects of integrity.

Weeks, Kay D. and Grimmer, Anne E. 1995. *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/standards/index.htm

Meyers, John H. *Preservation Briefs #9, The Repair of Historic Wooden Windows.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Park, Sharon C. *Preservation Briefs #13, The Repair and Thermal Upgrading of Historic Steel Windows.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Nelson, Lee H. *Preservation Briefs #17, Architectural Character: Identifying the Visual Aspects of Historic Buildings as an Aid to Preserving Their Character.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Jandl, H. Ward. *Preservation Briefs #18, Rehabilitating Interiors in Historic Buildings.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Auer, Michael J. *Preservation Briefs #25, The Preservation of Historic Signs.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Jester, Thomas C. and Park, Sharon C. *Preservation Briefs #32, Making Historic Properties Accessible.* National Park Service, U.S. Department of the Interior. www2.cr.nps.gov/tps/briefs/presbhom.htm

Fisher, Charles E. *Tech Notes #2, Installing Insulating Glass in Existing Steel Windows.* National Park Service, U.S. Department of the Interior.

Park, Sharon C. *Tech Notes #8, Thermal Retrofit of Historic Wooden Sash Using Interior Piggyback Storm Panels.* National Park Service, U.S. Department of the Interior.

Fisher, Charles E. *Tech Notes #11, Installing Insulating Glass in Existing Wooden Sash Incorporating the Historic Glass.* National Park Service, U.S. Department of the Interior.

Powers, Robert. *Technical Notes #17, Repair and Retrofitting Industrial Steel Windows.* National Park Service, U.S. Department of the Interior.

All photographs by Brian Forseth except for the following:

Page 8 photo: Rudy Arnold, photographer. National Air and Space Museum, Smithsonian Institution, Photograph No. 78-17662.

Page 8 plan: The City of New York, Department of the Docks, Contract No. 1967, November 15, 1929, Location of Hangars, Sheet 8 of 12. Gateway NRA, Jamaica Bay Unit Archives.

Page 9 map: Regional Map, Harpers Ferry Design Center, NPS.

Page 9 map: Site Map, page 5, Historic Structures Report, Architec tural Data Section, Vol. II, May 1981, NPS.

Page 13 Elev.: The City of New York, Department of the Docks, Contract No. 1967, November 15, 1929, Hangar Eleva tions, Sheet 6 of 12. Gateway NRA, Jamaica Bay Unit Achives.

Page 19 Plan: Joseph Tonetti & Associates Architects, Hangar Row Stabilization & Rehabilitation, IFB No. 1770-80A, July 7, 1980, Sheet 1 of 9. Gateway NRA Archives.

Page 23 photo: Sheet Metal Raised Circle: Janice Slivko, photographer.

Page 24 Elev.: The City of New York, Department of the Docks, Contract No. 1967, November 15, 1929, Hangar Eleva tions, Sheet 6 of 12. Gateway NRA, Jamaica Bay Unit Achives.

Page 24 photo: Rudy Arnold, photographer. National Air and Space Museum, Smithsonian Institution, Photograph No. 78-17662.

Page 25 photo: Hangar Number 5: Janice Slivko, photographer.

Page 33 photo: AFB: Janice Slivko, photographer.

Prepared for:
National Park Service
U. S. Department of the Interior
by Brian Forseth, Architect
Gateway National Recreation Area, Office of Planning & Professional Services

Marc Koenings, General Superintendent
Billy Garrett, Superintendent Jamaica Bay Unit

Property Documents

THIS SUPPLEMENT TO INDENTURE OF LEASE executed the 15th day of October, 1938 by and between THE CITY OF NEW YORK, a Municipal Corporation of the State of New York, acting by its Commissioner of Docks (hereinafter referred to as "Lessor"), and **American Airlines, Inc.** a corporation organized and existing under and by virtue of the laws of the State of **Delaware** (hereinafter referred to as "Lessee"), such documents and attachments being hereinafter referred to as "Indenture of Lease",

W I T N E S S E T H:

WHEREAS, under the said Indenture of Lease Lessor did for valuable considerations lease to Lessee certain premises and facilities located in the Borough of Queens, City of New York, State of New York, known as "Municipal Airport Number 2, LaGuardia Field" (hereinafter referred to as "LaGuardia Field"), and did grant certain rights, licenses and privileges thereon; and

WHEREAS, Lessee has continued to occupy and utilize the premises and the facilities leased to Lessee under the said Lease, and to exercise the rights, licenses and privileges granted to Lessee under the terms of such Indenture of Lease since the date of execution thereof; and now continues so to do; and

WHEREAS, Lessor is the owner of certain real property located at Flatbush Avenue, in the Borough of Brooklyn, City of New York, on which is constructed a landing area for aircraft, known as "New York Municipal Airport - Floyd Bennett Field" (hereinafter referred to as "Floyd Bennett Field"); and

WHEREAS, it is the intention of both Lessor and Lessee that the said Floyd Bennett Field shall be utilized as an alternate during unfavorable weather conditions at LaGuardia Field, or when instrument landing is necessary, to the said LaGuardia Field by the aircraft of Lessee; and

WHEREAS, Lessor desires to lease to Lessee certain premises and facilities on said Floyd Bennett Field, and to grant certain rights,

NA 24/L4-3(7)(4104-29)

REPRODUCED AT THE NATIONAL ARCHIVES

licenses and privileges thereon; and Lessee desires to obtain said premises, facilities, rights, licenses and privileges, and

WHEREAS, it is the intention of Lessor and Lessee that this agreement shall be a supplement to said Indenture of Lease executed by Lessor and Lessee on the 15th day of October, 1938, concerning LaGuardia Field, above referred to; and

WHEREAS, an appropriate resolution has been duly adopted by the Board of Estimate of The City of New York on November 19, 1940 (Calendar No. 1) authorizing the execution of this Lease by the respective parties hereto.

NOW, THEREFORE, for and in consideration of the sum of One Dollar ($1.00) cash in hand paid, the receipt of which is hereby acknowledged, and other rents, covenants and agreements herein contained, Lessor does hereby demise and let unto Lessee and the Lessee does hereby hire and take from Lessor the following premises and facilities, rights, licenses and privileges in connection with and on the property of Lessor, known as Floyd Bennett Field, located on Flatbush Avenue, in the Borough of Brooklyn, City of New York, as more particularly hereinafter set forth, it being, however, mutually understood and agreed between the parties hereto that (excepting always that portion of the premises herein demised which are to be used exclusively by Lessee), any of such rights, licenses or privileges for the use of said Floyd Bennett Field, its appurtenances and facilities in common with others, as more particularly described in Paragraphs (A), (C), and (D) of this Supplement to Indenture of Lease, shall be exercised only subject to and in accordance with such rules and regulations as are now, or may hereafter be prescribed by the Commissioner of Docks in relation thereto, and shall in no manner be construed to grant to Lessee any rights, privileges or licenses in or to any portion of said Floyd Bennett Field, its appurtenances and facilities, leased or to be leased by Lessor to any other person or persons for their exclusive use, anything hereinafter set forth to the contrary notwithstanding;

(A) The use as an alternate to said LaGuardia Field for all purposes other than the regular scheduling of origination and termina-

NA 74/LL-3(17)(410429)

REPRODUCED AT THE NATIONAL ARCHIVES

tion of flights, and in common with others authorized so to do, of said airport, its facilities and appurtenances, the same being more particularly described in a drawing attached hereto, designated Exhibit A, and made a part hereof.

(B) The exclusive use of so much space in the "Terminal Building" located on the said airport for ticket office, operations office and crew lounge as may be agreed upon with the Commissioner of Docks and thereafter designated on a drawing to be marked Exhibit B and attached hereto;

(C) The use, in common with others authorized so to do, of said Terminal Building, together with its lobby, waiting rooms, hallways, rest rooms, and other public and passenger conveniences for Lessee, its employees, passengers, guests, patrons and invitees;

(D) All rights, privileges, licenses, uses and easements in, on and to Floyd Bennett Field, its facilities and buildings located thereon, which were granted to Lessee on and to the said LaGuardia Field in the following sections of said Indenture of Lease: Parts "B", "E", "F", "G" (excepting subsections 5 and 9 thereof) and "H".

TO HAVE AND TO HOLD the said premises, facilities, rights, licenses, privileges and uses set forth and referred to herein for a term commencing on the 1st day of October, 1940 and expiring on the 30th day of September, 1950 unless sooner terminated for reason or reasons set out in the said Indenture of Lease and herein incorporated by reference.

RENTALS

For the use of the said premises and facilities set forth in Parts "B" herein, the sum of Two Dollars ($2.00) per square foot per annum, which rentals are to be payable quarterly in advance from the date of occupancy of such premises.

CONTROL TOWER

Lessee hereby agrees that in the event Lessor maintains a

REPRODUCED AT THE NATIONAL ARCHIVES

agreement and no terms incorporated by reference in this supplemental contract shall apply thereto.

IT IS FURTHER HEREIN AGREED that all provisions hereinbefore made for incorporation herein of specific provisions of the said Indenture of Lease are for reasons of clarity only, in no way restricting the force and effect of the above general provisions for incorporation by reference.

IN WITNESS WHEREOF, the Commissioner of Docks has executed these presents, for and on behalf of Lessor, THE CITY OF NEW YORK, and has caused the seal of the Department of Docks to be hereunto affixed, attested and approved by its Secretary, and the said Lessee has caused these presents to be signed by its proper officers and its corporate seal to be hereunto affixed, all done the 29 day of December, 1940.

John McKeever
Commissioner of Docks
for Lessor

Attest:

Joyce A. Boylan
Acting Secretary, Department
of Docks

AMERICAN AIRLINES, INC.

by C. R. Smith
VICE PRESIDENT

Attest:

Vice President

M. Rathson
Secretary

APPROVED AS TO LEGALITY AND FORM
PRUITT, HALE & MacINTYRE
DATED 12-2-40 BY MM

NA 211/11-31/7 12/16/39

RG-71 Bureau of Yards & Docks

Naval Property Case Files, 1901-1958

New York : 33

Brooklyn

Box 334

Entry 1001/470/58/18/3

Folder: Brooklyn C33-70-B2 (1 of 2)

REPRODUCED AT THE NATIONAL ARCHIVES

All [illegible] for payment under this [illegible] No. 7201-1317

L E A S E

between

COMMISSIONER OF DOCKS, CITY OF NEW YORK

and

THE UNITED STATES OF AMERICA

---

1. This LEASE, made and entered into this 8th day of [illegible], in the year one thousand nine hundred and [illegible] by and between THE COMMISSIONER OF DOCKS, CITY OF NEW YORK, whose address is New York, N. Y., for his heirs, executors, administrators, successors, and assigns, hereinafter called the Lessor, and the UNITED STATES OF AMERICA, hereinafter called the Government:

WITNESSETH: The parties hereto for the considerations hereinafter mentioned, as authorized by resolution of the Board of Estimate, adopted January 18, 1940 (Cal. No. 2), covenant and agree as follows:

2. The Lessor hereby leases to the Government the following described premises, viz:

DESCRIPTION OF THE PROPERTY.

All that certain property lying and being in the Borough of Brooklyn, City of New York, State of New York, described as follows:

A parcel of land at Floyd Bennett Field, Borough of Brooklyn, City of New York, State of New York, described and bounded as follows:

Beginning at a point distant 1735 feet northerly from the southerly line of Floyd Bennett Field, Jamaica Bay, Borough of Brooklyn, and 750 feet westerly from the pierhead and bulkhead line established by the Secretary of War, May 1, 1911, along the westerly side of Jamaica Bay, thence northwardly and parallel with the aforesaid pierhead and bulkhead line a distance of 1100 feet; thence westwardly and at right angles to the last mentioned line a distance of 650 feet; thence southwardly and at right angles to the last mentioned line a distance of 1100 feet to a point; thence eastwardly and at right angles to the last

REPRODUCED AT THE NATIONAL ARCHIVES

mentioned line a distance of 650 feet to the point or place of beginning, containing an area of 715,000 square feet.

Including the right to erect on the site in question hangars and the right to build outshore such waterfront structures as docks, wharves, ramps, boat landings, and any other structures for operation of government boats or seaplanes. Also the right to fill the said site to grade conforming to the grade adjoining Coast Guard Air Station Reservation and the grade along the west line of the property approximately one foot lower than the existing grade of the easterly improved portion of Floyd Bennett Field. Also the right to obtain from the submerged and tide lands adjoining the said site to the eastward and from other adjacent or nearby submerged and tide lands the sand and other material necessary to fill by hydraulic fill or other process the said site to the grades as herein described. Also the right to access to said site from Flatbush Avenue through and over the City owned lands of Floyd Bennett Field particularly over the road existing along the southerly border of the field and thence northerly along the existing road adjoining the existing physical bulkhead line to the southeasterly corner of the Coast Guard Air Station.

to be used exclusively for the following purposes (see instruction No. 3): Naval aviation activities.

3. TO HAVE AND TO HOLD the said premises with their appurtenances for the term beginning January 1, 1940 and ending with December 31, 1940.

4. The Government shall not assign this lease in any event, and shall not sublet the demised premises except to a desirable tenant, and for a similar purpose, and will not permit the use of said premises by anyone other than the Government, such sublessee, and the agents and servants of the Government, or of such sublessee.

5. This lease may, at the option of the Government, be renewed from year to year at a rental of one dollar ($1.00) per year and otherwise upon the terms and conditions herein specified, provided notice be given in writing to the Lessor at least thirty days before this lease or any renewal thereof would otherwise expire: Provided that no renewal thereof shall extend the period of occupancy of the premises beyond the 31st day of December 1944.

REPRODUCED AT THE NATIONAL ARCHIVES

6. The Lessor shall furnish to the Government, during the occupancy of said premises, under the terms of this lease, as part of the rental consideration, the following:

Access to the site as hereinbefore described and the right to connect to existing services of water, electricity, telephone and similar utilities within the limits of Floyd Bennett Field provided that the cost of such connections shall be borne by the Government and the Government shall pay the established charges for its consumption of such materials and services through whatever meters are necessary to be furnished at Government expense.

As part of this lease the United States shall have the right to install and maintain underground electrical, water or gas services, underground telephone service through conduits in a parcel of ground approximately six feet wide laying ten feet east of the existing easterly boundary of Floyd Bennett Field and parallel thereto and running from the southerly boundary of the field to any point perpendicular to the premises hereinabove leased. The installation of such electrical services or gas services shall be in accordance with the rules and regulations of the Department of Water Supply, Gas and Electricity of the City of New York. This right to install and maintain underground gas, telephone, and electrical services includes the right to install necessary manholes and pull boxes. All existing surfaces disturbed in such installation shall be restored to the condition existing at the time of installation. Upon approval of the Commissioner of Docks the United States shall have the right to change the exact location of these underground facilities in order to more adequately conform to the entrance of existing services to the United States Coast Guard Reservation.

REPRODUCED AT THE NATIONAL ARCHIVES

7. The Government shall pay the Lessor for the premises rent at the following rate: One Dollar ($1.00) per year. Payment shall be made at the end of each year.

8. The Government shall have the right, during the existence of this lease, to make alterations, attach fixtures, and erect additions, structures, or signs, in or upon the premises hereby leased (provided such alterations, additions, structures, or signs shall not be detrimental to or inconsistent with the rights granted to other tenants on the property or in the building in which said premises are located); which fixtures, additions, or structures so placed in or upon or attached to the said premises shall be and remain the property of the Government and may be removed therefrom by the Government prior to the termination of this lease, and the Government, if required by the Lessor, shall, before the expiration of this lease or renewal thereof, restore the premises to the same condition as that existing at the time of entering upon the same under this lease, reasonable and ordinary wear and tear and damages by the elements or by circumstances over which the Government has no control, excepted: Provided, however, that if the Lessor requires such restoration, the Lessor shall give written notice thereof to the Government days before the termination of the lease.

9. If the said premises be destroyed by fire or other casualty this lease shall immediately terminate. In case of partial destruction or damage, so as to render the premises untenantable, either party may terminate the lease by giving written notice to the other within fifteen days thereafter, and if so terminated no rent shall accrue to the Lessor after such partial destruction or damage.

...ICED AT THE NATIONAL ARCHIVES

10. (a) No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this lease or to any benefit to arise therefrom. Nothing, however, herein contained shall be construed to extend to any incorporated company, if the lease be for the general benefit of such corporation or company.

(b) The lessee will not construct any improvements on the demised premises which will project higher than an elevation of 67 feet above mean low water and such hangars or structures whose highest point is more than 35 feet above mean low water shall be constructed no closer to the existing southerly side of the 4,000 foot runway than 700 feet.

(c) The lessee without payment of further consideration may use jointly with the lessor the existing ramp of the lessor for a period not to exceed one year from the date hereof.

IN WITNESS WHEREOF, the parties hereto have hereunto subscribed their names as of the date first above written.

In presence of:

_____

_____
(Address)

_____
Lessor.

UNITED STATES OF AMERICA.

By_____

_____
(Official title)

REPRODUCED AT THE NATIONAL ARCHIVES

BOARD OF ESTIMATE
CITY OF NEW YORK

(Cal. No. 2)

Resolved, By the Board of Estimate, if executed within sixty days after the adoption hereof, that the Commissioner of Docks be and is hereby authorized to enter into the following described lease:

Lessee: The United States of America.

Property: All that certain property lying and being in the Borough of Brooklyn, City of New York, State of New York, described as follows:

A parcel of land at Floyd Bennett Field, Borough of Brooklyn, City of New York, described and bounded as follows:

Beginning at a point distant 1,735 feet northerly from the southerly line of Floyd Bennett Field, Jamaica Bay, Borough of Brooklyn, and 750 feet westerly from the pierhead and bulkhead line, established by the Secretary of War, May 1, 1911, along the westerly side of Jamaica Bay, thence northwardly and parallel with the aforesaid pierhead and bulkhead line a distance of 1,100 feet; thence westwardly and at right angles to the last mentioned line, a distance of 650 feet; thence southwardly and at right angles to the last mentioned line a distance of 1,100 feet to a point; thence eastwardly and at right angles to the last mentioned line, a distance of 650 feet to the point or place of beginning, containing an area of 715,000 square feet.

Structures and Improvements: Lessee shall have the right:

1. To construct such hangars, bulkheads, ramps, docks, wharves, boat landings and other structures as may be required for the operation of government boats or seaplanes.

2. To fill the site to grade conforming to grade of adjoining Coast Guard station.

3. To obtain from the adjacent submerged and tide lands the sand and other necessary material for fill.

4. To have access to the site from Flatbush avenue over City-owned lands of Floyd Bennett Field, particularly along the southerly boundary of the field and along the existing road leading to the Coast Guard Air Station.

5. To connect to existing services of water, electricity, telephones and similar utilities within the limits of Floyd Bennett Field, subject, however, to the condition that the lessee shall pay all costs of construction, consumption, maintenance and meters.

6. To install and maintain underground telephone, electrical, water or gas services, through conduits in a parcel of ground approximately six feet wide lying ten feet east of the easterly boundary of the field and parallel thereto.

Term: The term of the lease shall commence January 1, 1940, and end December 31, 1940, and the lessee shall have the right of annual renewals, on thirty days' notice to December 31, 1944, but in any case the term shall cease and terminate if said leased plot of land be duly ceded to the United States of America.

Rent: Rent for the initial term of one year shall be at the rate of one dollar ($1.00), with an increase of ten cents (10c.) per annum for each successive renewal.

Other Terms: The lease shall contain the usual clauses of the United States standard form of lease, except and unless any clause therein, which, in the opinion of the Corporation Counsel, is prejudicial to the interest of the City. There shall also be a clause in the lease limiting the height of hangars and other structures to 67 feet above mean low water, and such structures whose highest point is more than 35 feet above mean low water shall be constructed no closer to the existing southerly side of the north-east-southwest runway than 700 feet.

The lessee shall have the right, without payment of further consideration, to jointly use with the lessor the existing ramp of the lessor for a period not to exceed one year from the date of occupancy.

Resolved, By the Board of Estimate, that the inclusion of the clause concerning the depositing with the Comptroller and to his satisfaction, a surety bond, or in lieu thereof New York City securities, as required by the resolution of the Commissioners of the Sinking Fund, adopted on May 23, 1934 (Cal. No. 80), amending the resolution adopted June 6, 1919 (Cal. No. 6), be and hereby is waived; and be it further

Resolved, By the Board of Estimate that should the plot of land hereinabove authorized to be leased be hereafter ceded to the United States of America, it is to be understood that if the United States of America shall cease to use the same for aviation purposes the said property together with all structures constructed thereon shall revert to The City of New York.

A true copy of resolution adopted by the Board of Estimate, JANUARY 18, 1940.

.....

Secretary

RG-71 Records of the Bureau of Yards & Docks
Naval Property Case Files, 1911-1953

Entry 1001 / 470 / 58 / 18 / 3

Box 585

Folder: Brooklyn C33-70-BR (2 of 2)

REPRODUCED AT THE NATIONAL ARCHIVES

65-Pk-6

All public bills for payment under this contract should include a reference to No. 1041-1956

THIS INDENTURE, made the 22nd day of May in the year one thousand nine hundred and forty one, between THE CITY OF NEW YORK, acting by the Commissioner of Docks, party of the first part, hereinafter called the City, and UNITED STATES OF AMERICA, party of the second part, hereinafter called the Government,

W I T N E S S E T H:

WHEREAS, the Board of Estimate of the City of New York, pursuant to Section 707 of the New York City Charter, did, by resolution adopted at a meeting held May 27th, 1941 (Calendar No. 1), approve of and consent to the execution of a lease by the Commissioner of Docks to the Government, of the hereinafter described wharf property upon the terms and conditions in said resolution set forth and herein contained;

NOW, THEREFORE, the City for and in consideration of the rents, covenants, terms and conditions hereinafter mentioned and contained, on the part of the Government to be made, kept, and observed, does hereby demise and let unto the Government and the Government does hereby hire and take from the City, for a term commencing on May 26, 1941 and ending June 30, 1942, with privilege of seven renewals for terms of one year each as hereinafter more specifically provided, subject to termina-

REPRODUCED AT THE NATIONAL ARCHIVES

tion, cancellation, and readjustment of rentals as hereinafter provided:

ALL of the real property located at Flatbush Avenue, Borough of Brooklyn, City of New York, on which is constructed a landing area for aircraft known as "New York Municipal Airport--Floyd Bennett Field", which premises are more particularly described as follows:

> ALL that certain piece or parcel of wharf property lands, lands under water, lands under water filled in, lying and being in the Borough of Brooklyn, City and State of New York, more particularly bounded and described as follows:
>
> Beginning at a point in the easterly line of Flatbush Avenue, the coordinates of said point being south 28,852.428 ft. and east 17,605.273 ft.; thence north 77°49'49.5" east a distance of 7,137.942 ft. to a point in the United States Pierhead and Bulkhead Line as now laid down along the westerly side of Jamaica Bay, the coordinates of said point being south 27,347.708 ft. and east 24,582.811 ft; thence south 12°10'10.5" east and along the above mentioned United States Pierhead and Bulkhead Line a distance of 3,523.761 ft. to a point in the said United States Pierhead and Bulkhead Line whose coordinates are south 30,792.282 ft. and east 25,325.636 ft.; thence south 77°49'49.5" west a distance of 5,249.677 ft. to an intersection with the easterly line of Flatbush Avenue, the coordinates of said intersection being south 31,898.944 ft. east 20,193.934 ft.; and running thence north 40°21'17.8" west along the said easterly line of Flatbush Avenue a distance of 3,997.803 ft. to the point or place of beginning. Containing a total area of 501 acres, together with all City-owned structures, appurtenances and equipment now erected thereon. The coordinates hereinabove referred to are in the rectangular

REPRODUCED AT THE NATIONAL ARCHIVES

system established for the Borough of Brooklyn and refer to the United States Coast and Geodetic Survey Station "Prospect Park Water Tower" as origin and the meridian passing through it as the principal axis, as the same is shown on the plan attached hereto and made a part hereof, marked Exhibit "A".

TOGETHER with all of the hangars, buildings, structures, facilities and equipment and appurtenances erected and being thereon and connected with or used in connection with said Floyd Bennett Field and the demised premises.

SUBJECT to the rights and privileges of the following commercial airlines as contained and set forth in certain supplements to indentures of leases which are incorporated herein by reference, and more particularly hereinafter referred to, to use a portion of the premises and the facilities located at said Floyd Bennett Field:

(1) Supplement to indenture of lease executed December 2, 1940, between The City of New York- acting by its Commissioner of Docks, and American Airlines, Inc., pursuant to resolution of the Board of Estimate adopted November 19, 1940 (Calendar No. 1); and

(2) Supplement to indenture of lease executed December 2, 1940, between The City of New York, acting by its Commissioner of Docks, and United Airlines Transport Corporation,

REPRODUCED AT THE NATIONAL ARCHIVES

pursuant to resolution of the Board of Estimate, adopted November 19, 1940, (Cal. No. 1); and

(3) Supplement to indenture of lease executed December 2, 1940, between The City of New York, acting by its Commissioner of Docks, and Transcontinental & Western Air, Inc., pursuant to resolution of the Board of Estimate, adopted November 19, 1940, (Cal. No. 1); and

(4) Supplement to indenture of lease executed December 5, 1940, between The City of New York, acting by its Commissioner of Docks, and Eastern Airlines, Inc., pursuant to resolution of the Board of Estimate, adopted November 19, 1940. (Cal.No. 1); and

(5) Supplement to indenture of lease executed December 2, 1940, between The City of New York, acting by its Commissioner of Docks, and Canadian Colonial Airways, Inc., pursuant to resolution of the Board of Estimate, adopted November 19, 1940, (Cal. No. 1); and

Reserving to the City the right to grant similar rights and privileges as contained in the aforesaid supplement

REPRODUCED AT THE NATIONAL ARCHIVES

to indentures of lease, to other commercial airlines that may use the facilities and premises known as "Municipal Airport No. 2--LaGuardia Field", located in the Borough of Queens, City and State of New York; and subject also to the following conditions:

FIRST: That the Government will use the demised premises exclusively for general naval and military purposes.

SECOND: That the Government will not at any time assign this lease nor sublet the same nor in any way charge or encumber the premises hereby demised or any part thereof, without the consent in writing of the Commissioner of Docks.

THIRD: That the Government will well and truly, and without any manner of deduction, abatement, delay, pay or cause to be paid to the said City, its successors and assigns, at the office of the Commissioner of Docks, during the first term of this lease, an annual rent in the sum of Fifty Thousand ($50,000.) Dollars, payable at the end of each quarter on the first day of October, January, April and July, provided that the rent for the period from May 26, 1941 to June 30, 1941, shall be payable on July 1, 1941.

FOURTH: If at any time, not less than three months before the expiration of the term of these presents, or of any renewal term thereof, the Government

REPRODUCED AT THE NATIONAL ARCHIVES

shall give to the City notice in writing by service thereof on the Commissioner of Docks of its desire that this lease shall be renewed, and if the said Government shall have kept and observed all of the covenants and stipulations in this Indenture contained, then and in that case the said City will again demise and let unto the said Government for a further term of one (1) year next ensuing the day on which the term hereby demised shall expire, all and singular, the property described in this Indenture of Lease, by an Indenture with like covenants as are contained in this Indenture, and except that the annual rent for the first renewal term shall be the sum of Fifty thousand and one ($50,001.) Dollars; for the second renewal term, the sum of Fifty thousand and two ($50,002.) Dollars; for the third renewal term, the sum of Fifty thousand and three ($50,003.) Dollars; and for the fourth renewal term, the sum of Fifty thousand and four ($50,004.) Dollars, payable at the end of each quarter on the first day of October, January, April and July.

Provided, however, that should a state of national emergency, pursuant to Presidential Proclamation, exist, it is further understood and agreed that the Government shall have the further right and option to renew this lease for three additional terms of one (1) year each, if three months prior to the expiration of the fourth renewal term, or of any subsequent additional renewal term, the Government shall give notice of such option to renew

REPRODUCED AT THE NATIONAL ARCHIVES

for such additional terms, to the Commissioner of Docks, as provided for in this paragraph. The rental for the first of such additional renewal terms shall be the sum of Fifty thousand and five ($50,005.) Dollars for the second of such additional renewal terms, the sum of Fifty thousand and six ($50,006.) Dollars, and for the third of such additional renewal terms, the sum of Fifty thousand and seven ($50,007.) Dollars.

This Indenture of Lease shall be renewed for the further additional terms hereinabove referred to upon the compliance by the Government with all of the covenants and stipulations in this Indenture contained, and upon the giving of the notice in writing as provided in this paragraph to the City, by service thereof upon the Commissioner of Docks.

FIFTH: That the Government shall have the right, during the original or any renewal term, to cancel this lease and all of the covenants, terms, and conditions thereof, upon the giving to the City of notice in writing by service thereof on the Commissioner of Docks, not less than six months prior to the date fixed in such notice for the termination and cancellation of this lease, and upon the date fixed in such notice, this lease and all of the terms, covenants, and conditions thereof shall cease and determine, as if the same

REPRODUCED AT THE NATIONAL ARCHIVES

were the end of the original or any renewal term of this lease.

In the event, however, that at the end of the original term, or any renewal term of this lease, a state of national emergency, pursuant to Presidential Proclamation, no longer exists, then and in such event, either party hereto shall have the right and privilege to cancel this lease upon the giving of six months' notice in writing to the other immediately upon the termination of said national emergency.

SIXTH: That the acceptance of rental by the City for any period or periods after a default of any of the terms, covenants and conditions herein contained to be performed, kept, and observed by the Government, shall not be deemed a waiver of any right on the part of the Commissioner of Docks to cancel this lease for failure by the Government to so perform, keep or observe any of the terms, covenants or conditions of this lease. No waiver of default by the City of any of the terms, covenants or conditions hereof, to be performed, kept and observed by the Government shall be construed to be or act as a waiver of any subsequent default of any of the terms, covenants and conditions herein contained to be performed, kept and observed by the Government.

SEVENTH: That the Government shall have the right to erect or construct any building or

REPRODUCED AT THE NATIONAL ARCHIVES

structure upon the demised premises, the title thereto to remain in the United States, provided, however, that any such building or structure shall be constructed or erected in such a manner as not to interfere with the use of any of the runways on the demised premises, nor to violate the rules and regulations of the Civil Aeronautics Board of the United States with respect thereto, and the Government covenants and agrees to remove such buildings and structures at the end of the original or any renewal term of this lease, and restore the demised premises to the state or condition existing at the time of the commencement of this lease.

The City agrees to provide tower control service to regulate and control the landing and taking off of aircraft to and from the demised premises during the periods when such premises shall be used by the various commercial airlines hereinbefore set forth and referred to for the purposes specified in the supplements to the indentures of lease also hereinbefore referred to.

EIGHTH: That the Government will, at its own sole expense at all times during the said original term and any renewal term thereof, maintain the said premises and every part thereof, and the structures thereon in good and sufficient repair and condition; if all or any part of the premises or any buildings or facilities thereon at the time of the commencement of this lease are wholly or partially damaged or destroyed for any cause whatsoever, the Government will make appropriate recommendation to Congress that the same

REPRODUCED AT THE NATIONAL ARCHIVES

be restored to their original condition at Government expense; that the Government will furnish at its own sole expense at all times, all electric power necessary to operate or to light said premises and any facilities and equipment in connection therewith, and will pay for any and all water consumed or used in, on, or about said premises; and will do such dredging, from time to time, either before or during the term hereby created, as may be necessary in the water immediately adjacent to the said premises.

NINTH: That if at any time during the aforesaid term in any action or actions brought to recover damages for injuries to any person or persons or property by reason of any accident happening on or in proximity to the aforesaid premises through the negligence of the Government, its agents or employees, a judgment shall be recovered against the said City, upon written demand being made upon it, the Government shall make recommendation to Congress that it authorize the reimbursement of the City for any sums paid as a result of such judgment, provided the City shall have given notice in writing to the Government of the pendency of the action, from which such judgment arose, and shall have afforded the counsel of the said Government an opportunity to cooperate with the Corporation Counsel of The City of New York, in the defense of such action.

TENTH: The City agrees to serve lawful notice immediately on all tenants and persons occupying

REPRODUCED AT THE NATIONAL ARCHIVES

any part of the demised premises, to vacate said premises, and will take all necessary and lawful steps required to remove said tenants and persons therefrom, and the Government agrees that in all cases of loss sustained by the City resulting from any actions or proceedings made or brought by any tenant, occupants of the demised premises, or any other persons, by reason of the making of this lease, or from the termination of any permits, licenses, concessions, or other privileges granted to such tenants, occupants, or other persons, it will recommend to Congress that the City be reimbursed therefor as the circumstances require.

The Government agrees, however, to permit the restaurant concession now existing at such demised premises, to continue and remain therein and thereon, for such a period of time and under such rules and regulations as may be fixed by the City and are acceptable to the Government.

ELEVENTH: That if the Government shall fail to perform, keep and observe any of the terms, covenants or conditions herein contained on the part of the Government to be performed, kept or observed, the Commissioner of Docks may terminate this lease by a notice to be served as herein provided, and the term hereby demised shall thereupon cease and expire in the same manner and to the same effect as if that were the expiration of the original term, or of any renewal term thereof.

REPRODUCED AT THE NATIONAL ARCHIVES

TWELFTH: That wherever the words "Commissioner of Docks" shall be mentioned herein, they shall be construed to mean the officer or agent of the City, who for the time being shall be exercising the same or equivalent functions to those now exercised by the Commissioner of Docks.

THIRTEENTH: That any notices required by the provisions of this lease to be sent to the Government shall be sufficiently complied with by sending the same by registered mail to the Secretary of Navy, Navy Department, Washington, D. C.

FOURTEENTH: That the Government will peaceably and quietly leave, surrender and yield up unto the possession of the said City, without delay, the premises and property hereby leased and demised, at the end of the original or of any renewal term, or other sooner termination of this lease, as herein provided, and that the said premises and structures of the City thereon shall then be well and sufficiently repaired, painted and in good order and condition, reasonable wear and tear excepted, in accordance with the terms of Paragraph Eighth hereof.

REPRODUCED AT THE NATIONAL ARCHIVES

FIFTEENTH: It is understood that the premises hereinbefore described, include an area of 16.4 acres, more or less, which is now occupied by the Government under lease from the City and which the Government is authorized by Act of Congress approved April 18, 1940 (Public No. 456 - 76th Congress), to accept from the City for use as a naval seaplane base, and that if and when such tract shall be conveyed to the United States by the City as in said act provided the area herein leased will be reduced to that extent without reduction of the rental consideration herein named, provided however that no rental consideration shall be due and payable hereunder unless and until the City has conveyed the aforesaid parcel of 16.4 acres, more or less, to the United States without cost, and as provided in said Act of April 18, 1940.

SIXTEENTH: This lease supersedes and terminates two existing leases between the parties, both dated June 13, 1940, being Nos. NOD-1385 and NOD-1386 and covering certain hangars and other buildings located upon the premises herein leased.

SEVENTEENTH: No Member of or Delegate to Congress or Resident Commissioner shall be admitted to any share or part of this permit or to any benefit to arise therefrom. Nothing, however, herein contained shall be construed to extend to any incorporated company, if the permit be for the general benefit of such corporation or company.

IN WITNESS WHEREOF, the Commissioner of Docks has executed these presents for and on behalf of The City of

REPRODUCED AT THE NATIONAL ARCHIVES

New York, and has caused the seal of the Department of Docks to be hereunto affixed, attested and proved by its Secretary, and the party of the second part has caused these presents to be signed by its proper officer, all done in the day and year first above written.

In presence of:

Attest:

Secretary

THE CITY OF NEW YORK

By:
Commissioner of Docks

APPROVED AS TO FORM
ACTING CORPORATION COUNSEL

UNITED STATES OF AMERICA

By:
Acting Secretary of the Navy

RG-71 Records of the Bureau of Yards and Docks

Naval Property Case Files, 1941-1958

Entry 1001 / 470/58/18/3

Box 585

Folder: Brooklyn C33-70-BR (2 of 2)

THIS INDENTURE, made the 27th day of May nineteen hundred and forty-one, between THE CITY OF NEW YORK, a municipal corporation, party of the first part, and THE UNITED STATES OF AMERICA, party of the second part;

WHEREAS, the party of the second part desires to use a portion of Floyd Bennett Field, situated in the Borough of Brooklyn, City and State of New York, as more particularly hereinafter described, for the purpose of establishing an air station in connection with the defense of New York Harbor and the Atlantic Coast; and

WHEREAS, the party of the first part, acting by its Board of Estimate, pursuant to the provisions of subdivision 3b of Section 383-3.0 of the Administrative Code of The City of New York, is willing to cede, grant, and convey to the party of the first part, free of cost, all the estate, right, title and interest of the party of the first part in and to such premises;

NOW, THEREFORE

WITNESSETH, that the party of the first part, in consideration of the conditions hereinafter stated and pursuant to a resolution of the Board of Estimate of The City of New York, adopted on the 19th day of May, 1941, (Calendar No. 2), does hereby cede, grant, and convey unto the party of the second part, all the estate, right, title, and interest of the party of the first part in and to

ALL that certain property lying and being in the Borough of Brooklyn,

REPRODUCED AT THE NATIONAL ARCHIVES

City of New York, State of New York, being a parcel of land at Floyd Bennett Field, Borough of Brooklyn, City of New York, State of New York, together with any and all buildings, structures and improvements erected and being thereon, described and bounded as follows:

BEGINNING at a point distant 1735 feet northerly from the southerly line of Floyd Bennett Field, Jamaica Bay, Borough of Brooklyn, and 750 feet westerly from the pierhead and bulkhead line established by the Secretary of War, May 1, 1911, along the westerly side of Jamaica Bay, thence northwardly and parallel with the aforesaid pierhead and bulkhead line a distance of 1100 feet; thence westwardly and at right angles to the last mentioned line a distance of 650 feet; thence southwardly and at right angles to the last mentioned line a distance of 1100 feet to a point; thence eastwardly and at right angles to the last mentioned line a distance of 650 feet to the point or place of beginning, containing an area of 715,000 square feet.

TOGETHER with the right of access to the above described premises from Flatbush Avenue, a street bordering said Floyd Bennett Field on the west, over, across, and along the existing road on the southerly side of said field, leading to the Coast Guard Air Station adjacent to the premises herein described; the right of access over and across the portion of Floyd Bennett Field adjoining the premises herein described on the north, and, between the shore line of Jamaica Bay and the existing boundary lights of said Floyd Bennett Field on the east side of said field, for the purpose of transporting dredging material to be taken from the submerged or tidal lands adjacent to said Floyd Bennett Field, for filling the premises herein

FEDERALLY PRIVATE NATIONAL ARCHIVES

described to a grade conforming to the present grades of the Coast Guard Air Station adjacent to the said premises; such right of access, however, shall only be until such filling has been completed; and also the right to lay, construct, and maintain underground telephone lines, electrical lines, water lines, or gas lines and other services as the Navy Department may find necessary for its proper and convenient use of the premises herein described, in the existing conduits along the northerly boundary of said field from Flatbush Avenue to the above premises, through which the party of the second part has heretofore constructed and maintained such services. All of the foregoing rights shall be exercised in such a manner as not to interfere with the operations of said Floyd Bennett Field and as not to violate any of the rules, regulations and requirements of the Civil Aeronautics Board, or the proper successor body thereto;

TOGETHER with the appurtenances and all the estate and rights of the party of the first part in and to said premises.

TO HAVE AND TO HOLD the premises herein granted unto the party of the second part forever, upon the condition however, that the same shall be used by the party of the second part for the purposes of an air station in connection with the defense of New York Harbor and the Atlantic Coast, and in the event that said premises shall cease to be used by the party of the second part for such purposes, then

REPRODUCED AT THE NATIONAL ARCHIVES

and in such event, the premises herein described, together with all the buildings and structures erected and being thereon, shall immediately revert to the party of the first part without let or hindrance by the party of the first part, to the same extent as if this conveyance had never been made.

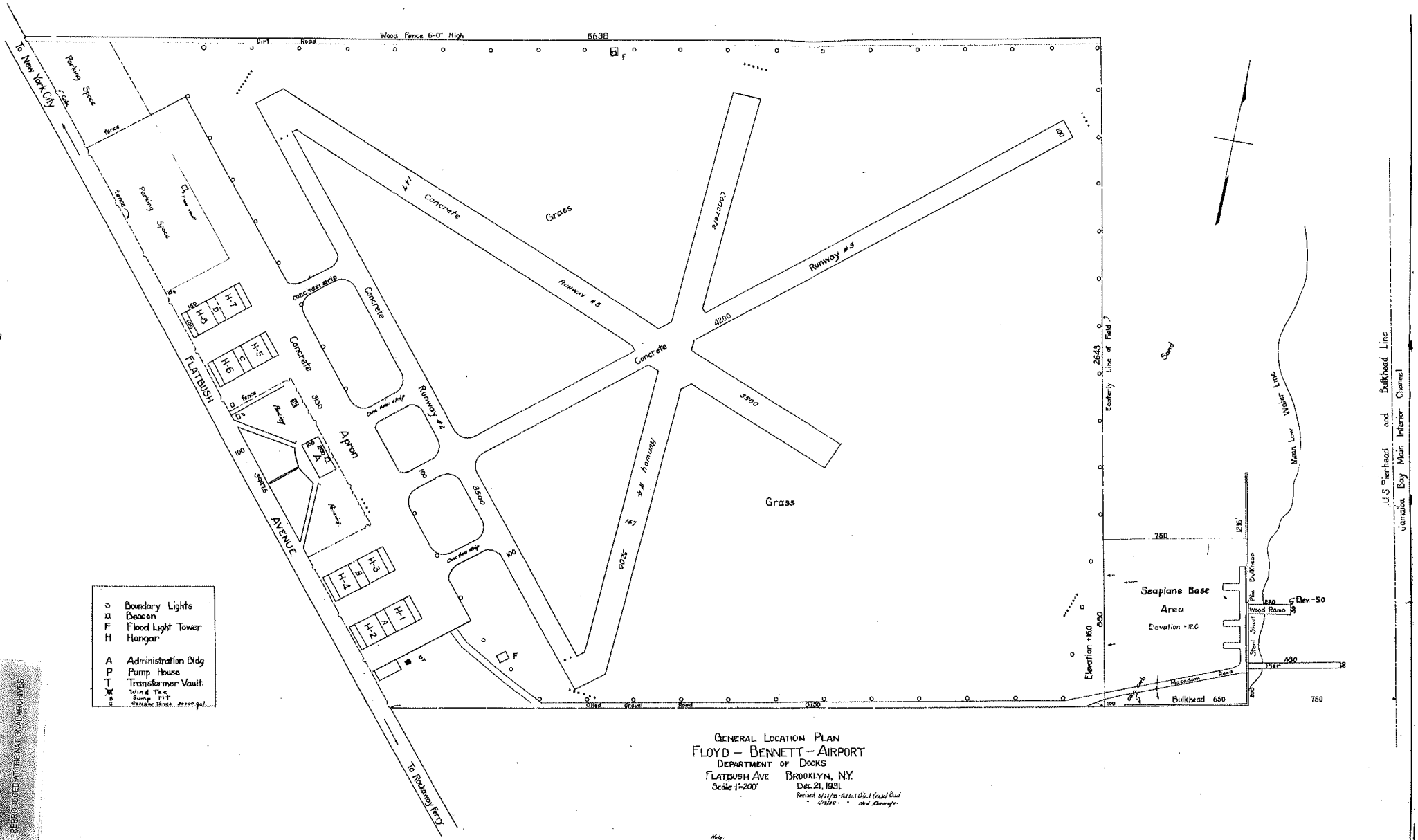
IN WITNESS WHEREOF, the said The City of New York, party of the first part, has caused these presents to be subscribed to by the Mayor and by its City Clerk, and its corporate seal to be hereunto affixed the day and year first above written.

Mayor

City Clerk.

Approved as to form

Acting Corporation Counsel



GENERAL LOCATION PLAN
FLOYD – BENNETT – AIRPORT
DEPARTMENT OF DOCKS
FLATBUSH AVE BROOKLYN, N.Y.
Scale 1"=200' Dec. 21, 1931.
Revised 6/1/32 to Add Wind Guard Rail and Runways.

Note: Do Not use scaled distances

REPRODUCED AT THE NATIONAL ARCHIVES

RG-71 Bureau of Yards & Docks

Naval Property Case Files, 1901-1958

New York : 33

Brooklyn

Box 534

Entry 1001/470/58/18/3

Folder: Brooklyn C33-70-B12 (1 of 2)

Appendix E: Material Analysis

Floyd Bennett Field
Hangars 1 and 2

Brooklyn, New York



Mortar Analysis

March 2012

BCA

BUILDING CONSERVATION ASSOCIATES INC

© BUILDING CONSERVATION ASSOCIATES INC

Floyd Bennett Field Hangars 1 and 2

Brooklyn, New York

Mortar Analysis

Prepared For
URS Corporation
437 High Street
Burlington, NJ 08016

Prepared By
Building Conservation Associates, Inc.
158 West 27th Street
New York, New York 10001

BCA Team
Raymond Pepi
Dean Koga
Chris Gembinski

March 2012

BCA

BUILDING CONSERVATION ASSOCIATES INC

March 2012



BUILDING CONSERVATION ASSOCIATES INC

CONTENTS

SUMMARY OF FINDINGS AND RECOMMENDATIONS..... 1
INTRODUCTION..... 2
METHODOLOGY..... 2
Aggregate Matching Through Wet Chemical Analysis..... 2
Petrographic Analysis..... 3
OBSERVATIONS..... 3
Exterior Hangar 1: Original Pointing Mortar..... 3
Interior Hangar 1: Original Pointing Mortar..... 4
Exterior WPA Infill: Original Pointing Mortar..... 5
Exterior Hangar 1 Lean-to: Original Pointing Mortar..... 6
Exterior Hangar 1 Lean-to: Re-pointing Mortar..... 7
CONCLUSIONS AND RECOMMENDATIONS..... 7
Exterior Masonry Mortar..... 8
Interior Masonry Mortar..... 8
APPENDICES
Appendix A: Sample Data
Appendix B: Mortar Analysis Report

LABORATORY REPORT: MORTAR ANALYSIS

Date:	March 2012
Commissioned By:	URS Corporation
Building/Project:	Floyd Bennett Field: Hangar Buildings 1 and 2
Building Address:	Brooklyn, New York
Construction Date:	Hangar 1 (1931), Hangar 1 Lean-to (1936), and WPA Infill (1937)
No. of Samples:	5
Samples Removed By:	BCA
Analysis Performed By:	C. Gembinski and D. Overholt (ATL)
Analysis Checked By:	D. Koga

SUMMARY OF FINDINGS AND RECOMMENDATIONS

Exterior Hangar 1: Original Pointing Mortar (sample FBF-01)
The exterior 1931 pointing is a white Portland cement and lime mortar showing signs that it is disbonded from the brick masonry and requires replacement.

Interior Hangar 1: Original Pointing Mortar (Samples FBF-02)
The interior 1931 pointing is light gray Portland cement and slaked lime mortar susceptible to water infiltration. There are two options for treatment: An isolated spot re-pointing campaign, or a full replacement if determined necessary.

Exterior WPA Infill: Original Pointing Mortar (Sample FBF-03)
The exterior 1936 pointing is a white Portland cement and lime mortar showing signs that it is disbonded from the brick masonry, as well as evidence of delayed ettringite formation (DEF) and requires replacement.

Exterior Hanger 1 Lean-to Structure: Original Pointing Mortar (Sample FBF-04)
The exterior 1936 pointing of the lean-to structure visually matches that of the WPA Infill.

Exterior Hangar 1 Lean-to Structure: Re-pointing Mortar (FBF-05)
The exterior c.1937 re-pointing is visually a very good match to the original mortar, but not identical, incorporating the same sand evidently sieved before being mixed in a different binder ratio. Similar to all of the other exterior mortars it is disbanded from the brick masonry, but also separated from the original mortar, as well as missing in some locations.

Recommended New Mortars

Exterior Masonry: Replacement Pointing Mortar
ASTM C 270-06, Type N Mortar consisting of a 1:1:6 (cement: lime: sand) ratio.

Interior Masonry: Replacement Pointing Mortar
ASTM C 270-06, Type O Mortar consisting of a 1:2.9 (cement: lime: sand) ratio.

All mortars should be formulated using high-calcium hydrated lime.

All sand should comply with ASTM C 144.

INTRODUCTION

URS Corporation (URS) retained Building Conservation Associates, Inc. (BCA) to conduct an analysis of the existing mortars and make recommendations for replacement mortars for the Hangar 1 and 2 buildings at Floyd Bennett Field in Brooklyn, NY. On February 21 and 22, 2012, BCA and Arch Technology Ltd. (ATL) removed the mortar samples from the mortar joints in the buff colored brick masonry of the Hangar 1 building, the 1936 Hangar 1 Lean-to construction attached to the east end of Hangar 1 and the 1937 Work Progress Administration (WPA) Infill structure between Hangars 1 and 2. In addition, this analysis includes original brick pointing mortar from the interior of Hangar 1. The samples removed from each building construction are to the best of our knowledge representative of the typical mortars for each location.

BCA retained Highbridge Materials Consulting, Inc. (HMC) to perform laboratory analysis on three mortar samples (See Appendix B). HMC examined the samples using petrography and chemical analysis in order to identify materials and estimate original proportions in accordance with the standard practices contained within ASTM C 1324: Standard Test Method for Examination and Analysis of Hardened Masonry Mortar. The petrographer is qualified according to the requirements of Section 3 of ASTM C 856: Standard Practice for Petrographic Examination of Hardened Concrete.

BCA visually characterized and subjected five mortar samples to wet chemical analysis to separate the samples into their three constituent fractions (acid soluble component, fines and sand) for examination of the aggregates within the mortars and comparison to ASTM C 144: Standard Specification for Aggregate for Masonry Mortar standards. Extracted sands were matched to Munsell® Standard Soil colors and compared using gravimetric analysis.

METHODOLOGY

Aggregate Matching Through Wet Chemical Analysis

Wet chemical analysis for sand extraction and visual characterization is performed to assess the overall appearance of the mortar samples, extract and examine the original sands in the mortars, and provide comparative data for the evaluation of the samples. Given the limitations of the wet chemical technique, it is often the case that the greatest value of this test is to isolate the sand component of the mortar sample.

The wet chemical analysis method entails lightly crushing each sample with a mortar and pestle, performed carefully to avoid altering the size of the aggregate particles, and digesting the crushed samples in an excess 3 molar hydrochloric acid solution for 6 hours in a glass beaker. Acid insoluble residue is obtained by filtration and washing with distilled water and the residue (sand and fines) is dried in an oven to a constant weight at 110 degrees C, and equilibrated to room temperature and relative humidity.

The sands extracted from the samples are passed through sieves to determine the relative proportions of their granular size by weight. Visual characterization to assess the overall appearance, color and shapes of the sand granules is performed using a Nikon SMZ-U

stereobinocular microscope with fiber optic light source and a magnification up to 75X. The bulk mortar sample and the sand colors are matched to Munsell® Standard Soil colors. The isolated sands can then be matched to commercially available sands for replacement mortar mixes.

The comparative data provided by the method generally is not reliable for the formulation of exact replica mortars, especially when significant quantities of Portland cement are present in the mortar samples, portions of the sands contain carbonaceous aggregate, and/or the mortar being analyzed is in a deteriorated state. Further information such as the aggregate to binder ratio and the identification of specific crystalline materials present within the aggregate and binder can be determined by other analytical techniques such as petrographic analysis and x-ray diffraction. In conjunction with the standard wet chemical technique, these tests can provide a more comprehensive understanding of the composition of the mortar.

Petrographic Analysis

Petrographic analysis is carried out to characterize the aggregate in terms of mineral constituents, sizes, and shapes. Petrographic analysis is also used to determine the approximate relative proportions of aggregate to binder, as well as the type of binder in each mortar sample. Microscopic examination was performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera.

OBSERVATIONS

Exterior Hangar 1: Original Pointing Mortar (Sample FBF-01)

BCA removed a representative exterior pointing mortar sample from between a horizontal joint in the buff-colored brick masonry from the east elevation of Hangar 1 above the Hangar 1 Lean-to roof structure. The sample easily detached from the brick masonry when removed and a void behind the mortar exists. This is most likely original to the building and is in poor condition.

This mortar is hard, cohesive, and rough in texture exhibiting signs of weathering and erosion of the matrix paste from the exterior-facing surface. A moderate accumulation of atmospheric soil exists on the surface of the sample; however, the mortar appears “white” in color (Munsell® Neutral Value Scale N9), as does the cross-section of the sample.

The results of the analyses show that the existing exterior brick masonry pointing mortar of the 1931 hangar building (Hangar 1) contains “pinkish gray” (Munsell® 5 YR 6/2) aggregate. The aggregate particles from this mortar are characterized as angular to mostly subangular in shape with medium sphericity. The medium-grained sand is not well sorted and over 75% of the particles range in size from 300-600 micrometers. The aggregate is comprised of more than 85% clear and white particles, 10% pink particles, 5% gray/brown particles, and less than 1% black particles. The fines are “white” in color (Munsell® 2.5 Y 8/2). There is no evidence of a pigment present. Based on the sieve analysis, this sand does not comply with modern masonry sand gradations as specified by ASTM C 144.

Petrographic analysis determined that the binder in the mortar sample is white Portland cement and high calcium hydrated lime. Most likely, it was mixed with a high water content and possibly

tempered giving it a high capillary porosity and a moderately low permeability. The mortar is estimated to have a cement to lime ratio of 1: 0.10 and a total binder to sand ratio of 1: 2.5. This cement-rich formula does not meet modern ASTM C 270: Standard Specification for Mortar for Unit Masonry requirements, however, is seen at times in cement-lime mortars dating between c.1910 to c.1925[1]. Petrography and carbonation testing confirmed the physical evidence that the mortar is disbonded from the brick masonry, and that all surfaces of the sample, including the inboard side, were exposed.

Because this mortar is estimated to have a cement to lime ratio of 1: 0.10, which does not meet modern ASTM standards, and a total binder to sand ratio of 1: 2.5 and shows evidence of loss of adhesion due to its physical characteristics, BCA recommends installing new "deep" pointing in the exterior brick masonry of the hangar complex, where the existing mortar should be raked out of the joints to a minimum depth of 2".

Interior Hangar 1: Original Pointing Mortar (Sample FBF-02)

ATL removed a representative interior pointing mortar sample from between a horizontal joint in the brick masonry at the ground floor level from the west wall in Hangar 1 (looking west). BCA noted active water infiltration and biological growth on the wall. This is most likely original to the building and is in fair condition.

This mortar is relatively soft, highly water absorptive, cohesive, and smooth in texture exhibiting some evidence of weathering and erosion due to active water infiltration and biological growth. The mortar appears "white" in color (Munsell® color 10 YR 8/1).

The results of the analyses show that the overall color of the aggregate is "very pale brown" (Munsell® 10 YR 7/3). The aggregate particles from this mortar are characterized as mostly subangular in shape with medium sphericity. The aggregate is fairly well sorted coarse-grained sand and most of the particles are larger than 300 micrometers. The aggregate is comprised of more than 85% clear and white particles, 10% yellow particles, less than 5% gray/brown particles, and less than 1% black particles. The fines are "light gray" in color (Munsell® 10 YR 7/2). There is no evidence of a pigment present. Based on the sieve analysis, this sand does not comply with modern masonry sand gradations as specified by ASTM C 144.

Petrographic analysis determined that the binder in the mortar sample is gray Portland cement and high calcium lime with a moderately high capillary porosity and high permeability. The characteristics of the lime component suggest it was slaked on site and mixed in the formula as a high-calcium lime putty rather than a dolomitic dry hydrate lime. The mortar is estimated to have a cement to lime ratio of 1: 2.5 and a total binder to sand ratio of 1: 3.6 and comparatively matches a modern ASTM type "O" or historic type "K" cement-lime formulation. This mix appears to be disproportionately sanded, however if slaked lime was used in the original formulation, the lime ratio would be approximately 1.5 times less in volume calculated, which is based on a dry hydrated lime component. This ratio would compare more closely to a modern type "N" mortar, but highly over sanded. Although highly absorptive, no evidence of a loss of the binder materials due to water infiltration is observed because of the interior location of the mortar.

[1] Walsh, John J., Highbridge Materials Consulting, Inc., Appendix B, page 3.

BCA recommends installing an ASTM compliant mortar for pointing the interior brick masonry of the hangar complex. Replication of the original formula of this mortar would not meet current ASTM standards.

Exterior WPA Infill: Original Pointing Mortar (Sample FBF-03)

BCA removed a representative exterior pointing mortar sample from between a horizontal joint in the buff-colored brick masonry from the north wall of the WPA Infill at the ground floor level between Hangar 1 and Hangar 2. The sample easily detached from the brick masonry when removed and a void behind the mortar exists. It is most likely original to the building and is in poor condition.

This mortar is hard, cohesive, and rough in texture exhibiting signs of weathering and erosion of the matrix paste from the exterior-facing surface. A moderate accumulation of atmospheric soil exists on the surface of the sample; however, the mortar appears "white" in color (Munsell® Neutral Value Scale N9), as does the cross-section of the sample.

The results of the analyses show the overall color of the aggregate is "white" (Munsell® 10 YR 8/2). The aggregate particles from this mortar are characterized as subangular in shape with medium sphericity. The sharp-textured aggregate appears to be a coarse-grained sand, with more than 60% of the particles it contains larger than 600 micrometers. The aggregate is comprised of more than 90% clear and white particles, 5% pink particles, 5% gray/brown particles, and less than 1% black particles. The sand is more uniform compared to the sands in the exterior and interior hangar mortars. The fines are "white" in color (Munsell® N9). There is no evidence of a pigment present. Due to the skewed grain-size distribution, it appears this sand may not compact well and therefore does not satisfy the modern masonry sand gradations specified in ASTM C 144, this is supported by the sieve analysis indicating that this sand does not comply with modern masonry sand gradations.

Petrographic analysis determined that the binder in the mortar sample is white Portland cement and high calcium hydrated lime similar to the exterior pointing mortar in Hangar 1, with a high capillary porosity and a moderately low permeability. The mortar is estimated to have a cement to lime ratio of 1: 0.47 and a total binder to sand ratio of 1: 2.4. Unlike the 1936 exterior mortar, this cement-lime is comparable to a modern ASTM C 270 type "S" mortar. Petrography and carbonation testing confirmed the physical evidence that the mortar is disbonded from the brick masonry, and that all surfaces of the sample, including the inboard side, were exposed, similar to the exterior mortar in Hangar 1.

In addition, analysis revealed there are microscopic fissures both surrounding many of the sand grains, and within the paste between the grains in the more porous areas of the sample. These fissures, as well as most of the air-voids in the sample are lined with needles of ettringite, which normally indicates delayed ettringite formation (DEF). DEF is commonly found in concrete subject to high temperatures during curing, materials containing high alkali Portland cement, and/or sands contaminated with seawater containing alkalis and sulfates. The late formation of ettringite after a mortar hardens can result in internal expansive forces that can crack the mortar. Ettringite, calcium sulfoaluminate, is found in all Portland cement concretes[2] and DEF is

[2] PCA, Ettringite Formation and the Performance of Concrete, IS417, Portland Cement Association, 2001. Ettringite, calcium sulfoaluminate, is found in all Portland cement concretes. In some cases, the sources and admixtures required to form ettringite, such as gypsum, are added to the cement to prevent rapid setting and improve strength development. Gypsum and other sulfate compounds react with calcium aluminate to form ettringite within the first

often associated with other forms of deterioration of a mortar. The marine environment, or the possible use of sands containing salts in the formulation of the existing mortars are potential factors involved in the observed DEF in the mortar at Floyd Bennett Field. Further analysis using analytical techniques such as x-ray diffraction or SEM-EDS are required to identify the constituents involved in the development of the DEF.

Because this mortar shows evidence of DEF, loss of adhesion, and the sand does not conform to modern standards that allow close packing of aggregate particles, BCA recommends completely replacing the existing mortar with an ASTM mortar for new "deep" pointing in the exterior brick masonry of the infill structure, where the existing mortar should be raked out of the joints to a minimum depth of 2".

Exterior Hangar 1 Lean-to: Original Pointing Mortar (Sample FBF-04)

BCA removed a representative exterior pointing mortar sample from between a horizontal joint in the buff-colored brick masonry from the east elevation of Hangar 1 Lean-to at the second floor level. Visual observations suggest that the existing exterior brick masonry pointing mortar of the lean-to structure matches that of the 1936 WPA Infill.

This mortar is hard, cohesive, and rough in texture exhibiting signs of weathering and erosion of the matrix paste from the exterior-facing surface similar to sample FBF-03. A moderate accumulation of atmospheric soil exists on the surface of the sample; however, the mortar appears "white" in color (Munsell® Neutral Value Scale N9), as does the cross-section of the sample.

The results of the analyses show the overall color of the aggregate is "white" (Munsell® 10 YR 8/2). The aggregate particles and fines match those seen in sample FBF-03. No petrographic analysis was performed on this sample; however, it appears to visually and physically match sample FBF-03. Based on the sieve analysis, this sand does not comply with modern masonry sand gradations as specified by ASTM C 144.

Because this mortar so closely matches the mortar found in the WPA Infill, it is assumed that the lean-to structure was built using the same specifications and materials. In this case, where evidence of DEF exists in the infill structure mortar, it is possible that the same condition exists in the lean-to structure. Observation on-site revealed that the bedding mortar in the lean-to masonry at the ground level is severely deteriorated and highly friable, and that part of the structure is collapsing.

Given these conditions, BCA recommends completely replacing the existing mortar with the same mortar recommended for the WPA Infill. The existing mortar should be raked out of the joints to a minimum depth of 2" for new "deep" pointing. The same mortar can be used for re-building the masonry as well.

---

few hours after mixing with water and the expansion of the fresh concrete is normally not an issue. If cured concrete is exposed to water, especially seawater containing soluble salts such as sulphates, for an extended period of many years, the ettringite can slowly dissolve and reform in air voids or cracks. Wetting and drying, as well as freezing and thawing, can create a cycle of deterioration that includes recrystalization of ettringite, an increase in the internal expansive forces, eventually leading to the formation of new cracks, and the formation of ettringite in the paste of the mortar.

Exterior Hangar 1 Lean-to: Re-pointing Mortar (Sample FBF-05)

BCA removed a representative exterior re-pointing mortar sample from between a horizontal joint in the buff-colored brick masonry at the east wall of Hangar 1 Lean-to at the ground level.

This mortar is moderately hard, cohesive, and rough in texture exhibiting signs of weathering and erosion of the matrix paste from the exterior-facing surface similar to samples FBF-03 and FBF-04. A moderate accumulation of atmospheric soil exists on the surface of the sample; however, the mortar appears "white" in color (Munsell® Neutral Value Scale N9), as does the cross-section of the sample.

The overall color of the aggregate is "white" (Munsell® 10 YR 8/2). The re-pointing mortar contained sieved coarse-grained natural pinkish gray sand almost identical to the sands found in samples FBF-03 and FBF-04. Most likely, this sand was sieved through a screen matching the 1934 DIN #5 size. Based on the sieve analysis, this sand does not comply with modern masonry sand gradations as specified by ASTM C 144.

The acid soluble content of this mortar is higher than the ratios found in samples FBF-03 and FBF-04 suggesting it was mixed using a different formula higher in lime content. Similar to all of the other exterior mortars, this mortar not only shows signs that it is disbonded from the brick masonry, in some areas it is detached from the substrate mortar, falling out of the joints, or completely missing.

No petrographic analysis was performed on this sample, however, the re-pointing mortar visually is most likely a white cement-lime mortar and is a very good match to the original mortar with a slightly smaller aggregate particle texture exhibiting the same typical signs of weathering and erosion. The primary differences between the original mortar and the later re-pointing mortar include the aggregate particle size distribution, and most likely the cement: lime: sand ratio.

The results of the analyses suggest that the existing exterior brick masonry re-pointing mortar of the 1936 Hangar 1 Lean-to is visually a very good match to the original mortar, but not the same as the mortar found in the WPA Infill or original lean-to masonry. The later re-pointing mortar includes a sieved sand, most likely the same sand as found in the other 1936-1937 mortars. Similar to all of the other exterior mortars, this mortar not only shows signs that it is disbonded from the brick masonry, in some areas it is detached and missing. BCA recommends replacing this later re-pointing mortar.

BCA recommend replacing this later re-pointing mortar.

CONCLUSIONS AND RECOMMENDATIONS

Lime, sands, or other foreign matter can wash out of a mortar over time and alter the original ratio of components. The actual data obtained from the analyzed samples does not necessarily represent the actual original formulae for the mortar sampled. Considering this, our recommendations for new mortars are based on an interpretation of onsite observations, analytical techniques, and ASTM standards for typical physical properties of the masonry materials. All modern mortar materials should conform to the latest ASTM standards.

It should be noted that modern Portland cement mortars are known to be stronger and less elastic compared to historic cement-lime mortars, and therefore the formulation of the recommended mortar does not directly correlate with the original formula types.

Exterior Masonry Mortar

The exterior mortars are all white and contain the same or very similar sand. These mortars are in varying states of deterioration due to weathering and water infiltration affecting their physical characteristics, as well as other factors such as the development of delayed ettringite formation (DEF), and potential corrosion jacking of the masonry. The discovery of DEF suggests the mortars contain soluble sulfates reacting with alkali components or a high Portland cement content. The cement to lime to sand ratios of the exterior hangar, infill and lean-to samples suggest they were formulated as historic type "S" mortars. The later re-pointing mortar does not match and most likely was a later type "N" mortar.

BCA recommends replacing the exterior brick masonry pointing mortars, providing "deep" pointing, and re-setting and re-installing salvaged or new masonry at Floyd Bennett Field Hangars 1 and 2, using an ASTM C 270-06, Type N Mortar consisting of 1:1:6 (cement: lime: sand) ratio. The cement used in the mortar should be an ASTM C-150: Standard Specification for Portland Cement, Type 1 white Portland cement. A high-calcium lime should be used.

The new aggregate in all exterior mortars should match the color and texture of the original sands in the existing mortar (samples enclosed) and comply with ASTM C 144. Matching sand should be located from a local supplier. The color, texture, and pointing profiles of the new mortar installed should match the original and existing adjacent mortars. BCA matched the sand in the mortars at Floyd Bennett Field to Schofield #181 sand sieved through a #8 screen.

Interior Masonry Mortar

The interior mortar is a light gray mortar originally formulated using lime slaked on site. Similar to the exterior mortar this mortar is in varying states of deterioration due to water infiltration and biological growth. In addition, the soft physical characteristics and high absorptivity of this mortar compromise its performance. This mortar appears to be historic type "K" mortar, which is no longer in compliance with ASTM standards.

Because the original mortar was over sanded, BCA recommends replacing it with an ASTM C 270-06, type "O" Mortar consisting of a 1:2:9 (cement: lime: sand) ratio. The cement used in the mortar should be an ASTM C 150 Type 1 gray Portland cement. A high-calcium lime should be used.

The new interior aggregate in all mortars should match the color and texture of the original sands in the existing mortar (samples enclosed) and comply with ASTM C 144. Matching sand should be located from a local supplier. The color, texture, and pointing profiles of the new mortar installed should match the original and existing adjacent mortars. BCA matched the sand in the interior mortars at Floyd Bennett Field to Schofield "Concrete Sand" (formerly #108).

Source for high-calcium hydrated lime: "Standard Hydrated Lime", Mississippi Lime Company, 3870 S. Lindberg Blvd, Suite 200, St. Louis, MO 63127-1308, (800) 437-5463.

Source for sands: Schofield Stone, 831 E. Main Street, Bridgewater, NJ 08807 (800) 82-ROCKS.

Appendix A
Sample Data

FLOYD BENNETT FIELD: MORTAR ANALYSIS

Date	29-Mar-12
Commissioned By	URS Corporation
Building/Project	Hangar 1, Lean-to 1, and WPA Infill
Building Address	Brooklyn, NY
Construction Date	1931-c.1937
No. of Samples	5
Samples Removed By	BCA
Analysis Performed By	C. Gembinski
Analysis Checked By	C. Gembinski

ANALYSIS

Observations	**Sample FBF-01**	**Sample FBF-02**	**Sample FBF-03**	**Sample FBF-04**	**Sample FBF-05**
Location	Exterior Hangar 1 (1931)	Interior Hangar 1 (1931)	Exterior Infill (1937)	Exterior Lean-to (1936)	Lean-to Re-pointing (c.1937 or later)
Mortar Color	White	White	White	White	White
Munsell Soil Color	N9	10YR 8/1	N9	N9	N9
Hardness	Hard	Soft	Hard	Hard	Hard
Condition of Mortar	Cohesive	Cohesive	Cohesive	Cohesive	Cohesive
Absorptivity	Low	High	Low		
Capillary Porosity	Moderately High	Moderately High	High		
Permeability	Moderately Low	Moderately High	Moderately Low		
Sand Color	Pinkish Gray	Very Pale Brown	White	White	White
Munsell Soil Color	5YR 6/2	10YR 7/3	10YR 8/2	10YR 8/2	10YR 8/2
Fines Color	White	Light Gray	White	White	White
Munsell Soil Color	2.5Y 8/2	10YR 7/2	N9	N9	10YR 8/1

DATA (weight in grams)

Sample	50.00	44.50	50.00	50.00	50.00
Sand	28.98	33.15	31.33	33.00	26.52
Acid Solubles	17.73	9.33	16.56	13.82	18.94
Fines	3.29	2.02	2.11	3.18	4.54
Weight Percents					
Sand	57.96%	74.49%	62.66%	66.00%	53.04%
Acid Solubles	35.46%	20.97%	33.12%	27.64%	37.88%
Fines	6.58%	4.54%	4.22%	6.36%	9.08%
Sand Sieve Screen					
>16 (1.18 mm)	15.65%	27.97%	28.16%	25.34%	3.78%
>30 (600 µm)	27.78%	41.97%	40.78%	35.34%	42.44%
>50 (300 µm)	35.28%	21.15%	21.75%	29.47%	38.74%
>100 (100 µm)	17.61%	6.89%	7.27%	7.73%	12.03%
Pan	3.68%	2.02%	2.05%	2.11%	3.01%
Sand Description	Medium-grained	Medium to course-grained	Medium to course-grained	Medium to course-grained	Medium-grained
Particle Shape	Subangular to subrounded Medium Sphericity	Subangular Medium Sphericity	Angular to Subrounded Medium Sphericity	Angular to Subrounded Medium Sphericity	Angular to Subrounded Medium Sphericity
Particle Colors					
White/Clear	85%	85%	95%	95%	95%
Pink	10%	-	-	-	-
Yellow	-	10%	-	-	-
Gray/Brown	5%	<5%	5%	5%	5%
Black	<5%	<5%	<5%	<5%	<5%
Notes	White Portland Cement Dry Hydrated Lime Assume historic type "S"	Gray Portland Cement Slaked Lime Assume historic type "K" (1:3:12) with slaked lime putty Lime proportioned as dry hydrate	White Portland Cement Dry Hydrated Lime Exhibits signs of DEF Assume historic type "S"	Same as FBF-03 Assume historic type "S"	Assume white Portland cement Assume dry hydrated lime Sand same as FBF-03 and FBF-04 sieved through 1934 DIN #5 screen Assume Historic Type S or later Type N
RECOMMENDATIONS					
Replacement Type	ASTM type N	ASTM type O	ASTM type N	ASTM type N	ASTM type N
Replacement Formula (cmt:lime:sand)	1:1:6	1:2:9	1:1:6	1:1:6	1:1:6

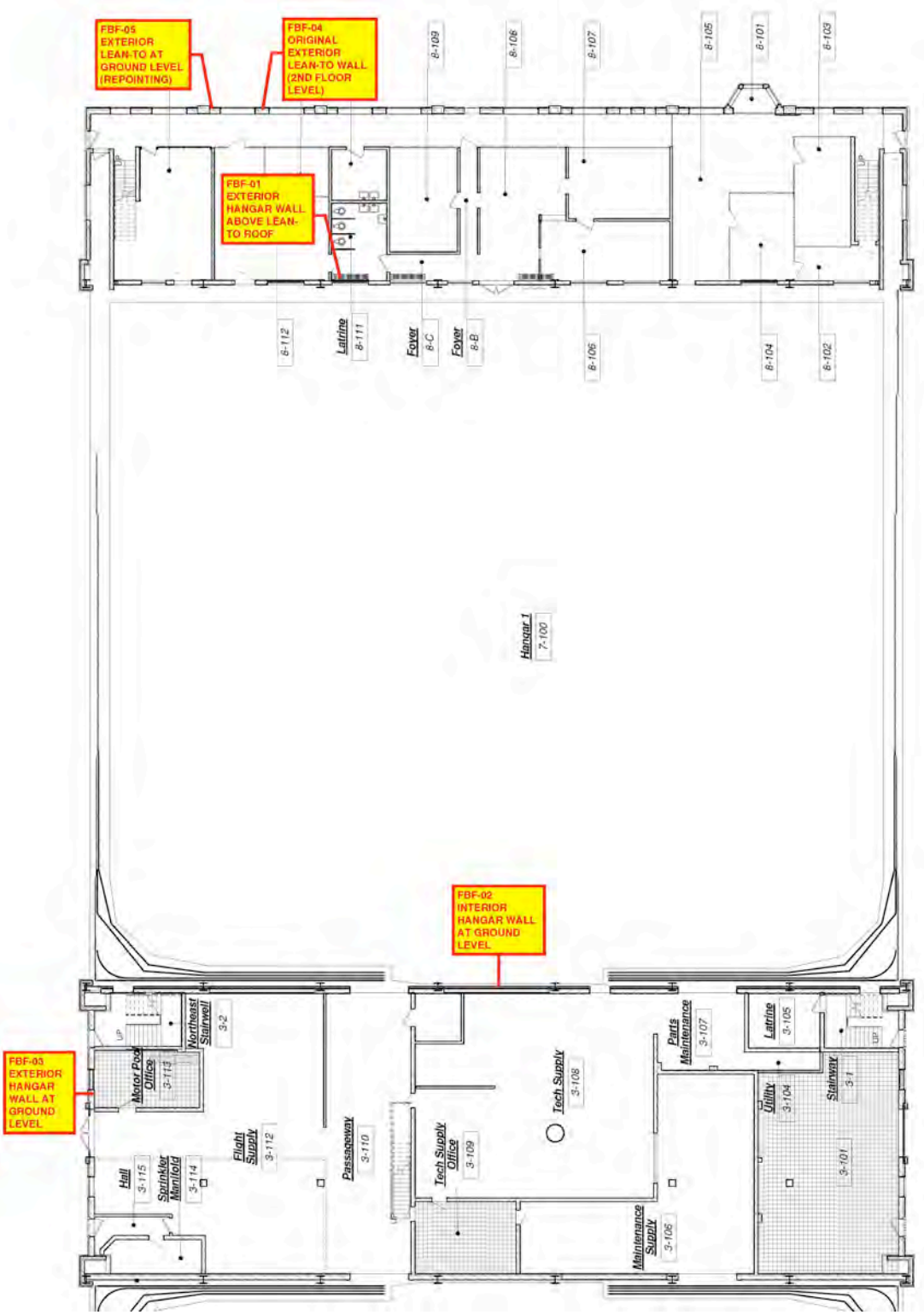


Figure A.1. Hangar 1, Hangar 1 Lean-to, and WPA Infill Key Plan. Samples taken at all levels are shown on this ground floor plan. Red text in yellow boxes indicates approximate locations of mortar samples.



Figure A.2. Location of mortar sample FBF-01, from the exterior east elevation of Hangar1 above the Hangar 1 Lean-to roof.



Figure A.3. Detail of location FBF-01.



Figure A.4. Location of mortar sample FBF-02, from the interior west wall in Hangar 1 (looking west).

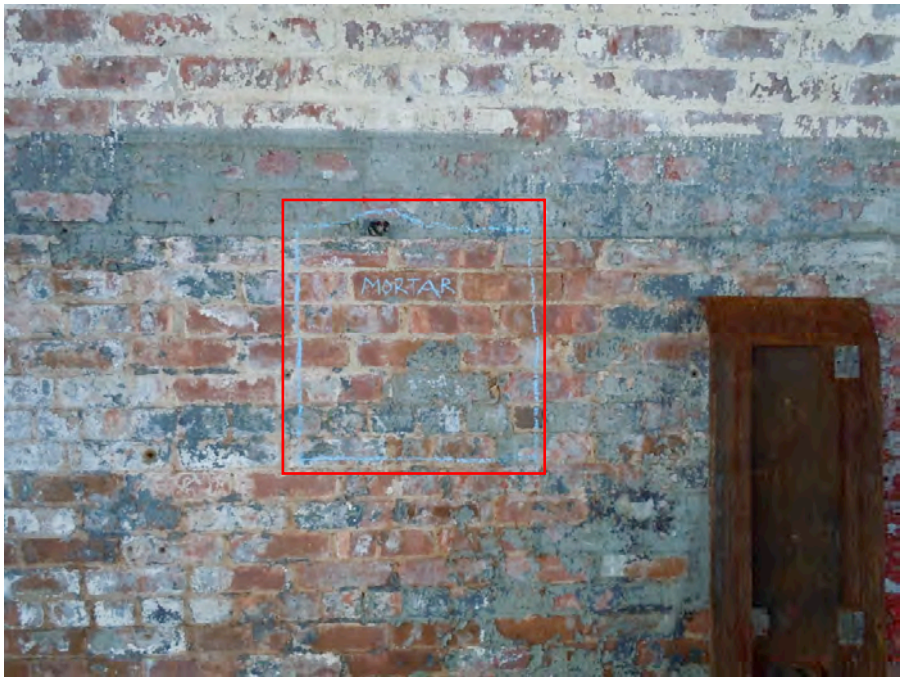


Figure A.5. Detail of location FBF-02; sample was taken adjacent to the missing brick.



Figure A.6. Location of mortar sample FBF-03, from the exterior north wall of the WPA Infill.



Figure A.7. Detail of location FBF-03. Note the movement of the brick masonry in this location.

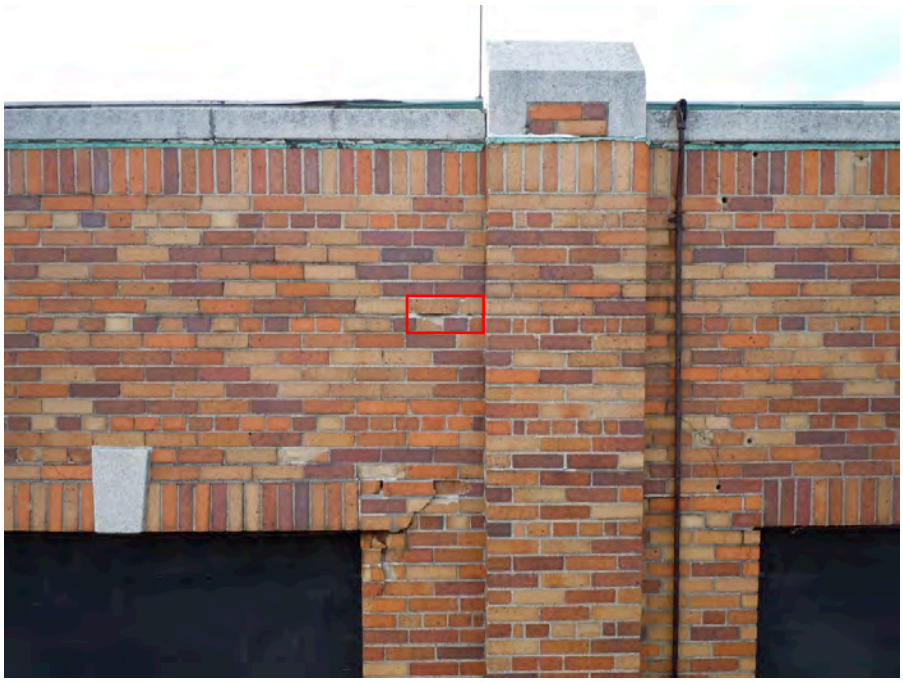


Figure A.8. Location of mortar sample FBF-04, from the exterior east wall of Hangar 1 Lean-to at the second floor level.



Figure A.9. Location of mortar sample FBF-05: re-pointing mortar from the exterior east wall of Hangar 1 Lean-to at ground level.

Appendix B
Mortar Analysis Report
(Highbridge Materials Consulting, Inc.)

HIGHBRIDGE
MATERIALS CONSULTING, INC.

404 Irvington Street
Pleasantville, NY 10570
Phone: (914) 502-0100
Fax: (914) 502-0099
www.highbridgematerials.com

MORTAR ANALYSIS REPORT

Client:	Building Conservation Associates, Inc.	**Client ID:**	BUIL002
Project:	Floyd Bennett Field Hangars 1 and 2	**Report #:**	SL0320-01
Address:	Brooklyn, NY	**Date Received:**	03/06/12
Sample Type:	Mortar	**Report Date:**	03/18/12
Delivered by:	Client (C. Gembinski)	**Chemist:**	M. Malaj
		Petrographer:	J. Walsh
		Page 1 of 23	

Report Summary

- Three mortar samples from Hangars 1 and 2 at Floyd Bennett Field are examined petrographically and chemically for this report.
- All three samples are identified as cement-lime mortars. White portland cement was used in FBF-01 and FBF-03. Gray portland cement is present in FBF-02. All three contain high calcium lime. In FBF-01 and FBF-03, the lime is interpreted to have been added as a prepackaged dry hydrate and the lime in FBF-02 is interpreted to have been slaked on site.
- There are variations in the sand observed between the three samples. FBF-01 contains red sandstones and other darker rock types that produce a color variegation on the weathered joint surface. FBF-03 is more purely quartzitic and also exhibits a skewed gradation with most particles coarser than a No. 30 sieve.
- Estimated cement-lime ratios vary with FBF-01, 02, and 03 having ratios of 1 : 0.10, 1 : 0.25, and 1 : 0.47 respectively. Total binder to sand ratios are estimated at 1 : 2.5, 1 : 3.6, and 1 : 2.4. Sample FBF-02 is considered oversanded. This one sample has a high air-void content as a result.
- Little evidence for deleterious effects of service are found in Samples FBF-01 and FBF-02. Sample FBF-03 exhibits evidence for some minor volume expansion possibly related to delayed ettringite formation. The features are only observed microscopically.
- A more detailed discussion of these findings may be found in the “Laboratory Findings and Discussion” sections beginning on page 3 of this report.

1. Introduction

On March 6th, 2012, Highbridge received three mortar samples from Mr. Chris Gembinski of Building Conservation Associates, Inc. The samples are reported to have been extracted from hangar structures at Floyd Bennett Field in Brooklyn, NY. The samples are identified as follows:

FBF-01: Mortar from the exterior main façade, constructed of buff-colored face brick in 1931.
FBF-02: Mortar from the interior hangar constructed of a similar buff-colored brick in 1931.
FBF-03: Mortar from the exterior façade of the 1936 infill addition between hangars 1 and 2 constructed of buff-colored face brick in 1936/37.

At the client's request, a compositional analysis is performed on each sample. The testing includes a petrographic examination to identify components and assess material quality and a chemical analysis to estimate proportions. An acid digestion to provide a graded sand sample is excluded from the analysis.

2. Methods of Examination

The petrographic examination is conducted in accordance with the standard practices contained within ASTM C 1324. Data collection is performed by a degreed geologist who by nature of his/her education is qualified to operate the analytical equipment employed. Analysis and interpretation is performed or directed by a supervising petrographer who satisfies the qualifications as specified in Section 3 of ASTM C 856.

Chemical analysis was conducted according to the procedures outlined in ASTM C 1324. Water, carbon dioxide and aggregate weight percentages are determined gravimetrically. Oxide weight percentages are determined by atomic absorption spectroscopy. The methods are modified when accounting for dolomitic lime. Rather than approximating lime through DTA with possible errors due to carbonated lime, dolomitic lime is instead calculated directly from the chemical analysis by simultaneous equations based on typical dolomitic lime chemistry.

3. Sample FBF-01 - Laboratory Findings and Discussion

General Summary

Sample FBF-01 is identified as a cement-lime mortar containing a medium-grained natural sand. The binders include white portland cement and high calcium hydrated lime estimated to have been mixed at a proportion of 1 : 0.10 by volume. The total binder to sand ratio is estimated at 1 : 2.5. The mortar is hard and indurate with apparently low absorptivity. Components are well mixed and the mortar is well consolidated with an air content estimated at 2-3% by volume. The mortar is uniform in appearance with a nearly white color due to the white cement and lime binder (Munsell color code approximately N9). The weathered joint surface is more textured and variegated in appearance due to the exposure of medium-sized sand grains some of which have reddish and less commonly gray colors.

Materials

The aggregate is a medium-grained natural sand consisting primarily of monocrystalline quartz, quartzite, and granitic grains. A minor assemblage of red sandstone, iron mudstone, and basalt is present and these are typical of sediments derived from the Newark Basin. There are also minor metawackes including siltstone and slate more typical of Hudson Valley sediments. No clay coatings or friable materials are identified and the mineralogical types are considered hard, non-porous, and durable for use in masonry construction. A sand extraction was not performed though the aggregate color and texture may be viewed under magnification along the weathered joint surface. Most grains are light-colored and translucent with some buff tones, weak pinks, and light grays due to the granite. There is a notable variegation mostly visible in the coarser particles including darker grays from the basalt and metawackes and brick-reds from the sandstone. The sand is sharp-textured with equidimensional particles that are subangular in shape on average. The nominal top size is estimated at the No. 8 sieve and the peak abundance appears to lie somewhere in the range of the No. 30 or No. 50 sieve sizes. There is only a minor abundance of fines. Though the gradation is not quantified by acid extraction of a representative sand sample, it is estimated that the sand would likely comply with modern masonry sand gradations as specified by ASTM C 144.

The binder contains a mixture of white portland cement and high calcium hydrated lime. The matrix is a well developed and cured hydraulic paste. Though homogeneous overall, the hydrated cementitious binder is characterized by microscopically dense clots surrounded by thin microscopic zones of moderate to moderately high capillary porosity. The microstructure is consistent with a highly workable fresh mix with somewhat higher water content and one that was possibly retempered before placement. The higher water content is also evident in the medium-grained crystallinity of the calcium hydroxide formed due to the cement hydration in areas where the mortar has not later carbonated. Nonetheless, the overall permeability of the matrix appears moderately low.

The portland cement hydration is relatively advanced though some hydraulic calcium silicate remains. Residual portland cement grains are detected in moderate abundance as fine-grained belite agglomerates as well as single alite crystals. Most of the coarser-grained belite grains remain unhydrated. The absence of interstitial ferrite (the iron-bearing phase) identifies the cement as a white rather than gray variety. The high SiO_2 : Fe_2O_3 ratio measured chemically is also indicative of a white portland cement. Undispersed lime grains are detected in moderate abundance as very fine-grained particulates with non-descript texture. The characteristics of the lime are consistent with those of a prepackaged dry hydrate rather than a lime slaked on site. The chemical analysis indicates the lime to be a high calcium variety. Many of the lime particles remain uncarbonated and this is unusual for calcium -rich types. The unaltered nature of much of the lime is indicative of the relatively low permeability of the matrix.

Component Proportions

The mortar is estimated to have a cement to lime ratio of 1 : 0.10 and a total binder to sand ratio of 1 : 2.5 with the sand assumed to be in a damp, bulked condition. The estimates are calculated from the chemical analysis and the data from which these results are derived are presented in Section 6 below. The sand content is considered appropriate for brick masonry mortar. The cement-rich formulation does not fit neatly into modern categories of cement-lime mortars as specified today by ASTM C 270. However, the tenth of a part lime gauging was a popular mix for brick masonry in the early part of the twentieth century. The author has encountered these in mortars examined mainly from the period between about 1910 and 1925. It should be stressed that modern cements may be significantly stronger and less elastic than historic counterparts. It is almost never appropriate to use similar cement-rich mixtures today.

Condition and Quality
The examined mortar is quite dense and indurate with no evidence for unusual service distress. The constituents are well mixed and the mortar well consolidated. The air content is estimated at only 2-3% by volume. The low air content and nearly spherical nature of the fine voids are indicative of a highly workable mortar mix. The weathered nature of some of the bed surfaces suggest that this particular piece was disbonded from the brick masonry. The mix water content and sanding appears to have been sufficient to allow for adequate bonding even if the lime content is low. Disbonding may be related to differential stresses between the brick and mortar during service. The mortar may be assumed to have a fairly high elastic modulus due to the cement-rich composition. Only very minor microcracking is found in the mortar and most of this is barely resolved at the scale of the light microscope. There is no evidence for excessive moisture infiltration through the mortar matrix. Secondary mineral deposits are not identified in air-voids and much of the original calcium hydroxide from cement hydration remains intact and unleached. Carbonation is found as a microscopically thin veneer around all sample edges including the rear. The carbonation profile suggests that all surfaces were exposed in service due to disbonding and possibly a placement void in the rear. The carbonation zone is quite sharply defined indicating that the reaction has become self-limiting due to densification of the already dense mortar matrix. This densification is responsible for the lack of lime carbonation deeper within the joint.

4. Sample FBF-02 - Laboratory Findings and Discussion

General Summary
Sample FBF-02 is identified as a cement-lime mortar containing a medium to coarse-grained natural sand. The binders include gray portland cement and high calcium lime estimated to have been mixed at a proportion of 1 : 2.5 by volume. The total binder to sand ratio is estimated at 1 : 3.6 and the mortar is considered oversanded. Though cohesive, the mortar is soft with a high water absorptivity. Components are well mixed and the mortar is well consolidated. However, the microscopic consolidation is not ideal due to the oversanding and the air content is estimated at 12-15% by volume. The mortar is uniform in appearance with a very light color (Munsell color code approximately 10YR 8/1-1.5). There is no evidence for deleterious water infiltration or microcracking. The matrix is fully carbonated.

Materials
The aggregate in FBF-02 is a medium to coarse-grained natural sand consisting mainly of monocrystalline quartz and quartzite with lesser feldspar. A minor assemblage of metamorphic grains includes biotite schist, sillimanite schist, and amphibole. Red sandstone grains are found in trace quantity. No clay coatings or friable materials are identified and the mineralogical types are considered hard, non-porous, and durable for use in masonry construction. A sand extraction was not performed though the aggregate color and texture may be viewed under magnification along freshly exposed surfaces. Most grains are light-colored and translucent with buff to yellowish tones. The sand is sharp-textured with equidimensional particles that are subangular in shape on average. The nominal top size is estimated at the No. 8 sieve though one grain along a saw-cut surface would be retained on a No. 4 sieve. The peak abundance appears to lie somewhere in the range of the No. 30 or No. 50 sieve sizes and there is only a moderate quantity of fines. Though the gradation is not quantified by acid extraction of a representative sand sample, it is estimated that the sand would likely come close to complying with modern masonry sand gradations as specified by ASTM C 144. Retention of a few particles on a No. 4 sieve would represent a minor deviation from the standard.

The binder contains a mixture of gray portland cement and high calcium lime. The matrix is homogeneously developed hydraulic paste with moderately high capillary porosity. The portland cement hydration is quite advanced and virtually all hydraulic calcium silicate has been consumed. Residual portland cement grains are present in moderately low abundance as fine to medium-grained agglomerates of former calcium silicates with interstitial iron-bearing ferrite. The ferrite identifies the cement as a gray rather than white variety. Undispersed lime grains are identified in moderate abundance as fine-grained, mostly non-descript particles that are fully carbonated. Though the lime has little internal texture, the slightly larger size and internal fracturing are more indicative of lime slaked on site rather than lime incorporated as a powdered dry hydrate. The chemical analysis indicates the lime to be a high calcium rather than dolomitic variety.

Component Proportions
Chemical analysis was used to estimate the constituent proportions and results are presented in Section 6 below. The mortar is estimated to have a cement to lime ratio of 1 : 2.5 by volume. If compared to modern mortar specifications, the binder composition lies at the boundary between a Type O and Type K cement-lime formulation. The binder is mildly hydraulic though the mortar properties are more heavily influenced by the lime. The total binder to sand ratio is estimated at 1 : 3.6 by volume and the mortar is considered undersanded. The high sanding results in a close packing of sand particles within the mortar and in places there is insufficient binder available to completely fill the interstitial space. The mortar is more permeable as a result with a total air-void content estimated at 12-15% by volume.

It should be noted that the lime is calculated as the equivalent of a modern dry hydrate though it appears that the lime was slaked on site. This is done for convenience as the calculation does not depend on density variations due to water content in a putty. If it is assumed that dry hydrated lime loses approximately half its volume when mixed with water to a typical putty consistency, the quantity of reported lime could be reduced by half. The sand to binder ratio would increase accordingly.

Condition and Quality
The mortar components are well mixed and the mortar is well compacted. However, there is a high air content estimated at 12-15% by volume due to the high sanding. Though the mortar is relatively soft and highly water absorptive, the pieces provided for examination are cohesive and relatively sound. The full depth of the examined sample is carbonated and this is a normal and desirable consequence of long term exposure. Despite the high permeability, there is no evidence for binder leaching or other deleterious effects of water infiltration. No microcracking is identified petrographically.

5. Sample FBF-03 - Laboratory Findings and Discussion

General Summary
Sample FBF-03 is identified as a cement-lime mortar containing a medium to coarse-grained quartz sand. The binders include white portland cement and high calcium hydrated lime estimated to have been mixed at a proportion of 1 : 0.47 by volume. The total binder to sand ratio is estimated at 1 : 2.4. The sand appears poorly graded with the bulk of the gradation retained above the No. 30 sieve. The mortar is hard and indurate with apparently low absorptivity. Components are well mixed and the mortar is well consolidated with an air content estimated at 3-4% by volume. The mortar is uniform in appearance with a nearly white color due to the white cement and lime binder (Munsell color code approximately N9). The weathered joint surface is textured in appearance due to the exposure of medium-sized sand grains most of which are light-colored and translucent. There is some evidence for minor expansion of the mortar with characteristics similar to those of delayed ettringite formation. All cracking is microscopic and no visible failures are apparent in the hand sample.

Materials
The aggregate is a medium to coarse-grained natural sand with an apparently poor gradation profile. Monocrystalline quartz and lesser quartzite represent the great majority of sand constituents. Trace calcite is detected along with metamorphic grain types including schist, white mica, and amphibole. No clay coatings or friable materials are identified and the mineralogical types are considered hard, non-porous, and durable for use in masonry construction. A sand extraction was not performed though the aggregate color and texture may be viewed under magnification along the weathered joint face. Most grains are light-colored and translucent with few yellowish or light pink grains. The color is much more uniform than observed in the other two samples due to the relative absence of rock types other than quartz. The sand is sharp-textured with equidimensional particles that are subangular in shape on average. The nominal top size is estimated at the No. 8 sieve and the overall gradation appears skewed toward the coarser sizes. Most particles are estimated to be retained on a No. 30 sieve with relatively few particles below this mesh. The sand would be expected to have less than ideal packing characteristics as a result. Though the gradation is not quantified, it is suspected that the aggregate would not satisfy modern masonry sand gradations as specified in ASTM C 144.

The binder contains a mixture of white portland cement and high calcium hydrated lime. The matrix is a well developed and cured hydraulic paste with characteristics similar to that of Sample FBF-01. Though homogeneous overall, the hydrated cementitious binder is characterized by microscopically dense clots surrounded by thin microscopic zones of moderate to moderately high capillary porosity. As with FBF-01, the microstructure is consistent with a highly workable fresh mix with somewhat higher water content. The higher water content is also evident in the medium-grained crystallinity of the calcium hydroxide formed due to the cement hydration in areas where the mortar has not later carbonated. Nonetheless, the overall permeability of the matrix appears moderately low.

The portland cement hydration is highly advanced and virtually all hydraulic calcium silicate is consumed except in areas that were carbonated early. Residual portland cement grains are detected in moderately low abundance as fine-grained agglomerates of former calcium silicates. The nature of the cement is best observed near the carbonated joint surface. Here, unhydrated belite agglomerates lack interstitial iron product and the binder is clearly a white portland cement. The high SiO_2 : Fe_2O_3 ratio measured chemically is also indicative of a white portland cement. Undispersed lime grains are detected in moderately high abundance as very fine-grained particulates with non-descript texture. The characteristics of the lime are consistent with those of a prepackaged dry hydrate rather than a lime slaked on site. The chemical analysis indicates the lime to be a high calcium variety. Many of the lime particles are fully carbonated though a low proportion still contain original uncarbonated hydroxides.

Component Proportions
The mortar is estimated to have a cement to lime ratio of 1 : 0.47 and a total binder to sand ratio of 1 : 2.4 with the sand assumed to be in a damp, bulked condition. The estimates are calculated from the chemical analysis and the data from which these results are derived are presented in Section 6 below. The sand content is considered appropriate for brick masonry mortar. Compared to the modern ASTM C 270 specification for cement-lime mixtures, Sample FBF-03 is consistent in proportion with a Type S mortar. As discussed for Sample FBF-01, it should be assumed that modern cements may be significantly stronger and less elastic than historic counterparts.

Condition and Quality
The examined mortar is quite dense and indurate. The constituents are well mixed and the mortar well consolidated. The air content is estimated at only 3-4% by volume. The low air content and nearly spherical nature of the fine voids are indicative of a highly workable mortar mix. The weathered nature of the bed surfaces suggest that this particular piece was disbonded from the brick masonry. The mix water content and sanding appears to have been sufficient to allow for adequate bonding even if the lime content is low. Disbonding may be related to differential stresses between the brick and mortar during service.

Carbonation of the mortar is similar to that of Sample FBF-01 with a thin veneer surrounding all sample edges. However, there are some areas of patchy carbonation within the mortar interior. Though the mortar is in good condition, there are signs of some minor volume instability. Extremely fine, microscopic fissures surround many sand grains. These are lined with needles of secondary ettringite, a calcium aluminosulfate. There are also microcracks within the paste bridging the aggregate fissures and these generally follow the more porous zones of the cement paste. Ettringite needles are also found in the paste adjacent to these cracks as well as within most air-voids. Ettringite is only absent where the paste is carbonated. The microtextures are consistent with those normally associated with delayed ettringite formation (DEF). DEF is more commonly found in pre-cast concrete or concrete subject to high temperatures during curing. It is also thought that high alkali contents with portland cement may contribute to the reaction. Formation of ettringite after hardening can result in expansion of the paste leaving the types of ettringite-filled fissures observed in FBF-03.

It is not certain if DEF is the cause of the minor cracking in the sample and if so, what might have caused the reaction. It is possible that the sand might have been contaminated with seawater and therefore alkalis and sulfates. However, these elements were not measured as a part of the standard chemical analysis. If there are signs of visible cracking in the field, these may be related to the expansive structures identified in the sample microscopically.

6. Chemical Analysis

Table 6.1: Chemical Analysis Results

SAMPLE ID	FBF-01	FBF-02	FBF-03
Component (wgt. %)			
SiO_2	5.95	1.48	4.88
CaO	17.79	10.12	17.11
MgO	0.33	0.26	0.25
Al_2O_3	1.00	0.38	0.68
Fe_2O_3	0.31	0.25	0.21
Insoluble residue	60.43	76.58	63.87
LOI to 110°C	2.66	0.45	2.97
LOI 110°C-550°C	3.89	1.94	3.50
LOI 550°C-950°C	8.58	6.69	5.15
Measured Totals	**100.94**	**98.16**	**98.61**

Table 6.2: Calculated Components

SAMPLE ID	FBF-01	FBF-02	FBF-03
Component			
Portland cement (wgt. %)	29.6	7.7	23.8
Natural cement (wgt. %)	Not detected	Not detected	Not detected
Hydraulic lime (wgt. %)	Not detected	Not detected	Not detected
Lime expressed as dry hydrate (wgt. %)	1.3	8.2	4.7
Supplementary cementitious materials (wgt. %)	Not detected	Not detected	Not detected
Pigment (wgt. %)	Not detected	Not detected	Not detected
Sand (wgt. %)	69.1	84.0	71.5
Cement : lime ratio (by volume)	1 : 0.10	1 : 2.50	1 : 0.47
Total binder : sand ratio (by volume)	1 : 2.5	1 : 3.6	1 : 2.4

Notes:
1. Portland cement content is calculated assuming an original SiO_2 content of 21% for gray portland cement or 23% for white portland cement. Sufficient CaO and MgO are subtracted from the chemical analysis to account for the calculated cement content. In all cases, it was possible to reduce the remaining MgO content to 0% by very small changes in the assumed MgO content of the original portland cement. The remaining CaO is calculated as hydrated lime by molecular weight conversion. Sand is taken directly from the insoluble residue measurement as no chemical interferences are identified in the sand. All weights are then normalized to 100%. Volumetric ratios are calculated assuming bulk weights for portland cement, hydrated lime and sand of 94 lbs./ft.^{3}, 40 lbs./ft.^{3}, and 80 lbs./ft.^{3} respectively.

Respectfully submitted,

John J. Walsh
President/ Senior Petrographer

The interpretations and conclusions presented in this report are based on the samples provided.
Methods and interpretations are the intellectual property of Highbridge Materials Consulting, Inc.
This report may only be reproduced in full. Presentation of any or all of the data or interpretations for purposes other than those necessary to satisfy the goals of the investigation are not permitted without the express written consent of the author.

Appendix I: Visual Description of Sample as Received

Sample ID	**FBF-01**
Description	The sample consists of two bedding mortar pieces weighing a total of 60.2 g. The larger piece represents an outside corner joint with a 1/2" to 5/8" bed thickness, The maximum depth represented is approximately 1.75".
Surfaces	Bed surfaces are compact. One side is partly creamy with a high microvoidage content. The other side is weathered with moderate relief, medium sand exposure. The tooled profile is concave, mildly soiled, with moderate relief, medium sand exposure. The joint appearance is textured and variegated mostly due to reddish sandstone particles exposed at the joint surface.
Hardness / Friability	The paste is very hard and the mortar is non-friable.
Appearance	Fresh surfaces have a moderately subvitreous luster and are nearly white in color (Munsell color code approximately N9).
Other Details	No cracking, efflorescence, mineral deposits, or binder inclusions are identified in hand sample. The matrix is not noticeably water absorptive where freshly exposed. The joint surface is highly absorptive and the bed surfaces slightly less so.

Sample ID	**FBF-02**
Description	The sample consists of three saw-cut bedding mortar pieces weighing a total of 17.9 g. The largest piece contains a partial impression of a shallow, rectangular frog.
Surfaces	Surfaces are either fresh or saw-cut. The one bed surface is compact, moderately sandy-textured with minor dusty brick residues.
Hardness / Friability	The paste is moderately soft to moderately hard and the mortar is non-friable.
Appearance	Fresh surfaces have a dull luster and are very light gray in color (Munsell color code approximately 10YR 8/1-1.5).
Other Details	No cracking, efflorescence, mineral deposits, or binder inclusions are identified in hand sample. The matrix is highly water absorptive where freshly exposed though somewhat less so along the one bed surface.

Sample ID	**FBF-03**
Description	The sample consists of one bedding mortar piece weighing 67.5 g. The piece represents a broken portion of an outside corner joint.
Surfaces	Bed surfaces are compact. One side is somewhat creamy with a moderate microvoidage content and light soiling. The other side is sandy-textured and heavily soiled. The tooled profile is gently concave with a high relief, medium sand exposure and moderate soiling. The exposed sand grains are narrowly graded and light-colored.
Hardness / Friability	The paste is hard and the mortar is non-friable.
Appearance	Fresh surfaces have a moderately subvitreous luster and are nearly white in color (Munsell color code approximately N9).
Other Details	No cracking, efflorescence, mineral deposits, or binder inclusions are identified in hand sample. The matrix is not noticeably water absorptive where freshly exposed. The joint surface is highly absorptive and the bed surfaces slightly less so.

Appendix II: Photographs and Photomicrographs

Microscopic examination is performed on an Olympus BX-51 polarized/reflected light microscope and a Bausch and Lomb Stereozoom 7 stereoscopic reflected light microscope. Both microscopes are fitted with an Olympus DP-11 digital camera. The overlays presented in the photomicrographs (e.g., text, scale bars, and arrows) are prepared as layers in Adobe Photoshop and converted to the jpeg format. Digital processing is limited to those functions normally performed during standard print photography processing. Photographs intended to be visually compared are taken under the same exposure conditions whenever possible.

The following abbreviations may be found in the figure captions and overlays and these are defined as follows:

cm	centimeters	PPL	Plane polarized light
mm	millimeters	XPL	Crossed polarized light
μm	microns (1 micron = 1/1000 millimeter)		
mil	1/1000 inch		

Microscopical images are often confusing and non-intuitive to those not accustomed to the techniques employed. The following is offered as a brief explanation of the various views encountered in order that the reader may gain a better appreciation of what is being described.

Reflected light images: These are simply magnified images of the surface as would be observed by the human eye. A variety of surface preparations may be employed including polished and fractured surfaces. The reader should note the included scale bars as minor deficiencies may seem much more significant when magnified.

Plane polarized light images (PPL): This imaging technique is most often employed in order to discern textural relationships and microstructure. To employ this technique, samples are milled (anywhere from 20 to 30 microns depending on the purpose) so as to allow light to be transmitted through the material. In many cases, Highbridge also employs a technique whereby the material is impregnated with a low viscosity, blue-dyed epoxy. Anything appearing blue therefore represents some type of void space (e.g.; air voids, capillary pores, open cracks, etc.) Hydrated cement paste typically appears a light shade of brown in this view (with a blue hue when impregnated with the epoxy). With some exceptions, most aggregate materials are very light colored if not altogether white. Some particles will appear to stand out in higher relief than others. This is a function of the refractive power of different materials with respect to the mounting epoxy.

Crossed polarized light images (XPL): This imaging technique is most often employed to distinguish components or highlight textural relationships between certain components not easily distinguished in plane polarized light. Using the same thin sections, this technique places the sample between two pieces of polarizing film in order to determine the crystal structure of the materials under consideration. Isotropic materials (e.g.; hydrated cement paste, pozzolans and other glasses, many oxides, etc.) will not transmit light under crossed polars and therefore appear black. Non-isotropic crystals (e.g.; residual cement, calcium hydroxide, calcium carbonate, and most aggregate minerals) will appear colored. The colors are a function of the thickness, crystal structure, and orientation of the mineral. Many minerals will exhibit a range of colors due to their orientation in the section. For example, quartz sand in the aggregate will appear black to white and every shade of gray in between. Color difference does not necessarily indicate a material difference. When no other prompt is given in the figure caption, the reader should appeal to general shapes and morphological characteristics when considering the components being illustrated.

Chemical treatments: Many chemical techniques (etches and stains typically) are used to isolate and enhance a variety of materials and structures. These techniques will often produce strongly colored images that distinguish components or chemical conditions.

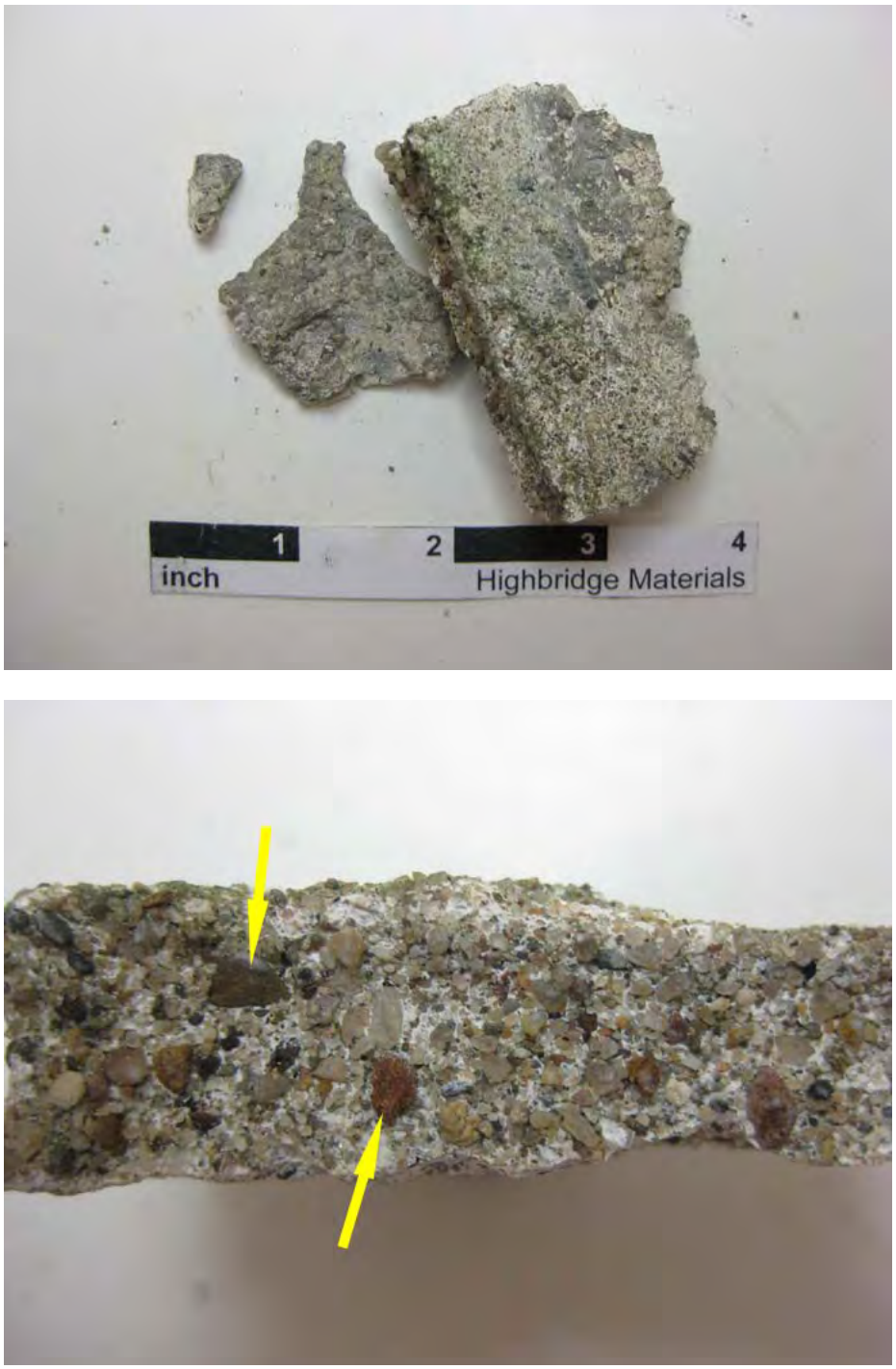


Figure 1: Photographs of mortar sample FBF-01 as received by Highbridge for examination. (Upper image) The mortar where fresh is uniform and nearly white in appearance. Surfaces shown here are weathered and soiled. (Lower image) The joint surface has a rich texture and color variegation due to exposed sand grains (arrows). Red and gray particles are most visible though light-colored particles are also exposed.

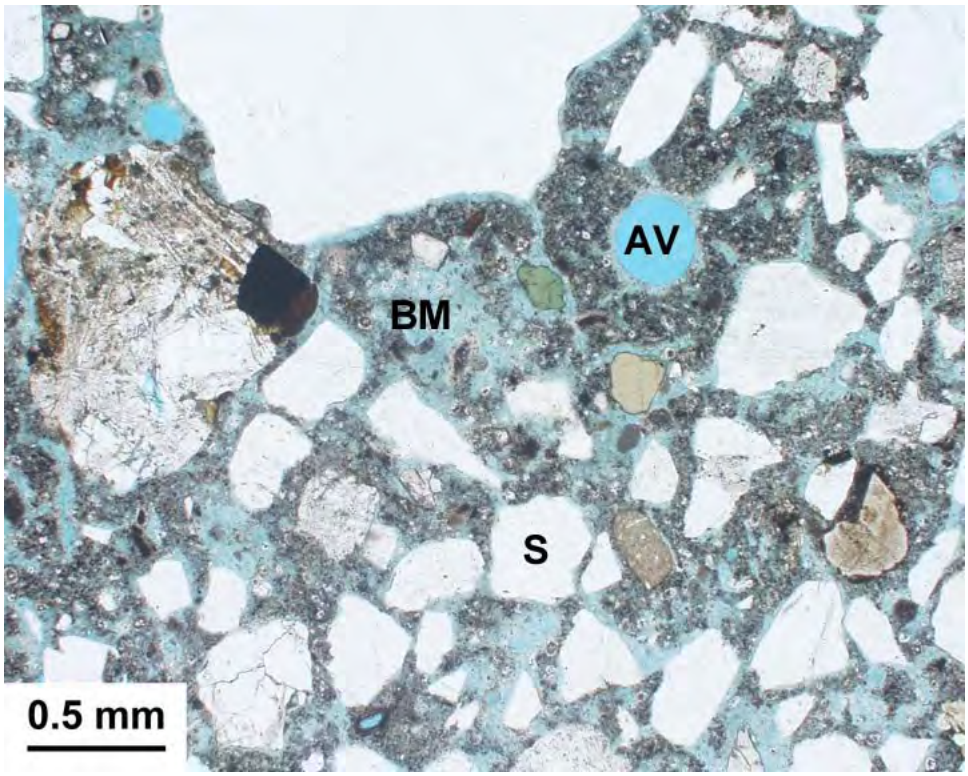


Figure 2: PPL photomicrograph illustrating the microtexture of Sample FBF-01. The sample is impregnated with a low-viscosity, blue-dyed epoxy and the intensity of blue coloration is an indication of porosity. The binder matrix (BM) is homogeneously developed. However, note that there are darker clots of lower porosity surrounded by bluish zones of higher porosity. The more porous areas coincide with microscopic zones of higher water content. Some retempering is likely indicated. Nevertheless, the binder has relatively low permeability on average. Sand grains (S) are well distributed and fully coated with binder. Note the broad distribution of particle sizes. Air-voids (AV) are present in low abundance. Those that are found tend to be fine in diameter and subspherical in shape.

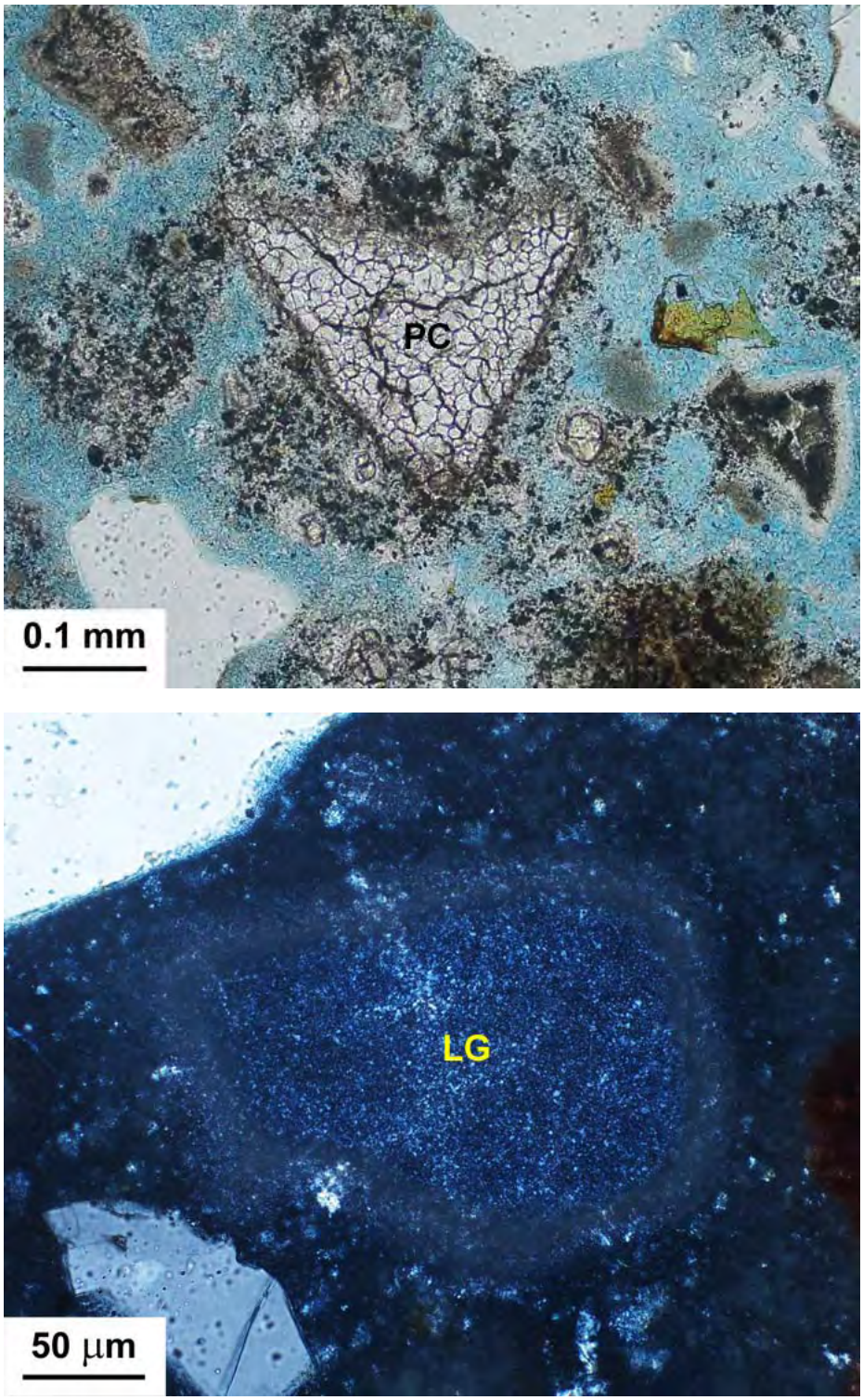


Figure 3: Photomicrographs illustrating the nature of the binder in FBF-01. (Upper) PPL image. Residual portland cement grains (PC) are present in moderate abundance. The one shown here is atypically coarse-grained but better illustrates the fine, rounded crystals of belite. The lack of dark-colored iron matrix identifies the cement as a white rather than gray variety. (Lower) XPL image. Undispersed lime grains (LG) are moderately abundant. The monotonous internal texture and very fine grain size is typical of prepackaged dry hydrate. The black and white speckling indicates that the original hydroxide is still present and much of the lime is uncarbonated.

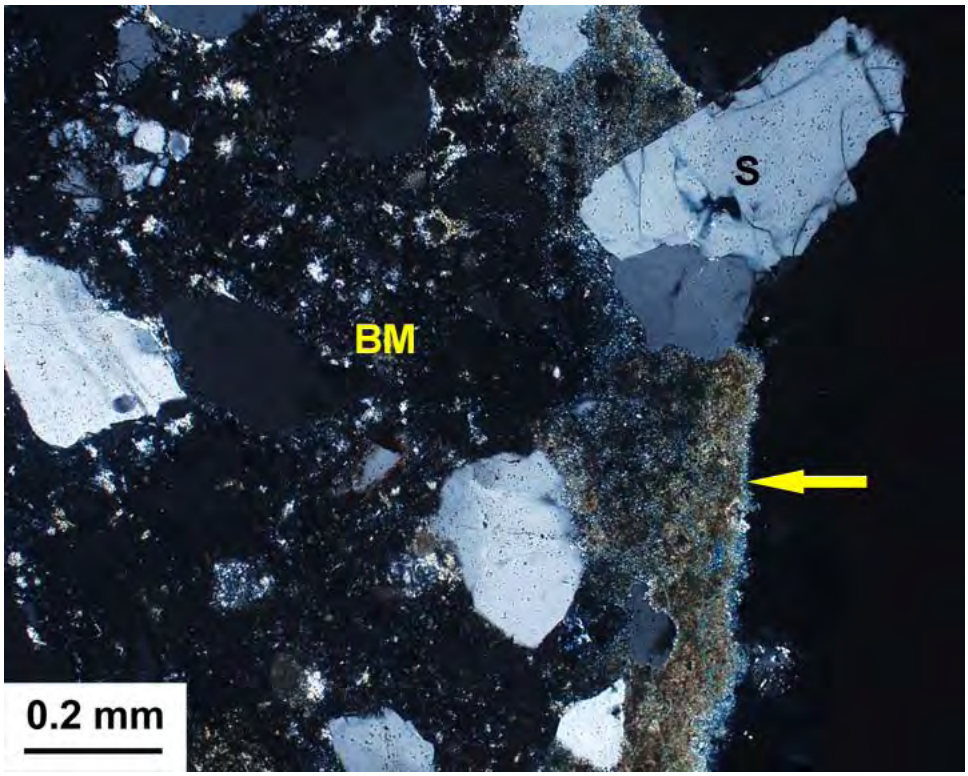


Figure 4: XPL photomicrograph illustrating a cross sectional view of the joint surface in Sample FBF-01. Sand grains (S) remain proud due to weathering of the joint face. The binder matrix (BM) is mostly dark (isotropic) where the paste retains its original characteristics including the calcium hydroxide formed during cement hydration. The arrow indicates a golden band along the front of the joint. The color is caused by the presence of ultrafine-grained calcium carbonate crystallites and indicates the depth of carbonation along the joint surface.



Figure 5: Photograph of mortar sample FBF-02 as received by Highbridge for examination. The mortar is uniform with a very light gray color. Joint surfaces are not included with this sample.

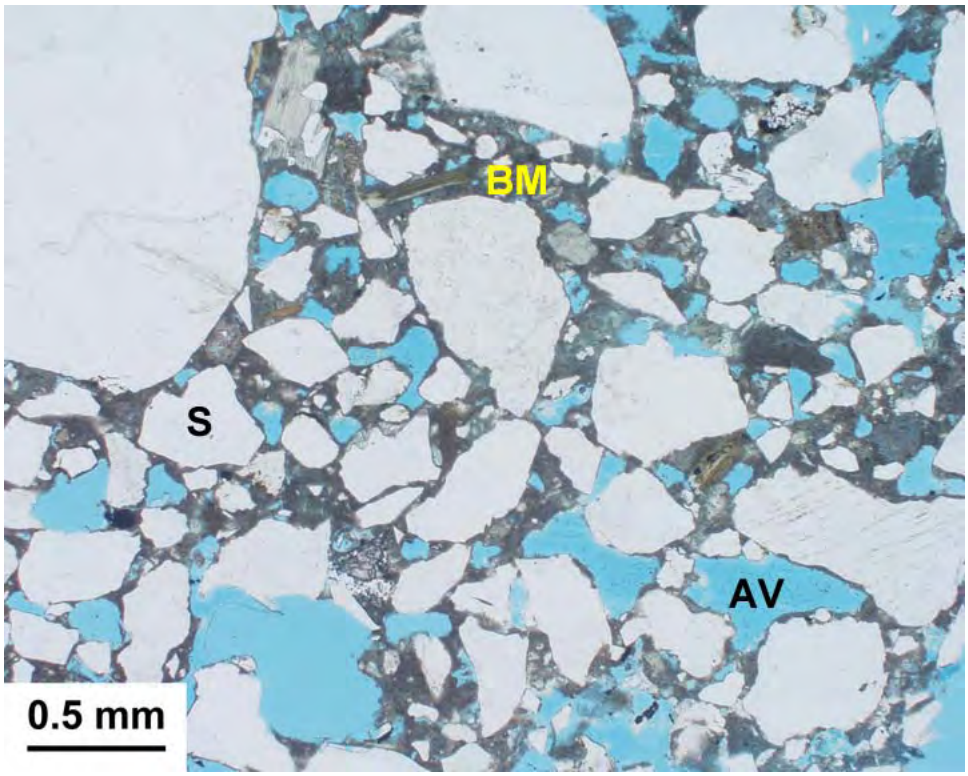


Figure 6: PPL photomicrograph illustrating the microtexture of Sample FBF-02. The sample is impregnated with a low-viscosity, blue-dyed epoxy and the intensity of blue coloration is an indication of porosity. The binder matrix (BM) is homogeneously developed with moderately high capillary porosity. The characteristics are consistent with lime-rich mortars. Sand grains (S) exhibit a broad particle size distribution. The grains are tightly packed due to oversanding of the mix. Insufficient binder is available to fill all interstitial space leaving air-voids (AV) at these locations. The air content is high with a void volume estimated at 12-15%. The capillary pores in the lime binder in addition to these coarser voids both contribute to the high absorptivity of the matrix.

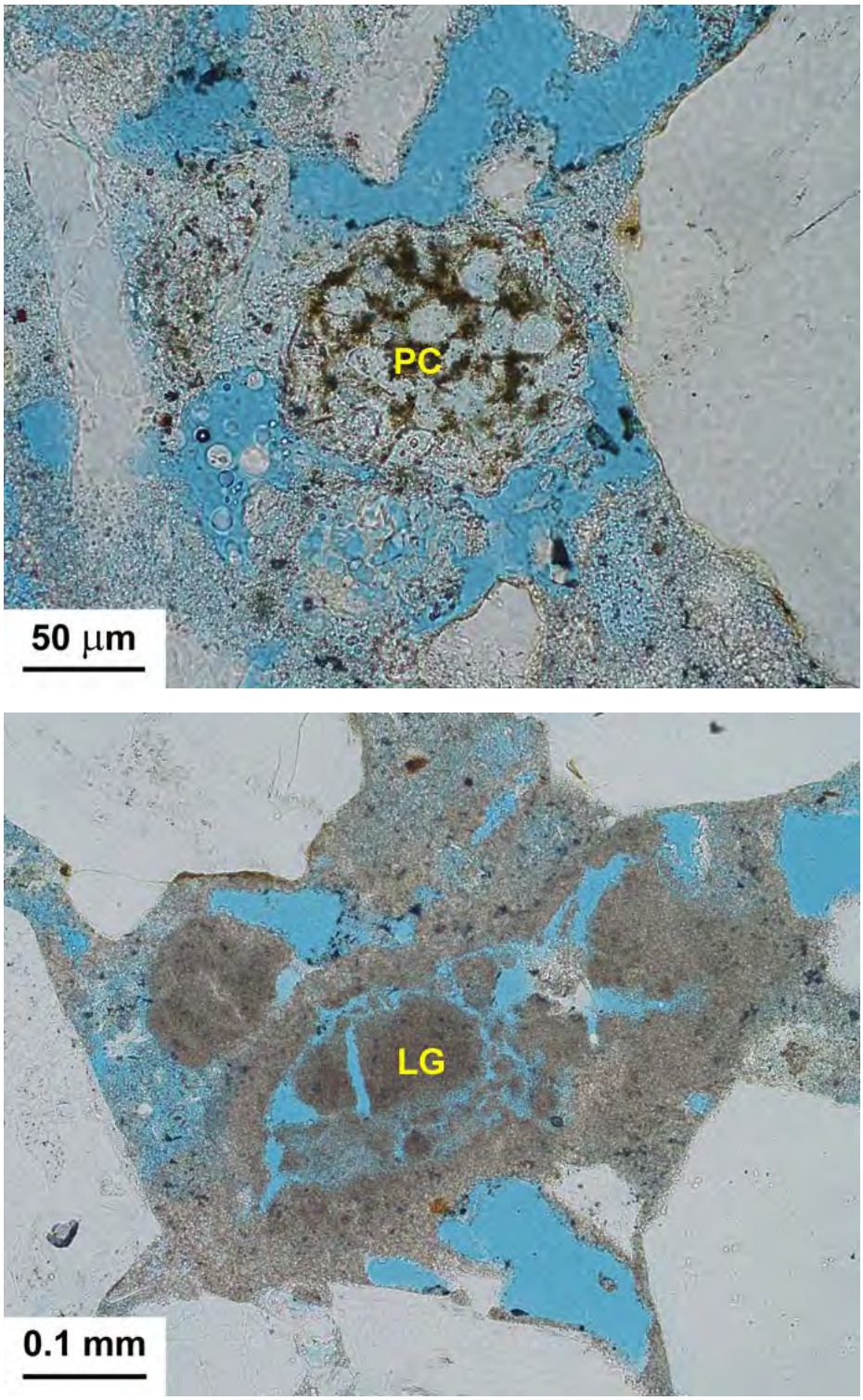


Figure 7: PPL photomicrographs illustrating the nature of the binder in FBF-02. (Upper) Residual portland cement grains (PC) are not very abundant. The agglomerate shown here contains rounded shapes representing the original sites of hydraulic calcium silicate. Virtually all of the hydraulic material in the mortar is consumed in hydration reactions. The brown interstitial phase is ferrite and the abundance of the iron mineral identifies the cement as a gray variety. (Lower) Undispersed lime grains (LG) are not particularly coarse but they are coarser than usually found in dry hydrated lime. The internal cracking is consistent with lime slaked on site.

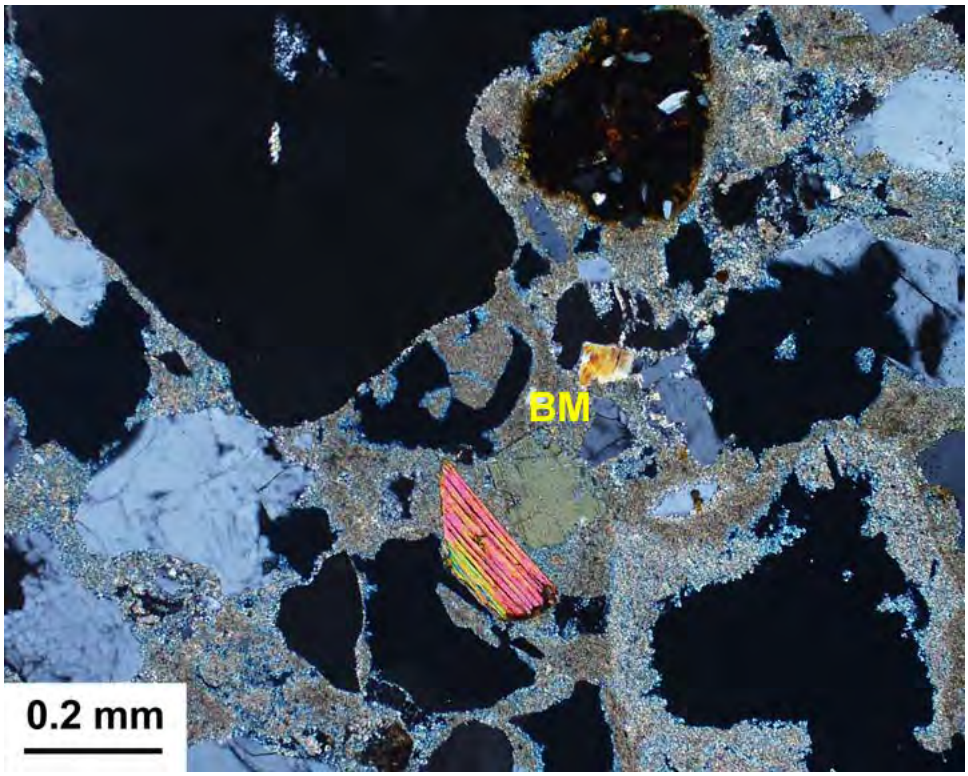


Figure 8: XPL photomicrograph of Sample FBF-02. The golden color of the binder matrix (BM) is the result of ultrafine-grained calcium carbonate distributed throughout the binder. The mortar is carbonated throughout the full depth provided.

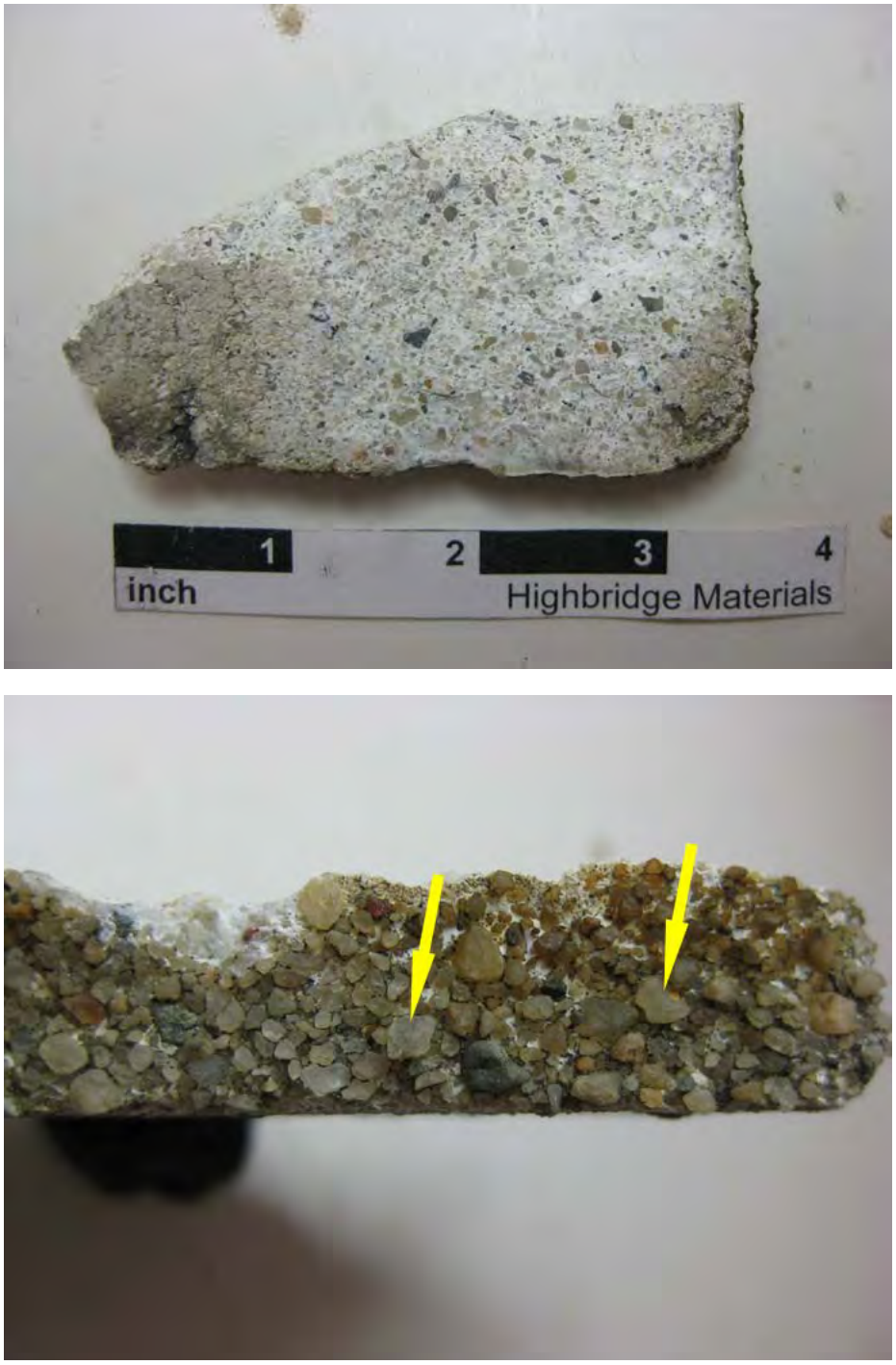


Figure 9: Photographs of mortar sample FBF-03 as received by Highbridge for examination. (Upper image) The mortar where fresh is uniform and nearly white in appearance. A fresh surface is shown here. (Lower image) The joint surface is highly textured due to exposed sand grains (arrows). These are mostly light-colored due to the pure quartz composition. The coarser gradation also influences the texture.

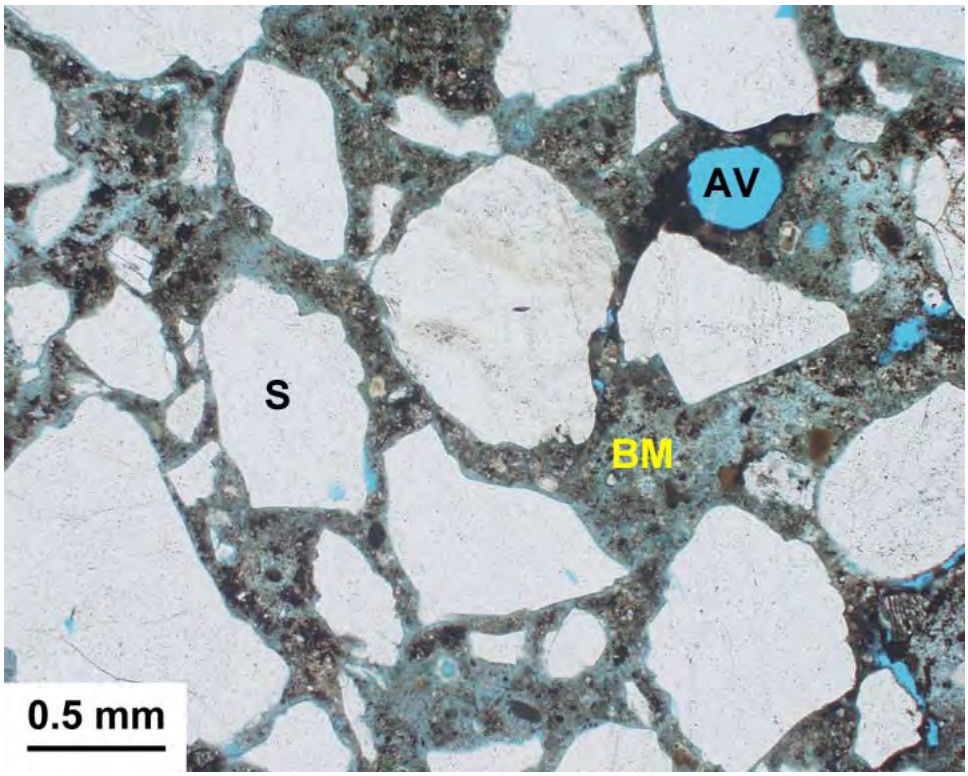


Figure 10: PPL photomicrograph illustrating the microtexture of Sample FBF-03. The sample is impregnated with a low-viscosity, blue-dyed epoxy and the intensity of blue coloration is an indication of porosity. The binder matrix (BM) is homogeneously developed. As in Sample FBF-01 there are darker clots of lower porosity surrounded by bluish zones of higher porosity. The more porous areas coincide with microscopic zones of higher water content. Nevertheless, the binder has relatively low permeability on average. Sand grains (S) are well distributed and fully coated with binder. However, note the narrow distribution of particle sizes with most grains coarser than a No. 30 sieve. Air-voids (AV) are present in low abundance. Those that are found tend to be fine in diameter and subspherical in shape.

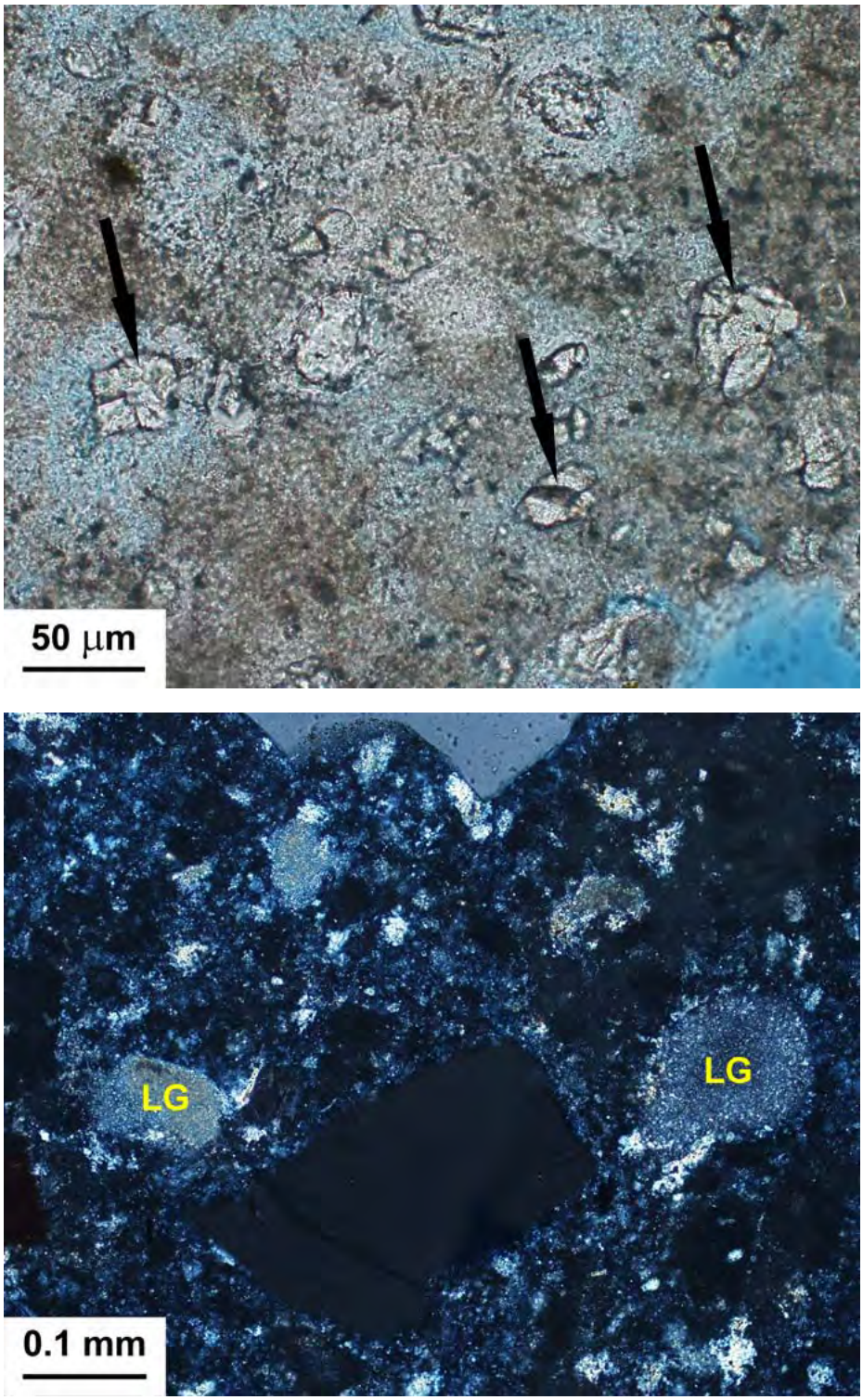


Figure 11: Photomicrographs illustrating the nature of the binder in FBF-03. (Upper) PPL image. Residual portland cement grains (PC) are best observed in the carbonated zone at the joint face where hydration is not as advanced. The arrows illustrate fine-grained belite agglomerates. The lack of dark-colored iron matrix identifies the cement as a white rather than gray variety. (Lower) XPL image. Undispersed lime grains (LG) are moderately abundant. The monotonous internal texture and very fine grain size is typical of prepackaged dry hydrate. The golden-colored grain at left is fully carbonated while the speckled grain at right remains uncarbonated.

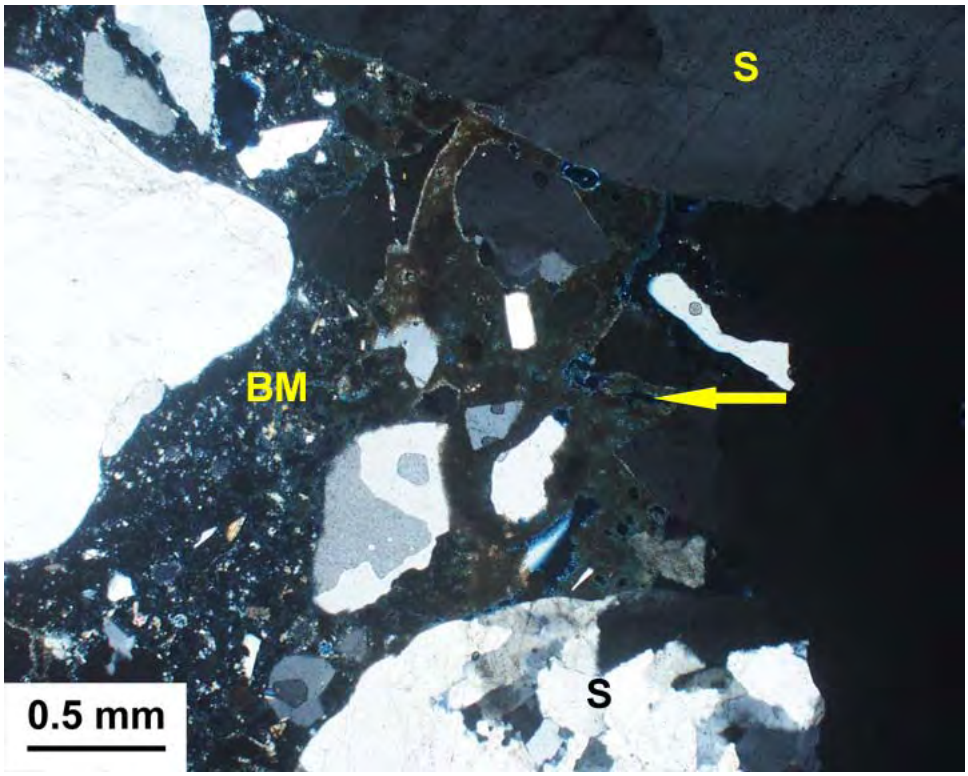


Figure 12: XPL photomicrograph illustrating a cross sectional view of the joint surface in Sample FBF-03. Sand grains (S) remain proud due to weathering of the joint face. The binder matrix (BM) is mostly dark (isotropic) where the paste retains its original characteristics including the calcium hydroxide formed during cement hydration. The arrow indicates a golden band along the front of the joint. The color is caused by the presence of ultrafine-grained calcium carbonate crystallites and indicates the depth of carbonation along the joint surface.

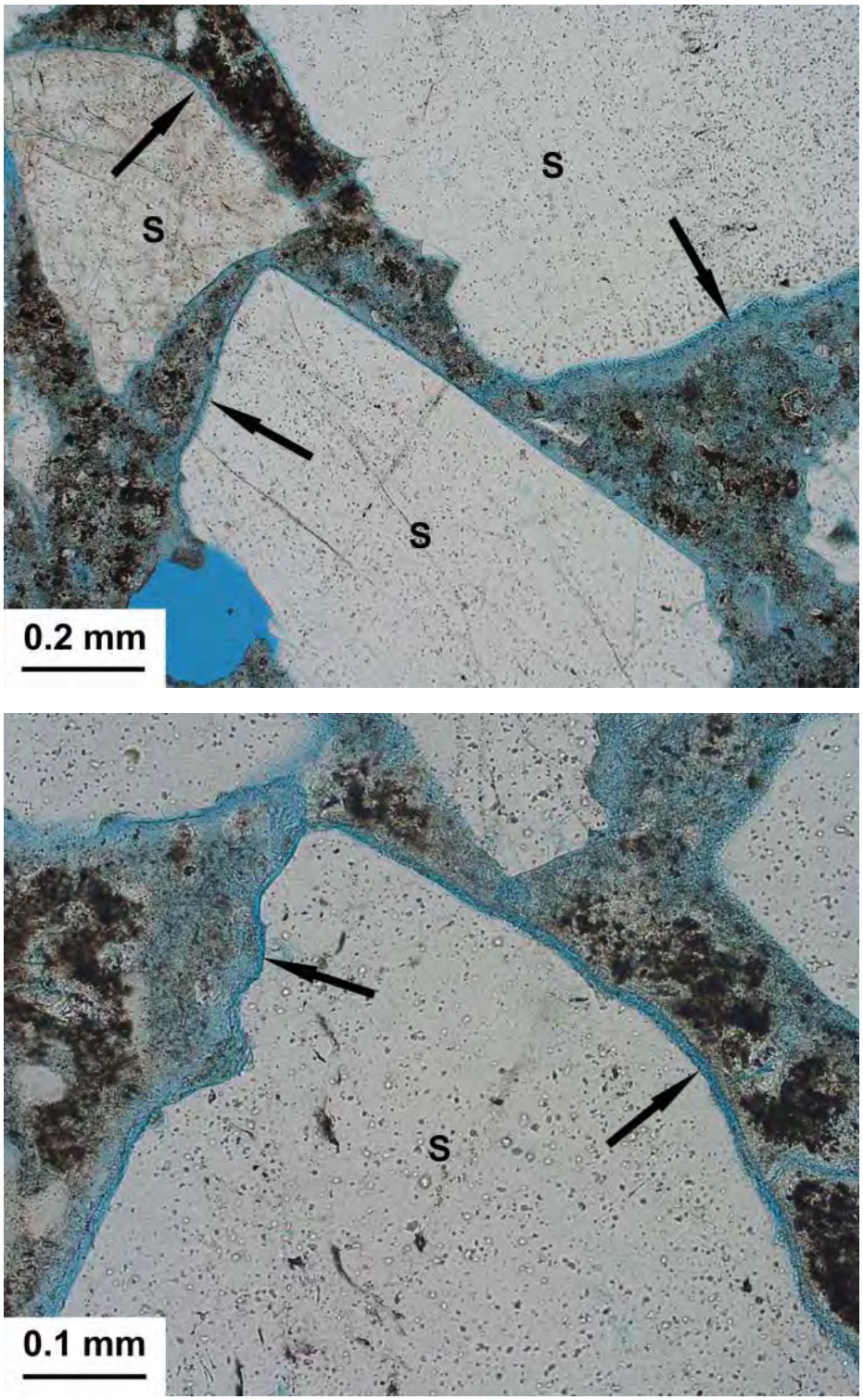


Figure 13: PPL photomicrographs of Sample FBF-03. Extremely fine fissures (arrows) are commonly found surrounding sand grains (S). The lower image presents a higher magnification view where the blue-dyed epoxy highlights the fine separation. These fissures are filled with microscopic needles of ettringite. The microcracking is consistent with minor expansion of the binder and has the hallmarks of delayed ettringite formation.

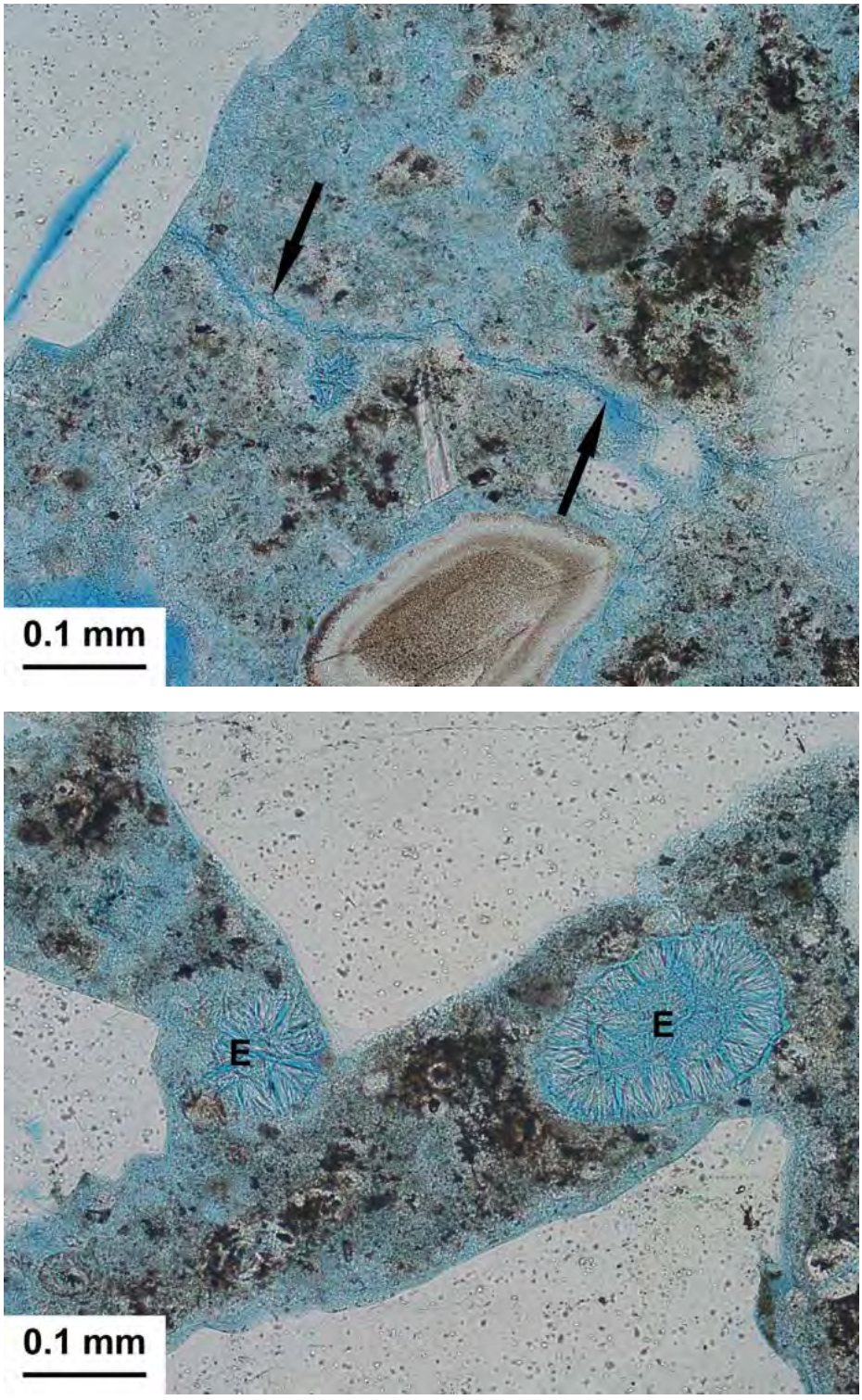


Figure 14: PPL photomicrographs of Sample FBF-03. (Upper image) The arrows indicate a very fine microcrack within the cement paste that links up the fissures shown in the last figure. (Lower image) Ettringite (E) is also found within air-voids.

Floyd Bennett Field
Hangars 1 and 2

Brooklyn, New York



Finishes Analysis

March 2012

BUILDING CONSERVATION ASSOCIATES INC

© BUILDING CONSERVATION ASSOCIATES INC

Floyd Bennett Field
Hangars 1 and 2

Brooklyn, New York

Finishes Analysis

Prepared For
URS Corporation
437 High Street
Burlington, NJ 08016

Prepared By
Building Conservation Associates, Inc.
44 East 32nd Street
New York, New York 10016

BCA Team
Raymond Pepi
Dean Koga
Chris Gembinski
Laura Buchner
Erica Morasset

March 2012

BUILDING CONSERVATION ASSOCIATES INC

CONTENTS

INTRODUCTION....1
METHODOLOGY....1
- Archival and Photograph Document Review....1
- On-Site Investigation and Sampling....2
- Laboratory Analysis....2

Observations....3
- Exterior Signage....3
- Hangars 1 and 2....4
- Lean-Tos 1 and 2....5
- WPA Infill....6

CONCLUSIONS AND RECOMMENDATIONS....7
APPENDICES
- Appendix A: Sample Locations: Key and Plan
- Appendix B: Representative Photomicrographs

LABORATORY REPORT: FINISHES ANALYSIS

Date:	March 2012
Commissioned By:	URS Corporation
Building/Project:	Floyd Bennett Field: Hangar Buildings 1 and 2
Building Address:	Brooklyn, New York
Construction Date:	Hangars 1 and 2 (Including First Floor of Lean-tos) (1931), Second Floor of Lean-to 1 (1936), and WPA Infill (1937)
No. of Samples:	74
Samples Removed By:	BCA
Analysis Performed By:	L. Buchner and E. Morasset
Analysis Checked By:	C. Gembinski

INTRODUCTION

URS Corporation (URS) retained Building Conservation Associates, Inc. (BCA) to conduct a finishes analysis on the exterior signage of Hangar 1 and the most significant interior elements of the Hangar 1 and 2 buildings at Floyd Bennett Field in Brooklyn, NY. On February 2, 2012, BCA removed the paint samples from: select locations in Hangars 1 and 2; the lean-tos attached to these hangars; and the Work Progress Administration (WPA) Infill structure between the hangars. The samples were removed, in conjunction with URS Corporation, from each building construction and are to the best of our knowledge representative of the typical finishes for each location.

BCA removed representative (89) paint samples from metal, plaster, wood, brick, and cast stone elements in locations selected by URS. The samples were taken to the BCA laboratory for examination, and seventy-four were subjected to full laboratory analysis, including color matching. Additional samples were taken for purposes of confirming findings if determined necessary.

The following report summarizes the findings of the finishes study and identifies the first extant finish (as opposed to primer) found at each sample location. The paint on many of the elements was severely deteriorated. Some of the analyzed samples appear to have incomplete paint stratigraphies. Conclusions about these samples and the original paint scheme were drawn from a comparison of samples that included both substrate and early finish layers. Following the introductory information regarding the study methodology, this report discusses the findings of the research and then makes recommendations for appropriate restoration paint colors.

METHODOLOGY

Archival and Photograph Document Review

Before the site visit and removal of samples, information related to the history of Floyd Bennett Field, provided by URS, was reviewed. Historic images and drawings were studied in order to gain a general understanding of the history of the building and any information related to its paint finishes. Three significant historic photographs were used as a reference throughout the course of this study. These photographs were provided by URS and pictured:

- Hangar 1 in the 1930s, during occupation by the US Navy (Source: GATE Museum Collection #30293).

- A commercial aircraft outside Hangar 8 in 1937.
- Hangar 1 in the 1950s, during occupation by the 2230th Air Force Reserve (Source: GATE Museum Collection #30288).

These photographs were a valuable resource for the interpretation of the physical evidence uncovered as part of this finishes study.

On-Site Investigation and Sampling

Once the relevant historical documentation was reviewed, BCA visited the site with URS, and the building was physically examined for areas from which representative samples of paint finishes could be removed. Once these intact areas were identified and the project team agreed, BCA removed the samples.

Small finish samples were removed from metal, wood, and plaster using a scalpel or Exacto knife. A small metal blade attached to a Dremel® tool was additionally employed to sample from wood elements. Masonry and cement plaster samples were removed using masonry chisels and a hammer. Samples were transported in labeled plastic bags to the BCA laboratory. The findings of this report are based on samples removed from the initially determined 67 sample locations, plus an additional 4 samples from the signage, 2 samples from the brick in Hangar 2, and 1 sample from the steel truss. See Appendix A for a sample key and plan showing locations of the analyzed samples.

Laboratory Analysis

All finish samples were initially examined in reflected light using a Nikon high-resolution stereomicroscope SMZ-1500 with variable magnification (16x-160x) to identify which samples would be embedded and sectioned for analysis. The selected samples were then mounted in a commercial polyester/methacrylate resin polymerized with a methyl ethyl ketone peroxide catalyst (Bioplast®). Embedded samples were sectioned on a Leco® VC-50 micro-saw for microscopic examination. The sectioned samples were dry-polished using a series of fine Micromesh® polishing clothes ranging from 6,000 to 12,000 grit. Sectioned samples were observed under a Nikon SMZ-U microscope with magnification power to 75x and a Nikon 50i compound microscope with magnification power to 200x. Samples were observed in both visible light filtered through a daylight correction filter and ultraviolet light. The ultraviolet light was generated by a mercury illumination system filtered through a violet filter cube (EF4 V-2A Ex400/40 Dm430 Bar 450).

Photomicrographs of representative samples were taken using a 5-mega pixel Nikon DigiSight color digital camera system and are included in Appendix B of this report to illustrate specific observations. All paint samples were viewed in cross-section and their paint layering sequences, or stratigraphies, recorded. Once the stratigraphies of every sample were deciphered, significant paint layers were identified and raw samples were manipulated in order to expose these layers for color matching purposes. Where original paint layers could not be exposed on the bulk sample, colors were matched to the embedded cross-section. Original paint colors were matched in the Munsell Color System and to Benjamin Moore Paint Systems. All color matches are included in the Conclusions and Recommendations section of this report.

Where possible, the exposed original paint layer was analyzed by a portable spectrophotometer, a GretagMacbeth X-Rite *EyeOne*®, in order to generate a CIE L*a*b* value for the original paint

color. The spectrophotometer was then used to generate CIE L*a*b* values for the corresponding Benjamin Moore color matches, so that the difference between the original paint color and the color match could be quantified. A color in the CIE L*a*b* system is defined according to three axes. The L*-axis (from 0 to 100) is the light-dark axis. The a*-axis (from –100 to +100) is the green-red color axis. The b*-axis (from –100 to +100) is the yellow-blue axis. Delta E is a measurement of the color difference between the original paint surface color and the closest color matches that BCA has identified. A perfect match would have a Delta E value of 0.00 and, in general, the lower the Delta E value the closer the match. Delta E equals the square root of $[(L^*_1 – L^*_2)^2 + (a^*_1 – a^*_2)^2 + (b^*_1 – b^*_2)^2]$, where L^*_1, a^*_1, b^*_1 are the original paint surface values and L^*_2, a^*_2, b^*_2 are the commercial or Munsell paint values. Unfortunately, the irregular surfaces and degraded finishes of most of the Floyd Bennett samples prevented a CIE L*a*b* value from being generated because the spectrophotometer cannot take a reading of a rough and uneven surface. Spectrophotometer readings and CIE L*a*b* values were only performed for relatively smooth surface samples, such as those with a plaster or wood substrate, where more than 0.75 mm square of an original finish could be consistently exposed; this size limitation is dictated by the size of the aperture on the spectrophotometer. The resulting data is included in Appendix A of this report.

OBSERVATIONS

Exterior Signage

First Finish Campaign

The laboratory analysis of paint samples removed from the exterior copper sign on the north elevation is consistent with archival photographs and historic drawings of this elevation. A 1937 archival photograph of Hangar 8 shows the exterior sign as a dark field with light colored text. Hangar 1 appears to have been originally finished in a similar fashion. A 1929 elevation drawing indicates the numbers and letters were to be painted white. Samples taken at locations of this early text confirmed the paint was off-white. The stratigraphies of other samples taken in the field area of the sign do not include a corresponding paint layer, suggesting this area of copper was originally left unpainted. This study documented the presence of what appears to be a clear coating beneath the earliest paint layers on the exterior signage (See Sample 61 in Appendix B). Further laboratory testing is recommended to determine the composition of this material; however its auto-fluorescence is a bright blue-white color, which suggests that it is a nitrocellulose coating. Nitrocellulose coatings were used in the early 20th c. as a lacquer for metalwork.

Subsequent Paint Campaigns

This study documented that all subsequent paint campaigns used a similar color palette consisting of white, off-white, and navy blue. The first paint campaign using these colors employed what appears to be an aluminum-bronze powder primer, which was commonly selected for its moisture proofing efficiency.[1] This silver-colored metallic primer is visible on numerous other substrates in Floyd Bennett Field. Further testing is recommended to

[1] Aluminum became widely used as a pigment for commercial paints after 1920; experiments and field tests by the Forest Products Laboratory and the H.A. Gardner Laboratory led to its development as an exterior coating. Gettens, Rutherford J., and George L. Stout, "Pigments and Inert Materials," in *Painting Materials: A Short Encyclopedia,* (New York: Dover, 1942), 92.

determine the composition of this material.

The1930s image of Hangar 1 during occupation by the US Navy shows the hangar numbers replaced by stars. A study of the finishes suggests that the field of the circle was dark blue, the star was white, and the circle at the center of the star was red (See Sample 72). Red paint was not found elsewhere on the signage.

Decorative Crest

The finishes on the crest at the top center of the sign were unique amongst the elements sampled at Floyd Bennett Field. A 1929 elevation drawing of Hangar 1 calls for this crest to be gilded copper ornament. Finish samples taken at the crest show this area was actually painted with bronze powder paint. Some samples have three layers of this bronze powder paint, but at the letters "NYC" on the crest, have only two layers of bronze powder paint with an intermediate layer of dark blue paint. This contrasting blue paint is visible on the letters in the 1930s image of the Hangar, during its occupation by the US Navy. All later paint layers on the crest are shades of white and off-white; these light shades are consistent with the paint visible in the 1950s image of Hangar 1, during occupation by the US Air Force Reserve.

Hangers 1 and 2

Brick

Finish samples were removed from brick on the east wall of Hangar 1 and the west wall of Hangar 2 (Samples 5, 6, 37, and 38). These non-original walls were early in-fills, shown on 1932 plans, and built for the purposes of separating the Lean-to spaces from the hangars. Samples taken at the upper sections of the brick walls in Hangars 1 and 2 exhibit only an aluminum-colored metallic primer and one finish coat. The more accessible lower sections of the walls in both Hangars were repainted multiple times.

The rough surfaces of the bricks and appearance of a thin soil layer suggests that the brick walls were most likely exposed without a surface finish. The first finishes on the upper and lower sections of the brick wall in Hangar 2 are a contrasting off-white and gray. The first colors of the upper and lower sections of the brick wall in Hangar 1 are two shades of off-white. However, the second coating on the lower wall in Hangar 1 is a gray, similar to the first layer found in Hangar 2 as well as the cast stone on the first floor of the WPA Infill. It is possible that the lower part of the walls in Hangar 1 was repainted to match these other spaces shortly after its initial coating.

Ceiling Elements

The wood fascia, catwalk, and underside of the roof deck of Hangar 1 have few paint layers, which is to be expected given the difficulties associated with accessing these high elements (Samples 27-29). All samples were initially finished with an off-white paint. The spandrel panel, also sampled near the ceiling, did not exhibit any white paint. The only coating noted on this element was a silver-colored metallic paint, suggesting these panels were originally exposed metal or may have been installed at a later date (Sample 31).

Steel

Samples of a horizontal member of the steel truss and the upper section of the steel column in Hangar 1 also exhibit an off-white first extant finish (Sample 30 and 35). The lower section of the steel column was originally painted brown, which may have been intended to compliment the color of exposed brick walls (Sample 34).

Windows and Doors

The paint at the second floor windows within Hangar 1 is severely deteriorated and the sample removed from this area only contained a few layers of white paint (Sample 36). A sample removed from the Lean-to side of the window consisted of many additional paint layers and indicated that these windows were originally painted dark green (Sample 58). The first finishes on the windows in the first floor of the WPA Infill and the second floor of the Hangars are a similar dark green, suggesting that the Infill windows were relocated to their current (Samples 8 and 9).

The earliest extant finishes on the exterior of the pilot and hangar doors are cream-colored, although they differ slightly (Samples 24 and 26). The interior finishes of these features do not appear to have matched: the interior of the hangar door was white, and the first exposed paint layer on the pilot door was a dark gray-blue (Samples 23 and 25). Evidence shows the interior and exterior of the pilot door has been painted red during a number of finish campaigns.

Lean-tos 1 and 2

Plaster

The cement plaster in the Lean-tos of both hangars was initially finished with a thin, bright coating. These coatings are inconsistent in thickness and are very thin in some locations. These coatings were likely an intentionally applied finish, given their bright colors: green in Lean-to 2 (Samples 1 and 2) and yellow in two rooms in Lean-to 1 (Samples 40, 41, 42). The thin application of the paint suggests that it may have been a lime wash or a cement paint, applied to seal the surface of the hard plaster walls. Further laboratory testing is recommended to characterize the composition of this finish.

Sampling of the upper and lower sections of the plaster walls in the Lean-tos indicates that these surfaces were initially painted a uniform color and that the two-tone decorative scheme simulating a painted wainscot, which is now seen throughout the building, was added during later painting campaigns.

The sample taken from the east wall of the first floor of Lean-to 1 did not have the bright first finish seen in the other cement plaster samples (Sample 39). However, the finishes on this wall were badly deteriorated, and the sample taken contains far few layers than seen elsewhere in Lean-to 1, suggesting that early finishes may have been previously stripped.

The north stairwell of Lean-to 1 was also initially painted an off-white color (Samples 46 and 47). All other sampled wall surfaces on the second floor of Lean-to 1 had a tan-colored first finish (Samples 53-57).

Brick

The 1932 infill brick on the east wall of Lean-to 2 may have initially been left exposed. Like the bricks sampled in the hangars, the first coating identified on this wall was an aluminum-colored metallic primer (Samples 3 and 4). The first finishes on the upper and lower sections of the brick wall are different.

Windows and Doors

A double door and frame at the center of the east wall of Hangar 1 was originally gray-blue, similar to the original finish on door elements in the WPA Infill. The coatings on the metal door at the southeast corner of Hangar 1, leading to the Lean-to, were severely deteriorated. The cross-section showed only a few coatings on the surface facing the Hangar, the earliest finish being light blue-gray (Sample 45). This frame and door was enclosed within a wall on its east side. Through a hole in the wall, the frame was sampled and found to contain numerous paint layers, the first of which is a tan (Sample 44).

The early tan finish on Sample 44 matches the first color on the metal door and frame on the second floor of the Lean-to (Samples 59 and 60). The earliest extant color on all of the other doors sampled on the second floor is a light tan matching the walls (Samples 48-52).

The first extant finish on the wood in the projecting window bay addition on the east elevation of the first floor in Lean-to 1 is a pale blue with a white primer (Sample 43).

WPA Infill

A gray-blue finish was identified as the first extant finish on multiple elements in the WPA Infill. It was found on: the first floor cast stone; the upper plaster wall of the southeast stairwell; the doorframes at the north and south elevations of the Infill; and the door at the base of the northeast stairwell (Samples 10, 21, 11, 14, and 13). It also appears similar to the third finish coating on the steel windows within the Infill passageway (Sample 8). Samples 11, 13, and have what appears to be a zinc chromate based primer; further testing is recommended to confirm the composition of this primer.

Plaster

The plaster in the south stair hall appears to have been finished in two colors, unlike other walls in the hangar buildings. Evidence suggests that the darker color (blue) was initially applied to the top of the walls and a lighter color (yellow) was applied to the bottom (Samples 21 and 22). The cement plaster in the second floor hall was painted a uniform tan (Samples 15 and 16).

Wood

Samples from the wood columns on the second floor of the Infill appear to have only one finish campaign, during which they were painted white, and the lower section was over-painted with blue (Samples 17 and 18). The blue paint on the lower half of the columns may be a later addition, given that the brick walls in this room as well as the cement plaster walls in the second floor hall were originally painted a single uniform color (Samples 15, 16, 19, and 20). The surface condition of the wood substrate suggests that the columns may have been originally exposed or previously stripped of earlier coatings. All other samples taken on this Infill level

have an aluminum-colored metallic primer, but the white finish paint of the columns was applied directly to the wood, supporting the hypothesis that the first finish was previously removed.

The wood doorframe between the Infill and Hangar 2 appears to be a replacement, as it has only one finish coat (Sample 7).

CONCLUSIONS AND RECOMMENDATIONS

Recommendations for restoration paint colors are provided in the Table 1 below. This table provides Munsell and Benjamin Moore color matches for the earliest extant finish identified in each sample location. In addition, metallic paints are recommended for the following elements:

- Bronze powder paint for the crest at the top center of the exterior signage.
- Silver-colored metallic paint for the sheet metal spandrel panels at the ceiling level within the hangar.

There were two major design schemes for the exterior hangar sign, which could be used as the inspiration for new signage finishes. Applying a bronze-colored paint to the background field and using an off-white paint for lettering could reference the original exposed copper metal signage. Alternatively, the blue, white, off-white, and red paints below could be employed to reference the subsequent painting campaigns that consistently used these colors. BCA recommends retention and encapsulation of the previous historic painting campaigns on the sign by over-painting with new finishes rather than stripping all of the finishes completely. Alternatively, all coatings could be removed and the original design replicated.

Evidence suggests that the brick walls within both hangars and the Lean-to of Hangar 2 were initially exposed. These surfaces were likely painted around the same time as the construction of the WPA Infill, and have remained painted since that time. The period of significance and date of interpretation need to be established when selecting finishes for this structure. Removing all layers of paint from the brick masonry within the hangers would return them to their original appearance. However, if the hangars are going to be interpreted to a date after the infill construction, the wall should be repainted. This study did not determine if the brick infill between the hangars and lean-tos matches that originally used for the hangars' construction.

Table 1: Restoration Paint Color Recommendations for Hangar and Lean-to 2

Sample Locations and Numbers	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Matching Samples in Other Buildings
Hangar 2 Lean-to: *Upper and Lower Plaster Wall (Samples 1 & 2)*	 2.5BG 6/6	670 - Gulf Stream	

Hangar 2 Lean-to: *Upper Brick Wall (Sample 3)*	10Y 8/2	521 - Nantucket Breeze	
Hangar 2 Lean-to: *Lower Brick Wall (Sample 4)*	2.5Y 8/4	192 - Key West Ivory	WPA Infill: *Lower Plaster Wall (Sample 22)* and Hangar 1 Lean-to: *Upper and Lower Plaster Wall (Samples 46 & 47)*
Hangar 2: *Upper Brick Wall (Sample 5)*	5Y 9/1	OC-6 – Feather Down	WPA Infill: *Upper Wood Column (Sample 18)* and Hanger 1: *Rear of Wood Fascia; Interior of Roof; and Window Frame at Exterior of Lean-to (Samples 27, 29, & 36)*
Hangar 2: *Lower Brick Wall (Sample 6)*	 10B 5/1	1616 - Stormy Sky	WPA Infill: *Wood Door Frame (Samples 7)* and Hangar 1 Lean-to: *Metal Door (Sample 45)*

Table 2: Restoration Paint Color Recommendations for the WPA Infill

Sample Locations and Numbers	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Matching Samples in Other Buildings
WPA Infill: *Wood Door Frame (Sample 7)*	 10B 5/1	1616 - Stormy Sky	Hangar 2: *Lower Brick Wall (Sample 6)* and Hangar 1 Lean-to: *Metal Door (Sample 45)*

WPA Infill: *Metal Window Frame – Passageway Side (Sample 8)*	 5G 2/4	Essex Green (Exterior Ready Made)	
WPA Infill: *Metal Window Frame – Room Side (Sample 9)*	 5G 2/1	Essex Green (Exterior Ready Made)	Hangar 1 Lean-to: *Metal Window Frame at Interior of Lean-to (Sample 58)*
WPA Infill: *Cast Stone Wall; Two Metal Door Frames; One Metal Door; and Upper Plaster Wall (Samples 10, 11, 13, 14, & 21)*	 10B4/1	1630 – Ocean Floor	Hangar 1: *Door and Frame (Samples 32 & 33)*
WPA Infill: *Doorframe and Lower Plaster Wall (Samples 12 and 22)*	2.5Y 8/4	192 - Key West Ivory	Hangar 2 Lean-to: *Lower Brick Wall (Sample 4)* and Hangar 1 Lean-to: *Upper and Lower Plaster Wall (Samples 46 & 47)*
WPA Infill: *Lower and Upper Plaster Wall (Samples 15 &16)*	10YR 8/4	1110 – Tawny Bisque	
WPA Infill: *Lower Wood Column (Sample 17)*	 10B 2/2	HC-154 Hale Navy	

WPA Infill: *Upper Wood Column (Sample 18)*	5Y 9/1	OC-6 – Feather Down	Hangar 2: *Upper Brick Wall (Sample 5)* and Hanger 1: *Rear of Wood Fascia; Interior of Roof; and Window Frame at Exterior of Lean-to (Samples 27, 29, & 36)*
WPA Infill: *Upper and Lower Plaster Wall (Samples 19 & 20)*	2.5Y 9/4	178 - Golden Lab	Hangar 1: *Metal Door (Sample 26)* and Hangar 1 Lean-to: *Plaster Wall (Sample 39)*

Table 3: Restoration Paint Color Recommendations for Hangar and Lean-to 1

Sample Locations and Numbers	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Matching Samples in Other Buildings
Hangar 1: *Metal Door (Interior) (Sample 23)*	 10B 3/1	1638 – Midnight Blue	
Hangar 1: *Metal Door (Sample 26)* Hangar 1 Lean-to: *Plaster Wall (Sample 39)*	2.5Y 9/4	178 - Golden Lab	WPA Infill: *Upper and Lower Plaster Wall (Samples 19 & 20)*
Hangar 1: *Metal Door and Parts of Exterior Signage (Samples 25, 70, & 71)*	N9.25	OC-68 Distant Gray	

Hangar 1: *Door and Frame (Samples 32 & 33)*	 10B4/1	1630 – Ocean Floor	WPA Infill: *Cast Stone Wall; Two Metal Door Frames; One Metal Door; and Upper Plaster Wall (Samples 10, 11, 13, 14, & 21)*
Hangar 1: *Lower Section of Steel Column (Sample 34)*	 5YR 3/4	HC -71 - Hasbrouck Brown	
Hangar 1: *Metal Door (Exterior); Upper Section of Steel Column; and Upper Brick Wall (Samples 24, 35, and 37)*	2.5Y 9/2	OC-85 - Mayonnaise	
Hangar 1: *Catwalk; Horizontal Member of Steel Truss; and Lower Brick Wall (Samples 28, 30, & 38)*	5Y 9/2	OC - 34 - Marble White	
Hanger 1: *Rear of Wood Fascia; Interior of Roof; and Window Frame at Exterior of Lean-to (Samples 27, 29, & 36)*	5Y 9/1	OC-6 – Feather Down	Hangar 2: *Upper Brick Wall (Sample 5)* and WPA Infill: *Upper Wood Column (Sample 18)*
Hangar 1 Lean-to: *Metal Window Frame at Interior of Lean-to (Sample 58)*	 5G 2/1	Essex Green (Exterior Ready Made)	WPA Infill: *Metal Window Frame – Room Side (Sample 9)*

Hangar 1 Lean-to: *Upper and Lower Plaster Walls (Samples 40-42)*	 2.5Y 7/12	315 – Oxford Gold	
Hangar 1 Lean-to: *Upper and Lower Plaster Wall (Samples 46 & 47)*	2.5Y 8/4	192 - Key West Ivory	Hangar 2 Lean-to: *Lower Brick Wall (Sample 4)* and WPA Infill: *Lower Plaster Wall (Sample 22)*
Hangar 1 Lean-to: *Two Wood Doors; Two Wood Door Frames; One Wood Door Transom Frame; and Upper and Lower Plaster Walls (Samples 48-57)*	10YR 9/4	Tucson Tan	
Hangar 1 Lean-to: *Metal Door and Two Metal Door Frames (Samples 44, 59 60)*	 2.5Y 7/2	HC-44 – Lenox Tan	
Hangar 1 Lean-to: *Metal Door (Sample 45)*	 10B 5/1	1616 - Stormy Sky	Hangar 2: *Lower Brick Wall (Sample 6)* and WPA Infill: *Wood Door Frame (Sample 7)*
Hangar 1 Lean-to: *Wood Frame Between Windows in Projecting Bay (Sample 43)*	5PB 8/1	1627 - Manor Blue	

Hangar 1: *Earliest Known Lettering on Exterior Signage (Samples 64 & 72)*	5Y 9/1	OC - 123 Bavarian Cream	
Hangar 1: *Parts of Exterior Signage (Samples 65, 69, 73, & 74)*	 5PB 2/2	HC-154 - Hale Navy	
Hangar 1: *Parts of Exterior Signage (Samples 66 & 67)*	2.5Y 9/4	177 - Mushroom Cap	

Appendix A
Sample Locations: Key and Plan

Table 1A. Hangar 2 (Including Lean-to): Sample Locations and Color Matches

Sample Number	Element	Location	Substrate	Primer Color	Earliest Extant Finish Color	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Bulk Sample (First Finish) CIE L*a*b*Values	Benjamin Moore CIE L*a*b*Values	CIE L*a*b*Values: Delta E	Notes
1	Wall	Lean-to: Upper wall	Cement Plaster	None	Sea Green	2.5BG 6/6	670 - Gulf Stream	Not Available: Thin Finish Over Irregular Surface	Not calculated due to condition of bulk sample.		Second finish is a peach paint matching Munsell Color 2.5 Y 9.4.
2	Wall	Lean-to: Lower wall	Cement Plaster	None	Sea Green	2.5BG 6/6	670 - Gulf Stream	Not Available: Thin Finish Over Irregular Surface	Not calculated due to condition of bulk sample.		Second finish is a peach paint matching Munsell Color 2.5 Y 9.4.
3	Brick	Lean-to: Upper brick, near north end of building	Brick	Aluminum-Colored Metallic	Pale Green	10Y 8/2	521 - Nantucket Breeze	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
4	Brick	Lean-to: Lower brick near north end of building	Brick	Aluminum-Colored Metallic	Off-White	2.5Y 8.5/4	192 - Key West Ivory	71.0*3.5*21.2*	86.2*5.1*23.5*	15.46	CIE L*a*b* value taken from irregular surface.
5	Brick	Upper brick	Brick	Aluminum-Colored Metallic	White	5Y 9/1	OC-6 - Feather Down	79.7*0.9*5.7*	89.3*0.3*9.0*	10.5	CIE L*a*b* value taken from discolored and soiled exposed surface.
6	Brick	Lower brick	Brick	Aluminum-Colored Metallic	Light Gray-Blue	10B 5/1	1616 - Stormy Sky	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		

Table 2A. WPA Infill: Sample Locations and Color Matches

Sample Number	Element	Location	Substrate	Primer Color	Earliest Extant Finish Color	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Bulk Sample (First Finish) CIE L*a*b*Values	Benjamin Moore CIE L*a*b*Values	CIE L*a*b*Values: Delta E	Notes
7	Wood Frame	From north side of frame	Wood	Black	Light Gray-Blue	10B 5/1	1616 - Stormy Sky	44.7*-1.8*-1.7*	42.5*-0.1*-1.9*	2.77	Relatively few paint layers are found on this sample: only two including the primer. This suggests that the frame was not original to the building. The primer matches Munsell Color N1/1.2% R.
8	Window Frame	Passageway side	Metal	None	Green	5G 2/4	Essex Green (Exterior Ready Made)	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		The green finish is backed by a corrosion product.
9	Window Frame	Room side	Metal	None	Dark Green	5G 2/1	Essex Green (Exterior Ready Made)	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
10	Wall	South elevation	Cast Stone	Aluminum-Colored Metallic	Gray-Blue	10B 4/1	1630 - Ocean Floor	51.0*-0.9*0.5*	42.3*-1.8*-4.3*	10.01	CIE L*a*b* value taken from irregular surface.
11	Doorframe	At north elevation	Metal	Green	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
12	Doorframe	At north wall of northeast stairwell (interior)	Metal	Undetermined	Tan	2.5Y 8/4	192 - Key West Ivory	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Neither substrate nor primer were visible in cross section.
13	Door	At north wall of northeast stairwell (interior)	Metal	Green	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
14	Doorframe	Interior side at south elevation (left side of frame)	Metal	Green	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
15	Wall	Upper wall, west of window	Cement Plaster	Aluminum-Colored Metallic	Tan	10YR 8/4	1110 - Tawny Bisque	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
16	Wall	Lower wall, east of window	Cement Plaster	Aluminum-Colored Metallic	Tan	10YR 8/4	1110 - Tawny Bisque	71.5*5.4*17.8*	74.4*8.5*27.3*	10.48	CIE L*a*b* value taken from irregular surface.
17	Column	Column just below change in color	Wood	White (Finish coat of Sample 18)	Dark Blue	10B 2/2	HC-154 - Hale Navy	44.9*0.4*3.4*	30.3*-1.2*-7.8*	18.47	CIE L*a*b* value taken from irregular and soiled surface.
18	Column	Column just above change in color	Wood	None	White	5Y 9/1	OC-6 - Feather Down	Not Available: Exposure Not Suitable For Testing Due to Surface Irregularity and Soiling	Not calculated due to condition of bulk sample.		This is the only coating visible on the surface of this sample.
19	Wall	Lower wall	Brick	None	Off-White	2.5Y 9/4	178 - Golden Lab	Not Available: Exposure Not Suitable For Testing Due to Surface Irregularity and Soiling	Not calculated due to condition of bulk sample.		This is the only coating visible on the surface of this sample. Isolated red on surface of masonry under the paint appears to be ferrous stains.
20	Wall	Upper wall	Brick	Off-White	Off-White	2.5Y 9/4	178 - Golden Lab	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Primer is same color as finish coat.
21	Wall	Upper wall	Cement Plaster	Aluminum-Colored Metallic	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
22	Wall/ Window Sill	Lower wall	Cement Plaster	Aluminum-Colored Metallic	Off-White	2.5Y 8.5/4	192 - Key West Ivory	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Sample has incomplete stratigraphy. Relatively few paint layers are visible in the cross-section: only two including the primer.

Table 3A. Hangar 1 (Including Lean-to): Sample Locations and Color Matches

Sample Number	Element	Location	Substrate	Primer Color	Earliest Extant Finish Color	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Bulk Sample (First Finish) CIE L*a*b*Values	Benjamin Moore CIE L*a*b*Values	CIE L*a*b*Values: Delta E	Notes
23	Door	Pilot door (interior)	Metal	Undetermined	Dark Gray-Blue	10B 3/1	1638 - Midnight Blue	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		The first red paint matches Munsell 6.25R 4/14 and Benjamin Moore's Heritage Red Exterior Ready Made paint.
24	Door	Pilot door (exterior)	Metal	Undetermined	Cream	2.5Y 9/2	OC-85 - Mayonnaise	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		The first red paint matches Munsell 6.25R 4/14 and Benjamin Moore's Heritage Red Exterior Ready Made paint. Sample contains incomplete stratigraphy. Field observations indicated a dark blue and light gray proceeded the cream color paint. The dark gray color may be the same first coating seen in Sample 23.
25	Hangar Door	Interior side	Metal	Aluminum-Colored Metallic	White	N9.25 84.2%	OC-68 Distant Gray	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Very deteriorated sample.
26	Hangar Door	Exterior side (field area)	Metal	Undetermined	Off-White	2.5Y 9/4	178 - Golden Lab	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Substrate missing. Earliest visible finish in thin section is consistent with field observations.
27	Wood (Rear of Fascia)		Wood	Peach	White	5Y 9/1	OC-6 - Feather Down	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Primer matches 10YR 8/4.
28	Catwalk	Bottom of catwalk	Wood	None	Off-White	5Y 9/2	OC - 34 - Marble White	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Only two finishes are visible on this sample: the identified off-white paint and a subsequent silver metallic paint.
29	Roof (Interior)		Wood	Peach	White	5Y 9/1	OC-6 - Feather Down	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Primer matches 10YR 8/4.
30	Truss Steel	Horizontal member	Metal	Red	Off-White	5Y 9/2	OC - 34 - Marble White	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
31	Spandrel Panel		Metal	None	Silver	Not Applicable	Not Applicable	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Surfacing coating is deteriorated. Field observation determined it is sheet metal with one layer of silver paint.
32	Door	Door to Lean-to 1	Metal	Red (2 Layers)	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
33	Doorframe		Metal	Red & Aluminum-Colored Metallic	Gray-Blue	10B 4/1	1630 - Ocean Floor	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
34	Steel Column	Lower portion	Metal	Red	Brown	5YR 3/4	HC -71 - Hasbrouck Brown	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		The next paint color is white matching Munsell 5Y 9/1.
35	Steel Column	Upper portion	Metal	Red	Off-White	2.5Y 9/2	OC-85 - Mayonnaise	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Relatively few paint colors. Appears to have dirt layer between primer and first layer.
36	Window Frame	2nd floor (exterior of Lean-to 1)	Metal	Undetermined	White	5Y 9/1	OC-6 - Feather Down	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Finishes are severely deteriorated. Neither substrate nor primer are visible in cross section.
37	Brick	Upper brick	Mortar	Aluminum-Colored Metallic	Off-White	2.5Y 9/2	OC-85 - Mayonnaise	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Coatings consist of only one finish on silver primer.
38	Brick	Lower brick	Brick	Aluminum-Colored Metallic	White	5Y 9/2	OC - 34 - Marble White	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
39	Wall	Lean-to	Cement Plaster	Off-White	Off-White	2.5Y 9/4	178 - Golden Lab	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Relatively few paint colors. Lack of soiling between first two layers suggest they are primer and finish coat. First layer matches Munsell 2.5Y 9/2.
40	Wall	Lean-to: Upper wall (Interior wall separating rooms)	Cement Plaster	None	Yellow	2.5Y 7/12	315 - Oxford Gold	67.6*7.7*30.0*	81.0*18.8*67.2*	41.04	Large Delta E attributed to CIE L*a*b* value taken from irregular surface.
41	Wall	Lean-to: Lower wall (Interior wall separating rooms)	Cement Plaster	None	Yellow	2.5Y 7/12	315 - Oxford Gold	Not Available: Exposure Not Suitable For Testing Due to Surface Irregularity	Not calculated due to condition of bulk sample.		CIE L*a*b* value taken from irregular surface.

Sample Number	Element	Location	Substrate	Primer Color	Earliest Extant Finish Color	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Bulk Sample (First Finish) CIE L*a*b*Values	Benjamin Moore CIE L*a*b*Values	CIE L*a*b*Values: Delta E	Notes
42	Wall	Lean-to (West wall separating Lean-to and Hangar)	Cement Plaster	None	Yellow	2.5Y 7/12	315 - Oxford Gold	63.3*8.3*36.2*	81.0*18.8*67.2*	37.15	Large Delta E attributed to CIE L*a*b* value taken from irregular surface.
43	Frame Between Windows	Lean-to	Wood	White	Light Blue	5PB 8/1	1627 - Manor Blue	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Incomplete stratigraphy. Only first two layers of paint are visible in cross section. The condition of the wood surface suggests that it may have been previously stripped. There is no soiling visible between the layers, suggesting that the paints represent a primer and finish. The primer matches Munsell 5Y 9/1.
44	Doorframe	Lean-to Side	Metal	Red (2 Layers)	Tan	2.5Y 7/2	HC-44 - Lenox Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Substantially more paint layers are found on this sample than on the reverse side of the door (Sample 45). Early layers are similar to those found on Sample 59.
45	Door	Hangar Side	Metal	Red	Light Gray-Blue	10B 5/1	1616 - Stormy Sky	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Stratigraphy of door doesn't coincide with frame layers on opposite side of door.
46	Wall	Lean-to: Upper wall, adjacent door at top of second floor stairs	Plaster	Off-White	Off-White	2.5Y 8.5/4	192 - Key West Ivory	85.3*3.7*17.5*	86.2*5.1*23.5*	6.22	CIE L*a*b* value taken from back side of first layer chipped from substrate.
47	Wall	Lean-to: Lower wall in stairwell to second floor	Plaster	Off-White	Off-White	2.5Y 8.5/4	192 - Key West Ivory	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
48	Door	Lean-to	Wood	Off-White	Tan	10YR 9/4	1144 - Tucson Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		The rough surface of wood suggests it may have been stripped, but the number of paint layers indicates the existing finishes are early.
49	Doorframe	Lean-to: Hall Side - molding removed from north side of frame	Wood	None	Tan	10YR 9/4	1144 - Tucson Tan	74.7*5.7*25.9*	79.8*8.3*22.5*	6.66	
50	Door Transom Frame	Lean-to: Hall Side - vertical mullion	Wood	None	Tan	10YR 9/4	1144 - Tucson Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
51	Door	Lean-to: Facing north, molding at east side of center panel	Wood	None	Tan	10YR 9/4	1144 - Tucson Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
52	Doorframe	Lean-to: Facing north, west side of frame	Wood	None	Tan	10YR 9/4	1144 - Tucson Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		No substrate visible in cross section. Exposure of first layer on bulk sample used to confirm first finish.
53	Wall	Lean-to: Upper wall	Cement Plaster	None	Tan	10YR 9/4	1144 - Tucson Tan	89.0*2.4*15.6*	79.8*8.3*22.5*	12.94	Only two layers of paint are visible in the cross section. The second is very similar to the first, matching Munsell 2.5Y 8.5/4 in cross section. There is no soiling between the layers but the pigment sizes vary. CIE L*a*b* value taken from irregular surface.
54	Wall	Lean-to: Lower wall	Cement Plaster	None	Tan	10YR 9/4	1144 - Tucson Tan	83.3*1.9*13.0*	79.8*8.3*22.5*	12.03	CIE L*a*b* value taken from irregular surface.
55	Wall	Lean-to: East wall of hall, upper wall	Plaster	None	Tan	10YR 9/4	1144 - Tucson Tan	76.3*6.6*24.0*	79.8*8.3*22.5*	4.12	CIE L*a*b* value taken from back side of first layer chipped from substrate.
56	Wall	Lean-to: West wall, below windows	Plaster	None	Tan	10YR 9/4	1144 - Tucson Tan	84.6*5.6*23.2*	79.8*8.3*22.5*	5.58	First two layers are this color. Next grouping of layers matches Munsell 10 YR 8/4.
57	Wall	Lean-to: East wall of hall, lower wall	Plaster	None	Tan	10YR 9/4	1144 - Tucson Tan	74.8*8.3*27.4*	79.8*8.3*22.5*	7.00	CIE L*a*b* value taken from back side of first layer chipped from substrate.
58	Window Frame	Lean-to: Facing east	Metal	None	Dark Green	5G 2/1	Essex Green (Exterior Ready Made)	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		Next layer is green matching Munsell 5G 2/4.
59	Door	Lean-to: Facing west	Metal	Red (2 Layers)	Tan	2.5Y 7/2	HC-44 - Lenox Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
60	Doorframe	Lean-to: Facing west	Metal	Red & Aluminum-Colored Metallic	Tan	2.5Y 7/2	HC-44 - Lenox Tan	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
61	Exterior Signage	North elevation: Wings of crest	Copper	Translucent Coating	Metallic Gold	Not Applicable	Not Applicable	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		

Sample Number	Element	Location	Substrate	Primer Color	Earliest Extant Finish Color	Munsell Color Match (Earliest Extant Finish)	Benjamin Moore Color Recommendation	Bulk Sample (First Finish) CIE L*a*b*Values	Benjamin Moore CIE L*a*b*Values	CIE L*a*b*Values: Delta E	Notes
62	Exterior Signage	North elevation: Field of NYC crest	Copper	None (potentially a translucent coating)	Metallic Gold	Not Applicable	Not Applicable	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
63	Exterior Signage	North elevation: "N" chips of NYC	Copper	None (potentially a translucent coating)	Metallic Gold	Not Applicable	Not Applicable	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
64	Exterior Signage	North elevation: "D" in Floyd	Copper	None (potentially a translucent coating)	White	5Y 9/1	OC - 123 Bavarian Cream	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
65	Exterior Signage	North elevation: Field area within "D" in Floyd	Copper	Aluminum-Colored Metallic	Dark Blue	5PB 2/2	HC-154 - Hale Navy	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
66	Exterior Signage	North elevation: "I" in Air Force Reserve	Copper	Aluminum-Colored Metallic	Off-White	2.5Y 9/4	177 - Mushroom Cap	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
67	Exterior Signage	North elevation: "S" in US Navy (east of "A" sample 69)	Copper	Aluminum-Colored Metallic	Off-White	2.5Y 9/4	177 - Mushroom Cap	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
68	Exterior Signage	North elevation: Corrugated metal field above "A" (under crest)	Copper	Aluminum-Colored Metallic	Metallic Gold	Not Applicable	Not Applicable	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
69	Exterior Signage	North elevation: "A" below center crest	Copper	Aluminum-Colored Metallic	Dark Blue	5PB 2/2	HC-154 - Hale Navy	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
70	Exterior Signage	North elevation: Horizontal molding over crest	Copper	Aluminum-Colored Metallic	White	N9.25	OC-68 Distant Gray	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
71	Exterior Signage	North elevation: Field of border around eastern-most circle	Copper	Aluminum-Colored Metallic	White	N9.25	OC-68 Distant Gray	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
72	Exterior Signage	North elevation: "1" in eastern-most circle	Copper	None (potentially a translucent coating)	White	5Y 9/1	OC - 123 Bavarian Cream	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
73	Exterior Signage	North elevation: Star in western-most circle	Copper	Aluminum-Colored Metallic	Dark Blue	5PB 2/2	HC-154 - Hale Navy	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		
74	Exterior Signage	North elevation: Western most circle	Copper	Aluminum-Colored Metallic	Dark Blue	5PB 2/2	HC-154 - Hale Navy	Not Available: Exposure Not Suitable For Testing Due to Size Limitations	Not calculated due to condition of bulk sample.		

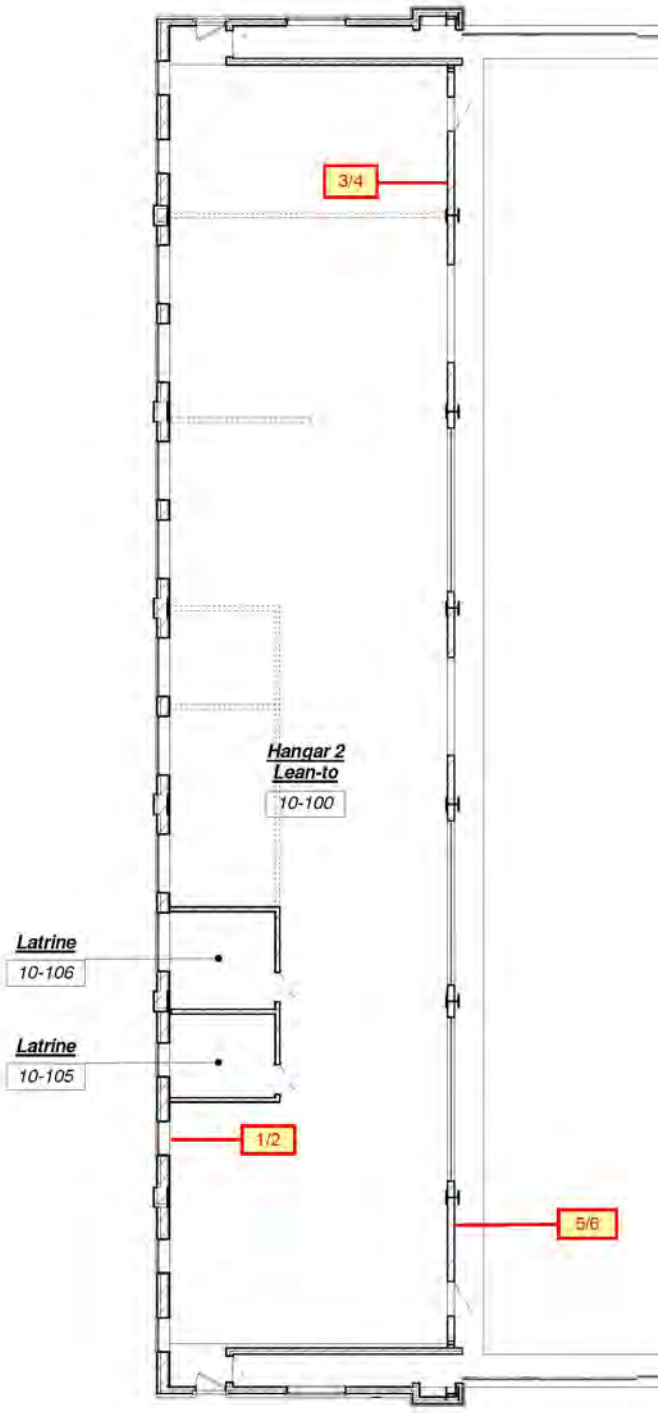


Figure A1. Lean-To 2 and Hangar 2 Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

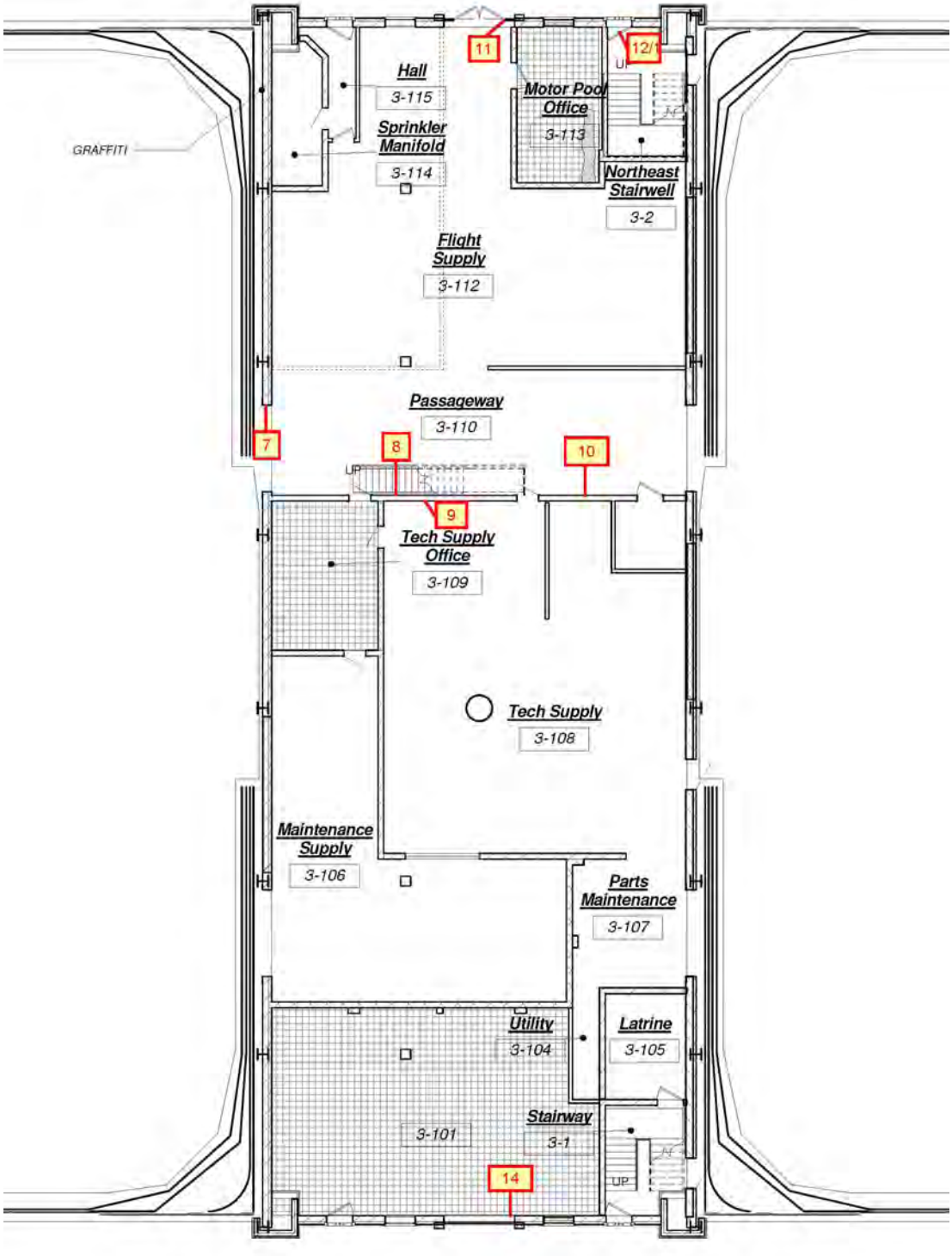


Figure A2. WPA Infill First Floor Paint Sample Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

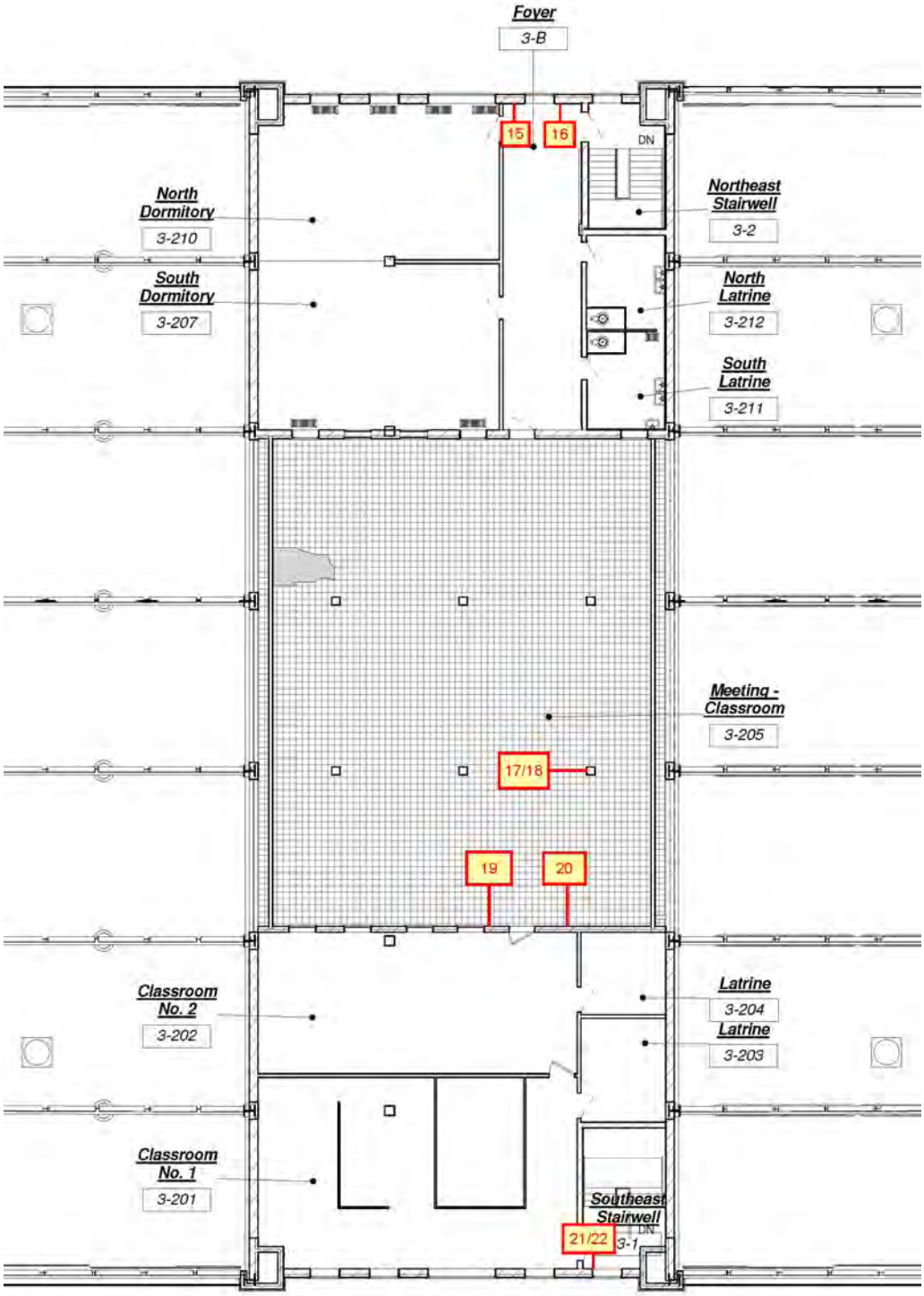


Figure A3. WPA Infill Second Floor Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

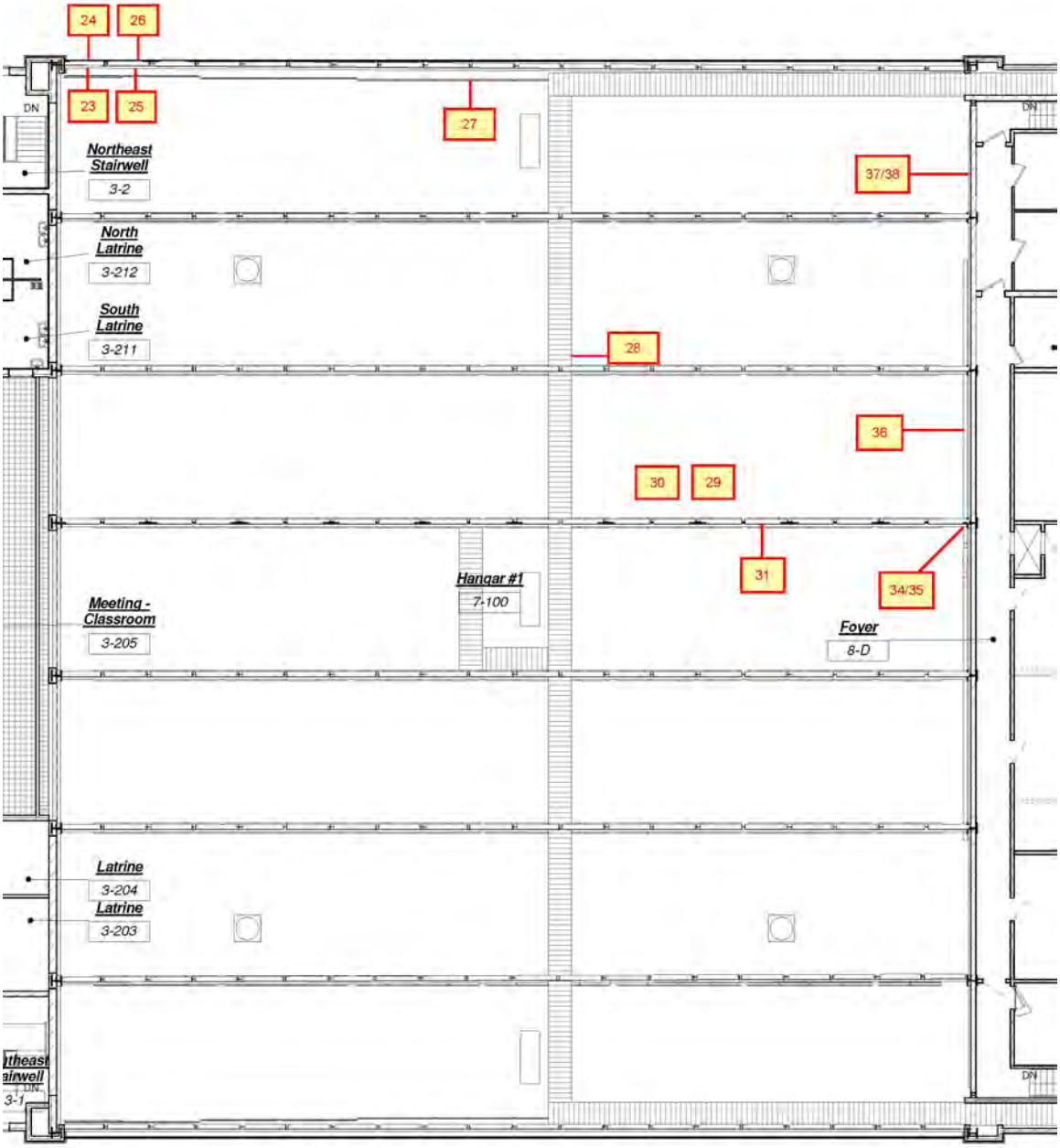


Figure A4. Hangar 1 Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

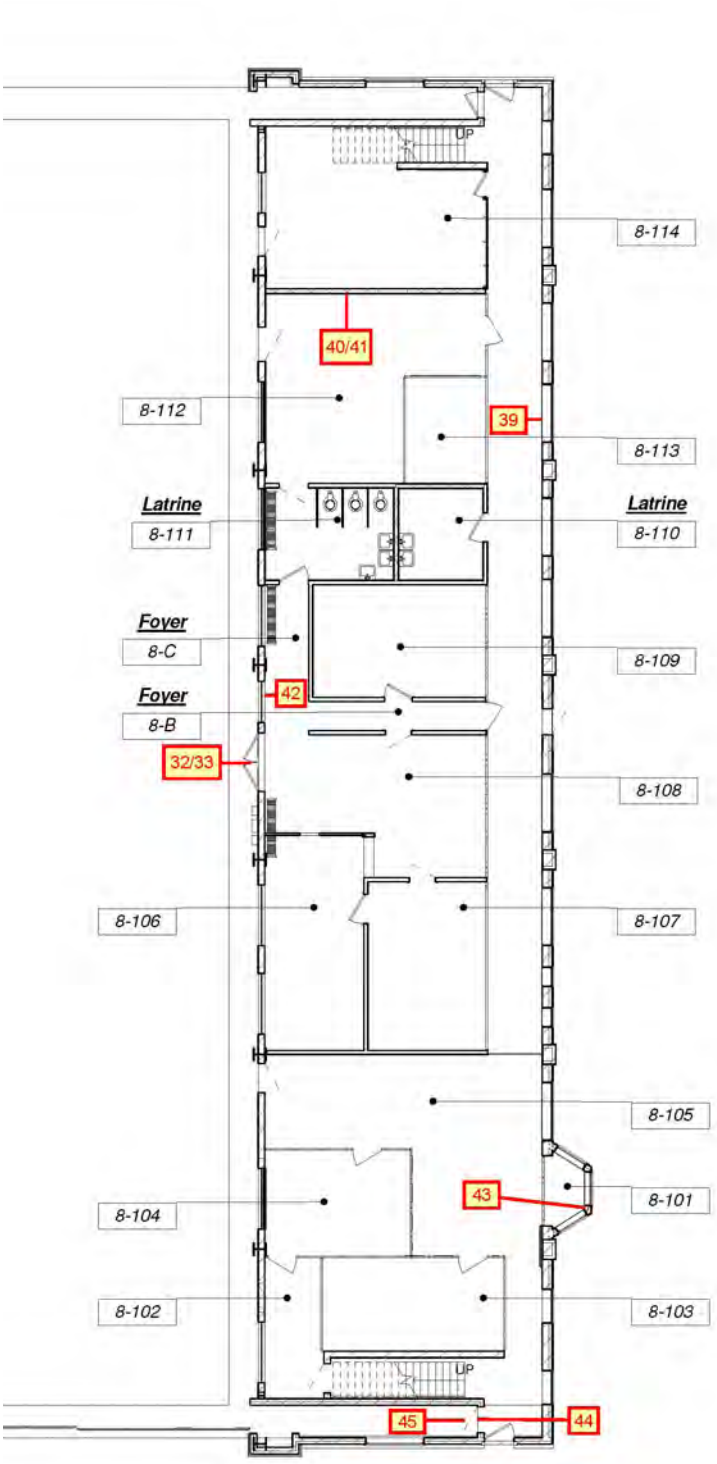


Figure A5. Lean-To 1 First Floor Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

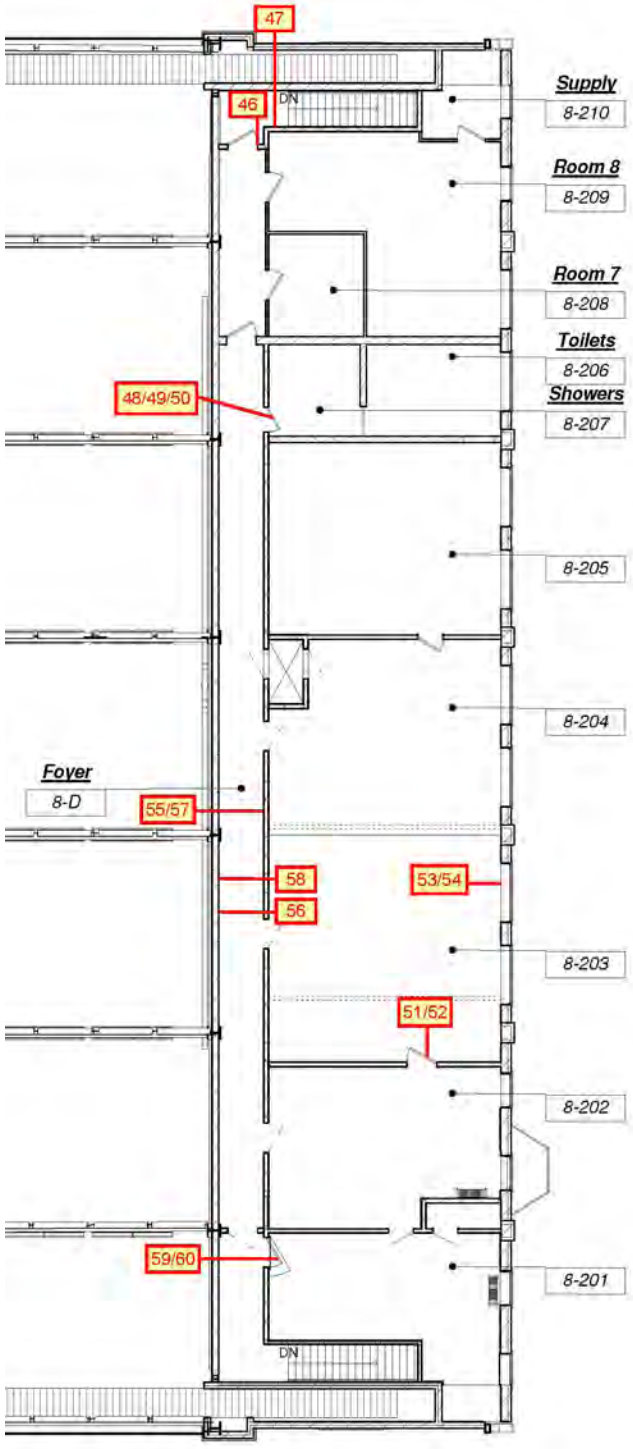


Figure A5. Lean-To 1 First Floor Key Plan. Red text in yellow boxes indicates approximate locations of removed paint samples.

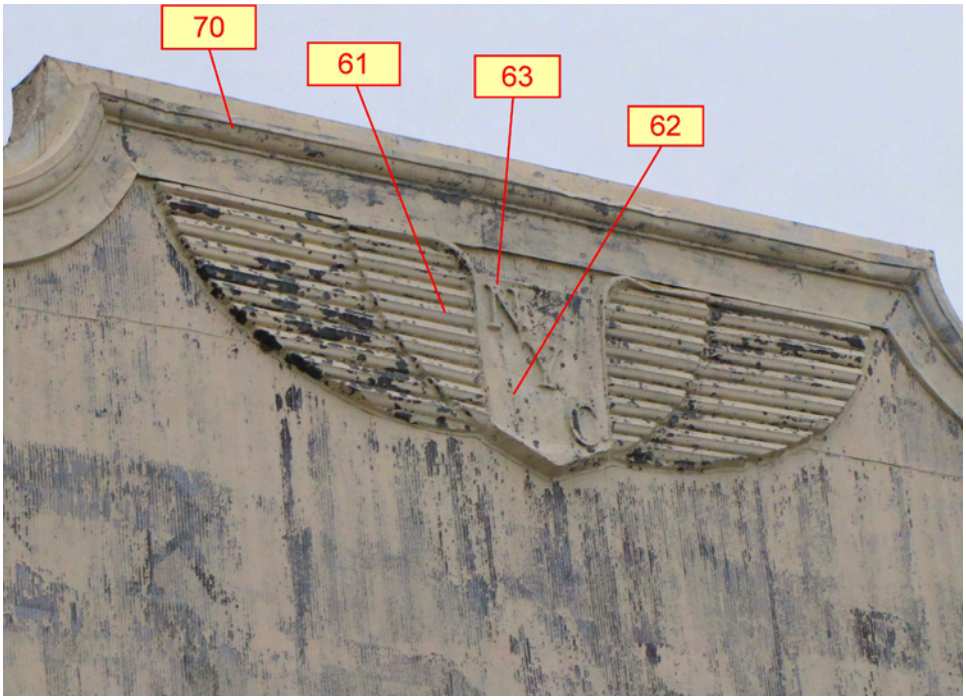


Figure A7. Sample locations on north signage of Hangar 1. Red text in yellow boxes indicates approximate locations of removed paint samples.

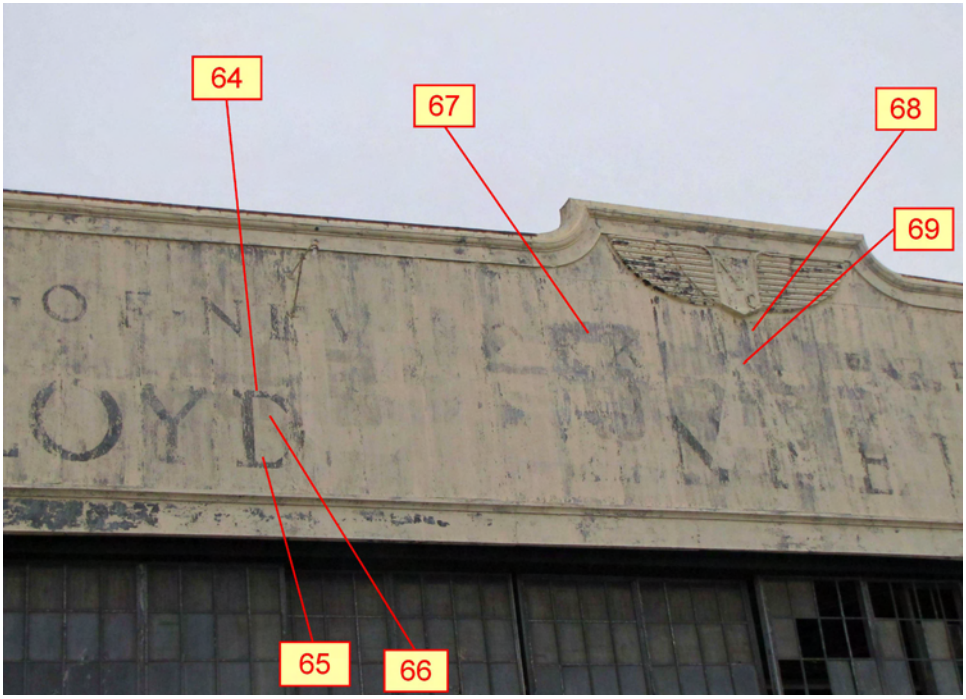


Figure A7. Sample locations on north signage of Hangar 1. Red text in yellow boxes indicates approximate locations of removed paint samples.

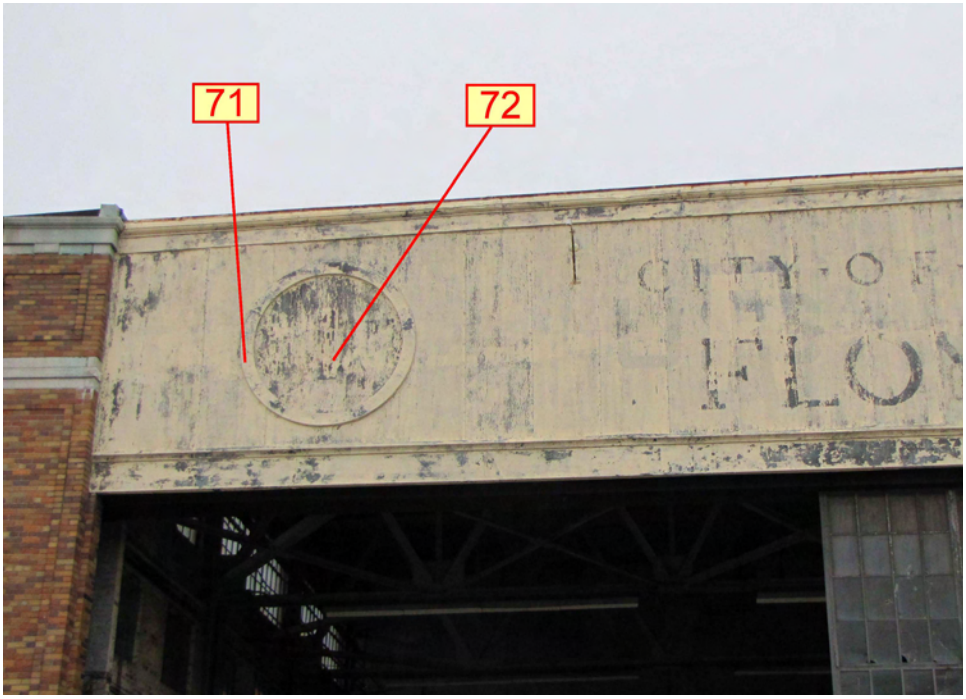
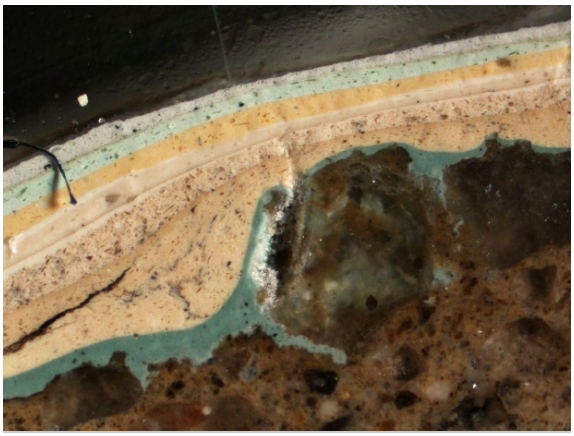


Figure A7. Sample locations on north signage of Hangar 1. Red text in yellow boxes indicates approximate locations of removed paint samples.

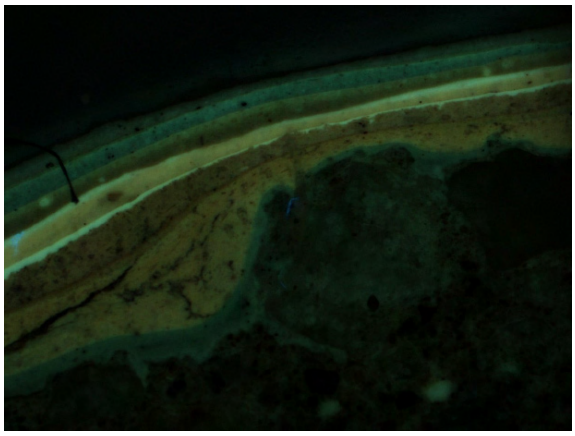


Figure A7. Sample locations on north signage of Hangar 1. Red text in yellow boxes indicates approximate locations of removed paint samples.

Appendix B
Representative Photomicrographs

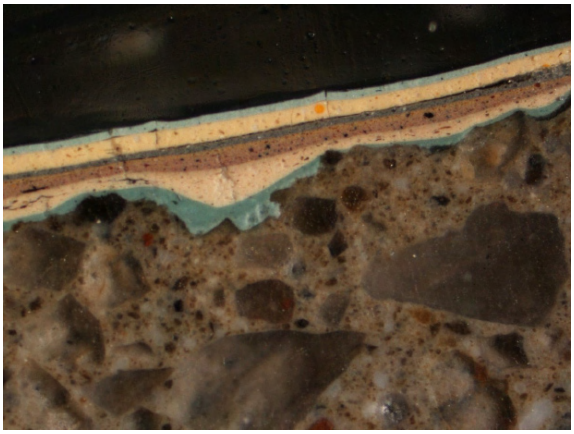


Visible Light, 40x Magnification

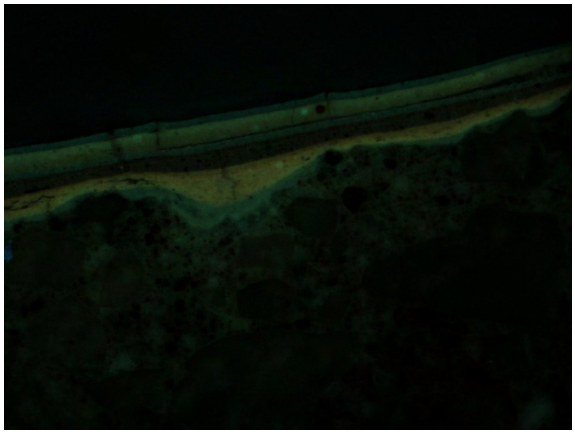


UV Light, 40x Magnification

SAMPLE NO:	1
LOCATION:	Hangar 2 Lean-To
ELEMENT:	Cement Plaster (Upper Section of Wall)
FIRST FINISH	Sea Green (Munsell 2.5BG 6/6)
COMMENTS: The first coating is very thin in some locations. It was likely intended as a finish layer though, due to its bright color.	

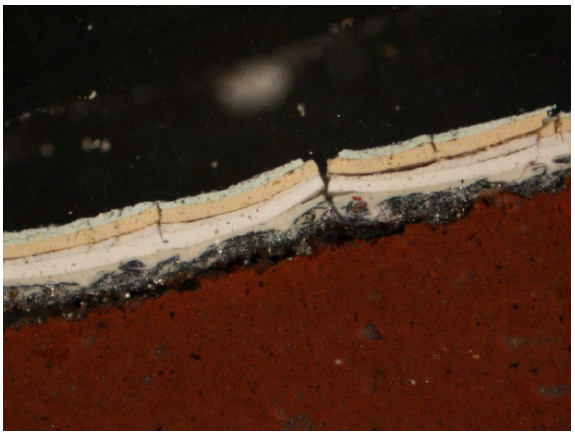


Visible Light, 40x Magnification

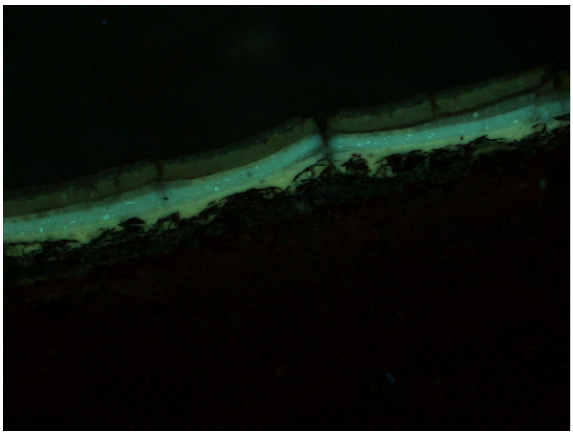


UV Light, 40x Magnification

SAMPLE NO:	2
LOCATION:	Hangar 2 Lean-To
ELEMENT:	Cement Plaster (Lower Section of Wall)
FIRST FINISH	Sea Green (Munsell 2.5BG 6/6)
COMMENTS: The first two coatings of Samples 1 and 2 match, indicating that the entire wall was originally painted one color. The two-tone decorative paint scheme, where the upper and lower sections of wall are contrasting colors, began with the third painting campaign in this area.	

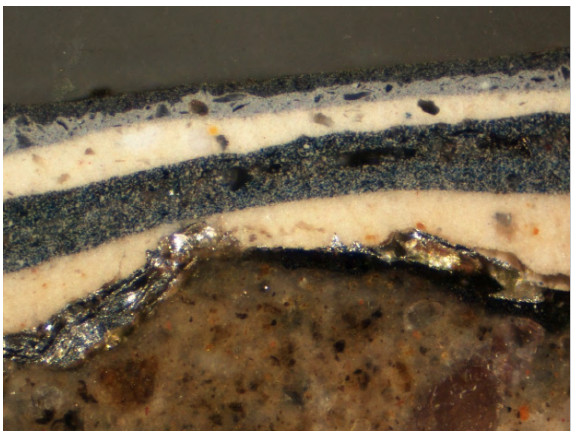


Visible Light, 40x Magnification

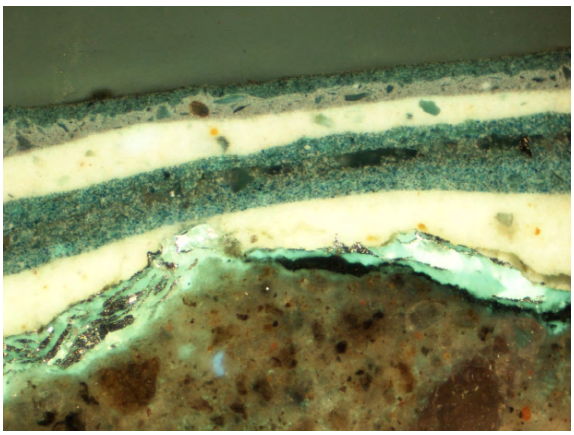


UV Light, 40x Magnification

SAMPLE NO:	3
LOCATION:	Hangar 2 Lean-To
ELEMENT:	Brick (Upper Section of Wall)
FIRST FINISH	Pale Green (Munsell 10Y 8/2)
COMMENTS: The first coating is an silver-colored metallic primer, likely produced with an aluminum bronze powder. This also appears as a first coating on many WPA Infill surfaces and a second coating on the exterior signage.	

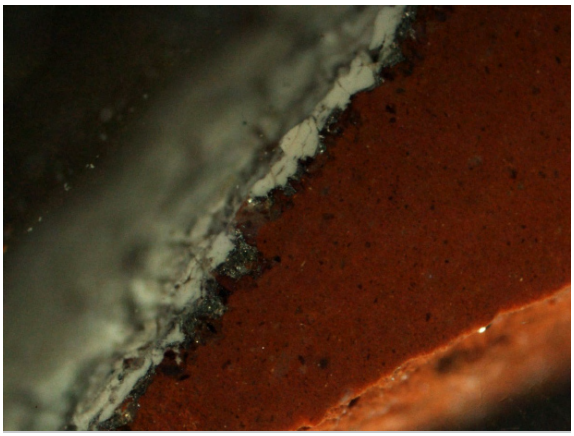


Visible Light, 200x Magnification

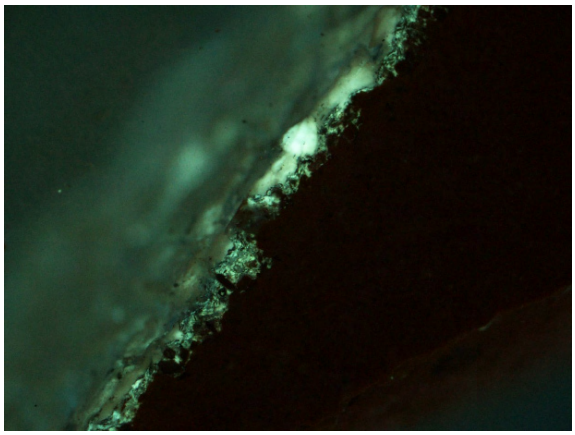


UV Light, 200x Magnification

SAMPLE NO:	4
LOCATION:	Hangar 2 Lean-To
ELEMENT:	Brick (Lower Section of Wall)
FIRST FINISH	Off-White (Munsell 2.5Y 8.5/4)
COMMENTS: Like Sample 3, the first coating is a silver primer. A thin layer of soil is visible below the primer, suggesting that the masonry surface was originally left exposed. Samples 3 and 4 indicate this wall was painted two-toned during its first finish campaign.	

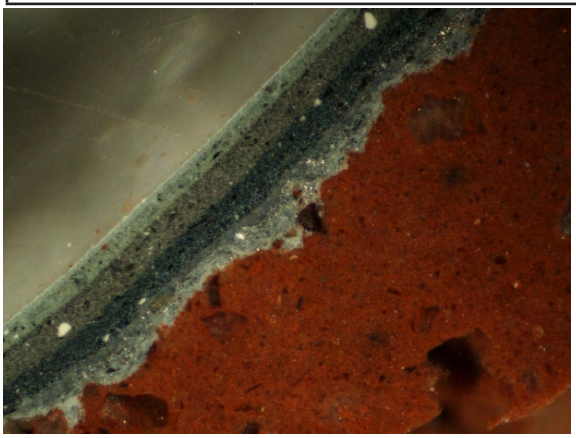


Visible Light, 40x Magnification

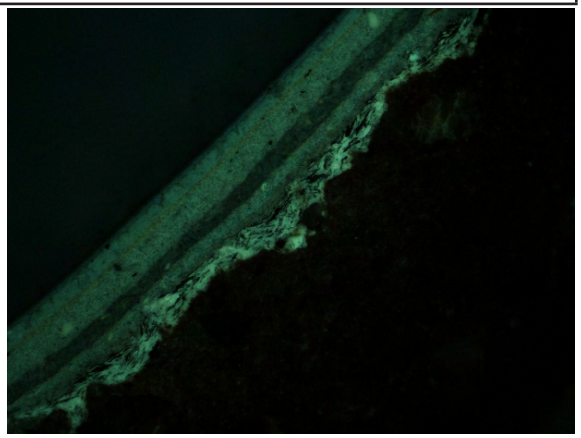


UV Light, 40x Magnification

SAMPLE NO:	5
LOCATION:	Hangar 2
ELEMENT:	Brick (Upper Section of Wall)
FIRST FINISH	White (Munsell 5Y 9/1)
COMMENTS: Like Samples 3 and 4, the first coating on this material is a silver primer. Only one finish is visible. The same is true for Sample 37, taken from a similar location in Hangar 1. The surface of the bricks in Samples 5 and 6 have a rough texture, suggesting that they may have been originally exposed.	

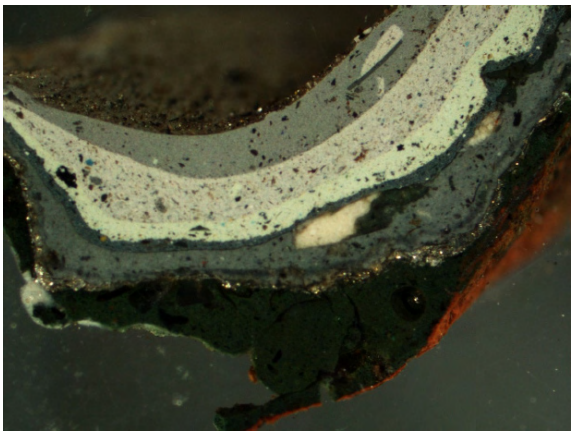


Visible Light, 100x Magnification

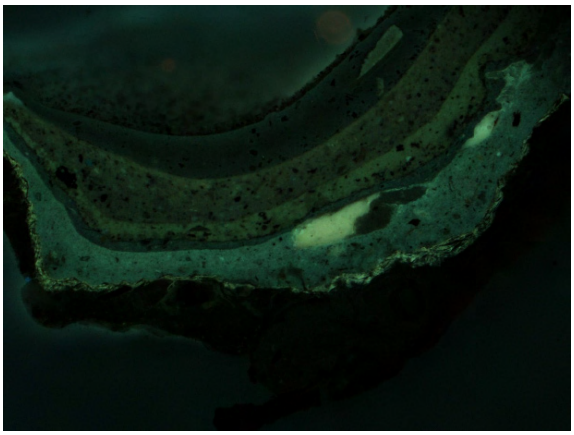


UV Light, 100x Magnification

SAMPLE NO:	6
LOCATION:	Hangar 2
ELEMENT:	Brick (Lower Section of Wall)
FIRST FINISH	Light Gray-Blue (Munsell 10B 5/1)
COMMENTS: The lower section of the hanger wall was readily accessible and painted substantially more times than the two-story high upper section (See Sample 5).	

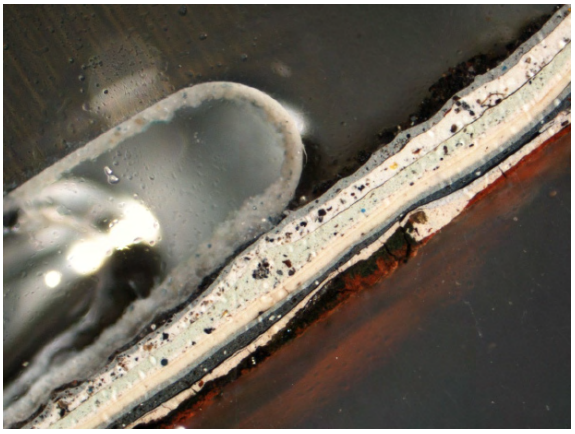


Visible Light, 40x Magnification

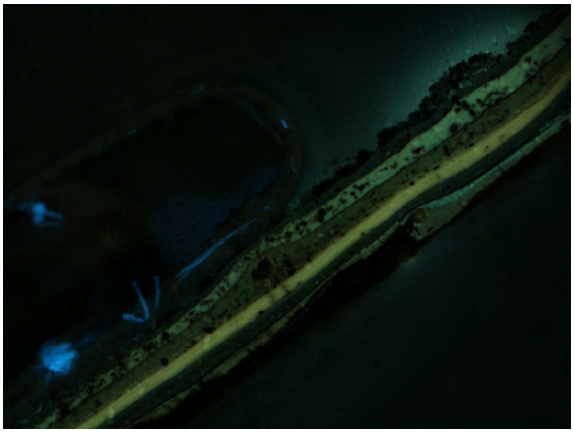


UV Light, 40x Magnification

SAMPLE NO:	8
LOCATION:	WPA Infill
ELEMENT:	Metal Window Frame (Passageway Side)
FIRST FINISH	Green (Munsell 5G 2/4)
COMMENTS: The window frames in this area appear to have been relocated from a Hangar to this location. The early green paint of this sample and Sample 9 is followed by an aluminum-colored metallic primer. The paint layers on these samples then differ, indicating the relocated window frames were painted different colors on the passageway and room side of the Infill.	

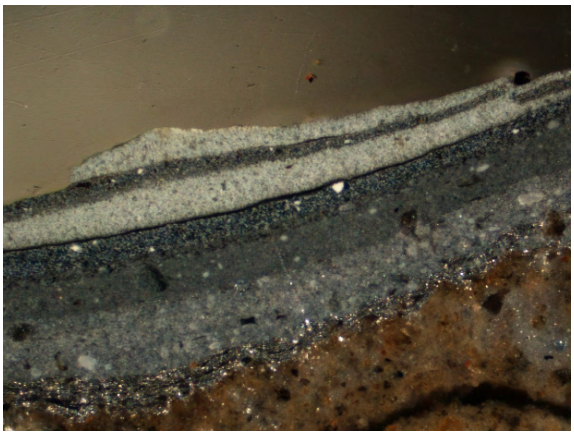


Visible Light, 40x Magnification

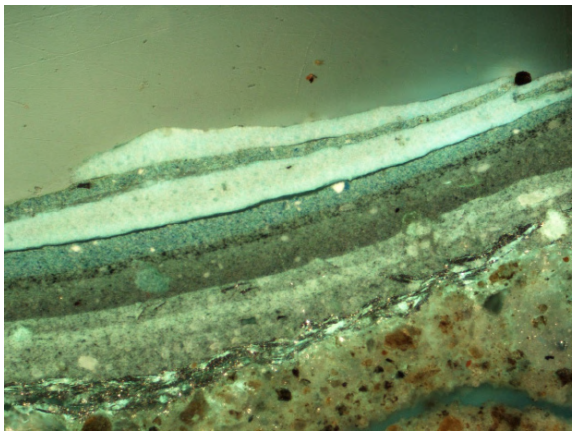


UV Light, 40x Magnification

SAMPLE NO:	9
LOCATION:	WPA Infill
ELEMENT:	Metal Window Frame (Room Side)
FIRST FINISH:	Dark Green (Munsell 5G 2/1)
COMMENTS: Two layers of green paint are visible on samples removed from this location. These match the first finishes in Sample 58, which was taken from a window frame set into the second floor of the Hangar 1 Lean-To. This indicates that these Infill windows were relocated from one of the Hangars to their current location.	

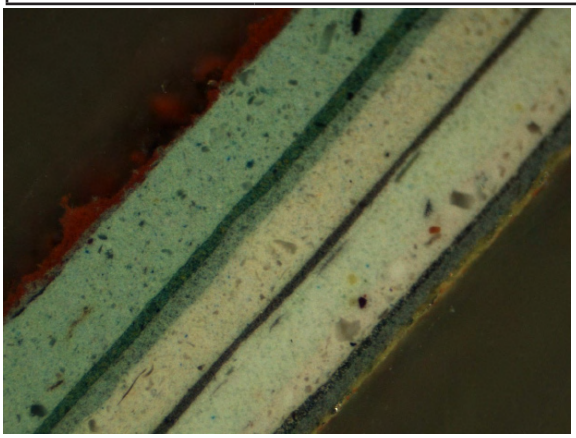


Visible Light, 100x Magnification

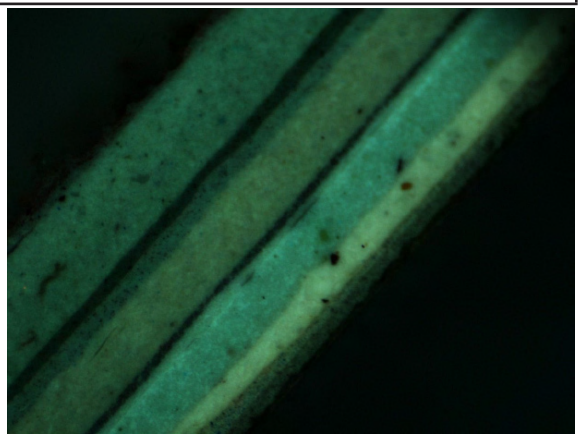


UV Light, 100x Magnification

SAMPLE NO:	10
LOCATION:	WPA Infill
ELEMENT:	Cast Stone Wall
FIRST FINISH	Gray-Blue (10B 4/1)
COMMENTS: The metallic primer and gray-blue finish on the surface of the cast stone appears the same as the cement plaster in the stair hall (Sample 21). This first finish is also similar to the third and fourth coatings on the nearby window frames, whose eearlier coatings date from when they were installed in a hangar (Sample 8).	

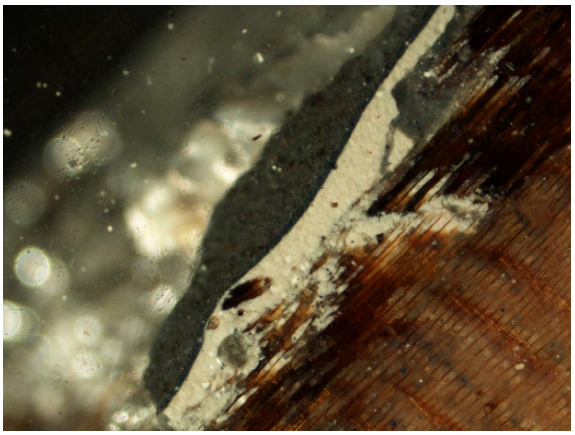


Visible Light, 200x Magnification

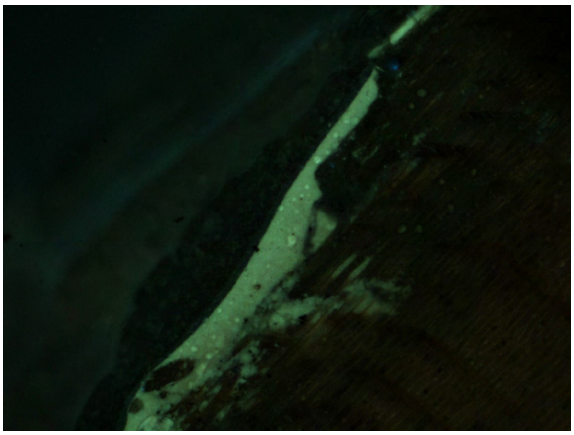


UV Light, 200x Magnification

SAMPLE NO:	14
LOCATION:	WPA Infill
ELEMENT:	Interior Side of Metal Doorframe
FIRST FINISH:	Gray-Blue (10B 4/1)
COMMENTS: The green color of the primer suggests that it is a zinc chromate coating. This primer and the first finish match those visible in Samples 11 and 13.	

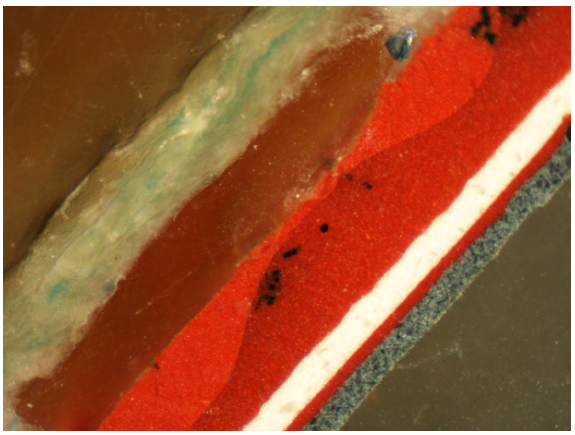


Visible Light, 40x Magnification

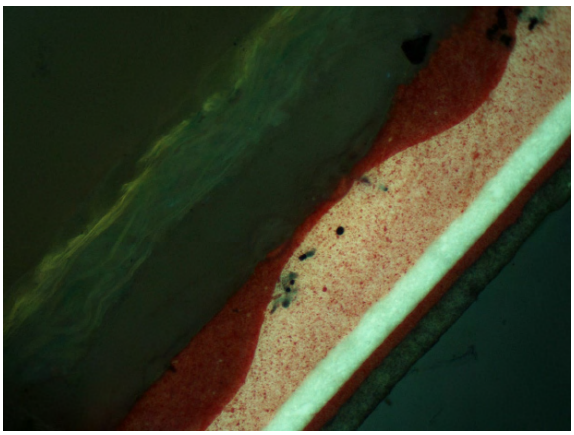


UV Light, 40x Magnification

SAMPLE NO:	17
LOCATION:	WPA Infill
ELEMENT:	Wood Column (Lower Section)
FIRST FINISH:	Dark Blue (Munsell 10B 2/2)
COMMENTS: The first finish is the only finish visible on the upper section of the column (Sample 18). The surface of the wood is deteriorated suggesting that it was originally exposed or previously stripped.	

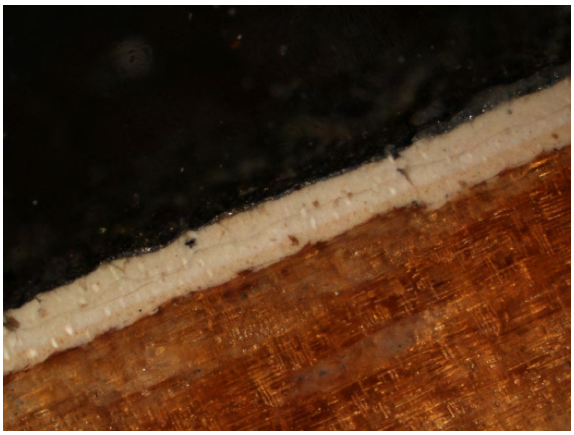


Visible Light, 200x Magnification

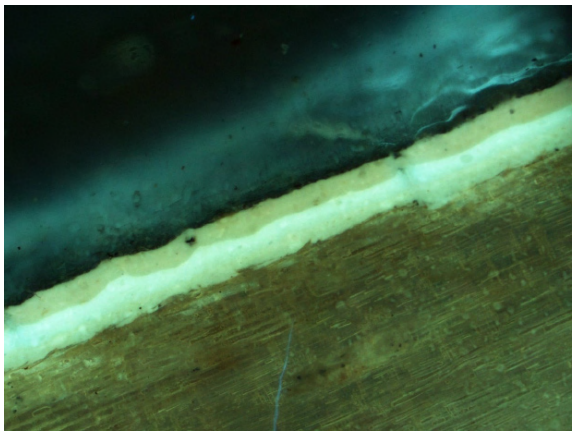


UV Light, 200x Magnification

SAMPLE NO:	23
LOCATION:	Hangar 1
ELEMENT:	Metal Pilot Door (Interior)
FIRST FINISH:	Dark Gray-Blue (Munsell 10B 3/1)
COMMENTS: Field observations suggested the first coating was a primer and the color is consistent with some zinc chromate primers. However, the appearance of this coating under UV light indicates it served as an exposed finish before being painted red.	

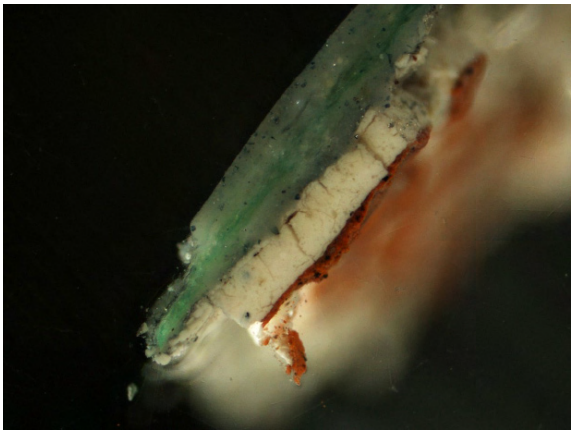


Visible Light, 40x Magnification

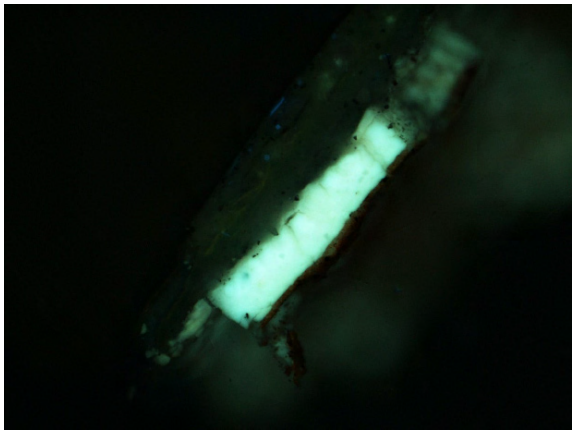


UV Light, 40x Magnification

SAMPLE NO:	27
LOCATION:	Hangar 1
ELEMENT:	Wood (Rear of Fascia)
FIRST FINISH:	White (Munsell 5Y 9/1)
COMMENTS: First coating appears to be primer followed by finish coat. These coatings match those visible on the interior side of the roof (Sample 29)	

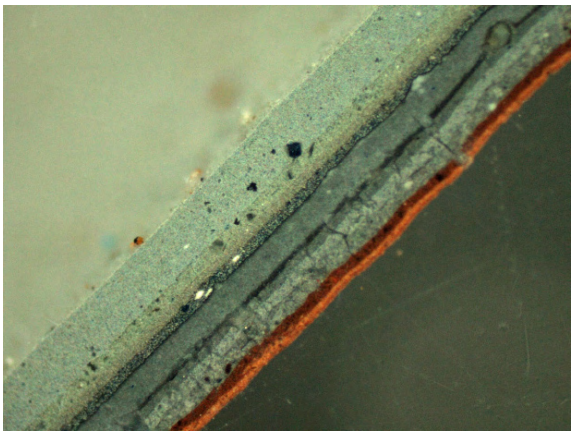


Visible Light, 40x Magnification

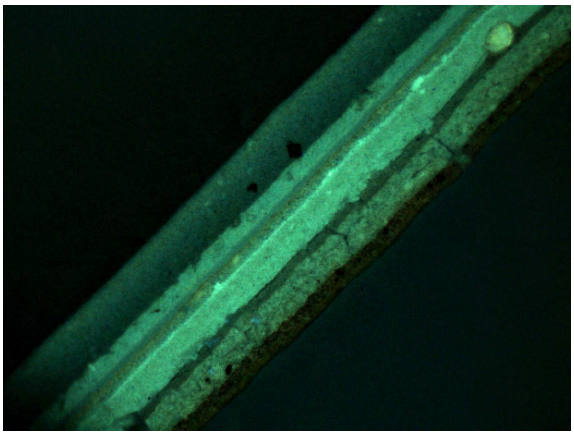


UV Light, 40x Magnification

SAMPLE NO:	30
LOCATION:	Hangar 1
ELEMENT:	Horizontal Member of Steel Truss
FIRST FINISH:	Off-White (Munsell 5Y 9/2)
COMMENTS: Coating are similar to these found on the upper section of the steel column (Sample 35), except the column has a layer of soiling directly on the primer, suggesting it was exposed for a period of time before the first extent finish was applied.	

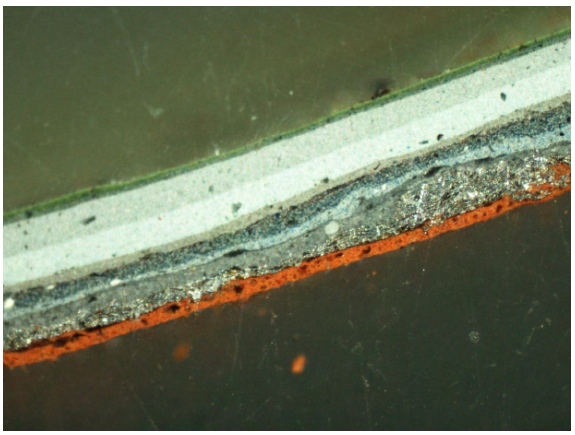


Visible Light, 100x Magnification

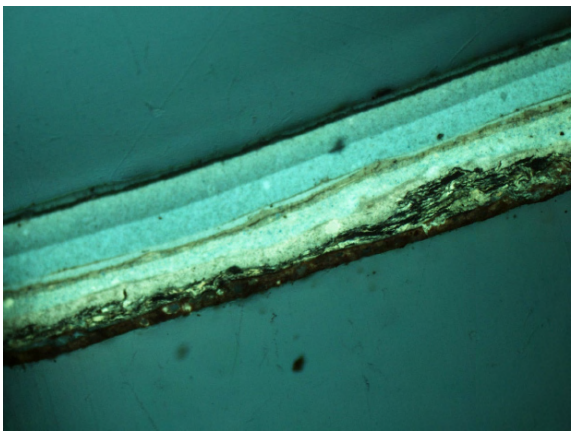


UV Light, 100x Magnification

SAMPLE NO:	32
LOCATION:	Hangar 1
ELEMENT:	Metal Door to Lean-To
FIRST FINISH:	Gray-Blue (Munsell 10B 4/1)
COMMENTS: The first two red coatings appear to be primers. The first finish color is a gray matching that seen on the doorframe (Sample 33).	

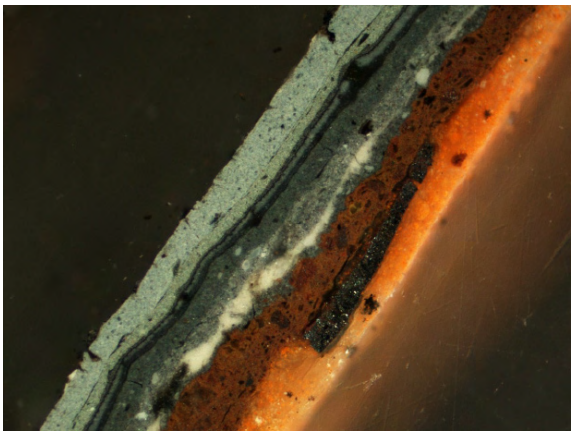


Visible Light, 100x Magnification

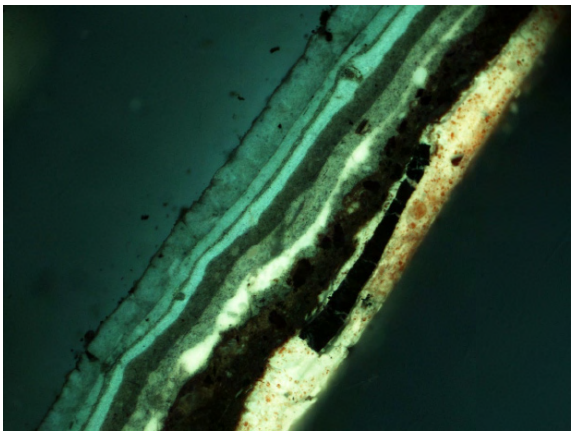


UV Light, 100x Magnification

SAMPLE NO:	33
LOCATION:	Hangar 1
ELEMENT:	Metal Doorframe Leading to Lean-To
FIRST FINISH:	Gray-Blue (Munsell 10B 4/1)
COMMENTS: The first red primer is similar to that seen in Sample 32. The second primer is an aluminum-colored metallic coating and matches other primers found on site. Early finish coats are similar to early finishes found on elements in the WPA Infill.	

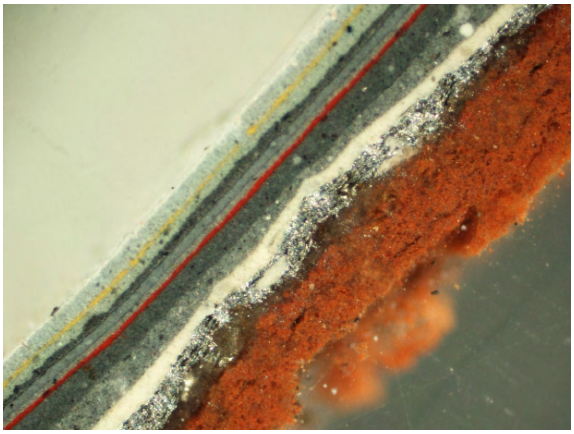


Visible Light, 100x Magnification

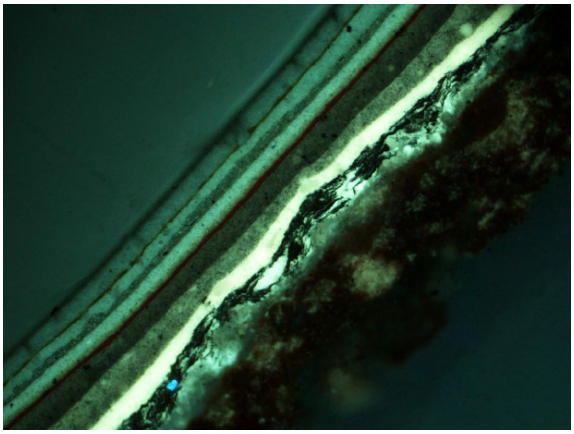


UV Light, 100x Magnification

SAMPLE NO:	34
LOCATION:	Hangar 1
ELEMENT:	Steel Column (Lower Section)
FIRST FINISH:	Brown (Munsell 5YR 3/4)
COMMENTS: The first finish layer is a brown paint. This differs from the upper section of the column (Sample 35), which has an off-white finish. Sample 35 has a layer of soiling over its primer though; it may have lost its first finish and remained exposed prior to repainting.	

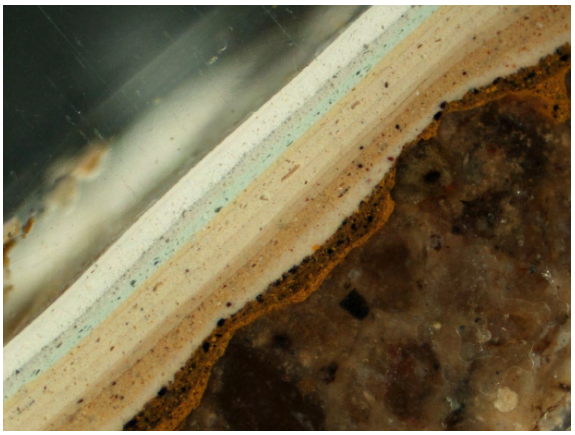


Visible Light, 100x Magnification

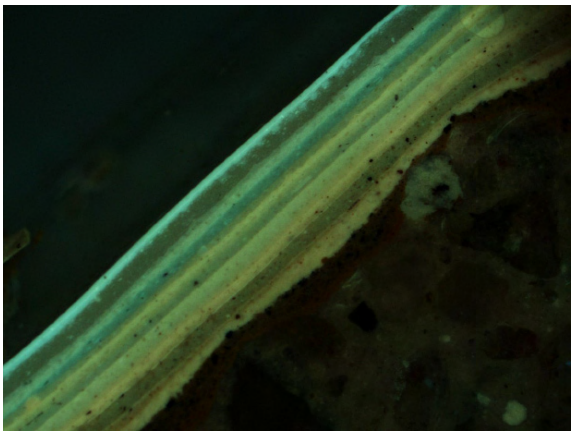


UV Light, 100x Magnification

SAMPLE NO:	38
LOCATION:	Hangar 1
ELEMENT:	Brick (Lower Section of Wall)
FIRST FINISH:	White (Munsell 5Y 9/2)
COMMENTS: White was the first finish color at this location but a gray paint may have been applied shortly after as it is similar to the first finish at a similar location in Hangar 2 (Sample 6).	

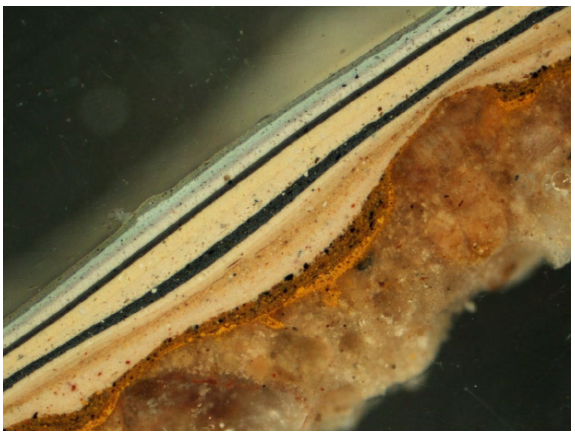


Visible Light, 40x Magnification

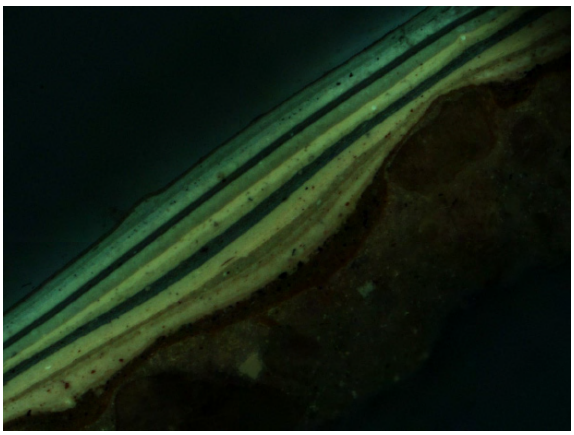


UV Light, 40x Magnification

SAMPLE NO:	40
LOCATION:	Hangar 1 Lean-To (First Floor)
ELEMENT:	Cement Plaster (Upper Section of Wall)
FIRST FINISH:	Yellow (Munsell 2.5Y 7/12)
COMMENTS: As in Samples 1 and 2, the first coatings of Samples 39, 40, and 41 are very thinly applied in some areas.; however, the bright color of the coating suggests that it was intended as a finish. The upper and lower sections of the wall were painted a single color for the first few paint campaigns, before being finished with a two-tone decorative scheme.	



Visible Light, 40x Magnification

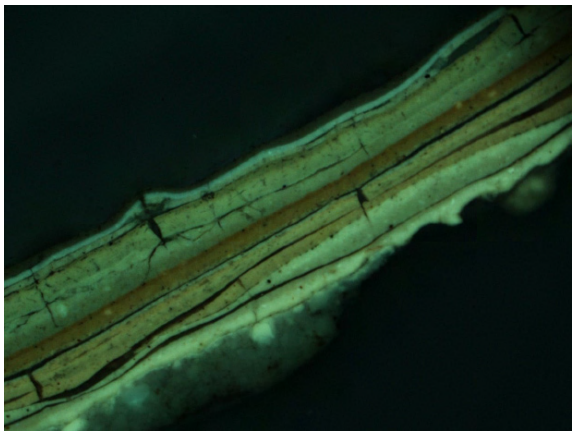


UV Light, 40x Magnification

SAMPLE NO:	41
LOCATION:	Hangar 1 Lean-To (First Floor)
ELEMENT:	Cement Plaster (Lower Section of Wall)
FIRST FINISH:	Yellow (Munsell 2.5Y 7/12)
COMMENTS: This sample has a similar stratigraphy as Sample 39, which as taken below a window to the Hangar in another room. However, Sample 39 does not have the second dark yellow coating see here. Samples taken from door infill material adjacent Sample areas 40 and 41 only exhibit the five most recent coatings.	

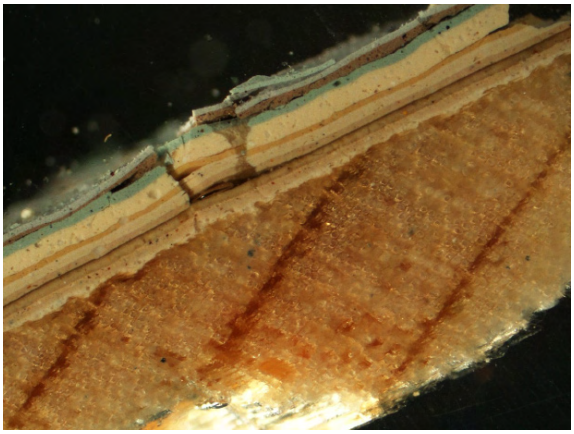


Visible Light, 40x Magnification

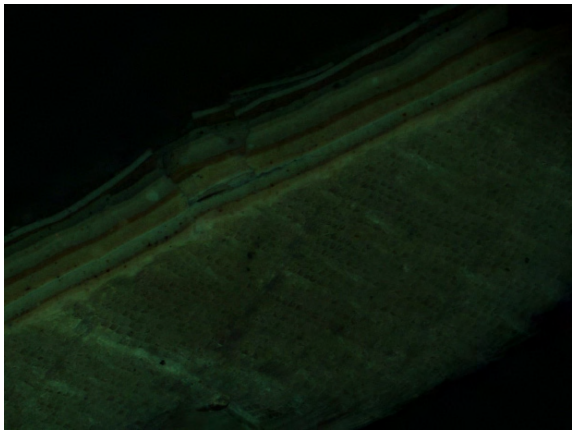


UV Light, 40x Magnification

SAMPLE NO:	46
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Plaster (Upper Section of Wall at Top of Stairs)
FIRST FINISH:	Off-White (Munsell 2.5Y 8.5/4)
COMMENTS: The lower and upper sections of this stairwell wall share the same early finishes.	

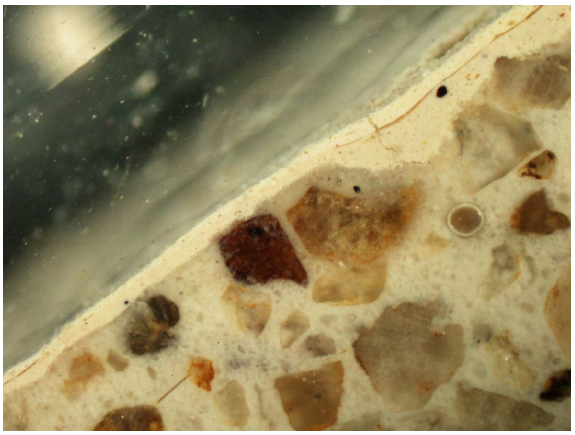


Visible Light, 40x Magnification

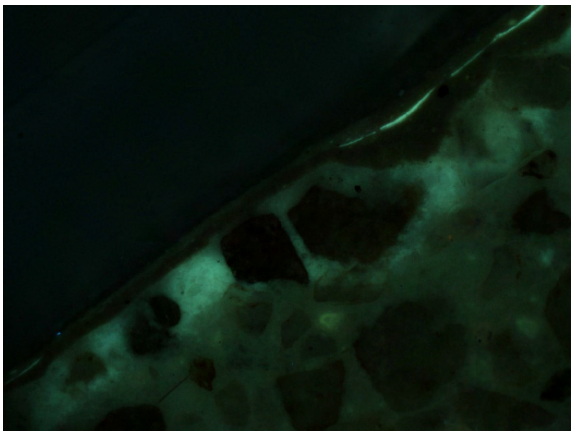


UV Light, 40x Magnification

SAMPLE NO:	48
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Wood Door (Hall Side)
FIRST FINISH:	Tan (Munsell 10YR 9/4)
COMMENTS: The doorframe (Sample 49) has the same first finish. The first finish on the transom frame (Sample 50) is a similar tan and aligns with the second finish in the stratigraphies of the door and its frame, suggesting the door and frame were relocated to this opening.	

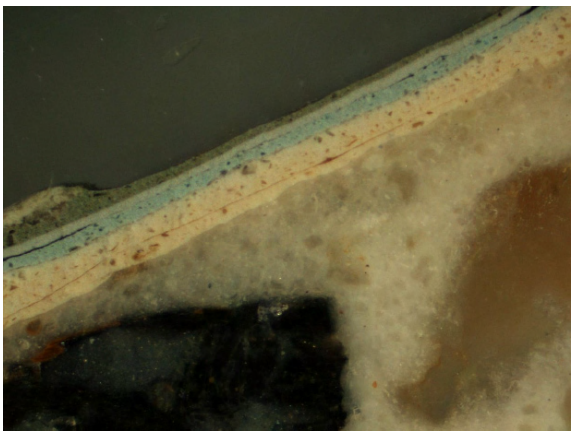


Visible Light, 40x Magnification

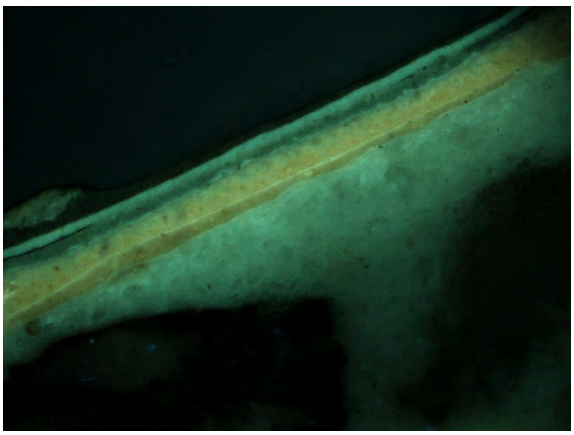


UV Light, 40x Magnification

SAMPLE NO:	53
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Cement Plaster (Upper Section of Wall)
FIRST FINISH:	Tan (Munsell 10YR 9/4)
COMMENTS: The two existing layers of paint are similar in color, but have different pigment sizes and are therefore thought to be from different campaigns.	

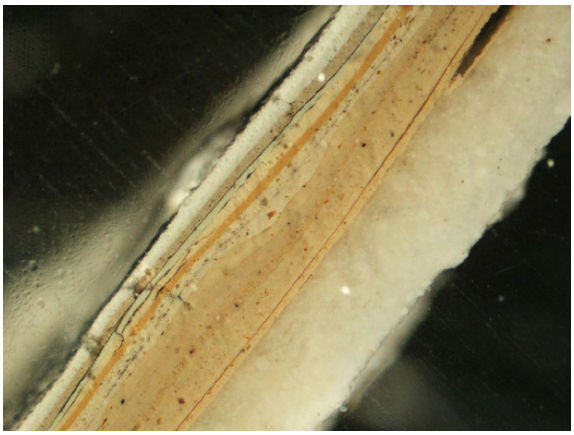


Visible Light, 100x Magnification

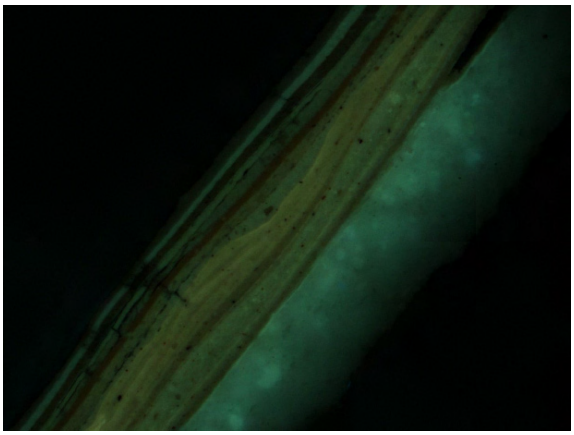


UV Light, 100x Magnification

SAMPLE NO:	54
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Cement Plaster (Lower Section of Wall)
FIRST FINISH:	Tan (Munsell 10YR 9/4)
COMMENTS: The first few layers of paint match those in Sample 53. Later painting campaigns addressed just the lower section of the wall, creating a two-tone finish scheme.	

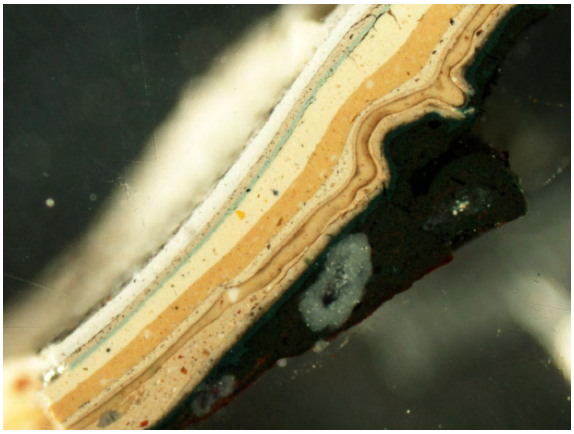


Visible Light, 40x Magnification

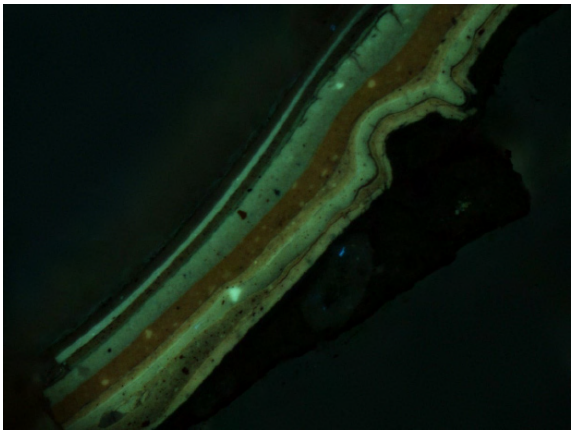


UV Light, 40x Magnification

SAMPLE NO:	55
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Plaster (Upper Section of Wall)
FIRST FINISH:	Tan (Munsell 10YR 9/4)
COMMENTS: Early finishes match those found in Samples 56 and 57 (taken from the lower section of this wall and the facing wall, below the windows).	

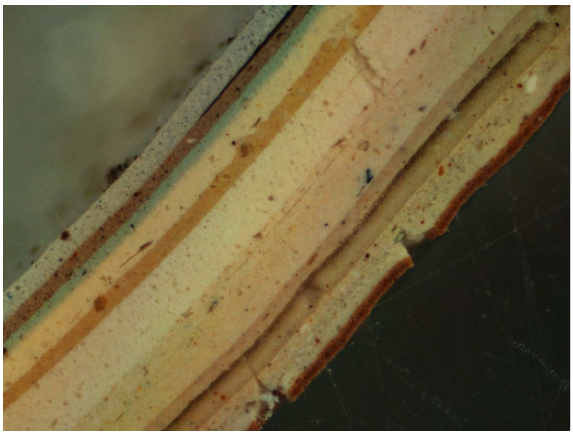


Visible Light, 40x Magnification

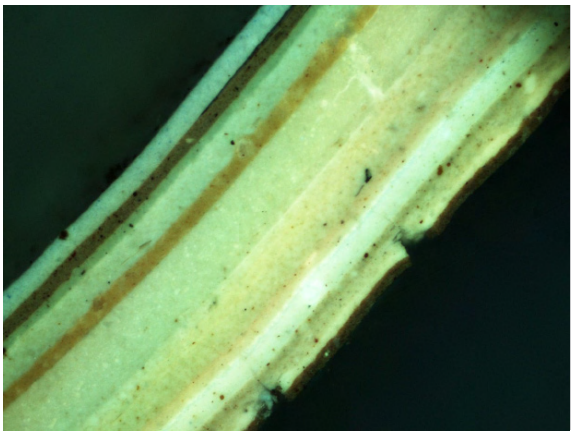


UV Light, 40x Magnification

SAMPLE NO:	58
LOCATION:	Hangar 1 Lean-To (Second Floor Interior)
ELEMENT:	Metal Window Frame
FIRST FINISH:	Dark Green (Munsell 5G 2/1)
COMMENTS: The first two layers of green paint match the earliest finishes on window frames within the first floor Infill. This window frame was then painted tan to match doors and walls within the Lean-To hall.	

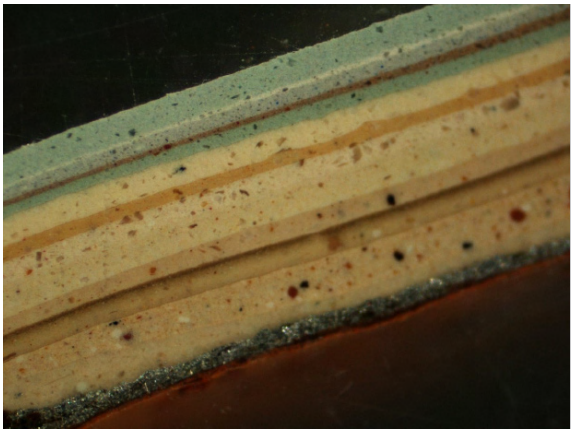


Visible Light, 100x Magnification

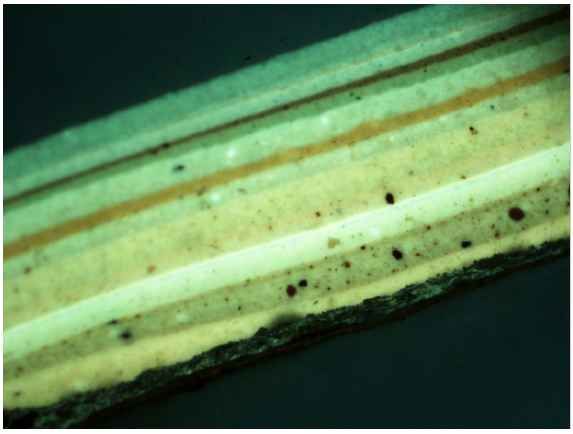


UV Light, 100x Magnification

SAMPLE NO:	59
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Metal Door
FIRST FINISH:	Tan (Munsell 2.5Y 7/2)
COMMENTS: Two red finishes appear to be primers, similar to the door Sample 32. The first finish color is a tan matching that seen on the doorframe (Sample 60). The rest of the stratigraphy is similar to that seen on door Samples 48-52.	

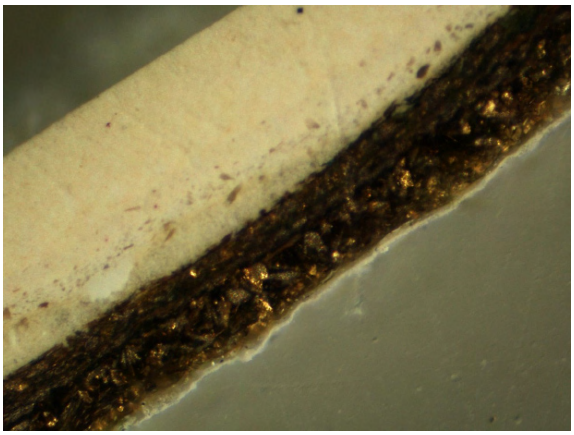


Visible Light, 100x Magnification

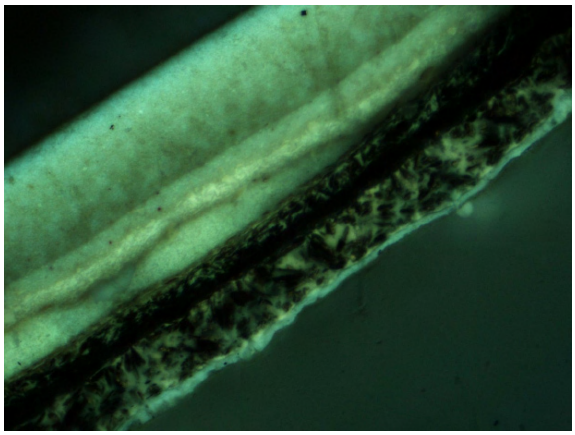


UV Light, 100x Magnification

SAMPLE NO:	60
LOCATION:	Hangar 1 Lean-To (Second Floor)
ELEMENT:	Metal Doorframe
FIRST FINISH:	Tan (Munsell 2.5Y 7/2)
COMMENTS: The first red primer is similar to that seen in Sample 59. The second primer is an aluminum-colored metallic coating and matches other primers found on site. The rest of the stratigraphy is similar to that seen on Samples door 48-52.	

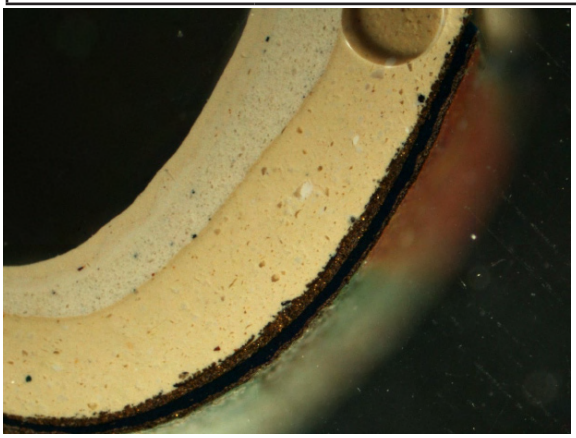


Visible Light, 200x Magnification

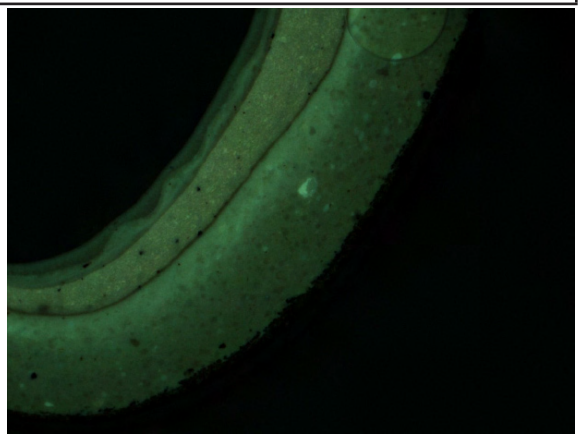


UV Light, 200x Magnification

SAMPLE NO:	61
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	Wings of Crest at Top Center of Sign
FIRST FINISH:	Bronze Powder Paint
COMMENTS: Same coatings as Sample 62. Historic drawings specified gold leaf at this feature. Instead the metal was sealed with translucent coating and painted with a bronze powder paint. Three layers of metallic paint are visible when viewed in UV light. The later off-white finish is visible on the crest in a 1950s image showing the U.S. Air Force Reserve sign.	

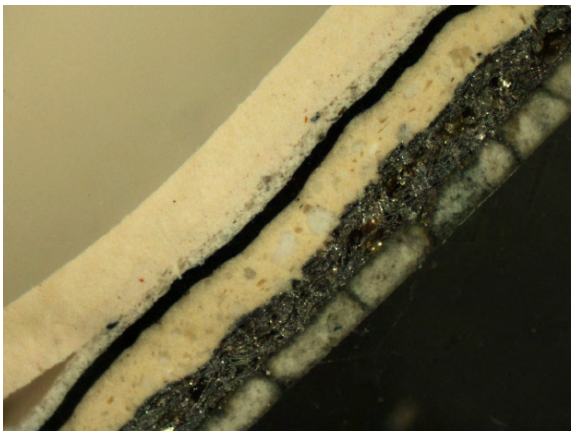


Visible Light, 40x Magnification

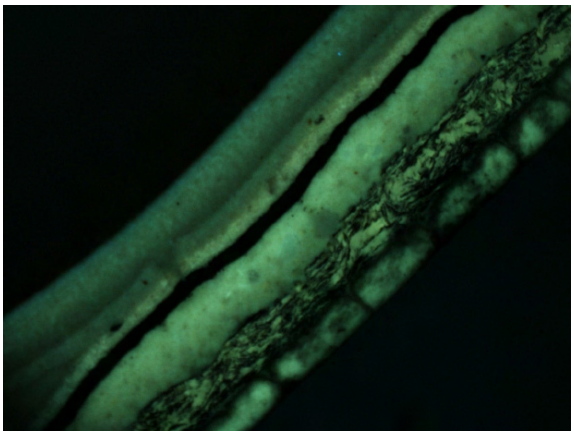


UV Light, 40x Magnification

SAMPLE NO:	63
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	"N" on Crest
FIRST FINISH:	Bronze Powder Paint
COMMENTS: The second coating visible on this feature is a dark blue. This is consistent with a late 1930s photograph of the Navy sign, where the letters "NYC" appear dark and contrast with the rest of the crest. The letters were subsequently repainted with a bronze powder paint.	

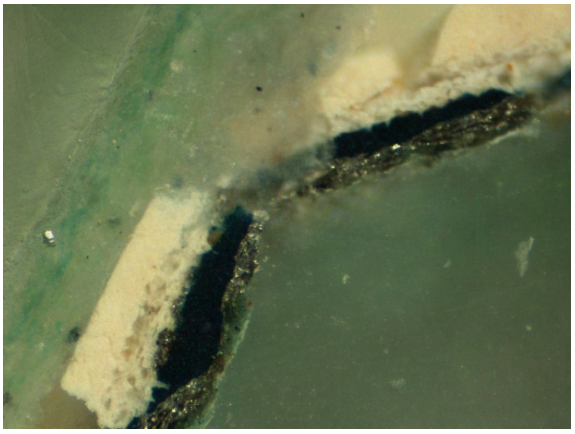


Visible Light, 100x Magnification

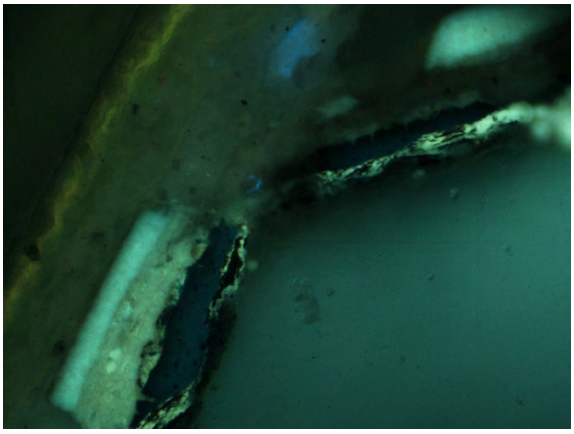


UV Light, 100x Magnification

SAMPLE NO:	64
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	"D" in "Floyd"
FIRST FINISH:	White (Munsell 5Y 9/1)
COMMENTS: The first coating in this area is a deteriorated white paint. This is consistent with a 1937 image of Hangar 8 that shows the sign as a dark field with "Floyd Bennett Field" painted in a light color. The early clear coating in Sample 61 suggest the field of the sign may have been unpainted, sealed copper.	

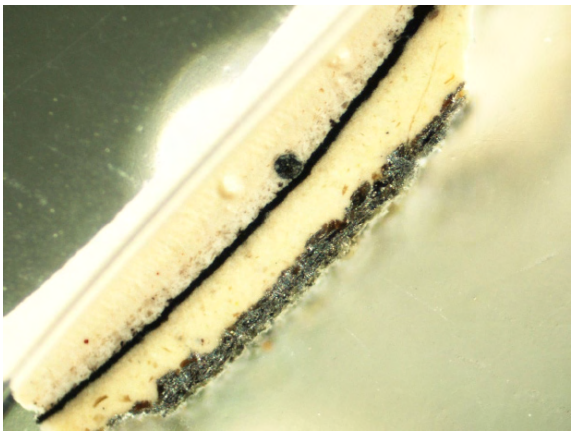


Visible Light, 200x Magnification

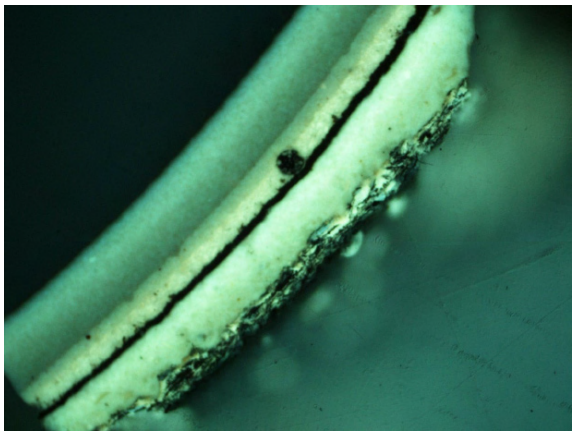


UV Light, 200x Magnification

SAMPLE NO:	65
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	Field Area Within "D" of "Floyd"
FIRST FINISH:	Dark Blue (Munsell 5PB 2/2)
COMMENTS: A thin corrosion product is visible under the first coating, an aluminum-colored, metallic primer. The first finish coat is dark blue.	

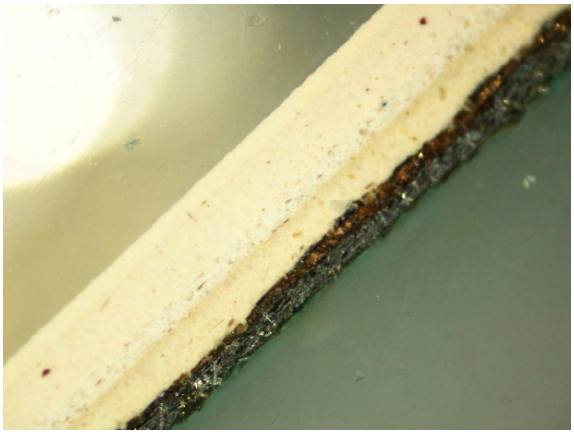


Visible Light, 100x Magnification

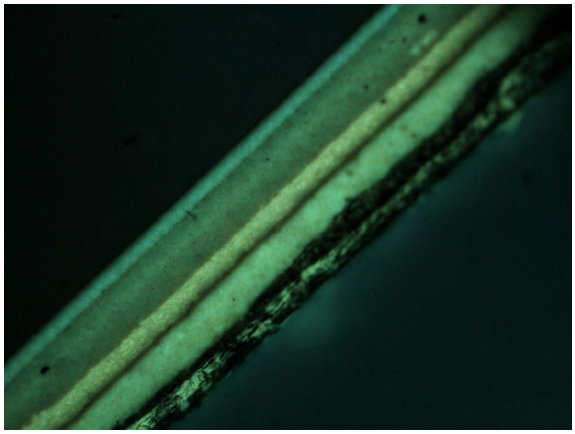


UV Light, 100x Magnification

SAMPLE NO:	67
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	"S" Below and East of Center Crest
FIRST FINISH:	Off-White (Munsell 2.5Y 9/4)
COMMENTS: This sample has a stratigraphy similar to Sample 66.	

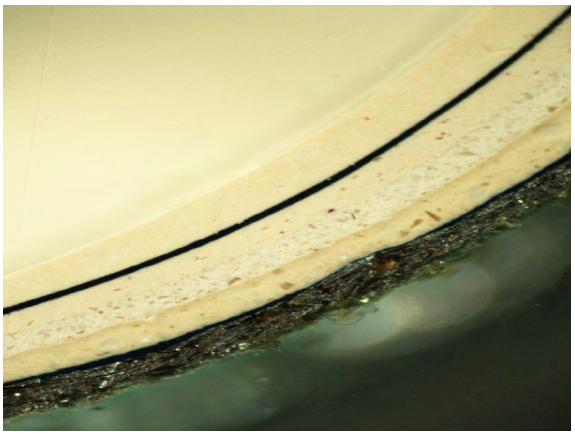


Visible Light, 100x Magnification

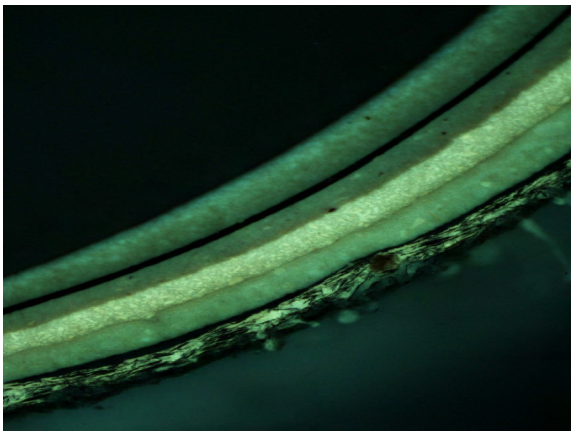


UV Light, 100x Magnification

SAMPLE NO:	68
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	Corrugated Metal at Center of Sign, Above the "A" and Under the Crest
FIRST FINISH:	Bronze Powder Paint
COMMENTS: This sample shows bronze powder paint applied over an aluminum-colored metallic primer. A bronze powder finish is not visible in any other samples outside the crest area and is not apparent at this location on any of the historic photographs provided.	

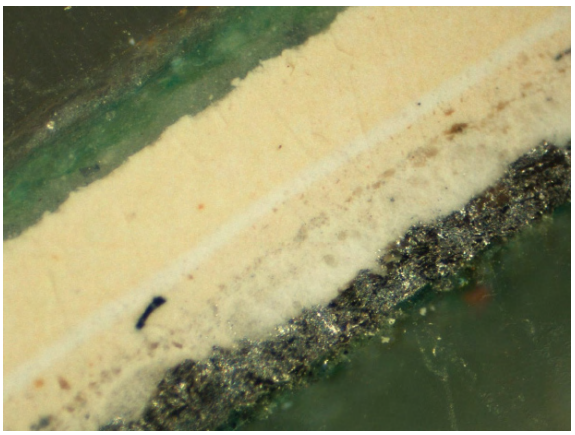


Visible Light, 100x Magnification

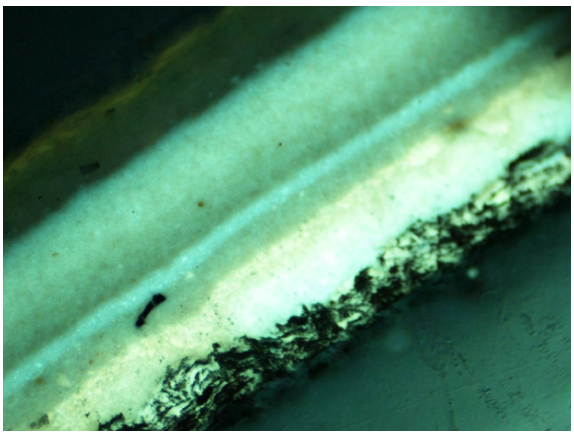


UV Light, 100x Magnification

SAMPLE NO:	69
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	"A" Below Center Crest
FIRST FINISH:	Dark Blue (Munsell 5PB 2/2)
COMMENTS: A thin corrosion product is visible under the first coating, an aluminum-colored, metallic primer. The first finish coat is dark blue.	

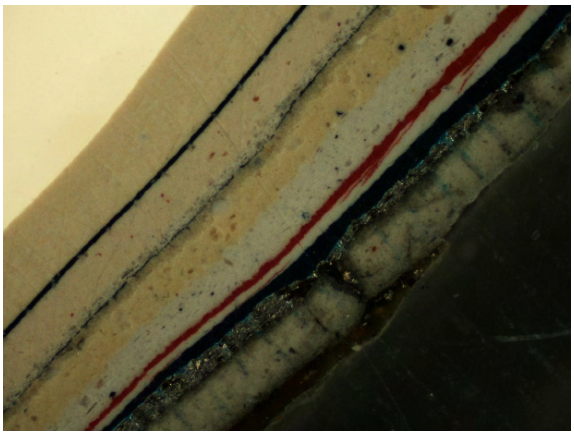


Visible Light, 200x Magnification

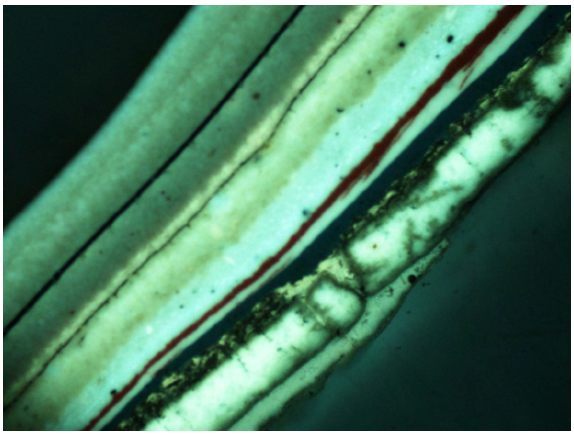


UV Light, 200x Magnification

SAMPLE NO:	71
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	Border of Eastern-Most Circle
FIRST FINISH:	White (Munsell N9.25)
COMMENTS: This sample has a stratgraphy similar to Sample 70, which was taken in the horizontal molding over the sign crest.	

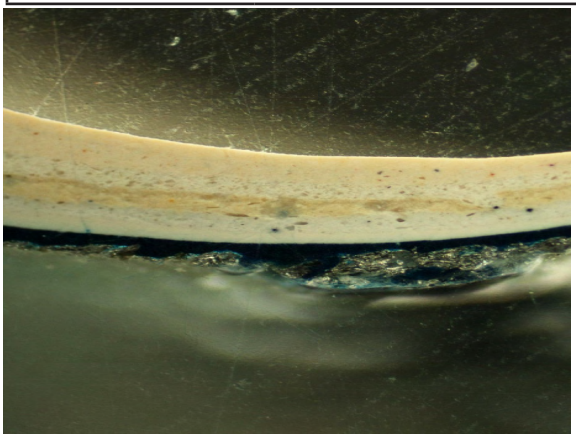


Visible Light, 100x Magnification

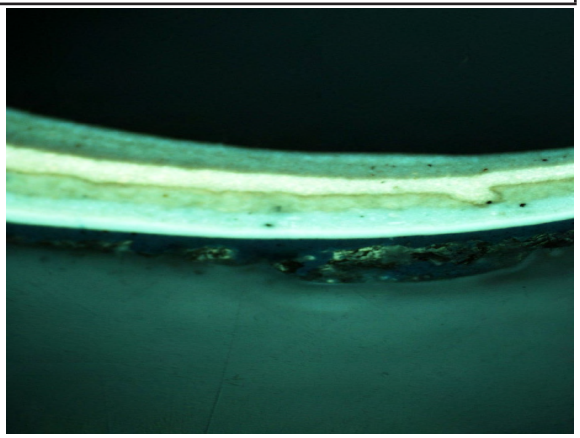


UV Light, 100x Magnification

SAMPLE NO:	72
LOCATION:	Exterior Copper Sign (North Elevation)
ELEMENT:	"1" in Center of Eastern-Most Circle
FIRST FINISH:	White (Munsell 5Y 9/1)
COMMENTS: The first white paint is consistent with a 1937 image of Hangar 8 that shows the hangar numbers painted in a light color. The subsequently applied metallic primer penetrated the cracks in this paint. The later applied blue, white, and red paints correspond to the colors of the background field, star, and circle visible in this area on a late 1930s photograph.	

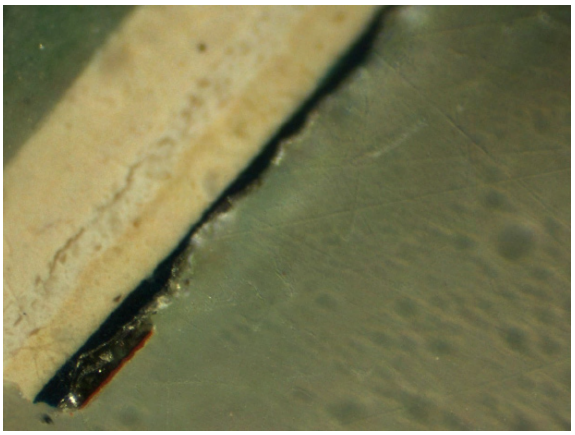


Visible Light, 100x Magnification

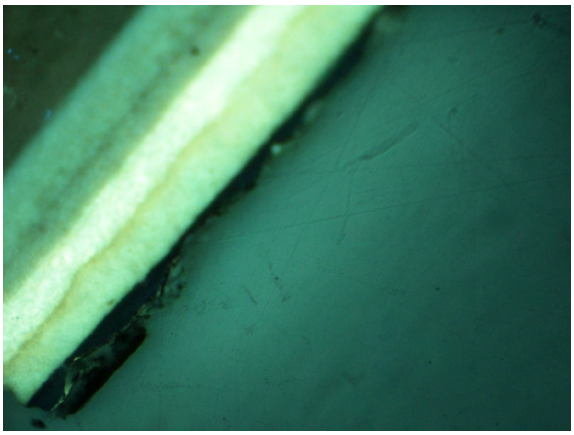


UV Light, 100x Magnification

SAMPLE NO:	73
LOCATION:	Exterior Copper Sign (North Elevation)
ELEMENT:	Star in Western-Most Circle
FIRST FINISH:	Dark Blue (Munsell 5PB 2/2)
COMMENTS: The first blue and white paint layers correspond to the shades of the background field and star visible on a late 1930s photograph. Having moved away from the center of the circle, the earlier white paint and subsequent red paint of Sample 72 is not visible.	



Visible Light, 200x Magnification



UV Light, 200x Magnification

SAMPLE NO:	74
LOCATION:	Exterior Copper Sign (North Elevation of Hangar 1)
ELEMENT:	Field of Western-Most Circle
FIRST FINISH:	Dark Blue (Munsell 5PB 2/2)
COMMENTS: The copper substrate is visible under the primer. The blue paint corresponds to the dark finish visible in this area on a late 1930s photograph. Having moved away from the center of the circle, the earlier white paint and subsequent red paint of Sample 72 is not visible. White paint from the star is no longer visible directly over the blue, as it is in Sample 73.	