CAPE CANAVERAL AIR FORCE STATION, HAER FL-8-11-T-1
LAUNCH COMPLEX 39,
HYPERGOL MAINTENANCE AND CHECKOUT AREA,
HYPERGOL MODULE PROCESSING NORTH
(HMP North)
(John F. Kennedy Space Center)
Cape Canaveral
Brevard County
Florida

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
100 Alabama St., SW
Atlanta, GA 30303

HISTORIC AMERICAN ENGINEERING RECORD
CAPE CANAVERAL AIR FORCE STATION, LAUNCH COMPLEX 39
HYPERGOL MAINTENANCE AND CHECKOUT AREA,
(HMCA Complex)
HYPERGOL MODULE PROCESSING NORTH,
(HMP North)

HAER No. FL-8-11-T-1

Location: John F. Kennedy Space Center, Industrial Area, Brevard County, Florida.

USGS Orsino, Florida, Quadrangle, Universal Transverse Mercator Coordinates: E 535140 N 3154380 Zone 17, NAD 1983.

Date of Construction: 1964

Present Owner: National Aeronautics and Space Administration (NASA)

Present Use: Not in use

Significance: The Hypergol Module Processing North (HMP North) (M7-961) is eligible to the National Register of Historic Places in the context of the U.S. Space Shuttle Program (SSP) (1969-2011) under Criterion A for its significant associations in the area of Space Exploration. Since it has achieved exceptional national significance in the last 50 years, Criteria Consideration G applies. HMP North was built in 1964 as part of what was originally called the Fluid Test Complex, now called the Hypergol Maintenance and Checkout Area (HMCA Complex). Originally called the Environmental Systems Test Building, HMP North's refurbished the Space Shuttle's Forward Reaction Control System (FRCS) and Orbital Maneuvering System (OMS) pods, performed hypergolic test loading, and hazardous systems tests and checkouts.

Report Prepared By: New South Associates, Stone Mountain, Georgia

Date: March 14, 2013

Part I. HISTORICAL INFORMATION

List of Acronyms

APU	Auxiliary Power Units
CIF	Central Instrumentation Facility
EST	Environmental Systems Test Building
FRCS	Forward Reaction Control System
HAER	Historic American Engineering Record
He	Helium
HMCA	Hypergol Maintenance and Checkout Area
HMP	Hypergol Module Processing
KSC	Kennedy Space Center
LCC	Launch Control Center
LH_2	Liquid Hydrogen
LO_2	Liquid Oxygen
LRU	Line Replaceable Units
MMH	Monomethyl Hydrazine
NASA	National Aeronautics and Space Administration
GN_2	Gaseous Nitrogen
N_2O_4	Nitrogen Tetroxide
O&C	Operations & Checkout
OMS	Orbital Maneuvering System
OPF	Orbiter Processing Facility
PRF	Parachute Refurbishment Facility
SCAPE	Self Contained Atmospheric Protective Ensemble
SSP	Space Shuttle Program
TPS	Thermal Protection System
VAB	Vehicle Assembly Building

A. HMP North and the Space Shuttle Program

HMP North was built in 1964 and was originally called the Environmental Systems Test Building (EST). It contained test equipment for spacecraft environmental control, or life support, systems. The facility had two 40′ square by 60′ high test cells on opposite sides of a central building

that contained control rooms on the second floor and equipment storage rooms on the first floor. Each test cell had overhead cranes with hook heights of 45′. There were also pre-installation acceptance laboratories for the validation of spacecraft components on the first floor.[1]

To support the SSP, the Fluid Test Complex facilities were modified in 1976 by Pan American Technical Services, Inc., of Cocoa Beach, Florida. At this time the name of the complex was changed to the Hypergol Maintenance and Checkout Area and the Environmental Systems Test Building's name was changed to HMP North (M7-961). Changes were made to the interiors of the buildings in the area, especially in the high bay work areas, to refurbish and checkout the Space Shuttle's Forward Reaction Control System (FRCS), aft Orbital Maneuvering Systems (OMS) pods, hypergolic systems, and other hazardous systems tests and checkouts.

Specifically, HMP North was modified to refurbish and checkout the hypergolic fuel modules of the Space Shuttle orbiter's aft OMS pods.[2] The OMS pods were attached to either side of the orbiter's upper aft fuselage, and each pod was divided into two compartments containing the OMS engines.[3]

The RCS and OMS systems worked in tandem on the orbiter to provide thrust for orbital maneuvers and small axis changes. Each RCS contained high-pressure gaseous helium storage tanks, pressure regulation and relief systems, hypergolic fuel and oxidizer tanks, an engine propellant

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[1] Pan American World Airways, Inc., "Analytical Report, John F. Kennedy Space Center, NASA, Kennedy Space Center, Florida – Master Plan." (KSC Master Planning Office, 1965), 33.
[2] For an explanation of hypergolic propellants as they relate to the SSP, see: HAER No. FL-8-11-T, page 4.
[3] NASA, "Reaction Control System," NSTS Shuttle Reference Manual, 1988, http://science.ksc.nasa.gov/shuttle/technology/sts-newsref/sts-rcs.html.

distribution system, and thermal control systems. The RCS rockets and thrusters provided thrust for attitude (rotational) maneuvers, including pitch, yaw, and roll, and for small velocity changes along the orbiter's axis. Each OMS contained one engine and the hardware needed to pressurize, store, and distribute the hypergolic propellants and oxidizers needed to perform maneuvers. The OMS engines provided thrust for orbit insertion, orbit circularization, orbit transfer, rendezvous, deorbit, and other orbital maneuvers.[4] When the Space Shuttle was docked at the International Space Station (ISS), the OMS engines could be used to push the ISS into a higher orbit.[5]

HMP North continued to service the orbiter's aft RCS and OMS pods through the end of the SSP. The program ended in July of 2011, when the crew of *Atlantis* landed at KSC to complete the program's 135th mission (STS-135). Since the SSP's first launch in 1981, the program launched 355 astronauts from 16 countries. The five shuttles traveled more than 542 million miles and conducted over 2,000 experiments in the fields of Earth, astronomy, biological, and materials sciences. The shuttles docked with two space stations, including the Russian *Mir* and the International Space Station, and deployed 180 payloads such as satellites and spacecraft. With the return of the final mission, NASA Administrator Charles Bolden said, "the brave astronauts of STS-135 are emblematic of the shuttle program – skilled professionals from diverse backgrounds who propelled America to continued leadership in space with the shuttle's many successes."[6]

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[4] Ibid.
[5] Larry Taylor, URS Facilities Manager, interview with author, April 8, 2013.
[6] Michael Curie, Kyle Herring, and Candrea Thomas, "NASA's Proud Space Shuttle Program Ends With Atlantis Landing," NASA press

D. Physical History

1. Date of Construction:

1964

2. Architect/Engineer:

Tampa Bay Engineering Company, St. Petersburg, Florida[7]

3. Builder/Contractor/Supplier:

Not known

4. Original Plan and Construction:

HMP North was built in two consecutive phases. The first phase was the construction of the building's main portion, including two 40' square by 60' high test cells on opposite sides of a two-story central building. The central building contained control rooms on the second floor that operated equipment used in the test cells. The first floor contained two equipment storage rooms, two locker rooms, an office, a mechanical room, and two pre-installation acceptance laboratories for the validation of spacecraft environmental systems components. The test cells had segmented vertical-lift doors on their east and west elevations, and each cell had an overhead crane with a hook height of 45'. The building had a reinforced

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release, http://www.nasa.gov/home/hqnews/2011/jul/HQ 11-240 Atlantis Lands.html, accessed on March 8, 2012.

[7] Tampa Bay Engineering Company, "Fluid Test Complex, Environmental Control Systems Building," construction drawings, March 5, 1963.

concrete frame structure, concrete block walls, and steel high bay doors.[8]

The second phase of construction occurred immediately after the first and included a one-story, 3,000-square foot addition to the building's south elevation. The addition had a reinforced concrete frame structure, concrete block walls, and a gently sloping built-up flat roof. Its floor plan contained eight work rooms, a locker room/toilet, and a central corridor. The work rooms included two pre-installation acceptance rooms for coolant systems, one pre-installation acceptance room for water systems, two parts storage/tool crib rooms, a blacklight inspection room, a mechanical equipment room, and an equipment maintenance room.[9]

5. Additions and Alterations

HMP North was modified for the SSP in 1976. The modifications included the building's civil, architectural, structural, mechanical, and electrical systems. Civil site alterations to HMP North included new asphalt pavement, curbs and gutters, drainage grates, storm drains, and site contouring. Architectural changes included partition removal and modification of the original second-floor control rooms, entrance door replacements, new roofing, and a new roof penetration plan to accommodate new ventilation equipment. Structural changes included the installation of new fixed and hinged test stands in each of the building's test cells, which were used to service the shuttle's OMS and

[8] Ibid.
[9] NASA, "Addition to Manned Spacecraft Environmental Control Systems Building," construction drawings, August 1964.

RCS systems. Various mechanical and electrical systems were also changed and upgraded throughout the facility.[10]

[10] Pan American Technical Services, Inc., "Fluid Test Complex, Modifications for Shuttle," construction drawings, January 1976.

Part II. Structural/Design/Equipment Information

A. General Statement:

1. Character:

HMP North was originally used to process and checkout the environmental, or life support, systems of the Gemini and Apollo spacecraft. It was later modified to process and checkout the Space Shuttle's aft RCS and OMS pods. The concrete-frame and concrete-block building has a pair of high bay work cells on either side of a two-story central building, which contains control rooms and support areas. There is a one-story wing on the south elevation of the building that contains offices, labs, and storage areas.

2. Condition of Fabric:

The condition of HMP North's fabric is good. The building was regularly maintained throughout its lifespan. It does exhibit minor signs of deterioration such as peeling paint and rust.

B. Descriptions of Interior and Exterior:

HMP North is a spacecraft test facility with a reinforced concrete frame structure, painted 12" nominal concrete block walls, a reinforced concrete foundation, and a gently sloping built-up roof. The building has an irregular footprint and has overall dimensions of 128'-0" long (north-south) and 110'-0" wide (east-west). The building contains 7,600 square feet. The defining features of the building are two high-bay test cells with exterior dimensions of 40'-0" wide x 40'-0" long x 60'-0" high. The test cells are arranged on the east and west sides of a central two-story building that measures 30'-0" wide x 40'-0" long.

There is a central, one-story projection on the north elevation that measures 30′-0″ wide x 13′-0″ deep. There is also a one-story concrete-block wing on the south elevation of the building that measures 68′-0″ long x 48′-0″ wide. The wing has a gently sloping built-up roof and a concrete foundation.

Each test cell features an exterior vertical-lift door that measures 22′-0″ wide x 40′-0″ high. The doors are equipped with inflatable seals that exclude contaminants and seal the building in case of toxic spills. Other entrances include a number of single and double pedestrian doors on all elevations. There are no windows on the building.

The test cells are equipped with large capacity exhaust systems designed to reduce contaminants and remove toxic fumes from the interior. A large array of ventilation equipment is located on top of the building's two-story portion, between the two test cells' exterior walls.

Arrayed around the building are a variety of chemical storage tanks, control panels, valves, and pipes that serve the interior testing areas. Just north of the east test cell is a monomethyl hydrazine (MMH) fuel pump and storage tank. Likewise, there is a nitrogen tetroxide (N_2O_4) tank on the north side of the west test cell. On the south side of the building are four storage tanks that contain gaseous helium and gaseous nitrogen.

The interior dimensions of HMP North's two test cells contain 38′-0″ x 38′-0″ of work space. This space includes service areas that checked out the hypergolic fuel and oxidizer systems used in the Space Shuttle orbiter's aft RCS and OMS pods. Each test cell contains four levels of stationary work platforms arranged in a U-shape around

their interior walls. These work levels are spaced at 12′-0″, 19′-0″, 27′-0″, and 35″-0″ above the finished concrete floor. Steel staircases lead from one platform to the next. At the 12′-0″, 19′-0″, and 27′-0″ levels there are hinged platforms that were lowered into place around the aft RCS and OMS modules after they were maneuvered into place. The modules were maneuvered with an overhead 10-ton hydraulic bridge crane with a hook height of 45′.

The interior of the central building's first floor contains storage rooms, a break room/kitchen, restroom, a power supply monitor room, lockers, and a gaseous helium/gaseous nitrogen regulator room filled with equipment panels. There is a metal spiral staircase that leads to the second floor. Interior finish materials include suspended acoustic tile ceilings, tile floors, and a combination of drywall and concrete block walls.

The interior of the central building's second floor contains the Hardware Interface Module (HIM) room, which was originally a control room for the test cells. The HIM room contains cabinets of computer equipment that control the hardware used in the test cells. This room has a raised floor that can be opened to reach the HIM cables and connectors that run under it.

C. Operations and Process

The operations at HMP North included the refurbishment disassembly/assembly, testing, propellant loading, and pressurization of hypergolic fuel and oxidizer lines of the Space Shuttle orbiter's aft OMS pods, RCS modules, and auxiliary power units (APUs). The building also houses the Quick Disconnect Laboratory, equipped to service the fuel and oxidizer Quick Disconnect lines used on the components, and the Thruster Bench Test Lab where OMS/RCS thrusters were refurbished.[11]

The RCS/OMS pods were moved into the building's test cells through the vertical lift doors. The module on the left (port) side of the orbiter was processed in the west test cell, and the right (starboard) module was processed in the east test cell.

Once inside the building and raised into position, the hinged work platforms were lowered into place to allow access to the modules. Each component underwent an inspection and hookup of electrical testing cables and propellant lines. The components' thrusters were removed and inspected. The thrusters' regulators and valves were replaced if needed. Residual hypergolic propellants were drained and the systems were flushed and dried. All of the modules' line replaceable units (LRUs) were repaired or replaced, followed by an electrical and pneumatic checkout. The facility also inspected and repaired the electrical and Thermal Protection Systems (TPS) on the modules.[12]

Depending on launch and regular orbiter maintenance down periods, the OMS and RCS module process time varied from

[11] Sciarini and Tzareff, "Hypergol Maintenance Facility – North Area," 2004, 3.
[12] Slovinac and Deming, "Hypergolic Maintenance and Checkout Area Historic District," 2007; Stan D. Johnson, Senior Systems Technician, interview with author, April 9, 2012.

one to six months. Once the systems were revalidated and in proper working order, they were closed out and removed from the test cells and transported to the Orbiter Processing Facility (OPF) for installation.[13]

At the height of the SSP the number of technicians working in HMP North varied from 15-20.[14] The hazardous nature of the toxic hypergolic fuels used in the modules required that technicians wear full-body self-contained atmospheric protective ensemble (SCAPE) suits, and vapor concentration monitors were used throughout the building.

Part III. Sources of Information

A. Primary Sources

Pan American World Airways, Inc.

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B. Secondary Sources

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[13] Slovinac and Deming, "Hypergolic Maintenance and Checkout Area Historic District," 2007; Johnson, interview with author, 2012.
[14] Johnson, interview with author, 2012.

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Sciarini, E. Daniel, and Susan S. Tzareff

2004 "Hypergol Maintenance Facility - North Area (HMP North) (M7-961), Kennedy Space Center, Florida, Solid Waste Management Unit (SWMU) Assessment Report, PRL #118 (Revision 0) [KSC-TA-7110]. J-BOSC Environmental Health and Services, Environmental Compliance and Public Health Section, Kennedy Space Center.

C. Engineering Drawings and Plans

Tampa Bay Engineering Co.

1963 "NASA Merritt Island Launch Area, Merritt Island, FLA., Fluid Test Complex - Environmental Control Systems Bldg." Construction Drawings.

"NASA Merritt Island Launch Area, Merritt Island, FLA., Addition to Manned Spacecraft Environmental Control Systems Building." Construction Drawings.

D. Early Views

Kennedy Space Center. Photograph negative number LOC-63-7252, dated 1963. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number LOC-63-8565, dated 1963. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number LOC-63-9100, dated 1963. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number 100-KSC-64C-2626, dated 1964. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number KSC-64C-0037, dated 1964. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number 100-KSC-65C-8832, dated 1965. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number 107-KSC-72-338, dated 1972. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number KSC-396C-0940-10, dated 1996. On file at Kennedy Space Center Archives.

Kennedy Space Center. Photograph negative number KSC-396C0947-36, dated 1996. On file at Kennedy Space Center Archives.

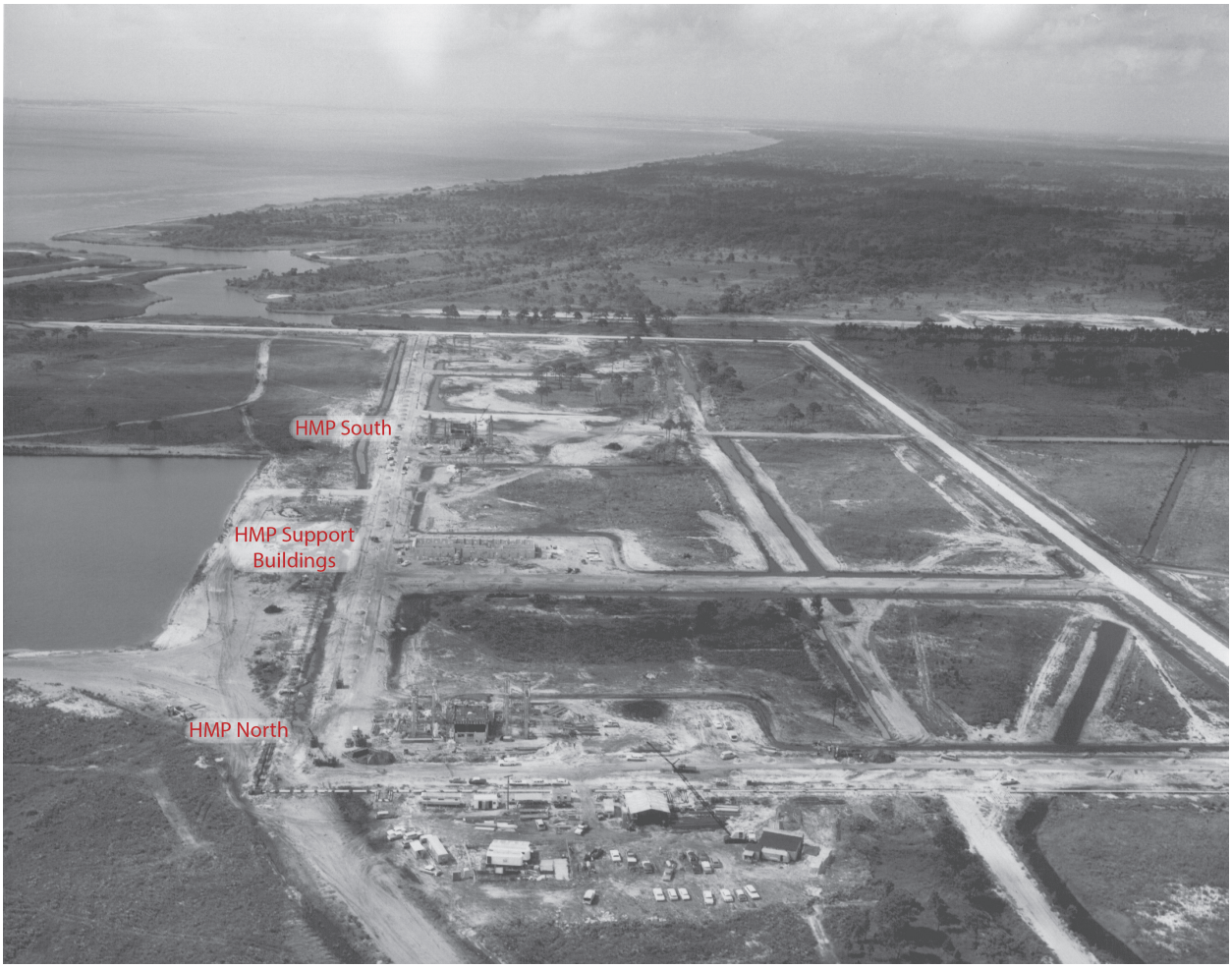
E. Interviews

Johnson, Stanley D.

2012 United Space Alliance. Senior Systems Technician. Interview with author.

Taylor, Larry

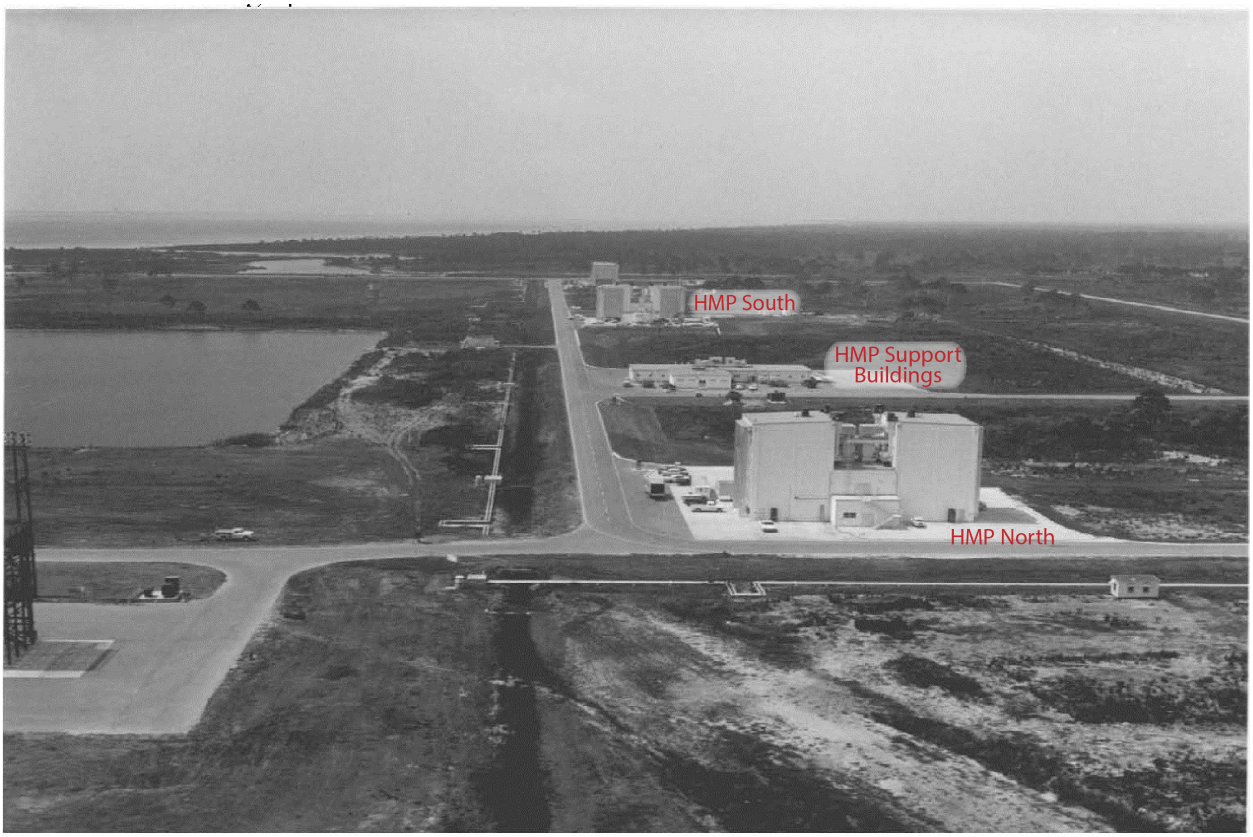
2013 URS Facilities Manager. Interview with author.



1963 aerial photograph of HMCA Complex under construction with HMP North building site in foreground, view south. (Courtesy KSC: Image LOC-63-7252)

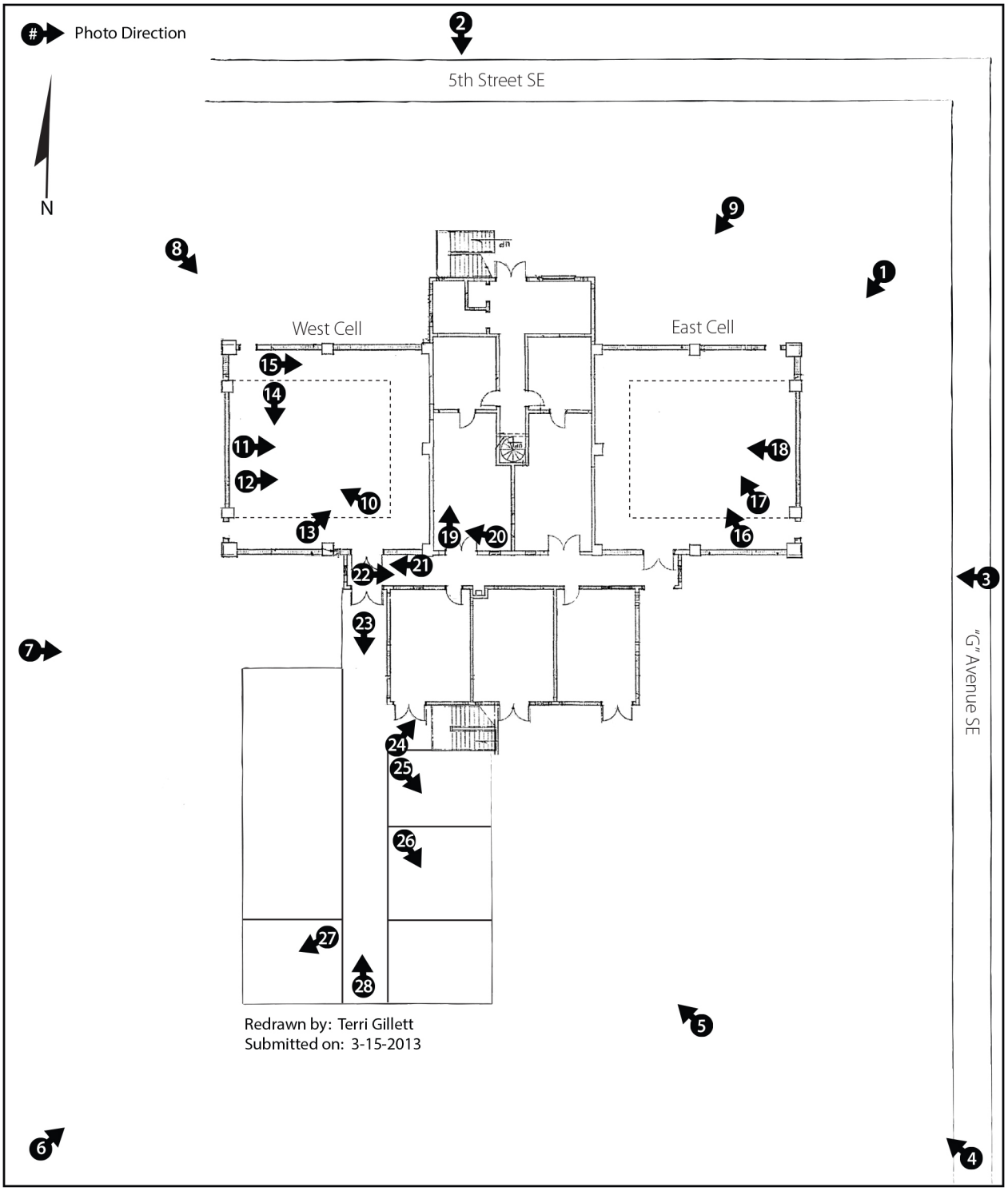
1963 view of HMP North under construction, view southwest. (Courtesy KSC: Image LOC-63-8565).

1963 aerial view showing the HMCA area under construction with HMP North in foreground. (Courtesy KSC: Image LOC-63-9100)



1964 aerial view of the HMCA area shortly after construction, HMP North in foreground, view south. (Courtesy KSC: Image 100-KSC-64C-2626)

1972 oblique view of HMP North, view southeast. (Courtesy KSC: Image 107-KSC-72-338).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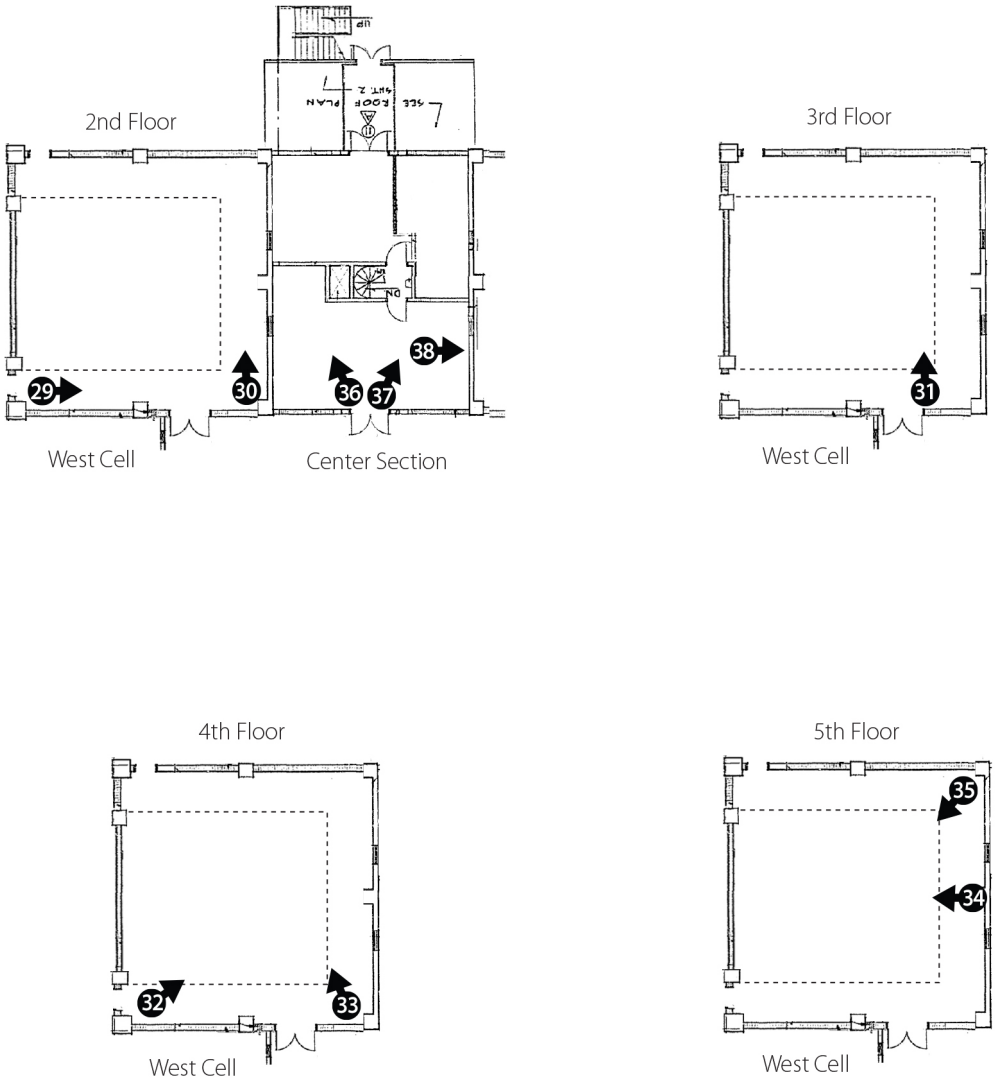

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HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

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David Diener, Photographer April 2012

FL-8-11-T-1-1 EXTERIOR OBLIQUE VIEW OF HMP NORTH, VIEW SOUTHWEST.

FL-8-11-T-1-2 EXTERIOR NORTH ELEVATION OF HMP NORTH, VIEW SOUTH.

FL-8-11-T-1-3 EXTERIOR EAST ELEVATION OF HMP NORTH, VIEW WEST.

FL-8-11-T-1-4 EXTERIOR OBLIQUE VIEW OF HMP NORTH, VIEW NORTHWEST.

FL-8-11-T-1-5 EXTERIOR DETAIL VIEW OF HMP NORTH PUMPS AND VALVES, VIEW NORTHWEST.

FL-8-11-T-1-6 EXTERIOR OBLIQUE VIEW OF HMP NORTH, VIEW NORTHEAST.

FL-8-11-T-1-7 EXTERIOR WEST ELEVATION OF HMP NORTH, VIEW EAST.

FL-8-11-T-1-8 EXTERIOR DETAIL VIEW OF HMP NORTH PUMPS AND VALVES AT NORTHWEST CORNER OF BUILDING, VIEW SOUTHEAST.

FL-8-11-T-1-9 EXTERIOR DETAIL VIEW OF HMP NORTH PUMPS AND VALVES AND NORTHEAST CORNER OF BUILDING, VIEW SOUTHWEST.

FL-8-11-T-1-10 INTERIOR VIEW OF VERTICAL LIFT DOOR IN HMP NORTH WEST TEST CELL, VIEW NORTHWEST.

FL-8-11-T-1-11 INTERIOR VIEW OF GROUND FLOOR WORK AREA IN HMP NORTH WEST TEST CELL, VIEW EAST.

FL-8-11-T-1-12 INTERIOR VIEW OF UPPER LEVEL WORK AREAS IN HMP NORTH, WEST TEST CELL, VIEW EAST.

FL-8-11-T-1-13 INTERIOR OBLIQUE VIEW OF GROUND LEVEL WORK AREA IN HMP NORTH, WEST TEST CELL, VIEW NORTHEAST.

FL-8-11-T-1-14 INTERIOR VIEW OF GROUND LEVEL WORK AREA IN HMP NORTH, WEST TEST CELL, VIEW SOUTHEAST.

FL-8-11-T-1-15 INTERIOR VIEW OF GROUND LEVEL WORK AREA IN HMP NORTH, WEST TEST CELL WITH PROPELLANT LINES AND TUBING, VIEW EAST.

FL-8-11-T-1-16 INTERIOR VIEW OF GROUND FLOOR WORK AREA IN HMP NORTH, EAST TEST CELL, VIEW NORTHWEST.

FL-8-11-T-1-17 INTERIOR VIEW OF GROUND FLOOR WORK AREA IN HMP NORTH, EAST TEST CELL, VIEW NORTHWEST.

FL-8-11-T-1-18 INTERIOR VIEW OF UPPER LEVEL WORK AREAS AND CEILING IN HMP NORTH, EAST TEST CELL, VIEW NORTHWEST.

FL-8-11-T-1-19 LOCKER AND EQUIPMENT ROOM ON GROUND FLOOR OF HMP NORTH, VIEW NORTH.

FL-8-11-T-1-20 WORK BENCH AND CALIBRATING EQUIPMENT IN HMP NORTH, VIEW WEST.

FL-8-11-T-1-21 INTERIOR VIEW OF ENTRANCE DOOR TO HMP NORTH, WEST TEST CELL, VIEW WEST.

FL-8-11-T-1-22 CORRIDOR IN HMP NORTH CONNECTING WEST AND EAST TEST CELLS, VIEW EAST.

FL-8-11-T-1-23 CORRIDOR IN HMP NORTH LEADING TO LABORATORY AREAS IN SOUTH WING OF BUILDING, VIEW SOUTH.

FL-8-11-T-1-24 THRUST BENCH TEST LAB IN HMP NORTH, VIEW NORTHEAST.

FL-8-11-T-1-25 QUICK DISCONNECT LABORATORY IN HMP NORTH, VIEW SOUTHEAST.

FL-8-11-T-1-26 GENERAL SHOP AREA IN HMP NORTH, VIEW SOUTHEAST.

FL-8-11-T-1-27 THERMAL CONTROL SYSTEM LABORATORY IN HMP NORTH, VIEW SOUTHWEST.

FL-8-11-T-1-28 CORRIDOR IN HMP NORTH SOUTH WING, VIEW NORTH.

FL-8-11-T-1-29 INTERIOR VIEW OF SECOND FLOOR WORK AREA IN HMP NORTH WEST TEST CELL ALONG SOUTH WALL, VIEW EAST.

FL-8-11-T-1-30 INTERIOR VIEW OF SECOND FLOOR WORK AREA IN HMP NORTH, WEST TEST CELL ALONG EAST WALL, VIEW NORTH.

FL-8-11-T-1-31 INTERIOR VIEW OF THIRD FLOOR WORK AREA IN HMP NORTH, WEST TEST CELL ALONG EAST WALL, VIEW NORTH.

FL-8-11-T-1-32 INTERIOR OBLIQUE VIEW OF HMP NORTH, WEST TEST CELL FROM FOURTH FLOOR, VIEW NORTHEAST.

FL-8-11-T-1-33 INTERIOR OBLIQUE VIEW OF HMP NORTH, WEST TEST CELL FROM FOURTH FLOOR, VIEW NORTHWEST.

FL-8-11-T-1-34 INTERIOR OBLIQUE VIEW OF HMP NORTH, WEST TEST CELL FROM FIFTH FLOOR, VIEW SOUTHWEST.

FL-8-11-T-1-35 INTERIOR VIEW OF VERTICAL LIFT DOOR IN HMP NORTH, WEST TEST CELL FROM FIFTH FLOOR, VIEW WEST.

FL-8-11-T-1-36 HIM ROOM EQUIPMENT IN HMP NORTH, VIEW NORTHWEST.

FL-8-11-T-1-37 HIM ROOM EQUIPMENT IN HMP NORTH, VIEW NORTHEAST.

FL-8-11-T-1-38 OBSERVATION FROM HIM ROOM TO EAST TEST CELL IN HMP NORTH, VIEW EAST.

FL-8-11-T-1-39 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) FLUID TEST COMPLEX, ENVIRONMENTAL CONTROL SYSTEMS BLDG, ARCHITECTURAL FLOOR PLANS & DETAILS"

FL-8-11-T-1-40 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "LIFE SUPPORT TEST, ARCHITECTURAL ELEVATIONS"

FL-8-11-T-1-41 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "LIFE SUPPORT TEST, SECTIONS & DETAILS"

FL-8-11-T-1-42 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "LIFE SUPPORT TEST, SECTIONS & DETAILS"

FL-8-11-T-1-43 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "FLUID TEST COMPLEX, E.C.S. BUILDING, AIR CONDITIONING DUCT L.O. & DET. (FIRST FLOOR)"

FL-8-11-T-1-44 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "FLUID TEST COMPLEX, ENVIRONMENTAL CONT. SYST. BLDG., HEATING, VENTILATION & AIR COND., SECOND FLOOR & ROOF PLAN"

FL-8-11-T-1-45 PHOTOCOPY OF ENGINEERING DRAWINGS (8" X 10" PHOTO OF SCANNED ORIGINAL; MARCH 5, 1963 BY TAMPA BAY ENGINEERING CO.; DRAWING IN POSSESSION OF KENNEDY SPACE CENTER) "LIFE SUPPORT TEST, HEATING, VENTILATION & AIR CONDITIONING – SECTIONS"


Kodak 100TMX


FUEL
Kodak 10 TMX

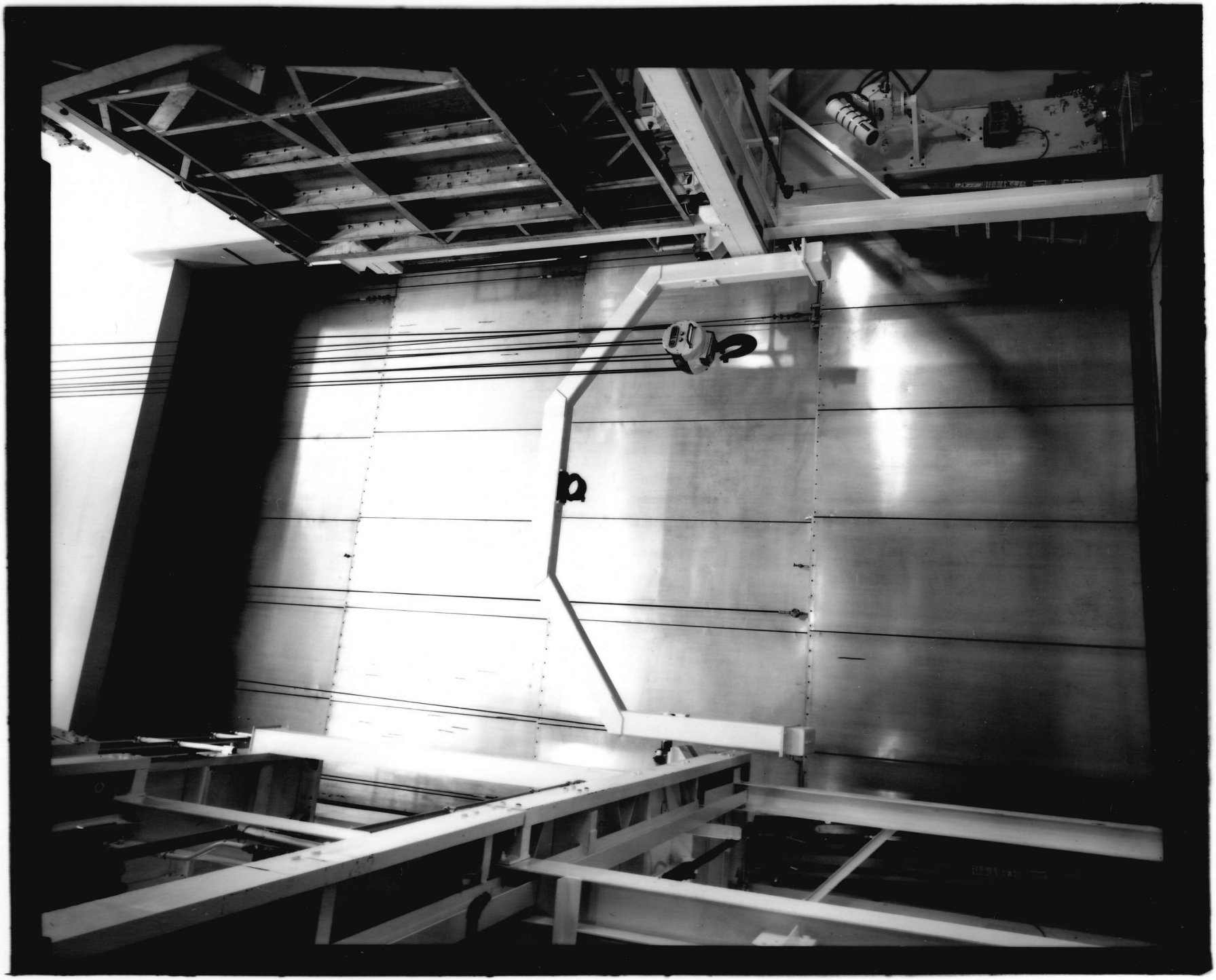
Kodak 100TMX

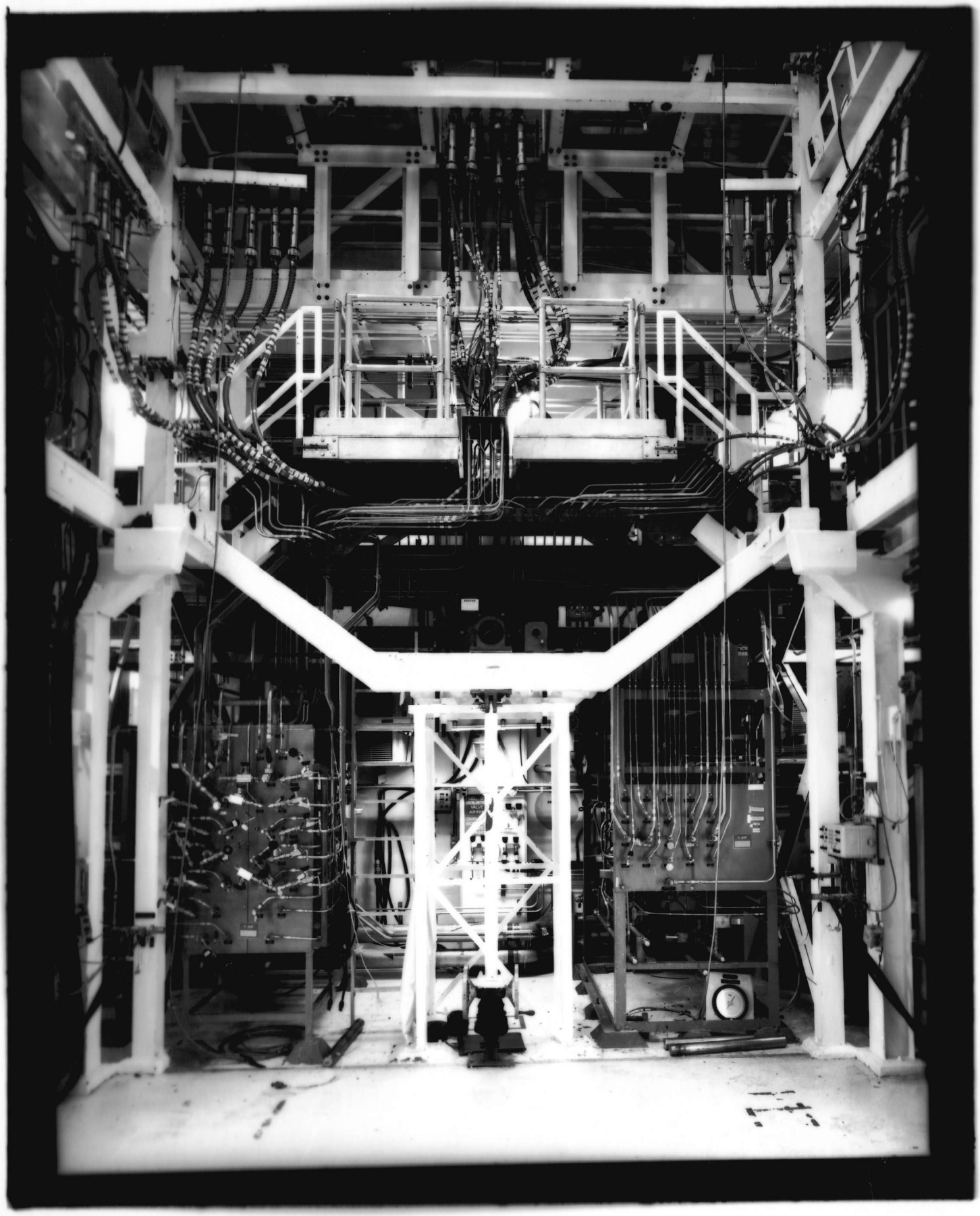

GHE
Kodak 100TMX

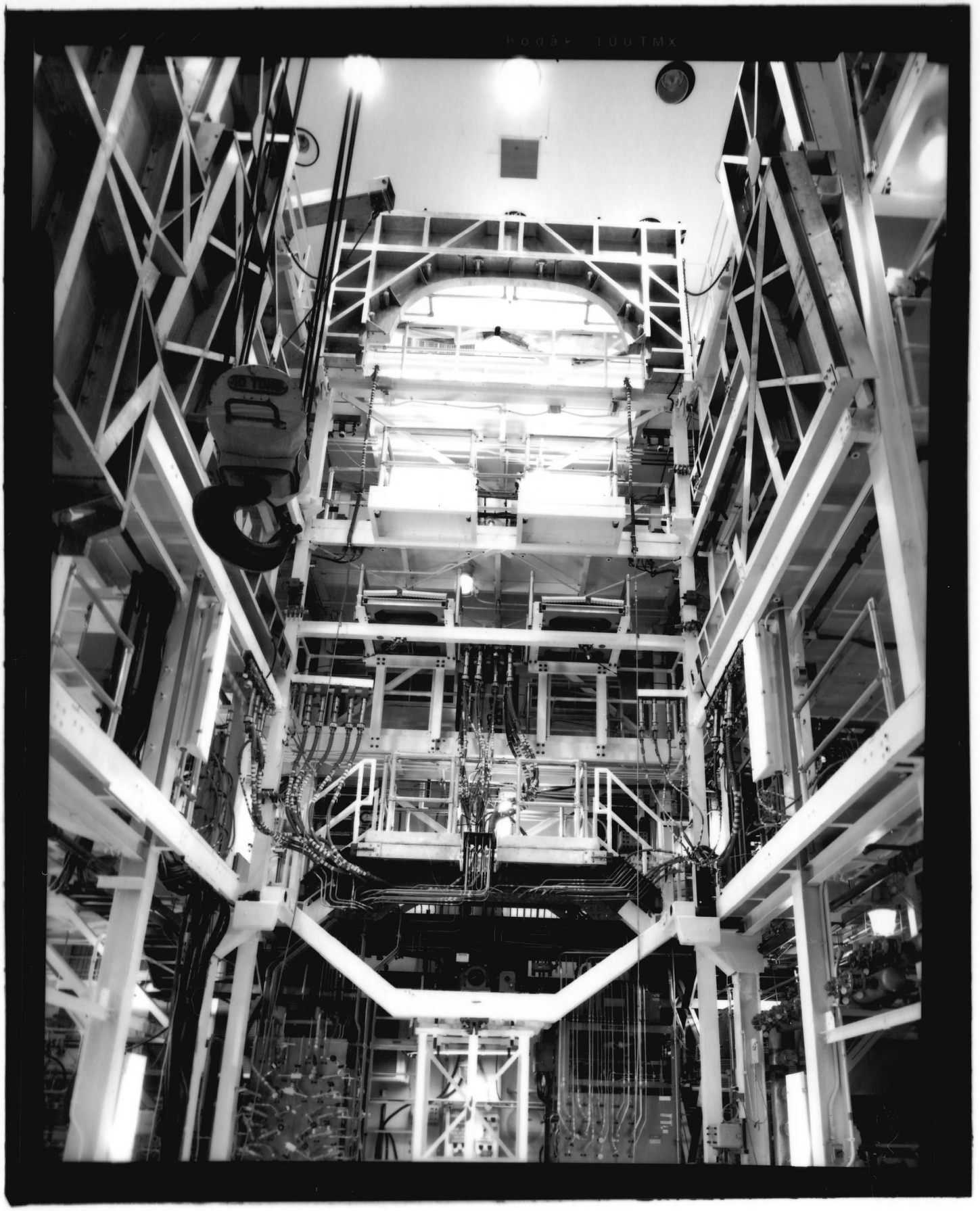
Kodak 100TMX

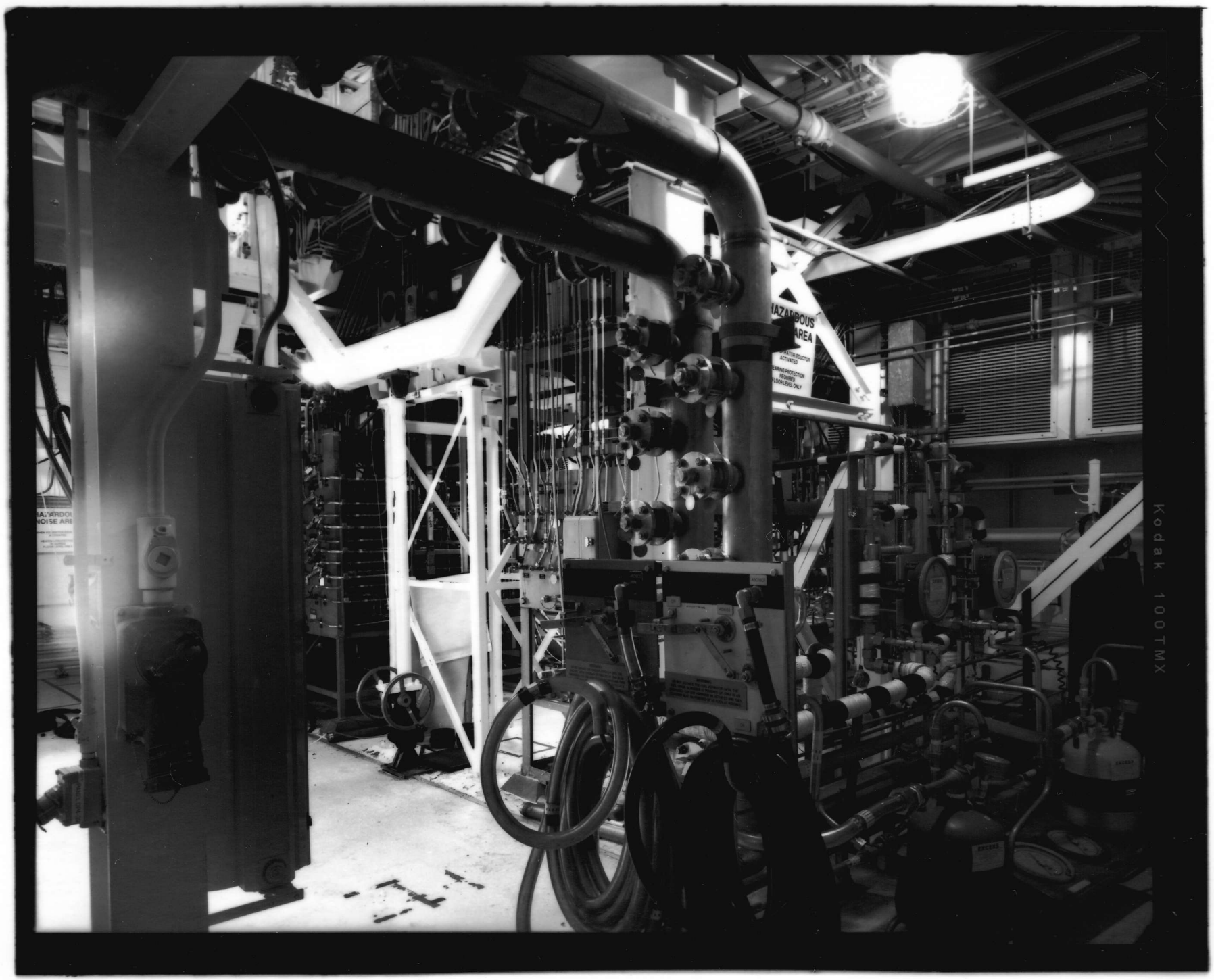

M7-961 OX
N204
OX
N204
WATCH YOUR STEP

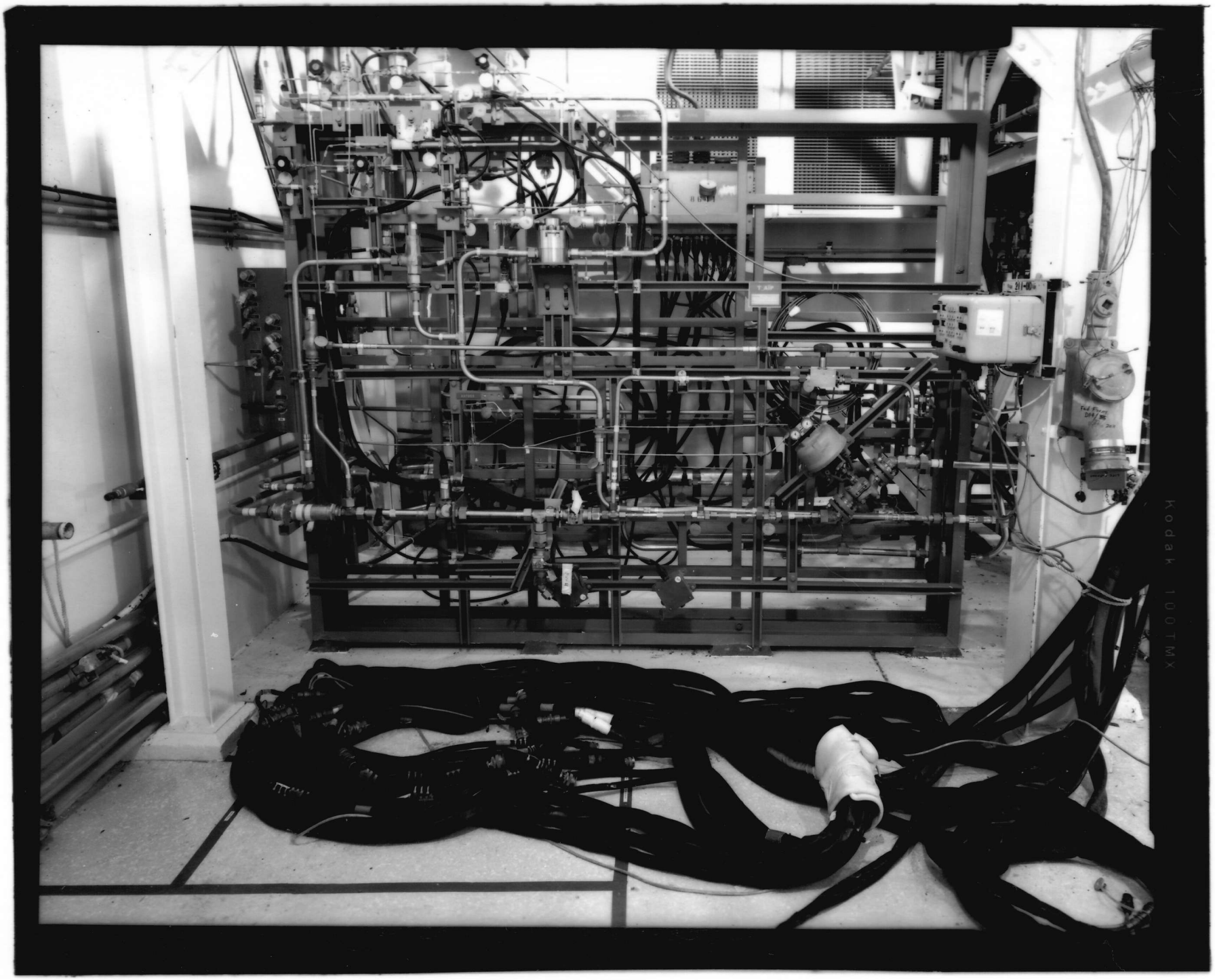

FUEL M7-981
Kodak 100TMX

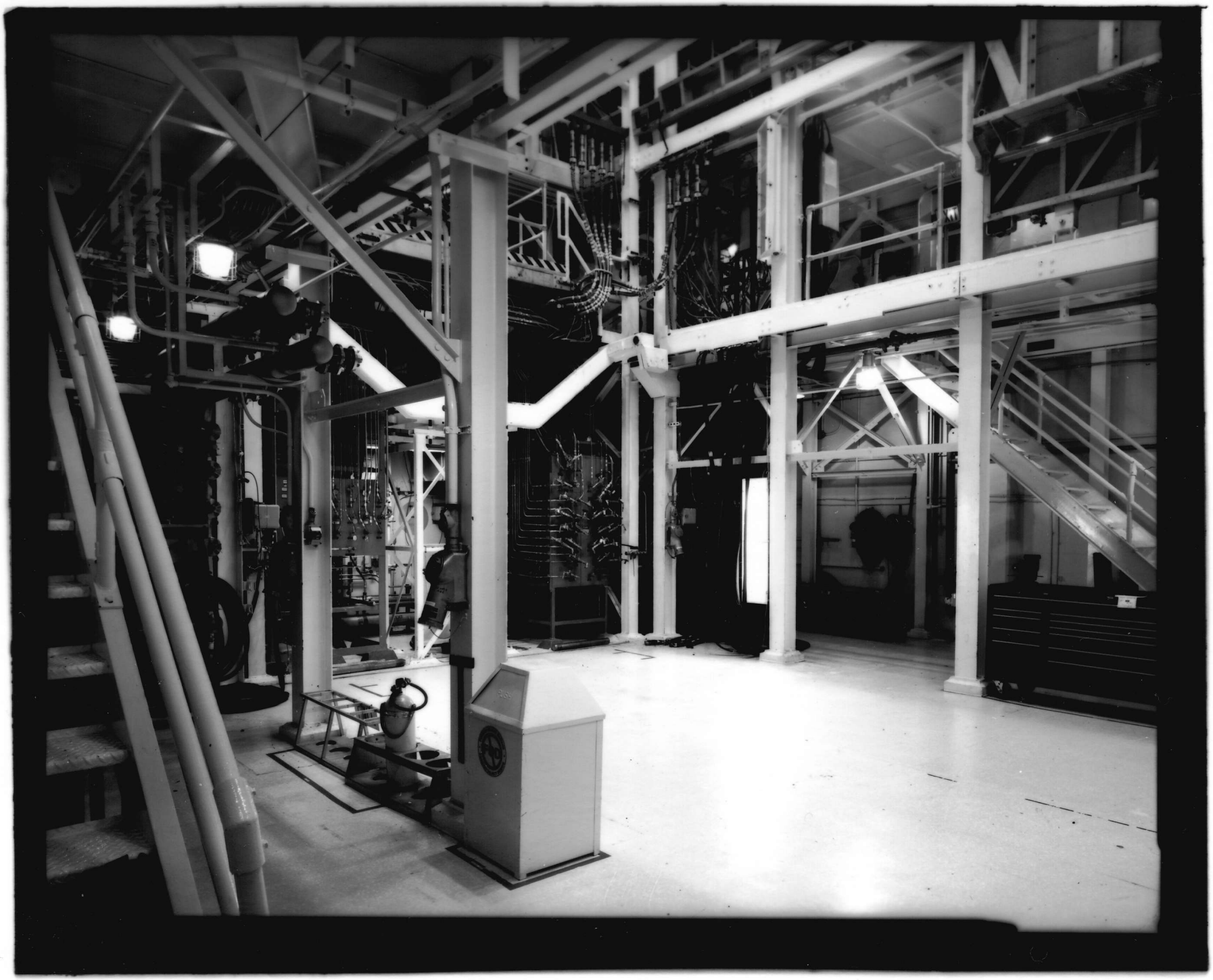


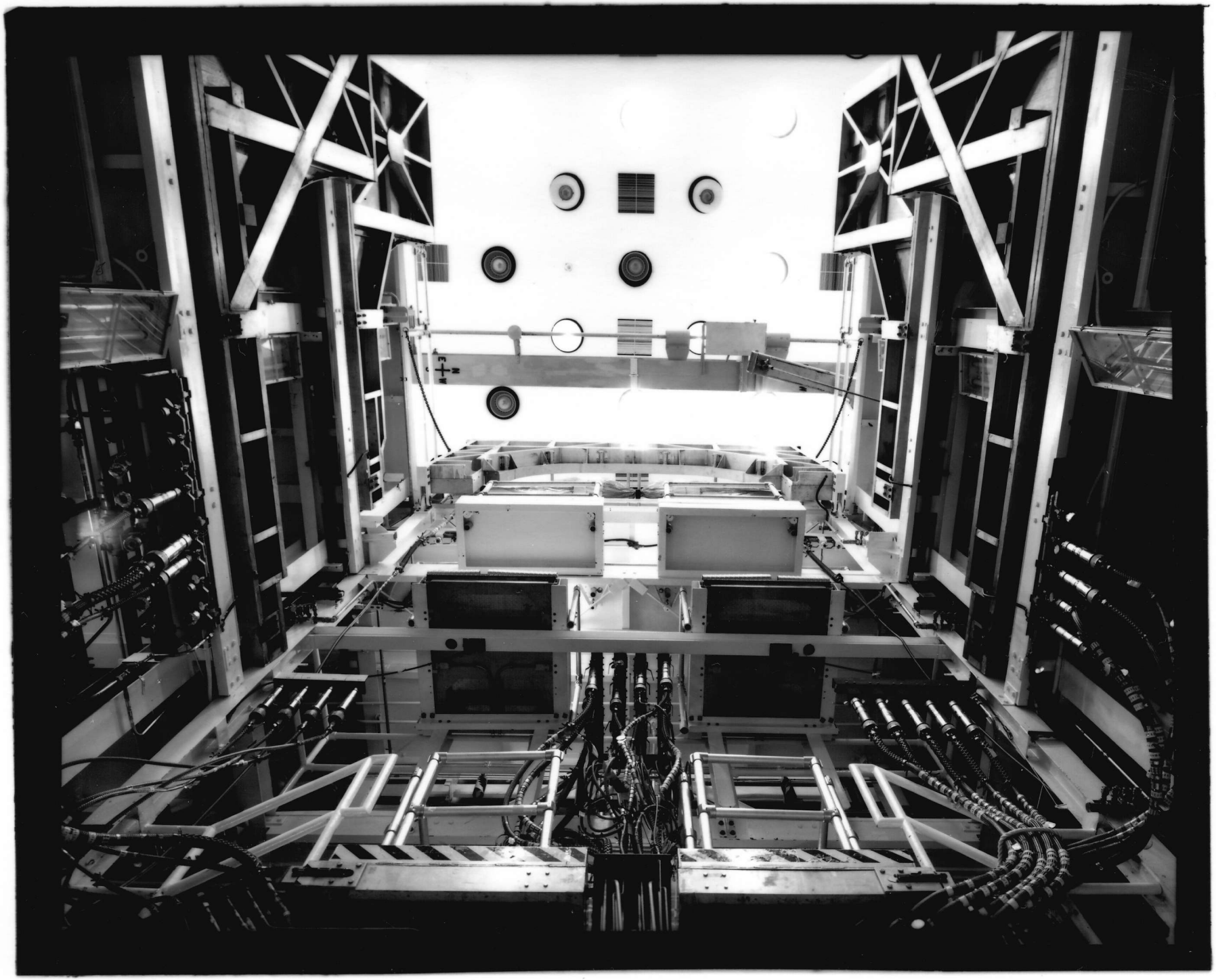



Kodak TOUTMX


HAZARDOUS
AREA
Kodak 100 TMX


Kodak 100TMX





KEEP SEA
URTLES IN
E DARK.
FPL
Kodak 100TMX

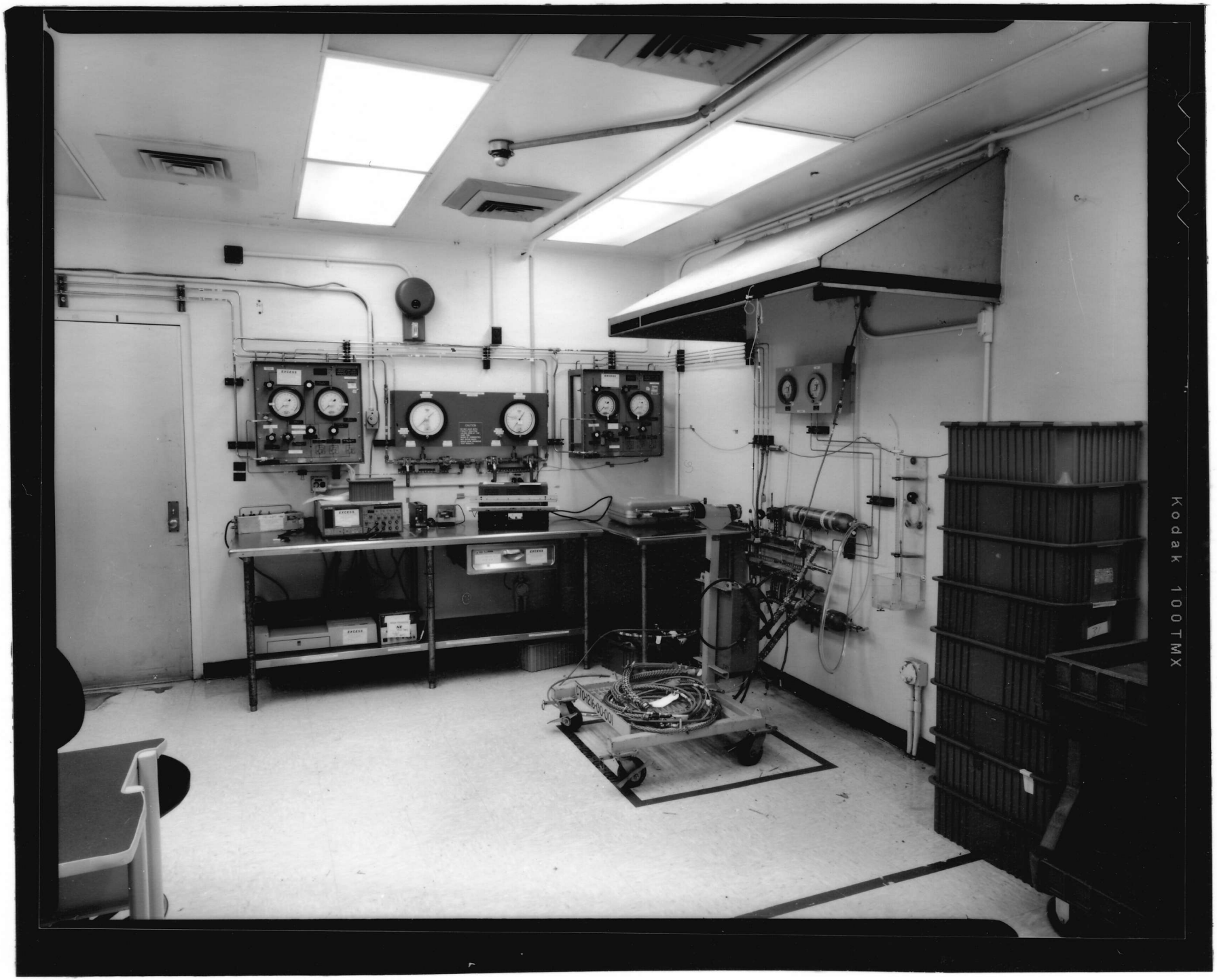

EXCESS
EXCESS
QUE ANALYZER CONTACT
BRADY - 7-2854 - 7-0306
USA
OXIDIZER
EXCESS
PPB
HMF
Kodak 100TMX


ESS HMPNLB:05
STEP DOWN
EMERGENCY EXIT ONLY
ATTENTION
WEST TEST CELL
CAUTION
Kodak 100TMX

We're Not FOD Free Yet
A TEAM COMMITTED TO EXCELLENCE
211-2B
Kodak 100TMX

FOD
FOREIGN OBJECT DEBRIS/DAMAGE
NASA • KSC
AED
201
Kodak 100TMX


3 SPARE PARTS
FLAMMABLE
Kodak 100TMX


Kodak 100TMX

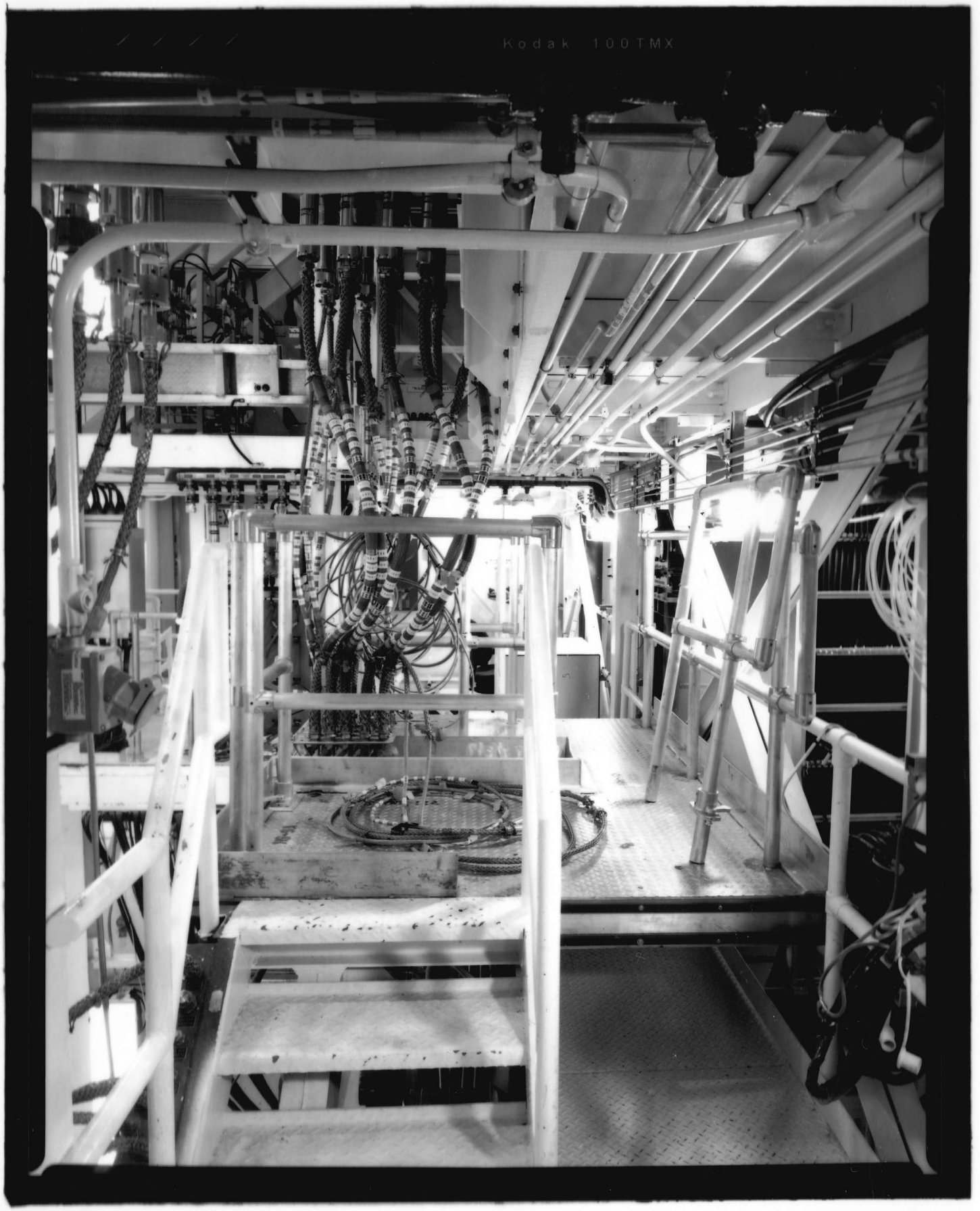

EXIT
ESS HMPNLB:02
FIRE ALARM
EXIT
CAUTION OPEN DOOR SLOWLY!
Kodak 100 TMX

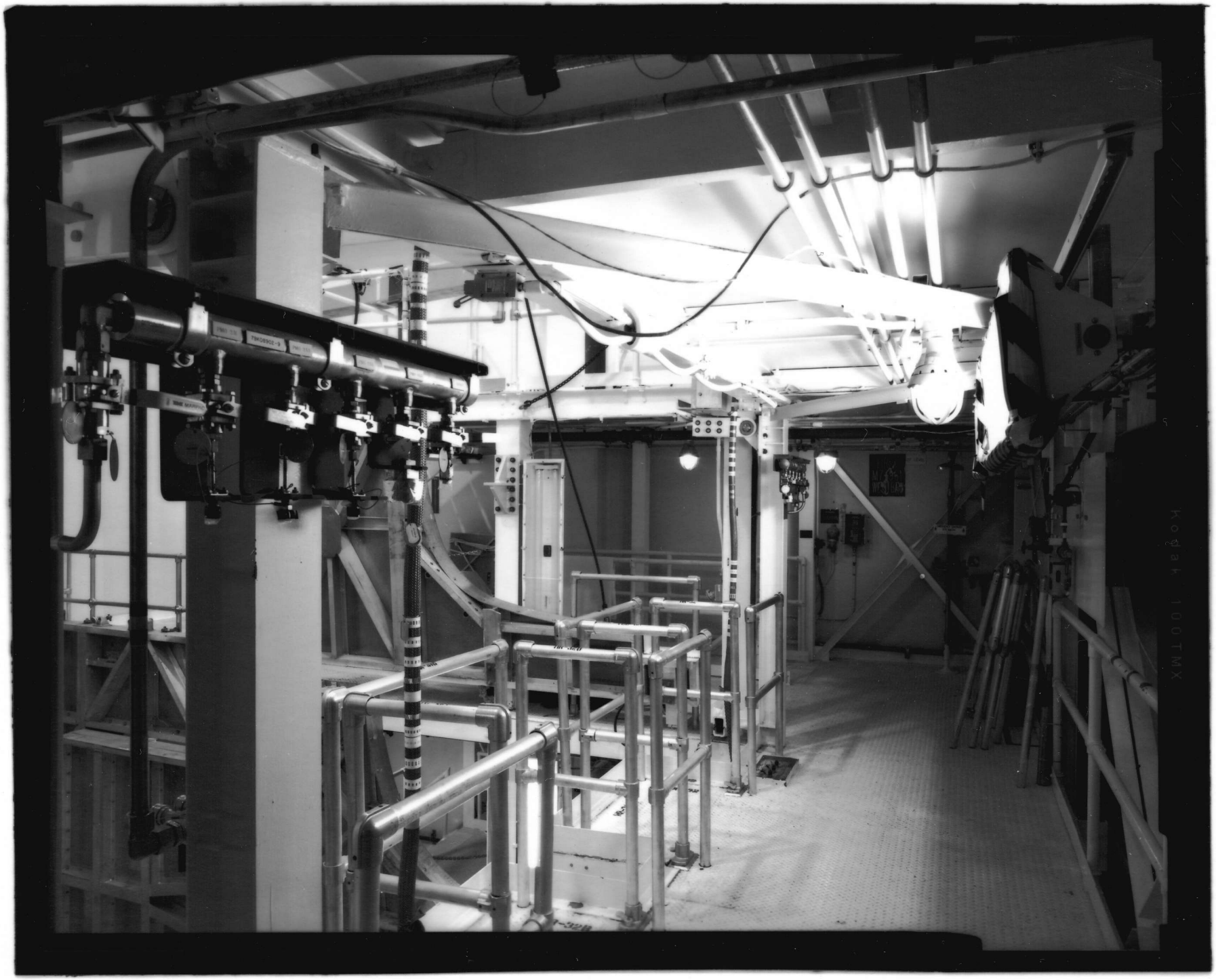

Kodak 100TMX


Kodak 100TMX

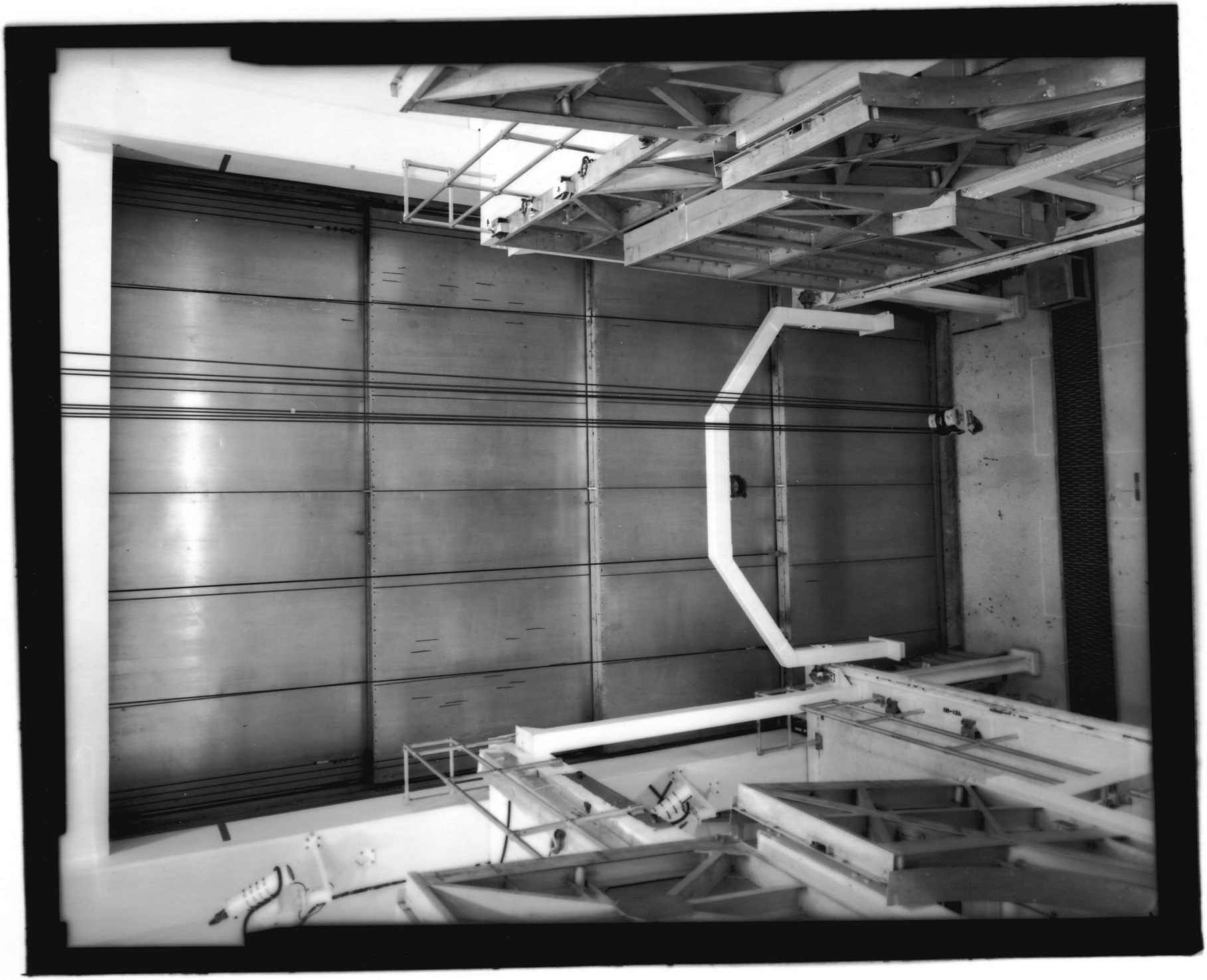
EXIT
EXIT

FIREX
EXIT
Kodak 100TMX


Kodak 100TMX


Kodak 100TMX

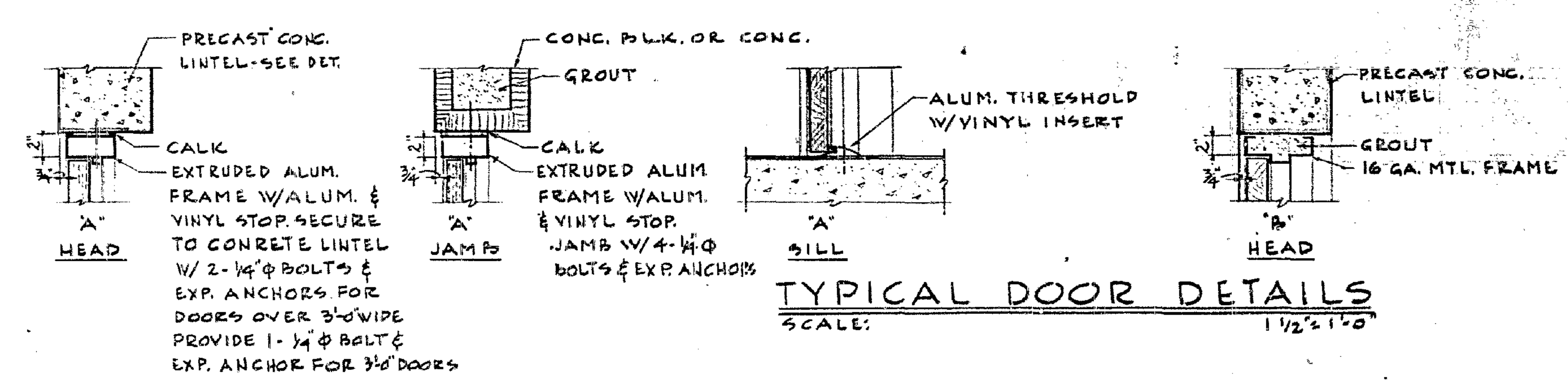

SHEPARD NILES
SHEPARD NILES
EXIT



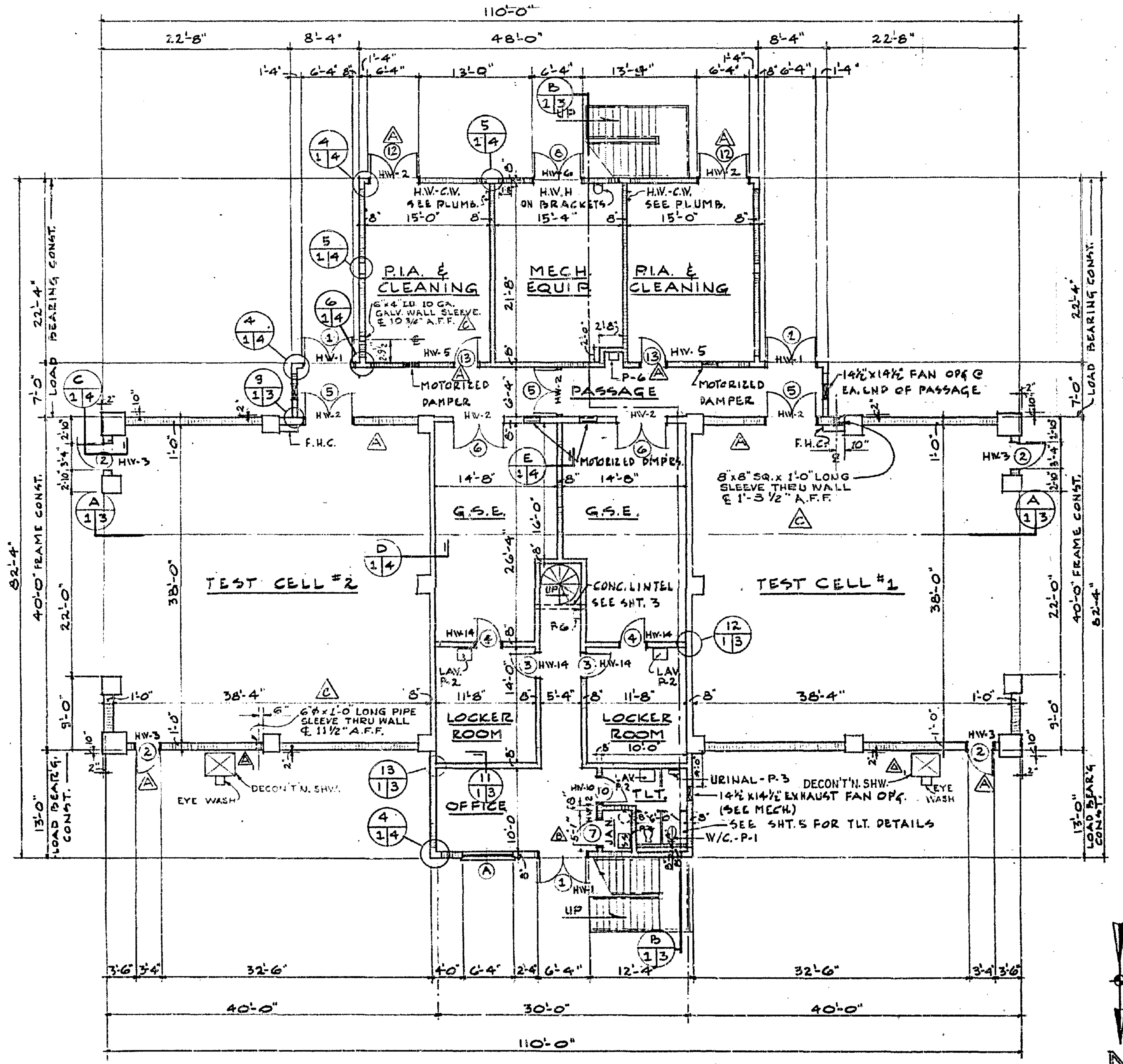

EXCESS
EXCESS
2112


EXCESS
Kodak 100TMX

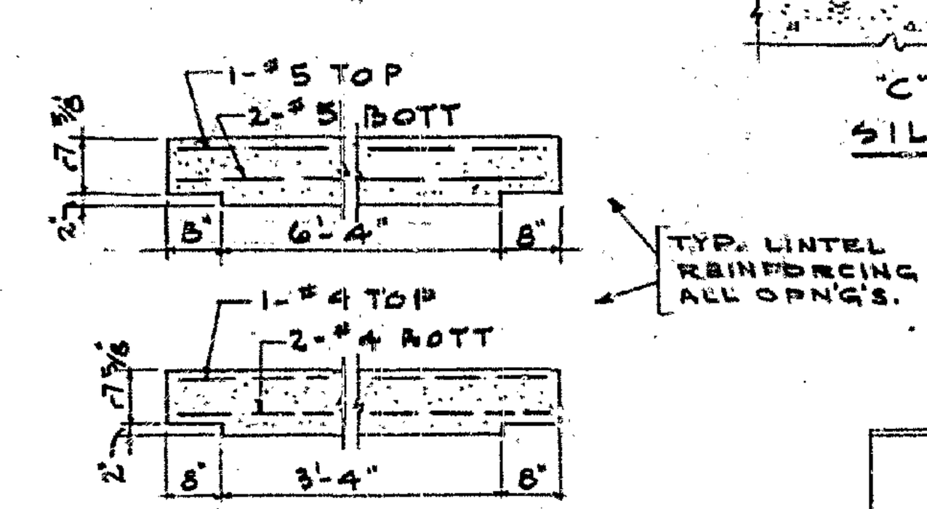

Kodak 100TMX
WEST CELL



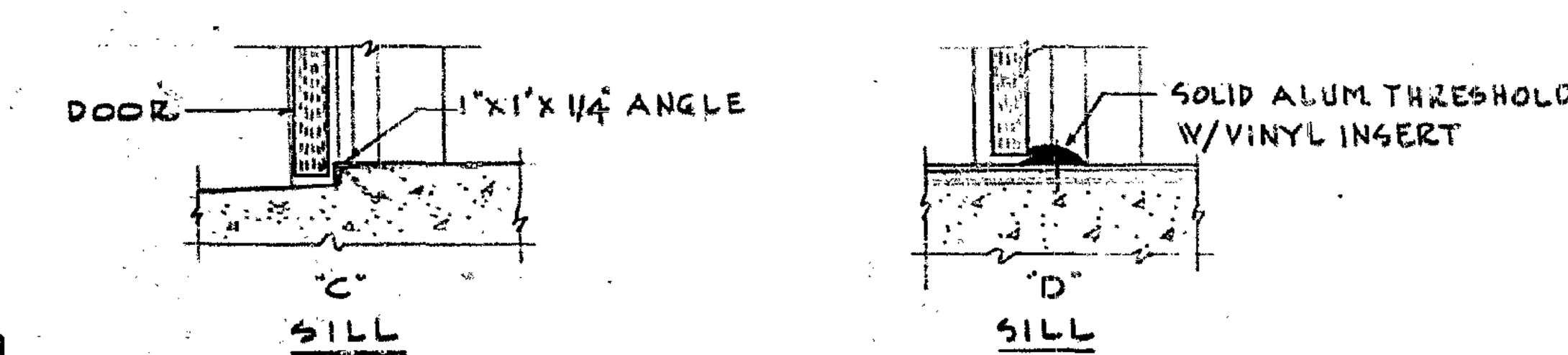
TYPICAL DOOR DETAILS
SCALE: 1 1/2"=1'-0"

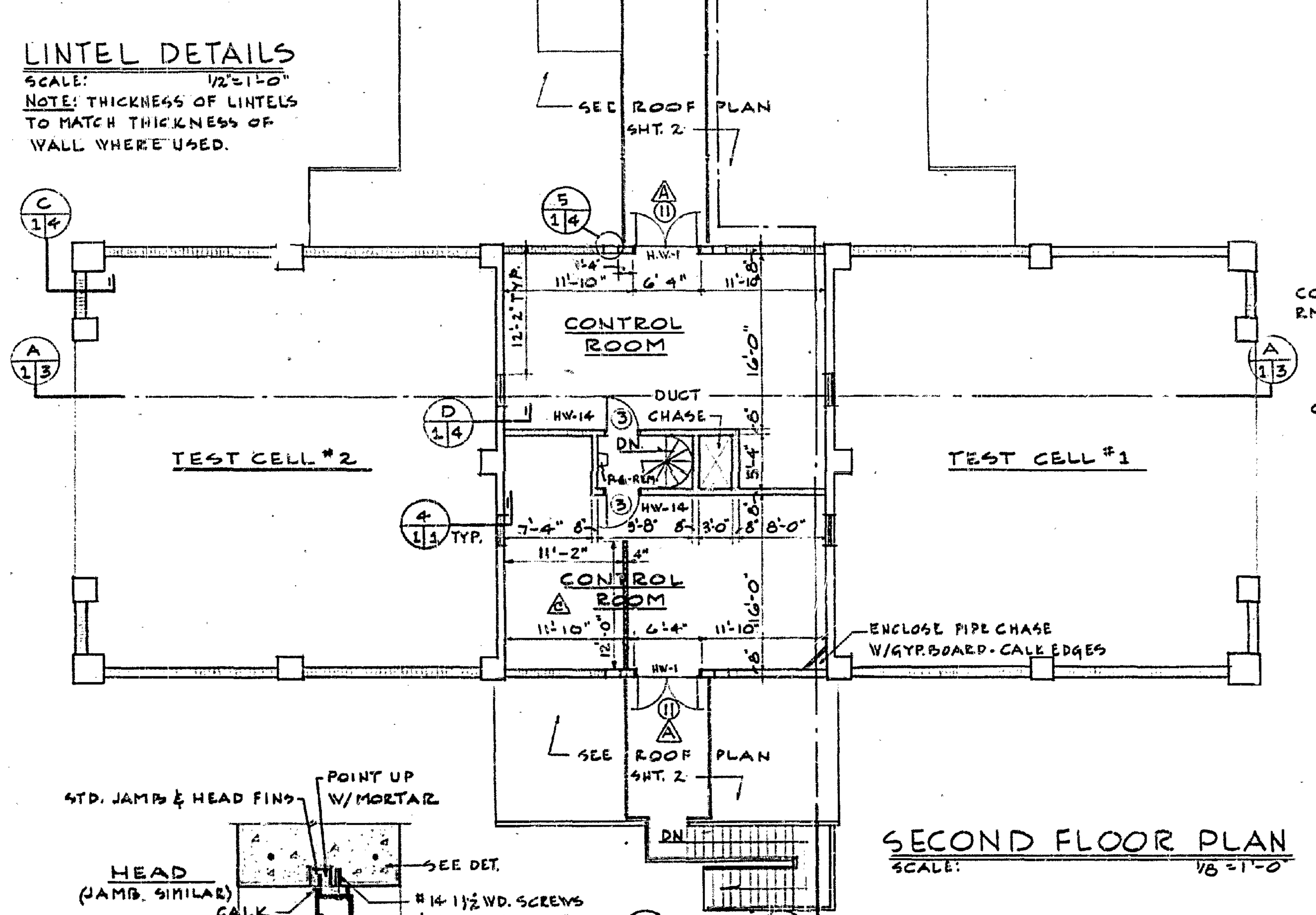


FIRST FLOOR PLAN
SCALE: 1/8"=1'-0"

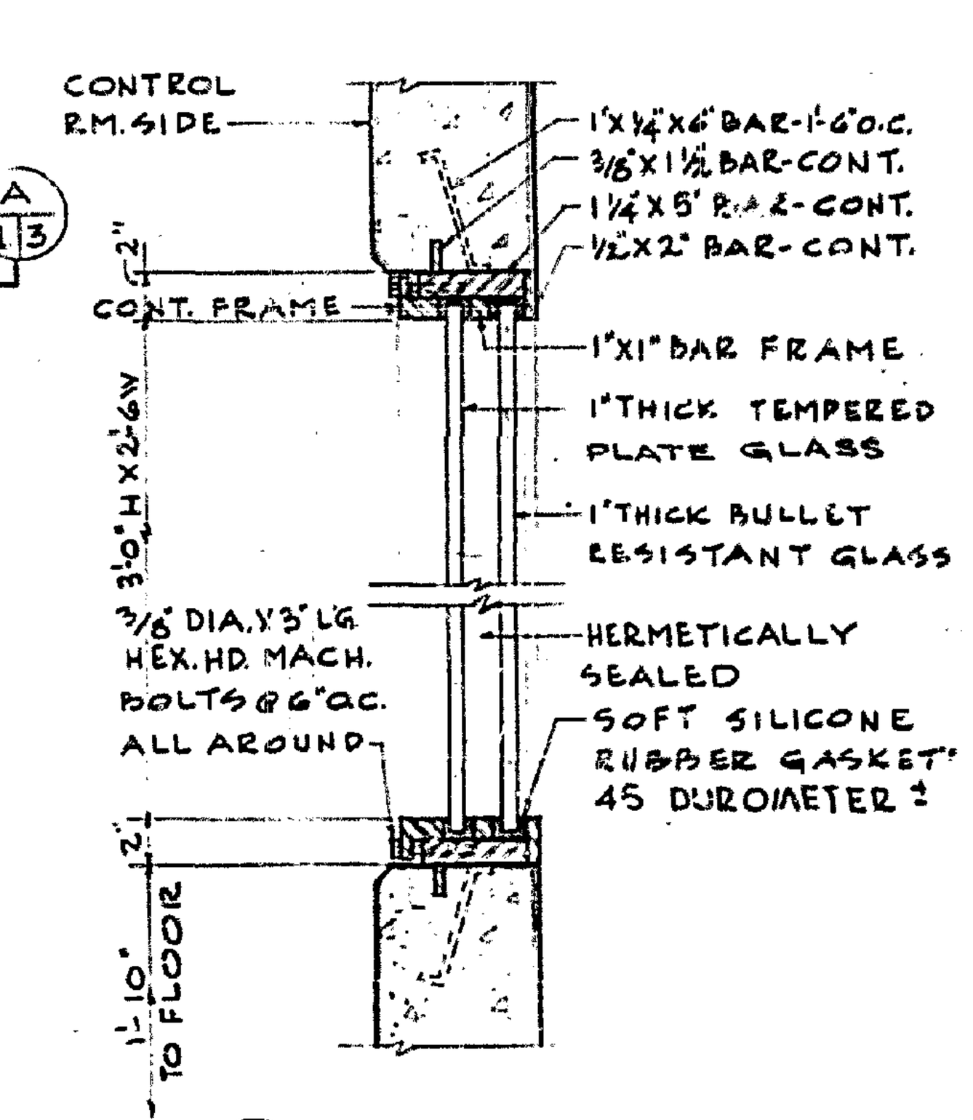


LINTEL DETAILS
SCALE: 1/2"=1'-0"
NOTE: THICKNESS OF LINTELS TO MATCH THICKNESS OF WALL WHERE USED.

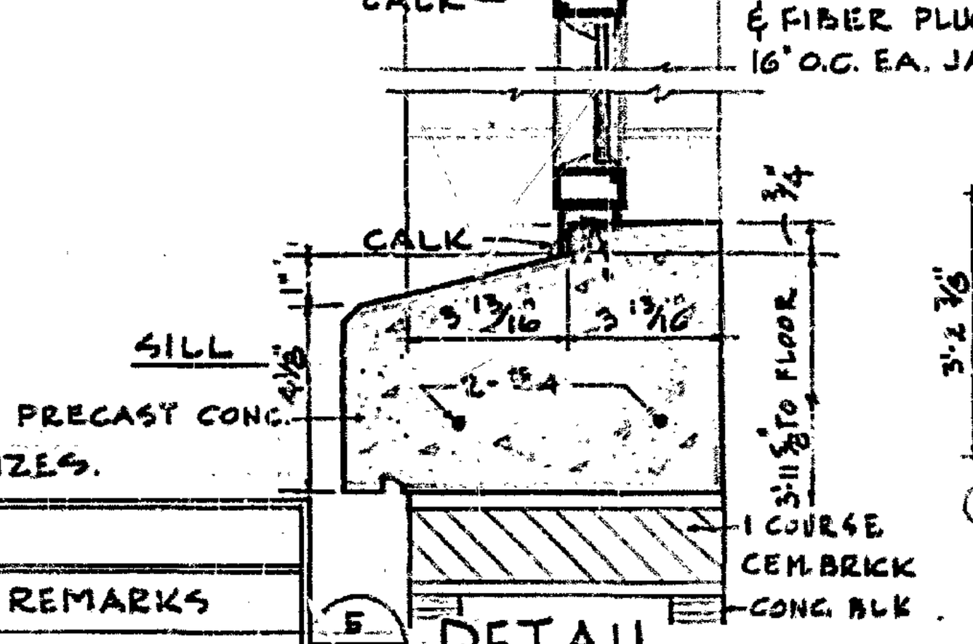




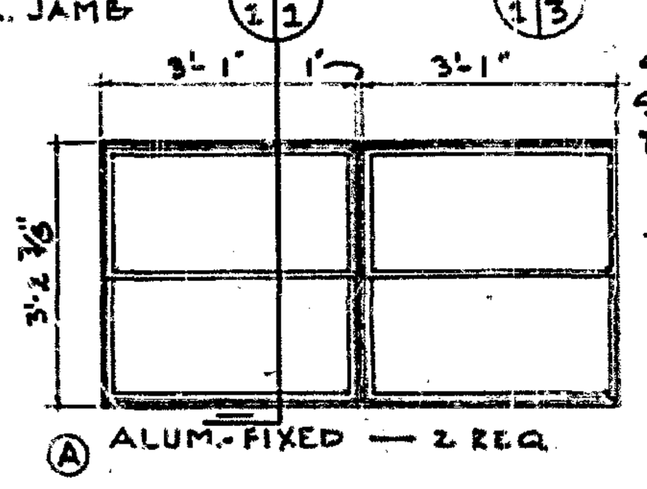
SECOND FLOOR PLAN
SCALE: 1/8"=1'-0"



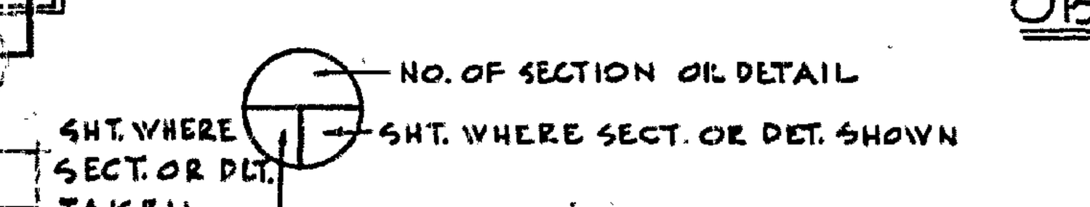
DETAIL
OBSERVATION WINDOW
SCALE: 1 1/2"=1'-0"



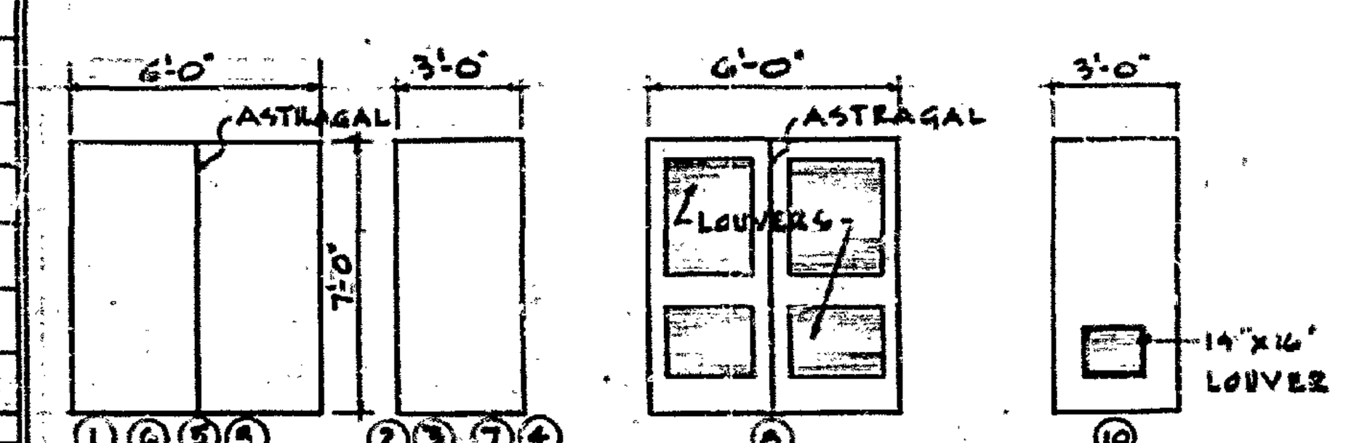
DETAIL
SCALE 3"=1'-0"



WINDOW SCHEDULE
SCALE: 1/2"=1'-0"



SECTION SYMBOL



DOOR ELEVATIONS
SCALE: 1/4"=1'-0"

REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
15	A	C3,C4 C5,A4	ADDED DOORS 11, 12 & 13; RELOCATED EYE WASH & SHOWER IN TEST CELLS & CHANGED SWINGS OF DOORS 2 TO ACC. MOD. TO CONTRACT	6-21-63	[illegible]
1	B	B-4	ENLARGE JANITOR CLOSET, TO ACCOMPANY MOD. (NASA)-1970 "H"	7/23/65	[illegible]
2	A	B,C4,5	MOVED EYE WASH & DECONTAMINATION SHOWER TO OUTSIDE OF TEST CELLS	11/27/66	[illegible]
5	C		ADDED PARTITION IN CONTROL ROOM TO ACCOMP. MOD. TO CONTR. NASA 1970	[illegible]	[illegible]

MATERIAL LEGEND
CONCRETE BLOCK
OR POURED CONC.

NOTE: ALL INTERIORS TO BE PAINTED ACCORDING TO SPEC'S.

ROOM FINISH SCHEDULE

AREA	FLOOR	BASE	WALLS	CEILING	REMARKS
TEST CELL #1 & 2	CONCRETE W/ SPARKPROOF TOP	———	CONC. BLK. & CONC.	*GYP. BOARD	*CLEAN RM. SEE SUSPENSION DET.
G.S.E.	VINYL ASB. T	RUBBER	CONC. BLK. & CONC.	*GYP. BOARD	* "
LOCKER RM'S.	"	"	"	* "	* "
OFFICE	"	"	CONC. BLK	*ACOUS. TILE	* "
TOILET	CERAMIC TILE	CER. TILE	CONC. BLK & 4'-0" CER. TILE	*GYP. BOARD	*SEE DET. & SPEC'S.
P.I.A. & CLEANING	VINYL SHT	RUBBER	CONC. BLK	*GYP. BOARD	*CLEAN RM. SEE SUSPENSION DET.
PASSAGE	VINYL ASB. T	"	"	* "	* "
MECH. EQUIP.	CONC.	"	"	* NONE	*SEE PAINT'G SPECS.
CONTROL RM'S.	VINYL ASB. T.	RUBBER	CONC. BLK. CONC. & GYP. BD.	*GYP. BOARD	*SEE SUSPENSION DET.
JANITOR	"	"	CONC. BLK.	* "	* "

NOTE: ALL MASONRY DIMENSIONS REFER TO NOMINAL SIZES.

DOOR SCHEDULE

MARK	SIZE	TYPE	FRAME	THRESH'LD	CLOSER	REMARKS
1	PR. 3'-0"x7'-0"x1 3/4"	HOL. ALUM	TYPE "A"	TYPE "A"	YES-EACH LEAF	WEATHERSTRIP
2	3'-0"x7'-0"x1 3/4"	"	"	"	YES, 1 ACTIVE LEAF	"
3	3'-0"x7'-0"x1 3/4"	WOOD, H.C.	TYPE "B"	"	YES	"
4	3'-0"x7'-0"x1 3/4"	"	"	TYPE "B"	NO	
5	PR 3'-0"x7'-0"x1 3/4"	HOL. ALUM.	TYPE "A"	TYPE "D"	YES, 1 ACTIVE LEAF	WEATHERSTRIP
6	PR 3'-0"x7'-0"x1 3/4"	WOOD S.C.	TYPE "B"	TYPE "D"	YES, 1 ACTIVE LEAF	"
7	3'-0"x7'-0"x1 3/4"	WOOD, H.C.	TYPE "B"	TYPE "B"	NO	OMIT CLOSER
8	PR 3'-0"x7'-0"x1 3/4"	HOL. ALUM.	TYPE "A"	TYPE "C"	NO	LOUVERED
9	PR. 3'-0"x7'-0"x1 3/4"	HOL. ALUM.	"	TYPE "A"	YES, 1 ACTIVE LEAF	NO EXT. HARDWARE WEATHERSTRIP
10	3'-0"x7'-0"x1 3/4"	WOOD S.C.	TYPE "B"	MARBLE	YES	14"x16" LOUVER
11	3'-6"x7'-0"x1 3/4"	HOL. ALUM.	TYPE "A"	TYPE "D"	YES, 1 ACTIVE	WEATHERSTRIP
12	3'-6"x7'-0"x1 3/4"	"	"	TYPE "A"	" , 1 "	NO EXT. HARDWARE, WEATHERSTRIP
13	3'-6"x7'-0"x1 3/4"	"	"	"	" , 1 "	WEATHERSTRIP

RECORD DRAWING NOTE
'Shall be,' 'Provide,' 'Install,' 'Remove,' etc. indicates work was accomplished under the contract.

AS BUILT
APPROVED BY [signature]
DATE 11 August 1964

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LAUNCH OPERATIONS CENTER

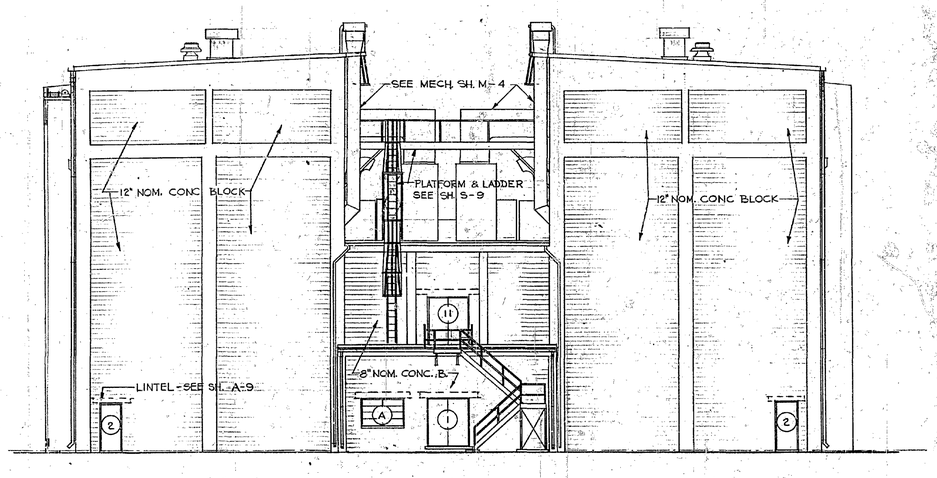
TAMPA BAY ENGINEERING CO. 151 TREASURE ISLAND CWY. ST. PETERSBURG 6, FLA.	U. S. ARMY ENGINEER DISTRICT, JAX. CORPS OF ENGINEERS JACKSONVILLE, FLA.

NASA MERRITT ISLAND LAUNCH AREA
MERRITT ISLAND, FLA.
FLUID TEST COMPLEX
ENVIRONMENTAL CONTROL SYSTEMS BLDG
ARCHITECTURAL FLOOR PLANS & DETAILS

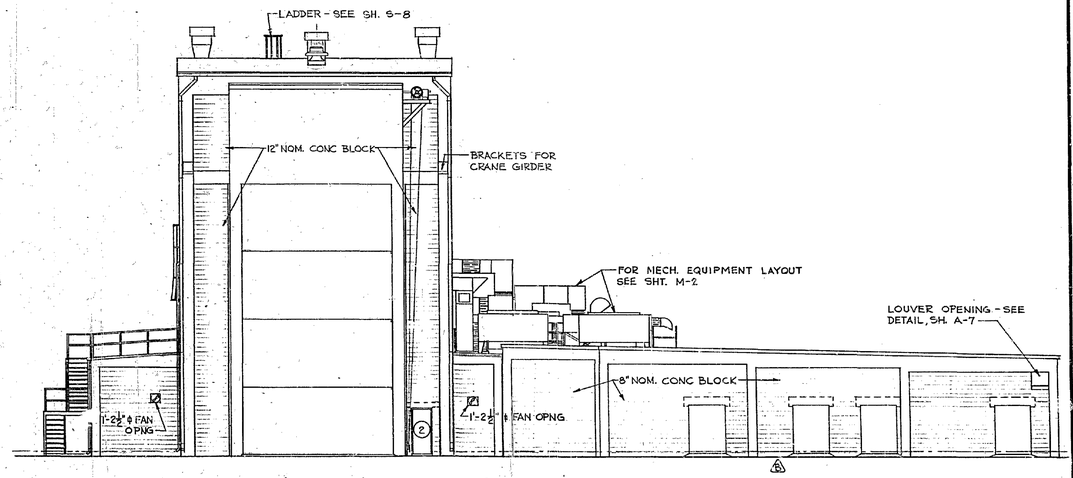
DRN BY C.P.C.	INV. NO. ENG. (NASA) 08-123-63-55 DATED: 5 MARCH 1963	SIZE F	FILE NO. 203-28,155
CKD BY O.C.R.S.	SCALE: AS NOTED	DATED: 2-15-63	SHEET 2 OF

D. O. File No. 203-28,155

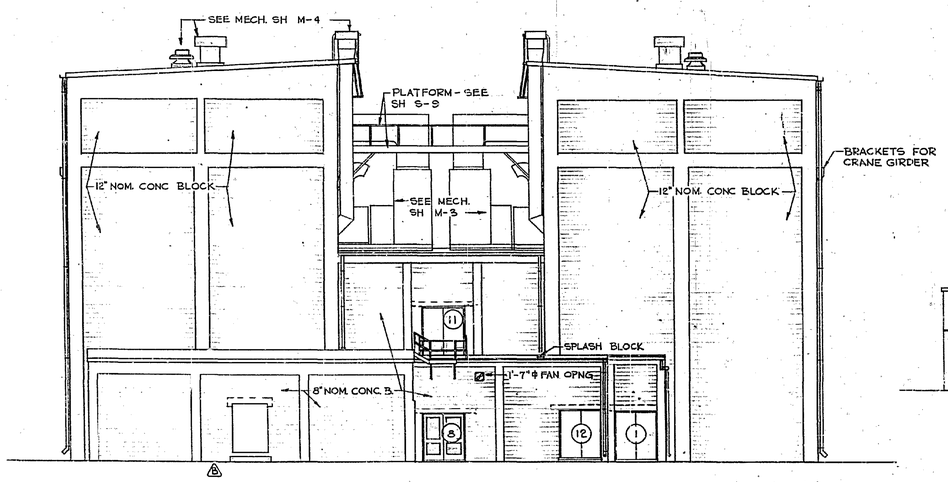
REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
4	A	D-2 D-4	RATING DOWNSPOUT TO GRD. LEVEL ON NORTH ELEV. CHG. TO ACC. MOD. TO CONT. NASA 1970	1/4/67	
3	B		UP-DATED FOR "F.R.D." - ADDED NEW BLDG. ADD.	1/14/65	



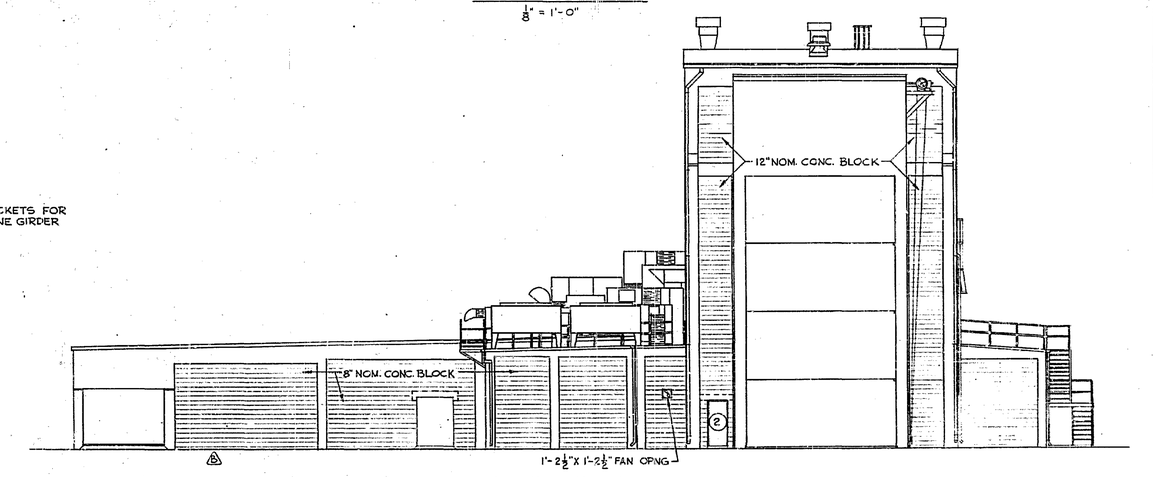
NORTH ELEVATION
1/8" = 1'-0"



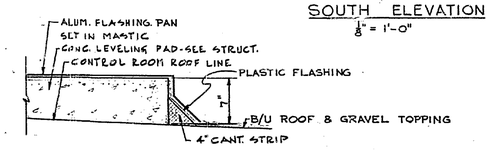
WEST ELEVATION
1/8" = 1'-0"



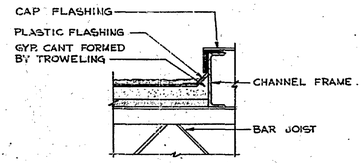
SOUTH ELEVATION
1/8" = 1'-0"



EAST ELEVATION
1/8" = 1'-0"



LEVELING PAD DETAIL (FOR ROOF MOUNTED MECH. EQUIP.)
1½" = 1'-0"



TYP. FAN CURB DETAIL
1½" = 1'-0"

NOTE:
FOR HEIGHTS & OTHER DIMENSIONS SEE FLOOR PLANS & SECTIONS

GRAPHIC SCALES
1/8" = 1'-0" 0' 5' 10' 15' 20'
1½" = 1'-0" 0 3' 6' 9' 1' 2'

NASA-KSC
FACILITY RECORD DRAWING
DRAWING NO. BC55.00.00.ADA002.00
DATE 5/16/67 APPROVED

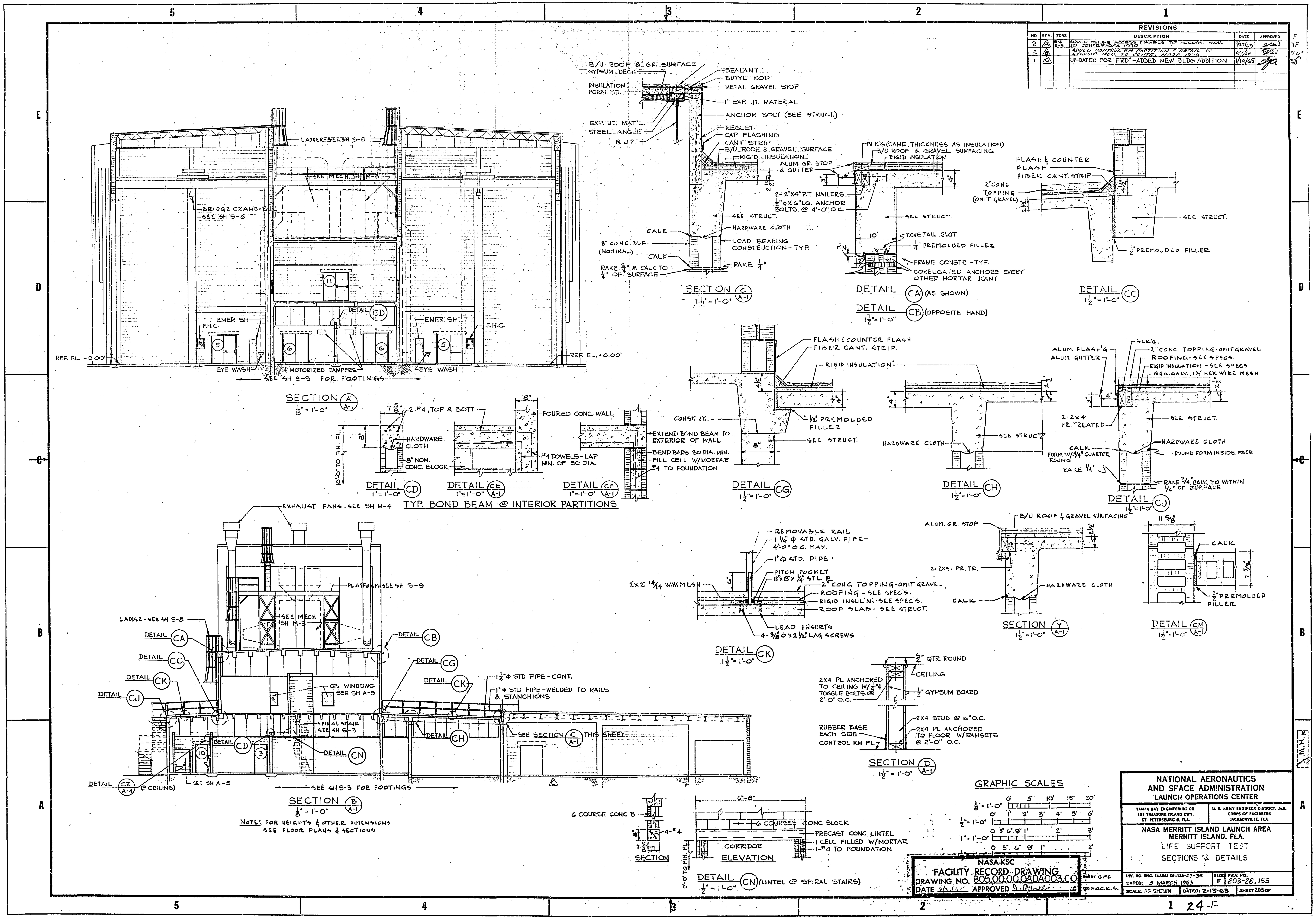
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LAUNCH OPERATIONS CENTER

TAMPA BAY ENGINEERING CO. 751 TREASURE ISLAND CWY. ST. PETERSBURG 6, FLA.	U. S. ARMY ENGINEER DISTRICT, JAX. CORPS OF ENGINEERS JACKSONVILLE, FLA.

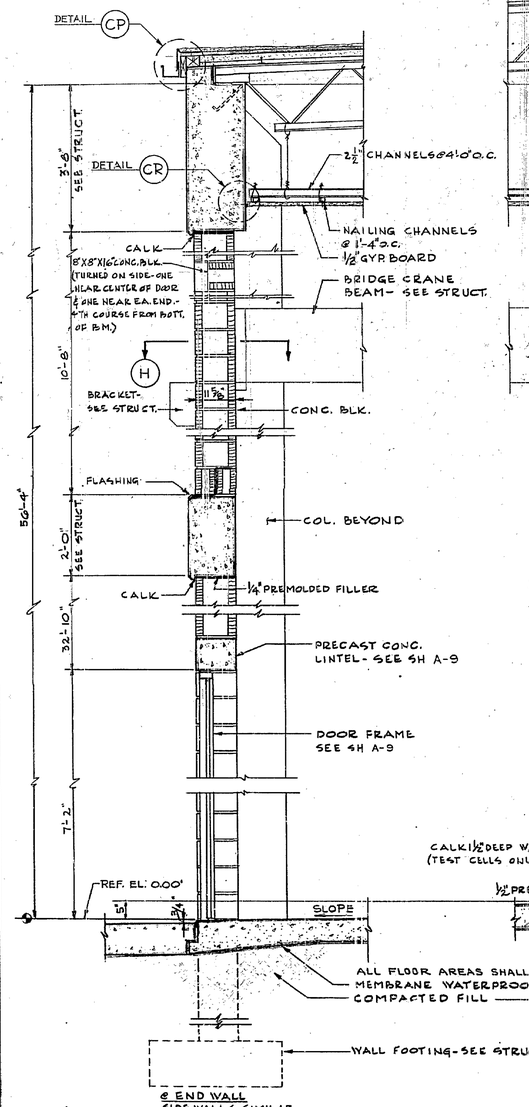
NASA MERRITT ISLAND LAUNCH AREA
MERRITT ISLAND, FLA.
LIFE SUPPORT TEST
ARCHITECTURAL ELEVATIONS

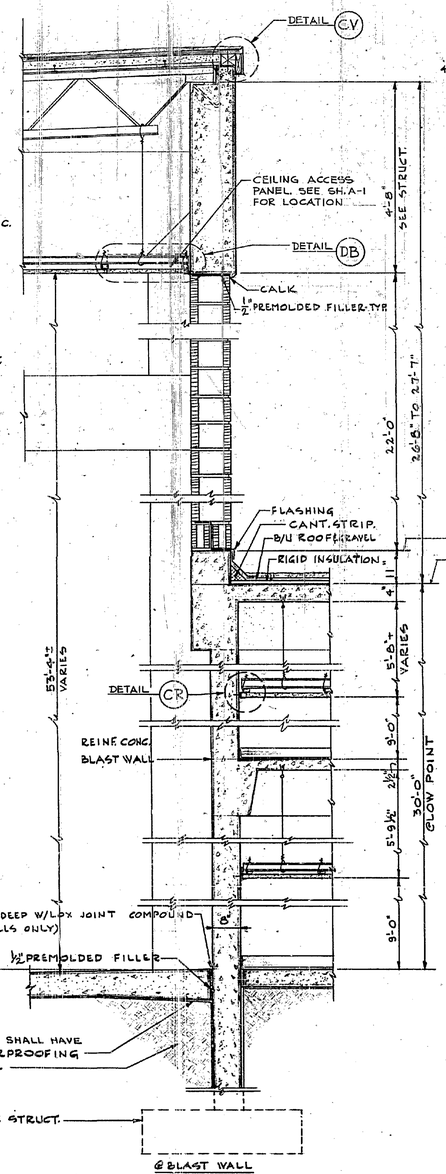
INV. NO. ENG. (NASA) 08-123-67-35		SIZE	FILE NO.
DATED: 5 MARCH 1963		F	203-28.155
SCALE: AS SHOWN	DATED: 2-15-63	SHEET 202 OF	

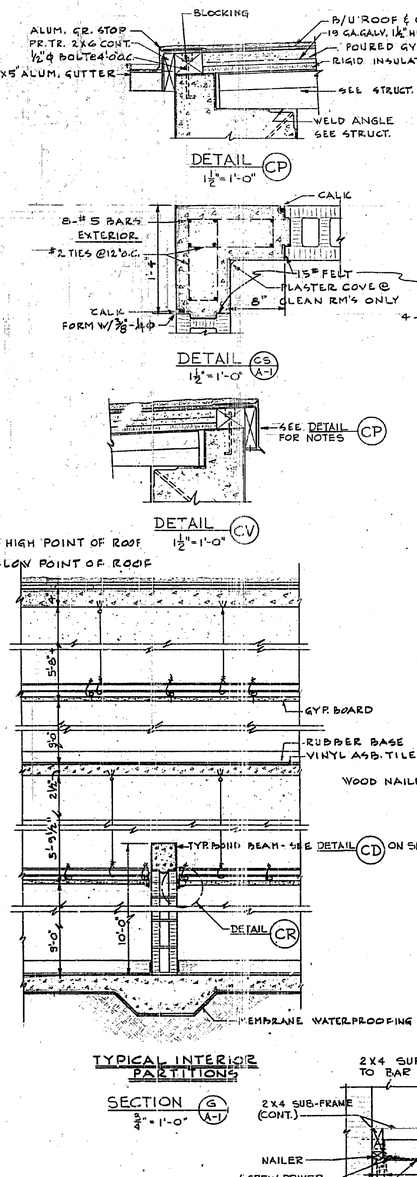
1 24F

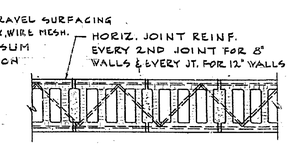


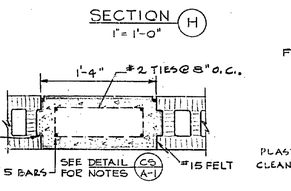
REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
3	3		ADDED CEILING ACCESS PANELS & DETAIL TO ACCOM. MOD "D CONTR #NAS9-1970	9/27/63	JCW
	4		UP-DATED FOR "FRD"	1/14/65	



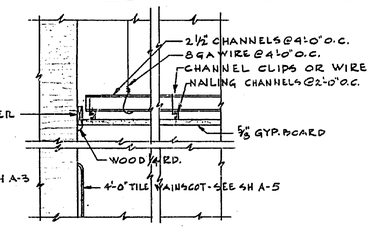


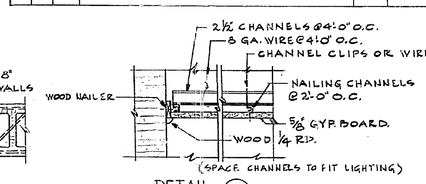


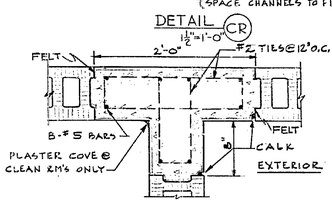


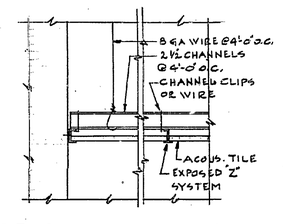


NOTE: INTERIOR COL. SIMILAR-SEE STRUCT.

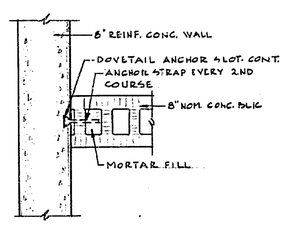




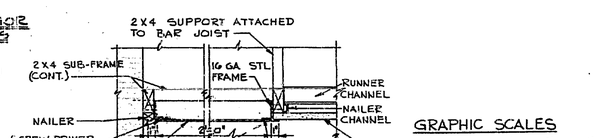




TYP. DETAIL OF CEILING @ OFFICE
1½"=1'-0"



TYPICAL INTERIOR PARTITIONS



GRAPHIC SCALES

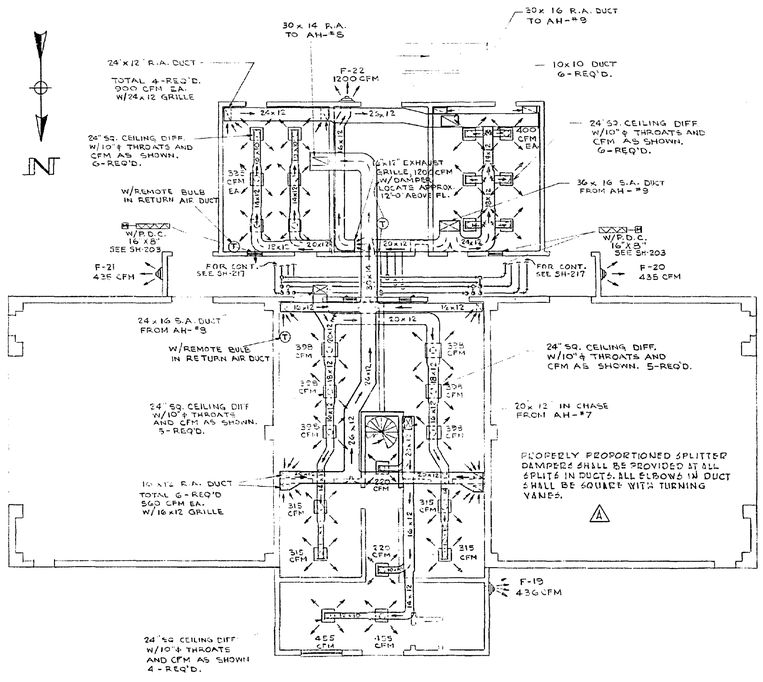
NASA-KSC
FACILITY RECORD DRAWING
DRAWING NO. B05.00.00.QA.DA.004.00
DATE 5/6/63 APPROVED

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION LAUNCH OPERATIONS CENTER	
TAMPA BAY ENGINEERING CO. 151 TREASURE ISLAND CWY. ST. PETERSBURG 6, FLA.	U. S. ARMY ENGINEER DISTRICT, JAX. CORPS OF ENGINEERS JACKSONVILLE, FLA.
NASA MERRITT ISLAND LAUNCH AREA MERRITT ISLAND, FLA.	
LIFE SUPPORT TEST SECTIONS & DETAILS	
DWN BY C.R.C.	
CHK'D BY O.C.E.S.	
DWY. NO. ENG. (NASA) 08-123-63-55	SIZE F
DATED: 5 MARCH 1963	FILE NO. 203-28,15-5
SCALE: AS SHOWN	DATED: 2-15-63
	SHEET 204 OF

1 24-15

B. K. ELLIOTT CO. 312 150 12-63

REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
1	1		REVISED TO CONFORM TO AMEND. #4	5/26/65	J.L.H.



FIRST FLOOR PLAN
SCALE: 1/8"=1'-0"

RECORD DRAWING
'Shall be,' 'Provide,' 'Install,' 'Remove,' etc. indicates work that was accomplished under the contract.

AS BUILT
APPROVED BY
DATE

SHEET	REFERANCE DWG'S.
217	BUILDING PLAN (2ND FL. & ROOF PLAN)
218	ELEVATIONS
219	FLOW DIAGRAM
220	EQUIP. RM. PLAN AND SECTION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LAUNCH OPERATIONS CENTER

TAMPA BAY ENGINEERING CO. 151 TREASURE ISLAND CWY. ST. PETERSBURG 6, FLA.

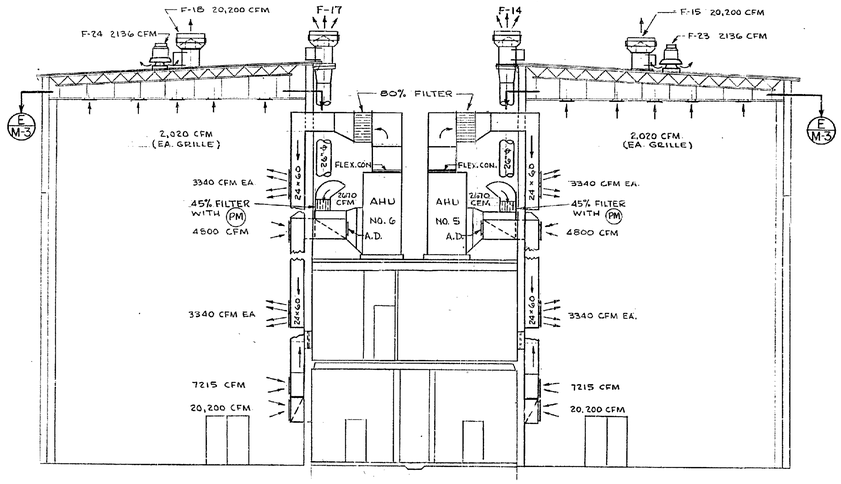
U. S. ARMY ENGINEER DISTRICT, JAX CORPS OF ENGINEERS JACKSONVILLE, FLA.

NASA MERRITT ISLAND LAUNCH AREA
MERRITT ISLAND, FLA.
FLUID TEST COMPLEX
E.C.S. BUILDING
AIR CONDITIONING DUCT L/O & DET (FIRST FLOOR)

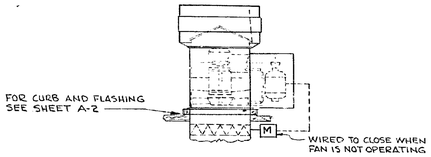
DRWN	CMT	INV. NO. ENG (NASA) OR-123-63-**	SIZE F
ENGR	SND MWS	DATED: 5 MARCH 1965	FILE NO. E-38-63
		SCALE: 1/8"=1'0"	DATED: 2-5-65 SHEET 216 OF

203-28.155

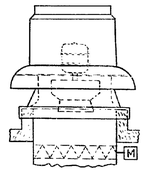
REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
3	3		REVISED SUPPLY AND RETURN DUCTS IN BOTH TEST CELLS	11/6/63	[illegible]
	2		UP-DATED FOR "ERD"	1/14/65	[illegible]



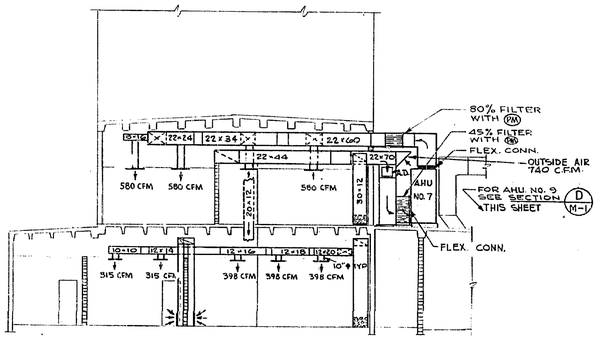
SECTION A M-3
1/8" = 1'-0"



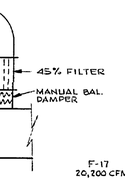
DETAIL - POWER ROOF VENTILATOR
SCALE - NONE



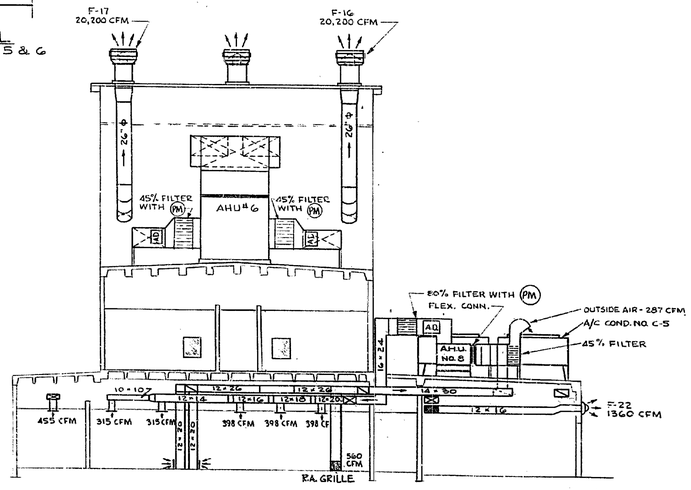
DETAIL - POWER ROOF VENTILATOR
NO SCALE



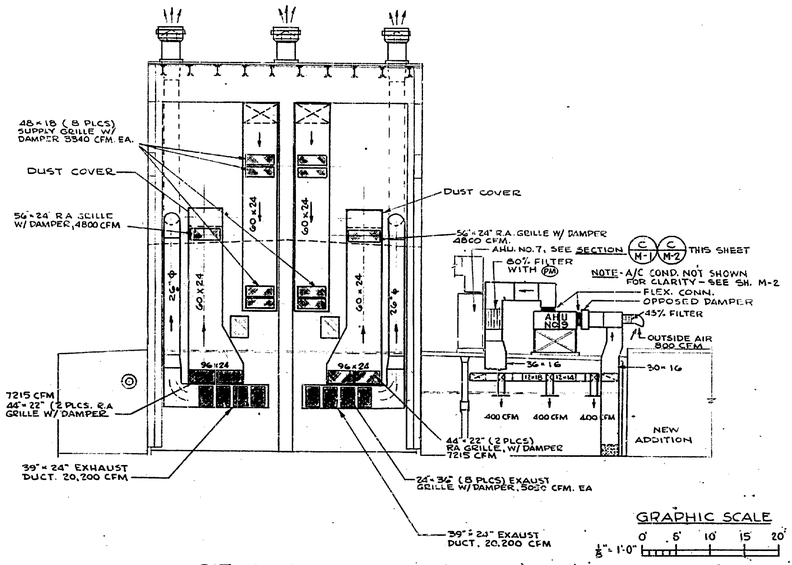
SECTION C C
M-1 M-2
1/8" = 1'-0"



DETAIL
TYPICAL - AHU 5 & 6
NO SCALE



SECTION B M-1
1/8" = 1'-0"



SECTION D M-1
1/8" = 1'-0"

GRAPHIC SCALE
0 5' 10' 15 20'
1/8" = 1'-0"

LEGEND	
B.D.D.	BACK DRAFT DAMPER
P.D.C.	PRESSURE DIFFERENTIAL CONTROLLED
A.D.	ACCESS DOOR
PM	PRESSURE DIFFERENTIAL MANOMETER
	RETURN OR EXHAUST AIR DUCT
	SUPPLY OR FRESH AIR DUCT
C	CEILING DIFFUSER
	OPPOSED BLADE DAMPER
M	MOTOR OPERATED DAMPER
T	THERMOSTAT--5'-0" ABOVE FLOOR
	VOLUME EXTRACTOR OR FLOW CONTROL
	SIDE WALL SUPPLY REGISTER
	SIDE WALL RETURN INLET
	CEILING RETURN INLET

NOTE :
1. ALL ACCESS DOORS FOR REPLACING FILTERS ARE WEATHER-TIGHT.

NASA-KSC
FACILITY RECORD DRAWING
DRAWING NO. 805.00.00.04DM004.00
DATE 6/24/66 APPROVED [illegible]
CHG BY S.N.D. M.W.P

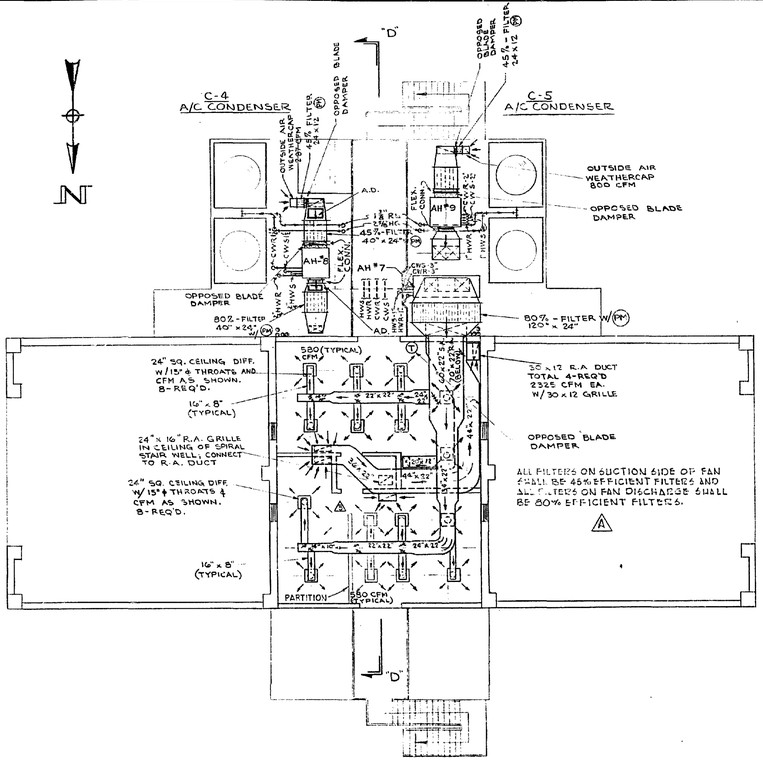
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LAUNCH OPERATIONS CENTER

TAMPA BAY ENGINEERING CO. 131 TREASURE ISLAND CWY. ST. PETERSBURG 6, FLA.	U. S. ARMY ENGINEER DISTRICT, JAX. CORPS OF ENGINEERS JACKSONVILLE, FLA.

NASA MERRITT ISLAND LAUNCH AREA
MERRITT ISLAND, FLA.
LIFE SUPPORT TEST
HEATING, VENTILATION & AIR CONDITIONING - SECTIONS

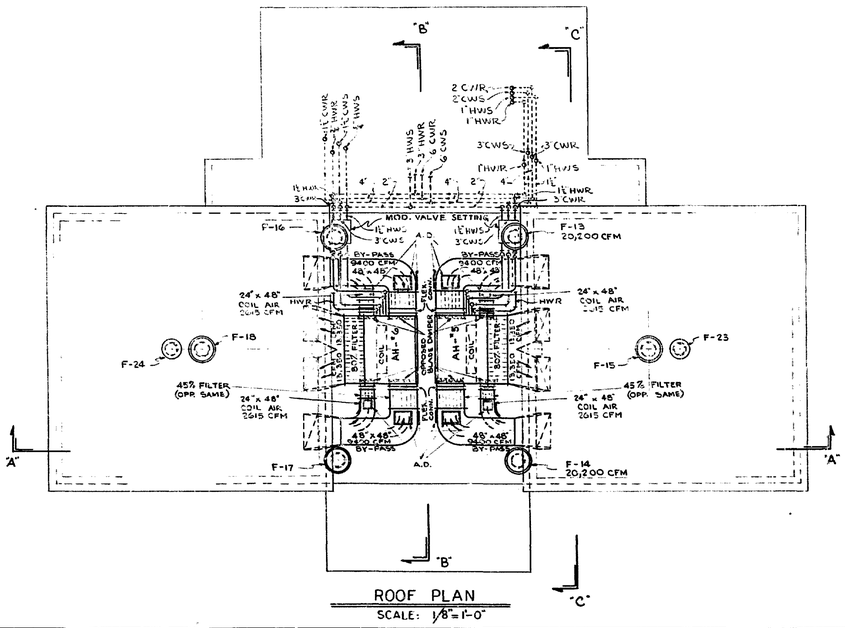
DRW. NO. ENG. (NASA) 08-123-63-39	SIZE F	FILE NO. 803-28,155	
DATED: 5 MARCH 1963			
SCALE: AS SHOWN	DATED:	SHEET 218 OF	

D.O. File No. ~~20-28-155~~ 1 24-F



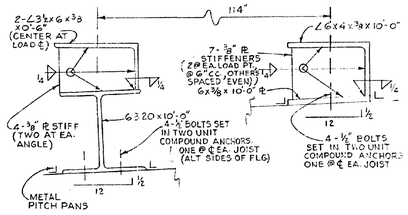
SECOND FLOOR PLAN

SCALE: 1/8" = 1'-0"



ROOF PLAN

SCALE: 1/8" = 1'-0"

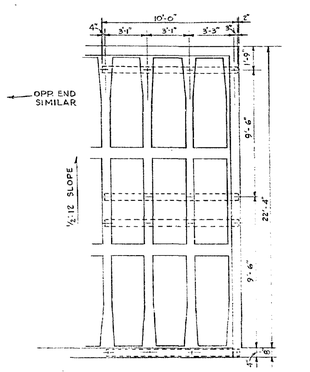


AIR-COOLED CONDENSER SUPPORTS

(TYP - FOUR UNITS, ECS BUILDING)

MSC, FLUID TEST FAC

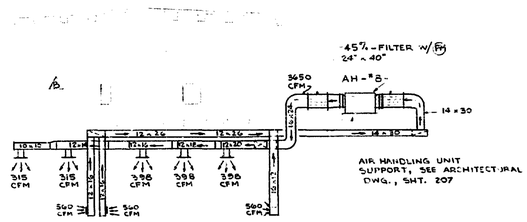
SCALE: 3"=1'-0"



AIR COOLED CONDENSER SUPPORTS

MSC FLUID TEST FAC.

SCALE: ½" = 1'-0"



SECTION "D-D"

SCALE 1/8"=1'-0"

REVISIONS					
NO.	SYM.	ZONE	DESCRIPTION	DATE	APPROVED
1	A		REVISED TO CONFORM TO AMEND. #4	5/21/63	J.L.H.
2	A		ADDED PARTITION IN CONTROL ROOM TO ACCOMODATE TO CONTRACT CHANGE 1370.	6/6/63	J.L.H.

EXHAUST FAN DATA

UNIT NO.	F-19	F-20, F-21	F-22	F-23, F-24	F-18, 14, 16, 17	F-15, 18
ZONE SERVED	CONTROL OFFICE, CORRIDOR, TOILET RM'S	P.I.A., G.S.E. LOCKERS PASSAGE	MECH. ROOM	TEST CELLS	TEST CELL FLOOR	TEST CELL CEILINGS
SIZE, INCHES TYPE UNIT	14.5 SQ	14.5 SQ	19 SQ.	19.5 SQ.	36 DIA. AXIAL	36 DIA. AXIAL
DRIVE	DIRECT	DIRECT	DIRECT	DIRECT	V-BELT	V-BELT
FAN CAPACITY MAX. CFM (DESIGN)	4360	6700	13,600	23,700	20,200	20,200
TOTAL STATIC PRESS (DESIGN) IN H₂O	⅛	⅛	⅛	⅛	1.25	0.5
FAN OUTLET VEL FPM. (MAXIMUM)	—	—	—	—	2800	2800
FAN SPEED (MAXIMUM) RPM	1100	1650	1140	1140	1155	993
FAN MOTOR H.P (APPROX.)	1/30	1/10	⅛	⅓	7.5	5.0
MOTOR SPEED RPM	1100	1650	1140	1140	1800/1200	1800
MOTORIZED DAMPER	YES	YES	NO*	YES	YES	YES
DIFFERENTIAL PRESS. CONTROL	YES	YES	NO	YES	NO	NO

* BACKDRAFT DAMPER ONLY

RECORD DRAWING NOTE

'Shall be,' 'Provide,' 'Install,' 'Remove,' etc. indicates work was accomplished under the contract.

AS BUILT

APPROVED BY: C. G. Lambros

DATE 11 August 1964

M.W.P.

SHEET	REFERENCE DWG'S
216	BUILDING PLAN (1ST. FL.)
217	BUILDING PLAN (2ND FL. & RF PLAN)
218	ELEVATIONS
219	FLOW DIAGRAM
220	EQUIP. RM. PLAN & SECTIONS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LAUNCH OPERATIONS CENTER

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U. S. ARMY ENGINEER DISTRICT, JAX. CORPS OF ENGINEERS JACKSONVILLE, FLA.

NASA MERRITT ISLAND LAUNCH AREA
MERRITT ISLAND, FLA.

FLUID TEST COMPLEX
ENVIRONMENTAL CONT. SYST'S BLD'G
HEATING, VENTILATING & AIR COND.
SECOND FLOOR & ROOF - PLAN

DWN BY HOLUBEC
CHD BY SND M-W-P

INV. NO. ENG. (NASA) OR-123-63-35
DATED: 5 MARCH 1963
SCALE: AS SHOWN
SIZE F
FILE NO. 203-28,155
DATED 2-15-63
SHEET 217 OF

D. O. File No. 203-28,155