CAPE CANAVERAL AIR FORCE STATION, LAUNCH COMPLEX 39, FLIGHT CREW TRAINING BUILDING

HABS No. FL-581-C

(Engineering Development Laboratory)
(John F. Kennedy Space Center)
Southeast corner of Second Street/Avenue E intersection
Cape Canaveral
Brevard County
Florida

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Buildings Survey
National Park Service
U.S. Department of the Interior
100 Alabama Street, SW
Atlanta, GA 30303

HISTORIC AMERICAN BUILDINGS SURVEY

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Location: Southeast corner of Second Street/Avenue E intersection
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The Flight Crew Training Building (FCTB; renamed the Engineering Development Laboratory [EDL] circa 1985)[1] is located within the Industrial Area of the Kennedy Space Center (KSC), at latitude: 28.522579, longitude: -80.642253. These coordinates were obtained on March 12, 2013, through Google Earth™. The coordinates datum are North American Datum 1983.

Present Owner: National Aeronautics and Space Administration (NASA)
Kennedy Space Center, FL 32899-0001

Present Use: Laboratory facility

Significance: The FCTB was determined eligible for listing in the National Register of Historic Places in 2013, in recognition of its importance at the national level in the context of the Apollo Program (ca. 1961-1975). It is significant under Criterion A in the area of space exploration, and under Criterion B for its association with the Apollo astronauts. The FCTB derives its primary significance from the High Bay area at the south of the building, which was designed for the unique purpose of astronaut training. The facility was modeled after the astronaut training facilities at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas; the astronauts underwent general training at JSC and more specific mission training at KSC.[2]

Historian: Patricia Slovinac, Architectural Historian
Archaeological Consultants, Inc. (ACI)
8110 Blaikie Court, Suite A
Sarasota, Florida 34240

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[1] For ease of discussion, the historic name, Flight Crew Training Building (FCTB) will be used throughout the document.

[2] David Price, "Architectural Survey and Evaluation of 45 Facilities That Have Reached the Age of 45-50 Years, John F. Kennedy Space Center, Brevard County, Florida" (survey report, New South Associates, Stone Mountain, GA, 2013), 70.

Date: March 2014

Project Information: The documentation of the Cape Canaveral Air Force Station (CCAFS), Launch Complex 39, Flight Crew Training Building (Engineering Development Laboratory) was conducted in 2013 for KSC by ACI, under contract to InoMedic Health Applications (IHA), and in accordance with KSC's Programmatic Agreement Regarding Management of Historic Properties, dated May 18, 2009. The field team consisted of architectural historian, Patricia Slovinac (ACI), and independent photographer, Penny Rogo. Assistance in the field was provided by Barbara Naylor, KSC Historic Preservation Officer, and Nancy English, KSC Cultural Resource Specialist. The written narrative was prepared by Ms. Slovinac; it was edited by Joan Deming, ACI Project Manager; Elaine Liston, KSC Archivist; Ms. Naylor; Ms. English; and Jane Provancha, Environmental Projects-Manager, IHA. The photographs and negatives were processed by Zebra Color, Inc., an independent photography/processing studio.

The Scope of Services for the project, which was compiled based on the Programmatic Agreement, specifies a documentation effort following Historic American Buildings Survey (HABS) Level II standards. Information for the written narrative was primarily gathered through informal interviews with current NASA and contractor personnel and research materials housed at the KSC Archives Department. A search for historic photographs also was conducted at the Kennedy Institutional Imaging Facility. Selected drawings were provided by KSC's Engineering Documentation Center, which serves as the repository for all facility drawings. The available drawings for the FCTB include the "as-built" drawings, as well as those depicting minor modifications that required a set of drawings (such as changes to the electrical or mechanical systems). KSC does not periodically produce drawings of their facilities to show current existing conditions.

LEGEND OF ACRONYMS

ACI	Archaeological Consultants, Inc.
ACOE	Army Corps of Engineers
AMR	Atlantic Missile Range
AS	Apollo-Saturn
CCAFS	Cape Canaveral Air Force Station
CSM	Command/Service Module
EDL	Engineering Development Laboratory
EST	Eastern Standard Time
FCTB	Flight Crew Training Building
JSC	Johnson Space Center
IHA	InoMedic Health Applications
ISS	International Space Station
KSC	Kennedy Space Center
LC	Launch Complex
LEM	Lunar Excursion Module
LOC	Launch Operations Center
LOD	Launch Operations Directorate
MILA	Merritt Island Launch Area
MR	Mercury-Redstone
MSC	Manned Spacecraft Center
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
O&C	Operations and Checkout (Building)
SA	Saturn-Apollo
SSP	Space Shuttle Program
STS	Space Transportation System
U.S.	United States
VAB	Vehicle Assembly Building

Part I. Historical Information

A. Physical History:

1. Date of construction: The original portion of the FCTB was constructed between December 1964 and June 1966 (Figure No. A-1). The eastern addition was constructed in 1967.[3]

2. Architects/engineers: Both the original portion and addition were designed by Broadfoot & Mathis Architects-Engineers of Jacksonville, Florida, and the United States (U.S.) Army Corps of Engineers (ACOE) of Merritt Island, Florida.[4]

3. Original and subsequent uses: Originally, the FCTB contained three Apollo Program simulators for astronaut training (two of the Command/Service Module [CSM] and one of the Lunar Excursion Module) and various support areas. In the 1970s, the facility was utilized by the Space Shuttle Launch Processing System Task Team. Since then, the FCTB has been used as a laboratory facility, as reflected by its circa 1985 name change to the EDL.

4. Builder: The original portion of the facility was built by Smith & Sapp Construction Company, Orlando, Florida.[5] The consulted sources did not contain information on the construction contractor for the eastern addition to the FCTB. This information is unknown.

5. Original plans and construction: The plans for the original section of the FCTB were completed in October 1964; it was constructed between December 1964 and June 1966. The original facility was rectangular in plan and contained roughly 34,285 square feet in total. Of this space, approximately 12,900 square feet comprised office and operational support areas at the north end; 6,600 square feet was the Low Bay area in the middle; and 11,000 square feet served as the High Bay area at the south end.[6]

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[3] NASA KSC, "Real Property Record, Engineering Development Laboratory," on file, KSC Real Property Office; Broadfoot & Mathis Architects-Engineers, Jacksonville, "Flight Crew Training Building Additions," November 1966, on file, KSC Engineering Documentation Center; "Whole Lot of Construction Going On," *Spaceport News*, April 13, 1967, 3; "Major KSC Facilities Completed during 1967," *Spaceport News*, January 4, 1968, 5.

[4] Broadfoot & Mathis Architects-Engineers, Jacksonville, "MSC Flight Crew Training Building," October 1964, on file, KSC Engineering Documentation Center; Broadfoot & Mathis, "Building Additions."

[5] NASA KSC, "Engineering Development Laboratory;" D.O. Black, "Construction Cost-FY-1965 Flight Crew Training Building," memo to HA/Manager, MSC-Florida Operations, December 14, 1964, Sweetsir Collection, Box 14B.2, Folder: Memoranda & Charts 1962-1965, KSC Archives Department, Florida.

[6] NASA KSC, *Apollo/Saturn V MILA Facilities Descriptions* (Florida: Kennedy Space Center, 1965), 3-15, on file at KSC Archives Department; Black, "Flight Crew Training Building."

6. Alterations and additions: In 1967, a two-story, approximately 31,030 square foot addition was constructed to the east of the original building (Figure No. A-1). This addition extended the High Bay area and provided additional support equipment and programming spaces between the two floor levels.[7] Throughout its existence, the interior of the FCTB has undergone modifications as technology changed and/or as new space programs brought different requirements. Nearly all of the original rooms have been subdivided into offices or laboratory areas; the equipment rooms, restrooms, and stairwells are the only spaces left unaltered.

B. Historical Context:

Introduction

Following the launch of Sputnik I and Sputnik II, which placed Soviet satellites into Earth's orbit in 1957, the attention of the American public turned to space exploration. President Dwight D. Eisenhower initially assigned responsibility for the U.S. Space Program to the Department of Defense. The Development Operations Division of the Army Ballistic Missile Agency, led by Dr. Wernher von Braun, began to focus on the use of missiles to propel payloads, or even a man, into space. The United States successfully entered the space race with the launch of the Army's scientific satellite Explorer I on January 31, 1958, using a modified Jupiter missile named Juno I.[8]

With the realization that the military's involvement in the space program could jeopardize the use of space for peaceful purposes, President Eisenhower formed NASA on October 1, 1958, as a civilian agency with the mission of carrying out scientific aeronautical and space exploration, both manned and unmanned. At this time, several Army facilities at CCAFS were given to NASA, including various offices and hangars, as well as launch complexes (LCs) 5, 6, and 26. Within one year of its establishment, NASA formulated the basics for its first three Manned Space Programs: Project Mercury (ca. 1958-1963), Project Gemini (ca. 1959-1966), and the Apollo Program (ca. 1959-1975).

During NASA's formative years, the Agency worked with the Army Ballistic Missile Agency's Development Operations Division, as it provided the Redstone rockets for the early Project Mercury missions and was in the process of developing the Saturn rocket, which would be used in Apollo. The Development Operations Division had maintained its Missile Firing Laboratory, under the direction of Dr. Kurt H. Debus, at CCAFS since 1951 to supervise the experimental

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[7] Broadfoot & Mathis, "Building Additions;" NASA KSC, "Engineering Development Laboratory."
[8] Charles D. Benson and William B. Faherty, *Gateway to the Moon. Building the Kennedy Space Center Launch Complex* (Gainesville, FL: University Press of Florida, 2001), 1-2.

launches of the Redstone missile.[9] On March 15, 1960, President Eisenhower officially transferred the Development Operations Division to NASA, naming the new installation the George C. Marshall Space Flight Center (MSFC). Two months later, the Missile Firing Laboratory oversaw the first test flight of a Redstone modified for Project Mercury, which launched from LC 5 at CCAFS.[10]

On July 1, 1960, the Missile Firing Laboratory, along with the Atlantic Missile Range (AMR) Operations Office, became the Launch Operations Directorate (LOD) and was absorbed by MSFC.[11] Over the next two years, the LOD assisted NASA in the launch of five additional Redstone rockets as part of Project Mercury. This included three test flights (Mercury-Redstone (MR)-1, MR-1A, and MR-2), and two manned launches (MR-3 and MR-4), which carried Alan B. Shepard, Jr. and Virgil I. "Gus" Grissom to space, respectively. The LOD also launched one test flight for the Apollo Program, Saturn-Apollo (SA)-1 from LC 34 on October 27, 1961, the first test flight of the Saturn I vehicle.[12]

NASA's John F. Kennedy Space Center

On May 25, 1961, sixteen days after the flight of Alan Shepard, President John F. Kennedy charged NASA with putting a man on the Moon by the end of the decade. With the Agency's decision to use the powerful Saturn V launch vehicle, it was apparent that a new launch complex was required, and CCAFS, already with twenty-two launch complexes, did not have the space for new rocket facilities. After an evaluation of nine potential launch sites throughout the U.S. and nearby islands, NASA chose to acquire land on Merritt Island, an undeveloped area west and north of the existing CCAFS missile launching area. By September 1961, the initial master plan for what would initially be referred to as NASA's Merritt Island Launch Area (MILA) was completed. In late 1962, NASA began to gain title to the land, with the ACOE acting as

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[9] Francis E. Jarrett, Jr. and Robert A. Lindemann, *Historical Origins of NASA's Launch Operations Center to July 1, 1962* (Cocoa Beach, FL: John F. Kennedy Space Center, 1964), http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19670031213_1967031213.pdf. The Redstone missile, which holds "the distinction of being the first operational US ballistic missile," was developed by von Braun's group in the early 1950s as an adaptation of the Navaho cruise missile. The first test of the Redstone occurred at LC 4 at CCAFS on August 20, 1953; the missile was declared operational in June 1958. Cliff Lethbridge, "Redstone Fact Sheet," 2000, http://www.spaceline.org/rocketsum/redstone.html.

[10] Kay Grinter, "Beach-Abort (7)," 2000, http://www-pao.ksc.nasa.gov/kscpao/history/mercury/beach-abort/beach-abort.htm.

[11] Benson and Faherty, *Gateway*, 15, 136; Jarrett and Lindemann, *Launch Operations Center*, 68. The Atlantic Missile Range Operations Office was a NASA liaison group established in 1958 to coordinate the scheduling and use of CCAFS facilities with the Atlantic Missile Range (AMR)/CCAFS.

[12] E. Bell, II, "Saturn SA-1," 2012, http://nssdc.gsfc.nasa.gov/nmc/masterCatalog.do?sc=SATURNSA1. Because the rocket used to launch the Gemini spacecraft was the Air Force's Titan missile, the LOD's support of Project Gemini, NASA's second Manned Space Program, was limited to acting as NASA's point of contact with CCAFS and gathering/processing telemetry measurements.

purchasing agent. Over 83,903.9 acres were acquired by outright purchase, which included several small towns, such as Orsino, Wilson, Heath and Audubon, many farms, citrus groves, and several fish camps. Negotiations with the State of Florida provided submerged lands, resulting in the acquisition of property identified on the original Deed of Dedication. Much of the State-provided land was located south of the Old Haulover Canal and north of the barge canal/terminal facility.[13]

As work on the Apollo Program progressed, it became clear to NASA Headquarters that the LOD needed to be an independent center. On March 7, 1962, NASA announced the separation of the LOD from MSFC and its establishment as an independent field installation, the Launch Operations Center (LOC), effective July 1, 1962; Dr. Debus was appointed the Center's first Director.[14] The LOC "would serve all NASA projects at Cape Canaveral, and would consolidate under a single official all of NASA's operating relationships with the Air Force Commander of AMR."[15] Because of the increase in responsibilities, the LOC acquired new personnel. While most offices, or directorates, remained at CCAFS, crammed in tiny spaces, some groups were forced to find space in buildings throughout the cities of Cape Canaveral and Cocoa Beach. The various directorates would remain in these facilities until the new buildings at MILA were completed.[16] Eventually, MILA incorporated the LOC as part of its jurisdiction; the entirety was renamed the John F. Kennedy Space Center in November 1963 following the death of the President.[17]

A Manned Lunar Landing Program Master Planning Board, which consisted of NASA and Air Force personnel, was established to oversee the development of the new Center on Merritt Island. Pan American was hired to complete the master plan for the Center; the ACOE served as the LOC's supervisory design and construction agent.[18] The master plan, mostly developed between 1961 and 1965, divided MILA into four functional zones: the launch zone, the launch support zone, the industrial zone, and the general support zone. The zones were arranged to maximize the protection of people and facilities from the four common types of launch hazards, blast, acoustic, toxic, and nuclear.[19]

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[13] Benson and Faherty, *Gateway*, 96-107.
[14] Jarrett and Lindemann, *Launch Operations Center,* 79.
[15] Jarrett and Lindemann, *Launch Operations Center,* 80.
[16] Benson and Faherty, *Gateway*, 138-39.
[17] Benson and Faherty, *Gateway*, 65-68, 96-98, 105, 133-137, 146-48.
[18] Benson and Faherty, *Gateway*, 252-253; E.R. Bramlitt, *History of Canaveral District 1950-1971* (Cape Canaveral, FL: South Atlantic Division, U.S. Army Corps of Engineers, 1971).
[19] Pan American World Airways, Guided Missiles Range Division, *Analytical Report for NASA Merritt Island Launch Area Master Plan, Volume III* (Cape Canaveral, FL: Pan American World Airways, 1962), Sweetsir Collection, File No. ARCH00017252, KSC Archives Department, Florida; Pan American World Airways, Guided Missiles Range Division, *Analytical Report for NASA Merritt Island Launch Area Master Plan, Volume III* (Cape

The launch zone consisted of the launch pads and their direct support structures, such as fuel storage facilities, arming towers, and cable terminal buildings; this area was constructed along the shoreline between CCAFS and Playalinda Beach. The launch support zone, or Vehicle Assembly Building (VAB) Area located roughly 3 miles southwest of the launch zone, included the assembly building, Launch Control Center, and other facilities that directly supported launch activities. The industrial zone, or Industrial Area, included assembly and checkout facilities, engineering and administrative facilities, such as the Headquarters Building and employee/center support services. The general support zone contained support structures, such as instrumentation sites, security control buildings, and telemetry receiver areas; these are interspersed throughout the Center.[20]

Construction of KSC began in 1962, when the ACOE and hired contractors began to prepare the swampy land for the required facilities. Canals were dredged, and the sand was used to compact and flatten the ground where the launch pads would be built. Surface water was then drained into the canals. Over the next four years, the majority of the Center's key facilities, such as the VAB, the Launch Control Center, LC 39, Pad A, the barge canal and terminal facility, ordnance storage and laboratory areas, the Crawlerway, the Operations & Checkout (O&C) Building, the Central Instrumentation Facility, and the Headquarters Building, were completed.[21]

Development of KSC's Industrial Area

The approximately 1,070-acre Industrial Area sits roughly 4 miles south of the VAB Area, at the former town of Orsino. Its site plan was largely developed by the Master Planning Board, with help from smaller committees that had been established to focus on facilities, instrumentation, and communications. The streets within the Industrial Area were arranged in a grid pattern. Those that run north to south were given alphabetic designations; those that extend west to east were given numeric designations. The Headquarters Building was positioned in a highly visible central location along First Street. To its east was the O&C Building, and to its west were the Central Instrumentation Facility and the Base Operations Building; all four buildings used similar exterior wall materials. Additional spacecraft support facilities were placed within the east portion of the Industrial Area, and support, storage, and maintenance facilities to the south. The hazardous operations facilities were placed at the southeast corner to isolate them from the remainder of the Industrial Area.[22]

Canaveral, FL: Pan American World Airways, 1965), Sweetsir Collection, File No. ARCH00017254, KSC Archives Department, Florida.

[20] Pan American World Airways, *Merritt Island Launch Area Master Plan, Volume III*, 1965.

[21] Benson and Faherty, *Gateway*, 247-270.

[22] Benson and Faherty, *Gateway*, 238-241.

The earliest work in the Industrial Area was the preliminary groundwork for the O&C Building, which was completed by the Azzarelli Construction Company of Tampa, Florida, in November 1962. In January 1963, groundbreaking ceremonies for the O&C Building marked the start of facilities construction within the Industrial Area. Shortly afterwards, "the Corps of Engineers awarded a contract for the construction of primary utilities to provide for a water distribution system, sewer lines, an electrical system, a central heating plant, streets, and hydraulic fill from the Indian River causeway to connect the Industrial Area on Merritt Island with the Florida mainland."[23] This was followed by the awarding of numerous contracts to various construction firms such as the joint venture of Paul Hardeman of Stanton, California, and Morrison-Knudsen Construction Company of Boise, Idaho; Franchi Construction Company of Indian River City, Florida; and Blount Brothers Construction Company of Shreveport, Louisiana, for other buildings within the Industrial Area.[24]

The O&C Building was the first facility at KSC to be occupied; the Florida Operations team of the Manned Spacecraft Center (MSC)[25] moved into the building in September and October 1964. Formal opening ceremonies for the Headquarters Building occurred in May 1965.[26] Other major facilities within the area completed by 1966 included the Central Instrumentation Facility, the Central Supply Facility, the FCTB, two Spacecraft Assembly/Encapsulation facilities, the High Pressure Gas Storage Facility, the Fluid Test Complex, and the Parachute Refurbishment Facility. Additional support buildings, such as a cafeteria, an auditorium and training building, a medical services dispensary, a fire station, a security building, and maintenance facilities, also were constructed within the Industrial Area.[27]

As of 2006, the Industrial Area was comprised of roughly 178 buildings and structures. By the end of the 1960s, roughly 38 percent (sixty-seven) of these facilities was completed, which included the key structures listed above, as well as numerous support buildings, such as storage sheds, maintenance shops, site utility structures, fuel storage areas, and equipment shelters.[28] During the Apollo Program, these facilities supported the inspection, checkout, and integration of the spacecraft modules; ordnance storage; telemetry data analysis and transmission; testing of hazardous fluids; and testing the LEM's rendezvous radar. The O&C Building also provided pre-

[23] Benson and Faherty, *Gateway*, 252, 266.
[24] Benson and Faherty, *Gateway*, 252-268.
[25] The MSC grew from the Space Task Group, the initial office created by NASA upon its establishment to operate its manned spaceflight program; it was stationed at the Langley Aeronautical Laboratory (now Langley Research Center) in Hampton, Virginia. As the space program grew, the Space Task Group became the autonomous MSC and moved to Houston, Texas. Following the death of President Lyndon B. Johnson in 1973, it became JSC.
[26] Benson and Faherty, *Gateway*, 268-269.
[27] Kenneth Lipartito and Orville R. Butler, *A History of the Kennedy Space Center* (Gainesville, FL: University Press of Florida, 2007), 222-223; Space Gateway Support, *CCAFS/KSC Basic Information Guide*, January 2006, 3-28 to 3-31, on file, KSC.
[28] Space Gateway Support, *Basic Information Guide,* 3-28 to 3-31.

flight living quarters for the astronauts.[29] The Industrial Area facilities provided similar support for the Skylab missions and the Apollo-Soyuz Test Project of the mid-1970s. Only a few additional support structures, roughly 3 percent of the current total, were constructed during this period.[30]

The Space Shuttle Program (SSP) brought the first major changes to the Industrial Area of KSC. Although many of the existing facilities were modified to meet the needs of this program, new structures were required to accommodate payload processing and launch procedure testing, as well as to provide storage and maintenance for new ground support equipment.[31] The first major facility designed for the SSP, the Launch Equipment Test Facility, was completed in 1975. This was followed in the 1980s by the construction of a Proof Load Test Structure, a Cryogenics Test Laboratory, and a Multi-Mission Support Equipment Building within the spacecraft support area, and a Payload Hazardous Servicing Facility, a Multi-Operation Support Building, and an Operations Support Building within the hazardous operations area.[32] In 1992, the last major facility to be added to the Industrial Area for the SSP, the Canister Rotation Facility, was completed. The introduction of the Space Station *Freedom*, which later became the International Space Station (ISS) Program, spurred the construction of the last two major facilities of the Industrial Area: the Space Station Processing Facility, completed in 1992, and the Multi-Payload Processing Facility, finished in 1995. The remainder of the facilities (105, or roughly 95 percent) constructed from 1980 to the 2006, are small support structures, such as maintenance shops, storage sheds, and utility buildings.[33]

The Flight Crew Training Building

The ACOE hired Broadfoot & Mathis, Architects-Engineers of Jacksonville, Florida, to design the FCTB; the design work was completed in October 1964 and approved by architect, A. Robert Broadfoot.[34] The overall layout for the building was based on design criteria developed by engineers and technicians from KSC, JSC (then, the MSC), and the ACOE. They patterned the building after the astronaut training facilities at JSC, where the crewmembers received most of their training. The FCTB would provide additional training for the primary and backup crews for a forthcoming mission, who arrived at KSC roughly three months before launch.[35] Construction

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[29] Benson and Faherty, *Gateway*, 240-242; Lipartito and Butler, 105.
[30] Space Gateway Support, *Basic Information Guide*, 3-28 to 3-31.
[31] Lipartito and Butler, 186, 201, 222-223; Space Gateway Support, *Basic Information Guide*, 3-28 to 3-31.
[32] Space Gateway Support, *Basic Information Guide*, 3-28 to 3-31.
[33] Space Gateway Support, *Basic Information Guide*, 3-28 to 3-31.
[34] Broadfoot & Mathis, "MSC Flight Crew Training Building."
[35] This roughly corresponded to the arrival at KSC of the spacecraft they would occupy. Black, "Flight Crew Training Building;" "Flight Crew Training Building Approved," *Spaceport News*, January 20, 1966, 3; "KSC Readies Astronaut Quarters," *Spaceport News*, May 25, 1979, 6.

contract bids for the FCTB were opened on December 2, 1964; the contract, for $1,337,628, was awarded to Smith & Sapp Construction Company of Orlando, Florida, which was the low bidder.[36]

Construction of the building began on December 21, 1964. By March 1965, roughly half of the building's structural skeleton was installed (Figure No. A-2). Over the next month and a half, the walls of the one-story north portion were finished, and the remainder of the structural framing system for the High Bay was erected (Figure No. A-3). The building was approved for occupancy in January 1966 (Figure No. A-4). Over the next several months, North American Aviation installed one CSM simulator (east end) and one LEM simulator (west end) in the High Bay; this work was completed on June 10, 1966.[37]

In 1966, Broadfoot and Mathis, and the ACOE designed an addition to be built at the east end of the FCTB; the drawings were completed in November.[38] This addition was designed to hold a second CSM simulator, an operational area, a documentation center, and additional storage space. Construction of the addition occurred in 1967, with all work completed by July (Figure No. A-5).[39]

From July 1966 to December 1972, the FCTB trained Apollo astronauts for their upcoming flights while they lived at KSC. This training was mostly mission-specific, but included some general flight training as well. To support the training activities, the FCTB High Bay held two CSM simulators and one LEM simulator (Figure Nos. A-6 through A-10). The key component of each simulator was the crew station, the inside of which was an exact replica of the spacecraft. Each simulator control switch and instrument was "in the exact and operable position" as it was in the flight vehicle and required the exact same forces to activate. Other components of each simulator included an instructors' station, a computer complex with its associated peripheral equipment, and an infinity optics system with its associated peripheral equipment.[40]

Each training session began with classroom-like briefings by the instructors, followed by practice with the simulators. Earlier sessions concentrated on a review of the vehicles' systems in general and then how the systems related to the flight plan and mission rules. Later sessions

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[36] Black, "Flight Crew Training Building."
[37] NASA KSC, "Engineering Development Laboratory;" "Training Building Approved."
[38] Broadfoot & Mathis, "Building Additions."
[39] "Whole Lot of Construction Going On," "Major KSC Facilities Completed During 1967."
[40] "Training Building Approved;" "Astronauts Receive MSC-KSC Simulator Training," *Spaceport News*, March 28, 1968, 6. Computer complex peripheral equipment included digital conversion equipment, visual equipment, and interfaces between the instructors' station, crew station, and individual computers. The infinity optics system consisted of a plastic celestial sphere to imitate stars, an effects projector, and a rendezvous and docking system to provide a target for maneuvers.

emphasized the specific activities the astronauts were scheduled to perform, which ultimately led to a finalization of the procedures to complete the activity (Figure Nos. A-11, A-12). Through the computer system, technicians could program "hundreds of varieties of mission profiles and thousands of varieties of malfunctions" to better prepare astronauts for potential off-nominal situations.[41]

Between September 25 and December 27, 1969, NASA installed a simulation of the lunar surface, called the Lunar Surface Training Area, to the southeast of the FCTB (Figure No. A-13). Here, astronauts practiced conducting the experiments they were scheduled to perform while on the Moon (Figure No. A-14). They also trained with a one-gravity version of the Lunar Roving Vehicle over a roughly 1.1-mile course, playfully referred to as the 'rover racetrack' (Figure No. A-15).[42]

From 1970-71, the FCTB received some systems modifications to support Apollo crew health protocols. These protocols were designed to minimize the likelihood of crewmembers being exposed to infectious diseases. First, air filtration units were installed in the air conditioning systems of the primary astronaut training areas of the FCTB. These filters removed 99 percent of atmospheric dust and particles and 97 percent of airborne bacteria. Also in these areas, double air-tight doors were installed to prevent outside air from entering the rooms. In addition, the conference room was fitted with an airtight glass partition to separate the astronauts from secondary contacts; an intercom system allowed them to converse with one another.[43]

The FCTB was set to support astronaut training for the Skylab Program in the same manner it did for the Apollo missions. However, budget restrictions forced NASA to close the KSC training facilities following Apollo 17 (December 1972).[44] In March 1973, the NASA task team

[41] "Training Building Approved;" "MSC-KSC Simulator Training."
[42] "Lunar Activities Practiced Often by Crews Here," *Spaceport News*, July 29, 1971, 3 and 7. Following the Apollo Program, the Lunar Surface Training Area was abandoned in place, and nature gradually reclaimed the area. A few remnants of the facility were visible at the time of this documentation (see Figure A-18).
[43] "Crew Health Plans Detailed at Spaceport," *Spaceport News*, December 3, 1970, 1 and 4; "Apollo Crew Health Plans Outlined," *Spaceport News*, June 17, 1971, 1 and 4. Beginning twenty-one days before launch, the crewmembers were limited to face-to-face contact with NASA-designated 'primary contacts.' These were family members and those NASA/contractor personnel who were required to have direct contact with the astronauts, such as physicians and training instructors.
[44] "KSC is Moving Ahead on Plans for Skylab," *Spaceport News*, August 27, 1970, 2-3; Library of Congress: Science and Technology Division, *Astronautics and Aeronautics, 1972: Chronology of Science, Technology, and Policy* (Washington, DC: NASA Scientific and Technical Information Office, 1974), 301, http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19750002057_1975002057.pdf.

charged with developing the launch processing system for the SSP moved into the FCTB. This team would remain in the building until December 2007.[45]

KSC's 1974 Facilities Catalog noted that the three simulators were scheduled to be dismantled; this process was likely completed in 1975, when the property record lists "remove raised floor panels to excess."[46] In addition, drawings show that by 1976, the western half of the Low Bay area had been partitioned into cubicle office spaces, as had many of the support areas in the north part of the building.[47] Around the same time, a portion of the High Bay near the east end was renovated into a lunar display, complete with a simulated lunar surface, a model of a LEM, and two astronaut figures (Figure A-15). Beginning circa 1977, this display served as a stop on the KSC Visitor Complex "Red Tour," which drove guests through KSC. A covered walkway also was constructed around the same time to denote the visitors' entrance.[48]

Circa 1985, the FCTB was renamed the EDL to reflect its change in function. Since then, the facility has contained a variety of labs, most notably electrical development laboratories that provided the capabilities "for complete system design, development, electrical prototype, assembly, testing, integration, validation, and verification."[49]

A space utilization plan from May 1988 shows that the internal layout of the building had again been altered. The size and layout of nearly every support room had been changed; the support area had expanded into the eastern end of the Low Bay; and the eastern 175' of the High Bay had been subdivided into a theater space and additional support rooms.[50] From 1997 to 1998, the High Bay was further altered to hold an ISS exhibit for the KSC Visitor Complex's bus tour of KSC. At this time, the 1980s theater was removed and replaced with a smaller theater, the High Bay floor was altered, the original enclosed balcony was opened and fitted with new handrails, the LEM exhibit was removed, and an elevator was installed.[51] From 2007 to 2008, the support

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[45] "New Tenants Move into Flight Crew Building," *Spaceport News*, August 9, 1973, 2 and 8; Jeffrey Starnes, personal communication (email) with Patricia Slovinac, July 26, 2013.
[46] NASA KSC, "Engineering Development Laboratory;" Sweetsir Collection, Box 59C.1, Folder: M7-0409, KSC Archives Department, Florida.
[47] Planning Research Corporation, Cape Canaveral, "Air Conditioning Modifications, Phase I," November 1976, on file, KSC Engineering Documentation Center.
[48] Daniel Gruenbaum, curator for Delaware North, personal communication (e-mail) with Patricia Slovinac, August 15, 2013; NASA KSC, "Engineering Development Laboratory."
[49] Sweetsir Collection, Box 59C.1, Folder: M7-0409, KSC Archives Department, Florida.
[50] NASA KSC, "Engineering Development Laboratory." The consulted sources did not provide information on the exact dates when these modifications were made; the property records only note "mods for VIC [visitor's information center] displays" in May 1985.
[51] BRHP Architects-Engineers, Inc., Melbourne, "Modifications to Building M7-409, Space Station/Future Enterprises," January 1997, on file, KSC Engineering Documentation Center. The LEM was moved to the circa 1997 Apollo Saturn V Center; the remainder of the lunar exhibit was excessed. Gruenbaum, personal communication.

areas of the FCTB were once again altered to hold laboratories and cubicle office areas. In Fall 2011, the ISS exhibit and theater were removed from the High Bay. The smaller ISS exhibit components were moved to the Infinity Science Center, the visitor center for the John C. Stennis Space Center in Mississippi, whereas the larger components were excessed.[52]

In 2012, the High Bay was again altered to hold the Granular Mechanics and Regolith Operations Laboratory and the Electrostatics and Surface Physics Laboratory, which were moved from the Space Life Sciences Lab (Facility No. M6-1025). In addition, a hydraulic dock lift was installed in the High Bay floor (Photo No. 10).[53] Aside from these two labs, at the time of documentation, the High Bay area also contained an Experimental Imaging Laboratory and a Spaceport Processing Systems Laboratory. The remainder of the FCTB contained an Electrical Development Lab, which consisted of a combined electronics development and test lab, an electromagnetic compatibility development lab, a fabrication assembly and test area, an advanced electronics and technology development lab, an electrical Computer Aided Design lab, and a machine shop; a Power Systems Development Lab; a Control Systems Development Lab; an Instrumentation and Data Acquisition Development Lab, which included a sensor data acquisition lab, a weather lab, and a hazardous gas detection lab; a Transducers and Sensors Development Lab; a Range Technologies Development Lab; and an Embedded Systems Development Lab, which contained a Combined Systems Health Management Lab and Data Acquisition Lab.

U.S. Manned Space Programs Supported by the FCTB/EDL

The Apollo Program

The Apollo Program had unofficially begun on February 5, 1959, when NASA established the Working Group on Lunar Exploration to formulate a lunar exploration program. Subsequently, a Research Steering Committee was created, which included personnel from the various NASA centers. At its first meeting in May 1959, the Committee prioritized various aspects of a space program, which included a manned lunar landing and return to Earth. The concept was further discussed at the Committee’s second meeting (June 1959) and at its third meeting (December 1959). By the following January (1960), enough progress had been made to bring about the suggestion of a formal name, “Apollo,” for the new program, with the goal of landing astronauts on the Moon and returning them safely to Earth. T. Keith Glennan, NASA Administrator, approved the name on July 25, 1960, and it was subsequently announced at the first NASA-

[52] Gruenbaum, personal communication. The ISS exhibit modules were built in place and not made to disassemble.
[53] Institutional Services Contract, Kennedy Space Center, “Relocate GMRO and ESPL from M6-1025 to M7-0409,” February 2012, on file, KSC Engineering Documentation Center.

Industry Program Plans Conference three days later. On September 1, 1960, the Space Task Group officially created the "Apollo Project Office."[54]

Altogether, the Apollo Program flew thirty-two missions, including the initial research/development and qualification flights, the lunar flights, the Skylab application, and the Apollo-Soyuz Test Project. Three different launch complexes were used: LC 34 (seven launches) and LC 37 (eight launches) at CCAFS, and LC 39 (seventeen launches; twelve from Pad A and five from Pad B) at KSC. Of the total thirty-two flights, fifteen were manned, and of the seven attempted lunar landing missions, six were successful. No major launch vehicle failures of either the Saturn IB or Saturn V occurred; however, there were two major CSM failures, one on the ground (Apollo 1) and one on the way to the Moon (Apollo 13).[55]

The first four test flights of the Apollo Program were launched from LC 34 and flew suborbital trajectories utilizing the Saturn I Block I vehicle. These flights verified the aerodynamics and structure of the launch vehicle, performed scientific experiments known as Project High Water I and Project High Water II, and tested an "engine-out" contingency, in which the fuel was rerouted from the failed engine to the seven remaining engines.[56]

The next phase of testing utilized the Block II configuration of the Saturn I vehicle. All six of these flights were launched from LC 37, since LC 34 was being modified for the assembly, checkout, and launch of the larger, more powerful Saturn IB vehicle. The first flight, SA-5, launched on January 24, 1964, and was the first orbital flight of the Apollo Program, as well as the first to test a fully-fueled second stage. The next two flights, SA-6 (May 28, 1964) and SA-7 (September 18, 1964), carried boilerplate CSMs to test telemetry and various systems, as well as the Launch Escape System. Due to the success of these two flights, the next three were used to carry satellites into space.[57]

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[54] Ivan D. Ertel and Mary Louise Morse, *The Apollo Spacecraft: A Chronology, Volume 1* (Washington, DC: NASA, Scientific and Technical Information Office, 1969), http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20I.

[55] NASA, *Facts: John F. Kennedy Space Center*, 1994, 82. The Space Task Group was the forerunner of MSC/JSC (see Footnote 24).

[56] These experiments created artificial clouds to provide data on atmospheric physics. Although the vehicle tests were successful, the experiments produced questionable results. Robert Godwin, *Project Apollo: The Test Program* (Burlington, Ontario: Apogee Books, 2006), 4; Ertel and Morse, *A Chronology, Volume 1*; Mary Louise Morse and Jean Kernahan Bays, *The Apollo Spacecraft: A Chronology, Volume 2* (Washington, DC: NASA, Scientific and Technical Information Office, 1973), http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20II.

[57] SA-9, carrying Pegasus 1, was launched on February 16, 1965; SA-8 launched on May 25, 1965, with Pegasus 2; and SA-10 launched on July 30, 1965, with Pegasus 3. Godwin, *The Test Program*, 5-6, 16-24; Morse and Bays, *A Chronology, Volume 2*; Courtney G. Brooks and Ivan D. Ertel, *The Apollo Spacecraft: A Chronology, Volume 3* (Washington, DC: NASA, Scientific and Technical Information Office, 1973). http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20III.

The first test flight using the Saturn IB vehicle, designated Apollo/Saturn 201 (AS-201), launched from LC 34 on February 26, 1966, carrying the first true spacecraft on a suborbital flight to test its heat shield. Two more unmanned test flights followed to test the instrumentation unit and the behavior of the fuel in the vehicle's second stage. AS-202 also subjected the Command Module to the full force of re-entry for the first time. The fourth scheduled flight, designated as AS-204 and set to launch from LC 34 in February 1967, was to be the first manned mission of the Apollo Program. During a countdown simulation on January 27, 1967, the Command Module caught fire on the launch pad, killing astronauts Virgil I. "Gus" Grissom, Edward H. White, II, and Roger B. Chaffee. The event was later commemorated as Apollo 1.[58]

Following the fire, and subsequent modifications to the spacecraft, NASA conducted three additional unmanned Earth orbital missions to continue verification testing of the Apollo-Saturn combination and to begin testing of the Lunar Module. Apollo 4 was launched on November 9, 1967. This flight was the first to use the Saturn V vehicle, and thus, the first to launch from the new LC 39, Pad A at KSC. Apollo 5 launched on January 22, 1968, from LC 37 carrying the first LEM into space for verification tests. Apollo 6 was the final unmanned mission of the Apollo Program; it launched on April 4, 1968, from LC 39, Pad A.[59]

Although still considered part of the Apollo Program's testing phase, the October 11, 1968, Apollo 7 launch from LC 34 was the first manned mission, which placed astronauts into an Earth orbit for ten days using a Saturn IB vehicle. The crew, Walter M. Schirra, Jr., Donn F. Eisele, and R. Walter "Walt" Cunningham, tested the CSM and their guidance and control systems, the instrument unit, the spacecraft lunar adapter, the new spacesuit design, food supplies and work routines. During this flight, the astronauts separated the CSM from the second stage in order to practice rendezvous operations with the booster. The spacecraft and astronauts returned to Earth on October 22, after successfully completing all goals of the mission.[60]

The next mission, designated as Apollo 8, launched on December 21, 1968, from LC 39, Pad A, and became the first manned flight to use the Saturn V vehicle. It was the first mission to reach the Moon, which it orbited ten times before returning to Earth. Apollo 9, which launched on March 3, 1969, from LC 39, Pad A, remained in a low-Earth orbit, where its crew, James M. McDivitt, Russell L. "Rusty" Schweickart, and David R. Scott, performed the first extravehicular activity of the Apollo Program and the first docking of the CSM and LEM. Apollo 10 was the "final dress rehearsal" for landing on the Moon. Launched on May 18, 1969, from LC 39, Pad B, it reached the Moon, which it orbited thirty-one times. While in orbit, the crew jettisoned the

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[58] Godwin, *The Test Program*, 7-8, 25-35; Ivan D. Ertel and Roland W. Newkirk (with Courtney G. Brooks), *The Apollo Spacecraft: A Chronology, Volume 4* (Washington, DC: NASA, Scientific and Technical Information Office, 1978), http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20IV.
[59] Godwin, *The Test Program*, 9-10, 36-48; Ertel and Newkirk, *A Chronology, Volume 4*.
[60] Godwin, *The Test Program*, 52-55; Ertel and Newkirk, *A Chronology*, *Volume 4*.

LEM and allowed it to come within 50,000 feet of the Moon's surface, prior to initializing the ascent stage for its return to the CSM (the descent stage was left to fall onto the Moon; the ascent stage would be jettisoned into a solar orbit).[61]

On July 16, 1969, Apollo 11 launched from LC 39, Pad A, carrying its crew, astronauts Neil A. Armstrong, Edwin E. "Buzz" Aldrin, Jr., and Michael Collins, into a lunar orbit just over three days later. On July 20, 1969, as Collins remained in the Command Module, Armstrong and Aldrin climbed into the LEM and descended to the Moon's surface. Landing at 4:17 p.m., Eastern Standard Time (EST), Armstrong reported to Mission Control, "Houston, Tranquility Base here. The Eagle has landed."[62] Armstrong and Aldrin completed one extravehicular activity to collect lunar surface material for scientific analysis. Just over twenty-one hours after landing, the LEM ascent stage lifted-off to dock with the CSM in lunar orbit, and the two astronauts rejoined their colleague in the Command Module, prior to jettisoning the ascent stage. The three astronauts landed in the Pacific Ocean on July 24, 1969, at roughly 12:50 p.m. EST, officially accomplishing the goal set by President Kennedy on May 25, 1961.[63]

Four months later, Apollo 12 launched from LC 39, Pad A, for its rendezvous with the Moon. Essentially a repeat of Apollo 11, the crew remained in lunar orbit for one extra day to take photographs. On April 11, 1970, the ill-fated Apollo 13 lifted-off from LC 39, Pad A. Approximately fifty-six hours after launch, Oxygen Tank No. 2 ruptured, also causing a failure in Oxygen Tank No. 1. The three-man crew, James A. "Jim" Lovell, Jr., Fred W. Haise, Jr., and John L. "Jack" Swigert, Jr., remained in limbo within the LEM as the ground controllers in Mission Control at JSC frantically worked to bring them home safely. On April 17, they landed on Earth proving the ingenuity of the ground controllers. The event would have repercussions though, as two Apollo flights were removed from the program.[64]

The next mission, Apollo 14, was launched on January 31, 1971. Astronauts Alan B. Shepard, Jr., and Edgar D. Mitchell spent just over thirty-three hours on the Moon's surface and conducted two extravehicular activities. Apollo 15, which launched on July 26, 1971, was the first mission to use the Lunar Roving Vehicle, an electric-powered, four-wheel drive vehicle, to traverse the lunar surface. The crew spent just under sixty-seven hours on the Moon collecting lunar samples,

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[61] Godwin, *The Test Program*, 12-13, 56-69; Ertel and Newkirk, *A Chronology, Volume 4*.
[62] Tranquility Base refers to their designated landing site; Eagle was the name given to the Lunar Module. NASA MSC [Manned Spacecraft Center, now JSC], *Apollo 11 Spacecraft Commentary*, July 16-24, 1969, http://www.jsc.nasa.gov/history/mission_trans/AS11_PAO.PDF.
[63] NASA KSC, "Apollo 11," *Apollo website*, 2003, http://www-pao.ksc.nasa.gov/kscpao/history/apollo/apollo-11/apollo-11.htm; Robert Godwin, *Project Apollo: Exploring the Moon* (Burlington, Ontario: Apogee Books, 2006), 3-5, 20-22; Ertel and Newkirk, *A Chronology, Volume 4*.
[64] Godwin, *Exploring the Moon*, 5-10, 23-30; Ertel and Newkirk, *A Chronology, Volume 4*. One flight had already been cancelled following the return of Apollo 12.

including one dubbed the "Genesis Rock." The next mission, Apollo 16, was essentially a repeat of Apollo 15, albeit with a different lunar landing site. Apollo 17, which launched on December 7, 1972, was the final lunar mission and the only one to carry a scientist-astronaut, Harrison H. "Jack" Schmitt, to the Moon.[65]

The Space Shuttle Program

On January 5, 1972, President Richard M. Nixon delivered a speech in which he outlined the end of the Apollo era and the future of a reusable space flight vehicle, the Space Shuttle, which would provide "routine access to space."[66] During this speech, President Nixon instructed NASA to proceed with the design and building of a partially reusable Space Transportation System (STS; commonly referred to as the Space Shuttle) consisting of a reusable orbiter, three reusable main engines, two reusable solid rocket boosters, and one expendable external liquid fuel tank. NASA selected KSC as the primary launch and landing site for the SSP. KSC, responsible for designing the launch and recovery facilities, was to develop methods for shuttle assembly, checkout, and launch operations.[67]

The first orbiter intended for spaceflight, *Columbia*, arrived at KSC from Air Force Plant 42, Palmdale, California, in March 1979. Originally scheduled for liftoff in late 1979, the launch date was delayed by problems with both the main engine components as well as the thermal protection system. *Columbia* spent 610 days in the Orbiter Processing Facility, another 35 days in the VAB and 105 days on LC 39, Pad A, before lifting off on April 12, 1981. STS-1, the first orbital test flight and first SSP mission, ended with a landing on April 14, 1981, at Edwards Air Force Base in California. This launch demonstrated *Columbia's* ability to fly into orbit, conduct on-orbit operations, and return safely.[68] *Columbia* flew three additional test flights in 1981 and 1982, all with a crew of two. The Orbital Test Flight Program ended in July 1982 with 95 percent of its objectives accomplished. After the end of the fourth mission, President Reagan declared that with the next flight the Shuttle would be "fully operational."

During the SSP, 135 missions were launched from KSC. The Space Shuttle carried a number of planetary and astronomy missions including the Hubble Space Telescope, the Galileo probe to

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[65] Godwin, *Exploring the Moon*, 10-18, 31-49; Ertel and Newkirk, *A Chronology, Volume 4*.
[66] Marcus Lindroos, ed., "President Nixon's 1972 Announcement on the Space Shuttle," updated April 14, 2000, http://history.nasa.gov/stsnixon.htm.
[67] Linda Neuman Ezell, *NASA Historical Databook Volume III Programs and Projects 1969-1978*, The NASA History Series (Washington, DC: NASA History Office, 1988), 121-24, Table 2-57; Ray A. Williamson, "Developing the Space Shuttle," in *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume IV: Accessing Space*, ed. John M. Logsdon (Washington, DC: U.S. Printing Office, 1999), 172-174.
[68] Dennis R. Jenkins, *Space Shuttle, The History of the National Space Transportation System. The First 100 Missions* (Cape Canaveral, FL: Specialty Press, 2001), 99.

Jupiter, Magellan to Venus, and the Upper Atmospheric Research Satellite. In addition, a series of Spacelab research missions were flown, which carried dozens of international experiments in disciplines ranging from materials science to plant biology. Between 1995 and 1998, NASA conducted a joint U.S./Russian Shuttle-*Mir* Program as a precursor to construction of the ISS. The Shuttle-*Mir* Program served to acclimate the astronauts to living and working in space. Many of the activities carried out were types they would perform on the ISS.[69] Construction of the ISS began in 1998; it was completed in 2011.

The SSP suffered two major setbacks with the tragic losses of the *Challenger* and *Columbia* on January 28, 1986, and February 1, 2003, respectively. *Challenger* was destroyed 73 seconds after launch due to a faulty O-ring seal in the right solid rocket booster; the crew of seven astronauts all perished. *Columbia* was lost on February 1, 2003, following a sixteen-day mission. The physical cause of the accident was a breach in the thermal protection system on the leading edge of the left wing, caused by a piece of insulating foam, which separated from the external tank after launch and struck the wing.[70] Sixteen minutes prior to its scheduled touchdown at KSC, the spacecraft broke apart during reentry over eastern Texas and all seven members of the crew perished.

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[69] Judy A. Rumerman, with Stephen J. Garber, *Chronology of Space Shuttle Flights 1981-2000* (Washington, DC: NASA History Division, 2000), 3.
[70] Columbia Accident Investigation Board, *Report, Volume I*, (Washington, DC: U.S. Government Printing Office, 2003), 25, http://history.nasa.gov/columbia/CAIB_reportindex.html.

Part II. Architectural Information

A. General Statement:

1. Architectural Character: The FCTB (Photo Nos. 1-8) is a Masonry Vernacular style building with an irregular plan. Portions of the approximately 68,755 square foot building[71] are one story in height with the remainder being two stories high. The walls are comprised of concrete block, with windows extending across the north elevation and a small portion of the south elevation. The building features a slightly-gabled, built-up roof.

2. Condition of fabric: Due to periodic maintenance and continual use of the facility, the building is in good condition.

B. Description of Exterior:

1. Overall dimensions: The FCTB (Figure Nos. B-8, B-22) has an irregular plan with approximate overall dimensions of 341' in length (east-west), 152'-6" in width (north-south), and 36' in height.

2. Foundations: The foundation of the FCTB is comprised of a roughly 6"-thick reinforced concrete slab supported by reinforced concrete footers.

3. Walls: The walls of the FCTB are comprised of reinforced concrete columns and beams with concrete block infill (Photo No. 9). In general, the north and south elevations (Photo Nos. 3 and 7, respectively) of the building are divided into 20'-wide bays by 1'-4"-wide/1'-deep, gray-painted concrete pilasters, whereas the west and east elevations (Photo Nos. 1 and 5, respectively) are divided into varying-width bays (14'-8", 16'-4", 16'-7", 18', 18'-4", or 18'-8") by similar pilasters. The west wall also features a parapet, which hides the slope of the roof.

4. Structural system, framing: The structural system for the FCTB is composed of reinforced concrete columns, beams, and rafters.

5. Porches, patios, stoops: The main entrance, located on the west elevation, has a small, 17' x 6' porch area that dates to circa 1992. The porch features a poured concrete floor accessed by steps on the south edge, a sidewalk on the north edge, and a handicapped ramp

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[71] NASA KSC, "Engineering Development Laboratory." This was the total square footage listed in the Real Property Record at the time of documentation. It includes all additional areas installed within the building as part of the various post-1967 modifications and renovations.

in the center of the west edge. An original 19’ x 6’ precast concrete canopy provides a covering for the porch area (Photo Nos. 1, 2). The remaining doorways feature a poured concrete apron.

7. Openings:

a. Doorways and doors: The main entrance to the FCTB is on the west elevation of the building (Photo Nos. 1, 2). This entrance features one set of glass and aluminum sliding doors, with a six-light transom and one-light sidelights, all of which date to the circa 1992 renovation. Aside from the main entrance, there are three single aluminum swing doors along the west elevation. One of these provides access to the viewing balcony within the High Bay; it is accessed by a set of metal steps mounted to the wall.

The north elevation (Photo Nos. 3, 4) features one set of double aluminum swing doors at the west end of the two-story addition.

The east elevation (Photo No. 5) features two sets of double aluminum swing doors and one single aluminum swing door. The single swing door provides access to the viewing balcony within the High Bay and is accessed by a set of U-shaped metal steps. One set of double swing doors is at the second floor level of the circa 2004, east entrance/elevator shaft addition; there are no access steps to this doorway.[72]

The south elevation (Photo No. 7) features four sets of double aluminum swing doors, three single aluminum swing doors, and one 16’ x 16’ aluminum sliding door.[73] One of the sets of double swing doors is at the second floor level; this door provides access to the equipment room and has no exterior access stairs. The easternmost single swing door is situated within the circa 2004, east entrance/elevator shaft addition. This door is at the second floor level and serves as an emergency egress for the second floor and is accessed by a set of U-shaped metal stairs.[74]

b. Windows: The FCTB features pairs of one-light fixed windows on the north elevation, one at each floor level in every vertical bay except the western bay in the two-story section, which corresponds to an internal stairwell (Photo No. 5). The same type of

[72] This doorway provided access for heavy equipment to be installed or removed from the second floor; a forklift was used to raise or lower the equipment. Starnes, personal communication, July 26, 2013.
[73] Originally, there were two 16’ x 16’ sliding doors on the south elevation; the eastern door was removed circa 1997 as part of the modifications for housing the ISS exhibit and the opening was filled in with concrete block. Broadfoot & Mathis, “MSC Flight Crew Training Building;” BRHP Architects-Engineers, Inc., “Modifications to Building M7-409.”
[74] Prior to the construction of the east entrance/elevator shaft, this door was on the east elevation of the building.

windows are located on the south elevation, within the second floor of the three eastern vertical bays, and at the second floor level within the four middle bays of the west elevation of the 1967 addition (Photo No. 6). All were installed in 2007 and have aluminum frames and poured concrete sills.[75]

8. Roof:

a. Shape, truss type, covering: The entire facility is covered by a slightly gabled roof comprised of a poured concrete deck faced with rigid insulation and built-up roofing. The roof is supported by open web steel joists.

b. Cornice, eaves: The FCTB has a parapet on the west elevation and continuous reinforced concrete boxed eaves on the south, east, and north elevations; the latter are painted gray. The eaves rest atop the pilasters that divide each elevation into vertical bays. Attached to the eaves on the north and south elevation is an aluminum gutter, with aluminum downspouts mounted to the end pilasters, and alternate pilasters in between.

C. Description of Interior:

1. Floor plans:[76] At the time of documentation, the original western portion of the FCTB was comprised of a High Bay area to the south and a one-story office and laboratory area to the north (which includes the original Low Bay area). The L-shaped 1967 eastern addition to the FCTB had been transformed into a two-story office and laboratory area at the east end of the building.[77] For ease of discussion, the description of the interior will be divided by original portion and addition (Figure No. A-1).

a. Original Portion: The High Bay area of the FCTB (Photo Nos. 11, 12; Figure Nos. B-22, B-27), from which the building's significance derives, measured roughly 134' in length (east-west) and 48' in width at the time of documentation.[78] Along the north wall, at roughly 14'-6" above the finished floor, was an open balcony that extends for the entire length of the High Bay (Photo No. 12). The balcony features a red-painted aluminum safety railing and red-painted tubular supports.[79] At the east end of the High

[75] Originally, the windows were pairs of four-light awning windows. Broadfoot & Mathis, "MSC Flight Crew Training Building;" Starnes, personal communication, July 26, 2013.
[76] A series of architectural drawings showing the evolution of the FCTB/EDL are attached as Appendix B.
[77] As originally constructed, the southern arm of the L was part of the High Bay area (Figure No. B-9).
[78] As originally constructed, the High Bay extended for the entire length of the building, approximately 260' (Figure Nos. B-2, B-9).
[79] The balcony was originally enclosed (Photo No. 13). It was modified circa 1997 as part of the renovations for the KSC Visitor Complex's ISS display.

Bay were two enclosed rooms. The western room measured approximately 34' x 34', and had an open meeting area in the mezzanine. The eastern room had rough dimensions of 48' x 32' and retained its original flooring and access ladder to the overhead crane (Photo Nos. 14, 15, 16).

Because of numerous alterations, the room arrangement of the one-story north portion of the original FCTB is not based on any standard interior layout (Figure No. B-22). The 6'-6"-wide main corridor of the building extends west to east and is located approximately 22' from the north wall; to its north are three offices and four labs. To the south of the corridor are two labs, two conference rooms, eight cubicle office areas, restrooms, and several individual offices.

b. Addition: At the time of documentation, the layout of the first floor of the FCTB addition was based on a double-loaded corridor arrangement (Figure No. B-22). The main corridor from the original portion extended through the addition and had two smaller corridors that branched off it. To the north of the main corridor were two office areas and one lab. South of the main corridor were two cubicle office areas, a machine shop, and ten labs. There was also one restroom. The second floor of the addition (Figure No. B-23) was comprised mostly of office areas, with some equipment rooms and restrooms; as with the first floor, the layout was based on a double-loaded corridor arrangement.

2. Stairways: There are three stairways within the FCTB, all of which are U-shaped. One of the stairways is within the High Bay area; it was installed circa 1997 as part of the modifications for the ISS display. This stairway is comprised of aluminum and painted red to match the High Bay balcony railing. The second and third stairways are located within the 1967 addition to the facility, one at the southeast corner and one at the northwest corner. Both are comprised of poured concrete; the treads are faced with vinyl tile. There is a 4'-3"-high steel railing along the inner side of the stairs and steel handrail mounted to the outer wall.

3. Flooring: The flooring of the FCTB varies by internal space. The conference room, offices, and most of the laboratories either have carpeting or vinyl tile floors (Photo Nos. 21, 22, 25). Some of the laboratory areas feature raised floors comprised of vinyl-tiled panels that rest on a steel frame (Photo No. 24). The corridors and stairways have vinyl tile flooring, the restrooms have ceramic tile floors, and the equipment rooms have bare concrete floors.

4. Wall and ceiling finish: The walls and ceiling of the FCTB also vary. Typically, the High Bay, laboratories, office areas, and corridors have painted gypsum walls and suspended acoustical tile ceilings. A few laboratories that were placed within the original High Bay area have acoustical tile walls and exposed ceilings (Photo No. 15). The stairways generally have painted concrete masonry unit walls and suspended acoustical tile ceilings. The restrooms feature plaster walls and ceilings; the equipment and other service rooms (e.g., janitorial closets) have bare concrete masonry unit walls and exposed concrete ceilings.

5. Openings:

a. Doorways and doors: There are approximately 146 internal doors within the FCTB, most of which are fabricated of hollow metal and are fitted with pressed steel frames. Roughly 107 of the doors are single swing doors, whereas the remainder are sets of double swing doors.

b. Windows: The windows within the FCTB are paired one-light fixed with aluminum trims. They all have 3” internal sills faced with tile.

8. Mechanical equipment:

a. Heating, air conditioning, ventilation: The FCTB contains its own centralized, heating, ventilating, and air conditioning system.

b. Lighting: The lighting system for the FCTB is mostly comprised of recessed and surface mounted fluorescent fixtures.

c. Plumbing: The FCTB contains its own plumbing system, one for chilled water and one for heated water.

d. Other: The FCTB is fitted with a fire suppression system.

D. Site:

1. **Historic landscape design:** As originally designed, the FCTB had a driveway that extended from 2nd Street into the main parking lot to the west of the building (Figure No. B-1). From the southeast corner of the parking lot, a drive extended eastward, providing vehicular access to the equipment building and the two sliding doors into the High Bay. This drive then continued to circle around the east side of the building before it turned westward to provide access to the northeastern door. As part of the 1967 addition (Figure No. B-8), the original eastern leg of the drive was removed and reconstructed roughly 30’ further east; a second parking lot was then constructed to the east of the new drive. Also, two new access branches were constructed from the new east drive, one to the northeastern door and the second to the new sliding door in the east addition to the High

Bay. Between the end of 1969 and beginning of 1970 a lunar training area was installed to the southeast of the FCTB (Figure Nos. A-13, A-14, A-15).

2. **Outbuildings:** At the time of the FCTB's original construction, an equipment building was built 50' to its south, roughly between the two sliding doors into the High Bay (Figure Nos. B-1, B-7). This equipment building had a rectangular plan that measured approximately 45' x 34', and featured similar construction materials as the FCTB. At the same time, a small cooling tower was constructed to the west of the equipment building, and an electrical substation and switching building were erected to the east. In 1967, an addition to the equipment building was constructed at the east end, forming an L-shaped plan. At the same time, a second cooling tower was built to the west of the original tower, and a third transformer was added to the substation. In 1968, a storage building was erected to the southeast of the equipment building.[80]

   As part of the circa 1997 modifications to the FCTB for housing the ISS exhibit, a concession building and guard house were constructed west of the equipment building; at this time, the cooling towers were removed. Finally, in 2001, two storage sheds were erected to the immediate southeast of the FCTB (Photo No. 6).[81]

[80] Space Gateway Support, *Basic Information Guide,* 3-28 to 3-31.
[81] Space Gateway Support, *Basic Information Guide,* 3-28 to 3-31.

Part IV. Sources of Information

A. Primary Sources:

BRHP Architects-Engineers, Inc., Melbourne. "Modifications to Building M7-409, Space Station/Future Enterprises." January 1997. On file, KSC Engineering Documentation Center.

Broadfoot & Mathis Architects-Engineers, Jacksonville. "MSC Flight Crew Training Building." October 1964. On file, KSC Engineering Documentation Center.

________. "Flight Crew Training Building Additions." November 1966. On file, KSC Engineering Documentation Center.

Brooks, Courtney G. and Ivan D. Ertel. *The Apollo Spacecraft: A Chronology, Volume 3*. Washington, DC: NASA, Scientific and Technical Information Office, 1973. http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20III.

Columbia Accident Investigation Board. *Report, Volume I*. Washington, DC: U.S. Government Printing Office, 2003. http://history.nasa.gov/columbia/CAIB_reportindex.html.

Ertel, Ivan D. and Mary Louise Morse. *The Apollo Spacecraft: A Chronology, Volume 1*. Washington, DC: NASA, Scientific and Technical Information Office, 1969. http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20I

Ertel, Ivan D. and Roland W. Newkirk (with Courtney G. Brooks). *The Apollo Spacecraft: A Chronology, Volume 4*. Washington, DC: NASA, Scientific and Technical Information Office, 1978. http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20IV.

Institutional Services Contract, Kennedy Space Center. "Relocate GMRO and ESPL from M6-1025 to M7-0409." February 2012. On file, KSC Engineering Documentation Center.

Jarrett, Jr., Francis E. and Robert A. Lindemann. *Historical Origins of NASA's Launch Operations Center to July 1, 1962*. Cocoa Beach, FL: John F. Kennedy Space Center, 1964. http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19670031213_1967031213.pdf.

Library of Congress: Science and Technology Division. *Astronautics and Aeronautics, 1972: Chronology of Science, Technology, and Policy.* Washington, DC: NASA Scientific and Technical Information Office, 1974. http://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19750002057_1975002057.pdf.

Morse, Mary Louise and Jean Kernahan Bays. *The Apollo Spacecraft: A Chronology, Volume 2.* Washington, DC: NASA, Scientific and Technical Information Office, 1973. http://www.hq.nasa.gov/office/pao/History/SP-4009/contents.htm#Volume%20II.

National Aeronautics and Space Administration, Kennedy Space Center. *Apollo/Saturn V MILA Facilities Descriptions.* Florida: Kennedy Space Center, 1965.

________. “Real Property Record, Engineering Development Laboratory.” On file, KSC Real Property Office.

National Aeronautics and Space Administration, Manned Spacecraft Center. *Apollo 11 Spacecraft Commentary*. July 16-24, 1969. http://www.jsc.nasa.gov/history/mission_trans/AS11_PAO.PDF.

Pan American World Airways, Guided Missiles Range Division. *Analytical Report for NASA Merritt Island Launch Area Master Plan, Volume III.* Cape Canaveral, FL: Pan American World Airways, 1962. On file, Sweetsir Collection, Kennedy Space Center Archives Department, Florida.

________. *Analytical Report for NASA Merritt Island Launch Area Master Plan, Volume III.* Cape Canaveral, FL: Pan American World Airways, 1965. On file, Sweetsir Collection, Kennedy Space Center Archives Department, Florida.

Planning Research Corporation, Cape Canaveral. “Air Conditioning Modifications, Phase I.” November 1976. On file, KSC Engineering Documentation Center.

Space Gateway Support. *CCAFS/KSC Basic Information Guide*. KSC-CCAFS-6747, Revision B, January 2006. On file, Kennedy Space Center, Master Planning Office.

Sweetsir Collection, Kennedy Space Center Archives Department, Florida.

B. Secondary Sources:

Benson, Charles D. and William B. Faherty. *Gateway to the Moon. Building the Kennedy Space Center Launch Complex*. Gainesville: University Press of Florida, 2001 (first paperback printing).

________. *Moon Launch! A History of the Saturn-Apollo Launch Operations*. Gainesville: University Press of Florida, 2001 (first paperback printing).

Bilstein, Roger E. *Stages to Saturn: A Technological History of the Apollo/Saturn Launch Vehicles.* Gainesville: University Press of Florida, 2003.

Bramlitt, E. R. *History of Canaveral District*. Cape Canaveral, Florida: South Atlantic Division, U.S. Army Corps of Engineers, 1971.

Brooks, Courtney G., James M. Grimwood, and Loyd S. Swenson, Jr. *Chariots for Apollo: The NASA History of Manned Lunar Spacecraft to 1969.* Mineola, NY: Dover Publications, Inc., 2009.

Ezell, Linda Neuman. *NASA Historical Databook Volume III Programs and Projects 1969-1978.* The NASA History Series, NASA SP-4012, Washington, DC: NASA History Office, 1988.

Godwin, Robert. *Project Apollo: Exploring the Moon*. Burlington, Ontario: Apogee Books, 2006.

________. *Project Apollo: The Test Program*. Burlington, Ontario: Apogee Books, 2006.

Jenkins, Dennis R. *Space Shuttle, The History of the National Space Transportation System. The First 100 Missions*. Cape Canaveral, Florida: Specialty Press, 2001.

Lipartito, Kenneth and Orville R. Butler. *A History of the Kennedy Space Center*. Gainesville: University Press of Florida, 2007.

National Aeronautics and Space Administration. *Facts: John F. Kennedy Space Center*. 1994.

Orloff, Richard W. *Apollo by the Numbers: A Statistical Reference*. Washington, DC: NASA History Division, Office of Policy and Procedures, 2000. http://history.nasa.gov/SP-4029/SP-4029.htm.

Price, David. "Architectural Survey and Evaluation of 45 Facilities That Have Reached the Age of 45-50 Years, John F. Kennedy Space Center, Brevard County, Florida." Survey report, New South Associates, Stone Mountain, GA, 2013.

Rumerman, Judy A. with Stephen J. Garber. *Chronology of Space Shuttle Flights 1981-2000*. HHR-70. Washington, DC: NASA History Division, Office of Policy and Plans, October 2000.

Williamson, Ray A. "Developing the Space Shuttle." In *Exploring the Unknown: Selected Documents in the History of the US Civil Space Program, Volume IV: Accessing Space*, edited by John M. Logsdon, 161-93. Washington, DC: US Printing Office, 1999.

APPENDIX A: Historic Photos of the Flight Crew Training Building

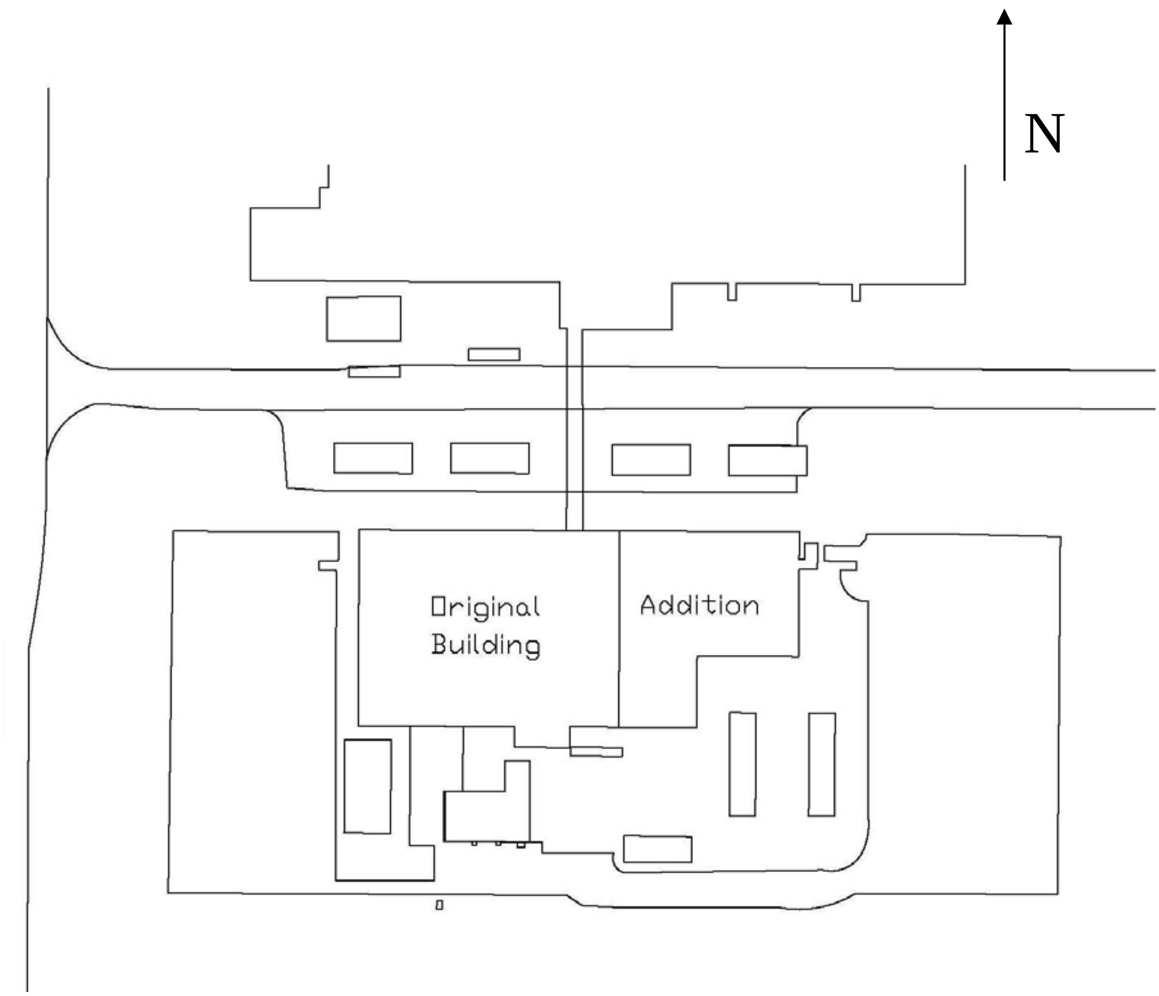

Figure A-1. Flight Crew Training Building, showing original portion and addition.
Source: Base map provided by KSC.

Figure A-2. Construction of the Flight Crew Training Building, March 9, 1965.
Source: John F. Kennedy Space Center Archives, 100-KSC-65-5371.

Figure A-3. Construction of the Flight Crew Training Building, May 13, 1965.
Source: John F. Kennedy Space Center Archives, 100-KSC-65-9379.

Figure A-4. Aerial of the Flight Crew Training Building prior to the construction of the east addition, June 21, 1966.
Source: John F. Kennedy Space Center Archives, 100-KSC-66C-5746.

Figure A-5. Aerial of the Flight Crew Training Building following the construction of the east addition (to left in photo, denoted by arrow), September 25, 1969.
Source: John F. Kennedy Space Center Archives, 116-KSC-69C-7182.

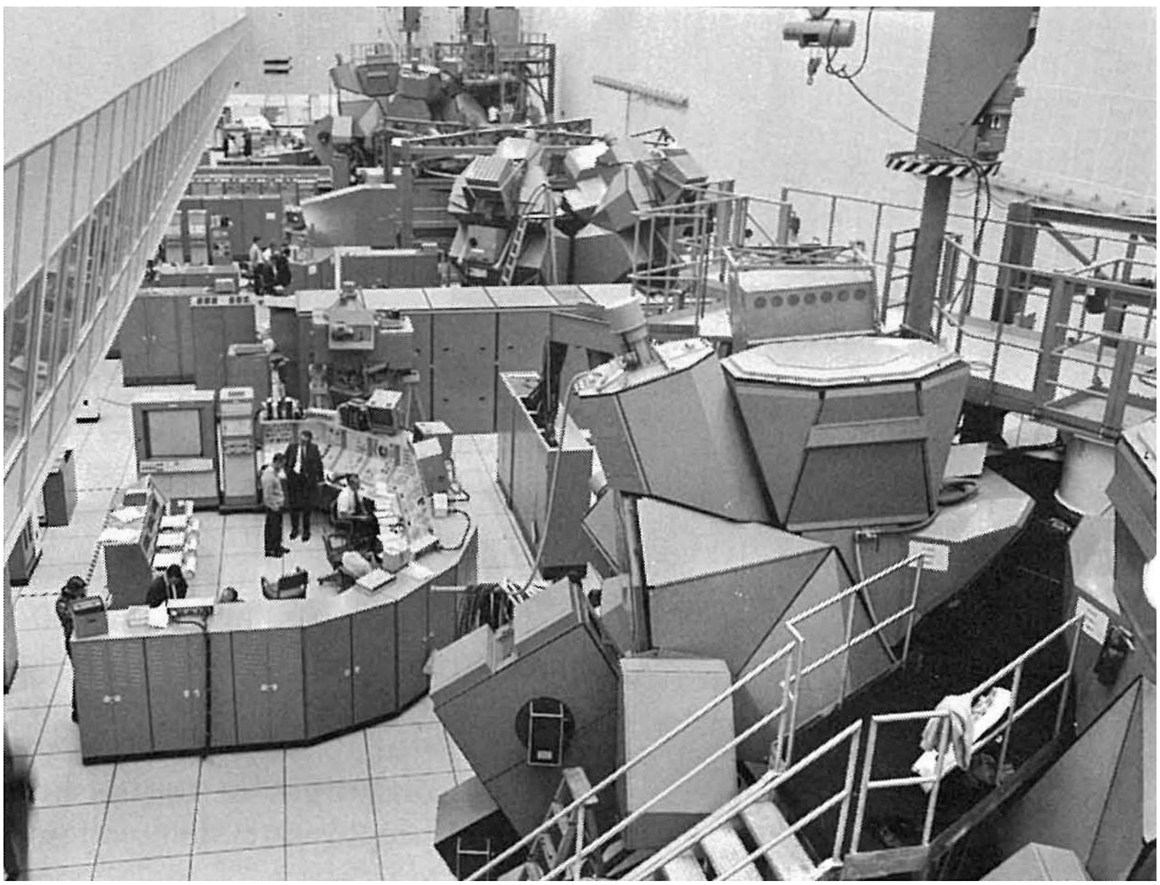

Figure A-6. View of the Flight Crew Training Building High Bay area, facing east, 1968. The Lunar Excursion Module simulator is in the foreground; the two CSM simulators are in the background.
Source: *Spaceport News*, March 28, 1968, 6.

Figure A-7. View of the Lunar Module simulator, facing west, November 1, 1966.
Source: John F. Kennedy Space Center Archives, 108-KSC-66C-9209.

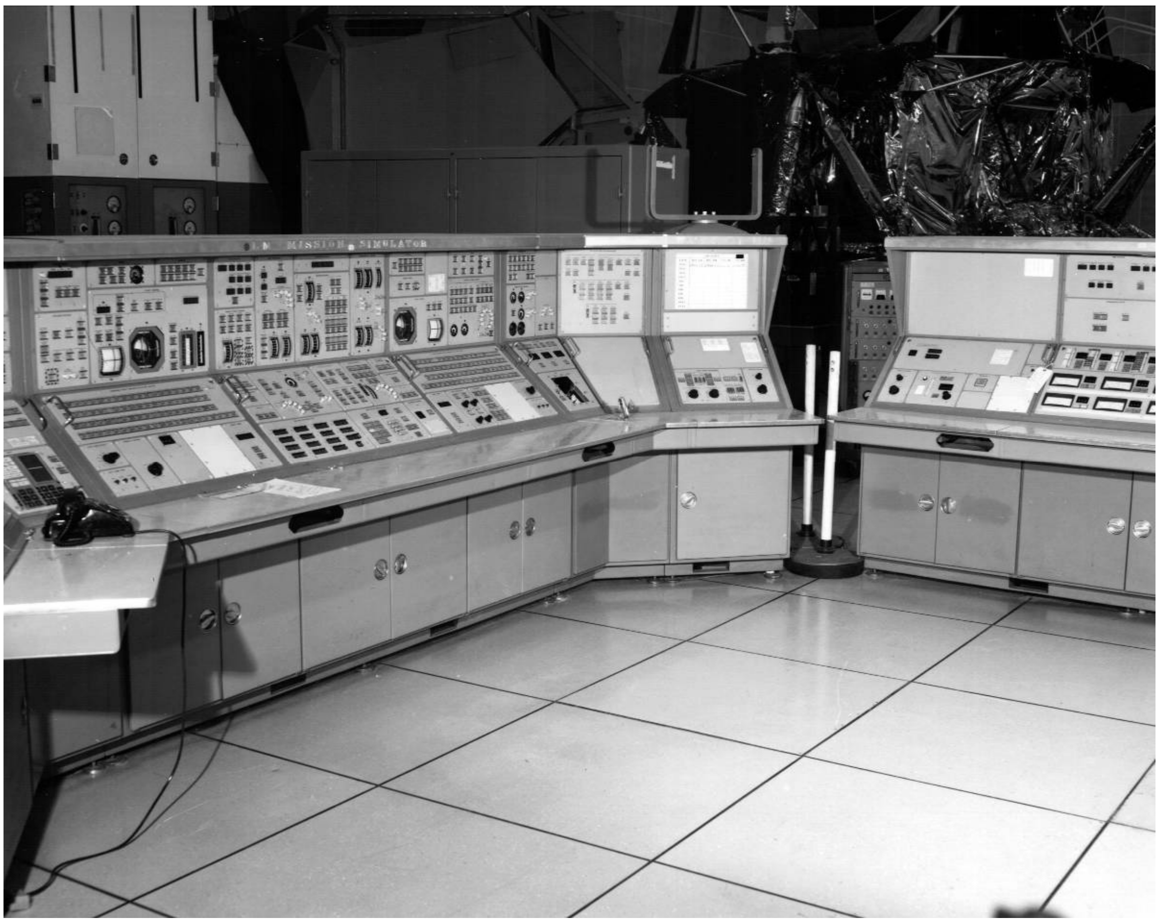

Figure A-8. View of the Lunar Module simulator control station, facing southwest, December 11, 1975.
Source: John F. Kennedy Space Center Archives, 116-KSC-75C-1491.

Figure A-9. View of the Command Module simulator with astronauts John W. Young (left) and Thomas P. Stafford (right), facing northeast, May 16, 1969.
Source: John F. Kennedy Space Center Archives, 108-KSC-69P-335.

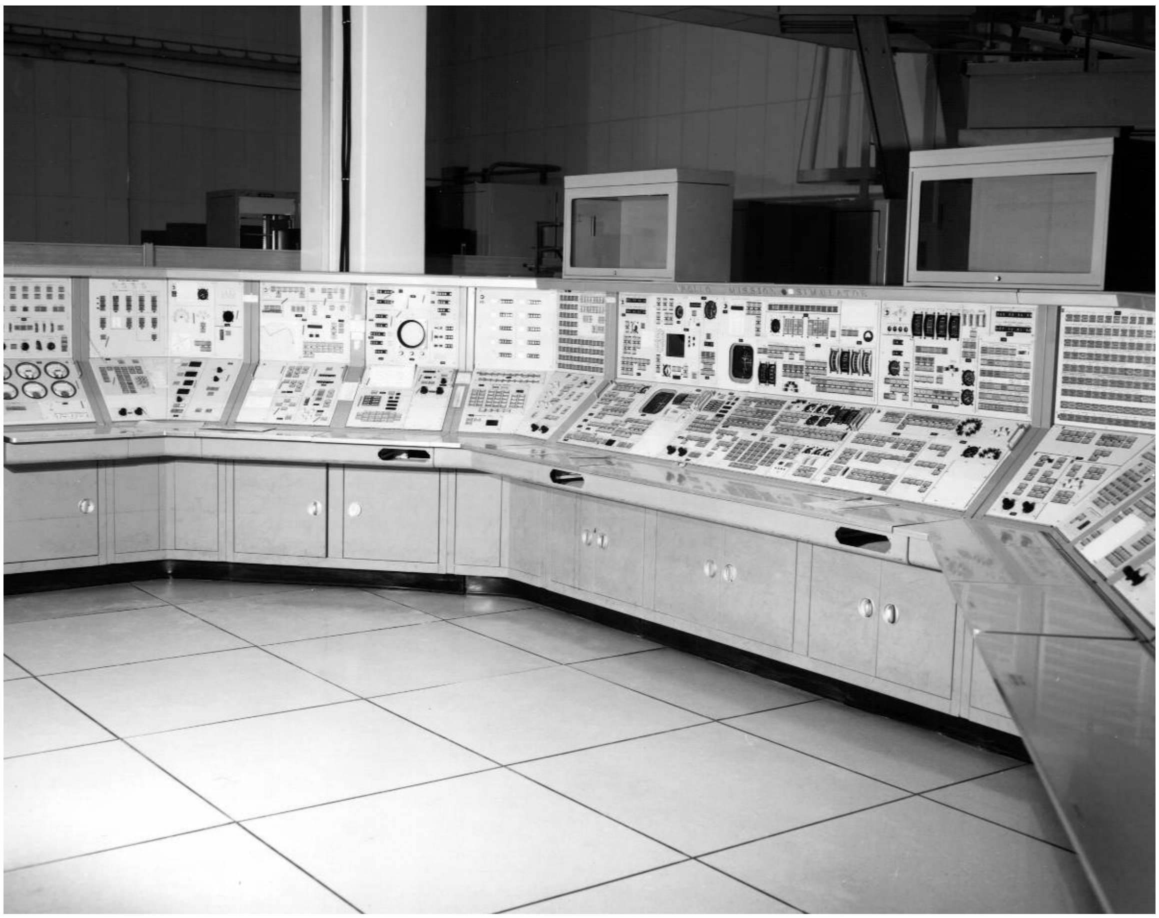

Figure A-10. View of the Command Module simulator control station, facing southeast, December 11, 1975.
Source: John F. Kennedy Space Center Archives, 116-KSC-75C-1493.

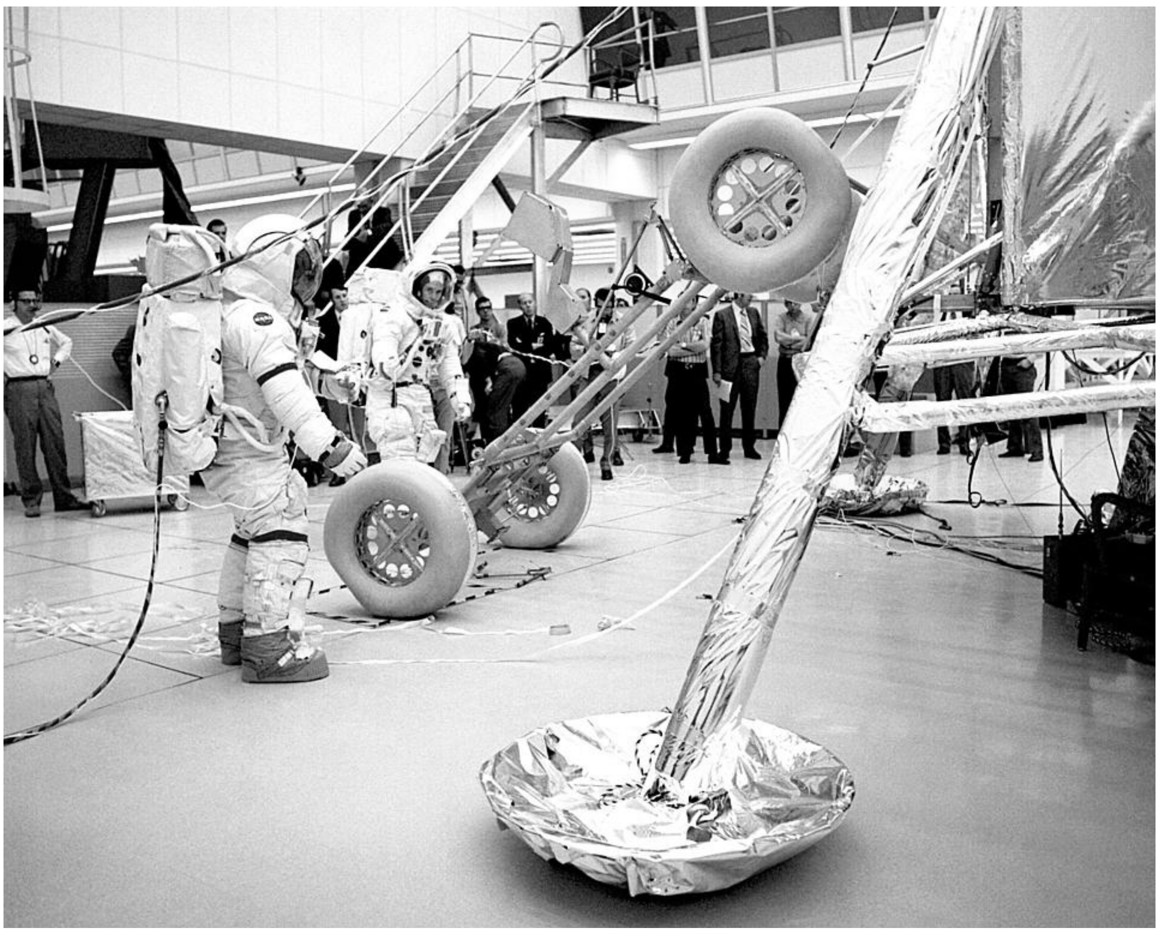

Figure A-11. Astronauts John W. Young (left) and Charles M. Duke, Jr. (right) practicing deployment of the Lunar Roving Vehicle from the Lunar Module simulator, facing northwest, November 11, 1971.
Source: John F. Kennedy Space Center Archives, 108-KSC-71PC-741.

Figure A-12. Astronauts Alan Bean (left) and Charles Conrad (right) training with the Surveyor 3 mockup, facing northwest, October 6, 1969.
Source: John F. Kennedy Space Center Archives, KSC-69PC-552.

Figure A-13. Aerial showing the Lunar Surface Training Area (denoted by arrow) to the southeast of the FCTB, December 27, 1969.
Source: State University Libraries of Florida, Publication of Archival Library & Museum Materials, Aerial Photography Florida, Photo CYS-1KK-115, http://ufdc.ufl.edu/aerials/?n=palmm.

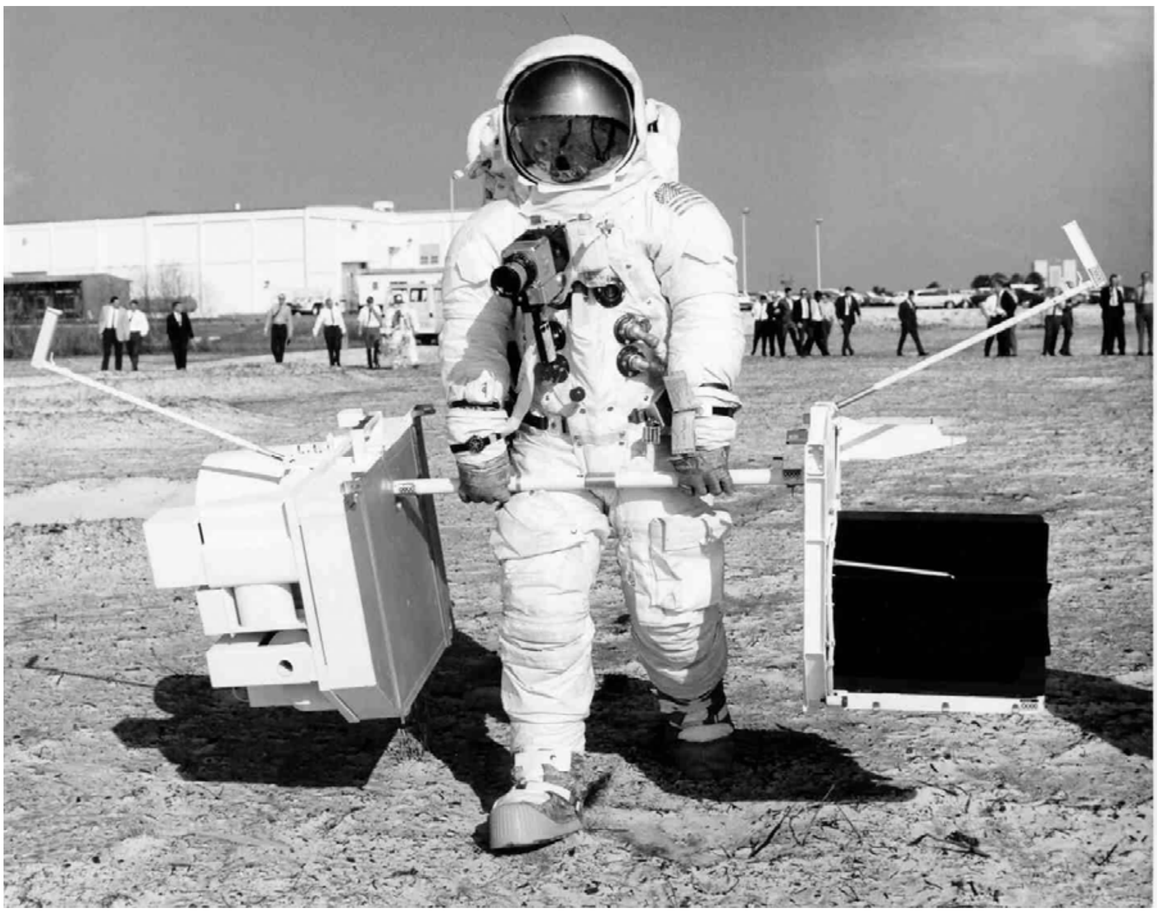

Figure A-14. Astronaut James A. Lovell, Jr. conducting training activities in the Lunar Surface Training Area once located to the southeast of the Flight Crew Training Building, facing northwest, January 28, 1970.
Source: John F. Kennedy Space Center Archives, KSC-70PC-15.

Figure A-15. Apollo 16 backup astronauts, Edgar Mitchell and Fred Haise, driving the Lunar Roving Vehicle simulator in the Lunar Surface Training Area, facing northwest, date unknown. Source: *Spaceport News*, December 22, 2006, 7.

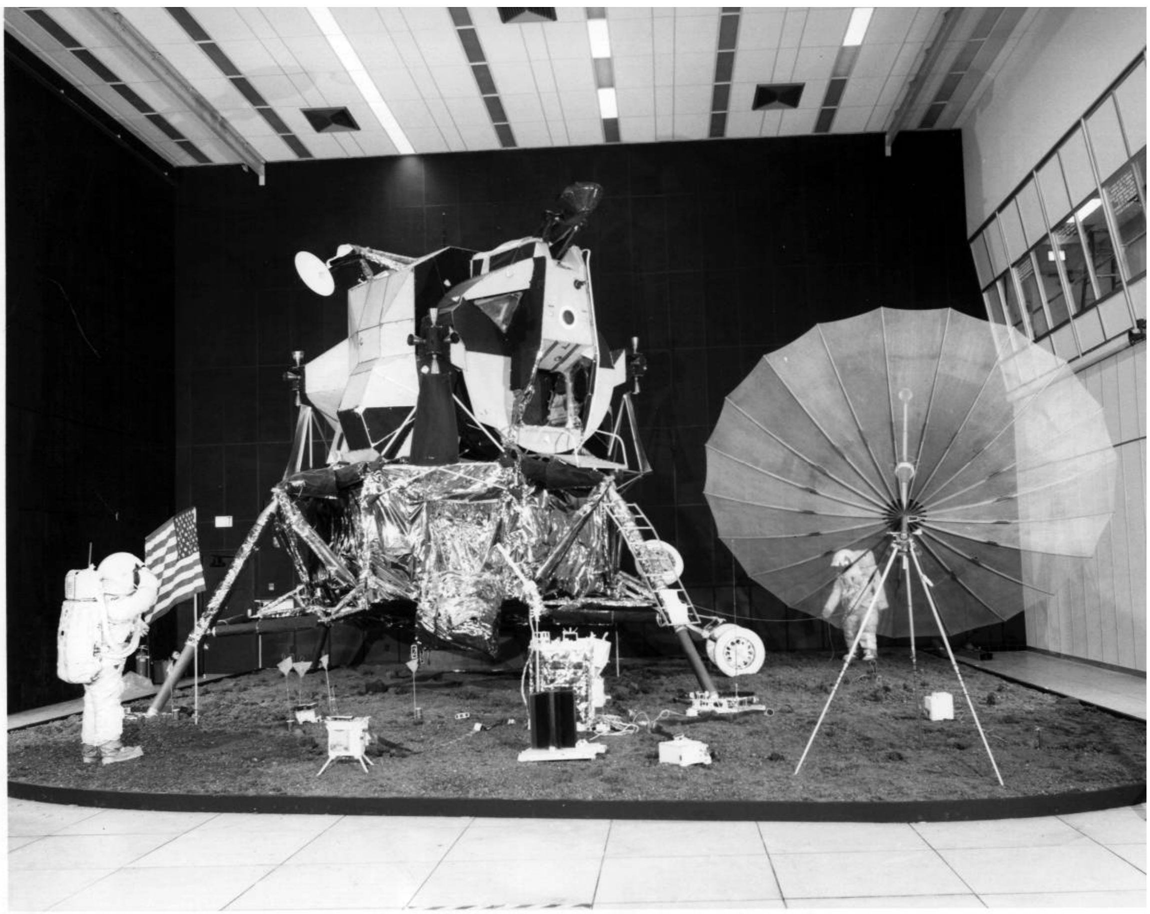

Figure A-16. View of the lunar scene exhibit located in the Flight Crew Training Building from the mid-1970s to the mid-1990s, facing west, May 25, 1976.
Source: John F. Kennedy Space Center Archives, KSC-76PC-180.

Figure A-17. Aerial of the Flight Crew Training Building [Engineering Development Laboratory by this time], facing northwest, February 21, 1996.
Source: John F. Kennedy Space Center Archives, KSC-396C-0958_01.

Figure A-18. January 2013 photographs of Lunar Surface Training Area remnants. The top photograph is an overall view of the area facing northwest; the bottom photograph is of a simulated Moon rock.
Source: Archaeological Consultants, Inc.

APPENDIX B: Architectural Drawings of the Flight Crew Training Building
(PDF Scans of each Drawing at the original size are located within the Field Notes)

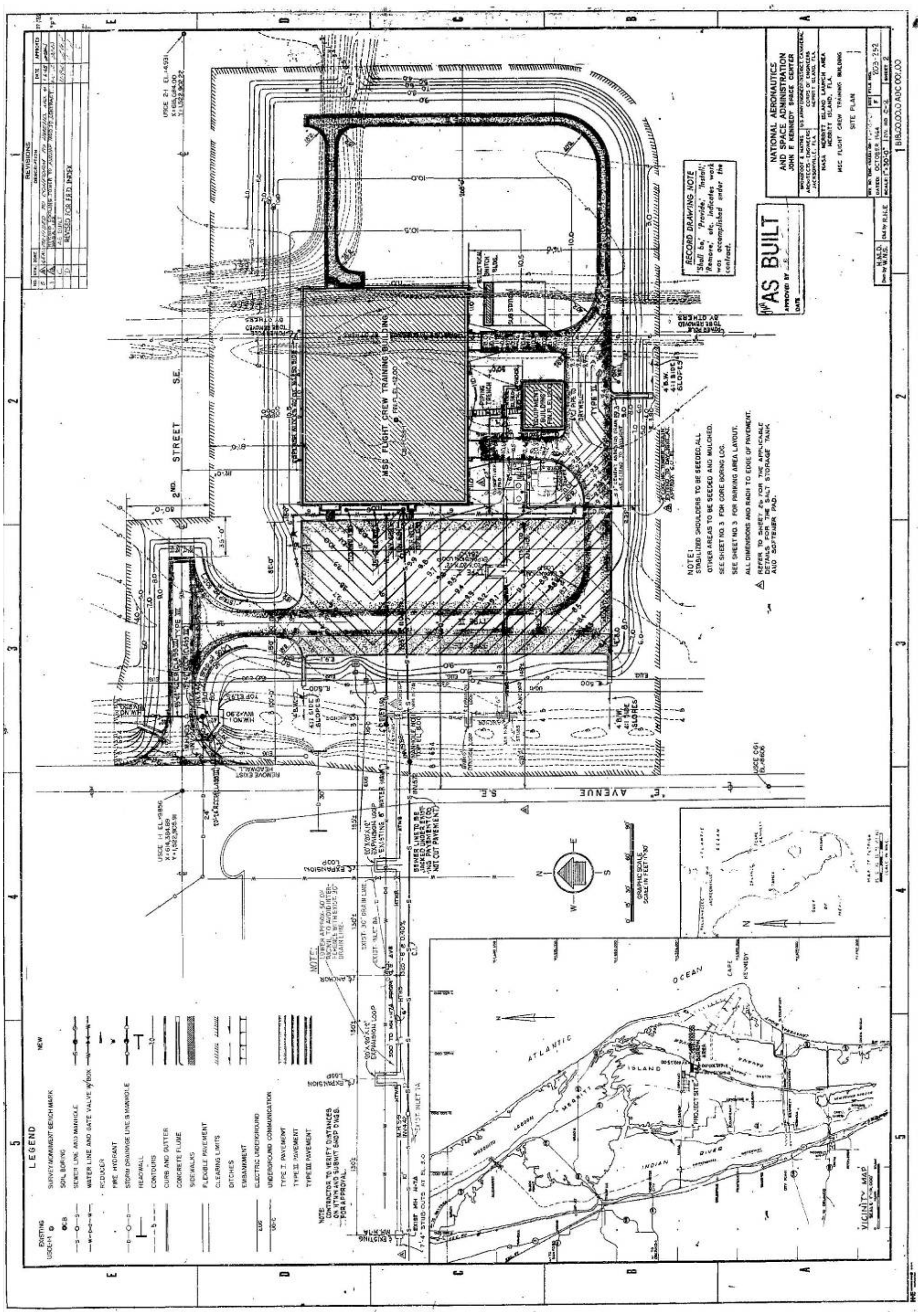

Figure B-1. Broadfoot & Mathis, Flight Crew Training Building, Site Plan, October 1964, Sheet 2.

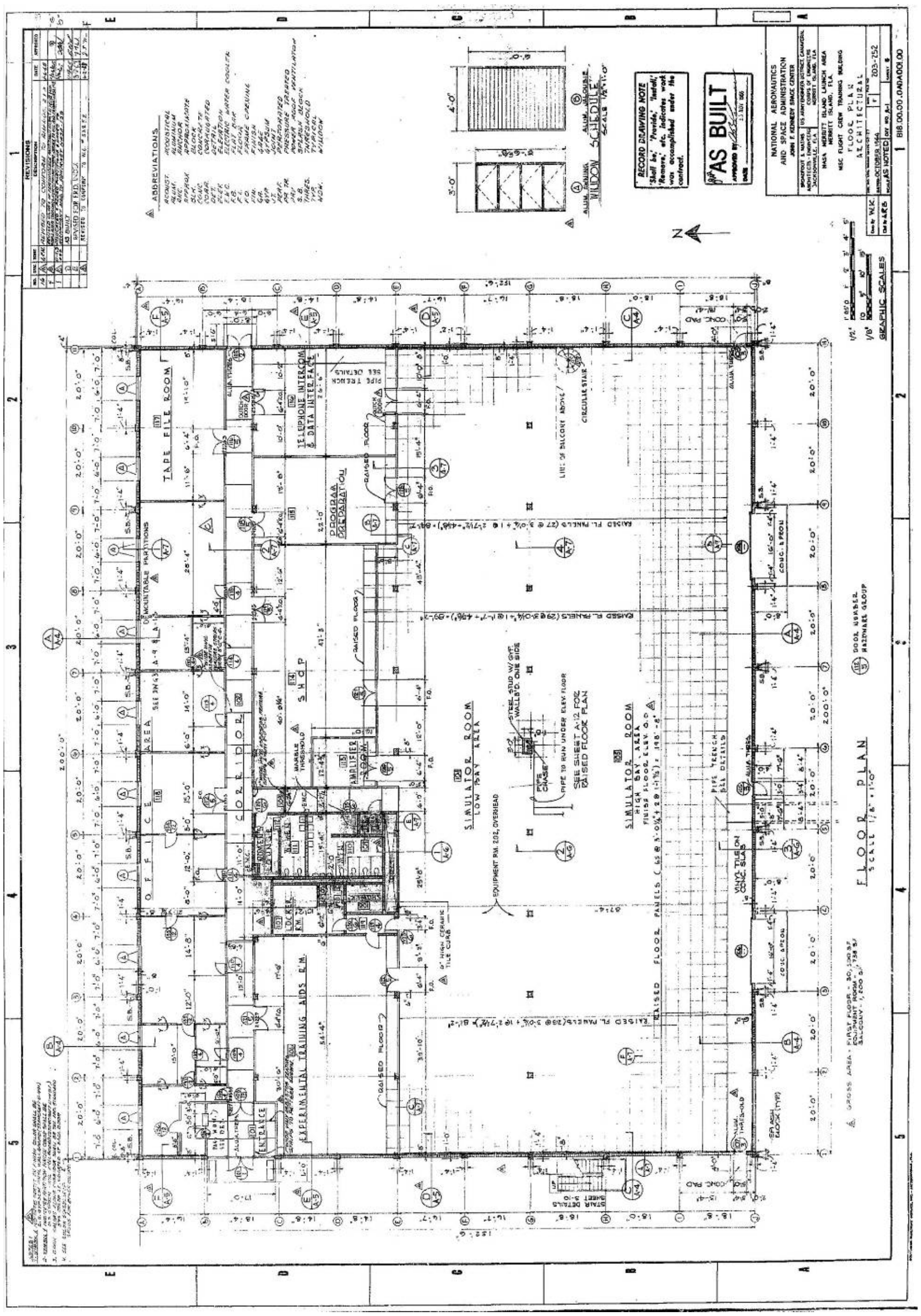

Figure B-2. Broadfoot & Mathis, Flight Crew Training Building, First Floor Plan, October 1964, Sheet 6.

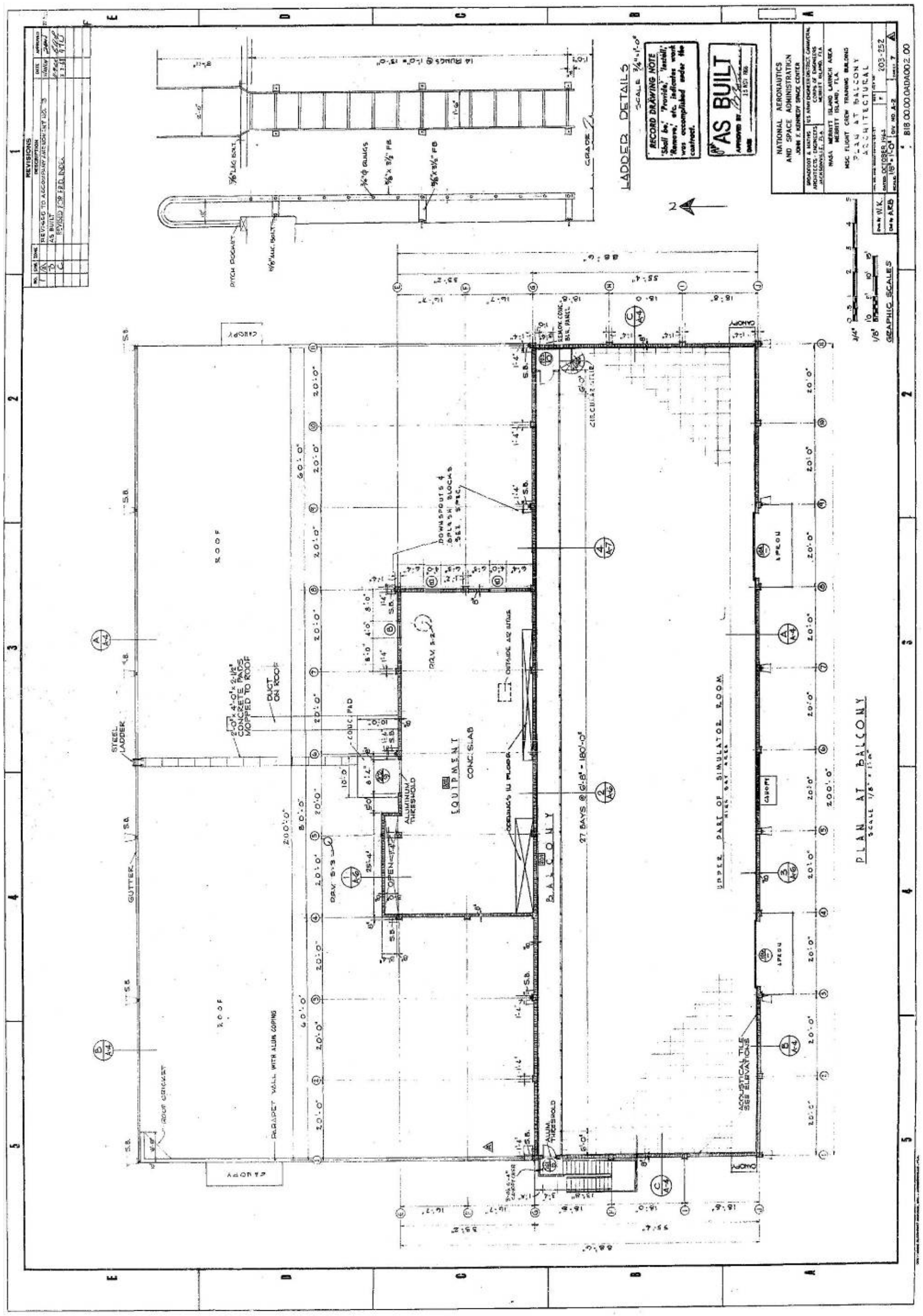

Figure B-3. Broadfoot & Mathis, Flight Crew Training Building, Plan at Balcony, October 1964, Sheet 7.

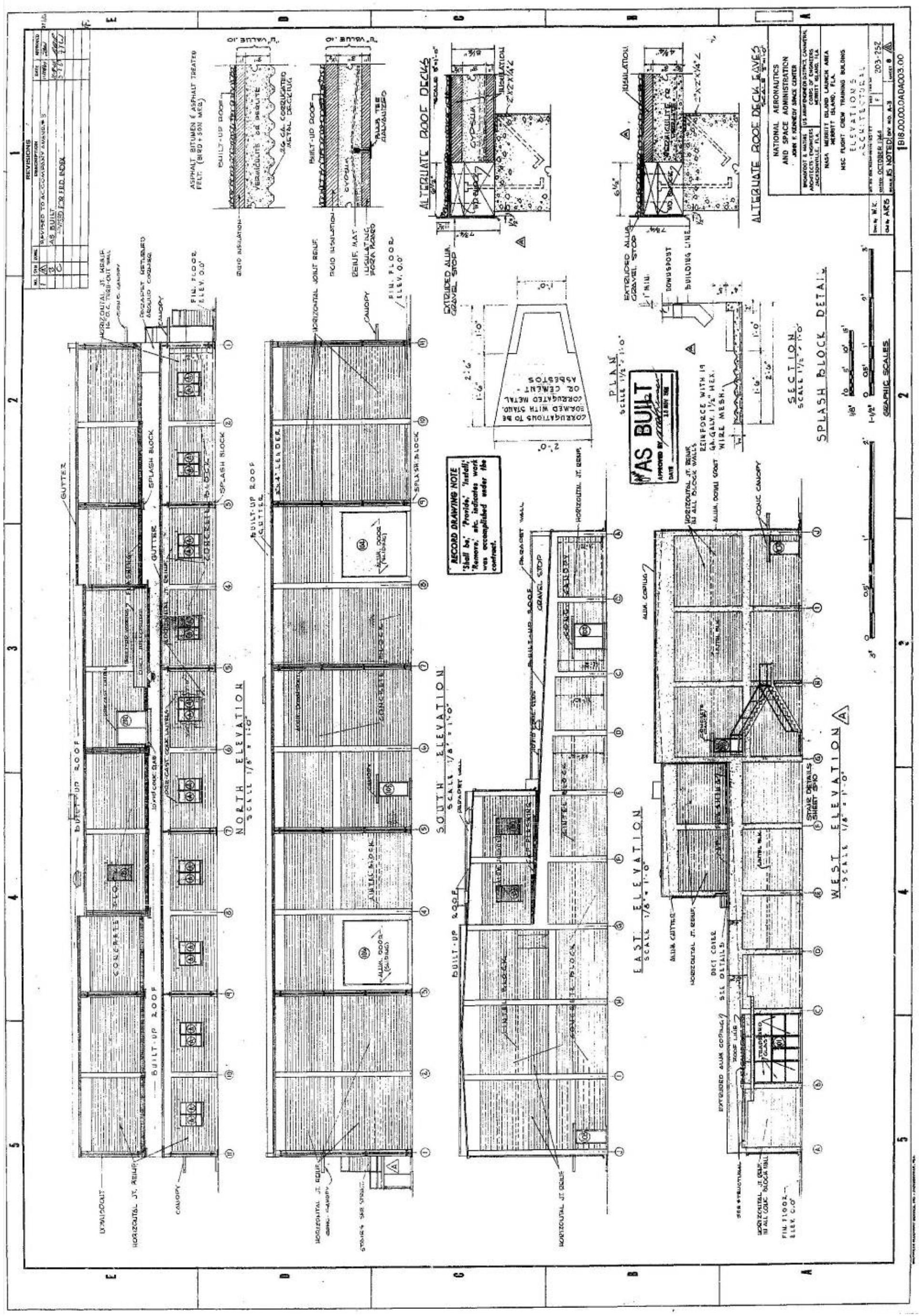

Figure B-4. Broadfoot & Mathis, Flight Crew Training Building, Elevations, October 1964, Sheet 8.

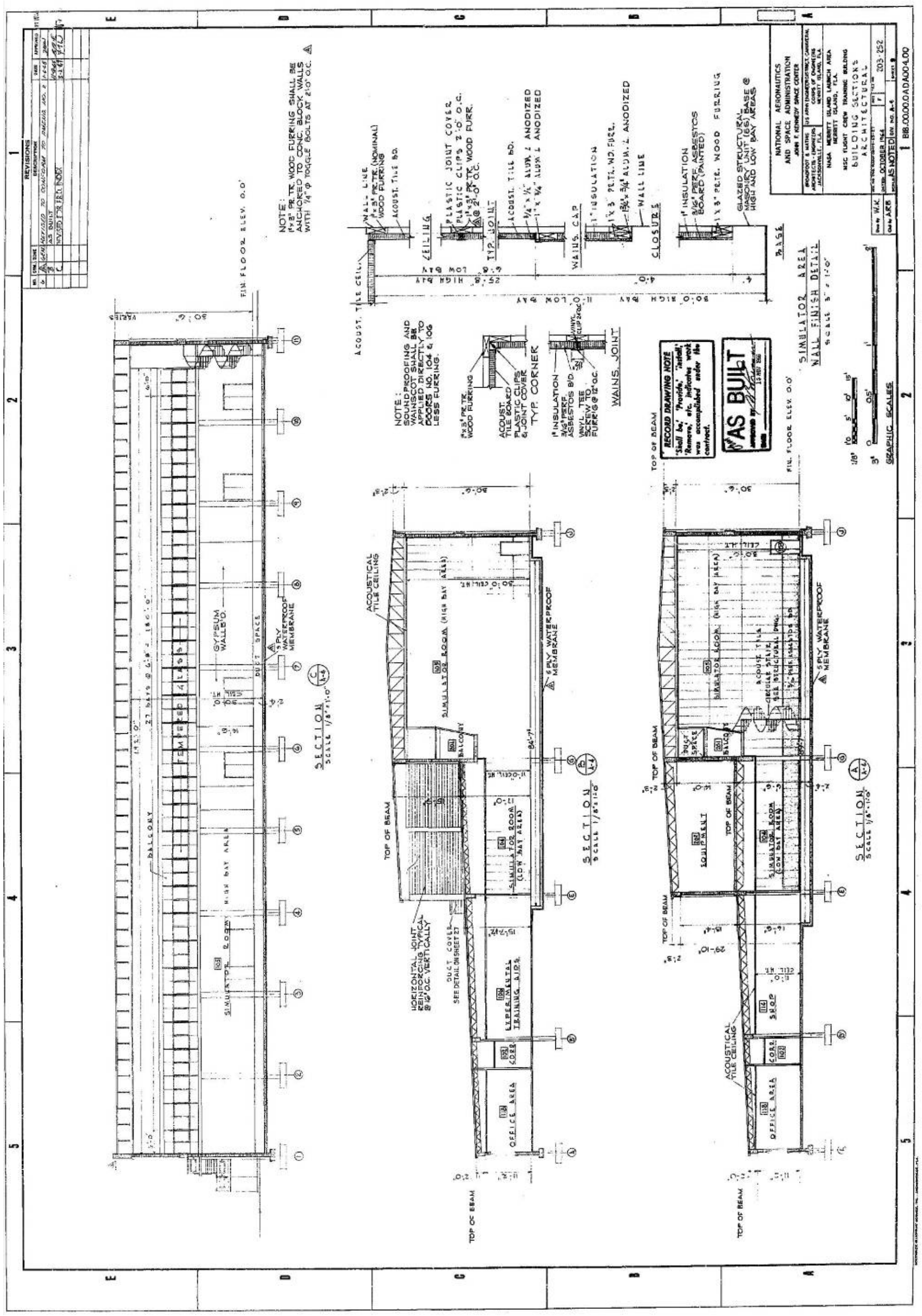

Figure B-5. Broadfoot & Mathis, Flight Crew Training Building, Building Sections, October 1964, Sheet 9.

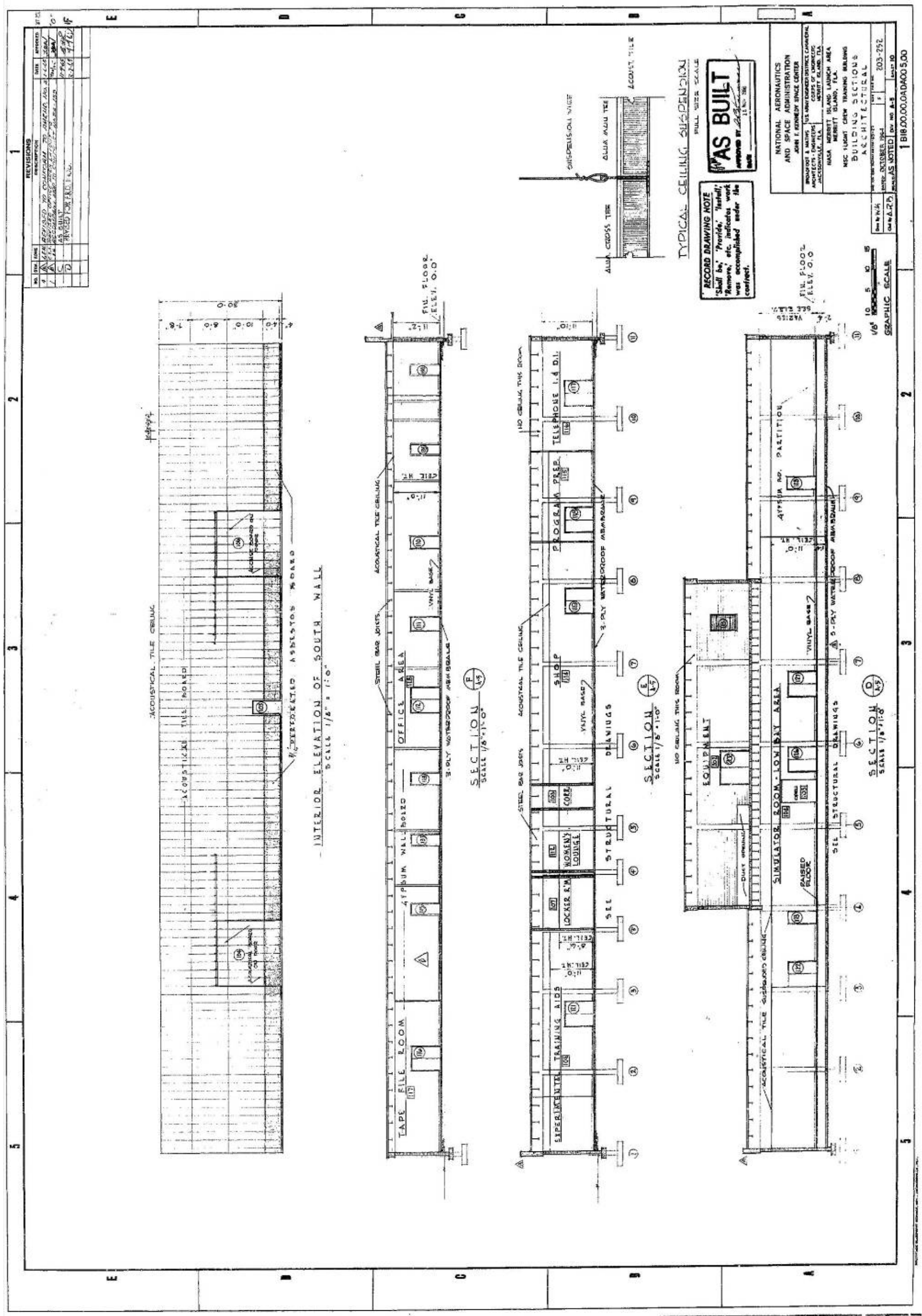

Figure B-6. Broadfoot & Mathis, Flight Crew Training Building, Building Sections, October 1964, Sheet 10.

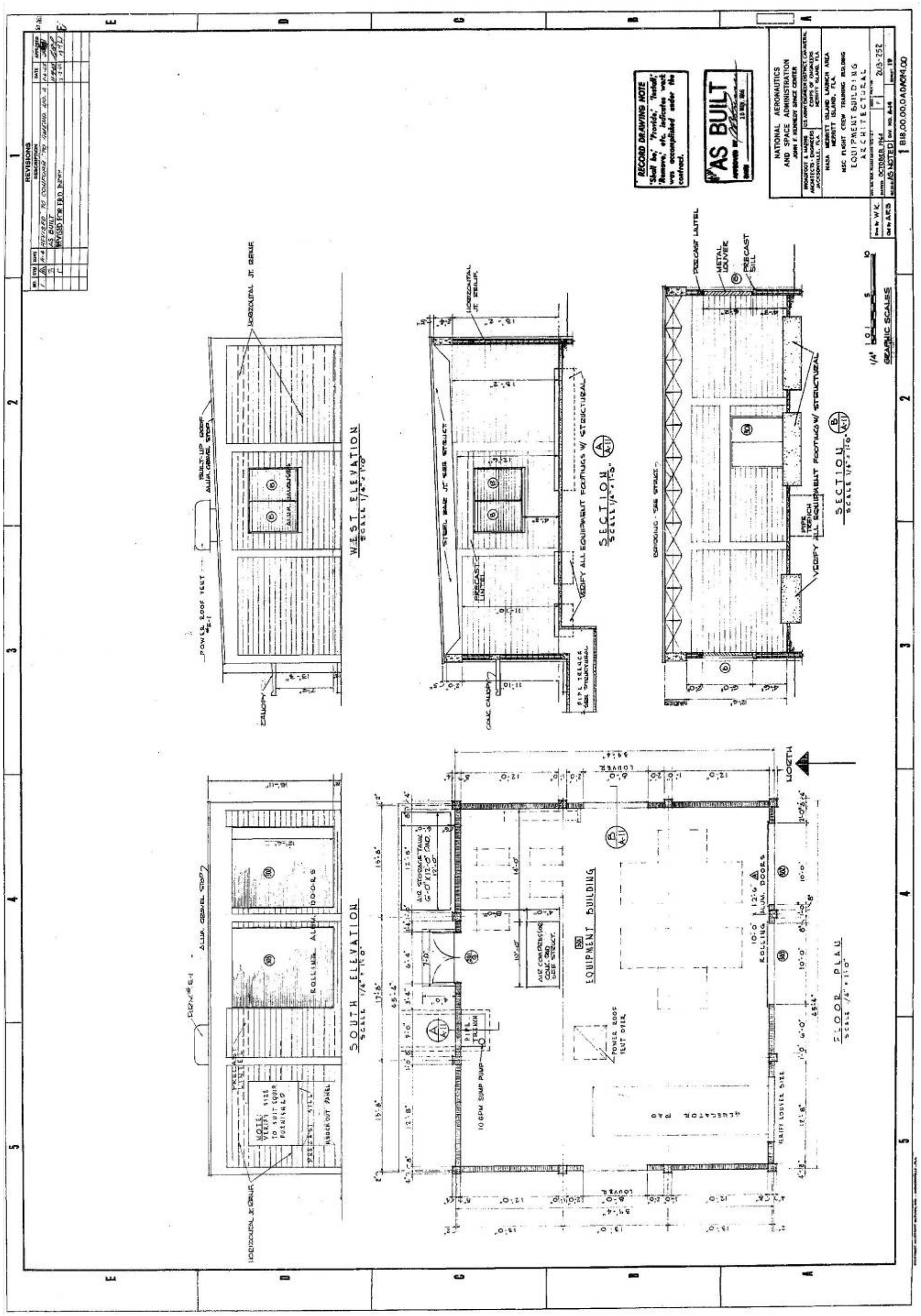

Figure B-7. Broadfoot & Mathis, Flight Crew Training Building, Equipment Building, October 1964, Sheet 19.

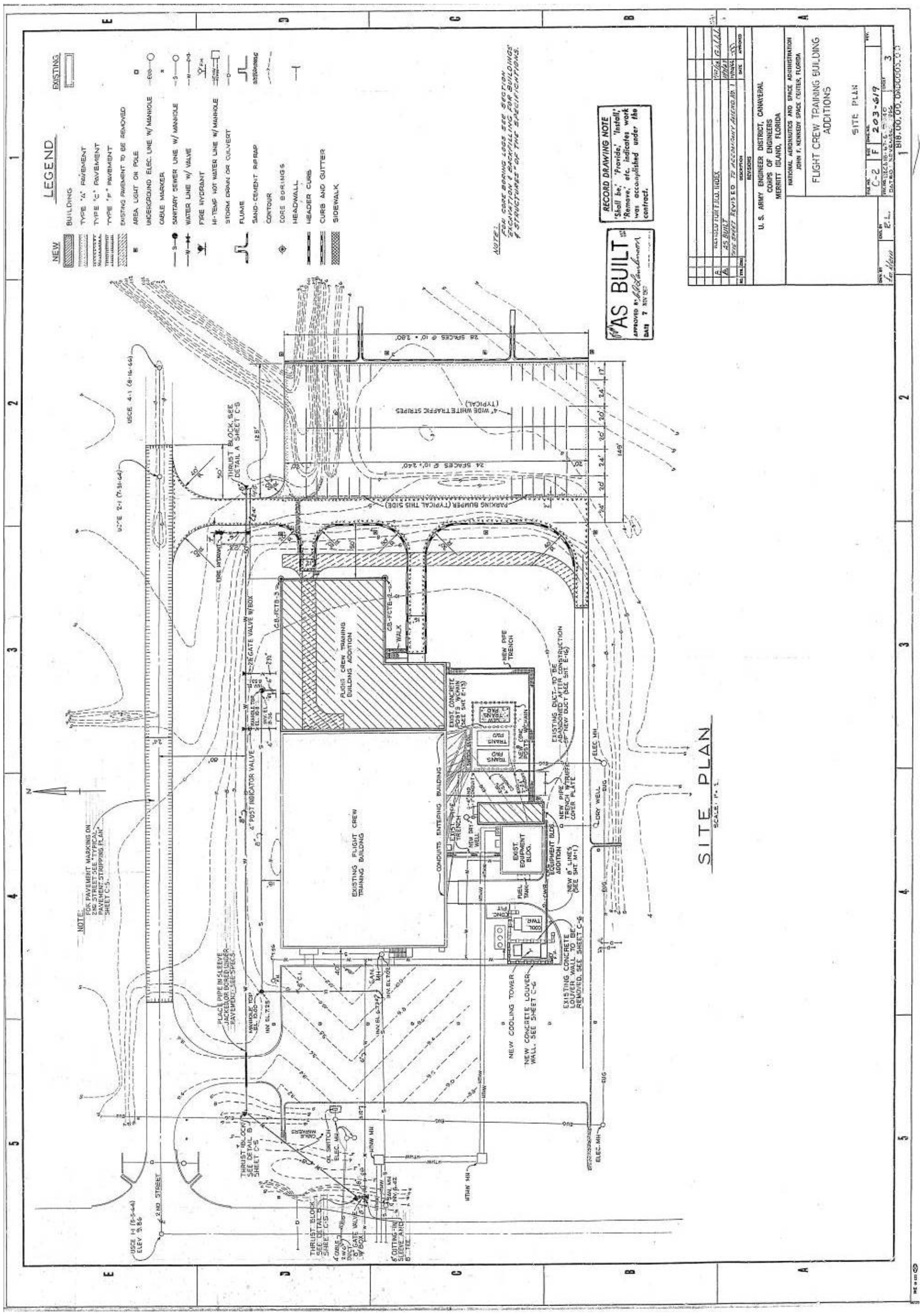

Figure B-8. U.S. Army Corps of Engineers, Flight Crew Training Building Addition, Site Plan, November 1966, Sheet 3.

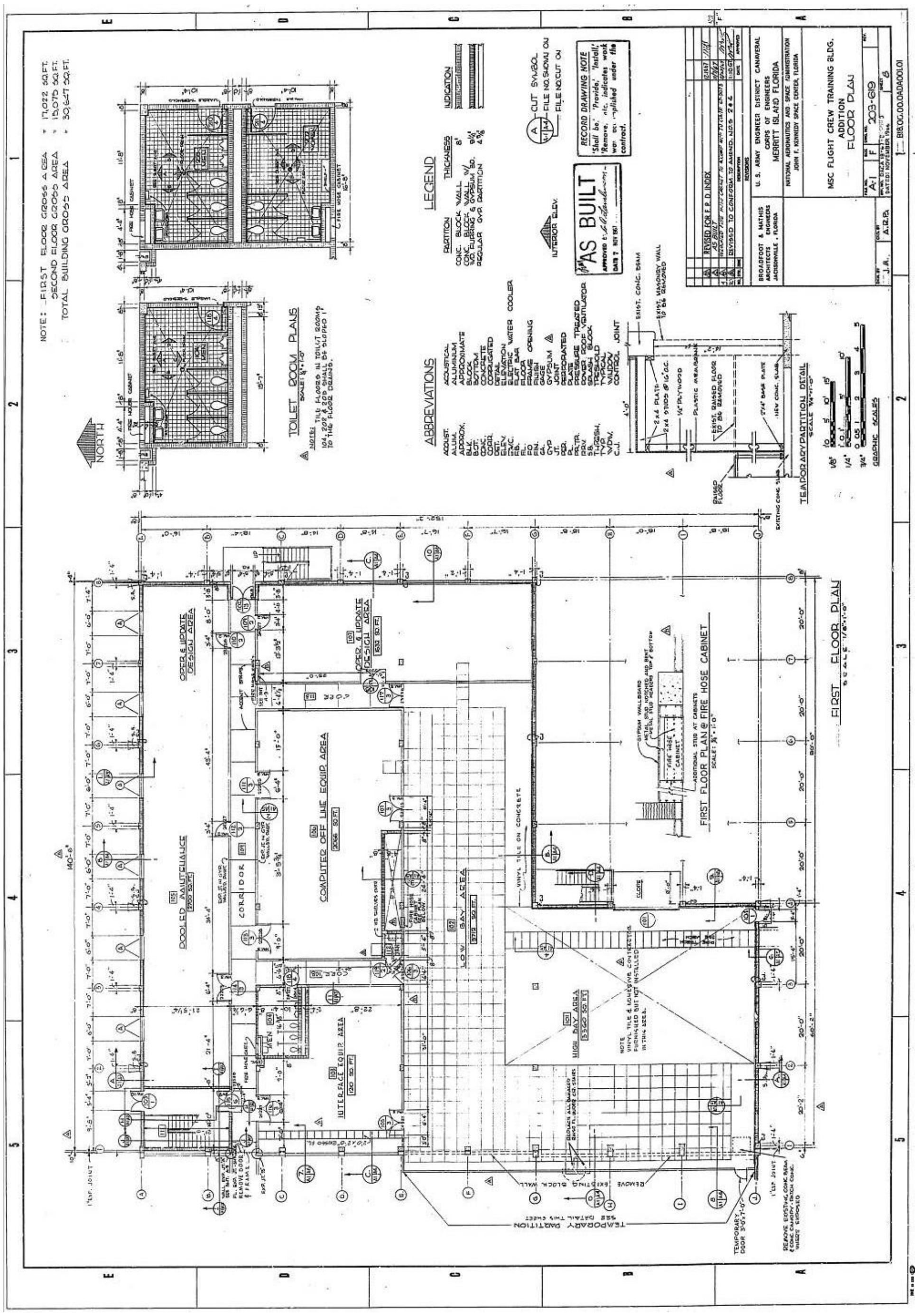

Figure B-9. Broadfoot & Mathis, Flight Crew Training Building Addition, First Floor Plan, November 1966, Sheet 8.

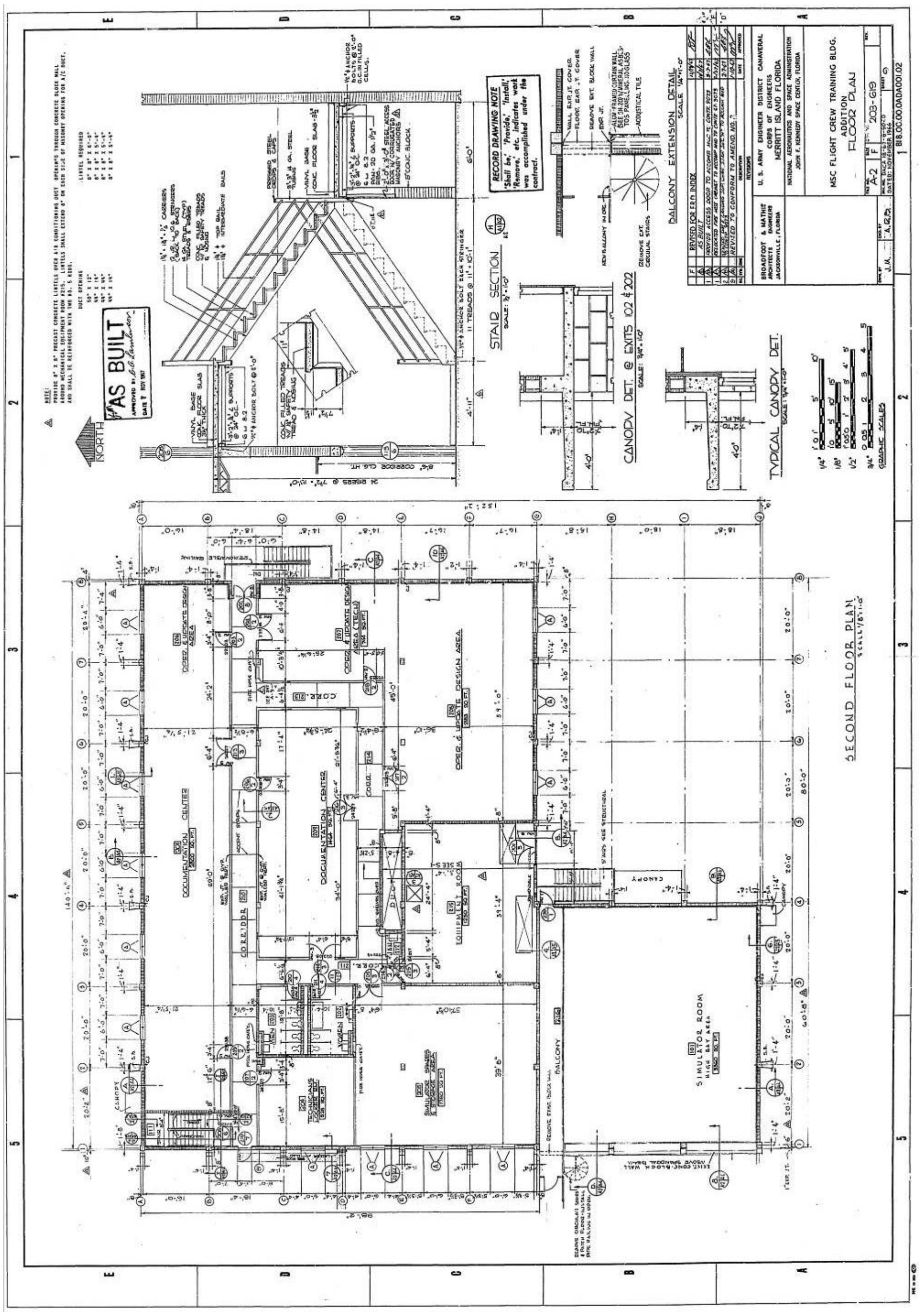

Figure B-10. Broadfoot & Mathis, Flight Crew Training Building Addition, Second Floor Plan, November 1966, Sheet 9.

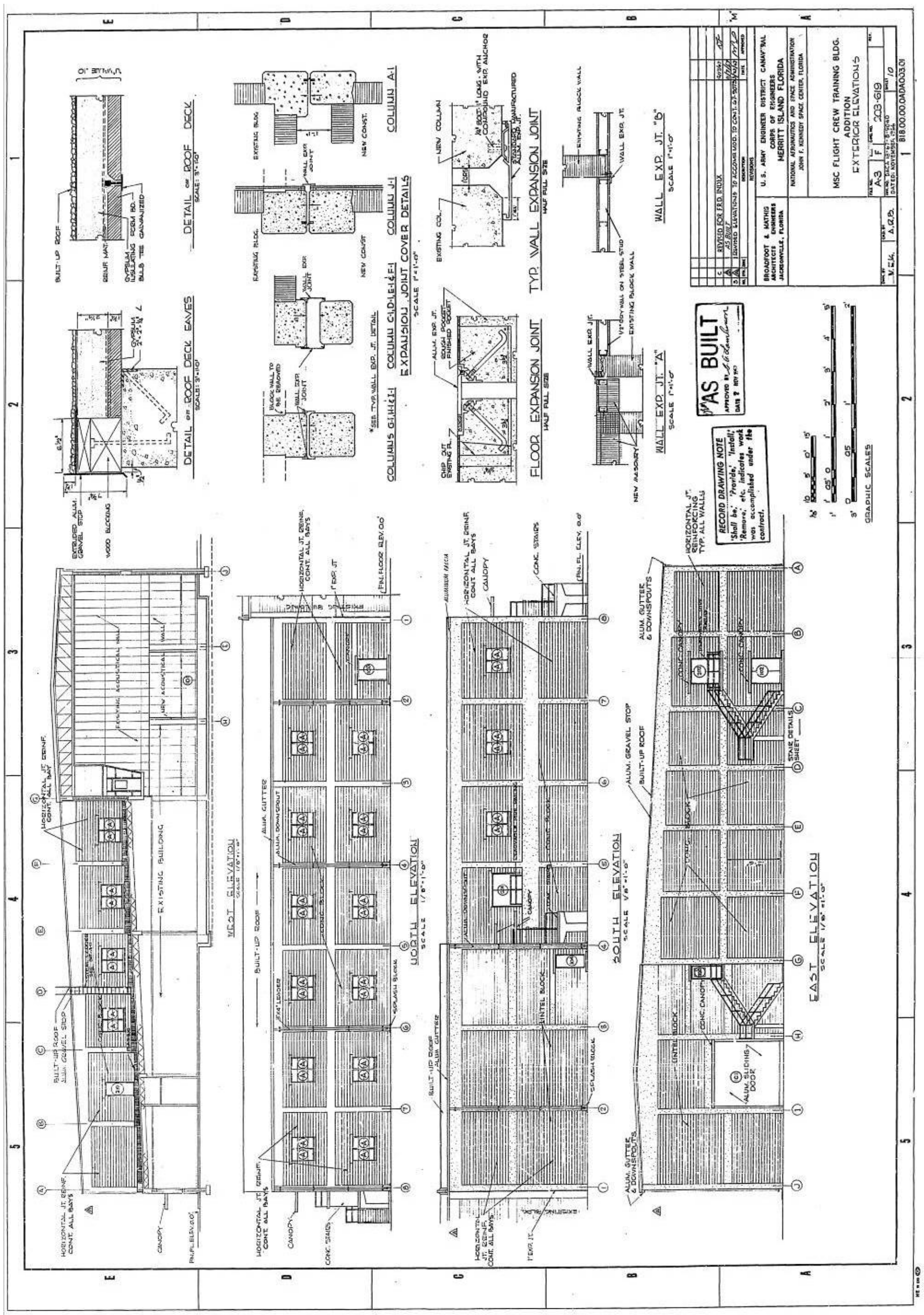

Figure B-11. Broadfoot & Mathis, Flight Crew Training Building Addition, Elevations, November 1966, Sheet 10.

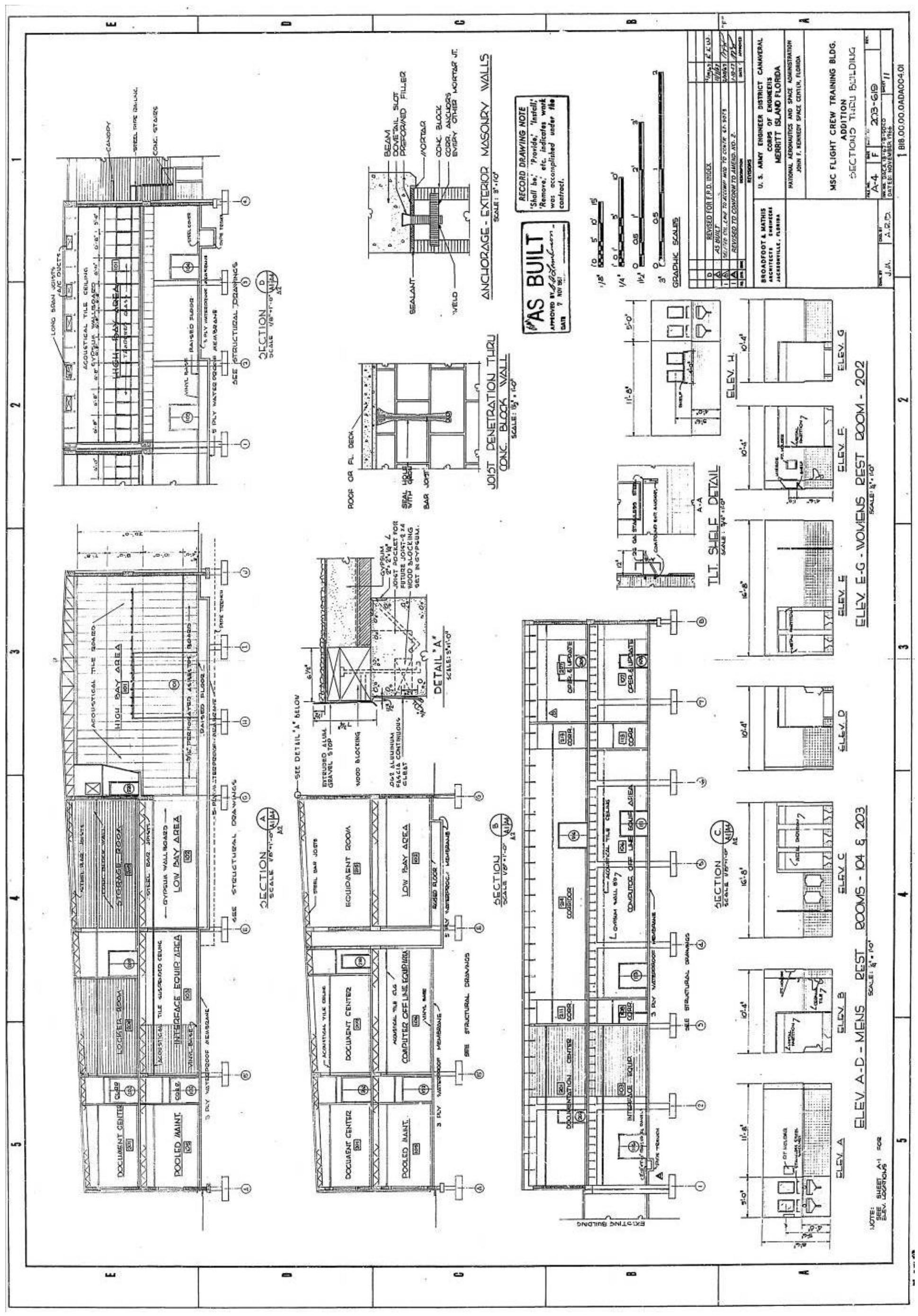

Figure B-12. Broadfoot & Mathis, Flight Crew Training Building Addition, Sections Through Building, November 1966, Sheet 8.

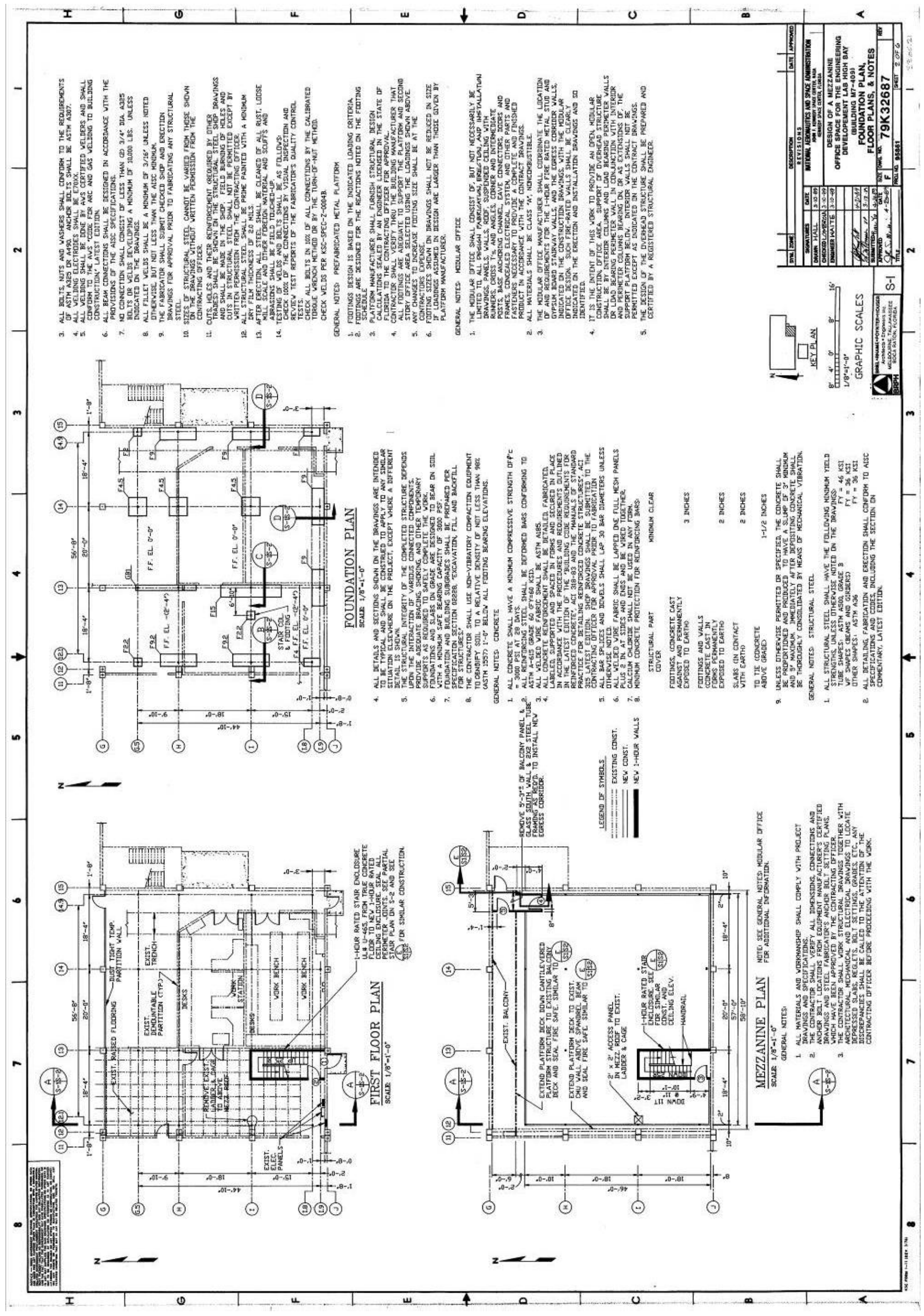

Figure B-13. NASA KSC, Building M7-409-Mezzanine Office Space, Foundation Plan, Floor Plans and Notes, April 1989, Sheet 2 of 6.

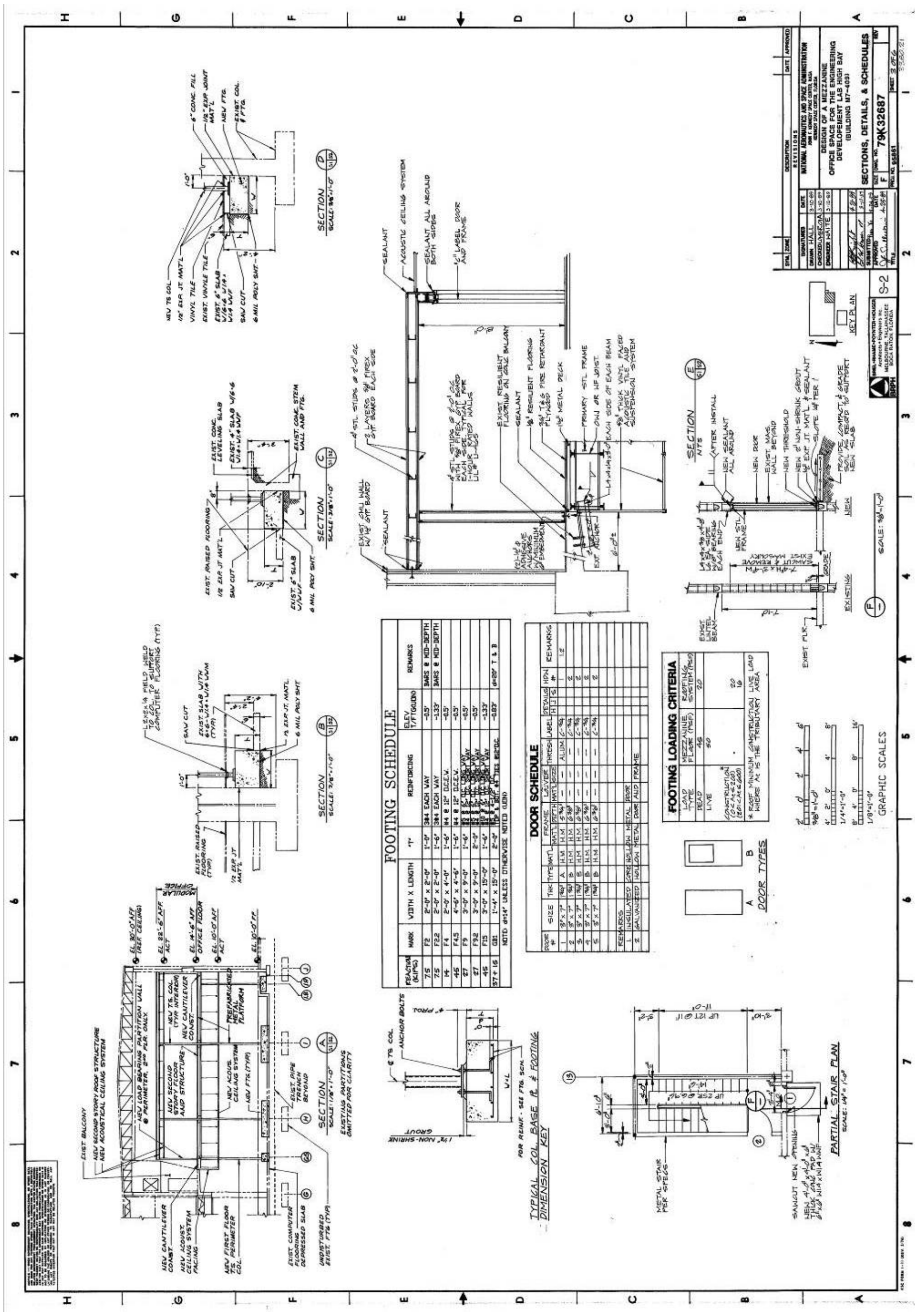

Figure B-14. NASA KSC, Building M7-409-Mezzanine Office Space, Foundation Plan, Floor Plans and Notes, April 1989, Sheet 3 of 6.

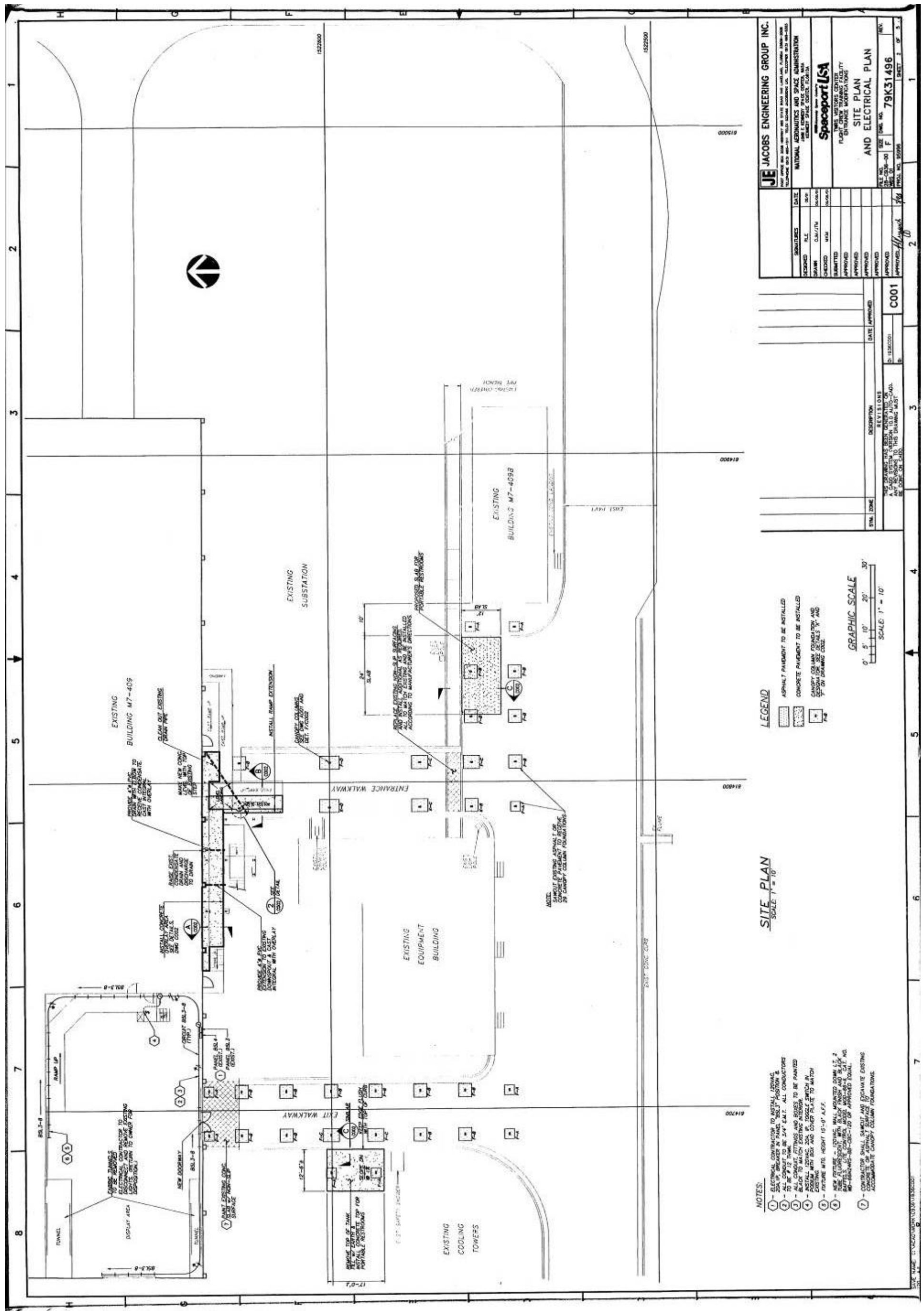

Figure B-15. Jacobs Engineering Group, Entrance Modifications, Site Plan and Electrical Plan, September 1991, Sheet 2 of 5.

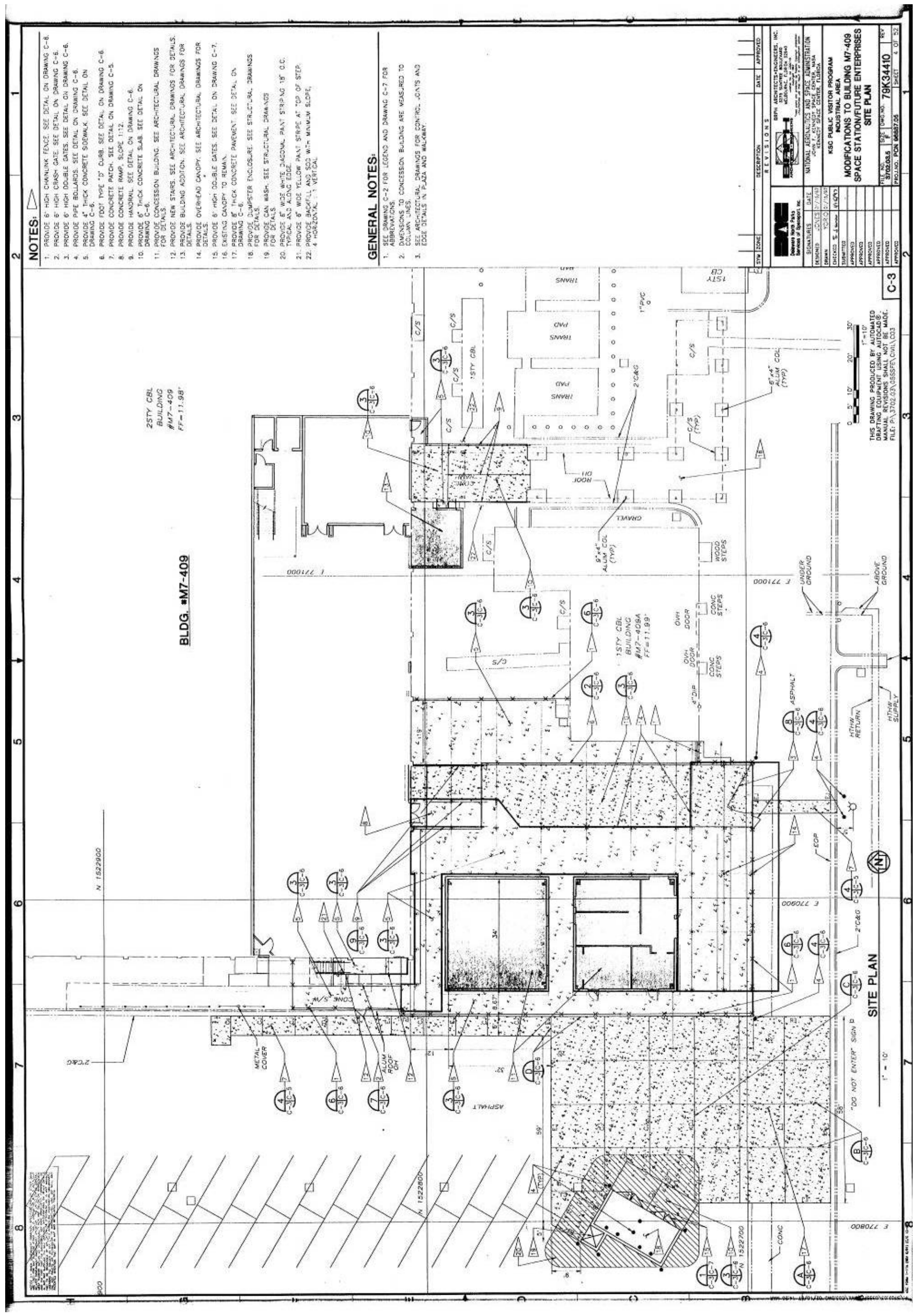

Figure B-16. BRPH Architects & Engineers, Modifications to Building M7-409, Site Plan, January 1997, Sheet 4 of 52.

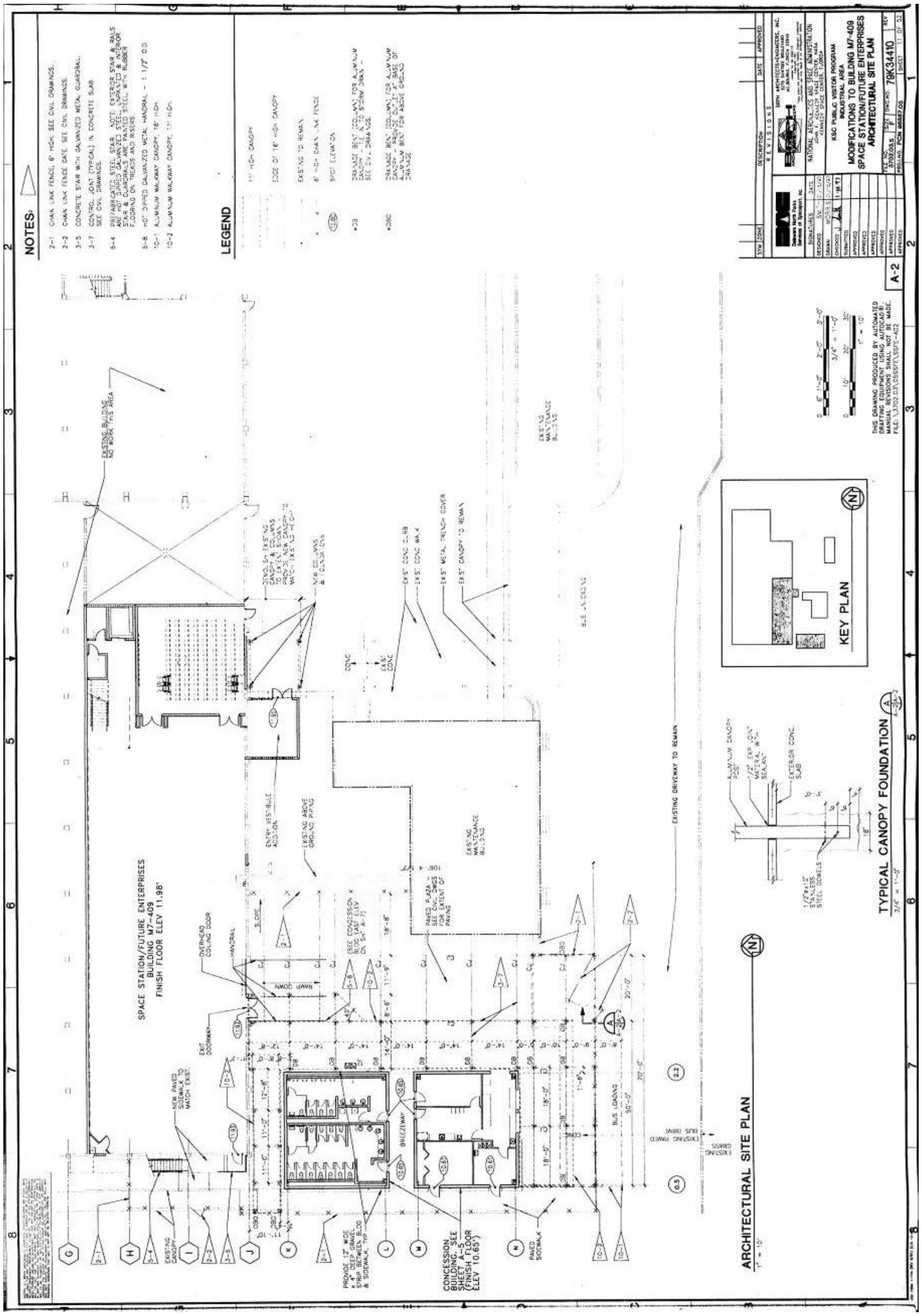

Figure B-17. BRPH Architects & Engineers, Modifications to Building M7-409, Architectural Site Plan, January 1997, Sheet 11 of 52.

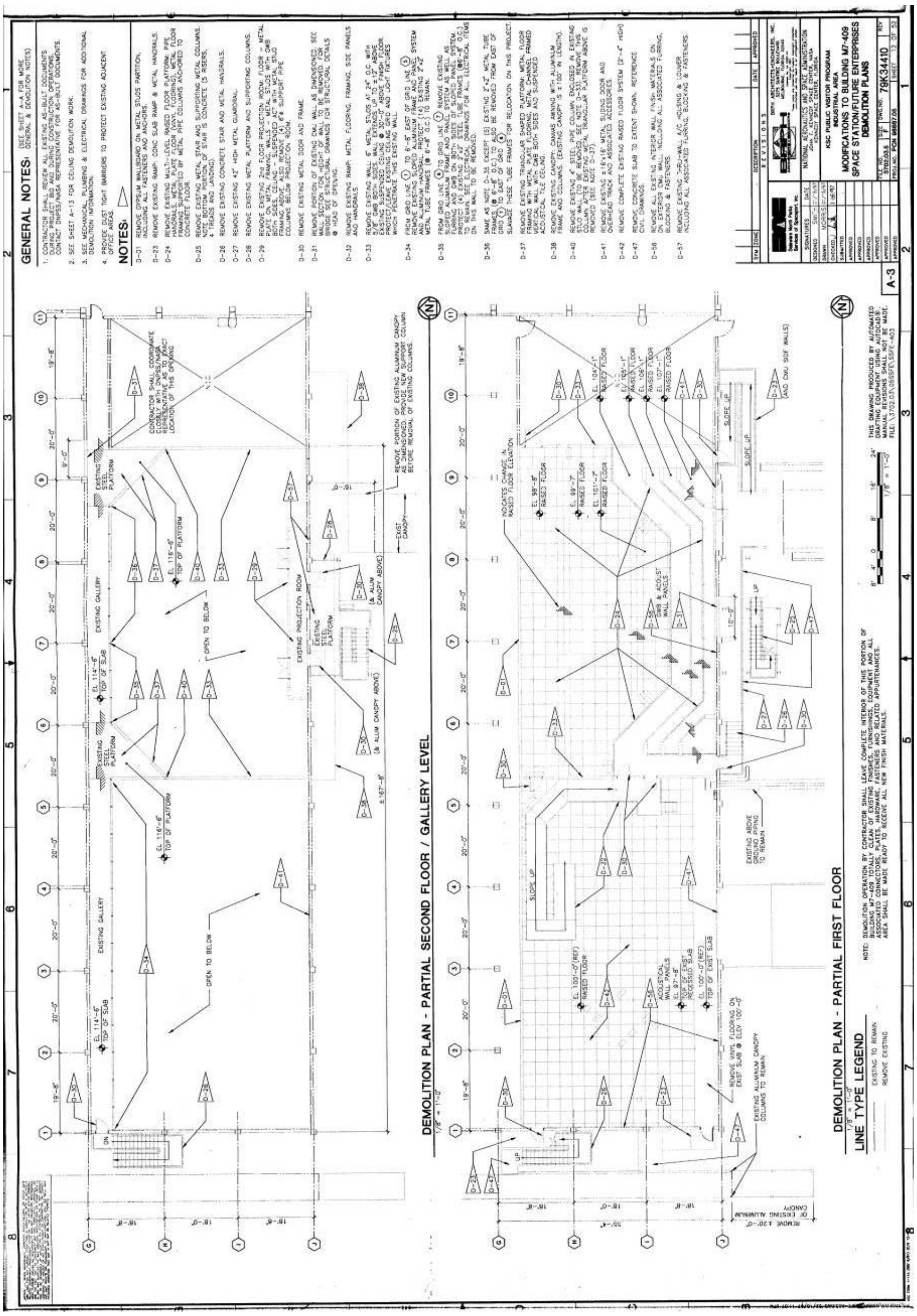

Figure B-18. BRPH Architects & Engineers, Modifications to Building M7-409, Demolition Plans, January 1997, Sheet 12 of 52.

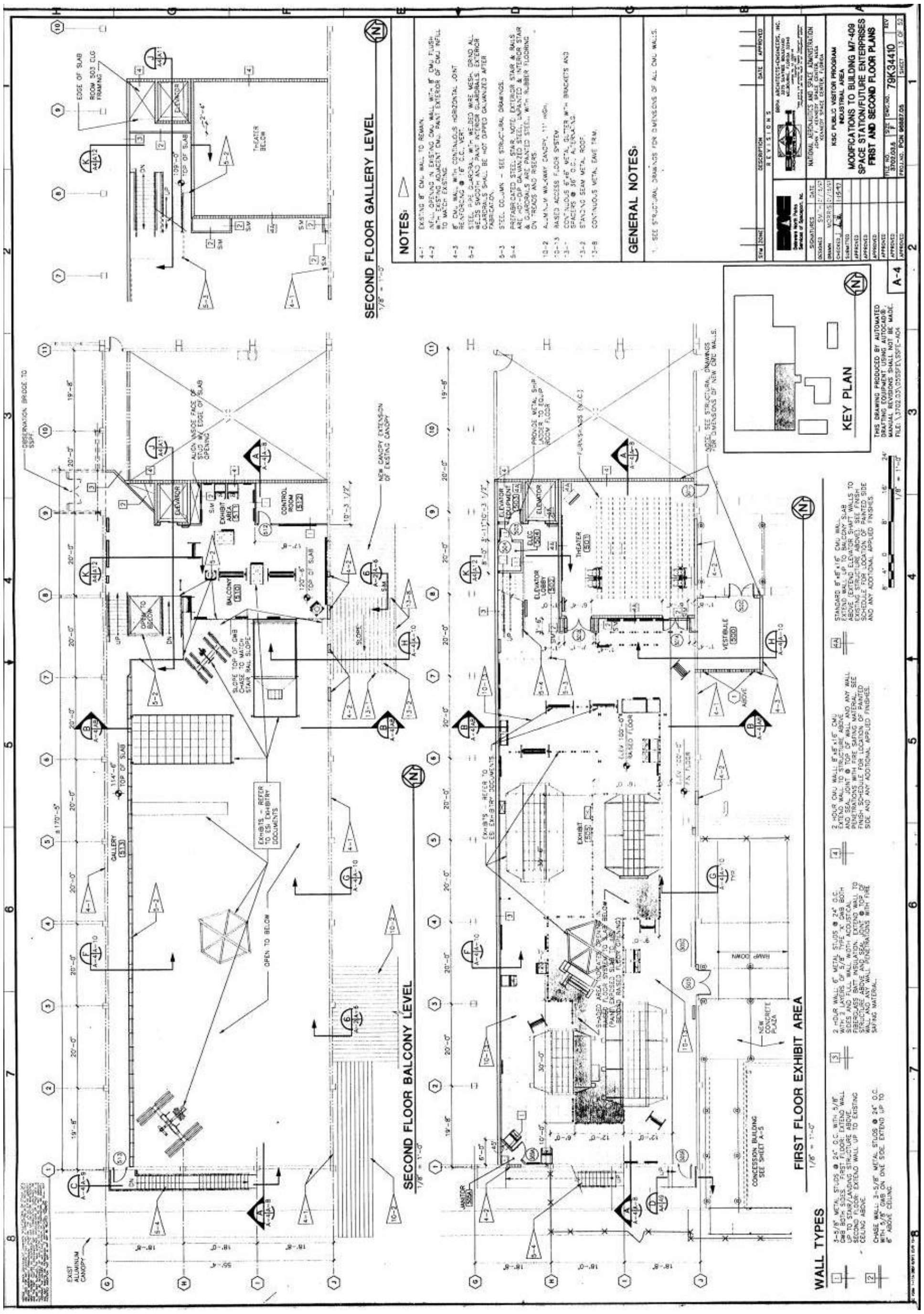

Figure B-19. BRPH Architects & Engineers, Modifications to Building M7-409, First and Second Floor Plans, January 1997, Sheet 13 of 52.

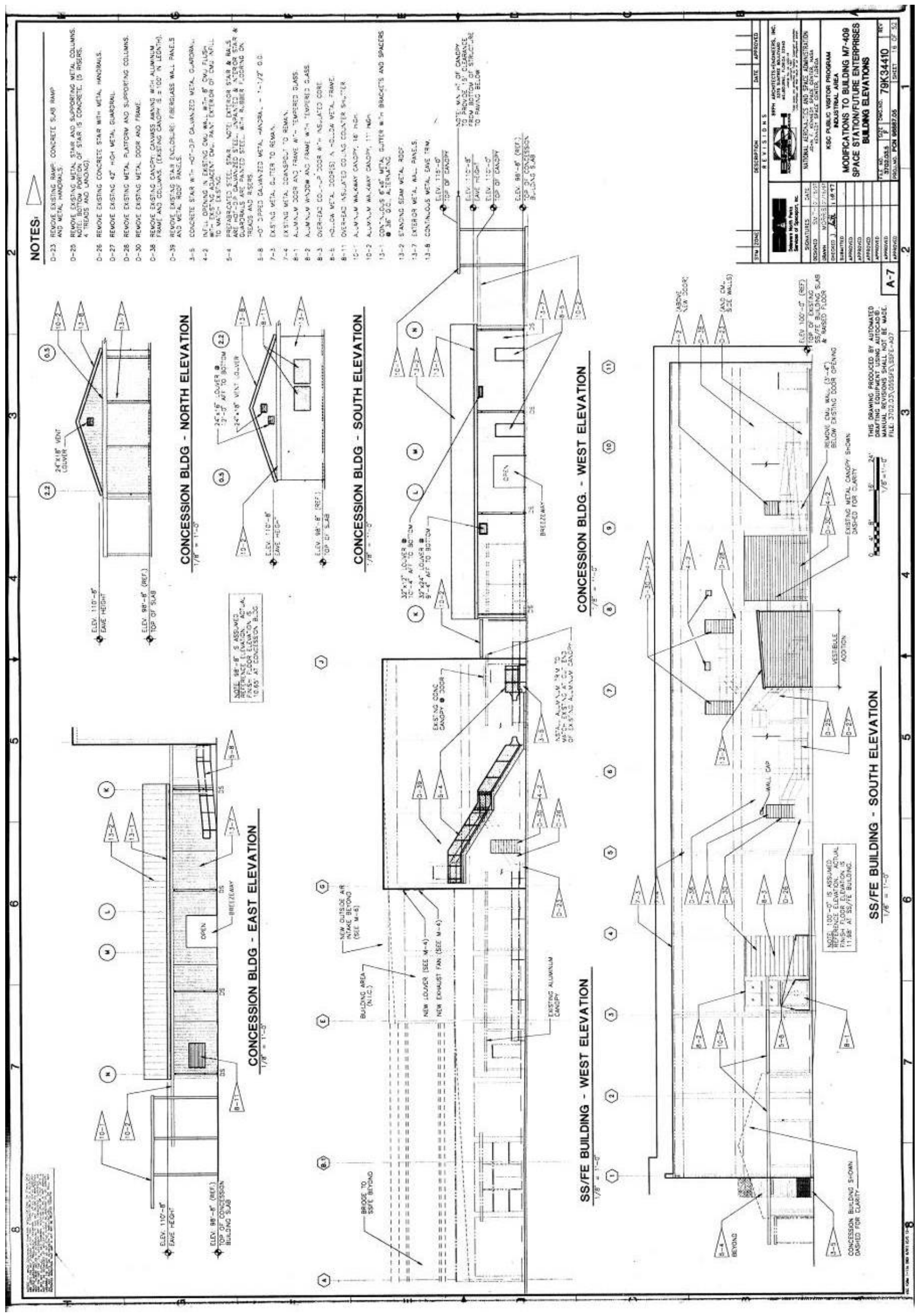

Figure B-20. BRPH Architects & Engineers, Modifications to Building M7-409, Building Elevations, January 1997, Sheet 14 of 52.

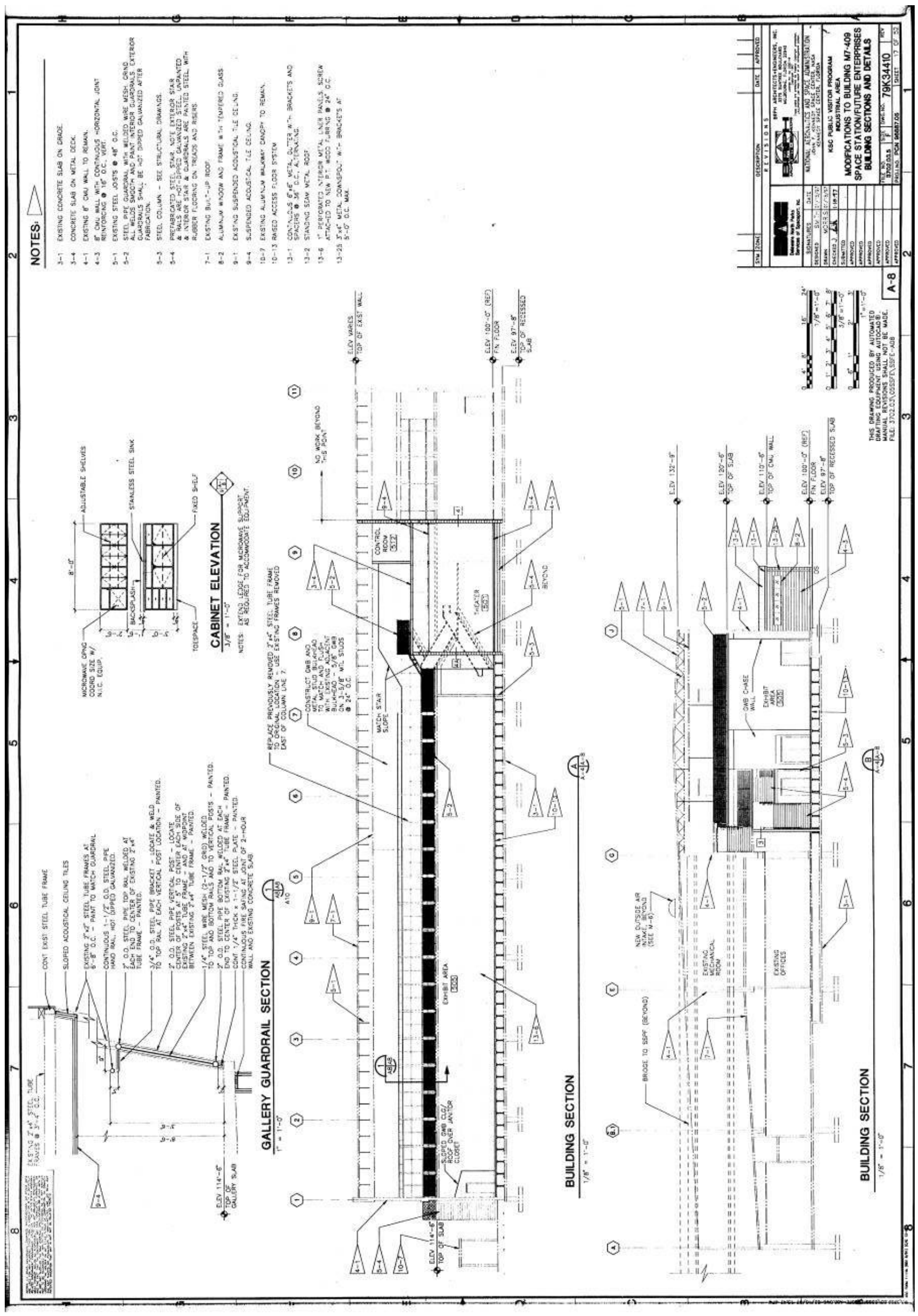

Figure B-21. BRPH Architects & Engineers, Modifications to Building M7-409, Building Sections and Details, January 1997, Sheet 17 of 52.

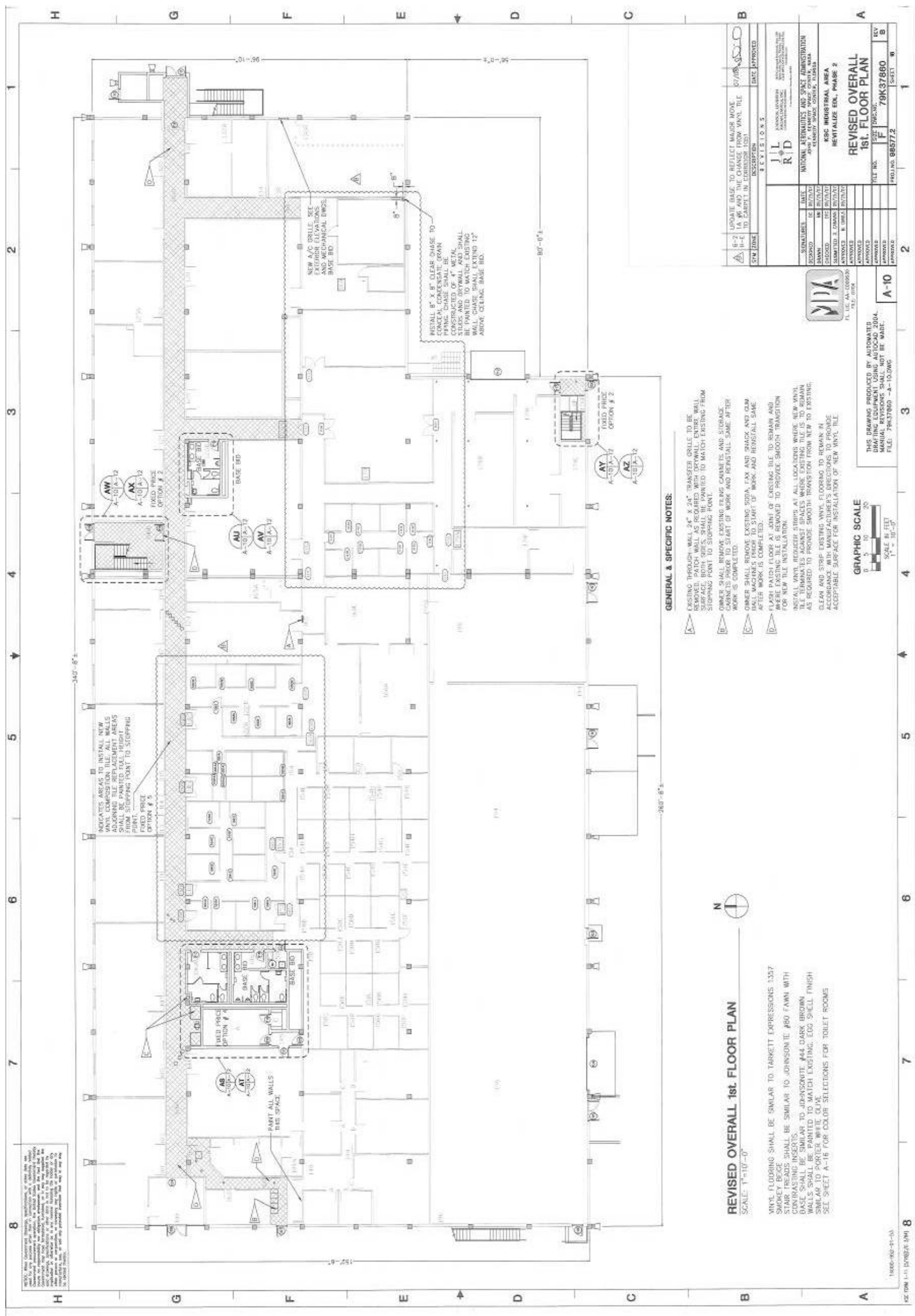

Figure B-22. Johnson, Levinson, Ragan, Davila Inc., Revitalize EDL, Phase 2, 1st Floor Plan, September 2007, Sheet 16.

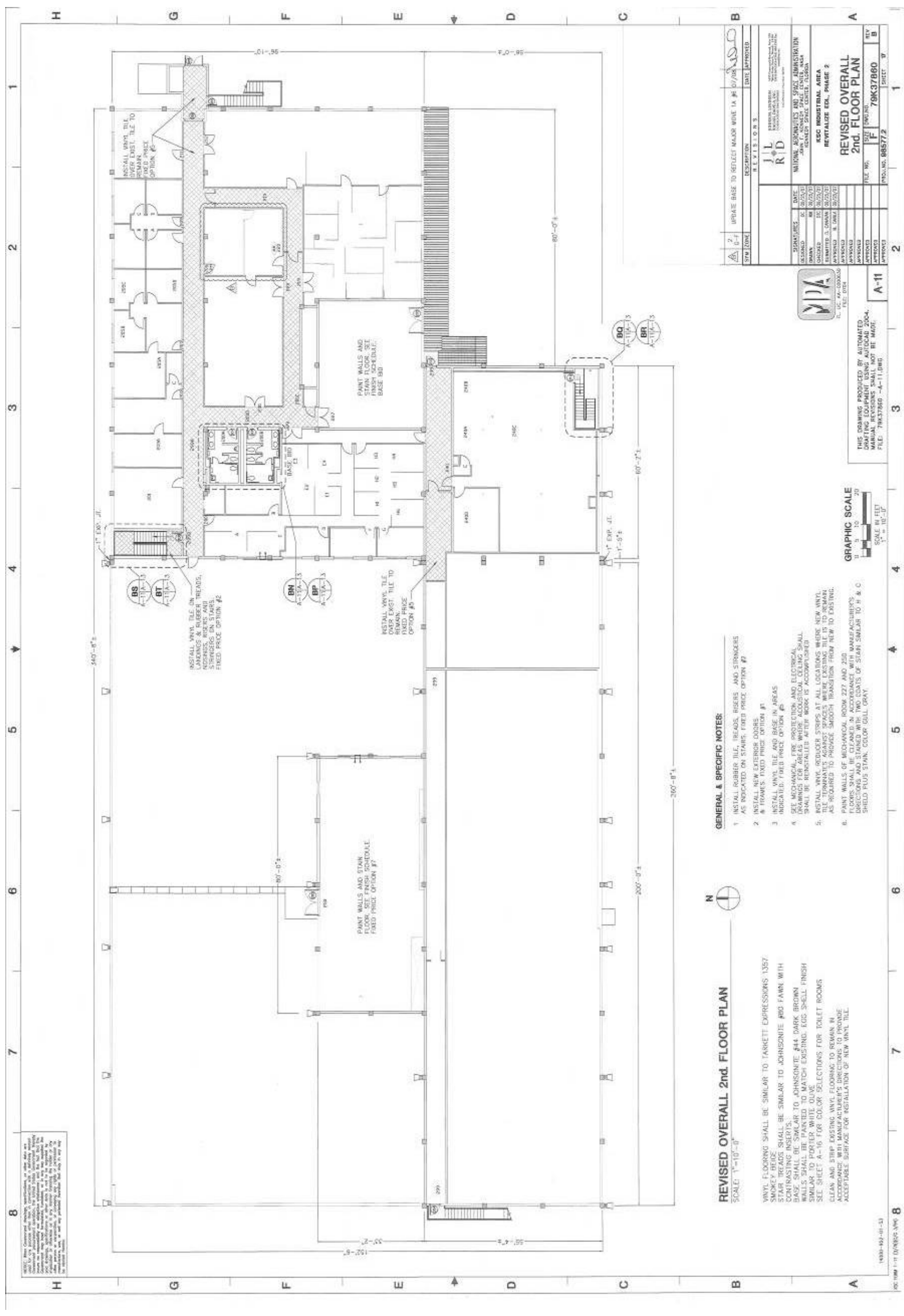

Figure B-23. Johnson, Levinson, Ragan, Davila Inc., Revitalize EDL, Phase 2, 2nd Floor Plan, September 2007, Sheet 17.

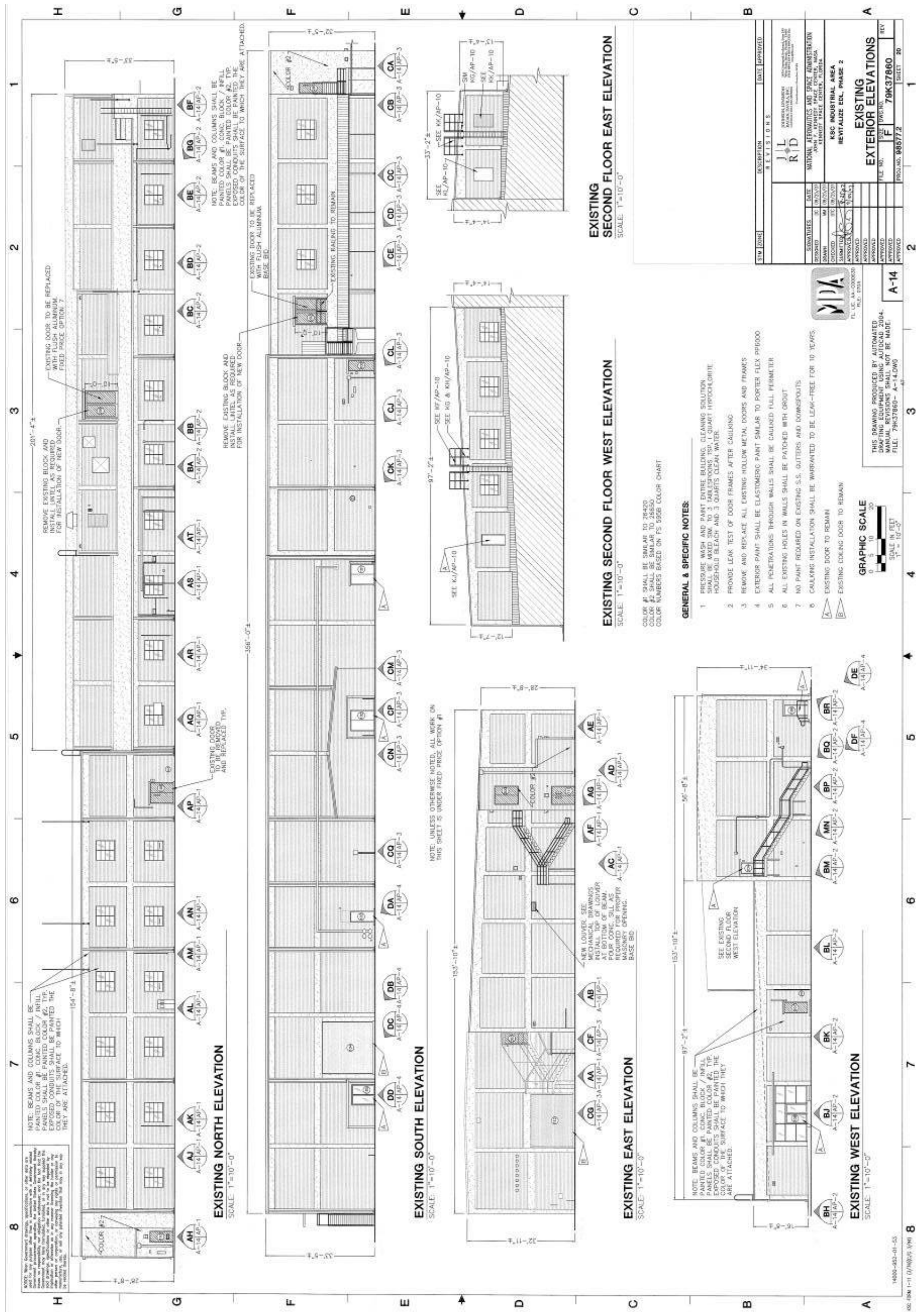

Figure B-24. Johnson, Levinson, Ragan, Davila Inc., Revitalize EDL, Phase 2, Existing Exterior Elevations, September 2007, Sheet 20.

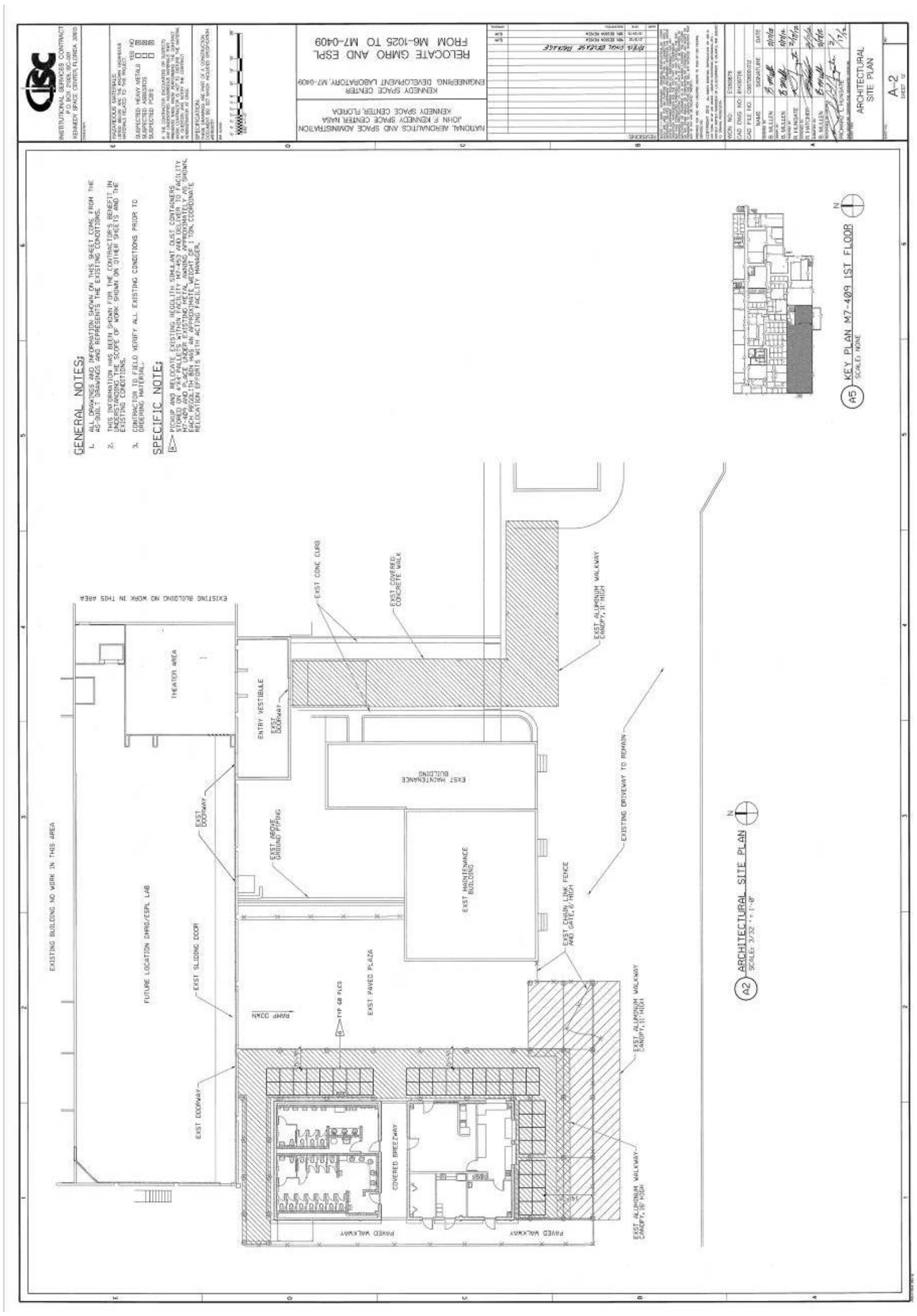

Figure B-25. Institutional Services Contract, Relocate GMRO and ESPL, Architectural Site Plan, February 2012, Sheet 12.

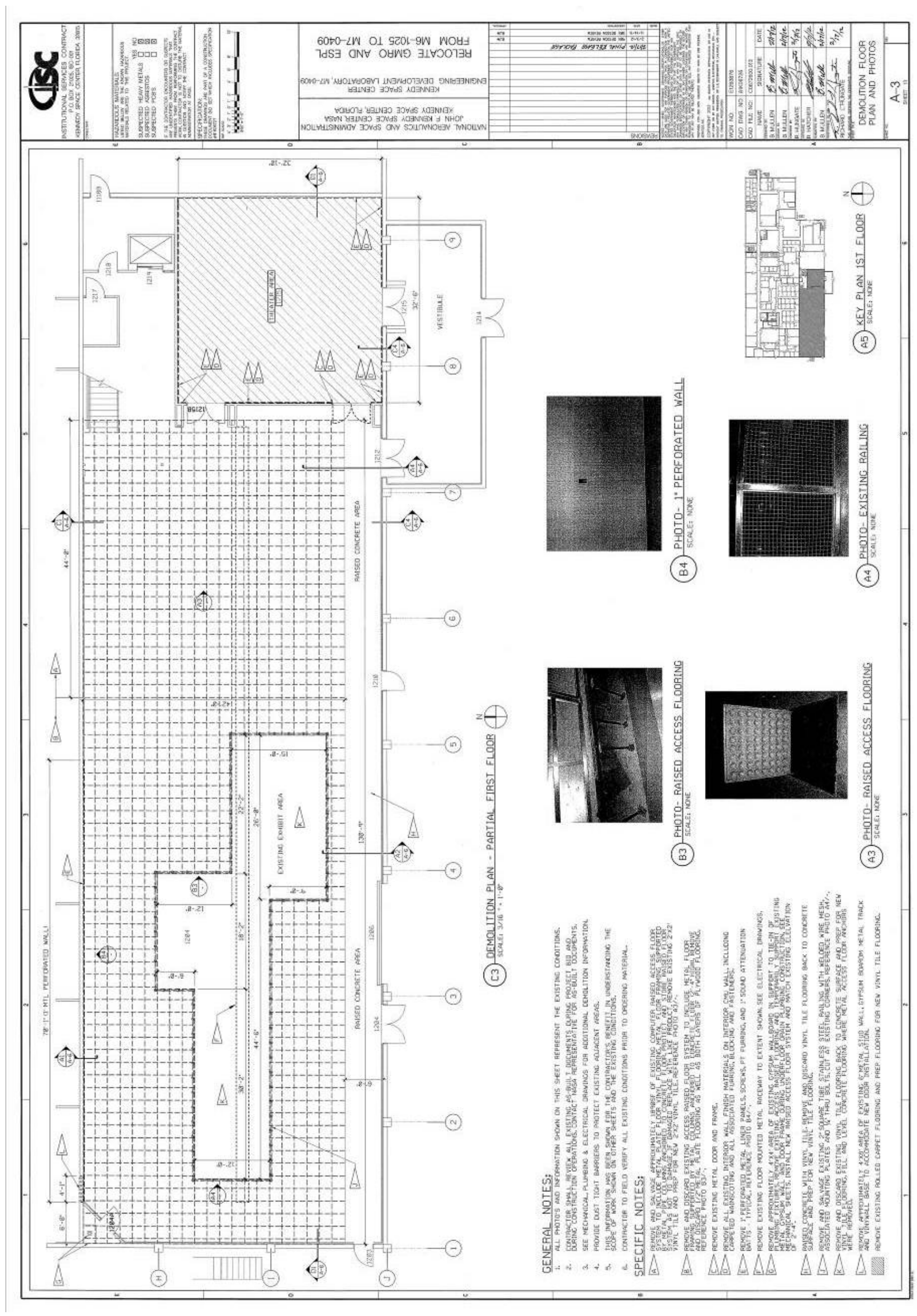

Figure B-26. Institutional Services Contract, Relocate GMRO and ESPL, Demolition Floor Plan, February 2012, Sheet 13.

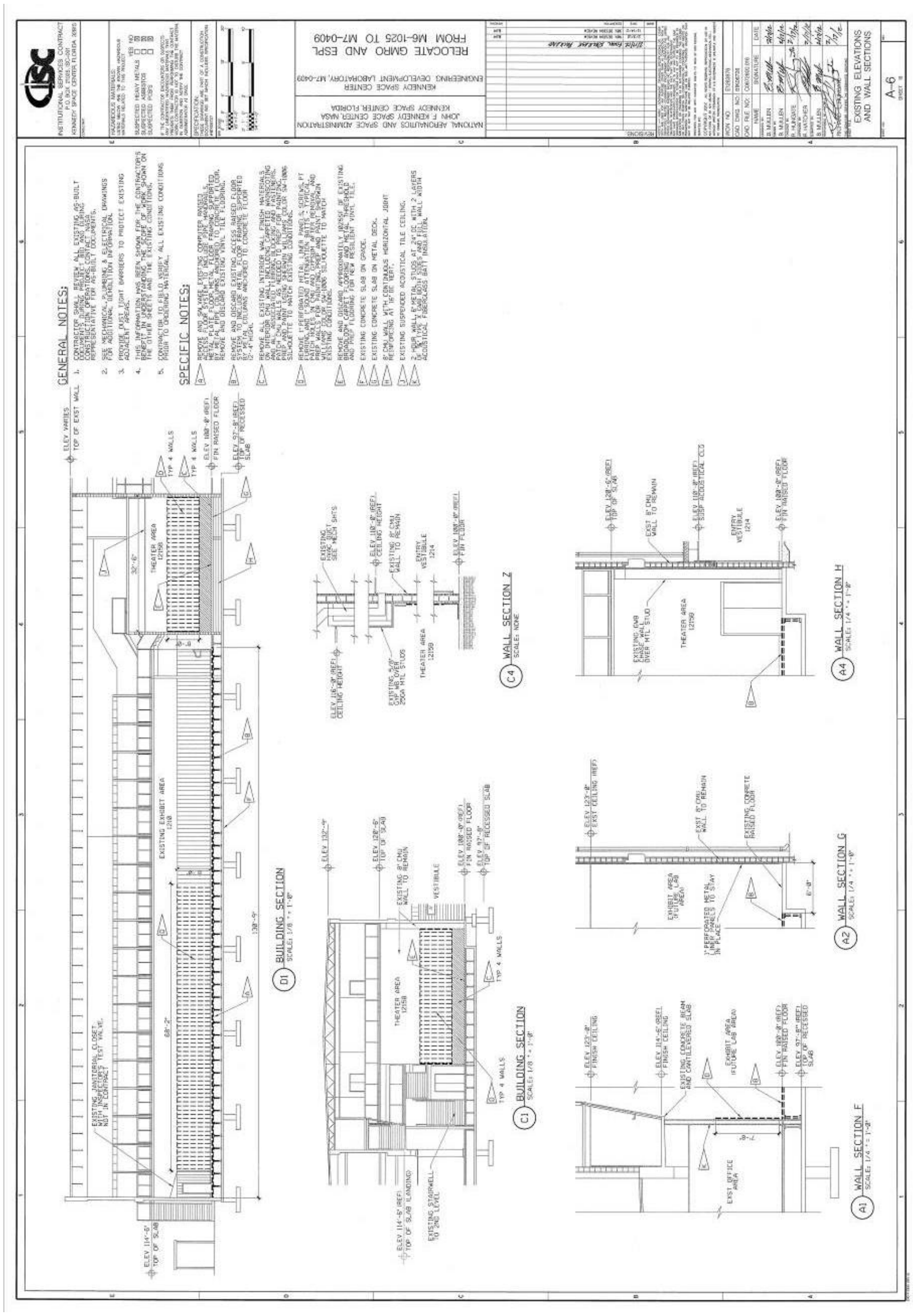

Figure B-27. Institutional Services Contract, Relocate GMRO and ESPL, Existing Elevations and Wall Sections, February 2012, Sheet 16.

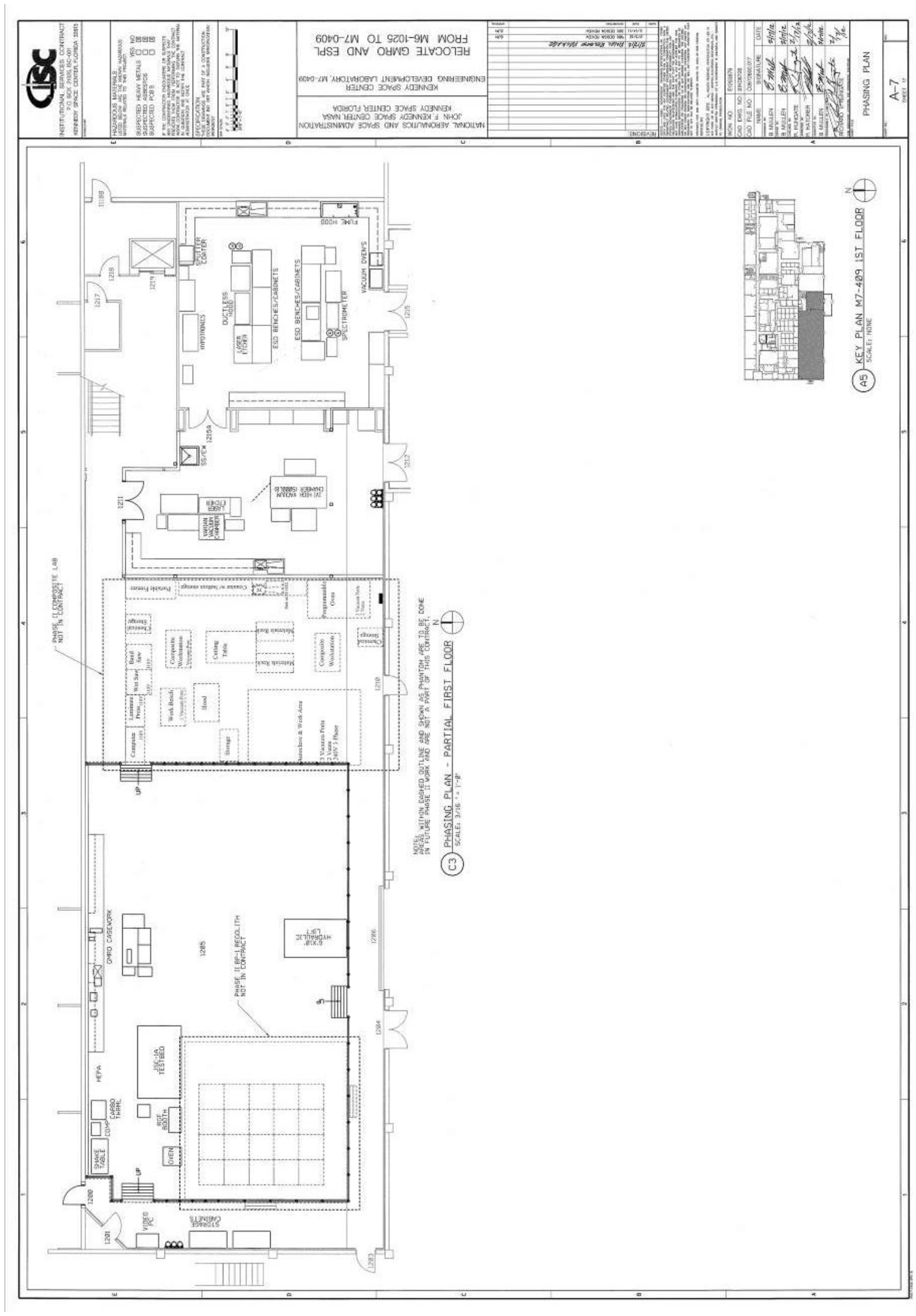

Figure B-28. Institutional Services Contract, Relocate GMRO and ESPL, Phasing Plan, February 2012, Sheet 17.

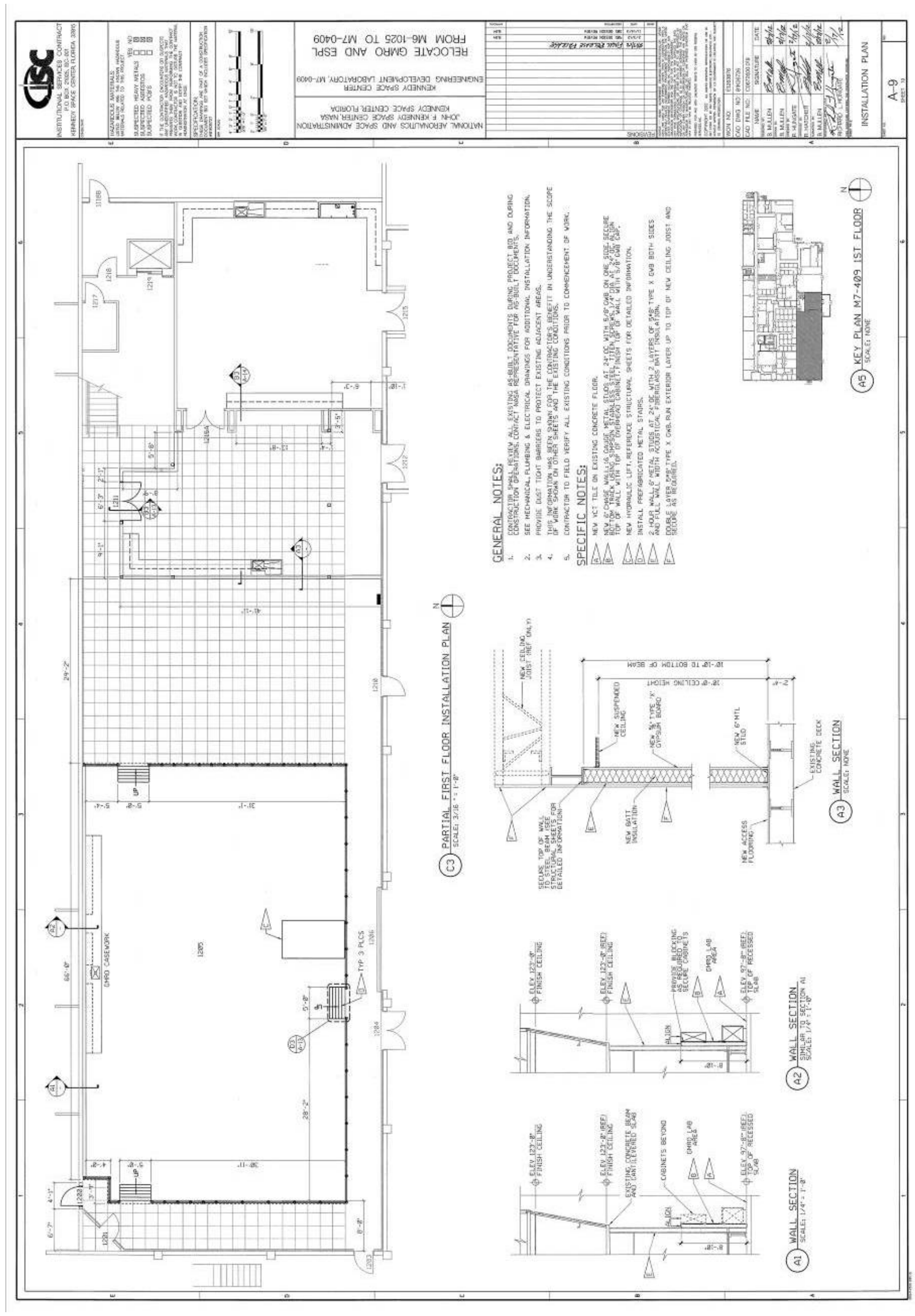

Figure B-29. Institutional Services Contract, Relocate GMRO and ESPL, Installation Plan, February 2012, Sheet 19.

HISTORIC AMERICAN BUILDINGS SURVEY

INDEX TO PHOTOGRAPHS

CAPE CANAVERAL AIR FORCE STATION, LAUNCH COMPLEX 39, HABS No. FL-581-C
FLIGHT CREW TRAINING BUILDING
(Engineering Development Laboratory)
(John F. Kennedy Space Center)
Southeast corner of Second Street/Avenue E intersection
Cape Canaveral
Brevard County
Florida

Penny Rogo, Photographer; January 2013 (FL-581-C-1 through FL-581-C-31)

FL-581-C-1 OVERALL VIEW OF WEST ELEVATION, FACING EAST.

FL-581-C-2 OVERALL VIEW OF WEST AND NORTH ELEVATIONS, FACING SOUTHEAST.

FL-581-C-3 OVERALL VIEW OF NORTH ELEVATION, FACING SOUTHEAST.

FL-581-C-4 OVERALL VIEW OF NORTH AND EAST ELEVATIONS, FACING SOUTHWEST.

FL-581-C-5 OVERALL VIEW OF EAST ELEVATION, FACING WEST.

FL-581-C-6 OVERALL VIEW OF EAST AND SOUTH ELEVATIONS, FACING NORTHWEST.

FL-581-C-7 OVERALL VIEW OF SOUTH ELEVATION, FACING NORTH.

FL-581-C-8 OVERALL VIEW OF SOUTH AND WEST ELEVATIONS, FACING NORTHEAST.

FL-581-C-9 DETAIL VIEW OF THE EXTERIOR OF AN ORIGINAL SLIDING DOOR INTO HIGH BAY, FACING NORTH.

FL-581-C-10 DETAIL VIEW OF THE INTERIOR OF AN ORIGINAL SLIDING DOOR INTO HIGH BAY, FACING SOUTHEAST.

FL-581-C-11 OVERALL VIEW OF THE HIGH BAY, FACING WEST-SOUTHWEST.

FL-581-C-12 OVERALL VIEW OF THE HIGH BAY, FACING NORTHEAST.

FL-581-C-13 DETAIL VIEW OF THE MEZZANINE AREA AND WINDOWS INTO THE HIGH BAY, FACING WEST-SOUTHWEST.

FL-581-C-14 OVERALL VIEW OF ROOM NO. 1118, ORIGINALLY THE EAST END OF THE HIGH BAY, FACING NORTHEAST. THIS ROOM RETAINS ITS ORIGINAL FLOOR MATERIALS AND THE ORIGINAL ACCESS LADDER FOR THE OVERHEAD CRANE.

FL-581-C-15 DETAIL VIEW OF THE ORIGINAL ACCESS LADDER AND THE OVERHEAD CRANE IN ROOM NO. 1118, ORIGINALLY THE EAST END OF THE HIGH BAY, FACING SOUTHEAST.

FL-581-C-16 DETAIL VIEW OF THE ORIGINAL FLOOR MATERIALS IN ROOM NO. 1118, ORIGINALLY THE EAST END OF THE HIGH BAY, FACING SOUTH.

FL-581-C-17 DETAIL VIEW OF THE ORIGINAL UTILITY TRENCH LOCATED IN ROOM NO. 1112 IN THE EAST ADDITION TO THE FACILITY, FACING SOUTH.

FL-581-C-18 OVERALL VIEW OF ROOM NO. 1145, ONE OF THE FEW AREAS THAT MAINTAINS MUCH OF ITS ORIGINAL FORM, FACING NORTH.

FL-581-C-19 OVERALL VIEW OF ROOM NO. 1103, DIGITAL ELECTRONICS LABORATORY, FACING NORTHWEST. A HISTORIC PHOTO OF ASTRONAUT TRAINING CAN BE SEEN JUST LEFT OF CENTER IN THE PHOTOGRAPH.

FL-581-C-20 OVERALL VIEW OF ROOM NO. 1103, DIGITAL ELECTRONICS LABORATORY, FACING WEST-SOUTHWEST. HISTORIC PHOTOS OF ASTRONAUT TRAINING CAN BE SEEN IN THE CENTER-RIGHT OF THE PHOTOGRAPH.

FL-581-C-21 OVERALL VIEW OF ROOM NO. 1023, CONFERENCE ROOM, FACING SOUTHWEST.

FL-581-C-22 OVERALL VIEW OF ROOM NO. 1026, RANGE TECHNOLOGIES LABORATORY, FACING EAST-NORTHEAST.

FL-581-C-23 OVERALL VIEW OF ROOM NO. 1048A, HAZARDOUS GAS DETECTION LABORATORY, FACING EAST-NORTHEAST.

FL-581-C-24 OVERALL VIEW OF ROOM NO. 1108, TRANSDUCER DEVELOPMENT LABORATORY, FACING WEST.

FL-581-C-25 OVERALL VIEW OF ROOM NO. 1108, TRANSDUCER DEVELOPMENT LABORATORY, FACING EAST.

FL-581-C-26 OVERALL VIEW OF ROOM NO. 1137, MACHINE SHOP, FACING SOUTHEAST.

FL-581-C-27 OVERALL VIEW OF ROOM NO. 1144, ELECTROMAGNETIC QUALIFICATION AREA, FACING SOUTHWEST.

FL-581-C-28 DETAIL VIEW OF THE LARGE ANECHOIC CHAMBER IN ROOM NO. 1144, FACING SOUTHEAST.

FL-581-C-29 DETAIL VIEW OF THE SMALL ANECHOIC CHAMBER IN ROOM NO. 1144, FACING SOUTH.

FL-581-C-30 OVERALL VIEW OF A TYPICAL MID-SIZE OFFICE AREA ON THE SECOND FLOOR (ROOM NO. 2103), FACING SOUTH.

FL-581-C-31 OVERALL VIEW OF A TYPICAL INDIVIDUAL OFFICE ON THE SECOND FLOOR (ROOM NO. 2146C), FACING NORTHEAST.