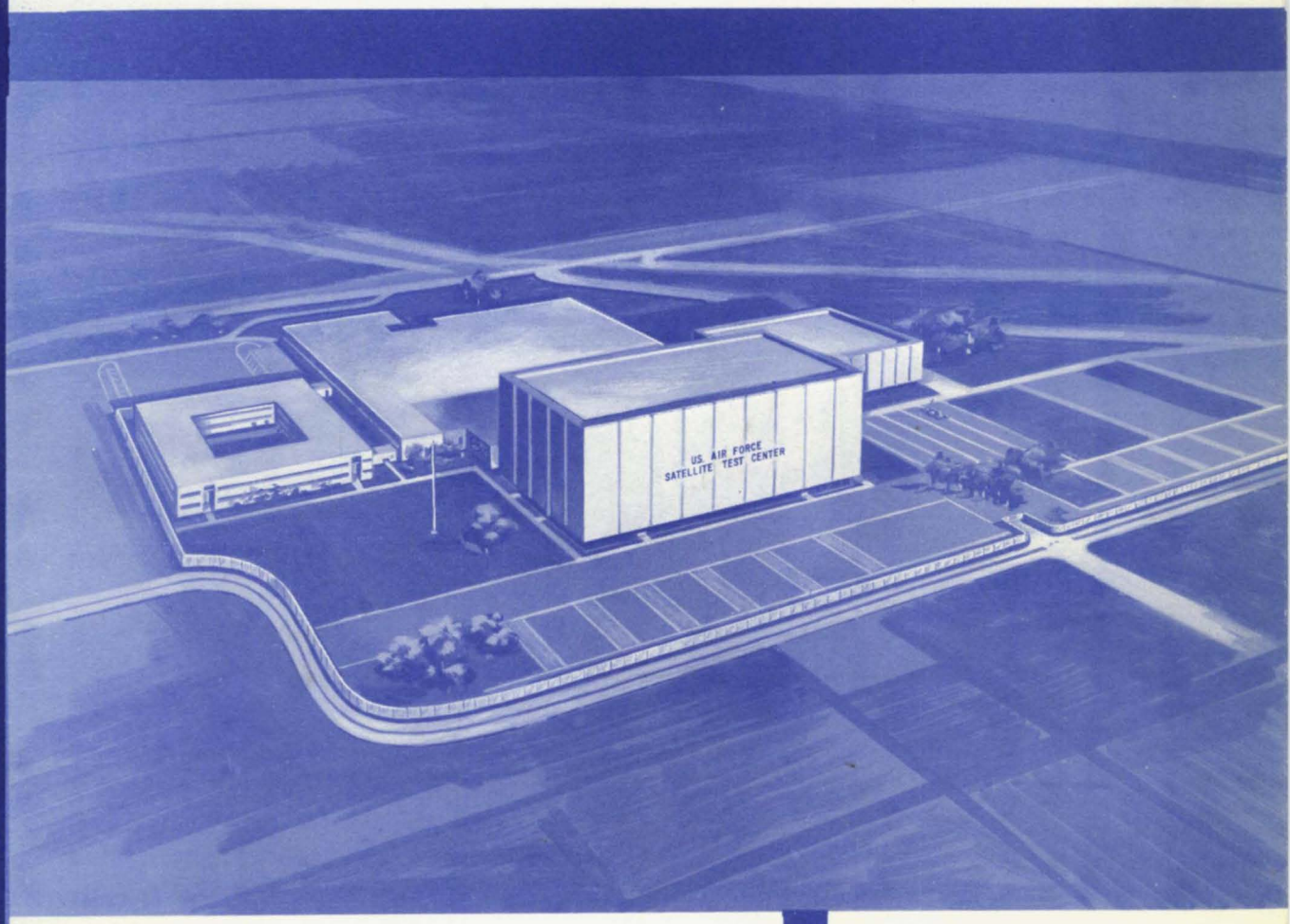
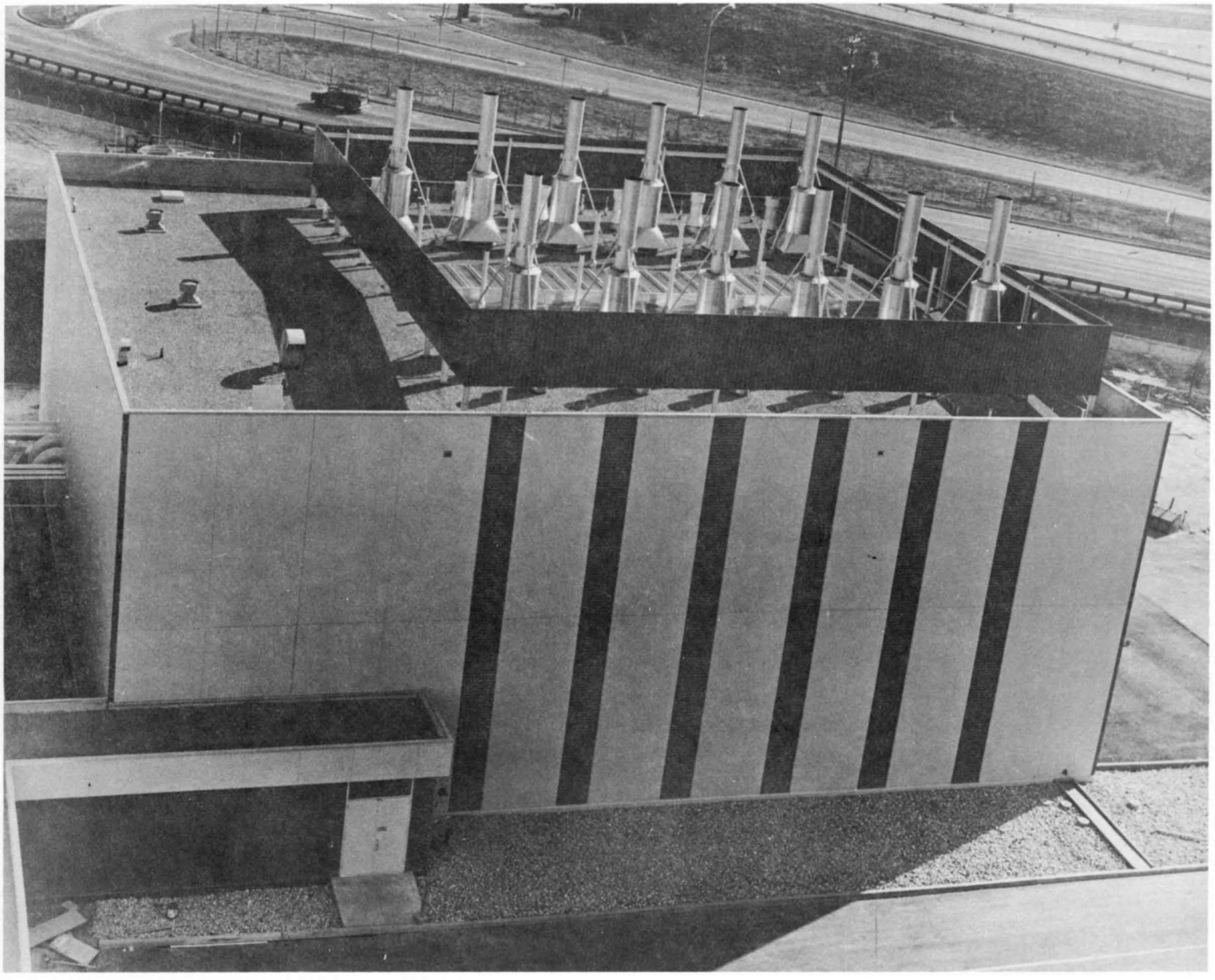
AIR FORCE SATELLITE TEST CENTER



PREPARED FOR:

SECTION 1
BUILDING 1004



AIR FORCE SATELLITE TEST CENTER
POWER PLANT BUILDING 1004

ACKNOWLEDGEMENTS

Although it is impossible to express appreciation individually to the many organizations and people that contributed toward the successful completion of Building 1003 and 1004. . . to all those "TROOPS" is extended a heartfelt THANKS.

CONSTRUCTION, DESIGN, SUPERVISION, AND INSPECTION

I **ARCHITECT-ENGINEER**

C. F. BRAUN AND COMPANY – ALHAMBRA, CALIFORNIA

CONSTRUCTION

INDUSTRIAL CONTRACTORS – IDAHO FALLS, IDAHO

SOLAR, A DIVISION OF INTERNATIONAL HARVESTER – SAN DIEGO, CALIFORNIA

II **SUPERVISION AND INSPECTION**

NAVAL FACILITIES ENGINEERING COMMAND
UNITED STATES NAVY – SAN BRUNO, CALIFORNIA

III **DESIGN**

UNITED STATES AIR FORCE

AGENDA

Introduction – Major H. S. Brown, Civil Engineer

Presentation – Industrial Contractors
Solar
C. F. Braun Company

Presentation – United States Navy
United States Air Force

Tour of Facility

HONORED GUESTS

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POWER PLANT BUILDING 1004

The Power Plant building contains a unique combination of equipment which operates in conjunction to provide a "Total Energy System". This energy system provides all the electrical and mechanical power required to support both the STC Building (B/1003) and the Power Plant Building (B/1004). All necessary redundancy features, for continued and uninterruptable operation of both buildings electrically and mechanically, have been included in the design of the energy system.

Twelve (12) turbine generators, rated at 750 KW each, provide power to two separate electrical distribution systems, one each for technical and utility power. Power to each distribution system is provided by one more generator than the load requires. This ensures that with failure of any one generator unit, no interruption of power will occur.

Each turbine is supplied by two sources of fuel; natural gas and diesel oil. In the event of natural gas interruption or failure, the turbines are automatically switched to the constantly circulating fuel oil supply with no power interruption.

A six minute reserve supply of natural gas, in a pressure tank, permits an orderly sequential change-over to the fuel oil supply.

Turbine waste heat is piped into recovery boilers (one to one ratio) where it is converted to steam to run the absorption chillers, provide controlled humidification, heat the power plant building and generate hot water for the Building 1003 zone re-heat coils.

There are four chillers, one of which is stand-by. Five cooling towers, on a common basin, serve the refrigeration condensing requirements. Any four towers serve the load with one as stand-by. There are two air compressors to supply 80 psig air for the pneumatic control system, one of which is stand-by.

Two air dryers, to provide oil and moisture free instrument quality air, are included in the compressed air system. One dries the air while the alternate unit is being regenerated. All pumping systems have three pumps with one as stand-by. The water and steam treatment systems incorporate stand-by elements in their design, as required, to ensure continuity of operation.

The control room of the Power Plant Building contains an extensive control console system (Supervisory Data Center) which serve to provide control and total readout of the air conditioning system functions.

A complete and comprehensive analysis of the air conditioning system performance can be made from this single location by selectively looking at the elements of the system including chillers, air handling unit coils/ fans, heat exchangers and pumping systems with their associated temperature requirements. The console system also includes a graphic representation of each of the above subsystems, an alarm print-out of each parameter which has exceeded its limits and a multipoint recorder to show subsystem operating trends.

In addition to total readout of the air conditioning functions, the Supervisory Data Center Consoles permit the operator to control humidity, re-heat functions, actuate various dampers, start/stop selective pumps controlling fuel flow, gas flow, and hot and chilled water systems.

The nerve center of Building 1004 has been designated as the "Civil Engineer Center" which major functional components are: Supervisory Data Centers; Solar Generator Control Panels; and Fire Control Center.

PERTINENT FACTS – BUILDING 1004

FACILITY

Two Story Precast Concrete – 102 feet x 110 feet x 42 feet high

AIR CONDITIONING

Chilled Water:

2 Pumps, 1800 GPM each; and 1 Pump, 1800 GPM Standby –

145 Foot Head –

100 H. P. each –

2 Chillers, 650 Tons each –

2 Chillers, 600 Tons each –

Hot Water:

2 Pumps, 275 GPM each and 1 Pump 275 GPM Standby –

79 Foot Head –

10 H. P. each –

Instrument Air:

2 Compressors, 90 PSIG each; and 1 Compressor 90 PSIG Standby, Developing 100 SCFM each –

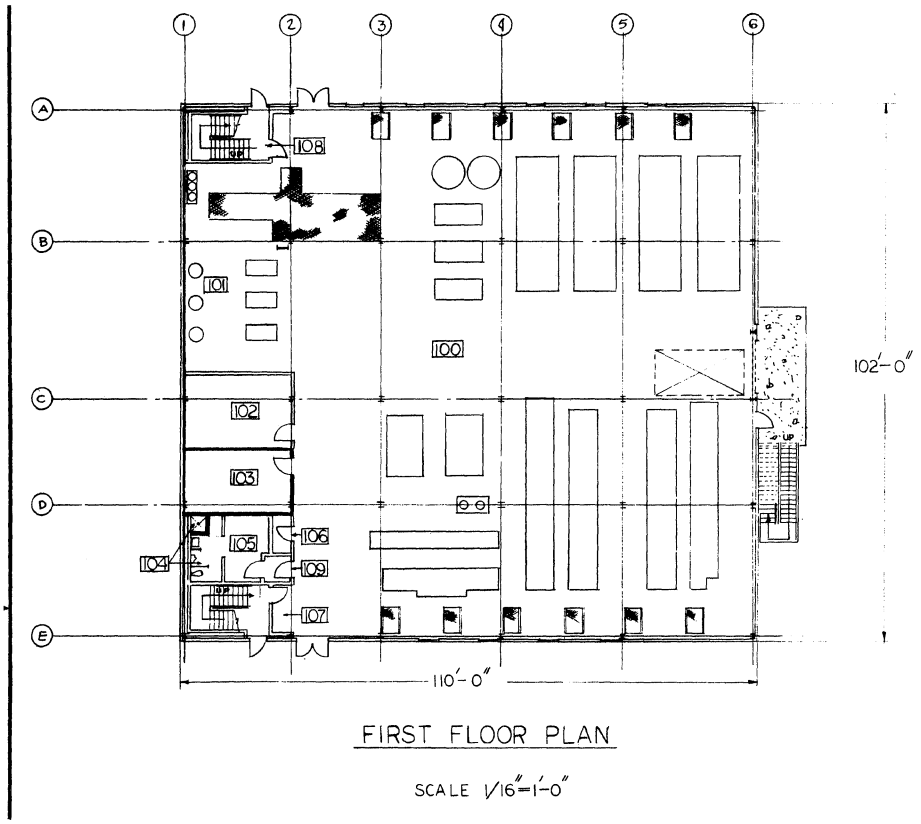
Humidification:

12 PSIG System off Common Header –

ELECTRICAL

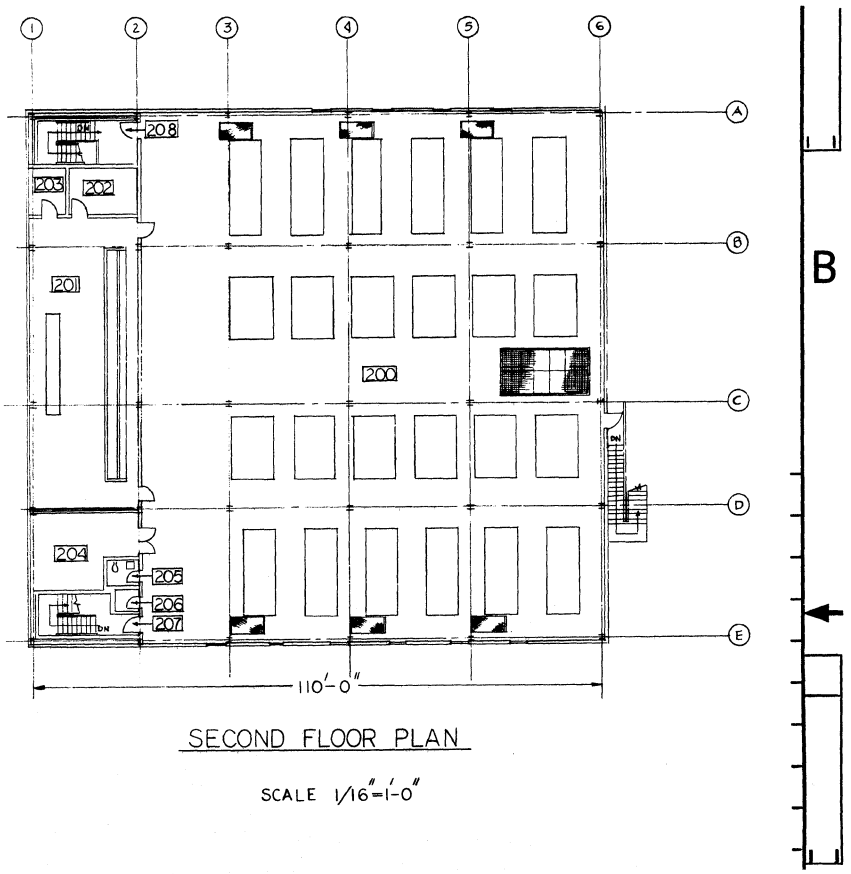
12 Gas Turbine Generators Developing 750 KVA each –

12 Boilers, 250 Gallons each –



FIRST FLOOR PLAN

SCALE 1/16"=1'-0"



SECOND FLOOR PLAN

SCALE 1/16"=1'-0"

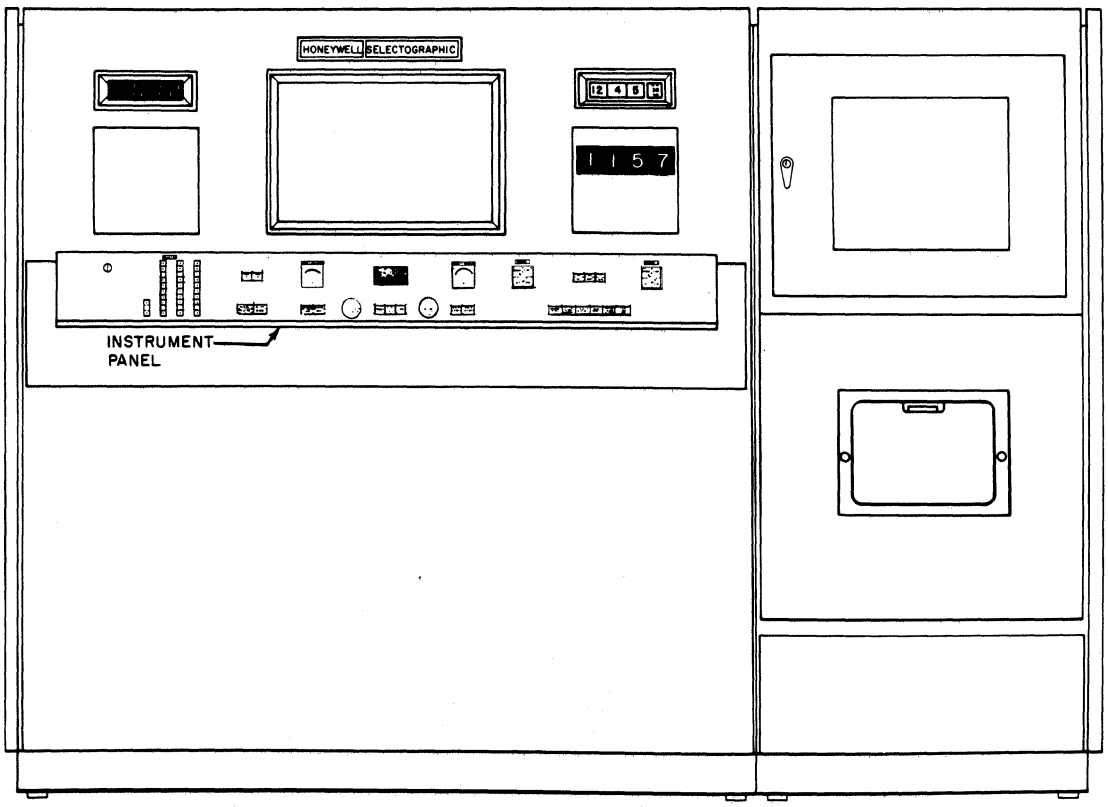
SATELLITE TEST CENTER POWER PLANT – BUILDING 1004
FLOOR PLAN

DATA/CENTER CONSOLE DESCRIPTION

Central Console – The central console contains a writing shelf, an instrument panel, and all the controls and displays necessary for receiving data, making analysis, and taking corrective action. Also included is an alarm scanner, a start-stop programmer, and a graphic display system.

Alarm Printer – The right cubicle contains a flush mounted strip printer and input control equipment necessary for printing a permanent record of alarm points and time. The printer also provides alarm or run-status summary printouts.

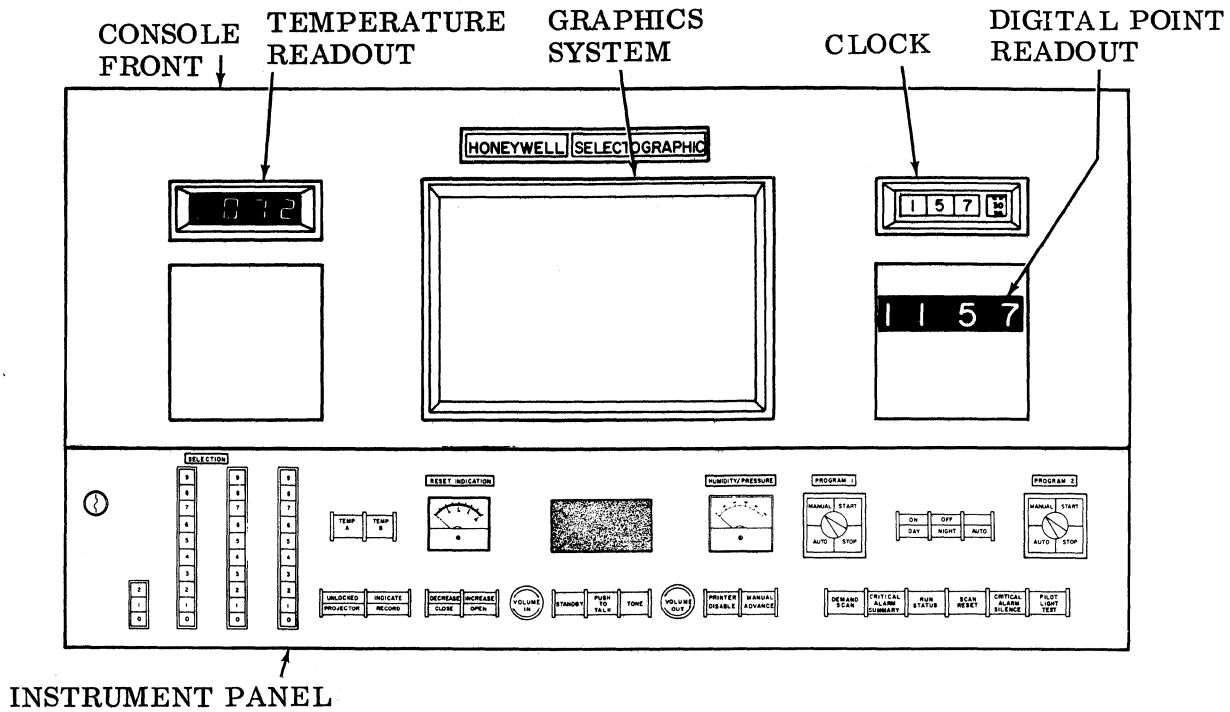
System Analyzer Recorder – The right cubicle also contains a 10-point, strip-chart recorder; and all the controls necessary for recording any 10, temperature, humidity, or process-pressure points in the system.

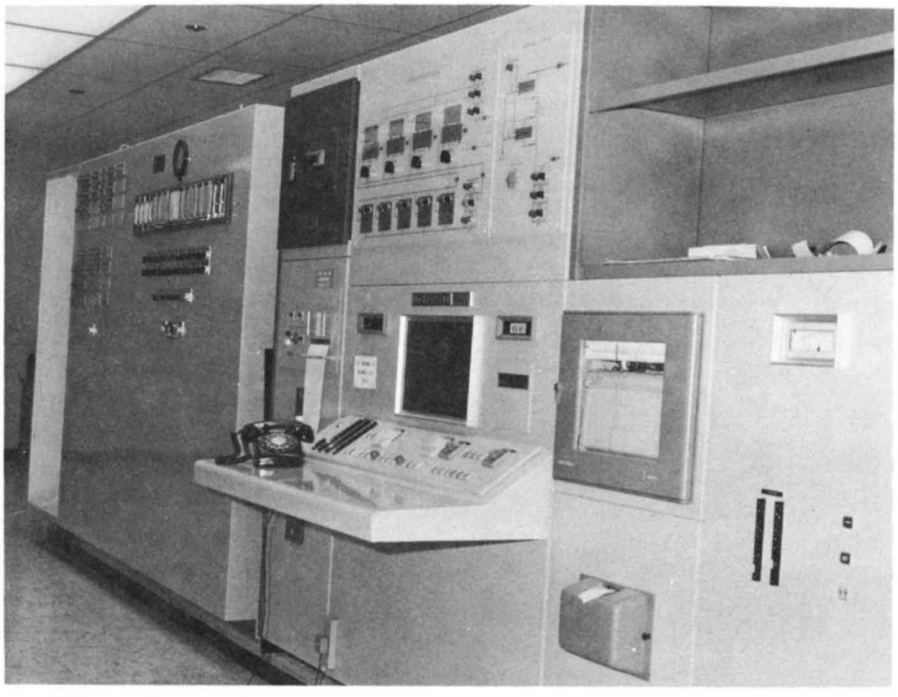


CENTRAL CONSOLE

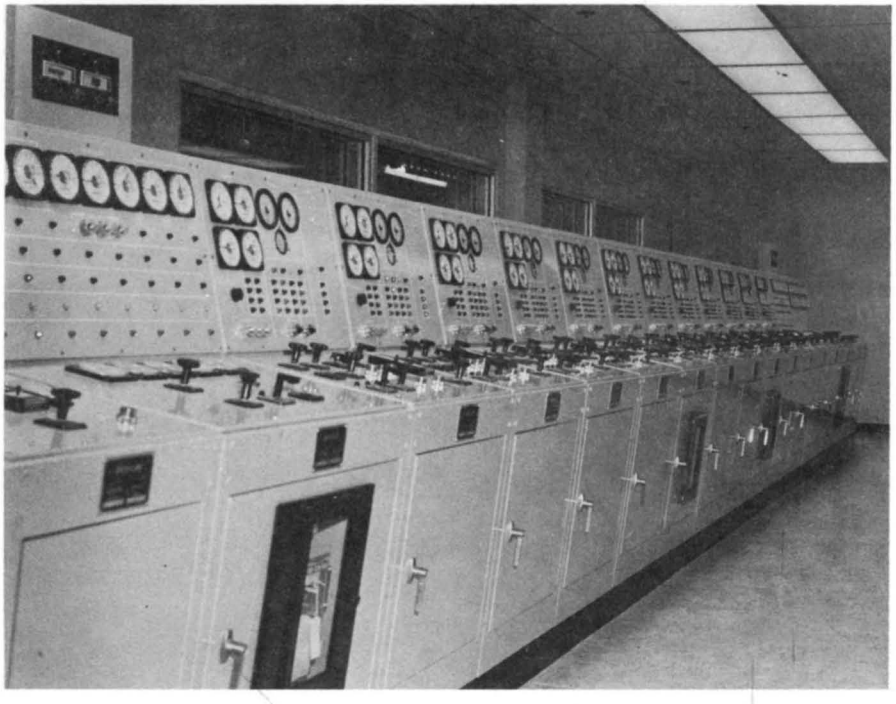
PRINTER AND SYSTEM ANALYZER CUBICLE

DATA/CENTER CONSOLE INSTRUMENT PANEL

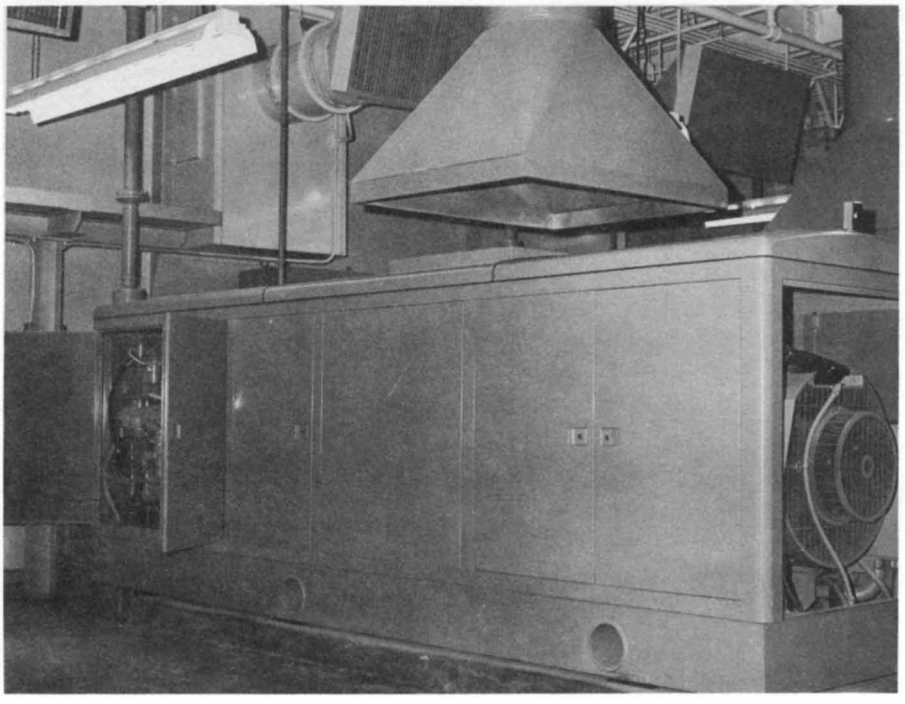




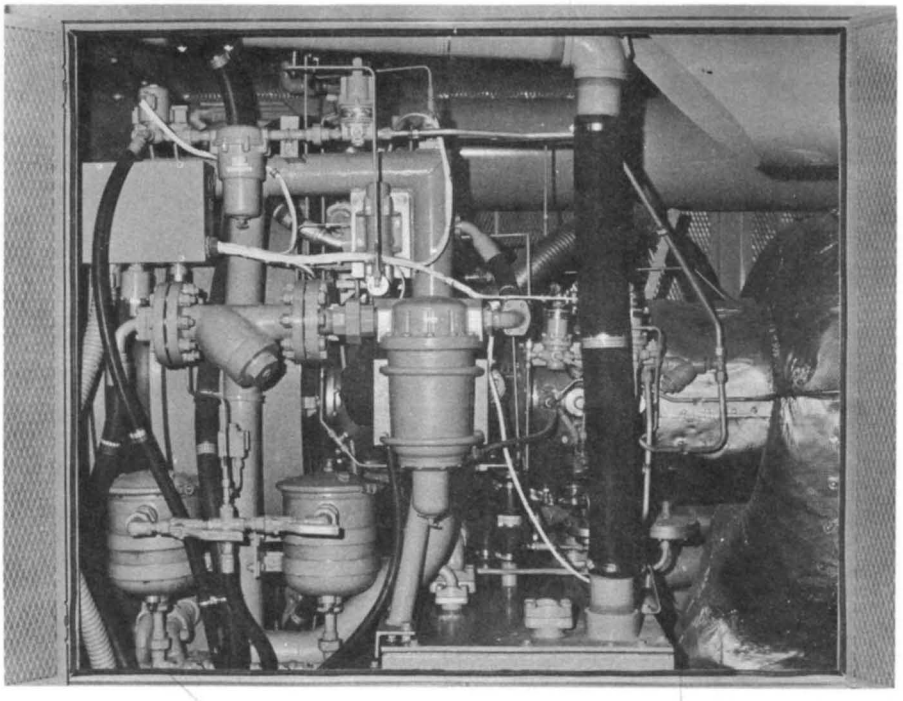
CIVIL ENGINEER DATA CENTER



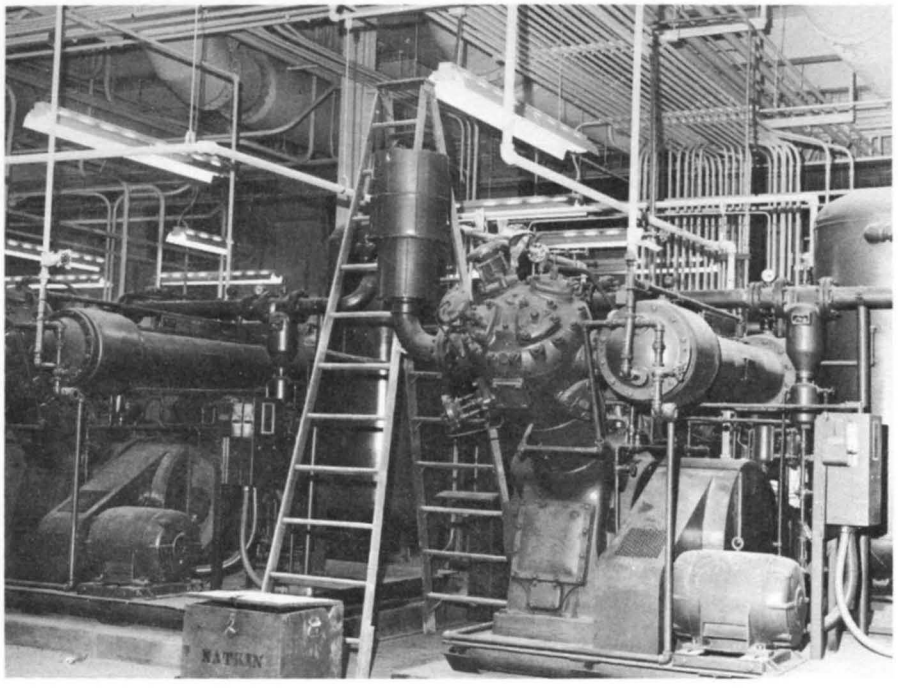
TURBINE CONTROL PANELS



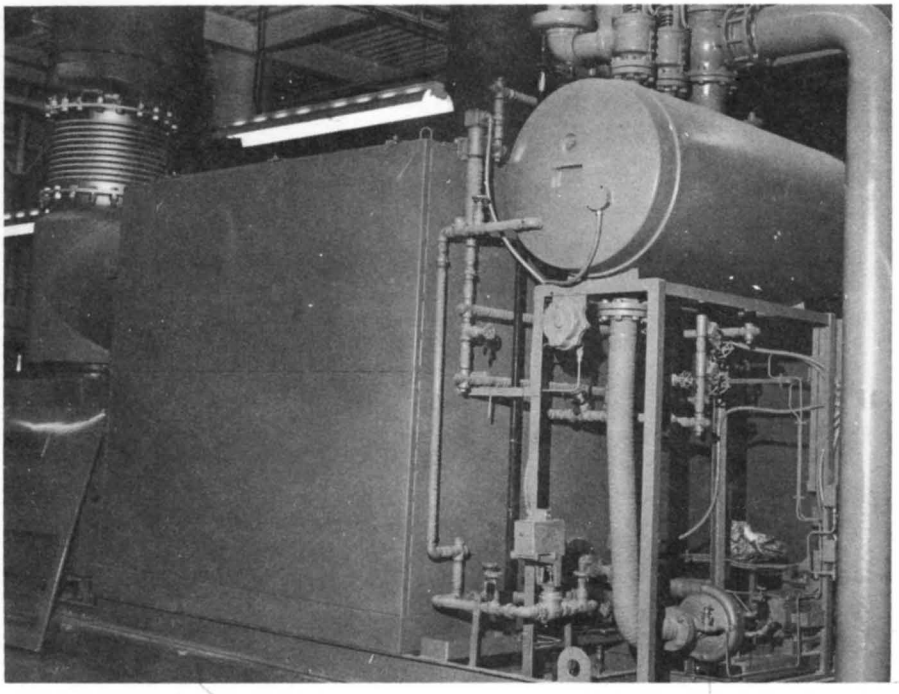
SOLAR TURBINE PACKAGE



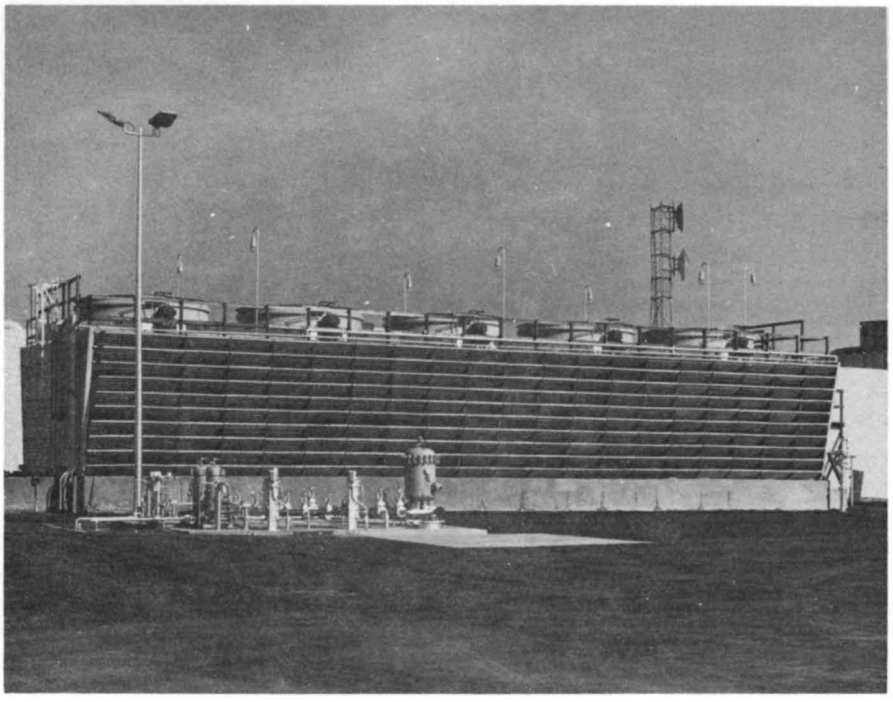
TURBINE JET ENGINE



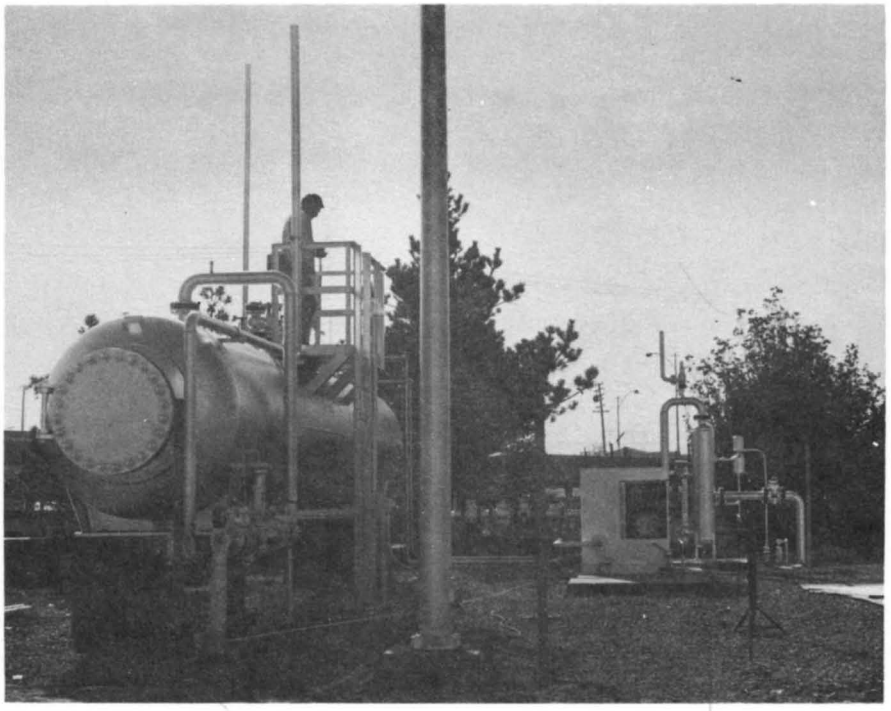
INSTRUMENT AIR SYSTEM COMPRESSORS



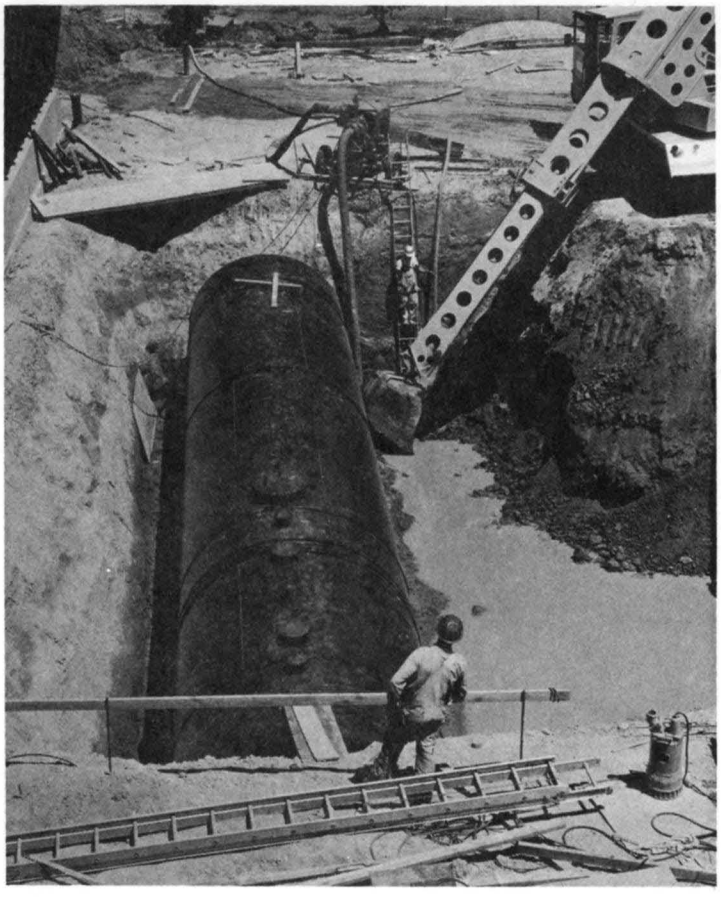
TOTAL ENERGY BOILER



COOLING TOWER

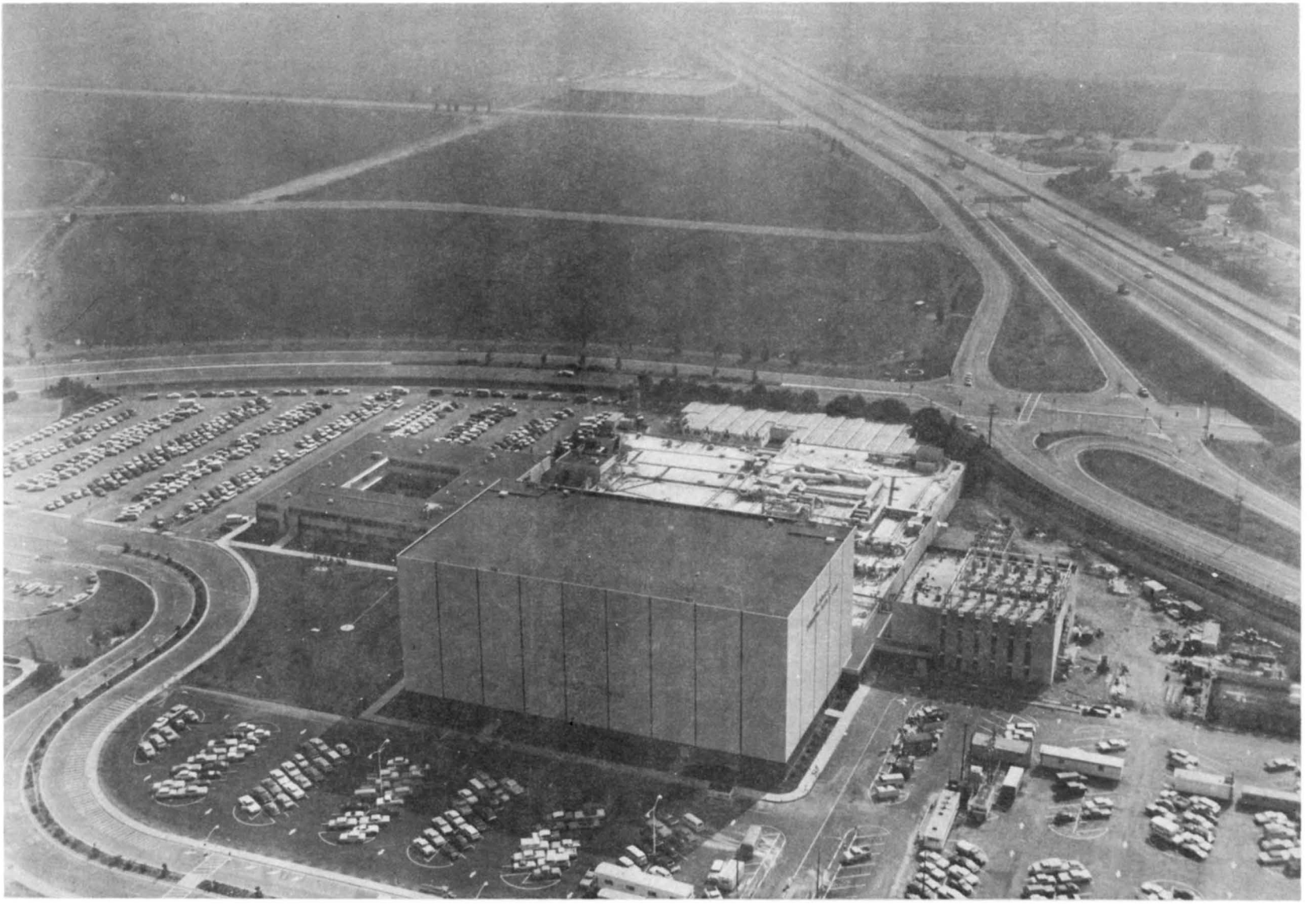


L. P. GAS ACCUMULATOR



ONE OF TWO 32, 000 GALLON FUEL OIL TANKS

SECTION 2
BUILDING 1003



BUILDING 1003

CONSTRUCTION, DESIGN, SUPERVISION, AND INSPECTION

I **ARCHITECT-ENGINEER**

C F BRAUN AND COMPANY – ALHAMBRA, CALIFORNIA

CONSTRUCTION

CARL N. SWENSON COMPANY, INC. – SAN JOSE, CALIFORNIA

II **SUPERVISION AND INSPECTION**

NAVAL FACILITIES ENGINEERING COMMAND (US NAVY) – SAN BRUNO, CALIFORNIA

III **DESIGN**

UNITED STATES AIR FORCE

DEDICATION AGENDA

1500 hours	:	Introduction by Commander N. L. Martinson, OICC
1505	:	Mr. Carl N. Swenson, Prime Contractor, officiates in Building 1003 key presentation to Captain C. J. Merdinger, Naval District Commander
1515	:	Captain Merdinger makes presentation of Building 1003 key to Colonel L. S. Norman, Commander, AFSCF
1525	:	Building 1003 plaque presented to Colonel C. E. Hughes, Satellite Test Center Commander. Presentation shall be made by Lieutenant P. L. Poythress, ROICC, and Captain H. S. Brown, Civil Engineer.
1530	:	Tour of the new facility.

HONORED GUESTS

BUILDING 1003 DEDICATION

- UNITED STATES AIR FORCE

  Col L. S. Norman, Jr.
  Commander AFSCF

  Col C. E. Hughes
  Commander Det. 1 AFSCF

  Capt H. S. Brown
  Base Civil Engineer (AFRCE) for Director

  E. Sears
  SAMSO Project Engineer (AFRCE)

- UNITED STATES NAVY

  Capt C. J. Merdinger
  Officer in Charge of Construction

  Cdr N. L. Martinson
  Resident Officer in Charge of Construction

  Lt P. L. Poythress
  Asst. Resident Officer in Charge of Construction

  H. B. Murnan
  Resident Engineer in Charge of Construction

- INSPECTION FORCES:

  William J. Brown
  E. C. Bailey
  John F. O'Connor
  James T. O'Donnell
  Walter Kitchens
  Earl Buethe
  Otis Finley

- CARL N. SWENSON CO., INC. (CONTRACTOR)

  Carl N. Swenson
  Chairman of the Board

  Arnold G. Swenson
  Executive Vice President

  Giles A. Pond
  Vice President

  Philip S. Mirenda
  Project Manager

- C. F. BRAUN & CO. (ARCHITECT–ENGINEER)

  W. A. Jack
  Vice President

  John Kokoszenski
  Project Manager

FACILITIES COMPENDIUM

HISTORICAL DATA

The Satellite Control Programs have experienced a dynamically changing technology during the past ten years. These technological advances have required more sophistication, not only in the electronic subsystems but also in the facilities subsystems which support them. The growth rate of these subsystems has been exponential. A simple illustration of this growth rate is reflected in the expanding computer utilization. For example:

1960	1-1604
1963	2-1604
1965	4-1604
1966	5-3600
1968	5-3800

This change in numbers of computers has been accompanied by an increase in storage and memory capacity as well as in processing rate, and has been associated with the Space Ground Link Systems, Multisatellite Augmentation Program, and Interim Expansion Programs.

STC BUILDING 1003

Final design of Building 1003 was completed in December 1967. Bids were opened 13 March 1968. A contract was awarded a week later on 20 March 1968.

The new building is over 107 feet tall and has four floors, with a mezzanine between the third and fourth floors. The building is 260 feet north to south and 145 feet east to west. Floor-to-floor dimensions vary from 19 feet on the second floor under the mezzanine to 25 feet 6 inches between the third and fourth floors. Each story has a raised floor 30 inches above the respective floor slab to provide space for the interconnecting cables between the many electronic racks, consoles, and computer equipment. It also provides space for the under-floor air conditioning ducts which serve six CDC-3800 computers.

There are three elevators; two passenger types located at the northeast corner and one for freight service at the southeast corner. The passenger types have a 3500-pound capacity, the freight unit has a 10,000-pound capacity. Passenger elevator No. 1 will have four stops and four openings, while No. 2 and the freight elevator will have five. The additional stop is the mezzanine level, which will permit – among other things – rapid access to the mezzanine for service and maintenance.

The west side of the building contains a 5-foot wide cable chase running the full width and height of the building. It has continuous floors (with cable openings) at each floor slab level and intermediate discontinuous landings between floor levels to aid in establishing the cable runs. Ladders are provided on the walls of the chase, with access from the stairway platforms between floors.

The east side of the building from the second floor up contains air duct shafts and air supply/return plenums for the air conditioning systems. The first floor area on the east side is dedicated to mechanical/electrical subsystems serving the building.

The 20,000-square-foot mezzanine area contains nineteen of the 25 air handling units of the air conditioning system, the pneumatic tube exhausters and central exchanger, and the supply and return air plenums.

The STC Building was designed for the following utilization:

4th Floor	–	Four (4) Mission Control Centers
3rd Floor	–	Four (4) Mission Control Centers and a Network Control Center
2nd Floor	–	Data Processing/Computer Equipment
1st Floor	–	EXCELS/Communications Equipment

Structurally, the STC building addition is quite massive. The columns consist of 10- and 14-inch wide flange beams at various locations. The horizontal steel members come in many sizes and shapes.

The steel structure is enclosed by reinforced, precast concrete panels, bolted in place. 670 panels of approximately 9' 6" x 11' 8" x 3", weighing two tons each, enclose the building.

ELECTRICAL

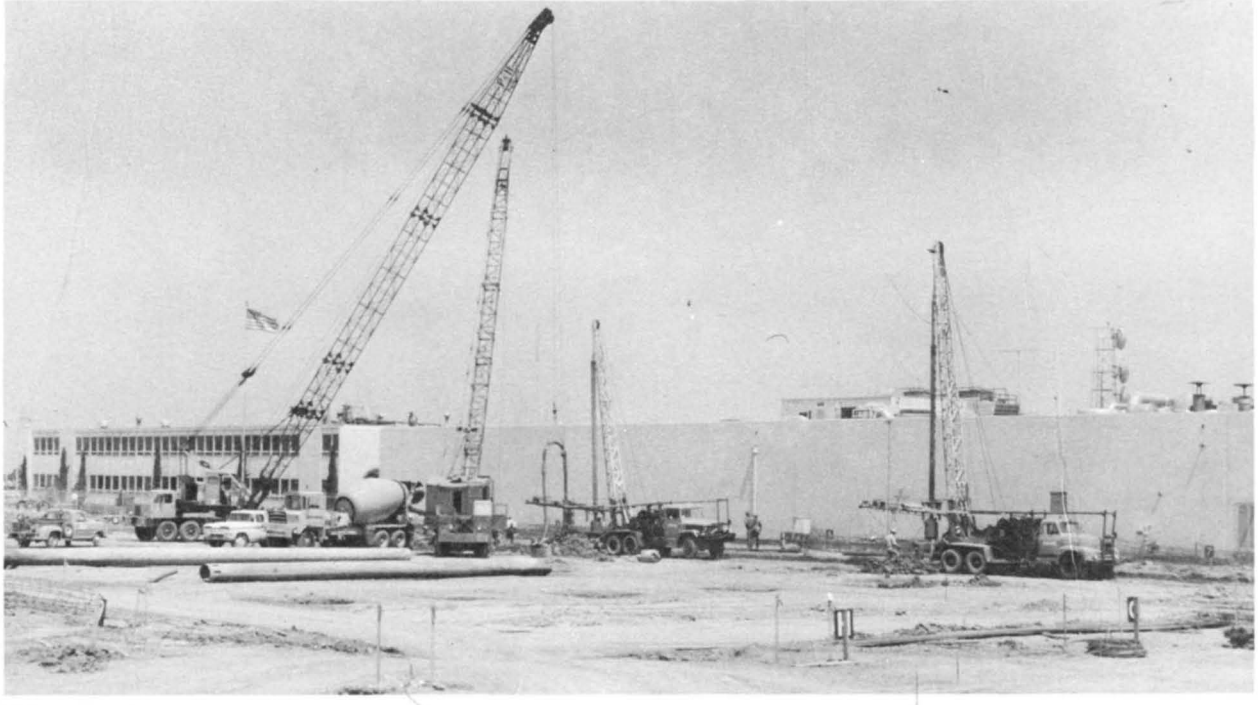
There are six electrical substations in the building; four located on the mezzanine and two in the first floor equipment room. The four are dedicated to technical equipment, and two for utility equipment. Each of these is double-ended or, to put it another way, there are two transformers back-to-back, nominally rated at 750 KVA, which can be operated at 1000 KVA under emergency conditions by using the fan cooling designed for this purpose. Space has been allowed to permit doubling the substation capability. The utility transformers reduce the 4160 volt primary power to 480/277 V. The technical transformers reduce the primary power to 208/120 V.

AIR CONDITIONING

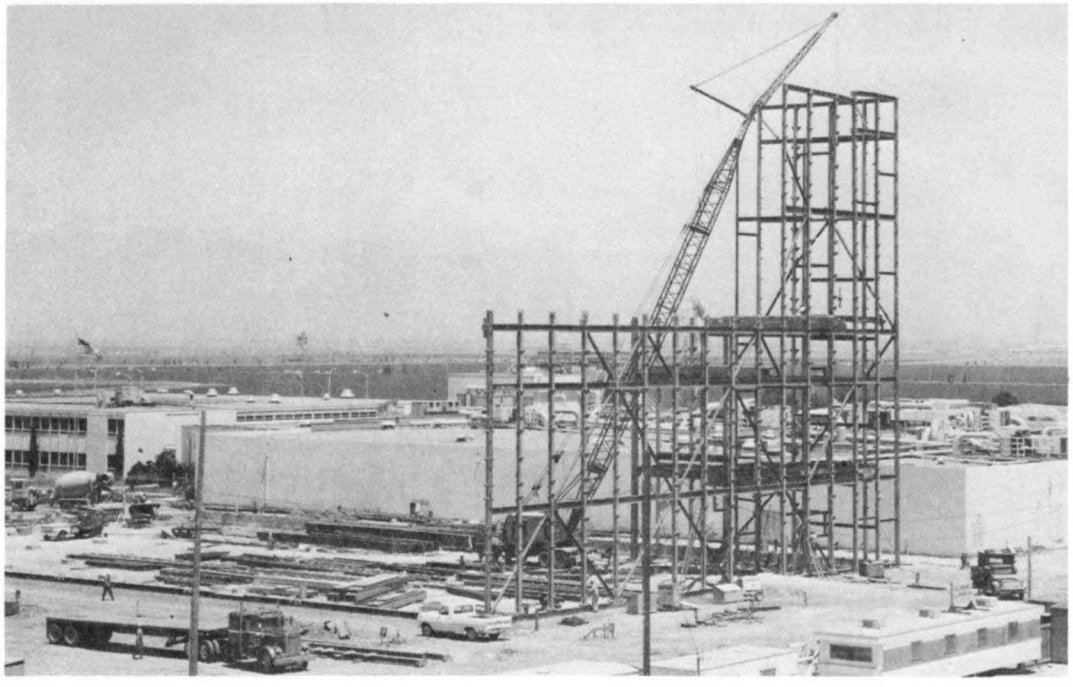
3600 gallons of chilled water per minute will flow to and from the power plant in 14-inch diameter pipes – at 7.5 feet per second or a little over five miles per hour. Two pumps of 100 horsepower each are required to circulate this chilled water at 80 pounds per square inch pressure.

The 25 air handling units with 655 horsepower will circulate 700,000 cubic feet of air per minute, producing one air change every five minutes in the total building.

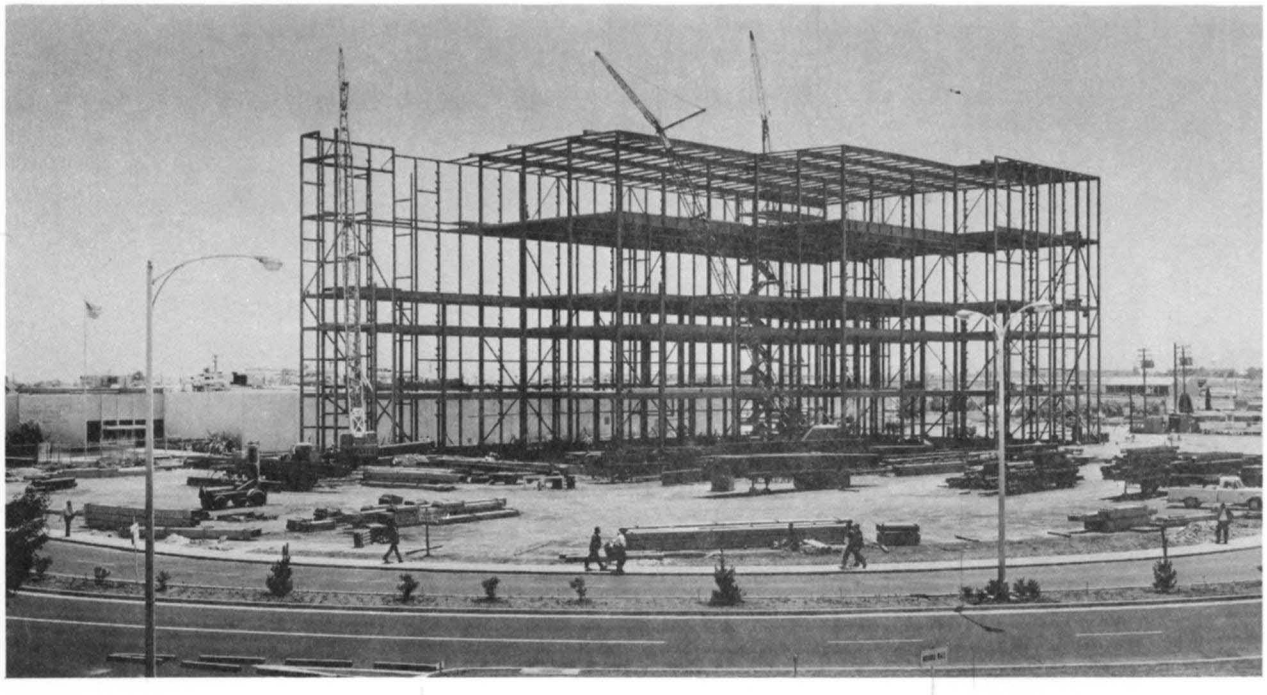
AREA PRIOR TO START OF CONSTRUCTION



START OF CONSTRUCTION



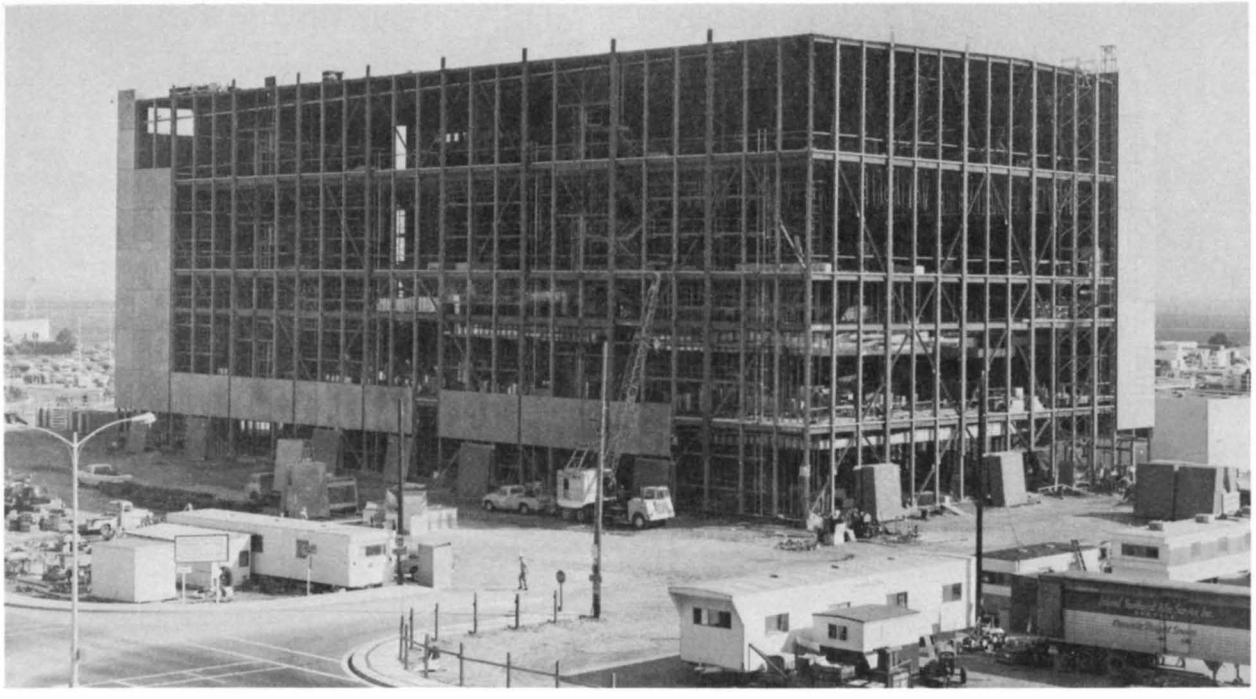
THE FIRST "STEEL" IN PLACE



TAKING SHAPE

LAST STEEL MEMBER IN PLACE

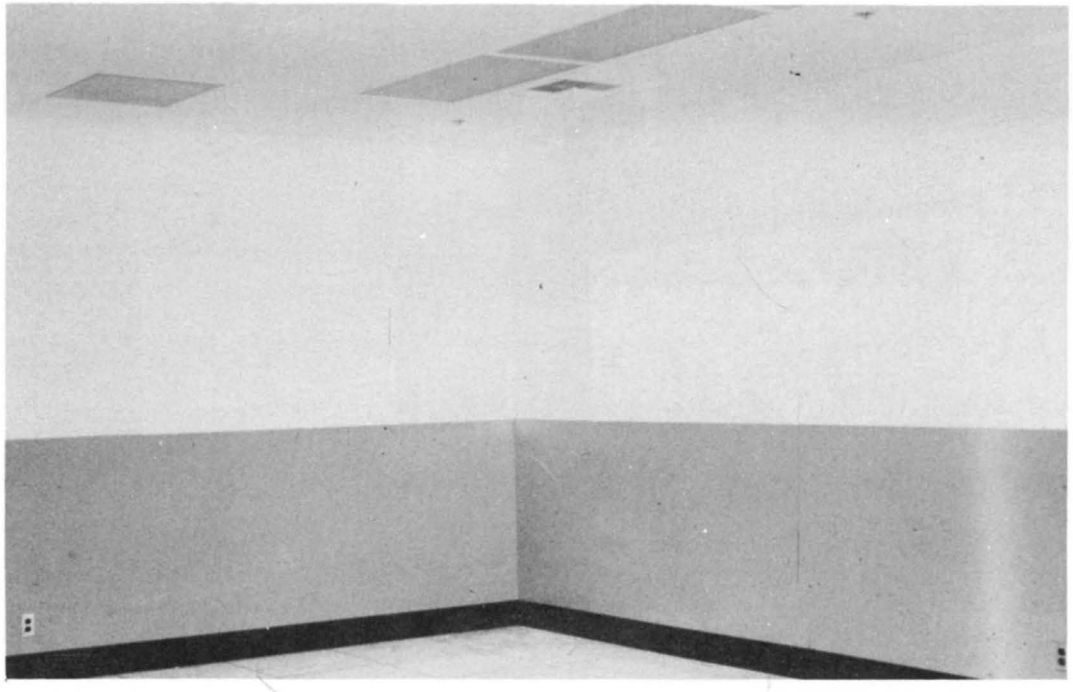
COMPLETION OF STEEL WORK CEREMONY



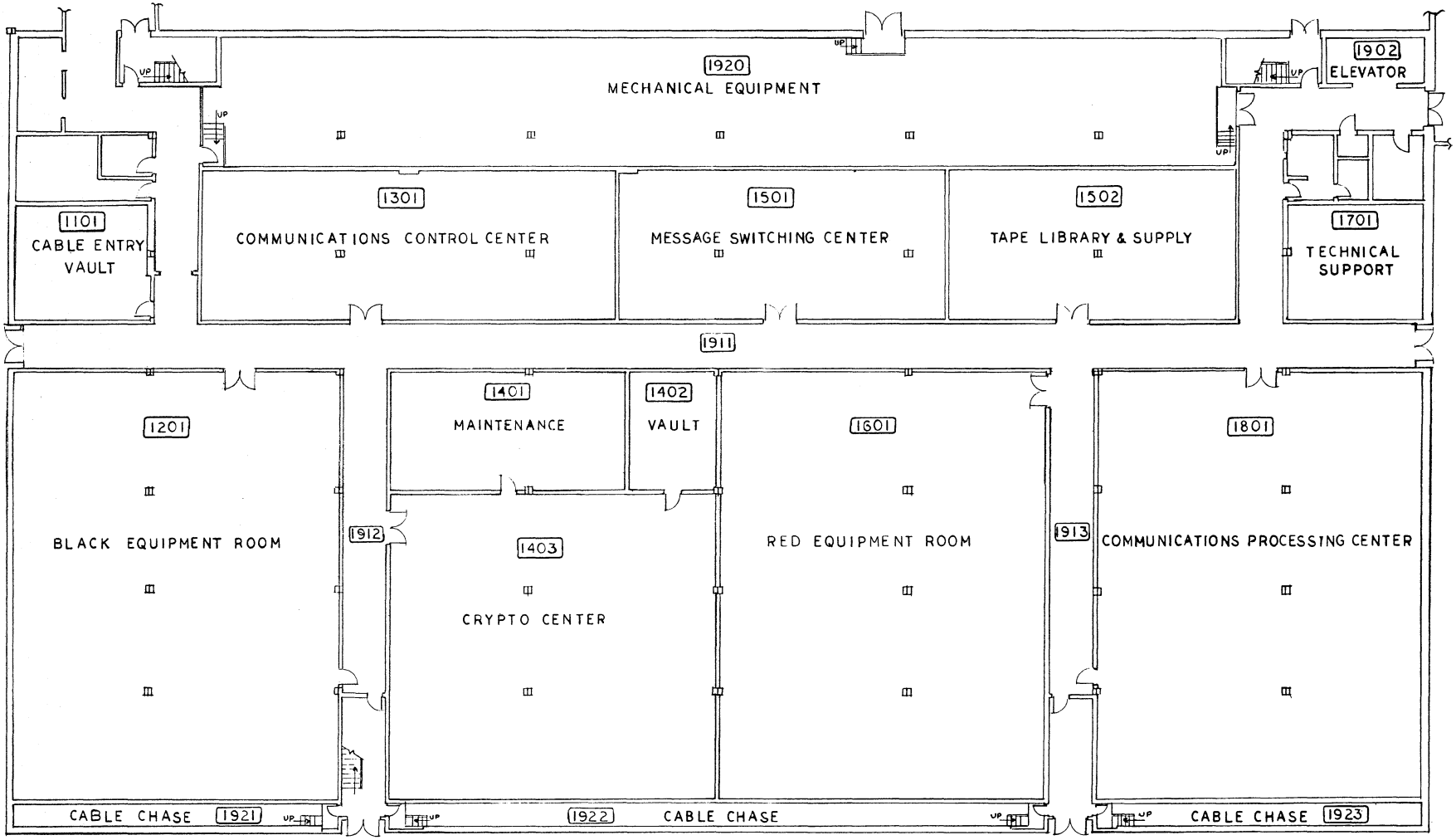
BUILDING 1003 BEING FITTED WITH ITS NEW SKIN

COMPLETION – BUILDING 1003

INTERIOR-ROOM 2401 (TYPICAL)



INTERIOR-ROOM 3405 (TYPICAL)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ELEVATOR
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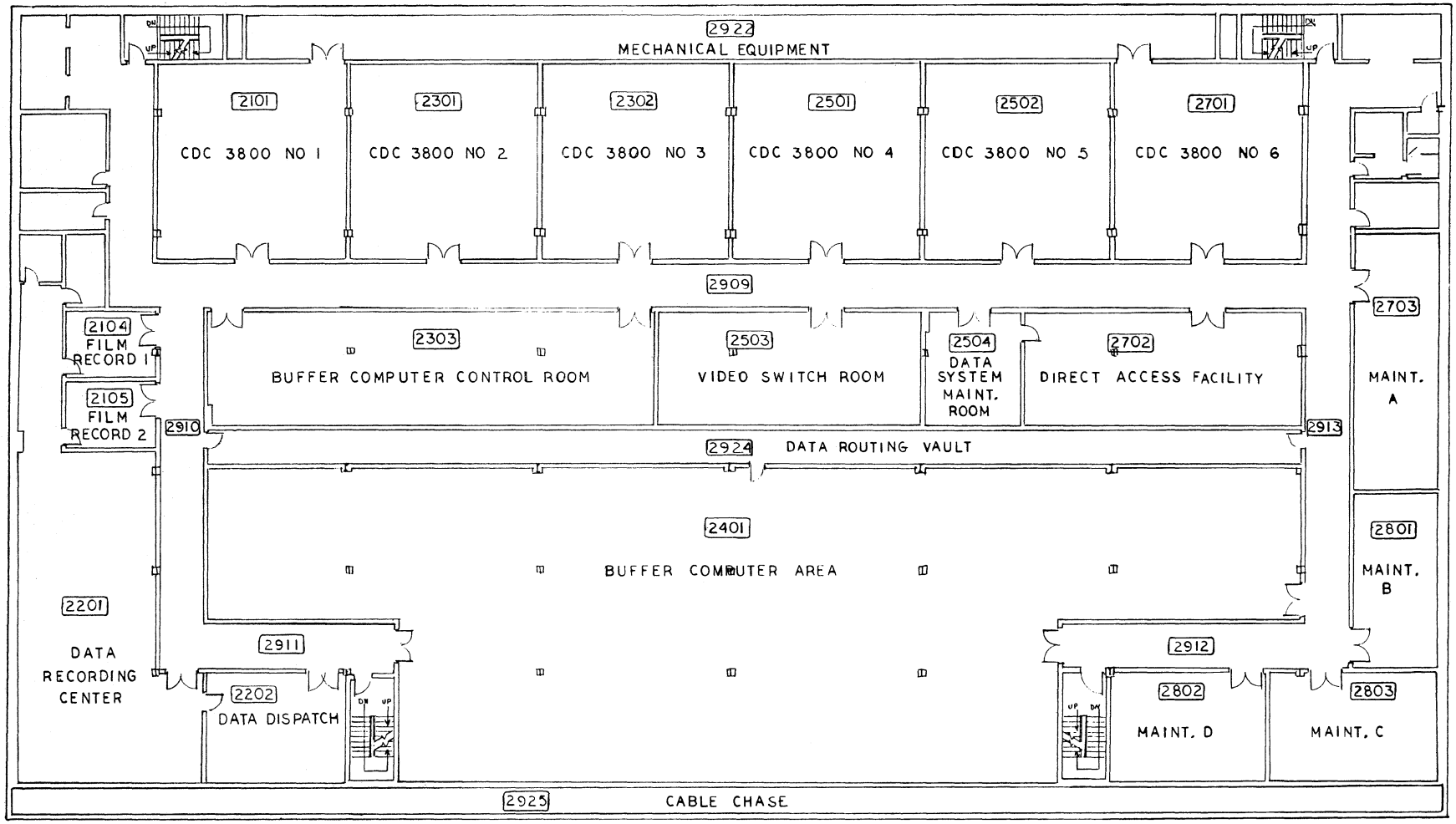
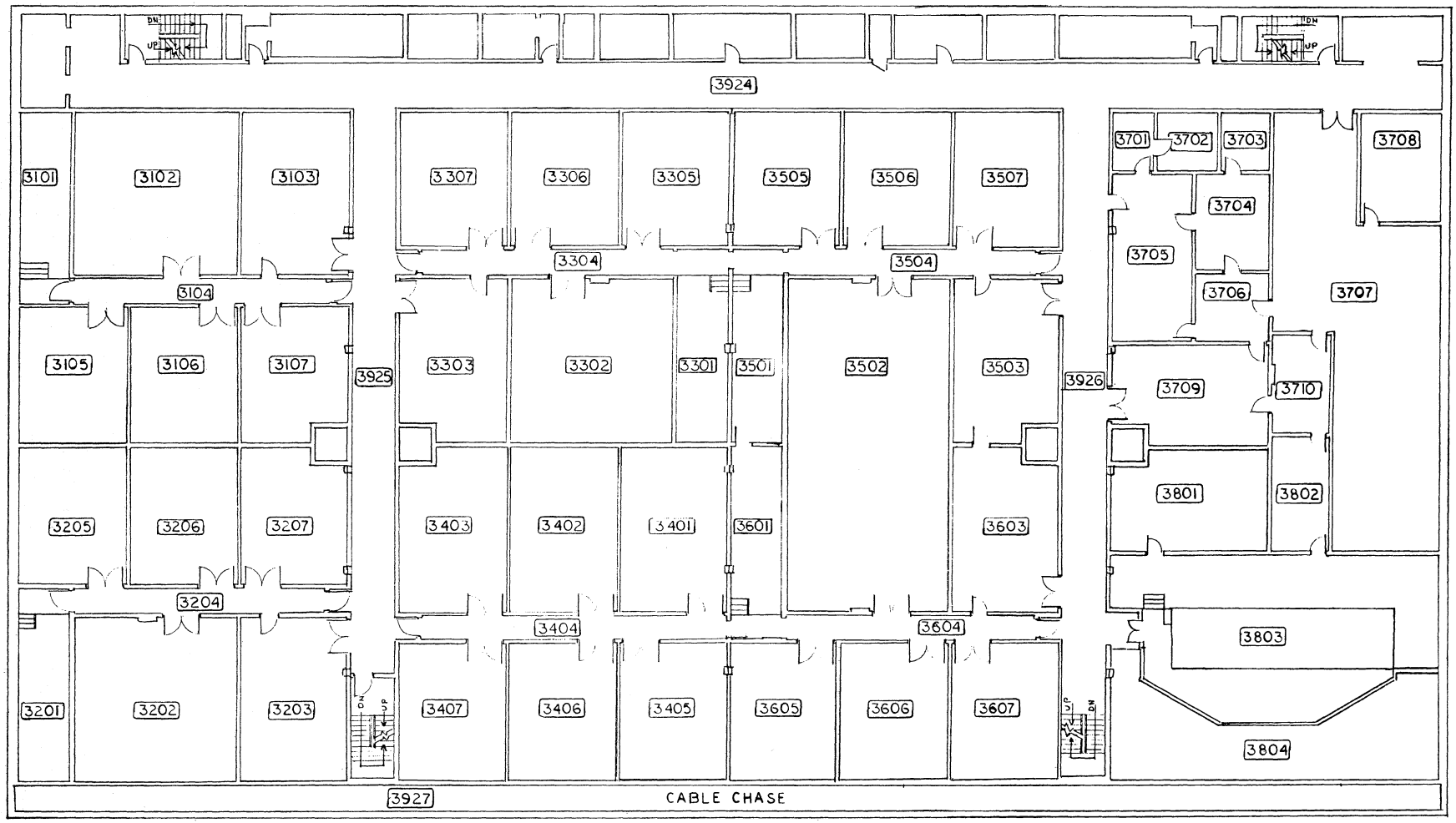
CABLE ENTRY VAULT
1301
COMMUNICATIONS CONTROL CENTER
1501
MESSAGE SWITCHING CENTER
1502
TAPE LIBRARY & SUPPLY
1701
TECHNICAL SUPPORT
1911
1201
BLACK EQUIPMENT ROOM
1401
MAINTENANCE
1402
VAULT
1601
RED EQUIPMENT ROOM
1801
COMMUNICATIONS PROCESSING CENTER
1912
1403
CRYPTO CENTER
1913
CABLE CHASE 1921
1922 CABLE CHASE
CABLE CHASE 1923

FIRST FLOOR



SECOND FLOOR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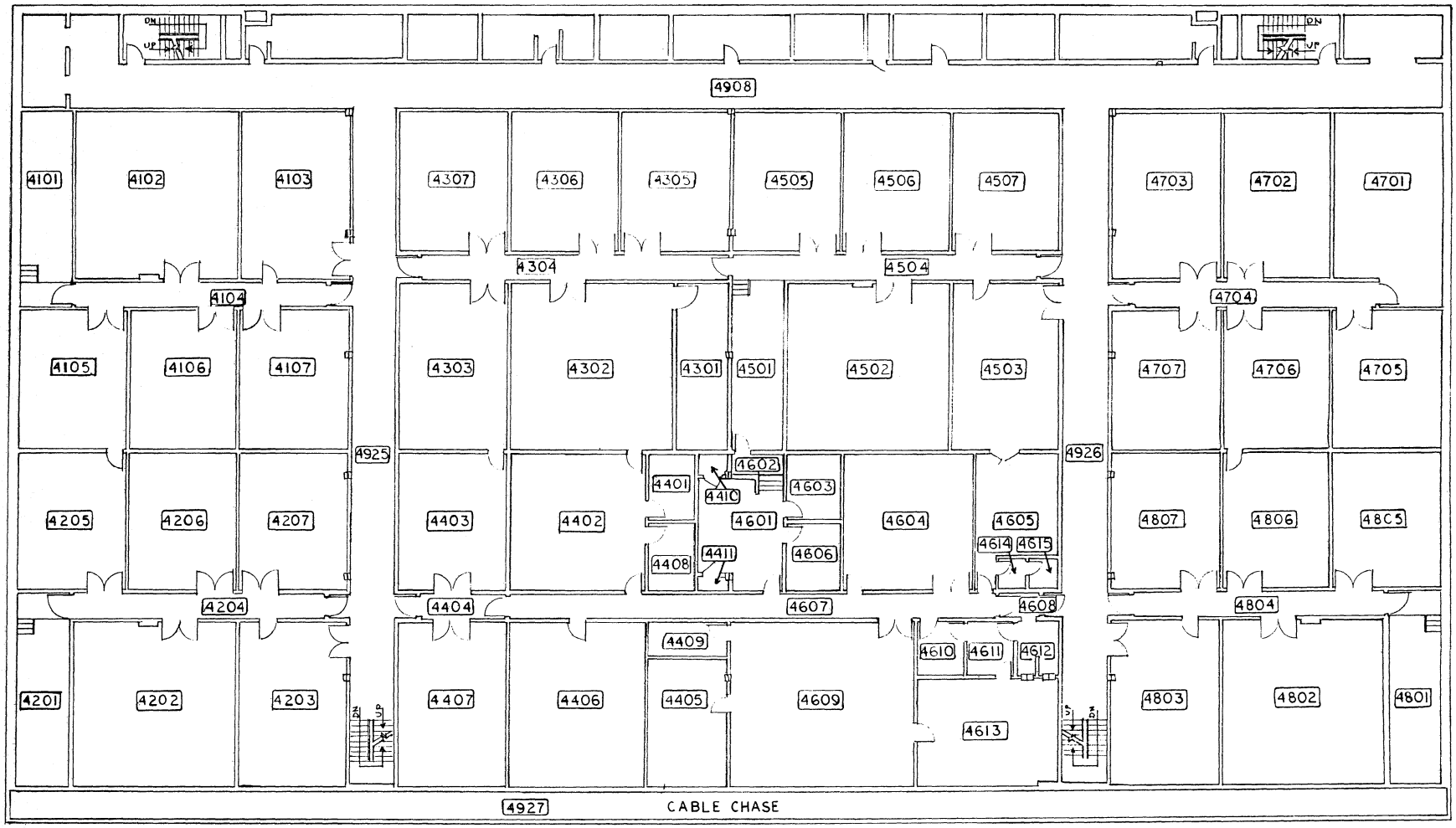
THIRD FLOOR



FOURTH FLOOR