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Apollo/Saturn
Data Handbook

1966

SATURN HISTORY DOCUMENT
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APOLLO/SATURN

DATA HANDBOOK

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHN F. KENNEDY SPACE CENTER - FLORIDA



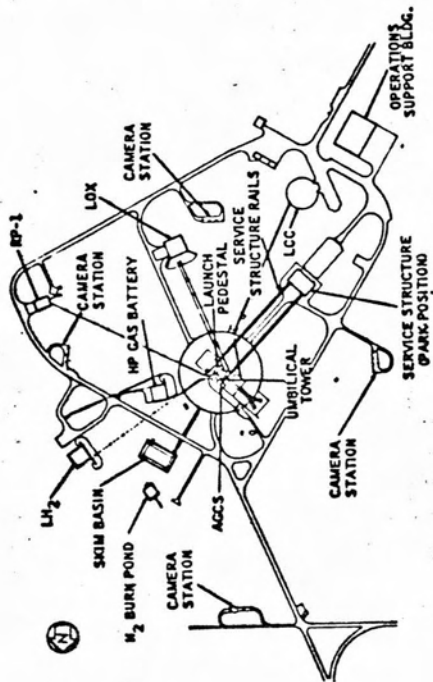
APOLLO/SATURN DATA HANDBOOK

PREFACE

This handbook provides KSC management personnel with general information relative to the Apollo/Saturn program. Emphasis is placed on Saturn launch facilities and related support equipment. Saturn vehicle parameters are included for general information.



LAUNCH COMPLEX 34



JOHN F. KENNEDY SPACE CENTER, NASA

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MERRITT ISLAND INDUSTRIAL AREA

VEHICLE PARAMETERS

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LAUNCH PAD

| | |
|--------------------------------|-------------|
| Diameter | 430 ft |
| Height (Above Sea Level) | 16 ft (max) |

LAUNCH PEDESTAL

| | |
|----------------------------|------------------------|
| Dimensions (Overall) | 42 ft sq by 27 ft high |
| Exhaust Opening | 25-ft ϕ |

FLAME DEFLECTOR

| | |
|--------------|--|
| Type | Dry, roof-truss structure, ASTM A36 steel |
| Length | 43 ft |
| Width | 32 ft 4 inches |
| Height | 21 ft |
| Weight | 150 tons |

UMBILICAL TOWER

| | |
|-----------------------|--|
| Type | Steel-trussed structure |
| Height | 240 ft |
| Base Dimensions | 24 ft sq by 27 ft high |
| Tapers to | 10 ft |
| Swing Arms | 1 for S-1; 2 for S-1V; 1 for spacecraft |
| Hoist | 2 $\frac{1}{2}$ -ton capacity |

AUTOMATIC GROUND CONTROL STATION

| | |
|------------|-----------------------------|
| AGCS | 8170 sq ft under launch pad |
|------------|-----------------------------|

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SERVICE STRUCTURE

| | |
|-------------------------------|--|
| Type | Inverted U, box truss |
| Height | 310 ft |
| Column Base | 70 by 37 ft |
| Overall Base | 130 by 70 ft |
| Weight | 2900 tons |
| Base Mount | Four 12-wheel trucks equipped with hyd jacks |
| Hoists | Two, 40- and 60-ton |
| Hook Height | 245 ft each |
| Hook Reach | 28 ft forward; 20 ft lateral both |
| Platforms (Fixed) | 7 |
| Floor Area | 790 sq ft each |
| Platforms (Retractable) | 5 |
| Floor Area | 814 sq ft each |
| Launch Position | 680 ft from pad center |

LAUNCH CONTROL CENTER

| | |
|-----------------------------|--|
| Type | 2-story, dome-shaped |
| Protected Space | 9500 sq ft |
| Unprotected Space | 2150 sq ft |
| Distance From Pad | 1000 ft |
| Construction | 5-ft reinforced concrete earth revetted (7 ft at top, varying to to 30 ft at base) surfaced with 4 inches of shotcrete; interior, 2-inch acoustical material |
| Design Blast Pressure | 2188 psi |



LAUNCH COMPLEX 34

OPERATIONS SUPPORT BUILDING

| | |
|------------------|---|
| Dimensions | 201 ft long by 151 ft 9 inches wide by 15 ft 8 inches high |
| Space | 30,000 sq ft |

RP-1 FACILITY

| | |
|---------------------|---------------------|
| Storage Tanks | 2 (identical) |
| Type | Cylindrical |
| Size | 41 ft long, 11 ft d |
| Capacity | 60,000 gal |
| Transfer Rate | 2000 gpm |

LIQUID OXYGEN FACILITY

| | |
|--------------------------|------------------------|
| Storage Tanks | 2 (main and replenish) |
| Main Capacity | 125,000 gal |
| Replenish Capacity | 13,000 gal |

| | |
|------------------|--|
| Construction | |
| Main Tank | Double-walled sphere |
| Size | 41 ft d outside wall; 33 ft d inside wall |
| Insulation | Expanded perlite |

| | |
|---------------------------|----------------------------|
| Replenish Tank | Cylindrical |
| Size | 37-3/4 ft long 11 ft d |
| Insulation | Vacuum |
| Pumping Rate (Main) | 2500 gpm |
| Replenish System | Pressure transfer, 180 psi |

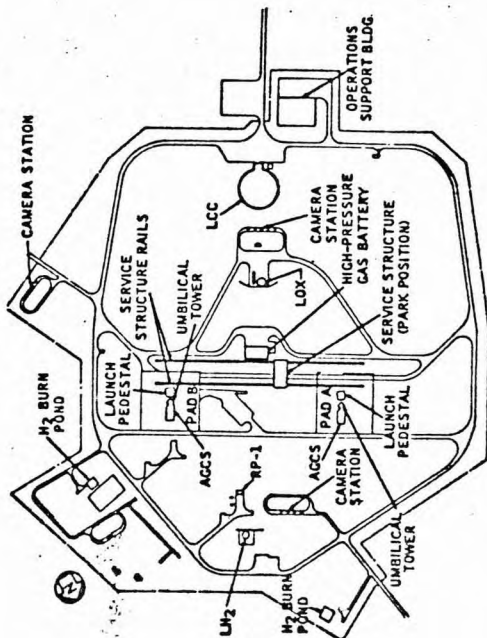
LIQUID HYDROGEN FACILITY

| | |
|--------------------|--|
| Storage Tank | Double-walled sphere |
| Capacity | 125,000 gal |
| Size | 38 ft d outside wall; 34 ft d inside wall |
| Insulation | Perlite, vacuum |

Fill Rate 2000 gpm

CONVERTER-COMPRESSOR FACILITY
(Serves both LC 34 & 37)

| | |
|---|--|
| LN₂ Storage Tank | Double-walled sphere |
| Capacity | 35,000 gal |
| Size | 27 1/2 ft d outside wall, |
| | 21 1/2 ft d inside wall |
| Insulation | Perlite, GN ₂ pressurized (2 psf) |
| GN₂ Storage Battery | 12 cylinders (un manifolded) |
| Capacity | 2400 cu ft |
| Pressure | 6000 psi |
| Low Pressure Converter | 10 to 30 psi |
| Helium Storage Battery | 8 cylinders (un manifolded) |
| Capacity | 1600 cu ft |
| Pressure | 6000 psi |



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LAUNCH COMPLEX 37

LAUNCH PADS

| | |
|------------|-----------|
| Pads | 2 |
| Size | 300 ft sq |

LAUNCH PEDESTALS

| | |
|-----------------------------|------------------------|
| Dimensions | 55 ft sq by 35 ft High |
| Exhaust Opening | 32-ft d |
| Holddown/Support Arms | 8 (Identical) |

FLAME DEFLECTORS

| | |
|--------------|--|
| Type | Dry, roof-truss structure, ASTM A36 steel |
| Length | 43 ft |
| Width | 32 ft 4 inches |
| Height | 21 ft |
| Weight | 150 tons |

UMBILICAL TOWERS

| | |
|-----------------------|-------------------------|
| Type | Steel-brussed structure |
| Height | 268 ft |
| Base Dimensions | 32 ft sq by 35 ft High |
| Tapers to | 14 ft sq |

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| | |
|------------------------|--|
| Tower Separation | 900 ft centerline |
| Spring Arms | 1 for S-I; 2 for S-IV; 1 for spacecraft |
| Hoist | 21-ton capacity |
| Trolley | 27-ft maximum extension from pivot |

AUTOMATIC GROUND CONTROL STATIONS

| | |
|----------------|------------------------------|
| Location | Base of each umbilical tower |
| Space | 16,884 sq ft, 4 levels |

ENVIRONMENTAL CONTROL SYSTEM

| | |
|------------------------------|--|
| Converter-Compressor | 35 psig CN_2 to AGCS roof facilities |
| Conditioner Air Intake | 900 or 18,000 acfm |
| Cooling | Evaporative |

SERVICE STRUCTURE

| | |
|-----------------------|---|
| Type | Trapezoidal, rigid truss |
| Height | 300 ft (excl derrick) |
| Base Dimensions | 120 ft by 120 ft, centerline of columns |
| Weight | 5200 tons |
| Base Mount | 4 trucks, 2 each side, 1 side driven; 24 flanged wheels per driven truck; 12 flanged wheels per non-driven truck |



LAUNCH COMPLEX 37

| | |
|-----------------------|---|
| Hoist | Derrick type, 3 hooks |
| Capacity | 60-ton main hook, 40-ton auxiliary hook, 10-ton jib hook |
| Reach | 80-ft working radius |
| Hook Height | 375 ft (with rated load) |
| Platforms | 10 (minimum) |
| Elevators | 3 |
| Capacity | 3000 lb each |
| Launch Position | Unused pad |
| Rail Length | 1200 ft |

LAUNCH CONTROL CENTER

| | |
|-----------------------------|--|
| Type | 2-story, dome-shaped |
| Protected Space | 18,668 sq ft |
| Unprotected Space | 2300 sq ft |
| Distance from Pad | 1200 ft |
| Construction | 5-ft reinforced concrete, earth revetted (7 ft at top, vary- ing to 4 1/2 ft at base) surfaced with 4 inches of shotcrete; interior, 2-inch coat of acousti- cal material |
| Design Blast Pressure | 2188 psf |

OPERATIONS SUPPORT BUILDING

| | |
|------------------|--|
| Space | 5600 sq ft |
| Dimensions | 101 ft 10 inches long by 40 ft wide |

SPARE PARTS STORAGE BUILDING

| | |
|-----------------------------|---------------------------|
| Space | 6600 sq ft |
| Dimensions | 162 ft long by 42 ft wide |
| Outside Storage Space | 2000 sq yd |

RP-1 FACILITY

| | |
|-----------------|-----------------------------|
| Storage Tank | |
| Type | Cylindrical, earth revetted |
| Capacity | 43,500 gal |
| Size | 67 ft long by 12 ft d |
| Transfer Rate | |
| Fast Fill | 2000 gpm |
| Slow Fill | 200 gpm |

LIQUID OXYGEN FACILITY

| | |
|---------------------------------|--|
| Storage Tanks | 2 (main and replenish) |
| Main Capacity | 125,000 gal |
| Replenish Capacity | 28,000 gal |
| Construction | |
| Main Tank | Double-walled sphere |
| Size | 421 ft d outside wall; 331 ft d inside wall |
| Insulation | Perlite (GN ₂ purge) |
| Replenish Tank | Double-walled cylinder |
| Size | 62 ft long by 11½ ft d |
| Insulation | Perlite (with vacuum) |
| Transfer Rate (Main) | 1000 gpm to S-IV; 2500 gpm to S-I |
| Replenish Transfer System | Pressure, 200 psi |

LIQUID HYDROGEN FACILITY

| | |
|--------------------|--|
| Storage Tank | Double-walled sphere |
| Capacity | 125,000 gal |
| Size | 38.8 ft d outside wall; 32.8 ft d inside wall |
| Insulation | Perlite with vacuum |
| Fill Rate | 2000 gpm |

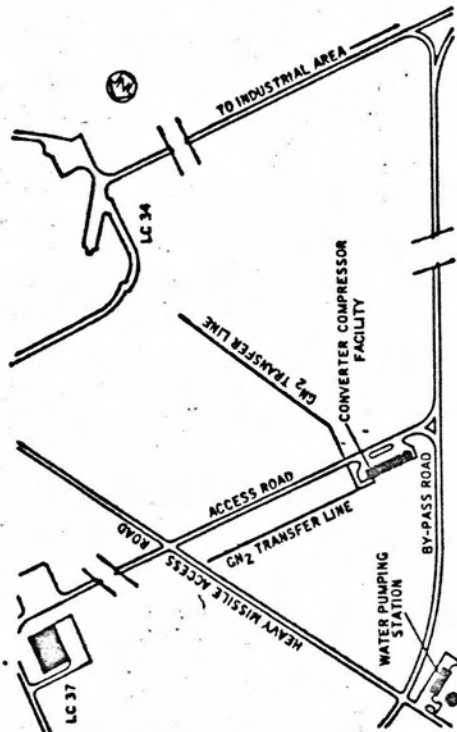
CONVERTER-COMPRESSOR FACILITY
(Serves both LC 34 & 37)

| | |
|---------------------------------------|--|
| LN ₂ Storage Tank | Double-walled sphere |
| Capacity | 35,000 gal |
| Size | 27½ ft d outside wall; 21½ ft d inside wall |
| Insulation | Perlite with 2 psi GN ₂ |
| GN ₂ Storage Battery | 12 cylinders (manifolded) |
| Capacity | 2400 cu ft |
| Pressure | 6000 psi |
| Low Pressure Converter | 10 to 30 psi |
| Medium Storage Battery | 8 cylinders (manifolded) |
| Capacity | 1600 cu ft |
| Pressure | 6000 psi |

WATER PUMPING STATION

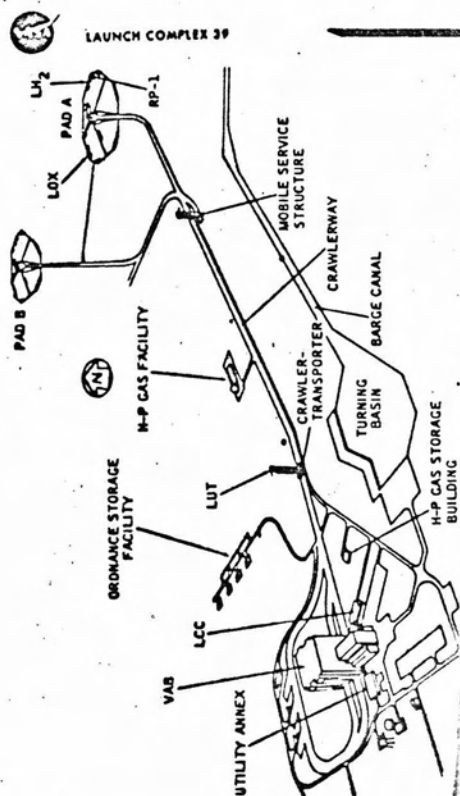
| | |
|--------------------------|-----------------------|
| Reservoir Capacity | 1,000,000 gal |
| Pumping Units | 8 |
| 750-HP Diesel | 6 (launch operations) |
| Total Capability | 30,000 gpm |
| 260-HP Diesel | 2 (fire fighting) |
| Total Capability | 2000 gpm |

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LAUNCH COMPLEX 39



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VERTICAL ASSEMBLY BUILDING

| | |
|---|-------------------|
| Overall Length..... | 716 ft 6 in |
| Overall Width..... | 518 ft |
| Height (Top of Finished Roof, High Bay)..... | 525 ft 10 inches |
| Volume..... | 129,482,000 cu ft |
| Imprint Area..... | 343,500 sq ft |
| Low Bay | |
| Volume..... | 12,282,000 cu ft |
| Length..... | 274 ft 6 in |
| Width..... | 442 ft |
| Height | |
| Top of Parapet..... | 211 ft 3 inches |
| Top of Finished Roof..... | 210 ft 4 inches |
| Imprint Area..... | 117,600 sq ft |
| Checkout Cells..... | 8 |
| Floors..... | 3 plus mezzanine |
| Elevators..... | 4 |
| High Bay | |
| Volume..... | 117,200,000 cu ft |
| Length..... | 442 ft |
| Width..... | 518 ft |

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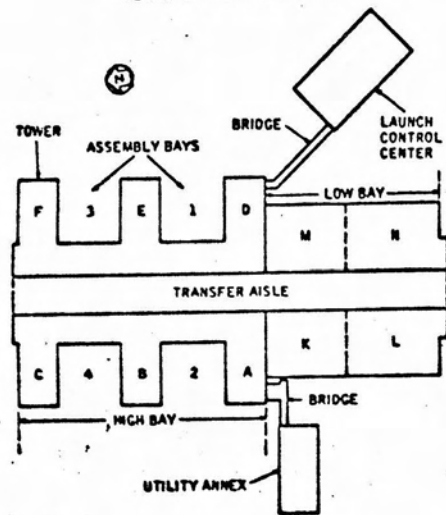
VERTICAL ASSEMBLY BUILDING

| | |
|------------------------|--------------------------------------|
| Core Shaft | 551 R 10 inches |
| Encasing | 535 R 10 inches |
| ..... | 526 R 9 inches |
| ..... | 525 R 10 inches |
| ..... | 225,900 sq ft |
| ..... | 4 (2 equipped initially) |
| Shed | 30 (some not used in certain towers) |
| ..... | 16 (420 ft level) |
| ..... | 1 |
| Cranes | Bridge type (2) |
| Capacity | 250 tons each |
| Height | 462 ft (centerline of hook) |
| Mobile Platforms | 10 in each bay, 5 each side |
| Service Levels | Floors 10, 14, 20, 23, and 28 |
| Mobile Crane | Bridge type (1) |
| Capacity | 175 tons |
| Height | 166 ft (centerline of hook) |
| Span Length | 670 R 6 inches |
| Clearance | 92 R 5 inches |



LAUNCH COMPLEX 39

VERTICAL ASSEMBLY BUILDING



LAUNCH CONTROL CENTER

| | |
|-----------------|--|
| Type | 4-story, rectangular |
| Length | 181 R |
| Width | 378 R |
| Height | 76 R |
| Elevators | 2 |
| Floor 1 | Offices, shops, and cafeteria |
| Floor 2 | Telemetry, data processing, and offices |
| Floor 3 | Firing rooms (4) and computers |
| Floor 4 | Display and mechanical |



ORDNANCE STORAGE

| | |
|------------------------------------|--|
| Lab, Shipping, and Receiving | 65 R by 40 R |
| Storage Areas No. 1 and 2 | 50 ft by 50 ft each 2500 sq R, overburdened |
| No. 3 (Ready Storage) | 40 ft by 50 R 2000 sq R, overburdened |
| No. 4 | 20 R by 12 R |
| No. 5 and 6 | 10 R by 8 R each |

UTILITY ANNEX BUILDING

| | |
|--------------------|--|
| Type | 1 story with mezzanine |
| Construction | Steel |
| Length | 253 R 2 inches |
| Width | 105 R 2 inches |
| Height | 29 R 4 inches |
| Purpose | Air conditioning, water, and electric equipment |

FUEL OIL STORAGE

| | |
|----------------------|---|
| Fuel Oil Tanks..... | 3 |
| Size..... | 11 R d by 43 R long |
| Capacity..... | 90,000 gal |
| Diesel Oil Tank..... | 1 |
| Size..... | 8 R d by 30 R long |
| Capacity..... | 10,000 gal |
| Purpose..... | For heating plant, diesel engines, etc. |

WATER COOLING TOWER

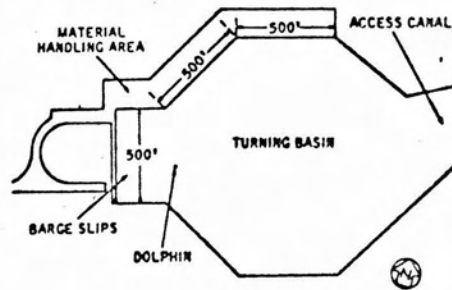
| | |
|------------------------|---|
| Type..... | 4-fan, evaporative |
| Length..... | 36 R |
| Width..... | 33 R 6 inches |
| Height..... | 23 R 8 inches |
| Pumps..... | 3 |
| Water Temperature..... | In = 95°F; out = 85°F |
| Purpose..... | For air conditioning equipment in annex |



POL, PAINT, AND CHEMICAL STORAGE

| | |
|-------------------|---------------------|
| Type..... | Reinforced concrete |
| Storage Area..... | |
| Paint..... | 640 sq R |
| Chemical..... | 1280 sq R |

BARGE TURNING BASIN



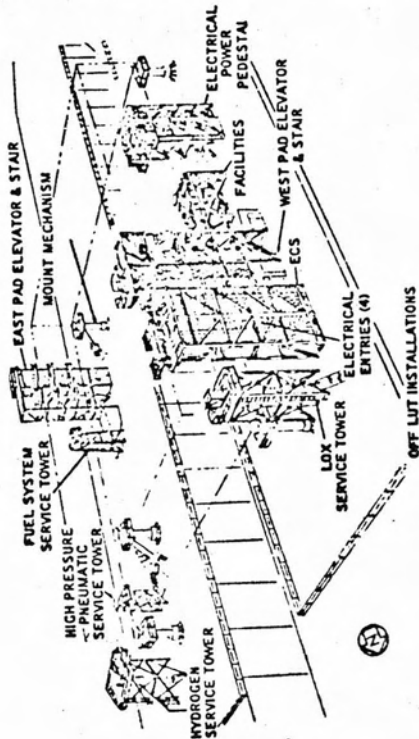
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LAUNCH PADS

Shape 8-sided polygon
 Distance Across 3000 Ft
 Hardstand Size 390 Ft by 325 Ft
 Elevation (At Center) 48 Ft above sea level



LAUNCH COMPLEX 39



RP-1 SYSTEM

Fuel Unloading Station

| | |
|----------------------------|---|
| Number of Stations | 1, with 4 manifold outlets |
| Transfer Lines | 3-inch ϕ |
| Manifold Disconnects | Quick disconnect, 40 ft from storage tank |
| Fuel Transfer Pump | 1, single-stage, centrifugal |
| Flow Rate | 1000 gpm |
| Outlet Pressure | 56 psig |
| Pump Motor | 50 hp, 440 v |

Storage Facility

| | |
|-------------------------|--|
| Number of Tanks | 3 |
| Configuration | Cylindrical |
| Capacity | 86,000 gal per tank |
| Supports | 4 per tank, 18-ft centers |
| Diameter | 15 ft |
| Length | 63 ft |
| Material | Carbon steel |
| External Pressure | 6.3 psi blast over-pressure, plus 3 ft sand overburden |
| Vessel Weight | 100,000 lb per tank |
| Fluid Weight | 1.73 million lb total |
| Distance from Pad | 1350 ft |



RP-1 SYSTEM

| | |
|------------------------|--|
| Transfer Pump | 1, single-stage, 3600 rpm centrifugal, double volute |
| Loading Rate | 2000 gpm |
| Outlet Pressure | 200 psig |
| Power Required | 300 hp, 440 v |
| Transfer Line | 8-inch d welded, uninsulated |
| Material | Stainless steel |
| Expansion Joints | 3 |
| Service Tower | At LUT interface |
| Height | 31 ft approx |
| Connections | 2 flexible hoses and a quick disconnect at LUT interface |

Pad Area

| | |
|-----------------------|--|
| Interface Point | Fuel tall service mast, level 0 of the LUT |
| Components | Filter, vent trap, reservoir, and control valves |

LIQUID OXYGEN SYSTEM

LOX Transfer System

| | |
|----------------------|---|
| Pumps | 2 main, 2 replenish |
| Tank Pressurization | LOX vaporizer |
| Transfer Lines | Main fills 14-inch di S-IVB fill and vehicle replenish 6-inch di, vacuum jacketed |
| Main Transfer Pumps | 2 |
| Loading Rate | 10,000 gpm |
| Pump Capacity | 10,000 gpm per pump |
| Outlet Pressure | 320 psi |
| NPSH | 21 psig |
| Power Required | 2500 hp, 4160 v |
| Replenish Pumps | 2 |
| Loading Rate | 1000 gpm |
| Pump Capacity | 1000 gpm per pump |
| Outlet Pressure | 260 psi |
| NPSH | 21 psig |
| Power Required | 275 hp, 440 v |
| Stage Transfer Rates | 10,000 gpm fill, 500 gpm replenish |
| S-IC | 5000 gpm fill, 200 gpm replenish |
| S-II | 1000 gpm fill, 500 gpm replenish |
| S-IVB | |
| LOX Storage Tank | |
| Capacity | 900,000 gal |
| Configuration | Spherical |
| Supports | Supported above ground on 36-inch di legs |



LIQUID OXYGEN SYSTEM

| | |
|-----------------------------|---|
| Insulation | Perlite |
| Inner Shell | |
| Diameter | 62 ft 9 inches |
| Material | Stainless steel |
| Outer Shell | |
| Diameter | 68 ft 9 inches |
| Material | Carbon steel |
| Internal Operating Pressure | 10 psig |
| External Blast Pressure | 6 psig |
| Boiloff Rate | 0.18% per day max |
| Number of Supports | 16 |
| Vessel Weight | 1.6 million lb |
| Fluid Weight | 8.6 million lb |
| Distance from Pad | 1450 ft |
| Fill Manifold | |
| Stations | 5 |
| Fill Lines | 4-inch di, perlite insulation |
| Line Couplings | Quick disconnect, 50 ft from main tank centerline |

LIQUID HYDROGEN SYSTEM

| | |
|---------------------------------------|--|
| LH ₂ Storage Facility..... | 1 storage dewar, fill manifold vaporize-heat exchanger, and GH ₂ storage bunker |
| Fill Manifold | |
| Number of Stations..... | 5 |
| Manifold Couplings..... | Bayonet type, located 50 ft from storage dewar |
| Dewar Fill Line..... | 3-inch d, vacuum-jacketed |
| Transfer Method..... | By truck dewar pressure |
| Storage Dewar | |
| Capacity..... | 850,000 gal |
| Configuration..... | Spherical |
| Supports..... | Supported above ground on 30-inch d legs |
| Insulation..... | Vacuum and perlite |
| Vacuum Pump..... | 15 hp, 440 v |
| Inner Shell | |
| Diameter..... | 56 ft 6 inches |
| Material..... | Stainless steel |
| Outer Shell | |
| Diameter..... | 62 ft 6 inches |
| Material..... | Carbon steel |
| Internal Operating Pressure | |
| Pressure..... | 75 psig |
| Pressuring Means..... | Vaporizer |



LIQUID HYDROGEN SYSTEM

| | |
|-------------------------------|---|
| External Blast Pressure..... | 6 psig |
| Boiloff Rate..... | 0.10% per day max |
| Number of Supports..... | 10 legs |
| Vessel Weight..... | 1.6 million lb |
| Fluid Weight..... | 385,000 lb |
| Distance from Pad..... | 1450 ft |
| Transfer Method..... | Internal pressure |
| Vaporizer-Heat Exchanger..... | Pressurizes storage dewar to 75 psig. Conversion rate, 250 gpm of LH ₂ at -300°F |
| Transfer System | |
| Transfer Line to LUT..... | Vacuum-jacketed, 10-inch d |
| Material..... | Invar pipe |
| Outer Jacket..... | Stainless steel |
| Supports..... | Pedestals common with RP-1 line |
| Vent System | |
| Lines..... | 18-inch d, uninsulated, from vehicle |
| | 12-inch d, uninsulated, from storage area |
| Length..... | 1800 ft |

LIQUID HYDROGEN SYSTEM

| | |
|----------------------------|--|
| Umbilical Tower Vent Lines | 2 |
| S-IVB Line Size | 10-inch d |
| Insulation | Annular gas space |
| S-II Line Size | 18-inch d = |
| Insulation | Annular gas space |
| Horizontal Lines | 2 |
| Size | 18-inch d from vehicle to burn pond 12-inch d from storage area to burn pond |
| Jum Pond | Contains 100 ft of 18-inch d aluminum pipe and 500 ft of 10-inch d vent line submerged in water, with 450 bubble caps |
| Pond Size | 100 ft by 100 ft |
| Water Flow Rate | 350 gpm |
| Subcooler Power | 30 hp, 440 v |
| Ignition | Electrical (hot wire) |



HIGH-PRESSURE GAS FACILITY

Converter-Compressor Facility

| | |
|--|--|
| LN ₂ Storage Tank | 1 |
| Capacity | 500,000 gal, excluding 10% ullage |
| Outer Tank Diameter | 60 ft |
| Material | Carbon steel |
| Inner Tank Diameter | 50 ft |
| Material | 300 series stainless steel |
| Operating Pressure | 25 psig |
| Insulation | Perlite |
| Evaporation | 0.2% per day |
| Fill Manifold | 6 Stations, with quick-dis- connect couplings |
| Helium Storage | |
| Method | Rail cars |
| Transfer to C-C | Common manifold and flexible 3-inch high pressure lines |
| Tank Vaporizer (LN ₂) | 1 |
| High Pressure LN ₂ Pumps | 6 |
| High Pressure Vaporizers | 6 |
| High Pressure Helium Compressor Units | 5 |
| LN ₂ Pumps | 2 at 230 gpm each |
| Low Pressure LN ₂ Vaporizer | 1 at 230 gpm |
| High Pressure Storage | Pad and VAB locations |
| Battery Size | 12,000 cu ft each |
| Storage Pressure | 6000 psig |

HIGH-PRESSURE GAS FACILITY

Hydrogen Storage and Conversion Located at LH₂ storage facility

Storage Vessels 4
 Capacity 200 cu ft
 Operating Pressure 6000 psig
 Source Charged prior to start of
 countdown from portable
 recharger unit

Distribution System

Material Aluminum
 Cross-Country Lines 13,000 ft of 14-inch d at
 150 psig
 4800 ft of 3-inch d at 6000 psig
 13,000 ft of 2 1/2-inch d at
 6000 psig
 18,500 ft of 1 1/2-inch d at
 6000 psig
 Pad Distribution Piping 4500 ft of 1 1/2-inch d at
 3000 psig

Maximum Flow Rates

Nitrogen 40,000 scfm
 Helium 200,000 scfm
 Hydrogen 6800 scfm

Pneumatic Control Panels 9



ENVIRONMENTAL CONTROL SYSTEM

Design Basis, Outside Ambient

Summer 95° FDB, 85° FWB
 Winter 29° FDB

Temperature Control Medium

Early Prep Stages Processed outside air
 Final Countdown Period GN₂ (N₂-conditioned purge will
 be initiated just prior to tanking
 LH₂.)

Air and GN₂ Rates and Temp

S-1C FWD Compartment instrument
 containers
 Humidity 0 to 37 gr/lb dry air
 S-1C AFT Engine compartment
 Flow Rate 150 lb/min air at 2002 scfm
 150 lb/min GN₂ at 2070 scfm
 Inlet Temperature 40° to 260° F
 Humidity 0 to 37 gr/lb dry air
 S-1I FWD Compartment instrument containers
 Flow Rate 25 lb/min air at 334 scfm
 25 lb/min GN₂ at 345 scfm
 Inlet Temperature 80° F to 260° F
 Humidity 0 to 37 gr/lb dry air
 S-1I AFT Engine compartment
 Flow Rate 500 lb/min air at 6673 scfm
 500 lb/min GN₂ at 6900 scfm
 Inlet Temperature 80° F to 250° F
 Humidity 0 to 37 gr/lb dry air

ENVIRONMENTAL CONTROL SYSTEM

| | | |
|-------------------------|-------|-----------------------------------|
| S-H AFT | ..... | Compartment instrument containers |
| Flow Rate | ..... | 25 lb/min air at 334 scfm |
|  | ..... | 25 lb/min GN_2 at 345 scfm |
| Inlet Temperature | ..... | 60° F to 100° F |
| Humidity | ..... | 0 to 37 gr/lb dry air |
| S-IVB AFT | ..... | Interstage and engine compartment |
| Flow Rate | ..... | 300 lb/min air at 4003 scfm |
|  | ..... | 300 lb/min GN_2 at 4140 |
| Inlet Temperature | ..... | 75° F to 140° F |
| Humidity | ..... | 0 to 37 gr/lb dry air |
| S-IVB FWD | ..... | Instrument unit compartments |
| Flow Rate | ..... | 150 lb/min air at 2002 scfm |
|  | ..... | 150 lb/min GN_2 at 2070 scfm |
| Inlet Temperature | ..... | 45° F to 120° F |
| Humidity | ..... | 0 to 37 gr/lb dry air |
| Elevator Machinery Room | ..... |  |
| Flow Rate | ..... | 114 lb/min air at 1500 scfm |
|  | ..... | 109 lb/min GN_2 at 1500 scfm |
| Inlet Temperature | ..... | Ambient |

Cooling

| | | |
|-------------------------|-------|-----------------------------|
| Type | ..... | Chilled glycol-water |
| Chiller Units | ..... | 8, R-22 |
| Condenser Heat Disposal | ..... | Outdoor water cooling tower |



ENVIRONMENTAL CONTROL SYSTEM

Heating

| | | |
|------------------|-------|--|
| 150° F Supply | ..... | Hot water to reheat coils, supplementary electric immersion heaters for 185° F water |
| High Temp Supply | ..... | High temp reheat coils in addition to hot water reheat |
| Fluid | ..... | UCON (high temp fluid) |
| Supplementary | ..... | Proportionally controlled immersion electric heaters for 300° F fluid |

ECS Room Requirements

| | | |
|-------------------|-------|---------|
| Temperature | ..... | 80° FDB |
| Relative Humidity | ..... | 60% max |

FLAME DEFLECTORS

| | | |
|--------------------|-------|--|
| Type Construction | ..... | Steel, roof-truss, with replaceable refractory tip |
| Height | ..... | 41 R 6 inches |
| Base Dimensions | ..... | 48 ft by 77 R 6 in |
| Weight | ..... | 700,000 lb |
| Positioning Method | ..... | Retractable steel wheels on 34-ft gauge railway, with shear plates and slots for positioning |

LAUNCHER-UMBILICAL TOWER

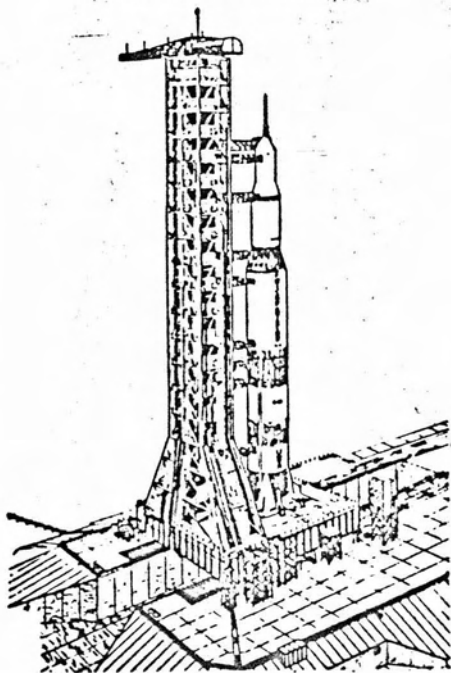
| | |
|-------------------------------------|--|
| Type | Open-steel structure on launch platform |
| Height | (Above ground level, less 42-ft retractable lightning rod) |
| At Pad, VAB, or Erection Area | 445 ft 9 inches |
| On Crawler | 451 ft max (cylinders extended) |
| Weight | 10.6 million lb |
| Launch Platform | |
| • Height | 25 ft |
| Width | 135 ft |
| Length | 160 ft |
| Mount Mechanisms | 6, 22 ft above ground |
| Exhaust Opening | 45 ft sq |
| Floor Space | |
| Level A (Upper) | 12,131 sq ft |
| Level B (Lower) | 18,553 sq ft |
| Umbilical Tower | |
| Height (Above Launcher) | 380 ft (not including crane) |
| Height (Above Launcher) | 398 ft 9 inches (with crane) |
| Height (Above Launcher) | 440 ft 9 inches (including lightning rod) |
| Base Dimensions | |
| Level 0 | 60 ft by 111 ft (tapers to level 80) |
| • Level 80 to 380 | 40 ft sq |



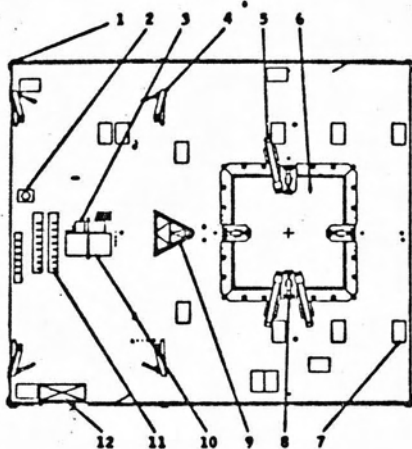
LAUNCHER-UMBILICAL TOWER

| | |
|--------------------------------|------------------------------------|
| Platforms | 17 |
| Elevators | 2 |
| Capacity (Each) | 2500 lb |
| Speed | 600 fpm max |
| Crane | 1 |
| Type | Hammerhead |
| Capacity | 50 ft from Swivel .. 25 tons |
| 85 ft from Swivel | 10 tons |
| Beam Rotation | 360° |
| Hook Lowering Capability | 468 ft below top tower level (max) |
| Lift Speed | 30 fpm |
| Trolley Speed | 100 fpm |
| Swing Arms | 9 |
| S-IC Stage | 2 |
| S-II Stage | 3 |
| S-IVB Stage | 2 (Includes IU) |
| Spacecraft | 2 |
| Holddown-Support Arms | 4 |
| Base Dimensions | 9 ft 9 inches by 6 ft 4 inches |
| Height | 10 ft 5 inches |
| Weight | 37,000 lb |

LAUNCHER-UMBILICAL TOWER



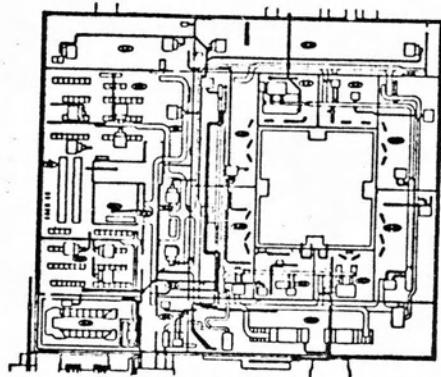
LAUNCHER-UMBILICAL TOWER, LEVEL 0



LEGEND

- | | |
|---------------------------|-------------------------------------|
| 1 Dynamic Support Columns | 7 Access Hatches |
| 2 Condenser (AC) | 8 Vehicle Ho/downs and Support Arms |
| 3 Stair Well | 9 Blast Shield |
| 4 Umbilical Tower Columns | 10 Elevators |
| 5 Tail Service Mast | 11 Deck Mounted Cable Enclosures |
| 6 Vehicle Engine Chamber | 12 FC'S Duct Support |

LAUNCHER-UMBILICAL TOWER, LEVEL A



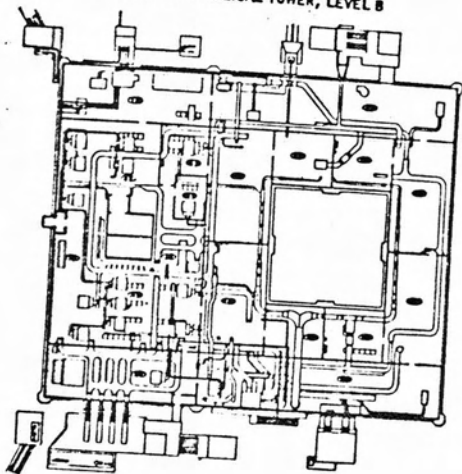
ROOM

EQUIPMENT

- 1A Service Arms - Electrical Equipment Racks
- 4A Engine Gimbaling Hydraulic Pumping Unit
- 2A Electrical Equipment Racks for Digital Data Acquisition System, Instrument Unit, S-1C, S-II, S-IVB Stages, Count Down Clock, and Propellant and Gases
- 8A Service Arms - Electrical Equipment Racks
- 9A Communications Distributors
- 10A Electrical Equipment Racks for signal Conditioners System Integration, Instrument Unit, S-IVB and S-II Stages
- 12A Deluge Purge Panel, Valve Panel No. 11 Operational Intercom Distributor
- 13A S-1C Valve Panels
- 15A Computer Room
- 16A Industrial Load Center-2500KVA Instrumentation Load Center-100 KVA



LAUNCHER-UMBILICAL TOWER, LEVEL B



ROOM

EQUIPMENT

- 1B Hydraulic Charging Unit, Helium Distribution Manifold GN2 Distribution Manifold, GN2 Accumulator Gas Analyzer Racks
- 2B Inert Prefill Reservoir (Motor Control Center), Inert Prefill Pump Skid (For Hydraulic Engine Gimbals)
- 5AB Operational Intercommunication Distributor
- 7B Reserved for MSC
- 9B Electrical Equipment Racks and Terminal Distributors for Measuring, Electrical Equipment Racks for NASA and Base Communications
- 15B Terminal Room, Instrumentation and Communications Interface

CRAWLER-TRANSPORTER

Height

Minimum (Cylinders
Retracted) 20 ft

Maximum (Cylinders
Extended) 26 ft

Length 131 ft

Width 114 ft

Weight 5.5 million lb

Speed

Loaded 1 mph max

Unloaded 2 mph max

Load Capacity 12 million lb

Hydraulic System

Pressure (Normal) 2780 psi

Pressure (Maximum) 5000 psi

Power System (DC) Powers 16 traction motors

Diesel Engines 2
Horsepower 2750 each

Generators 4
Power Output 1000 kw each



CRAWLER-TRANSPORTER

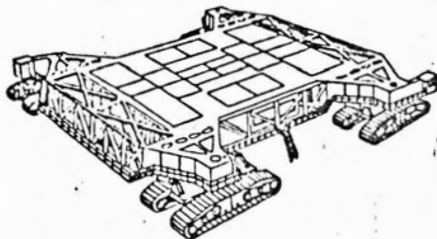
Power System (AC) Powers leveling, jacking,
steering, lighting,
ventilating, electronic
equipment, etc

Diesel Engines 2
Horsepower 1065 each

Generators 2
Power Output 750 kw each

Auxiliary System (AC) Powers LUT during transit

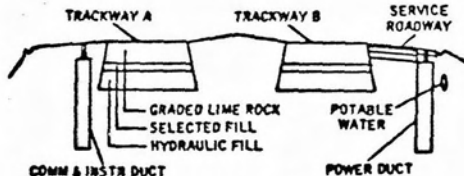
Generators 2
Power Output 150 kw each



CRAWLERWAY

- Type Dual roadway; spaced on 90-R centers
- Main Roadway Area 2 divided lanes
- Lane Width 40 R
- Overall Width 130 R
- Design Load 65 psf
- Service Roadway
- Width 24 R
- Length (Approx. from VAB)
- To Cranter Parking Area 1200 R
- To Mobile Service Structure 12,000 R
- To Launch Pad A 18,000 R
- To Launch Pad B 25,000 R

TYPICAL CRAWLERWAY PROFILE
(Not to Scale)



MOBILE SERVICE STRUCTURE

- Type Construction Steel truss
- Height (Approx)
- Above Ground Level 402 R
- Above LUT Deck 353 R
- Base Dimensions 135 ft by 132 ft
- Top Dimensions 113 ft sq
- Platforms 5
- Self-propelled 2; Nos. 1 and 2
- Type Open, with 6-R hurricane fence
- Vertical Speed 10 fpm
- Preparation Time for Relocation, 30 min
- Access Capability No. 1 to serve S-IC, S-II and a portion of S-II/S-IVB interstage
No. 2 to serve a portion of S-II/S-IVB interstage, S-IVB, and IU
- Fixed-Relocatable 3; Nos. 3, 4, and 5
- Platform No. 3 Enclosed, with ECS for LEM
- Platform No. 4 Enclosed, with ECS for CM and SM
- Platform No. 5 Open, with chain-link fence, serving LES
- Live Load Capability
- Nos. 1, 2, and 3 10 people, 50 psf or 1000 lb conc load
- No. 4 12 people per floor (2 floors), 50 psf or 1000 lb conc load
- No. 5 4 people, 500 lb equip load

MOBILE SERVICE STRUCTURE

| | |
|---------------------|---|
| High-Rise Elevators | 2; serving vehicle access platforms |
| Type | Combination passenger/freight; bottom landing 11-12 ft above LUT deck |
| Net Size | 6 ft 3 inches by 8 ft 8 inches, with 8-ft ceiling |
| Lead Capacity | |
| Equipment | 5000 lb |
| Personnel | 12 to 16 people |
| Speed | 600 fpm max |
| Base Work Elevator | 1; provides access to base work areas and to platform elevators from ground |
| Net Size | 6 ft 3 inches by 8 ft 8 inches, with 8-ft ceiling |
| Lead Capacity | |
| Equipment | 5000 lb |
| Personnel | 12 to 16 people |
| Speed | 200 fpm max |
| Manlifts | 1; supported on arming tower, to serve base work areas and platform elevators from ground (Space reserved for addition of high-rise manlift.) |
| Boom and Hoists | 2; one manually operated to replace APS modules on S-IVB, and one monorail-mounted to replace RCS units on SIII |



MOBILE SERVICE STRUCTURE

Base Buildings

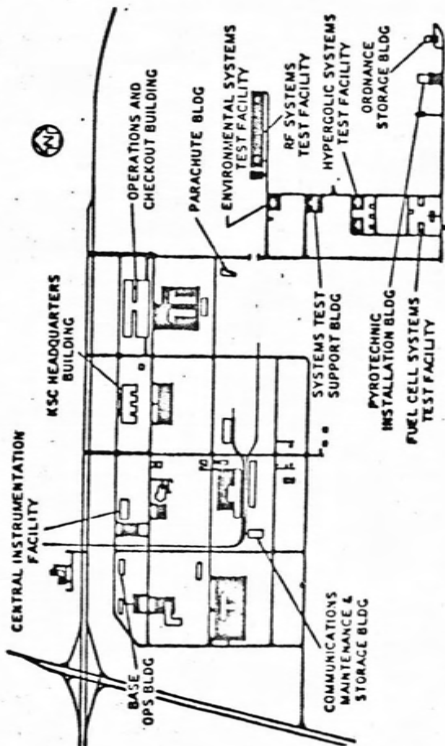
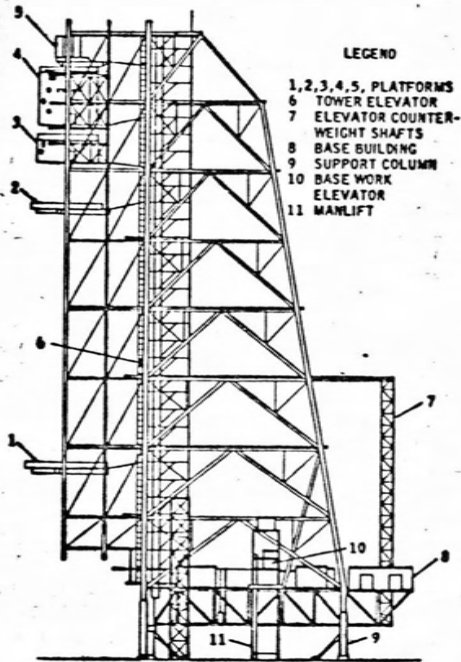
| | |
|---------------------------|------------|
| Mechanical Equipment Room | 1800 sq ft |
| Operations Support Room | 460 sq ft |
| Sanitary Facility | 180 sq ft |
| Elevator Equip Room | 1695 sq ft |
| Comm & TV Equipment Room | 430 sq ft |
| Electrical Equipment Room | 1500 sq ft |

Support Columns

| | |
|----------------|--|
| No. Required | 4 on at pad and park position |
| Special Clamps | Quick-disconnect at pad. Clamp used at pad for wind conditions in excess of 63 mph |

| | |
|-------------------|---|
| Operational Winds | 63 mph, free standing 85 mph, pad position with hold-down clamps 125 mph, park position with hold-down clamps |
|-------------------|---|

MOBILE SERVICE STRUCTURE



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KSC HEADQUARTERS BUILDING
(Including First Addition)

| | |
|------------------------|---|
| Type | 4-story |
| Construction | Reinf concrete and masonry |
| Floor Area | 318,783 sq ft |
| Dimensions | |
| Length (Frontal)..... | 580 ft |
| Width (Depth)..... | 216 ft |
| Height | |
| 3rd Floor Roof..... | 44 ft 6 inches |
| 4th Floor Roof..... | 59 ft 8 inches |
| Elevators | 5 (2 pass; 3 pass/freight) |
| Door Opening | |
| Passenger..... | 5 ft wide by 7 ft high |
| Passenger/Freight..... | 6 ft wide by 8 ft high |
| Capacity..... | 4000 lb each |
| Speed..... | 160 fpm max |
| Floor 1 | |
| Area (Gross)..... | 102,423 sq ft |
| Planned Use | Offices, cafeteria, publications, elec/mech rooms |
| Floor 2 | |
| Area (Gross)..... | 103,140 sq ft |
| Planned Use..... | Offices, comm/crypto, library, ADPS, conference room |

KSC HEADQUARTERS BUILDING
(Including First Addition)

Floor 3

Area (Gross) 103,140 sq ft
 Planned Use Offices, conference room,
 computer room

Floor 4

Area (Gross) 10,000 sq ft
 Planned Use Offices



CENTRAL INSTRUMENTATION FACILITY

Main Building

Type 3-story and masonry screened
 area on roof

Construction Reinf concrete and masonry

Floor Area 133,000 sq ft

Length 288 ft

Width 154 ft

Height

Main Building 49 ft 9 in

Top of Screen 62 ft 4 in

Antenna Platform 64 ft

Elevator 1

Size 9 ft 6 in wide by 6 ft deep

Door Opening 6 ft wide by 8 ft high

Capacity 4000 lbs

Speed 160 fpm max

Floor 1

Area 44,352 sq ft

Equipment Labs and offices

Floor 2

Area 44,352 sq ft

Equipment TM station, computers, data
 reduction

Floor 3

Area 44,352 sq ft

Equipment Data display, presentation,
 data reduction

CENTRAL INSTRUMENTATION FACILITY

| | |
|-------------------------|-----------------------------|
| Roof | |
| Antennas (Dish) | 2 TM; 1 tracking |
| Base Size | 8 ft sq |
| Dish Size | 20 ft d |
| Dish Height | 15 ft (base to dish center) |
| Air Conditioning Equip. | 3 units |
| Hoist | 2-ton jib crane |

Operations Building

Type 1-story and masonry screened area on roof

Construction Reinf concrete and masonry

Floor Area 7023 sq ft

Length 132 ft

Width 71 ft

Height

Main Building 19 ft 9 in

Top of Screen 28 ft 3 in

Main Floor

Area 7023 sq ft

Equipment TM operations, equipment, and documentation

Roof

| | |
|--------------------|-----------------------------|
| Antenna (Dish) | 1 |
| Base Size | 8 ft sq |
| Dish Size | 20 ft d |
| Dish Height | 15 ft (base to dish center) |
| Air Handling Units | 3 |



OPERATIONS & CHECKOUT BUILDING

Type 5-story, irregular shape

Construction Reinf concrete and masonry

Floor Area 333,000 sq ft

Length (Overall) 408 ft

Width (Overall) 475 ft

Height (Overall) 106 ft

Functional Areas 5

Eng and Admin 3-story structure

Floor Area (Total) 96,396 sq ft

Length (Depth) 116 ft

Width (Frontal) 277 ft

Height 49 ft

Auditorium and Cafeteria 1-story structure

Floor Area 9560 sq ft

Length (Depth) 80 ft

Width (Frontal) 117 ft

Height (Main Roof) 23 ft

Laboratory and Control 4- and partial 5-story structure

Floor Space (Total) 15,850 sq ft

Length 475 ft

Width 77 ft

Height 79 ft

Elevators 3 (2 pass; 1 pass/freight)

Size

Passenger 8 ft wide by 6 ft 2 inches deep

Passenger/Freight 10 ft wide by 20 ft deep

Door Opening

Passenger 4 ft wide by 7 ft high

Passenger/Freight 9 ft wide by 8 ft high

JOHN F. KENNEDY SPACE CENTER, NASA

OPERATIONS & CHECKOUT BUILDING

Assembly and Test

| | |
|---------------------------|--------------------------------|
| Floor Area (Total) | 39,900 sq R |
| High Bay | 18,816 sq R |
| Low Bay | 21,084 sq R |
| Length (Total) | 475 R |
| High Bay | 224 R |
| Low Bay | 251 R |
| Width (High and Low Bays) | 84 R |
| Height | |
| High Bay | 106 R |
| Low Bay | 71 R |
| Cranes (Bridge Type) | 3 (2 low bay; 1 high bay) |
| Hook Height | 50 R (low bay) 85 R (high bay) |
| Capacity | 25 tons each |

Utility and Service

| | |
|------------|-------------------|
| Structure | 1-story structure |
| Floor Area | 24,225 sq R |
| Length | 475 R |
| Width | 51 R |
| Height | 22 R |



MERRITT ISLAND INDUSTRIAL AREA

HYPERGOLIC SYSTEMS TEST FACILITY-GEMINI-APOLLO,
AND HYPERGOLIC SYSTEMS TEST FACILITY-APOLLO

| | |
|--------------------------|--|
| Buildings | 2 |
| Type | 2-story central core plus 2 test cells |
| Construction | Reinf concrete and masonry |
| Floor Area | 7100 sq R each |
| Length | 110 R |
| Width | 68 R |
| Height (Overall) | 60 R |
| Cell Finished Roof | 57 R 6 in (high point) |
| Core Finished Roof | 33 R 4 in (high point) |
| Test Cells | 40 R sq each |
| Vertical Lift Main Doors | 6 (3 each cell) |
| Vertical Opening | 40 R |
| Width | 22 R |
| Cranes | 2 (1 each cell) |
| Hook Height | 45 R |
| Capacity | 10 tons |

**FLUID SYSTEMS TEST FACILITY-GEMINI, AND
FUEL CELL TEST FACILITY APOLLO-SM**

Buildings 2

Type 1-story lab and dressing area
plus test cell

Construction Reinforced concrete and masonry

Floor Area 1900 sq ft each
Test Cell 40 ft sq
Lab and Dressing Area 10 by 30 ft

Length 70 ft

Width 40 ft

Height (Overall) 60 ft
Cell Finished Roof 56 ft
Lab Finished Roof 14 ft

Vertical Lift Doors 8 (4 each building)
Vertical Opening 40 ft
Width (N-S Sides) 35 ft (nominal)
Width (E-W Sides) 25 ft (Bldg 1 E door = 35 ft)

Cranes 2 (1 each bldg)

Type
Bldg 1 Monorail
Bldg 2 Bridge

Hook Height 45 ft

Capacity 10 tons

ENVIRONMENTAL SYSTEMS TEST FACILITY

Type 2-story central core plus 2
test cells

Construction Reinforced concrete and masonry

Floor Area 7100 sq ft

Length 110 ft

Width 68 ft

Height 60 ft

Test Cells 40 ft sq each

Cranes 2 (1 each cell)
Hook Height 45 ft
Capacity 10 tons

SYSTEMS TEST SUPPORT BUILDING

Type 1-story, irregular "T" shape
 Construction Reinf concrete and masonry
 Floor Space 10,250 sq ft
 Length
 Main Part 160 ft
 FY '64 Wing 50 ft
 Width
 Main Part 50 ft
 FY '64 Wing 45 ft
 Height (Roof HP) 14 ft

Complex Service Facilities

Fueling Stations Transfer fluids from mobile vehicles to test cells
 Dilution System and Sump Dispose of spilled fuels
 Burn Pond Dispose of hazardous gases



PYROTECHNIC INSTALLATION BUILDING

Type High bay test area plus 2 low bay service areas (1 each side)
 Construction Steel and concrete insulated aluminum siding on high bay
 Floor Area 18,000 sq ft
 Length 150 ft
 Width (Overall) 120 ft
 High Bay 80 ft
 Low Bays 20 ft each
 Height (Above Floor Line) 110 ft 10 inches
 Crane 1, bridge type
 Hook Height 95 ft
 Capacity 25 tons
 Vertical-Lift Door 1
 Opening 90 ft high by 40 ft wide

RF SYSTEMS TEST FACILITY

| | |
|-----------------------------|---|
| Type | 2-towers, 1000 ft apart |
| Control Tower | 2-story structure |
| Construction | Concrete block and steel |
| Floor Area (Enclosed) | 800 sq ft |
| Length | 30 ft |
| Width | 30 ft |
| Height (Main Roof) | 20 ft |
| Floor 1 Area | 400 sq ft |
| Equipment | Test support and air condition |
| Floor 2 Area | 400 sq ft |
| Equipment | Electronic test and recording |
| Roof Deck Equipment | MSC platform and hoist |
| Target Tower | |
| Construction | Cement slab and wood tower |
| Length | 65 ft 6 in |
| Width | 35 ft |
| Height (Top Deck) | 50 ft (3-ft rail around deck) |
| Cable Pit Building | 4 ft 4 in by 9 ft, 3 in enclosed wooden structure over cable pit at tower |



PARACHUTE BUILDING

| | |
|-------------------------------|---------------------------------------|
| Type | 1-story, irregular shape |
| Construction | Steel/reinforced concrete and masonry |
| Floor Area (Total) | 8,200 sq ft |
| Length (Overall) | 280 ft |
| Width (Overall) | 80 ft |
| Height (Overall) | 64 ft (roof ridge) |
| Parachute Area | 4000 sq ft |
| Length | 200 ft |
| Width | 20 ft |
| Height | 18 ft |
| Office and Service Area | 4200 sq ft |
| Length | 140 ft |
| Width | 30 ft |
| Height | 15 ft |

ORDNANCE STORAGE BUILDING

| | |
|--------------------------------|----------------------------------|
| Type | 1-story, irregular shape |
| Construction | Steel/reinf concrete and masonry |
| Floor Area (Total) | 3780 sq R |
| Ordnance Storage | 3240 sq R controlled division |
| Machine Room | 540 sq R |
| Length (Overall) | 90 R |
| Ordnance Storage | 72 R |
| Machine Room | 30 R |
| Width (Overall) | 45 R |
| Ordnance Storage | 45 R |
| Machine Room | 18 R |
| Height (Overall) | 31 R 2 inches |
| Ordnance Storage | 27 ft 6 in to eave |
| Machine Room | 13 ft 6 in to eave |
| Crane | 1, 2-hook, bridge type |
| Hook Height | 18 R |
| Vertical-Lift Main Doors | 3 (on south side) |
| Opening Height | 10 R |
| Opening Width | 14 R |



AUDITORIUM AND TRAINING FACILI..

| | |
|-------------------------------------|--|
| Type | 1-story |
| Construction | Reinf concrete and masonry |
| Floor Area (Total) | 9287 sq R |
| Auditorium | 4575 sq R (including projector room and stage) |
| Capacity (Seats) | 350 |
| Conference Area | 4712 sq R (excluding offices) |
| Length (Side) | 91 ft 6 in |
| Width (Row) | 101 ft 6 in |
| Height (Above Finished Grade) | 25 R |

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SATURN I, BLOCK I

Designation..... SA-1 thru SA-4

Overall Dimensions

Diameter (S-1 Midsection)..... 21 ft 5 inches

Diameter (Thrust Structure)..... 22 ft 9 inches

Length

SA-1 thru SA-3..... 163 ft

SA-4..... 165 ft

Weight at Liftoff

SA-1 and SA-2..... 926,300 lb

SA-3..... 1,086,000 lb

SA-4..... 940,000 lb

Rated Thrust..... 1.32 million lb

Payload..... Jupiter nose cone and adapter

Stages

S-I..... Live

S-II..... Dummy

S-IV-D..... Dummy

Primary Mission..... S-I propulsion, structure,
and control flight test

Secondary Missions

SA-2 and SA-3..... Project High Water

SA-3..... Canstar dynamic pressure study

SATURN I, BLOCK II

Designation SA-5 thru SA-10

Overall Dimensions

Diameter (S-1 Midsection) 21 ft 5 inches

Diameter (Thrust Structure) 22 ft 9 inches

Diameter (With Fins) 40 ft 8 inches

Length

Without Spacecraft 126 ft 7 inches

SA-5 163 ft 7 inches

SA-6 and SA-7 190 ft 6 inches

SA-8 thru SA-10 188 ft

Weight

At Ground Ignition 1.165 million lb (two stages,
IU, payload, and LES)

Rated Thrust (S-1) 1.5 million lb

Stages

S-1 Live

S-IV Live

Primary Mission

SA-5 S-1 and S-IV propulsion, structure,
and control flight test with Jupiter
nose cone payloadSA-6 thru SA-10 S-1 and S-IV propulsion, structure,
and control flight test with boiler-
plate Apollo payload

SATURN I, BLOCK II

Secondary Missions

SA-5 thru SA-10 S-1 from S-IV separation

SA-6 thru SA-10 Guided flights

SA-6 thru SA-10 Jettison LES at S-IV ignition
+ 10 seconds

SA-8, SA-9, and SA-10 Micrometeoroid capsule

SA-10 Spacecraft separation

S-1 Stage

Prime Contractor Chrysler

Maximum Diameter

Without Fins 22 ft 9 inches (thrust structure)

With Fins 40 ft 8 inches

Length 80 ft 3 inches

Weight

Dry 103,000 lb

At Ground Ignition 1.016 million lb

Engines Rocketdyne M-1 (8)

Total Nominal Thrust 1.5 million lb (see level)

Propellant Capacity 880,000 lb (LOX/RP-1)

LOX 67,500 gal

RP-1 42,400 gal

SATURN I, BLOCK II

Mixture Ratio (W₂/W₁).....2.26:1
 Outboard Grid Pattern.....8° square
 Cant Angles
 Outboard.....6°
 Inboard.....3°
 Separation (S-I/S-IV).....4 all-gate motors - Thiokol TX-290

S-IV Stage

Prime Contractor.....Douglas
 Length.....41 ft 5 inches
 Diameter.....18 ft 4 inches
 Weight
 Dry.....13,000 lb (excludes 2100 lb
 for the S-I/S-IV interstage)
 At Ground Ignition.....114,000 lb (less interstage)
 Engines.....6 by Pratt and Whitney RL10A-3
 Total Nominal Thrust.....90,000 lb (vacuum)
 Propellant Capacity.....100,000 lb
 LOX.....8750 gal
 LH₂.....28,540 gal
 Mixture Ratio (W₂/W₁).....5:1

SATURN I, BLOCK II

Instrument Unit

Prime Contractor.....MSFC
 Length.....4 ft 11 inches
 Diameter.....12 ft 10 inches
 Weight (At Ground Ignition).....2700 lb

SATURN IB

Overall Dimensions

Diameter

| | |
|-----------------------|----------------|
| S-IB Midsection..... | 21 ft 5 inches |
| Thrust Structure..... | 22 ft 9 inches |
| With Fins..... | 40 ft 8 inches |

Length

| | |
|-------------------------|-----------------|
| Without Spacecraft..... | 141 ft 9 inches |
| With Spacecraft..... | 223 ft 5 inches |

Weight (At Ground Ignition).....1,294 million lb (two stages,
IU, payload, and LES)

Rated Thrust (S-IB).....1.5 million lb

Stages

S-IB.....Live

S-IVB.....Live

S-IB Stage

Prime Contractor.....Chrysler

Maximum Diameter

| | |
|-------------------|-----------------------------------|
| Without Fins..... | 22 ft 9 inches (thrust structure) |
| With Fins..... | 40 ft 8 inches |

Length.....80 ft 3 inches

Weight

| | |
|-------------------------|------------------|
| Dry..... | 91,000 lb |
| At Ground Ignition..... | 1,003 million lb |

Engines.....8; Rocketdyne M-1

Total Nominal Thrust.....1.5 million lb (sea level)



SATURN IB

| | |
|--------------------------|-----------------------|
| Propellant Capacity..... | 880,000 lb (LOX/RP-1) |
| LOX..... | 67,500 gal |
| RP-1..... | 42,400 gal |

Mixture Ratio (W_o/W_f).....2.26:1

S-IVB Stage

Prime Contractor.....Douglas

Length.....58 ft 5 inches

Diameter.....21 ft 8 inches

Weight

| | |
|-------------------------|---------------------------------|
| Dry..... | 20,000 lb (excludes interstage) |
| At Ground Ignition..... | 243,000 lb |

Engine.....1; Rocketdyne J-2

Total Nominal Thrust.....200,000 lb (vacuum)

Propellant Capacity.....219,000 lb (LOX/LH₂)

| | |
|-----------------------|------------|
| LOX..... | 20,650 gal |
| LH ₂ | 72,860 gal |

Mixture Ratio (W_o/W_f).....5:1

Instrument Unit

Prime Contractor.....MSFC

Length.....3 ft

Diameter.....21 ft 8 inches

Weight (At Ground Ignition).....2600 lb

SATURN V

Vehicle

| | |
|---------------------------|-------------------------------------|
| Number of Stages | 3 |
| Length | |
| Without Apollo Spacecraft | 281 ft 11 inches |
| With Apollo Spacecraft | 363 ft 8 inches |
| Maximum Diameter | |
| Without Fins | 33 ft |
| With Fins | 63 ft |
| Weight | Three stages, IU, Apollo Spacecraft |
| Dry | 500,000 lb |
| At Ground Ignition | 6,102,000 lb |
| S-IC Stage | |
| Prime Contractor | Boeing |
| Length | 138 ft |
| Diameter | |
| Without Fins | 33 ft |
| With Fins | 63 ft |
| Weight | |
| Dry | 287,000 lb |
| At Ground Ignition | 4.7 million lb |
| Engines | 5; Rocketdyne F-1 |

SATURN V

S-IC Stage

| | |
|---|----------------------------|
| Total Nominal Thrust | 7.5 million lb (sea level) |
| Propellants | LOX and RP-1 |
| Propellant Capacity | 4,400,000 lb |
| LOX | 340,900 gal |
| RP-1 | 205,900 gal |
| Mixture Ratio (W _o /W _f) | 2.25:1 |

S-II Stage

| | |
|---|--|
| Prime Contractor | North American |
| Length | 81 ft 6 inches |
| Diameter | 33 ft |
| Weight | |
| Dry | 75,000 lb (excludes 13,800 lb for S-IC/S-II interstage and ullage motors) |
| At Ground Ignition | 1 million lb (excludes 13,800 lb for S-IC/S-II interstage and ullage motors) |
| Engines | 5; Rocketdyne J-2 |
| Total Nominal Thrust | 1 million lb (vacuum) |
| Propellants | LOX and LH ₂ |
| Propellant Capacity | 930,000 lb |
| LOX | 82,700 gal |
| LH ₂ | 263,000 gal |
| Mixture Ratio (W _o /W _f) | 5:1 |

SATURN V

S-IVB Stage

| | |
|---|--|
| Prime Contractor | Douglas |
| Length | 58 ft 8 inches |
| Diameter (Forward of Interstage) ... | 21 ft 8 inches |
| Weight | |
| Dry | 21,900 lb (excludes 7400 lb for S-II/S-IVB Interstage and retrorockets) |
| At Ground Ignition | 262,000 lb (excludes 7400 lb for S-II/S-IVB Interstage and retrorockets) |
| Engine | Rocketdyne J-2 |
| Total Nominal Thrust | 200,000 lb (vacuum) |
| Propellants | LOX and LH ₂ |
| Propellant Capacity | 230,000 lb |
| LOX | 20,652 gal |
| LH ₂ | 72,860 gal |
| Mixture Ratio (W ₂ /W ₁) | 5:1 |

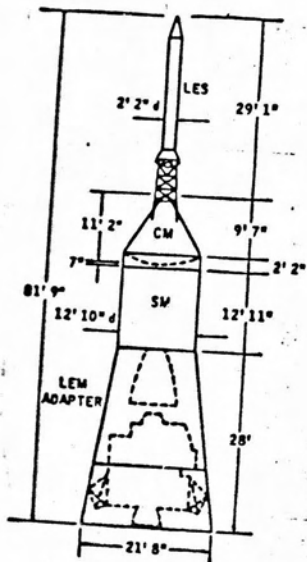
Instrument Unit

| | |
|-----------------------------------|----------------|
| Prime Contractor | MSFC |
| Length | 3 ft |
| Diameter | 21 ft 8 inches |
| Weight (At Ground Ignition) | 3500 lb |



APOLLO SPACECRAFT

| | |
|------------------------------------|--|
| Overall Length | 81 ft 9 inches (LEM adapter/TU Interface to top of LES) |
| Weight Dry | 32,000 lb |
| At Ground Ignition | 96,500 lb |
| LEM (Fully Extended) | |
| Height | 19 ft 4 inches |
| Base Dimension | 27 ft 4 inches (center of legs) |
| Weight (At Ground Ignition) | 26,500 lb |
| LEM Adapter | |
| Length | 28 ft |
| Diameter | Tapers from 21 ft 8 inches at bottom to 12 ft 10 inches at top |
| Weight (At Ground Ignition) | 3500 lb |
| SM | |
| Length (Including Fairing) | 15 ft 1 inch |
| Diameter | 12 ft 10 inches |
| Weight (At Ground Ignition) | 50,500 lb |
| CM | |
| Length | 11 ft 2 inches |
| Diameter (Fairing Interface) | 12 ft 10 inches |
| Weight (At Ground Ignition) | 9500 lb |
| LES | |
| Length | 29 ft 1 inch (above CM Up) |
| Diameter (Rocket Case) | 2 ft 2 inches |
| Weight (At Ground Ignition) | 6500 lb |



CRYOGENIC DATA
(Arranged according to Boiling Points)

| Name | Symbol | Normal Boiling Point °F | Weight Density Gas, STP g/lit | Weight Density Liquefied Gas g/lit |
|-----------------|-----------------|-------------------------|-------------------------------|------------------------------------|
| Helium | He | -453.8 | 0.010 | 9.18 (-456°F) |
| Hydrogen | H ₂ | -423.0 | 0.005 | 4.37 (-423°F) |
| Nitrogen | N ₂ | -320.4 | 0.072 | 50.4 (-321°F) |
| Air (dry) | -- | -317.6 | 0.075 | 57.4 (-233°F) |
| Carbon Monoxide | CO | -310 | 0.072 | 53.7 (-90°F) |
| Fluorine | F ₂ | -306.4 | 0.107 | 94.5 (-307°F) |
| Oxygen | O ₂ | -297.4 | 0.089 | 71.2 (-298°F) |
| Carbon Dioxide | CO ₂ | -109.3 | 0.117 | 94.4 (-110°F) |
| Ammonia | NH ₃ | -28 | 0.044 | 38.1 (+61°F) |