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# MASTER ACTIVITIES PLAN

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## SECTION 2.0

### GOE/GSE COMPLEX INSTALLATION PLANS

The installation of TMC equipment at the complex is accomplished by the implementation of Process Plans. Process Plans are prepared by the Site Manufacturing Division for TMC supplied GOE/GSE.

The Process Plans are identified by Work Directives which include the following information:

- a. Notations of sequence of installation together with their prerequisites;
- b. Requirement to perform installation to applicable drawings, specifications and standard processes;
- c. Approximate size and weight of major pieces of equipment;
- d. Complete bill of material;
- e. List of TMC supplied tools;
- f. Detailed installation procedure with explicit reference to pertinent portions of drawings;
- g. Installation validation tests;
- h. Quality Control check items with blocks for inspection stamps to provide certification that the system installation conforms to applicable drawings and specifications.

A summary of each Work Directive for Operational Bases T-1 thru T-5 is included in this section. The installation activities, as described in this section, will be performed at each site, however, the numbering system of the Work Directives may vary between squadrons. Refer to the Page & Line schedule for the appropriate squadron to resolve any differences.



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## INSTALLATION PROCESS PLAN SUMMARY

TITLE: Mechanical Installation Sub-Assemblies, Work Directive #1

RESPONSIBILITY: The Martin Company

### OBJECTIVE:

The purpose of this work directive is to provide a detailed work plan for the fabrication and assembly of all sub-assemblies required for the installation of mechanical systems.

### ITEMS TO BE INSTALLED:

Support Assemblies

Ducts

Clamp Assemblies

Hydraulic Lines Supports

Gas and Propellant Services

N<sub>2</sub> Start System Sub-Assemblies

Mechanical Installation Umbilical

Piping Installation Liquid Oxygen Fill

Flex Hoses

### SUPPORT EQUIPMENT:

All tools required for installation will be furnished by the subcontractor.

PREREQUISITES: None

### DESCRIPTION:

The individual components are assembled to form sub-assemblies of the major system. The sub-assemblies are then installed in the complex with appropriate hardware.

### REFERENCE DRAWINGS:

327P9100X02  
327P9301X20  
327P9301X30  
327P9401X40  
327P9302X20  
327P9302X30  
327P9302X40  
327P9321X00  
327P9322X10

327P9322X20  
327P9322X30  
327P9322X40  
327P9322X50  
327P9322X60  
327P9322X70  
327P9332X00  
327P9321X20  
327P9321X30

327P9321X31  
327P9321X32  
327P9321X40  
327P9321X44  
327P9321X45  
327P9321X49  
327P9321X50  
327P9321X51  
327P9401X00

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INSTALLATION PROCESS PLAN SUMMARY

TITLE: Mechanical Installation - Control Center, Work Directive #2

RESPONSIBILITY: The Martin Company

OBJECTIVE:

The purpose of this work directive is to provide a detailed plan for the mechanical installations in the control center.

ITEMS TO BE INSTALLED:

Control Monitor, CP 2040

Launch Facility Console, CP 2130

Launch Console, CP 2110

Time Display Board, CP 4905

Maintenance Status Board

SUPPORT EQUIPMENT:

Templates

1 & 2 T7-801904

T2-811077

T2-811076

T2-811079

T2-811078

T2-811080

All tools required for installation will be furnished by the subcontractor. This shall include padding and covers to protect the equipment being installed.

PREREQUISITES: None

DESCRIPTION:

The location for the Control Monitor Group CP 2040, Launch Complex Facilities Console CP 2130 and the Launch Control Console CP 2110 is laid out with templates. After necessary flooring is installed the pallet assemblies are



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positioned to match weldment assembly located under flooring. The pallet base is installed to the weldment assembly. The pallets are then attached to pallet base.

After installation of the status board support assemblies, the status board is secured to the support assembly with appropriate hardware in existing holes.

The time display board is secured to studs located in the wall approximately 6'-6" above floor.

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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Mechanical Installation - Equipment Terminal, Work Directive #3

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the mechanical installation in the equipment terminal.

**ITEMS TO BE INSTALLED:**

Hydraulic Pump Unit

Air Conditioner Unit

Control Monitor Groups

Status Board

Battery Power Supply

Power Switchboard

Motor Generator

Power Supply 28VDC

Power Supply Inverter

**SUPPORT EQUIPMENT:**

T2-811078 - Drill Templates

T2-811079 - Drill Templates

T2-801904 - Drill Templates

T2-811077 - Drill Templates

T2-811076 - Drill Templates

T2-811080 - Drill Templates

**PREREQUISITES:**

This installation to be accomplished before final capping of equipment terminal.



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## DESCRIPTION:

The hydraulic and air conditioner units vibration isolation pad retaining angles are clamped into position and welded. Isolation pads are cut to size and installed. The units are located and aligned to the layout. The units are secured with cap screws and washers.

The control monitor groups are located by the use of a drill template (T7-801904). After the holes are drilled from the template and expansion shields are installed the units are lowered into position and secured with cap screws, fillers and washers.

The status board is secured to expansion shields located on the wall with cap screws. Location is as shown on 327P9332200 Sheet 2 at D/4 and Sheet 3 at A/11.

The following units are located on the fourth floor of the equipment terminal; battery supply, power switchboard, motor generator, power supply 28VDC and the power supply inverter. The units are located with the use of drill templates and drawing 327P9332200. Holes are drilled and the expansion shields are installed. The units are then lowered into position and holes aligned in the base of the unit with expansion shields in the floor. The units are secured with cap screws and washers.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Firewall Sleeve, Raceway, and Cable Installation Utility Tunnel,  
Work Directive #4

**RESPONSIBILITY:** The Martin Company

**OBJECT:**

The purpose of this work directive is to provide a detailed plan for the installation of raceways, cables and firewall sleeves.

**ITEMS TO BE INSTALLED:**

Nipple, Chase WF 406

Electrical cables

Coupling, Conduit Rigid, WWC-581C

**SUPPORT EQUIPMENT:**

All tools required for the installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following process plans must be completed prior to this installation:

None

**DESCRIPTION:**

The nipple assemblies (52) are installed into the firewall plate and tightened. The couplings are then welded all around, cleaned, and painted.

All cables are pre-fabricated on the equipment terminal end, except those which terminate at control point 9521. None of the cables are pre-fabricated on the missile silo end. When pulling cables, cable reels shall be placed on the second level of the Equipment Terminal near the Utility Tunnel entrance.





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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Conduit and Raceway Installations Control Center, Work Directive #5

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of conduit and raceways in the control center.

**ITEMS TO BE INSTALLED:**

3KVA Transformer  
Rigid Conduit  
Flex Conduit  
Appropriate Hardware

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following process plans must be completed prior to this installation:

327P9401X00-OP5  
327P9401X00-OP30  
Motor Control Center #10 - Lower Level  
Cable Tray RA06T

**DESCRIPTION:**

After all prerequisites have been accomplished the 3KVA transformer is installed in the lower level of the Control Center. The conduit (with hardware) is installed between the Motor Control Center #10 and the 3KVA Transformer; the 3KVA Transformer and cable tray RA06T; CP 2040 Pallet and CP Time Display Board.

**REFERENCE DRAWINGS:**

327P9204X11 - Conduit and Raceway Installation - Control Center.  
327P9100X01 - Electrical Installation Specifications



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Raceway, Grounding and Cable Installation Equipment Terminal,  
Work Directive #6

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of raceways and cables in the Equipment Terminal.

**ITEMS TO BE INSTALLED:**

Supports and Brackets

Raceways (TMC)

Electrical Cables

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following installation must be accomplished prior to this installation:

Corps of Engineer Raceway Installation

Generator Sub-Station

Motor Control Center #2

Alarm Panel

Pneumatic Control Panel

AMF Termination Panel

**DESCRIPTION:**

The brackets and supports are installed in the Equipment Terminal with appropriate hardware. The TMC raceways are secured to the brackets.

The cables are routed, secured and terminated per the wiring diagram tables. A continuity and megger check is performed after completion of installation.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Raceway, Grounding and Cable Installation Propellant Terminal  
Work Directive #7

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of raceways and cables in the Propellant Terminal.

**ITEMS TO BE INSTALLED:**

Supports and Brackets

Cables

Raceways

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following installations must be accomplished prior to this installation:

Liquid Oxygen Transfer Panel

Nitrogen Transfer Panel

Helium Transfer Panel

**DESCRIPTION:**

The brackets and supports are installed in the Propellant Terminal with appropriate hardware. The raceways are then secured to the supports,

The cables are routed and secured in the raceways. Termination of wires will be accomplished under another work directive.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Air Conditioning Pipe and Ducting Installation, Work Directive #8

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed work plan for the installation of the piping and ducting between the Equipment Terminal and Missile Silo.

**ITEMS TO BE INSTALLED:**

Brackets and Supports  
Ducting and Duct Insulation  
Hot and Cold Water Piping  
Instrument Air System

**SUPPORT EQUIPMENT:**

All tools required for this installation will be furnished by the sub-contractor.

**PREREQUISITES:**

The Missile Air Conditioning unit, the facility air intake ducting and the chilled water piping must be installed.

**DESCRIPTION:**

The brackets and supports are installed in the Equipment Terminal, Utility Tunnel and Missile Silo with appropriate hardware

The air conditioning ducting is installed and secured to the brackets.

The ducting is then pressure tested and the insulation is applied.

The hot and chilled water piping is cleaned prior to installation, and cleanliness of the pipe is to be maintained during fabrication. Spool pieces and blind flanges are installed in place of relief valves, valves, and gauges. Each system is then subjected to a hydrostatic test at 100 psig. The spool pieces and blind flanges are removed and the valves,

gages and all line components are installed. Hot and cold water systems are flushed with water until visibly clean. The lines are then connected to the Martin Facility Interface.



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INSTALLATION PROCESS PLAN SUMMARY

TITLE: Hydraulic Piping and Water Service, Work Directive #9

RESPONSIBILITY: The Martin Company

OBJECTIVE:

The purpose of this work directive is to provide a detailed work plan for the hydraulic piping and water service installation.

ITEMS TO BE INSTALLED:

Support Brackets

Raceways

Piping

SUPPORT EQUIPMENT:

Hydraulic Power Unit (Sprague or equivalent)

Pressure Relief Valve

Bleed Valve

Shut-off Valve

Pressure Gauge

PREREQUISITES:

Hydraulic Pumping Unit (CP 8861) must be installed

DESCRIPTION:

The support brackets are installed in the Equipment Terminal, Utility Tunnel and Missile Silo with expansion shields and cap screws. After installation of the support brackets, the raceways are secured to the brackets.

The hydraulic piping is cut and bent as necessary to conform with routing and is secured to previously installed supports.

The return lines are isolated and subjected to a static pressure test at  $375 \pm 25$  psig. The supply lines are pressure tested at  $7000 \pm 100$  psig.

The hydraulic pressure for the above test is supplied by the hydraulic pumping unit.



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The chilled water supply and chilled water return piping will be fabricated per drawing 327P9302X20. The piping is installed using spool pieces and blind flanges in place of line components. The water piping is subjected to a hydrostatic test pressure of 100 psig. The spool pieces and blind flanges are removed and replaced by line components. System is then flushed with water until visibly clean. Connection is made to the facility lines.

Nitrogen supply tubing to the Hydraulic Pumping Unit, (from "K" bottle external to pumping unit) is formed and installed. The tubing is then subjected to a hydrostatic test of 100 psig. The tubing is cleaned, installed in position and secured. A nitrogen pressure of 20 psig is applied to the line. All joints and connections are soap tested for leaks.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Raceway, Grounding and Cable Installation Personnel Tunnel, Work Directive #10

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of raceways and cables in the personnel tunnel.

**ITEMS TO BE INSTALLED:**

Supports and Brackets

Raceways (TMC)

Electrical Cables

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following installation must be accomplished prior to this installation:

Fuel Terminal Transfer Box

**DESCRIPTION:**

The brackets and supports are installed in the personnel tunnel with appropriate hardware. The TMC raceways are secured to the brackets.

The cables are routed, secured and terminated per the wiring diagram tables. Termination and verification of cables will be accomplished with a separate work directive.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Termination and Verification of Personnel Tunnel, Propellant Terminal, and Equipment Terminal Cables. Work Directive #11.

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the termination and verification of cables in the Personnel Tunnel, Propellant Terminal and Equipment Terminal.

**ITEMS TO BE INSTALLED:**

Terminal Lugs.

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following installation process plans must be accomplished prior to this installation:

327P9204322 - Cable installation - Personnel Tunnel

327P9204232 - Cable installation - Equipment Terminal

327P9204242 - Cable installation - Propellant Terminal

**DESCRIPTION:**

Terminal lugs are installed on each wire of pre-installed cables. After completion of termination a continuity and megger checks are performed.





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INSTALLATION PROCESS PLAN SUMMARY

TITLE: Termination and Verification Propellant Terminal Cables. Work Directive #12.

RESPONSIBILITY: The Martin Company

OBJECTIVE:

The purpose of this work directive is to provide a detailed plan for the installation of Propellant Terminal cables.

ITEMS TO BE INSTALLED:

Propellant Terminal cables.

SUPPORT EQUIPMENT:

All tools required for installation will be furnished by the subcontractor.

PREREQUISITES:

The following installation process plan must be accomplished prior to this installation:

327P9202X42

DESCRIPTION:

The Terminals are secured to the individual wires in existing cables installed according to 327P9202X42 installation log. After completion of the cable installation a continuity and megger checks are performed.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Termination and Verification of Control Center and Personnel Tunnel Cables. Work Directive #13 and #20.

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the termination and verification of cables in the Control Center and Personnel Tunnel.

**ITEMS TO BE INSTALLED:** Terminal Lugs

**SUPPORT EQUIPMENT:**

All tools required for termination of cables will be furnished by the sub-contractor.

**PREREQUISITES:**

The following installations must be accomplished prior to this installation:

327P9202X12 Cable Installation Control Center

Motor Control Center #3

Ground Guidance Console

Locked Junction Box

Control Points: 2110, 2130, 2040, and 4905.

327P9204X42 Cable Installation

327P9204X22 Cable Installation

**DESCRIPTION:**

All individual wires and shields previously installed in the Control Center are terminated at the GOE. Upon completion of interconnecting wiring terminations, continuity and megger tests are performed.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Piping Installation Nitrogen Service Leak Check and Degrease,  
Work Directive #14.

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of the nitrogen service leak check and degreaser piping.

**ITEMS TO BE INSTALLED:**

Hose and Pipe Support Assembly

Hose Assembly

Valves

Pressure Gauge

Quick Disconnect

Brackets

Tubing

Channel

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:** None

**DESCRIPTION:**

The piping supports are installed in the wall channels. Brackets and fittings are attached to the channel with nuts and bolts. The tubing valves and fitting are installed to the bracket supports.

A special check is made to insure that all brackets, supports, valves and gauges are installed. The piping is then cleaned per Martin criteria and secured.



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INSTALLATION PROCESS PLAN SUMMARY

TITLE: Mechanical Installation Propellant Loading System Surface Connectors, Work Directive #15

RESPONSIBILITY: The Martin Company

OBJECTIVE:

The purpose of this work directive is to provide a detailed work plan for the mechanical installation of the Propellant Loading System surface connectors.

ITEMS TO BE INSTALLED:

Fuel Fill Connector  
Fuel Return Connector  
Quick Disconnects

SUPPORT EQUIPMENT:

All tools required for this installation will be furnished by the subcontractor.

PREREQUISITES:

The facility portion of the PLS must be installed.

DESCRIPTION:

The bushing reducers are attached to existing facility pipe couplings. The quick disconnects and pipe nipples are connected to the busing reducers. The dust plug is attached to the quick disconnect.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Missile Silo Raceway, Cable, and Grounding Installation. Work Directive #16

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for raceway installation and termination and verification of cables in the Missile Silo.

**ITEMS TO BE INSTALLED:**

Electrical Cables

Raceway and Conduit Support

**SUPPORT EQUIPMENT:**

Multimeter, Simpson - 263 or equiv.

All other tools required for installation will be furnished by the sub-contractor.

**PREREQUISITES:**

327P9202X52 - Cable Installation - Utility Tunnel

327P9202X62 - Cable Installation - Utility Tunnel

327P9202X61 - Raceway Installation - Missile Silo

**DESCRIPTION:**

The Raceways and Conduit Supports are positioned and welded to existing channels in the Missile Silo.

The Ground Binding Posts are located with respective wires to ground pads and secured in (4) places. For each cable tray a continuity check is made upon completion of ground installation.

Terminal lugs are attached to the ends of each wire and meager checks performed in accordance with specification 327P9100X08. The lugs are then secured to the proper termination and verified by a continuity check.



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INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Waveguide Installation Missile Silo, Utility Tunnel and Equipment Terminal, Work Directive #17.

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the installation of waveguides and supporting brackets.

**ITEMS TO BE INSTALLED:**

Brackets and Supports

Waveguide

**SUPPORT EQUIPMENT:**

All tools for installation will be furnished by the subcontractor.

**DESCRIPTION:**

The brackets and supports are installed in the Equipment Terminal and in the Missile Silo to the missile interface. The waveguides are secured on the brackets with appropriate hardware.

After installation, the waveguide will be pressure tested and then purged with gaseous nitrogen.



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## INSTALLATION PROCESS PLAN SUMMARY

**TITLE:** Termination and Verification of Cables in Missile Silo, Work Directive #18.

**RESPONSIBILITY:** The Martin Company

**OBJECTIVE:**

The purpose of this work directive is to provide a detailed plan for the termination and verification of electrical cables.

**ITEMS TO BE INSTALLED:**

Terminal Lugs

**SUPPORT EQUIPMENT:**

All tools required for installation will be furnished by the subcontractor.

**PREREQUISITES:**

The following installations must be accomplished prior to this installation:  
Silo Termination Box #1 and #2

Launch Umbilical Transition Box #4

Explosive Bolt Assembly AF #1 and #2

Lower Bolt Junction Box

Electrical Umbilicals, 1B1E, 1B2E, 3D1E, 3D2E

**DESCRIPTION:**

Terminal lugs are attached to the individual wires and shields previously installed between the GOE components listed in prerequisites above. The lugs are secured to the appropriate terminals of the GOE. Continuity and megger tests are performed after the terminations are completed.



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INSTALLATION PROCESS PLAN SUMMARY

TITLE: Waveguide Transmission System Verification Test, Work Directive #19.

RESPONSIBILITY: The Martin Company

OBJECTIVE:

The purpose of this work directive is to provide a detailed plan for testing the waveguide system.

ITEMS TO BE INSTALLED: None

SUPPORT EQUIPMENT:

2-N<sub>2</sub> "K" Bottles 2250PSIG

Andrew Corp. Type 858 or Equivalent Pressure Kit

Regulator, Gauge, Hose and Fittings

PREREQUISITES:

The following installation must be accomplished prior to this installation: Waveguide installation in the Equipment Terminal, Utility Tunnel and Missile Silo.

DESCRIPTION:

The waveguide system is tested for V.S.W.R., R.F. Attenuation and electrical isolation. The system is then pressure tested and purged with gaseous nitrogen.