Cray Y-MP8 E and Cray Y-MP8I Computer Systems

Site Planning Reference Manual;

HR-04022

1 SITE PLANNING AND PREPARATION

Proper site planning and preparation is important for the successful installation of your CRAY Y-MP8E or CRAY Y-MP8I computer system. This section describes the various considerations and requirements involved in the site planning and preparation process which should be completed prior to system installation.

Cray Research site planning personnel will assist you with the site planning process. Each site has different site planning characteristics that need to be considered. Also, you can ensure effective site planning by identifying your initial system configuration and any upgrade plans.

Allow at least 6 months to plan and prepare your facility for the installation of a CRAY Y-MP8E or CRAY Y-MP8I computer system. Qualified electrical and mechanical facility engineers should be involved early in the site planning process.

Prior to any site preparation activities, Cray Research site planning personnel must review and approve customer-prepared electrical and mechanical design drawings.

Site Planning Meetings

Site planning meetings establish a communications link between you and Cray Research. Cray Research site planning personnel will schedule a minimum of three site planning meetings with you at your facility. The site planning and preparation process and any questions or concerns are discussed in these meetings.

Site Evaluation

Site evaluation is an important consideration in the site planning and preparation process. Some considerations that may help you in your site selection may include the following:

- Electrical power quality. Electrical requirements are discussed in Section 2 of this manual, "Operational Requirements."
- Air quality. Refer to *Federal Standards Clean Room and Work Station Requirements, Controlled Environment*, federal standard number 209, for information on computer room air-quality requirements.
- Cooling water quality. Refer to *Water Quality Requirements*, Site Engineering document number 10658280 for information on water quality requirements.
- Vibration sources (such as heavy industrial traffic). Refer to *Vibration and Shock Limits for Installed Computer Systems*, Site Engineering document number 10658300, for information on vibration limits for computer equipment.
- Electromagnetic interference (EMI) sources. EMI sources include radar, broadcast towers, and radio communication antennas. If EMI sources exist on or near the proposed site, the intensity of the EMI must be measured to determine whether it may affect your computer system.
- Structural strength. The floor loading requirements of the equipment to be installed must be examined to ensure that the building structure will support the computer equipment.

Refer to the *Principles of Computer Room Design*, Cray Research publication number HR-04013, for a complete list and explanation of possible site selection concerns.

Site Access Requirements

Prior to system installation, your site must meet certain site access requirements. This subsection explains these requirements and provides specifications for each.

Your building should have a loading dock approximately 46 in. to 50 in. (117 cm to 127 cm) high for computer system delivery. The loading dock should not open directly into the computer room because the computer room environment must be carefully controlled. You should take special precautions when moving equipment if the loading dock or access route has an engraved floor pattern; an engraved pattern could cause vibration damage to computer equipment on casters.

If no loading dock exists, or if your loading dock does not meet site engineering specifications, you will have to provide a forklift to unload computer equipment. Refer to *Forklift Size Requirements for the Handling of Cray Research Equipment*, Site Engineering document number 10658374, for information on forklift requirements.

The entire access route to your computer room should meet the following specific requirements.

- Minimum ceiling and door height - 80 in. (203 cm)
- Minimum hallway and door width - 60 in. (152 cm)
- Maximum delivery route slope - One unit in height for every six units in length

If your computer room is on a different level than your loading dock, an elevator will be needed to move the computer system to the proper floor level. If your building doesn't have an elevator, you may have to arrange for a crane or other special handling equipment to lift the computer equipment to the same level as your computer room. Refer to the appropriate computer system section for specific shipping weights and sizes.

Computer Room Design

Computer room design is an important consideration in the site planning and preparation process. Proper computer room design can minimize problems with static electricity, security, personnel safety, and air contamination. The following list contains important considerations for designing your computer room.

- Personnel safety
- Security
- Air quality

- Positive air pressure
- Future computer equipment
- Seismic vibration
- Raised flooring
- Sound reduction
- Lighting
- Handicapped personnel access
- Layout

Refer to the *Principles of Computer Room Design*, Cray Research publication number HR-04013, for a complete explanation of these suggestions and proper construction procedures.

Service Personnel Office Requirements

Cray Research provides trained hardware and software service personnel on a contractual basis to support the computer system. The following subsections provide information about the facility requirements if you choose to have on-site service.

Hardware Service Personnel Office

You must provide the hardware service personnel with a locking office, approximately 150 ft^2 (14 m^2), or two offices approximately 75 ft^2 to 100 ft^2 (7 m^2 to 9 m^2) each. The office should be in a quiet environment and contain the following items:

- Two desks with locks
- One locking 4-drawer file cabinet
- One computer terminal table
- Three chairs
- One telephone

Additional items may be required due to the system configuration. Check with your site planning representative for any additional items necessary for the hardware service personnel office.

Hardware Service Personnel Repair Shop

You must provide the hardware service personnel with a locking maintenance repair shop, approximately 150 ft^2 (14 m^2). It must be equipped with adequate lighting and power outlets for tools and test equipment. The repair shop should be adjacent to the hardware service personnel office and close to the computer room. The repair shop must include the following items:

- One workbench with power outlets and a static-dissipative work surface
- One workbench chair with static-dissipative casters
- Three locking parts cabinets, approximately 36 in. x 72 in. (91 cm x 183 cm)
- Two 3-shelf bookcases
- One locking 4-drawer file cabinet
- One worktable, 30 in. x 60 in. (76 cm x 152 cm), with a static-dissipative work surface
- One chair with static-dissipative casters
- One telephone with data-quality telephone line

Additional items may be required due to your system configuration. Check with your site planning representative for any additional items necessary for your computer system.

Software Service Personnel Office

You must provide the software service personnel with a locking office, approximately 150 ft^2 (14 m^2), or two offices approximately 75 ft^2 to 100 ft^2 (7 m^2 to 9 m^2) each. The office should be in a quiet environment and contain the following items:

- Two locking desks
- Two 3-shelf bookcases
- One locking 4-drawer file cabinet

- One worktable, 30 in. x 60 in. (76 cm x 152 cm)
- Four chairs
- Two telephones
- One terminal connected to the Cray Research system
- One terminal connected to the front-end systems

Modem Requirements

Cray Research support personnel use a modem data communications link as a diagnostic aid in administrating, troubleshooting, and maintaining Cray Research computer systems.

Some customer sites do not allow modems to be used as a diagnostic aid because of security reasons. If a modem is allowed, contact the local telephone company well in advance of the system delivery to arrange for the installation of the telephone line used with the modem. A private outside line is recommended to avoid interruptions caused by customer and local operators. Make arrangements with Cray Research for payment of monthly service charges.

Cray Research supplies the customer with a Telebit Trailblazer Plus modem, Model #T2SAA, for systems located in the United States and Canada. Customers outside of the United States and Canada should contact their local Cray Research hardware service office for modem telephone line requirements. Install the modem equipment prior to the installation of the computer system. Locate the telephone and modem on the maintenance workstation table.

Telephone company representatives may request information from you about modem requirements. Table 1-1 provides the specifications necessary for modem operation.

Table 1-1. Modem Requirements

Option	Specification
FCC registration number	ER95W5-16287-MD-E
Transmission rate	19.2 kBD
The modem uses a standard telephone with a voice grade line; jack type	RJ11C
Touch tone/rotary dial	touch tone preferred
Ringer equivalence	0.4 db
External/internal clock	internal
Grounding	chassis ground to signal ground
Transmit level	-7 dBm
Force answer/originate	originate
Private/dial-up line	dial-up line
Receive long space disconnect	disabled
Transmit long space disconnect	disabled
Data terminal ready disconnect	enabled
Carrier fail disconnect	enabled
Auto-answer/manual-answer	auto-answer
Make busy in analog loopback	disabled
Permanent/DTR controlled auto-answer	permanent
Synchronous/asynchronous	asynchronous
9-bit/10-bit/11-bit character	10-bit character

System Installation Overview

The installation of a CRAY Y-MP8E or CRAY Y-MP8I computer system consists of the following stages:

- Shipment and installation of support equipment
- System shipping preparation
- System transportation
- System installation

- System startup and stabilization
- System on-site quality assurance
- System operations preparation

Approximately 8 weeks prior to system delivery, Cray Research delivers all necessary support equipment (motor generator sets, refrigeration condensing units, and refrigeration piping kits) through a commercial transportation company. You are responsible for receiving, unloading, and installing the support equipment without Cray Research attendance or supervision. Refer to the *Cray Research Support Equipment Site Planning Reference Manual*, Cray Research publication number HR-00082, for more information on installing support equipment.

Approximately 1 week before delivery, the computer system is prepared for shipment. Major components are protectively packaged into their shipping configuration. Cabling and miscellaneous materials are packaged and labeled for shipment.

The system equipment is transported to your facility by a commercially available, dedicated tractor-trailer semi with air-suspension ride and climate control. For intercontinental shipments, the equipment is prepared for shipment and transported by commercial cargo-carrying aircraft, then transported to your facility by a tractor-trailer semi.

Under Cray Research supervision, you will unload and move the system equipment into your computer room. If needed, you must make arrangements for any special equipment (such as forklifts, cranes, platforms, and so on) required to unload the computer system.

Cray Research installation personnel perform the following tasks:

- Position all equipment in its designated location
- Reassemble the computer system
- Connect all logic cables
- Attach refrigeration hoses and dielectric-coolant hoses

Upon completion of these tasks, Cray Research personnel perform system startup and power and cooling stabilization tests. You must provide personnel to correct any problems involving contractor-installed electrical, refrigeration, or cooling water circuitry that may occur during these tests.

Cray Research declares the system ready for use upon satisfactory completion of all quality assurance functions. At this point, Cray Research personnel install the operating system software to prepare the system for customer acceptance.

SECTION 2
OPERATIONAL REQUIREMENTS

2 OPERATIONAL REQUIREMENTS

Cray Research computer equipment is designed to operate within specific ranges of air quality, temperature, and relative humidity levels. Significant variations in a computer room environment may cause disruptions in equipment operation and decrease the life of the equipment. To ensure proper operation of the CRAY Y-MP8E and CRAY Y-MP8I computer systems, your facility must meet the operational requirements outlined in the following subsections.

Computer Room Environment

Cray Research designs resilience into system hardware. However, your facility's environment must be properly maintained to ensure that hardware reliability is not adversely affected.

The CRAY Y-MP8E and CRAY Y-MP8I computer systems must operate in a controlled computer room environment. Although the requirements outlined in this section encompass the overall computer room, they particularly affect air-cooled devices such as disk drives, printers, and graphic display terminals. Therefore, the design and component placement of your environmental control system (such as computer room air-conditioning units) must ensure that inlet air to the air-cooled device meets the specified environmental requirements.

The CRAY Y-MP8E and CRAY Y-MP8I computer systems require a computer room environment controlled within the following ranges:

- Temperature: 60 °F to 80 °F (16 °C to 27 °C)
  The maximum temperature change in a one-hour period is 3 °F (2 °C). The rate of change cannot exceed 10 °F (6 °C) per hour.
- Humidity: 35% to 65% relative humidity (noncondensing)
  The maximum rate of change of relative humidity is 5% per hour.

- Dew point: 55 °F (13 °C) maximum
- Air quality: For particles greater than 0.5 micron in size, the concentration must not exceed 1.0×10^5 particles/ft^3 (3.5×10^6 particles/m^3).

  For particles greater than 1.0 micron in size, the concentration must not exceed 2.0×10^4 particles/ft^3 (7.1×10^5 particles/m^3).

  For particles greater than 5.0 microns in size, the concentration must not exceed 6.5×10^2 particles/ft^3 (2.3×10^4 particles/m^3).

The computer room environment must be strictly monitored and controlled. One fresh air change per hour is required in the computer room. No smoking is allowed. Also, no food or beverages are allowed in the vicinity of the Cray Research computer room equipment.

Computer Room Floor

You must prepare the computer room with a static-dissipative raised-floor system that allows a minimum of 12-in. (30-cm) free clearance between the subfloor and the underside of the raised-floor panels. This free clearance zone accommodates routing of the various power circuits, signal cables, and cooling components. All Cray Research equipment requires floor cutouts for power wiring, signal-cable entrances, and in some cases, dielectric-hose or refrigerant-line entrances. In addition, some equipment requires reinforcement of the raised floor due to concentrated floor loading conditions. Refer to the appropriate computer system section in this manual for specific equipment requirements.

The raised-floor panels described in this manual are 24 inches square. Raised-floor panels other than 24 in. x 24 in. must be reviewed by Cray Research site engineering personnel for placement of equipment, floor cutouts, and refrigeration piping.

Power Plant Room Environment

Some customers choose to locate their support equipment (motor generator sets and refrigeration condensing units) in the computer room. However, facility constraints sometimes make it necessary to locate the support equipment in a plant equipment room. The plant equipment room must meet the following environmental specifications.

- Temperature: 65 °F to 95 °F (18 °C to 35 °C) with the maximum rate of change not to exceed 20 °F (11 °C) per hour
- Humidity: 30% to 80% relative humidity (noncondensing)
- Air quality: Maintain a clean, dirt- and dust-free environment

The plant equipment room should be located as close as possible to the computer room. Refer to the appropriate computer system section in this manual for specific equipment separation limits.

Electrical Requirements

Cray Research makes every effort to minimize the effects of power failures and interruptions to the hardware. However, if the computer equipment is subjected to repeated power interruptions and fluctuations, it will be subject to a higher component failure rate than it would with a stable power source. Cray Research encourages you to provide a stable power source, such as an uninterruptable power system, to reduce the possibility of component failures.

Cray Research computer equipment has certain voltage, frequency, and grounding requirements. These requirements are provided in the following subsections.

Voltage and Frequency Requirements

The motor generator sets (MGSs), refrigeration condensing units (RCUs), and heat exchanger units (HEUs) used with the CRAY Y-MP8E and CRAY Y-MP8I computer systems require one of the following voltages.

- 460±10% Vac, 3 phase, 60±3 Hz
- 398±5% Vac, 3 phase, 50±3 Hz

The operator workstation (OWS) and the maintenance workstation (MWS) require 120- or 220-Vac, 50- or 60-Hz single-phase power.

Disk drive units require 208-Vac, 50- or 60-Hz, 3-phase power. Disk control cabinets (DCCs) require 208-Vac, 50- or 60-Hz, 3-phase power. Refer to the *Cray Research Peripheral Equipment Site Planning Reference Manual*, Cray Research publication number HR-00080, for related disk drive site planning information.

Table 2-1 provides the specifications for all electrical services.

Table 2-1. Electrical Service Requirements

Electrical Service	Requirement
Voltage tolerance	±10%
Phase imbalance	5% maximum (line-to-line, line-to-line neutral)
Voltage harmonics	5% maximum total, 3% largest
Voltage deviation from sine wave	5% to 10%
Voltage modulation	3% maximum
Transient voltage surges	+5%
Transient voltage sags	-5%
Frequency tolerance	±5%
Frequency rate of change	Less than 1.0 Hz during any 10-cycle period

Total kilowatt power requirements depend on system configuration and equipment upgrades. Cray Research will provide documentation during the initial site planning meeting to estimate the power requirements for your specific system configuration.

Equipment Grounding

Cray Research provides the document *Equipment Grounding for Cray Computer Systems*, Site Engineering document number 10658002, during the initial site planning meeting. This document describes the grounding system requirements and identifies alternative methods for providing the signal-ground reference system. In addition, the document describes electrostatic discharge (ESD) precautions and maintenance of the facility's grounding systems. You must provide, install, and maintain the approved grounding systems as described in the equipment grounding document and this subsection.

All Cray Research computer equipment requires a protective power safety-ground system. The power safety-ground system protects personnel from shock hazards while protecting the computer equipment from damage due to electrical malfunctions. The power safety-ground system is regulated by your local and national electrical codes.

All Cray Research computer equipment also requires a signal-ground reference system. The signal-ground reference system establishes an equipotential reference plane for high-frequency digital signals between

interconnected computer equipment. All Cray Research equipment is supplied with braided ground straps. You are responsible for connecting the ground straps to the signal-ground reference system.

Dielectric Coolant

The CRAY Y-MP8E and CRAY Y-MP8I computer systems use a dielectric coolant (Fluorinert Liquid) to cool the mainframe and input/output subsystem (IOS) and SSD solid-state storage device (SSD). Heat dissipated from the integrated circuit modules and power supplies within the mainframe and IOS/SSD cabinet is absorbed by the dielectric coolant. The dielectric coolant is circulated through the mainframe by a pump located within the heat exchanger unit (HEU). (Refer to the appropriate computer system section in this manual for the HEU model for your computer system.) The HEU also contains a heat exchanger that transfers the heat from the dielectric coolant to the refrigeration circuit of the RCU.

You must ensure that there is one fresh air change per hour in the computer room and that there are no excessive heat sources that may cause Fluorinert Liquid to decompose. Smoking must not be allowed in the computer room or any other areas where Fluorinert Liquid may be used or stored. Refer to the "Computer Room Environment" subsection in this section for more information.

NOTE: Fluorinert Liquid is a safe product when used properly. When exposed to an excessive heat source, Fluorinert Liquid can decompose and produce hazardous by-products. Refer to *Safe Use and Handling of Fluorinert Liquids*, Cray Research publication number HR-00306, for information on Fluorinert Liquid properties and precautionary requirements. All personnel must read this publication before working in the CRAY Y-MP8E or CRAY Y-MP8I computer room.

Cooling Water Supply Requirements

The CRAY Y-MP8E and CRAY Y-MP8I computer systems require that an adequate source of clean cooling water be supplied to the refrigeration condensing units (RCUs). Cray Research provides the document *Water Quality Requirements*, Site Engineering document number 10658280, during the initial site planning meeting. This document identifies the water quality requirements necessary to operate the CRAY Y-MP8E and CRAY Y-MP8I computer systems.

You must meet Cray Research water quality requirements described in both the Site Engineering document and this subsection. A closed-loop cooling water system may be necessary to meet these requirements. An open system (such as a cooling tower) does not guarantee satisfaction of the water quality requirements.

Cooling water temperature, measured at the inlet of the RCU, must not vary more than ±10 °F (6 °C) from the original design and start-up temperature. The rate of change must not exceed 5 °F (3 °C) per 15-minute cycle. Although the RCUs are designed to accommodate water supply temperatures from 40 °F to 70 °F (4 °C to 21 °C), Cray Research recommends a water supply temperature of 50 °F (10 °C).

The cooling water flow-rate requirements and pressure-drop values of the RCUs vary depending on the cooling water supply temperature and the percentage of treatment (antifreeze, corrosion inhibitors, etc.) in the water. During the initial site planning meeting, Cray Research provides flow-rate and pressure-drop values, based on your system configuration and recommended water supply temperature. For more information regarding the RCUs, refer to the *Cray Research Support Equipment Site Planning Reference Manual*, publication number HR-00082.

SECTION 3
CRAY Y-MP8E COMPUTER SYSTEM

3 CRAY Y-MP8E COMPUTER SYSTEM

The site planning requirements for the CRAY Y-MP8E computer system are different than those of the CRAY Y-MP8I computer system. This section provides detailed site planning information for the CRAY Y-MP8E computer system including system configurations, equipment separation limits, specifications, floor preparation, power wiring, and cooling requirements.

System Configurations

The CRAY Y-MP8E computer system has a number of different configurations. A standard CRAY Y-MP8E computer system consists of the following components:

- Mainframe chassis (MFC)
- Combined input/output subsystem (IOS) and solid-state storage device (SSD) cabinet
- Heat exchanger unit (HEU-E/D)
- Maintenance workstation (MWS)
- Operator workstation (OWS)
- Disk drives and other peripheral equipment
- Motor generator sets (MGSs)
- Refrigeration condensing unit (RCU)

The mainframe chassis (MFC) and IOS/SSD chassis house various configurations of logic modules. For example, the SSD is optional. If your computer system is not configured with an SSD, the IOS/SSD chassis will contain only the IOS. This cabinet may be upgraded with an SSD.

The heat exchanger unit (model E type) for the CRAY Y-MP8E computer system contains a dual pump and a dual heat exchanger system (HEU-E/D). The HEU-E/D removes heat generated by the components in the MFC and IOS/SSD cabinets.

The OWS is designated for your computer operator use. Cray Research hardware and software support personnel use the MWS for maintenance and troubleshooting. Both the OWS and MWS consist of a graphics display terminal (GDT-200) and a VME-based microcomputer (VBM-2). The OWS and MWS also share a single laser printer (LP-5). Refer to *Cray Research Peripheral Equipment Site Planning Reference Manual*, Cray Research publication number HR-00080, for more information.

Disk drives and other peripheral equipment are also used with the CRAY Y-MP8E computer system. The number of disk drives and other peripheral equipment depends on individual customer needs. However, a typical CRAY Y-MP8E computer system disk drive configuration consists of disk enclosures (DE-60s and DE-41s), and disk control cabinets (DCC-2As). Refer to *Cray Research Peripheral Equipment Site Planning Reference Manual*, Cray Research publication number HR-00080, for more information about peripheral equipment.

The standard CRAY Y-MP8E computer system also includes one or two motor generator sets (MGSs) and one refrigeration condensing unit (RCU). An optional standby MGS can also be configured in the system. Refer to the *Cray Research Support Equipment Site Planning Reference Manual*, Cray Research publication number HR-00082, for more information.

Figure 3-1 illustrates a typical computer room floor plan for a CRAY Y-MP8E computer system. The computer system is configured on a 24 ft x 26 ft (7.3 m x 7.9 m) floor with 24 in. x 24 in. floor panels.

The lengths of the signal cables and cooling system hoses limit the arrangement of the computer equipment. Refer to the "Equipment Separation Limits" subsection in this section for more information.

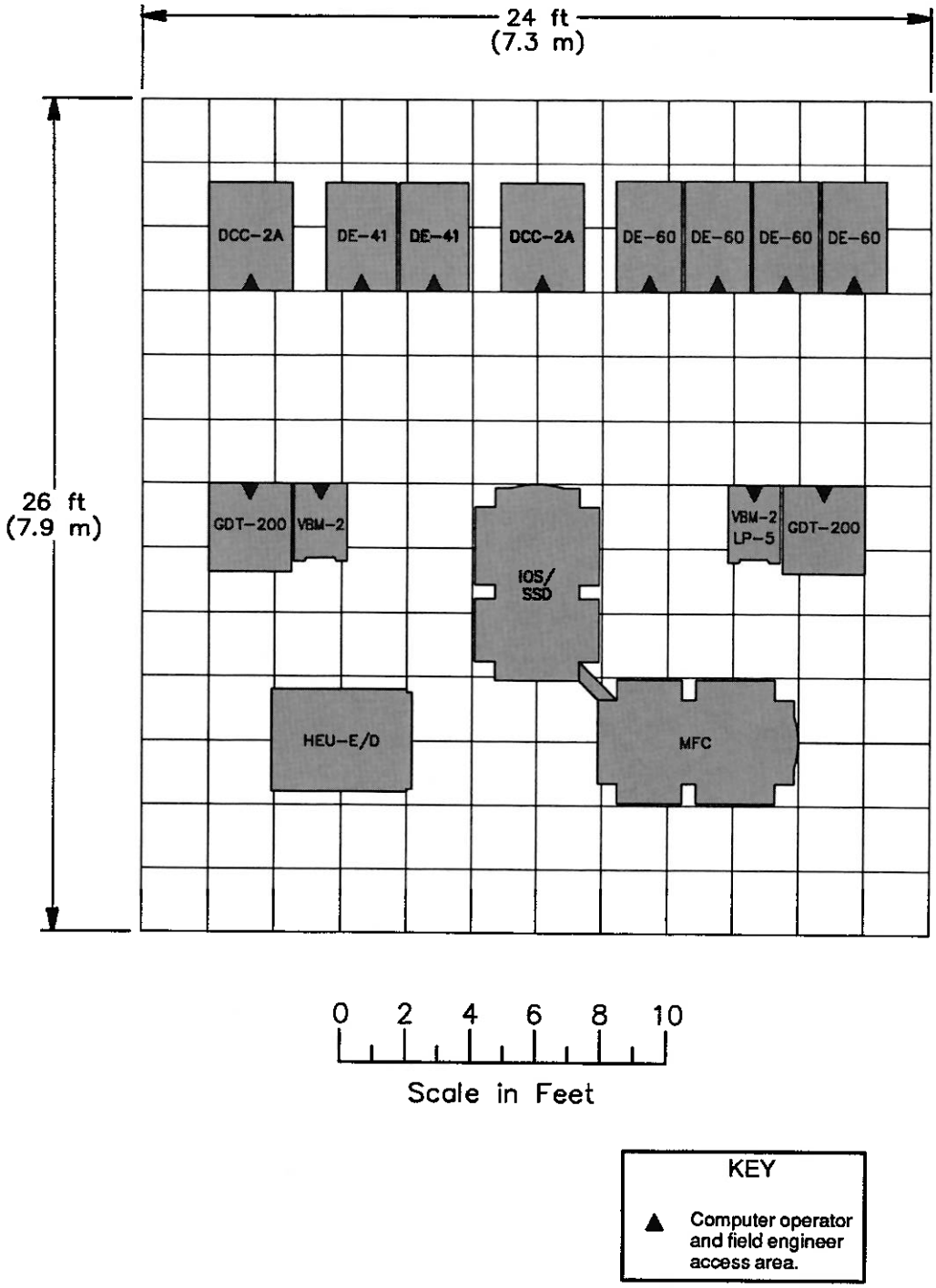


Figure 3-1. CRAY Y-MP8E Typical Floor Plan

Specifications

This subsection describes the specifications for the mainframe chassis (MFC), IOS/SSD chassis, and the heat exchanger unit (HEU-E/D). The information described in this section is useful when designing the computer room, planning the floor layout, and installing the equipment.

Mainframe Chassis

The CRAY Y-MP8E mainframe chassis (refer to Figure 3-2) is a dielectric-cooled unit which contains logic modules and power supplies. Table 3-1 provides additional mainframe chassis specifications. Refer to Figure 3-3 for the mainframe shipping configuration.

Table 3-1. CRAY Y-MP8E Mainframe Chassis Specifications

Characteristics	Specifications
Height	76.25 in. (194 cm)
Width	46 in. (117 cm)
Depth	73.5 in. (187 cm)
Weight	7,495 lbs (3,399 kg)
Floor loading	507 lbs/ft^2 (2,474 kg/m^2)
Access requirements	3 ft (0.9 m) on all sides
Heat dissipation to air	3.15 kW (maximum)
Shipping size: Height Width Depth	77.5 in. (197 cm) 40.5 in. (103 cm) 111 in. (282 cm)
Shipping weight	8,028 lbs (3,641 kg)

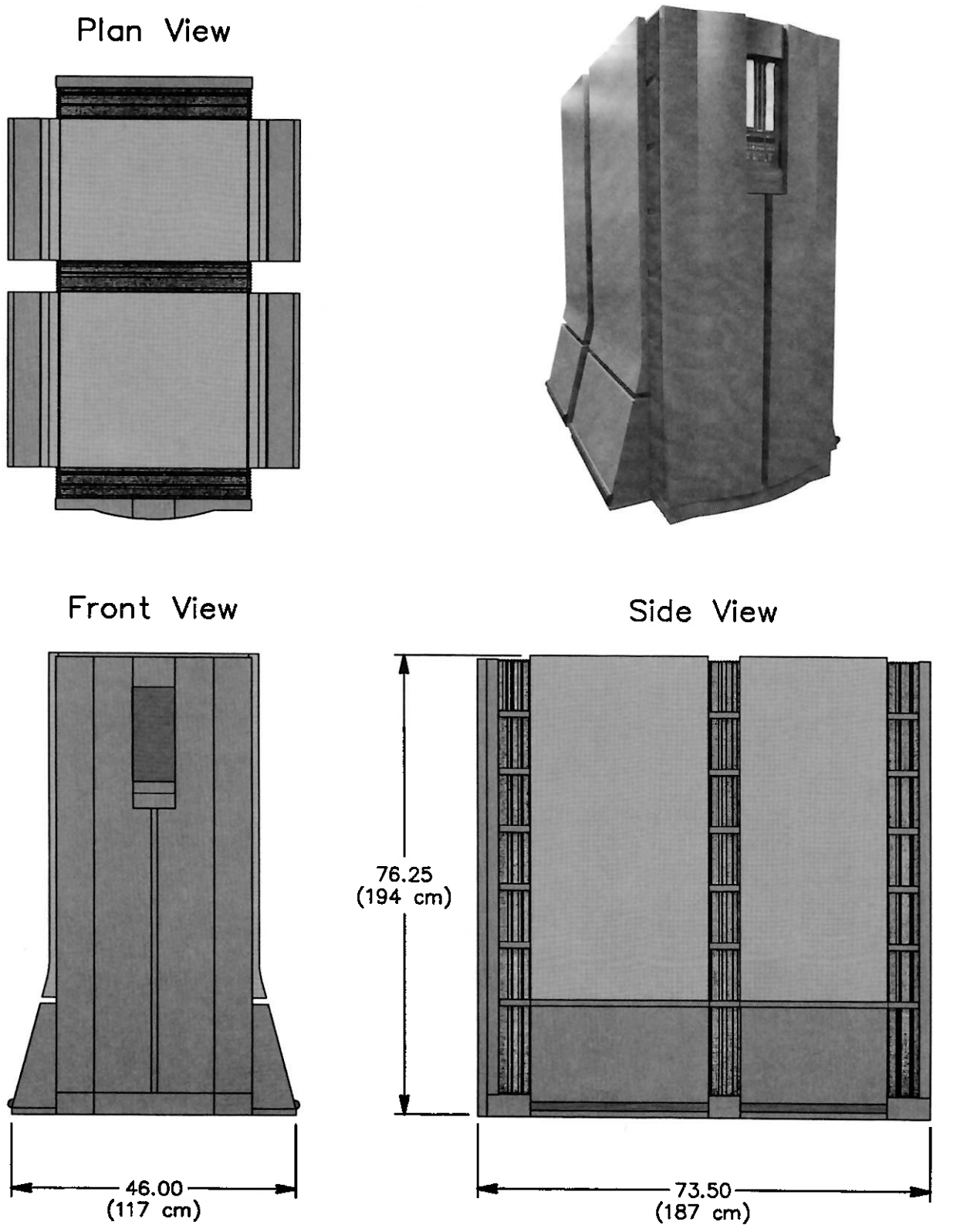


Figure 3-2. CRAY Y-MP8E Mainframe Chassis

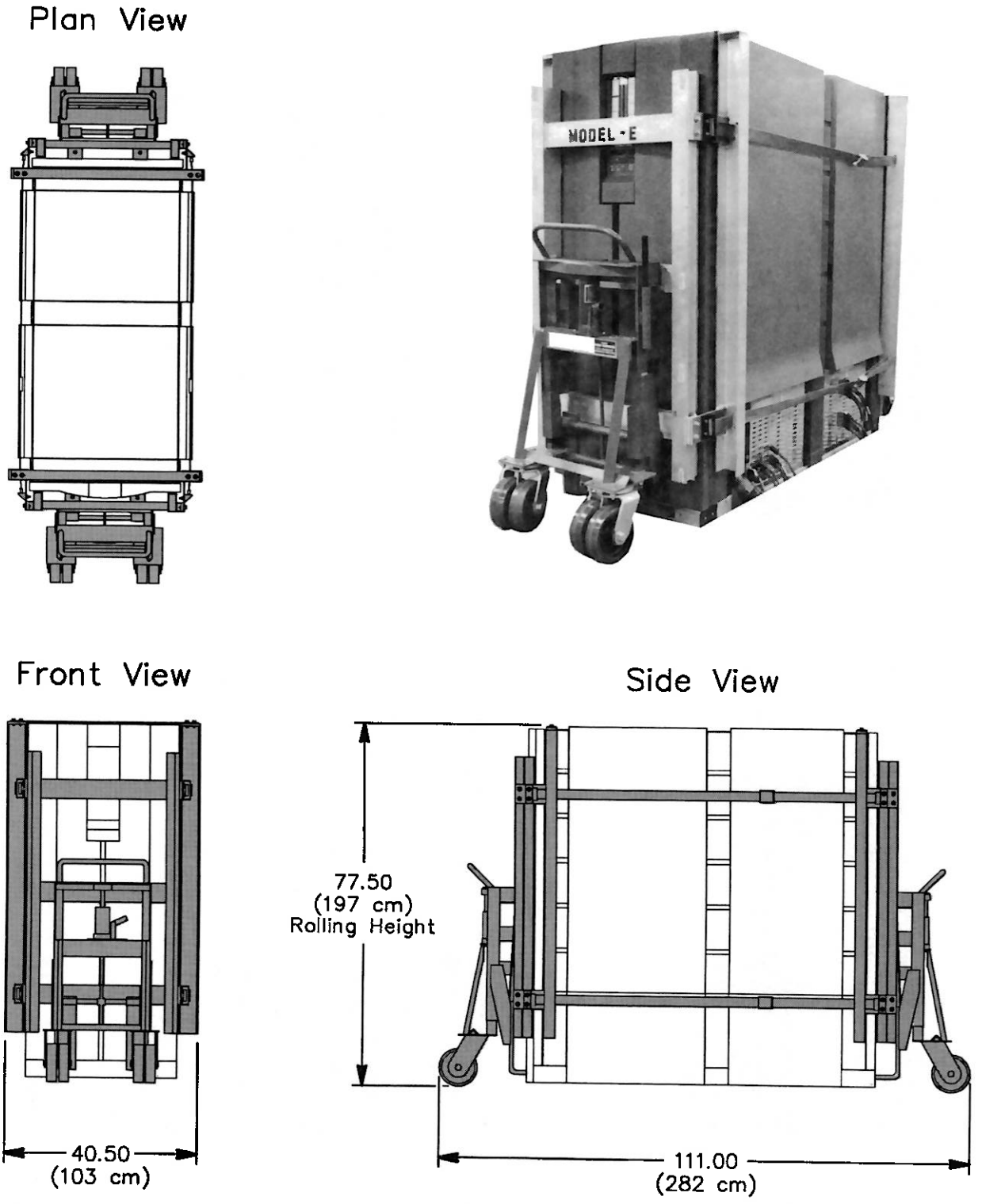


Figure 3-3. CRAY Y-MP8E Mainframe Shipping Configuration

IOS/SSD Chassis

The input/output subsystem (IOS) and SSD solid-state storage device (SSD) chassis (refer to Figure 3-4) is a dielectric-cooled unit. It contains the logic modules and power supplies associated with the IOS and SSD. The SSD portion of this cabinet is optional. All specifications given in this section include the SSD option.

Table 3-2 provides the IOS/SSD chassis specifications. Refer to Figure 3-5 for the shipping configuration of the IOS/SSD chassis.

Table 3-2. IOS/SSD Chassis Specifications

Characteristics	Specifications
Height	76.25 in. (194 cm)
Width	46 in. (117 cm)
Depth	73.5 in. (187 cm)
Weight	7,695 lbs (3,490 kg)
Floor loading	520 lbs/ft^2 (2,538 kg/m^2)
Access requirements	3 ft (0.9 m) on all sides
Heat dissipation to air	3.15 kW (maximum)
Shipping size: Height Width Depth	77.5 in. (197 cm) 40.5 in. (103 cm) 111 in. (282 cm)
Shipping weight	8,228 lbs (3732 kg)

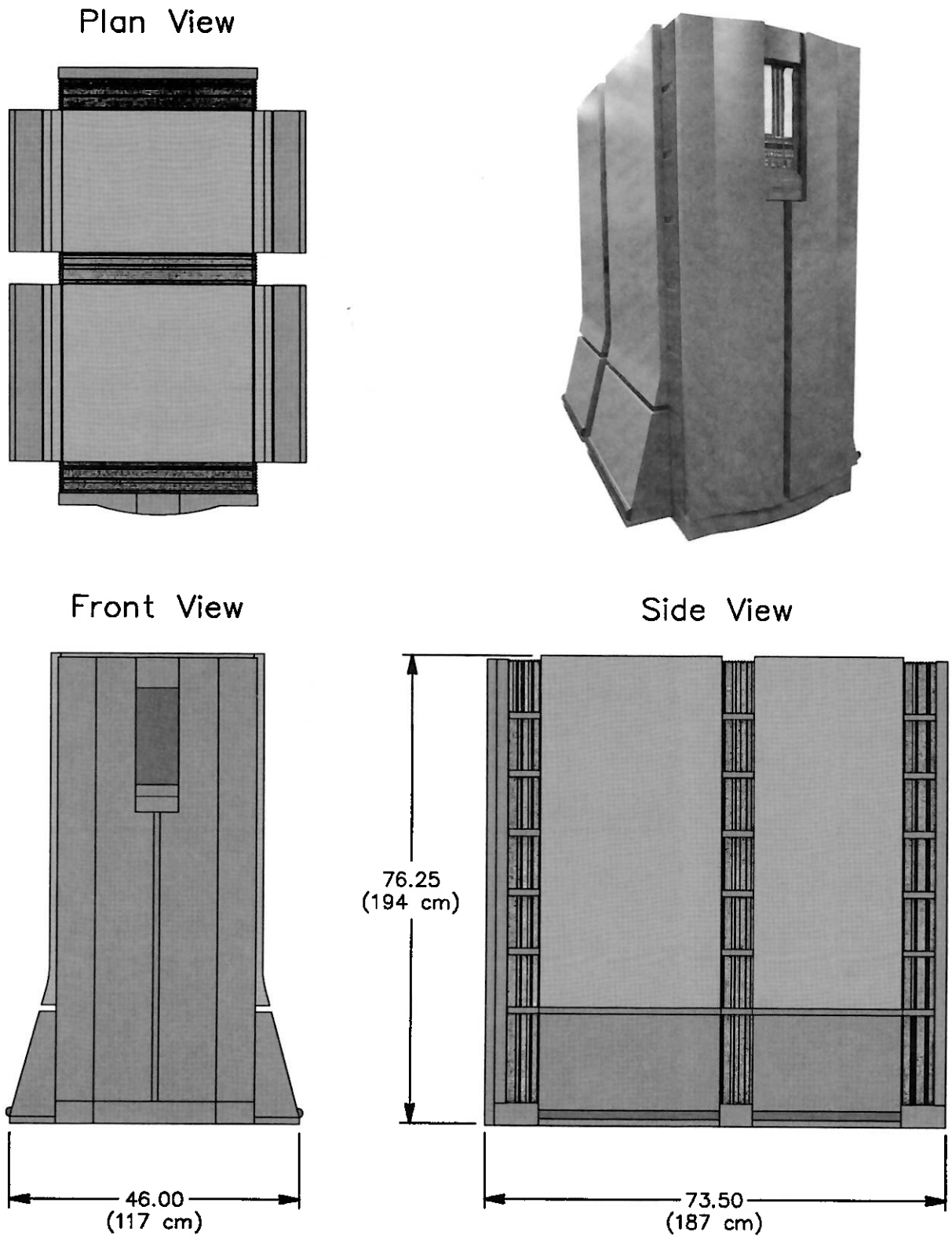


Figure 3-4. IOS/SSD Chassis

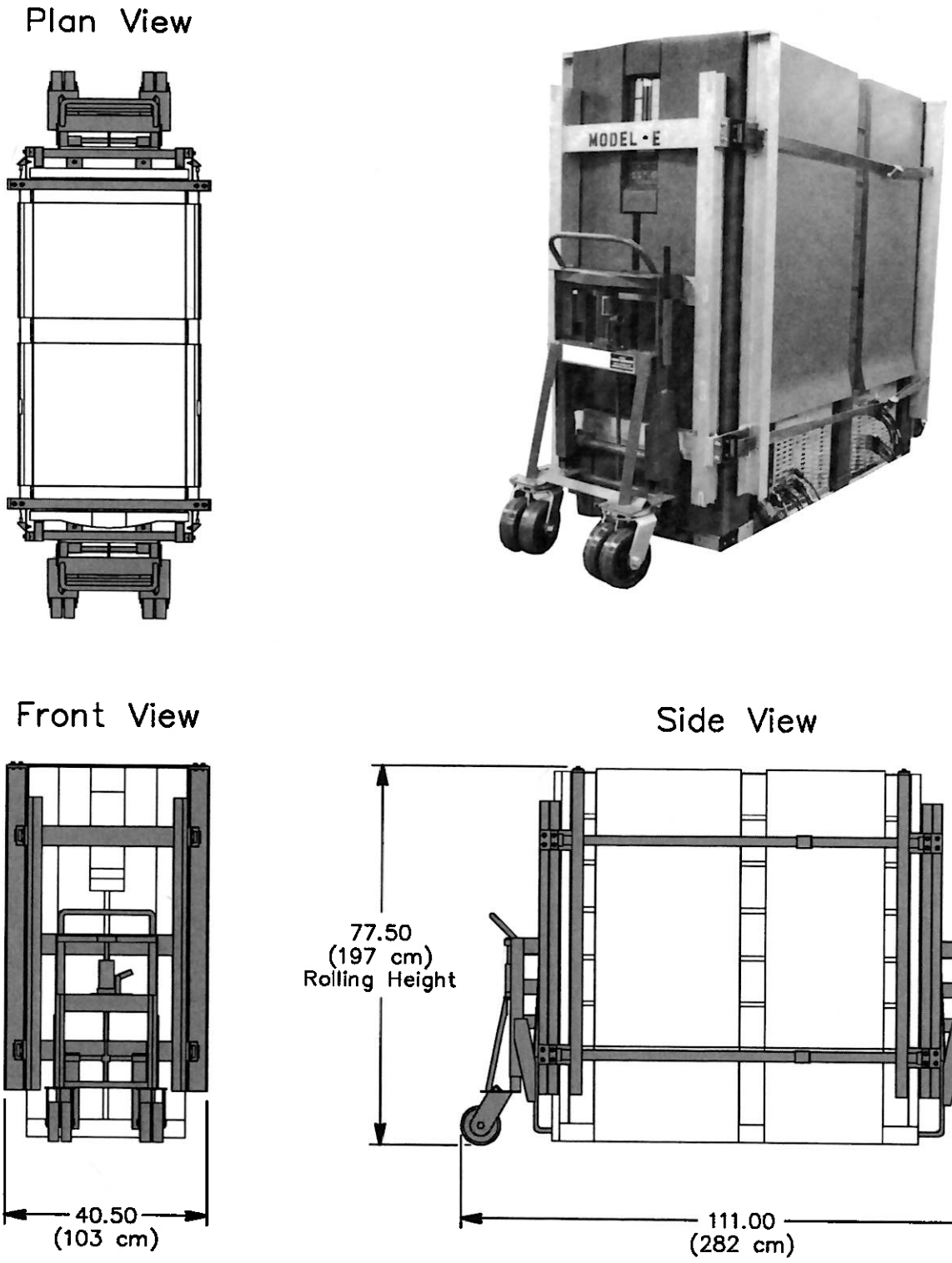


Figure 3-5. IOS/SSD Shipping Configuration

Heat Exchanger Unit (HEU-E/D)

The heat exchanger unit (HEU-E/D) is an integral element of the CRAY Y-MP8E computer system. The HEU-E/D (refer to Figure 3-6) contains two pumps and the controls required to circulate dielectric coolant through the mainframe chassis (MFC) and the IOS/SSD chassis.

The HEU-E/D also contains two dielectric coolant-to-refrigerant heat exchangers. The dielectric coolant transfers the heat generated within the mainframe chassis and IOS/SSD chassis to the heat exchangers contained in the HEU-E/D. The heat is then transferred to the refrigeration circuitry of the refrigeration condensing unit (RCU).

Refer to Table 3-3 for the HEU-E/D chassis specifications.

Table 3-3. HEU-E/D Chassis Specifications

Characteristics	Specifications
Height	62 in. (157 cm)
Width	38 in. (97 cm)
Depth	51 in. (130 cm)
Weight	1,700 lbs (771 kg)
Floor loading	142 lbs/ft^2 (693 kg/m^2)
Access requirements	3 ft (0.9 m) on all sides
Heat dissipation to air	2.3 kW
Shipping size: Height Width Depth	61 in. (155 cm) 36 in. (91 cm) 82 in. (208 cm)
Shipping weight	1,817 lbs (824 kg)

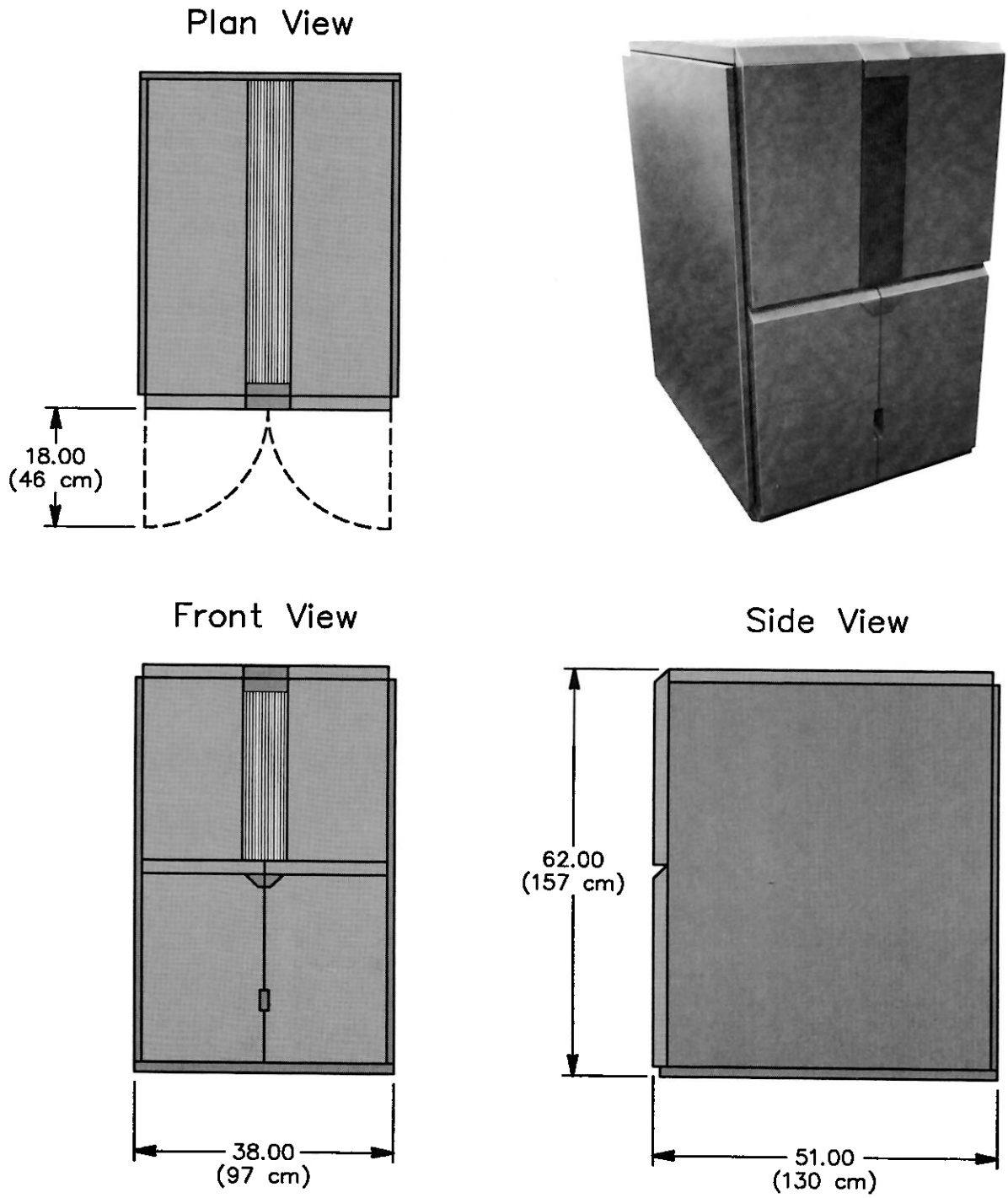


Figure 3-6. Heat Exchanger Unit (HEU-E/D)

Equipment Separation Limits

The arrangement of computer equipment within the facility must meet certain placement and separation requirements. You must prepare drawings and documentation specifying detailed information about the arrangement and location of the computer equipment. These drawings must be reviewed and approved by Cray Research site planning personnel prior to any site preparation. You should involve the site planning personnel early in the design stage.

The following general requirements must be met when arranging your computer room:

- Personnel safety
- Maximum system performance
- Satisfactory system installation
- Satisfactory operator and maintenance access

All arrangements must meet signal cable and refrigeration piping length requirements. Consideration should also be given to the 400-Hz power wiring lengths to minimize voltage drops.

Figure 3-7 illustrates the equipment separation limits for the CRAY Y-MP8E computer system.

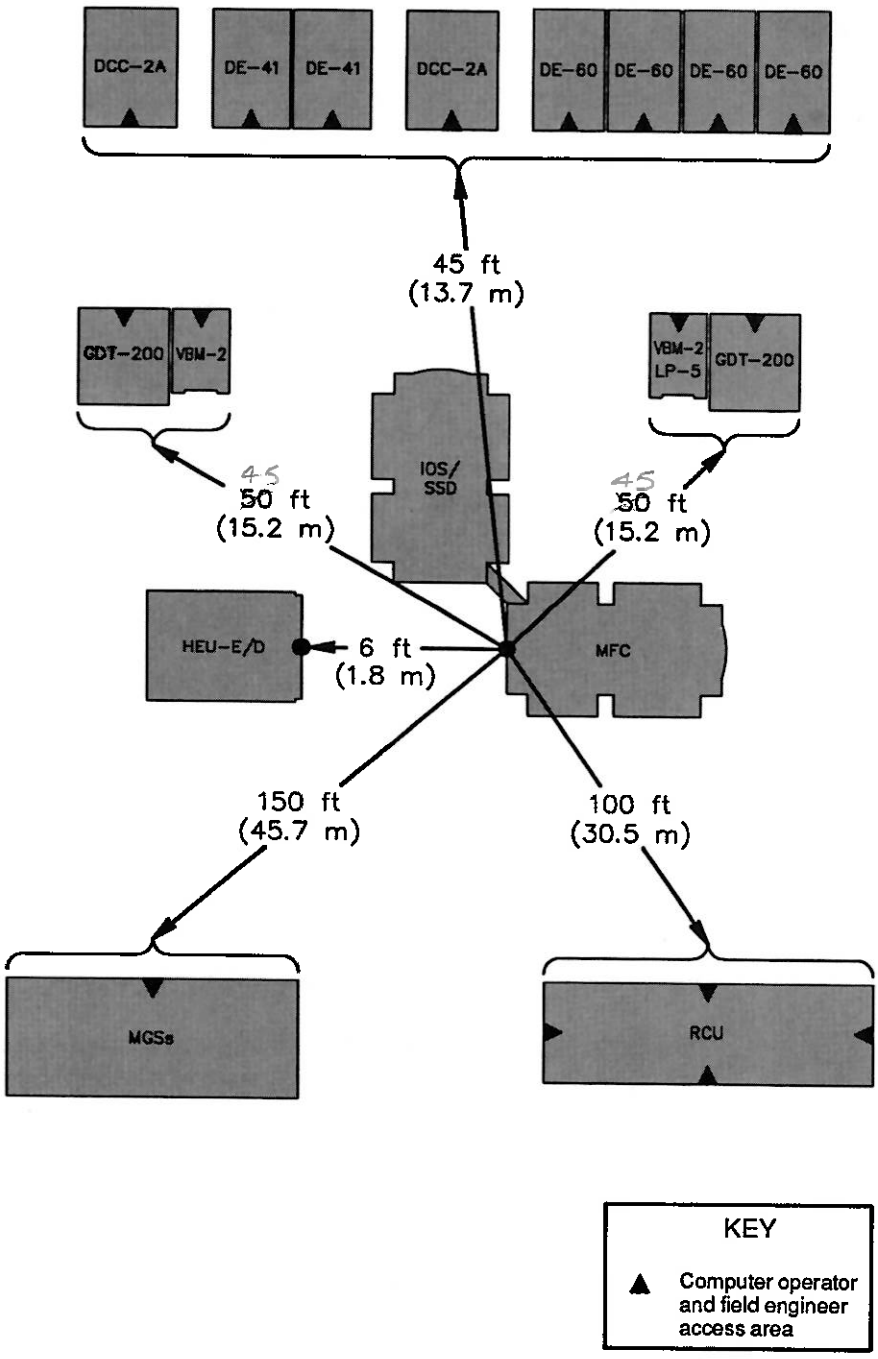


Figure 3-7. CRAY Y-MP8E Computer System Separation Limits

Floor Preparation

Prior to system delivery, you must prepare the raised floor for the CRAY Y-MP8E computer system installation. You must prepare the floor cutouts and install the additional floor support pedestals. Cray Research provides full-scale templates used to prepare all MFC, IOS/SSD, and HEU-E/D floor cutouts.

Figure 3-8 illustrates the standard placement of the CRAY Y-MP8E computer system on 24 in. x 24 in. floor panels. Use the reference lines (A-A and B-B) in this figure to locate the MFC and IOS/SSD.

The standard location of the HEU-E/D is illustrated in Figure 3-9. This location ensures that dielectric-coolant hose length requirements will be met. If facility constraints prevent locating the HEU-E/D as illustrated, alternate locations must be discussed with Cray Research site planning personnel. Use the reference lines (A-A and B-B) in this figure to locate the HEU-E/D.

Floor Cutouts

Floor cutouts provide an opening for data, power, and dielectric-coolant system connections. The floor cutouts must be free of burrs and sharp edges to prevent damage to these system connections.

You must prepare five floor cutouts for the mainframe chassis (MFC) and five floor cutouts for the IOS/SSD chassis. Refer to Figure 3-10 for the location and size of the floor cutouts for each chassis.

The HEU-E/D requires two floor cutouts for the entrance of refrigeration piping, dielectric-coolant hoses, and power and control wiring. Refer to Figure 3-11 for an illustration of the floor cutouts for the HEU-E/D.

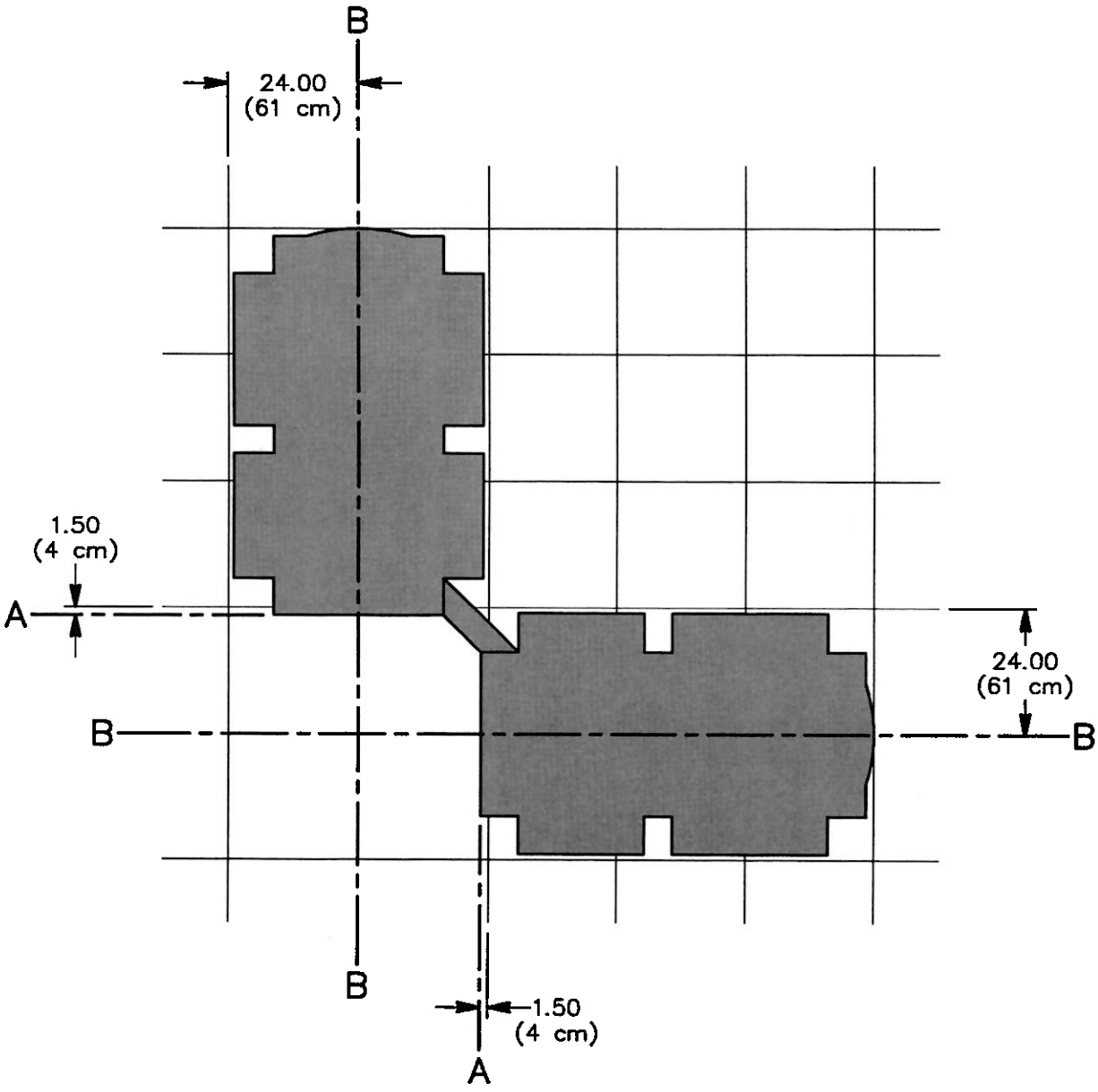


Figure 3-8. CRAY Y-MP8E Computer System Standard Placement

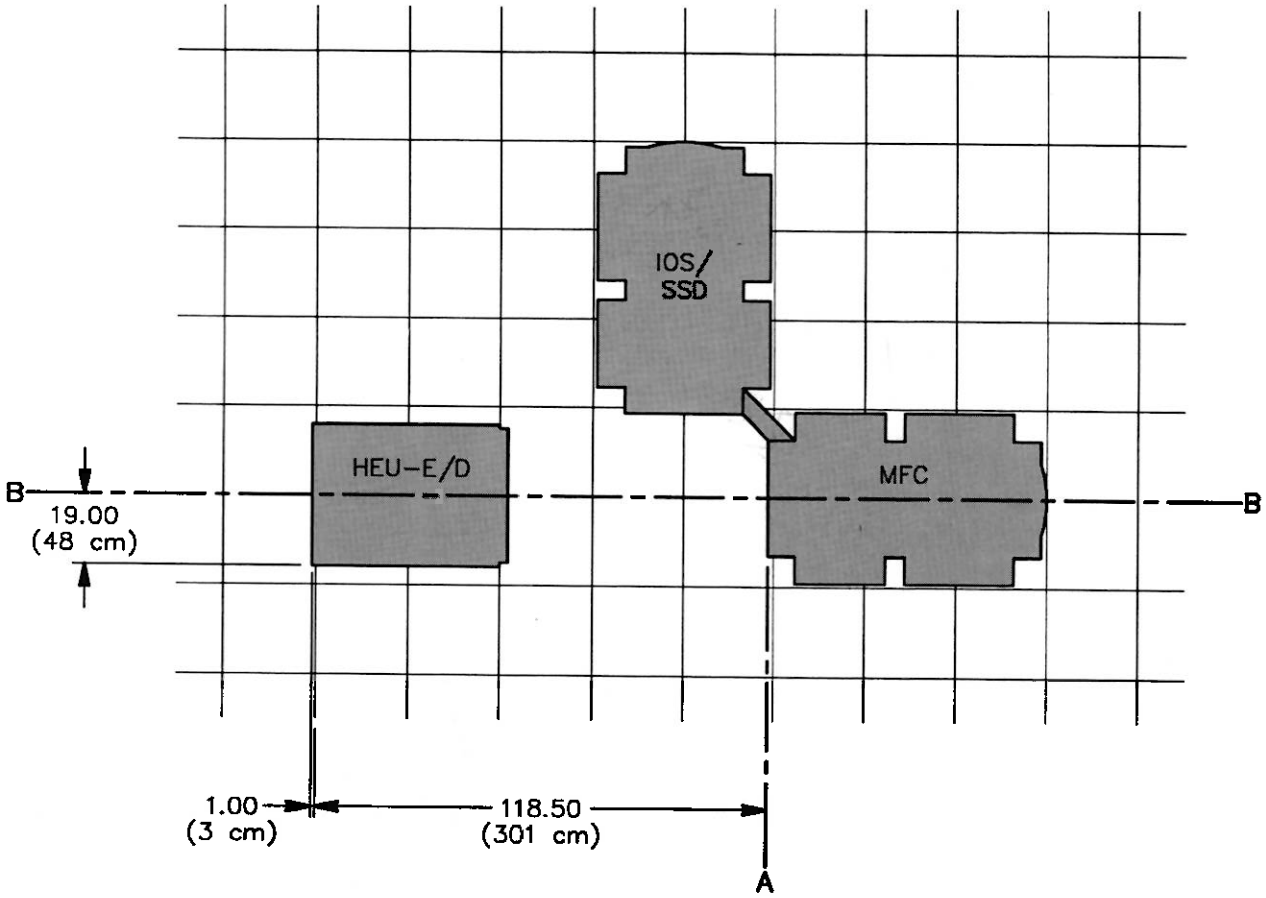


Figure 3-9. HEU-E/D Standard Placement

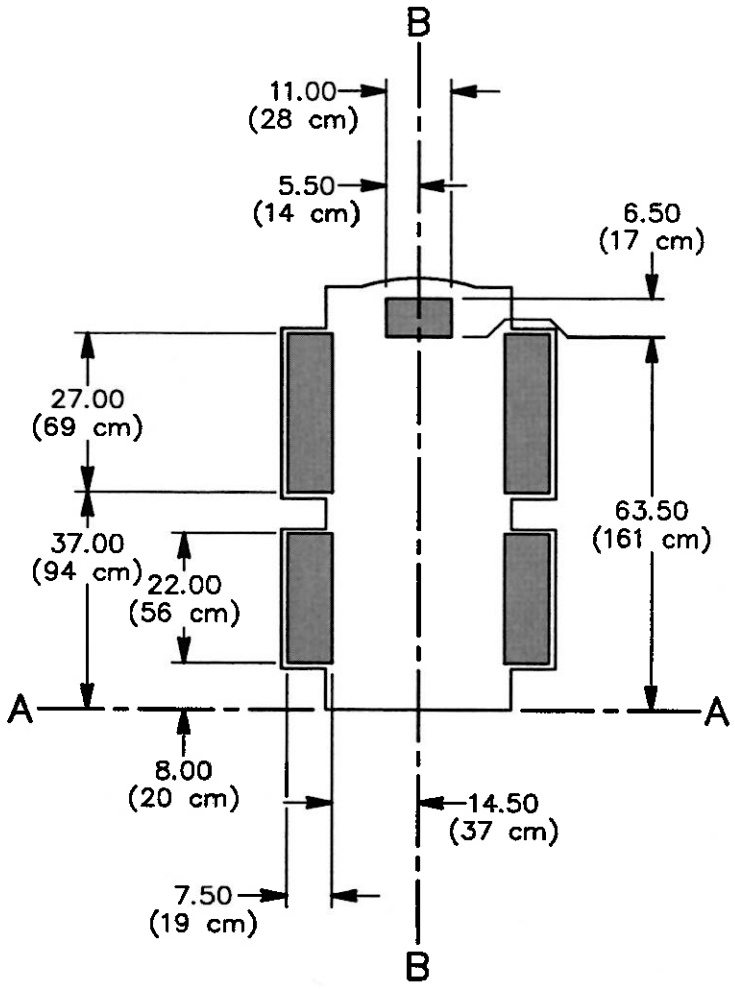


Figure 3-10. CRAY Y-MP8E Mainframe and IOS/SSD Chassis Floor Cutouts

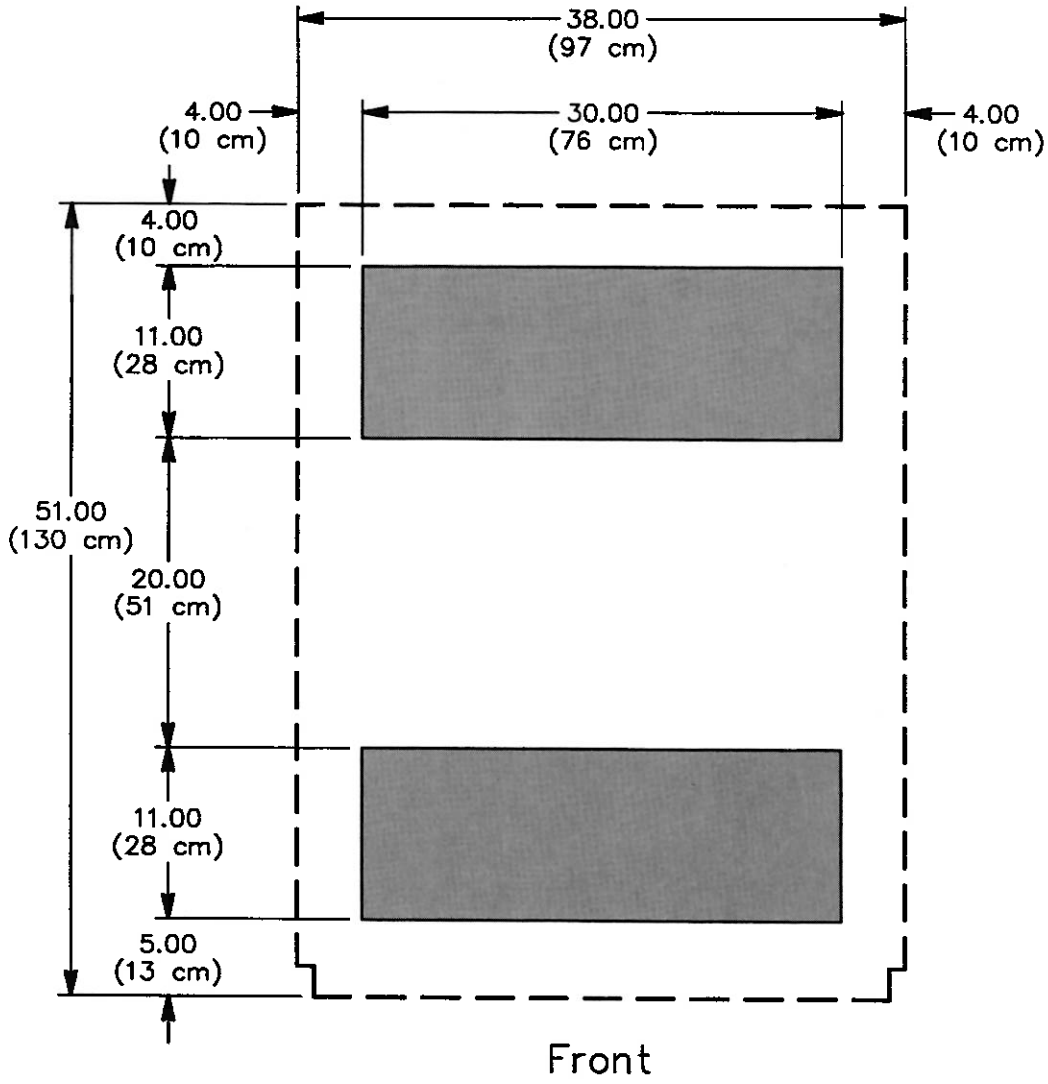


Figure 3-11. HEU-E/D Floor Cutouts

Additional Floor Support Pedestals

Additional floor support pedestals are necessary to accommodate the concentrated floor loading characteristics of the computer equipment.

You must supply and install a minimum of 14 additional floor support pedestals to accommodate the mainframe and IOS/SSD chassis floor loading characteristics. Some sites may require more floor support pedestals to restore the structural strength of the floor, depending on the stringer style and panel size. Refer to Figure 3-12 for the location of the additional floor support pedestals.

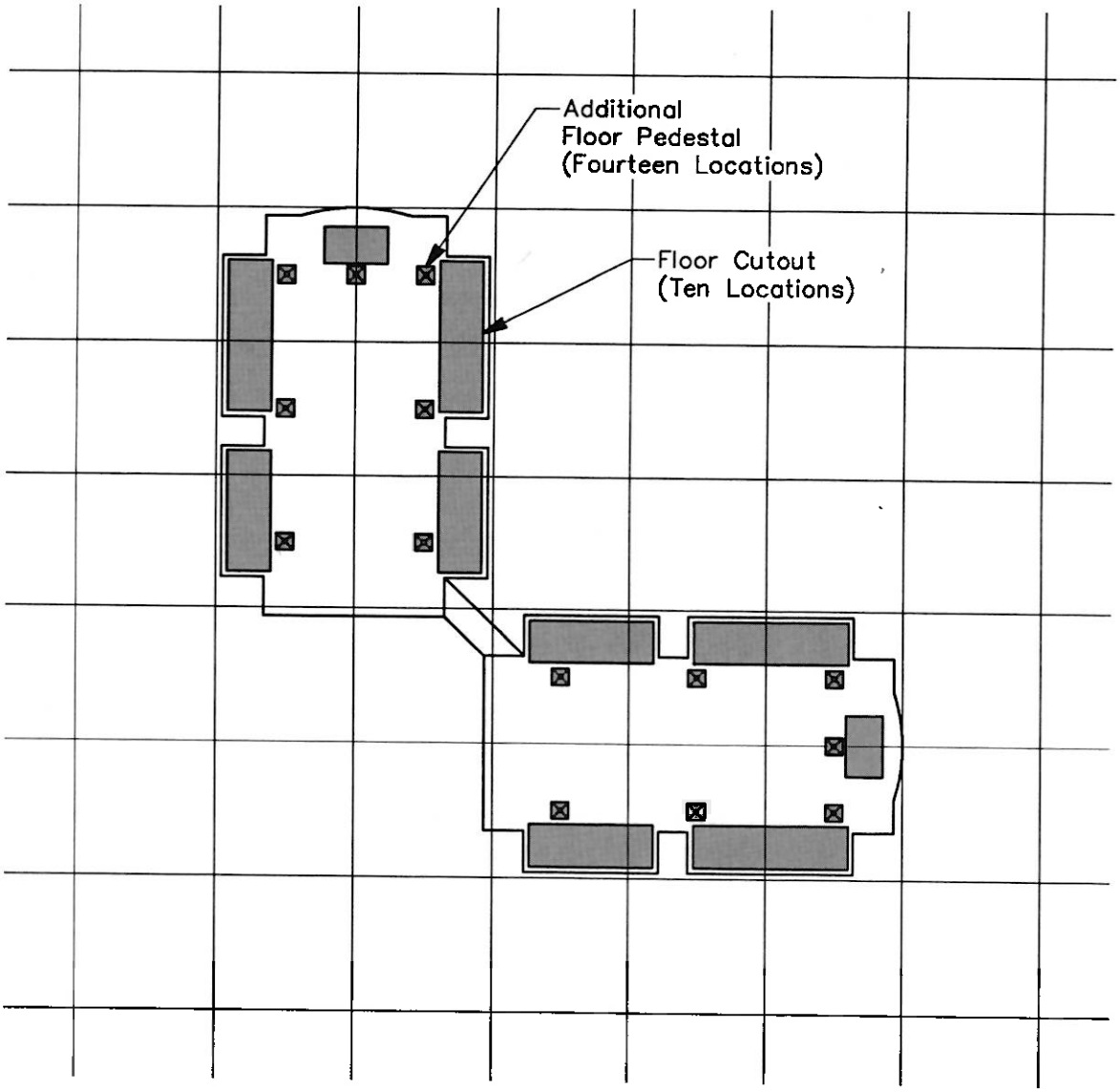


Figure 3-12. CRAY Y-MP8E Computer System Additional Floor Pedestal Locations

Power Wiring Requirements

You must provide and install the following power and control wiring for the mainframe and IOS/SSD chassis:

- One 208-Vac, 3-phase, 400-Hz circuit from motor generator sets (MGSs) to the mainframe chassis (MFC) and the IOS/SSD chassis
- One of the following incoming single-phase, 15-A circuits to each chassis for control power:
  - 120 Vac, 60 Hz, or
  - 220 Vac, 50 Hz
- One 4-wire control circuit between the mainframe chassis (MFC) and the No. 1 MGS for remote voltage sensing
- One 4-wire control circuit between the IOS/SSD chassis and the No. 2 MGS for remote voltage sensing
- One 6-wire control circuit between the mainframe chassis and the No. 1 MGS for stop and start capabilities
- One 6-wire control circuit between the IOS/SSD chassis and the No. 2 MGS for stop/start capabilities
- One 2-wire shielded cable (Belden 8720 or equivalent) between the mainframe chassis (MFC) and the No. 1 MGS for remote voltage control of the MGSs
- One 2-wire shielded cable (Belden 8720) between the IOS/SSD chassis and the No. 2 MGS for remote voltage control of the MGSs

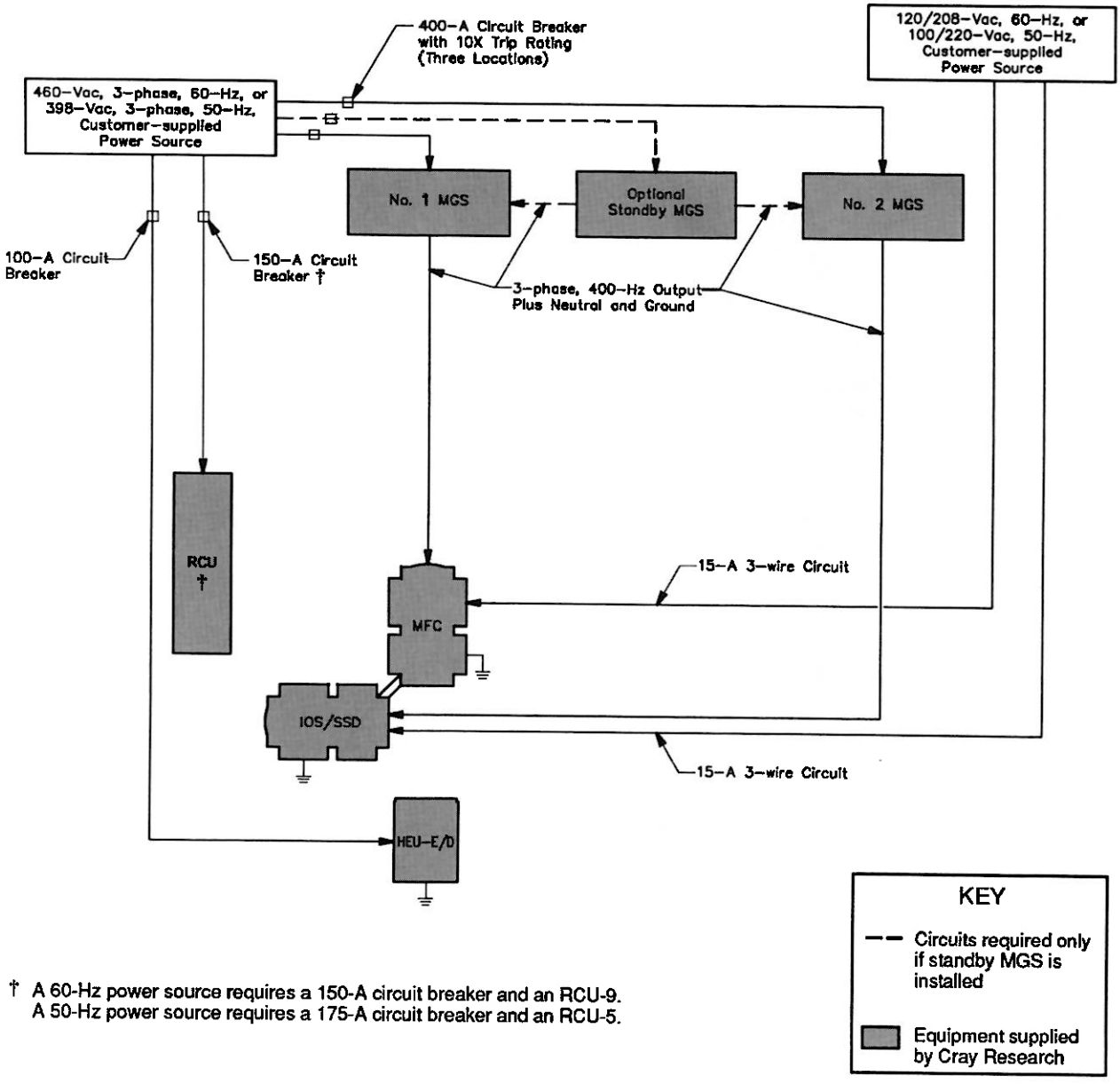
You must supply and install the following circuits for the HEU-E/D:

- One of the following incoming 3-phase, 4-wire, 100-A circuits (including ground wire):
  - 460-Vac, 60-Hz circuit, or
  - 398-Vac, 50-Hz circuit
- One 3-wire control circuit from the HEU-E/D to the refrigeration condensing unit (RCU)

When preparing these circuits, allow 2 ft (0.6 m) of excess wire length above the floor surface to ensure adequate wire length for system connection.

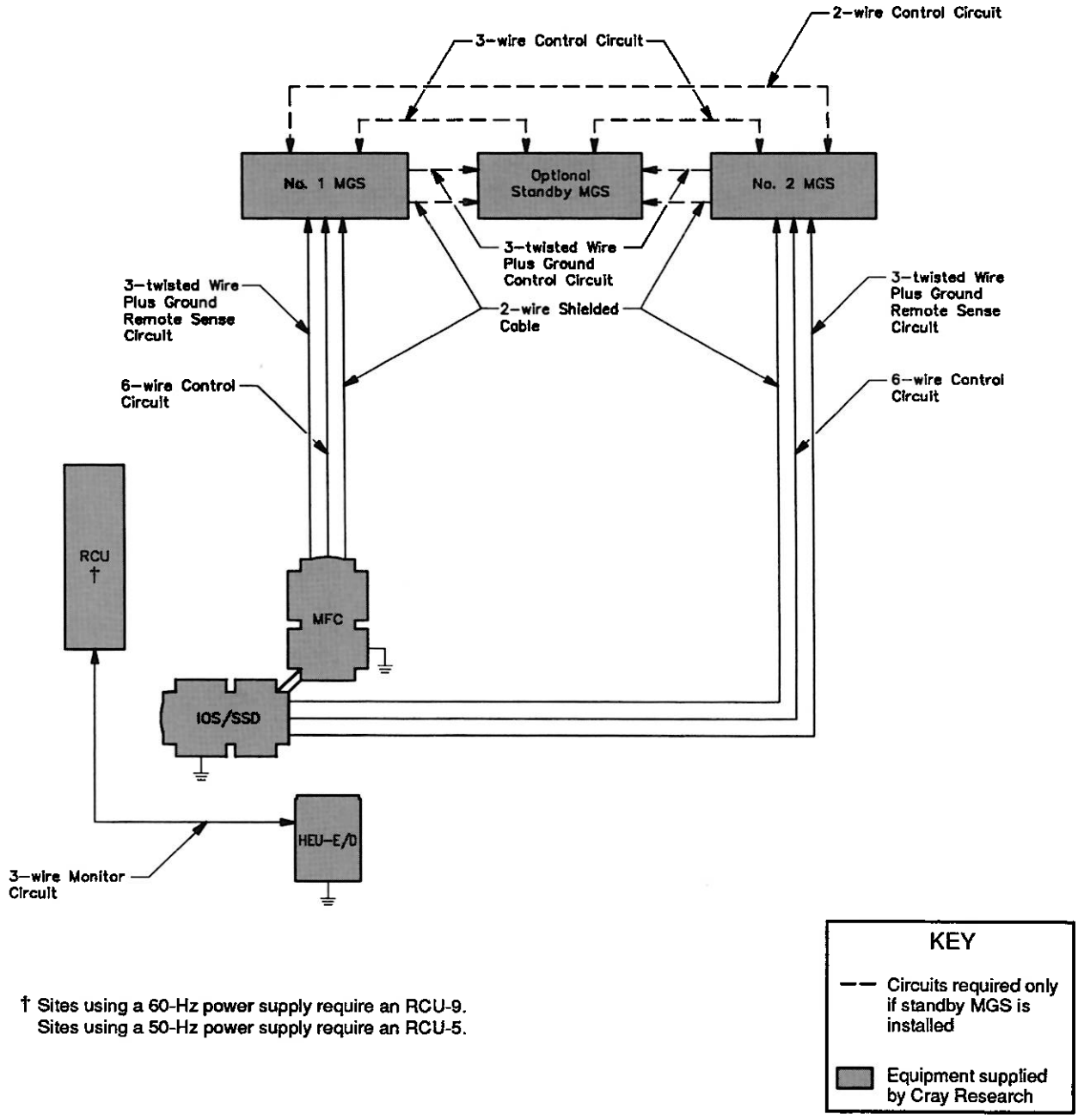
All Cray Research computer equipment must be earth grounded. Refer to the *Equipment Grounding for Cray Research, Inc. Computer Systems*, Site Engineering document number 10658002, for more information about equipment grounding.

Figures 3-13 and 3-14 are block diagrams showing the basic power and control wiring for the CRAY Y-MP8E computer system. The diagrams display the optional standby motor-generator set (MGS). If your computer system does not include this motor-generator set, you do not need to install the wiring associated with this device.



† A 60-Hz power source requires a 150-A circuit breaker and an RCU-9.
A 50-Hz power source requires a 175-A circuit breaker and an RCU-5.

Figure 3-13. CRAY Y-MP8E Basic Power Wiring



† Sites using a 60-Hz power supply require an RCU-9.
Sites using a 50-Hz power supply require an RCU-5.

Figure 3-14. CRAY Y-MP8E Basic Control Wiring

The following notes provide information additional to the block diagrams:

- Figures 3-13 and 3-14 are guides for your electrical design engineer and must not be used as bid documents or working drawings.
- The equipment arrangement shown in Figures 3-13 and 3-14 is not an actual equipment layout.
- All wiring should be prepared according to applicable local and national codes.
- The maximum 400-Hz voltage drop from the MGSs to the mainframe chassis (MFC) and IOS/SSD cabinet can not exceed 2%. Verify that wire sizes and quantity of conductors will meet this requirement.
- All circuit breakers, circuit breaker panels, magnetic contactors, main power disconnect switches, junction boxes, power wiring, raceways, and conduits must be provided and installed by you.
- Conduits or raceways used for 400-Hz power distribution must be aluminum or nonferrous.
- Circuit breakers used for 400-Hz power distribution can be 60-Hz rated, but must be sized for 400-Hz application.
- The minimum suggested control wiring size is #14 AWG (2.5 mm^2).
- Your site preparation design should allow for circuit additions proportionate to system upgrade plans.
- Cray Research recommends the installation of one emergency OFF switch at each computer room exit. All emergency OFF switches should be wired in series and should interrupt power to the computer equipment and to all air-circulating units in the computer room.
- Secure all conduits ending at computer equipment with approved fittings at the equipment entrance.
- Detailed point-to-point diagrams for all wiring connections to the MFC, HEU-E/D, IOS/SSD cabinet, RCU, and MGSs are included in the Cray Research-supplied site planning documentation.

Cooling Requirements

The CRAY Y-MP8E computer system uses a dielectric-coolant cooling technique that requires special piping and hoses. Dielectric-coolant hoses are required between the HEU-E/D, mainframe chassis (MFC), and IOS/SSD chassis. Refrigeration piping is required between the HEU-E/D and the RCU. The following subsections provide these requirements. Refer to the "Operational Requirements" section of this manual for more information about cooling water requirements.

Dielectric-coolant Hoses

Flexible hoses are required to complete the dielectric-coolant network between the MFC and HEU-E/D. Cray Research supplies and installs all associated flexible hoses for the dielectric coolant at the time of system installation. Figure 3-15 illustrates the standard arrangement of dielectric-coolant hoses for the CRAY Y-MP8E computer system.

Refrigeration Piping

The HEU-E/D is cooled by a refrigerant cooling technique that requires refrigeration piping to distribute the refrigerant liquid and return the refrigerant vapor to the remote refrigeration condensing unit (RCU). Your mechanical design engineering staff must prepare working drawings providing details about planned refrigeration piping.

Approximately 8 weeks prior to the computer system delivery, Cray Research will deliver the RCU and a special refrigeration piping component kit to your facility. This kit consists of special manifold assemblies but does not include all refrigeration piping components and materials necessary to prepare the facility.

Figure 3-16 illustrates the refrigeration piping requirements for the HEU-E/D for the CRAY Y-MP8E computer system. You are responsible for the installation of the special refrigeration components and the RCU. Refer to the *Cray Research Support Equipment Site Planning Reference Manual*, publication number HR-00082, for more information about installing the RCU. You must supply and install all piping, couplings, and elbows needed to interconnect the Cray Research supplied components and prepare the facility refrigeration piping for the computer installation. You must also test the refrigeration piping and prepare for final connection before delivery of the computer system.

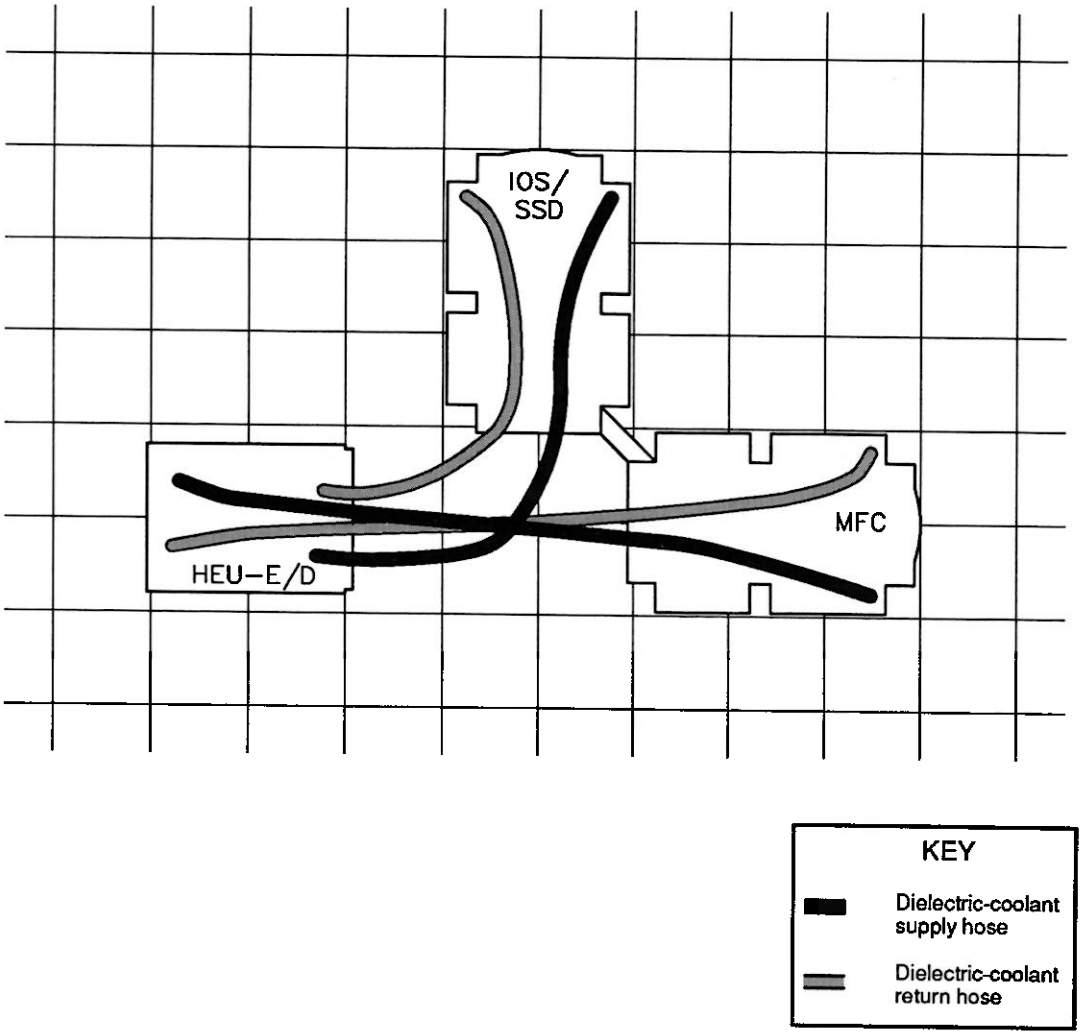
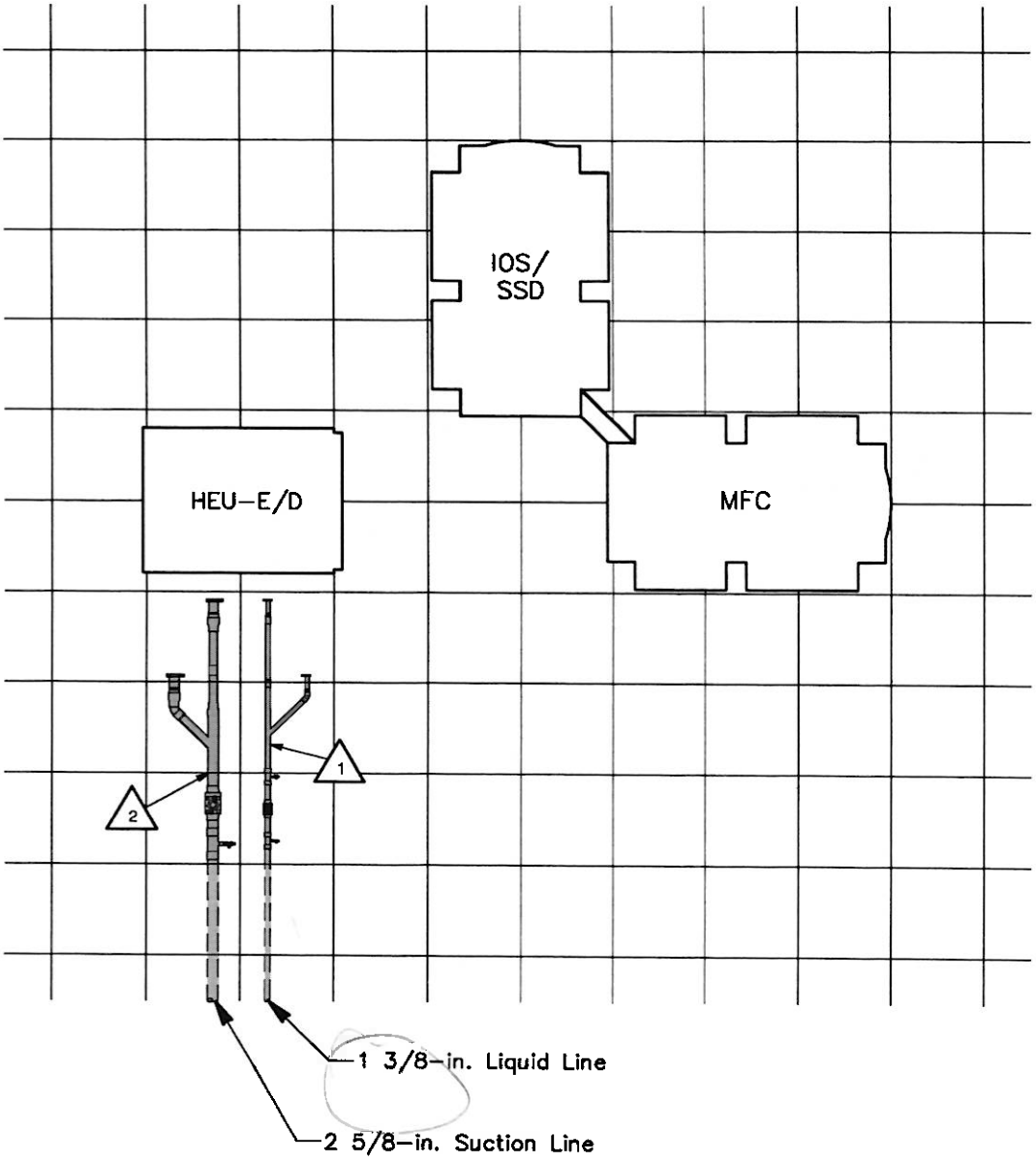


Figure 3-15. CRAY Y-MP8E Dielectric-coolant Hoses

Cray Research provides the *Refrigeration Piping and Component Installation Requirements*, Site Engineering document number 10650228, during the initial site planning meeting. This document describes the required materials, proper installation procedures, leak testing procedures, and evacuation procedures that must be followed by your facility personnel.



1 Liquid-line flange assembly-double, Cray Research part number 12187000

2 Suction-line flange assembly-double, Cray Research part number 12187100

Figure 3-16. CRAY Y-MP8E Refrigeration Piping Requirements

CAUTION

The compressor motor windings in the refrigeration condensing unit (RCU) will overheat if operated without a heat load. Do not energize the RCU prior to system installation.

At the time of the computer system installation, Cray Research supplies and installs the flexible refrigeration hoses required to complete the refrigeration piping network. In addition, Cray Research installation personnel will charge the refrigeration system, adjust all controls and valves, and apply power to initialize operation of the RCU. You must supply an adequate amount of R-22 refrigerant to fully charge the system (refer to the *Cray Research Support Equipment Site Planning Reference Manual*, Cray Research publication number HR-00082, for more information about your RCU).

The refrigeration piping from the RCU to the computer equipment must not exceed the total equivalent lineal piping restriction of 100 ft (30.5 m), including directional and elevational changes. Directional changes in pipe routing should be minimal. If directional changes are necessary, they should be at 45° angles. All refrigeration piping elbows must be long-radius type.

Changes in pipe routing elevation should also be minimal. When the routing of refrigeration piping requires a vertical rise, the vertical rise must not exceed 25 ft (7.6 m). In most instances, an extended vertical rise requires the construction of a double riser within the suction line. In this case, Cray Research site planning personnel will provide the preferred design requirements for the double riser.

The following notes provide information additional to Figure 3-16.

- You must supply, route, and install the liquid-line and suction-line piping between the HEU-E/D and the RCU. These items must conform to Cray Research engineering requirements and must be approved by Cray Research site planning personnel.

- Refrigerant-grade piping components and materials for the refrigeration piping network must be installed in accordance with the requirements illustrated in Figure 3-16 and Cray Research engineering requirements. Any variations of the piping network requirements must be approved by Cray Research site planning personnel.

- Cray Research furnishes you with the refrigeration components (items 1 and 2) illustrated in Figure 3-16. You are required to install both of these items.

- Cray Research furnishes and installs the flexible refrigerant hoses that connect the liquid and suction lines to the HEU-E/D at the time of system installation.

- Piping support clamps must have a compressible insert between the clamp and the refrigeration piping.

- All refrigeration piping and components must be assembled by you using silver solder and silver soldering techniques according to Cray Research engineering requirements.

- All refrigeration piping and components must be leak tested, evacuated, and prepared for service by you.

- All suction-line piping must be insulated by you after it passes all tests.

Refer to the *Refrigeration Piping and Component Installation Requirements*, Site Engineering document number 10650228, for more information about the installation requirements.

SECTION 4
CRAY Y-MP8I COMPUTER SYSTEM

4 CRAY Y-MP8I COMPUTER SYSTEM

The site planning requirements for the CRAY Y-MP8I computer system are different than those of the CRAY Y-MP8E computer system. This section provides detailed site planning information for the CRAY Y-MP8I computer system including system configurations, equipment separation limits, specifications, floor preparation, power wiring, and cooling requirements.

System Configurations

The CRAY Y-MP8I computer system has a number of different configurations. A standard CRAY Y-MP8I computer system consists of the following components:

- Mainframe chassis (MFC) containing an integrated input/output subsystem (IOS) and SSD solid-state storage device (SSD)
- Heat exchanger unit (HEU-E/S)
- Maintenance workstation (MWS)
- Operator workstation (OWS)
- Disk drives and other peripheral equipment
- Motor generator set (MGS)
- Refrigeration condensing unit (RCU)

The mainframe chassis (MFC) contains various configurations of logic modules. For example, the SSD is optional. If your computer system is not configured with an SSD, the MFC will contain only the mainframe chassis and IOS. This chassis may be upgraded with an SSD.

The heat exchanger unit (model E type) for the CRAY Y-MP8I computer system contains a single pump and heat exchanger (HEU-E/S). The HEU-E/S removes heat generated by the components in the MFC.

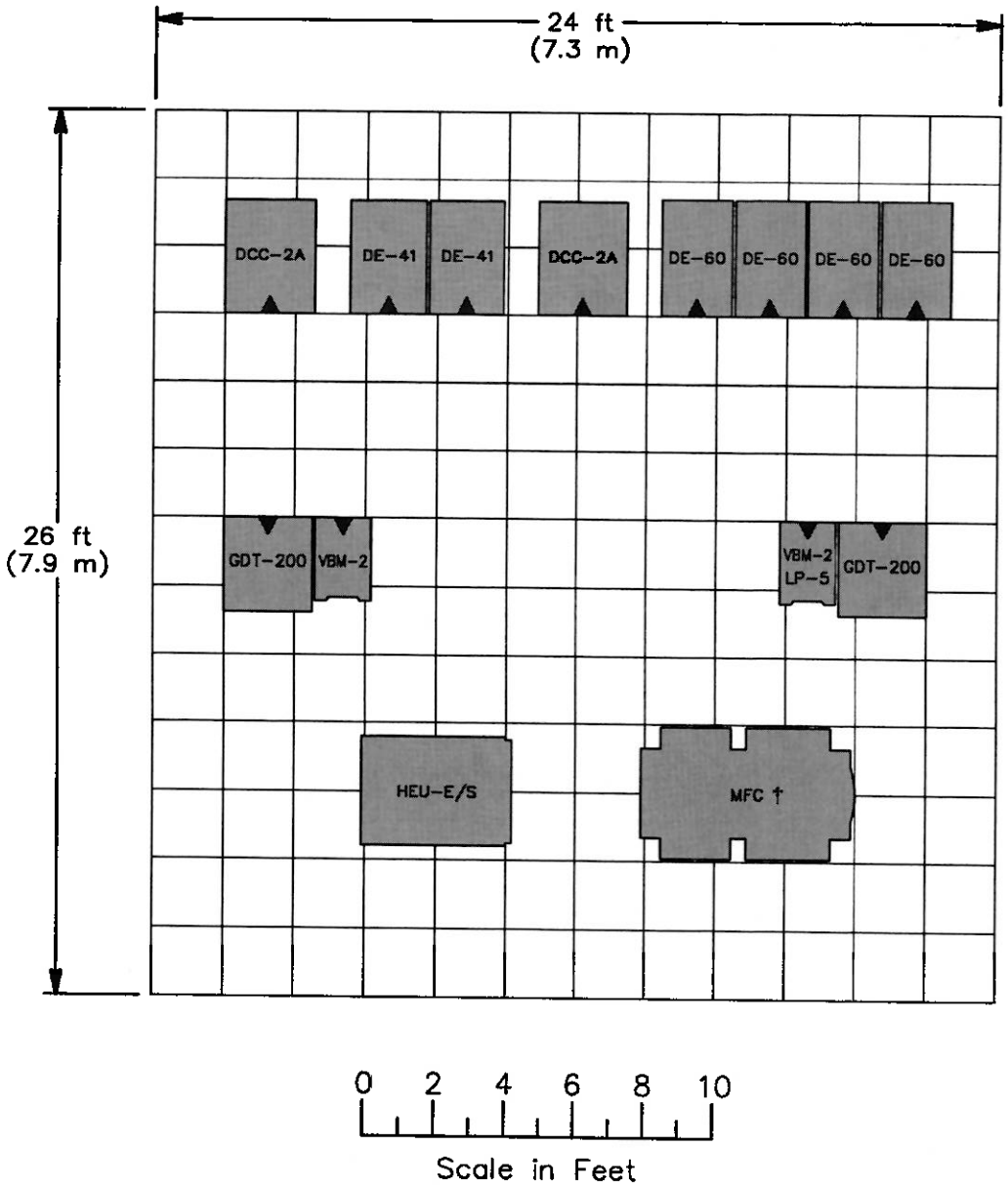
The OWS is designated for your computer operator use. Cray Research hardware and software support personnel use the MWS for maintenance and troubleshooting. Both the OWS and MWS consist of a graphics display terminal (GDT-200) and a VME-based microcomputer (VBM-2). The OWS and MWS also share a single laser printer (LP-5). Refer to *Cray Research Peripheral Equipment Site Planning Reference Manual*, Cray Research publication number HR-00080, for more information.

Disk drives and other peripheral equipment are also used with the CRAY Y-MP8I computer system. The number of disk drives and other peripheral equipment depends on individual customer needs. However, a typical CRAY Y-MP8I computer system disk drive configuration consists of disk enclosures (DE-60s and DE-41s), and disk control cabinets (DCC-2As). Refer to *Cray Research Peripheral Equipment Site Planning Reference Manual*, Cray Research publication number HR-00080, for more information about peripheral equipment.

The standard CRAY Y-MP8I computer system includes a motor generator set (MGS) and one refrigeration condensing unit (RCU). An optional standby MGS can also be configured in the system. Refer to the *Cray Research Support Equipment Site Planning Reference Manual*, Cray Research publication number HR-00082, for related site planning information.

Figure 4-1 illustrates a typical computer room floor plan for a CRAY Y-MP8I computer system. The computer system is configured on a 24 ft x 26 ft (7.3 m x 7.9 m) floor with 24 in. x 24 in. floor panels.

The lengths of the signal cables and cooling system hoses limit the arrangement of the computer equipment. Refer to "Equipment Separation Limits" subsection in this section for more information.



† The MFC contains an IOS and an optional SSD.

KEY

▲ Computer operator and field engineer access area

Figure 4-1. CRAY Y-MP8I Typical Floor Plan

Specifications

This subsection describes the specifications for the mainframe chassis and the heat exchanger unit (HEU-E/S). The information described in this section is useful for designing the computer room, planning the floor layout, and installing the equipment.

Mainframe Chassis

The CRAY Y-MP8I mainframe chassis (refer to Figure 4-2) is a dielectric-cooled unit which contains logic modules and power supplies. Table 4-1 provides additional mainframe chassis specifications. Refer to Figure 4-3 for the mainframe shipping configuration.

Table 4-1. CRAY Y-MP8I Mainframe Chassis Specifications

Characteristics	Specifications
Height	76.25 in. (194 cm)
Width	46 in. (117 cm)
Depth	73.5 in. (187 cm)
Weight	7,495 lbs (3,399 kg)
Floor loading	507 lbs/ft^2 (2,474 kg/m^2)
Access requirements	3 ft (0.9 m) on all sides
Heat dissipation to air	3.15 kW (maximum)
Shipping size: Height Width Depth	77.5 in. (197 cm) 40.5 in. (103 cm) 111 in. (282 cm)
Shipping weight	8,028 lbs (3641 kg)

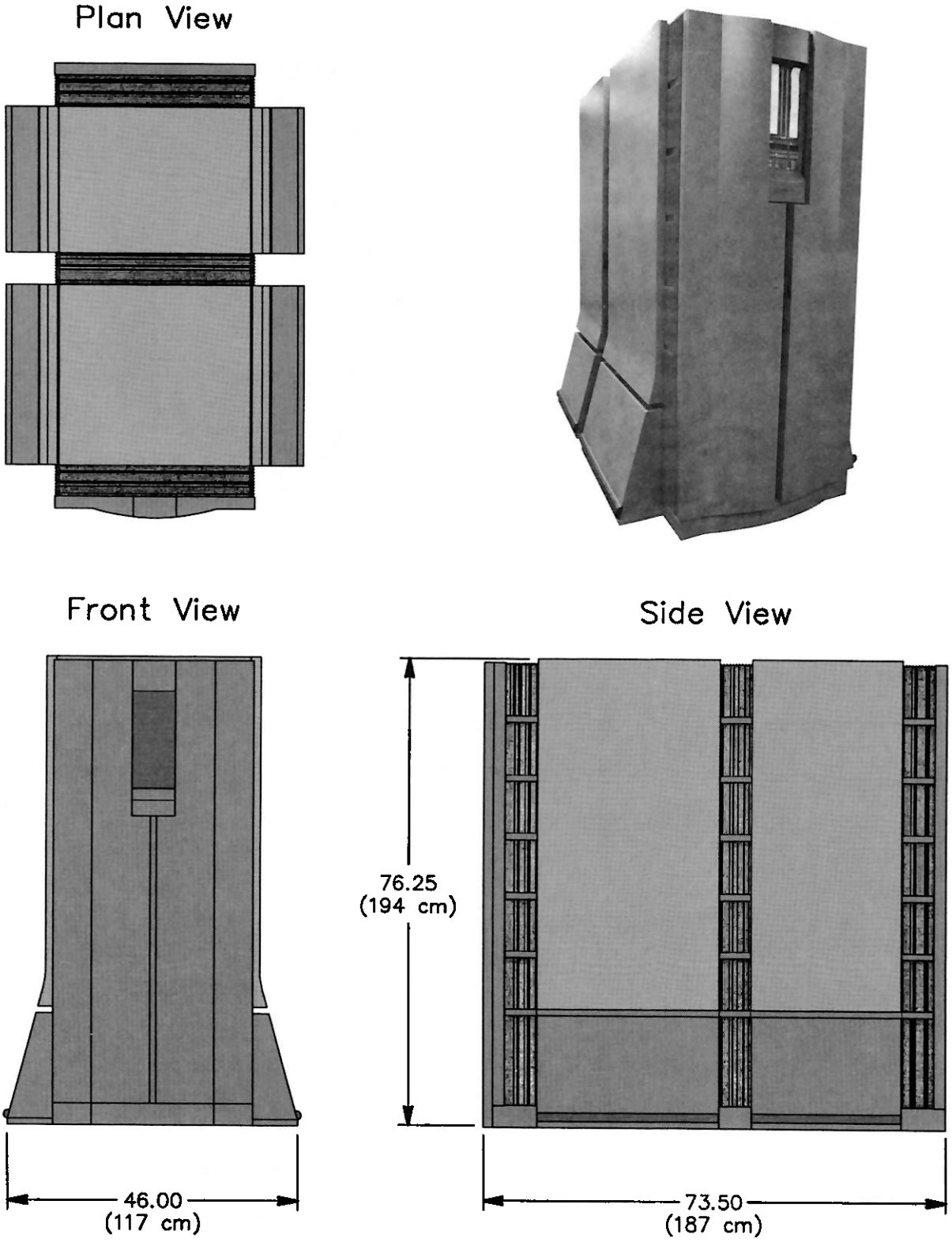


Figure 4-2. CRAY Y-MP8I Mainframe Chassis

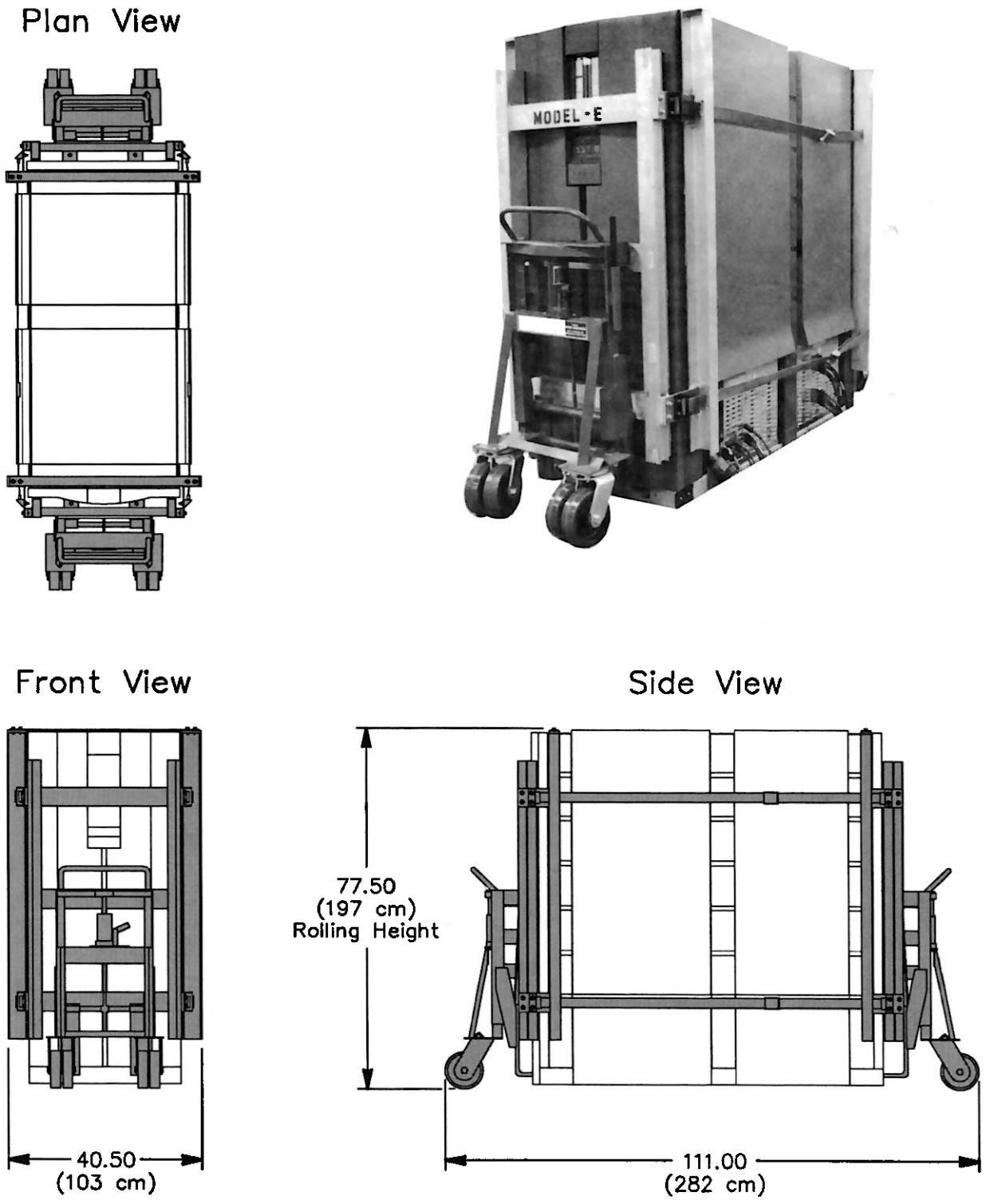


Figure 4-3. CRAY Y-MP8I Mainframe Shipping Configuration

Heat Exchanger Unit (HEU-E/S)

The heat exchanger unit (HEU-E/S) is an integral element of the CRAY Y-MP8I computer system. The HEU-E/S (refer to Figure 4-4) contains a single pump and the controls required to circulate dielectric coolant through the mainframe chassis (MFC).

The HEU-E/S also contains a single dielectric coolant-to-refrigerant heat exchanger. The dielectric coolant transfers the heat generated within the mainframe chassis to the heat exchangers contained in the HEU-E/S. The heat is then transferred to the refrigeration circuitry of the refrigeration condensing unit (RCU).

Refer to Table 4-2 for the HEU-E/S chassis specifications.

Table 4-2. HEU-E/S Chassis Specifications

Characteristics	Specifications
Height	62 in. (157 cm)
Width	38 in. (97 cm)
Depth	51 in. (130 cm)
Weight	1,200 lbs (544 kg)
Floor loading	100 lbs/ft^2 (488 kg/m^2)
Access requirements	3 ft (0.9 m) on all sides
Heat dissipation to air	1.15 kW
Shipping size: Height Width Depth	61 in. (155 cm) 36 in. (91 cm) 82 in. (208 cm)
Shipping weight	1,312 lbs (595 kg)

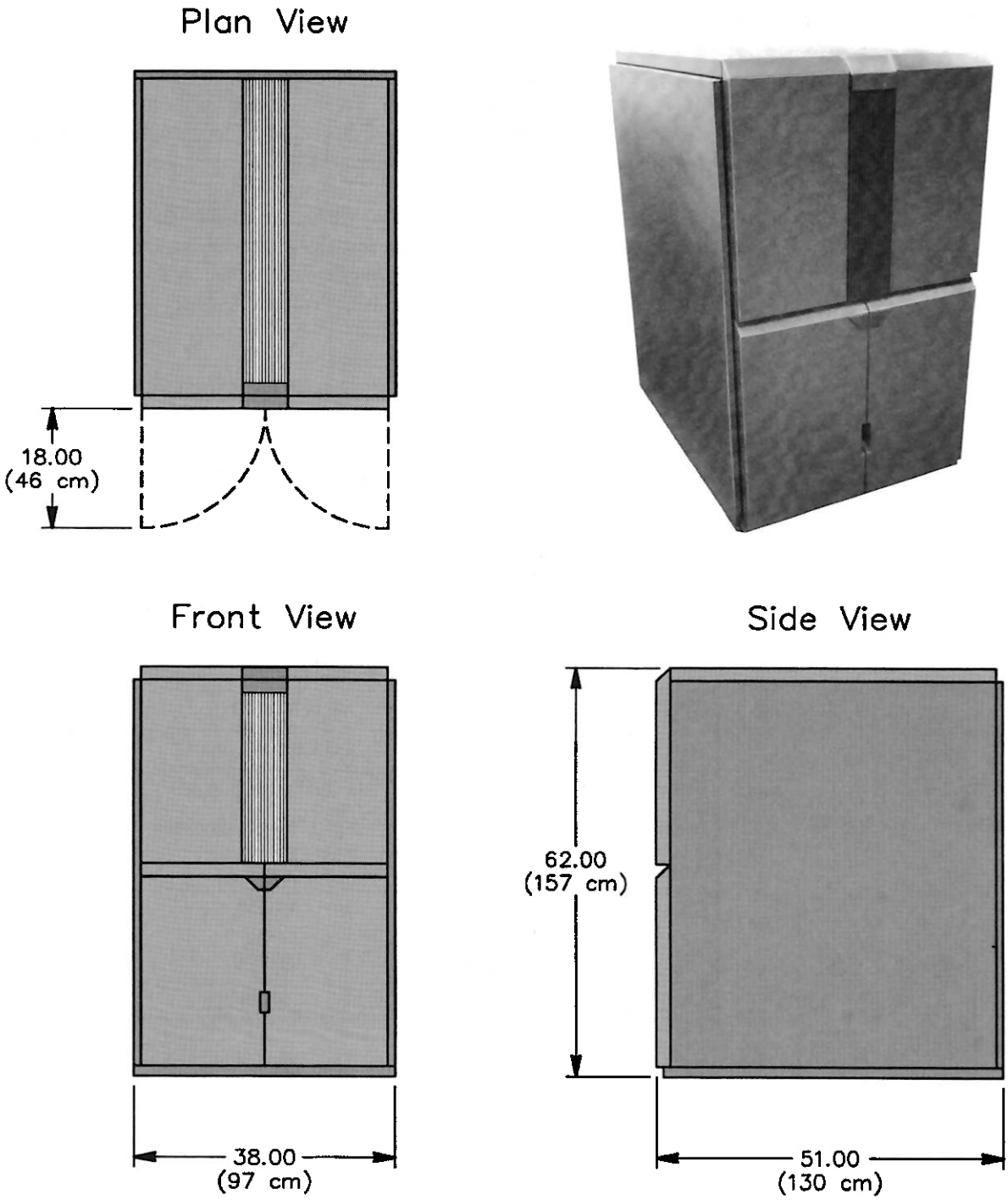


Figure 4-4. Heat Exchanger Unit (HEU-E/S)

Equipment Separation Limits

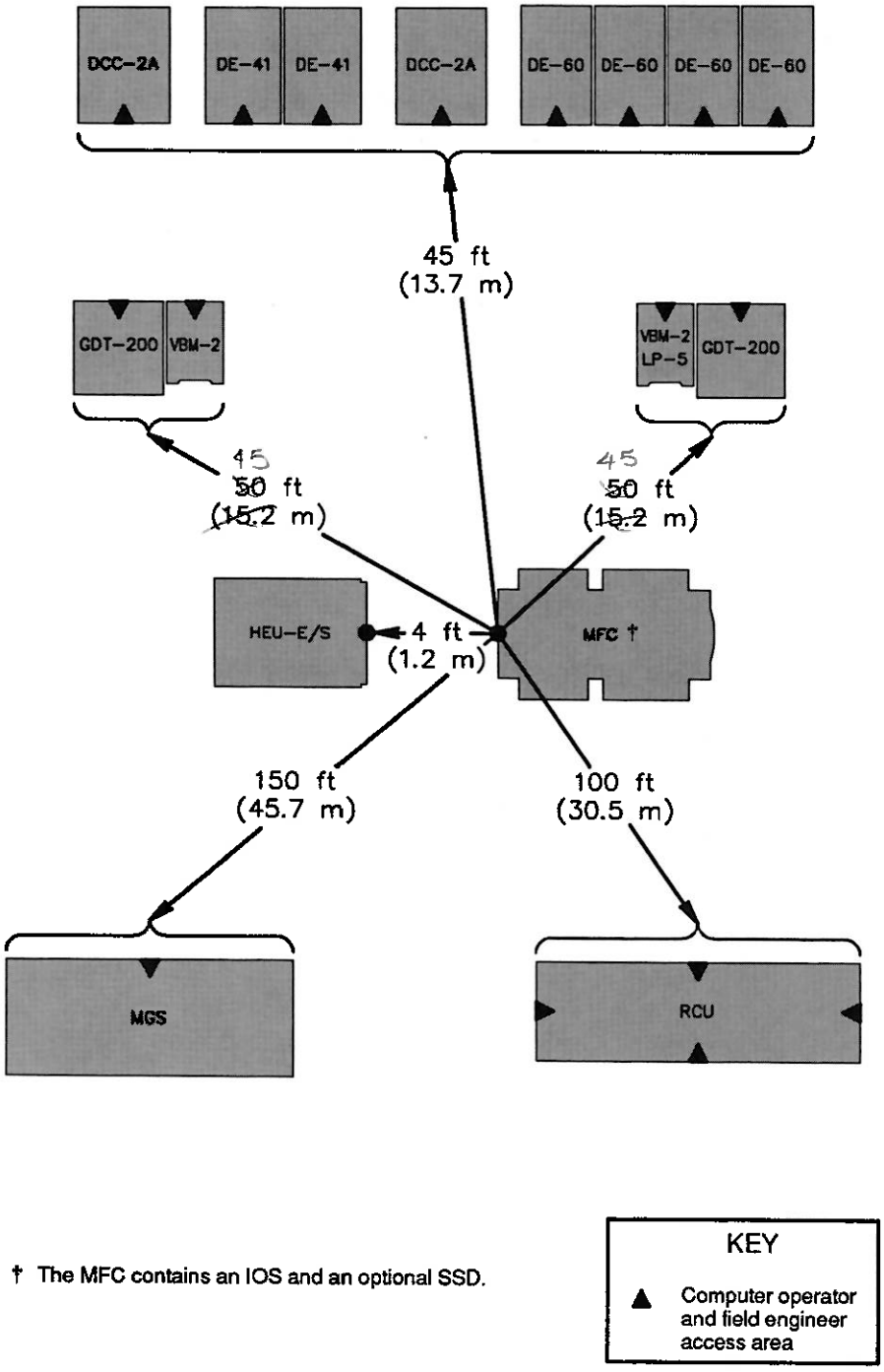
The arrangement of computer equipment within the facility must meet certain placement and separation requirements. You must prepare drawings and documentation specifying detailed information about the arrangement and location of the computer equipment. These drawings must be reviewed and approved by Cray Research site planning personnel prior to any site preparation. You should involve the site planning personnel early in the design stage.

The following general requirements must be met when arranging your computer room:

- Personnel safety
- Maximum system performance
- Satisfactory system installation
- Satisfactory operator and maintenance access

All arrangements must meet signal cable and refrigerant piping length requirements. Consideration should also be given to the 400-Hz power wiring lengths to minimize voltage drops.

Figure 4-5 illustrates the equipment separation limits for the CRAY Y-MP8I computer system.



† The MFC contains an IOS and an optional SSD.

Figure 4-5. CRAY Y-MP8I Computer System Separation Limits

Floor Preparation

Prior to system delivery, you must prepare the raised computer room floor for the CRAY Y-MP8I computer system installation. You must prepare the floor cutouts and install the additional floor support pedestals. Cray Research provides full-scale templates to locate and prepare all MFC and HEU-E/S floor cutouts.

Figure 4-6 illustrates the standard placement of the CRAY Y-MP8I computer system on 24 in. x 24 in. floor panels. Use the reference lines (A-A and B-B) in this figure to locate the MFC.

The standard location of the HEU-E/S is illustrated in Figure 4-7. This location ensures that dielectric-coolant hose length requirements will be met. If facility constraints prevent locating the HEU-E/S as illustrated, alternate locations must be discussed with Cray Research site planning personnel. Use the reference lines (A-A and B-B) in this figure to locate the HEU-E/S.

Floor Cutouts

Floor cutouts provide an opening for data, power, and dielectric-coolant system connections. The floor cutouts must be free of burrs and sharp edges to prevent damage to these system connections.

You must prepare five floor cutouts for the mainframe chassis (MFC). Refer to Figure 4-8 for the location and size of the floor cutouts for each chassis.

The HEU-E/S requires two floor cutouts for the entrance of refrigeration piping, dielectric-coolant hoses, and power and control wiring. Refer to Figure 4-9 for an illustration of the floor cutouts for the HEU-E/S.

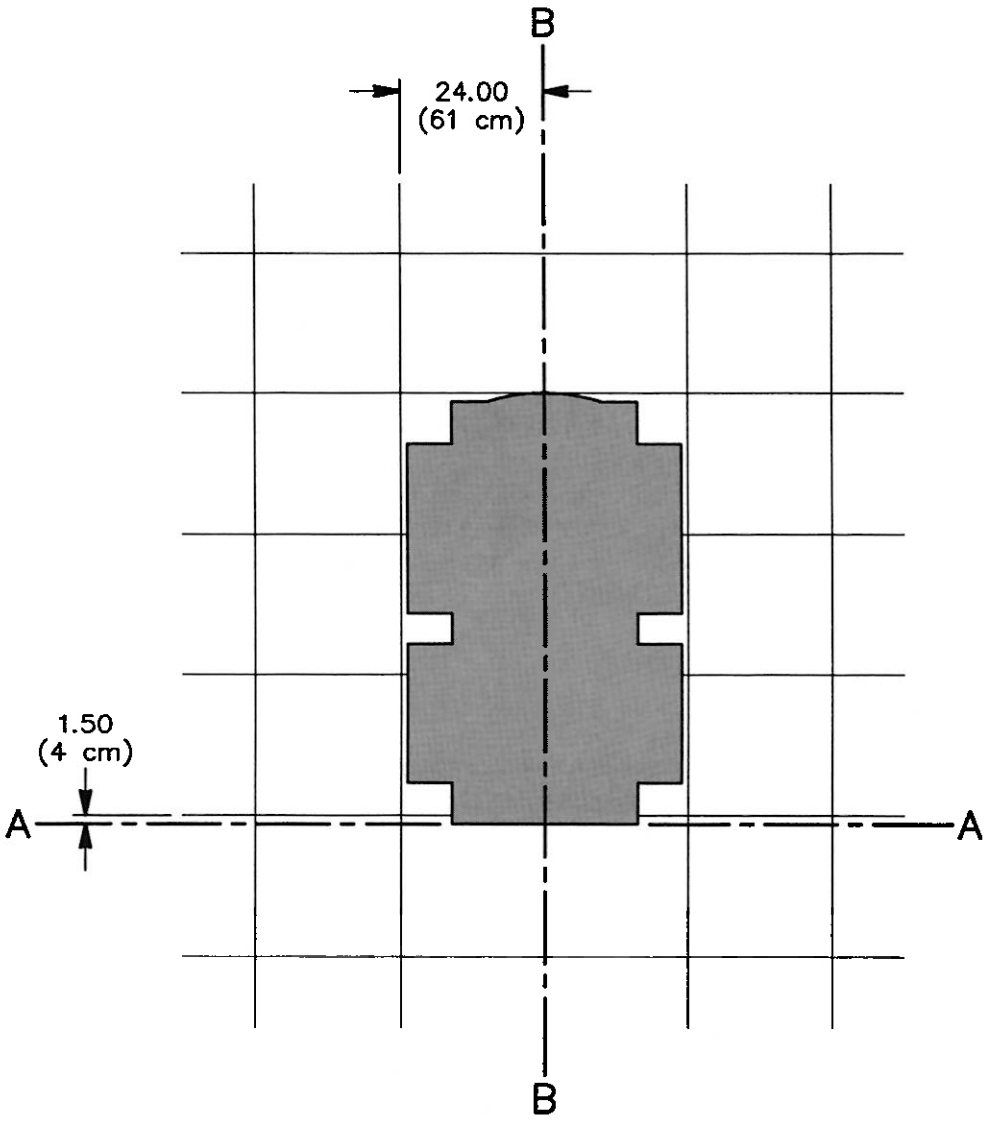


Figure 4-6. CRAY Y-MP8I Computer System Standard Placement

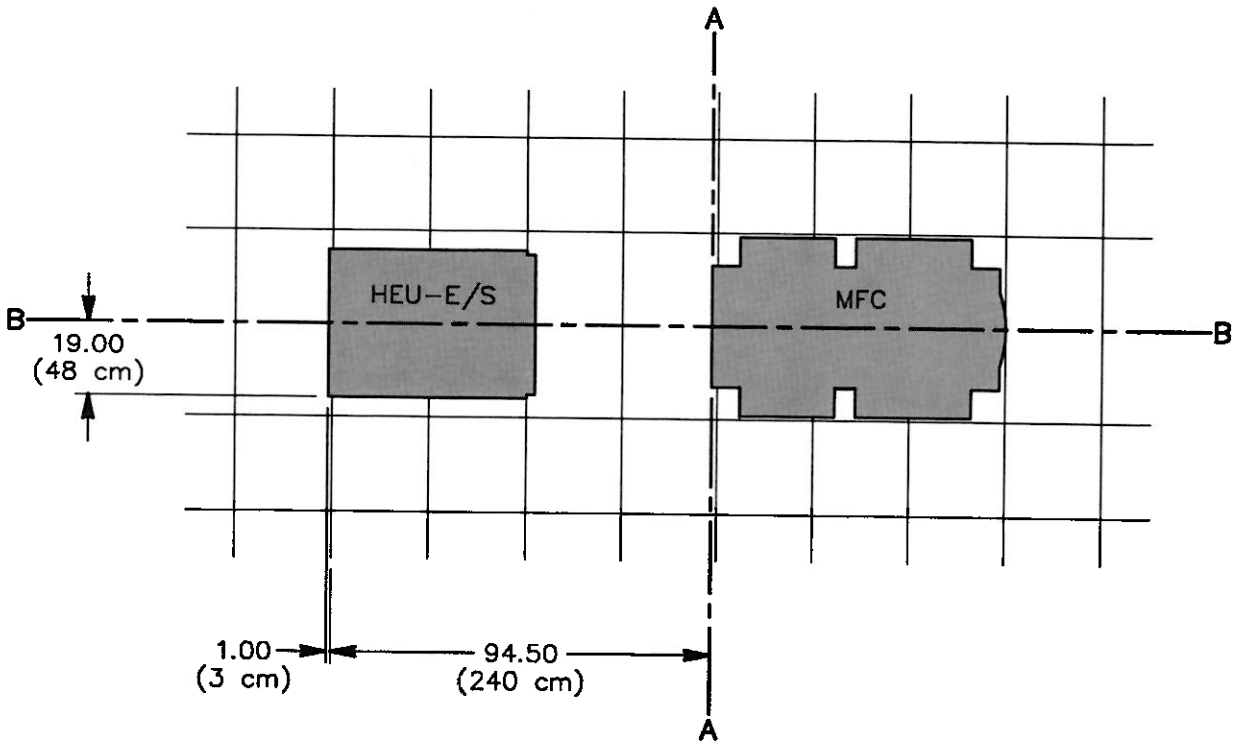


Figure 4-7. HEU-E/S Standard Placement

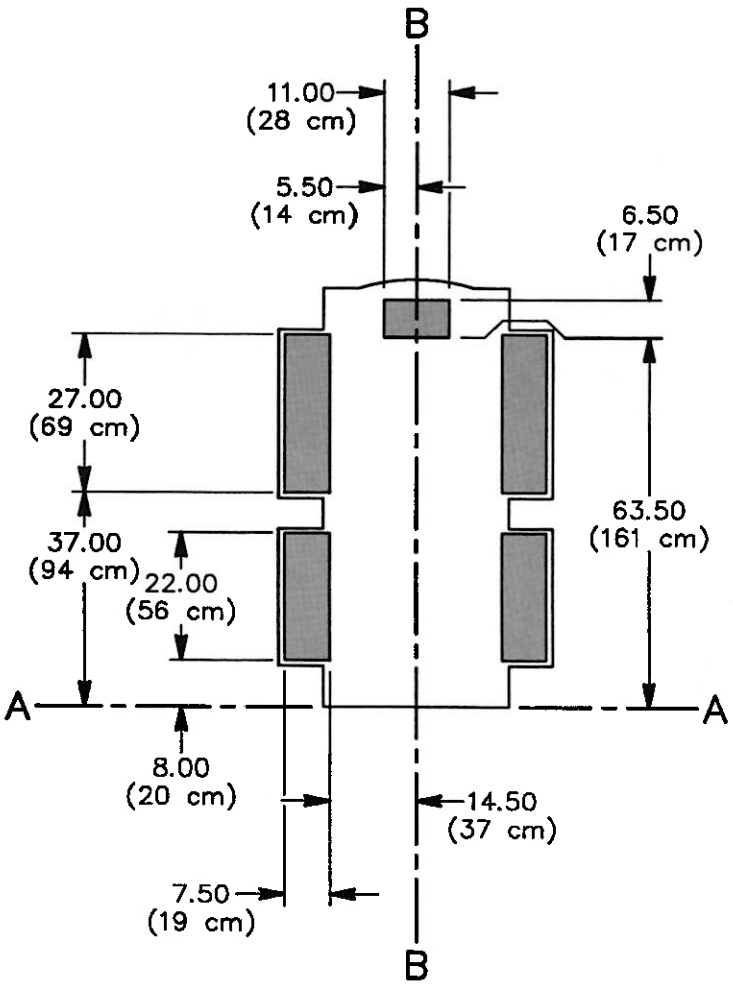


Figure 4-8. CRAY Y-MP8I Mainframe Chassis Floor Cutouts

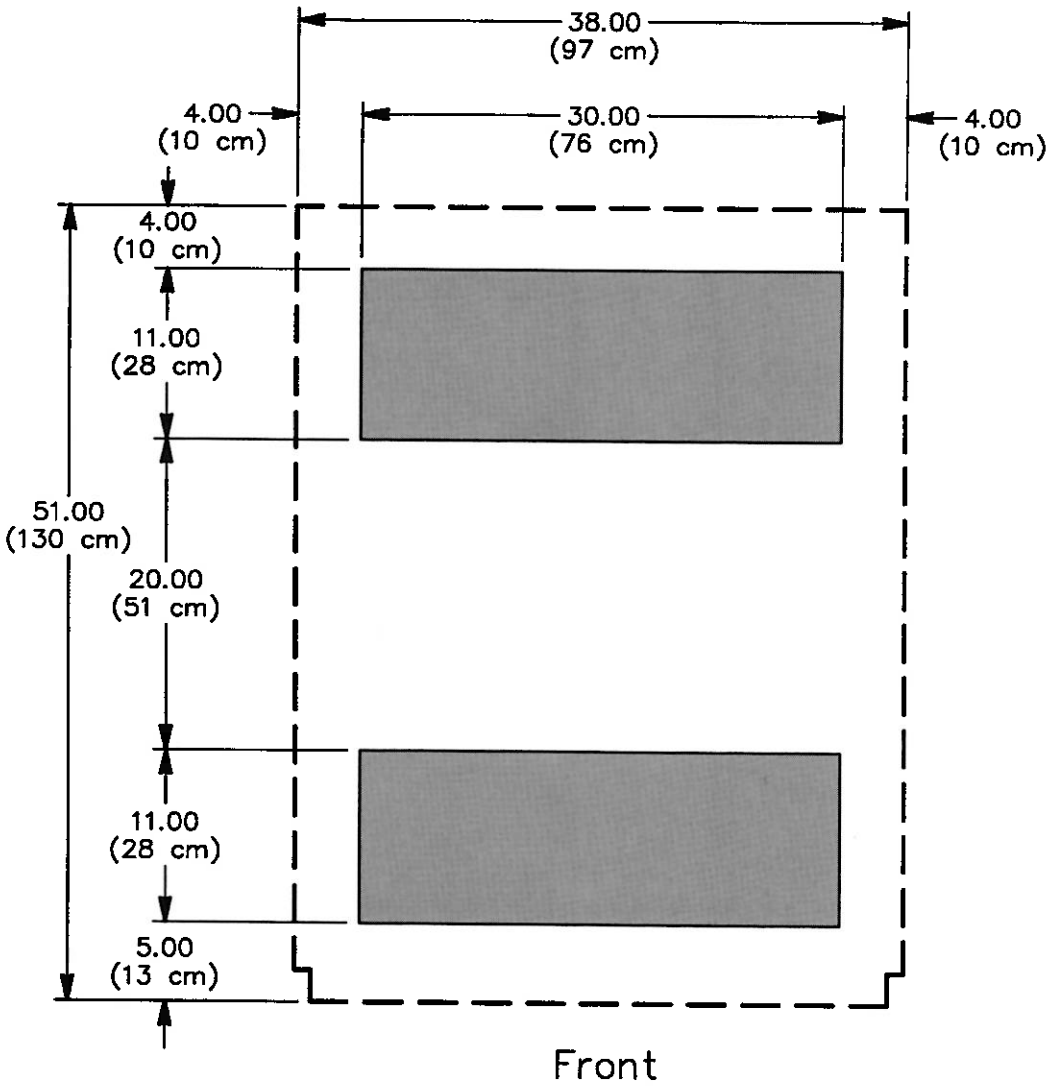


Figure 4-9. HEU-E/S Floor Cutouts

Additional Floor Support Pedestals

Additional floor support pedestals are necessary to accommodate the concentrated floor loading characteristics of the computer equipment.

You must supply and install a minimum of seven additional floor support pedestals to accommodate the mainframe chassis (MFC) floor loading characteristics. Some sites may require more floor support pedestals to restore the structural strength of the floor, depending on the stringer style and panel size. Refer to Figure 4-10 for the location of the additional floor support pedestals.

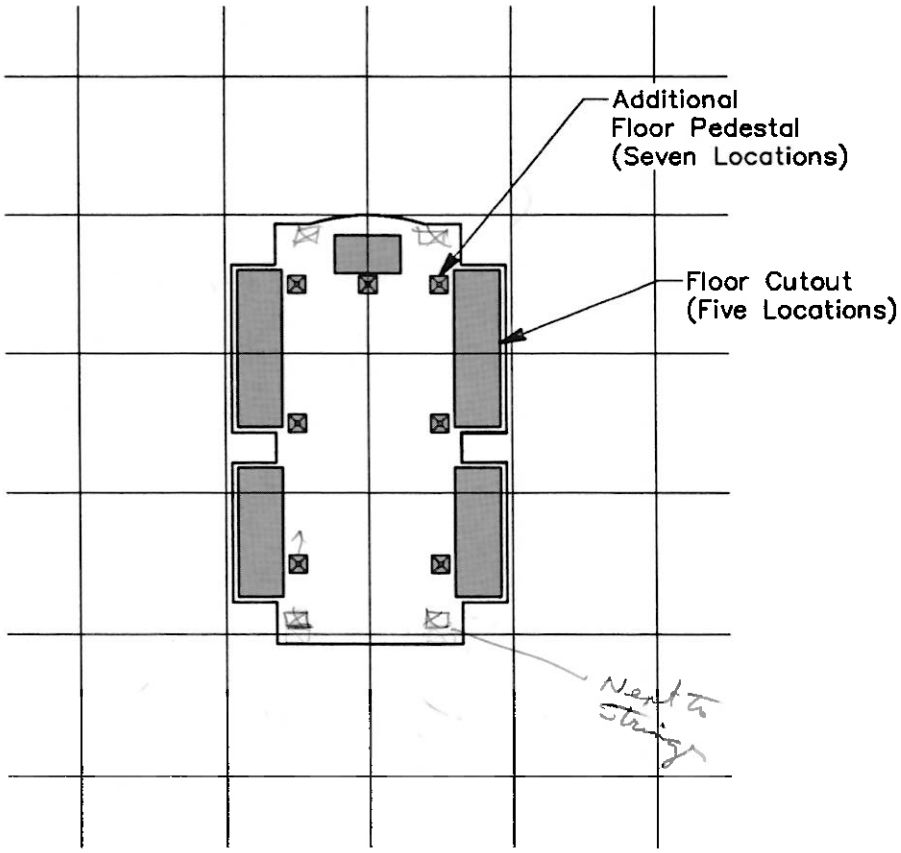


Figure 4-10. CRAY Y-MP8I Additional Floor Pedestal Locations

Power Wiring Requirements

You must provide and install the following power and control wiring for the mainframe chassis (MFC).

- One 208-Vac, 3-phase, 400-Hz circuit from the motor generator set (MGS) to the mainframe chassis (MFC)
- One of the following incoming single-phase, 15-A circuits to each chassis for control power:
  - 120-Vac, 60-Hz circuit, or
  - 220-Vac, 50-Hz circuit
- One 4-wire control circuit between the mainframe chassis (MFC) and the No. 1 MGS for remote voltage sensing
- One 6-wire control circuit between the mainframe chassis and the No. 1 MGS for stop/start capabilities
- One 2-wire shielded cable (Belden 8720) between the mainframe chassis (MFC) and the No. 1 MGS for remote voltage control of the MGSs

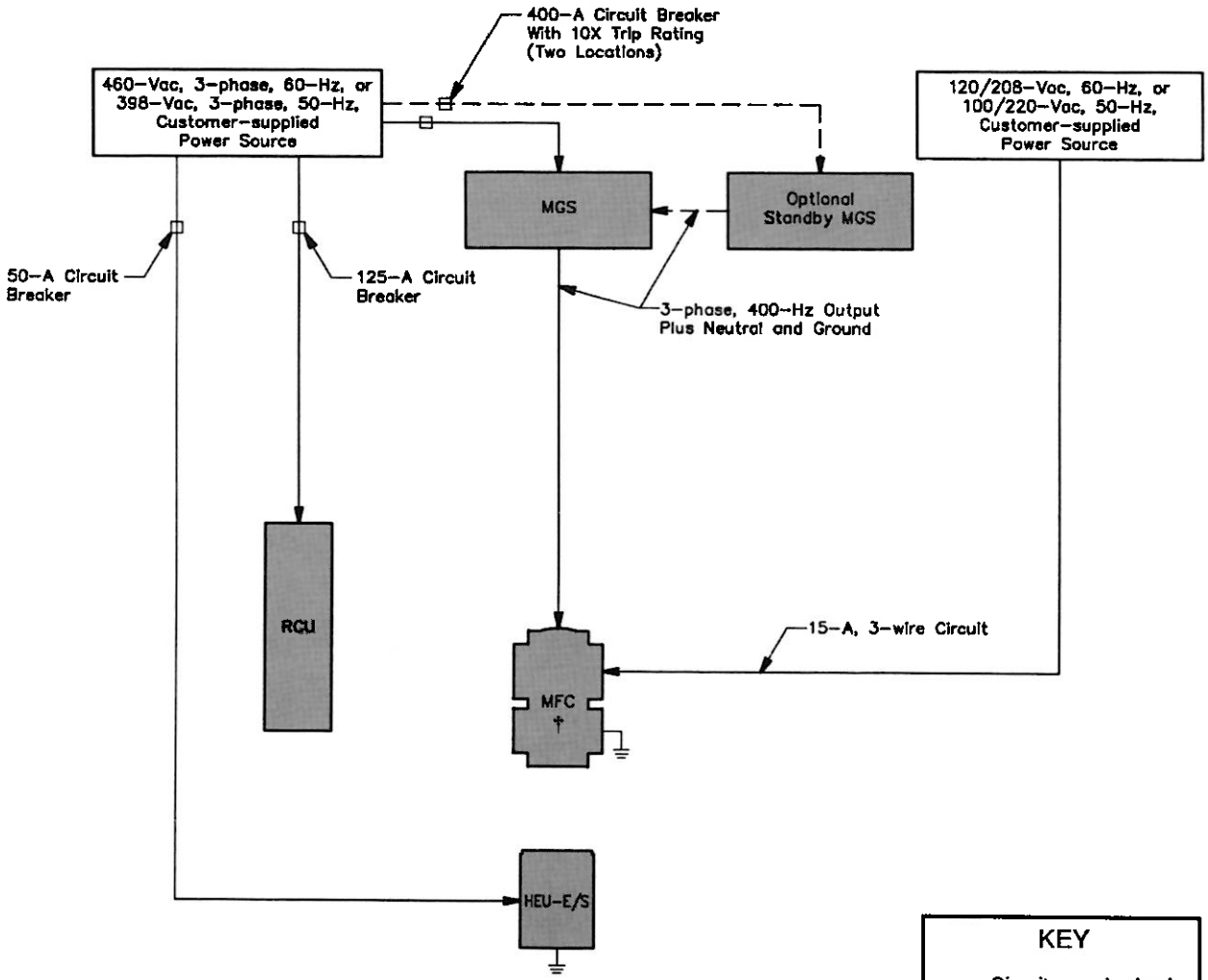
You must supply and install the following circuits for the HEU-E/S:

- One of the following incoming 3-phase, 4-wire, 50-A circuits (including ground wire):
  - 460-Vac, 60-Hz circuit, or
  - 398-Vac, 50-Hz circuit
- One 3-wire control circuit from the HEU-E/S to the refrigeration condensing unit (RCU)

When preparing these circuits, allow 2 ft (0.6 m) of excess wire length above the floor surface to ensure adequate wire length for system connection.

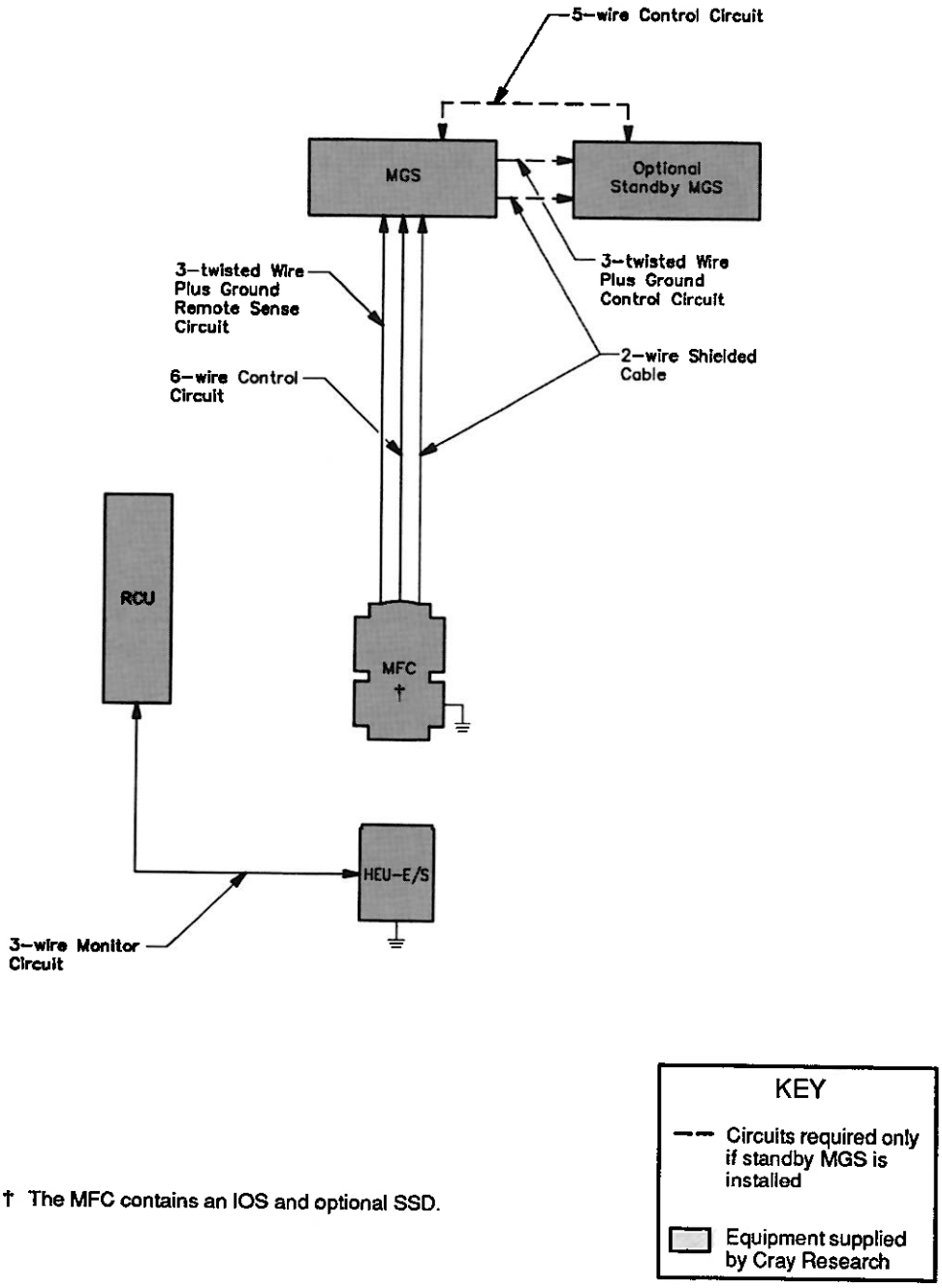
All Cray Research computer equipment must be earth grounded. Refer to the *Equipment Grounding for Cray Research, Inc. Computer Systems*, Site Engineering document number 10658002, for more information about equipment grounding.

Figures 4-11 and 4-12 are block diagrams showing the basic power and control wiring for the CRAY Y-MP8I computer system. The diagrams display the optional standby motor-generator set (MGS). If your computer system does not include this motor-generator set, you do not need to install the wiring associated with this device.



† The MFC contains an IOS and optional SSD.

Figure 4-11. CRAY Y-MP8I Basic Power Wiring



† The MFC contains an IOS and optional SSD.

Figure 4-12. CRAY Y-MP8I Basic Control Wiring

The following notes provide information additional to the block diagrams:

- Figures 4-11 and 4-12 are guides for your electrical design engineer and must not be used as bid documents or working drawings.
- The equipment arrangement shown in Figures 4-11 and 4-12 is not an actual equipment layout.
- All wiring should be prepared according to applicable local and national codes.
- The maximum 400-Hz voltage drop from the MGS to the mainframe chassis (MFC) cannot exceed 2%. Verify that wire sizes and quantity of conductors will meet this requirement.
- All circuit breakers, circuit breaker panels, magnetic contactors, main power disconnect switches, junction boxes, power wiring, raceways, and conduits must be provided and installed by you.
- Conduits or raceways used for 400-Hz power distribution must be aluminum or nonferrous.
- Circuit breakers used for 400-Hz power distribution can be 60-Hz rated, but must be sized for 400-Hz application.
- The minimum suggested control wiring size is #14 AWG (2.5 mm^2).
- Your site preparation design should allow for circuit additions proportionate to system upgrade plans.
- Cray Research recommends the installation of one emergency OFF switch at each computer room exit. All emergency OFF switches should be wired in series and should interrupt power to the computer equipment and to all air-circulating units in the computer room.
- Secure all conduits ending at computer equipment with approved fittings at the equipment entrance.
- Detailed point-to-point diagrams for all wiring connections to the MFC, HEU-E/S, RCU, and MGS are included in the Cray Research-supplied site planning documentation.

Cooling Requirements

The CRAY Y-MP8I computer system uses a dielectric-coolant cooling technique that requires special piping and hoses. Dielectric-coolant hoses are required between the HEU-E/S and mainframe chassis (MFC). Refrigeration piping is required between the HEU-E/S and the RCU. The following subsections provide these requirements. Refer to the "Operational Requirements" section in this manual for more information about cooling water requirements.

Dielectric-coolant Hoses

Flexible hoses are required to complete the dielectric-coolant network between the MFC and HEU-E/S. Cray Research supplies and installs all associated flexible hoses for the dielectric coolant at the time of system installation. Figure 4-13 illustrates the standard arrangement of dielectric-coolant hoses for the CRAY Y-MP8I computer system.

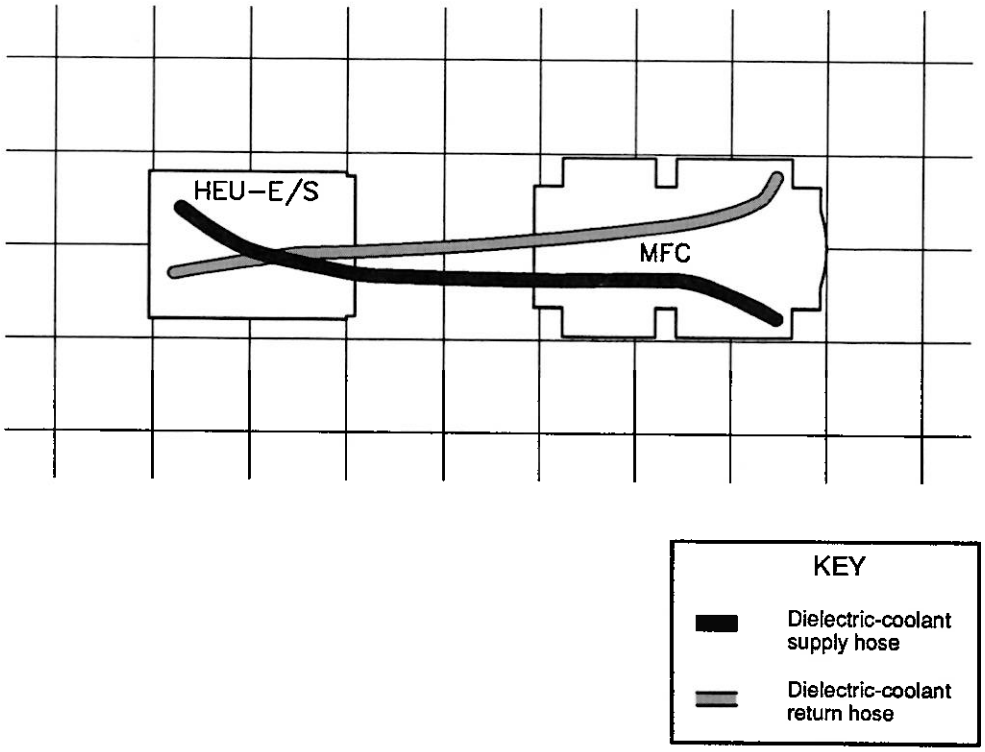


Figure 4-13. CRAY Y-MP8I Dielectric-coolant Hoses

Refrigeration Piping

The HEU-E/S is cooled by a refrigerant cooling technique that requires refrigeration piping to distribute the refrigerant liquid and return the refrigerant vapor to the remote refrigeration condensing unit (RCU). Your mechanical design engineering staff must prepare working drawings providing details about planned refrigeration piping.

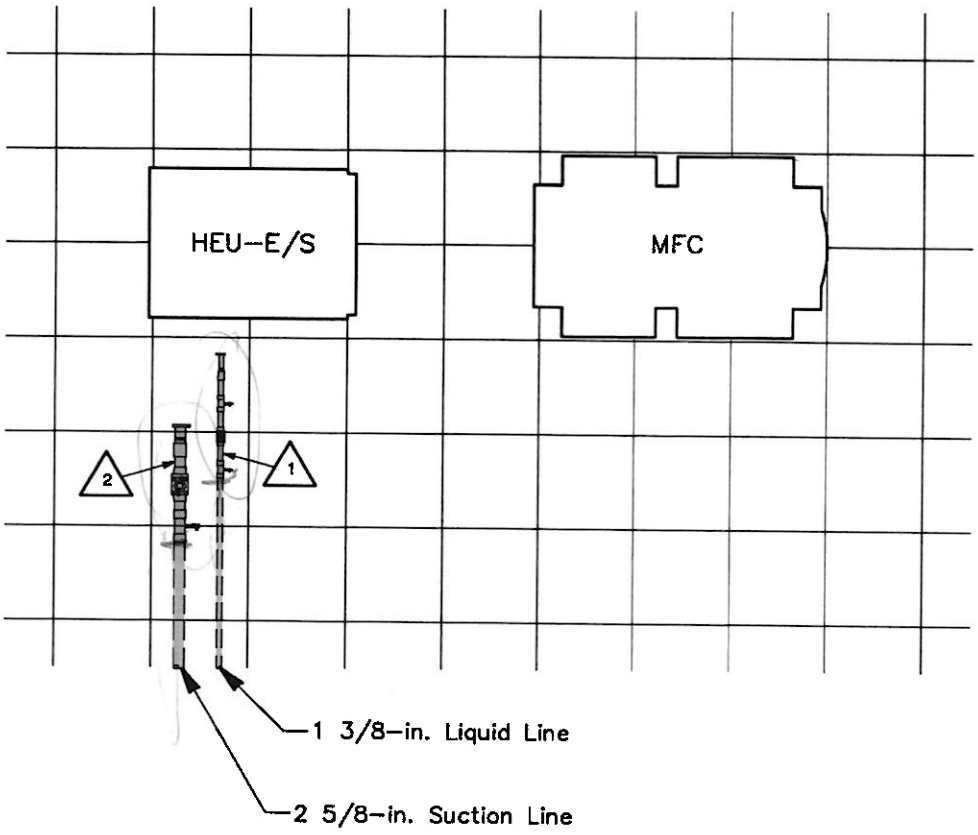
Approximately 8 weeks prior to the computer system delivery, Cray Research will deliver the RCU and a special refrigeration piping component kit to your facility. This kit consists of special manifold assemblies but does not include all refrigeration piping components and materials necessary to prepare the facility.

Figure 4-14 illustrates the refrigeration piping components of the HEU-E/S for the CRAY Y-MP8I computer system. You are responsible for the installation of the special refrigeration components and the RCU. Refer to the *Cray Research Support Equipment Site Planning Reference Manual*, publication number HR-00082, for more information about installing the RCU. You must supply and install all piping, couplings, and elbows needed to interconnect the Cray Research-supplied components and to prepare the facility refrigeration piping for the computer installation. You must also test the refrigeration piping and prepare for final connection before delivery of the computer system.

Cray Research provides the *Refrigeration Piping and Component Installation Requirements*, Site Engineering document number 10650228, during the initial site planning meeting. This document describes the required materials, proper installation procedures, leak testing procedures, and evacuation procedures that must be followed by your facility personnel.

CAUTION

The compressor motor windings in the refrigeration condensing unit (RCU) will overheat if operated without a heat load. Do not energize the RCU prior to system installation.



1 Liquid-line flange assembly-single, Cray Research part number 12187200

2 Suction-line flange assembly-single, Cray Research part number 12187300

Figure 4-14. CRAY Y-MP8I Refrigeration Piping Requirements

At the time of the computer system installation, Cray Research supplies and installs the flexible refrigeration hoses required to complete the refrigeration piping network. In addition, Cray Research installation personnel will charge the refrigeration system, adjust all controls and valves, and apply power to initialize operation of the RCU. You must supply an adequate amount of R-22 refrigerant to fully charge the system (refer to the *Cray Research Support Equipment Site Planning Reference Manual*, Cray Research publication number HR-00082, for more information about your RCU).

The refrigeration piping from the RCU to the computer equipment must not exceed the total equivalent lineal piping restriction of 100 ft (30.5 m), including directional and elevational changes. Directional changes in pipe routing should be minimal. If directional changes are necessary, they should be at 45° angles. All refrigeration piping elbows must be long-radius type.

Changes in pipe routing elevation should also be minimal. When the routing of refrigeration piping requires a vertical rise, the vertical rise must not exceed 25 ft (7.6 m). In most instances, an extended vertical rise requires the construction of a double riser within the suction line. In this case, Cray Research site planning personnel will provide the preferred design requirements for the double riser.

The following notes provide information additional to Figure 4-14.

- You must supply, route, and install the liquid-line and suction-line piping between the HEU-E/S and the RCU. These items must conform to Cray Research engineering requirements and must be approved by Cray Research site planning personnel.

- Refrigerant-grade piping components and materials for the refrigeration piping network must be installed in accordance with the requirements illustrated in Figure 4-14 and Cray Research engineering requirements. Any variations of the piping network requirements must be approved by Cray Research site planning personnel.

- Cray Research furnishes you with the refrigeration components (items 1 and 2) illustrated in Figure 4-14. You are required to install both of these items.

- Cray Research furnishes and installs the flexible refrigerant hoses that connect the liquid and suction lines to the HEU-E/S at the time of system installation.

- Piping support clamps must have a compressible insert between the clamp and the refrigeration piping.

- All refrigeration piping and components must be assembled by you using silver solder and silver soldering techniques according to Cray Research engineering requirements.

- All refrigeration piping and components must be leak tested, evacuated, and prepared for service by you.

- All suction-line piping must be insulated by you after it passes all tests.

Refer to the *Refrigeration Piping and Component Installation Requirements*, Site Engineering document number 10650228, for more information about the installation requirements.