SGI® ICE X in M-cells Site Planning Guide (Four Shelf Version)

007-5910-001

Record of Revision

Version	Description
001	August 2013 Original printing.

Contents

1 Site Preparation Overview

Warnings and Cautions 2
Pallet Jack Requirements 3
About this Guide. 3
Obtaining Publications 3
Reader Comments 4
Physical Location 5
Selecting a Delivery Route 5
Selecting a Final Location 7
Floor Requirements 8
Electrical Requirements 9
Voltage Requirements 9
Power Requirements 10
Grounding Requirements 11
Power Factor 12
Inrush Current 12
Power-line Treatment 13
Total Harmonic Distortion 13
Thermal Requirements 14
Heat Output 14
Air-conditioning Terminology 14
Calculating Thermal Load 15
Water Cooling Requirements 16
Cooling Water Requirements 16
Piping Requirements 17

Cooling Water Supply Requirements 17
Thermal Gradient 18
Cooling In Mission-critical Installations 18
Environmental Requirements 19
Electromagnetic Interference 19
Electrostatic Discharge 19
Vibration 20
Humidity 20
Humidity Gradient 20
Ergonomic Requirements 21
Acoustics 21
Local Regulations 22
Planning for the Future 22

2 Components

Compute Racks 24
Blade Enclosure Pair 25
Power Supplies 27
M-cell Cooling 28
Cooling Racks 28
Cooling Distribution Units (CDUs) 30
M-cell Plumbing Components 32
Water Requirements 35
I/O Expansion Racks 36
Trellis System 37

3 Specifications

Shipping Container Specifications 39
M-rack Shipping Crate 40
Cooling Rack Shipping Crate 41
CDU Packaging 42
Dimensions 44
M-rack Dimensions 44
Cooling Rack Dimensions 45

CDU Dimensions 46
System Specifications 47
Environmental Specifications 50
Shock and Vibration 51

4 Layouts and Clearances

General Recommendations 53
Full M-cell Layouts 54
Full M-cell without CDU 54
Full M-cell with CDU 56
Half M-cell Layouts 59
Half M-cell without CDU 59
Half M-cell with CDU 60
Cutouts and Service Clearance Requirements 61
M-cell 61
CDU 62

5 Site Planning Checklist

Figures

Figure 2-1 M-cell Components 23
Figure 2-2 SGI ICE X M-rack 24
Figure 2-3 Blade Enclosure Pair - Front 25
Figure 2-4 Blade Enclosure Pair Component Numbering 26
Figure 2-5 Blade Enclosure Pair Power Supplies. 27
Figure 2-6 Cooling Rack Used to Cool the M-racks 28
Figure 2-7 Air Circulation within an M-cell 29
Figure 2-8 CDUs are Used with Blades that Have Cold Sinks 30
Figure 2-9 How a CDU Removes Heat from Compute Blade Cold Sinks . . . 31
Figure 2-10 M-cell Plumbing Components 32
Figure 2-11 M-cell Piping Requirements 33
Figure 2-12 CDU Piping Connection Locations 34
Figure 2-13 I/O Expansion Rack 36
Figure 2-14 M-cell with Trellis System 37
Figure 3-1 M-rack Shipping Crate Dimensions 40
Figure 3-2 Cooling Rack Shipping Crate Dimensions 41
Figure 3-3 CDU Packaging (Domestic Shipments) 42
Figure 3-4 CDU Packaging (International Shipments) 43
Figure 3-5 M-rack Dimensions 44
Figure 3-6 Cooling Rack Dimensions 45
Figure 3-7 CDU Dimensions 46
Figure 4-1 Full M-cell (without CDU) Layout 54
Figure 4-2 Full M-cell (without CDU) Layout -- Two M-cells (Shown on 24-in by 24-in Grid) 55
Figure 4-3 Full M-cell with CDU in Cube Configuration (Shown on 24-in by 24-in Grid) 56
Figure 4-4 Full M-cell with CDU in Aisle Configuration (Shown on 24-in by 24-in Grid) 57
Figure 4-5 Full M-cell (with CDU) Layout -- Two M-cells (Shown on 24-in by 24-in Grid) 58
Figure 4-6 Half M-cell (without CDU) Layout (Shown on 24-in by 24-in Grid) . 59

Figure 4-7 Half M-cell (with CDU) Layout (Shown on 24-in by 24-in Grid) . . . 60
Figure 4-8 M-cell Cutouts and Service Clearance Requirements 61
Figure 4-9 CDU Cutouts and Service Clearance Requirements 62

Tables

Table 1-1	Floor Load Terminology	8
Table 1-2	Electrical Service Requirements	9
Table 1-3	Cooling Water Specifications (Example)	16
Table 3-1	System Specifications	47
Table 3-2	Environmental Requirements	50
Table 5-1	Site Planning Checklist	63
Table 5-2	Water Cooling Site Planning Checklist	65

Site Preparation Overview

This document provides information that helps management and facilities personnel prepare for an SGI ICE X in M-cell(s) server installation. It includes general site planning concepts as well as specific site requirements that you may use as a guide during the site planning and preparation process.

SGI site planning representatives are available in the United States of America for site planning consultation; contact a site planning representative by telephone in the USA at +1 715 726 2820; by fax at +1 715 726 2969; or by e-mail at *site@sgi.com*.

Contact your account manager to discuss your site planning, preparation, and installation plans and to obtain configuration information for any system.

Use the following steps as a planning guide for your system installation:

1. Identify the space, power, and environmental requirements for the system.
2. Select a location for the system and identify any necessary modifications.
3. Prepare the site according to the guidelines in this publication. You may use the site planning checklist in Chapter 5 on 63 of this document as a guide.

Warnings and Cautions

Read the following safety and warnings and cautions before you receive your SGI ICE X server.

Warning: The maximum weight of a single water-cooled SGI ICE X M-rack is:

- 2,815 lb (1,277 kg) when in shipping configuration
- 2,415 lb (1,095 kg) when cabled and operating

This system must be moved and installed by trained SGI personnel or authorized agents only. Make sure that the weight of the rack and pallet jack does not exceed the maximum safe floor load limits at your location. Failure to do so may result in property damage, serious injury, or death.

Warning: The maximum weight of an SGI ICE X M-rack is 2,815 lb (1,277 kg). This system must be moved and installed by trained SGI personnel or authorized agents to ensure that the rolling weight of the rack and the pallet jack does not exceed the maximum safe floor load limits at your location. Failure to do so may result in property damage, serious injury or death.

Warning: The maximum operating weight of a single water-cooled SGI ICE X M-rack while operating is 2,415 lb. (1,095 kg). Make sure that the weight of the entire system does not exceed the maximum safe floor load capacity at your location. Failure to do so may result in property damage, serious injury, or death.

Caution: To avoid an impact related injury, keep the water-cooled doors closed when working near (or beneath) the rear of the rack.

Caution: To reduce the likelihood of exposure to personal injury or property damage, SGI recommends that you use a 27-in wide pallet jack to move the system racks or crates. Use the pallet jack to lift the rack only as far as needed to clear obstacles.

Pallet Jack Requirements

Two people are required to push or pull the rack, ideally a third to inspect and clear the path of any obstacles. When possible, use a pallet jack to move crates or racks, especially up/down ramps.

When a pallet jack is not available:

- Push rather than pull the system racks. It is easier and safer to push than to pull. You can use your body weight to assist when pushing.
- Keep close to the load and lock your arms. Try not to lean over and keep your back in its natural arches.
- Use both hands. Racks are easier to push and control using both hands.

About this Guide

This guide is intended for people who are responsible for physical site planning and preparation. By planning for your SGI ICE X in M-cell(s) system installation, you will have the opportunity to make adjustments to your site and order any additional facility equipment, thereby reducing the time required to install your system.

Obtaining Publications

To obtain SGI documentation, go to the SGI Technical Publications Library at http://docs.sgi.com.

Reader Comments

If you have comments about the technical accuracy, content, or organization of this document, please tell us. Be sure to include the title and document number of the manual with your comments. (Online, the document number is located in the front matter of the manual. In printed manuals, the document number is located on the back cover.)

You can contact us in any of the following ways:

- Send e-mail to site@sgi.com
- Contact your customer service representative and ask that an incident be filed in the SGI incident tracking system.
- Send mail to the following address:

  SGI Site Planning
  890 Technology Way
  Chippewa Falls, WI 54729-0078
  USA

Physical Location

This section addresses the issues that you need to consider when you select a physical location for a new system.

Selecting a Delivery Route

Warning: The maximum weight of a single water-cooled SGI ICE X M-rack is:

- 2,815 lb (1,277 kg) when in shipping configuration
- 2,415 lb (1,095 kg) when cabled and operating

This system must be moved and installed by trained SGI personnel or authorized agents only. Make sure that the weight of the rack and pallet jack does not exceed the maximum safe floor load limits at your location. Failure to do so may result in property damage, serious injury, or death.

To ensure that the system can be delivered to the planned location, answer the following questions before you plan a delivery route for the new system:

- Will the shipping crate fit through doorways and hallways and on elevators?

  In addition to measuring the width of the hallways along the planned delivery route, measure corners where the system might get stuck, the width and height of doorways and elevators, and other areas that may cause problems. Table 3-1 lists the relevant system dimensions.

- **SGI recommends that you use a pallet jack to position the rack as close as possible to its final destination.** If the shipping crate cannot be transported to the final destination, can you unpack the system somewhere else?

  Often it is possible to unpack the system in a hallway or on a loading dock, and then roll the system to its final destination.

- Is the floor strong enough to support the weight of the system?

  Determine the weight of each rack and verify that the floor along the delivery route can safely support the weight. Refer to Table 3-1 for the maximum weight per system rack. Refer to “Floor Requirements” on page 8 for information about floor loading.

  Note: It may be necessary to depopulate IRUs in the rack to reduce the weight of the system. You may also consider using floor plates to disperse the weight of the system during transport to its final location.

- Is the elevator capable of lifting the system?

  If the intended delivery route includes an elevator, check its weight capacity and size against the system specifications listed in Table 3-1. The use of freight blankets can reduce damage to the elevator or the system.

- Are there any steep angles, bumps, changes in level, or thick carpeting along the delivery route?

  Large systems are typically equipped with casters. However, the casters are designed to roll easily only on relatively smooth, level surfaces. Ramps, sliding door channels, rough flooring, and even thick carpeting may present difficulty. If in doubt, arrange for additional assistance. The maximum access incline should not exceed 10 degrees (height:length = 1:6).

- Did you ensure that the leveling pads are fully retracted?

  Some systems have screw-in leveling pads. If you move the system with these feet extended, severe damage to the chassis can occur. These feet sometimes unscrew during shipment. Before you unpack or move a system, ensure that the leveling pads are fully retracted.

Selecting a Final Location

Consider the following issues when you select a final location for the system:

- Will the system fit in its intended location?

  Carefully calculate the total system dimensions to ensure that it will fit in its intended final location.

- Does the intended system location provide adequate access space for maintenance?
- Even if the system will fit in its intended final location, you must have room to maintain it. Ensure that you have enough room to open the doors, remove boards, and accomplish other routine tasks. Table 3-1 lists the relevant system dimensions. Chapter 4, “Layouts and Clearances” shows the typical computer room floor space requirements. As a general rule, SGI ICE X systems require 48-in of clearance from the front and rear of the rack. Side access to the rack is not required for service.
- Is the intended location subject to flooding, extremes of humidity or temperature, or any other factor that would make it inappropriate for sensitive electronic equipment?

  The air temperature should not be too high and should not fluctuate dramatically, air should circulate freely and be relatively dust-free, and the system should not be exposed to any caustic or corrosive chemicals or vapors. Refer to Table 3-1 for computer room air temperature requirements.

- Will the system interfere with normal traffic through aisles, hallways, or entrance ways in the intended location?
- Will the intended location enable you to conveniently perform routine operations, such as loading and unloading media, attaching cables, and so on?
- Is the floor of the intended final location strong enough to support the weight of the system and any future expansions? Large systems should be installed in computer rooms with raised floors. Pay particular attention to floor loading and weight distribution in this case. Floor-loading specifications are typically calculated by averaging the total chassis weight that is distributed over the entire footprint of the chassis. Because the chassis sits on four casters or four leveling pads, the load at each of these four points is greater. Refer to “Floor Requirements” on page 8 for more information about floor loading.
- Does the intended location of the system allow for future expansion plans?
- Is there the potential for seismic activity in your area?.

Floor Requirements

The total system weight on a facilities floor and the building structure must be considered. The computer room floor, as well as any floors along the delivery route, must be able to support the total weight of the computer system when installed as well as the weight of individual racks as they are moved into position.

Note: It may be necessary to depopulate blade enclosures in the rack to reduce the weight of the system. You may also consider using floor plates to disperse the weight of the system during transport to its final location.

Any floor system should be evaluated and verified by a structural engineer or appropriate floor consultant. They should use the manufacture's specifications to determine what floor loading characteristics the floor should have to support this computer equipment.

SGI recommends a bolted stringer understructure raised floor. Raised floor systems provide space to route power and signal cables as well as room for cooling water pipes if needed. The height of the raised floor should be at least 24-in (61 cm).

Table 1-1 lists some commonly used floor load terminology.

Table 1-1 Floor Load Terminology

Live Load	The load that the floor can safely support. Lbs/Sq Ft (KG/Sq m)
Concentrated Load	The load that a floor panel can support on one square inch at its weakest point, typically the center of the panel, without the panel deflecting more than a predetermined amount.
Ultimate Load	The maximum load per floor panel that the floor system can support without failure such as bending or braking.
Rolling Load	The load a floor panel can support without failure when a wheel or castor of a specified diameter and width is rolled across the panel.
Average Floor Load	Determined by dividing the total equipment weight by the area of the footprint of equipment expressed in Lbs/Sq Ft (KG/Sq M). Average floor loading is useful for determining floor loading at the building level, such as the area of solid floor or raised floor panels covered by the systems footprint.

Electrical Requirements

An SGI ICE X server requires electrical resources beyond those that are normally provided in a typical office environment. The following sections describe those requirements in general. These sections, along with the data presented in subsequent sections, can help you determine the exact requirements for the new system. Table 1-2 lists the electrical service requirements.

Table 1-2 Electrical Service Requirements

Electrical Service	Requirement
Phase imbalance	5% maximum (line-to-line, line-to-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

Voltage Requirements

SGI ICE X servers in M-cells ship with three-phase input power. Refer to Table 3-1 on page 47 for the voltage requirements of the rack. You must ensure that your account manager knows of your needs before the system is ordered.

Ensure that the required voltage is available and is within a reasonable distance of the intended location. If it is not, the site must be wired for the required voltage.

Power Requirements

Power is measured in voltamperes (VA) and watts. Both measurements are important when you prepare to install wiring, power conditioning, and cooling.

A VA rating is a function of the voltage and amperage of a system. A watt rating is the VA rating multiplied by its power factor (refer to the section titled “Power Factor” on page 12). You can convert among amps, volts, VA, power factor, and watts by using the following formulas:

Single Phase	Three Phase
$VA = (Amps \cdot Volts)$	$VA = (Amps \cdot Volts \cdot 1.73)$
$VA = \left(\frac{Watts}{Power\ Factor}\right)$	$VA = \left(\frac{Watts}{Power\ Factor}\right)$
$Watts = (VA \cdot Power\ Factor)$	$Watts = (VA \cdot Power\ Factor)$
$Amps = \left(\frac{Watts}{Volts \cdot Power\ Factor}\right)$	$Amps = \left(\frac{Watts}{Volts \cdot Power\ Factor \cdot 1.73}\right)$

Even one SGI ICE X server rack can require more power than is routinely available in an office environment (approximately 34.58 kVA). A room full of racks will almost certainly require specially installed electrical circuits. Refer to Table 3-1 on page 47 for the power requirements of the rack. (The calculated power consumption for specific SGI ICE X rack configurations is available from your SGI site planning representative.)

Note: To maintain a ground potential of less than 250 millivolts between interconnected SGI ICE X systems, SGI requires that all power circuits that supply power to an SGI ICE X system originate from the same distribution panel if possible. If not, they must originate from the same source (transformer). Electrical work and installations must comply with all applicable local, state, and national electrical codes.

SGI makes every effort to minimize the effects of power failures and interruptions to the system hardware. Studies indicate that computer systems that are subjected to repeated power interruptions and fluctuations experience higher component failure rates than systems with stable power sources.

SGI encourages you to install a stable power source, such as an uninterruptible power system (UPS), to minimize component failures. Each SGI ICE X system and each piece of support equipment requires its own customer-supplied receptacles. If you have difficulty obtaining the correct receptacles as listed in Table 3-1, please contact your account manager.

Note: The wattages listed in this guide are the system maximums. While most systems may never draw the maximum rated wattage, SGI recommends that you install wiring that is capable of supporting the system's maximum potential wattage.

If, after you add up the power requirements of all the devices in the room, you find that the total is close to the limit that the existing wiring can support, you should install additional power circuits to support the systems.

Grounding Requirements

- Ensure that the ground has sufficiently low impedance in order to limit the voltage to ground and to facilitate the operation of protective devices in the electrical circuit.
- Ensure that all grounds entering the room are interconnected somewhere within the building to provide a common ground potential. This includes any separate power sources, lighting, convenience outlets, and other grounded objects such as building steel, plumbing, and ductwork. Refer to the *IEEE Emerald Book: IEEE Recommended Practices for Powering and Grounding Electronic Equipment* and the *National Electric Code (NEC)* for power, grounding, and life safety issues.

Caution: Any difference in ground potential greater than 250 millivolts between two racks can cause severe equipment damage.

- To maintain an entire M-cell at the same electrical potential, all racks in it must be bolted together with bonding straps.

Power Factor

Power factor is a number between 0 and 1 that represents the ratio of the total power in watts to the total volt-amperage input. A system with a power factor of one (sometimes called “unity”) is making full use of the energy that it draws. A system with a power factor of 0.75 is effectively using only three-quarters of the energy that it draws.

SGI ICE X systems are power-factor corrected and thus have a power factor very close to 1. Some peripherals do not have this correction built in.

Caution: Ensure that you consider the power factor of the system when you select an uninterruptible power supply (UPS).

Inrush Current

Inrush current is the peak current that flows into a power supply as AC power is applied. The inrush current is usually much higher than the nominal current. This temporary increase is due to the charging of the input filter capacitors in the power supply and is limited only by the input impedance of the power supply and the wiring that supplies power to the system.

The inrush current often far exceeds the rating of the electrical outlet to which the system is connected. If the system is connected directly to “wall power” (that is, it is not on a UPS or a standby power system [SPS]), this is typically not a problem. The peak inrush current lasts for only a part of one AC cycle (less than 1/60 of a second). This is not long enough to damage wiring and, in most cases, will not trip a circuit breaker (depending on the delay curves of the circuit breaker).

It is very important that you consider the inrush current of the system when you select a UPS or SPS. Unlike power-company lines, these power-conditioning devices may not be able to supply the current that is required during power-on, even if they are sized appropriately for nominal current loads. For more information, refer to the following “Power-line Treatment” section.

It is possible for the inrush current drawn by a device to cause a slight drop in the line voltage. Although it is very brief, this drop can, in unusual situations, be enough to cause problems in other devices on the same line.

Inrush current is a characteristic of the power supplies in a system. The inrush current values apply whether the system is heavily or lightly loaded. Therefore, although a lightly loaded system may draw less power while it is running, it may still draw a very large inrush current.

SGI ICE X systems typically have low inrush characteristics.

Power-line Treatment

Power-line treatment may be required if the site has unstable power that results in problems such as fluctuating voltage, transients, surges and spikes, and noise. Common causes of unreliable power are old wiring; load-switching equipment, such as welding and plating devices; and variable-speed motors or motors that start and stop frequently.

A variety of devices are available to improve the quality of a power line, including:

- Line conditioners
- Line regulators
- Isolation transformers
- UPSs

Ask your SGI representative for more information about power solutions.

Total Harmonic Distortion

Table 3-1 lists total harmonic distortion (THD). Total harmonic distortion is a measure of the extent to which a waveform is distorted by harmonic content. This rating indicates how much the power supply in the system affects the quality of power delivered to other systems that are supplied by the same transformer.

Note: While the term *total harmonic distortion* can be applied to either voltage or current, all of the numbers listed in this guide apply to current.

Thermal Requirements

It is important that SGI ICE X systems be maintained within their rated thermal range.

Refer to Table 3-1 on page 47 for the temperature ranges for each rack, both operating and nonoperating as well as the recommended operating ambient temperature. Typically, the upper limit of the temperature range is more likely to become a problem than the lower limit.

Heat Output

All of the systems that this guide describes have a maximum rated operating temperature. Exceeding this temperature greatly increases the rate of hardware failure and, in many cases, causes the system to shut itself down.

All of the power consumed by a computer system must exist as some form of energy. For air-cooled systems, this energy exists in the form of heat in the surrounding air. Every watt drawn by a system is eventually dissipated as heat. This heat tends to raise the temperature of the air in the room that houses the system. Therefore, some method is needed to keep the temperature within the required range. The typical method is to install additional process cooling capacity or to order a system with water-cooled racks.

The maximum heat dissipation-to-air per rack is listed in Chapter 3, “Specifications”.

Air-conditioning Terminology

Air-conditioning capacity is generally measured in Btu/hr, tons, or kilocalories (kcal). A Btu, or British thermal unit, is the amount of energy needed to raise the temperature of one pound of water by one degree Fahrenheit at a constant pressure of one atmosphere. One ton of air conditioning removes 12,000 Btu of heat energy per hour.

The more systems that are installed in a given area, the larger the air-conditioning capacity that is required. It is important to calculate the total thermal load of the systems that you will be installing and determine whether the existing air-conditioning system can handle the additional load. If not, you must provide additional cooling capacity.

Calculating Thermal Load

You can calculate the thermal load as follows:

1. Add the wattages of all the items in the room.
2. Calculate Btu/hour by multiplying the total wattage by 3.41.
3. Calculate the kcal/hour by multiplying the total wattage by 3.23.
4. Calculate the tons of air-conditioning load by dividing Btu/hr by 12,000.
   1 kBtu/hr = 1000 Btu/hr
   12,000 Btu/hr = 1 ton of air-conditioning load

The calculations above yield results that represent the maximum thermal output of the equipment. These calculations and the heat-dissipation numbers that Table 3-1 on page 47 lists are based on maximum rated wattage.

The thermal figures quoted in this guide are likely to be worst-case figures.

Some sources quote a “typical” thermal output for a system, which may be significantly less than the numbers listed in this guide. Selecting an air-conditioning capacity that accommodates the “worst-case” thermal output, however, helps to minimize system problems later.

When you calculate the air-conditioning capacity that is required, be sure to include the heat load from computer equipment that is already installed at the site, noncomputer equipment that is already installed at the site, and the computer equipment that is being added. Also remember to include noncomputer equipment that is already installed or will be installed, and other factors such as solar gain, outside ambient air temperatures, and the number of people who work in the room.

Water Cooling Requirements

The following requirements must be met for the water-cooling used in M-rack configurations:

- "Cooling Water Requirements" on page 16
- "Piping Requirements" on page 17
- "Cooling Water Supply Requirements" on page 17

Cooling Water Requirements

Each water-cooled rack requires a customer-supplied source of clean cooling water. The system will operate on cooling water supply temperatures from 45 °F (7 °C) to 60 °F (15.5 °C). The actual heat rejection to water, water flow rate, and pressure drop values depend on the temperature of the water used.

Caution: Water flow and pressure drop values will differ for treated water (antifreeze, corrosion inhibitors, etc.) depending on the percentage (maximum 30% by volume) of treatment in the solution. Water flow and pressure drop values will also differ with the temperature and pressure of the water supply. Water pressure must be limited to 100 psig (690 kPA) maximum.

Example:

The following example values are based on 100% water at a supply temperature of 60 °F (15.6 °C). Anticipated water-temperature increase across the coil is 12 °F (7 °C).

Table 1-3 Cooling Water Specifications (Example)

	Heat Rejection to Water (based on a rack at 30.55 kW)		Water Flow Rate		Pressure Drop	
	kBTU/hour	Tons	gpm	m^3/hour	psi	kPA
Each Cooling Tower	135.70	11.31	22.61 gpm	5.13	20	138
Each CDU	479.28	39.94	79.88 gpm	18.13	20	138

Piping Requirements

Water piping must be installed under the raised floor within 3 ft (.91 m) of the front of each cooling tower and within 3 ft (.91 m) of the rear coils. SGI supplies flexible hoses with female quick-disconnect couplings to connect the cooling distribution unit (CD) to the facility piping connectors. Each cooling tower and CDU requires one supply and one return pipe connection. It is the customer's responsibility to supply:

- 2 inch male pipe thread for cooling tower
- 2.5 male pipe thread for CDU
- NPT thread for domestic locations and BSPT thread for international locations

SGI also recommends that you:

- Place isolation valves (ball-valves or butterfly valves) near the quick-disconnect nipples
- Insulate the chilled-water supply and chilled-water return piping under the raised-floor to minimize condensation
- Install a condensate drain/pipe to provide connection to an SGI supplied 6 ft (1.8 m) long, 1/4 inch (5.71 mm) outside diameter nylon drain hose from each cooling tower.

  You must supply one 1/4-inch push-to-connect type fitting [Parker P/N W68PL-4-6 or equivalent} connection point within 4 ft (1.2 m) of the front of each cooling tower floor cutout.

Cooling Water Supply Requirements

The cooling towers and CDUs can be supplied with water ranging in temperature from 45 to 90 °F (7.2 to 32 °C); however, water temperatures cooler than 60 °F (15.6 °C) could cause condensate to form on the hoses and manifolds.

The customer may treat the cooling water for each cooling tower and the primary circuit in the CDU with glycol or corrosion inhibitors up to a maximum of 30%. Distilled water with an inhibitor should be used in the CDU secondary circuit; approximately 55 gallons is required for each CDU. Water pressure must be limited to 100 psig (690 kPA) maximum.

Based on pure cooling water supplied at 60 ºF (15.6 ºC), each cooling tower could require up to 16 gpm (3.63 m^3/hr) and each CDU up to 80 gpm (18.16 m^3/hr). SGI will provide rates based on you specific configuration. The corresponding cooling water pressure drop for the (coil + hoses + mated quick-disconnect fittings) shall be less than 20 psig (140 kPa). These flow and pressure drop values are based on analytical modeling of expected CDU performance.

Thermal Gradient

Table 3-1 on page 47 includes a maximum thermal gradient for each system. The thermal gradient is the rate at which the temperature changes, which is typically expressed in degrees per hour. Temperature changes that are more rapid than the given rate can damage some of the components in the system.

Unless otherwise indicated, the thermal gradients listed apply whether or not the system is operating.

Cooling In Mission-critical Installations

In mission-critical installations, it is important to consider what would happen if an air conditioner or chiller failed. Complete consideration of this topic is beyond the scope of this guide; however, consider the following questions:

- Should the site have multiple air-conditioning or chiller units, each capable of maintaining a safe temperature?
- If an air conditioner or chiller fails, how long can the systems run before they get too warm and must be shut off?
- Can the air conditioner or chiller be repaired before the systems get too warm?

Environmental Requirements

Electromagnetic interference (EMI), electrostatic discharge (ESD), vibration, and humidity can cause problems for computer systems.

Electromagnetic Interference

Electromagnetic interference (EMI) is caused by malfunctioning, incorrectly manufactured, or incorrectly installed devices that radiate electrical signals. Common sources of EMI include electronic, telephone, and communications equipment. EMI transmissions can be conducted or emitted.

Use properly shielded connectors and cables throughout the site.

Caution: Failure to use shielded cables where appropriate may violate FCC regulations and void the manufacturer's warranty.

Electrostatic Discharge

SGI designs and tests its products to ensure that they resist the effects of electrostatic discharge (ESD). However, it is still possible for ESD to cause problems that range from data errors and lockups to permanent component damage. To protect the systems from ESD, follow these precautions:

- Minimize the use of carpeting at computer locations (or consider special static-reducing carpet).
- Ensure that all electronic devices are properly grounded.
- Keep chassis doors and access panels closed while the system is operating.
- Fasten all screws, thumbnail-fasteners, and slide locks securely.
- Use a grounded static wrist strap whenever you work with the chassis or components.
- Use antistatic packing material for storage and transportation.
- Clear the site of all devices that create static electricity or provide possible sources of EMI.

Vibration

The SGI ICE X server is designed for typical computer room environments; it requires no special modifications or protection. If you plan to install a system at an industrial site, ensure that vibration does not exceed the limits in Table 3-1 on page 47.

Humidity

Table 3-1 on page 47 lists the maximum humidity levels for each rack, both operating and nonoperating. Exposure to humidity levels above the rated maximums and/or exposure to condensation can damage equipment.

Humidity Gradient

Table 3-1 on page 47 lists the maximum humidity gradient for the system. The humidity gradient is the rate at which the humidity changes, which is typically expressed in percent relative humidity per hour. Humidity changes that are more rapid than the given rate can damage some of the components in the system. Unless otherwise indicated, the humidity gradients that are listed apply whether or not the system is operating.

Ergonomic Requirements

When you select a physical location, pay attention to ergonomic considerations. The location of a system often restricts the location of the devices that attach to it, such as monitors, keyboards, and so on. Decisions that are made during the installation process can affect workers much later.

In addition to attached devices, consider other issues such as noise, temperature, air quality, and so on, some of which may be affected by the addition of the new system.

Acoustics

The acoustic measurement that Table 3-1 on page 49 lists is approximate. Acoustic values depend on many factors that are outside the control of the manufacturer. Room characteristics such as carpeting and wall coverings affect the noise levels at an installation. The acoustic measurement provided in this document is in dBa (decibels absolute) rather than dB (decibels). This is a measurement of weighted absolute noise power, and it includes frequency corrections.

If a site exceeds desirable noise levels, try these remedies:

- Reduce the quantity of flat reflective surfaces, such as glass, tile, or metal.
- Add sound-absorbing wall coverings, drapes, and ceiling tiles.
- Add sound baffles in critical locations (without blocking airflow).
- Modify the office space to separate the operators from the hardware.

Local Regulations

Before system installation, become familiar with any applicable local regulations. Because these vary dramatically by country and state, it is difficult for SGI to provide a complete list of such regulations. These regulations, however, might involve:

- Power
- Emissions
- Safety issues
- Ergonomic and health issues
- Telecommunications

I you have suggestions about obtaining the local regulations, please ask your SGI representative for assistance.

Planning for the Future

Even if the existing infrastructure can handle the immediate site needs, consider the future plans. It is much easier to provide enough space, power, air-conditioning capacity, chilled water capacity and other resources in advance, rather than to add them later.

Components

An SGI ICE X system is an integrated compute environment that can scale to thousands of Intel processor cores, terabytes (TBs) of memory, and petabytes (PBs) of storage.

M-cell configurations provide closed-loop, sealed layouts that isolate the system from the computer room air. M-cell configurations include compute racks and cooling racks (refer to Figure 2-1) Water running through coils inside the cooling racks transfer heat from the system to the facility chilled water system.

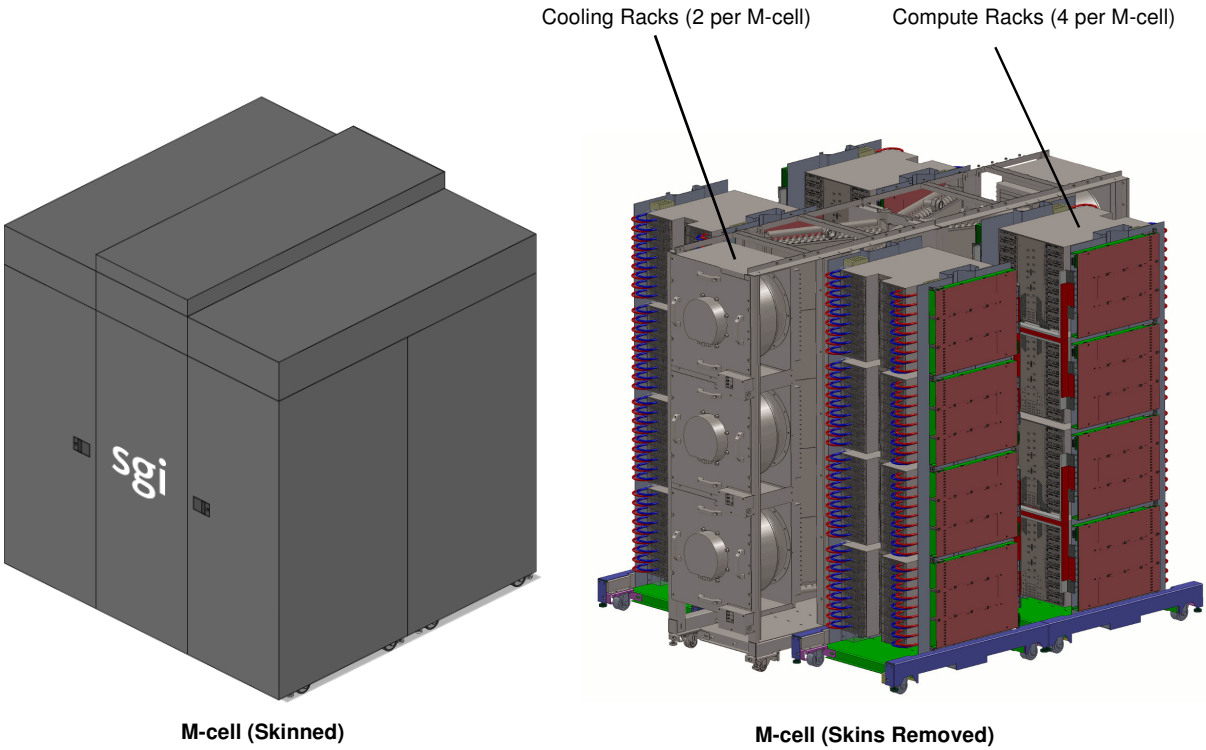


Figure 2-1 M-cell Components

Compute Racks

Each SGI ICE X compute rack contains up to two blade enclosure pairs, 24 power supplies, and two power distribution units (PDUs). Compute racks use the SGI M-rack; refer to Figure 2-2.

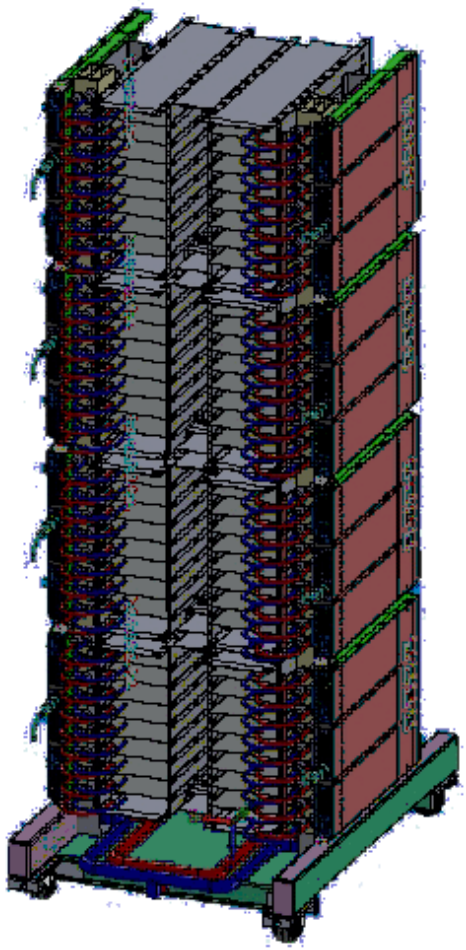


Figure 2-2 SGI ICE X M-rack

Blade Enclosure Pair

The basic building block in an M-rack is the blade enclosure pair. A blade enclosure pair provides power, system control, and the network fabric for up to 36 compute blades (refer to Figure 2-2).

Compute blades can support up to four four-core, six-core, or eight-core Xeon processor sockets and 16 fully-buffered DDR3 memory DIMMs. Two blade enclosure pairs reside in a 42U high M-rack.

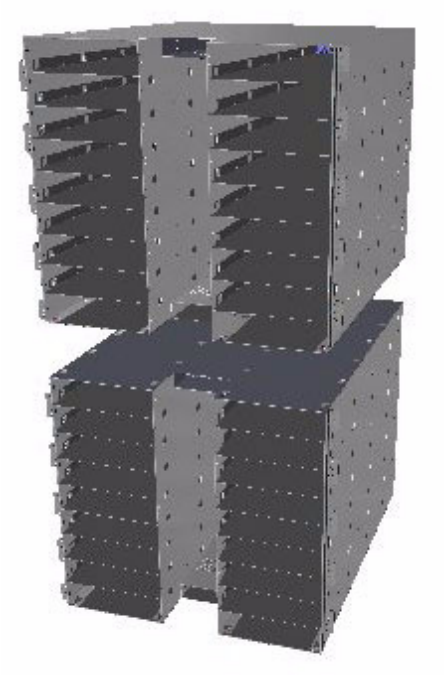


Figure 2-3 Blade Enclosure Pair - Front

Figure 2-4 shows the numbering for components in each blade enclosure pair.

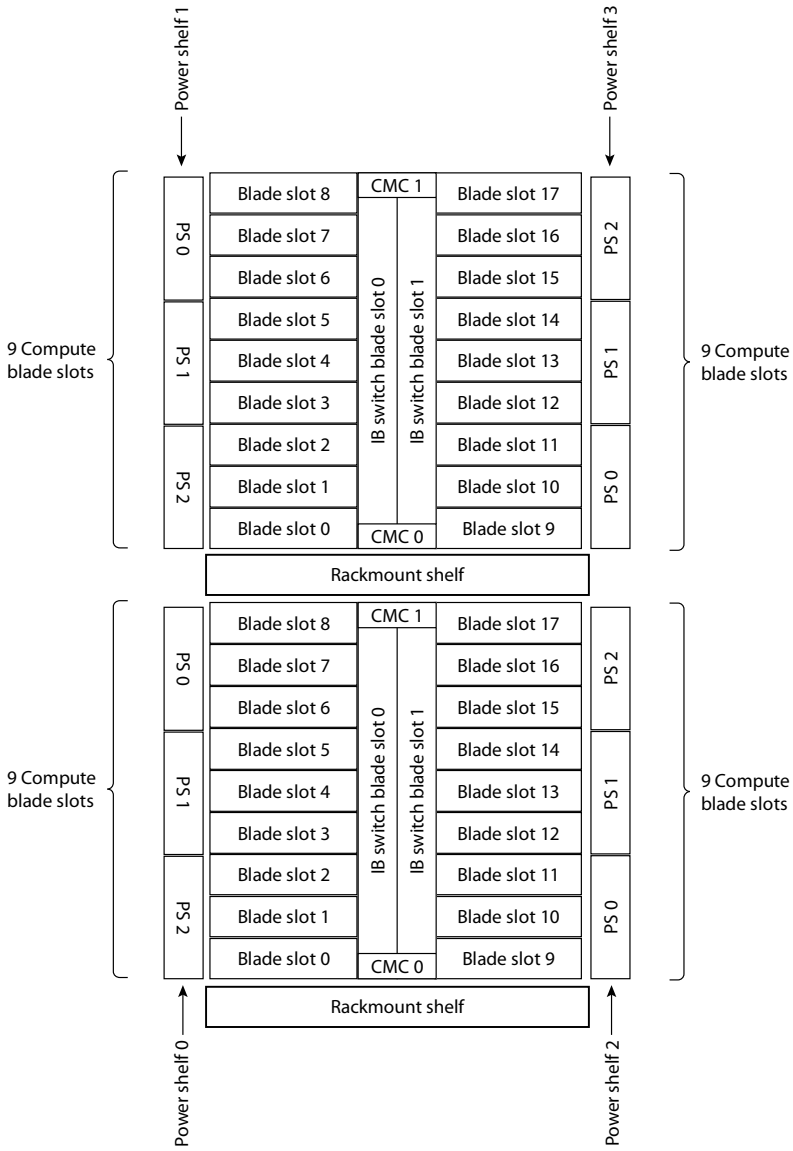


Figure 2-4 Blade Enclosure Pair Component Numbering

Power Supplies

A blade enclosure pair uses up to 12 hot-swappable 3,037W 12V power supplies to provide power to components located in it. Four power shelves are mounted on the sides of the blade enclosure pair; each shelf holds three power supplies (refer to Figure 2-5).

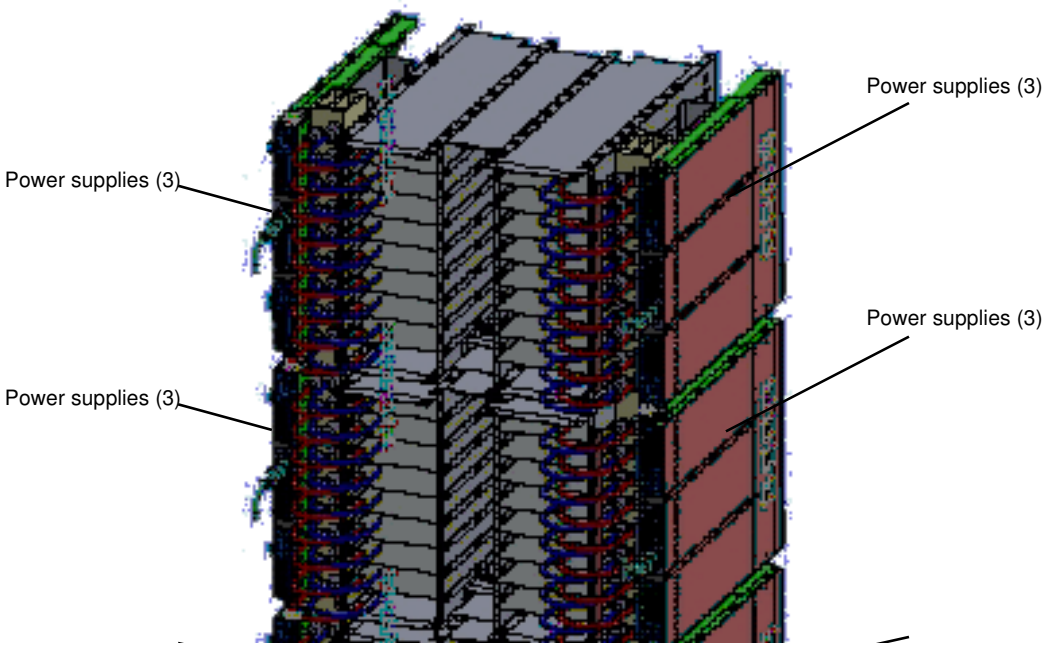


Figure 2-5 Blade Enclosure Pair Power Supplies

M-cell Cooling

The standard cooling method for SGI ICE X systems in M-cells is water cooling using cooling racks or a combination of cooling racks and cooling distribution units (CDUs):

- Cooling racks provide conditioned air to cool M-racks in an M-cell.
- CDUs provide additional water cooling to cold sinks on compute blades that use higher-power processors.

Cooling Racks

The compute racks are air cooled using conditioned air provided by the cooling racks. The cooling racks use water cooling to condition the air. Figure 2-6 shows the components in a cooling rack.

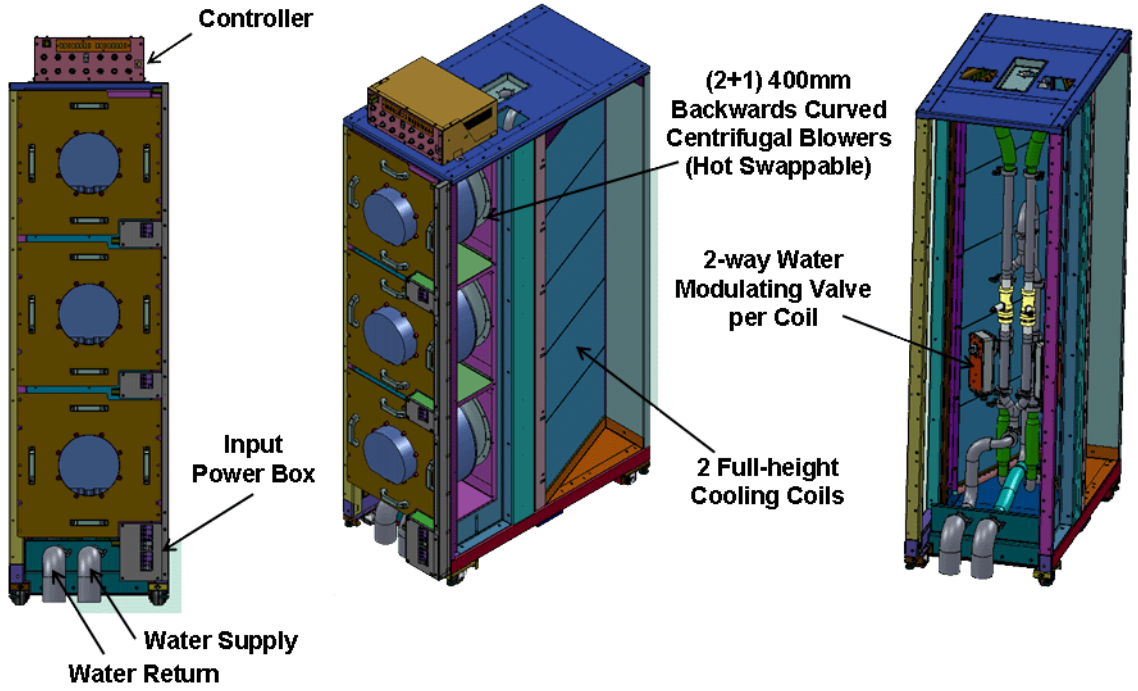


Figure 2-6 Cooling Rack Used to Cool the M-racks

Figure 2-7 shows air circulation within an M-cell.

Each half of the M-cell is an independent closed-loop airflow domain. The cooling rack in that half cools the two compute racks in that half.

Each cooling rack contains two cooling coils that circulate water to absorb heat from the computer racks; the heat is then transferred away from the M-cell.

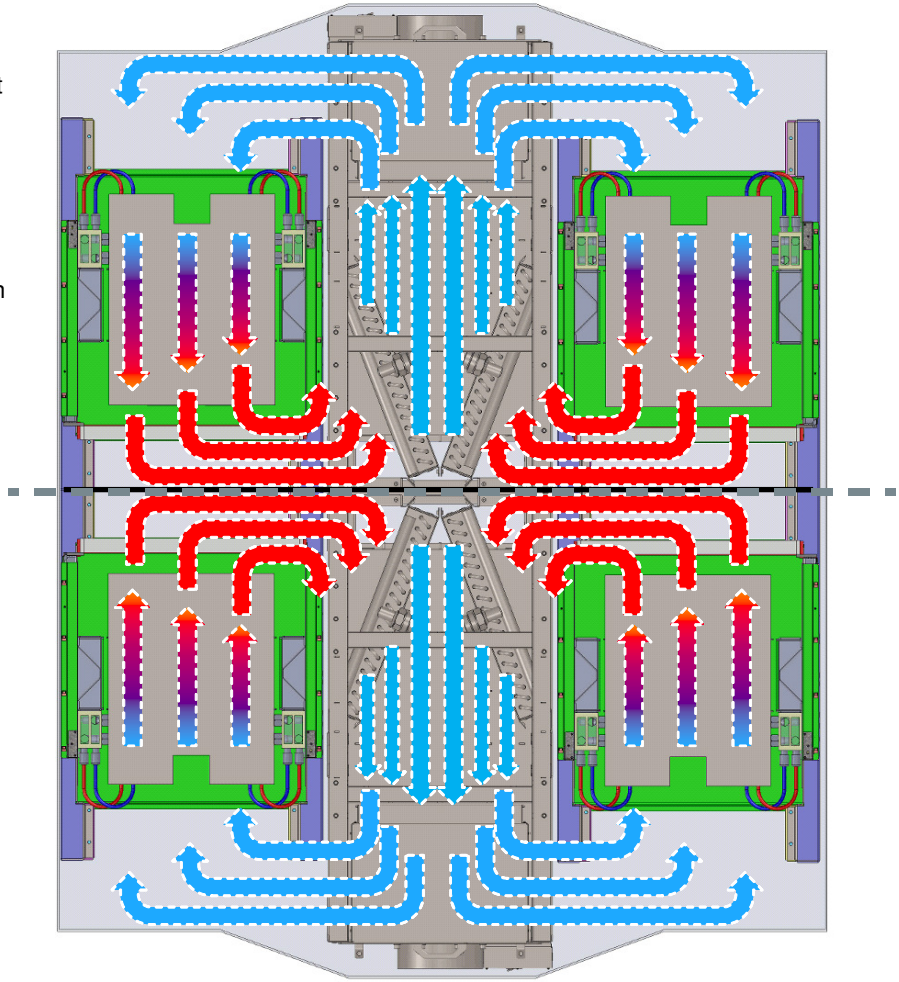


Figure 2-7 Air Circulation within an M-cell

Cooling Distribution Units (CDUs)

CDUs are used only in systems that have cold sinks in the compute blades. (Cold sinks are used in blades that include higher-power processors.) Figure 2-8 shows a CDU.

Front View (Doors Closed) | **Front View (Doors Open)** | **Rear View**

Figure 2-8 CDUs are Used with Blades that Have Cold Sinks

A single CDU distributes cooled water to up to four M-racks in an M-cell. The water passes into two manifolds in each M-rack, through the cold sinks on the compute blades to absorb heat, and back out of the manifolds in the rack and then returns to the CDU. The CDU transfers the heat to a site-supplied water system that transfers the heat to external heat exchangers.

Figure 2-9 shows how a CDU removes heat from the compute blade cold sinks in an M-rack.

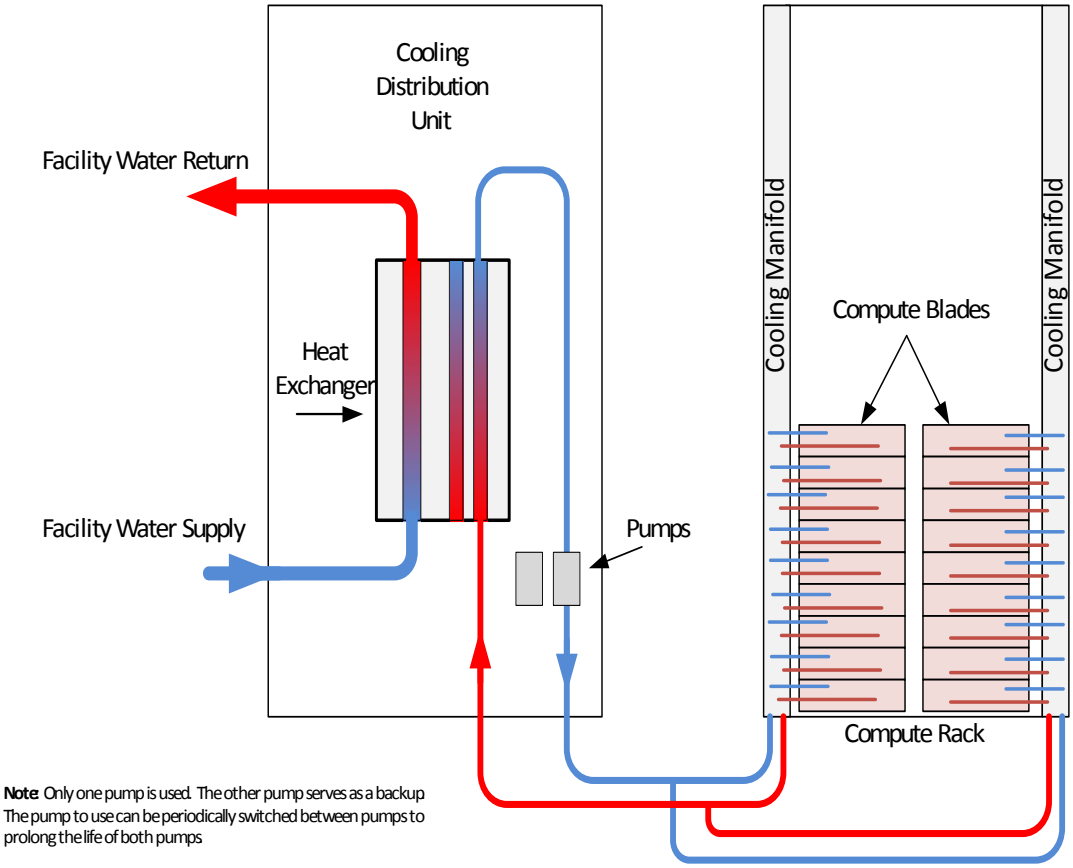


Figure 2-9 How a CDU Removes Heat from Compute Blade Cold Sinks

The CDU controls the temperature of the water being supplied to the M-racks to ensure it is greater than the room dew point temperature, which prevents condensation in the M-racks

M-cell Plumbing Components

Figure 2-10 shows the plumbing connections used for M-cells that include cooling racks and a CDU.

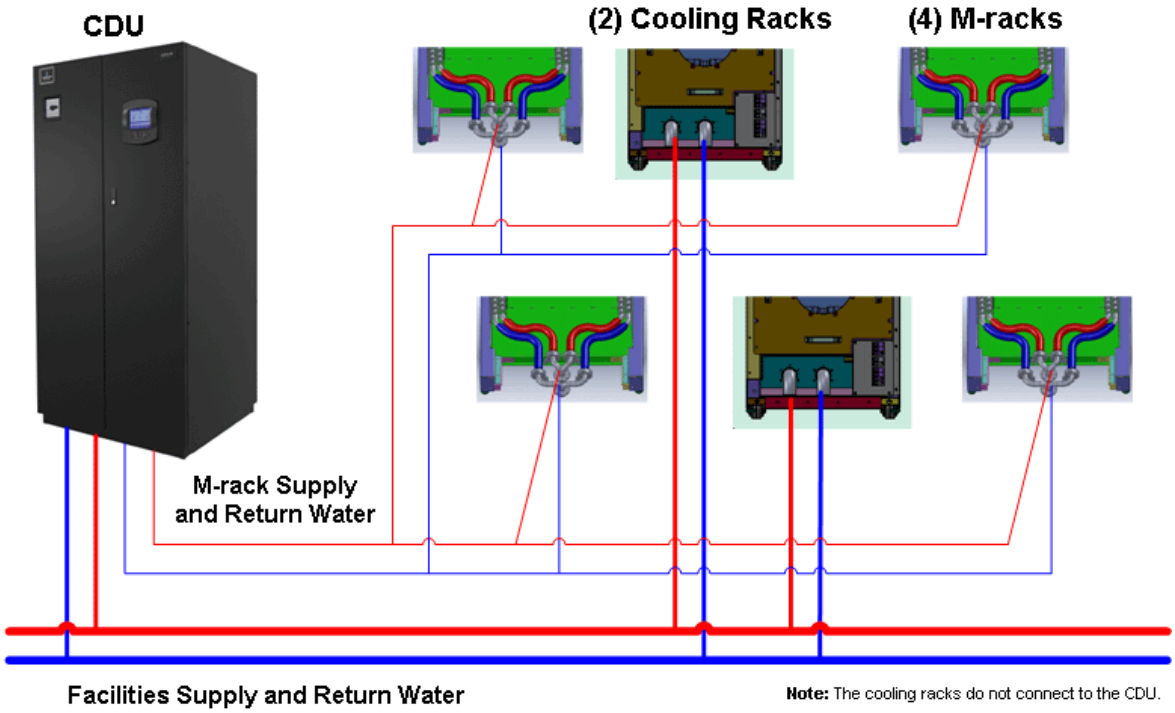
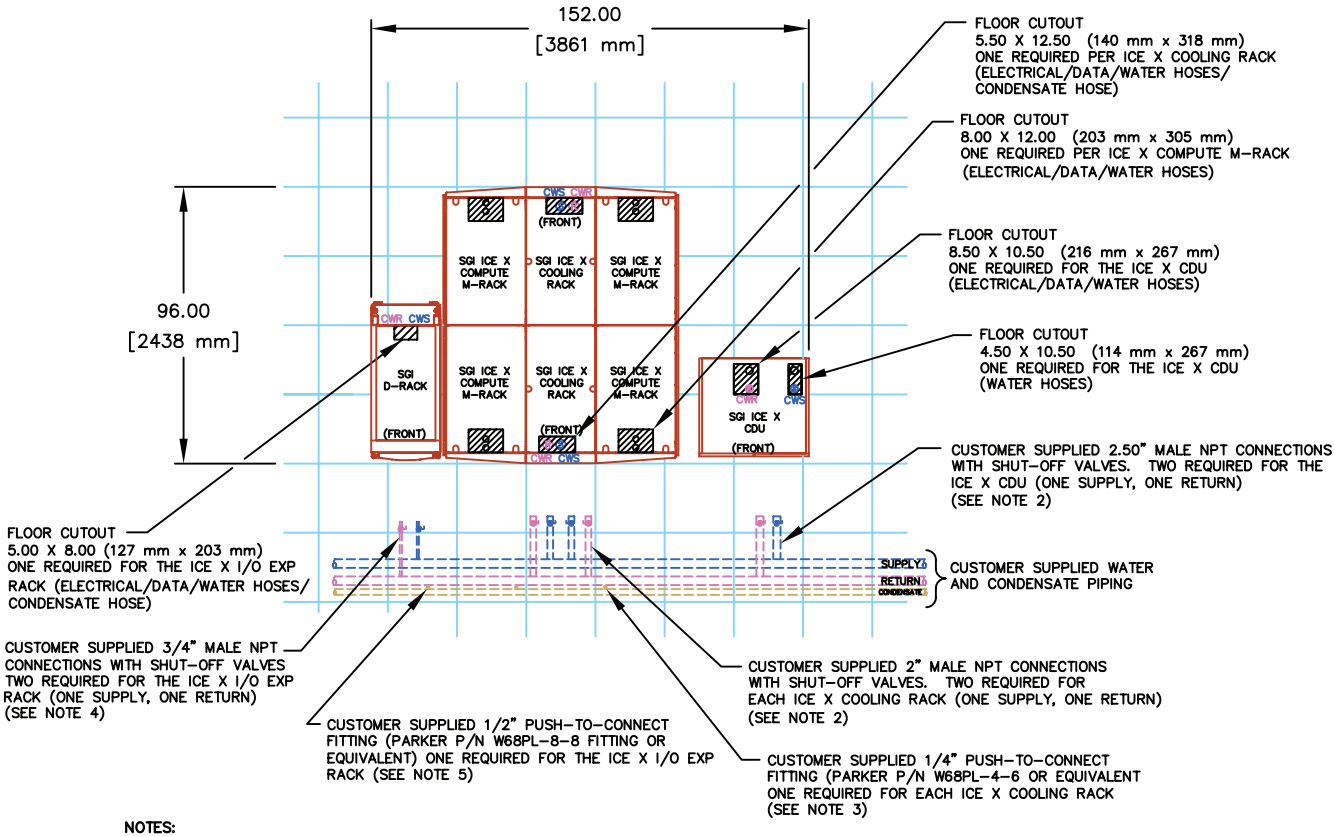


Figure 2-10 M-cell Plumbing Components

Figure 2-11 shows the piping requirements.



NOTES:

1) EQUIPMENT SHOWN ON 24 INCH FLOOR TILE
   APPROXIMATE AREA OF 76 SQ. FT (7.1 SQ. M) WITHOUT ACCESS
   APPROXIMATE AREA OF 185 SQ. FT (17.2 SQ M) WITH ACCESS

2) EACH ICE X COOLING RACK REQUIRES TWO 2.00" (50.8 mm) MALE NPT CONNECTIONS WITH SHUTOFF VALVES LOCATED IN PROXIMITY AS SHOWN. SGI PROVIDES TWO 2" FEMALE NPT STAINLESS STEEL FITTINGS WITH WATER HOSES TO EACH COOLING RACK. THE ICE X CDU REQUIRES TWO 2.50" (63.5 mm) MALE NPT CONNECTIONS WITH SHUTOFF VALVES LOCATED IN PROXIMITY AS SHOWN. SGI PROVIDES TWO 2.50" FEMALE NPT STAINLESS STEEL FITTINGS WITH WATER HOSES TO THE CDU.

3) CUSTOMER SUPPLIED PUSH-TO-CONNECT FITTINGS TO BE LOCATED WITHIN 4 FT (1.2 M) OF THE ASSOCIATED COOLING RACK FLOOR CUTOUT. SGI PROVIDES ONE 6 FT LONG (1.8 M), 1/4" (6.4 mm) O.D. FLEXIBLE NYLON CONDENSATE HOSE FOR EACH COOLING RACK. CUSTOMER TO PROVIDE ONE PARKER P/N W68PL-4-6, 1/4" MALE NPT PUSH-TO-CONNECT FITTING OR EQUIVALENT PER RACK TO MAKE THIS CONNECTION.

4) CUSTOMER SUPPLIED 3/4" MALE NPT CONNECTIONS TO BE LOCATED WITHIN 6 FT (1.8 M) OF THE ASSOCIATED I/O EXP RACK FLOOR CUTOUT. SGI PROVIDES TWO 3/4" FEMALE NPT STAINLESS STEEL FITTINGS WITH WATER HOSES TO EACH RACK.

5) CUSTOMER SUPPLIED PUSH-TO-CONNECT FITTINGS TO BE LOCATED WITHIN 4 FT (1.2 M) OF THE ASSOCIATED I/O EXP RACK FLOOR CUTOUT. SGI PROVIDES ONE 6 FT (1.8 M) LONG, 1/2" (12.7mm) O.D., 3/8" (9.5mm) I.D. FLEXIBLE NYLON CONDENSATE HOSE FOR EACH I/O EXP RACK. CUSTOMER TO PROVIDE ONE PARKER P/N W68PL-8-8, 1/2" MALE NPT PUSH-TO-CONNECT FITTING OR EQUIVALENT PER RACK TO MAKE THIS CONNECTION.

Figure 2-11 M-cell Piping Requirements

Figure 2-12 shows the piping connection locations for a CDU.

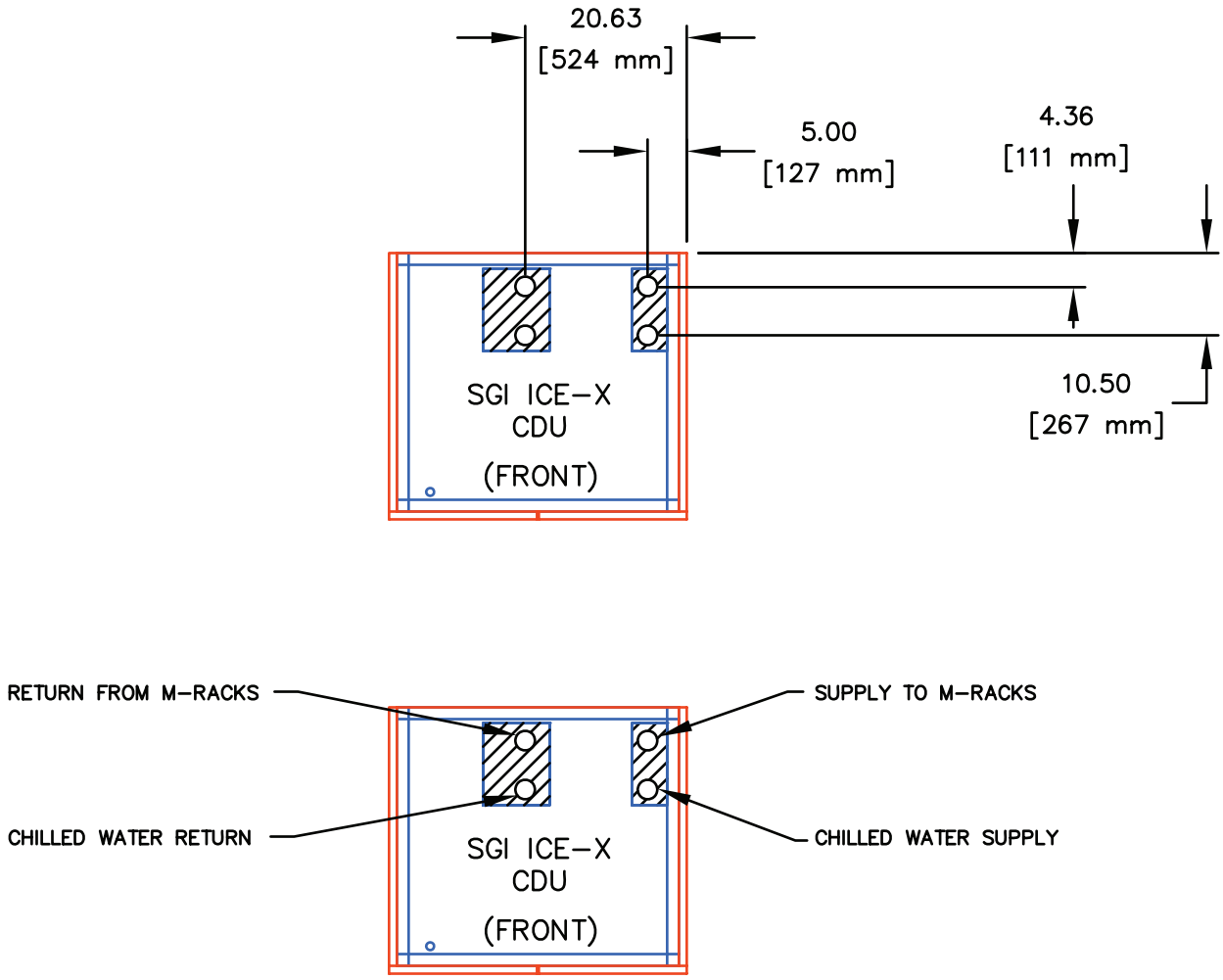


Figure 2-12 CDU Piping Connection Locations

Water Requirements

Each water-cooled rack requires a customer-supplied source of clean cooling water. The system will operate on cooling water supply temperatures from 45 °F (7 °C) to 60 °F (15.5 °C). The actual heat rejection to water, water flow rate, and pressure drop values depend on the temperature of the water used.

The cooling racks and CDUs can be supplied with water ranging in temperature from 45 to 90 °F (7.2 to 32 °C); however, water temperatures cooler than 60 °F (15.6 °C) could cause condensate to form on the hoses and manifolds.

The customer may treat the cooling water for each cooling rack and the primary circuit in the CDU with glycol or corrosion inhibitors up to a maximum of 30%. Distilled water with an inhibitor should be used in the CDU secondary circuit; approximately 55 gallons is required for each CDU. Water pressure must be limited to 100 psig (690 kPA) maximum.

Refer to “Cooling Water Requirements” on page 16 and “Cooling Water Supply Requirements” on page 17 for more details.

I/O Expansion Racks

I/O expansion racks are typically used to hold the system console, support nodes, switches, and storage. I/O expansion racks use SGI D-racks; refer to Figure 2-13.

Refer to the *SGI ICE X in D-racks Site Planning Guide*, publication number 007-5890-00x, for site planning information for SGI D-racks.

Figure 2-13 I/O Expansion Rack

Trellis System

System configurations that span multiple rows use a trellis system to route cables overhead between the rows; refer to Figure 2-14.

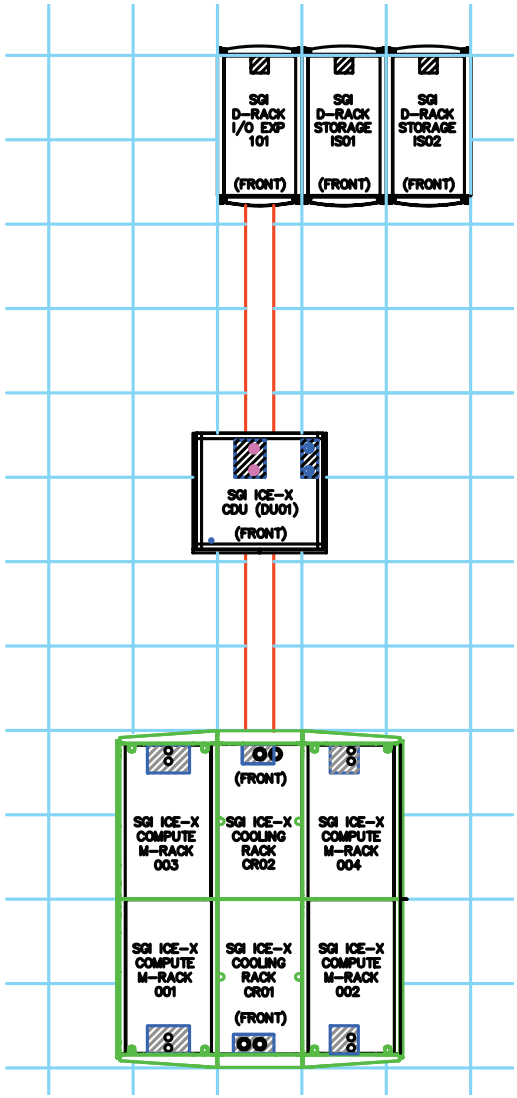


Figure 2-14 M-cell with Trellis System

Specifications

This section provides a summary of the shipping, mechanical, electrical, and environmental specifications for SGI ICE X systems in M-cell configurations.

Note: For information about the SGI D-rack used for I/O expansion racks, refer to the SGI ICE X in D-racks Site Planning Guide, publication number 007-5890-00x.

Shipping Container Specifications

Individual shipping crates are used for:

- M-racks
- Cooling racks
- CDUs

M-rack Shipping Crate

Figure 3-1 provides the dimensions of the shipping crate for the M-rack.

Height: 88.63 in [2,251 mm]
Width: 39.50 in [1,003 mm]
Depth: 52.75 in [1,040 mm]
Weight: 410 lbs [186 kg] (crate only)

Figure 3-1 M-rack Shipping Crate Dimensions

Cooling Rack Shipping Crate

Figure 3-2 provides the dimensions of the shipping crate for the cooling rack.

Height: 88.88 in [2,258 mm]
Width: 44.00 in [1,118 mm]
Depth: 63.75 in [1,620 mm]
Weight: 491 lbs [223 kg] (crate only)

Figure 3-2 Cooling Rack Shipping Crate Dimensions

CDU Packaging

Figure 3-3 shows the CDU packaging for domestic shipments. This packaging only adds slightly to the CDU shipping dimensions and weight.

Domestic Shipments:
Height: 83.00 in [2,108 mm]
Width: 44.00 in [1,118 mm]
Depth: 40.00 in [1,016 mm]
Weight: 1,049 lbs [475 kg] (including pallet)

Figure 3-3 CDU Packaging (Domestic Shipments)

International shipments include wooden walls and top structure that are screwed together to enclose the domestic packaging; refer to Figure 3-4

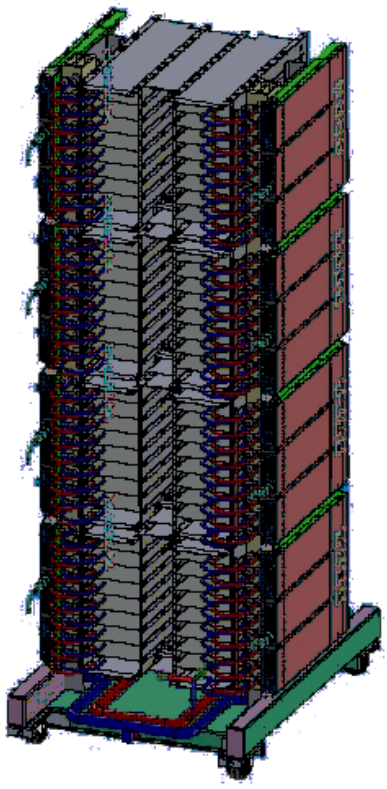
International Shipments:
Height: 84.00 in [2,134 mm]
Width: 44.00 in [1,118 mm]
Depth: 40.00 in [1,016 mm]
Weight: 1,160 lbs [526 kg] (including pallet)

Figure 3-4 CDU Packaging (International Shipments)

Dimensions

M-rack Dimensions

Figure 3-5 provides the dimensions of the M-rack.

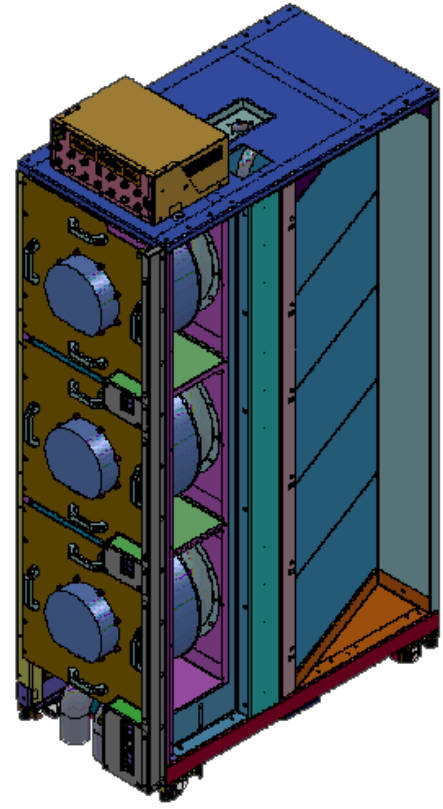


Height: 89.63 in [2,277 mm]
Width: 28.00 in [711 mm]
Depth: 48.00 in [1,219 mm]
Weight: 2,415 lbs [1,095 kg]

Figure 3-5 M-rack Dimensions

Cooling Rack Dimensions

Figure 3-6 provides the dimensions of the cooling rack.



Height: 93.00 in [2,362 mm]
Width: 24.00 in [610 mm]
Depth: 48.00 in [1,219 mm]
Weight: 1,400 lbs [635 kg]

Figure 3-6 Cooling Rack Dimensions

CDU Dimensions

Figure 3-7 provides the dimensions of the CDU.

Height: 78.00 in [1,981 mm]
Width: 38.00 in [965 mm]
Depth: 34.00 in [864 mm]
Weight: 880 lbs [399 kg]

Figure 3-7 CDU Dimensions

System Specifications

Table 3-1 shows the specifications for SGI ICE X systems in M-racks.

Table 3-1 System Specifications

Characteristic	M-rack	Cooling Rack	CDU
	Mechanical Requirements		
Maximum component dimensions:			
Height	89.63 in (2,277 mm)	93.00 in (2,362 mm)	78.00 in (1,981 mm)
Width	28.00 in (711 mm)	24.00 in (610 mm)	38.00 in (965 mm)
Depth	48.00 in (1,219 mm)	48.00 in (1,219 mm)	34.00 in (864 mm)
Maximum shipping dimensions:			Domestic:
Height	88.63 in (2,251 mm)[a]	88.88 in (2,258 mm)[b]	83.00 in (2,108 mm)
Width	39.50 in (1,003 mm)	44.00 in (1,118 mm)	44.00 in (1,118 mm)
Depth	52.75 in (1,040 mm)	63.75 in (1,620 mm)	40.00 in (1,016 mm)
			International: 84.00 in (2,134 mm) 44.00 in (1,118 mm) 40.00 in (1,016 mm)
Weight (maximum while operating):	2,415 lbs (1,095 kg)	1,400 lbs (635 kg)	880 lbs (399 kg)
Shipping weight (maximum):	2,825 lbs (1,282 kg)	1,891 lbs (858 kg)	Domestic: 1,049 lbs (475 kg) International: 1,160 lbs (526 kg)
Access requirements:			
Front	48.00 in (1,219 mm)	48.00 in (1,219 mm)	48.00 in (1,219 mm)
Rear	None	None	None
Top	None	None	None
Side	None	None	6 in (152 mm)

Table 3-1 System Specifications **(continued)**

Characteristic	M-rack	Cooling Rack	CDU
	Electrical Requirements		
Voltage:			
Three-phase options:			
400 VAC	312 to 440 VAC (International)	312 to 440 VAC (International)	312 to 440 VAC (International)
480 VAC	456 to 504 VAC (North America/Japan)	456 to 504 VAC (North America/Japan)	456 to 504 VAC (North America/Japan)
Frequency:	47 - 63 Hz	47 - 63 Hz	47 - 63 Hz
Phases	Three-phase	Three-phase	Three-phase
Power requirements (maximum)	53.23 kVA (52.17 kW)	4.26 kVA (4.17 kW)	5.55 kVA (5.11 kW)
Hold-up time	16 ms	16 ms	16 ms
Power cable	8 ft (2.4 m) pluggable drop cords	TBD	Hardwired
Power receptacles:			
400 VAC (International)	Two IEC60309, 63 A	One IEC60309, 32A	Hardwired
480 VAC (North America/Japan)	One IEC60309, 60 A	One IEC60309, 30A	Hardwired
Wall breaker size:			
Three-phase (North America/Japan)	60 A	30 A	15 A
Three-phase (Europe)	63 A	32 A	16 A

Table 3-1 System Specifications **(continued)**

Characteristic	M-rack	Cooling Rack	CDU
	Electrical Requirements (cont.)		
Total harmonic distortion (THD)	Less than 10% at full load		
	Environmental Requirements		
Non-operating environment:			
Temperature	-40 to 140 °F (-40 to +60 °C)		
Humidity	8% to 95% non-condensing		
Altitude	40,000 ft (12,192 m) max.		
Operating environment:	Refer to Table 3-2 for the M-rack environmental requirements.		
Acoustical noise level (maximum)	TBD		
Heat dissipation to air (maximum)	115.63 kBTU/hr (9.64 tons) (maximum) 102.50 kBTU/hr (8.54 tons) (typical)		

a. The PDUs are removed and overpacked.

b. The controller is removed from the top of the cooling rack for shipping. The controller is shipped in a separate cardboard box.

Environmental Specifications

Table 3-2 lists the maximum operating environmental specifications.

Table 3-2 Environmental Requirements

Characteristic	Specification
Maximum Environmental Requirements	
Humidity	20% to 80% non-condensing Rate of change must not exceed 10% relative humidity/hour
Operating environment:	
Air temperature (0 to 5,000 ft [1,524 m])	41 to 95 °F (5 to 35 °C)
Derate maximum allowable dry-bulb temperature	1.8 °F per 1000 ft (1 °C per 305 m)

Shock and Vibration

The vibration specifications for a rack are:

- Operational vibration
  - Sine Sweep 5-500-5 Hz, 0.25g @ 1 oct/min
  - Dwells at four lowest resonant frequencies at 0.25g for 15 minutes each
  - Random vibration at 0.10gRMS for 15 minutes
  - Vertical orientation
- Non-operational vibration
  - Sine sweep 3-200-3 Hz, 0.5g @ 1 oct/min
  - Dwells at four lowest resonant frequencies at 0.5g for 15 minutes each
  - Random vibration at 1.15gRMS for 15 minutes
  - Vertical orientation

Layouts and Clearances

The following illustrations show the overall dimensions and required service clearances for SGI ICE X in M-cell system configurations:

- Full M-cell Layouts, on page 54
- Half M-cell Layouts, on page 59
- Cutouts and Service Clearance Requirements, on page 61

If necessary, contact SGI site planning for site planning consultation by telephone at +1 715 726 2820, by fax at +1 715 726 2969, or by e-mail at *site@sgi.com*.

General Recommendations

- M-cell systems that must be installed on raised-floor panels require floor cutouts below each rack to accommodate the entrance of data and power cables and water cooling.
- Ensure that the water shut-off valves are located in an area that is easily accessible by service personnel.
- In areas that are prone to earthquakes, secure the racks to the computer room subfloor. Four M12 threaded weld nuts are located on the underside of each rack frame for attachment to customer-supplied hold-down devices.

Full M-cell Layouts

Full M-cell without CDU

Figure 4-1 shows a full M-cell without CDU.

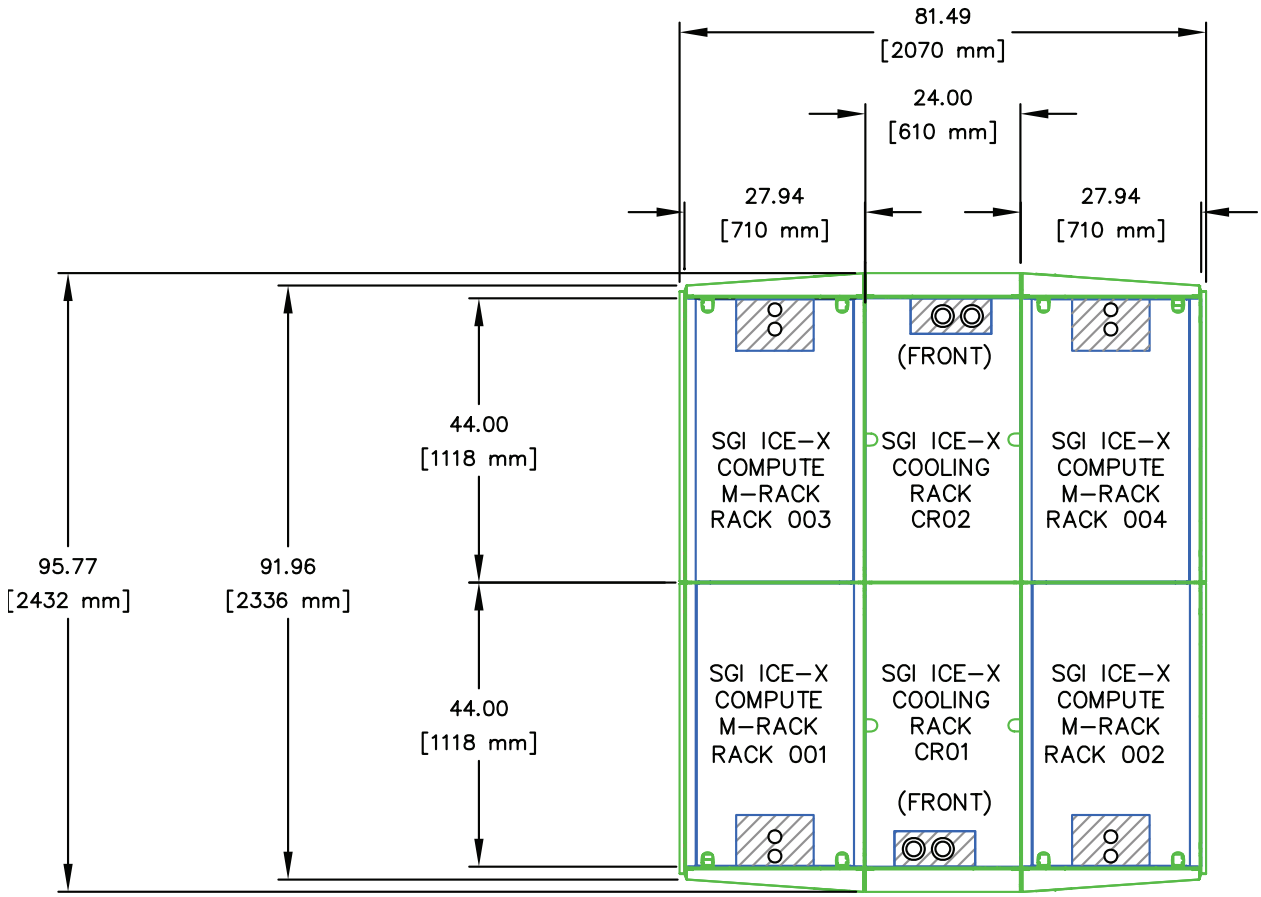


Figure 4-1 Full M-cell (without CDU) Layout

Figure 4-2 shows a two M-cell configuration without CDUs.

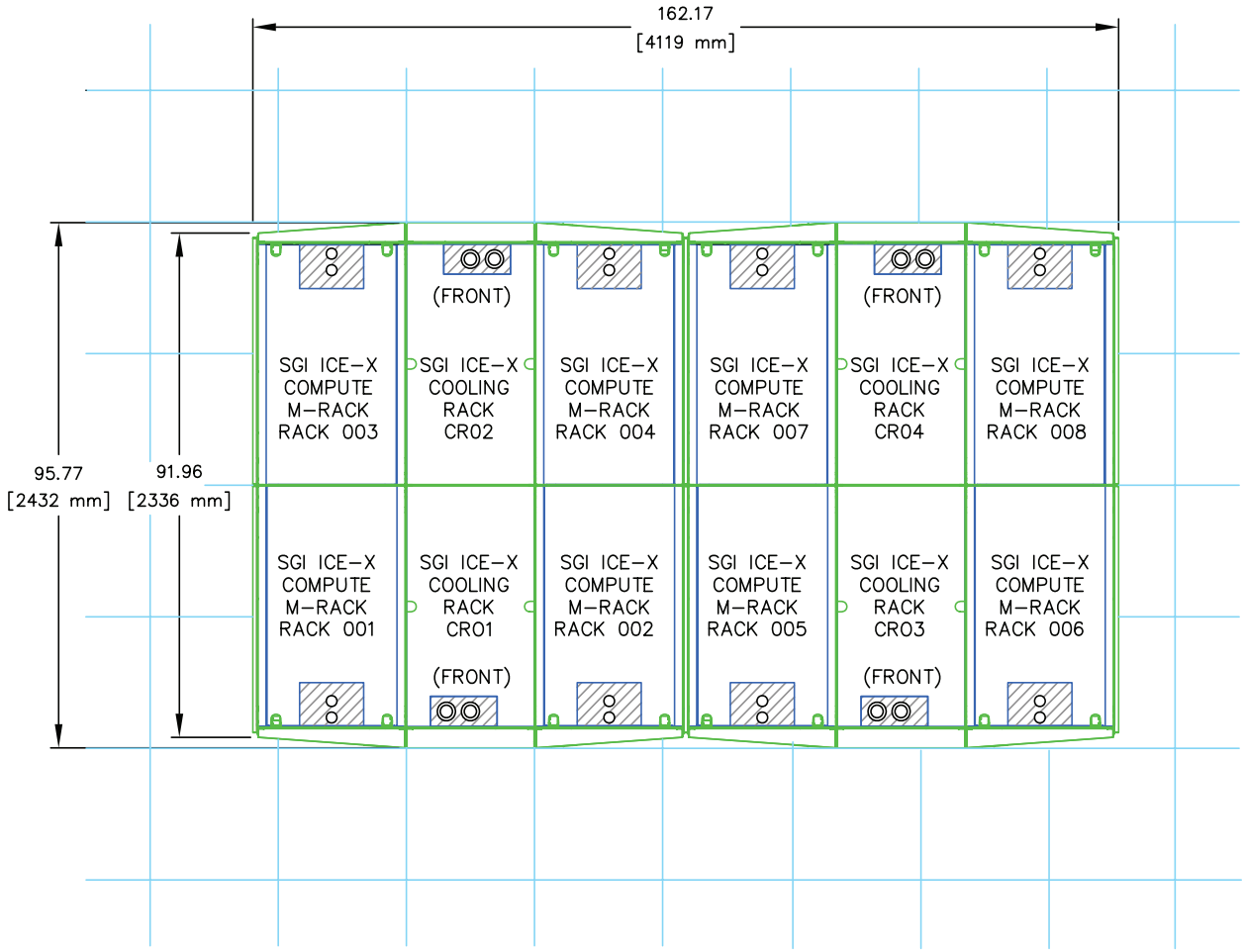


Figure 4-2 Full M-cell (without CDU) Layout -- Two M-cells (Shown on 24-in by 24-in Grid)

Full M-cell with CDU

Figure 4-3 shows a full M-cell with a CDU in cube configuration. Figure 4-4 shows a full M-cell with a CDU in aisle configuration.

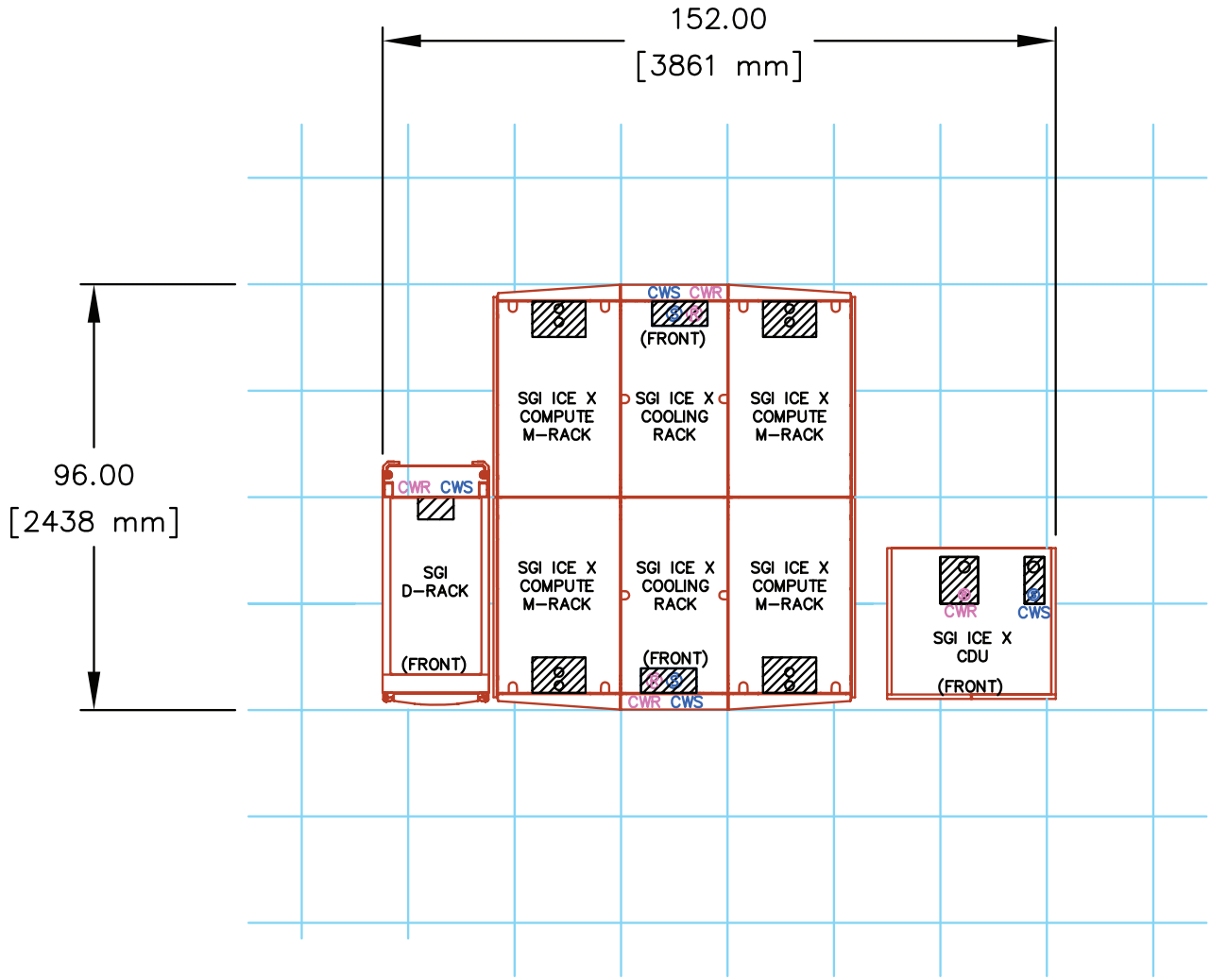


Figure 4-3 Full M-cell with CDU in Cube Configuration (Shown on 24-in by 24-in Grid)

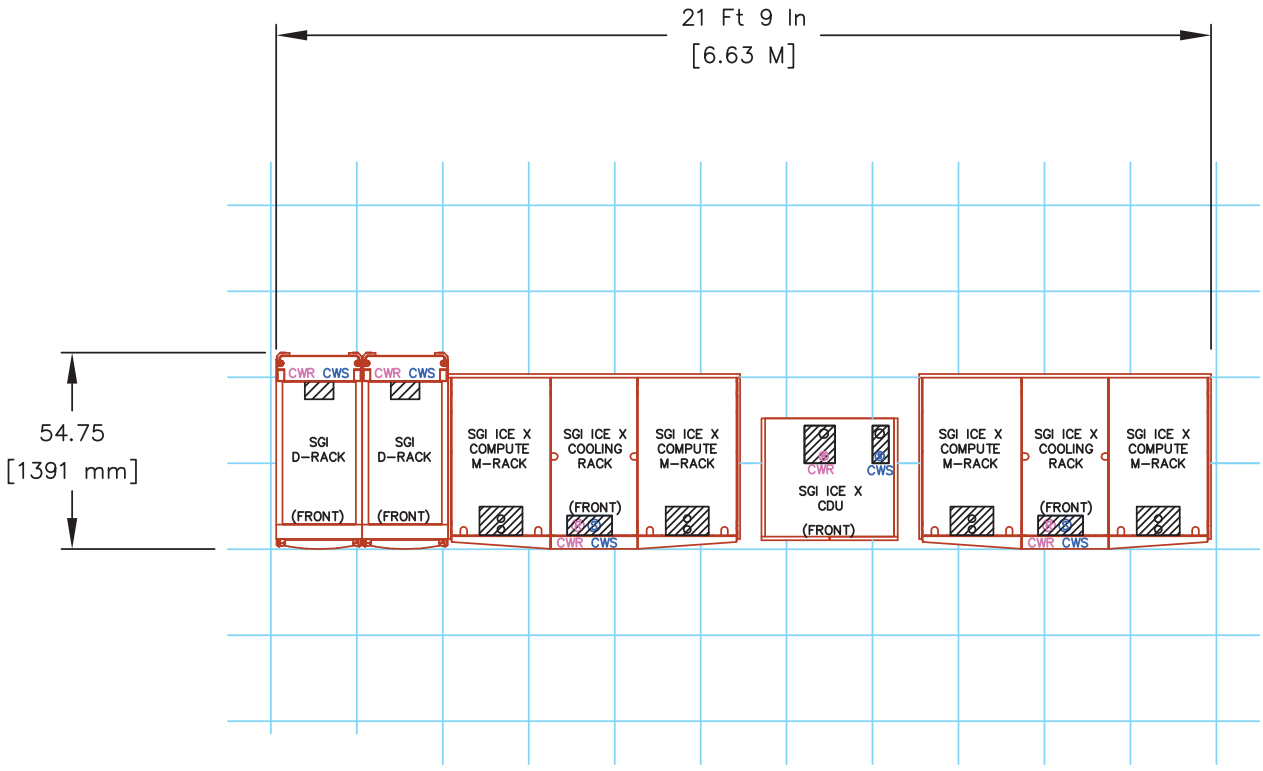


Figure 4-4 Full M-cell with CDU in Aisle Configuration (Shown on 24-in by 24-in Grid)

Figure 4-5 shows a two M-cell configuration with a CDU for each M-cell.

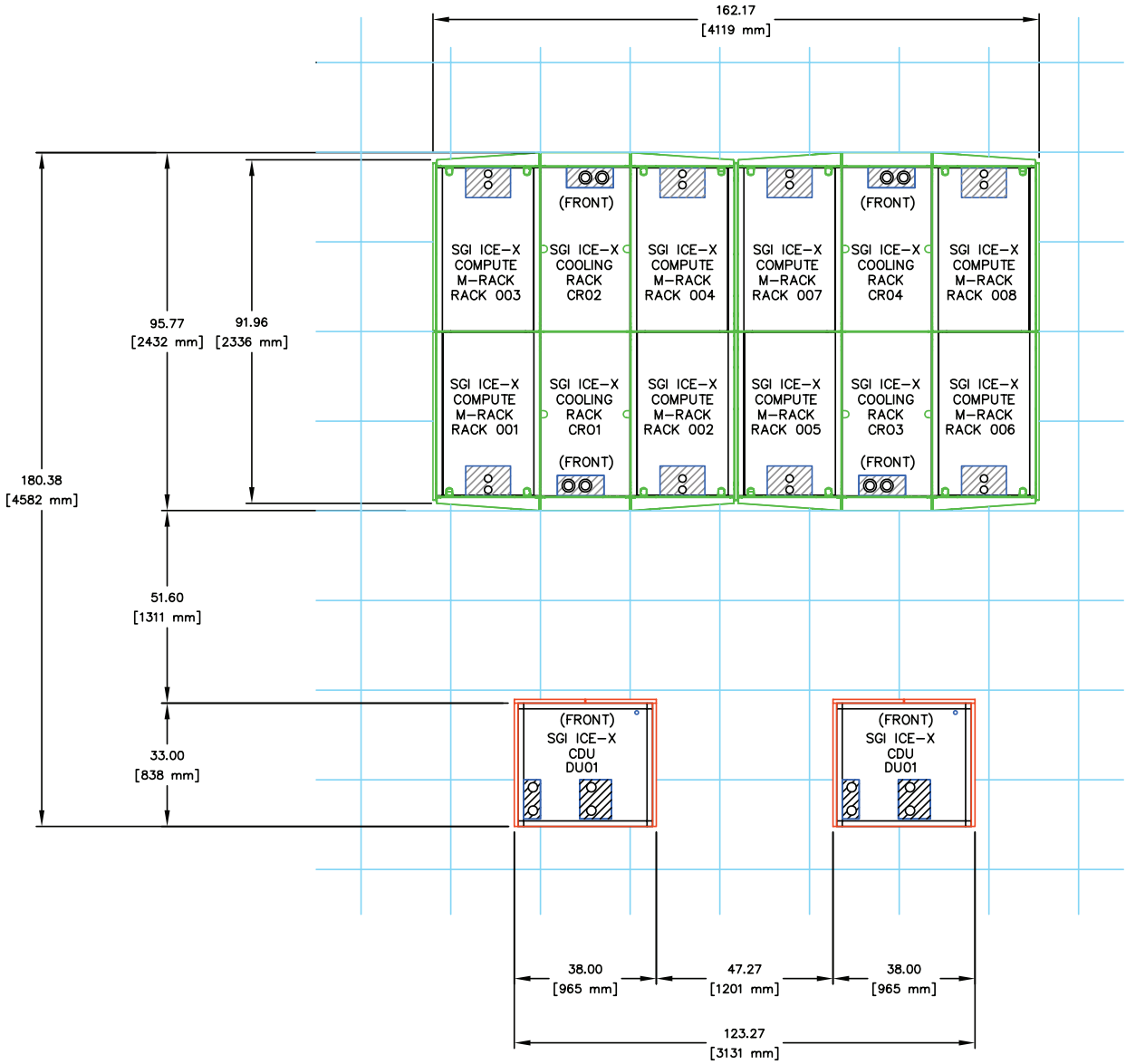


Figure 4-5 Full M-cell (with CDU) Layout -- Two M-cells (Shown on 24-in by 24-in Grid)

Half M-cell Layouts

Half M-cell without CDU

Figure 4-6 shows a half M-cell without CDU.

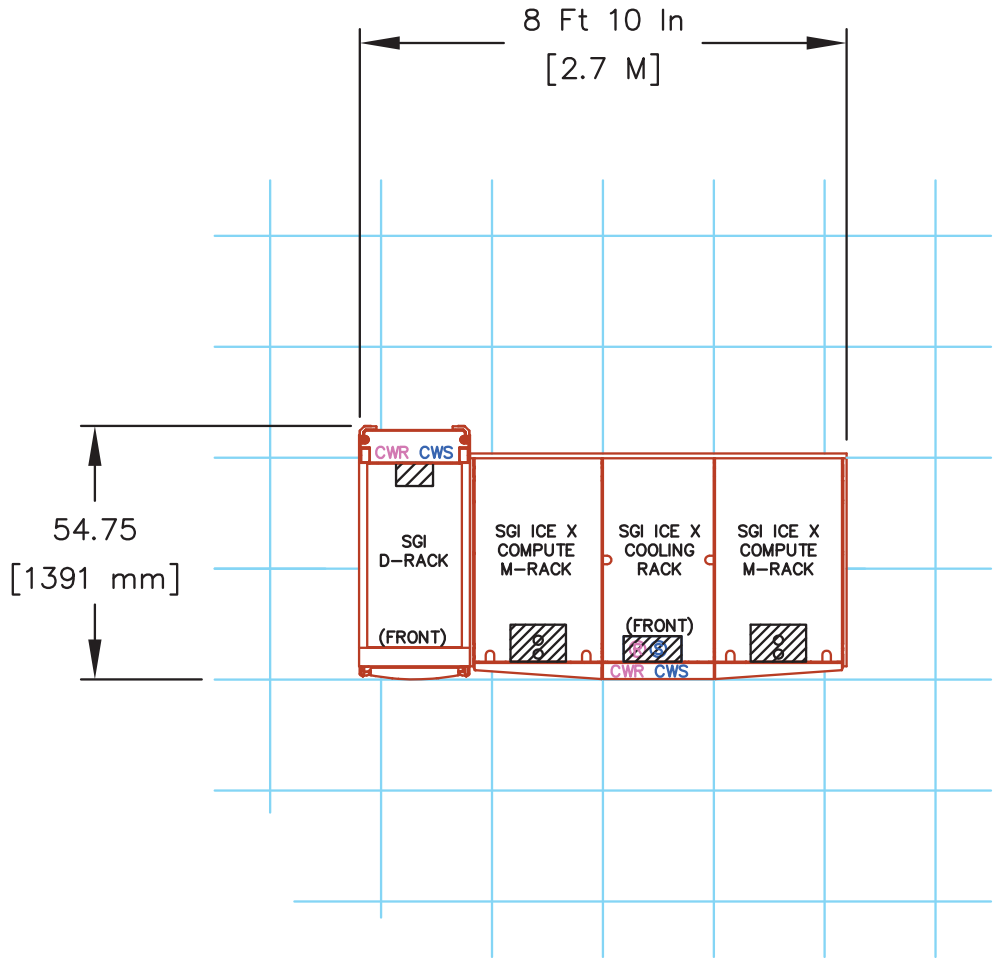


Figure 4-6 Half M-cell (without CDU) Layout (Shown on 24-in by 24-in Grid)

Half M-cell with CDU

Figure 4-7 shows a half M-cell with CDU.

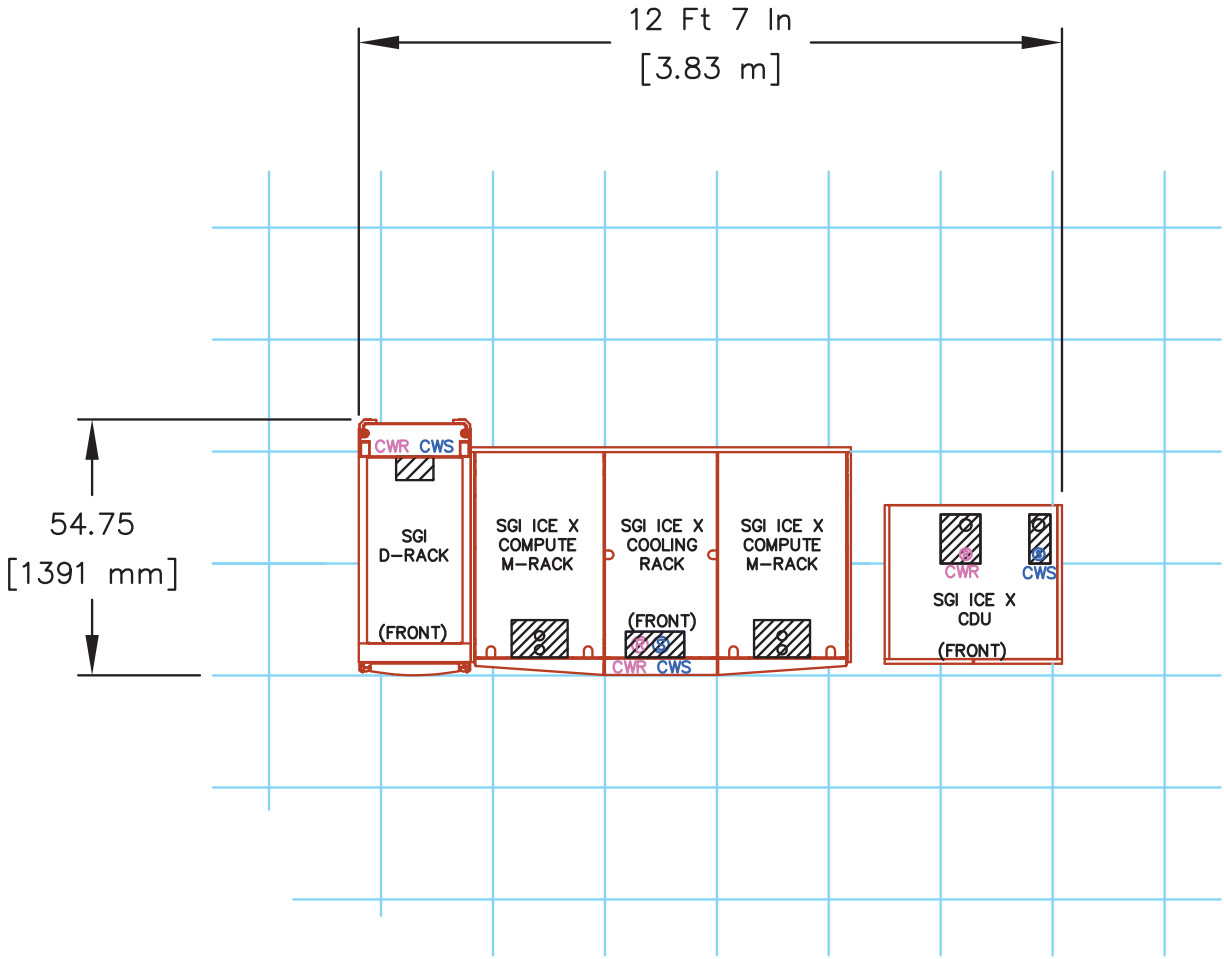


Figure 4-7 Half M-cell (with CDU) Layout (Shown on 24-in by 24-in Grid)

Cutouts and Service Clearance Requirements

M-cell

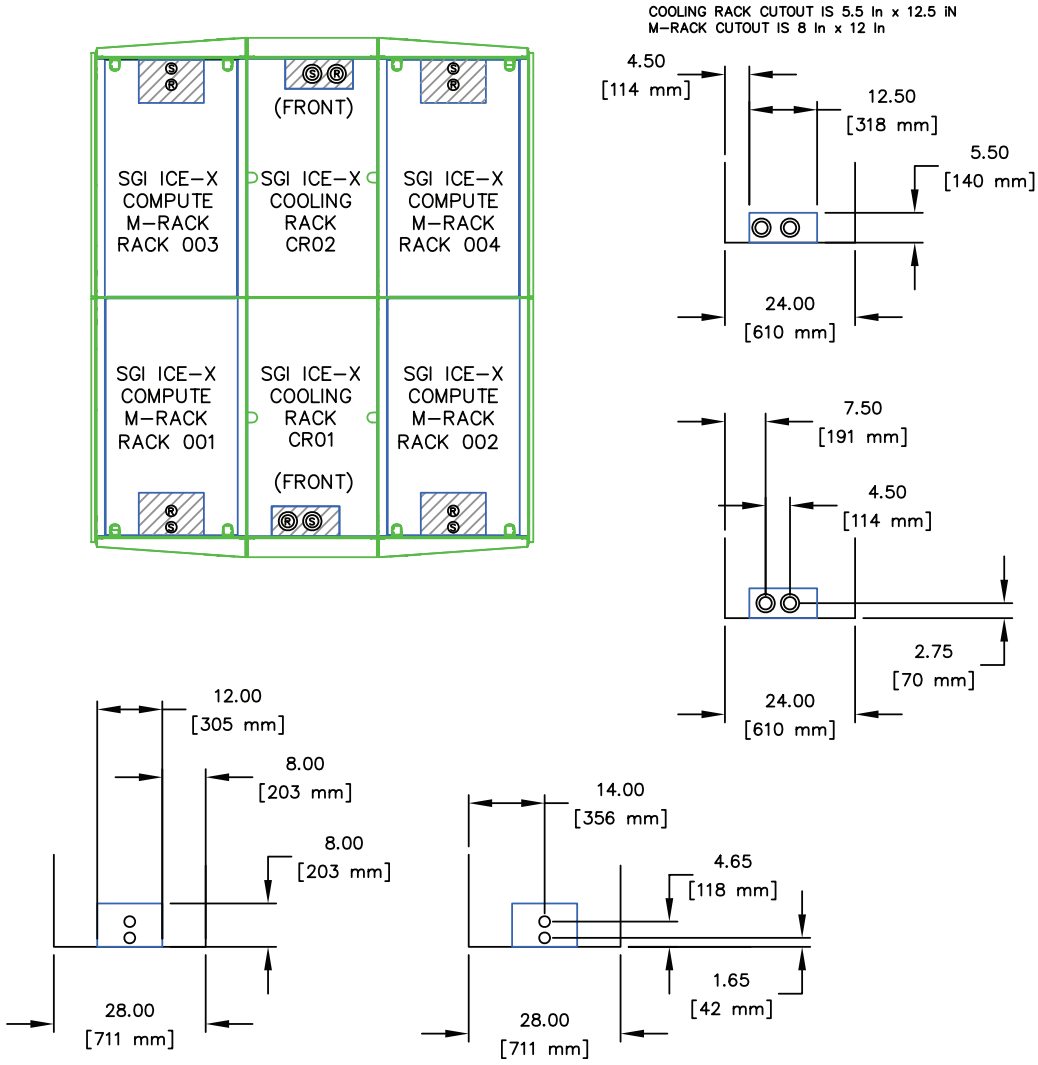


Figure 4-8 M-cell Cutouts and Service Clearance Requirements

CDU

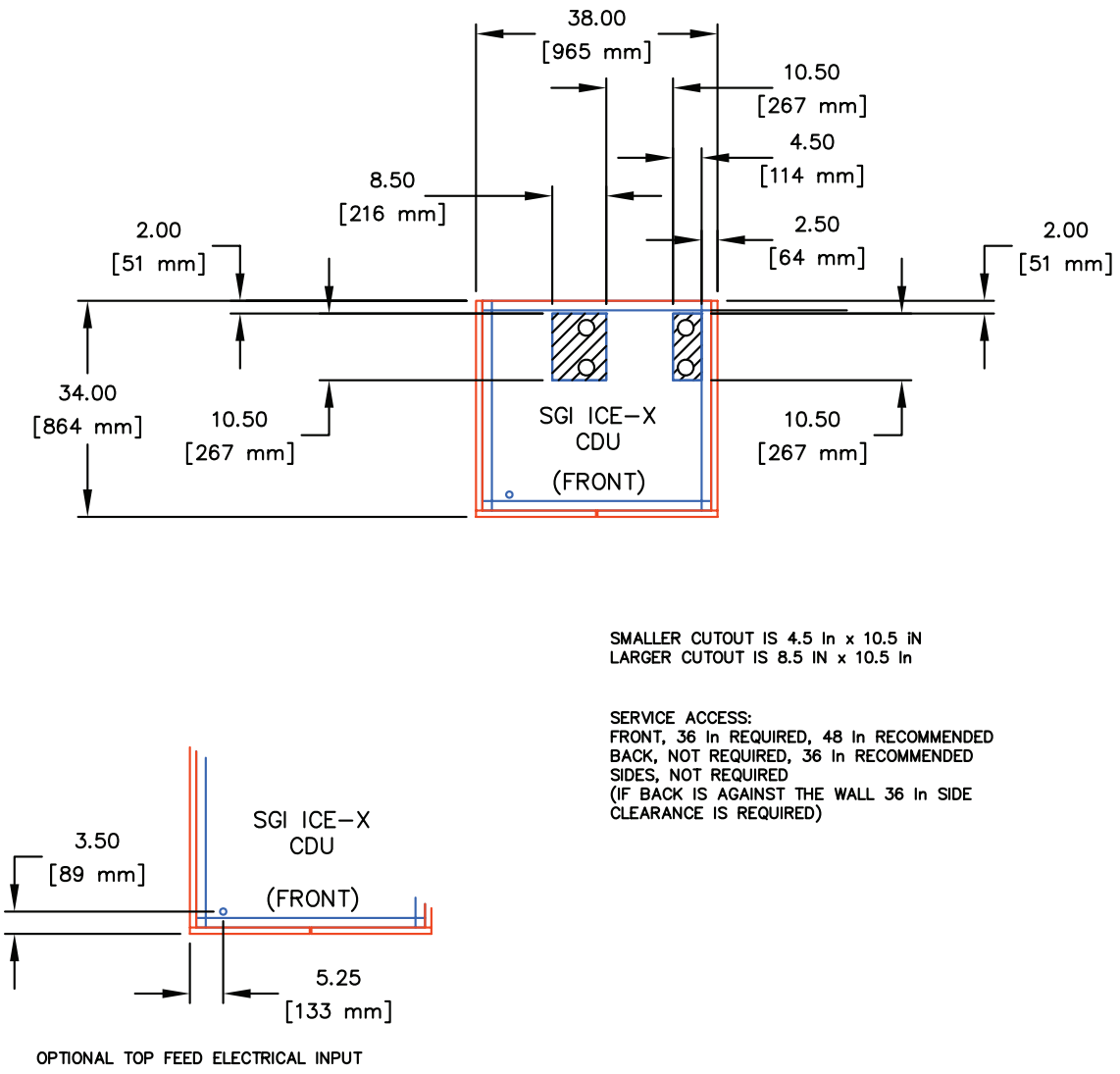


Figure 4-9 CDU Cutouts and Service Clearance Requirements

Site Planning Checklist

Table 5-1 and Table 5-2 provide a site planning checklist that you can use as an organizational tool during the site planning and preparation process. During the planning process, you might discover additional preparation issues at your site that this checklist does not address. To discuss your site plans and to resolve any issues, contact an SGI site planning representative by one of the methods listed in the summary of this document. .

Table 5-1 Site Planning Checklist

Yes	No	Planning Issue	Comments
		Have you determined the system configuration? Configuration:_____	
		Have you determined the installation date? Date:_____	
		What is the total number of system cabinets?	
		Have you established the system location?	
		Does the equipment floor layout meet the equipment maintenance access requirements?	
		Is the equipment positioned so that the exhaust air of one heat-ejecting device does not enter the air inlet of another?	
		Have you identified an access route to the final system location?	
		Does the access route meet the access requirements for the system?	
		Does the access route meet the floor-loading requirements for the system?	
		Have you made provisions to cover irregular or engraved floor patterns along the access route to reduce vibration of the system while moving it?	

Table 5-1 Site Planning Checklist

Yes	No	Planning Issue	Comments
		Does your loading dock meet standard freight-carrier truck requirements? If not, have you allocated a forklift for delivery? Contact your site planning representative if you have concerns about your loading dock.	
		Is a pallet jack available on-site to move the system in its shipping container to the final system location?	
		Do the pallet-jack fork dimensions meet the requirements for the shipping container?	
		Are the elevator and elevator door dimensions adequate?	
		Is the elevator weight capacity adequate?	
		Does each ramp in the access route have an incline that is less than 10 degrees?	
		Did you order the power receptacles for your system?	
		Are the circuit breakers for all cabinets properly installed and labeled?	
		Are all power receptacles properly installed and labeled?	
		Are the floor cutouts properly positioned and free of sharp edges?	
		Are any recommended perforated floor panels properly positioned?	
		Is the computer room floor strong enough to support the weight of the system?	
		Can the computer room environment be properly maintained within the specifications listed in Table 3-1 on page 47?	
		Are telephone lines installed if you plan to implement remote support for your system?	
		Have you trained system administrators or enrolled operators in the necessary training courses? http://www.hpctraining.com hpctraining@sgi.com	

Table 5-2 Water Cooling Site Planning Checklist

Yes	No	Planning Issue	Comments
		Do you have an adequate chilled-water supply?	
		Are the required plumbing and pipe fixtures installed?	
		Have floor cutouts been provided for the cooling water and condensate hose?	