

# Laboratory Construction Guidelines

## Vicon MX Systems

*These Vicon MX Laboratory Construction Guidelines illustrate how to prepare a life sciences laboratory for installation of your new Vicon MX motion measurement and analysis system. We recommend that you follow these guidelines on setting up the room, furniture, electrics, and any third-party devices you intend to use before you receive your Vicon MX system.*

*You will then be ready to set up the Vicon MX hardware as soon as you receive your product shipment. For details on Vicon MX system components, see the Vicon MX Hardware System Reference book. For detailed guidance on setting up your Vicon MX hardware, see the System Components and Assembly module of the Essentials of Motion Capture for Vicon MX training video.*

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Before installing your new Vicon MX system, you must prepare your laboratory to be used as a Vicon MX motion measurement and analysis lab. Your lab arrangements depend on your intended use and available space.

## Laboratory Uses

Vicon MX motion measurement and analysis systems are used for a broad range of life sciences applications including gait analysis, medical research, sports medicine, sports performance, ergonomics, biomechanics education and research, and animal/non-human studies. The types and size of rooms used as labs vary equally widely.

For ease of explanation, the examples in these [Lab Construction Guidelines](#) cards are based on traditional gait analysis studies in small to medium sized labs. You can apply this guidance to your particular application and capture space, whether it is small animal capture or virtual rehabilitation in a small room or sports capture in a large hall or outdoors.

If the guidance in these cards does not adequately address the type of application you are planning or the dimensions of your lab space, contact your Vicon Sales representative or your nearest agent or distributor to discuss details of your application setup.

## Laboratory Considerations

The following [Lab Construction Guidelines](#) cards describe the key areas you must consider when preparing your laboratory for the installation of your new Vicon MX system:

- **Room Arrangement:** the physical size and layout of the room.
- **Furniture and Equipment:** the positioning of furniture, Vicon MX hardware, and any third-party equipment.
- **Electrics and Lighting:** the provision of electric outlets, conduiting, network facilities, and lighting.

Some of the details described in these guidelines are considered during the preinstallation process and reviewed by a Vicon engineer during a site survey meeting. You may find it useful to have any notes you have made based on these [Lab Construction Guidelines](#) cards available when you speak with the Vicon engineer.

This diagram illustrates the physical aspects of the room you will use as the Vicon MX motion measurement and analysis lab. More details on the illustrated aspects are provided in the following *Room Arrangement* cards.

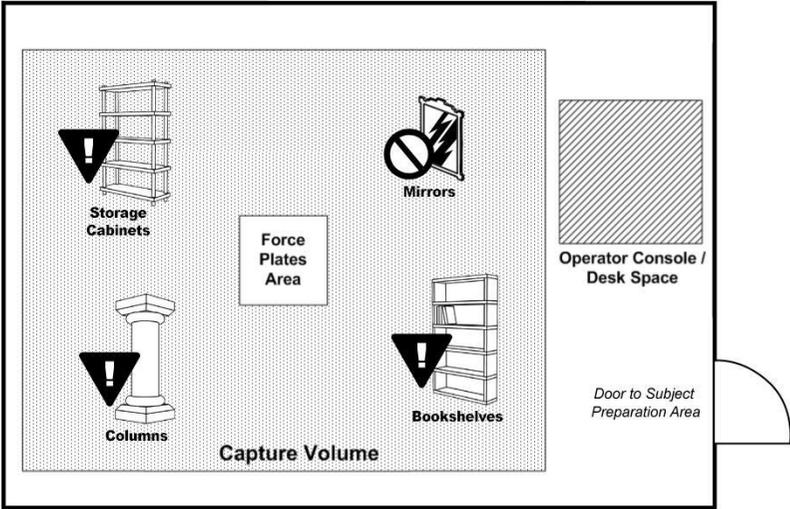
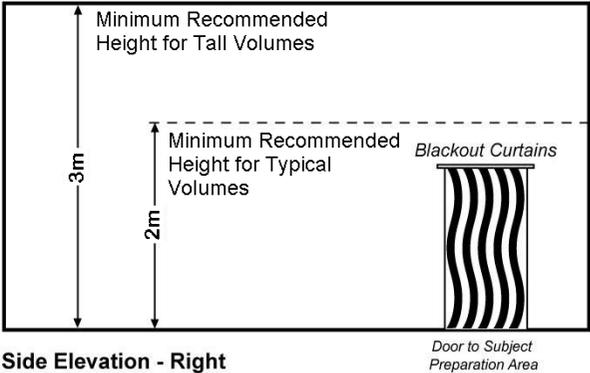


Figure Room-1: Example Lab Construction Room Arrangement

## Lab Dimensions

Your room arrangements depend largely on the physical size of the room to be used as the motion measurement and analysis lab.

### Important

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Small or large rooms can be successfully used as labs, depending on your application. Your Vicon Sales representative or your nearest agent or distributor, can help you to determine the optimum arrangements for your lab (e.g. adjusting the camera count or lens type to cater for your available space).

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The analysis area of your lab in which you capture a subject's movement is called the capture volume. The size of this area within your lab depends on your motion capture requirements, the overall size of your lab, and any physical obstructions in the room.

The lab must not contain any uncovered mirrors, and you should minimize or cover reflective surfaces such as shiny doorknobs, metal plates around switches or wall power outlets, chrome kick plates, or railings to prevent unwanted reflections from being captured. If possible, keep the capture volume free of any obstructions such as columns, bookshelves, or storage cabinets.

## Floor

Use a dull tile or linoleum for your floor surface—and do not polish it to a high gloss—to prevent unwanted reflections. We recommend a conductive linoleum material to prevent static build up discharges during dry weather, which could disturb subjects or discharge through the force plate and cause analog data capture issues.

The color of the floor does not affect system performance. You may wish to choose a color suitable to hide wear and tear and scuff marks.

If you are installing third-party devices such as force plates, you may need to use a raised floor, under which you can place camera and force plate cables and other associated cabling. We recommend a raised computer floor. For details on installing force plates, see the [Furniture and Equipment](#) cards. For details on cabling and power sources, see the [Electrics and Lighting](#) cards.

## Ceiling

For full body gait captures, the minimum recommended ceiling height is approximately 2m above the finished floor. However, should your ceiling height be lower than this, please check with your Vicon Sales representative or your nearest agent or distributor. For studies of stair climbing, golf swings, or similar activities, the ceiling height should be at least 3m. Use non-reflective ceilings. We recommend a tiled suspended ceiling constructed of 600mm x 600mm tiles.

## Walls

If you intend to mount cameras on the walls, ensure that the walls do not vibrate or shake due to sources such as air conditioning, power equipment in an adjacent room, or a slamming door. We recommend a matt or satin finish paint for walls. The color of the walls does not affect system performance. We recommend that you do not mount cameras on stud walls.

## Windows

Cover any windows or skylights to completely block out external light. We recommend hanging backed curtains to a length just above floor level. Use dark-colored curtains made from a non-shiny material. You can also use adjustable blinds, which can be closed during trials.

## Doors/Entrances

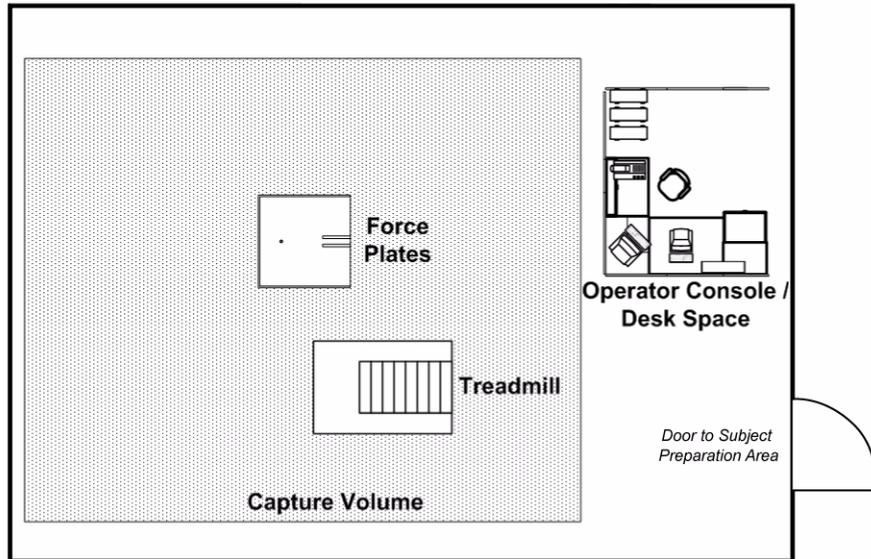
The main door into the lab must be wide enough to allow subjects easy access. Keep additional entrances to a minimum and keep any doors other than the main one locked. We recommend that you recess any doors that open directly into the lab and hang curtains over them to reduce camera interference during trials.

## Subject Preparation Area

You may need to provide an area in which you can prepare subjects for a motion capture trial. Depending on your application, this could be an area within the lab or a separate examination room or changing facilities adjacent or near to the lab with appropriate accessibility (e.g. wheelchair access). For further details on subject preparation area contents, see the [Furniture and Equipment](#) cards.

**Notes**

This diagram illustrates the furniture and equipment you could include in the motion measurement and analysis lab. More details on the illustrated aspects are provided in the following *Furniture and Equipment* cards.



**Plan View**

*Figure Furniture-1: Example Lab Construction Furniture and Equipment*

### Operator Console/Desk Space

An operator console or desk space is necessary for the Vicon MX hardware as well as any peripheral equipment to be used in the lab.

Ensure that you have the appropriate amount of desk space, floor space, or storage racks to accommodate the equipment the operator must use:

- MX host PC and monitor
- Remote PCs and monitors
- MX Control, MX Link, MX Net, MX Sync units, MX Ultraset (all MX units are 1U units that can be rack-, wall-, or floor mounted and stacked either horizontally or vertically.)
- Printer
- Force plate amplifier for each force plate

- EMG system
- Optional third-party video equipment (e.g. video mixer, monitor)

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**Important**

The actual specification of the PCs you use in your Vicon system architecture depends on your application requirements. In all cases, Vicon application software requires a PC with an Intel processor. Since Intel processors are used in Vicon development and testing, Vicon applications are optimized for this processor type.

For further initial guidance, see [PC Specifications and Recommendations for Vicon Software](#). If you are logged into the Vicon Online Support site, click the hyperlink to display the document. Otherwise, log into the Vicon Online Support site and click

**FAQs**. In the **Search FAQs** field, type `PC Specifications`, from the drop-down list select **General Motion Capture Considerations**, and then click **Find FAQs**. In the returned list, click the title of the document.

Your Vicon Sales representative or your nearest agent or distributor can help you to identify the requirements for your specific needs.

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### Subject Preparation Area

You may want to set aside an area within the lab, or allocate a nearby or adjacent room, in which you can include any equipment required to prepare your subject for the trial (e.g. an examination table; height and weight scales; and storage for tape, marker, electrodes, and similar accessories).

### Third-Party Devices

You can incorporate third-party devices, such as force plates and video equipment, in your Vicon MX architecture.

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**Important**

You must always follow the instructions for installing and using any third-party devices supplied by the device manufacturer. Some manufacturers may install their devices for you; contact them for information.

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### Force Plates

Force platforms (force plates) generally are located in the middle of the lab analysis area. Force plates typically are installed in either of the following ways:

- **Floor-mounted**

The force plates are mounted on top of the lab floor and surrounded by either a raised walkway or, preferably, a raised computer floor.

- **Floor-sunken**

The force plates are sunk in a pit that is deep enough to leave a minimum depth of 15cm of concrete underneath the proposed mounting surface of the force plates. The thickness of any floor covering you intend to apply to the plate must be taken into consideration.

For movable force plates, the pit must be wide enough to provide flexibility in positions. For mounted force plates, the pit must be wide and long enough to provide access to the cable connectors and the fittings securing them to the floor.

A cover for the pit must be constructed to surround the force plates. The cover must be flush with the floor surface so that any subjects' walking aids will not catch on it.

In either case (force plates mounted or sunk), you must provide space for the force plate cables (for details, see the *Electrics and Lighting* cards).

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**Important**

Because the force plates behave like accelerometers and produce outputs from floor vibrations, it is important to keep these vibrations to a minimum. Ground floor locations are best for minimizing vibrations. If you have to mount force plates on an upper floor, it is best to locate them over support beams, near support columns, or near walls whenever possible. As the outputs from force plates that are caused by floor vibrations are directly related to the mass of the top plate, they can be minimized by using a plate with a composite top, which will have higher resonant frequencies (AMTI Models OR6-6 and BP400600HF).

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## Video Equipment

In addition to your Vicon 3D motion measurement and analysis system, you may also wish to use third-party video devices to provide additional visual information, such as VCRs, camcorders, monitors, and mixers.

We recommend digital video recording equipment over analog video recording equipment. Vicon Motion Systems can supply video recording equipment, or you can source such equipment locally. Before including third-party video equipment in your Vicon MX architecture, contact your Vicon Sales representative or your nearest agent or distributor.

**Notes**

This diagram illustrates the electric outlets, conduiting, and network facilities you will need in the motion measurement and analysis lab. More details on the illustrated aspects are provided in the following [Electrics and Lighting](#) cards.

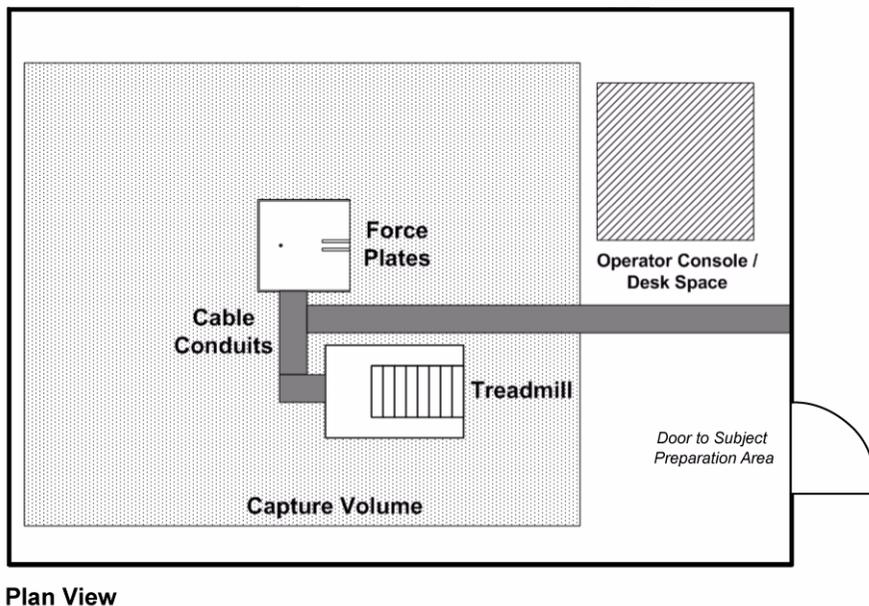
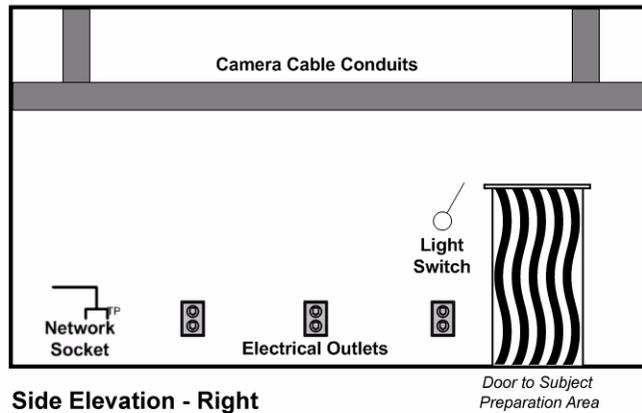


Figure Electrics-1: Example Lab Construction Electrics and Lighting

## Electrical Outlets

Position electrical outlets for the local supply of digital or analog video cameras, distributed MX units, or any third-party devices every 3m or closer. Double electrical outlets are preferable.

### Warning

Use only wall-mounted electrical outlets. Extension cords or power outlet strips can suffer electrical surges that can damage the Vicon MX hardware or third-party devices.

Near the operator desk/console, provide the appropriate number of outlets for the electrical equipment included in your Vicon MX architecture:

#### Vicon MX Hardware:

Vicon Host PC	≥2 (1 per each CPU and monitor)
Remote PCs (for Vicon RealTime Engine or visualization software)	≥2 (1 per each CPU and monitor)
MX Net, MX Link, MX Ultranet	1 per MX unit

#### Third-party Devices:

Force Plate Amplifiers	1 per amplifier
EMG Units	1 per unit
Additional equipment (e.g. video mixers, printers)	≥1 per device (as required)

## Cable Conduits

Provide conduits for channeling MX cables (supplying power and communications) or force plate cables from the equipment to the operator desk/console area (for details, see the [Furniture and Equipment](#) cards). Alternatively, you could use a removable baseboard (skirting board) to conceal the camera cables.

Wall-mounted camera cable conduits should be 30-50mm in diameter and should extend into the ceiling from the mounting location of the camera.

One conduit is required for each camera location. You may wish to install larger conduit (60-70 mm) where a group of camera cables are to pass to an MX Net or MX Ultranet unit. For very large labs, consider installing additional conduits to allow for greater flexibility when repositioning the cameras (for guidance, contact your Vicon Sales representative or your nearest agent or distributor).

If you have installed a false floor (e.g. for force plates), provide space for the cable conduits underneath the flooring. You require a 15mm hole in the

floor and associated trunking to pass the cable from each camera. If you have installed a force plate pit, you need a conduit at least 75mm in diameter in the floor, extending from the force plates pit area to the operator console area. Ensure that there no sharp bends in the cable conduits.

We recommend that you install camera cable conduits after the optimum room layout and camera positions have been established. This enables you to place the conduits close to each camera position.

## Network Considerations

All Vicon MX hardware communicates through a dedicated Ethernet network using supplied MX cables. Also use a dedicated connection between MX hardware and the host PC to ensure that MX communications traffic does not affect Internet or other network communications. If you need to connect your MX host PC to another network, you must use a separate Ethernet port in the host PC. For further details, see the [Vicon MX Hardware System Reference](#) book.

## Lighting

No special lighting is required in the lab. Normal laboratory lux levels can be used without affecting system performance; however, spotlights should not be used. We recommend that you use fluorescent lights throughout the lab; starters may be included with ceiling assemblies. Recessed fluorescent lights are particularly recommended, though you may need to provide more of these than of normal fluorescent lights.

Incandescent lights or any lights located directly over the calibration volume, must be able to be turned off and still leave a reasonable lighting level in the lab. It also is useful to be able to dim the lighting levels around any computers to reduce screen glare.

If possible, provide lighting controls inside the lab, locating light switches near the entrance door. Wire lighting into a separate electrical circuit than the Vicon MX system to minimize the effects of any switching surges.

## Fan and Heating Circuitry

Wire any electrical fan coils or heating systems into a separate electrical circuit than the Vicon MX system to minimize the effects of any switching surges.

**Notes**