

# General Site Selection Criteria

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It is easier to address facility design issues in the planning stages than to correct problems after the fact. Often, it is impossible to implement extensive actions in an on-line computer room without impacting uptime. For this reason, it is extremely important that adequate attention is paid to issues such as the physical location of the building, the location of the data center relative to the other areas of the building, and all aspects of the support infrastructure. A little extra planning can save a tremendous amount of time, money and aggravation over the lifetime of the facility.

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## 1.1 Locating the Building

Cost and numerous external factors influence the site selection for a building accommodating a new data center. Not least among these factors is the potential environmental impacts the building will have on the data center. Often, a site planner weighs numerous conflicting criteria when selecting the most appropriate location. Whenever possible, consider the following factors.

- **Natural Disasters;** avoid sites in areas susceptible to natural disasters. Flood plains, tornado or hurricane hot-spots or seismically active areas are not optimal choices. While precautions can be taken to accommodate building in such areas, there are additional cost considerations, and more likelihood of impact on utilities or other infrastructure support.
- **Electromagnetic Interference;** avoid choosing a site near sources of electromagnetic interference (EMI) or Radio Frequency Interference (RFI). Telecommunications signal facilities, airports, electrical railways, or other similar sites are often associated with high levels of EMI/RFI that could interfere with the proper functioning of computer hardware. Shielding computer rooms from EMI/RFI adds to the construction cost.

- **Industrial Pollution;** avoid locating the facility near major sources of industrial pollution, such as factories, manufacturing facilities, or sewage treatment facilities. Chemicals associated with these facilities can impact hardware reliability if they migrate to the controlled areas of the data center. Even the chemicals associated with field treatment in large agricultural areas have been known to cause hardware failures. While these contaminants can normally be arrested with high-efficiency filtration or chemical filters, these processes can add significant costs to the maintenance of the data center
- **Vibration;** avoid locating the site near major sources of vibration. Airports, rail lines, busy highways, traffic tunnels, mines and other similar sites can generate continued or intermittent vibration that could disrupt operations. Such vibration can affect disruption of utilities or support equipment, or it might directly disrupt the hardware.
- **Established security;** consider locating the building within an existing complex so as to take advantage of established security measures. Costs associated with the expansion of existing patrols and security systems will most likely be less than replicating these at a separate site. Both active and passive security measures should be employed to protect the data center from vandalism, industrial espionage, or terrorism.
- **Minimized Target;** avoid making the data center a crime target. Besides the vapor barrier concerns normally associated with them, exterior windows can also pinpoint the location of the data center for designed assault. In addition, due to its 24 hour operation, data center windows have been known to be targeted in vandalism shootings simply because they are the only lights on in the middle of the night.
- **Proximity to neighboring structures;** isolate the building from the risks associated with neighboring structures. Office areas or industrial buildings have a higher risk of fires or other hazards. The data center should not be susceptible to downtime caused by activities not associated with its functioning.
- **Emergency services;** ensure adequate access for support and emergency services. This is particularly important in congested urban areas. Access for large delivery trucks or emergency fire response should be free of obstacles at all times. Parking for emergency power generation or air conditioning vehicles, necessary during a prolonged outage, should be considered.
- **Availability of utilities;** ensure adequate utilities are available. While urban areas pose many logistical problems, they normally provide the availability of redundant utility feeds and good infrastructure support. Extreme rural areas may be more susceptible to single points of failure, making the data center more reliant on its on-site backup equipment.

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## 1.2 Locating the Computer Room

Whether a dedicated facility or part of a multipurpose building, the physical location of the data center is extremely important. The raised floor space, air conditioning support, uninterruptable power supply (UPS), generators, and related support equipment must be coordinated with the other areas of the building and properly positioned within the building perimeter in order to optimize their interaction and the overall support of operations. The location of the data center within the overall facility should be based on numerous criteria, including the following general considerations.

- **Isolation from contaminants;** isolate the computer room from contaminant-producing activities. Isolate the computer room from contaminant-producing activities. Influences from print rooms, machine shops, kitchens, loading docks, or any area with high levels of contaminant generation or operator activity should be avoided. Ensure the exhaust from generators or other sources does not directly enter the intake of air handlers serving the computer room.
- **Access;** ensure adequate access for hardware from loading dock, freight elevator or appropriate entrances. This will include appropriate door sizes negotiable corners, ramps and smooth floor surfaces. In addition, it is important that proper access is provided in support areas to allow for service or replacement of UPS, chillers and other large items. As a facility grows or changes, access paths are often eliminated or changed.
- **Security;** provide secure points of entry to the computer room. This helps secure sensitive data, limit the possibility of employee vandalism, minimize exposure to inappropriate psychrometric or contaminant conditions, and control the possibility of failures caused by inadvertent actions of untrained personnel.
- **Raised flooring;** design the raised floor computer spaces in convenient proximity to the support equipment (UPS, chillers, etc.). It is often appropriate to locate the data center on floors above the support equipment in order to consolidate cooling and power trunklines.
- **Air conditioning;** consider the type of air conditioning to be used. Chilled water units will need to be connected to chillers located in the building or an adjoining support facility, and may require cooling towers. Due to noise and structural issues, chillers are normally located in the basement of the facility or in a separate wing of the main building. Direct expansion air conditioners require condenser units located outside the building. In addition, the roof or outside pads should provide adequate structural stability to accommodate the condensers.
- **Risk of leaks;** avoid locating the hardware areas beneath potential liquid leaks. Do not run the air conditioner piping through the ceiling void of the computer room. Do not locate the data center beneath kitchens, workshops, or other areas that have a high potential for leaks. Locating the computer room below building grade adds the potential for leaks from outside the building. In addition, locating the computer room on the lower floors of a multistory building, particularly one

with multiple tenants, runs the risk of leaks associated with a sprinkler discharge in the floors above. Expansion joints, conduit or pipe penetrations, cracks and other breaches can all allow for water infiltration.

- **Proximity to tenants;** avoid locating the computer room near areas leased by other tenants. While the current application of the neighboring room may be appropriate, this could change dramatically should the lease change hands. In addition an area with a short-term lease may change hands frequently, necessitating potentially disruptive renovation activity.
- **Room to expand;** locate the computer room in an area that offers the potential for future expansion. Even though technology changes tend to make hardware more space-efficient over time, the ability to expand, either within the current footprint of the building, or through additions, should be available to accommodate possible growth as the room evolves. If growth is anticipated, constructing surrounding offices on a preinstalled raised floor will facilitate the conversion to hardware areas. If growth is not anticipated in the near future, but is still possible, applications that can be easily moved should be considered for the surrounding areas. Avoid land-locking the computer room. While the expansion need not be directly connected to the existing areas, it is often easier to share support equipment, such as chilled water loops or security, if they are located in close proximity.