So, you want to build a data center?

1. Select a Team

Select a builder and a design engineer. The technical complexity of these buildings requires team members with specialized expertise in datacenter construction, as well as a proven record of successful projects and satisfied customers. Success also depends upon the resources team members bring with them. If multiple sites are planned, choose team members with a national presence and with experience in many geographic locations. Such teams should offer the owner a single point of contact (for the sake of consistency) but rely upon the knowledge, experience, and relationships developed over the years by their regional offices.

2. Decide on Project Format

The format that the owner chooses greatly affects the tenor of the project. The "design/bid/build" format creates adversarial relationships between the owner, designer, and builder. Time and effort is often wasted on dispute resolution. In contrast, the "design/build" format fosters a cooperative environment. The owner's costs and the required schedule are agreed on at the outset of the project. Team members work together toward one goal, which, throughout the project, saves time and money. Collaboration is essential for ensuring projects are completed on time, under budget, and without litigation.

3. Planning

A) Conduct Needs Assessment. The design/build team first works to determine the datacenter's program requirements. Generally, the driving factor is to maximize the amount of computer/server floor area. This, in turn, drives the other requirements: mechanical, electrical, power, backup generators, cooling, etc. To guide the design program, the needs assessment will also uncover other required building features, such as minimum ceiling heights and floor loading, the amount of front office space needed, acceptable roof and skin materials, and the preferred redundancy and security measures.

B) Select & Evaluate Site. The design/build team can assist the owner in identifying possible datacenter sites. The optimum location is often within an industrial park or warehouse area, one with available fiber to provide a high-bandwidth connection to the Internet backbone. Whether the selected site is an existing building or an empty plot of land, the team can assist in the site acquisition to help determine if any obstacles need to be addressed before the property can be developed as a datacenter.

4. Check Fiber Connectivity and Power Availability

The owner and team meet with fiber-optic cable providers to review locations of local fiber-optic cable in relation to the site. It is preferable to have multiple fiber suppliers feed each site, to provide supplier options and redundancy.

One of the most critical components for a potential datacenter project is a thorough investigation into the availability of electricity from the local utility provider, plus a cost assessment for providing electrical service to the building. The team meets with the local utility provider on the owner's behalf, prepares and submits a letter to the utility, requesting service for a specified load, and then coordinates all design and installation activities for the service. Depending on the specific situation, the team may also be involved in the design and/or construction of a private substation or cogeneration plant to serve the datacenter's power requirements.

5. Engineering Design and Preconstruction Services

The entire team□owner, designer, and builder□must work together from the onset of the project to ensure that the owner's criteria and the designer's thoughts and plans can be constructed within specified schedule and budget constraints. Valuable time is wasted if the builder is brought on board after the design is finalized. Often, value engineering studies and alternative equipment suggestions offered by the builder present tremendous savings to the owner. The sooner these suggestions can be considered and incorporated, the less likely redesign time will affect the overall project schedule. Therefore, the most successful projects□whether or not they are subject to fast-track schedule requirements□are those in which the entire team works

cooperatively on engineering design and preconstruction services from inception.

6. Equipment Redundancy & Construction Needs

Any mission-critical datacenter requires redundant mechanical and electrical systems, in order to ensure uninterrupted computer operations. The level of redundancy and resultant system reliability presents a major decision-making situation for the owner. With the growth of Internet website hosting, high availability is key, and a measurement standard has been established to guide datacenter design. For instance, if the owner requires 99.0 percent uptime per year in its datacenter systems, then the balance of the year (1.0 percent) translates into probable downtime equal to 88 hours per year. At the opposite end of the spectrum, if the owner is willing to invest in a much more sophisticated level of systems redundancy, thereby reducing the probability of downtime, then a datacenter can be designed for 99.9999 percent uptime, translating into a 32-second per year downtime likelihood. The goal is to ensure that no server ever loses power, even if the utility company suffers an outage, allowing e-commerce to continue, without interruption, as mission-critical applications stay online. However, the cost of each successive level of redundancy is very high, and the owner must weigh that cost against his future customers' willingness to pay for that redundancy.

Obtaining the right equipment and material for datacenters can be difficult in an active market. Currently there are long wait times for many items. This should be a consideration when selecting your builder, as larger builders often have considerable purchasing power, which can expedite delivery of key items. Long-standing relationships with vendors and subcontractors ensure that material arrives and is installed on time, permitting each datacenter to be completed on schedule.

7. Construction Scheduling

Preparation of, and adherence to, the construction schedule is one of the most critical aspects of data center construction. The design/build team must be willing to commit to the schedule milestones identified by the owner. Actual performance during the project should then be compared to the original plan, followed by a computation of projected completion dates for future activities. These projections will then be used by the builder to control the execution and timely completion of the project.

8. Quality-Controlled Construction

A top-notch builder implements an on-site quality control program to monitor and verify that each component of the project is fabricated, constructed, installed, tested, and documented to be in compliance with the construction documents. Dedicated construction professionals should lead the quality process from the planning of each package, to design and procurement, through inspection and documentation of construction activities, to successful project commissioning, and turnover to the owner.

9. The builder typically coordinates the efforts of the individual manufacturers who provide equipment integral to the building itself.

The purpose of commissioning is to verify the proper operation of all systems, including all mechanical, electrical, fire, safety, power, and building automation systems. The design/ build team reviews all of the final as-built drawings, testing reports, and operating manuals used in the operation and maintenance of the facility for completeness, and then delivers those materials to the owner.

10. Server and Fiber Installation

Finally, technicians install densely packed servers in racks, maximizing every available square foot of space in the data center. High speed backbone cabling in the data center connects every server to a telecommunications distribution room. Here a digital signal is "handed off" to the fiber cable of the local loop routed into the building by telecommunications providers. The local loop takes the connections to a hub of the Internet backbone, which sends each message packet along the way to its encoded destination.