ENGINEERS AND THE LAW

Data Center Dilemma

Downtime Can Lose Millions Of Dollars

Litigation Trend: Mission Critical Meltdown

By: Michael Hutchens and Elizabeth Poeschl, Attorneys, Meagher & Geer, P.L.L.P.

In 2013 we represented a design firm in litigation that can be described as a battle of titans with the owner, GC and subs, all gunning to place blame on the design. Our successful defense focused on the adequacy of the design at the time of design, the failures of the contractors to properly install the system and the overreaching scope of the repair, which arguably constituted an upgrade. The case involved a Fortune 500 retail giant that entered into a design-build contract for the construction of a mission critical data center facility. After the facility had been constructed, and after it was up and running for nearly eight years, concerns developed that some of the underground feeders for the data center were overheating. Eventually, various consultants weighed in, and the owner of the project made the decision to run an extraordinary number of underground feeders overhead instead, to better dissipate the heat. There was a debate as to whether the scope of that work constituted an upgrade, or a repair. Highly qualified experts weighed in and disagreed on nearly every issue. The case ultimately went to a jury trial for resolution.

Among the issues presented was whether the original design complied with the standards in the industry that existed at the time of the design. Technologies had evolved, so there was more information about the RHO value of the soils that were used to compact around the underground feeders. There was also a debate as to who had responsibility for conducting heat dissipation calculations once the contractor determined how it would lay out its complicated network of underground duct banks. In order to do the heat calculations, one must know detailed information including, among other factors, the type of backfill material; RHO value of the backfill material; the compaction level; load factor; the proximity of the duct banks to one another; and the depth of the duct banks.

Eventually, a jury returned a verdict finding the general contractor 43% at fault; the general contractor's electrical subcontractor to be 37% at fault; and the electrical engineer to be 20% at fault.

The Data Explosion

Today's personal computing devices are faster and smaller than ever, giving people the unprecedented ability to work, shop and play from any Wi-Fi enabled location. That leap in computing freedom may foreshadow a hidden legal issue: Aging data centers that were not constructed to handle today's unexpected torrential processing demand, or new centers that do not meet all code and regulatory requirements.

As construction and product liability litigators, we find that this issue has very real meaning for many people and businesses. Over the past decade, we've gone from people mainly having computers at home to now having multiple devices they carry every day. People now expect almost instant on-the-go information access, and that puts greater loads on data centers that we expect to be up and running all the time.

How much has data demand exploded in recent years? Consider these findings from a global mobile traffic study by Cisco Systems[1]:

- In 2012, mobile data traffic was nearly 12 times the size of all global Internet traffic in 2000 (885 petabytes per month vs. 75 petabytes per month).
- Last year alone, mobile data traffic grew 70 percent and mobile video traffic exceeded 50 percent of overall usage for the first time.
- The average data use per smartphone grew 81 percent (342 MB per month in 2012, up from 189 MB in two years ago).
- The number of mobile-connected tablets increased to 36 million, and each tablet generated nearly 250 percent more mobile data traffic than the average smartphone (820 MB per month vs. 342 MB).
- Finally, 161 million laptops logged into mobile networks in 2012, and each one generated seven times more traffic than the average smartphone (2.5 GB per month vs. 342 MB).

Due to this rapid escalation of mobile computing, data centers are generally considered "mission critical" facilities, since downtime can lead to lost revenue, unhappy customers or threats to business continuity. Increased system demand leads to more power consumption, creating a heat load that older data center circuits may not be able to dissipate. Even new facilities are not immune to problems, including a massive National Security Agency data-storage project in Utah that has been hindered by several "arc flash" meltdowns that have caused significant delays and hundreds of thousands of dollars in damage[2].

Why Heat Calculations Matter in Data Center Design

Here's a simple way of thinking about heat and electricity: If a homeowner plugs in an appliance that draws more amperage (current) than a basic outlet can handle, a fuse or circuit breaker will pop, cutting off power as a safety measure. In some cases, the outlet faceplate will be very warm after such an event, due to circuit overheating.

Now, think about the exponentially higher electrical load in a data center, which often houses hundreds or thousands of servers. When

Data centers are generally considered "mission critical" facilities, since downtime can lead to lost revenue, unhappy customers or threats to business continuity.

a data facility is designed, engineers often perform a Neher-McGrath calculation, which helps determine the potential amount of heat transfer from power cables to the surrounding environment[3]. This is an important step, because it affects conduit or conductor size and spacing, electrical load factors and how well the environment surrounding electrical circuits can dissipate heat.

For example, if a data center's electrical circuits are underground and packed in native backfill, precise soil sampling, compaction and fill depth calculations must be done to reduce the risk of electrical overheating. If the engineer's soil thermal resistivity (RHO) calculation is overly conservative, too many conduits will be installed, which raises installation costs. But, if the RHO calculation underestimates the heat dissipation capacity of backfill, or if the underground conduits are not properly installed and carefully backfilled, hot spots can develop on underground conduits. This can lead to overheating, thermal instability and, eventually, system failure.

This heat dissipation calculation has been around for a long time, but it's only in recent years that it has become a critical component for data center design. Going forward, this calculation will become even more important, since data demand is only going to increase."

Modern Standards Do Not Necessarily Apply to Aging Data Centers

The ripple effect of a major data center system failure can lead to significant costs. For instance, industry research from Emerson Network Power released in 2011 noted that companies lose an average of about $5,000 per minute during an IT system outage[4]. Collectively, the surveyed companies reported average downtime length of 90 minutes, meaning that a typical business faced costs of nearly $500,000. In addition, the report said data center outages for telecommunications or ecommerce firms were even more expensive, with the highest cost for a single outage reported at $1 million (or about $11,000 per minute). Depending on company size, the costs associated with an outage could be significantly higher and have a far reaching impact on the firm's business.

Due to the expense of IT downtime – and its subsequent effect on productivity, revenue generation and corporate brand – business owners and executives will often assign initial blame to a data center's design engineers and contractors. However, any liability discussion with respect to data center design must begin by examining a simple premise: Did the project's engineering work meet all code and other relevant standards applicable *at the time of design*?

Consider this example: Say a company constructed a data center eight years ago. At the time of project completion, the facility met all relevant engineering and construction standards. Now, assume that load factors increased at that facility over the past several years, with servers running at or over design capacity. Or, assume the contractor improperly installed the electrical system. In either scenario, the resulting heat load from increased power use could cause overheating or "arc flash" incidents, which frequently trigger system downtime.

If systems in this aging data center did go down from overheating, it is likely that business leaders would retain IT consultants to conduct a failure analysis. However, that analysis typically relies on current-state standards or techniques, which may show that the design or construction was defective. Such a report may also lead business leaders to mistakenly conclude that the original engineering or construction companies should be liable for any significant repairs or upgrades they deem necessary.

From a legal vantage point, using a current-state analysis as the basis for any liability claims is an untenable approach. A better idea for business leaders is to hire experts to conduct two separate analyses – one that uses current-day standards to determine the cause of system failure and needed repairs, and another that uses the original engineering code and standards as the benchmark to determine if the data center's design was adequate, and if legal damages are justified.

"It makes no difference whether an aging data center had a risk of failure or an actual failure – unless someone could prove that the center's approved engineering design was defective," says Poeschl. "A consultant's analysis based simply on modern-day standards will not prove that the engineering firm's design work was negligent, or that the firm breached its duty of care."

Both Sides of the Liability Question /
The Battle Between Designers and Contractors

What happens if a proper failure analysis shows that the engineering firm's work did not meet acceptable codes and standards at the time the

>

What happens if a proper failure analysis shows that the engineering firm's work did not meet acceptable codes and standards at the time the data center went online? Under Minnesota law, if the facility suffers overheating or other damage that can be repaired, then the data center's owner can sue to recover actual costs to restore the building to its original state.

Michael Hutchens

Elizabeth Poeschl

data center went online? Under Minnesota law, if the facility suffers overheating or other damage that can be repaired, then the data center's owner can sue to recover actual costs to restore the building to its original state. However, the repairs cannot include any "betterment" (actual damages plus the cost of improvement to current standard), since that is not allowed under state law. If system damage attributable to faulty engineering design or construction is not repairable, damages are calculated on the replacement value of affected systems and surrounding structure.

On the other hand, assume a data center's engineering design met all acceptable standards upon opening, but the facility still suffered an overload event and subsequent damage. If internal records or other documents show that the facility's IT staff – or third-party technical contractors – took no corrective steps to handle rising demand on an overtaxed system, the liability for damages could rest squarely with the company itself.

Under such circumstances, it's legitimate to examine what the owner may have done to overload – or not properly maintain – data center systems. A business can't just put more load on an older system and then look to sue the original engineering firm when things finally go wrong.

Documentation is best defense against potential liability claims?

While there is no perfect way for engineering firms to protect themselves from future legal claims arising from data center (or other "mission critical") projects, one proactive step could strengthen any future legal defense – assure that the lines of responsibility are clearly delineated. Engineering firms should also ensure that all contracts specifically state that design work must only comply with the applicable standard of care at this time. In a marketplace where demand for faster, more accessible data will only increase, this contract provision provides engineers with assurance that today's best practices will not become tomorrow's litigation nightmare.

About the authors:
Mike Hutchens and Liz Poeschl are skilled litigators focusing on the prevention and the litigation of business-related disputes, especially those involving construction law, products liability law and employment law. They regularly defend contractors, architects, design professionals and engineers.

Sources:
1) http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html
2) http://online.wsj.com/news/articles/SB10001424052702304441404579119490744478398
3) http://en.wikipedia.org/wiki/Neher-McGrath
4) http://www.cioinsight.com/c/a/Latest-News/Data-Center-Outages-Rack-Up-Costs-Quickly-Report-412374/