



**TECH READY
BUILDINGS**
A program of Concert Technologies

IMPACT OF IOT INFRASTRUCTURE FOR CRE MULTI-TENANT PROPERTIES

*Understanding the challenges of actively managing and updating Information
& Communications Technology (ICT) infrastructure in modern CRE Assets*



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INFRASTRUCTURE MANAGEMENT CHALLENGES IN MULTI-TENANT ENVIRONMENTS

It is Concert's intent that this report should shed light on the shortcomings of historical infrastructure management practices which, while at one time considered the "norm", are now proving to exacerbate the challenge areas and create additional issues which take time and money to overcome; in a multi-tenant environment, these challenge areas also pose a risk to valuable tenants, whose technology needs continue to grow as new technologies become available, and as the speed of all business continues to increase with the advent of greater bandwidth capabilities.

When it comes to managing ICT (Information & Communications Technology) infrastructures in multi-tenant environments, the primary challenge areas present themselves in the forms of Access and Multi-Vendor Management, Building Infrastructure Challenges, and ICT Lifecycle Management:

ACCESS MANAGEMENT AND MULTI-VENDOR CHALLENGES

These issues present themselves in the forms of communication and management challenges throughout project planning phases and implementation at the site level, including communicating work to be performed, juggling multiple vendors, COVID-19 verification, and keeping track of the work that has been performed.

BUILDING INFRASTRUCTURE CHALLENGES

These are the physical obstacles in an infrastructure which can interfere with deployment of technologies (including cabling and equipment) into critical spaces which already house preexisting cabling and equipment; this causes infrastructure capacity to become a major point of focus.

ICT LIFECYCLE MANAGEMENT

These are the management practices which ensure the building infrastructure becomes and remains capable of receiving and supporting all technologies for all tenants at any time, for the entire lifecycle of the building. Rather than viewing infrastructure upkeep on a per-task basis, Lifecycle Management focuses on the building infrastructure as a whole.





ACCESS MANAGEMENT & MULTI-VENDOR CHALLENGES

Multi-tenant CRE environments can have a complex series of day-to-day operational requirements, between the Property Manager(s) and Building Engineer(s), and the performance of both building and tenant-related tasks; these operational requirements, while already demanding of both time and resources, are made more difficult when additional parties and communication channels are added to the mix. The telecommunications requirements of tenants is one area in particular which can drastically increase the demands on the property and its resources, on both a reoccurring and ongoing basis, as tenants' technology needs grow and compound.

As tenants order telecommunications services from a range of vendors, multiple vendors access the site, often on a weekly basis, for service delivery – this means engagement on the part of the Property Manager, Building Engineer, and tenant point of contact (POC) in order for the vendors to gain access to the site and its critical spaces. These already high-traffic communication channels can become quickly strained with the added burden of communicating the need for telecommunications services, ordering and coordinating the services with the property and/or Building Engineer, and may be proven inefficient or ineffective when relied upon as the primary means of managing multiple vendors with limited knowledge of services being performed and the impact these services have on the property's infrastructure.

To aid in the streamlining of communication, scheduling of services, and generating legacy access history information (what party accessed which space and what time, and for what reason), Concert recommends employing the use of a template, such as an "Access Request Form" (ARF). This template would be utilized by Tenants of a building any time vendor access to critical spaces is required. The form would serve to alert the CRE Property Management Team of day-to-day telecom work being scheduled, and to provide summary information on what that work entails. If CRE Property Management is able to prescribe the consistent use of a template of this nature, it would improve communication and information sharing on day-to-day work performed at the building level.

Additionally, if the completed forms were to be stored in a central repository, this would not only allow the Tenants to look back at work which they have contracted over time – which would aide in determining existing service versus what new services might be necessary – but would also provide the CRE Property with historical access data, and on work performed over time.

For your reference and review, Concert can provide an example of the template, the "Access Request Form", upon request.



BUILDING INFRASTRUCTURES CHALLENGES

Building infrastructure challenges are inherent in most buildings, and are influenced by a number of building characteristics, ranging from building age and history to current management practices.

To help bring an infrastructure up to a continuously operational and manageable point, it is important for CRE Properties to develop and enforce the use of Facilities Standards, which should govern such activities as installation, materials required or disallowed, and general requirements for contractors to follow when performing work on site.

For telecommunications requirements, these standards should reflect current ICT industry standards and best practices to help ensure the large number of vendors who may be accessing the site on a regular basis are performing all work in accordance with building requirements, and industry standards.

CRE PROPERTIES FACILITIES STANDARDS

Over the past few decades, Concert has had access to hundreds of properties' Facilities Standards. Through our research we have been able to identify a few reoccurring areas of concern across the gamut of standards, which can play a significant role in adversely impacting an infrastructure, if put into practice. This only works if you have the ability and knowledge to manage the results.

One of these areas of concern which occurs frequently is the required use of innerduct in riser environments, for the deployment of fiber optic cabling. While the use of innerduct was at one time strongly encouraged due to the historically fragile nature of fiber optic cabling, such is no longer the case. See Facilities Standards: Innerduct for more information.

Secondly, there is typically little to no addressment of the concept of continuous Infrastructure Lifecycle Management in the average Facilities Standards document, which is the primary means by which an entity like a CRE Property would control their infrastructure environment (see [Facilities Standards: Critical Space Management](#)).

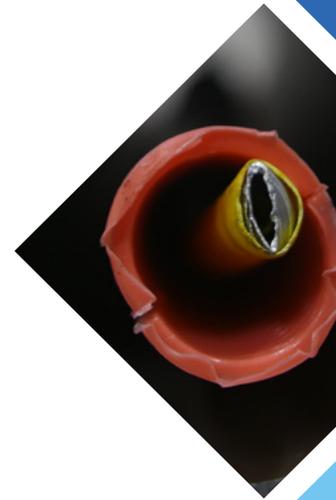
Finally, Site Readiness is a vitally important area of consideration when it comes to maximizing efficiency during the planning and deployment phases of new services (see [Site Readiness](#)).



WATCH: Tech Ready Buildings utilize ICT lifecycle management processes and methodologies to ensure building infrastructure capacity, connectivity, and maintenance services are available to support all current and future tenant and building technology requirements.

1. FACILITIES STANDARDS: INNERDUCT

The purpose of innerduct is to provide visual separation of fiber cabling from all other cabling, as well as to provide an additional level of protection both during the installation process, as well as for day-to-day operation (protection from accidental cutting, etc.). However, fiber optic cabling is far more resilient today than it was when it was first being deployed in ISP (Inside Plant) environments; its bend radius is more forgiving, its jacketing is more protective, and even unarmored, jacketed fiber can now be considered safe from harm when deployed in an infrastructure which is actively monitored and managed (see [Critical Space Management](#)).

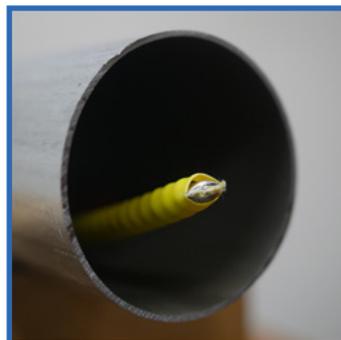


There exists no requirement in ICT industry standards that innerduct must be installed along with fiber optic cabling; even the leading fiber manufacturers, such as Corning, provide installation guidelines for environments where innerduct is required by the owner, but they typically make no requirement of their own for its use, and the use of innerduct bears no influence over fiber warranty.

Fiber cabling deployed by the Local Access Provider and/or Carrier will often come with the Carrier's own requirement that their fiber travels alone through its own innerduct and no other cabling is permitted to share the same space. As Carriers typically deploy just one to a few fiber cables through an innerduct at a time, the result is a massive amount of space consumption dedicated to a single carrier, as demonstrated in the images below:



An armored 12 strand micro-armored fiber optic cable installed inside a plenum innerduct (typically 1.25").



An armored 12 strand fiber optic cable.



An armored 12 strand micro-armored fiber optic cable.

Understanding the historical innerduct requirement and resultant (likely) pre-existing congestion in the riser system and considering the additional circuit deployment that will occur over time just by virtue of a CRE Property typically being a multi-tenant environment, the CRE Property should consider the "readiness" of the riser systems and other restrictive pathways to accept additional cabling.

It is entirely possible that this gradual increase in media deployment will necessitate either, 1.) The procurement of coring services to produce more capacity – a service which is costly and time-consuming, or, 2.) The procurement of remedial services to remove the unnecessary innerduct (another costly and time/resource-consuming service), thereby reclaiming core capacity.

It is important to understand that the Carrier is bound to abide by the site's requirements. If the CRE property were to dictate "no innerduct shall be used" (or substituted alternative) to save core holes, conduits, and other restrictive pathways spaces, that property requirement would override the desires of the Carrier (see [Recommendations](#)).



2. CRITICAL SPACE MANAGEMENT

The continuous management of critical spaces in CRE Properties, such as the entrance facilities, equipment rooms, riser closets, etc., is essential to the continued protection and maintenance of critical circuits and systems.

Critical space management is comprised of a series of controls, such as access management (e.g., identifying designated points of contact, providing escort services to secure spaces, monitoring access to spaces), documentation of space contents and work performed, and other practices essential to securing the infrastructure. The “Access Request Form” template discussed in section 2.1 is an example of a critical space management tool.

Without critical space management, critical circuits and systems are left vulnerable to inexperienced technicians, disgruntled employees or Tenants, or other persons who simply should not have access to these spaces.

Additionally, without active critical space management efforts, documentation of work performed (e.g., services delivered), space contents (e.g., equipment inventory and removal, carrier presence), etc. tends to go undeveloped, meaning repeat surveys are contracted over and over for single project efforts, and in some cases additional circuits are ordered when they are not needed (i.e. POTS lines), simply due to a lack of knowledge or documentation of the existing system.

3. SITE READINESS

Site Readiness is a series of activities performed at the building level to ensure the building’s physical infrastructure is capable of receiving additional circuits and equipment. This includes ensuring there is capacity in the OSP (Outside Plant) pathways, through the service entrance into the building, and throughout the main distribution pathways of the building. Often, it also includes horizontal pathways in building environments where circuits are intended to be deployed directly to the customer suite. Additionally, Site Readiness includes ensuring the spaces slated to receive the circuits have the necessary power to support the local access provider’s and/or Tenant contractor’s active equipment which will be installed as part of circuit delivery.

In multi-tenant, multi-story buildings, this should be a particular point of focus considering how unorganized and depleted pathway and space capacities becomes over time through the deployment of circuit cabling (including the installation of innerduct) and equipment, and the rarity of their removal once no longer in use.

Through proper Site Readiness activities, infrastructure capacity, code compliance, and general preparedness for circuit deployment can be evaluated, documented, and recommendations can be provided for activities such as dead cable removal, dead equipment removal, electrical outlet installation, and other important activities necessary to restore capacity to the building and in general to ensure the site is ready to receive the new circuits necessary to support Tenant needs.

Without proper performance of Site Readiness activities, when the time comes for Contractors to perform survey and/or circuit installation activities, their work could be delayed for long periods of time for performance of Tag-and-Locate on circuits, or for survey and installation of additional cores and conduit to expand capacity, or for other time and expense increasing activities necessary in order for them to be able to perform installation activities (see [Common Site Issues/Resolutions Chart](#)).



WATCH: For additional information on Site Readiness, please watch the following short video (6:05) on what it is, what it involves, and why it’s so important.

COMMON SITE ISSUES AND RESOLUTIONS

The following table includes examples of issues which are frequently encountered during the delivery and maintenance of telecommunications circuits and services. These issues can be compounded in buildings in which Organizations lease space, due to lack of understanding building telecom infrastructure and proper controls to manage it.

#	Common Situations (Site Issues)	Possible Culprits	Property Management Resolutions
1	<i>A tenant's network is down inside a building, and Carrier indicates the building's cabling is at fault.</i>	<p>1-Highly-congested and unmanaged room/closet spaces mean technicians can accidentally disconnect the services of others.</p> <p>2-Disgruntled personnel sabotages cables in telco spaces.</p> <p>3-An active cable has been damaged by attempting to pull additional cable in highly congested pathway.</p>	<p>1- Have an accurate log of individuals (including contact information) accessing critical spaces, for traceability (used with Access Request Form (ARF) for secondary accountability).</p> <p>2- Vendor completed ARF, Building should centrally store all ARFs.</p>
2	<i>A technician installs cabling through riser closets and does not firestop or properly firestop the core holes penetrated after installation.</i>	<p>1-Typically, technicians do not utilize any kind of quality control process to ensure core holes are evaluated prior to and after install.</p> <p>2-Often the firestop materials which are used are not of the correct rating.</p>	<p>1-Set up a process by which firestopping is a post-installation quality control effort and/or post signs in spaces indicating that firestopping after any/all penetrations is required.</p> <p>2-ARF used in post-work Building QA.</p>
3	<i>Creating new pathways with cable fasteners (tie-wraps) become loose or adding cables over time and break, causing cables to droop in areas (i.e. parking garage) causing safety concerns and likely cable damage (i.e. vehicles catching loose cables).</i>	<p>1-Conduit pathways are full, and the installation of additional conduit would require extensive workmanship, so technicians fasten cabling to existing conduit</p> <p>2-Once the alternative pathway is established (fastening to conduits) future technicians follow same pathway.</p>	<p>1-Property Management should have a Quality Assurance process in place for post-installation impacts to the building.</p> <p>2- ARF used in post work Building QA</p>
4	<i>Time spent on installation of telecommunications cabling is significantly increased due to lack of building documentation and guidance.</i>	<p>1-There is very little accurate documentation for building common areas (e.g., telco closets, etc.).</p> <p>2-The Property Management Team has very little involvement with directing onsite technicians due to lack of knowledgeable resources.</p>	<p>1-Develop and maintain a central repository of up-to-date building documentation.</p> <p>2-The Property Management Team develops an understanding of the potential impacts of telecom work on the building and tenants they serve.</p>

COMMON SITE ISSUES AND RESOLUTIONS (CONT.)

#	Common Situations (Site Issues)	Possible Culprits	Property Management Resolutions
5	<i>Existing telecom cabling cannot be used because it appears to be connected and active, causing additional cabling to be ordered, thus further decreasing capacity in core holes and other pathways.</i>	1-When decommissioning circuits, connections are not removed causing technicians to install new cabling. This is due to the investigation time it takes to determine if the necessary connection and cable are available, which can be very time-consuming task.	1- All cabling not removed must be labeled "abandoned" at each cable end point with opposite end locations indicated on each tag (NEC 700.25 & 800.25). 2-Property Management requires that contractors/ carriers remove any cross-connects or interconnections no longer in use (post sign in telco rooms)
6	<i>Unused equipment is left in telco rooms, occupying valuable wall and/or room space, which could be used in future.</i>	1-In many cases when vendors deem equipment unusable, they will leave it on site to avoid the expense of removal and disposal.	1-Photos of all telco spaces should be taken and placed in a central repository for the building. Discussions should take place to identify abandoned equipment and plan its removal. 2- Post work performance requirement signs in telco rooms 3 – ARF used in post work Building QA
7	<i>A hodgepodge of cabling, associated materials, and poor installation practices are utilized in telco spaces. This results in inferior materials used, life/safety violations, and unpleasant looking telco spaces.</i>	1-No standardization for the revolving door of technicians entering these spaces weekly, and each having their own methods 2-No post-installation quality control, and continued alteration of cable pathways and spaces. Different grades of cabling are used, and some cables are not fire rated for riser spaces.	1-Development of a short document which standardizes installations, decommissioning practices, and alterations of pathways and critical spaces. This document would be used to direct contractors/ technicians working within critical spaces.
8	<i>A telecommunications circuit is brought into a building, but it is not labeled or is labeled incorrectly. The technician spends additional time trying to identify the circuit, and ultimately cannot locate it, at which point the technician must call in a "Tag and Locate", which could mean another 2 visits, one by the local access provider to identify and label the correct circuit, and the second visit by the contractor to complete the inside cabling.</i>	1-Lack of labeling or improper labeling can be an issue with local access providers.	1- Property Management requires contractors and carriers to ensure all active carrier cabling is labeled with the appropriate circuit ID at the cable endpoints.



COMMON SITE ISSUES AND RESOLUTIONS (CONT.)

#	Common Situations (Site Issues)	Possible Culprits	Property Management Resolutions
9	<i>Tech is turned away at site - Points of Contacts (POCs) aren't properly informed of the tech's visit, or breakdown in the communication channel occurs (between property mgt/building engineer and Vendor/Vendor Subs/local access providers).</i>	<p>1-A lot of individuals can be involved in this process. Any individuals not properly informed can jeopardize technician access to site, which can cause delays, additional visits, and additional costs.</p> <p>2-Designated site POC is not available at time of visit, and either no alternate POC was identified, or alternate POC is unavailable.</p>	<p>1- ARF is completed and submitted to building prior to visit.</p>
10	<i>Extensive delays for installation of conduit from right-of-way manhole to building service entrance.</i>	<p>1-Inexperienced personnel dealing with multiple parties and permitting; parties involved are unaware of OSP (outside plant) right-of-way and must spend extra time and engage additional parties to investigate.</p>	<p>1-Require documentation (plans, drawings, etc.) for all construction and permitting to be submitted for approval by property management.</p>
11	<i>The technician does not perform necessary bonding as part of circuit installation.</i>	<p>Depending on the location of the new circuit, there may not be the necessary bonding or grounding busbars in place.</p>	<p>1-Ensure all telco spaces are outfitted with proper bonding/grounding busbars based on their location in the system.</p> <p>2-Ensure requirements for bonding and grounding are clearly delineated in building requirements documentation and are communicated to all persons working within the building telco spaces.</p> <p>3- ARF used in post work Building QA Enforce the requirement through post-installation quality control efforts, and by requiring as-built documentation from installers.</p>
12	<i>Delivery of the new circuit is delayed due to pathway unknowns (e.g. location, direction, current capacity, etc.); with fiber being utilized for ethernet, many tenants' circuits are delivered directly to their tenant space, so pathways must be known.</i>	<p>Building pathways have not been surveyed properly, or the results of the survey have not been documented or maintained, leading to pathway unknowns and preventing swift installation.</p>	<p>1-Require the contractor to document the pathway(s) utilized during installation and provide to Property Management.</p> <p>2-All documentation should be stored in a centralized building repository for easy access.</p>



COMMON SITE ISSUES AND RESOLUTIONS (CONT.)

#	Common Situations (Site Issues)	Possible Culprits	Property Management Resolutions
13	<i>Multiple or lengthier surveys are performed with more disruption to tenants and property management's team.</i>	Unorganized or no documentation to provide vendor increasing service time.	1-Have a central repository indexed for building documentation to support contractors to decrease service time on site.
14	<i>Building experiences continued capacity and code compliance issues in telco spaces.</i>	<p>1-Often, building requirements regarding acceptable installation practices and general maintenance of the telco spaces are not established, or are not communicated to technicians prior to site work.</p> <p>2-Inexperienced or unprofessional installers may not be aware of or used to performing what are considered standard installation-related practices, such as firestopping.</p>	1-Place a sign in each telco space identifying the building's standard requirements related to telecom installation practices (i.e. "Must firestop all penetrations", "Must remove all unused cabling", "Must remove all unused equipment", "Must perform proper bonding", etc.)

ICT LIFECYCLE MANAGEMENT

In order to ensure accurate and efficient project planning, from activities as simple as running a new cable to complex design-builds and demo projects, and to guarantee continuous uninterrupted access to the cloud, it is imperative that the ICT infrastructure that supports that connectivity is accurately documented and maintained for the life cycle of your building.

For the success of both long-term planning and immediate maintenance, CRE properties need to make sure that all ICT infrastructure spaces and pathways are inventoried thoroughly, accurately documented and all documentation is amended in accordance with all MACs (moves-adds-changes) as they are performed within the building.

Engineers, Property Managers, and C-Level tech execs face many challenges when implementing in-house solutions to the documentation of their infrastructures, such as over-committed personnel and departments, tight budget constraints, legacy infrastructure issues, succession of new personnel, and contract transitions. These challenges can quickly push other tasks, like managing day-to-day infrastructure issues, to the bottom of the to-do list.

Historical trends in ICT have been more of a 'set it and forget it' approach. MACs are performed, such as the retirement or relocation of telecommunications closets and installation of new cabling, but the infrastructure changes largely go undocumented. When these infrastructures are left unmanaged and undocumented, there is no regard for future connectivity in mind.





ICT LIFECYCLE MANAGEMENT (CONT.)

Pathways are often unknown and upgrades implemented in a haphazard fashion, leaving existing pathways congested with abandoned cabling and newer cabling not being utilized to its full potential. Without accurate information that shows the existing, usable facilities and available capacity, decision-makers have no choice but to bring in technicians to conduct repeat surveys before every new install.

By implementing a proactive solution, CRE Properties can avoid the headaches inherent in an undocumented or inadequately-documented infrastructure, such as having to contract repeat surveys to locate infrastructure elements, dealing with long site visits, and lengthy planning cycles due to insufficient information, and suffering difficult-to-resolve outages.

RECOMMENDATIONS

In summary, to aid in both the return of pathway and space capacity to the telecommunications infrastructures of CRE Properties, as well as to ensure the continued maintenance of building infrastructures moving forward, Concert's recommendations are as follows:

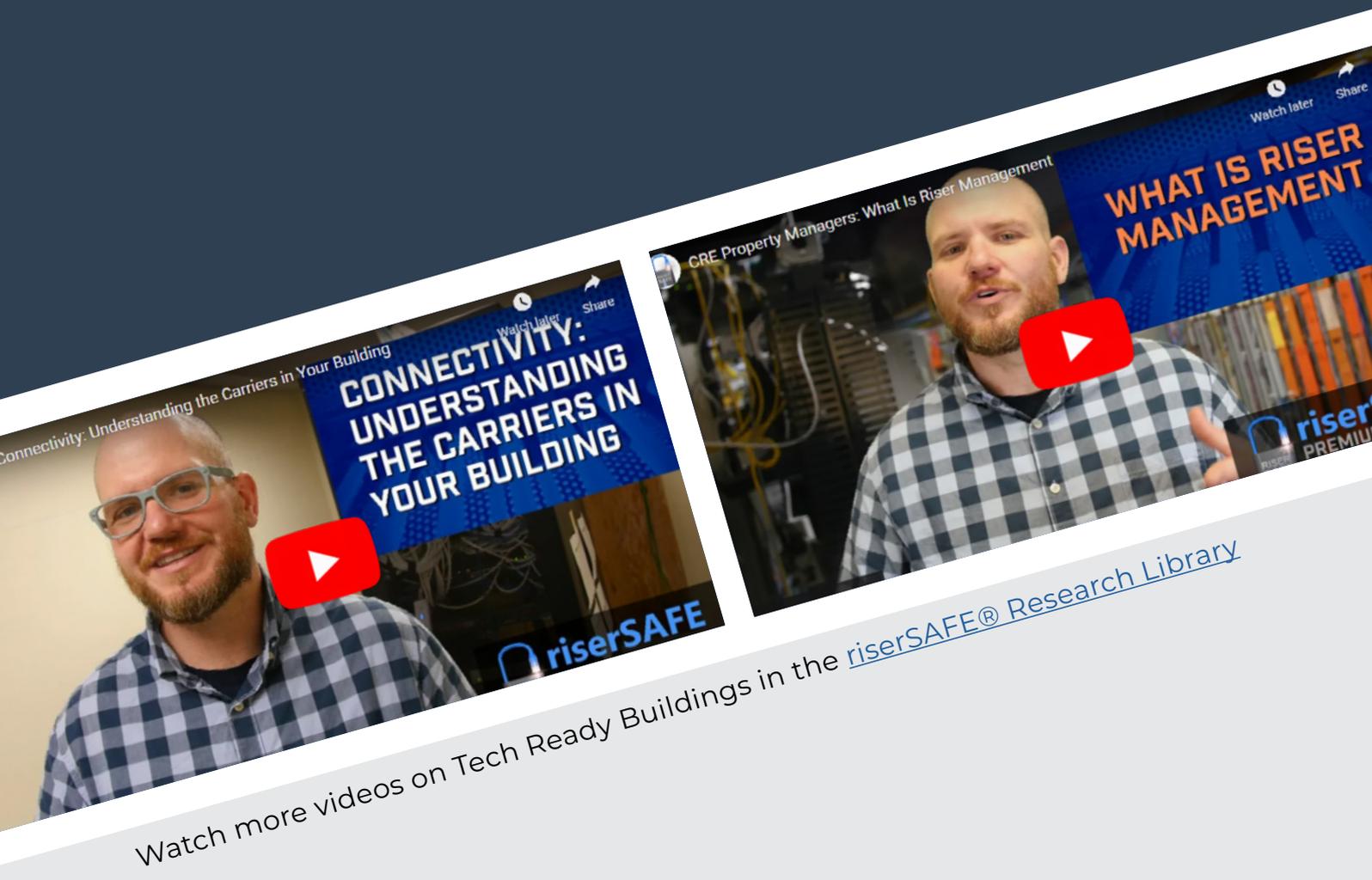
1. CRE Property Facilities Standards documents should require that all contractors performing fiber installation in multi-tenant buildings should deploy said fiber using either armored fiber, or "TiniFiber" or equivalent, rather than utilizing innerduct as part of the installation. The cost considerations are comparable, and this method will reduce overall pathway fill and protect against capacity issues.
2. The CRE Property should post a sign in all secured telecommunications spaces (e.g. telecommunications/riser closets) in all buildings which indicates vendor and local access provider work requirements, such as dead cabling and equipment removal, general cleanliness, and other requirements aimed at protecting the space and the integrity of the installed systems. Upon request can provide sample signage.
3. The CRE Property should require all contractors accessing the property's controlled spaces to complete an Access Request Form prior to site access; these forms should be stored in a central repository for legacy documentation purposes and should be shared with any vendor(s) responsible for the maintenance of the infrastructure.
4. The CRE Property should standardize on a central repository for the collection of building documentation/data at each site; when properly administered, this can significantly reduce onsite work time for vendors and overextension of other resources (e.g. Building Engineer).
5. Concert Technologies would be pleased to provide an online or in-person Tech-Ready Buildings Presentation to inform CRE Property Owners, Managers, Engineers, and other personnel of the importance of the points covered in this report, and to assist in preparing existing and new real estate for BloT.



CLOSING

As technology continues to advance and Tenant needs become greater, requiring more bandwidth, faster data transmission, and more unique and modern technologies, it is Concert’s opinion that the CRE Property is going to see an increasing number of new circuit-related requirements crop up in their buildings, portfolios, and campuses. The recommendations in this report are all provided from a perspective of identifying the most likely obstacles to swift and relatively issue-free physical deployment of circuits and new technologies, and infrastructure management for CRE Properties, and providing expert recommendations for their mitigation.

It is our hope that the information in this report is informational but, most of all, useful as the CRE Property works to define its path moving forward in the continued maintenance of its buildings’ infrastructures.



Watch more videos on Tech Ready Buildings in the [riserSAFE® Research Library](#)