

Certificate of merit

The advent of smart buildings and internet of things (IoT) technologies brought about significant changes in the way cabling is designed, deployed and tested. **Steve Cowles** of AEM Precision Cable Test charts the evolution of certification in the IoT era

▶ In the ever-evolving landscape of information and communication technology (ICT), testing and certifying cabling infrastructure is vital to ensure it can handle the demands of modern systems. This is especially true as the role of network connected devices expands in the development of smart buildings.

ONE STEP BEYOND

Today's building systems go far beyond the basic networking solutions of the past. Smart buildings integrate a wide array of IoT technologies – from heating, ventilation and air conditioning (HVAC) and security systems to lighting and environmental sensors – all of which require a robust and reliable cabling infrastructure. But certification alone is no longer enough. With more complex and interconnected systems, testing standards and strategies need to be updated to meet these modern requirements.

Historically, information technology (IT) and operational technology (OT) operated in separate spheres. IT handled data and networks, while OT managed physical devices. This separation was a product of earlier technological limitations and organisational structures. However, the rise of smart buildings has shattered this paradigm. Today, multiple building systems – ranging from security and lighting to environmental sensors and network devices – can be centrally managed and optimised for performance, cost efficiency

and maintenance.

This integrated approach is at the heart of the IoT, a term that encapsulates the growing network of connected devices. The IoT revolution is making everyday devices smarter and more interconnected, enabling deeper collaboration between IT and OT teams. These advancements allow for real-time data collection and analysis, offering insights that help organisations improve building operations and meet performance objectives.

EVOLVING TESTING NEEDS

As buildings evolve, so do the cabling systems that support them. The simplicity of the past – where basic cable certification was sufficient for ensuring the infrastructure's ability to support network applications – has given way to a more complex landscape. Modern smart buildings require a higher level of testing, as the infrastructure needs to support not only traditional network data but also power and specialised requirements for devices like IoT sensors, cameras and digital lighting. Let's take a closer look at some of the critical testing considerations that go beyond traditional certification.

• Power over Ethernet (PoE) testing

One of the most significant changes in modern cabling infrastructure is the increasing use of PoE. Many IoT devices, including wireless access points and security cameras, are powered via the same

cables that carry network data. This introduces additional challenges, as the cabling needs to support both data transmission and power delivery over the same link.

Traditional certification tests do not account for the power requirements of these devices and testing for PoE readiness has become essential. For example, testing for DC resistance unbalance (DCRU) ensures that the cable can handle the power delivery without causing issues like power loss or overheating, while PoE load testing post-deployment can ensure adequate power is reaching the powered device at the end of the link. This type of testing helps avoid potential issues when network components and powered devices are installed and ensures that the infrastructure can handle future PoE requirements.

• Link speed and signal integrity

With the growing use of high bandwidth applications, it is crucial to test cabling to ensure it supports the required link speeds. Multigigabit Ethernet links are becoming standard, with devices like Wi-Fi 6 access points and high definition cameras requiring speeds up to 10Gb/s.

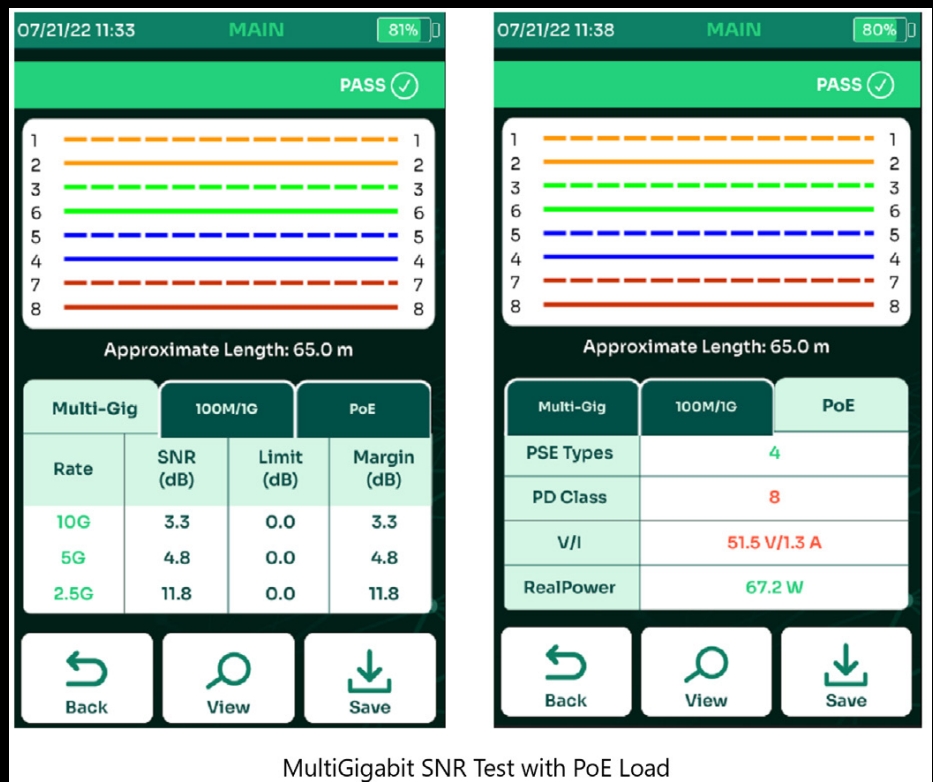
Signal to noise ratio (SNR) testing, which ensures that the cable maintains a strong signal despite potential interference, is another consideration. For high bandwidth applications, testing for sufficient SNR becomes essential, ensuring the cabling infrastructure can support the full capacity

of modern devices without degradation in performance.

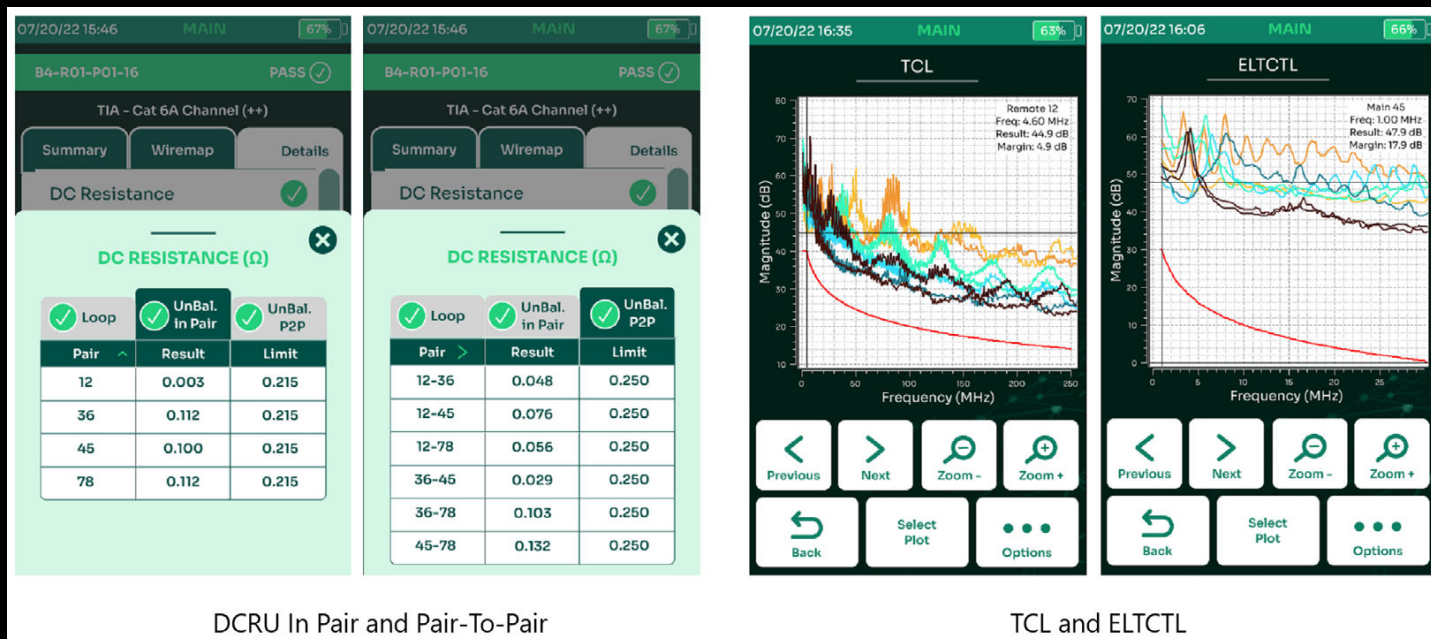
• Single Pair Ethernet (SPE) and hybrid fibre optic testing

Another emerging smart building technology is SPE. Smaller, lighter and cost effective, SPE provides a solution for connecting low bandwidth devices such as sensors and cameras over long distances. As these devices become increasingly important in the IoT ecosystem, ensuring that the cabling can support these technologies is crucial. SPE requires a different set of testing parameters compared to traditional Ethernet cables, so it's important to consult test equipment manufacturers to ensure compatibility.

Similarly, hybrid powered fibre cables, which combine fibre optic cables with copper conductors for power delivery, require a specialised testing approach. Measuring both the optical loss in the fibre and the DC loop resistance in the copper conductors simultaneously ensures that the



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DCRU In Pair and Pair-To-Pair

TCL and ELTCTL

cable infrastructure can deliver both data and power efficiently.

A COMPREHENSIVE APPROACH

For a smart building to function as intended, the cabling infrastructure must be carefully designed, installed and tested. A traditional certification test simply cannot account for the modern demands placed on the system. Today’s networks need to support devices that require higher power, higher speeds and more robust security – all of which demand a more detailed testing process.

For example, when deploying cabling to support IoT technologies, particularly those that use PoE, additional test parameters should be selected. By adjusting your test equipment to include parameters like DCRU, transverse conversion loss (TCL), and equal level transverse conversion transfer loss (ELTCTL), you can assess the readiness of the infrastructure to support PoE and ensure noise immunity. This

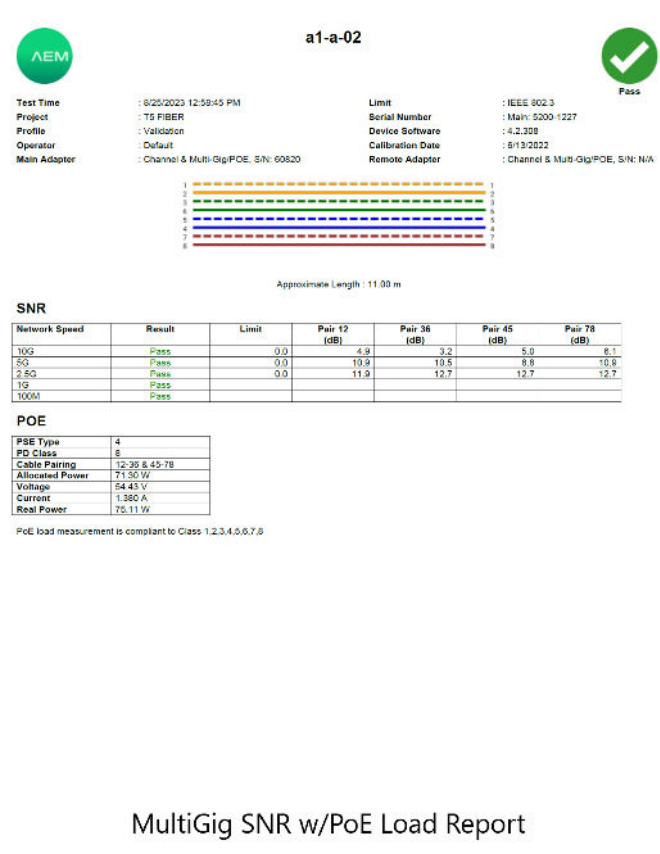
additional testing will help identify potential issues before devices are installed, reducing the risk of failure after deployment.

After networking devices are deployed, the SNR and PoE load tests previously mentioned should be done. This ensures necessary PoE power is reaching the end of the link and there is no excessive noise from alien crosstalk or external noise influence. Testing the network connectivity to ensure connection to correct switch/port/VLAN should also be performed.

DOCUMENTARY EVIDENCE

As the demand for more complex testing grows, so does the importance of accurate documentation. Providing in-depth test reports, which detail the type of cabling tested, the results for parameters like link speed, SNR and PoE performance, ensures that the infrastructure can meet the requirements of modern devices.

These reports can also be used for troubleshooting and ensuring that



a1-a-02 Pass

Test Time: 6/25/2023 12:59:45 PM
 Project: T5 FIBER
 Profile: Validation
 Operator: Default
 Main Adaptor: Channel & Multi-Gig/PoE, S/N: 60620

Limit: IEEE 802.3
 Serial Number: Main: 5200-1227
 Device Software: 4.2.308
 Calibration Date: 6/13/2023
 Remote Adaptor: Channel & Multi-Gig/PoE, S/N: N/A

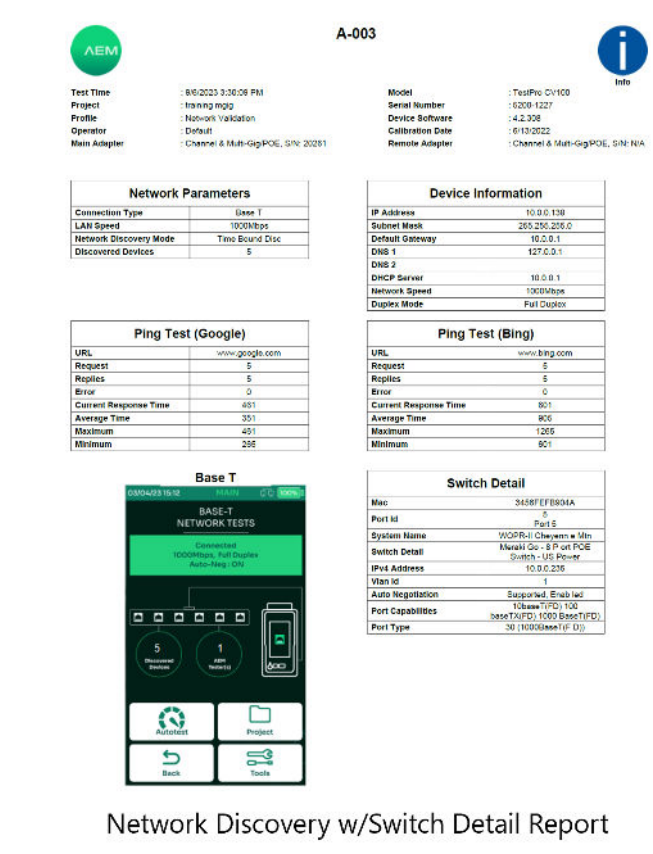
Approximate Length: 11.00 m

Network Speed	Result	Limit	Pair 12 (dB)	Pair 36 (dB)	Pair 45 (dB)	Pair 78 (dB)
10G	Pass	0.0	4.9	3.2	5.0	6.1
5G	Pass	0.0	10.9	10.5	8.8	10.8
2.5G	Pass	0.0	11.9	12.7	12.7	12.7
1G	Pass					
100M	Pass					

POE

PSE Type	4
PD Class	8
Cable Pairing	12-36 & 45-78
Allocated Power	71.50 W
Voltage	54.43 V
Current	1.380 A
Real Power	76.11 W

POE load measurement is compliant to Class 1,2,3,4,5,6,7,8



A-003 Info

Test Time: 6/6/2023 3:30:08 PM
 Project: Training mfg
 Profile: Network Validation
 Operator: Default
 Main Adaptor: Channel & Multi-Gig/PoE, S/N: 20261

Model: TestPvc CV100
 Serial Number: 6200-1227
 Device Software: 4.2.308
 Calibration Date: 6/13/2022
 Remote Adaptor: Channel & Multi-Gig/PoE, S/N: N/A


Network Parameters	
Connection Type	Line 1
LAN Speed	1000Mbps
Network Discovery Mode	Time Bound Disc
Discovered Devices	5

Device Information	
IP Address	10.0.0.130
Subnet Mask	255.255.255.0
Default Gateway	10.0.0.1
DNS 1	127.0.0.1
DNS 2	
DHCP Server	10.0.0.1
Network Speed	1000Mbps
Duplex Mode	Full Duplex

Ping Test (Google)	
URL	www.google.com
Request	5
Replies	5
Error	0
Current Response Time	401
Average Time	351
Maximum	451
Minimum	295

Ping Test (Bing)	
URL	www.bing.com
Request	5
Replies	5
Error	0
Current Response Time	801
Average Time	906
Maximum	1265
Minimum	801

Switch Detail	
Mac	3458FEFB0A
Port Id	5
System Name	WQPR01-04-wm-4-Mtr
Switch Detail	Mavali Co - 8 P on PoE
IP Address	Switch - US Power
Vlan Id	10.0.0.236
Auto Negotiation	Supported: Enabled
Port Capabilities	10baseT(FD), 100baseTX(FD), 1000baseT(FD), 30.11055baseT(F, D)
Port Type	



MultiGig SNR w/PoE Load Report

Network Discovery w/Switch Detail Report

the cabling remains reliable over time, especially as devices are added or moved. Moreover, the ability to generate reports that detail the power load and remaining headroom for PoE ensures that issues related to power delivery are identified early, before a device fails to power-up.

BEST IN CLASS

From ensuring PoE readiness to testing for multigigabit speeds and power delivery, the right test equipment and strategies are essential for ensuring that smart building systems perform at their best. The need for thorough testing and certification has never been greater, and with the right tools and knowledge there is an opportunity to provide enhanced services and drive new revenue streams for the businesses that support these technologies. In this rapidly evolving landscape, staying ahead of the curve with cutting edge testing equipment will help ensure that smart buildings are optimised for performance, reliability and the future. ■



STEVE COWLES

Steve Cowles is product line manager at AEM Precision Cable Test. He has been involved in the voice/data industry for over 35 years, with the last 25 focused on test equipment applications for copper and fibre certification, Wi-Fi, PoE, Ethernet and DSL. Cowles has been a BICSI member for over 30 years and holds the RCDD and NTS credentials.