

CHOOSING CATEGORY CABLES

An Insider's Perspective

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By Andrew Restivo

SimplyBrands-SCP International Sales Director and Product Development

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This paper is meant to serve as a reference resource on the issues that are driving the proliferation of low-quality Category cables in the market. This document is designed to be dynamic. There will be ongoing changes and topical sections added as these are put together. New topics will be added from sales team feedback and to address challenging customer questions.

To the best of my knowledge the information contained herein is accurate. Any typos or grammatical errors will be corrected when brought to my attention. This paper is not designed to disparage any specific company or cable brand. Any inference to the contrary is accidental and unintended.

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1. Introduction

Everyone is feeling the effects of inflation these days. In the low-voltage cable industry, copper prices are at historic highs, jacketing and insulation material costs have risen dramatically, labor costs are up, and supply timelines are extended. Combined, these factors are giving purchasing managers "sticker shock" over the new prices for copper cabling.

To minimize project costs, purchasing managers are scouring Amazon and other online marketplaces for lower-cost alternatives. While these buyers may have a preferred cable brand, they are noticing a wide range of pricing levels for seemingly identical products. Most cable brands promote the exact same elements, such as:

- AWG size
- Bandwidth performance
- Datasheet standards

When buyers perceive all cable brands as identical, they naturally default to the lowest price. However, selecting low-voltage cables based solely on cost is a slippery slope that introduces severe long-term risks.

This guide helps you see through marketing hype. You will learn why upfront price is just one factor in the real cost of cable procurement. For purposes of this guide, we will primarily use CAT6 unshielded LAN cables as an example. But first a short introduction to cabling standards is necessary.

Category Cable Standards You Need to Know

ANSI/TIA-568.2-D is the North American standard for twisted-pair copper telecommunication cables, more commonly known as Category cables, Ethernet cables, or LAN cables. The governing bodies that set these standards are the Telecommunications Industry Association (TIA) and the American National Standards Institute (ANSI).

Global cable standards are managed by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) for telecommunication cabling systems under ISO/IEC 11801.

Both ANSI/TIA 568.2-D and ISO/IEC 11801 are closely aligned and provide globally recognized frameworks for structured cabling. The table below summarizes the performance and mechanical requirements for Cat5e, Cat6, and Cat6A.

CATEGORY (TIA)	CHANNEL CLASS (ISO/IEC)	MAX BANDWIDTH	MAX SPEED / THROUGHPUT	CONDUCTORS	DISTANCE
Cat 5e	Class D	100 MHz	1 Gbps (Gigabit)	24 AWG solid bare copper	100 meters
Cat 6	Class E	250 MHz	1 Gbps to 100m (10 Gbps to 35–55m)	23 AWG solid bare copper	100 meters
Cat 6A	Class EA	500 MHz	10 Gbps (10– Gigabit)	23 AWG solid bare copper	100 meters

In addition to bandwidth frequency and maximum speed requirements, standards dictate other performance characteristics for each category cable type. These standards include stringent metrics for crosstalk — specifically Near-End Crosstalk (NEXT), Alien Crosstalk (AXT), and Far-End Crosstalk (FEXT) — along with system noise suppression and improved insertion loss (IL). As technology and bandwidth performance demands rise, so does the construction complexity of the cable.

Reputable cable manufacturers continue to adapt and modify their Category cables to meet these evolving technological requirements, such as Power over Ethernet (PoE) and Power over HDBaseT (PoH).

Power over Ethernet (PoE) and Power over HDBaseT (PoH)

The current PoE standard for category cables is governed by IEEE 802.3bt. PoE provides low-voltage power over twisted-pair category cables. IEEE 802.3bt establishes four power classes, designated as Type 1 through Type 4. Type 1 delivers up to 15.4W of power, while Type 4 supports up to 90W at a 90-meter distance. Typically, a high-quality Cat 5e cable can support Type 1 power, whereas a high-quality Cat 6A cable is required to support Type 4 power.

While the granular details of these various power levels are beyond the scope of this guide, the key takeaway is that PoE integration forces cable manufacturers to use higher-quality materials. Specifically, they must increase the copper content (gauge size) to reduce heat buildup, which can otherwise damage cable jacks, plugs, sockets, and connected devices. Because of this thermal risk, third-party testing laboratories, such as UL and ETL, developed the Limited Power (LP) certification for PoE cabling.

2. The Reality of Cable Quality

Rising copper prices have created a "race to the bottom" in cable manufacturing quality. Many traditionally reputable cable brands now compromise on construction details to minimize price increases. Purchasing managers face a critical challenge: balancing tight budgets against falling cable standards. Prices lower than the market often mean hidden non-compliance, exposing your operation to safety violations, network downtime, and costly replacements.

The Regulatory Gap

- **Honor System** — Standards rely on manufacturer honesty rather than strict, continuous enforcement.
- **Exploitation** — Unscrupulous brands frequently ignore published compliance standards to cut costs.
- **End User Risk** — Visual inspection rarely reveals substandard materials or altered internal engineering.

Red Flags for Purchasing Managers

- **Substandard Metals** — Copper-clad aluminum (CCA) masquerading as pure copper.
- **Thinned Insulation** — Reduced jacket thickness failing physical safety tests.
- **Fake Certifications** — Counterfeit UL or ETL marks printed on jackets.
- **Under-Gauge Wires** — Shrunk conductor sizes failing to meet AWG standards.

Use the sections below to arm yourself with the necessary knowledge to separate marketing hype from verifiable facts.

3. Cost vs Quality: The AWG Copper Cable Deception

Most cable brands do not want you to know this, but assuming the same AWG (American Wire Gauge) cables are identical is a costly mistake.

For Cat 6 and Cat 6A specifications, ANSI/TIA 568.2-D and ISO/IEC 11801 standards designate 23 AWG as the required size. However, cable brands frequently exploit a critical loophole: AWG defines a diameter range, not a precise measurement. Brands weaponize this lack of clarity to mask inferior copper content.

The AWG Sizing Loophole Explained

- **Inverse Scale** — Higher AWG numbers indicate smaller physical wire diameters.
- **The Thresholds** — 23 AWG spans from 0.53 mm to 0.58 mm, while 24 AWG spans from 0.47 mm to 0.52 mm.
- **The Variance** — A lower millimeter thickness within the 23 AWG range equates to less copper inside the cable.

The Bottom-Line Impact

Cable manufacturers use this diameter variance to optimize their bill of materials (BOM). They choose between two manufacturing strategies:

- **The Bare Minimum** — Shaving off fractions of a millimeter to meet legal minimums while drastically reducing raw material costs.
- **Performance Maximum** — Maximizing copper volume to ensure superior signal integrity and Power over Ethernet (PoE) efficiency.

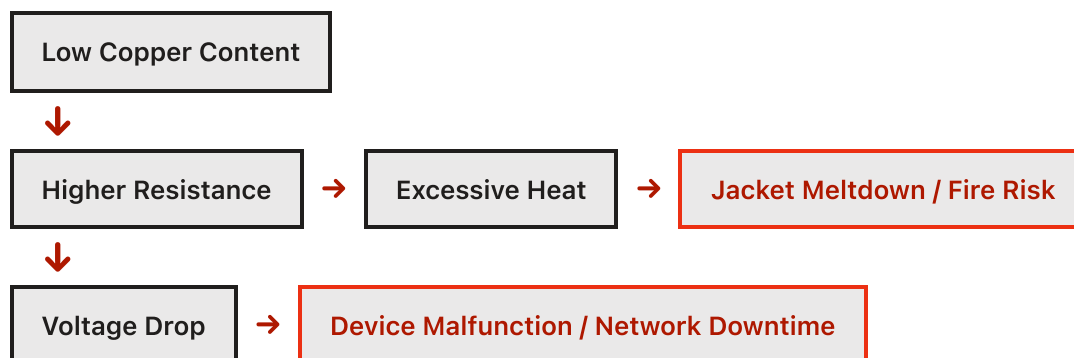
This structural flexibility allows brands to either minimize costs by meeting bare-minimum regulatory standards or maximize network performance. These small variances drastically impact pricing when global copper markets are high. If you find two Cat 6 cables with identical fire ratings but vastly different prices, the cheaper option likely contains less copper. Selecting Category cables based solely on the lowest market price exposes projects to severe performance failures, safety violations, and massive replacement costs.

SIMPLYBRANDS-SCP

We offer three levels of Cat6 UTP — ProSeries, Installer Series, and Standard Series. We recognize that today's market needs price-point options for our customers. Our ProSeries cables have the highest copper content and other premium features. Our Installer Series is typically constructed to be comparable to the primary offer by reputable competitors. Our Standard Series is designed to provide a quality cable at the most competitive price point.

4. Electrical Risks of Low Copper Content Category Cables

As discussed above, when cable brands reduce the copper content in their Category cables to create a price advantage in the market, severe consequences can be introduced into a project when these cables are installed. Reducing the copper content, especially with Cat6 cables, introduces severe electrical and operational hazards.



Critical Operational Hazards

- **Excessive Heat Generation** — Higher resistance causes the cable to dissipate more power as heat. This creates a severe fire hazard when cables are tightly bundled.
- **Severe Voltage Drop** — Power dissipates over the length of the cable. Distant Powered Devices (PDs) receive insufficient voltage and fail to boot.
- **PoE Failure** — Power over Ethernet (PoE) demands high current. Low copper content leads to erratic power delivery and permanent equipment damage.
- **Signal Degradation** — Thinner conductors alter the cable's impedance. This causes massive return loss, high attenuation, and dropped data packets.
- **Mechanical Brittleness** — Aluminum substitutes crack easily under tension. A single kink can completely sever the electrical connection inside the jacket.

5. PoE Performance Hardest Hit by Low Copper Content Category Cables

The risk associated with lowering the copper content in Category cables increases dramatically as the network power requirements increase. As PoE standards have evolved to support high-wattage devices, they have become highly sensitive to physical cable flaws. The higher the wattage, the higher the cable copper content level requirement.

1. IEEE 802.3bt Type 4

Power Profile — Delivers up to 90W–100W from the switch, providing roughly 71.3W–73W directly to the device.

Why it is hardest hit — This standard pushes up to 960mA of current across all 4 pairs simultaneously. Because power dissipation scales exponentially with current, even a tiny increase in conductor resistance due to thinner copper conductors or copper clad aluminum (CCA) causes extreme and dangerous heat spikes within cable bundles.

2. IEEE 802.3bt Type 3

Power Profile — Delivers up to 60W from the switch, yielding 51W at the device.

Why — Like Type 4, Type 3 networks deliver power to all 4 cable pairs. When cable manufacturers use inconsistent wire diameters to reduce copper content, it creates severe DC resistance unbalance between the pairs. This unbalance saturates the data transformer, causing immediate packet corruption, data retransmissions, or power negotiation failure.

3. IEEE 802.3at Type 2

Power Profile — Delivers up to 30W from the switch, providing 25.5W to the device over 2 pairs.

Why — While less severe than Type 3–4, Type 2 networks are frequently deployed for pan-tilt-zoom (PTZ) cameras and Wi-Fi 6 access points. Low copper content in the Cat cable causes major voltage drops over longer runs that approach the 100-meter limit. Devices will experience "brownouts," randomly rebooting when attempting to draw peak rated power, along with other intermittent failures over time.

The Impact of Lower Copper Content by PoE Type

POE STANDARD	MAX SWITCH POWER	PRIMARY FAILURE MODE WITH LOW COPPER	DANGER LEVEL
802.3af (Type 1)	15.4W	Minor voltage drops; mostly unaffected.	Low
802.3at (Type 2)	30.0W	Device brownouts; intermittent link drops.	Moderate
802.3bt (Type 3)	60.0W	DC resistance unbalance; bit errors.	High
802.3bt (Type 4)	90W–100W	Thermal breakdown; severe bundle fire hazard.	Critical

SIMPLYBRANDS-SCP

While our Installer Series and Standard Series all support various PoE levels, we highly recommend our ProSeries as these cables are manufactured to premium standards with the highest copper content applicable to each Category Cable type.

6. Using Inflated MHz Bandwidth Ratings Does Not Guarantee Better Cable Performance

According to ANSI/TIA standards, the actual Cat 6 bandwidth frequency standard is 250 MHz based on a 100-meter distance. However, Cat 6 can also support 10 Gbps speeds at shorter distances of 35 to 55 meters.

Because 10 Gbps is technically a Cat 6A performance standard requiring 500 MHz frequency, manufacturers use the 500 MHz label on Cat 6 cables to attest that their cable has been tested to support 10GBASE-T. Therefore, 500 MHz is not an indicator of the cable's maximum possible performance, but rather confirmation of regulatory compliance for 10G support.

Any rating above 500 MHz on a Cat 6 cable — such as 600 MHz — is merely a marketing number chosen by the cable brand. In real-world scenarios, a high-quality Cat 6 cable can support frequencies of 700+ MHz over short distances depending on the installation, but such claims only serve to mislead the marketplace.

In most instances, Cat 6 bandwidth performance above 500 MHz is a marketing gimmick unless the cable brand provides additional support such as higher copper content, or other specialized construction features to distinguish these enhanced performance features.

SIMPLYBRANDS-SCP

Our ProSeries Cat 6 cable has a 550 MHz bandwidth number. Our Installer Series and Standard Series use 500 MHz bandwidth frequency. We use 550 MHz with the ProSeries to communicate that this cable has a higher copper content than our Installer Series and Standard Series Cat 6 cables. The 550 MHz is NOT an indicator of the cable's maximum performance.

SimplyBrands-SCP is not interested in marketing gimmickry to trick you into buying our cable — the same as other premium brands such as Belden and Commscope that are not interested in trying to "one-up" the competition.

7. Cables Being Sold in Market Not Matching Their Published Data Sheets

A critical consequence of rising global copper prices is the growing mismatch between published cable data sheets and the actual product sold in the market.

Data sheets are the "source-of-truth" documents for cable specifications. Procurement managers rely on them to evaluate products. When these documents become unreliable, procurement teams must adapt their verification processes.

Core Data Sheet Specifications

Category cable data sheets typically detail six core areas:

- **Cable Construction** — Conductor size and shielding types.
- **Mechanical Properties** — Bend radius and maximum tension limits.
- **Electrical Characteristics** — Resistance levels and impedance ratings.
- **Environmental Parameters** — Operating temperature ratings.
- **Standards Reference** — Compliance with ANSI/TIA or ISO/IEC.
- **Performance Data** — Available bandwidth and attenuation limits.

The Tactics Behind Market Deception

To protect profit margins against surging copper costs, some brands use deceptive tactics to gain a price advantage:

- **Secret Material Swaps** — Brands keep the same part number but secretly alter the cable construction.
- **Reduced Copper Content** — Manufacturers lower the copper volume or use inferior insulation and jacketing materials.
- **False Reorders** — Purchasing teams believe they are buying a previously verified product, but they receive an inferior substitute.

The Primary Warning Sign: Price

Price remains the most reliable indicator of a compromised product. Global copper prices are uniform for all manufacturers at any given time.

While temporary price imbalances can occur when a brand sells stock secured at older, lower copper rates, these gaps close quickly. A consistently low price is a clear warning sign of a compromised product.

8. There is No Such Cable Standard as Cat 6e

The term "Cat 6e" is entirely a marketing gimmick. It is not an officially recognized industry standard. This guide shows you how to identify the scams and unscrupulous cable brands. These types of marketing gimmicks are designed to take advantage of procurement teams and integrators alike.

Here is a breakdown of the facts behind this marketing tactic and the hidden risks of buying these unrated cables.

The Truth About Cat 6e

- **No Official Standard** — Organization standards like ANSI/TIA and ISO/IEC do not recognize Cat 6e.
- **Only Two Legit Options** — Valid standards skip from Cat 6 straight to Cat 6A.

- **Fake Performance Claims** — Brands invent the "e" label to pretend their product outperforms standard Cat 6.

To ensure your network is safe and performs well, stick to trusted manufacturers selling official Cat 6 or Cat 6A cables.

9. I Always Select the Lowest Priced Cat 6 UTP Cable on the Market. None of My Customers Have Complained

Professional custom installation companies and IT professionals know the importance of installing good quality cables for their installation projects. Selecting cables from high quality cable brands ensures reliable data transmission in modern networking environments for both residential and commercial installations.

Using cheaply made cables and continuing to do so based on a lack of customer complaints is very risky to your business. "Absence of complaints is not the same as presence of satisfaction." Most customers today rarely complain when they are unhappy — they just quietly switch over to a competitor. A lack of complaints does not mean your customers are satisfied with the cheaply made cables you are selling.

If one of your competitors makes your customer aware of a feature or features that they did not even know they were missing by using cheap cables, don't you believe it is likely that customer will move over to that competitor? And further, troubleshooting issues with connected devices can take some time to identify that the real culprit was the cheaply made cable causing the issues.

SIMPLYBRANDS-SCP

SimplyBrands-SCP (Structured Cable Products) has always focused on quality at a competitive price point. In new construction, cables are one of the first things to be installed. When the walls go up and devices are connected to the network, it is much more costly to tear out and replace the cabling.

It is common that poorly made cables degrade over time due to resistance (heat buildup) and material degradation of the cable insulation and jacketing. Depending on the installation, this can show up much sooner than expected.

All SimplyBrands-SCP cables are made with high quality materials and the copper content to do the job properly. We back this up with our Lifetime Warranty.

10. Why You Should Not Use "Spline-Less" Cat 6 UTP (Solid Copper) Cables for Permanent (Behind-the-Wall) Installations

"To Spline, or Not to Spline, that is the Question." Pardon any offence to Hamlet, but when it comes to Cat 6 cable constructions, there is some debate in the industry about whether the "center spline" or "pair separator" is really a necessary construction feature. Proponents of "spline-less" Cat 6 cables argue that when the spline is removed, the cable is much more flexible and has a smaller diameter that is easier to work with.

Both are valid points. And for "stranded" copper conductors, spline-less is the universal construction method. But when it comes to "solid copper," the typical Cat 6 unshielded (UTP) cable construction is with a spline.

For permanent installation cables (behind-the-wall) solid bare copper outperforms stranded bare copper due to its lower attenuation, superior signal integrity, improved PoE performance, and reduced resistance over longer lengths. While stranded copper cables are highly flexible and ideal for short patch cords, solid copper conductors provide the physical and electrical stability required for permanent network infrastructure.

Cat 6 cable standards are not just about higher frequencies (faster) and more data throughput (volume of data). The standard also requires these cables to meet more stringent specifications for crosstalk and system noise over the expected life of the cable.

To mitigate crosstalk, unshielded solid conductor Cat 6 cables typically incorporate an internal center spline (aka pair separator, cross-filler) — a rigid, often cross-shaped plastic divider running down the center of the cable. This component isolates the four twisted pairs from one another, significantly reducing internal signal interference. Without it, the pairs can shift, twist unevenly, and move closer to one another, causing signals from one pair to leak into another. The spline also guarantees consistent geometry that naturally rejects interference from neighboring cables.

There are some cable brands that promote a spline-less Cat 6 solid copper UTP cable as a superior design over Cat 6 UTP cables with a spline. They typically use 4 recurring marketing themes:

- We use "thicker wire insulations to absorb near-end crosstalk (NEXT)."

- We "utilize tighter wire twists" to prevent crosstalk.
- The Cat 6 standard does not require the use of a center spline/pair separator.
- Our spline-less Cat 6 UTP cable costs less than cables with a spline.

Let's look more closely at each of the above claims:

Does thicker conductor insulation absorb near-end crosstalk (NEXT)?

No. Physical separation (distance) is what reduces crosstalk. A center spline increases and maintains distance between each wire pair. Further, all well-made Cat 6 UTP cables have thicker insulation in addition to the center spline. Thicker conductor insulation does not "absorb" near-end crosstalk (NEXT), nor does it alone materially increase the distance between the pairs. Further, if a cable brand used an abnormal insulation thickness, it would cause considerable termination problems. The claim that thicker wire insulation somehow absorbs crosstalk is **FALSE**.

Does using tighter wire twists prevent crosstalk?

Yes, tighter and staggered wire twists are effective at reducing crosstalk by physically cancelling out electromagnetic interference. Tighter and staggered wire twists between the 4 pairs are used by all Cat 6 UTP cable manufacturers. However, tighter wire twists alone are not enough to protect against crosstalk with Cat 6 UTP cables. The tighter and staggered wire twists plus a center spline is required. The claim by low-end cable brands that tighter wire twists alone (or with thicker insulation) are enough to eliminate or significantly reduce crosstalk is **FALSE**.

Does the Cat 6 standard require a center spline?

The Cat 6 ANSI/TIA and ISO/IEC standards do not require cable manufacturers to use a center spline. Yes, this is correct. The standards rely on performance metrics rather than specific construction features. There are various shielded Cat 6 constructions that do not incorporate the use of a center spline. These include U/FTP, F/FTP, and S/FTP. Typically, only U/UTP and F/UTP Cat 6 constructions require the pair separator feature. Through extensive testing, cable manufacturers have determined that the center spline is a necessary construction feature for U/UTP and F/UTP to meet the crosstalk and signal requirements for the Cat 6 standard. The implication by low-end cable brands is that because the standards do not specify the use of a center spline, that such feature is not necessary. This is patently **FALSE**.

The first 3 nonsense marketing themes above are all designed to get you to number 4 — price. These low-end cable brands' primary marketing tactic is "we have a lower price than everyone else" while implying that their cable performance is comparable. Throughout this guide, the consistent theme of low-end cable brands is primarily selling on price.

Using a Cat 6 Unshielded Twisted Pair (UTP) cable without a center spline increases the risk of crosstalk (signal interference between wire pairs), degrades high-frequency performance (making 10 Gbps speeds highly unstable), and weakens the cable's structural integrity.

The primary trade-offs and risks associated with spline-less Cat 6 include:

1. Severe Crosstalk and Signal Degradation

- **Pair Separation** — The primary job of a central spline is to keep the four twisted pairs physically isolated from each other.
- **Proximity Issues** — Without a spline, the pairs can shift and compress tightly against one another inside the jacket.
- **Near-End Crosstalk (NEXT)** — This structural shifting causes internal electrical interference, leading to high NEXT and packet loss.
- **Altered Twist Rates** — Cat 6 relies on precise, differing twist rates between pairs to cancel out noise. Pulling a spline-less cable stretches and alters these delicate twist configurations.

2. Physical Deformity During Pulling

- **Kinking and Crushing** — Pulling network cables through wall studs, tight corners, and conduit exerts significant mechanical stress.
- **No Internal Skeleton** — A spline acts as an internal skeletal support structure that maintains the cable's geometry.
- **Solid Copper Vulnerability** — Solid copper conductors are rigid and prone to stretching or micro-fracturing under tension.
- **Flattening Risk** — Spline-less cables easily flatten or kink when pulled around a bend, which permanently compromises the geometry required for high-speed data transmission.

3. Alien Crosstalk in Bundled Runs

- **Inter-Cable Interference** — Permanent installations often involve bundling multiple cables together in the same tray, hook, or conduit pathway.
- **Proximity to Other Cables** — Without the structural thickness and spacing provided by an internal spline, the twisted pairs of one cable sit too close to the twisted pairs of an adjacent cable.
- **High-Frequency Failures** — This proximity triggers "Alien Crosstalk" (AXT), which severely hinders the cable's ability to reliably support 1 Gbps or 10 Gbps speeds over long distances.

Summary

For permanent, behind-the-wall Cat 6 UTP installations, a center spline is crucial for maintaining physical pair separation, controlling near-end crosstalk (NEXT), and ensuring consistent geometry, as solid-conductor cables lack the structural integrity to resist deformation during pulling without it. Spline-less solid cables are prone to internal kinking, pair migration, increased alien crosstalk in bundles, and higher thermal degradation under Power over Ethernet (PoE) loads. Solid copper conductors with a spline maintain superior signal integrity, lower attenuation, and long-term reliability for network infrastructure, whereas spline-less designs are suited only for flexible, short patch cords. To ensure your installation meets critical performance standards, always opt for splined Cat 6 UTP cable for permanent, in-wall, or in-conduit runs.

11. The Truth About Installing Copper Clad Aluminum (CCA) Category Cables

Are you prepared for the criminal and civil legal risks for installing CCA category cables in your projects?

By Andrew Restivo, SimplyBrands-SCP International Sales Director and Product Development

General contractors and subcontractors that install Copper Clad Aluminum (CCA) category cables in their projects are exposing themselves to severe legal, financial, operational, and insurance risks that far outweigh any upfront cost savings. Virtually all 50 US states prohibit the use of Copper-Clad Aluminum (CCA) category cables through the mandatory adoption of the National Electrical Code (NEC).

For those not familiar with the term copper clad aluminum (CCA), this refers to cables that have an aluminum core surrounded by a thin layer of copper. There are no industry-approved applications for CCA category cables. All Category-rated cables must be 100% solid or stranded copper conductors to meet ANSI/TIA 568.2-D and ISO/IEC 11801 specifications. Further, NEC Article 800 dictates that "conductors in communications cables, other than coaxial, shall be copper." Because this NEC code explicitly mandates 100% solid or stranded copper, any category cable containing aluminum conductors fails to meet the definition of a communications cable. State laws give local building inspectors and fire marshals full authority to enforce NEC codes. Installation of CCA category cables behind the wall or in commercial spaces is illegal across the USA. By definition, the term "category cable" requires the cable

to be 100% solid or stranded copper. As such, all CCA category cables are counterfeit. Any cable brand that promotes CCA category cables is promoting counterfeit cables. There are no exceptions.

If CCA category cables are illegal to install, then why are we still seeing CCA category cables primarily sold by electrical wholesalers and installed in both large and small projects primarily by electrical contractors?

Electrical Wholesale Market is Familiar with Using Aluminum Wiring

Whereas low voltage data and IT contractors typically know never to use aluminum-based wiring (CCA), the electrical industry has no such aversion to aluminum. In the electrical industry, some aluminum wiring is safe and legal to install. Today's code-approved aluminum wiring utilizes advanced aluminum alloys paired with specialized heavy-gauge, stranded configurations. Approved aluminum wiring applications fall within defined legal categories such as:

1. Approved Large-Gauge Feeder and Service Infrastructure

Aluminum is the dominant industry standard for high-amperage lines due to its immense cost and weight advantages over copper. The NEC explicitly approves aluminum for the following heavy structural loads:

- **Service Entrance Cables** — Bringing utility power from the street or meter base directly into the main breaker panel.
- **Subpanel Feeders** — Heavy-duty runs, routing power from a main breaker panel to a secondary distribution subpanel.
- **Heavy Appliance Dedicated Branch Circuits** — Sizing wires for large-draw appliances such as 240V central air conditioners, electric ranges, heat pumps, and clothes dryers.
- **Mobile Home Feeders** — Supplying outdoor underground service loops directly into manufactured or mobile properties via specialized Mobile Home Feeder Cables.

2. Mandatory Material and Design Specifications

To be legally code-compliant, any structural aluminum wiring must satisfy distinct engineering criteria:

- **AA-8000 Metallurgy Requirement** — Per NEC Section 310.14, all indoor structural aluminum conductors must be constructed using a certified AA-8000 series electrical-grade aluminum alloy. This modern alloy is highly pliable, resists mechanical breakage when bent, and maintains terminal tightness under thermal cycles.

- **Stranded Construction** — Unlike legacy single-strand solid wiring, modern heavy aluminum wires are composed of tightly bundled, compact stranded conductors to maximize flexibility and connection surface area.
- **Upsized Gauge Calibration** — Aluminum has higher electrical resistance than copper. To safely carry an identical electrical load, the aluminum wire must be stepped up in size. For example, a 15-amp lighting circuit legally requires either a #14 AWG copper wire or a larger #12 AWG aluminum wire.

3. Strict Code-Compliant Termination Requirements

The NEC enforces specific rules for how aluminum must be terminated to prevent galvanic corrosion, oxidation, and arcing — including AL-CU or CO/ALR terminals, anti-oxidizing joint compounds, and approved retrofit pigtailing.

More Low Voltage Cables Being Installed by Electrical Contractors

In years past, licensed electrical contractors installed all medium and high voltage electrical wires and systems. Low voltage cabling was not considered dangerous and did not require the same inspection levels of higher voltage cables and was typically installed by data installation companies or telephone technicians. These two groups tended not to overlap — high voltage for the electricians, low voltage for the telecom and data guys.

Due to technological advancements, uses for low voltage cabling also advanced. These low voltage systems became much more complex and almost as important to building construction as the electrical systems. Maybe to save money or to reduce the number of subcontractors, general contractors began using their electrical contractors to also install the low voltage cabling in new construction.

Electrical wiring is commoditized. All Romex wiring is basically the same. Testing of installed wiring is limited to basic continuity testing. Quick and simple.

Price is the key differentiator between electrical wholesalers. Whomever quoted the lowest price today or had the best spiffs, typically got today's job order. CCA category cables are a direct result of the electrical industry's commoditization of all wire and cable, and the "de-skilling" of the data cable industry.

Electrical contractors' installation of category cables tends to be installed in a similar manner to electrical cables and with the same simple continuity testing confirming the cables are in working order. Installation testing using industry standard test equipment is usually not

done, so any cable problems are found out much later, well after the electrical contractor has long gone.

Electrical contractors are inherently very price driven and CCA category cables are significantly lower priced than copper category cables. Electrical wholesalers know this, and they react accordingly by stocking CCA category cables. Supply and demand.

CCA Category Cables Are Not Illegal to Sell — Only Illegal to Install

If CCA category cables are illegal to install, then why are they readily available online and through many electrical wholesalers? This is the legal loophole — sale vs. installation.

It is entirely legal under federal commerce laws to manufacture, import, and sell CCA wiring. The "illegality" is triggered the moment an installer attempts to install the CCA category cable as permanent building infrastructure wiring (inside a wall, ceiling, floor, or conduit) under state building codes.

Electrical wholesalers commonly sell Copper-Clad Aluminum (CCA) category cables primarily because there continues to be market demand for lower-cost category cables from budget-conscious buyers and electrical contractors. Many electrical contractors would not purchase or install CCA category cables if they really understood the severe legal and financial liability they are creating for themselves. Much of this demand is from unintentional buying patterns.

The Deception Starts Here — The Low-End Cable Brands

The initial deception starts with unreputable cable brands. Their CCA category cables are presented to the market as a lower-cost category cable solution. The packaging, the labeling, and the jacket markings all create an appearance that CCA category cables are acceptable. They use verbiage such as "Cat 6," Category Cable, and even standards referencing such as ANSI/TIA 568.2-D in their marketing. To many buyers "all of the boxes are ticked" by this deceptive marketing.

"I've used CCA Cables before and never had a problem."

It is difficult to believe that most professional electrical contractors are not aware that CCA category cables should not be installed. These contractors rationalize away the aversion to CCA category cables first and foremost because of the significant price savings. CCA category cables can be 50+% lower in price than 100% solid copper cables. That is a strong motivator. In addition to "price," here are some actual reasons given by contractors that use CCA category cables:

- "I've used CCA Cat 6 before and never had a problem."
- "I've installed these CCA cables before and they always test out."
- "In the future if there is a problem with the wiring, someone else will have to deal with it."
- "I only use CCA Cat cables for residential projects."
- "What is PoE?"
- "Nowhere in the project specs that I read prohibited the use of CCA Cat 6."
- "I need to save money where I can. Prices for copper Cat cables are way too expensive these days."

From their perspective, installing CCA category cables lowers contractor expenses without causing any subsequent performance issues or client complaints. Given these perspectives, what can the industry do to initiate a change in behavior?

Reasons Why CCA Category Cables Should Not Be Installed

There are numerous articles online that discuss why you should never use CCA category cables. Most of these articles focus on performance and mechanical reasons. This information has been available for many years, yet the purchase and installation of CCA category cables continues. These reasons have not "moved the needle" with electrical wholesaler and contractor buying patterns.

For purposes of this article, I am not going to do a deep dive into the performance and mechanical hazards of using CCA category cables. That is not going to change buying behavior patterns. For now, here are some performance and mechanical hazards on why CCA category cables should never be used in permanent cable (behind the wall) installations:

- **Not Compatible with Power Over Ethernet (PoE)** — When the cable is first installed, it is impossible to know with certainty that PoE will not be used. The contractor must assume that PoE use is probable. Aluminum has higher electrical resistance than copper. Using

CCA for PoE devices like IP cameras or access points can cause the cable to heat up rapidly, melting the cable jacket and igniting surrounding insulation, creating a dangerous fire hazard.

- **Poor Performance and Signal Loss** — CCA cables create higher attenuation and packet loss during transmission, especially as the cable length increases. This creates ongoing intermittent troubleshooting that is time consuming and costly to identify.
- **Mechanical Fragility and Failure Rates** — Aluminum is far more brittle and less flexible than copper. It is very easy for CCA cables to be damaged during installation. Aluminum also oxidizes rapidly when exposed to air. At connection points (like RJ45 plugs or punch-down blocks), this oxidation creates micro-gaps that cause electrical arcing, destroying expensive network switches and patch panels. Even terminating these cables with an RJ45 can cause microfractures that inhibit performance or worse. Over time the extent of the installation damage will become more pronounced, causing system failures.
- **Delayed Onset of Cable Failures** — Initially, freshly punched-down CCA will pass basic continuity tests. It will deliver internet packets immediately after installation, allowing the contractor to secure their sign-off, collect payment, and leave the job site before issues are identified. The severe problems begin developing over time as the cables degrade, creating troubleshooting nightmares. Identifying the cable as the system culprit is time consuming and expensive.
- **Zero Warranty Protection** — Network hardware manufacturers will not warrant their products for an installation that uses CCA Cat cables.

As discussed earlier, most contractors that install CCA category cables are aware of some of these performance issues. However, the significant price savings and the likelihood that future issues will not be their problem rationalize the continued use of CCA Cat cables.

If ethics and professionalism fail to motivate change, the threat of severe financial and legal risks should do so.

Legal, Financial, and Insurance Risks with Using CCA Category Cables

As detailed in this article, installation of CCA category cables is illegal. NEC code prohibits the installation of CCA category cables. This is enforceable by law in all 50 US states. Because these cables violate fundamental building codes and safety standards, anyone deceptively marketing, specifying, purchasing with intent to install, or installing CCA Cat cables faces potential legal, financial, and insurance risks. Further, strict "duty of care exposure" actively warns that ignorance of installing CCA Cat cables does not excuse future liability.

The legal and financial risks of using CCA Cat cables far outweigh any upfront cost savings. These risks include:

1. Building Code Violations and Penalties

- **Legal Enforcement** — States and local jurisdictions integrate the National Electrical Code (NEC) into local law. Installing CCA in areas requiring proper multi-conductor communications listings (like CM, CMR, or CMP) is an explicit violation of the law.
- **Withheld Occupancy Permits** — If an inspector discovers CCA, the local municipality can deny a building's Certificate of Occupancy. This stops a commercial or residential project entirely.
- **Daily Accruing Fines** — Depending on the local jurisdiction, deploying non-compliant infrastructure can result in significant legal fines, which some states compound for every day the violation remains active.

2. Civil Tort Liability for Property Damage and Injury

- **Negligence Claims** — If a fire starts or worsens due to the overheating of CCA cables (especially with PoE use), victims and property owners can sue for negligence.
- **Strict Duty of Care** — Installers have a baseline obligation to follow standard safety principles. Courts can hold technicians legally responsible for damages even if they were completely unaware the cable they bought was counterfeit CCA.
- **Punitive Damages for Fraud** — If a contractor intentionally uses or bills for "Cat 6" cabling knowing that the project contains non-compliant CCA, they face severe civil fraud charges. This frequently results in steep punitive damages meant to punish willful deception.

3. Breach of Contract and Business Claims

- **Warranty Failures** — System installers usually offer performance warranties. Because CCA suffers from severe oxidation and conductor breakage, technicians face constant warranty claims and costly callouts to replace troubleshooting channels.
- **Breach of Contract** — Installation contracts for Category cables generally mandate compliance with NEC codes and ANSI/TIA networking standards. Installing CCA constitutes a fundamental failure to deliver the agreed-upon performance standards, enabling clients to sue to recover their entire investment.

4. Insurance Voiding and System Expenses

- **Canceled Insurance Coverage** — Insurance providers do not pay out claims for damages caused by known building code violations. If an investigator traces a fire in a building where non-compliant CCA cables were installed, the building owner's entire property policy can be voided.

- **Compulsory Rework Costs** — If non-compliant cables are identified during an inspection, the general contractor, installer, or building owners must fund the immense overhead of tearing down walls and rewiring the complete structure with genuine 100% copper Category cables.

5. Consumer Protection and Fraud Violations

- Marketing or invoicing an installation as "Cat 6" when it contains CCA constitutes legal fraud and deceptive business practices.
- **Regulatory Fines** — The State Attorney General and consumer protection boards can levy severe statutory fines against companies that deceptively swap copper Cat cables for cheap CCA cables.
- **Loss of Licensing** — General electrical contractors and sub-contractors risk the immediate suspension or permanent revocation of their professional state licenses for deliberately deploying non-compliant materials such as CCA Cat cables.

Why risk massive long-term exposure for a tiny upfront savings? Most electrical contractors and purchasing managers simply aren't aware of these hidden risks.

Unfortunately, there will always be unscrupulous contractors wanting cheaply made cables, and there are plenty of unscrupulous low-end cable brands that are willing to supply these.

How Do Contractors Get Away With Installing Illegal CCA Cat Cables in Projects?

Contractors that install CCA category cables depend on exploiting gaps in the local inspection process and utilizing deceptive labeling. While the National Electrical Code (NEC) strictly prohibits CCA for in-wall communications, several regulatory and physical factors allow unscrupulous contractors to bypass enforcement:

1. Enforcement Gaps in Low-Voltage Inspections

- **High-Voltage Focus** — Local municipal electrical inspectors focus much of their time on higher voltage systems (120V/240V). They prioritize checking service panels, grounding, GFCI/AFCI placement, and heavy-gauge wire routing. Low-voltage data cabling is frequently overlooked during the rough-in phase.
- **No Specialized Low-Voltage Licensing** — In many jurisdictions, general contractors or low-voltage installers do not need a specialized trade license to pull data cables. The lack of strict credential oversight allows uncertified laborers to run cheap, non-compliant lines unnoticed.

2. Counterfeit and Fraudulent Cable Markings

- **Fake Safety Standards** — Reputable cable brands must pass stringent fire testing to earn a UL 444 certification and fire safety levels such as "CMR" (Riser Rated) or "CMP" (Plenum Rated). Unscrupulous low-end cable brands simply print counterfeit "UL Listed," "Cat6," and fake fire-safety ratings directly onto the PVC jackets of CCA cables.
- **Visual Deception** — To a busy inspector gliding past a data bundle, fake "Cat 6 CMR Rated" printing on a gray or blue cable jacket looks identical to compliant, pure copper cables.

3. Hiding the Cable Behind Closed Walls

- **Strategic Timing** — Shady contractors pull the cheap CCA network cable right before the drywall crew arrives. Once the sheetrock is hung, taped, and painted, the evidence is entirely sealed inside the wall cavities.
- **The "Pass" at the Wall Plate** — At the final inspection, only wall plates with the RJ45 keystone jacks are visible. In most instances the building inspector will not remove the wall plate, disconnect the wires from the keystone jack, and then scrape away the copper appearing conductor to see if there is aluminum underneath. Most of the time the inspector will simply do a continuity test in the jack.

4. Delayed Onset of Failures

- **Initial Success** — Freshly punched-down CCA will pass basic continuity tests. It will deliver internet packets immediately after installation, allowing the contractor to secure their sign-off, collect payment, and leave the job site before performance degrades.
- **Future Hazards** — The severe problems will only manifest weeks, months, or years later. By then, the contractor has closed their LLC or moved on to another project.

Contractors that use CCA category cables depend on these gaps in inspection enforcement. However, technology is changing, and with the growing adoption of PoE for both commercial and residential applications, so does the fire safety risk.

PoE May Finally Openly Expose the Risks Associated With CCA Category Cables

As technology advances so does the growth in devices that are using PoE cabling. From flat screen TVs, IP cameras, and access points, PoE is becoming commonplace in our environment. The greatest fire safety risks with non-compliant PoE cabling such as CCA Cat cables are in multifamily residential and commercial buildings. As discussed earlier, aluminum has roughly 40% higher electrical resistance than copper. This resistance can cause CCA cables to dangerously overheat, especially when these cables are bundled together as is common for

multifamily residential buildings. As aluminum melts at a much lower temperature than copper, it can easily accelerate a fire if it experiences an electrical hotspot. CCA category cables are a tragedy-in-waiting.

With the proliferation of PoE cabling, electrical wholesalers, contractors, and everyone that is involved in the cable specification process should expressly prohibit the use of CCA category cable.

Summary

The legal and financial risks associated with the use of CCA category cables affect all parties in the process. Unfortunately, as copper prices continue to rise the demand for lower cost cable alternatives will as well. It is hoped that as contractors, purchasing managers, building owners, and building inspectors become aware of the CCA category cable risks, this will motivate change in buying habits. However, despite all the risks, some contractors will continue taking that risk as long as they can save upfront money on their cabling costs and hope that the day of reckoning will not be — this time.

Use of CCA category cables is a direct result of the electrical industry's commoditization of all wire and cable, and the "de-skilling" of the data cable industry. This has led to a proliferation of low-end cable brands competing on price with deceptive marketing claims. Purchasing managers and general contractors need to be aware of the issues raised in this article so they can be empowered to make better decisions in their Category cable sourcing.

12. The True Costs of Purchasing Low-Quality Category Cables

[Coming soon]