Recommended Measures to Define and Deploy "Trusted Fiber" in the United States

VERSION 1.0

Fiber Broadband
ASSOCIATION

INTRODUCTION

Fiber is the fundamental broadband network technology for the 21st century, underpinning our modern economy by connecting homes, communities, campuses, and businesses across the US, and serving as critical infrastructure for a wide variety of applications, including 5G wireless, smart grid, telehealth, precision agriculture, secure financial transactions, remote learning and work, sensing, concentrated computing, and other high speed connectivity networks.

The Fiber Broadband Association (FBA) formed the Trusted Fiber Working Group, a cross-functional team of experts from the fiber optic ecosystem, to define what constitutes "Trusted Fiber" – fiber upon which broadband service providers and users can rely to meet their needs. This document is intended to be a best practices resource for these providers and users. The Working Group has developed the following criteria to be used to evaluate whether a product is "trusted fiber":

I.   **Fiber Quality, Reliability, and Long-term Performance**
II. **National Security**
III. **Corporate Governance**
IV. **Dumping and Subsidies**
V.   **Labor and Worker Rights**
VI. **Environmental Stewardship and Sustainability**

In this document, the Working Group explains why each factor is important for reliable deployment and in accordance with U.S. and International norms and values. The document then sets forth guidelines, recommendations, and questions that purchasers of fiber should ask to confirm that the fiber they are procuring is "trusted."

I. *Fiber Quality, Reliability, and Long-term Performance*

Over decades, fiber manufacturers have invested enormous sums in research and development and advanced production and quality-assurance processes. They also have embraced precise specifications and metrics. As a result, today fiber has earned a well-deserved reputation for high quality, superior performance, and long-term reliability.[1]

When evaluating whether a fiber may be "trusted," fiber quality and long-term reliability/performance are top criteria. Quality means receiving a product that meets specified and exacting standards. Reliability and long-term performance means receiving a product that can withstand the rigors of installation and then provide service over many decades while supporting higher speeds as data rates increase.

Meeting global fiber standards should be seen only as a starting point because they specify only minimum levels of performance. Below, we suggest increased levels of performance that go beyond global standards to ensure fiber can be "trusted" to meet the definition above. For example, factors such as mechanical reliability, polarization mode dispersion, and long-term attenuation stability can affect the reliability and optical scalability of fiber. Fiber network deployers also should evaluate the historic reliability of the fiber supply and what level of long-term US market engagement and customer support the entity selling the fiber has shown. These and other factors discussed below are important for fiber networks to be survivable, trust-worthy and operational for decades to come.

Trusted Fiber Recommendation — **Quality Systems Certification**

ISO 9001[2] is a highly regarded international standard for quality management systems. When effectively implemented, it helps ensure that a vendor can consistently produce a product to its desired specifications. ISO 9001 does not specify the features or performance of a product. Rather, it provides a framework in which vendors should collaborate with customers to define product requirements. Vendors with strong quality management systems will want to document product specifications clearly. ISO 9001 has many requirements for the processing of quality claims. Even the best vendors have occasional quality claims. These should be logged, investigated to find a root cause, and resolved. Ask some simple questions about this process and ask to see examples.

A fiber manufacturer should have a complete program of data handling and traceability. This enables them to track the history of a fiber through the manufacturing process to the original raw materials. If an unexpected performance problem or issue occurs, this traceability can be used to determine the cause and effect of the issue and to predict other places in the network where the issue could occur, enabling corrective action to be taken. These systems typically involve in-process product identification techniques, such as barcoding, with database storage of this information. These databases can be accessed to retrieve the specific information requested when needed.

Action for Network Builders and Operators:

• Confirm active compliance with ISO 9001:2015 or equivalent. Ask for evidence of third-party registration

• If possible, visit the factory and/or have discussions with appropriate personnel to view the manufacturing process and verify safeguards and quality systems are in place. Specifically discuss data saving records and traceability throughout the manufacturing process to enable process investigation and quickly identify potentially defective product if a problem occurs

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[1] https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13585&lang=en
[2] https://www.iso.org/standard/62085.html

Trusted Fiber Recommendation — GR-20 Compliance

GR-20[3] is a well-known industry standard that outlines performance standards for commonly deployed cables in the U.S. Originally developed by Bellcore with roots back to Bell Labs and used in the earliest deployments of fiber in the US, GR-20 has been a trusted benchmark standard for optical fiber and fiber optic cable performance for decades. GR-20 is the most generally recognized performance standard in the US, which it is included in this document.

Action for Network Builders and Operators:

• Ask for objective evidence of compliance with GR-20. Third-party certification is preferred but not required if the supplier has a lengthy history of supply in the U.S.

Trusted Fiber Recommendation — Multi-Year Established History of Performance

A fiber network is a multi-decade investment. Fiber infrastructure produced by less than "trusted" manufacturers can have problems that only show up over a long period of time. An established history of supply highlights that this fiber can withstand the test of time.

Action for Network Builders and Operators:

• Ask the fiber manufacturer/vendor for the history of the supply in the U.S.
• Ask for U.S. customer testimonials and/or references

Trusted Fiber Recommendation — Mitigate Unknown Fiber Sourcing

Non-branded or distributor-branded products have been seen in the U.S. with fiber of unknown origin. Without fiber traceability, the specifications provided for fiber performance cannot be trusted since some fiber parameters are only tested in the factory, but not as fiber performs in the field. Also, in the case of a problem that shows up over time, it is unclear how a network operator can properly resolve the problem, short of de-installing the entire network. Contrast that to a problem with a cable with fiber of known origin. The fiber manufacturer will be able to trace the fiber history back to other fibers from the same preform or process to make a more informed assessment of any potential additional risk in the network.

A history of training and field installation support is also important. Proper training of installation crews can prevent later field-related issues.

Action Item for Network Builders and Operators:

• Require disclosure of the fiber manufacturer/vendor and fiber specification
• Ask for a domestically honed and qualified team to evaluate field-related performance issues and provide pre-installation training
• Ask for the manufacturer/vendor's field problem mitigation process and its history of problem identification, mitigation, correction, and response times

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[3] https://telecom-info.njdepot.ericsson.net/site-cgi/ido/docs.cgi?ID=SEARCH&DOCUMENT=GR-20

Trusted Fiber Recommendation – Follow ITU-T G-Series Supplement 59 Guidance on Optical Fiber and Fiber Optic Cable Reliability.[4]

The ITU-T (International Telecommunications Union) is the United Nations specialized agency for information and communication technologies. ITU-T Recommendations are used to classify fiber type and make fiber performance recommendations. ITU Recommendations G.652 and/or G.657 describe the type of fiber that is used in the vast majority of middle mile and fiber to the home networks in the U.S.. Supplement 59 helps end users understand the general long-term behaviors of optical fibers and fiber optic cables and provides guidelines to reduce the number of mechanical and optical failures during the expected lifetime of the fiber and its cable assembly. Although it is difficult to address all situations to guarantee long-term performance, adherence to the guidelines in Supplement 59 is one step that can be taken to help with longevity.

Action for Network Builders and Operators:

• Ask your fiber manufacturer/vendor what steps they take to comply with the guidelines provided
  in this document for both optical and mechanical reliability

Trusted Fiber Recommendation — Tighten Qualifications for Polarization Mode Dispersion (PMD) Performance

Polarization Mode Dispersion (PMD) is addressed in the ITU-T G.652[5] and G.657[6] fiber recommendations, yet fibers delivered to the specifications recommended in these documents may not be able to deliver future 100 Gbps and higher speeds over longer Passive Optic Network (PON) distances without coherent optics. It is recommended that network builders consider tighter PMD specifications for non-domestic fiber in line with the values typically provided by trusted U.S. single-mode fiber manufacturers. Trusted fiber manufacturers offer fiber made to specifications much tighter than the G.652 recommendation.

Action item for Network Builders and Operators:

• Specify to the fiber manufacturer/vendor Fiber PMD Link Design Value ≤ 0.06 ps/√km

Trusted Fiber Recommendation — Long-term Stable Attenuation

ITU-T G.652.D and IEC (International Electrotechnical Commission) 60793-2-50 documents clearly state that single-mode fibers should have stable attenuation in hydrogen aging test environments. Without this stability, attenuation could increase over time and disrupt service or require cable replacement. Though there are different ways to achieve this metric, trusted fiber manufacturers use a deuterium soak for better long-term resistance to hydrogen-related attenuation increases. Other methods may also be viable to provide long-term stable attenuation.

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[4] https://www.itu.int/ITU-T/recommendations/rec.aspx?id=13585&lang=en
[5] G.652 : Characteristics of a single-mode optical fibre and cable (itu.int)
[6] G.657 : Characteristics of a bending-loss insensitive single-mode optical fibre and cable (itu.int)

Action for Network Builders and Operators:

• Ask the fiber manufacturer/vendor if they use a deuterium soak or other methods for long-term
  resistance to hydrogen-related attenuation increases

II. National Security

National security must be a top consideration in the deployment of critical infrastructure. Trusting our fiber sources enables the US to best protect its citizens, economy, and other institutions, notably from foreign aggression or terrorism. As previously identified and addressed by the Secure and Trusted Communications Act[7], we must prevent communications equipment or services that pose a national security risk from entering U.S. networks. Additionally, Sec. 842 of the FY 2022 National Defense Authorization Act[8] added "optical transmission equipment, including optical fiber and cable equipment" to the list of high-priority goods and services the Department of Defense must annually assess. As all the nation's communication traffic flows over optical transmission equipment at some point, we believe this also applies to fiber.

Trusted Fiber Recommendation — National Security and Action Item for Network Builders and Operators

Abide by the applicable legal requirements for fiber manufacturers and vendors listed on the following sites, each of which seek to reduce the potential risk of a national security threat.

• On the Entity List as published by the U.S. Department of Commerce's Bureau of Industry
  and Security (BIS)
  – BIS Entity List

• Headquartered in a country on the adversary list at the US State Department
  – Countering America's Adversaries Through Sanctions Act

• On the Office of Foreign Assets Control (OFAC) Sanctioned Companies List
  – OFAC - Sanctions Programs and Information

• On the World Bank Debarment List
  – Procurement - World Bank Listing of Ineligible Firms and Individuals

• On the Federal Communications Commission's Covered List
  – The Secure Networks Act | FCC

• On the Countries of Particular Concern list at the U.S. Department of State
  – Countries of a Particular Concern, Special Watch List Countries, Entities of Particular
    Concern - U.S. Department of State

III. Corporate Governance

Corporate governance creates a structure and system of rules that determine how a company operates. An organization with proper corporate governance is more likely to have ethical business practices, leading to significantly reduced threats of safety, legal, performance, and warranty issues.

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[7] PUBL124.PS (congress.gov)
[8] S.1605 - 117th Congress (2021-2022): National Defense Authorization Act for Fiscal Year 2022 | Congress.gov | Library of Congress

Trusted Fiber Recommendation — **Corporate Governance**

A fiber manufacturer and vendor should respect the rule of law, including the following:

• Establishes and adheres to anti-corruption and anti-bribery policies[9]

• Complies with United States Sanctions policies[10]

• Respects Intellectual Property laws[11]

• Does not permit a government official to serve on the corporate board or hold the role of advisor

Action Item for Network Builders and Operators:

• Ask to see the fiber manufacture/vendor's anti-corruption and anti-bribery policies

• Confirm that the fiber manufacturer/vendor abides by US Sanction Policies

• Search for any open litigation regarding intellectual property violations by the fiber manufacturer/vendor[12]

These inquiries will help determine if a fiber manufacturer/vendor has strong corporate governance, reducing future risks with the fiber selected

IV. Dumping & Subsidies

As noted in the Notice of Funding Opportunity for the Broadband Equity, Access, and Deployment program,[13] "the Infrastructure Act presents an important opportunity to ensure that American taxpayer dollars are spent procuring needed products and supplies from American workers and businesses, strengthening and growing U.S. domestic manufacturing capacity." This objective is defeated by practices that provide foreign companies with an unfair competitive advantage by allowing them to sell products at less than fair value or utilize subsidies from their government. Such practices include dumping, when a country or company exports a product at a price that is lower in the foreign importing market than the price in the exporter's domestic market,and subsidies, when the government or a government agency that acts, either by paying out subsidies directly or by requiring companies to subsidize certain customers. These practices not only impact the ability of companies to compete fairly but can create scenarios in which our national security is threatened by our dependence on products produced by a limited number of companies or countries that utilize these practices.

Trusted Fiber Recommendation — **Dumping and Subsidies and Acton for Network Builders and Operators**

Ensure fiber manufacturer/vendors:

• Adhere to anti-dumping, countervailing duty laws and World Trade Organization (WTO) determinations[14]

• Is not subject to an anti-dumping or countervailing duties determination by a market economy WTO member

• Are headquartered in a country that has an export credit agency that meets the Organization for Economic Co-operation and Development Arrangement on Officially Supported Export Credits

[9] https://www.state.gov/policy-issues/anti-corruption-and-transparency/
[10] https://home.treasury.gov/policy-issues/financial-sanctions/sanctions-programs-and-country-information
[11] https://www.state.gov/intellectual-property-enforcement/
[12] https://dockets.justia.com/browse/noscat-10
[13] https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf
[14] WTO | What is the WTO? - What we stand for

V. Safety, Labor & Worker Rights

Standards of employment safety, which provide basic protections, are fundamental for any credible and "trusted" optical fiber manufacturer and vendor. Besides the obvious moral benefits, there are economic benefits of having a strong safety focus. An increase in injuries results in higher costs, lost workdays, interrupted production and the impact is experienced by customers.

Trusted Fiber Recommendation — Safety Standards and Systems

There are several ways a fiber provider can ensure employment safety standards and systems are in place. ISO 45001[15] certification is one way. ISO 45001:2018 specifies requirements for an occupational health and safety (OH&S) management system. It provides guidance for its use to enable organizations to provide safe and healthy workplaces by preventing work-related injury and ill health and by proactively improving its OH&S performance. A manufacturer or vendor can provide excellent work and safety conditions without certification. Guidelines are given below to confirm a commitment to health and safety.

Action for Network Builders and Operators:

- Confirm that the manufacturer/vendor has implemented well-established health and safety monitoring and continuous improvement systems
- Ask for evidence of an enforced health and safety policy, incident reporting system with updated incident rates, active health and safety training program, personal protective equipment policies, and regular job safety risk assessments and evaluations

Trusted Fiber Recommendation — Worker Rights

In addition to a safe and healthy working environment, as noted by the International Labour Organization (ILO), worker rights do not have a single definition but include the following key principles:[16]

1. Freedom of association and the effective recognition of the right to collective bargaining;
2. The elimination of all forms of forced or compulsory labor;
3. The effective abolition of child labor;
4. The elimination of discrimination in respect to employment and occupation; and
5. A safe and healthy working environment.

Worker rights are part of the fabric of an organization and find themselves in many of the other topics we have covered. Worker rights relate directly to an organization's ethics, concerns regarding national security, and respect for the rule of law. Acknowledging the rights of workers is important to a "trusted fiber" ecosystem.

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[15] ISO - ISO 45001:2018 - Occupational health and safety management systems — Requirements with guidance for use
[16] The text of the Declaration and its follow-up (DECLARATION) (ilo.org)

Trusted Fiber Recommendation — Freedom of Association and the Effective Recognition of the Right to Collective Bargaining

The right to organize and form employers' and workers' organizations is the prerequisite for sound collective bargaining and social dialogue. This freedom of association ensures that workers and employers can negotiate work relations effectively.

Action Item for Network Builders and Operators:

• Confirm that the fiber manufacturer/vendor respects legally established workers' organizations

Trusted Fiber Recommendation — Elimination of all Forms of Forced or Compulsory Labor

Forced or compulsory labor is reprehensible and contrary to the morals and laws of civilized society; yet it remains a persistent and evolving problem well into the 21st century.

Although universally condemned, forced labor practices account for billions of dollars in illegal profits annually. Coercive recruiting methods, both enterprise and state-imposed, exist globally as remnants of repudiated forced or compulsory labor practices in many countries.

Action Item for Network Builders and Operators:
Ask the following questions:

• Does the manufacturer/vendor provide workers with adequate rest?
• Can the manufacturer/vendor provide evidence of regular pay with deductions only allowable by applicable national laws?
• Can I visit the manufacturer/vendor's location? *(If in question, utilize a community-based group that is trained to conduct monitoring and independent compliance verification services.)*

Trusted Fiber Recommendation — Elimination of discrimination in Reporting Employment and Occupation[17]

Freedom from discrimination based on race, color, national origin, sex, religion, age, and other critical categories is a fundamental right. Definitions of discrimination vary from country to country, but the FBA suggests using the U.S. Equal Employment Opportunity Commission guidelines.

Action Item for Network Builders and Operators:
Ask the following questions:

• Does the manufacturer/vendor have effective anti-discrimination policies?

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[17] https://www.eeoc.gov/prohibited-employment-policiespractices

VI. *Environmental Stewardship & Sustainability*

Trusted Fiber Recommendation — Environmental Stewardship and Sustainability

Having environmental/sustainability standards and systems in place is important for any credible and trusted optical fiber or fiber optic cable manufacturer/vendor. There are several ways a manufacturer/vendor can assure it has such standards and systems. For instance, International Organization for Standardization (ISO) 14001[18] certification provides a framework for environmental management systems. When effectively implemented, it can ensure that environmental impact is being measured and improved. A manufacturer/vendor can meet acceptable environmental and sustainability goals without the certification, and guidelines are given below to confirm environmental/sustainability commitment instead of the ISO 14001 certification.

Action for Network Builders and Operators:

• Confirm that the manufacturer/vendor has well-established environmental monitoring and continuous improvement systems

• Ask the manufacturer/vendor for evidence of a well-established environment policy, with an assessment of the companies' environmental aspects and their impact on the organization, carbon footprint reduction targets, waste management program, and incident reporting system for spills

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[18] https://www.iso.org/iso-14001-environmental-management.html

APPENDIX

Supporting information regarding the World Trade Organization

• Over the past 60 years, the World Trade Organization (WTO) and its preceding organization, General Agreement on Tariffs and Trade (GATT), has developed an international system aimed at enabling open trade while creating a level playing field for all.

• The organization is comprised of 164 member from 117 different developing countries or separate customs territories.

Supporting information regarding International Organization for Standardization 45001

• International Organization for Standardization (ISO) was initiated in 1946 to review the future of International Standardization, with ISO 45001 launched in 2018.

• ISO is an internationally recognized organization that is an independent and non-governmental entity with a membership of 167 national standards bodies.

• ISO standards are a basis for the development of national and international regulation.

• ISO 45001 is the world's first International Standard for occupational health and safety.

• ISO 45001 is globally recognized at it deals with personal health and safety risks of any process or use of equipment within an organization.

• It provides an Occupational Health & Safety system that works to increase safety, reduce risk, enhance health and well-being while at the workplace.

• ISO 45001 incorporates various international standards including OHSAS 18001, the International Labour Organization's ILO-OSH Guidelines, and the ILO's international labour standards and conventions.

Supporting information regarding the ILO

• As stated by the ILO, "The only tripartite U.N. agency, since 1919 the ILO brings together governments, employers and workers of 187 Member States, to set labour standards, develop policies and devise programmes promoting decent work for all women and men."

• As stated by the ILO, "The unique tripartite structure of the ILO gives an equal voice to workers, employers and governments to ensure that the views of the social partners are closely reflected in labour standards and in shaping policies and programmes."

Supporting information regarding ISO 14001

• International Organization for Standardization (ISO) was initiated in 1946 to review the future of International Standardization, with ISO 14001 launched in 1996.

• ISO is an internationally recognized organization that is an independent and non-governmental entity with a membership of 167 national standards bodies.

• ISO standards are a basis for the development of national and international regulation.

• ISO 14001 is an internationally agreed upon standard that helps organizations meet their environmental legal responsibilities and more by establishing requirements for an environmental management system.

• ISO has more than 300,000 certifications to ISO 14001 in 171 countries around the world.