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DEPARTMENT OF AGRICULTURE

Rural Utilities Service

7 CFR Part 1755

Telecommunications Policies on Specifications, Acceptable Materials, and Standard Contract Forms

AGENCY: Rural Utilities Service, USDA.

ACTION: Final rule.

SUMMARY: The Rural Utilities Service, an agency delivering the United States Department of Agriculture's (USDA) Rural Development Utilities Programs, hereinafter referred to as USDA Rural Development or the Agency, is revising its regulation: on fiber optic cable specifications used by borrowers, their consulting engineers, and cable manufacturers; updates the specifications to meet current industry standards; includes additional requirements in the specifications to meet the construction requirements of fiber-to-the-home construction; clarifies certain existing definitions; separates the regulation into two distinct specifications for cables covering backbone and distribution plant, as well as for service entrance cables covering subscribers' drops; and includes new definitions.

DATES: *Effective Date:* This final rule will become effective May 5, 2009

Incorporation by Reference: The incorporation by reference of certain publications listed in this rule is approved by the Director of the Federal Register as of May 5, 2009.

FOR FURTHER INFORMATION CONTACT: Norberto Esteves, Chair, Technical Standards Committee ''A'' (Telecommunications), Advanced Services Division, USDA Rural Development Telecommunications Program, STOP 1550, Washington, DC 20250–1550. *Telephone:* (202) 720–0699; *Fax:* (202) 205–2924; *e-mail: norberto.esteves@wdc.usda.gov.*

SUPPLEMENTARY INFORMATION:

Executive Order 12866

This rule is exempt from the Office of Management and Budget (OMB) review for purposes of Executive Order 12866 and, therefore, has not been reviewed by OMB.

Executive Order 12988

This final rule has been reviewed under Executive Order 12988, Civil Justice Reform. USDA Rural Development has determined that this final rule meets the applicable standards provided in section 3 of the Executive Order. In addition, all state and local laws and regulations that are in conflict with this proposed rule will be preempted; no retroactive effect will be given to the rule, and, per section 212(e) of the Department of Agriculture Reorganization Act of 1994 (7 U.S.C. 6912(e)), administrative appeals procedures, if any are required, must be exhausted before an action against the Department or its agencies may be initiated.

Regulatory Flexibility Act Certification

USDA Rural Development has determined that this final rule will not have a significant economic impact on a substantial number of small entities, as defined by the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). The standard USDA Rural Development telecommunications loan documents contain provisions on procurement of products and construction of telecommunications facilities purchased with loan funds. This ensures that the telecommunications systems financed with loan funds are adequate to serve the purposes for which they are to be constructed and that loan funds are adequately secured. USDA Rural Development borrowers, as a result of obtaining Federal financing, receive economic benefits that exceed any direct cost associated with complying with USDA Rural Development regulations and requirements.

Information Collection and Recordkeeping Requirements

The information collection and recordkeeping requirements contained in this final rule are cleared under control number 0572–0059 pursuant to the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35, as amended).

Executive Order 13132

This regulation will not have substantial direct effects on the States, on the relationship between the national government and the States, or on distribution of power and responsibilities among the various levels of government. Under Executive Order 13132, this final rule does not have sufficient federalism implications requiring the preparation of a Federalism Assessment.

Catalog of Federal Domestic Assistance

The program described by this final rule is listed in the Catalog of Federal Domestic Assistance Programs under No. 10.851, Rural Telephone Loans and Loan Guarantees and No. 10.857, Rural Broadband Access Loans and Loan Guarantees. This catalog is available on a subscription basis from the Superintendent of Documents, the United States Government Printing Office, Washington, DC 20402 or at *http://www.cfda.gov. Telephone:* (202) 512–1800.

Executive Order 12372

This final rule is excluded from the scope of Executive Order 12372, Intergovernmental Consultation, which may require consultation with State and local officials. See the final rule-related notice titled ''Department Programs and Activities Excluded from Executive Order 12372'' (50 FR 47034), advising that USDA Rural Development Utilities Programs loans and loan guarantees are excluded from the scope of Executive Order 12372.

Unfunded Mandates

This final rule contains no Federal Mandates (under the regulatory provisions of Title II of the Unfunded Mandates Reform Act of 1995 (2 U.S.C. Chapter 25)) for State, local, and tribal governments or the private sector. Thus, this final rule is not subject to the requirements of sections 202 and 205 of the Unfunded Mandates Reform Act of 1995.

National Environmental Policy Act Certification

The Agency has determined that this final rule will not significantly affect the quality of the human environment as defined by the National Environmental

Policy Act of 1969 (42 U.S.C. 4321 *et seq.*). Therefore, this action does not require an environmental impact statement or assessment.

Background

On July 17, 2007, the Agency published a proposed rule [72 FR 39028] revising the current requirements for fiber optic cables of 7 CFR 1755.900 codified in 1995. The comment period ended on September 17, 2007. Comments were received from three companies by the due date. No changes in the regulations requirements have been made, except those in response to comments received.

This final rule revises the current requirements for fiber optic cables of 7 CFR 1755.900 codified in 1995 as well as minor editorial changes. The final rule sets the minimum performance requirements based on current industry standards. This revision was initiated to resolve problems the rural telecom industry is experiencing with cables manufactured under the existing specifications and reported by rural carriers and their consulting engineers. It addresses the buffer tube shrinkage caused by storage at low temperatures, which impairs fiber-to-the-home system performance, and sets new requirements for drop cables (cables with 12 or fewer fibers operating up to 100 meters (300 feet)).

Cables manufactured to these revised specifications will have lower average bi-directional loss at fusion splices, about 0.1 decibels (dB) instead of the 0.2 dB currently required. For fiber-to-the-home applications the specification requires a maximum mid-span length of 6.1 meters (20 feet) for cables used on mid-span applications with buffer tube storage. From a polarization mode dispersion standpoint, the maximum Statistical Parameter of Polarization Mode Dispersion (PMD_Q) of 0.20 Picosecond per nanometer times kilometer (ps/√km) specified will allow the deployment of higher-speed transmission systems at longer distances: 3,000 kilometers (km) (1,864 miles) for digital systems operating at 10 Gigabits per second (Gbps) and 80 km (50 miles) operating at 40 Gbps. These performance refinements are necessary because end-users deploying cable meeting this level of performance expect it to deliver high bit rate services during the useful economic life of these cables.

The comments, recommendations, and responses are summarized as follows:

The National Telecommunications Cooperative Association (NTCA) submitted one comment in support of the proposed rulemaking.

Response: Rural Development appreciates the recommendations given by NTCA to this proposed regulation.

Draka Comteq submitted one comment that addressed the following issues:

(1) *''To address proper field usage of optical fiber cable, we recommend adding the following statement in this specification: Installed cable must be properly terminated. This includes properly securing rigid strength members (i.e. central strength member) and clamping the cable and jacket. It is important that cable components be secured to prevent movement of the cable or components over the operating conditions. Positive stop central strength member (CSM) clamps must be used and the CSM must be routed as straight and as short as practical to prevent bowing or breaking of the CSM. The cable and jacket retention must be sufficient to prevent jacket slippage over the operating temperature range.''*

Response: The Agency agrees with this comment from Draka Comteq. The statement has been added to the specification under § 1755.900, (c)(1)(viii).

(2) ''Section 5, Fiber Optic Service Entrance Cable (1755.901): *Due to the product and application differences, Draka recommends that a separate specification be used for drop cable. We recommend using the Rural Development Utilities Programs Specification for Fiber Optic Service Entrance Cables that was finalized last year. Key drop specification differences include:*

—*Midspan tube storage should not be required*

—*Jacket thickness specifications are different: 0.5 mm minimum thickness, 0.30 mm over optional toning elements, 0.20 mm over any radial strength member not used as a primary strength member*

—*Reel wrap: applies to only reels weighing more than 75 lbs.*

—*Cable core: cylindrical core is not required (i.e. flat drop cable)*

—*Figure 8 drop will use a small messenger.''*

Response: The Agency agrees with Draka Comteq's comments. Section 1755.901 has been added to make the cable requirements for drop cables a stand alone section based on the Rural Development Utilities Programs Specification for Fiber Optic Service Entrance Cables draft specification.

TRW, Inc., submitted one comment which addressed the items as follows and expressed its support to the proposed regulation:

1. *''Reference § 1755.900(t)(15) Mid Span Test. Rural Fiber-to-the-Home systems in low density applications may include as many as 15 to 20 mid-span openings and in much of the USA are exposed to extreme temperature variations in the outside plant environment. Furthermore, an adequate length of fiber needs to be available to facilitate splicing in the confined space of pedestals and splice closures. It is also known that the various components of fiber cable are made of several types of materials and when such cables are opened at splice points the various materials are subject to differential expansion and contraction. It is essential that fiber optic cable be designed and proof tested to perform without degradation from temperature cycling throughout a service life of 20 to 30 years. Therefore, in order not to jeopardize service due to increased attenuation over the life other plant, the maximum increase in optical attenuation allowed after cycle testing should not exceed .1 dB pre mid-span opening as proposed by RUS.''*

Response: The Agency agrees with this comment. It is the Agency's viewpoint that the buffer tube needs to be designed so no attenuation losses occur due to micro-bending of the fibers caused by shrinking of the buffer tube in low temperature conditions that are within the cable operating temperatures range. The mid-span test has been revised and now calls for a maximum average loss of 0.05 dB.

2. *''Reference § 1755.900(t)(15)(iv)(c)—Mid-Span Test. For the reasons stated in the preceding paragraph, the mid-span lengths specified for testing should not be less than 16 feet as proposed by RUS.''*

Response: The Agency agrees with this comment. The 16-foot mid-span opening was set originally based on the maximum opening recommended for use in the Agency accepted pedestals. The Agency has received test data from various manufacturers that performed this mid-span test using a 20-foot mid-span opening. To allow a buffer, the specification has been changed to allow only a minimum mid-span opening of 20 feet.

3. *''Reference § 1755.900(t)(15)(iv)(E)—Mid-Span Test. For the reasons stated above the cable sample tested should be subjected to not less than 5 complete cycles as proposed by RUS.''*

Response: The Agency agrees. The Mid-Span Test now calls for 5 complete cycles.

4. *''Reference § 1755.900(b)(15)—Matched Cable: Should the wavelength 1310, 1550 nm or both be stated?''*

Response: No, by not stating the wavelength, the requirement applies to

both the 1310 nm MFD and 1550 nm MFD.

5. *''Reference § 1755.900(b)(15)—Matched Cable: Is the average bi-directional loss of .1 dB, expected at 1310 nm, 1550 nm, or both? This question will come up as actual splice data is evaluated in the field.''*

Response: At both wavelengths, however, the fiber normally is tested at the wavelength that will be used for transmission. For local loop applications splice loss measurements should be conducted at 1310 nm since losses measured at this wavelength are generally higher than losses measured at 1510 nm. For long haul application using non-zero-dispersion shifted fiber cable, such as ITU G.655 fiber, the splice loss measurement should be conducted at 1510 nm. The average bi-directional loss of a fusion splice to be ≤ 0.1 dB is a goal and not every splice needs to meet this goal as long as the total budget loss for the link is met.

6. *''Reference § 1755.900(c)(4)—ADSS cables. Per NESC C2–2007, Table 232–1, the typical minimum sagged ground clearance should be stated as 4.7 m (15.5 feet) rather than 4.3 m (14 feet) as proposed.''*

Response: The ''typical minimum sagged'' ground clearance has been changed to 4.7 m (15.5 feet).

7. *''Reference § 1755.900(g)(3)—Optical Fiber Ribbon: There appears to be a typographical error in the paragraph, ''manufactures'' should be ''manufacturer.''*

Response: A correction was made.

8. *Reference § 1755.900(o) —Armor. Typographical errors, ''mills'' should be ''mils.''*

Response: A correction was made.

9. *''Reference § 1755.900(s)(1)—Zero Dispersion Optical Fiber Cable. Typographical errors, should be ''Table2/G.652.B'' and ''Table4/G.652.D.''*

Response: A correction was made.

10. *Reference § 1755.900*(y)(1)—*Packaging * * * Typographical error, ''continues'' should be ''continuous.''*

Response: A correction was made.

11. *Clarification of definitions.*

Response: The Agency has added language to indicate reference materials available online and in a bulletin format on the Agency acceptance process and has added the definitions of the ''List of Acceptable Materials'' and ''Accept/Acceptance.'' Additionally, the definition of *''polarization mode dispersion''* was revised for clarity and the definition of *''birefringence''* has been defined separately, rather than being incorporated into the definition of *polarization mode dispersion.*

List of Subjects in 7 CFR Part 1755

Incorporation by reference, Loan programs—communications, Reporting and recordkeeping requirements, Rural areas, Telecommunications, Telephone.

■ For reasons set forth in the preamble, chapter XVII of title 7 of the Code of Federal Regulations, is amended as follows:

PART 1755—TELECOMMUNICATIONS POLICIES ON SPECIFICATIONS, ACCEPTABLE MATERIALS, AND STANDARD CONTRACT FORMS

■ 1. The heading of part 1755 is revised to read as set out above.

■ 2. The authority citation for part 1755 continues to read as follows:

Authority: 7 U.S.C. 901 *et seq.,* 1921 *et seq.,* 6941 *et seq.*

■ 3. Section 1755.900 is revised and §§ 1755.901, 1755.902, and 1755.903 are added to read as follows:

§ 1755.900 Abbreviations and Definitions.

The following abbreviations and definitions apply to §§ 1755.901 and 1755.902:

(a) *Abbreviations.*
(1) ADSS All dielectric self-supporting;
(2) ASTM American Society for Testing and Materials;
(3) °C Centigrade temperature scale;
(4) dB Decibel;
(5) CSM Central strength member;
(6) dB/km Decibels per 1 kilometer;
(7) ECCS Electrolytic chrome coated steel;
(8) EIA Electronic Industries Alliance;
(9) EIA/TIA Electronic Industries Alliance/Telecommunications Industry Association;
(10) FTTH Fiber-to-the-Home;
(11) Gbps Gigabit per second or Gbit/s;
(12) GE General Electric;
(13) HDPE High density polyethylene;
(14) ICEA Insulated Cable Engineers Association, Inc.;
(15) Km kilometer(s;)
(16) LDPE Low density polyethylene;
(17) m meter(s;)
(18) Max. Maximum;
(19) Mbit Megabits;
(20) MDPE Medium density polyethylene;
(21) MHz-km Megahertz-kilometer;
(22) Min. Minimum;
(23) MFD Mode-Field Diameter;
(24) nm Nanometer(s;)
(25) N Newton(s;)
(26) NA Numerical aperture;
(27) NESC National Electrical Safety Code;
(28) OC Optical cable;
(29) O.D. Outside Diameter;
(30) OF Optical fiber;
(31) OSHA Occupational Safety and Health Administration;
(32) OTDR Optical Time Domain Reflectometer;
(33) % Percent;
(34) ps/(nm · km) Picosecond per nanometer times kilometer;
(35) ps/(nm² · km) Picosecond per nanometer squared times kilometer;
(36) PMD Polarization Mode Dispersion;
(37) RUS Rural Utilities Service;
(38) s Second(s);
(39) SI International System (of Units) (From the French *Système international d'unités*); and
(40) µm Micrometer.

(b) *Definitions.*

(1) *Accept; Acceptance* means Agency action of providing the manufacturer of a product with a letter by mail or facsimile that the Agency has determined that the manufacturer's product meets its requirements. For information on how to obtain Agency product acceptance, refer to the procedures listed at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm,* as well as additional information in RUS Bulletin 345–3, *Acceptance of Standards, Specifications, Equipment Contract Forms, Manual Sections, Drawings, Materials and Equipment for the Telephone Program,* available for download at *http://www.usda.gov/rus/telecom/publications/bulletins.htm.*

(2) *Agency* means the Rural Utilities Service, an Agency which delivers the United States Department of Agriculture's Rural Development Utilities Programs.

(3) *Armor* means a metal tape installed under the outer jacket of the cable intended to provide mechanical protection during cable installation and environmental protection against rodents, termites, etc.

(4) *Attenuation* means the loss of power as the light travels in the fiber usually expressed in dB/km.

(5) *Bandwidth* means the range of signal frequencies that can be transmitted by a communications channel with defined maximum loss or distortion. Bandwidth indicates the information-carrying capacity of a channel.

(6) *Birefringence* means the decomposition of a pulse of light entering the fiber into ''two polarized pulses'' traveling at different velocities due to the different refractive indexes in the polarization axes in which the electric fields oscillate. Different refractive indexes in the fiber may be caused by an asymmetric fiber core, internal manufacturing stresses, or through external stresses from cabling and installation of the fiber optic cable, such as bending and twisting.

(7) *Cable cutoff wavelength* means the shortest wavelength at which only one mode light can be transmitted in any of the single mode fibers of an optical fiber cable.

(8) *Chromatic Dispersion* means the broadening of a light pulse as it travels down the length of an optical fiber, resulting in different spectral components of the light pulse traveling at different speeds, due to the fact that the index of refraction of the fiber core is different for different wavelengths.

(9) *Cladding* means the outer layer of an optical fiber made of glass or other transparent material that is fused to the fiber core. The cladding concentrically surrounds the fiber core. It has a lower refractive index than the core, so light travelling in the fiber is maintained in the core by internal reflection at the core-cladding interface.

(10) *Core* means the central region of an optical waveguide or fiber which has a higher refractive index than the cladding through which light is transmitted.

(11) *Cutoff Wavelength* means, in single mode fiber, the shortest wavelength at which only the fundamental mode of an optical wavelength can propagate.

(12) *Dielectric Cable* means a cable which has neither metallic members nor other electrically conductive materials or elements.

(13) *Differential Group Delay* means the arrival time differential of the two polarized light components of a light pulse traveling through the optical fiber due to birefringence.

(14) *Graded Refractive Index Profile* means the refractive index profile of an optical fiber that varies smoothly with radius from the center of the fiber to the outer boundary of the cladding.

(15) *List of Acceptable Materials* means the latest edition of RUS Informational Publication 344–2, *''List of Materials Acceptable for Use on Telecommunications Systems of RUS Borrowers.''* This document contains a convenient listing of products which have been determined to be acceptable by the Agency. The List of Acceptable Materials is available on the Internet at *http://www.usda.gov/rus/telecom/materials/lstomat.htm.*

(16) *Loose Tube Buffer* means the protective tube that loosely contains the optical fibers within the fiber optic cable, often filled with suitable water blocking material.

(17) *Matched Cable* means fiber optic cable manufactured to meet the requirement of this section for which the calculated splice loss using the formula below is ≤0.06 dB for any two cabled fibers to be spliced.

$$\text{LOSS (dB)} = -10\ \text{LOG}_{10}\ [4/(\text{MFD}_1/\text{MFD}_2 + \text{MFD}_2/\text{MFD}_1)^2],$$

where subscripts 1 and 2 refer to any two cabled fibers to be spliced.

(18) *Mil* means a measurement unit of length indicating one thousandth of an inch.

(19) *Minimum Bending Diameter* means the smallest diameter that must be maintained while bending a fiber optic cable to avoid degrading cable performance indicated as a multiple of the cable diameter (Bending Diameter/Cable Diameter).

(20) *Mode-Field Diameter* means the diameter of the cross-sectional area of an optical fiber which includes the core and portion of the cladding where the majority of the light travels in a single mode fiber.

(21) *Multimode Fiber* means an optical fiber in which light travels in more than one bound mode. A multimode fiber may either have a graded index or step index refractive index profile.

(22) *Numerical Aperture (NA)* means an optical fiber parameter that indicates the angle of acceptance of light into a fiber.

(23) *Optical Fiber* means any fiber made of dielectric material that guides light.

(24) *Optical Point Discontinuities* means the localized deviations of the optical fiber loss characteristic which location and magnitude may be determined by appropriate OTDR measurements of the fiber.

(25) *Optical Waveguide* means any structure capable of guiding optical power. In optical communications, the term generally refers to a fiber designed to transmit optical signals.

(26) *Polarization Mode Dispersion* means, for a particular length of fiber, the average of the differential group delays of the two polarized components of light pulses traveling in the fiber, when the light pulses are generated from a sufficient narrow band source. The differential group delay varies randomly with time and wavelength. The term PMD is used in the industry in the general sense to indicate the phenomenon of birefringence (polarized light having different group velocities), and used specifically to refer to the value of time delay expected in a specific length of fiber.

(27) PMD_Q means the statistical upper bound for the PMD coefficient of a fiber optic cable link composed of M number of randomly chosen concatenated fiber optic cable sections of the same length. The upper bound is defined in terms of a probability level Q, which is the probability that a concatenated PMD coefficient value exceeds PMD_Q. ITU G recommendations for fiber optic cables call for M = 20 and Q = 0.01%. This PMD_Q value is the one used in the design of fiber optic links.

(28) *Ribbon* means a planar array of parallel optical fibers.

(29) *Shield* means a conductive metal tape placed under the cable jacket to provide lightning protection, bonding, grounding, and electrical shielding.

(30) *Single Mode Fiber* means an optical fiber in which only one bound mode of light can propagate at the wavelength of interest.

(31) *Step Refractive Index Profile* means an index profile characterized by a uniform refractive index within the core, a sharp decrease in refractive index at the core-cladding interface, and a uniform refractive index within the cladding.

(32) *Tight Tube Buffer* means one or more layers of buffer material tightly surrounding a fiber that is in contact with the coating of the fiber.

§ 1755.901 Incorporation by Reference.

(a) *Incorporation by Reference:* The materials listed here are incorporated by reference where noted. These incorporations by reference were approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. These materials are incorporated as they exist on the date of the approval, and notice of any change in these materials will be published in the **Federal Register**. The materials are available for purchase at the corresponding addresses noted below. All are available for inspection at the Rural Development Utilities Programs, during normal business hours at room 2849–S, U.S. Department of Agriculture, Washington, DC 20250. Telephone (202) 720–0699, and e-mail *norberto.esteves@wdc.usda.gov.* The materials are also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of these materials at NARA, call (202) 741–6030, or go to: *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(b) The American National Standards Institute/Institute of Electrical and Electronics Engineers, Inc. ANSI/IEEE C2–2007, *The National Electrical Safety Code,* 2007 edition, approved April 20, 2006, (''ANSI/IEEE C2–2007''), incorporation by reference approved for § 1755.902(a), § 1755.902(p), § 1755.903(a), § 1755.903(k) and § 1755.903(n). ANSI/IEEE C2–2007 is available for purchase from IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854, telephone 1–800–678–4333 or online at *http://standards.ieee.org/nesc/index.html.*

(c) The following Insulated Cable Engineers Association standards are

available for purchase from the Insulated Cable Engineers, Inc. (ICEA), P.O. Box 1568, Carrollton, GA 30112 or from Global Engineering Documents, 15 Iverness Way East, Englewood, CO 80112, telephone 1–800–854–7179 (USA and Canada) or 303–792–2181 (International), or online at *http://global.ihs.com:*

(1) ICEA S–110–717–2003, *Standard for Optical Drop Cable,* 1st edition, September 2003 (''ICEA S–110–717''), incorporation by reference approved for § 1755.903(a), § 1755.903(b), § 1755.903(c), § 1755.903(d), § 1755.903(e), § 1755.903(f), § 1755.903(g), § 1755.903(l), § 1755.903(n), § 1755.903(p), § 1755.903(u); and

(2) ANSI/ICEA S–87–640–2006, *Standard for Optical Fiber Outside Plant Communications Cable,* 4th edition, December 2006 (''ANSI/ICEA S–87–640''), incorporation by reference approved for § 1755.902(a), § 1755.902(b), § 1755.902(c), § 1755.902(d), § 1755.902(e), § 1755.902(i), § 1755.902(l), § 1755.902(m), § 1755.902(n), § 1755.902(p), § 1755.902(q), § 1755.902(r), § 1755.902(u), § 1755.903(b), § 1755.903(g), § 1755.903(l), § 1755.903(o), § 1755.903(p), and § 1755.903(s).

(d) The following American Society for Testing and Materials (ASTM) standards are available for purchase from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. Telephone (610) 832–9585, Fax (610) 832–9555, by e-mail at *service@astm.org,* or online *at http://www.astm.org* or from ANSI, 1916 Race Street, Philadelphia, PA 19103, telephone (215) 299–5585, or online at *http://webstore.ansi.org/ansidocstore/default.asp:*

(1) ASTM A 640–97, (Reapproved 2002)$^{\varepsilon 1}$, *Standard Specification for Zinc-Coated Steel Strand for Messenger Support of Figure 8 Cable,* approved September 2002 (''ASTM A 640''), incorporation by reference approved for § 1755.902(n);

(2) ASTM B 736–00, *Standard Specification for Aluminum, Aluminum Alloy and Aluminum-Clad Steel Cable Shielding Stock,* approved May 10, 2000 (''ASTM B 736''), incorporation by reference approved for § 1755.902(m) and § 1755.903(j);

(3) ASTM D 4565–99, *Standard Test Methods for Physical and Environmental Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable,* approved March 10, 1999 (''ASTM D 4565''), incorporation by reference approved for § 1755.902(c), § 1755.902(m), § 1755.903(c) and § 1755.903(j);

(4) ASTM D 4566–98, *Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable,* approved December 10, 1998 (''ASTM D 4566''), incorporation by reference approved for § 1755.902(f), § 1755.902(t) and § 1755.903(t); and

(5) ASTM D 4568–99, *Standard Test Methods for Evaluating Compatibility Between Cable Filling and Flooding Compounds and Polyolefin Wire and Cable Materials,* approved April 10, 1999 (''ASTM D 4568''), incorporation by reference approved for § 1755.902(h).

(e) The following Telecommunications Industry Association/Electronics Industries Association (TIA/EIA) standards are available from Electronic Industries Association, Engineering Department, 1722 Eye Street, NW., Washington, DC 20006; or from Global Engineering Documents, 15 Iverness Way East, Englewood, CO 80112, telephone 1–800–854–7179 (USA and Canada) or (303) 792–2181 (International), or online at *http://global.ihs.com;* or from TIA, 2500 Wilson Blvd, Suite 300, Arlington, VA 22201, telephone 1–800–854–7179 or online *http://www.tiaonline.org/standards/catalog:*

(1) TIA/EIA Standard 455–3A, *FOTP–3, Procedure to Measure Temperature Cycling on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components,* approved May 1989, (''TIA/EIA Standard 455–3A''), incorporation by reference approved for § 1755.902(r).

(2) [Reserved]

(f) The following International Telecommunication Union (ITU) recommendations may be obtained from ITU, Place des Nations, 1211 Geneva 20, Switzerland, telephone +41 22 730 6141 or online at *http://www.itu.int/ITU-T/publications/recs.html*:

(1) ITU–T Recommendation G.652, *Series G: Transmission Systems and Media, Digital Systems and Networks, Transmission media characteristics—Optical fibre cables, Characteristics of a single-mode optical fibre and cable,* approved June 2005 (''ITU–T Recommendation G.652''), incorporation by reference approved for § 1755.902(b), § 1755.902(q), § 1755.903(b) and § 1755.903(o);

(2) ITU–T Recommendation G.655, *Series G: Transmission Systems and Media, Digital Systems and Networks, Transmission media characteristics—Optical fibre cables, Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable,* approved March 2006 (''ITU–T Recommendation G.655''), incorporation by reference approved for § 1755.902(b) and § 1755.902(q);

(3) ITU–T Recommendation G.656, *Series G: Transmission Systems and Media, Digital Systems and Networks, Transmission media characteristics—Optical fibre cables, Characteristics of a fibre and cable with non-zero dispersion for wideband optical transport,* approved December 2006 (''ITU–T Recommendation G.656''), incorporation by reference approved for § 1755.902(b) and § 1755.902(q);

(4) ITU–T Recommendation G.657, *Series G: Transmission Systems and Media, Digital Systems and Networks, Transmission media characteristics—Optical fibre cables, Characteristics of a bending loss insensitive single mode optical fibre and cable for the access network,* approved December 2006 (''ITU–T Recommendation G.657''), incorporation by reference approved for § 1755.902(b) and § 1755.902(q); and

(5) ITU–T Recommendation L.58, *Series L: Construction, Installation and Protection of Cables and Other Elements of Outside Plant, Optical fibre cables: Special Needs for Access Network,* approved March 2004 (''ITU–T Recommendation L.58''), incorporation by reference approved for § 1755.902(a).

§ 1755.902 Minimum Performance Specification for Fiber Optic Cables.

(a) *Scope.* This section is intended for cable manufacturers, Agency borrowers, and consulting engineers. It covers the requirements for fiber optic cables intended for aerial installation either by attachment to a support strand or by an integrated self-supporting arrangement, for underground application by placement in a duct, or for buried installations by trenching, direct plowing, and directional or pneumatic boring.

(1) *General.*

(i) Specification requirements are given in SI units which are the controlling units in this part. Approximate English equivalent of units are given for information purposes only.

(ii) The optical waveguides are glass fibers having directly-applied protective coatings, and are called ''fibers,'' herein. These fibers may be assembled in either loose fiber bundles with a protective core tube, encased in several protective buffer tubes, in tight buffer tubes, or ribbon bundles with a protective core tube.

(iii) Fillers, strength members, core wraps, and bedding tapes may complete the cable core.

(iv) The core or buffer tubes containing the fibers and the interstices

between the buffer tubes, fillers, and strength members in the core structure are filled with a suitable material or water swellable elements to exclude water.

(v) The cable structure is completed by an extruded overall plastic jacket. A shield or armor or combination thereof may be included under the jacket. The jacket may have strength members embedded in it, in some designs.

(vi) Buried installation requires armor under the outer jacket.

(vii) For self-supporting cable, the outer jacket may be extruded over the support messenger and cable core.

(viii) Cables for mid-span applications for network access must be designed for easy mid-span access to the fibers. The manufacturer may use reversing oscillating stranding (SZ) described in section 6.4 of ITU–T Recommendation L.58, *Construction, Installation and Protection of Cables and Other Elements of Outside Plant*, 2004 (incorporated by reference at § 1755.901(f)). The cable end user is cautioned that installed cable must be properly terminated. This includes properly securing rigid strength members (*i.e.*, central strength member) and clamping the cable and jacket. It is important that cable components be secured to prevent movement of the cable or components over the operating conditions. Central strength member (CSM) clamps must prevent movement of the CSM; positive stop CSM clamps are recommended. The CSM must be routed as straight and as short as practical to prevent bowing or breaking of the CSM. The cable and jacket retention must be sufficient to prevent jacket slippage over the operating temperature range.

(2) The normal temperature ranges for cables must meet paragraph 1.1.3 of ANSI/ICEA S–87–640, *Standard for Optical Fiber Outside Plant Communications Cable* (incorporated by reference at § 1755.901(c)).

(3) *Tensile Rating*. The standard installation tensile rating for cables is 2670 N (600 1bf), unless installation involves micro type cables that utilize less stress related methods of installation, *i.e.*, blown micro-fiber cable or All-Dielectric Self-Supporting (ADSS) cables (see paragraph (c)(4) of this section).

(4) *ADSS and Other Self-Supporting Cables*. Based on the storm loading districts referenced in Section 25, Loading of Grades B and C, of ANSI/IEEE C2–2007, *National Electrical Safety Code*, 2007 (incorporated by reference at § 1755.901(b)) and the maximum span and location of cable installation provided by the end user, the manufacturer must provide a cable design with sag and tension tables showing the maximum span and sag information for that particular installation. The information included must be for Rule B, *Ice and Wind Loading*, and when applicable, information on Rule 250C, *Extreme Wind Loading*. Additionally, to ensure the proper ground clearance, typically a minimum of 4.7 m (15.5 feet), the end user should factor in the maximum sag under loaded conditions, as well as, height of attachment for each application.

(5) *Minimum Bend Diameter*. For cable under loaded and unloaded conditions, the cable must have the minimum bend diameters indicated in paragraph 1.1.5, *Minimum Bend Diameter*, of the ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). For very small cables, manufacturers may specify fixed cable minimum bend diameters that are independent of the outside diameter. For cables having a non-circular cross-section, the bend diameter is to be determined using the thickness of the cable associated with the preferential bending axis.

(6) The cable is fully color coded so that each fiber is distinguishable from every other fiber. A basic color scheme of twelve colors allows individual fiber identification. Colored tubes, binders, threads, strippings, or markings provide fiber group identification.

(7) Cables must demonstrate compliance with the qualification testing requirements of this section to ensure satisfactory end-use performance characteristics for the intended applications.

(8) Optical cable designs not specifically addressed by this section may be allowed if accepted by the Agency. Justification for acceptance of a modified design must be provided to substantiate product utility and long term stability and endurance. For information on how to obtain Agency product acceptance, refer to the procedures listed at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm*, as well as additional information in RUS Bulletin 345–3, *Acceptance of Standards, Specifications, Equipment Contract Forms, Manual Sections, Drawings, Materials and Equipment for the Telephone Program* (hereinafter ''RUS Bulletin 345–3''), available for download at *http://www.usda.gov/rus/telecom/publications/bulletins.htm*.

(9) All cables sold to RUS telecommunications borrowers for projects involving RUS loan funds must be accepted by the Agency's Technical Standards Committee ''A'' (Telecommunications). Any design change to existing acceptable designs must be submitted to the Agency for acceptance. As stated in paragraph 8 above, refer to the procedures listed at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(10) The Agency intends that the optical fibers contained in the cables meeting the requirements of this section have characteristics that will allow signals having a range of wavelengths to be carried simultaneously.

(b) *Optical Fibers*.

(1) The solid glass optical fibers must consist of a cylindrical core and cladding covered by either an ultraviolet-cured acrylate or other suitable coating. Each fiber must be continuous throughout its length.

(2) *Zero-dispersion*. Optical fibers must meet the fiber attributes of Table 2, *G.652.B attributes*, found in ITU–T Recommendation G.652 (incorporated by reference at § 1755.901(f)). However, when the end user stipulates a low water peak fiber, the optical fibers must meet the fiber attributes of Table 4, *G.652.D attributes*, found in ITU–T Recommendation G.652; or when the end user stipulates a low bending loss fiber, the optical fibers must meet the fiber attributes of Table 7–1, *G.657 class A attributes*, found in the ITU–T Recommendation G.657 (incorporated by reference at § 1755.901(f)).

(3) *Non-zero-dispersion*. Optical fibers must meet the fiber attributes of Table 1, *G.656 attributes*, found in ITU–T Recommendation G.656 (incorporated by reference at § 1755.901(f)). However, when the end user specifies Recommendation A, B, C, D, or E of ITU–T Recommendation G.655 (incorporated by reference at § 1755.901(f)), the optical fibers must meet the fiber attributes of ITU–T Recommendation G.655.

(4) *Multimode fibers*. Optical fibers must meet the requirements of paragraphs 2.1 and 2.3.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(5) *Matched cable*. Unless otherwise specified by the buyer, all single mode fiber cables delivered to a RUS-financed project must be manufactured to the same MFD specification. However, notwithstanding the requirements of paragraphs (d)(2) and (d)(3) of this section, the maximum MFD tolerance allowed for cable meeting the requirements of this section must be of a magnitude meeting the definition of ''matched cable,'' as defined in paragraph (b) of § 1755.900. With the

use of cables meeting this definition the user can reasonably expect that the average bi-directional loss of a fusion splice to be ≤0.1 dB.

(6) Buyers will normally specify the MFD for the fibers in the cable. When a buyer does not specify the MFD at 1310 nm, the fibers must be manufactured to an MFD of 9.2 μm with a maximum tolerance range of ±0.5 μm (362 ± 20 microinch), unless the end user agrees to accept cable with fibers specified to a different MFD. When the end user does specify a MFD and tolerance conflicting with the MFD maximum tolerance allowed by paragraph (d)(5) of this section, the requirements of paragraph (d)(5) must prevail.

(7) Factory splices are not allowed.

(8) *Coating.* The optical fiber must be coated with a suitable material to preserve the intrinsic strength of the glass having an outside diameter of 250 ± 15 micrometers (10 ± 0.6 mils). Dimensions must be measured per the methods of paragraph 7.13 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). The protective coverings must be free from holes, splits, blisters, and other imperfections and must be as smooth and concentric as is consistent with the best commercial practice. The diameter of the fiber, as the fiber is used in the cable, includes any coloring thickness or the uncolored coating, as the case may be. The strip force required to remove 30 ± 3 millimeters (1.2 ± 0.1 inch) of protective fiber coating must be between 1.0 N (0.2 pound-force) and 9.0 N (2 pound-force).

(9) All optical fibers in any single length of cable must be of the same type, unless otherwise specified by end user.

(10) Optical fiber dimensions and data reporting must be as required by paragraph 7.13.1.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(c) *Buffers.*

(1) The optical fibers contained in a tube buffer (loose tube), an inner jacket (unit core), a channel, or otherwise loosely packaged must have a clearance between the fibers and the inside of the container sufficient to allow for thermal expansions of the tube buffer without constraining the fibers. The protective container must be manufactured from a material having a coefficient of friction sufficiently low to allow the fibers free movement. The loose tube must contain a suitable water blocking material. Loose tubes must be removable without damage to the fiber when following the manufacturer's recommended procedures.

(2) The tubes for single mode loose tube cables must be designed to allow a maximum mid-span buffer tube exposure of 6.096 meters (20 feet). The buyer should be aware that certain housing hardware may require cable designed for 6.096 meters of buffer tube storage.

(3) Optical fibers covered in near contact with an extrusion (tight tube) must have an intermediate soft buffer to allow for thermal expansions and minor pressures. The buffer tube dimension must be established by the manufacturer to meet the requirement of this section. Tight buffer tubes must be removable without damage to the fiber when following the manufacturer's recommended procedures. The tight buffered fiber must be strippable per paragraph 7.20 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(4) Both loose tube and tight tube coverings of each color and other fiber package types removed from the finished cable must meet the following shrinkback and cold bend performance requirements. The fibers may be left in the tube.

(i) *Shrinkback:* Testing must be conducted per paragraph 14.1 of ASTM D 4565 (incorporated by reference at § 1755.901(d)), using a talc bed at a temperature of 95 °C (203 °F). Shrinkback must not exceed 5 percent of the original 150 millimeter (6 inches) length of the specimen. The total shrinkage of the specimen must be measured. (Buffer tube material meeting this test may not meet the mid-span test in paragraph (t)(15) of this section).

(ii) *Cold Bend:* Testing must be conducted on at least one tube from each color in the cable. Stabilize the specimen to − 30 ± 1 °C (− 22 ± 2 °F) for a minimum of four hours. While holding the specimen and mandrel at the test temperature, wrap the tube in a tight helix ten times around a mandrel with a diameter to be greater than five times the tube diameter or 50 mm (2 inches). The tube must show no evidence of cracking when observed with normal or corrected-to-normal vision.

Note to paragraph (c)(4)(ii): Channel cores and similar slotted single component core designs do not need to be tested for cold bend.

(d) *Fiber Identification.*

(1) Each fiber within a unit and each unit within the cable must be identifiable per paragraphs 4.2.1 and 4.3.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(2) For the following items the colors designated for identification within the cable must comply with paragraphs 4.2.2 and 4.3.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)): loose buffer tubes, tight tube buffer fibers, individual fibers in multi-fiber tubes, slots, bundles or units of fibers, and the units in cables with more than one unit.

(e) *Optical Fiber Ribbon.*

(1) Each ribbon must be identified per paragraphs 3.4.1 and 3.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(2) Ribbon fiber count must be specified by the end user, *i.e.*, 2, 4, 6, 12, etc.

(3) Ribbon dimensions must be as agreed by the end user and manufacturer per paragraph 3.4.4.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(4) Ribbons must meet each of the following tests. These tests are included in the paragraphs of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), indicated in parenthesis below.

(i) Ribbon Dimensions (ANSI/ICEA S–87–640 paragraphs 7.14 through 7.14.2)—measures ribbon dimension.

(ii) Ribbon Twist Test (ANSI/ICEA S–87–640 paragraphs 7.15 through 7.15.2)—evaluates the ability of the ribbon to resist splitting or other damage while undergoing dynamic cyclically twisting the ribbon under load.

(iii) Ribbon Residual Twist Test (ANSI/ICEA S–87–640 paragraphs 7.16 through 7.16.2)—evaluates the degree of permanent twist in a cabled optical ribbon.

(iv) Ribbon Separability Test (ANSI/ICEA S–87–640 paragraphs 7.17 through 7.17.2)—evaluates the ability to separate fibers.

(5) Ribbons must meet paragraph 3.4.4.6 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), Ribbon Strippability.

(f) *Strength Members.*

(1) Strength members may be an integral part of the cable construction, but are not considered part of the support messenger for self-supporting optical cable.

(2) The strength members may be metallic or nonmetallic.

(3) The combined strength of all the strength members must be sufficient to support the stress of installation and to protect the cable in service.

(4) Strength members may be incorporated into the core as a central support member or filler, as fillers between the fiber packages, as an annular serving over the core, as an annular serving over the intermediate jacket, embedded in the outer jacket, or

as a combination of any of these methods.

(5) The central support member or filler must contain no more than one splice per kilometer of cable. Individual fillers placed between the fiber packages and placed as annular servings over the core must contain no more than one splice per kilometer of cable. Cable sections having central member or filler splices must meet the same physical requirements as un-spliced cable sections.

(6) In each length of completed cable having a metallic central member, the dielectric strength between the shield or armor, when present, and the metallic center member must withstand at least 15 kilovolts when tested per ASTM D 4566 (incorporated by reference at § 1755.901(d)). The voltage must be applied for 3 seconds minimum; no failures are allowed.

(g) *Cable Core.*

(1) Protected fibers may be assembled with the optional central support member, fillers and strength members in such a way as to form a cylindrical group.

(2) The standard cylindrical group or core designs commonly consist of 4, 6, 12, 18, or 24 fibers. Cylindrical groups or core designs larger than the sizes shown above must meet all the applicable requirements of this section.

(3) When threads or tapes are used in cables using water blocking elements as core binders, they must be a non-hygroscopic and non-wicking dielectric material or be rendered by the gel or water blocking material produced by the ingress of water.

(4) When threads or tapes are used as unit binders to define optical fiber units in loose tube, tight tube, slotted, or bundled cored designs, they must be non-hygroscopic and non-wicking dielectric material or be rendered by the filling compound or water blocking material contained in the binder. The colors of the binders must be per paragraphs (f)(2) and (f)(3) of this section.

(h) *Core Water Blocking.*

(1) To prevent the ingress of water into the core and water migration, a suitable filling compound or water blocking elements must be applied into the interior of the loose fiber tubes and into the interstices of the core. When a core wrap is used, the filling compound or water blocking elements, as the case may be, must also be applied to the core wrap, over the core wrap and between the core wrap and inner jacket when required.

(2) The materials or elements must be homogeneous and uniformly mixed; free from dirt, metallic particles and other foreign matter; easily removed; nontoxic and present no dermal hazards. The filling compound and water blocking elements must contain a suitable antioxidant or be of such composition as to provide long term stability.

(3) The individual cable manufacturer must satisfy the Agency that the filling compound or water blocking elements selected for use is suitable for its intended application by submitting test data showing compliance with ASTM D 4568 (incorporated by reference at § 1755.901(d)). The filling compound and water blocking elements must be compatible with the cable components when tested per ASTM D 4568 at a temperature of 80 °C (176 °F). The jacket must retain a minimum of 85% of its un-aged tensile and elongation values.

(i) *Water Blocking Material.*

(1) Sufficient flooding compound or water blocking elements must be applied between the inner jacket and armor and between the armor and outer jacket so that voids and air spaces in these areas are minimized. The use of flooding compound or water blocking elements between the armor and outer jacket is not required when uniform bonding, paragraph (o)(9) of this section, is achieved between the plastic-clad armor and the outer jacket.

(2) The flooding compound or water blocking elements must be compatible with the jacket when tested per paragraphs 7.19 and 7.19.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). The aged jacket must retain a minimum of 85% of its un-aged tensile strength and elongation values when tested per paragraph 7.19.2.3. The flooding compound must exhibit adhesive properties sufficient to prevent jacket slip when tested per paragraph 7.30.1 of ANSI/ICEA S–87–640 and meets paragraph 7.30.2 of ANSI/ICEA S–87–640 for minimum sheath adherence of 14 N/mm for armored cables.

(3) The individual cable manufacturer must satisfy the Agency by submitting test data showing compliance with the appropriate cable performance testing requirements of this section that the flooding compound or water blocking elements selected for use is acceptable for the application.

(j) *Core Wrap.*

(1) At the option of the manufacturer, one or more layers of dielectric material may be applied over the core.

(2) The core wrap(s) can be used to provide a heat barrier to prevent deformation or adhesion between the fiber tubes or can be used to contain the core.

(k) *Inner Jackets.*

(1) For designs with more than one jacket, the inner jackets must be applied directly over the core or over the strength members when required by the end user. The jacket must be free from holes, splits, blisters, or other imperfections and must be as smooth and concentric as is consistent with the best commercial practice. The inner jacket must not adhere to other cable components such as fibers, buffer tubes, etc.

(2) For armored and unarmored cable, an inner jacket is optional. The inner jacket may absorb stresses in the cable core that may be introduced by armor application or by armored cable installation.

(3) The inner jacket material and test requirements must be the same as the outer jacket material, except that either black or natural polyethylene may be used and the thickness requirements are included in paragraph (m)(4) of this section. In the case of natural polyethylene, the requirements for absorption coefficient and the inclusion of furnace black are waived.

(4) The inner jacket thickness must be determined by the manufacturer, but must be no less than a nominal jacket thickness of 0.5 mm (0.02 inch) with a minimum jacket thickness of 0.35 mm (0.01 inch).

(l) *Outer Jacket.*

(1) The outer jacket must provide the cable with a tough, flexible, protective covering which can withstand exposure to sunlight, to atmosphere temperatures, and to stresses reasonably expected in normal installation and service.

(2) The jacket must be free from holes, splits, blisters, or other imperfections and must be as smooth and concentric as is consistent with the best commercial practice.

(3) The jacket must contain an antioxidant to provide long term stabilization and must contain a minimum of 2.35 percent concentration of furnace black to provide ultraviolet shielding measures as required by paragraph 5.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), except that the concentration of furnace black does not necessarily need to be initially contained in the raw material and may be added later during the jacket making process.

(4) The raw material used for the outer jacket must be one of the types listed below.

(i) *Type L1.* Low density, polyethylene (LDPE) must conform to the requirements of paragraph 5.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) *Type L2.* Linear low density, polyethylene (LLDPE) must conform to the requirements of paragraph 5.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(iii) *Type M.* Medium density polyethylene (MDPE) must conform to the requirements of paragraph 5.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(iv) *Type H.* High density polyethylene (HDPE) must conform to the requirements of paragraph 5.4.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(5) Particle size of the carbon selected for use must not average greater than 20 nm.

(6) The outer jacketing material removed from or tested on the cable must be capable of meeting the performance requirements of Table 5.1 found in ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(7) *Testing Procedures.* The procedures for testing the jacket specimens for compliance with paragraph (n)(5) of this section must be as follows:

(i) *Jacket Material Density Measurement.* Test per paragraphs 7.7.1 and 7.7.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) *Tensile Strength, Yield Strength, and Ultimate Elongation.* Test per paragraphs 7.8.1 and 7.8.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(iii) *Jacket Material Absorption Coefficient Test.* Test per paragraphs 7.9.1 and 7.9.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(iv) *Environmental Stress Crack Resistance Test.* For large cables (outside diameter ≥ 30 mm (1.2 inch)), test per paragraphs 7.10.1 through 7.10.1.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). For small cables (Diameter < 30 mm (1.2 inch)), test per paragraphs 7.10.2 through and 7.10.2.2 of ANSI/ICEA S–87–640. A crack or split in the jacket constitutes failure.

(v) *Jacket Shrinkage Test.* Test per paragraphs 7.11.1 and 7.11.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(8) *Jacket Thickness.* The outer jacket must meet the requirements of paragraphs 5.4.5.1 and 5.4.5.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(9) *Jacket Repairs.* Repairs are allowed per paragraph 5.5 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(m) *Armor.*

(1) A steel armor, plastic coated on both sides, is required for direct buried cable manufactured under this section. Armor is optional for duct and aerial cable, as required by the end user. The plastic coated steel armor must be applied longitudinally directly over the core wrap or the intermediate jacket and have a minimum overlap of 3.0 millimeters (118 mils), except for small diameter cables with diameters of less than 10 mm (394 mils) for which the minimum overlap must be 2 mm (79 mils). When a cable has a shield, the armor should normally be applied over the shielding tape.

(2) The uncoated steel tape must be electrolytic chrome coated steel (ECCS) and must meet the requirements of paragraph B.2.4 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(3) The reduction in thickness of the armoring material due to the corrugating or application process must be kept to a minimum and must not exceed 10 percent at any spot.

(4) The armor of each length of cable must be electrically continuous with no more than one joint or splice allowed in any length of one kilometer of cable. This requirement does not apply to a joint or splice made in the raw material by the raw material manufacturer.

(5) The breaking strength of any section of an armor tape, containing a factory splice joint, must not be less than 80 percent of the breaking strength of an adjacent section of the armor of equal length without a joint.

(6) For cables containing no flooding compound over the armor, the overlap portions of the armor tape must be bonded in cables having a flat, non-corrugated armor to meet the mechanical requirements of paragraphs (t)(1) through (t)(16)(ii) of this section. If the tape is corrugated, the overlap portions of the armor must be sufficiently bonded and the corrugations must be sufficiently in register to meet the requirements of paragraphs (t)(1) through (t)(16)(ii) of this section.

(7) The armor tape must be so applied as to enable the cable to pass the Cable Low (− 30 °C (− 22 °F)) and High (60 °C (140 °F)) Temperatures Bend Test, as required by paragraph (t)(3) of this section.

(8) The protective coating on the steel armor must meet the Bonding-to-Metal, Heat Sealability, Lap-Shear and Moisture Resistance requirements of Type I, Class 2 coated metals per ASTM B 736 (incorporated by reference in § 1755.901(d)).

(9) When the jacket is bonded to the plastic coated armor, the bond between the plastic coated armor and the outer jacket must not be less than 525 Newtons per meter (36 pound-force) over at least 90 percent of the cable circumference when tested per ASTM D 4565 (incorporated by reference at § 1755.901(d)). For cables with strength members embedded in the jacket, and residing directly over the armor, the area of the armor directly under the strength member is excluded from the 90 percent calculation.

(n) *Figure 8 Aerial Cables.*

(1) When self-supporting aerial cable containing an integrated support messenger is supplied, the support messenger must comply with the requirements specified in paragraphs D.2.1 through D.2.4 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), with exceptions and additional provisions as follows:

(i) Any section of a completed strand containing a joint must have minimum tensile strength and elongation of 29,500 Newtons (6,632 pound-force) and 3.5 percent, respectively, when tested per the procedures specified in ASTM A 640 (incorporated by reference in § 1755.901(d)).

(ii) The individual wires from a completed strand which contains joints must not fracture when tested per the ''Ductility of Steel'' procedures specified in ASTM A 640 (incorporated by reference at § 1755.901(d)), except that the mandrel diameter must be equal to 5 times the nominal diameter of the individual wires.

(iii) The support strand must be completely covered with a flooding compound that offers corrosion protection. The flooding compound must be homogeneous and uniformly mixed.

(iv) The flooding compound must be nontoxic and present no dermal hazard.

(v) The flooding compound must be free from dirt, metallic particles, and other foreign matter that may interfere with the performance of the cable.

(2) Other methods of providing self-supporting cable specifically not addressed in this section may be allowed if accepted. Justification for acceptance of a modified design must be provided to substantiate product utility and long term stability and endurance. To obtain the Agency's acceptance of a modified design, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm,* as well as RUS Bulletin 345–3.

(3) *Jacket Thickness Requirements.* Jackets applied over an integral messenger must meet the following requirements:

(i) The minimum jacket thickness at any point over the support messenger must meet the requirements of paragraph D.3 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) The web dimension for self-supporting aerial cable must meet the requirements of paragraph D.3 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(o) *Sheath Slitting Cord.*

(1) A sheath slitting cord or ripcord is optional.

(2) When a sheath slitting cord is used it must be capable of slitting the jacket or jacket and armor, at least one meter (3.3 feet) length without breaking the cord at a temperature of 23 ± 5 °C (73 ± 9 °F).

(3) The sheath slitting cord must meet the sheath slitting cord test described in paragraph (t)(1) of this section.

(p) *Identification Markers.*

(1) Each length of cable must be permanently identified. The method of marking must be by means of suitable surface markings producing a clear distinguishable contrasting marking meeting paragraph 6.1.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), and must meet the durability requirements of paragraphs 7.5.2 through 7.5.2.2 of ANSI/ICEA S–87–640.

(2) The color of the initial marking must be white or silver. If the initial marking fails to meet the requirements of the preceding paragraphs, it will be permissible to either remove the defective marking and re-mark with the white or silver color or leave the defective marking on the cable and re-mark with yellow. No further re-marking is permitted. Any re-marking must be done on a different portion of the cable's circumference where the existing marking is found and have a numbering sequence differing from any other marking by at least 3,000. Any reel of cable that contains more than one set of sequential markings must be labeled to indicate the color and sequence of marking to be used. The labeling must be applied to the reel and also to the cable.

(3) Each length of cable must be permanently labeled OPTICAL CABLE, OC, OPTICAL FIBER CABLE, or OF on the outer jacket and identified as to manufacturer and year of manufacture.

(4) Each length of cable intended for direct burial installation must be marked with a telephone handset in compliance with requirements of the Rule 350G of the ANSI/IEEE C2–2007 (incorporated by reference at § 1755.901(b)).

(5) Each length of cable must be identified as to the manufacturer and year of manufacturing. The manufacturer and year of manufacturing may also be indicated by other means as indicated in paragraphs 6.1.2 through 6.1.4 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(6) The number of fibers on the jacket must be marked on the jacket.

(7) The completed cable must have sequentially numbered length markers in METERS or FEET at regular intervals of not more than 2 feet or not more than 1 meter along the outside of the jacket. Continuous sequential numbering must be employed in a single length of cable. The numbers must be dimensioned and spaced to produce good legibility and must be approximately 3 millimeters (118 mils) in height. An occasional illegible marking is permissible when it is located within 2 meters of a legible making for cables marked in meters or 4 feet for cables marked in feet.

(8) Agreement between the actual length of the cable and the length marking on the cable jacket must be within the limits of +1 percent and −0 percent.

(9) *Jacket Print Test.* Cables must meet the Jacket Print Test described in paragraphs 7.5.2.1 and 7.5.2.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(q) *Performance of a Finished Cable.*

(1) *Zero Dispersion Optical Fiber Cable.* Unless otherwise specified by the end user, the optical performance of a finished cable must comply with the attributes of Table 2, *G.652.B attributes,* found in ITU Recommendation G.652 (incorporated by reference at § 1755.901(f)). However, when the end user stipulates a low water peak fiber the finished cable must meet the attributes of Table 4, *G.652.D attributes,* found in ITU–T Recommendation G.652; or when the end user stipulates a low bending loss fiber, the finished cable must meet the attributes of Table 7–1, *G.657 class A attributes,* found in ITU–T Recommendation G.657 (incorporated by reference at § 1755.901(f)).

(i) The attenuation methods must be per Table 8.4, *Optical attenuation measurement methods,* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) The cable must have a maximum attenuation of 0.1 dB at a point of discontinuity (a localized deviation of the optical fiber loss). Per paragraphs 8.4 and 8.4.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), measurements must be conducted at 1310 and 1550 nm, and at 1625 nm when specified by the end user.

(iii) The cable cutoff wavelength (γ_{cc}) must be reported per paragraph 8.5.1 of ANSI/ICEA S–87–640 (incorporated by reference in § 1755.901(c)).

(2) *Nonzero Dispersion Optical Fiber Cable.* Unless otherwise specified by the end user, the optical performance of the finished cable must comply with the attributes of Table 1, *G.656 attributes,* found in ITU–T Recommendation G.656 (incorporated by reference at § 1755.901(f)). When the buyer specifies Recommendation A, B, C, D or E of ITU–T Recommendation G.655 (incorporated by reference at § 1755.901(f)), the finished cable must comply with the attributes of ITU–T Recommendation G.655.

(i) The attenuation methods must be per Table 8.4, *Optical attenuation measurement methods* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) The cable must have a maximum attenuation of 0.1 dB at a point of discontinuity (a localized deviation of the optical fiber loss). Per paragraphs 8.4 and 8.4.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), measurements must be conducted at 1310 and 1550 nm, and at 1625 nm when specified by the end user.

(iii) The cable cutoff wavelength (γ_{cc}) must be reported per paragraph 8.5.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(3) *Multimode Optical Fiber Cable.* Unless otherwise specified by the end user, the optical performance of the fibers in a finished cable must comply with Table 8.1, *Attenuation coefficient performance requirement (dB/k),* Table 8.2*, Multimode bandwidth coefficient performance requirements (MHz–km*) and Table 8.3*, Points discontinuity acceptance criteria (dB),* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(4) Because the accuracy of attenuation measurements for single mode fibers becomes questionable when measured on short cable lengths, attenuation measurements are to be made utilizing characterization cable lengths. Master Cable reels must be tested and the attenuation values measured will be used for shorter ship lengths of cable.

(5) Because the accuracy of attenuation measurements for multimode fibers becomes questionable when measured on short cable lengths, attenuation measurements are to be made utilizing characterization cable lengths. If the ship length of cable is less than one kilometer, the attenuation

values measured on longer lengths of cable (characterization length of cable) before cutting to the ship lengths of cable may be applied to the ship lengths.

(6) Attenuation must be measured per Table 8.4, *Optical Attenuation Measurement Methods,* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(7) The bandwidth of multimode fibers in a finished cable must be no less than the values specified in ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), Table 8.2 per paragraphs 8.3.1 and 8.3.2.

(r) *Mechanical Requirements.* Fiber optic cables manufactured under the requirements of this section must be tested by the manufacturer to determine compliance with such requirements. Unless otherwise specified, testing must be performed at the standard conditions defined in paragraph 7.3.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). The standard optical test wavelengths to be used are 1550 nm single mode and 1300 nm multi-mode, unless otherwise specified in the individual test.

(1) *Sheath Slitting Cord Test.* All cables manufactured under the requirements of this section must meet the Ripcord Functional Test described in paragraphs 7.18.1 and 7.18.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(2) *Material Compatibility and Cable Aging Test.* All cables manufactured under the requirements of this section must meet the Material Compatibility and Cable Aging Test described in paragraphs 7.19 through 7.19.2.4 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(3) *Cable Low and High Bend Test.* Cables manufactured under the requirements of this section must meet the Cable Low (− 30 °C (− 22 °F)) and High (60 °C (140 °F)) Temperatures Bend Test per paragraphs 7.21 and 7.21.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(4) *Compound Flow Test.* All cables manufactured under the requirements of this section must meet the test described in paragraphs 7.23, 7.23.1, and 7.23.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(5) *Cyclic Flexing Test.* All cables manufactured under the requirements of this section must meet the Flex Test described in paragraphs 7.27 through 7.27.2 of the ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(6) *Water Penetration Test.* All cables manufactured under the requirements of this section must meet paragraphs 7.28 through 7.28.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(7) *Cable Impact Test.* All cables manufactured under the requirements of this section must meet the Cable Impact Test described in paragraphs 7.29.1 and 7.29.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(8) *Cable Tensile Loading and Fiber Strain Test.* Cables manufactured under the requirements of this section must meet the Cable Loading and Fiber Strain Test described in paragraphs 7.30 through 7.30.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)). This test does not apply to aerial self-supporting cables.

(9) *Cable Compression Test.* All cables manufactured under requirements of this section must meet the Cable Compressive Loading Test described in paragraphs 7.31 through 7.31.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(10) *Cable Twist Test.* All cables manufactured under the requirements of this section must meet the Cable Twist Test described in paragraphs 7.32 through 7.32.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(11) *Cable Lighting Damage Susceptibility Test.* Cables manufactured under the requirements of this section must meet the Cable Lighting Damage Susceptibility Test described in paragraphs 7.33 and 7.33.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(12) *Cable External Freezing Test.* All cables manufactured under the requirements of this section must meet the Cable External Freezing Test described in paragraphs 7.22 and 7.22.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(13) *Cable Temperature Cycling Test.* All cables manufactured under the requirements of this section must meet the Cable Temperature Cycling Test described in paragraph 7.24.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(14) *Cable Sheath Adherence Test.* All cables manufactured under the requirements of this section must meet the Cable Sheath Adherence Test described in paragraphs 7.26.1 and 7.26.2 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(15) *Mid-Span Test.* This test is applicable only to cables of a loose tube design specified for mid-span applications with tube storage. Cable of specialty design may be exempted from this requirement when this requirement is not applicable to such design. All buried and underground loose tube single mode cables manufactured per the requirements in this section and intended for mid-span applications with tube storage must meet the following mid-span test without exhibiting an increase in fiber attenuation greater than 0.1 dB and a maximum average increase over all fibers of 0.05 dB.

(i) The specimen must be installed in a commercially available pedestal or closure or in a device that mimics their performance, as follows: A length of cable sheath, equal to the mid-span length, must be removed from the middle of the test specimen so as to allow access to the buffer tubes. All binders, tapes, strength members, etc. must be removed. The buffer tubes must be left intact. The cable ends defining the ends of the mid-span length must be properly secured in the closure to the more stringent of the cable or hardware manufacturer's recommendations. Strength members must be secured with an end stop type clamp and the outer jacket must be clamped to prevent slippage. A minimum of 6.096 meters (20 feet) of cable must extend from the entry and exit ports of the closure for the purpose of making optical measurements. If a device that mimics the performance of pedestals or closures is used, the buffer tubes must be wound in a coil with a minimum width of 3 inches and minimum length of 12 inches.

(ii) The expressed buffer tubes must be loosely constrained during the test.

(iii) The enclosure, with installed cable, must be placed in an environmental chamber for temperature cycling. It is acceptable for some or all of the two 20 feet (6.096 meters) cable segments to extend outside the environmental chamber.

(iv) Lids, pedestal enclosures, or closure covers must be removed if possible to allow for temperature equilibrium of the buffer tubes. If this is not possible, the manufacturer must demonstrate that the buffer tubes are at temperature equilibrium prior to beginning the soak time.

(v) Measure the attenuation of single mode fibers at 1550 ± 10 nm. The supplier must certify the performance of lower specified wavelengths comply with the mid-span performance requirements.

(vi) After measuring the attenuation of the optical fibers, test the cable sample per TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)). Temperature cycling, measurements, and data reporting must conform to TIA/EIA Standard 455–3A.

The test must be conducted for at least five complete cycles. The following detailed test conditions must apply:

(A) TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)), Section 4.1—Loose tube single mode optical cable sample must be tested.

(B) TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)), Section 4.2—An Agency accepted 8 to 12 inch diameter optical buried distribution pedestal or a device that mimics their performance must be tested.

(C) Mid-span opening for installation of loose tube single mode optical cable in pedestal must be 6.096 meters (20 feet).

(D) TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)), Section 5.1—3 hours soak time.

(E) TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)), Section 5.2—Test Condition C–2, minimum −40 °C (−40 °F) and maximum 70° Celsius (158 °F).

(F) TIA/EIA Standard 455–3A (incorporated by reference at § 1755.901(e)), Section 5.7.2—A statistically representative amount of transmitting fibers in all express buffer tubes passing through the pedestal and stored must be measured.

(G) The buffer tubes in the closure or pedestal must not be handled or moved during temperature cycling or attenuation measurements.

(vii) Fiber cable attenuation measured through the express buffer tubes during the last cycle at −40 °C (−40 °F) and +70 °C (158 °F) must not exceed a maximum increase of 0.1 dB and must not exceed a 0.05 dB average across all tested fibers from the initial baseline measurements. At the conclusion of the temperature cycling, the maximum attenuation increase at 23 °C from the initial baseline measurement must not exceed 0.05 dB which allows for measurement noise that may be encountered during the test. The cable must also be inspected at room temperature at the conclusion of all measurements; the cable must not show visible evidence of fracture of the buffer tubes nor show any degradation of all exposed cable assemblies.

(16) *Aerial Self-Supporting Cables.* The following tests apply to aerial cables only:

(i) *Static Tensile Testing of Aerial Self-Supporting Cables.* Aerial self-supporting cable must meet the test described in paragraphs D.4.1.1 through D.4.1.5 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) *Cable Galloping Test.* Aerial self-supporting cable made to the requirements of this section must meet the test described in paragraphs D.4.2 through D.4.2.3 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(s) *Pre-connectorized Cable.*

(1) At the option of the manufacturer and upon request by the end user, the cable may be factory terminated with connectors.

(2) All connectors must be accepted by the Agency prior to their use. To obtain the Agency's acceptance of connectors, refer to product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(t) *Acceptance Testing.*

(1) The tests described in the Appendix to this section are intended for acceptance of cable designs and major modifications of accepted designs. What constitutes a major modification is at the discretion of the Agency. These tests are intended to show the inherent capability of the manufacturer to produce cable products that have satisfactory performance characteristics, long life, and long-term optical stability but are not intended as field tests. After initial Rural Development product acceptance is granted, the manufacturer will need to apply for continued product acceptance in January of the third year after the year of initial acceptance. For information on Agency acceptance, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm,* as well as RUS Bulletin 345–3.

(2) *Acceptance.* For initial acceptance, the manufacturer must submit:

(i) An original signature certification that the product fully complies with each paragraph of this section;

(ii) Qualification Test Data, per the Appendix to this section;

(iii) A set of instructions for handling the cable;

(iv) OSHA Material Safety Data Sheets for all components;

(v) Agree to periodic plant inspections;

(vi) A certification stating whether the cable, as sold to RUS Telecommunications borrowers, complies with the following two provisions:

(A) Final assembly or manufacture of the product, as the product would be used by an RUS Telecommunications borrower, is completed in the United States or eligible countries (currently, Mexico, Canada and Israel); and

(B) The cost of United States and eligible countries' components (in any combination) within the product is more than 50 percent of the total cost of all components utilized in the product. The cost of non-domestic components (components not manufactured within the United States or eligible countries) which are included in the finished product must include all duties, taxes, and delivery charges to the point of assembly or manufacture;

(vii) Written user testimonials concerning performance of the product; and

(viii) Other nonproprietary data deemed necessary.

(3) *Re-qualification acceptance.* For submission of a request for continued product acceptance after the initial acceptance, follow paragraph (v)(1) of this section and then, in January every three years, the manufacturer must submit an original signature certification stating that the product fully complies with each paragraph of this section, excluding the Qualification Section, and a certification that the products sold to RUS Telecommunications borrowers comply with paragraphs (v)(2)(vi) through (v)(2)(vi)(B) of this section. The tests of the Appendix to this section must be conducted and records kept for at least three years and the data must be made available to the Agency on request. The required data must have been gathered within 90 days of the submission. A certification must be submitted to the Agency stating that the cable manufactured to the requirements of this section has been tested per the Appendix of this section and that the cable meets the test requirements.

(4) *Initial and re-qualification acceptance requests should be addressed to:* Chairman, Technical Standards Committee ''A'' (Telecommunications), STOP 1550, Advanced Services Division, Rural Development Telecommunications Program, Washington, DC 20250–1500.

(5) *Tests on 100 Percent of Completed Cable.*

(i) The armor for each length of cable must be tested for continuity using the procedures of ASTM D 4566 (incorporated by reference at § 1755.901(d)).

(ii) Attenuation for each optical fiber in the cable must be measured.

(iii) Optical discontinuities greater than 0.1 dB must be isolated and their location and amplitude recorded.

(6) *Capability Tests.* The manufacturer must establish a quality assurance system. Tests on a quality assurance

basis must be made as frequently as is required for each manufacturer to determine and maintain compliance with all the mechanical requirements and the fiber and cable attributes required by this section, including:

(i) Numerical aperture and bandwidth of multimode fibers;

(ii) Cut off wavelength of single mode fibers;

(iii) Dispersion of single mode fibers;

(iv) Shrinkback and cold testing of loose tube and tight tube buffers, and mid-span testing of cables of a loose tube design with tube storage;

(v) Adhesion properties of the protective fiber coating;

(vi) Dielectric strength between the armor and the metallic central member;

(vii) Performance requirements for the fibers.

(viii) Performance requirements for the inner and outer jacketing materials;

(ix) Performance requirements for the filling and flooding compounds;

(x) Bonding properties of the coated armoring material;

(xi) Sequential marking and lettering; and

(xii) Mechanical tests described in paragraphs (t)(1) through (t)(16)(ii) of this section.

(u) *Records Tests.*

(1) Each manufacturer must maintain suitable summary records for a period of at least 3 years of all optical and physical tests required on completed cable by section as set forth in paragraphs (v)(5) and (v)(6) of this section. The test data for a particular reel must be in a form that it may be readily available to the Agency upon request. The optical data must be furnished to the end user on a suitable and easily readable form.

(2) Measurements and computed values must be rounded off to the number of places or figures specified for the requirement per paragraph 1.3 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(v) *Manufacturing Irregularities.*

(1) Under this section, repairs to the armor, when present, are not permitted in cable supplied to the end user.

(2) Minor defects in the inner and outer jacket (defects having a dimension of 3 millimeter or less in any direction) may be repaired by means of heat fusing per good commercial practices utilizing sheath grade compounds.

(w) *Packaging and Preparation for Shipment.*

(1) The cable must be shipped on reels containing one continuous length of cable. The diameter of the drum must be large enough to prevent damage to the cable from reeling and unreeling. The diameter must be at least equal to the minimum bending diameter of the cable. The reels must be substantial and so constructed as to prevent damage during shipment and handling.

(2) A circumferential thermal wrap or other means of protection must be secured between the outer edges of the reel flange to protect the cable against damage during storage and shipment. The thermal wrap must meet the requirements included in the *Thermal Reel Wrap Test,* described below. This test procedure is for qualification of initial and subsequent changes in thermal reel wraps.

(i) *Sample Selection.* All testing must be performed on two 450 millimeter (18 inches) lengths of cable removed sequentially from the same fiber jacketed cable. This cable must not have been exposed to temperatures in excess of 38 °C (100 °F) since its initial cool down after sheathing.

(ii) *Test Procedure.*

(A) Place the two samples on an insulating material such as wood.

(B) Tape thermocouples to the jackets of each sample to measure the jacket temperature.

(C) Cover one sample with the thermal reel wrap.

(D) Expose the samples to a radiant heat source capable of heating the uncovered sample to a minimum of 71 °C (160 °F). A GE 600 watt photoflood lamp or an equivalent lamp having the light spectrum approximately that of the sun must be used.

(E) The height of the lamp above the jacket must be 380 millimeters (15 inches) or an equivalent height that produces the 71 °C (160 °F) jacket temperature on the unwrapped sample must be used.

(F) After the samples have stabilized at the temperature, the jacket temperatures of the samples must be recorded after one hour of exposure to the heat source.

(G) Compute the temperature difference between jackets.

(H) The temperature difference between the jacket with the thermal reel wrap and the jacket without the reel wrap must be greater than or equal to 17 °C (63 °F).

(3) Cables must be sealed at the ends to prevent entrance of moisture.

(4) The end-of-pull (outer end) of the cable must be securely fastened to prevent the cable from coming loose during transit. The start-of-pull (inner end) of the cable must project through a slot in the flange of the reel, around an inner riser, or into a recess on the flange near the drum and fastened in such a way to prevent the cable from becoming loose during installation.

(5) Spikes, staples or other fastening devices must be used in a manner which will not result in penetration of the cable.

(6) The arbor hole must admit a spindle 63.5 millimeters (2.5 inches) in diameter without binding.

(7) Each reel must be plainly marked to indicate the direction in which it should be rolled to prevent loosening of the cable on the reel.

(8) Each reel must be stenciled or lettered with the name of the manufacturer.

(9) The following information must be either stenciled on the reel or on a tag firmly attached to the reel: Optical Cable, Type and Number of Fibers, Armored or Non-armored, Year of Manufacture, Name of Cable Manufacturer, Length of Cable, Reel Number, 7 CFR 1755.902, Minimum Bending Diameter for both Residual and Loaded Condition during installation.

Example: Optical Cable, G.657 class A, 4 fibers, Armored, XYZ Company, 1050 meters, Reel Number 3, 7 CFR 1755.902. Minimum Bending Diameter: Residual (Installed): 20 times Cable O.D., Loaded Condition: 40 times Cable O.D.

Appendix to § 1755.902

FIBER OPTIC CABLES

BULLETIN 1753F–601(PE–90) QUALIFICATIONS TEST DATA

[Initial qualification and three year re-qualification test data required for TELECOMMUNICATIONS PROGRAM product acceptance. Please note that some tests may apply only to a particular cable design.]

Paragraph	Test	Initial qualification	3 Year re-qualification
(e)(4)(i)	Shrinkback	X	
(e)(4)(ii)	Cold Bend	X	
(t)(1)	Sheath Slitting Cord	X	

FIBER OPTIC CABLES—Continued

BULLETIN 1753F–601(PE–90) QUALIFICATIONS TEST DATA

[Initial qualification and three year re-qualification test data required for TELECOMMUNICATIONS PROGRAM product acceptance. Please note that some tests may apply only to a particular cable design.]

Paragraph	Test	Initial qualification	3 Year re-qualification
(t)(2)	Material Compatibility	X	
(t)(3)	Cable Low & High Bend	X	X
(t)(4)	Compound Flow	X	
(t)(5)	Cyclic Flexing	X	X
(t)(6)	Water Penetration	X	X
(t)(7)	Cable Impact	X	X
(t)(8)	Cable Tensile Loading & Fiber Strain	X	X
(t)(9)	Cable Compression	X	
(t)(10)	Cable Twist	X	X
(t)(11)	Cable Lighting Damage Susceptibility	X	
(t)(12)	Cable External Freezing	X	
(t)(13)	Cable Temperature Cycling	X	X
(t)(14)	Cable Sheath Adherence	X	
(t)(15)	Mid-Span	X	X
(t)(16)(i)	Static Tensile Testing of Aerial Self-Supporting Cables	X	X
(t)(16)(ii)	Cable Galloping	X	
(y)(2)(i)	Thermal Reel Wrap test	X	

§ 1755.903 Fiber Optic Service Entrance Cables.

(a) *Scope.* This section covers Agency requirements for fiber optic service entrance cables intended for aerial installation either by attachment to a support strand or by an integrated self-supporting arrangement, for underground application by placement in a duct, or for buried installations by trenching, direct plowing, directional or pneumatic boring. Cable meeting this section is recommended for fiber optic service entrances having 12 or fewer fibers with distances less than 100 meters (300 feet).

(1) *General.*

(i) Specification requirements are given in SI units which are the controlling units in this part. Approximate English equivalent of units are given for information purposes only.

(ii) The optical waveguides are glass fibers having directly-applied protective coatings, and are called ''fibers,'' herein. These fibers may be assembled in either loose fiber bundles with a protective core tube, encased in several protective buffer tubes, in tight buffer tubes, or ribbon bundles with a protective core tube.

(iii) Fillers, strength members, core wraps, and bedding tapes may complete the cable core.

(iv) The core or buffer tubes containing the fibers and the interstices between the buffer tubes, fillers, and strength members in the core structure are filled with a suitable material or water swellable elements to exclude water.

(v) The cable structure is completed by an extruded overall plastic jacket. A shield or armor or combination thereof may be included under the jacket. This jacket may have strength members embedded in it, in some designs.

(vi) For rodent resistance or for additional protection with direct buried installations, it is recommended the use of armor under the outer jacket.

(vii) For self-supporting cable the outer jacket may be extruded over the support messenger and cable core.

(viii) For detection purposes, the cable may have toning elements embedded or extruded with the outer jacket.

(2) The cable is fully color coded so that each fiber is distinguishable from every other fiber. A basic color scheme of twelve colors allows individual fiber identification. Colored tubes, binders, threads, striping, or markings provide fiber group identification.

(3) Cables manufactured to the requirements of this section must demonstrate compliance with the qualification testing requirements to ensure satisfactory end-use performance characteristics for the intended applications.

(4) Optical cable designs not specifically addressed by this section may be allowed. Justification for acceptance of a modified design must be provided to substantiate product utility and long term stability and endurance. For information on how to obtain Agency's acceptance of such a modified design, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(5) The cable must be designed for the temperatures ranges of Table 1–1, *Cable Normal Temperature Ranges*, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(6) *Tensile Rating:* The cable must have ratings that are no less than the tensile ratings indicated in paragraph 1.1.4, *Tensile Rating*, of Part 1 of the ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(7) *Self-Supporting Cables:* Based on the storm loading districts referenced in Section 25, Loading of Grades B and C, of ANSI/IEEE C2–2007 (incorporated by reference at § 1755.901(b)), and the maximum span and location of cable installation provided by the end user, the manufacturer must provide a cable design with sag and tension tables showing the maximum span and sag information for that particular installation. The information included must be for Rule B, *Ice and Wind Loading*, and when applicable, information on Rule 250C, *Extreme Wind Loading*. Additionally, to ensure the proper ground clearance, typically a minimum of 4.7 m (15.5 feet), the end user should factor in the maximum sag under loaded conditions as well as height of attachment for each application.

(8) *Minimum Bend Diameter:* For cable under loaded and unloaded conditions, the cable must have the minimum bend diameters indicated in paragraph 1.1.5, *Minimum Bend Diameter*, of Part 1 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)). For very small cables, manufacturers may specify fixed cable

minimum bend diameters that are independent of the outside diameter.

(9) All cables sold to RUS Telecommunications borrowers must be accepted by the Agency's Technical Standards Committee ''A'' for projects involving RUS loan funds. All design changes to Agency acceptable designs must be submitted to the Agency for acceptance. Optical cable designs not specifically addressed by this section may be allowed, if accepted by the Agency. Justification for acceptance of a modified design must be provided to substantiate product utility and long term stability and endurance. For information on how to obtain the Agency's acceptance of cables, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(10) The Agency intends that the optical fibers contained in the cables meeting the requirement of this section have characteristics that will allow signals, having a range of wavelengths, to be carried simultaneously.

(11) The manufacturer is responsible to establish a quality assurance system meeting industry standards described in paragraph 1.8 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(12) The cable made must meet paragraph 1.10 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(b) *Optical Fibers.*

(1) The solid glass optical fibers must consist of a cylindrical core and cladding covered by either an ultraviolet-cured acrylate or other suitable coating. Each fiber must be continuous throughout its length.

(2) Optical fibers must meet the fiber attributes of Table 2, *G.652.B attributes*, of ITU–T Recommendation G.652 (incorporated by reference at § 1755.901(f)), unless the end user specifically asks for another type of fiber. However, when the end user stipulates a low water peak fiber, the optical fibers must meet the fiber attributes of Table 4, *G.652.D attributes*, of ITU–T Recommendation G.652; or when the end user stipulates a low bending loss fiber, the optical fibers must meet the fiber attributes of Table 7–1, *G.657 class A attributes*, of ITU–T Recommendation G.657 (incorporated by reference at § 1755.901(f)).

(i) Additionally, optical ribbon fibers must meet paragraph 3.3, *Optical Fiber Ribbons*, of Part 3 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(ii) [Reserved]

(3) *Multimode fibers.* Optical fibers must meet the requirements of paragraphs 2.1 and 2.3.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(4) *Matched Cable.* Unless otherwise specified by the buyer, all single mode fiber cables delivered to an Agency-financed project must be manufactured to the same MFD specification. However, notwithstanding the requirements indicated in paragraphs (d)(2) and (d)(3) of this section, the maximum MFD tolerance allowed for cables meeting the requirements of this section must be of a magnitude meeting the definition of ''matched cable,'' as defined in paragraph (b) of § 1755.900. With the use of cables meeting this definition the user can reasonably expect that the average bi-directional loss of a fusion splice to be ≤0.1 dB.

(5) Buyers will normally specify the MFD for the fibers in the cable. When a buyer does not specify the MFD at 1310 nm, the fibers must be manufactured to an MFD of 9.2 μm with a maximum tolerance range of ±0.5 μm (362 ± 20 microinch), unless the buyer agrees to accept cable with fibers specified to a different MFD. When the buyer does specify a MFD and tolerance conflicting with the MFD maximum tolerance allowed by paragraph (d)(4) of this section, the requirements of paragraph (d)(4) must prevail.

(6) Factory splices are not allowed.

(7) All optical fibers in any single length of cable must be of the same type unless otherwise specified by end user.

(8) Optical fiber dimensions and data reporting must be as required by paragraph 7.13.1.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(c) *Buffers/Coating.*

(1) The optical fibers contained in a buffer tube (loose tube) loosely packaged must have a clearance between the fibers and the inside of the container sufficient to allow for thermal expansions without constraining the fibers. The protective container must be manufactured from a material having a coefficient of friction sufficiently low to allow the fibers free movement. The design may contain more than one tube. Loose buffer tubes must meet the requirements of Paragraph 3.2.1, *Loose Buffer Tube Dimensions*, of Part 3 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(2) The loose tube coverings of each color and other fiber package types removed from the finished cable must meet the following shrinkback and cold bend performance requirements. The fibers may be left in the tube.

(i) *Shrinkback:* Testing must be conducted per ASTM D 4565 (incorporated by reference at § 1755.901(d)), paragraph 14.1, using a talc bed at a temperature of 95 °C. Shrinkback must not exceed 5 percent of the original 150 millimeter length of the specimen. The total shrinkage of the specimen must be measured.

(ii) *Cold Bend:* Testing must be conducted on at least one tube from each color in the cable. Stabilize the specimen to -20 ± 1 °C for a minimum of four hours. While holding the specimen and mandrel at the test temperature, wrap the tube in a tight helix ten times around a mandrel with a diameter the greater of five times the tube diameter or 50 mm. The tube must show no evidence of cracking when observed with normal or corrected-to-normal vision.

(3) Optical fiber coating must meet the requirements of paragraph 2.4, *Optical Fiber Coatings and Requirements*, of Part 2 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(i) All protective coverings in any single length of cable must be continuous and be of the same material except at splice locations.

(ii) The protective coverings must be free from holes, splits, blisters, and other imperfections and must be as smooth and concentric as is consistent with the best commercial practice.

(iii) Repairs to the fiber coatings are not allowed.

(d) *Fiber and Buffer Tube Identification.* Fibers within a unit and the units within a cable must be identified as indicated in paragraphs 4.2 and 4.3 of Part 4 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)), respectively.

(e) *Strength Members.*

(1) Combined strength of all the strength members must be sufficient to support the stress of installation and to protect the cable in service. Strength members must meet paragraph 4.4, *Strength Members*, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)). Self supporting aerial cables using the strength members as an integral part of the cable strength must comply with paragraph C.4, *Static Tensile Testing of Aerial Self-Supporting Cables*, of ANNEX C of ICEA S–110–717.

(2) Strength members may be incorporated into the core as a central support member or filler, as fillers between the fiber packages, as an annular serving over the core, as an annular serving over the intermediate jacket, embedded in the outer jacket or as a combination of any of these methods.

(3) The central support member or filler must contain no more than one splice per kilometer of cable. Individual fillers placed between the fiber packages and placed as annular servings over the core must contain no more than one splice per kilometer of cable. Cable sections having central member or filler splices must meet the same physical requirements as un-spliced cable sections.

(4) Notwithstanding what has been indicated in other parts of this document, in each length of completed cable having a metallic central member, the dielectric strength between the optional armor and the metallic center member must withstand at least 15 kilovolts direct current for 3 seconds.

(f) *Forming the Cable Core.*

(1) Protected fibers must be assembled with the optional central support member and strength members in such a way as to form a cylindrical group or other acceptable core constructions and must meet Section 4.5, Assembly of Cables, of Part 4 of ICEA S–110–717 (incorporated by reference at 1755.901(c)). Other acceptable cable cores include round, figure 8, flat or oval designs.

(2) The standard cylindrical group or core designs must consist of 12 fibers or less.

(3) When threads or tapes are used as core binders, they must be colored either white or natural and must be a non-hygroscopic and non-wicking dielectric material. Water swell-able threads and tapes are permitted.

(g) *Filling/Flooding Compounds and Water Blocking Elements.*

(1) To prevent the ingress and migration of water through the cable and core, filling/flooding compounds or water blocking elements must be used.

(i) Filling compounds must be applied into the interior of the loose fiber tubes and into the interstices of the core. When a core wrap is used, the filling compound must also be applied to the core wrap, over the core wrap and between the core wrap and inner jacket when required.

(ii) Flooding compounds must be sufficiently applied between the optional inner jacket and armor and between the armor and outer jacket so that voids and air spaces in these areas are minimized. The use of floodant between the armor and outer jacket is not required when uniform bonding, per paragraph l(9) of this section, is achieved between the plastic-clad armor and the outer jacket. Floodant must exhibit adhesive properties sufficient to prevent jacket slip when tested per the requirements of paragraphs 7.26 through 7.26.2 of Part 7, *Testing, Test Methods, and Requirements*, of ANSI/ICEA S–87–640 (incorporated by reference at 1755.901(c)).

(iii) Water blocking elements must achieve equal or better performance in preventing the ingress and migration of water as compared to filling and flooding compounds. In lieu of a flooding compound, water blocking elements may be applied between the optional inner jacket and armor and between the armor and outer jacket to prevent water migration. The use of the water blocking elements between the armor and outer jacket is not required when uniform bonding, per paragraph (l)(10) of this section, is achieved between the plastic-clad armor and the outer jacket.

(2) The materials must be homogeneous and uniformly mixed; free from dirt, metallic particles and other foreign matter; easily removed; nontoxic and present no dermal hazards.

(3) The individual cable manufacturer must satisfy the Agency that the filling compound or water blocking elements selected for use is suitable for its intended application.

(i) Filling/Flooding compound materials must be compatible with the cable components when tested per paragraph 7.16, *Material Compatibility and Cable Aging Test*, of Part 7 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(ii) Water blocking elements must be compatible with the cable components when tested per paragraph 7.16, *Material Compatibility and Cable Aging Test*, of Part 7 of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(h) *Core Wrap (Optional).*

(1) At the option of the manufacturer, one or more layers of non-hygroscopic and non-wicking dielectric material may be applied with an overlap over the core.

(2) The core wrap(s) can be used to provide a heat barrier to prevent deformation or adhesion between the fiber tubes or can be used to contain the core.

(3) When core wraps are used, sufficient filling compound must be applied to the core wraps so that voids or air spaces existing between the core wraps and between the core and the inner side of the core wrap are minimized.

(i) *Inner Jacket (Optional).*

(1) Inner jackets may be applied directly over the core or over the strength members. Inner jackets are optional.

(2) The inner jacket material and test requirements must be the same as for the outer jacket material per paragraph (n) of this section, except that either black or natural polyethylene may be used. In the case of natural polyethylene, the requirements for absorption coefficient and the inclusion of furnace black are waived.

(j) *Armor (Optional).*

(1) A steel armor, plastic coated on both sides, is recommended for direct buried service entrance cable in gopher areas. Armor is also optional for duct and aerial cable as required by the end user. The plastic coated steel armor must be applied longitudinally directly over the core wrap or the intermediate jacket and must have an overlapping edge.

(2) The uncoated steel tape must be electrolytic chrome coated steel (ECCS) with a thickness of 0.155 ± 0.015 millimeters.

(3) The reduction in thickness of the armoring material due to the corrugating or application process must be kept to a minimum and must not exceed 10 percent at any spot.

(4) The armor of each length of cable must be electrically continuous with no more than one joint or splice allowed per kilometer of cable. This requirement does not apply to a joint or splice made in the raw material by the raw material manufacturer.

(5) The breaking strength of any section of an armor tape, containing a factory splice joint, must not be less than 80 percent of the breaking strength of an adjacent section of the armor of equal length without a joint.

(6) For cables containing no floodant over the armor, the overlap portions of the armor tape must be bonded in cables having a flat, non-corrugated armor to meet the requirements of paragraphs (r)(1) and (r)(2) of this section. If the tape is corrugated, the overlap portions of the armor must be sufficiently bonded and the corrugations must be sufficiently in register to meet the requirements of paragraphs (r)(1) and (r)(2) of this section.

(7) The armor tape must be so applied as to enable the cable to meet the testing requirements of paragraphs (r)(1) and (r)(2) of this section.

(8) The protective coating on the steel armor must meet the Bonding-to-Metal, Heat Sealability, Lap-Shear and Moisture Resistance requirements of Type I, Class 2 coated metals per ASTM B 736 (incorporated by reference at § 1755.901(d)).

(9) When the jacket is bonded to the plastic coated armor, the bond between the plastic coated armor and the outer jacket must not be less than 525 Newtons per meter over at least 90 percent of the cable circumference when tested per ASTM D 4565 (incorporated

by reference at § 1755.901(d)). For cables with strength members embedded in the jacket, and residing directly over the armor, the area of the armor directly under the strength member is excluded from the 90 percent calculation.

(k) *Optional Support Messenger (Aerial Cable).*

(1) Integrated messenger(s) for self-supporting cable must provide adequate strength to operate under the appropriate weather loading conditions over the maximum specified span.

(2) Based on the storm loading districts referenced in Section 25, Loading of Grades B and C, of ANSI/IEEE C2–2007 (incorporated by reference at § 1755.901(b)), and the maximum span and location of cable installation provided by the end user, the manufacturer must provide a cable design with sag and tension tables showing the maximum span and sag information for that particular installation. The information included must be for Rule B, *Ice and Wind Loading*, and when applicable, information on Rule 250C, *Extreme Wind Loading.* Additionally, to ensure the proper ground clearance, typically a minimum of 4.7 m (15.5 feet) the end user should factor in the maximum sag under loaded conditions as well as height of attachment for each application.

(l) *Outer Jacket.*

(1) The outer jacket must provide the cable with a tough, flexible, protective covering which can withstand exposure to sunlight, to atmosphere temperatures and to stresses reasonably expected in normal installation and service.

(2) The jacket must be free from holes, splits, blisters, or other imperfections, and must be as smooth and concentric as is consistent with the best commercial practice.

(3) Jacket materials must meet the stipulations of paragraph 5.4 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), except that the concentration of furnace black does not necessarily need to be initially contained in the raw material and may be added later during the jacket making process. Jacket thickness must have a 0.50 mm minimum thickness over the core or over any radial strength member used as the primary strength element(s), 0.20 mm when not used as the primary strength member, and 0.30 mm over any optional toning elements.

(4) Jacket Repairs must meet the stipulations of paragraph 5.5, *Jacket Repairs*, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(5) *Jacket Testing:* The jacket must be tested to determine compliance with requirements of this section. The specific tests for the jacket are described in paragraphs 7.6 through 7.11.2 of Part 7, *Testing, Test Methods, and Requirements*, of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(m) *Sheath Slitting Cord (Optional).*

(1) A sheath slitting cord is optional.

(2) When a sheath slitting cord is used it must be non-hygroscopic and non-wicking, or be rendered such by the filling or flooding compound, continuous throughout a length of cable and of sufficient strength to open the sheath over at least a one meter length without breaking the cord at a temperature of 23 ± 5 °C.

(n) *Identification and Length Markers.*

(1) Each length of cable must be permanently labeled OPTICAL CABLE, OC, OPTICAL FIBER CABLE, or OF on the outer jacket and identified as to manufacturer and year of manufacture.

(2) Each length of cable intended for direct burial installation must be marked with a telephone handset in compliance with the requirements of the Rule 350G of ANSI/IEEE C2–2007 (incorporated by reference at § 1755.901(b)).

(3) Mark the number of fibers on the jacket.

(4) The identification and date marking must conform to paragraph 6.1, Identification and Date Marking, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(5) The length marking must conform to paragraph 6.3, Length Marking, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(o) *Optical Performance of a Finished Cable.*

(1) Unless otherwise specified by the end user, the optical performance of a finished cable must comply with the attributes of Table 2, *G.652.B attributes,* found in ITU Recommendation G.652 (incorporated by reference at § 1755.901(f)). However, when the end user stipulates a low water peak fiber the finished cable must meet the attributes of Table 4, *G.652.D attributes,* found in ITU–T Recommendation G.652; or when the end user stipulates a low bending loss fiber, the finished cable must meet the attributes of Table 7–1, *class A attributes,* of ITU–T Recommendation G.657 (incorporated by reference at § 1755.901(f)).

(i) The attenuation methods must be per Table 8.4, *Optical attenuation measurement methods,* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(ii) The cable must have a maximum attenuation of 0.1 dB at a point of discontinuity (a localized deviation of the optical fiber loss). Per paragraphs 8.4 and 8.4.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)), measurements must be conducted at 1310 and 1550 nm, and at 1625 nm when specified by the end user.

(iii) The cable cutoff wavelength (γ_{cc}) must be reported per paragraph 8.5.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(2) *Multimode Optical Fiber Cable.* Unless otherwise specified by the end user, the optical performance of the fibers in a finished cable must comply with Table 8.1, *Attenuation coefficient performance requirement (dB/km),* Table 8.2*, Multimode bandwidth coefficient performance requirements (MHz-km*), and Table 8.3*, Points discontinuity acceptance criteria (d),* of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(3) Because the accuracy of attenuation measurements for single mode fibers becomes questionable when measured on short cable lengths, attenuation measurements are to be made utilizing characterization cable lengths. Master Cable reels must be tested and the attenuation values measured will be used for shorter ship lengths of cable.

(4) Because the accuracy of attenuation measurements for multimode fibers becomes questionable when measured on short cable lengths, attenuation measurements are to be made utilizing characterization cable lengths. If the ship length of cable is less than one kilometer, the attenuation values measured on longer lengths of cable (characterization length of cable) before cutting to the ship lengths of cable may be applied to the ship lengths.

(5) Attenuation must be measured per Table 8.4, *Optical Attenuation Measurement Methods,* ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(6) The bandwidth of multimode fibers in a finished cable must be no less than the values specified in Table 8.2 per paragraph 8.3.1 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(p) *Mechanical Requirements.*

(1) *Cable Testing:* Cable designs must meet the requirements of Part 7, Testing and Test Methods, of ICEA S–110–717 (incorporated by reference at § 1755.901(c)), except for paragraph 7.15 applicable to tight tube fibers.

(2) *Bend Test:* All cables manufactured must meet the ''Cable

Low and High Temperature Bend Test'' described in Section 7.21 (paragraphs 7.21, 7.21.1, and 7.21.2) of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(q) *Pre-connectorized Cable (Optional).*

(1) At the option of the manufacturer and upon request by the end user, the cable may be factory terminated with connectors.

(2) All connectors must be accepted by the Agency prior to their use. For information on how to obtain the Agency's acceptance, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(r) *Acceptance Testing and Extent of Testing.*

(1) The tests described in this section are intended for acceptance of cable designs and major modifications of accepted designs. What constitutes a major modification is at the discretion of the Agency. These tests are intended to show the inherent capability of the manufacturer to produce cable products that have satisfactory performance characteristics, long life, and long-term optical stability, but are not intended as field tests. For information on how to obtain the Agency's acceptance, refer to the product acceptance procedures available at *http://www.usda.gov/rus/telecom/listing_procedures/index_listing_procedures.htm* as well as RUS Bulletin 345–3.

(2) For initial acceptance, the manufacturer must submit:

(i) An original signature certification that the product fully complies with each paragraph of this section;

(ii) Qualification Test Data for demonstrating that the cable meets the requirements of this section;

(iii) A set of instructions for handling the cable;

(iv) OSHA Material Safety Data Sheets for all components;

(v) Agree to periodic plant inspections;

(vi) Agency's ''Buy American'' Requirements. For each cable for which the Agency acceptance is requested, the manufacturer must include a certification stating whether the cable complies with the following two domestic origin manufacturing provisions:

(A) Final assembly or manufacture of the product, as the product would be used by an Agency's borrower, is completed in the United States or eligible countries. For a list of eligible countries, see *http://www.usda.gov/rus/telecom/publications/eligible.htm;* and

(B) The cost of United States and eligible countries' components (in any combination) within the product is more than 50 percent of the total cost of all components utilized in the product. The cost of non-domestic components (components not manufactured within the United States or eligible countries) which are included in the finished product must include all duties, taxes, and delivery charges to the point of assembly or manufacture;

(vii) Written user testimonials concerning performance of the product; and

(viii) Other nonproprietary data deemed necessary by the Chief, Technical Support Branch (Telecommunications).

(3) For continued Agency product acceptance, the manufacturer must submit an original signature certification that the product fully complies with each paragraph of this section and a certification stating whether the cable meets the two domestic provisions of paragraph (t)(2)(vi) above for acceptance by January every three years. The certification must be based on test data showing compliance with the requirements of this section. The test data must have been gathered within 90 days of the submission and must be kept on files per paragraph (u)(1).

(4) Initial and re-qualification acceptance requests should be addressed to: Chairman, Technical Standards Committee ''A'' (Telecommunications), STOP 1550, Advanced Services Division, Rural Development Utilities Program, Washington, DC 20250–1550.

(s) *Records of Optical and Physical Tests.*

(1) Each manufacturer must maintain suitable summary records for a period of at least 3 years of all optical and physical tests required on completed cable manufactured under the requirement of this section. The test data for a particular reel must be in a form that it may be readily available to the Agency upon request. The optical data must be furnished to the end user on a suitable and easily readable form.

(2) Measurements and computed values must be rounded off to the number of places or figures specified for the requirement per paragraph 1.3 of ANSI/ICEA S–87–640 (incorporated by reference at § 1755.901(c)).

(t) *Manufacturing Irregularities.*

(1) Repairs to the armor, when present, are not permitted in cable supplied to the end user under the requirement of this section. The armor for each length of cable must be tested for continuity using the procedures of ASTM D 4566 (incorporated by reference at § 1755.901(d)).

(2) Minor defects in the inner and outer jacket (defects having a dimension of 3 millimeter or less in any direction) may be repaired by means of heat fusing per good commercial practices utilizing sheath grade compounds.

(3) Buffer tube repair is permitted only in conjunction with fiber splicing.

(u) *Packaging and Preparation for Shipment.*

(1) All cables must comply with paragraph 6.5, *Packaging and Marking,* of ICEA S–110–717 (incorporated by reference at § 1755.901(c)).

(2) For cables shipped on reels a circumferential thermal wrap or other means of protection complying with section (w)(3) of this section must be secured between the outer edges of the reel flange to protect the cable against damage during storage and shipment. This requirement applies to reels weighing more that 75 lbs. The thermal wrap is optional for reels weighing 75 lbs or less.

(3) The thermal wrap must meet the requirements included in the *Thermal Reel Wrap Test,* described below in paragraphs (w)(3)(i) and (w)(3)(ii) of this section. This test procedure is for qualification of initial and subsequent changes in thermal reel wraps.

(i) *Sample Selection.* All testing must be performed on two 450 millimeter (18 inches) lengths of cable removed sequentially from the same fiber jacketed cable. This cable must not have been exposed to temperatures in excess of 38 °C (100 °F) since its initial cool down after sheathing.

(ii) *Test Procedure.*

(A) Place the two samples on an insulating material such as wood.

(B) Tape thermocouples to the jackets of each sample to measure the jacket temperature.

(C) Cover one sample with the thermal reel wrap.

(D) Expose the samples to a radiant heat source capable of heating the uncovered sample to a minimum of 71 °C (160 °F). A GE 600 watt photoflood lamp or an equivalent lamp having the light spectrum approximately that of the sun must be used.

(E) The height of the lamp above the jacket must be 380 millimeters (15 inches) or an equivalent height that produces the 71 °C (160 °F) jacket temperature on the unwrapped sample must be used.

(F) After the samples have stabilized at the temperature, the jacket temperatures of the samples must be recorded after one hour of exposure to the heat source.

(G) Compute the temperature difference between jackets.

(H) The temperature difference between the jacket with the thermal reel wrap and the jacket without the reel wrap must be greater than or equal to 17 °C (63 °F).

(4) Cable must be sealed at the ends to prevent entrance of moisture.

(5) The end-of-pull (outer end) of the cable must be securely fastened to prevent the cable from coming loose during transit. The start-of-pull (inner end) of the cable must project through a slot in the flange of the reel, around an inner riser, or into a recess on the flange near the drum and fastened in such a way to prevent the cable from becoming loose during installation.

(6) Spikes, staples or other fastening devices must be used in a manner which will not result in penetration of the cable.

(7) The minimum size arbor hole must be 44.5 mm (1.75 inch) and must admit a spindle without binding.

(8) Each reel must be plainly marked to indicate the direction in which it should be rolled to prevent loosening of the cable on the reel.

(9) Each reel must be stenciled or lettered with the name of the manufacturer.

(10) The following information must be either stenciled on the reel or on a tag firmly attached to the reel: Optical Cable, Type and Number of Fibers, Armored or Nonarmored, Year of Manufacture, Name of Cable Manufacturer, Length of Cable, Reel Number, REA 7 CFR 1755.903.

Example: Optical Cable, G.657 class A, 4 fibers, Armored. XYZ Company, 1050 meters, Reel Number 3, REA 7 CFR 1755.903.

(11) When pre-connectorized cable is shipped, the splicing modules must be protected to prevent damage during shipment and handling.

Dated: March 27, 2009.

James R. Newby,

Acting Administrator, Rural Utilities Service.

[FR Doc. E9–9763 Filed 5–4–09; 8:45 am]

BILLING CODE 3410–15–P

SMALL BUSINESS ADMINISTRATION

13 CFR Part 121

RIN 3245–AF96

Small Business Size Standards; Temporary Alternative Size Standards for 7(a) Business Loan Program

AGENCY: Small Business Administration (SBA).

ACTION: Interim final rule with request for comments.

SUMMARY: The U.S. Small Business Administration (SBA) is temporarily amending the size eligibility criteria for loan assistance provided under its 7(a) Business Loan Program. This rule temporarily establishes the same alternative small business size standard that applies to SBA's Certified Development Company (CDC) Program. The U.S. Congress passed and the President signed the American Recovery and Reinvestment Act of 2009 (Recovery Act). The purposes and goals of the Recovery Act are to promote economic recovery and to preserve and create jobs. SBA prepared this rule as an interim final rule, effective immediately, because it will help alleviate the pressing needs of many small businesses for financial assistance in the current economic environment.

DATES: *Effective Dates:* This rule is effective on May 5, 2009.

Comment Date: Comments on the interim final rule must be received on or before August 3, 2009.

Applicability Dates: This rule applies to all 7(a) loan applications approved from May 5, 2009 through September 30, 2010.

ADDRESSES: You may submit comments, identified by [RIN number 3245–[INSERT] by any of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov*. Follow the instructions for submitting comments.
- *Mail:* Carl J. Jordan, Acting Division Chief for Size Standards, U.S. Small Business Administration, 409 3rd Street, SW., 8th floor, Washington, DC 20416.
- *Hand Delivery/Courier:* Carl J. Jordan, Acting Division Chief for Size Standards, U.S. Small Business Administration, 409 3rd Street, SW., 8th Floor, Washington, DC 20416.

All comments will be posted on *http://www.Regulations.gov*. If you wish to include within your comment confidential business information (CBI) as defined in the Privacy and Use Notice/User Notice at *http://www.Regulations.gov* and you do not want that information disclosed, you must submit the comment by either mail or hand delivery, and you must address the comment to the attention of Carl J. Jordan, Acting Division Chief for Size Standards. In the submission, you must highlight the information that you consider is CBI and explain why you believe this information should be held confidential. SBA will make the final determination, in its discretion, of whether the information is CBI and, therefore, will not be published.

FOR FURTHER INFORMATION CONTACT: For size standard questions please contact Carl J. Jordan, Acting Division Chief for Size Standards, (202) 205–6093, *carl.jordan@sba.gov*. For finance questions please contact Grady Hedgespeth, Director, Office of Financial Assistance, (202) 205–7562, *grady.hedgespeth@sba.gov*.

SUPPLEMENTARY INFORMATION:

I. Background Information

The American Recovery and Reinvestment Act of 2009 (Recovery Act), Public Law 111–05 was enacted on February 17, 2009, to among other things, promote economic recovery by preserving and creating jobs, and to assist those most impacted by the severe economic conditions facing the nation. SBA is one of several agencies that are intended to play a role in achieving these goals. SBA received funding and authority through the Recovery Act to modify its existing loan programs or establish new loan programs to help re-invigorate small business lending. SBA's actions will increase access to affordable credit for small businesses through the agency's 7(a) and 504 loan programs, unfreeze the secondary market for SBA guaranteed loans, help small businesses struggling with existing debt, and allow greater investment in high-growth small businesses. The changes to SBA's programs by the Recovery Act include the following: (1) Temporary reduction or elimination of fees in the 7(a) and 504 loan guarantee programs; (2) temporary authorization of up to a 90 percent guarantee on most 7(a) loans; (3) creation of a temporary Secondary Market Guarantee Authority to provide a Federal guarantee for pools of first lien 504 loans that are to be sold to third-party investors; (4) new authority for refinancing community development loans under the 504 program; (5) revision of the job creation goals of the 504 program; (6) simplification of the maximum leverage limits and aggregate investment limits required of Small Business Investment Companies; (7) temporary authority to provide loans on a deferred basis to viable small business concerns that have a qualifying small business loan and are experiencing immediate financial hardship; (8) temporary increase in the surety bond maximum amount; and (9) establishment of a Secondary Market Lending Authority to make loans to systemically important broker dealers in SBA's 7(a) secondary market.

To achieve its mandate under the Recovery Act and maximize credit available through its programs to