(4) *Handling precautions.* The following precautions shall be observed:

(i) Avoid damaging the cable during handling operations prior to splicing. Minor damage may change the transmission characteristics of the fibers to the extent that the cable section will have to be replaced;

(ii) The cable manufacturer's recommendations concerning pulling tension shall be observed. The maximum pulling tension for most fiber optic cable is 2669 newtons (600 poundforce);

(iii) The cable manufacturer's recommendations concerning bending radius shall be observed. Unless the cable manufacturer's recommendation is more stringent, the minimum bending radius for fiber optic cable shall be 20 times the cable diameter;

(iv) The cable manufacturer's recommendations concerning buffer tube bending radius shall be observed. Unless the cable manufacturer's recommendation is more stringent, the minimum bending radius for buffer tubes is usually between 38 millimeters (mm) (1.5 in.) and 76 mm (3.0 in.). The bending limitations on buffer tubes are intended to prevent kinking. Buffer tube kinking may cause excessive optical loss or fiber breakage; and

(v) Handle unprotected glass fibers carefully to avoid introducing flaws such as scratched or broken fibers.

(5) *Personnel safety.* The following safety precautions shall be observed:

(i) Safety glasses shall be worn when handling glass fibers;

(ii) Never view open-ended fibers with the naked eye or a magnifying device. Improper viewing of a fiber end that is transmitting light may cause irreparable eye damage; and

(iii) Dispose of bare scrap fibers by using the sticky side of a piece of tape to pick up and discard loose fiber ends. Fiber scraps easily penetrate the skin and are difficult to remove.

(6) *Equipment requirements.* (i) Fiber optic splices shall be made in areas where temperature, humidity, and cleanliness can be controlled. Both fusion and mechanical splicing techniques may require a splicing vehicle equipped with a work station that will allow environmental control.

(ii) Both fusion and mechanical splicing techniques are permitted on RUS financed projects. When using the mechanical splicing technique, only RUS accepted mechanical fiber optic splice connectors can be used.

(iii) Fusion splicing machines shall be kept in proper working condition. Regular maintenance in accordance with the machine manufacturer's recommendations shall be observed. (iv) Mechanical splicing tools shall be in conformance with the tool manufacturer's recommendations.

(v) An optical time domain reflectometer (OTDR) shall be used for testing splices. The OTDR shall be stationed at the central office or launch point for testing individual splices as they are made and for end-to-end signature tests for the fiber optic link.

(vi) An optical power meter shall be used for end-to-end cable acceptance tests.

(vii) A prerequisite for the successful completion of a fiber optic splicing endeavor is the presence of a talk circuit between the splicing technician in the splicing vehicle and the operator of the OTDR in the central office. The splicing technician and the OTDR operator shall have access to communications with each other in order to inform each other as to:

(A) Which splices meet the loss objectives;

(B) The sequence in which buffer tubes and fibers are to be selected for subsequent splicing operations; and

(C) The timing required for the performance of OTDR testing to prevent making an OTDR test at the same time a splice is being fused.

(7) Cable preparation. (i) Engineering work prints shall prescribe the cable slack needed at splice points to reach the work station inside the splicing vehicle. Consideration should be given to the slack required for future maintenance activity as well as initial construction activities. The required slack may be different for each splice point, depending on the site logistics. However, the required slack is seldom less than 15 meters (50 feet). The amount of slack actually used shall be recorded for each splice point to assist future maintenance and restoration efforts.

(ii) The splice case manufacturer's recommendations concerning the amount of cable sheath to be removed shall be followed to facilitate splicing operations. The length of the sheath opening shall be identified with a wrap of plastic tape.

(iii) If the cable contains a rip cord, the cable jacket shall be ring cut approximately 15 cm (6 in.) from the end and the 15 cm (6 in.) of cable jacket shall be removed to expose the rip cord. The rip cord shall be used to slit the jacket to the tape mark.

(iv) If the cable does not contain a rip cord, the cable jacket shall be slit using a sheath splitter. No cuts shall be made into the cable core nor shall the buffer tubes be damaged.

(v) If the cable contains an armor sheath, the outer jacket shall be opened

along the slit and the jacket shall be removed exposing the armor sheath. The armor shall be separated at the seam and pulled from the cable exposing the inner jacket. The armor shall be removed making allowances for a shield bond connector. The inner sheath shall be slit using a sheath splitter or rip cord. The cable core shall not be damaged nor shall there be any damage to the buffer tubes. The jacket shall be peeled back and cut at the end of the slit. The exposed buffer tubes shall not be cut, kinked, or bent.

(vi) After the cable sheath has been removed, the binder tape shall be removed from the cable. The cable shall not be crushed or deformed.

(vii) The buffer tubes shall be unstranded one at a time. The buffer tubes shall not be kinked.

(viii) If the cable is equipped with a strength member, the strength member shall be cut to the length recommended by the splice case manufacturer.

(ix) Each buffer tube shall be inspected for kinks, cuts, and flat spots. If damage is detected, an additional length of cable jacket shall be removed and all of the buffer tubes shall be cut off at the point of damage.

(x) The cable preparation sequence shall be repeated for the other cable end.

(8) Shield bonding and grounding. For personnel safety, the shields and metallic strength members of the cables to be spliced shall be bonded together and grounded before splicing activities are started. (See paragraphs (g)(4), and (g)(5)(i) through (g)(5)(iii) of this section for final bonding and grounding provisions).

(9) *Fiber optic color code.* The standard fiber optic color code for buffer tubes and individual fibers shall be as shown in Table 7:

TABLE 7.—FIBER AND BUFFER TUBE IDENTIFICATION

Buffer tube and fiber No.	Color
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17	Blue. Orange. Green. Brown. Slate. White. Red. Black. Yellow. Violet. Rose. Aqua. Blue/Black Tracer. Orange/Black Tracer. Green/Black Tracer. Brown/Black Tracer.
18	White/Black Tracer.