

Sound Talk[®]

Scotch Magnetic Tape

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SPLICING TAPES AND THEIR PROPER APPLICATION

An ideal splice is one that, when properly made, will remain intact for an indefinite period of time. Its mechanical strength is the first consideration, but there are other areas that may be counted just as important. There must be an absolute minimum of "adhesive escape" around the edge of the pressure sensitive tape used to make the splice, and the splice itself must not cause an audible disturbance on playback. With these three basic considerations in mind, let's investigate the factors and precautions that become part of the design of a splicing tape by the manufacturer and the fundamental rules and possible pitfalls with which the operator must be concerned.

DESIGN REQUIREMENTS

When designing *any* pressure sensitive tape, the two obvious components are the backing and the adhesive coating. In the development of a tape suitable for splicing magnetic recordings, both of these components were chosen with great care.

The backing had to be tough and durable while being as thin as possible. For this reason, paper was not suitable; and plastic was chosen. Both acetate and polyester are currently being used.

Developing an adhesive coating suitable for splicing tape was even more involved. Here, three basic qualities must be carefully evaluated. These are known as (1) shear adhesion, (2) peel back or ASTM adhesion, and (3) thumb appeal.

Shear adhesion can be defined as the adhesive's resistance to being parted from the surface to which it is adhered when pulled in what is commonly called the shear direction. Figure 1 demonstrates this by showing a piece of splicing tape being tested for its shear strength.

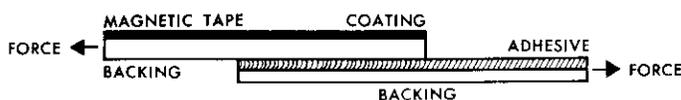


FIGURE 1. SHEAR ADHESION (CREEP)

Peel back or ASTM adhesion is, as its name implies, a measure of the adhesive's resistance to being peeled away from the surface to which it is adhered. Figure 2 graphically demonstrates how this test is performed.

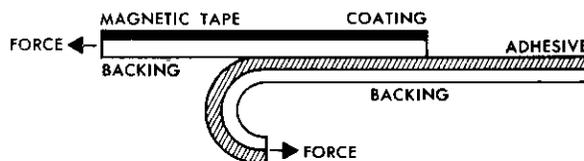


FIGURE 2. ASTM ADHESION (PEEL BACK)

The next property is "thumb appeal" or "quick stick." It is the quality of the adhesive to actually feel sticky. Oddly enough, it is not a particularly important quality as far as the strength of the bond is concerned, but it is a quality that is readily noticeable to the user. There seems to be an "old wives' tale" that has led some users to believe that "the stickier it feels, the better it will hold." This is not necessarily true when talking about splicing magnetic recording tape.

If the thumb appeal is high, the peel back adhesion might be improved to some small degree, but this advantage must be paid for in two ways, neither of which can be tolerated. First of all, with a sticky adhesive the probability of it leaking out from around the bond is greatly increased. This "ooze," as it is called, can be disastrous if it is permitted to exist in splicing tape. The adhesive oozing from under the splicing tape will tend to bond one layer of recording tape to the next layer in the roll. The result, when attempting to re-use the recording tape, would be possible removal of the oxide coating or complete blocking at that point in the reel. Secondly, with an increased "thumb appeal," the shear strength of the splice is reduced. This is evidenced by a degree of parting of the once tightly butted ends of the recording tape and referred to as "creep." Not only will creep manifest itself as an absence of program mate-

rial or a dropout; but now with the parted joint in the recording tape, the exposed portion of adhesive causes the additional problems that we cited above when we discussed ooze. This, then, is why a properly designed splicing tape does not feel very sticky.

SIZE CONSIDERATIONS

Having defined some of the terms, we are now ready to examine the splice itself. There are several variations in splice geometry from which one can select the combination best suited to the conditions of use. These include the size of the spliced area and the angle at which the tape ends meet each other.

Initially, it would be well to discuss the length of a splice and the effect it will have on strength. The length of a splice is dictated, basically, by the amount of curvature it will have to sustain in its path from reel to reel. (Figure 3A).

When the recording tape passes around the sharply curved surface of a guide as pictured in Figure 3B, there is a tendency for the leading edge of the splicing tape to continue in its original direction. It is, in effect, attempting to peel itself away from the recording tape. We are now back to one of our three previously discussed adhesive parameters, that of peel back or ASTM adhesion. With a given splicing tape, the amount of peel back is decided in manufacture and, of course, is constant. The length of the splice has no effect on the tendency to peel but is important for another reason.

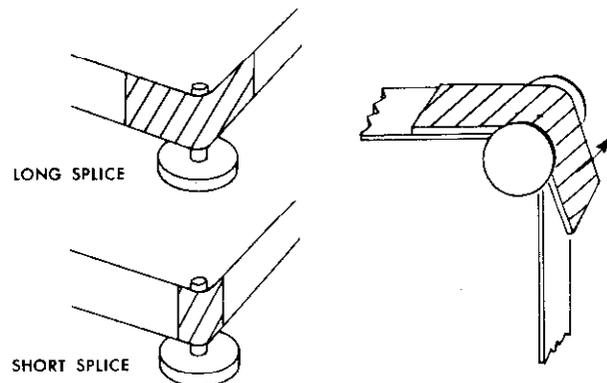


FIGURE 3A & 3B. SPLICE LENGTH AND BEND RADIUS

As shown in Figure 4, a short splice may tend to loosen when subjected to a tight bend because the area of peel may extend far enough into the tape's bond to completely free one end of the recording tape.

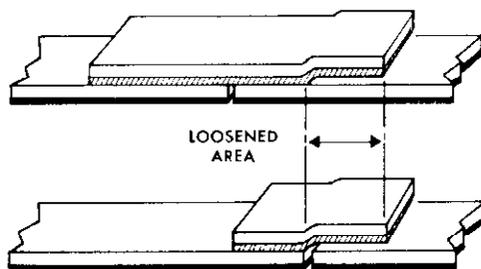


FIGURE 4. ENLARGED VIEW OF LOOSENED SPLICE

A longer splice will exhibit the same amount of peel but the area of peel in this case does not extend all the way to the recording tape junction. The bond at the junction is essentially undisturbed, and the splice passes the guide successfully. Of course, once the spliced area is wound on the take-up reel, the leading edge of the splicing tape that tended to peel is resecured to the recording tape by the pressure of the succeeding wraps as they are wound onto the take-up reel.

While it is impossible to assign a set of definite numerical values, generally speaking, use a long length splice if small radius bends or turns are expected.

As mentioned earlier, the tendency to creep is dependent on the shear strength of the splicing tape adhesive. The force that opposes this shear strength is, of course, the amount of tension the tape encounters on the transport and while wound on the reel during storage. The amount of shear strength is constant for a given splicing tape. If subjected to a constant tension, the important variable affecting creep is then the area of the bond. The larger the bonded area, the better will be the creep resistance.

A splicing tape with poor adhesive shear strength could be used if the area of the splice were greatly increased. Since the width dimension is limited by the recording tape, the area could only be increased by additional length. We could imagine a spliced bond 2 or 3 feet long, but that, of course, would be almost impossible to execute mechanically. Since the program material may drop in level as much as 4 db in the area of the bond because of the change in flexibility, the shorter the splice, the less disturbance there will be during playback. It is, therefore, important that the splicing tape chosen for use has high adhesive shear strength so the spliced length can be kept short.

SPLICING TAPE WIDTH

Much has been said and written about using splicing tape that is the same width as the recording tape and that which is somewhat narrower. It would be well to examine some of the variables and draw some conclusions.

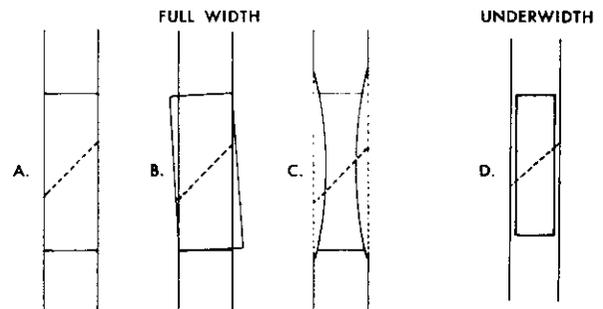


FIGURE 5A-B-C-D. SPLICING WIDTHS

When using the full width splicing method, such as shown in Figure 5A, care must be taken to trim the splicing tape exactly at the edges of the recording tape. If the splicing tape is poorly trimmed (Figure 5B), the overhanging adhesive coated splicing tape is apt to adhere to an adjacent layer on the reel, causing a problem similar to that encountered with ooze. Even though some splicing jigs are designed to cut an arc into each side

of the splice, as shown in Figure 5C, to insure against the possibility of overhang, this does not completely eliminate the chances of some adhesive oozing out of the edges.

Figure 5D illustrates a splicing tape somewhat narrower than the tape to be spliced. This technique offers a number of advantages with no apparent disadvantages. Since the splicing tape does not extend to the edges of the recording tape, overlap — as mentioned earlier — is no longer a problem. A simple splicing jig can be used because there is no need to undercut the spliced area in an hour-glass configuration. Notice that the use of a somewhat narrower splicing tape does not appreciably sacrifice the overall bonding area when compared to full width splicing tape that has been undercut.

RECOMMENDED SPLICING METHOD

In conclusion, let's examine the preparation of recording tape prior to the actual application of the splicing tape.

The most desirable method is to cut the recording tape to be spliced at an angle of 45° to 60°, measured with respect to the tape edge. As the angle increases above 60° towards a perpendicular cut, the amount of electrical disturbance is increased because the head sees the discontinuity at the junction as an abrupt change.

The shallower the angle, the less will be the amount of disturbance. But, as the angle is decreased below 45°, the pointed corners of the recording tape become vulnerable to being peeled back or debonded.

Regardless of the type of splice used, the first and possibly the most important consideration is cleanliness. The hands should be free of all dirt, dust, and oils as one fingerprint on the oxide can drop the output several db. Also, contamination of the recording tape backing or the adhesive of the splicing tape will usually reduce the strength of the bond between the two and can result in premature failure. After carefully placing the recording tape in a splicing jig, it should be cut as carefully as possible, using a sharp, demagnetized razor blade. When handling pressure sensitive splicing tape, care should be taken not to handle the adhesive more than is necessary. After carefully laying the splicing tape down so as not to disturb the alignment of the splice, the finger should be rubbed over the tape to promote intimate contact between the two pieces. Then to remove the air pockets, using the flat of the fingernail is recommended. The selection of the proper splicing tape and the use of correct splicing techniques will assure you of a clean, long lasting splice with no audible discontinuities.

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