INSTALLATION OF AN "ON-FLEX" BRIDGE DECK EXPANSION JOINT

by

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SUMMARY

This report describes a new type bridge deck expansion joint which was recently installed on a Rte 95 interchange bridge (Ramp N) at Petersburg. Details of the installation of the ON-FLEX joint are given and recommendations concerning possible modifications to the general installation technique are offered. It is suggested that these recommendations be implemented on a trial basis for one of the joint installations that are to be included on several other bridges that have an experimental features project approved for evaluation purposes.

The short-term performance of the joint has been excellent. Periodic inspections will be made over the next two years.

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This report is presented to supply information and suggestions concerning the installation of a relatively new type bridge deck expansion joint recently placed on an I-95 bridge located on an interchange ramp. More specifically, the bridge is located on Ramp N over Ramp S of the I-95 interchange with Washington Street in Petersburg, Virginia. The type of expansion joint installed is known as the "ON-FLEX".

While this report is concerned only with the installation of the joint, after it has been under traffic for two years a supplemental report will be prepared to deal with its performance.

GENERAL DESCRIPTION OF THE JOINT AND BRIDGE

A typical section of the "ON-FLEX" joint used on the Ramp N bridge is shown in Figure 1. Unlike some of the earlier bridge expansion joint products, this design incorporates a continuous elastomeric membrane which is held in place by two aluminum panels anchored to the concrete deck as shown in Figure 1. The wedge type anchor bolts shown are designed to be placed in holes drilled in the concrete deck at the time the joint is installed. The joint itself is designed to permit movements in all directions, including vertical deflections. Accommodation of movements in directions other than normal to the axis of the joint is a particularly useful feature when the joint is applied to skewed bridge decks.

The joint was installed on a 54-ft. simple span steel girder structure having a 50-degree skew. The clear roadway width on the bridge is 40 ft.; the length of the joint is approximately 62-1/4 ft. excluding the portion of joint installed on the lower face of the G. M. type parapet walls.

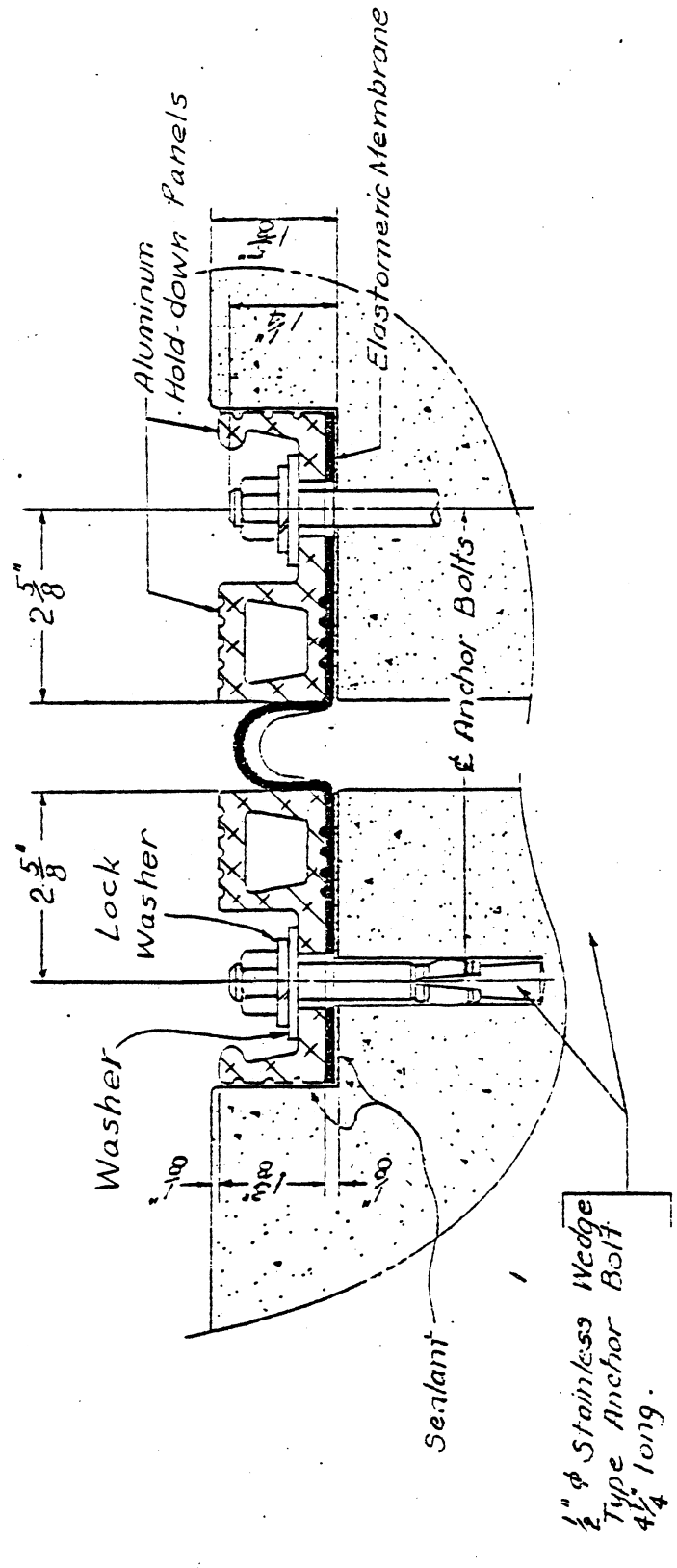

Figure 1. Typical section through the ON-FLEX bridge deck expansion joint.

INSTALLATION OF THE JOINT

The ON-FLEX joint was installed on the Ramp N bridge on April 14 and 15, 1977. Some predrilling of the anchor bolt holes was accomplished a day or so prior to the placement of the anchor bolts and joint materials.

The aluminum hold-down panel sections (Figure 2) were delivered to the job site and custom cut to fit the exact, as built, skew and length of the joint, parapet walls, etc. Holes for the anchor bolts to pass through the aluminum panel sections were also custom drilled at the bridge site.

The elastomeric membrane (Figure 2) was delivered to the site in two sections. The portion of the elastomeric membrane that turns up the face of the parapet wall (Figure 3) had been connected to each section prior to arrival at the bridge site to ensure a waterproof seal at these critical points. The elastomeric membrane sections were then custom cut to join together at the centerline of the bridge. The two cut ends of the membrane were cleaned and prepared (Figure 4) and joined together with the use of vulcanizing chemicals applied at the job site (Figure 5). Holes for anchor bolt pass-throughs were punched through the membrane prior to placing the material over the bridge joint areas.

Simultaneous with the splicing operation, the wedge type anchor bolts were driven into the prebored holes in the concrete. Then the joint area was cleaned, a caulking sealant was placed in the blocked out area while the elastomeric membrane was wiped clean (Figure 6), and the components of the ON-FLEX system were placed in the joint area. Finally, the anchor bolt nuts were tightened down (Figure 7) and additional sealant was placed along the edge of the hold-down panels as shown in Figure 8.

Little difficulty was encountered in installing the ON-FLEX joint. One problem involved in the installation of the joint on this particular structure, however, was the drilling of the anchor bolt holes in the concrete. In some instances, reinforcing steel in the deck hampered the drilling operation. Presetting of the anchor bolts whenever possible could eliminate this problem and reduce the time required to install the joints.

The only other problem associated with the installation involved an error on the part of the contractor who drove many of the anchor bolts too deep into the prebored holes. In order to obtain sufficient vertical thread height on the anchor bolts, a modification to the hold-down mechanism was necessary. The modification included omitting the spacer washer, shown earlier in Figure 1, and countersinking space for the lock washer down into the thickness of the aluminum hold-down panels. A view of the hold-down panels with the countersunk holes is shown in Figure 9.

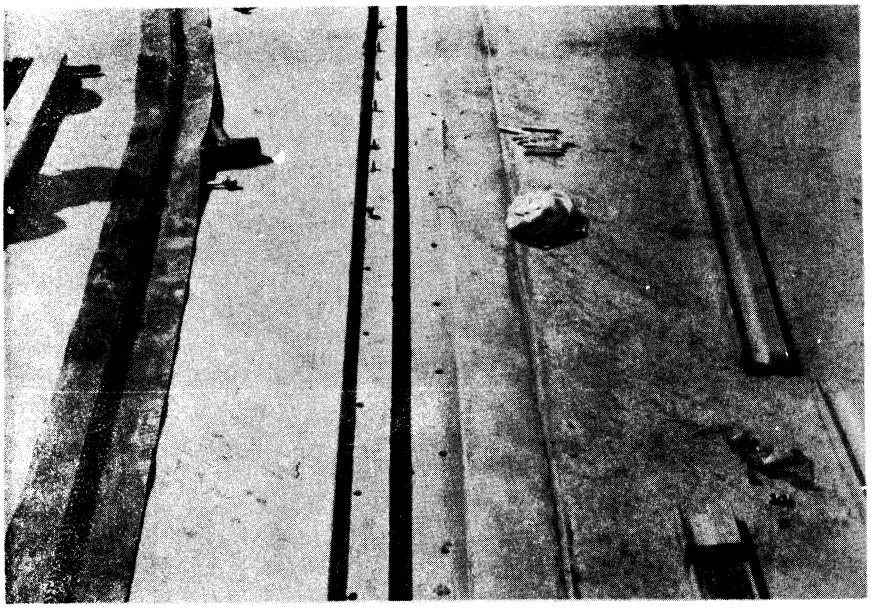

Figure 2. General view of the bridge expansion joint area (center) showing predrilled anchor bolt holes (foreground) with some bolts installed in the background. Aluminum hold-down panels lie to the right of the joint opening; the elastomeric membrane lies to the left.

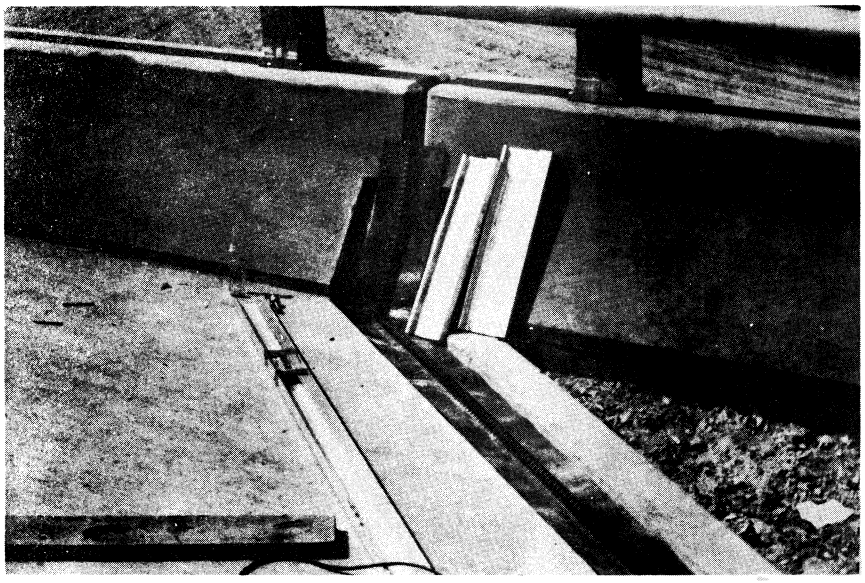

Figure 3. Joint turn-up at the parapet wall showing the elastomeric membrane and the wider panel sections that were used on the wall face.

Figure 4. Preparing the surface prior to splicing the two elastomeric membrane sections together.

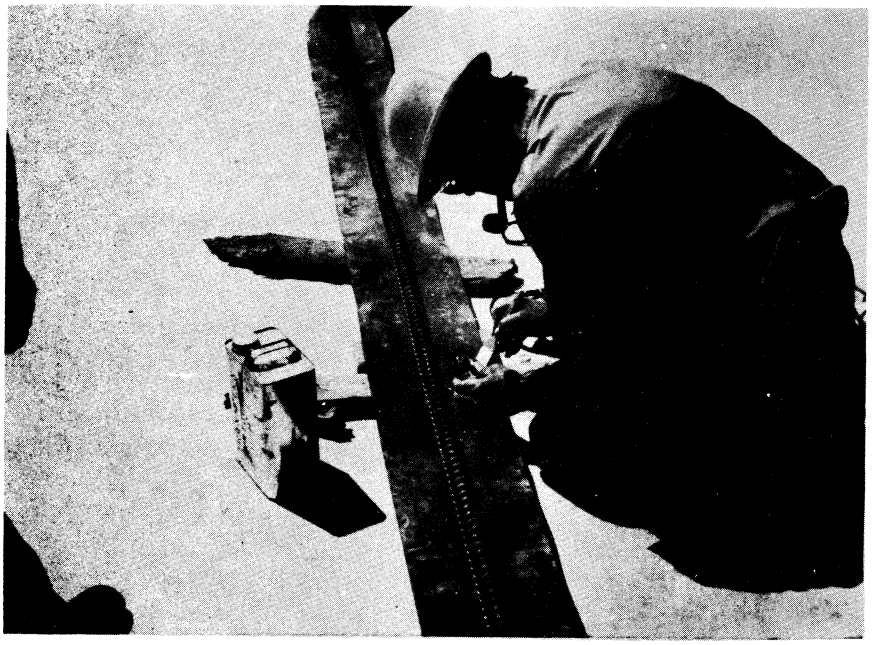

Figure 5. Application of sealing materials to complete the splicing of the two sections of the elastomeric membrane.

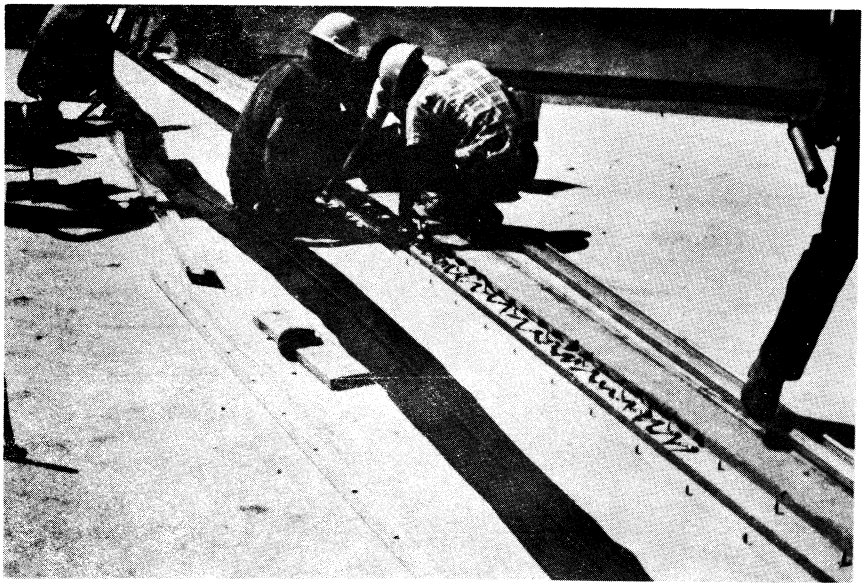

Figure 6. Application of the joint sealing compound to the block-out area while the elastomeric membrane was being wiped clean to the left of the joint area.

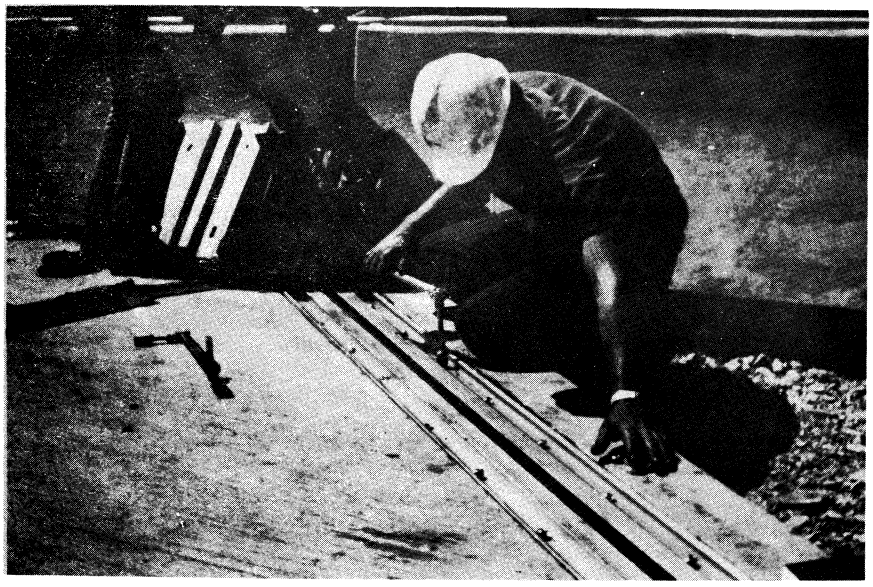

Figure 7. Torquing the anchor bolt nuts down against the hold-down panels.

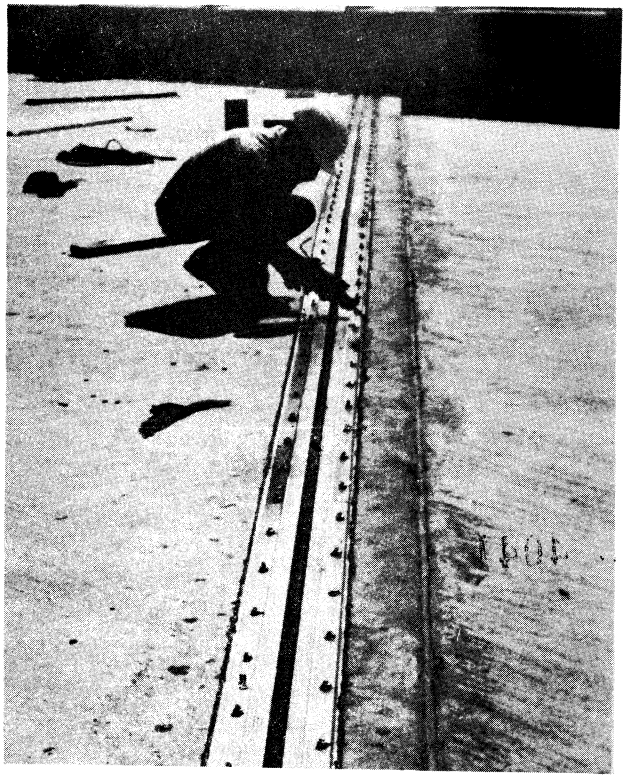

Figure 8. Applying additional sealant to the edges of the joint.

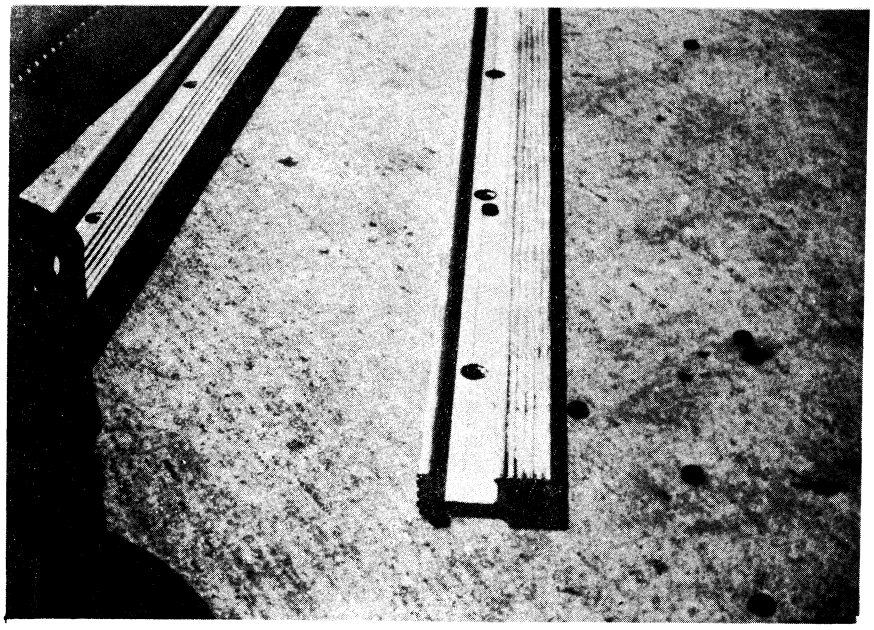

Figure 9. Hold-down panels with countersunk holes for anchor bolt lock washers.

OBSERVATIONS

Since the Ramp N bridge at the Rte 95 interchange with Washington Street in Petersburg is the first structure having an ON-FLEX joint in Virginia, the following observations and suggestions are offered for consideration on future applications. First, the joint installation could be speeded up by presetting the anchor bolts during construction of the bridge deck. This could be accomplished by preboring the anchor bolt holes in the hold-down panels at the normal 12 in. on center locations and using the panels as a template for locating and drilling holes in the joint block-out forms for the concrete deck. The anchor bolt holes in the wooden block-out could be countersunk to allow for the anchor bolt nut inserts. Thus, the nuts could be placed on the anchor bolts to hold them at the desired elevation during deck placement. The anchor bolts could, of course, be of different design than the wedge type used for the Ramp N bridge and shown earlier in Figure 1.

Although the joint hold-down panels would be prebored for anchor bolt pass-throughs, they could still be custom cut to the exact length and skew at the time of the final joint installation.

Splicing of the elastomeric membrane is not a desirable practice, but due to the skew angle on this particular installation, it may have been necessary considering the effect of the change in pavement slope at the pavement crown. This change in slope would probably have had a crinkling effect on the membrane at the point of slope change and would possibly have required cutting anyway. Bridge decks with no skew, therefore, should not present this potential problem. At any rate, the crown is the least vulnerable point for potential leakage and the field vulcanizing procedure appeared to provide an effective seal of the splice in the elastomeric membrane.

The wider block-out in the face of the parapet wall (see Figure 3), which results from extending the intersection of the pavement block-out edges up the face of the wall, does not appear to be necessary. Using the normal deck pavement block-out width on the face of the parapet wall would eliminate the need to fabricate special hold-down panel widths for that area. While the hold-down panel edges would not match at the intersection of the deck and wall, neither the appearance nor the effectiveness of the joint should be affected by such a change in procedure.

It should be noted that the above observations are presented with a view toward making future joint installation procedures even more efficient and possibly more economical than those used on the Ramp N bridge.

PERFORMANCE

After approximately 6 weeks under traffic conditions, the ON-FLEX joint has performed as intended. There is no evidence of

leakage after several days of rain during this period of time, and the joint appears to be functioning well. The riding quality of the Ramp N joint is excellent and there was no noise generated by automobiles and trucks crossing the joint area.

The performance of the Ramp N joint will be checked periodically for the next two years and reported upon as a supplement to this report.

RECOMMENDATIONS

Based on the observations made during the installation of the joint, and discussed earlier, the following recommendations are suggested for use on a trial basis for the first of the four bridges which were described in an earlier working plan[1] and are to be constructed in the near future.

1. Preset the anchor bolts for the joint during construction of the bridge deck using an appropriate anchor bolt for that type of application.

2. Prebore the anchor bolt holes in the joint hold-down panels, and use the panels as a template for locating the anchor bolt settings in the joint block-out form used for deck construction.

3. Continue to custom cut the joint hold-down panels to the exact length and skew angle needed.

4. Use the same block-out and hold-down panel widths on the face of the parapet walls as used on the surface of the bridge deck.

REFERENCE

1. Hilton, M. H., Working Plan, "Evaluation of the ON-FLEX Expansion Joint Sealing System for Bridge Decks", Virginia Highway and Transportation Research Council, VHTRC 77-WP5, September 1976.