

## ATT-73/95 - CRACK SEALING, Measurement of Rout Cross-Section and Sealing

### 1.0 SCOPE

This method describes the quality assurance and appeal procedures for visually inspecting and measuring randomly located sites on:

- routed transverse and longitudinal cracks to determine compliance to the specified rout cross-section, and
- sealed cracks to determine compliance to the specified filling requirements.

This method also describes the procedure for taking temperature measurements of the heated sealant.

### 2.0 EQUIPMENT

rout depth and width template (Figure 1)  
for specified rout cross-section  
underfill depth template (Figure 2)  
for specified rout depth

measuring wheel	brush or broom
tape measure	gloves
spray paint	thermometer

Data Sheet: Crack Sealing Data Sheet,  
MAT 6-8

### 3.0 PROCEDURE

#### 3.1 Length of Crack Missed

- Determine the location of the subplot test site as described in ATT-56, Part III.
- Use the measuring wheel to locate the site (line "C").

Use spray paint to **mark reference points** along the routs, e. g. at the start of each subplot, every 50 or 100 m, etc. These will later be used to locate the sites to be tested after the routs are filled.

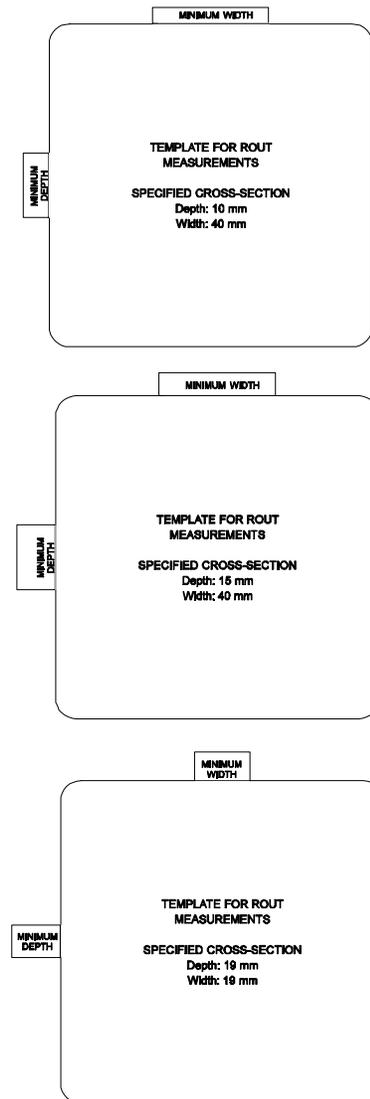


FIGURE 1

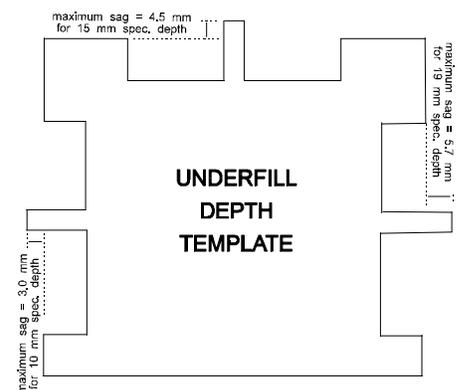


FIGURE 2

3. After the rout is cleaned and before it is sealed, for each test site use the measuring wheel to locate the site.
4. Measure the length of the site and record it in line "D" as shown in Figure 3. A minimum of 1 m site length is specified.

	<b>CRACK SEALING DATA SHEET</b>			
	PROJECT <u>74:06</u> FROM <u>Here</u> TO <u>There</u> LOT NO. <u>5</u>	CONTRACT NO. <u>6248/96</u> DATE SEALED <u>April 28, 1995</u> LOT LENGTH <u>5137</u> m		

**LENGTH OF CRACK MISSED BY ROUT**

SITE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13
A. SUBLOT LENGTH m	250	250	250	250	250	250	500	500	500	500	500	500	500
B. RANDOM NUMBER	0.115	0.662	0.241	0.564	0.985	0.790	0.391	0.876	0.448	0.026	0.802	0.373	0.130
C. DIST. FROM SUBLOT (A,B)	29	166	60	141	246	198	196	438	224	13	401	186	65
START OF LOT m	29	416	560	891	1246	1448	1696	2438	2724	3013	3901	4186	4565
D. LENGTH OF SITE cm	100	100	100	100	100	100	100	100	100	100	100	100	100
E. LENGTH MISSED cm	5	12	3	7	9	11	4	10	8	6	10	3	7
F. TOTAL LENGTH MISSED IN LOT	TOTAL "E" FOR THE LOT										cm	98	
G. TOTAL LENGTH OF SITES TESTED IN LOT	TOTAL "D" FOR THE LOT										cm	1300	
H. LOT PERCENT LENGTH MISSED	100 F / G										%	7.5	

**ROUT DEPTH AND WIDTH FAILED READINGS \***

I. NO. OF FAILED DEPTH READINGS PER SITE	1	1	0	2	1	3	2	1	0	1	1	3	1
J. NO. OF FAILED WIDTH READINGS PER SITE	3	2	1	1	0	0	1	2	1	4	1	1	0

\* NOTE: Take 10 minimum depth readings and 10 minimum width readings on each site

K. TOTAL NO. OF DEPTH OR WIDTH READINGS IN LOT	TOTAL NO. OF SITES IN LOT X 10 Readings/Site	130
L. TOTAL NUMBER OF DEPTH FAILURES IN LOT	TOTAL "I" FOR THE LOT if "I" is equal to or greater than 3	6
M. LOT PERCENT DEPTH FAILURE	100 L / K	% 4.6
N. TOTAL NUMBER OF WIDTH FAILURES IN LOT	TOTAL "J" FOR THE LOT if "J" is equal to or greater than 3	7
O. LOT PERCENT WIDTH FAILURE	100 N / K	% 5.4

**FILLED ROUT DEPTH MEASUREMENTS**

SITE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13
P. RANDOM NUMBER	0.688	0.311	0.432	0.957	0.613	0.854	0.130	0.195	0.578	0.268	0.166	0.634	0.601
Q. DIST. FROM SUBLOT (A,P)	172	78	108	239	153	213	65	98	289	134	83	317	300
START OF LOT m	172	328	608	989	1153	1463	1565	2098	2789	3134	3583	4317	4800
R. NUMBER OF UNDERFILL READINGS PER SITE	1	0	2	0	1	1	4	2	1	1	0	1	2
S. TOTAL NO. OF UNDERFILL READINGS IN LOT	TOTAL "R" FOR THE LOT if "R" is equal to or greater than 3										4		
T. LOT PERCENT UNDERFILL	100 S / K										% 3.1		

NOTE: TRANSFER SHADED DATA TO "DETAILS AND FINAL ESTIMATE - CRACK ROUTING AND SEALING" FORM

SEALANT TEMPERATURES °C 195 199 197 203

REMARKS No problems

TECHNOLOGIST m. smart PROJECT MANAGER J. Good

RECEIVED BY John Smith DATE RECEIVED April 20, 1995 TIME 09:30  
( Contractor's Representative )

FIGURE 3

MAT 6 - 8 / 95

- Measure the total length of the rout which has missed the crack. Record as Length Missed (line "E").

**NOTE:** The Length Missed is the total length of crack whose width is not totally within the rout of the test site. Length Missed includes the length of the crack on the edge of the rout wall.

### 3.2 Depth and Width of Rout

After the "length missed" measurements, for each test site proceed as follows:

- Lay the measuring tape on the test site parallel to the rout.
- At the start of the test site, insert into the rout the minimum depth side of the template (for the specified depth).
- If the sides of the template are above the edges of the rout, as shown in Figure 4-A, the rout depth is **below** the specified minimum depth. If the sides of the template are flush with the edges of the rout and the base of the template is touching the base of the rout (Figure 4-B) or is above the base of the rout (Figure 4-C), the rout depth meets the minimum specified depth.

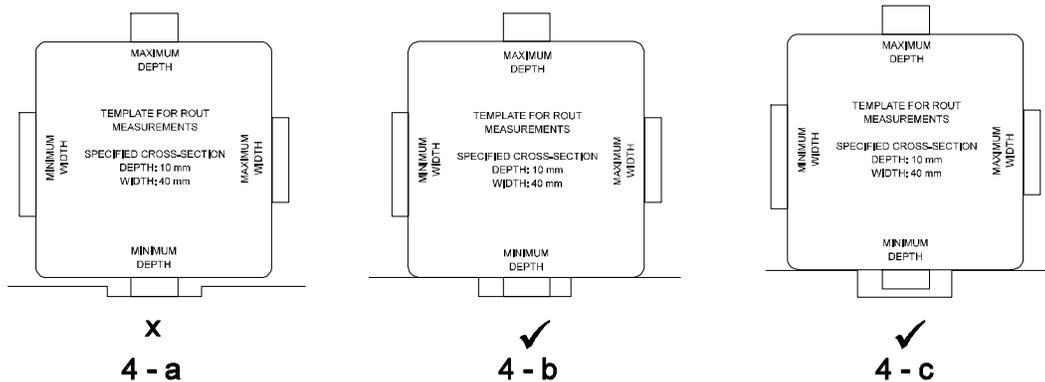


FIGURE 4

- Repeat steps 2 to 3 along the rout until 10 evenly spaced readings have been obtained over the full length of the test site.
- Record the number of failed depth readings for the site in line "I" in the corresponding subplot number column.
- At the start of the test site, insert into the rout the minimum width side of the template. If the template does not fit in the rout, the rout width is **below** the specified limits.

7. Repeat step 6 along the rout until 10 evenly spaced readings have been obtained over the full length of the test site.
8. Record the number of failed width readings for the site in line "J" in the corresponding subplot number.

### 3.3 Lot Percent Length Missed, Depth and Width Failed

1. For each subplot, repeat Sections 3.1 and 3.2 until the lot is tested.
2. Enter on the heading portion of the data sheet the total length of cracks routed for the lot.
3. Calculate the total length that the rout missed the tested cracks (line "F") by adding all the lot values in line "E".

**NOTE:** When performing steps 2, 3, 5, 6 and 8 (of this section) and more than one data sheet was used for the lot, ensure all lot data is included in the total. In this case, these calculations are completed on the last data sheet for the lot.

4. Calculate the total length in cm of the subplot sites tested (line "G") by adding all the lot values in line "D".
5. Calculate the Lot Percent Length Missed (line "H") as follows:

$$\text{Lot \% Length Missed} = \frac{\text{Total Length Missed in Lot}}{\text{Total Length of Sites Tested in Lot}} \times 100\%$$

6. Calculate the total number of Depth or Width readings taken in the lot (line "K") by multiplying the total number of sites tested in the lot by 10 readings/sites.
7. Calculate the total number of failed depth readings in the lot (line "L") by adding all the values in line "I" that are equal to or greater than 3.
8. Calculate the Lot Percent Depth Failure (line "M") using the formula:

$$\text{Lot \% Depth Failure} = \frac{\text{Total Number of Depth Failures } i}{\text{Total Number of Depth Readings } i}$$

9. Calculate the total number of width failures in the lot (line "N") by adding all the lot values in Line "J" that are equal to or greater than 3.
10. Calculate the Lot Percent Width Failure (line "O") using the formula:

$$\text{Lot \% Width Failure} = \frac{\text{Total Number of Width Failures in Lot}}{\text{Total Number of Width Readings in Lot}} \times 100\%$$

### 3.4 Filled Crack Measurements

1. At least 1 hour after the cracks are filled, use the measuring wheel to locate the calculated random test site location (line "Q").
2. Lay the measuring tape on the test site parallel to the rout.
3. Place the underfill depth template at the start of the test site across the filled rout, as shown in Figure 5.
4. If the base of the template centre piece touches or penetrates the sealant, the filled rout meets the depth and allowable sag specifications. **An underfill reading is obtained when the centre piece is above the sealant surface.**
5. Proceed along the site and repeat steps 3 and 4 until a total of 10 evenly spaced readings have been obtained over the full length of the test site.
6. Record in line "R" the total number of **underfill readings** obtained in the site.
7. Repeat steps 2 to 6 until all sublots have been tested. Record the results in the following columns. Use a second data sheet if testing more than 13 sublots.
8. Calculate the total number of underfill readings in the lot (line "S") by totalling the values on line "R" that are equal to or greater than 3. If more than one data sheet was used for the lot, ensure all lot data is included in the total.
9. Calculate the Lot Percent Underfill (Line "T") using the formula:

$$\text{Lot \% Underfill} = \frac{\text{Total No. of Underfill Readings in Lot}}{\text{Total Number of Depth Readings in Lot}} \times 100$$

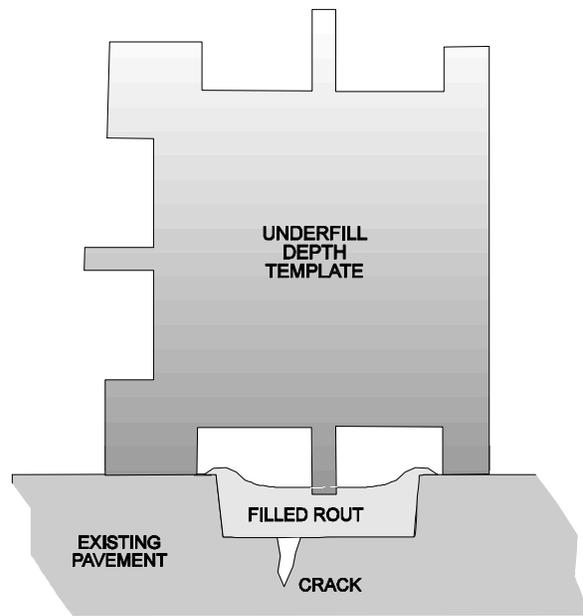


FIGURE 5

### 3.5 Sealant Temperature

Specifications state "Temperatures in excess of 10 EC above the manufacturer's specified safe heating temperature will result in the rejection of the material in use". Therefore the temperature at discharge of the heated sealant must be taken randomly throughout the day.

If taking the temperature of the sealant in a container e. g. the pouring pot, immerse the stem of the thermometer in the sealant and constantly agitate the thermometer. **If the thermometer is not agitated, sealant will coat its stem and the reading will not be accurate.**

Record the temperature readings on the bottom portion of the data sheet, as shown in Figure 3.

### 3.6 Appeal of Quality Assurance Test Results

The contractor may appeal the quality assurance test results performed on a lot. The conditions for an appeal are described in the Contract Specifications. If the lot appeal is accepted:

1. Randomly select the same number of new test sites as the number of original sites used to test the lot. Calculate the site locations as described in ATT-56, Part III, RANDOM TEST SITE SELECTION, Crack Sealing Operations, Section 3.0, steps 1 and 2.
2. Have the contractor locate each site. Ensure the site location is correct.

#### 3.6.1 Appeal of Lot Rout Cross-Section

1. Have the contractor prepare each test site for testing, e.g., remove filler, clean out site.
2. Measure the length of rout which has missed the crack and check the rout cross-section, as per Section 3.1, steps 4 to 5 and Section 3.2.
3. Have the contractor immediately reseal the test site.
4. Calculate the **new** percent length of crack missed by rout (line "H"), the **new** percent of depth and width failed sites (lines "M" and "O" respectively) in the lot, as described in Section 3.3.
5. For each the Lot Percent Length Missed, Lot Percent Depth Failure and Lot Percent Width Failure, calculate the **average** of the **original** and the **new** test results. Payment is based on the average of the total tests (original and new) performed on the lot.

#### 3.6.2 Appeal of Lot Rout Percent Underfill

1. Retest the lot as described in Section 3.4, Filled Crack Measurements, steps 2 to 7.
2. Calculate the **new** Lot Percent Underfill (line "T") as directed in Section 3.4, steps 8 to 9.
3. Calculate the **average** of the **original** and the **new** test results. Payment is based on the average of the total tests (original and new) performed on the lot.