Method of Test for
DETERMINING PAVEMENT PROFILE BY USE OF A CALIFORNIA TYPE PROFILOGRAPH
DOTD Designation: TR 641-96

I. Scope

This method describes procedures used to test pavement for surface smoothness with an approved California Type Profilograph (profilograph), to identify and isolate individual high points (bumps) in excess of specification limits and to determine the Average Profile Index of the pavement from the profile trace.

II. Apparatus

A. **Approved profilograph** - a device with a span of 25 ft used to measure and record the profile of pavement (Figure 1). The device shall use two sets of six wheels (one set at each end) to average the elevation of the 25-ft span. Of each set of six wheels, four in-line wheels spaced at 30 in. are offset 15 in. from the longitudinal centerline of the profilograph. The other two wheels, spaced at 20 in. are offset 15 in. and are also parallel to the longitudinal centerline. A single wheel (profile wheel) at mid-span of the longitudinal centerline of the device responds to vertical deviation. The profile wheel shall drive the recording mechanism and shall produce a profile trace on which 25 ft on the ground equals 1 in. of profile trace in longitudinal measurement and full scale in vertical measurement.

B. **Transport vehicle** - for transporting the profilograph and supporting equipment, the transport vehicle shall have a notched rack with tie downs or other suitable method for holding each disassembled piece of the profilograph firmly in place during transport.

C. **Calibration plates** - one set of metal plates, containing one plate each of the following thicknesses: 0.2 and 0.5 in., both with a tolerance of ± 0.01 in.

D. **Measuring scale** - graduated in a minimum of 0.02 in.

E. **Averaging pen** - a ballpoint pen with red ink or another colored ink which is easily seen on the profile trace.

F. **Electronic calculator.**

G. **Recording paper** - carbonless duplicating paper compatible to the profilograph operation.

H. **Bump template** - a plastic template having a line 1 in. long scribed on one face with a small hole or scribed mark at either end and a slot distance equal to the maximum high point specified from and parallel to the scribed line. The 1 - inch line corresponds to a horizontal distance of 25 ft on the horizontal scale of the profile trace. (Figure 2A).

I. **Blanking band template** - a plastic scale 1.70 in. wide and 21.12 in. long representing a pavement length of 528 ft or 0.1 mi at a scale of 1 in. = 25 ft. Near the center of the scale is an opaque band with lines 0.1 in. apart. These lines serve as a convenient scale to measure deviations of the averaged profile trace above or below the blanking band. The measurable deviations above and below the opaque blanking band are called scallops. (Figure 3A).

J. **Recording pen** - to fit recording device of profilograph.

K. **Hand air pump and tire pressure gauge.**

L. **Measuring tape** - 100 - foot steel measuring tape.

M. **Scanner** - approved by the Materials Engineer Administrator.

N. **Computer** - a 486 computer with 8 MB RAM memory, Microsoft Windows version 3.1 or greater, 50 MB hard drive space available, a parallel port and approved scanner software.

O. **Automated Pavement Profile Analysis and Roughness Evaluation (APPARE) Software.**

III. Assembly, Disassembly, Care and Maintenance of the Profilograph

The instructions for assembly, disassembly, care and maintenance of the profilograph are contained in a handbook accompanying each unit.

IV. Calibration

A. During calibration the horizontal scale and vertical recording mechanism shall be thoroughly checked. If the horizontal scale or vertical recording are incorrect, the cause shall immediately be determined and corrected. Profilograph calibrations shall be performed with the unit assembled.

B. Calibration of the vertical recording mechanism must be checked once a week before use, whenever the profilograph is completely re-assembled, or whenever there is evidence of possible inaccuracy. The vertical scale is checked by placing a 0.5 or 0.2 in. calibration plate under the profile wheel then scaling the result on the profile trace to check the vertical scale. Raise the profile wheel; put a calibration plate under the wheel, then lower the wheel until it rests upon the calibration plate. With the calibration plate in place under the profile wheel, mark the final resting point of the recording pen on the profile paper by rotating the bicycle wheel. Remove the calibration plate from under the profile wheel, and lower profile wheel to a smooth surface then mark the resting point of the recording pen on the profile paper by rotating the bicycle wheel to establish the base mark. Measure the scale height from the base mark to the point marked by the recording pen with the calibration plate in place. The recorded height on the profile paper must indicate the actual height of the calibration plate within ± 0.02 in. Repeat this procedure for each calibration plate. Inspect the recording pen's spring to ensure that the pen moves freely and does not drag. Record date, location (project number), results of calibration, and initials of the authorized profilograph operator or evaluator.

C. Calibration of the distance recording (horizontal scale) mechanism shall be checked once a week before use, whenever the profilograph is completely reassembled, or there is evidence of possible inaccuracy. The horizontal scale will be checked by pushing the profilograph a marked distance of 100 ft with the wheel down on reasonably even pavement and scaling the result on the profile trace. Push the profilograph forward until the profile wheel is at the marked beginning of the calibration section, lower the horizontal recording wheel and mark the point on the profile trace with the recording pen. The horizontal scaling mechanism must indicate 100 ± 1 ft between the two points (4.00 ± 0.04 in. on the profile trace). If the horizontal scale is inaccurate, the air pressure in the bicycle tire may need adjustment. The air pressure at which the profilograph is calibrated is to be maintained at all times. Record date, location (project number), results of calibration, and initials of the authorized profilograph operator or evaluator.

V. Preparation

A. Examine each test path of the pavement section to be tested. The surface must be free of excessive dirt and debris. If the surface is not in a condition acceptable for testing, the pavement surface must be cleaned. (Figure 3B).

B. Assemble the profilograph in accordance with its handbook.

C. Prior to testing, check the profilograph for cleanliness and if necessary, remove materials that are built up on the wheels which would interfere with the accuracy of the trace or with any working part of the profilograph.

D. Calibrate the profilograph in accordance with Section IV.

VI. Procedure

Note 1: *The specifications state which test paths and section lengths to use when computing the Average Profile Index for quality control of construction operations, locating surface deviations, surface finish acceptance, and surface finish payment adjustments.*

A. Position the profilograph on the pavement surface with the profile wheel resting near the beginning of the section to be tested.

B. Push the recording pen down to set it into position. Lift the paper drive wheel (bicycle wheel) and rotate it forward to remove any slackness from the chain. Turn the wheel and check the paper to be certain it is feeding properly. Lower the bicycle wheel back into position.

C. Record on the profile paper the project number, lot number, date of test, location of test (including lane and test path) and the beginning station number. Sign, date and note the time the trace was completed.

D. Push the profilograph until the profile wheel is at the beginning of the section to be tested. Pull down on the recording pen cable to mark the beginning of the test section. When the new pavement abuts existing pavement or a bridge approach slab, the test path will begin on the new pavement approximately 25 ft from the tie-in. When testing continuous sections of new pavements, the test section will begin at the end of the previous test section. Any exceptions should be marked on the trace.

E. Push the profilograph at a slow walk no faster than 3 mph (264 ft/min) longitudinally along the test path for the specified length. Observe the graph being traced on the profile paper during testing. If excessive spikes occur, reduce walking speed. Record the location of sublot and lot limits and all other reference points on the profile paper.

F. A lot for any roadway paving will be subdivided into equal sublots not to exceed 2500 ft in length. Once the lot or sublot has been profiled the profilograph operator will stop the trace, lift the pen, advance the chart one blank sheet of paper, allow a minimum of 2 in. before beginning the new trace for header information, set the pen back in position, then resume the profile. This procedure must be repeated for every sublot until the entire lot is profiled. In addition only one trace per sheet of trace paper will be allowed.

G. When the test path is complete, record the ending station number (location of the profile wheel) on the profile paper.

H. Repeat steps A - G for each test path.

I. After completion of testing, remove the profile paper in order to locate high points (bumps) in excess of the specification limits and determine the Average Profile Index.

J. Disassemble the profilograph and place it securely onto the transport vehicle.

VII. Determination of the Profile Index Using the APPARE Software

Note 2: *The manual method for determining the profile index is located in Section IX.*

A. The profile index may be determined from the profile trace produced in accordance with Section VI. utilizing a trace scanner and the appropriate APPARE software and user manual available from the Materials and Testing Section. The location of high points will still be performed manually, in accordance with Section VIII, after determination of the profile index. (Figure 4).

Note 3: *If the manual location of high points (bumps) is done before the trace is scanned the lines marking bumps could be picked up by the scanner and falsely incorporated into the profile index.*

B. For the scanner procedures see The Appare User Guide for Microsoft/IBM DOS Version 3.1 or higher, which may be obtained from the Materials and Testing Section.

VIII. Locating High Points (Bumps) in Excess of Specification Limits

A. Use the bump template to identify and isolate pavement areas which are in excess of specification limits. At each prominent peak or high point on the averaged profile trace, place the template so that the holes of marks at each end of the scribed line intersect the low points on the profile trace to form a 1-in. chord across the base of the peak or indicated high point. The line on the template need not be horizontal. With a sharp pencil, draw a line using the narrow slot in the template as a guide. The portion of the averaged profile trace extending above this drawn line will indicate the approximate length and height of the high point (bump) in excess of the specification limits. (Figure 2B).

B. There may be instances where the base of the peak or indicated high point on the averaged profile trace is less than 1 in./25 ft. In such cases, a shorter chord length shall be used in placing the scribed line on the template tangent to the profile trace at the low points. (Figure 2C). When the base of the peak or indicated high point is greater than 25 ft/1 in., align the ends of the scribed line to intersect the profile trace with the template in a position approximately parallel to the slope of the averaged profile trace. (Figure 2D).

C. Clearly mark all high points (bumps) in excess of specification limits on the profile trace. Figure 2E illustrates an averaged profile trace with high points which fall within specification limits.

Note 4: *After all high points (bumps) in excess of specification limits are corrected, a new pavement profile will be determined.*

IX. Manual Method for Determination of the Profile Index

A. Average the profile trace by drawing a contrasting color line with the averaging pen through the middle of the profile trace. (Figure 5).

B. Place the blanking band over the averaged profile trace so that as much of the averaged profile as possible is beneath the opaque band. This is called blanking out. After blanking out, scallops above and below the blanking band will usually be approximately balanced. (Figure 6).

C. When the profilograph has gone

around a superelevated curve, the profile trace will move from its generally horizontal position making it impossible to blank out the central portion of the averaged profile trace without shifting the blanking band template. When such conditions occur, the profile trace should be broken into short segments and marked and the blanking band repositioned on each segment. (Figure 7).

D. Starting at the right end of the profile trace, measure and total the heights of all the scallops appearing above and below the blanking band, using the horizontal lines spaced 0.1 in. apart for measurements. Vertical measurements should be rounded to the nearest 0.05 in. Only the highest peak of a double-peaked scallop shall be counted. (Figure 3C).

Note 5: *Small portions of the average profile trace may be visible outside the opaque blanking band, but unless the projections extend 0.03 in. or more vertically and 0.08 in. or more longitudinally on the profile trace, they are not to be included in the count (Figure 3D).*

E. Write the count to the nearest 0.05 in. on the profile paper above and below the blanking band.

F. Outline the position of the blanking band so that it can be repositioned later to check the trace reduction procedure. To ensure proper alignment and placement, place the blanking band at its last end position when moving forward in the trace reduction procedure. (Figure 8). Scallops occurring at the end of the blanking band will be counted only once and included in the segment in which the peak is highest. (Figure 9).

G. After completion of the trace reduction for the test path, add all counts together to determine the total profile count for the test path per section. Write and circle the total profile count in inches (to the nearest 0.01 in.) at the left end of the section for the test path. (Figure 6).

H. Repeat steps A - F for each test path.

X. Calculations

A. Portland Cement Concrete Pavement

1. Determine the lot length (L) to the nearest 0.001 mi using the following formula:

$$L = \frac{A}{5280}$$

where:

A = lot or trace length, ft
5280 = a constant, ft/mi

example:

$$A = 1500$$

$$L = \frac{1500}{5280}$$

$$= 0.28409$$

$$L = 0.284$$

2. Determine the profile index (P.I.) to the nearest 0.1 in./mi for each wheel path using the following formula:

$$P.I. = \frac{T}{L}$$

where:

T = total profile count, in.
L = wheel path length, mi

example:

T = 2.45
L = 0.284

$$P.I. = \frac{2.45}{0.284}$$

$$= 8.626$$

$$P.I. = 8.6$$

3. Determine the average profile index (API) to the nearest 0.1 in./mi for two or more wheel paths using the following formula:

$$API = \frac{(P.I._1 \times L_1) + (P.I._2 \times L_2) + \ldots + (P.I._n \times L_n)}{(L_1 + L_2 + \ldots + L_n)}$$

where:

$P.I._1$ = profile index for the first wheel path
$P.I._2$ = profile index for the second wheel path
$P.I._n$ = profile index for the nth wheel path
L_1 = length of the first wheel path, ft
L_2 = length of the second wheel path, ft
L_n = length of the nth wheel path, ft

Example for one lot of PCCP with two wheel paths:

$P.I._1 = 4.3$
$P.I._2 = 4.1$

$L_1 = 1500$
$L_2 = 1500$

$$API = \frac{(4.3 \times 1500) + (4.1 \times 1500)}{(1500 + 1500)}$$

$$= \frac{6450 + 6150}{3000}$$

$$= \frac{12600}{3000}$$

$$= 4.200$$

$$API = 4.2$$

B. Asphaltic Pavement

1. Determine the sublot length (SL) to the nearest 0.001 mi using the following formula:

$$SL = \frac{A}{5280}$$

where:

A = sublot or trace length, ft
5280 = a constant, ft/mi

example:

$A = 2500$

$$SL = \frac{2500}{5280}$$

$$= 0.47348$$

$$SL = 0.473$$

2. Determine the profile index (P.I.) To the nearest 0.1 in./mi for each sublot using the following formula:

$$P.I. = \frac{T}{SL}$$

where:

T = total profile count, in.
SL = sublot, mi

example:

$T = 2.45$
$SL = 0.473$

$$SL = \frac{2.45}{0.473}$$

$$= 5.179$$

$$SL = 5.2$$

3. Determine the average profile index (API) to the nearest 0.1 in./mi for two or more sublots using the following formula:

$$API = \frac{(P.I._1 \times SL_1) + (P.I._2 \times SL_2) + \ldots + (P.I._n \times SL_n)}{(SL_1 + SL_2 + \ldots + SL_n)}$$

where:

$P.I._1$ = profile index for the first sublot
$P.I._2$ = profile index for the second sublot
$P.I._n$ = profile index for the nth sublot
SL_1 = length of the first sublot, ft
SL_2 = length of the second sublot, ft
SL_n = length of the nth sublot, ft

Example for one lot of Asphaltic pavement:

$P.I._1 = 4.3$
$P.I._2 = 4.1$
$SL_1 = 2500$
$SL_2 = 2300$

$$API = \frac{(4.3 \times 2500) + (4.1 \times 2300)}{(2500 + 2300)}$$

$$= \frac{(10750 + 9430)}{(4800)}$$

$$= \frac{20180}{4800}$$

$$= 4.204$$

$$API = 4.2$$

XI. Use of Contractor's Profilograph Profile Trace for Acceptance Tests.

A. The contractor's profilograph must demonstrate a tolerance of ±0.5 in. when compared to the Department's profilograph over a 1000-ft identical wheelpath.
B. The contractor's authorized profilograph evaluator or operator shall perform surface testing in accordance with this procedure in the presence of a DOTD authorized profilograph evaluator or operator employee.
C. The contractor shall be required to use duplicating trace paper when performing surface tolerance testing for acceptance.
D. Immediately upon completion of the trace the contractor's authorized profilograph evaluator or operator and DOTD's authorized profilograph evaluator or operator shall sign, date and note the time the trace was completed.
E. The DOTD authorized profilograph evaluator or operator will take possession of the original trace and transport it to the District Lab for interpretation.
F. The Department reserves the right to retest any section of the pavement utilizing Department personnel and equipment.

XII. Report

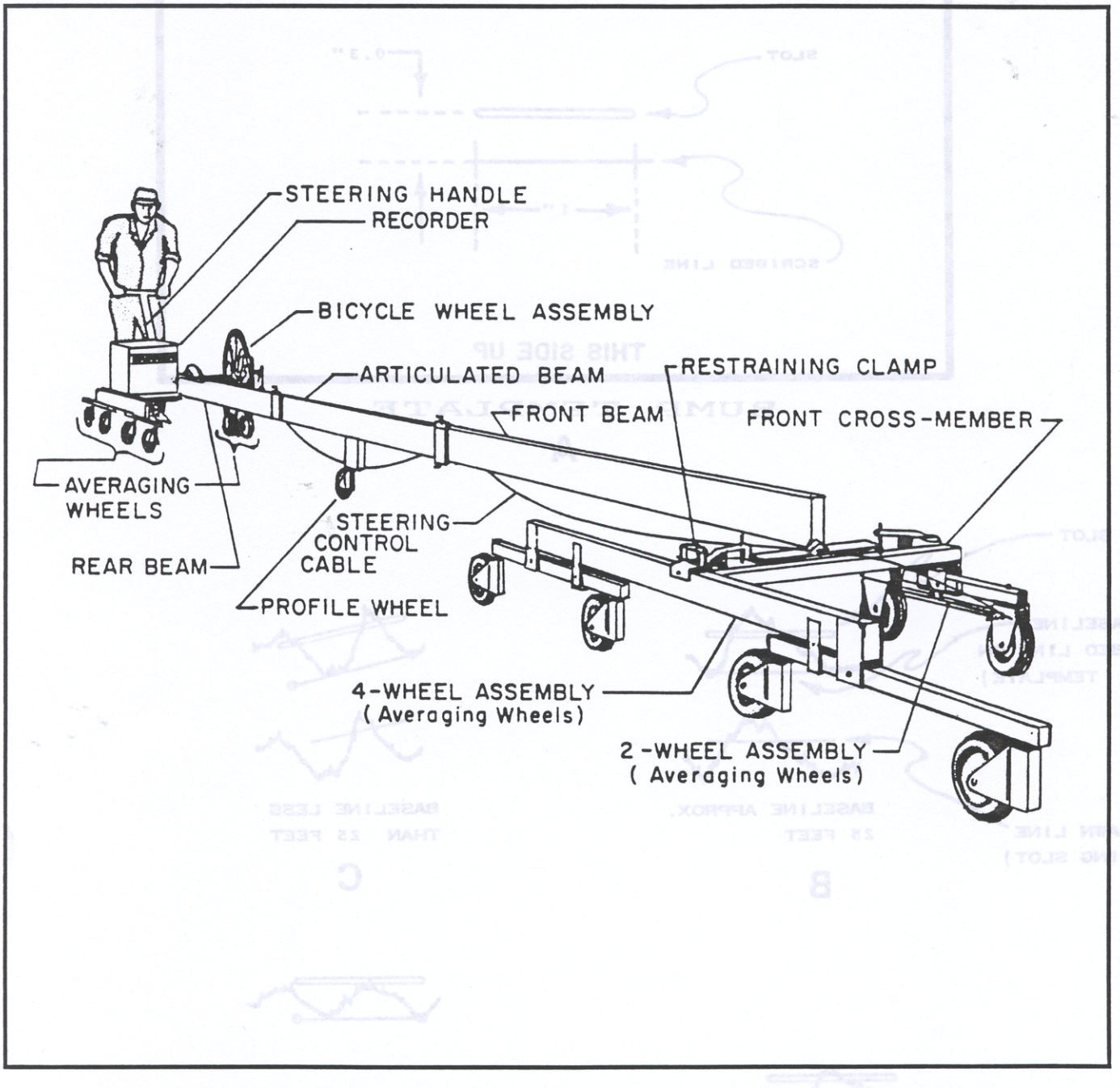
A. The APPARE generated report will include the Profile Index or Average Profile Index to the nearest tenth (0.1) of an in./mi. (Figures 10A and 10B). It will also include:
   1. The name of the certified profilograph operator.
   2. Trace length.
   3. Lot number.
   4. Sublot number.
   5. Test path.
   6. State project number.
   7. Profilograph run number.
   8. Layer type.
   9. Type of test (QC,QA,etc.).
   10. Date of the test.

   Also, a report of the location and number of high points (bumps) in excess of specification limits shall be included with the APPARE computer generated report.

B. For the manual method, the report shall include the above list plus the averaged and evaluated profile trace and all calculations used to determine the Profile Index or Average Profile Index along with the number and location of high points. (Figure 11).

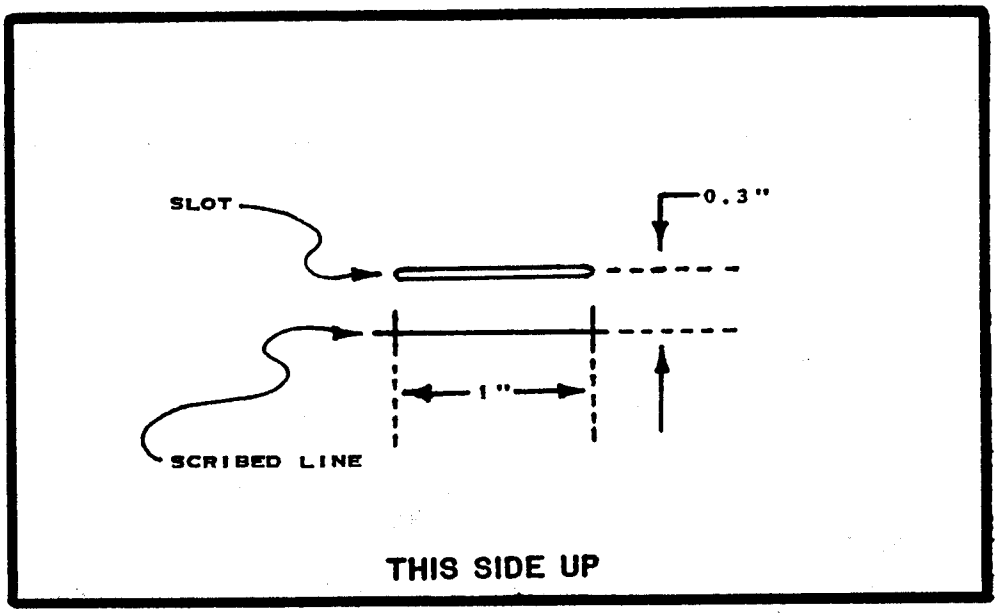
XIII. Normal Test Reporting Time

Normal test reporting time is 4 hours to 2 days.



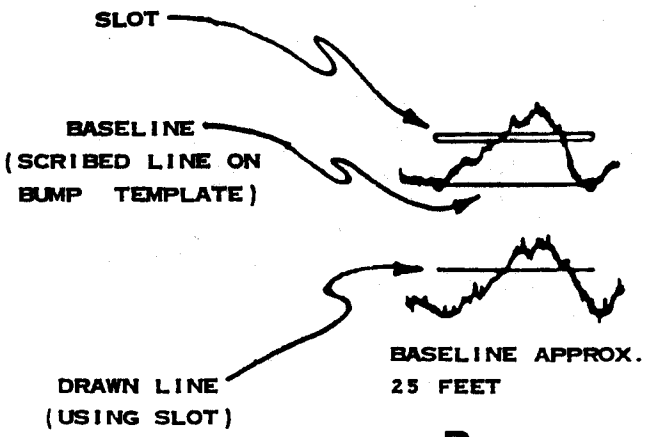
California Type Profilograph

Figure 1



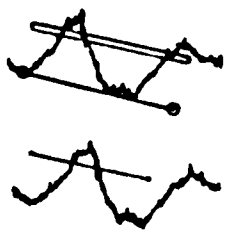
BUMP TEMPLATE

A



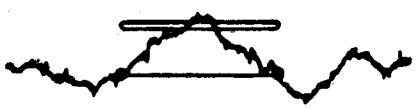
BASELINE APPROX.
25 FEET

B



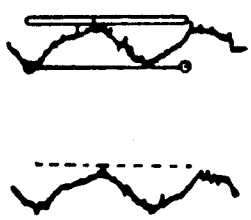
BASELINE LESS
THAN 25 FEET

C



BASELINE MORE
THAN 25 FEET

D



HEIGHT OF PEAK IS
WITHIN SPEC. LIMITS

E

Bump Template and Use of The Template to Locate High Points (Bumps)
Figure 2

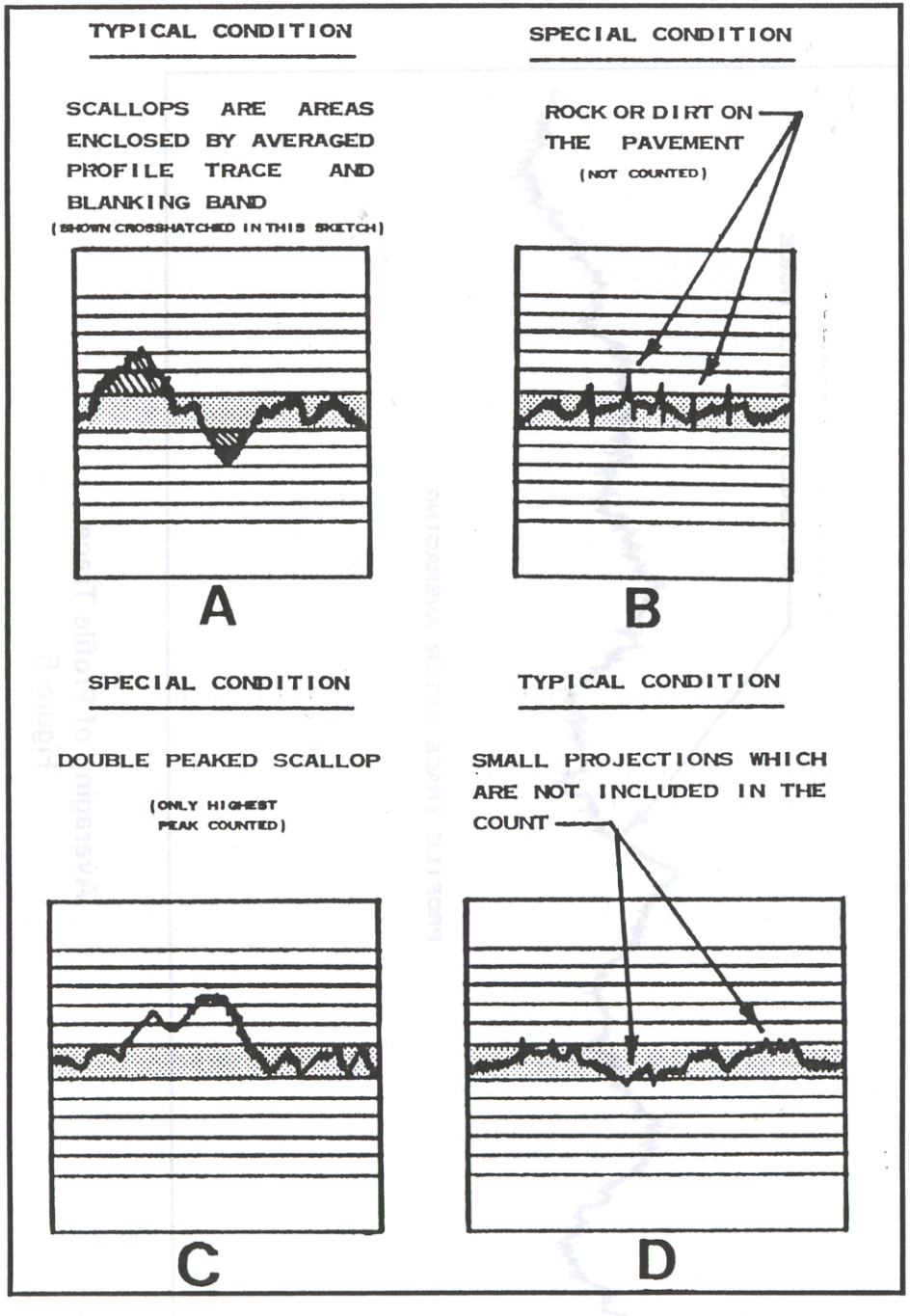


Figure 3

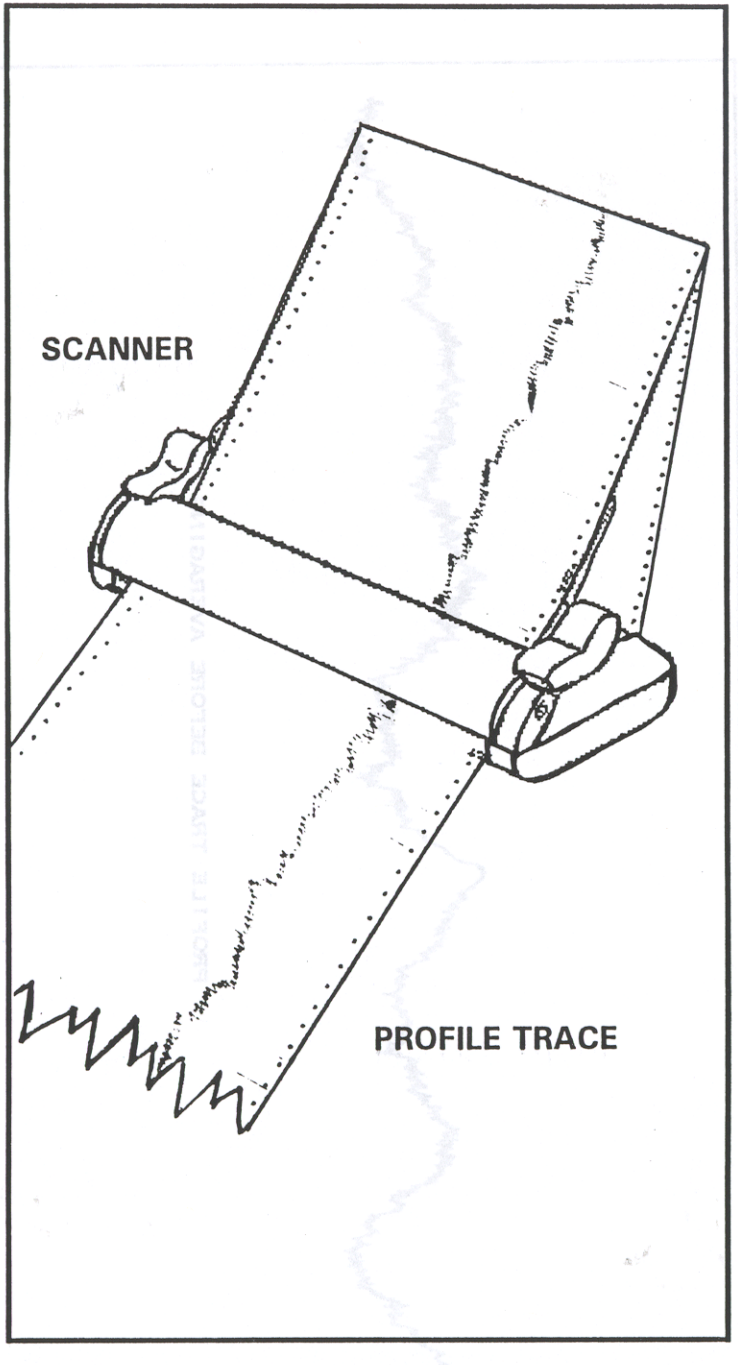
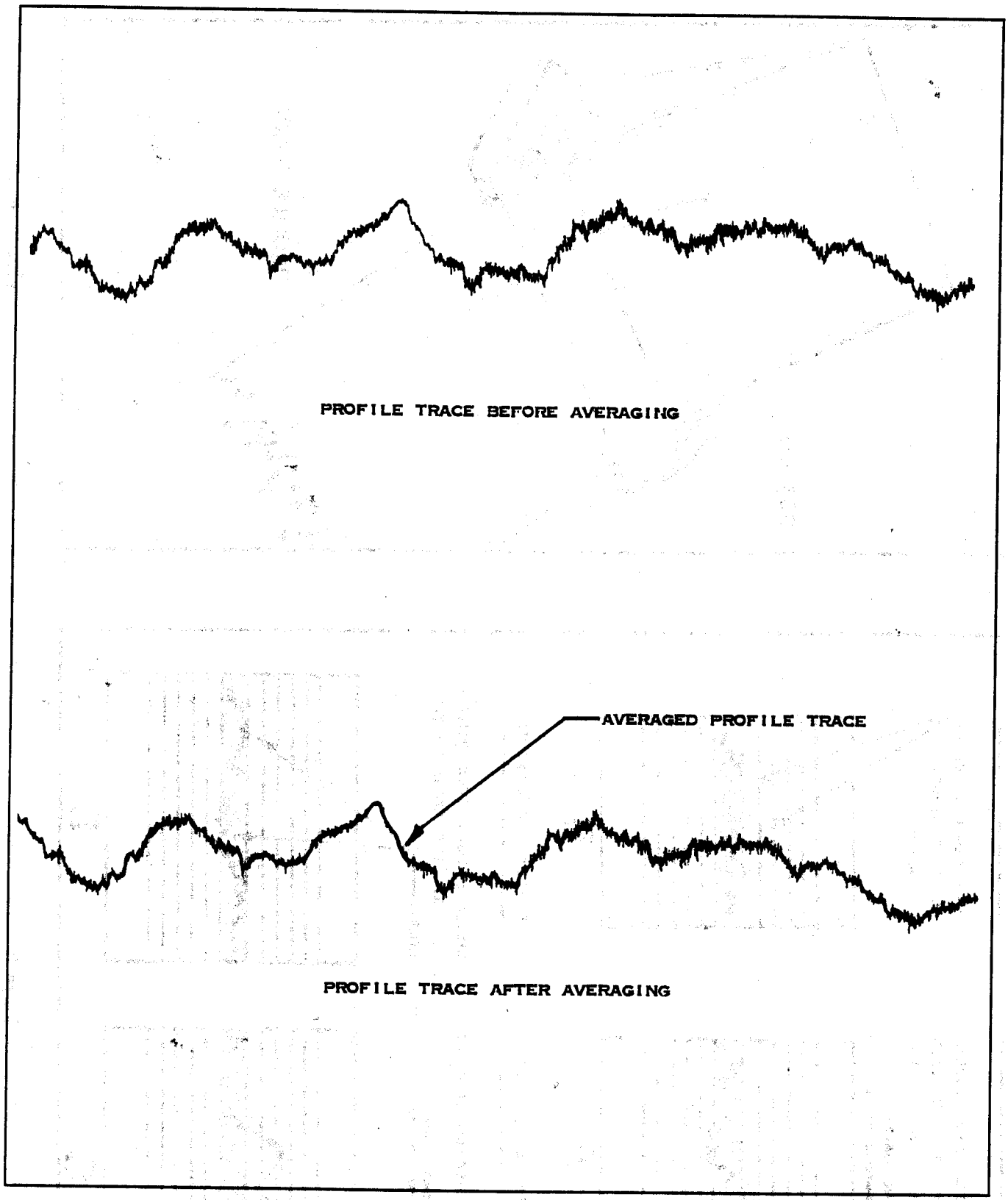
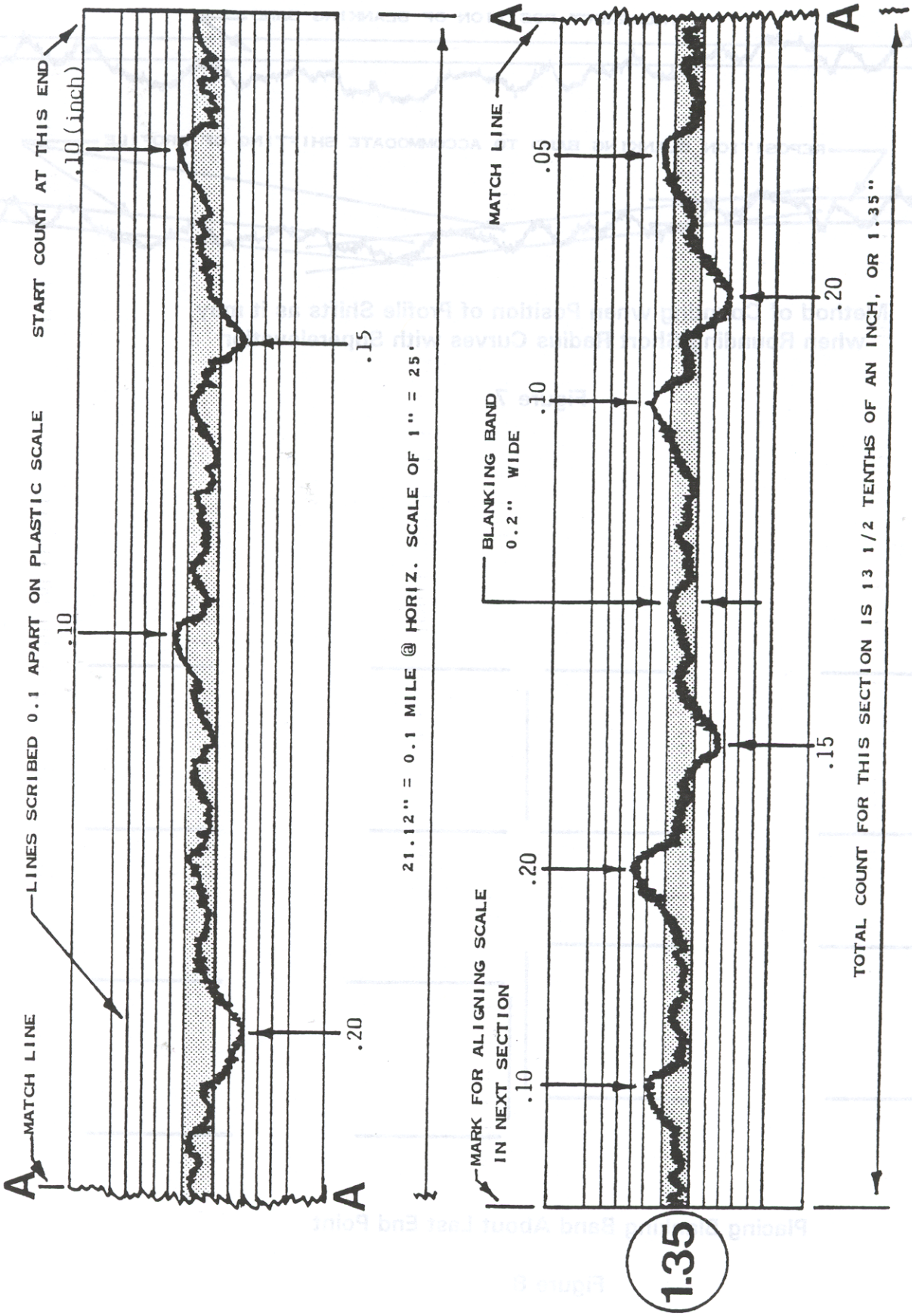


Figure 4

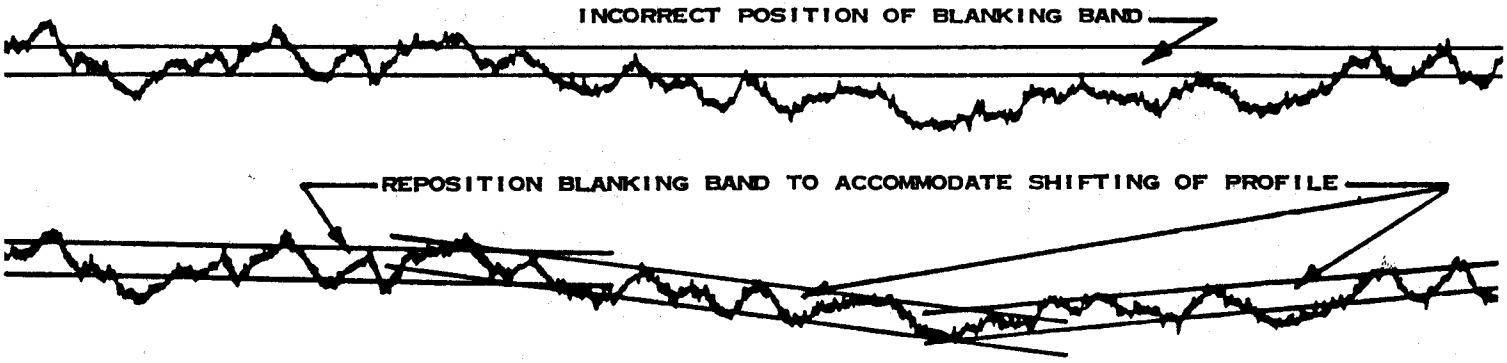


Averaging of Profile Trace
Figure 5



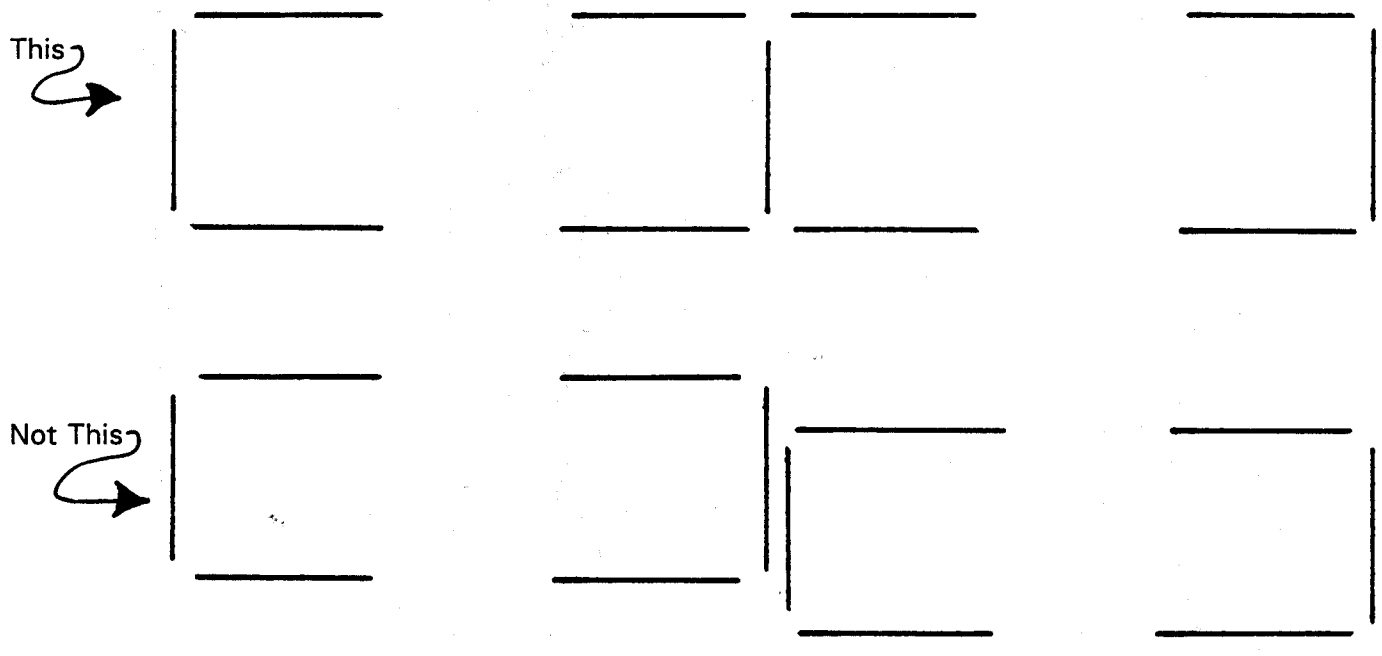
Example Showing Method of Deriving Profile Count from Averaged Profile Trace

Figure 6



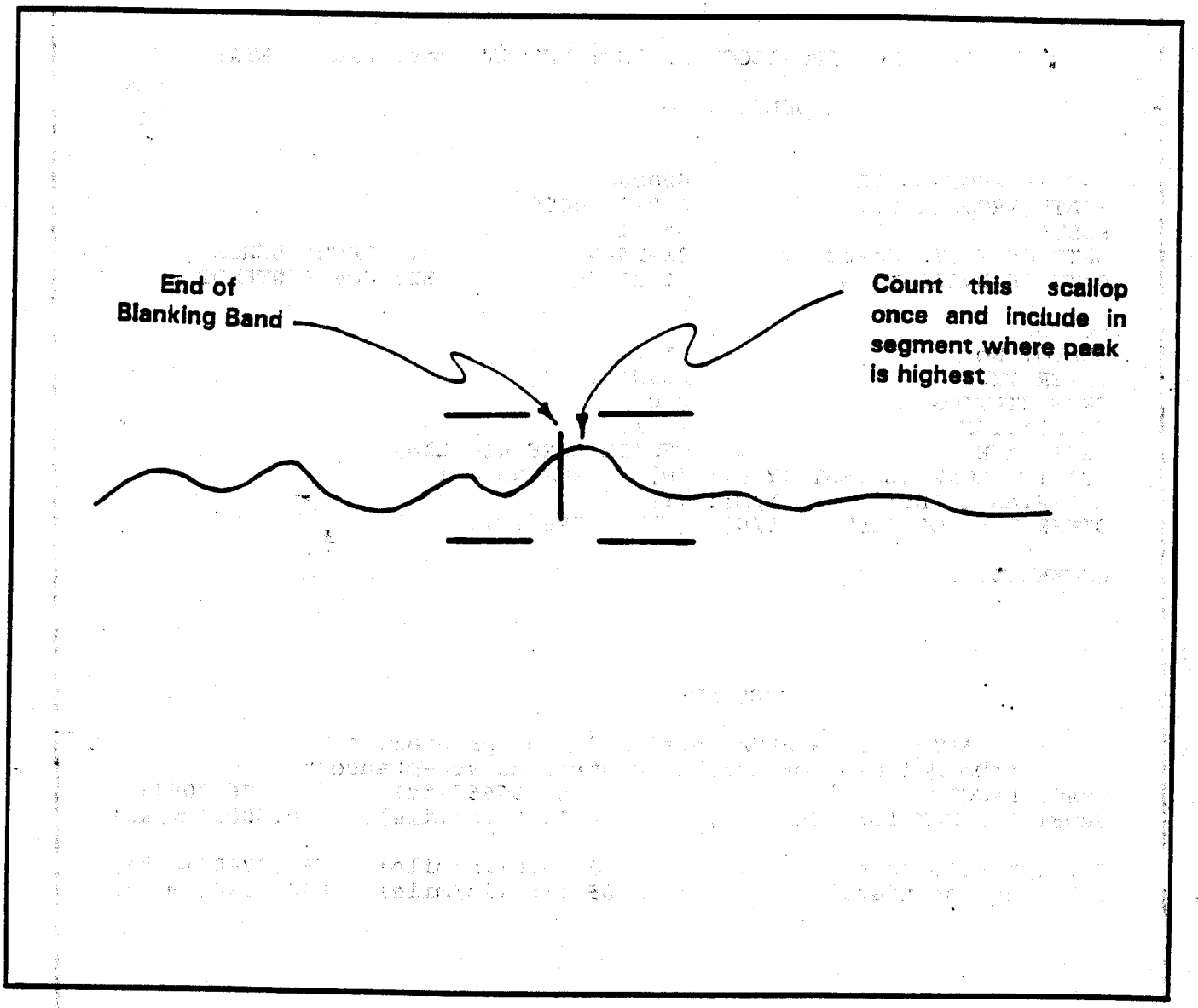
Method of Counting when Position of Profile Shifts as it may when Rounding Short Radius Curves with Superelevation

Figure 7



Placing Blanking Band About Last End Point

Figure 8



Scallops Occurring at End of Blanking Band

Figure 9

PROJECT PROFILOGRAPH TEST REPORT (ver. Final BETA)

SUBLOT REPORT

APPARE PROCESS ID	: 6000000	
STATE PROJECT No.	: 600-00-0000	
ROUTE	: LA. 1	
DATE OF TEST (mm-dd-yy)	: 01-25-96	BY: DANNY SEHON
DATE OF EVALUATION	: 1-26-96	BY: JOE FONTENOT
LOT No.	: 1	
SUBLOT No.	: 01	
LAYER TYPE	: ASPHALT	
FROM STATION	: 0+00	
TO STATION	: 2+51.7	
TEST PATH	: CENTER LINE RT. LANE	
QUALITY CONTROL TEST [Y/N]	: [N]	RUN No.: 1
ACCEPTANCE TEST [Y/N]	: [Y]	
OTHER TYPE OF TEST [Y/N]	: [N]	SPECIFY:

COMMENTS:

RESULTS

This is a BETA version of the program.
Do NOT use for qualify control or acceptance

TRACE LENGTH	: 251.66667(ft)	76.708(m)
PROFILE INDEX for SUBLOT 01	: 0.0000(in/mile)	0.0000(mm/km)
IRI (profilograph)	: 59.0000(in/mile)	931.3740(mm/km)
IRI (Est. standard)	: 105.1669(in/mile)	1660.1646(mm/km)

Sublot 1

APPARE Sublot Report ***(Sublots 2 and 3 are displayed on the following pages)***

Figure 10 A

PROJECT PROFILOGRAPH TEST REPORT (ver. Final BETA)

SUBLOT REPORT

```
APPARE PROCESS ID          : 6000000
STATE PROJECT No.          : 600-00-0000
ROUTE                      : LA. 1
DATE OF TEST (mm-dd-yy)    : 01-25-96          BY: DANNY SEHON
DATE OF EVALUATION         :  1-26-96          BY: JOE FONTENOT

LOT No.                    : 1
SUBLOT No.                 : 02
LAYER TYPE                 : ASPHALT
FROM STATION               : 2+51.7
TO STATION                 : 5+01.4
TEST PATH                  : CENTER LINE RT. LANE
QUALITY CONTROL TEST [Y/N] : [N]     RUN No.: 1
ACCEPTANCE TEST      [Y/N] : [Y]
OTHER TYPE OF TEST   [Y/N] : [N]     SPECIFY:

COMMENTS:
```

RESULTS

```
      **This is a BETA version of the program.**
     **Do NOT use for qualify control or acceptance**
TRACE LENGTH                :      249.66667(ft)        76.0984(m)
PROFILE INDEX for SUBLOT 02 :      2.1148(in/mile)    33.3842(mm/km)

IRI (profilograph)          :    109.0000(in/mile)  1720.6739(mm/km)
IRI (Est. standard)         :    142.6971(in/mile)  2252.6163(mm/km)
```

Sublot 2

APPARE Sublot Report ***(Sublot 3 displayed on the following page)***

Figure 10 A

PROJECT PROFILOGRAPH TEST REPORT (ver. Final BETA)

SUBLOT REPORT

```
APPARE PROCESS ID          : 6000000
STATE PROJECT No.          : 600-00-0000
ROUTE                      : LA. 1
DATE OF TEST (mm-dd-yy)    : 01-25-96          BY: DANNY SEHON
DATE OF EVALUATION         :  1-26-96          BY: JOE FONTENOT

LOT No.                    : 1
SUBLOT No.                 : 03
LAYER TYPE                 : ASPHALT
FROM STATION               : 5+01.4
TO STATION                 : 7+36.7
TEST PATH                  : CENTER LINE RT. LANE
QUALITY CONTROL TEST [Y/N] : [N]     RUN No.: 1
ACCEPTANCE TEST      [Y/N] : [Y]
OTHER TYPE OF TEST   [Y/N] : [N]     SPECIFY:

COMMENTS:
```

RESULTS

```
        **This is a BETA version of the program.**
      **Do NOT use for qualify control or acceptance**
TRACE LENGTH                 :      235.33333(ft)        71.7296(m)
PROFILE INDEX for SUBLOT 03  :     6.7309(in/mile)    106.2540(mm/km)

IRI (profilograph)           :    104.0000(in/mile)   1641.7439(mm/km)
IRI (Est. standard)          :    138.9441(in/mile)   2193.3716(mm/km)
```

Sublot 3

APPARE Sublot Report

Figure 10 A

PROJECT PROFILOGRAPH TEST REPORT (ver. Final BETA)

FINAL REPORT

```
APPARE PROCESS ID              : 6000000
STATE PROJECT No.              : 600-00-0000
ROUTE                          : LA. 1
DATE OF TEST (mm-dd-yy)        : 01-25-96          BY: DANNY SEHON
DATE OF EVALUATION             :  1-26-96          BY: JOE FONTENOT

LOT No.                        : 1
LAYER TYPE                     : ASPHALT
BEGINNING STATION              : 0+00
ENDING STATION                 : 7+36.7
TEST PATH                      : CENTER LINE RT. LANE
QUALITY CONTROL TEST [Y/N]     : [N]     RUN No.: 1
ACCEPTANCE TEST      [Y/N]     : [Y]
OTHER TYPE OF TEST   [Y/N]     : [N]     SPECIFY:

COMMENTS: LOT 1 CONTAINS 3 SUBLOTS.
```

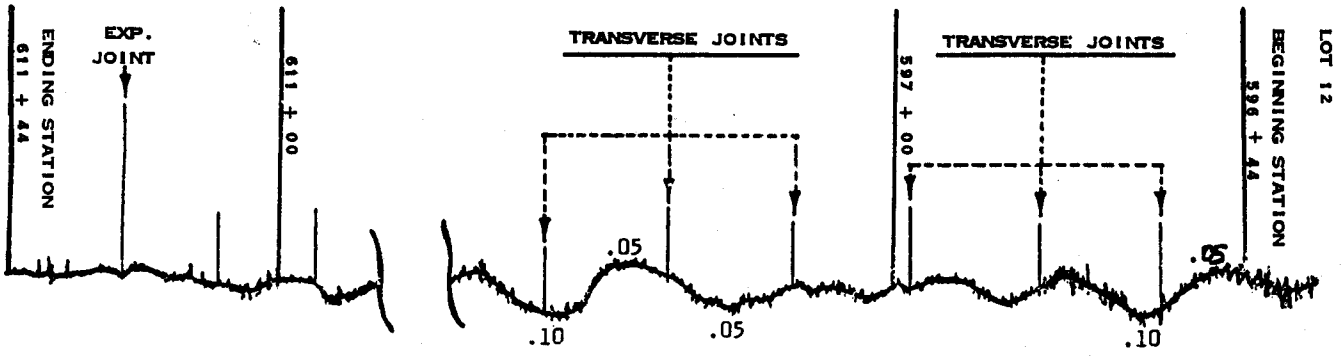
RESULTS

```
      **This is a BETA version of the software**
    **Do NOT use for qualify control or acceptance**
TOTAL TRACE LENGTH                :      735 Ft (     224 m)
PROFILE INDEX (P.I.) FOR LOT:       2.9 in/mi  (  45.4 mm/km)  (In Tenth's)
       SUBLOT  1 P.I.             :   0.0 in/mi  (   0.0 mm/km)  (In Tenth's)
       SUBLOT  2 P.I.             :   2.1 in/mi  (  33.4 mm/km)  (In Tenth's)
       SUBLOT  3 P.I.             :   6.7 in/mi  ( 106.3 mm/km)  (In Tenth's)

IRI (Profilograph)                :  90.5 in/mi  (1429.1 mm/km)  (In Tenth's)
IRI (Est. standard)               : 129.0 in/mi  (2035.9 mm/km)  (In Tenth's)
```

APPARE Final Report - Representing 3 Sublots

Figure 10 B



Project No. : 450-18-0015 Beginning Station No.: 596+44
Lot No. : 12 Ending Station No. : 611+44

Roadway Width 24 feet, Roadway Length 1500 feet: $\frac{1500}{5280}$ = 0.284 mile

Eastbound Roadway

Right Lane, Left Wheel Path:
Total Profile Count = 1.15 inches
Profile Index = $\frac{1.15 \text{ inches}}{0.284 \text{ mile}}$ = 4.0 inches/mile

Left Lane, Left Wheel Path:
Total Profile Count = 1.55 inches
Profile Index = $\frac{1.55 \text{ inches}}{0.284 \text{ mile}}$ = 5.5 inches/mile

Right Lane, Right Wheel Path:
Total Profile Count = 1.25 inches
Profile Index = $\frac{1.25 \text{ inches}}{0.284 \text{ mile}}$ = 4.4 inches/mile

Left Lane, Right Wheel Path:
Total Profile Count = 1.35 inches
Profile Index = $\frac{1.35 \text{ inches}}{0.284 \text{ mile}}$ = 4.8 inches/mile

Average Profile Index = $\frac{(4.0 \times 0.284) + (4.4 \times 0.284) + (5.5 \times 0.284) + (4.8 \times 0.284)}{0.284 + 0.284 + 0.284 + 0.284}$

= **4.7 inches/mile/lot**

Tested By: _____ Date: _____

Checked By: _____ Date: _____

Manual Report - Portion of One of Four Wheel Paths Representing Lot 12
Figure 11