

Table 14 (Continued). Visual Observations and General Notes

| Site No. | County | SR | Max. Surface Rut Depth (500') | Pavement Age (1990) | Subjective Rating | Figure (Photo) No. | Notes |
|----------|------------|-----|-------------------------------------|---------------------------|----------------------|--------------------------|---|
| 29 | Cumberland | 11 | 0.350 | 2 | F | 76 | Route 11 (Camp Hill By-pass) S.B. lanes, site on a mild long up grade, ID-3 wearing course flushing badly, rotting more pronounced near intersections, in-place voida 2.6% in ID-3 course. |
| 30 | Cumberland | 11 | 1.300 | 6 | P | 77, 78 | Route 11 (between Mechanicsburg and Carlisle), W.B. lanes, site on a flat terrain, excessive rotting and shoving in slow lanes, unfilled core holes were getting smaller due to plastic flow of the mix inwardly, heavy truck traffic slowing down to get on Pennsylvania Turnpike, in-place voida 2.9% in wearing course, according to rut profiles the binder course is also contributing significantly to the surface rotting. |
| 31 | Blair | 220 | 0.250 | 3 | F | 79 | Route 220, site on a mild up grade, rotting is more pronounced near the intersections - reported later, in-place voida 5.9% in wearing course, 100% manufactured sand in the fine aggregate of wearing course. |
| 32 | Fulton | 70 | 0.200 | 2 | G | 80 | 1-70 (E.B. lanes), site on a long steep up grade, minimal rutting downhill, heavy duty mix design (4.2% voids), in-place voida 4.4% in wearing and 2.5% in binder course, 100% manufactured sand in both courses, according to the rut profiles the binder course is a major contributor to the surface rotting. |
| 33 | | 70 | 0.300 | 2 | F | 81 | 1-70 (W.B. lanes), site on a long mild up grade, heavy duty mix name is Site #32, minus 200 content during production higher than Site #32, in-place voida 4.9% in wearing and 3.6% in binder course, 100% manufactured sand in both courses. |
| 34 | Bedford | 70 | 0.275 | 4 | G | 82 | 1-70 (just south of Pennsylvania Turnpike), site on a down grade, no flushing, mix ruts near intersections, in-place voida 2.5% in wearing course, 100% manufactured sand in both courses. |
| 35 | Jefferson | 80 | 0.000 | 2 | E | 83 | 1-80 (W.B. lanes), 2 miles E. of Corsica Exit, core site on moderate up grade, these W.B. lanes did not have 2-way traffic (built earlier E.B. lanes), even E.B. lanes do not show any significant rotting, appears like an excellent job so far, in-place voida 5.8% in wearing and 5.9% in binder course, 100% manufactured sand in both courses, heavy duty mix design. |

Table 15. Summary of Correlation Analysis
for General and Mix Design Variables

| Independent Variable | Correlation With Rut | | Best Correlation R value | Dependent Variable |
|----------------------|----------------------|-----------|---------------------------|--------------------|
| | Depth/SQRT TESAL's | R value | | |
| Layer 1 | | | | |
| TEMPERATURE | 0.1576 | 0.3585 | Rut in Layer/SQRT TESAL's | |
| ESAL ' S | -0.2762 | | | |
| VTM | 0.0415 * | 0.3984 * | Rut in Layer/SQRT TESAL's | |
| VMA | -0.2308 | 0.3162 * | Rut in Layer | |
| STABILITY | -0.3167 | 0.3992 * | Max Surface/SQRT TESAL's | |
| FLOW | -0.1384 * | -0.1370 * | Max Surface/SQRT TESAL's | |
| STABILITY/FLOW | -0.2127 * | -0.2945 * | Max Surface/SQRT TESAL's | |
| BEARING CAPACITY | -0.1996 * | -0.2797 * | Max Surface/SQRT TESAL's | |
| # BLOWS PER SIDE | -0.1916 | | | |
| PASSING #8 SIEVE | -0.4905 | | | |
| PASSING #200 SIEVE | 0.0973 | | | |
| ASPHALT CONTENT | -0.2979 | | | |
| Layer 2 | | | | |
| TEMPERATURE | 0.1576 | 0.2301 | Max Surface Rut Depth | |
| ESAL ' S | -0.2762 | | | |
| VTM | 0.0727 * | 0.0921 * | Max Surface/SQRT TESAL's | |
| VMA | 0.0949 * | | | |
| STABILITY | -0.1941 | -0.2662 | Max Surface Rut Depth | |
| FLOW | -0.3746 * | -0.4226 * | Avg Surface Rut Depth | |
| STABILITY/FLOW | 0.0370 * | -0..1584 | Max Surface Rut Depth | |
| BEARING CAPACITY | 0.0573 * | -0.1454 | Max Surface Rut Depth | |
| # BLOWS PER SIDE | -0.0287 | -0.2344 | Rut in Layer | |
| PASSING #8 SIEVE | -0.1922 | | | |
| PASSING #200 SIEVE | -0.1142 | | | |
| ASPHALT CONTENT | 0.0313 | | | |

* = Reverse relationship

Table 16. Summary of Correlation Analysis
for Construction Variables

| Independent Variable | Correlation With Rut | | Best Correlation R value | Dependent Variable |
|-----------------------|----------------------|---------|--------------------------|---------------------------|
| | Depth/SQRT TESAL's | R value | | |
| Layer 1 | | | | |
| VOIDS TOTAL MIX | -0.3207 | | | |
| ASPHALT CONTENT | -0.2289 * | | -0.2519 * | Max Surface/SQRT TESAL's |
| PASSING #8 SIEVE | -0.5258 | | | |
| PASSING #200 SIEVE | -0.1231 * | | -0.1817 * | Max Surface/SQRT TESAL's |
| PASSING 1/2" SIEVE | N/A | | N/A | |
| ASPHALT CONTENT CI | 0.3953 | | 0.6268 | Max Surface/SQRT TESAL's |
| PASSING #8 SIEVE CI | -0.2249 | | -0.2731 | Avg Surface Rut Depth |
| PASSING #200 SIEVE CI | 0.0187 | | 0.2741 | Avg Surface Rut Depth |
| PASSING 1/2" SIEVE CI | N/A | | N/A | |
| Layer 2 | | | | |
| VOIDS TOTAL MIX | -0.1988 | | -0.3110 | Avg Surface Rut Depth |
| ASPHALT CONTENT | 0.2300 | | | |
| PASSING #8 SIEVE | -0.1245 | | | |
| PASSING #200 SIEVE | -0.2096 * | | -0.2573 * | Rut in Layer/SQRT TESAL's |
| PASSING 1/2" SIEVE | 0.1082 | | 0.2320 | Avg Surface Rut Depth |
| ASPHALT CONTENT CI | -0.0321 * | | -0.3174 * | Rut in Layer |
| PASSING #8 SIEVE CI | -0.2390 | | -0.2986 | Max Surface/SQRT TESAL's |
| PASSING #200 SIEVE CI | -0.1067 * | | -0.2524 * | Max Surface/SQRT TESAL's |
| PASSING 1/2" SIEVE CI | 0.1169 | | -0.3332 * | Rut in Layer/SQRT TESAL's |

* = Reverse relationship

Table 17. Summary of Correlation Analysis for Post Construction Longitudinal Variables (C1-C6)

| Independent Variable | Correlation With Rut | | Best Correlation R Value | Dependent Variable |
|-----------------------|----------------------|---------|--------------------------|---------------------------|
| | Depth/SQRT TESAL's | R Value | | |
| Layer 1 | | | | |
| ASPHALT CONTENT | -0.2434 | | -0.3184 * | Rut in Layer/SQRT TESAL's |
| ASPHALT CONTENT CI | 0.3193 | | | |
| PASSING 1/2" SIEVE | N/A | | N/A | |
| PASSING 1/2" SIEVE CI | N/A | | N/A | |
| PASSING #8 SIEVE | -0.6039 | | -0.6812 | Avg Surface Rut Depth |
| PASSING #8 SIEVE CI | -0.4792 | | | |
| PASSING #200 SIEVE | 0.1556 | | 0.1865 | Rut in Layer/SQRT TESAL's |
| PASSING #200 SIEVE CI | 0.1030 | | 0.3542 | Rut in Layer |
| PENETRATION | 0.3197 | | 0.3537 | Avg Surface Rut Depth |
| VISCOSITY | -0.1497 | | -0.1686 | Avg Surface Rut Depth |
| % CRUSHED FACES | -0.1500 | | 0.1613 * | Rut in Layer/SQRT TESAL's |
| % NAT'L SAND | -0.1276 * | | -0.3976 * | Rut in Layer/SQRT TESAL's |
| VOIDS IN FINE AGG | 0.1448 * | | | |
| AVG VTM | -0.1856 | | -0.3817 | Avg Surface Rut Depth |
| MIN VTM | -0.01710 | | -0.3544 | Avg Surface Rut Depth |
| 20th PCT'L VTM | -0.2133 | | -0.3998 | Avg Surface Rut Depth |

* = Reverse relationship

Table 17. (Cent) Summary of Correlation Analysis for Post Construction Longitudinal Variables (C1-C6)

| Independent Variable | Correlation With Rut | | Best Correlation R Value | Dependent Variable |
|-----------------------|----------------------|-----------|---------------------------|--------------------|
| | Depth/SQRT TESAL's | R Value | | |
| Layer 2 | | | | |
| ASPHALT CONTENT | 0.6195 | | | |
| ASPHALT CONTENT CI | 0.1416 | 0.1858 | Rut in Layer/SQRT TESAL's | |
| PASSING 1/2" SIEVE | 0.2806 | | | |
| PASSING 1/2" SIEVE CI | 0.1590 | 0.3139 | Rut in Layer | |
| PASSING #8 SIEVE | 0.1289 | 0.1344 | Avg Surface Rut Depth | |
| PASSING #8 SIEVE CI | -0.0250 | 0.1428 | Rut in Layer | |
| PASSING #200 SIEVE | 0.0783 | -0.1937 * | Rut in Layer/SQRT TESAL's | |
| PASSING #200 SIEVE CI | 0.0041 | -0.0720 * | Rut in Layer/SQRT TESAL's | |
| PENETRATION | 0.0060 | 0.1465 | Max Surface Rut Depth | |
| VISCOSITY | 0.4219 * | | | |
| % CRUSHED FACES | -0.1037 | 0.1463 * | Rut in Layer | |
| % NAT'L SAND | -0.0549 * | -0.1689 * | Rut in Layer/SQRT TESAL's | |
| VOIDS IN FINE AGG | -0.4507 | | | |
| AVG VTM | -0.3094 | -0.3505 | Avg Surface Rut Depth | |
| MIN VTM | -0.3099 | -0.3157 | Rut in Layer | |
| 20th PCT'L VTM | -0.3421 | | | |

* = Reverse relationship

Table 18. Summary of Correlation Analysis for Post Construction Transverse Variables (C7-C11)

| Independent Variable | Correlation With Rut | | Best Correlation R Value | Dependent Variable |
|----------------------|----------------------|---------|--------------------------|------------------------------|
| | Depth/SQRT TESAL's | R Value | | |
| AVG VTM | -0.1813 | | -0.4309 | Avg Surface Rut Depth |
| MIN VTM | -0.1268 | | -0.3638 | Avg Surface Rut Depth |
| 20th PCT'L VTM | -0.1260 | | -0.3568 | Avg Surface Rut Depth |
| GTM VTM | -0.3733 | | -0.4457 | Avg Surface Rut/SQRT TESAL's |
| ROTATING VTM | -0.1979 | | -0.4251 | Avg Surface Rut Depth |
| STATIC VTM | -0.2072 | | | |
| GTM VMA | -0.2778 | | -0.3150 | Avg Surface Rut/SQRT TESAL's |
| ROTATING VMA | -0.1286 | | -0.1338 | Rut in Layer |
| STATIC VMA | -0.1697 | | 0.1710 | Rut in Layer |
| GSI | 0.4823 | | | |
| CREEP | -0.1856 | | 0.2878 | Rut in Layer |
| GTM STABILITY | -0.3371 | | -0.3742 | Max Surface Rut/SQRT TESAL's |
| GTM FLOW | 0.5134 | | 0.5736 | Rut in Layer |
| GTM STAB/FLOW | -0.4861 | | | |
| GTM BEARING CAPACITY | -0.4859 | | | |
| STATIC STABILITY | -0.5266 | | | |
| STATIC FLOW | 0.3928 | 004959 | | Rut in Layer |
| STATIC STAB/FLOW | -0.5221 | | | |
| STATIC BEARING CAP | -0.5108 | | | |
| ROTATING STABILITY | -0.5130 | -0.5361 | | Max Surface Rut/SQRT TESAL's |
| ROTATING FLOW | 0.3770 | 0.5509 | | Rut in Layer |
| ROTATING STAB/FLOW | -0.4974 | | | |
| ROTATING BEARING CAP | -0.4884 | | | |

* = Reverse relationship

Table 18. (Cent) Summary of Correlation Analysis
for Post Construction Transverse
Variables (C7-C11)

| Independent Variable | Correlation With Rut | | Best Correlation R Value | Dependent Variable |
|----------------------|----------------------|-----------|------------------------------|--------------------|
| | Depth/SQRT TESAL's | R Value | | |
| Layer 2 | | | | |
| AVG VTM | -0.3347 | -0.3925 | Max Surface Rut Depth | |
| MIN VTM | -0.1995 | -0.2877 | Max Surface Rut Depth | |
| 20th PCT'L VTM | -0.2749 | -0.3504 | Max Surface Rut Depth | |
| GTM VTM | -0.4863 | -0.6227 | Avg Surface Rut/SQRT TESAL's | |
| ROTATING VTM | -0.4569 | -0.5658 | Avg Surface Rut/SQRT TESAL's | |
| STATIC VTM | -0.3564 | -0.4107 | Avg Surface Rut/SQRT TESAL's | |
| GTM VMA | 0.0691 * | 0.2891 * | Avg Rut Depth | |
| ROTATING VMA | 0.0891 * | 0.3321 * | Avg Surface Rut/SQRT TESAL's | |
| STATIC VMA | 0.1342 * | 0.3827 * | Avg Surface Rut/SQRT TESAL's | |
| GS I | 0.4688 | | | |
| CREEP | -0.0204 * | 0.0893 | Rut in Layer | |
| GTM STABILITY | -0.2138 | | | |
| GTM FLOW | 0.1961 | 0.2299 | Max Surface Rut Depth | |
| GTM STAB/FLOW | -0.2417 | -0.2475 | Max Surface Rut Depth | |
| GTM BEARING CAPACITY | -0.2348 | -0.2407 | Max Surface Rut Depth | |
| STATIC STABILITY | -0.3388 | | | |
| STATIC FLOW | -0.1858 * | -0.2845 * | Avg Surface Rut/SQRT TESAL's | |
| STATIC STAB/FLOW | -0.1179 | 0.1557 * | Rut in Layer/SQRT TESAL's | |
| STATIC BEARING CAP | -0.0830 | 0.1642 * | Rut in Layer/SQRT TESAL's | |
| ROTATING STABILITY | -0.2788 | -0.3053 | Max Surface Rut Depth | |
| ROTATING FLOW | 0.1759 | 0.1823 | Max Surface Rut/SQRT TESAL's | |
| ROTATING STAB/FLOW | -0.3053 | | | |
| ROTATING BEARING CAP | -0.2958 | | | |

* = Reverse relationship

Table 19. Summary of ANOVA and Duncan's Test
on Unit Weight and Voids Total Mix
for Wearing Mixes (Age=4 or more years)

| SOURCE | DEGREES OF FREEDOM | SUM OF SQUARES | MEAN SQUARE | F VALUE |
|-----------------|--------------------|----------------|-------------|---------|
| UNIT WEIGHT | | | | |
| Total | 83 | 150.7 | | |
| Model | 4 | 95.7 | 23.9 | 34.36 |
| Error | 79 | 55.0 | 0.70 | |
| VOIDS TOTAL MIX | | | | |
| Total | 84 | 78.8 | | |
| Model | 4 | 36.3 | 9.08 | 17.10 |
| Error | 80 | 42.5 | 0.53 | |

DUNCAN'S MULTIPLE RANGE TEST
alpha = 0.05

| DUNCAN'S* GROUPING | UNIT WEIGHT | | DUNCAN'S* GROUPING | VOIDS TOTAL MIX | |
|--------------------|-------------|------------|--------------------|-----------------|----------|
| | COMPACTOR | MEAN (pcf) | | COMPACTOR | MEAN (%) |
| D | ROTATING | 1.437 | A | ROTATING | -0.954 |
| C | STATIC | 0.703 | B | STATIC | -0.376 |
| C | GTM | 0.205 | B & C | GTM | -0.056 |
| B | IN-PLACE | -0.432 | C | IN-PLACE | 0.193 |
| A | MIX DESIGN | -1.756 | D | MIX DESIGN | 1.073 |

* Variables with the same letter are not significantly different.

Table 20. Summary of ANOVA and Duncan's Test
on Unit Weight and Voids Total Mix
for Binder Mixes (Age=4 or more years)

| SOURCE | DEGREES OF FREEDOM | SUM OF' SQUARES | MEAN SQUARE | F VALUE |
|-----------------|--------------------|-----------------|-------------|---------|
| UNIT WEIGHT | | | | |
| Total | 80 | 176.3 | | |
| Model | 4 | 95.0 | 23.7 | 22.21 |
| Error | 76 | 81.3 | 1.07 | |
| VOIDS TOTAL MIX | | | | |
| Total | 84 | 89.1 | | |
| Model | 4 | 39.1 | 9.78 | 15.65 |
| Error | 80 | 50.0 | 0 . 6 2 | |

DUNCAN'S MULTIPLE RANGE TEST
alpha = 0.05

| DUNCAN 'S* GROUPING | UNIT WEIGHT | | DUNCAN 'S* GROUPING | VOIDS TOTAL MIX | |
|---------------------|-------------|------------|---------------------|-----------------|----------|
| | COMPACTOR | MEAN (pcf) | | COMPACTOR | MEAN (%) |
| D | ROTATING | 1.030 | A | ROTATING | -0.647 |
| D | GTM | 0.976 | A | GTM | -0.594 |
| C | STATIC | 0.130 | A & B | STATIC | -0.074 |
| B | IN-PLACE | -0.792 | B | IN-PLACE | 0.357 |
| A | MIX DESIGN | -1.964 | C | MIX DESIGN | 1.326 |

* Variables with the same letter are not significantly different

Table 21. Summary of Stepwise Regression Analysis
For Mix Design Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.33) | | | | |
| 1 | Passing #8 | 1 | 0.2445 | 0.2445 |
| 2 | # Blows | 2 | 0.0280 | 0.2725 |
| 3 | Stability | 3 | 0.0190 | 0.2915 |
| 4 | Flow | 4 | 0.0124 | 0.3040 |
| Binder Mix All Variables R-square = 0.43) | | | | |
| 1 | Flow | 1 | 0.1382 | 0.1382 |
| 2 | Passing #200 | 2 | 0.0469 | 0.1852 |
| 3 | VMA | 3 | 0.0666 | 0.2517 |
| 4 | Passing #8 | 4 | 0.0792 | 0.3308 |
| 5 | % Asphalt Cement | 5 | 0.0726 | 0.4035 |

Backward Selection Procedure

| Step | Variable Removed | Number In | Partial R-square | Model R-square |
|---|------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.33) | | | | |
| 1 | VTM | 9 | 0.0001 | 0.3273 |
| 2 | Passing #200 | 8 | 0.0011 | 0.3262 |
| 3 | % Asphalt Cement | 7 | 0.0049 | 0.3213 |
| 4 | Stability | 6 | 0.0032 | 0.3181 |
| 5 | VMA | 5 | 0.0050 | 0.3131 |
| 6 | Stability/Flow | 4 | 0.0062 | 0.3068 |
| 7 | Bearing Capacity | 3 | 0.0165 | 0.2903 |
| 8 | Flow | 2 | 0.0178 | 0.2725 |
| 9 | # Blows | 1 | 0.0280 | 0.2445 |
| Binder Mix (All Variables R-square = 0.43) | | | | |
| 1 | VTM | 9 | 0.0010 | 0.4285 |
| 2 | # Blows | 8 | 0.0039 | 0.4246 |
| 3 | Bearing Capacity | 7 | 0.0063 | 0.4183 |
| 4 | Stability/Flow | 6 | 0.0041 | 0.4141 |
| 5 | Stability | 5 | 0.0107 | 0.4035 |
| 6 | Passing #200 | 4 | 0.0317 | 0.3718 |
| 7 | VMA | 3 | 0.0582 | 0.3136 |
| 8 | Flow | 2 | 0.0937 | 0.2198 |

Table 22. Summary of Stepwise Regression Analysis
For Construction Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.34) | | | | |
| 1 | Passing #8 | 1 | 0.2787 | 0.2787 |
| 2 | Passing #200 | 2 | 0.0385 | 0.3172 |
| 3 | VTM | 3 | 0.0272 | 0.3444 |
| Binder Mix (All Variables R-square = 0.47) | | | | |
| 1 | Passing #8 | 1 | 0.1895 | 0.1895 |
| 2 | VTM | 2 | 0.0788 | 0.2684 |
| 3 | Passing #200 | 3 | 0.1678 | 0.4362 |
| 4 | % AC | 4 | 0 . 0 3 4 6 | 0.4708 |

Backward Selection Procedure

| Step | Variable Removed | Number In | Partial R-square | Model R-square |
|---|------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.34) | | | | |
| 1 | % AC! | 3 | 0.0001 | 0.3444 |
| 2 | VTM | 2 | 0.0272 | 0.3172 |
| 3 | Passing #200 | 1 | 0.0385 | 0.2787 |
| Binder Mix (All Variables R-square = 0.47) | | | | |
| 1 | % AC | 3 | 0.0346 | 0.4362 |

Table 23. Summary of Stepwise Regression Analysis For Post Construction Longitudinal Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.55) | | | | |
| 1 | Passing #8 | 1 | 0.4373 | 0.4373 |
| 2 | Passing #200 | 2 | 0.0341 | 0.4714 |
| 3 | Crushed particles | 3 | 0.0206 | 0.4920 |
| 4 | % Nat'l sand | 4 | 0.0122 | 0.5042 |
| 5 | Avg. VTM | 5 | 0.0161 | 0.5203 |
| 6 | % AC | 6 | 0.0189 | 0.5392 |
| Binder Mix (All Variables R-square = 0.64) | | | | |
| 1 | % AC | 1 | 0.2435 | 0.2435 |
| 2 | Passing #8 | 2 | 0.0873 | 0.3308 |
| 3 | Crushed particles | 3 | 0.0811 | 0.4119 |
| 4 | Avg. VTM | 4 | 0 . 0 8 5 7 | 0.4976 |
| 5 | Viscosity | 5 | 0.1008 | 0.5985 |
| 6 | Passing #200 | 6 | 0.0369 | 0.6354 |

Backward Selection Procedure

| Step | Variable Removed | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.55) | | | | |
| 1 | Passing #200 | 7 | 0.0043 | 0.5494 |
| 2 | Viscosity | 6 | 0.0160 | 0.5335 |
| 3 | Penetration | 5 | 0.0044 | 0.5290 |
| 4 | % AC | 4 | 0.0205 | 0.5086 |
| 5 | Avg. VTM | 3 | 0.0270 | 0.4816 |
| 6 | % Nat'l sand | 2 | 0.0185 | 0.4631 |
| 7 | Crushed particles | 1 | 0.0258 | 0.4373 |
| Binder Mix (All Variables R-square = 0.64) | | | | |
| 1 | Penetration | 7 | 0.0015 | 0.6382 |
| 2 | % Nat'l sand | 6 | 0.0028 | 0.6354 |
| 3 | Passing #200 | 5 | 0.0369 | 0.5985 |
| 4 | Crushed particles | 4 | 0.0550 | 0.5434 |

Table 24. Summary of Stepwise Regression Analysis
For GTM Recompacted Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.68) | | | | |
| 1 | Passing #8 | 1 | 0.4373 | 0.4373 |
| 2 | GSI | 2 | 0.1219 | 0.5592 |
| 3 | Avg. VTM | 3 | 0.0206 | 0.5798 |
| 4 | Creep | 4 | 0.0308 | 0.6106 |
| 5 | VMA | 5 | 0.0254 | 0.6360 |
| 6 | Passing #200 | 6 | 0.0103 | 0.6463 |
| Binder Mix (All Variables R-square = 0.95) | | | | |
| 1 | GTM VTM | 1 | 0.4158 | 0.4158 |
| 2 | Viscosity | 2 | 0.1022 | 0.5180 |
| 3 | Avg. VTM | 3 | 0.0600 | 0.5780 |
| 4 | Passing #8 | 4 | 0.0511 | 0.6290 |
| 5 | Creep | 5 | 0.0616 | 0.6906 |
| 6 | Bearing capacity | 6 | 0.0437. | 0.7344 |
| 7 | Crushed particles | 7 | 0.0474 | 0.7818 |
| 8 | GTM VMA | 8 | 0.0287 | 0.8105 |
| 9 | Stability | 9 | 0.0565 | 0.8670 |
| 10 | Passing #200 | 10 | 0.0657 | 0.9326 |
| 11 | Stab/Flow | 11 | 0.0173 | 0.9499 |
| 12 | % AC | 12 | 0.0091 | 0.9589 |
| 13 | GSI | 13 | 0.0095 | 0.9684 |

Table 24. (Cent) Summary of Stepwise Regression Analysis
For GTM Recompacted Variables

| Backward Selection Procedure | | | | |
|---|-------------------|-----------|------------------|----------------|
| Step | Variable Removed | Number In | Partial R-square | Model R-square |
| Wearing Mix (All Variables R-square = 0.68) | | | | |
| 1 | Stability | 15 | 0.0000 | 0.6769 |
| 2 | Avg. VTM | 14 | 0.0000 | 0.6769 |
| 3 | Flow | 13 | 0.0005 | 0.6764 |
| 4 | Penetration | 12 | 0.0003 | 0.6761 |
| 5 | Passing #200 | 11 | 0.0019 | 0.6742 |
| 6 | Passing #8 | 10 | 0.0029 | 0.6713 |
| 7 | GSI | 9 | 0.0068 | 0.6646 |
| 8 | Viscosity | 8 | 0.0030 | 0.6616 |
| 9 | % Nat'l sand | 7 | 0.0069 | 0.6547 |
| 10 | Crushed particles | 6 | 0.0074 | 0.6473 |
| 11 | GTM VMA | 5 | 0.0398 | 0.6075 |
| 12 | GTM VTM | 4 | 0.0134 | 0.5942 |
| 13 | Creep | 3 | 0.0413 | 0.5528 |
| 14 | Avg. VTM | 2 | 0.0405 | 0.5123 |
| Binder Mix (All Variables R-square = 0.95) | | | | |
| 1 | Flow | 14 | 0.0000 | 0.9450 |
| 2 | % Nat'l sand | 13 | 0.0003 | 0.9447 |
| 3 | GSI | 12 | 0.0013 | 0.9434 |
| 4 | Penetration | 11 | 0.0007 | 0.9589 |
| 5 | % AC | 10 | 0.0091 | 0.9499 |
| 6 | Passing #8 | 9 | 0.0074 | 0.9425 |
| 7 | Bearing Capacity | 8 | 0.0169 | 0.9257 |

Table 25. Summary of Stepwise Regression Analysis
For Static Base Recompacted Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.72) | | | | |
| 1 | Passing #8 | 1 | 0.4378 | 0.4378 |
| 2 | Stability | 2 | 0.1606 | 0.5986 |
| 3 | Avg. VTM | 3 | 0.0356 | 0.6342 |
| 4 | Static VMA | 4 | 0.0557 | 0.6899 |
| 5 | % Nat'l sand | 5 | 0.0140 | 0.7039 |
| Binder Mix (All Variables R-square = 0.97) | | | | |
| 1 | Static VTM | 1 | 0.3970 | 0.3970 |
| 2 | Viscosity | 2 | 0.1794 | 0.5764 |
| 3 | Passing #8 | 3 | 0.0553 | 0.6317 |
| 4 | Crushed particles | 4 | 0.0448 | 0.6765 |
| 5 | Avg. VTM | 5 | 0.0424 | 0.7189 |
| 6 | Static VMA | 6 | 0.0473 | 0.7662 |
| 7 | Flow | 7 | 0.0472 | 0.8134 |
| 8 | Creep | 8 | 0.0403 | 0.8537 |
| 9 | Passing #200 | 9 | 0.0299 | 0.8836 |
| 10 | % Nat'l sand | 10 | 0.0381 | 0.9217 |

Backward Selection Procedure

| Step | Variable Removed | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.72) | | | | |
| 1 | Stability | 13 | 0.0000 | 0.7217 |
| 2 | Bearing capacity | 12 | 0.0000 | 0.7217 |
| 3 | Crushed particles | 11 | 0.0001 | 0.7216 |
| 4 | Viscosity | 10 | 0.0002 | 0.7214 |
| 5 | Creep | 9 | 0.0003 | 0.7211 |
| 6 | Penetration | 8 | 0.0009 | 0.7201 |
| 7 | % AC | 7 | 0.0028 | 0.7173 |
| 8 | Passing #200 | 6 | 0.0046 | 0.7127 |
| 9 | Static VMA | 5 | 0.0036 | 0.7091 |
| 10 | % Nat'l sand | 4 | 0.0170 | 0.6922 |
| 11 | Flow | 3 | 0.0309 | 0.6612 |
| Binder Mix (All Variables R-square = 0.97) | | | | |
| 1 | % AC | 13 | 0.0013 | 0.9652 |
| 2 | Passing #8 | 12 | 0.0010 | 0.9642 |
| 3 | Penetration | 11 | 0.0044 | 0.9598 |
| 4 | % Nat'l sand | 10 | 0.0065 | 0.9534 |

Table 26. Summary of Stepwise Regression Analysis
For Rotating Base Recompacted Variables

Forward Selection Procedure

| Step | Variable Entered | Number In | Partial R-square | Model R-square |
|---|-------------------|-----------|------------------|----------------|
| Wearing Mix (All Variables R-square = 0.73) | | | | |
| 1 | Passing #8 | 1 | 0.4393 | 0.4393 |
| 2 | Stability | 2 | 0.1333 | 0.5726 |
| 3 | Rotating VMA | 3 | 0.0544 | 0.6270 |
| 4 | Average VTM | 4 | 0.0649 | 0.6919 |
| 5 | % Nat'l Sand | 5 | 0.0144 | 0.7063 |
| 6 | Rotating VTM | 6 | 0.0087 | 0.7151 |
| Binder Mix (All Variables R-square = 0.93) | | | | |
| 1 | Rotating VTM | 1 | 0.3970 | 0.3970 |
| 2 | Viscosity | 2 | 0.1794 | 0.5764 |
| 3 | Passing #8 | 3 | 0.0553 | 0.6317 |
| 4 | Crushed particles | 4 | 0.0448 | 0.6765 |
| 5 | Average VTM | 5 | 0.0424 | 0.7189 |
| 6 | Rotating VMA | 6 | 0.0473 | 0.7662 |
| 7 | Creep | 7 | 0.0343 | 0.8005 |
| 8 | Stability | 8 | 0.0380 | 0.8385 |
| 9 | Stability/Flow | 9 | 0.0617 | 0.9002 |
| 10 | Penetration | 10 | 0.0160 | 0.9162 |
| 11 | % Nat'l sand | 11 | 0.0130 | 0.9292 |

APPENDIX "B"

FIGURES

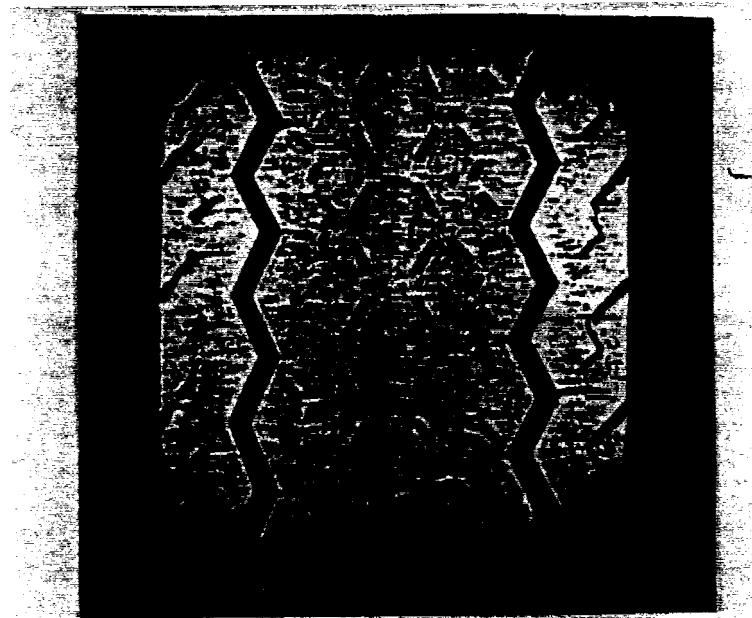


Figure 1. Pressure print of a load tire



Figure 2. Channelized two-way traffic during construction



Figure 3. Rutting on I-70, Washington County (1986)

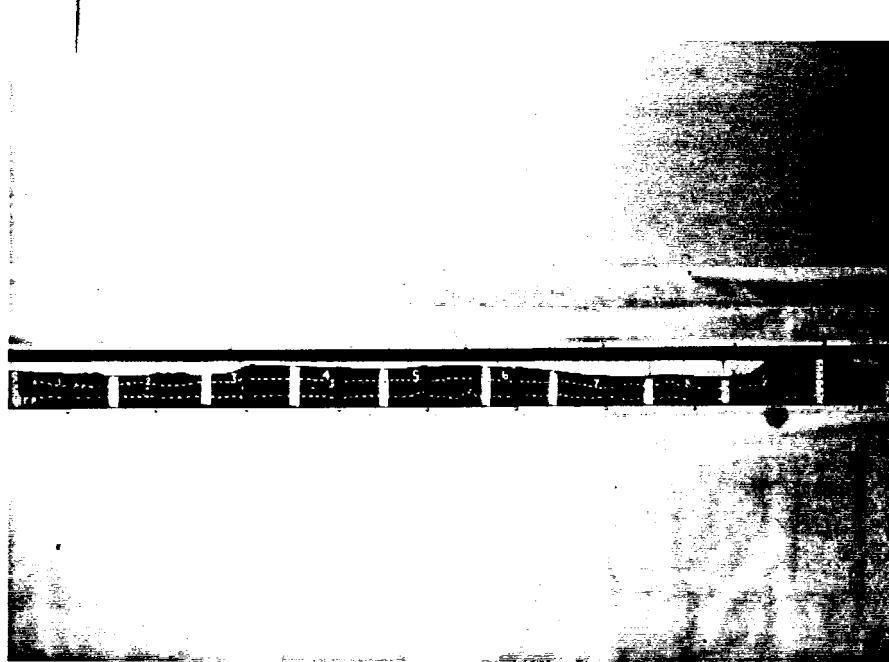


Figure 4. View of the pavement slab from 1-70

NOT TO SCALE

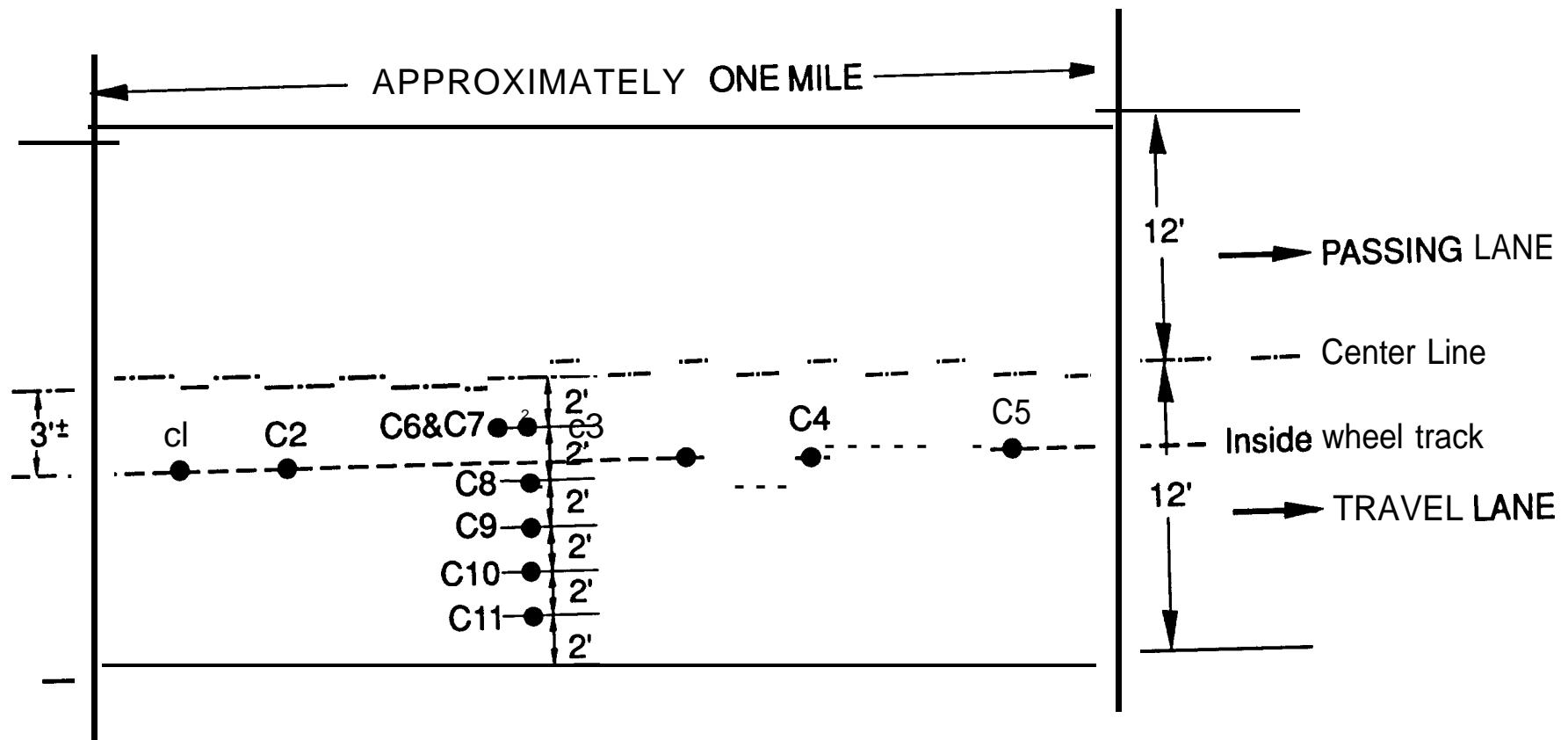


Figure 5. Core sampling plan

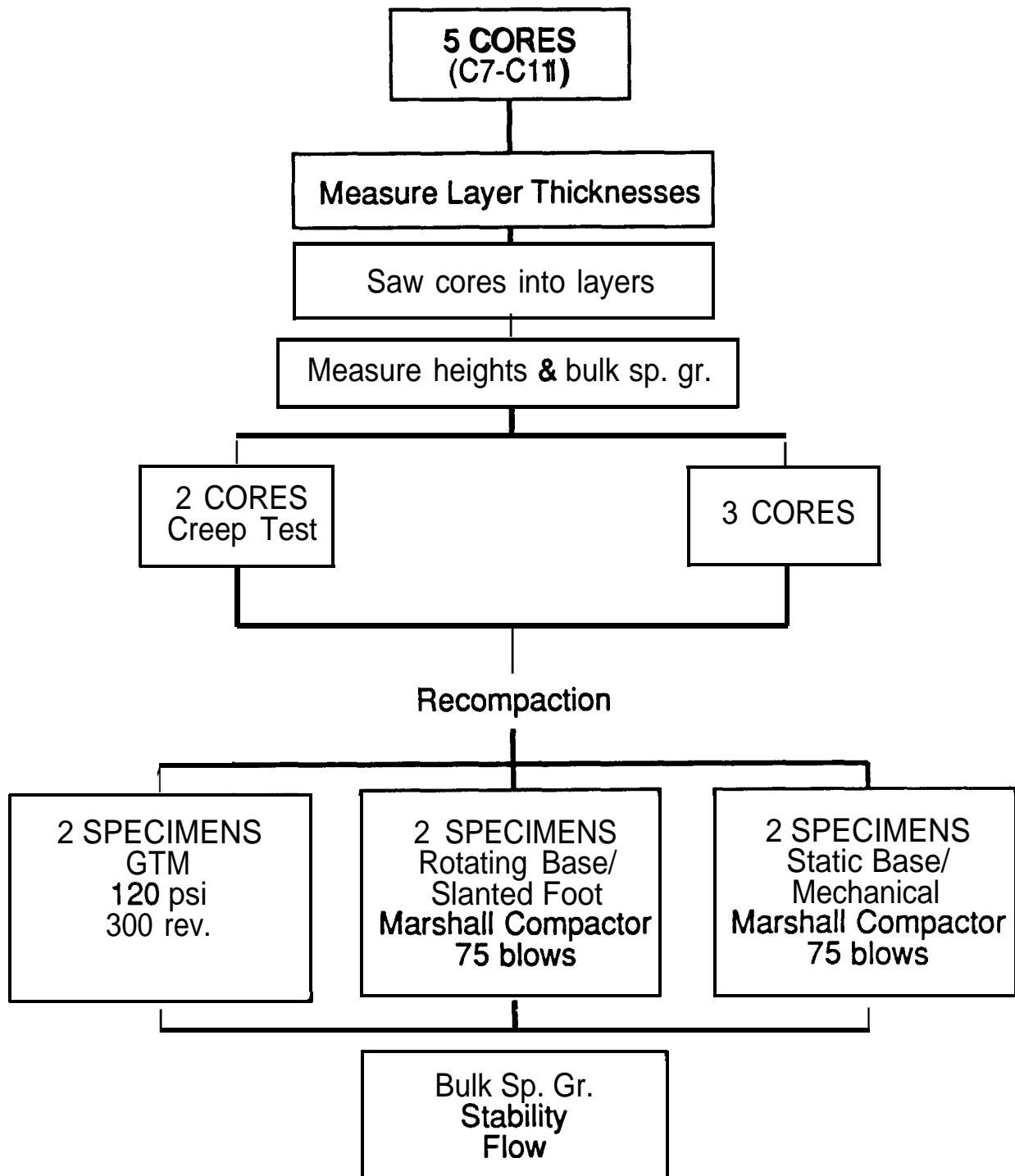


Figure 6. Flow chart for testing Cores C7-C11

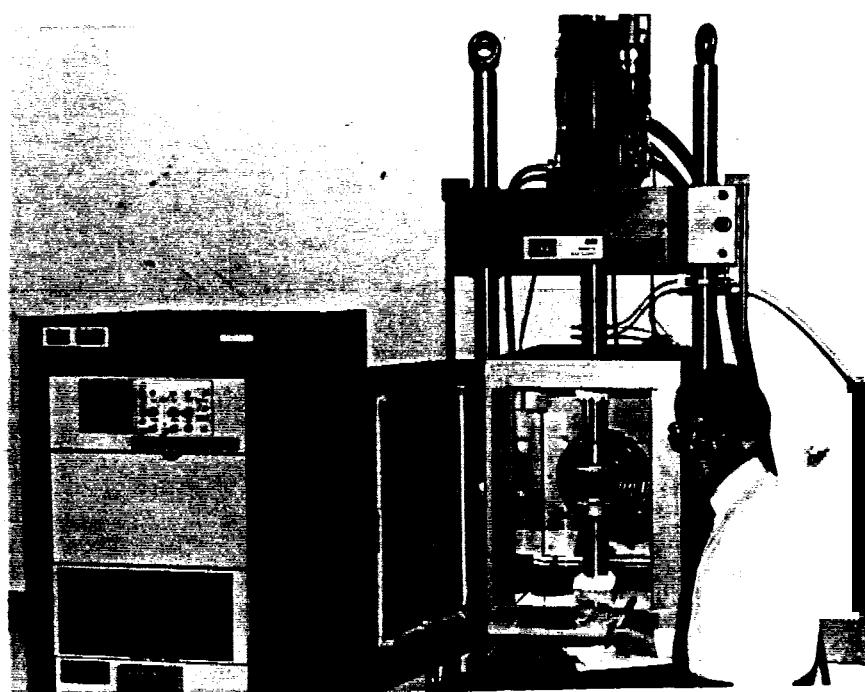


Figure 7. MTS machine used for static creep tests



Figure 8. Gyratory testing machine (GTM)

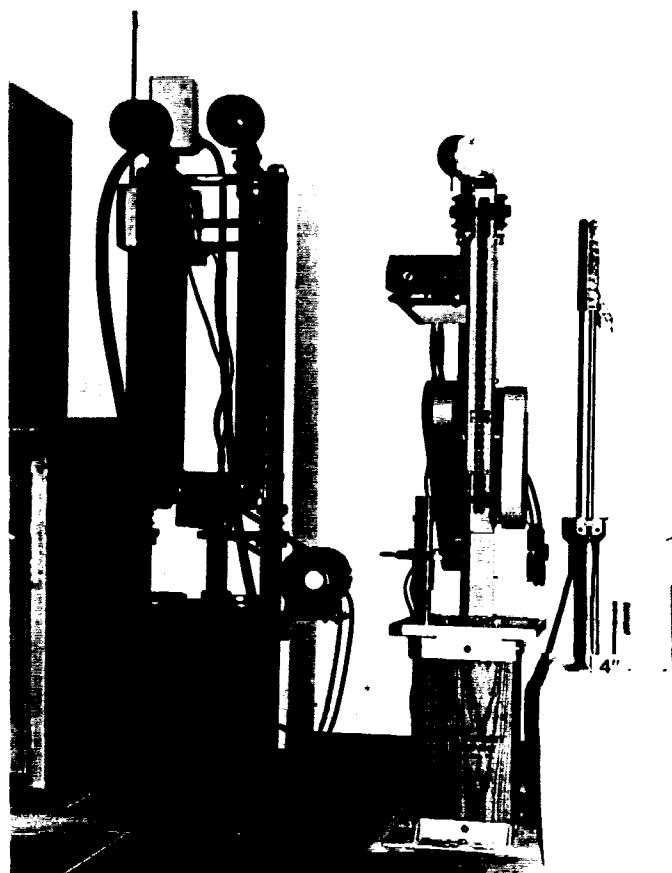


Figure 9. Rotating base (left) and static base (right) mechanical compactors

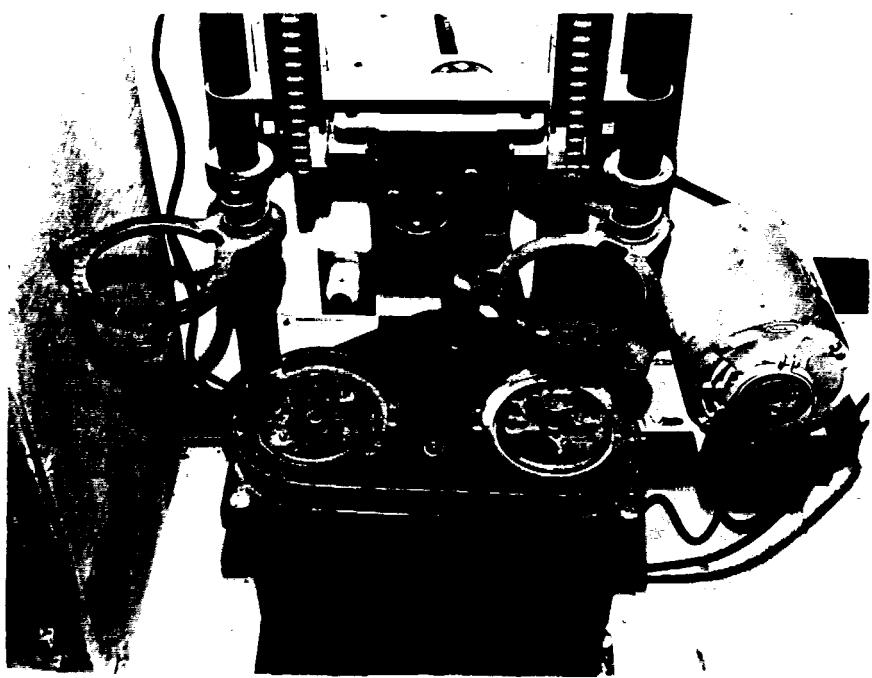


Figure 10. Closeup of rotating base slanted foot Marshall compactor