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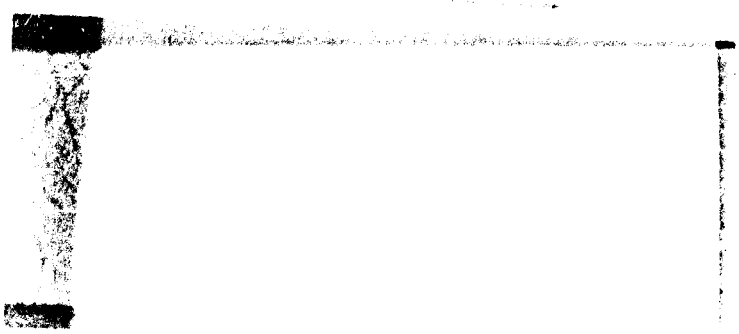

TRONCHEMICS RESEARCH INC.

MINNEAPOLIS 23, MINNESOTA

Final Report
Programming and Computing Service for Evaluation of Composite Armor
Contract DA 19-129-QM-2058
(OI 6134)

Project No. 7X80-05-001

U. S. Army
Q. M. R. &E. Center
Natick, Massachusetts

TABLE OF CONTENTS

Section I - Introduction.

The data contained in Sections 5 and 6 of this report represent the results of the analysis, programming and computing performed under the terms of Contract DA 19-129-QM-2058 (OI 6134) for the "Programming and Computing Service for Evaluation of Composite Armor".

A series of experiments concerned with the firing of projectiles through various materials resulted in sets of experimental data relating the striking velocity VS_o and the residual or exit velocity VR_o. The striking velocity and residual velocity for a material of areal density, M', can be characterized in terms of a given set of experimental data by the following relationships

$$(1) \quad VR = \frac{VS_o + VR_o}{2} - \left(\frac{VS_o + VR_o}{2}\right) \frac{(1 + a)\, M'}{K}$$

$$(2) \quad VS = (VS_o + VR_o) - VR$$

and

$$(3) \quad (1 + a) = \frac{K}{M} \left(\frac{VS_o - VR_o}{VS_o + VR_o}\right)$$

where M is the areal density of the material used in the experiment and K is a constant for the material. The parameter $(1 + a)$ is dependent only upon the average $\frac{(VS_o + VR_o)}{2}$ and not on the areal density. Eliminating $(1 + a)/K$ from equation (1) we obtain

$$(4) \quad VR = \frac{VS_o + VR_o}{2} - \left(\frac{VS_o + VR_o}{2}\right) \frac{M'}{M}$$

Using equations (4) and (2) an investigation was made to determine the "best armor" combinations for a set of ten materials in the sense that a combination of materials is a desirable one if it resulted in a resultant exiting residual velocity which was smaller than other combinations of materials.

A program was written to compute the residual velocity for a given striking (initial) velocity for a composite of three (or two) layered materials within three different total weight limits, M, (18, 28, 38 oz/ft^2) at intervals of 2 oz/ft^2 in order to locate optimum combinations for minimum projectile velocity of perforation. The resultant program considered all combinations of three materials (as well as two) varying the amounts of each from zero to the pertinent weight limits mentioned above. Material combinations of the form A B A (where A and B are material types) were also included. From the results of each combination of materials and weights for a given initial striking velocity the "ten best armor" combinations were obtained. These combinations would result in the lowest perforation velocities.

The tables contained in this document give the results for the computations applied to the experimental data given in Section 4. The tables in Section 5 correspond to the results of using equations (2) and (4), extrapolation and data smoothing. The first table contains the results for VS vs VR for M' = 2 oz/ft^2 for the ten materials. The remaining tables giving VS vs VR as a function of the materials and the weight M' where M' = 4, 6, 8, ..., 36, 38 oz/ft^2. Section 6 gives the tables which describe the "best armor combinations" as a function of initial striking velocity, total weight combination and material weight distribution. For example, for the striking velocity of 2100 ft/sec and a total weight of 38 oz/ft^2 we see that a combination of materials (5, 2, 8) with weight (6, 12, 20) oz/ft^2 gives an exiting velocity of 603 ft/sec. At 18 oz/ft^2 for the same velocity the two material combination of (2, 5) having a weight distribution of (16, 2) yields an exit velocity of 1658 ft/sec. Along with these tables we have

also given a set of tables which describe the number of cases (called In-range values) where the exit velocity can be almost as good (within possibly 1 '/sec) as the combinations listed in the tables. These cases will have velocities no smaller than those already in the table. To illustrate, we consider the case of the initial striking velocity of 2100 '/sec. Here for the total weights of 18, 28 and 38 oz/ft^2 we see there may be 20, 9 and 8 other combinations which have exiting velocities slightly larger than those contained in the best combination tables. Finally it can be seen from the tables in Section 5 that certain velocity cases might be outside the range of the table. A count was kept, called ICOUNT, of the total number of cases of velocities which were outside the range of the compiled tables. In the case we are currently discussing there were 9,732 combinations which were discarded at some part in the program since the residual velocity was outside permissible computed values.

A brief discussion follows on the assumptions made concerning the techniques for extrapolation, interpolation, smoothing and computational procedures. A more detailed discussion of all these items will be found in references 1, 2, 3, 4, 5 and 6.

As can be seen from equation (4) for certain values of VS_o, VR_o, M and M' it is possible that VR can become negative. Extrapolating, in general, the data based on the experimental information can also lead to difficulties. To overcome these problems certain reasonable limitations were placed on the procedures developed for computing the tables of Section 5 based on the experimental data of Section 4.

Using the experimental data of Section 4 and equations (4) and (2) values of VS vs VR were computed for each of the striking velocities 800, 900, 1000, --- 3600. At the high velocity end of the experimental table, linear extrapolation was used to obtain values by and those derived directly from the experimental data. An increment based on the difference between the highest values (VS_o = 3600'/sec) and the third from the highest value (VS_o = 3000'/sec) was used as the extrapolation interval. A similar aprocedure was used for VR_o. The computed tables were then checked for consistency. Monotonicity of VR and VS was checked, VS had to be greater than VR, and VS and VR had to be non-negative. Parabolic extrapolation was used to extend the tables at the lower end if any of the previous conditions were not satisfied. In particular two additional parts were added to the table using parabolic extrapolation. All data was checked for consistency after the parabolic extrapolation. Linear interpolation was used in the search for appropriate velocity combinations after correcting the table of computed values.

As was indicated earlier, if the value of the striking velocity sought in a table was outside of the table range it was discarded. In one case the velocity was still considered. If the residual velocity for the lowest value of the striking velocity in the table was zero, the associated table look up value was also called zero. For if a material stopped a projectile with a given velocity, it would do so for a smaller velocity.

Section II - References.

1. Letter - H. K. Smead to Quartermaster Research and Engineering Center, Attention of Mr. A. H. Kichen, August 7, 1962.

2. Contract DA 19-129-QM-2058 (OI-6134) as amended.

3. Letter - A. M. Crugnola to A. Franck, July 19, 1962.

4. Telephone Conversation of A. M. Crugnola with A. Franck of 2 August 1962.

5. Phase I Report, dated 7 September 1962.

6. Addendum to Phase I Report, dated 4 February 1963.

Section III - Remarks on Data.

1. Whenever the tables show only a period, the value indicated is zero.

2. INRG(i), i = 1, 2, 3 corresponds to the number of cases for material weights of 18, 28 and 30 oz/ft^2 respectively for which the combination will be possibly within 1'/sec of the best combination in the specified table.

3. ICOUNT designates the number of combination cases for which the velocity used in the table search was outside the table range.

Section IV - Experimental Data

TABLE OF RESIDUAL VELOCITIES VR (FT/SEC)

MAT.	Areal Density, M (Oz/Ft^2)	Striking Vel. VS (ft/sec)	800	900	1000	1200	1500	1800	2100	2400	2700	3000	3300	3600
1	12.0		660	760	855	1045	1330	1615	1900	2185	2475	2765	3055	3340
2	11.9		720	807	885	1050	1290	1540	1790	2035	2280	2530	2785	3030
3	13.2		490	665	770	960	1255	1540	1830	2120	2410	2700	2990	3280
4	10.2		560	690	810	1040	1350	1640	1920	2210	2490	2780	3070	3350
5	12.0		640	750	840	1030	1310	1580	1855	2130	2400	2680	2955	3230
6	13.5		200	500	700	1000	1290	1580	1860	2160	2440	2730	3020	3300
7	10.9		470	610	750	990	1330	1650	1950	2250	2550	2840	3120	3400
8	2.54		450	630	780	1060	1430	1765	2065	2355	2650	2950	3240	3540
9	6.4		235	515	700	985	1350	1685	1995	2295	2590	2890	3180	3470
10	25.0		560	640	720	880	1120	1360	1600	1840	2080	2325	2565	2810

$K = 8.666\ oz/ft^2$

Section V - Computed Data.

WEIGHT 2

1		2		3		4		5	
VS	VR	VS	VR	VS	VR	VS	VR	VS	VR
547.	521.	588.	574.	470.	375.	490.	427.	547.	507.
644.	620.	677.	663.	565.	498.	596.	542.	638.	607.
742.	718.	767.	753.	668.	622.	704.	656.	733.	707.
842.	818.	861.	846.	800.	765.	816.	774.	838.	813.
940.	915.	952.	933.	902.	868.	924.	886.	933.	907.
1135.	1110.	1138.	1112.	1098.	1062.	1136.	1104.	1129.	1101.
1429.	1401.	1413.	1377.	1396.	1359.	1440.	1410.	1421.	1389.
1723.	1692.	1692.	1648.	1690.	1650.	1736.	1704.	1708.	1672.
2017.	1983.	1971.	1919.	1985.	1945.	2028.	1992.	1998.	1957.
2310.	2275.	2248.	2187.	2281.	2239.	2324.	2286.	2288.	2243.
2606.	2569.	2525.	2455.	2577.	2533.	2616.	2574.	2575.	2525.
2902.	2863.	2804.	2726.	2873.	2827.	2912.	2868.	2867.	2813.
3198.	3157.	3086.	2999.	3168.	3122.	3208.	3162.	3156.	3099.
3492.	3448.	3363.	3267.	3464.	3416.	3500.	3450.	3446.	3384.
3786.	3741.	3642.	3538.	3760.	3710.	3793.	3742.	3735.	3670.
4081.	4034.	3921.	3809.	4056.	4004.	4087.	4033.	4025.	3955.

6		7		8		9		10	
VS	VR	VS	VR	VS	VR	VS	VR	VS	VR
249.	83.	433.	357.	609.	171.	380.	55.	690.	670.
393.	269.	549.	481.	678.	329.	485.	242.	690.	670.
544.	456.	665.	605.	763.	487.	606.	429.	690.	670.
730.	670.	782.	728.	871.	659.	768.	647.	780.	760.
872.	828.	898.	852.	977.	803.	897.	803.	871.	849.
1115.	1085.	1114.	1076.	1185.	1075.	1126.	1059.	1053.	1027.
1411.	1379.	1431.	1399.	1493.	1437.	1448.	1402.	1325.	1295.
1706.	1674.	1739.	1711.	1796.	1769.	1760.	1725.	1598.	1562.
1998.	1962.	2039.	2011.	2096.	2069.	2064.	2031.	1870.	1830.
2298.	2262.	2339.	2311.	2395.	2360.	2364.	2331.	2142.	2098.
2589.	2551.	2639.	2611.	2695.	2655.	2662.	2628.	2415.	2365.
2885.	2845.	2935.	2905.	2995.	2955.	2962.	2928.	2690.	2636.
3181.	3139.	3227.	3193.	3294.	3246.	3259.	3221.	2962.	2903.
3472.	3428.	3518.	3482.	3594.	3546.	3555.	3515.	3237.	3173.
3766.	3719.	3810.	3770.	3893.	3842.	3852.	3808.	3510.	3442.
4059.	4011.	4102.	4058.	4193.	4137.	4148.	4102.	3784.	3711.

MATERIAL 1

M = 12,00

4		6		8	
VS	VR	VS	VR	VS	VR
562.	510.	576.	499.	591.	487.
657.	608.	669.	597.	682.	585.
753.	707.	765.	695.	777.	683.
853.	807.	865.	795.	877.	783.
952.	903.	964.	891.	976.	879.
1148.	1097.	1161.	1084.	1174.	1071.
1443.	1387.	1458.	1373.	1472.	1358.
1738.	1677.	1754.	1661.	1769.	1646.
2033.	1967.	2050.	1950.	2067.	1933.
2328.	2257.	2346.	2239.	2364.	2221.
2625.	2550.	2644.	2531.	2663.	2513.
2922.	2843.	2941.	2824.	2961.	2804.
3218.	3137.	3239.	3116.	3259.	3096.
3513.	3427.	3535.	3405.	3557.	3383.
3809.	3718.	3832.	3696.	3855.	3673.
4105.	4010.	4129.	3986.	4153.	3963.

10		12		14	
VS	VR	VS	VR	VS	VR
606.	476.	621.	465.	635.	454.
695.	574.	708.	563.	720.	551.
788.	672.	800.	660.	812.	648.
888.	772.	900.	760.	912.	748.
988.	867.	1000.	855.	1012.	843.
1187.	1058.	1200.	1045.	1213.	1032.
1486.	1344.	1500.	1330.	1514.	1316.
1785.	1630.	1800.	1615.	1815.	1600.
2083.	1917.	2100.	1900.	2117.	1883.
2382.	2203.	2400.	2185.	2418.	2167.
2681.	2494.	2700.	2475.	2719.	2456.
2980.	2785.	3000.	2765.	3020.	2745.
3280.	3075.	3300.	3055.	3320.	3035.
3578.	3362.	3600.	3340.	3622.	3318.
3877.	3650.	3900.	3628.	3923.	3605.
4176.	3939.	4200.	3915.	4224.	3891.

MATERIAL 1

M = 12,00

16		18		20	
VS	VR	VS	VR	VS	VR
650.	443.	665.	431.	680.	420.
733.	540.	746.	528.	759.	517.
823.	637.	835.	625.	847.	613.
923.	737.	935.	725.	947.	713.
1024.	831.	1036.	819.	1048.	807.
1226.	1019.	1239.	1006.	1252.	993.
1528.	1302.	1543.	1288.	1557.	1273.
1831.	1584.	1846.	1569.	1862.	1553.
2133.	1867.	2150.	1850.	2167.	1833.
2436.	2149.	2454.	2131.	2472.	2113.
2738.	2438.	2756.	2419.	2775.	2400.
3039.	2726.	3059.	2706.	3078.	2687.
3341.	3014.	3361.	2994.	3382.	2973.
3643.	3297.	3665.	3275.	3687.	3253.
3945.	3582.	3968.	3559.	3991.	3537.
4248.	3868.	4271.	3844.	4295.	3820.

22		24		26	
VS	VR	VS	VR	VS	VR
694.	409.	709.	398.	724.	386.
772.	505.	784.	494.	797.	482.
858.	602.	870.	590.	882.	578.
958.	702.	970.	690.	982.	678.
1060.	795.	1073.	783.	1085.	770.
1265.	980.	1278.	968.	1290.	955.
1571.	1259.	1585.	1245.	1599.	1231.
1877.	1538.	1893.	1523.	1908.	1507.
2183.	1817.	2200.	1800.	2217.	1783.
2490.	2095.	2508.	2078.	2525.	2060.
2794.	2381.	2813.	2363.	2831.	2344.
3098.	2667.	3118.	2648.	3137.	2628.
3402.	2953.	3423.	2933.	3443.	2912.
3708.	3232.	3730.	3210.	3752.	3188.
4014.	3514.	4036.	3491.	4059.	3469.
4319.	3796.	4343.	3773.	4366.	3749.

MATERIAL 1

M = 12,00

28

VS	VR
739.	375.
810.	471.
893.	567.
993.	667.
1097.	758.
1303.	942.
1613.	1217.
1923.	1492.
2233.	1767.
2543.	2042.
2850.	2325.
3157.	2608.
3463.	2892.
3773.	3167.
4082.	3446.
4390.	3725.

30

VS	VR
754.	364.
823.	459.
905.	555.
1005.	655.
1109.	746.
1316.	929.
1628.	1203.
1939.	1476.
2250.	1750.
2561.	2024.
2869.	2306.
3176.	2589.
3484.	2871.
3795.	3145.
4104.	3423.
4414.	3701.

32

VS	VR
769.	353.
836.	448.
917.	543.
1017.	643.
1121.	734.
1329.	916.
1642.	1188.
1954.	1461.
2267.	1733.
2579.	2006.
2888.	2288.
3196.	2569.
3504.	2851.
3817.	3123.
4127.	3400.
4438.	3678.

34

VS	VR
783.	341.
848.	436.
928.	532.
1028.	632.
1133.	722.
1342.	903.
1656.	1174.
1970.	1445.
2283.	1717.
2597.	1988.
2906.	2269.
3215.	2550.
3525.	2830.
3838.	3102.
4150.	3378.
4461.	3654.

36

VS	VR
798.	330.
861.	485.
940.	520.
1040.	620.
1145.	710.
1355.	890.
1670.	1160.
1985.	1430.
2300.	1700.
2615.	1970.
2925.	2250.
3235.	2530.
3545.	2810.
3860.	3080.
4173.	3355.
4485.	3630.

38

VS	VR
813.	319.
874.	414.
952.	508.
1052.	608.
1157.	698.
1368.	877.
1684.	1146.
2000.	1415.
2317.	1683.
2633.	1952.
2944.	2231.
3255.	2510.
3565.	2790.
3882.	3058.
4195.	3332.
4509.	3606.

MATERIAL 2

M = 11,90

4		6		8	
VS	VR	VS	VR	VS	VR
599.	570.	610.	566.	621.	562.
684.	658.	692.	653.	700.	648.
773.	747.	780.	740.	787.	733.
869.	838.	877.	830.	885.	822.
962.	923.	971.	914.	981.	904.
1150.	1100.	1163.	1087.	1175.	1075.
1430.	1360.	1448.	1342.	1466.	1324.
1714.	1626.	1736.	1604.	1757.	1583.
1997.	1893.	2023.	1867.	2049.	1841.
2279.	2156.	2310.	2125.	2340.	2095.
2561.	2419.	2596.	2384.	2631.	2349.
2844.	2686.	2883.	2647.	2923.	2607.
3129.	2956.	3172.	2913.	3216.	2869.
3411.	3219.	3459.	3171.	3507.	3123.
3694.	3486.	3746.	3434.	3798.	3382.
3978.	3752.	4034.	3696.	4090.	3640.

10		12		14	
VS	VR	VS	VR	VS	VR
633.	559.	644.	555.	656.	551.
709.	642.	717.	637.	725.	632.
794.	726.	800.	720.	807.	713.
893.	814.	900.	807.	908.	799.
991.	894.	1000.	885.	1010.	875.
1188.	1062.	1201.	1049.	1213.	1037.
1483.	1307.	1501.	1289.	1519.	1271.
1779.	1561.	1801.	1539.	1823.	1517.
2075.	1815.	2101.	1789.	2127.	1763.
2371.	2064.	2402.	2033.	2432.	2003.
2666.	2314.	2702.	2278.	2737.	2243.
2962.	2568.	3002.	2528.	3041.	2489.
3259.	2826.	3302.	2783.	3345.	2740.
3554.	3076.	3602.	3028.	3650.	2980.
3851.	3329.	3903.	3277.	3955.	3225.
4147.	3583.	4203.	3527.	4259.	3471.

MATERIAL 2

M = 11.90

16		18		20	
VS	VR	VS	VR	VS	VR
669.	547.	682.	543.	695.	540.
734.	627.	742.	621.	751.	616.
814.	706.	821.	699.	827.	693.
916.	791.	924.	783.	932.	775.
1020.	865.	1029.	856.	1039.	846.
1226.	1024.	1238.	1012.	1251.	999.
1536.	1254.	1554.	1236.	1571.	1219.
1845.	1495.	1867.	1473.	1888.	1452.
2153.	1737.	2179.	1711.	2206.	1684.
2463.	1972.	2494.	1941.	2524.	1911.
2772.	2208.	2808.	2172.	2843.	2137.
3081.	2449.	3120.	2410.	3160.	2370.
3389.	2696.	3432.	2653.	3475.	2610.
3698.	2932.	3746.	2884.	3794.	2836.
4007.	3173.	4059.	3121.	4111.	3069.
4315.	3415.	4372.	3358.	4428.	3302.

22		24		26	
VS	VR	VS	VR	VS	VR
708.	536.	722.	532.	737.	528.
760.	611.	769.	606.	778.	600.
834.	686.	841.	679.	847.	673.
939.	768.	947.	760.	955.	752.
1049.	836.	1058.	827.	1068.	817.
1264.	986.	1276.	974.	1289.	961.
1589.	1201.	1607.	1183.	1624.	1166.
1910.	1430.	1932.	1408.	1954.	1386.
2232.	1658.	2258.	1632.	2284.	1606.
2555.	1880.	2586.	1849.	2616.	1819.
2878.	2102.	2914.	2066.	2949.	2031.
3199.	2331.	3239.	2291.	3278.	2252.
3519.	2566.	3562.	2523.	3605.	2480.
3842.	2788.	3890.	2740.	3938.	2692.
4163.	3017.	4215.	2965.	4267.	2913.
4484.	3246.	4541.	3189.	4597.	3133.

MATERIAL 2

M = 11,90

28

VS	VR
752.	525.
788.	595.
854.	666.
963.	744.
1078.	807.
1301.	949.
1642.	1148.
1976.	1364.
2310.	1580.
2647.	1788.
2984.	1996.
3318.	2212.
3648.	2437.
3986.	2644.
4319.	2861.
4653.	3077.

30

VS	VR
767.	521.
797.	590.
861.	659.
971.	736.
1087.	798.
1314.	936.
1660.	1130.
1998.	1342.
2336.	1554.
2678.	1797.
3019.	1961.
3357.	2173.
3692.	2393.
4033.	2597.
4372.	2808.
4710.	3020.

32

VS	VR
783.	517.
807.	585.
868.	652.
979.	728.
1097.	788.
1327.	923.
1677.	1113.
2020.	1320.
2362.	1528.
2708.	1727.
3055.	1925.
3397.	2133.
3735.	2350.
4081.	2549.
4424.	2756.
4766.	2964.

34

VS	VR
800.	517.
818.	581.
874.	646.
986.	721.
1107.	778.
1339.	911.
1695.	1095.
2041.	1299.
2388.	1502.
2739.	1696.
3090.	1890.
3436.	2094.
3778.	2307.
4129.	2501.
4476.	2704.
4822.	2908.

36

VS	VR
816.	526.
832.	582.
881.	639.
994.	713.
1116.	769.
1362.	898.
1713.	1077.
2063.	1277.
2414.	1476.
2770.	1665.
3125.	1855.
3476.	2054.
3821.	2264.
4177.	2453.
4528.	2652.
4878.	2852.

38

VS	VR
831.	533.
845.	583.
888.	632.
1002.	705.
1126.	759.
1364.	886.
1730.	1060.
2085.	1255.
2440.	1450.
2800.	1635.
3161.	1819.
3515.	2015.
3865.	2220.
4225.	2405.
4580.	2600.
4935.	2795.

MATERIAL 3

M = 13.20

4		6		8	
VS	VR	VS	VR	VS	VR
534.	346.	596.	316.	658.	287.
604.	472.	643.	445.	682.	419.
692.	598.	715.	575.	739.	551.
818.	747.	836.	729.	854.	711.
920.	850.	937.	833.	955.	815.
1116.	1044.	1135.	1025.	1153.	1007.
1415.	1340.	1433.	1322.	1452.	1303.
1709.	1631.	1729.	1611.	1749.	1591.
2006.	1924.	2026.	1904.	2047.	1883.
2302.	2218.	2324.	2196.	2345.	2175.
2599.	2511.	2621.	2489.	2643.	2467.
2895.	2805.	2918.	2782.	2941.	2759.
3192.	3098.	3215.	3075.	3239.	3051.
3488.	3392.	3513.	3367.	3537.	3343.
3785.	3685.	3810.	3660.	3835.	3635.
4082.	3978.	4107.	3953.	4133.	3927.

10		12		14	
VS	VR	VS	VR	VS	VR
714.	320.	757.	355.	793.	374.
726.	424.	764.	429.	797.	427.
762.	528.	786.	504.	809.	481.
872.	693.	889.	676.	907.	658.
972.	798.	990.	780.	1007.	763.
1171.	989.	1189.	971.	1207.	953.
1470.	1285.	1489.	1266.	1507.	1248.
1768.	1572.	1788.	1552.	1808.	1532.
2067.	1863.	2088.	1842.	2108.	1822.
2366.	2154.	2387.	2133.	2408.	2112.
2665.	2445.	2687.	2423.	2709.	2401.
2964.	2736.	2986.	2714.	3009.	2691.
3262.	3028.	3286.	3004.	3309.	2981.
3561.	3319.	3585.	3295.	3610.	3270.
3860.	3610.	3885.	3585.	3910.	3560.
4159.	3901.	4185.	3875.	4210.	3850.

MATERIAL 3

M = 13,20

16

VS	VR
825.	383.
827.	420.
833.	457.
925.	640.
1024.	746.
1225.	935.
1526.	1229.
1828.	1512.
2129.	1801.
2430.	2090.
2731.	2379.
3032.	2668.
3333.	2957.
3634.	3246.
3935.	3535.
4236.	3824.

18

VS	VR
854.	410.
854.	410.
856.	434.
943.	622.
1042.	728.
1244.	916.
1545.	1210.
1847.	1493.
2149.	1781.
2451.	2069.
2753.	2357.
3055.	2645.
3356.	2934.
3658.	3222.
3960.	3510.
4262.	3798.

20

VS	VR
880.	410.
880.	410.
880.	410.
961.	604.
1059.	711.
1262.	898.
1563.	1192.
1867.	1473.
2170.	1760.
2472.	2048.
2775.	2335.
3077.	2623.
3380.	2910.
3682.	3198.
3985.	3485.
4288.	3772.

22

VS	VR
903.	387.
903.	387.
903.	387.
978.	587.
1077.	693.
1280.	880.
1582.	1173.
1887.	1453.
2190.	1740.
2493.	2027.
2797.	2313.
3100.	2600.
3403.	2887.
3707.	3173.
4010.	3460.
4313.	3747.

24

VS	VR
927.	363.
927.	363.
927.	363.
996.	569.
1094.	676.
1298.	862.
1600.	1155.
1906.	1434.
2210.	1720.
2515.	2005.
2819.	2291.
3123.	2577.
3427.	2863.
3731.	3149.
4035.	3435.
4339.	3721.

26

VS	VR
950.	340.
950.	340.
950.	340.
1014.	551.
1112.	658.
1316.	844.
1619.	1136.
1926.	1414.
2231.	1699.
2536.	1984.
2841.	2269.
3145.	2555.
3450.	2840.
3755.	3125.
4060.	3410.
4365.	3695.

MATERIAL 3

M = 13,20

28		30		32	
VS	VR	VS	VR	VS	VR
974.	316.	997.	293.	1021.	269.
974.	316.	997.	293.	1021.	269.
974.	316.	997.	293.	1021.	269.
1032.	533.	1050.	515.	1067.	498.
1129.	641.	1146.	624.	1164.	606.
1335.	825.	1353.	807.	1371.	789.
1637.	1118.	1656.	1099.	1674.	1081.
1946.	1394.	1965.	1375.	1985.	1355.
2251.	1679.	2272.	1658.	2292.	1638.
2557.	1963.	2578.	1942.	2599.	1921.
2863.	2247.	2885.	2225.	2907.	2203.
3168.	2532.	3191.	2509.	3214.	2486.
3474.	2816.	3497.	2793.	3521.	2769.
3779.	3101.	3804.	3076.	3828.	3052.
4085.	3385.	4110.	3360.	4135.	3335.
4391.	3669.	4416.	3644.	4442.	3618.

34		36		38	
VS	VR	VS	VR	VS	VR
1044.	246.	1068.	222.	1091.	199.
1044.	246.	1068.	222.	1091.	199.
1044.	246.	1068.	222.	1091.	199.
1085.	480.	1103.	462.	1121.	444.
1181.	589.	1199.	571.	1216.	554.
1389.	771.	1407.	753.	1425.	735.
1693.	1062.	1712.	1043.	1730.	1025.
2005.	1335.	2025.	1315.	2044.	1296.
2313.	1617.	2333.	1597.	2354.	1576.
2621.	1899.	2642.	1878.	2663.	1857.
2928.	2182.	2950.	2160.	2972.	2138.
3236.	2464.	3259.	2441.	3282.	2418.
3544.	2746.	3568.	2722.	3591.	2699.
3852.	3028.	3876.	3004.	3901.	2979.
4160.	3310.	4185.	3285.	4210.	3260.
4468.	3592.	4494.	3566.	4519.	3541.

MATERIAL 4

M = 10,20

4		6		8	
VS	VR	VS	VR	VS	VR
525.	398.	560.	370.	594.	341.
624.	516.	653.	490.	681.	464.
727.	633.	751.	609.	774.	586.
836.	754.	857.	733.	877.	713.
942.	868.	961.	849.	980.	830.
1151.	1089.	1167.	1073.	1183.	1057.
1454.	1396.	1469.	1381.	1484.	1366.
1751.	1689.	1767.	1673.	1783.	1657.
2045.	1975.	2063.	1957.	2081.	1939.
2342.	2268.	2361.	2249.	2380.	2230.
2636.	2554.	2657.	2533.	2677.	2513.
2933.	2847.	2955.	2825.	2976.	2804.
3230.	3140.	3253.	3117.	3275.	3095.
3524.	3426.	3549.	3401.	3573.	3377.
3819.	3716.	3845.	3690.	3871.	3664.
4115.	4005.	4142.	3978.	4170.	3950.

10		12		14	
VS	VR	VS	VR	VS	VR
629.	313.	663.	284.	696.	256.
709.	438.	737.	412.	765.	386.
798.	562.	821.	539.	845.	515.
898.	692.	919.	671.	939.	651.
998.	812.	1017.	793.	1035.	775.
1198.	1042.	1214.	1026.	1230.	1010.
1499.	1351.	1513.	1337.	1528.	1322.
1798.	1642.	1814.	1626.	1830.	1610.
2098.	1922.	2116.	1904.	2134.	1886.
2398.	2212.	2417.	2193.	2435.	2175.
2698.	2492.	2719.	2471.	2739.	2451.
2998.	2782.	3019.	2761.	3041.	2739.
3298.	3072.	3320.	3050.	3343.	3027.
3598.	3352.	3622.	3328.	3647.	3303.
3897.	3638.	3923.	3612.	3949.	3586.
4197.	3923.	4225.	3895.	4252.	3868.

MATERIAL 4

M = 10.20

16

VS	VR
730.	228.
793.	360.
868.	492.
960.	630.
1054.	756.
1245.	995.
1543.	1307.
1845.	1595.
2151.	1869.
2454.	2156.
2760.	2430.
3063.	2717.
3365.	3005.
3671.	3279.
3975.	3560.
4280.	3840.

18

VS	VR
763.	199.
821.	334.
892.	468.
980.	610.
1073.	737.
1261.	979.
1557.	1293.
1861.	1579.
2169.	1851.
2473.	2137.
2780.	2410.
3084.	2696.
3388.	2982.
3696.	3254.
4001.	3534.
4307.	3813.

20

VS	VR
797.	171.
849.	308.
915.	445.
1001.	589.
1091.	719.
1277.	963.
1572.	1278.
1877.	1563.
2186.	1834.
2491.	2119.
2801.	2389.
3106.	2674.
3410.	2960.
3720.	3230.
4027.	3508.
4335.	3785.

22

VS	VR
830.	142.
877.	282.
939.	421.
1021.	569.
1110.	700.
1293.	947.
1587.	1263.
1893.	1547.
2204.	1816.
2510.	2100.
2821.	2369.
3127.	2653.
3433.	2937.
3745.	3205.
4053.	3482.
4362.	3758.

24

VS	VR
863.	114.
904.	256.
962.	398.
1042.	548.
1129.	681.
1308.	932.
1601.	1249.
1908.	1532.
2222.	1798.
2529.	2081.
2842.	2348.
3149.	2631.
3456.	2914.
3769.	3181.
4079.	3456.
4389.	3731.

26

VS	VR
896.	85.
932.	230.
986.	374.
1063.	527.
1147.	663.
1324.	916.
1616.	1234.
1924.	1516.
2239.	1781.
2547.	2063.
2863.	2327.
3170.	2610.
3478.	2892.
3794.	3156.
4105.	3430.
4417.	3703.

MATERIAL 4

M = 10.20

28

VS	VR
928.	57.
959.	204.
1009.	351.
1083.	507.
1166.	644.
1340.	900.
1631.	1219.
1940.	1500.
2257.	1763.
2566.	2044.
2883.	2307.
3192.	2588.
3501.	2869.
3818.	3132.
4131.	3404.
4444.	3676.

30

VS	VR
961.	29.
987.	178.
1033.	327.
1104.	486.
1184.	626.
1355.	885.
1646.	1204.
1955.	1485.
2275.	1745.
2584.	2026.
2904.	2286.
3214.	2566.
3523.	2847.
3843.	3107.
4157.	3378.
4472.	3648.

32

VS	VR
993.	.
1014.	152.
1056.	304.
1124.	466.
1203.	607.
1371.	869.
1660.	1190.
1971.	1469.
2292.	1728.
2603.	2007.
2924.	2266.
3235.	2545.
3546.	2824.
3867.	3083.
4183.	3352.
4499.	3621.

34

VS	VR
1027.	.
1044.	140.
1080.	280.
1145.	445.
1222.	588.
1387.	853.
1675.	1175.
1987.	1453.
2310.	1710.
2622.	1988.
2945.	2245.
3257.	2523.
3568.	2802.
3892.	3058.
4209.	3326.
4527.	3593.

36

VS	VR
1059.	.
1074.	128.
1104.	256.
1166.	424.
1240.	570.
1402.	838.
1690.	1160.
2002.	1438.
2328.	1692.
2640.	1970.
2966.	2224.
3278.	2502.
3591.	2779.
3916.	3034.
4235.	3300.
4554.	3566.

38

VS	VR
1090.	.
1102.	116.
1127.	233.
1186.	404.
1259.	551.
1418.	822.
1704.	1146.
2018.	1422.
2345.	1675.
2659.	1951.
2986.	2204.
3300.	2480.
3613.	2757.
3941.	3009.
4261.	3274.
4582.	3538.

MATERIAL 5

M = 12.00

4		6		8	
VS	VR	VS	VR	VS	VR
573.	493.	600.	480.	627.	467.
657.	593.	675.	580.	693.	567.
747.	693.	760.	680.	773.	667.
850.	800.	863.	788.	875.	775.
947.	893.	960.	880.	973.	867.
1143.	1087.	1158.	1073.	1172.	1058.
1437.	1373.	1453.	1358.	1468.	1342.
1727.	1653.	1745.	1635.	1763.	1617.
2018.	1937.	2039.	1916.	2059.	1896.
2310.	2220.	2333.	2198.	2355.	2175.
2600.	2500.	2625.	2475.	2650.	2450.
2893.	2787.	2920.	2760.	2947.	2733.
3185.	3070.	3214.	3041.	3243.	3013.
3477.	3353.	3508.	3323.	3538.	3292.
3768.	3637.	3801.	3604.	3834.	3571.
4060.	3920.	4095.	3885.	4130.	3850.

10		12		14	
VS	VR	VS	VR	VS	VR
654.	453.	681.	440.	708.	427.
712.	553.	730.	540.	749.	527.
787.	653.	800.	640.	813.	627.
888.	763.	900.	750.	913.	738.
987.	853.	1000.	840.	1013.	827.
1186.	1044.	1200.	1030.	1214.	1016.
1484.	1326.	1500.	1310.	1516.	1294.
1782.	1598.	1800.	1580.	1818.	1562.
2080.	1875.	2100.	1855.	2120.	1835.
2378.	2153.	2400.	2130.	2423.	2108.
2675.	2425.	2700.	2400.	2725.	2375.
2973.	2707.	3000.	2680.	3027.	2653.
3271.	2984.	3300.	2955.	3329.	2926.
3569.	3261.	3600.	3230.	3631.	3199.
3867.	3538.	3900.	3505.	3933.	3472.
4165.	3815.	4200.	3780.	4235.	3745.

MATERIAL 5

M = 12,00

16		18		20	
VS	VR	VS	VR	VS	VR
735.	413.	742.	400.	789.	392.
767.	513.	786.	500.	805.	489.
827.	613.	840.	600.	853.	587.
925.	725.	938.	713.	950.	700.
1027.	813.	1040.	800.	1053.	787.
1228.	1002.	1243.	988.	1257.	973.
1532.	1278.	1548.	1263.	1563.	1247.
1837.	1543.	1855.	1525.	1873.	1507.
2141.	1814.	2161.	1794.	2182.	1773.
2445.	2085.	2468.	2063.	2490.	2040.
2750.	2350.	2775.	2325.	2800.	2300.
3053.	2627.	3080.	2600.	3107.	2573.
3358.	2898.	3386.	2869.	3415.	2840.
3662.	3168.	3693.	3138.	3723.	3107.
3966.	3439.	3999.	3406.	4032.	3373.
4270.	3710.	4305.	3675.	4340.	3640.

22		24		26	
VS	VR	VS	VR	VS	VR
814.	406.	837.	416.	859.	422.
827.	490.	848.	488.	867.	484.
867.	573.	880.	560.	893.	547.
963.	688.	975.	675.	988.	663.
1067.	773.	1080.	760.	1093.	747.
1271.	959.	1285.	945.	1299.	931.
1579.	1231.	1595.	1215.	1611.	1199.
1892.	1488.	1910.	1470.	1928.	1452.
2202.	1753.	2223.	1733.	2243.	1712.
2513.	2018.	2535.	1995.	2558.	1973.
2825.	2275.	2850.	2250.	2875.	2225.
3133.	2547.	3160.	2520.	3187.	2493.
3444.	2811.	3473.	2783.	3501.	2754.
3754.	3076.	3785.	3045.	3816.	3014.
4065.	3340.	4098.	3308.	4130.	3275.
4375.	3605.	4410.	3570.	4445.	3535.

MATERIAL 5

M = 12,00

28		30		32	
VS	VR	VS	VR	VS	VR
878.	425.	897.	426.	915.	425.
886.	479.	903.	473.	920.	466.
907.	533.	920.	520.	933.	507.
1000.	650.	1013.	638.	1025.	625.
1107.	733.	1120.	720.	1133.	707.
1313.	917.	1328.	903.	1342.	888.
1627.	1183.	1643.	1168.	1658.	1152.
1947.	1433.	1965.	1415.	1983.	1397.
2263.	1692.	2284.	1671.	2304.	1651.
2580.	1950.	2603.	1928.	2625.	1905.
2900.	2200.	2925.	2175.	2950.	2150.
3213.	2467.	3240.	2440.	3267.	2413.
3530.	2725.	3559.	2696.	3588.	2668.
3847.	2983.	3878.	2953.	3908.	2922.
4163.	3242.	4196.	3209.	4229.	3176.
4480.	3500.	4515.	3465.	4550.	3430.

34		36		38	
VS	VR	VS	VR	VS	VR
932.	423.	949.	420.	965.	416.
936.	458.	952.	450.	967.	441.
947.	493.	960.	480.	973.	467.
1038.	613.	1050.	600.	1063.	588.
1147.	693.	1160.	680.	1173.	667.
1356.	874.	1370.	860.	1384.	846.
1674.	1136.	1690.	1120.	1706.	1104.
2002.	1378.	2020.	1360.	2038.	1342.
2325.	1630.	2345.	1610.	2365.	1590.
2648.	1883.	2670.	1860.	2693.	1838.
2975.	2125.	3000.	2100.	3025.	2075.
3293.	2387.	3320.	2360.	3347.	2333.
3616.	2639.	3645.	2610.	3674.	2581.
3939.	2891.	3970.	2860.	4001.	2829.
4262.	3143.	4295.	3110.	4328.	3077.
4585.	3395.	4620.	3360.	4655.	3325.

MATERIAL 6

M = 13,50

4

VS	VR
345.	17.
459.	214.
589.	411.
759.	641.
894.	806.
1130.	1070.
1426.	1364.
1723.	1657.
2016.	1944.
2316.	2244.
2609.	2531.
2905.	2825.
3201.	3119.
3494.	3406.
3789.	3696.
4084.	3986.

6

VS	VR
457.	.
537.	183.
633.	367.
789.	611.
917.	783.
1144.	1056.
1442.	1348.
1739.	1641.
2033.	1927.
2333.	2227.
2628.	2512.
2925.	2805.
3222.	3098.
3517.	3383.
3813.	3673.
4108.	3962.

8

VS	VR
557.	.
610.	161.
678.	322.
819.	581.
939.	761.
1159.	1041.
1457.	1333.
1755.	1625.
2051.	1909.
2351.	2209.
2647.	2493.
2945.	2785.
3243.	3077.
3539.	3361.
3836.	3649.
4133.	3937.

10

VS	VR
643.	.
676.	139.
722.	278.
848.	552.
961.	739.
1174.	1026.
1473.	1317.
1771.	1609.
2069.	1891.
2369.	2191.
2666.	2474.
2965.	2765.
3264.	3056.
3561.	3339.
3859.	3626.
4157.	3913.

12

VS	VR
717.	.
737.	117.
767.	233.
878.	522.
983.	717.
1189.	1011.
1488.	1302.
1788.	1592.
2087.	1873.
2387.	2173.
2686.	2454.
2985.	2745.
3284.	3036.
3583.	3317.
3883.	3603.
4182.	3888.

14

VS	VR
782.	.
794.	94.
811.	189.
907.	493.
1006.	694.
1204.	996.
1504.	1286.
1804.	1576.
2104.	1856.
2404.	2156.
2705.	2435.
3005.	2725.
3305.	3015.
3606.	3294.
3906.	3579.
4206.	3864.

MATERIAL 6

M = 13,50

16		18		20	
VS	VR	VS	VR	VS	VR
841.	.	895.	.	944.	56.
847.	72.	896.	50.	944.	56.
856.	144.	900.	100.	944.	56.
937.	463.	967.	433.	996.	404.
1028.	672.	1050.	650.	1072.	628.
1219.	981.	1233.	967.	1248.	952.
1519.	1271.	1535.	1255.	1551.	1239.
1820.	1560.	1837.	1543.	1853.	1527.
2122.	1838.	2140.	1820.	2158.	1802.
2422.	2138.	2440.	2120.	2458.	2102.
2724.	2416.	2743.	2397.	2763.	2377.
3025.	2705.	3045.	2685.	3065.	2665.
3326.	2994.	3347.	2973.	3367.	2953.
3628.	3272.	3650.	3250.	3672.	3228.
3929.	3556.	3953.	3533.	3976.	3509.
4231.	3839.	4255.	3815.	4279.	3791.

22		24		26	
VS	VR	VS	VR	VS	VR
989.	11.	1038.	127.	1075.	152.
989.	11.	1040.	200.	1076.	206.
989.	11.	1046.	272.	1080.	260.
1026.	374.	1056.	344.	1085.	315.
1094.	606.	1117.	583.	1139.	561.
1263.	937.	1278.	922.	1293.	907.
1566.	1224.	1582.	1208.	1597.	1193.
1869.	1511.	1886.	1494.	1902.	1478.
2176.	1784.	2193.	1767.	2211.	1749.
2476.	2084.	2493.	2067.	2511.	2049.
2782.	2358.	2801.	2339.	2820.	2320.
3085.	2645.	3105.	2625.	3125.	2605.
3388.	2932.	3409.	2911.	3430.	2890.
3694.	3206.	3717.	3183.	3739.	3161.
3999.	3486.	4023.	3463.	4046.	3439.
4304.	3766.	4328.	3742.	4353.	3717.

MATERIAL 6

M = 13.50

28		30		32	
VS	VR	VS	VR	VS	VR
1111.	210.	1144.	256.	1174.	226.
1111.	210.	1144.	256.	1174.	226.
1112.	248.	1144.	256.	1174.	226.
1115.	285.	1144.	256.	1174.	226.
1161.	539.	1183.	517.	1206.	494.
1307.	893.	1322.	878.	1337.	863.
1613.	1177.	1628.	1162.	1644.	1146.
1918.	1462.	1934.	1446.	1951.	1429.
2229.	1731.	2247.	1713.	2264.	1696.
2529.	2031.	2547.	2013.	2564.	1996.
2840.	2300.	2859.	2281.	2878.	2262.
3145.	2585.	3165.	2565.	3185.	2545.
3450.	2870.	3471.	2849.	3492.	2828.
3761.	3139.	3783.	3117.	3806.	3094.
4069.	3416.	4093.	3393.	4116.	3369.
4377.	3693.	4402.	3668.	4426.	3644.

34		36		38	
VS	VR	VS	VR	VS	VR
1204.	196.	1233.	167.	1263.	137.
1204.	196.	1233.	167.	1263.	137.
1204.	196.	1233.	167.	1263.	137.
1204.	196.	1233.	167.	1263.	137.
1228.	472.	1250.	450.	1272.	428.
1352.	848.	1367.	833.	1381.	819.
1659.	1131.	1675.	1115.	1691.	1099.
1967.	1413.	1983.	1397.	2000.	1380.
2282.	1678.	2300.	1660.	2318.	1642.
2582.	1978.	2600.	1960.	2618.	1942.
2897.	2243.	2917.	2223.	2936.	2204.
3205.	2525.	3225.	2505.	3245.	2485.
3513.	2807.	3533.	2787.	3554.	2766.
3828.	3072.	3850.	3050.	3872.	3028.
4139.	3346.	4163.	3323.	4186.	3299.
4451.	3619.	4475.	3595.	4499.	3571.

MATERIAL 7

M = 10,90

4

VS	VR
696.	574.
696.	574.
696.	574.
808.	702.
921.	829.
1134.	1056.
1446.	1384.
1753.	1697.
2053.	1997.
2353.	2297.
2653.	2597.
2949.	2891.
3243.	3177.
3537.	3463.
3830.	3750.
4124.	4036.

6

VS	VR
508.	282.
617.	413.
726.	544.
835.	675.
944.	806.
1153.	1037.
1462.	1368.
1766.	1684.
2066.	1984.
2366.	2284.
2666.	2584.
2964.	2876.
3260.	3160.
3555.	3445.
3851.	3729.
4146.	4014.

8

VS	VR
545.	245.
651.	379.
756.	514.
861.	649.
967.	783.
1172.	1018.
1477.	1353.
1780.	1670.
2080.	1970.
2380.	2270.
2680.	2570.
2979.	2861.
3276.	3144.
3573.	3427.
3871.	3709.
4168.	3992.

10

VS	VR
583.	207.
685.	345.
786.	484.
888.	622.
990.	760.
1191.	999.
1493.	1337.
1794.	1656.
2094.	1956.
2394.	2256.
2694.	2556.
2993.	2847.
3293.	3127.
3592.	3408.
3891.	3689.
4190.	3970.

12

VS	VR
817.	453.
817.	453.
817.	453.
915.	595.
1013.	737.
1211.	979.
1509.	1321.
1808.	1642.
2108.	1942.
2408.	2242.
2708.	2542.
3008.	2832.
3309.	3111.
3610.	3390.
3911.	3669.
4212.	3948.

14

VS	VR
658.	132.
753.	277.
847.	423.
941.	569.
1036.	714.
1230.	960.
1524.	1306.
1821.	1629.
2121.	1929.
2421.	2229.
2721.	2529.
3023.	2817.
3326.	3094.
3628.	3372.
3931.	3649.
4234.	3926.

MATERIAL 7

M = 10,90

16

VS	VR
696.	94.
787.	243.
877.	393.
968.	542.
1058.	692.
1249.	941.
1540.	1290.
1835.	1615.
2135.	1915.
2435.	2215.
2735.	2515.
3037.	2803.
3342.	3078.
3647.	3353.
3951.	3629.
4256.	3904.

18

VS	VR
734.	56.
821.	209.
907.	363.
994.	516.
1081.	669.
1268.	922.
1555.	1275.
1849.	1601.
2149.	1901.
2449.	2201.
2749.	2501.
3052.	2788.
3359.	3061.
3665.	3335.
3972.	3608.
4278.	3882.

20

VS	VR
771.	19.
854.	176.
938.	332.
1021.	489.
1104.	646.
1288.	902.
1571.	1259.
1863.	1587.
2163.	1887.
2463.	2187.
2763.	2487.
3067.	2773.
3375.	3045.
3683.	3317.
3992.	3588.
4300.	3860.

22

VS	VR
818.	.
893.	151.
968.	302.
1048.	462.
1127.	623.
1307.	883.
1587.	1243.
1876.	1574.
2176.	1874.
2476.	2174.
2776.	2474.
3081.	2759.
3392.	3028.
3702.	3298.
4012.	3568.
4322.	3838.

24

VS	VR
872.	.
935.	136.
998.	272.
1074.	436.
1150.	600.
1326.	864.
1602.	1228.
1890.	1560.
2190.	1860.
2490.	2160.
2790.	2460.
3096.	2744.
3408.	3012.
3720.	3280.
4032.	3548.
4344.	3816.

26

VS	VR
925.	.
977.	121.
1029.	241.
1101.	409.
1173.	577.
1345.	845.
1618.	1212.
1904.	1546.
2204.	1846.
2504.	2146.
2804.	2446.
3111.	2729.
3425.	2995.
3739.	3261.
4052.	3528.
4366.	3794.

MATERIAL 7

M = 10.90

28

VS	VR
974.	.
1017.	106.
1059.	211.
1127.	383.
1196.	554.
1365.	825.
1633.	1197.
1918.	1532.
2218.	1832.
2518.	2132.
2818.	2432.
3126.	2714.
3441.	2979.
3757.	3243.
4073.	3507.
4388.	3772.

30

VS	VR
1022.	.
1056.	90.
1089.	181.
1154.	356.
1219.	531.
1384.	806.
1649.	1181.
1931.	1519.
2231.	1819.
2531.	2119.
2831.	2419.
3140.	2700.
3458.	2962.
3775.	3225.
4093.	3487.
4410.	3750.

32

VS	VR
1119.	151.
1119.	151.
1119.	151.
1181.	329.
1242.	508.
1403.	787.
1665.	1165.
1945.	1505.
2245.	1805.
2545.	2105.
2845.	2405.
3155.	2685.
3474.	2946.
3794.	3206.
4113.	3467.
4432.	3728.

34

VS	VR
1150.	120.
1150.	120.
1150.	120.
1207.	303.
1265.	485.
1423.	767.
1680.	1150.
1959.	1491.
2259.	1791.
2559.	2091.
2859.	2391.
3170.	2670.
3491.	2929.
3812.	3188.
4133.	3447.
4454.	3706.

36

VS	VR
1154.	.
1167.	45.
1180.	90.
1234.	276.
1288.	462.
1442.	748.
1696.	1134.
1973.	1477.
2273.	1777.
2573.	2077.
2873.	2377.
3184.	2656.
3507.	2913.
3830.	3170.
4153.	3427.
4476.	3684.

38

VS	VR
1210.	60.
1210.	60.
1210.	60.
1261.	249.
1311.	439.
1461.	729.
1711.	1119.
1986.	1464.
2286.	1764.
2586.	2064.
2886.	2364.
3199.	2641.
3524.	2896.
3849.	3151.
4173.	3407.
4498.	3662.

MATERIAL 8

M = 2,54

4

VS	VR
842.	.
860.	175.
901.	349.
978.	552.
1063.	717.
1240.	1020.
1520.	1410.
1810.	1755.
2110.	2055.
2413.	2342.
2714.	2636.
3014.	2936.
3317.	3223.
3617.	3523.
3919.	3816.
4220.	4110.

6

VS	VR
1032.	81.
1033.	147.
1038.	212.
1084.	446.
1150.	630.
1295.	965.
1548.	1382.
1824.	1741.
2124.	2041.
2431.	2324.
2734.	2616.
3034.	2916.
3341.	3199.
3641.	3499.
3944.	3791.
4248.	4082.

8

VS	VR
1176.	74.
1176.	74.
1176.	74.
1190.	340.
1236.	544.
1350.	910.
1575.	1355.
1838.	1727.
2138.	2027.
2448.	2307.
2754.	2596.
3054.	2896.
3364.	3176.
3664.	3476.
3970.	3765.
4275.	4055.

10

VS	VR
1284.	.
1286.	78.
1291.	156.
1296.	234.
1323.	457.
1406.	854.
1603.	1327.
1851.	1714.
2151.	2014.
2466.	2289.
2773.	2577.
3073.	2877.
3388.	3152.
3688.	3452.
3995.	3740.
4303.	4027.

12

VS	VR
1403.	127.
1403.	127.
1403.	127.
1403.	127.
1410.	370.
1461.	799.
1630.	1300.
1865.	1700.
2165.	2000.
2484.	2271.
2793.	2557.
3093.	2857.
3412.	3128.
3712.	3428.
4021.	3714.
4330.	4000.

14

VS	VR
1496.	284.
1496.	284.
1496.	284.
1496.	284.
1496.	284.
1516.	744.
1658.	1272.
1879.	1686.
2179.	1986.
2502.	2253.
2813.	2537.
3113.	2837.
3435.	3105.
3735.	3405.
4047.	3688.
4358.	3972.

MATERIAL 8

M = 2,54

16

VS	VR
1571.	689.
1571.	689.
1571.	689.
1571.	689.
1571.	689.
1571.	689.
1685.	1245.
1893.	1672.
2193.	1972.
2519.	2236.
2832.	2518.
3132.	2818.
3459.	3081.
3759.	3381.
4072.	3663.
4385.	3945.

18

VS	VR
1626.	634.
1626.	634.
1626.	634.
1626.	634.
1626.	634.
1626.	634.
1713.	1217.
1907.	1658.
2207.	1958.
2537.	2218.
2852.	2498.
3152.	2798.
3483.	3057.
3783.	3357.
4098.	3637.
4413.	3917.

20

VS	VR
1681.	579.
1681.	579.
1681.	579.
1681.	579.
1681.	579.
1681.	579.
1741.	1189.
1920.	1645.
2220.	1945.
2555.	2200.
2872.	2478.
3172.	2778.
3506.	3034.
3806.	3334.
4123.	3612.
4441.	3889.

22

VS	VR
1736.	524.
1736.	524.
1736.	524.
1736.	524.
1736.	524.
1736.	524.
1768.	1162.
1934.	1631.
2234.	1931.
2572.	2183.
2892.	2458.
3192.	2758.
3530.	3010.
3830.	3310.
4149.	3586.
4468.	3862.

24

VS	VR
1791.	469.
1791.	469.
1791.	469.
1791.	469.
1791.	469.
1791.	469.
1796.	1134.
1948.	1617.
2248.	1917.
2590.	2165.
2911.	2439.
3211.	2739.
3553.	2987.
3853.	3287.
4175.	3560.
4496.	3834.

26

VS	VR
1823.	1107.
1823.	1107.
1823.	1107.
1823.	1107.
1823.	1107.
1823.	1107.
1823.	1107.
1962.	1603.
2262.	1903.
2608.	2147.
2931.	2419.
3231.	2719.
3577.	2963.
3877.	3263.
4200.	3535.
4523.	3807.

MATERIAL 8

M = 2,54

28		30		32	
VS	VR	VS	VR	VS	VR
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1851.	1079.	1878.	1052.	1906.	1024.
1975.	1590.	1949.	1576.	2003.	1562.
2275.	1890.	2249.	1876.	2303.	1862.
2626.	2129.	2643.	2112.	2661.	2094.
2951.	2399.	2970.	2380.	2990.	2360.
3251.	2699.	3270.	2680.	3290.	2660.
3601.	2939.	3624.	2916.	3648.	2892.
3901.	3239.	3924.	3216.	3948.	3192.
4226.	3509.	4251.	3484.	4277.	3458.
4551.	3779.	4578.	3752.	4606.	3724.

34		36		38	
VS	VR	VS	VR	VS	VR
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
1934.	996.	1961.	969.	1989.	941.
2017.	1548.	2031.	1534.	2044.	1521.
2317.	1848.	2331.	1834.	2344.	1821.
2679.	2076.	2696.	2059.	2714.	2041.
3010.	2340.	3029.	2321.	3049.	2301.
3310.	2640.	3329.	2621.	3349.	2601.
3672.	2868.	3695.	2845.	3719.	2821.
3972.	3168.	3995.	3145.	4019.	3121.
4303.	3432.	4328.	3407.	4354.	3381.
4634.	3696.	4661.	3669.	4689.	3641.

MATERIAL 9

M = 6.40

4		6		8	
VS	VR	VS	VR	VS	VR
578.	.	737.	.	899.	.
626.	170.	753.	126.	862.	82.
694.	341.	782.	253.	871.	164.
828.	587.	888.	527.	948.	467.
944.	756.	991.	709.	1038.	663.
1160.	1025.	1193.	992.	1227.	958.
1472.	1378.	1495.	1355.	1519.	1331.
1778.	1707.	1796.	1689.	1814.	1671.
2080.	2015.	2097.	1998.	2113.	1982.
2380.	2315.	2397.	2298.	2413.	2282.
2679.	2611.	2697.	2593.	2714.	2576.
2979.	2911.	2997.	2893.	3014.	2876.
3278.	3203.	3296.	3184.	3315.	3165.
3576.	3494.	3596.	3474.	3616.	3454.
3874.	3786.	3896.	3764.	3918.	3743.
4172.	4078.	4195.	4055.	4219.	4031.

10		12		14	
VS	VR	VS	VR	VS	VR
959.	76.	1046.	112.	1122.	195.
959.	76.	1048.	190.	1122.	195.
959.	76.	1056.	268.	1124.	241.
1008.	407.	1068.	347.	1129.	286.
1084.	616.	1131.	569.	1178.	522.
1260.	925.	1294.	891.	1328.	857.
1542.	1308.	1566.	1284.	1589.	1261.
1832.	1653.	1850.	1635.	1868.	1617.
2130.	1965.	2146.	1949.	2162.	1933.
2430.	2265.	2446.	2249.	2462.	2233.
2731.	2559.	2748.	2542.	2765.	2525.
3031.	2859.	3048.	2842.	3065.	2825.
3334.	3146.	3353.	3128.	3371.	3109.
3637.	3433.	3657.	3413.	3677.	3393.
3939.	3721.	3961.	3699.	3983.	3677.
4242.	4008.	4266.	3984.	4289.	3961.

MATERIAL 9

M = 6.40

16		18		20	
VS	VR	VS	VR	VS	VR
1189.	226.	1249.	166.	1309.	106.
1189.	226.	1249.	166.	1309.	106.
1189.	226.	1249.	166.	1309.	106.
1189.	226.	1249.	166.	1309.	106.
1225.	475.	1272.	428.	1319.	381.
1361.	824.	1395.	790.	1428.	757.
1613.	1238.	1636.	1214.	1659.	1191.
1886.	1599.	1904.	1581.	1922.	1563.
2179.	1916.	2195.	1900.	2212.	1883.
2479.	2216.	2495.	2200.	2512.	2183.
2783.	2508.	2800.	2490.	2817.	2473.
3083.	2808.	3100.	2790.	3117.	2773.
3390.	3090.	3409.	3071.	3428.	3053.
3698.	3373.	3718.	3352.	3738.	3332.
4005.	3655.	4027.	3633.	4049.	3611.
4313.	3938.	4336.	3914.	4359.	3891.

22		24		26	
VS	VR	VS	VR	VS	VR
1352.	169.	1407.	179.	1459.	241.
1352.	169.	1407.	179.	1459.	241.
1355.	224.	1408.	215.	1459.	241.
1359.	279.	1410.	251.	1459.	241.
1366.	334.	1413.	288.	1459.	241.
1462.	723.	1496.	689.	1529.	656.
1683.	1167.	1706.	1144.	1730.	1120.
1940.	1545.	1958.	1527.	1976.	1509.
2228.	1867.	2244.	1851.	2261.	1834.
2528.	2167.	2544.	2151.	2561.	2134.
2834.	2456.	2851.	2439.	2868.	2422.
3134.	2756.	3151.	2739.	3168.	2722.
3446.	3034.	3465.	3015.	3484.	2996.
3758.	3312.	3779.	3291.	3799.	3271.
4071.	3589.	4093.	3568.	4114.	3546.
4383.	3867.	4406.	3844.	4430.	3820.

MATERIAL 9

M = 6,40

28		30		32	
VS	VR	VS	VR	VS	VR
1506.	194.	1553.	147.	1600.	100.
1506.	194.	1553.	147.	1600.	100.
1506.	194.	1553.	147.	1600.	100.
1506.	194.	1553.	147.	1600.	100.
1506.	194.	1553.	147.	1600.	100.
1563.	622.	1596.	589.	1630.	555.
1753.	1097.	1777.	1073.	1800.	1050.
1994.	1491.	2012.	1473.	2030.	1455.
2277.	1818.	2294.	1801.	2310.	1785.
2577.	2118.	2594.	2101.	2610.	2085.
2886.	2404.	2903.	2387.	2920.	2370.
3186.	2704.	3203.	2687.	3220.	2670.
3503.	2978.	3521.	2959.	3540.	2940.
3819.	3251.	3840.	3230.	3860.	3210.
4136.	3524.	4158.	3502.	4180.	3480.
4453.	3797.	4477.	3773.	4500.	3750.

34		36		38	
VS	VR	VS	VR	VS	VR
1647.	53.	1694.	6.	1714.	248.
1647.	53.	1694.	6.	1714.	248.
1647.	53.	1694.	6.	1717.	299.
1647.	53.	1694.	6.	1720.	351.
1647.	53.	1694.	6.	1725.	403.
1664.	521.	1697.	488.	1731.	454.
1823.	1027.	1847.	1003.	1870.	980.
2048.	1437.	2066.	1419.	2084.	1401.
2326.	1769.	2343.	1752.	2359.	1736.
2626.	2069.	2643.	2052.	2659.	2036.
2937.	2353.	2954.	2336.	2972.	2318.
3237.	2653.	3254.	2636.	3272.	2618.
3559.	2921.	3578.	2903.	3596.	2884.
3880.	3190.	3901.	3169.	3921.	3149.
4202.	3458.	4224.	3436.	4246.	3414.
4523.	3727.	4547.	3703.	4570.	3680.

MATERIAL 10

M = 25.00

4		6		8	
VS	VR	VS	VR	VS	VR
516.	484.	709.	651.	532.	468.
608.	572.	709.	651.	625.	555.
699.	661.	709.	651.	718.	642.
791.	749.	801.	739.	812.	728.
882.	838.	894.	826.	905.	815.
1066.	1014.	1078.	1002.	1091.	989.
1340.	1280.	1356.	1264.	1371.	1249.
1615.	1545.	1633.	1527.	1650.	1510.
1890.	1810.	1910.	1790.	1930.	1770.
2165.	2075.	2187.	2053.	2210.	2030.
2440.	2340.	2464.	2316.	2489.	2291.
2717.	2609.	2744.	2582.	2771.	2555.
2991.	2874.	3021.	2844.	3050.	2815.
3268.	3142.	3300.	3110.	3331.	3079.
3544.	3408.	3578.	3375.	3612.	3341.
3820.	3675.	3856.	3639.	3892.	3603.

10		12		14	
VS	VR	VS	VR	VS	VR
540.	460.	738.	622.	556.	444.
634.	546.	738.	622.	652.	528.
728.	632.	738.	622.	747.	613.
822.	718.	832.	708.	843.	697.
916.	804.	927.	793.	938.	782.
1104.	976.	1117.	963.	1130.	950.
1386.	1234.	1401.	1219.	1416.	1204.
1668.	1492.	1686.	1474.	1703.	1457.
1950.	1750.	1970.	1730.	1990.	1710.
2232.	2008.	2254.	1986.	2277.	1963.
2514.	2266.	2539.	2241.	2564.	2216.
2798.	2528.	2825.	2501.	2852.	2474.
3080.	2786.	3109.	2756.	3138.	2727.
3363.	3047.	3395.	3015.	3426.	2984.
3646.	3307.	3680.	3273.	3714.	3239.
3929.	3567.	3965.	3530.	4001.	3494.

MATERIAL 10

M = 25,00

16

VS	VR
564.	436.
660.	520.
757.	603.
853.	687.
950.	770.
1142.	938.
1432.	1188.
1721.	1439.
2010.	1690.
2299.	1941.
2588.	2192.
2879.	2447.
3168.	2697.
3458.	2952.
3747.	3205.
4037.	3458.

18

VS	VR
572.	428.
669.	511.
766.	594.
864.	676.
961.	759.
1155.	925.
1447.	1173.
1738.	1422.
2030.	1670.
2322.	1918.
2613.	2167.
2906.	2420.
3197.	2668.
3489.	2921.
3781.	3171.
4073.	3422.

20

VS	VR
580.	420.
678.	502.
776.	584.
874.	666.
972.	748.
1168.	912.
1462.	1158.
1756.	1404.
2050.	1650.
2344.	1896.
2638.	2142.
2933.	2393.
3227.	2639.
3521.	2889.
3815.	3137.
4110.	3386.

22

VS	VR
786.	574.
786.	574.
786.	574.
884.	656.
983.	737.
1181.	899.
1477.	1143.
1774.	1386.
2070.	1630.
2366.	1874.
2663.	2117.
2960.	2366.
3256.	2609.
3553.	2857.
3849.	3103.
4146.	3349.

24

VS	VR
596.	404.
696.	484.
795.	565.
895.	645.
994.	726.
1194.	886.
1492.	1128.
1791.	1369.
2090.	1610.
2389.	1851.
2688.	2092.
2987.	2339.
3285.	2580.
3584.	2826.
3883.	3069.
4182.	3313.

26

VS	VR
805.	555.
805.	555.
805.	555.
905.	635.
1006.	714.
1206.	874.
1508.	1112.
1809.	1351.
2110.	1590.
2411.	1829.
2712.	2068.
3014.	2312.
3315.	2550.
3616.	2794.
3917.	3036.
4218.	3277.

MATERIAL 10

M = 25,00

28		30		32	
VS	VR	VS	VR	VS	VR
612.	388.	620.	380.	834.	526.
713.	467.	722.	458.	834.	526.
814.	546.	824.	536.	834.	526.
916.	624.	926.	614.	936.	604.
1017.	703.	1028.	692.	1039.	681.
1219.	861.	1232.	848.	1245.	835.
1523.	1097.	1538.	1082.	1553.	1067.
1826.	1334.	1844.	1316.	1862.	1298.
2130.	1570.	2150.	1550.	2170.	1530.
2434.	1806.	2456.	1784.	2478.	1762.
2737.	2043.	2762.	2018.	2787.	1993.
3041.	2285.	3068.	2258.	3095.	2231.
3344.	2521.	3374.	2492.	3403.	2462.
3647.	2763.	3679.	2731.	3711.	2699.
3951.	3002.	3985.	2968.	4019.	2934.
4254.	3241.	4291.	3205.	4327.	3168.

34		36		38	
VS	VR	VS	VR	VS	VR
636.	364.	644.	356.	862.	498.
740.	440.	748.	432.	862.	498.
843.	517.	853.	507.	862.	498.
947.	593.	957.	583.	968.	572.
1050.	670.	1062.	658.	1073.	647.
1258.	822.	1270.	810.	1283.	797.
1568.	1052.	1584.	1036.	1599.	1021.
1879.	1281.	1897.	1263.	1914.	1246.
2190.	1510.	2210.	1490.	2230.	1470.
2501.	1739.	2523.	1717.	2546.	1694.
2812.	1968.	2836.	1944.	2861.	1919.
3122.	2204.	3149.	2177.	3176.	2150.
3432.	2433.	3462.	2403.	3491.	2374.
3742.	2668.	3774.	2636.	3805.	2605.
4053.	2900.	4086.	2866.	4120.	2832.
4363.	3132.	4399.	3096.	4435.	3060.

Section VI - Best Velocity Combinations.

INITIAL STRIKING VELOCITY = 1200.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
8	8	6	6	0	0	.
1	2	2	6	8	10	.
1	4	2	4	8	10	.
1	6	2	2	8	10	.
1	2	3	6	8	10	.
1	4	3	4	8	10	.
1	6	3	2	8	10	.
1	2	4	6	8	10	.
1	4	4	4	8	10	.
1	6	4	2	8	10	.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.

INITIAL STRIKING VELOCITY = 1200.

INRG(1) =	281
INRG(2) =	0
INRG(3) =	0
ICOUNT =	1079

INITIAL STRIKING VELOCITY = 1500.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
8	6	1	2	8	10	.
8	6	2	2	8	10	.
8	6	3	2	8	10	.
8	6	4	2	8	10	.
8	6	5	2	8	10	.
8	6	6	2	8	10	.
8	6	7	2	8	10	.
8	6	10	2	8	10	.
8	14	6	4	0	0	61.
8	8	5	2	8	8	80.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
8	14	6	6	0	0	.
1	2	2	16	8	10	.
1	4	2	14	8	10	.
1	6	2	12	8	10	.
1	8	2	10	8	10	.
1	10	2	8	8	10	.
1	12	2	6	8	10	.
1	14	2	4	8	10	.
1	16	2	2	8	10	.
1	2	3	16	8	10	.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.
0	0	0	0	0	0	.

INITIAL STRIKING VELOCITY = 1500.

INRG(1) = 1
INRG(2) = 634
INRG(3) = 0
ICOUNT = 3829

INITIAL STRIKING VELOCITY = 1800.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	6	9	2	8	10	1360.
2	6	3	2	8	10	1360.
2	8	9	2	8	8	1361.
2	10	9	2	8	6	1363.
2	6	3	2	8	8	1364.
2	4	3	2	8	12	1364.
3	2	2	6	8	10	1365.
2	6	10	2	8	10	1365.
2	8	9	4	8	6	1365.
2	6	5	2	8	10	1365.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	6	9	8	8	14	304.
2	12	3	2	8	14	366.
2	10	3	4	8	14	413.
2	12	10	2	8	14	462.
2	4	9	10	8	14	472.
2	12	5	2	8	14	472.
2	8	3	6	8	14	480.
3	2	2	12	8	14	483.
10	2	2	12	8	14	506.
2	12	6	2	8	14	518.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
1	2	2	26	8	10	.
1	4	2	24	8	10	.
1	2	3	26	8	10	.
1	4	3	24	8	10	.
1	2	9	26	8	10	.
1	4	9	24	8	10	.
1	6	9	22	8	10	.
1	8	9	20	8	10	.
1	10	9	18	8	10	.
1	12	9	16	8	10	.

INITIAL STRIKING VELOCITY = 1800.

INRG(1) = 6
INRG(2) = 2
INRG(3) = 260
ICOUNT = 9531

INITIAL STRIKING VELOCITY = 2100.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	3	2	0	0	1655.
2	16	9	2	0	0	1657.
2	14	3	2	2	2	1657.
2	16	10	2	0	0	1658.
2	12	3	2	2	4	1658.
2	16	5	2	0	0	1658.
2	14	10	2	2	2	1659.
2	10	3	2	2	6	1659.
2	14	5	2	2	2	1659.
2	12	10	2	2	4	1660.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	18	9	2	8	8	1405.
2	20	9	2	8	6	1406.
2	18	3	2	8	8	1406.
2	16	3	2	8	10	1409.
2	20	3	2	8	6	1409.
2	18	10	2	8	8	1410.
2	18	9	4	8	6	1410.
2	18	5	2	8	8	1411.
2	16	9	2	8	10	1411.
2	22	9	2	8	4	1412.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	6	10	10	8	22	546.
2	10	4	6	8	22	573.
5	8	2	8	8	22	582.
2	10	10	8	8	20	588.
3	8	2	8	8	22	598.
4	4	2	14	8	20	598.
6	4	2	14	8	20	600.
5	6	2	12	8	20	603.
3	6	2	12	8	20	614.
2	10	5	8	8	20	617.

INITIAL STRIKING VELOCITY = 2100.

INRG(1) = 20
INRG(2) = 9
INRG(3) = 0
ICOUNT = 9732

INITIAL STRIKING VELOCITY = 2400.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	10	2	0	0	1883.
2	16	3	2	0	0	1884.
2	16	5	2	0	0	1884.
2	14	10	2	2	2	1884.
2	14	3	2	2	2	1885.
2	12	10	2	2	4	1886.
2	14	5	2	2	2	1886.
2	10	10	2	2	6	1886.
10	2	2	16	0	0	1887.
2	8	10	2	2	8	1887.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	26	3	2	0	0	1641.
2	26	9	2	0	0	1642.
2	26	8	2	0	0	1643.
2	24	3	2	2	2	1643.
2	26	10	2	0	0	1644.
2	26	5	2	0	0	1644.
2	22	3	2	2	4	1645.
2	24	10	2	2	2	1646.
2	24	9	2	2	2	1646.
2	24	5	2	2	2	1646.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	28	8	10	0	0	1379.
2	30	8	8	0	0	1379.
2	28	9	2	8	8	1384.
2	26	8	12	0	0	1385.
2	32	8	6	0	0	1385.
2	28	3	2	8	8	1386.
2	30	9	2	8	6	1386.
2	26	3	2	8	10	1387.
2	26	9	2	8	10	1388.
2	28	10	2	8	8	1390.

INITIAL STRIKING VELOCITY = 2400.

INRG(1) = 11
INRG(2) = 16
INRG(3) = 10
ICOUNT = 0

INITIAL STRIKING VELOCITY = 2700.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	10	2	0	0	2108.
2	14	10	2	2	2	2109.
2	16	5	2	0	0	2110.
2	12	10	2	2	4	2110.
2	16	3	2	0	0	2111.
2	14	5	2	2	2	2111.
10	2	2	16	0	0	2111.
2	10	10	2	2	6	2111.
2	2	10	2	2	14	2112.
2	8	10	2	2	8	2112.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	26	3	2	0	0	1832.
2	26	10	2	0	0	1832.
2	26	5	2	0	0	1833.
2	24	10	2	2	2	1835.
2	24	3	2	2	2	1835.
2	24	5	2	2	2	1836.
2	22	10	2	2	4	1837.
2	26	9	2	0	0	1837.
10	2	2	26	0	0	1838.
2	22	3	2	2	4	1838.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	36	8	2	0	0	1586.
2	36	9	2	0	0	1588.
2	36	3	2	0	0	1589.
2	36	10	2	0	0	1593.
2	36	5	2	0	0	1593.
2	34	5	2	8	2	1593.
2	34	3	2	2	2	1593.
2	34	9	2	8	2	1593.
2	34	9	2	2	2	1594.
2	34	8	4	0	0	1594.

INITIAL STRIKING VELOCITY = 2700.

INRG(1) =	3
INRG(2) =	16
INRG(3) =	21
ICOUNT =	0

INITIAL STRIKING VELOCITY = 3000.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	10	2	0	0	2337.
2	14	10	2	2	2	2338.
2	16	5	2	0	0	2339.
10	2	2	16	0	0	2339.
2	12	10	2	2	4	2339.
2	2	10	2	2	14	2340.
2	14	5	2	2	2	2341.
2	10	10	2	2	6	2341.
2	4	10	2	2	12	2341.
2	8	10	2	2	8	2341.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	26	10	2	0	0	2022.
2	26	5	2	0	0	2024.
2	26	3	2	0	0	2024.
2	24	10	2	2	2	2026.
10	2	2	26	0	0	2026.
2	24	3	2	2	2	2028.
5	2	2	26	0	0	2029.
2	24	3	2	2	2	2029.
2	22	10	2	2	4	2029.
2	2	10	2	2	24	2030.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	36	3	2	0	0	1748.
2	36	10	2	0	0	1749.
2	36	5	2	0	0	1750.
2	36	9	2	0	0	1752.
2	34	3	2	2	2	1753.
2	34	10	2	2	2	1754.
2	36	6	2	0	0	1755.
2	34	5	2	2	2	1755.
2	36	4	2	0	0	1756.
10	2	2	36	0	0	1756.

INITIAL STRIKING VELOCITY = 3000.

INRG(1) =	6
INRG(2) =	14
INRG(3) =	13
ICOUNT =	0

INITIAL STRIKING VELOCITY = 3300.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	10	2	0	0	2572.
2	6	10	2	2	10	2572.
2	4	10	2	2	12	2573.
2	2	10	2	2	14	2573.
2	8	10	2	2	8	2573.
10	2	2	16	0	0	2573.
2	14	10	2	2	2	2574.
2	10	10	2	2	6	2574.
2	16	5	2	0	0	2574.
2	12	10	2	2	4	2574.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	26	10	2	0	0	2220.
2	26	5	2	0	0	2222.
10	2	2	26	0	0	2223.
2	24	10	2	2	2	2224.
2	26	3	2	0	0	2224.
2	2	10	2	2	24	2225.
5	2	2	26	0	0	2226.
2	24	5	2	2	2	2226.
2	4	10	2	2	22	2227.
2	22	10	2	2	4	2228.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	36	10	2	0	0	1913.
2	36	3	2	0	0	1913.
2	36	5	2	0	0	1914.
10	2	2	36	0	0	1918.
2	34	10	2	2	2	1919.
2	36	6	2	0	0	1919.
2	36	4	2	0	0	1920.
2	36	9	2	0	0	1920.
5	2	2	36	0	0	1920.
2	34	5	2	2	2	1920.

INITIAL STRIKING VELOCITY = 3300.

INRG(1) = 7
INRG(2) = 11
INRG(3) = 16
ICOUNT = 0

INITIAL STRIKING VELOCITY = 3600.

TOTAL WEIGHT = 18 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	16	10	2	0	0	2800.
2	14	10	2	2	2	2801.
2	12	10	2	2	4	2801.
2	10	10	2	2	6	2803.
2	16	5	2	0	0	2804.
10	2	2	16	0	0	2804.
2	14	5	2	2	2	2805.
2	8	10	2	2	8	2805.
2	12	5	2	2	4	2805.
2	2	10	2	2	14	2806.

TOTAL WEIGHT = 28 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	26	10	2	0	0	2426.
2	24	10	2	2	2	2427.
2	10	10	2	2	16	2427.
2	8	10	2	2	18	2427.
2	12	10	2	2	14	2428.
2	22	10	2	2	4	2428.
2	6	10	2	2	20	2428.
10	2	2	26	0	0	2428.
2	14	10	2	2	12	2428.
2	4	10	2	2	22	2428.

TOTAL WEIGHT = 38 OZ/SQFT

MAT.	WT.	MAT.	WT.	MAT.	WT.	RES. VEL.
2	36	10	2	0	0	2085.
2	36	5	2	0	0	2087.
10	2	2	36	0	0	2087.
2	36	3	2	0	0	2088.
2	2	10	2	2	34	2089.
5	2	2	36	0	0	2091.
2	34	10	2	2	2	2092.
2	2	5	2	2	34	2093.
2	4	10	2	2	32	2093.
2	36	4	2	0	0	2093.

INITIAL STRIKING VELOCITY = 3600.

INRG(1) = 3
INRG(2) = 14
INRG(3) = 9
ICOUNT = 0