Willamette
Engineering and Earth Sciences

October 22, 2004

Mr. Scott Erickson
Stoneycreek Materials
Keizer, Oregon 97355

Re: Pervious Concrete Pavement Performance, Viesko-Quality Concrete, Pervious Pavement Test Facility, Matheny Road, Keizer, Oregon

Dear Mr. Erickson:

Willamette Engineering and Earth Sciences (Willamette) has completed a preliminary subgrade evaluation and qualitative evaluation of the pervious pavement test section at the referenced site. The test section was constructed from both Streamsafe and Stoneycrete mix designs, and includes pervious concrete pavement sections 4, 6, 8, and 10 inches in thickness. Pavement sections are loaded with light traffic (empty trucks) in one direction and heavy traffic (loaded trucks) in the other.

The test facility has to date been subjected to approximately 25,000, 18,000 pound axels (ESAL) on the heavy side and an equivalent number of approximately 11,000 pound axels on the light traffic side. The site has also been subjected to daily passenger and light truck traffic estimated to be on the order of 5,000 trips.

Qualitative performance of the pavement sections has been remarkably good. Distress has been observed in the heavy loaded 4 inch thick sections of the pervious concrete pavement. Distress is in general moderate with slight abrasive wearing on the surface, however the section appears to have failed based on cracking of the section. No other pavement sections appear to have sustained any structural distress, however a small amount of surface abrasion is present on the other sections. Some surficial raveling resulting from traffic wear and subgrade movement was observed along pavement joints.

Subgrade Testing

Willamette tested the subgrade at specific locations in the pavement test facility using a dynamic cone penetrometer (DCP). Testing was completed after pavement had been placed, through core holes in the pavement. Testing was completed prior to traffic being allowed on the test sections.

Data from the DCP indicate that the subgrade is somewhat variable, as would be expected. Based on evaluations by the Minnesota Department of Transportation, base rock is typically judged to exceed 95% compaction when the DCP penetration resistance exceeds 4 blows per inch, roughly equivalent to a California Bearing Ratio of 37. The average CBR for the 4" thick pervious concrete test section appears to be on the order of 50 considering an average

of the 8" thick base rock section, however the CBR in the upper 4-½ inches of the section was measured at approximately 19, substantially less than the standard of 37 or greater.

DCP data in the test section indicate the CBR for the open graded aggregate may range between a low of 8 and a high of 50, indicating a large percentage of the test pavement base may not be well compacted. Willamette has some concern with the application of the DCP in open graded aggregates, however the data is useful in at least a qualitative sense to assess the variability of the base aggregate compaction. DCP data is included in the attachment for your reference.

Discussion

Willamette believes that the pervious concrete pavement test facility will provide valuable performance data for the pervious concrete pavements. This facility provides a real world evaluation of the material performance under some of the most demanding conditions one could anticipate for a pavement section: fully loaded concrete and gravel trucks leaving the plant.

Truck traffic is one of the most aggressive loading environments that a pavement section will be subjected to. Airport runways and industrial yards with heavy equipment operation are the only traffic environments that exceed truck loading. Light vehicle traffic including automobiles and light trucks (axels weights typically less than 3,500 pounds) will account for 0.0005 of the structural damage compared with a single 18,000 pound axel; i.e. one fully loaded small garbage collection truck (a single 18,000 pound axel vehicle) is effectively the equivalent of 2,000 light vehicles. This is particularly important when discussing facility design that is primarily intended for light vehicles.

Willamette was particularly impressed with the performance of the 4 inch thick pervious concrete performing acceptably with more than 25,000 ESAL's. Parking lots in many areas will not experience loading of that intensity (25,000 x 2,000 = 50,000,000 light vehicles) over a 25 year design life.

Data analysis for this project is on-going. While the data and conclusions discussed herein are somewhat preliminary, Willamette believes the trends of the data are useful and will be very valuable for planning purposes.

If you have any questions, please call me at (503) 623-0304.

Sincerely,

Willamette
Engineering and Earth Sciences

Robert J. Slyh, P.E.
Principal

Attachments: Preliminary DCP Data

ATTACHMENT A

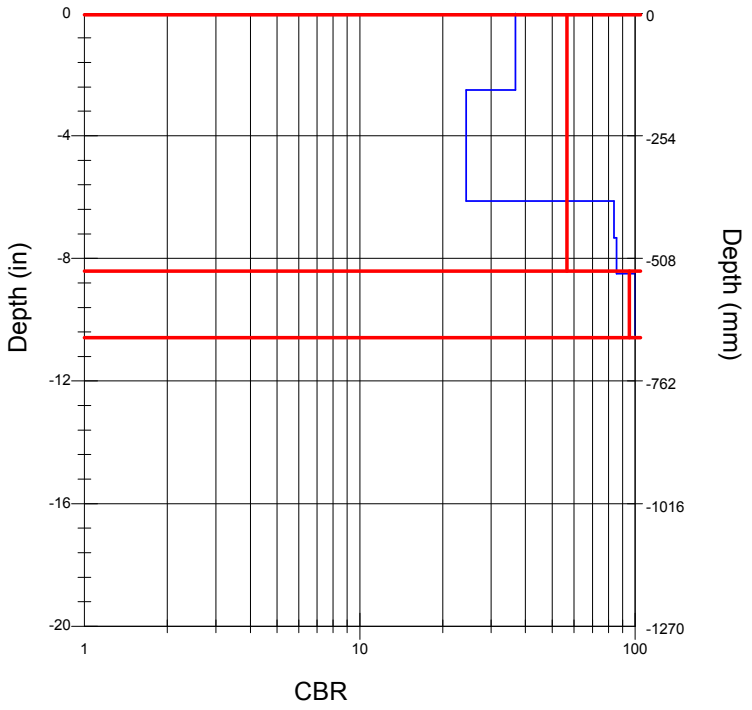
Dynamic Cone Penetrometer Logs

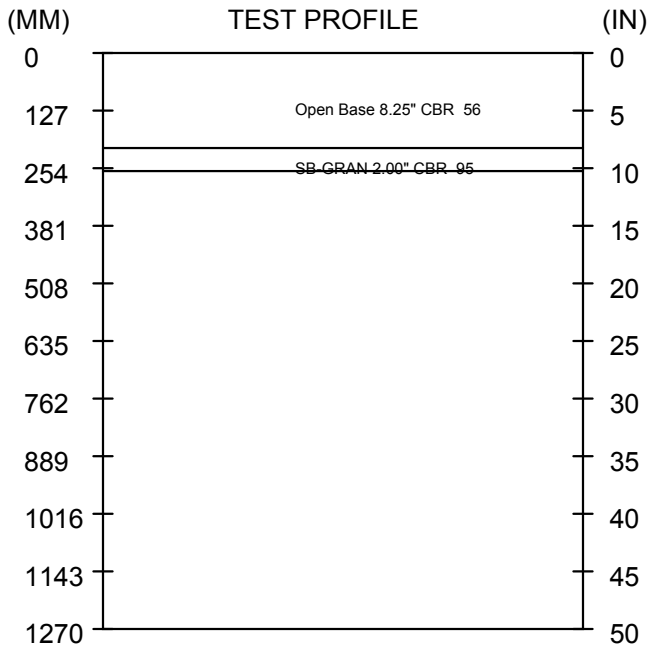
DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Feature: DCP-1 Stream Safe 10"

Date: 12/12/1998
Station: DCP-1

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	2.5	1
10	6.125	1
10	7.325	1
10	8.5	1
20	10.5	1



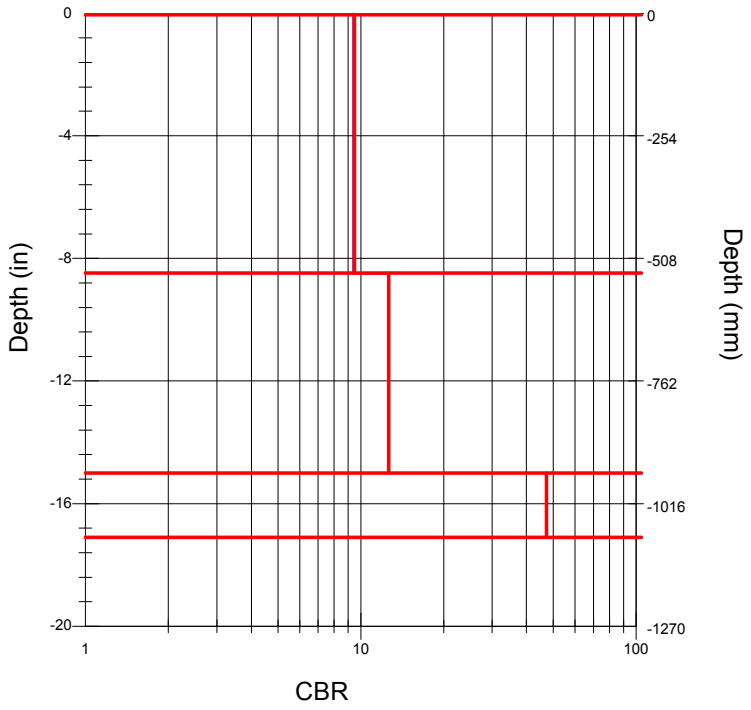


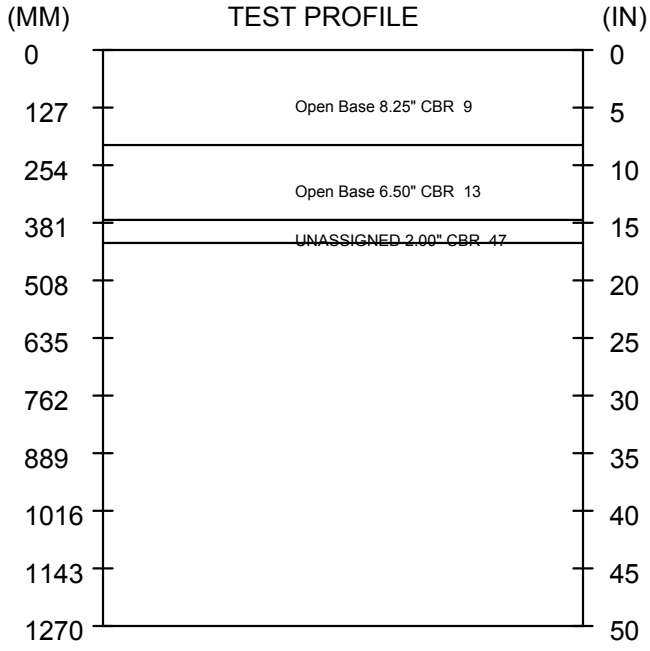
DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Feature: DCP-2 Stream Safe 6"

Date: 12/12/1998
Station: DCP-2

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	8.5	1
10	15	1
10	17	1



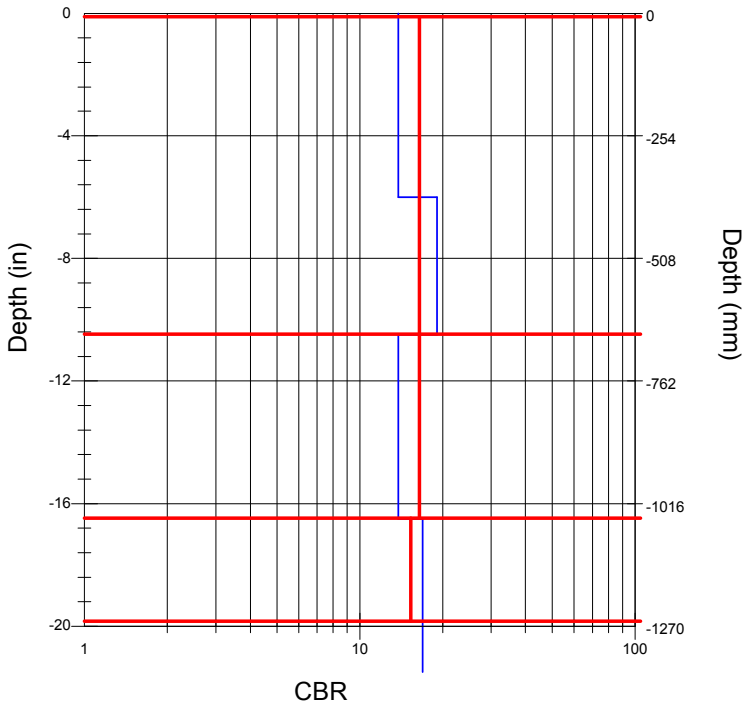


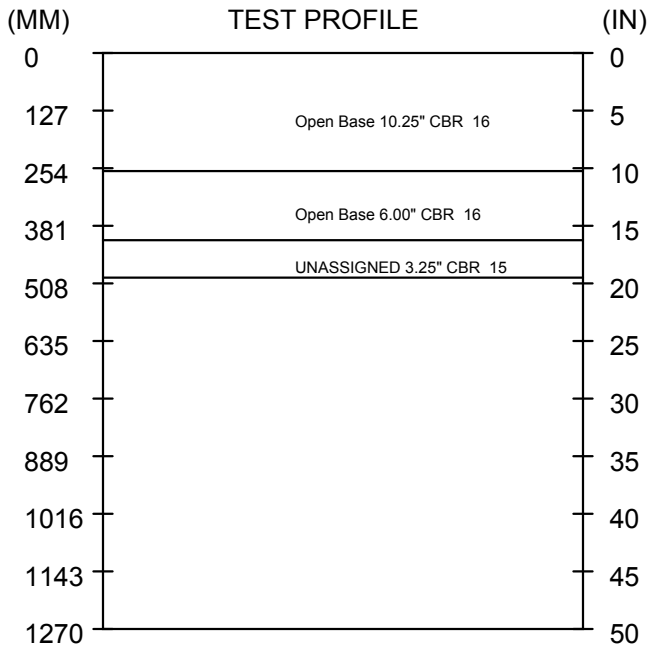
DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Feature: DCP-3 Stoney Crtete 6"

Date: 12/12/1998
Station: DCP-3

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	6	1
10	10.5	1
10	16.5	1
10	21.5	1

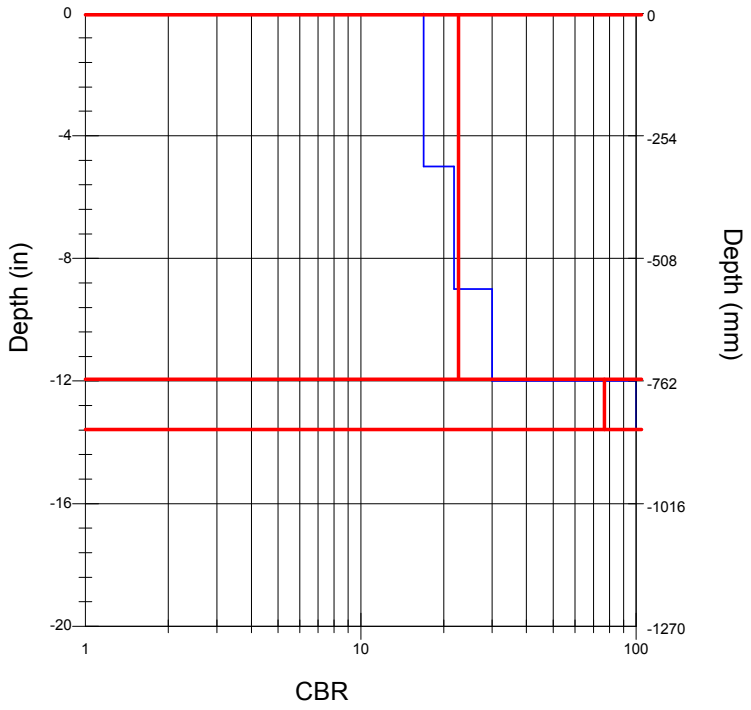


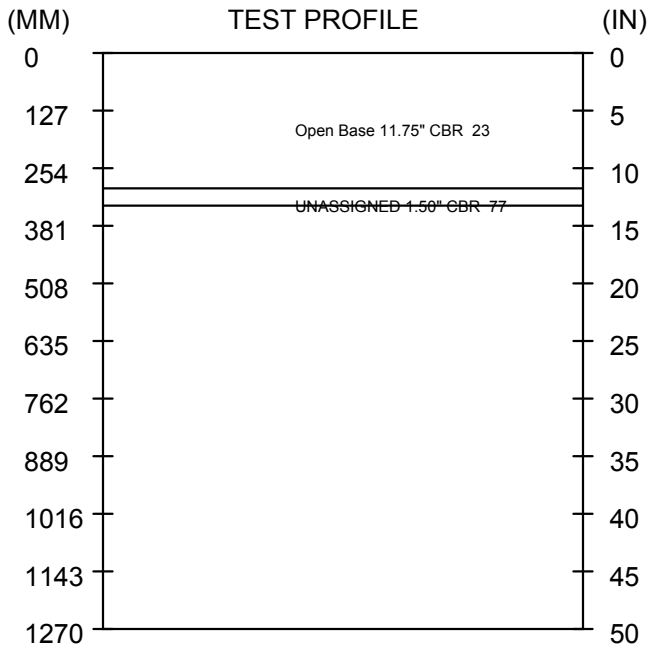


DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Date: 12/12/1998
Feature: DCP-4 Stoney Crete - 6" Heavy
Station: DCP-4

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	5	1
10	9	1
10	12	1
20	13.5	1

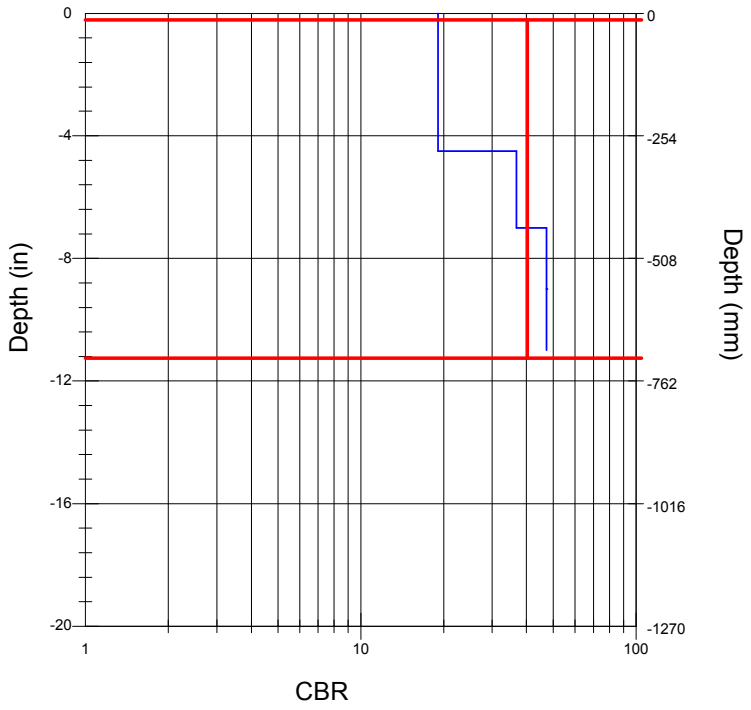


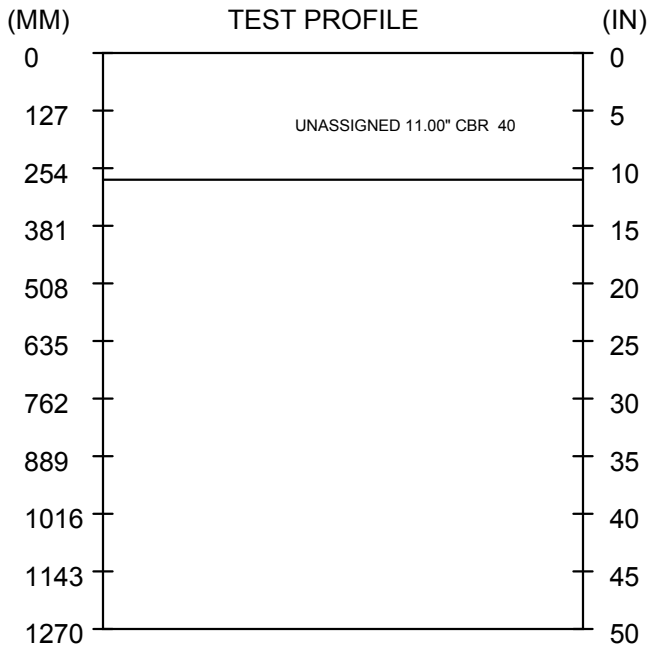


DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Date: 12/12/1998
Feature: DCP-5 Stoney Crete 4" Heavy
Station: DCP-5

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	4.5	1
10	7	1
10	9	1
10	11	1



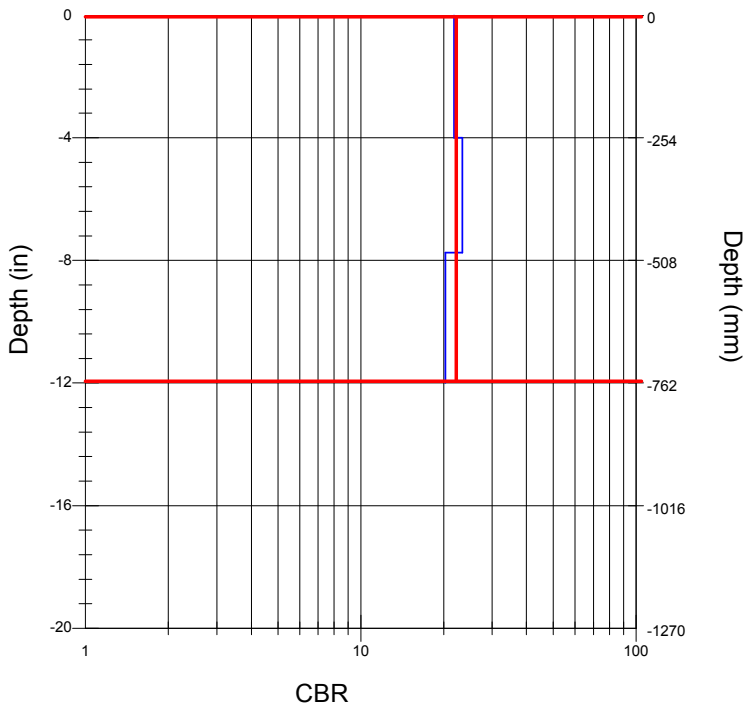


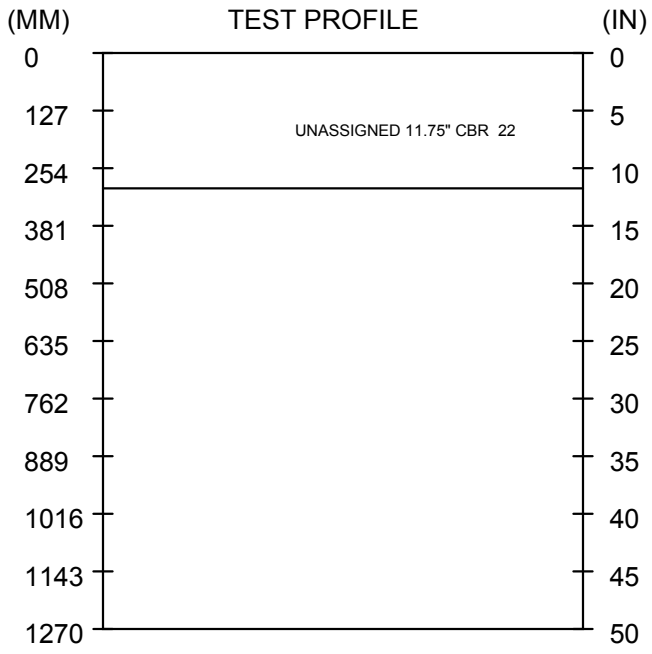
DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Feature: DCP-6 Stoney Crete 8" Heavy

Date: 12/12/1998
Station: DCP-6

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
10	4	1
10	7.75	1
10	12	1





DCP TEST DATA

Project: Quality Concrete Pervious Concrete Test Pad
Date: 12/12/1998
Feature: Standard
Station: DCP 95% Modified Proctor

No. of Blows	Accumulative Penetration (in)	Type of Hammer
0	0	1
8	2	1
8	4	1
8	6	1
8	8	1
8	10	1
8	12	1
8	14	1
8	16	1
8	18	1
8	20	1