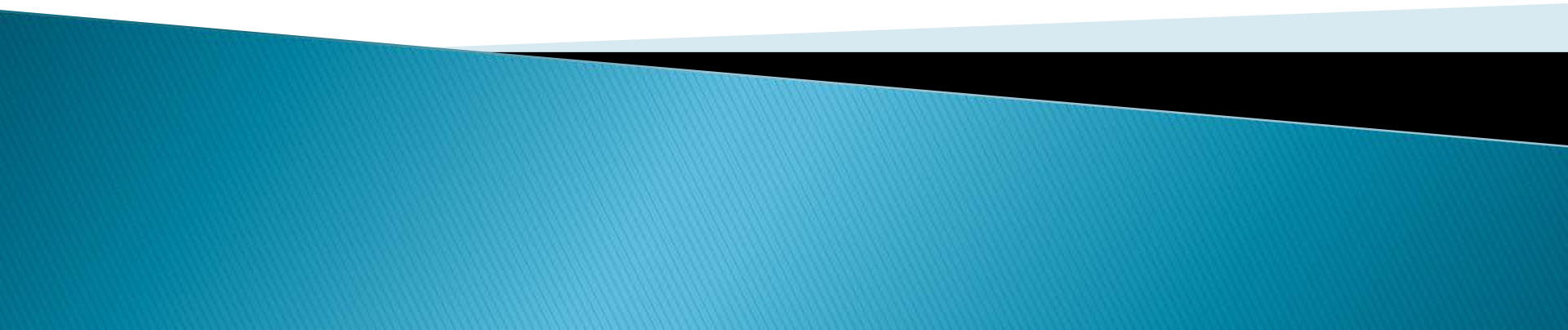



Ward County Coring and DCP

- Testing Methods
 - Coring and DCP Equipment
 - Coring & Testing
 - Data
- 

Testing Methods

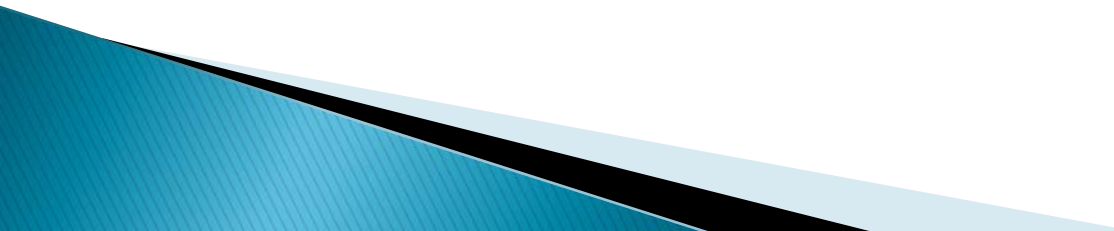
- ▶ There are different types of testing Methods that we have used in the past 20 years
 - Falling Weight Deflectometer (FWD) which applies a dynamic load that simulates the loading of a moving wheel.
 - Coring the pavement and collecting samples to be taken back to a laboratory for testing.
 - Coring the pavement, determining the depth of gravel and using a Dynamic Cone Penetrometer.
- 

Falling Weight Deflectometer

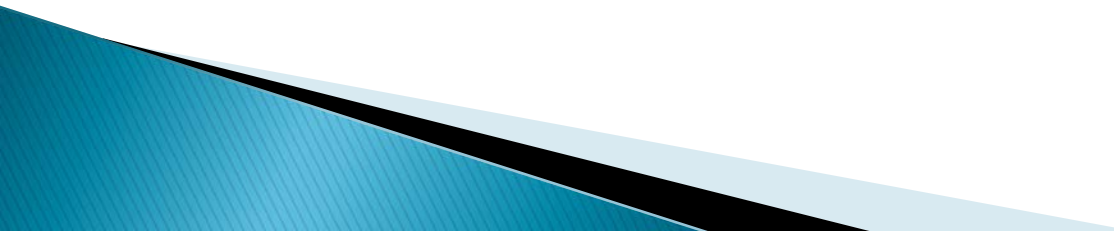
- ▶ System used by the DOT in the spring and by Ward County in the past for pavement design



Coring, Sampling & Lab Testing

- ▶ Testing Firm would core the road, collect samples and report results
 - ▶ Results consisted of Pavement thickness, gravel thickness, and strength of subgrade based on shear strength tests, and soil classifications
 - ▶ Cost was about \$2,000 for 8 miles in 2004
- 

Coring and DCP

- ▶ In 2008 Ward County purchased a Coring machine from ACME Tools.
 - ▶ The machine was made up of the Coring Motor, Stand, 30 Amp Meter Box, and a 6" Core Bit
 - ▶ We also built a mount to go on the back of a pickup.
 - ▶ We needed a small water tank and we use a small generator.
- 

Coring Motor



Click on above image to zoom.



Diamond Coring Motor 500/1000 RPM, 15 Amp with Clutch

MILWAUKEE-4097-20

Diamond coring motors are used with Vac-u-rig and Dymo-Rig diamond core rigs to drill holes into reinforced concrete. This 15 amp model provides core drilling power where 20 amp service is unavailable... [read more](#)

Rating:



[Write the first review](#)



Availability:

⇄ **Arriving Soon!**

Warehouse acquiring product. Usually ships in 7-10 business days.

 **Free Shipping!**

(ground shipping to lower 48)



List: \$1,250.00

NOW: **\$1,050.99**

Quantity

1

Add to Cart 

Add to Wish List



Coring Stand



Click on above image to zoom.



Diamond Coring Small Base Stand

MILWAUKEE-4115

This contractor series small base stand features a cast aluminum base with 4 leveling screws for fast accurate leveling adjustment. The durable precision-ground 2-1/2 In. steel column is 43-1/2 In. hi... [read more](#)

Rating:



[Write the first review](#)



Availability:

⇄ **Arriving Soon!**

Warehouse acquiring product. Usually ships in 7-10 business days.

 **Free Shipping!**

(ground shipping to lower 48)



List: \$970.00

NOW: **\$566.99**

Quantity

1

Add to Cart 

Add to Wish List



Truck Mount




Truck Mount



Truck Mount



Total Cost for Coring Setup

- ▶ The total cost of the coring setup was under \$2,000 in 2008
 - ▶ I would guess that the cost of the Motor, Stand, Amp Box, Water tank, and materials for the truck mount would be around \$2,200 today
 - ▶ Bits are around \$250 to \$350
 - ▶ First year we cored twice as many holes as the testing firm on 15 miles of roadway. We estimated that we more than paid for the setup the first time we used it.
- 

Coring



Coring



Coring



Coring



Coring



Coring



Coring



Coring



Coring



Coring



Coring



DCP – Dynamic Cone Penetrometer

- ▶ In 2009 Ward County purchased a Dynamic Cone Penetrometer (DCP) for around \$1,800
- ▶ We also purchased a 25 pack of disposable cone tips

DCP – Dynamic Cone Penetrometer

[HOME](#) < [STORE](#) < [SOIL-FIELD](#) < [PENETROMETER, DUAL-MASS](#) < **DUAL-MASS DYNAMIC CONE PENETROMETER**

SOIL-FIELD

- Augers & Auger Sets
- Color
- Compaction & Density
- Compaction Uniformity, Stiffness
- Dielectric Values
- Earth Drill, Powered
- Guelph Permeameter
- Moisture
- Penetrometer, Dual-Mass**
- Penetrometer, Dynamic Cone
- Penetrometer, Pocket
- Penetrometer, Proctor
- Penetrometer, Proving Ring
- Penetrometer, Static Cone
- Probe Rods
- Resistivity
- Samplers
- Shear Vane, Torvane
- Shelby Tubes
- Water Infiltration
- Water Level

Dual-Mass Dynamic Cone Penetrometer

The Dual-Mass Dynamic Cone Penetrometer supports the following standards: **ASTM D6951**

Features Quick-Connect Connectors

Developed by the Army Corps of Engineers, Dynamic Cone Penetrometers (DCPs) provide a low-cost, efficient test method for quickly determining in-situ CBR values of pavement base, subbase and subgrades. They can readily be used for depths up to 30" and up to 6' with optional drive rods and extensions. This model complies with ASTM D6951 specifications and comes with a chart to compute CBR values, as well as an Excel spreadsheet template, which automatically charts the test results. DCPs cover a CBR range from <.05 to 100% and a bearing value range from 430 to 10,800 psf.



 Larger View

The Standard DCP Kit measures the shear strength of soil with a CBR between 0.5-100% and from 430 to 10,800 psf. This single-operator kit is ideal for state/county/city highway departments and geotech firms. CBR and psf can be estimated in the field from tables in the manual and plotted using Corps of Engineers Excel template included on CD. It comes with a stainless steel dual-mass (17.6/10.1 lb) hammer and quick-connect upper rod, 30-inch drive rod (27-1/4 inch penetration), a 40-inch vertical scale, upper and lower scale mounts, a reusable hardened point and a disposable cone adapter with 25 disposable cones for fast and easy extraction of the instrument from hard/cohesive soil. The kit also includes a crush-proof Pelican carrying case with transport wheels and wrench set. Shipping wt. 54 lbs. (24.5kg)

[Email to Colleague](#)

\$1,895.70

H-4218C

Add to Cart 

DCP



DCP



DCP



DCP



DCP



DCP



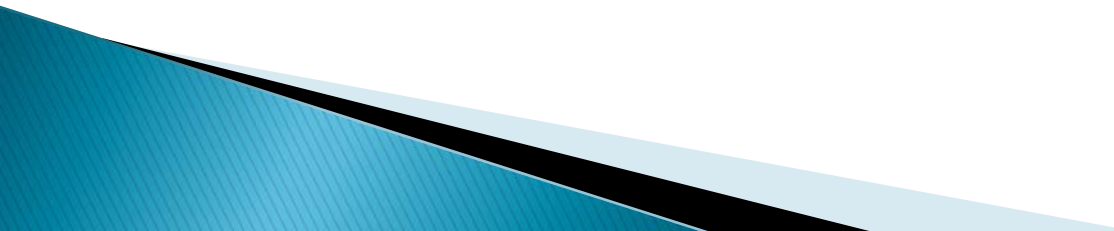
DCP



DCP



Test Results

- ▶ Once we have cored through the pavement, the asphalt core is removed and measured.
 - ▶ Then the aggregate base is removed from the 6" hole and the depth of the hole is measured and the depth of the core is subtracted from the total depth.
 - ▶ Then the DCP is set up and the hammer is dropped 5 times and the depth of penetration is recorded. This step is continued until desired depth is reached.
- 

Test Results from Coring

Core Number	Road	Station	Lane	Pavement Condition	Asphalt Depth	Gravel Depth	CBP Depth	Other Information	DCP	DCP Table
1	CR 22	5+00	Rt	Good	3 1/4	8			Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 1.xlsm
2		29+63	Lt	Good	3	7 1/4			No	
3		54+52	Rt	Good	4	6			No	
4		80+75	Lt	Good	3 1/2	8 1/4			Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 4.xlsm
5		107+46	Rt	Good	2 3/4	7 1/4			No	
6		133+32	Lt	Good	3 1/2	7 3/4			No	
7		160+09	Rt	Good	4	8			Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 7.xlsm
8		185+80	Lt	Good	3 1/4	8 3/4			No	
9		212+00	Rt	Good	3 3/4	8 1/4			No	
10		239+59	Lt	Good	3 1/4	7 1/2			Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 10.xlsm
11		264+82	Rt	Good	4	8			No	
12		293+21	Lt	Fair	3 1/2	1 1/2		Between Patches	No	
13		309+71	Rt	Good	3 3/4	6 3/4			Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 13.xlsm
14		319+50	Lt	Good	5 3/4	3		In City of Ryder	No	
15		331+11	Rt	Good	3 3/4	6		In City of Ryder	Yes	T:\Roads\DCP\2013 DCP\CR 22\CR 22 Hole 15.xlsm
16	CR 9	5+00	Rt	Good	8 1/2	4			No	
17		25+85	Lt	Good	11 1/4	1 1/4			Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 17.xlsm
18		55+28	Rt	Good	9	2			No	
19		74+50	Lt	Fair	9	2 1/4		South of Makoti Lake Grade Raise	Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 19.xlsm
20		111+63	Rt	Good	8 1/2	1		North of Makoti Lake Grade Raise	No	
21		132+61	Lt	Fair	9 1/4	2 3/4			No	
22		164+23	Rt	Good	9	2 3/4			Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 22.xlsm
23		217+57	Lt	Good	10	2 1/4			No	
24		238+92	Rt	Good	7 1/2	3			No	
25		270+60	Lt	Good	9	4			Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 25.xlsm
26		291+92	Rt	Good	8	4 3/4			No	
27		319+82	Lt	Good	9 1/2	4 1/2			No	
28		344+70	Rt	Good	8 1/2	4 3/4			Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 28.xlsm
29		373+36	Lt	Poor	6 1/2	3 3/4		Cracks prevalent	Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 29.xlsm
30		396+30	Rt	Good	7	3 3/4			No	
31		423+44	Lt	Good	8 1/2	6 3/4		In City of Makoti	Yes	T:\Roads\DCP\2013 DCP\CR 9\CR 9 Hole 31.xlsm
32		457+33	Rt	Good	5 1/2	6 1/2			No	
33		98+12	Rt	Poor	5	4 1/4		Patching Area	Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 33.xlsm
34		103+59	Lt	Poor	7	2 3/4		Patching Area	Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 34.xlsm
35		104+97	Lt	Poor (Failing)	6	4 1/2		Patching Area	Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 35.xlsm
36		5+12	Rt	Good	6 3/4	1 3/4		Start, south end	No	
37		27+52	Lt	Good	7	3/4			Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 37.xlsm
38		54+16	Rt	Good	6 1/2	2			No	
39		81+30	Lt	Good	7 1/2	1 1/2		South of patching area	No	
40		134+79	Rt	Good	7	2 1/2		North of patching area	No	
41		159+92	Lt	Good	7	1 3/4			No	
42		186+47	Rt	Good	8 1/2	3 1/4			Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 42.xlsm
43		204+94	Lt	Good	8	2			No	
44		240+37	Rt	Good	8	1 1/2			No	
45		264+68	Lt	Good	9	3/4			Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 45.xlsm
46		292+80	Rt	Good	7	1 1/4			No	
47		320+07	Lt	Good	8	3/4			No	
48		351+01	Rt	Good	8	2 1/4			Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 48.xlsm
49		372+70	Lt	Good	7	2 1/4			No	
50		396+56	Rt	Good	7	1			No	
51	CR 23	426+80	Lt	Good	6 3/4	3/4			Yes	T:\Roads\DCP\2013 DCP\CR 23\CR 23 Hole 51.xlsm

Test Results from Coring

Core Number	Road	Station	Lane	Pavement Condition	Asphalt Depth	Gravel Depth	CBP Depth
1	CR 22	5+00	Rt	Good	3 1/4	8	
2		29+63	Lt	Good	3	7 1/4	
3		54+52	Rt	Good	4	6	
4		80+75	Lt	Good	3 1/2	8 1/4	
5		107+46	Rt	Good	2 3/4	7 1/4	
6		133+32	Lt	Good	3 1/2	7 3/4	
7		160+09	Rt	Good	4	8	
8		185+80	Lt	Good	3 1/4	8 3/4	
9		212+00	Rt	Good	3 3/4	8 1/4	
10		239+59	Lt	Good	3 1/4	7 1/2	
11		264+82	Rt	Good	4	8	
12		293+21	Lt	Fair	3 1/2	1 1/2	
13		309+71	Rt	Good	3 3/4	6 3/4	
14		319+50	Lt	Good	5 3/4	3	
15		331+11	Rt	Good	3 3/4	6	

Test Results from Coring

71	CR 24	5+53	Rt	Fair	4 3/4	3 1/4	4
72		27+41	Lt	Fair	5 3/4	4 1/4	4 1/4
73		54+94	Rt	Fair	4	3 1/4	3
74		82+50	Lt	Fair	4	4	4
75		106+90	Rt	Fair	3 3/4	5	3 3/4
76		134+51	Lt	Fair	3 1/2	3 1/2	4 1/2
77		160+43	Rt	Fair	4	5 1/2	4
78		185+04	Lt	Fair	4 1/4	4 1/4	4 1/2
79		211+80	Rt	Fair	4 1/2	3 1/2	4 1/4
80		240+44	Lt	Fair	3 3/4	3	4 1/2
81		264+80	Rt	Fair	3 1/2	3 3/4	5
82		294+60	Lt	Fair	3 1/2	5	4 1/2
83		318+26	Rt	Fair	4	4 1/4	2 3/4
84		343+96	Lt	Fair	4 1/4	3 1/2	5 1/4
85		372+05	Rt	Fair	4	4 3/4	3 3/4
86		397+61	Lt	Fair	4 3/4	3 3/4	2 3/4
87		423+42	Rt	Fair	5 1/2	6 1/4	2 1/2
88		451+05	Lt	Fair	4 1/2	4 1/2	1 1/2

- ▶ Results are entered into a spread sheet for each location tested with a DCP

DCP TEST DATA

Project: County Road 22
Location: Hole 1 Right Lane 5+00

Date: 3-Oct-13
Soil Type(s): Gravel and Clay

Hammer

☐ 10.1 lbs.

☒ 17.6 lbs.

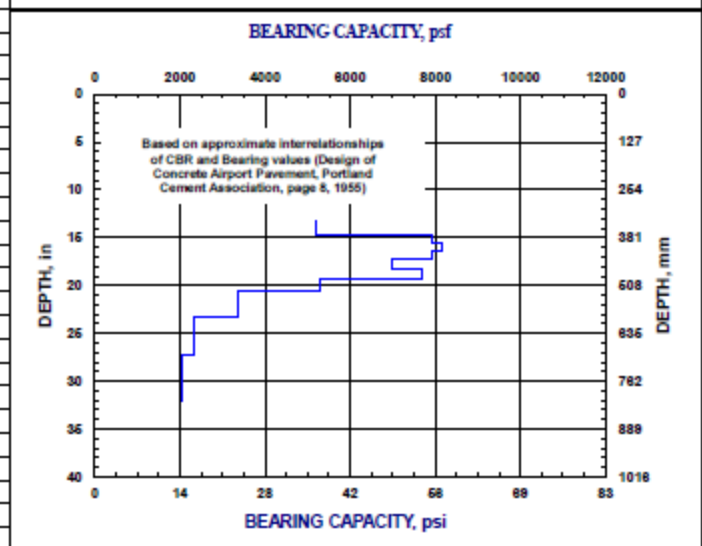
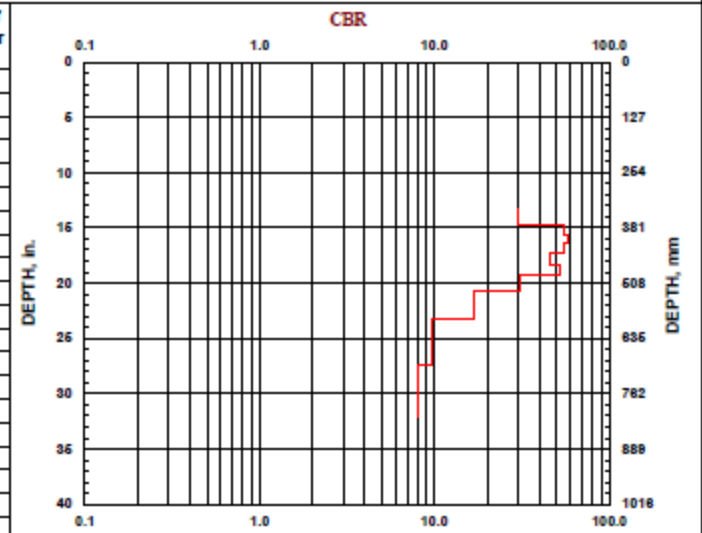
☐ Both hammers used

Soil Type

☐ OH

☐ CL

☒ All other soils

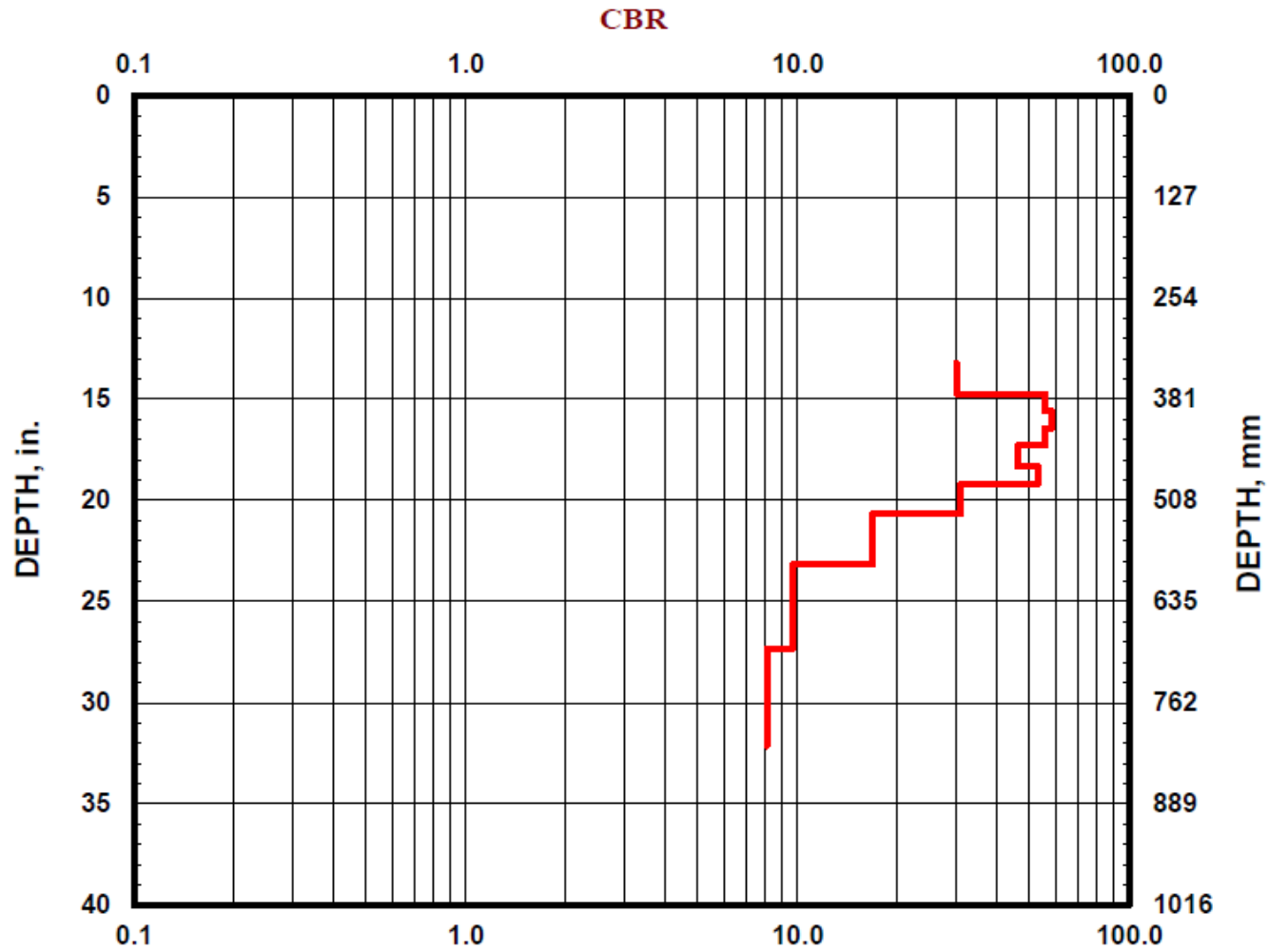
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Test Results for DCP

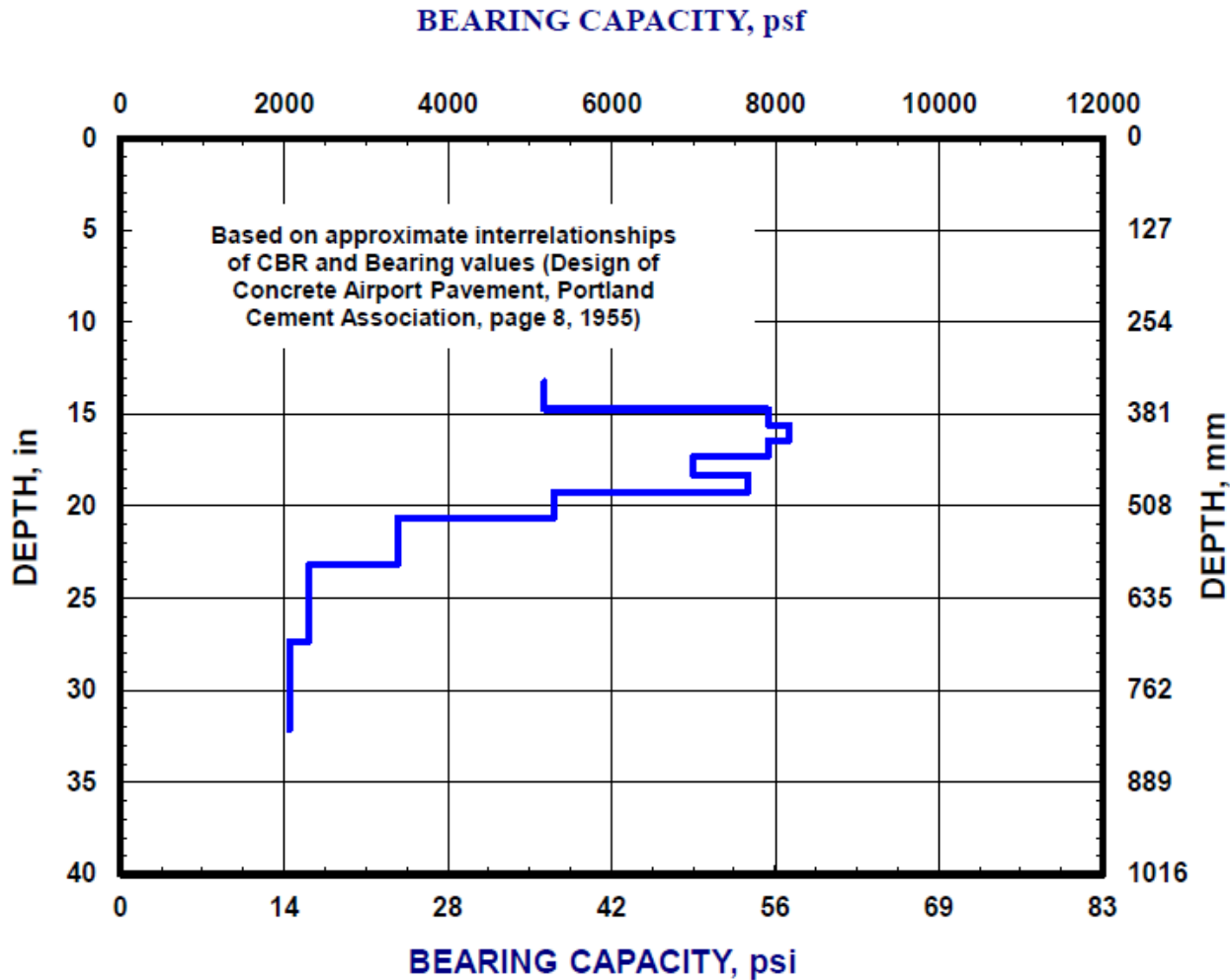


No. of Blows	Accumulative Penetration (mm)	Type of Hammer
5	336	1
5	374	1
5	396	1
5	417	1
5	439	1
5	465	1
5	488	1
5	525	1
5	589	1
5	694	1
5	817	1
5		1
5		1

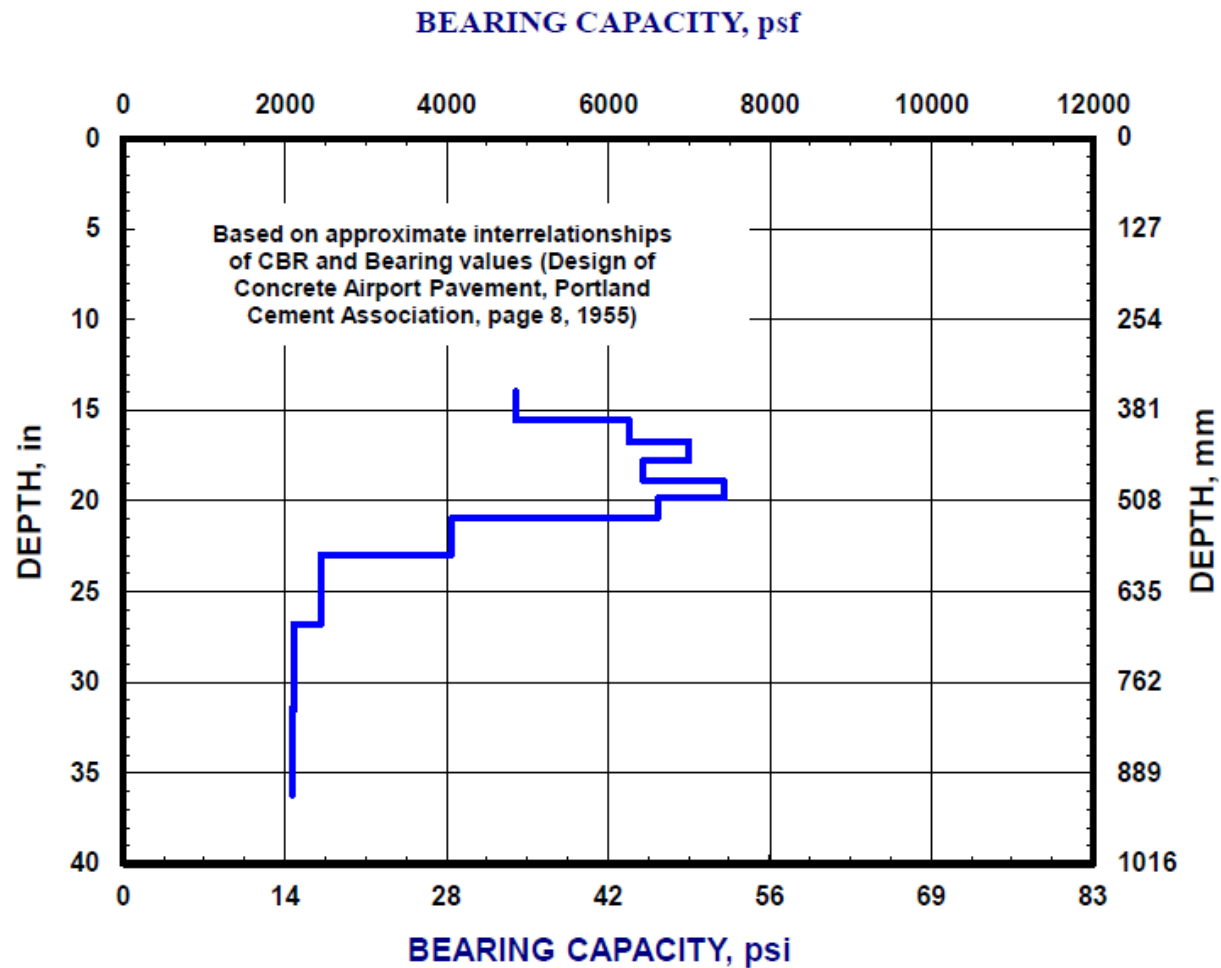
Test Results as a CBR Value



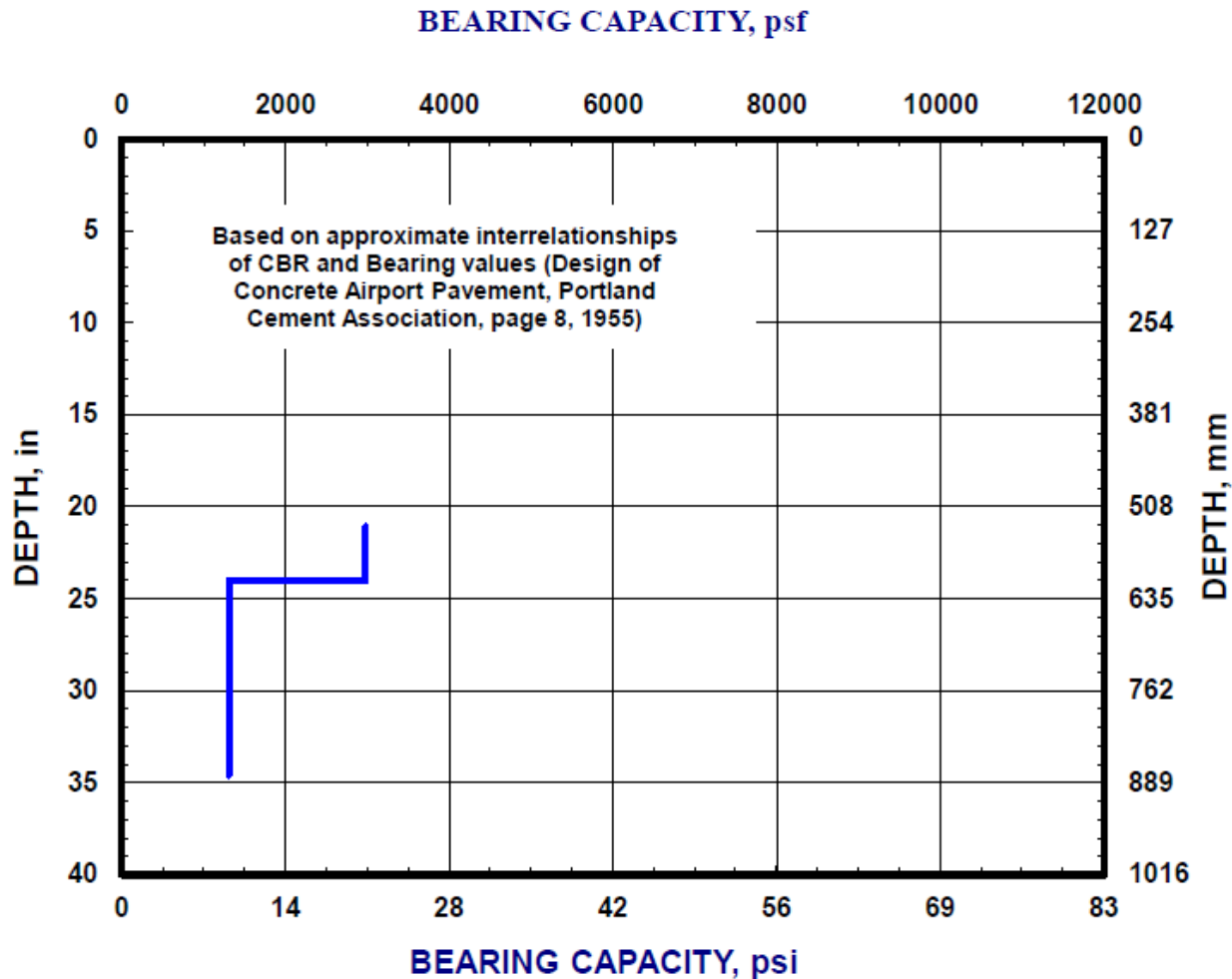
Test Results as Bearing Capacity



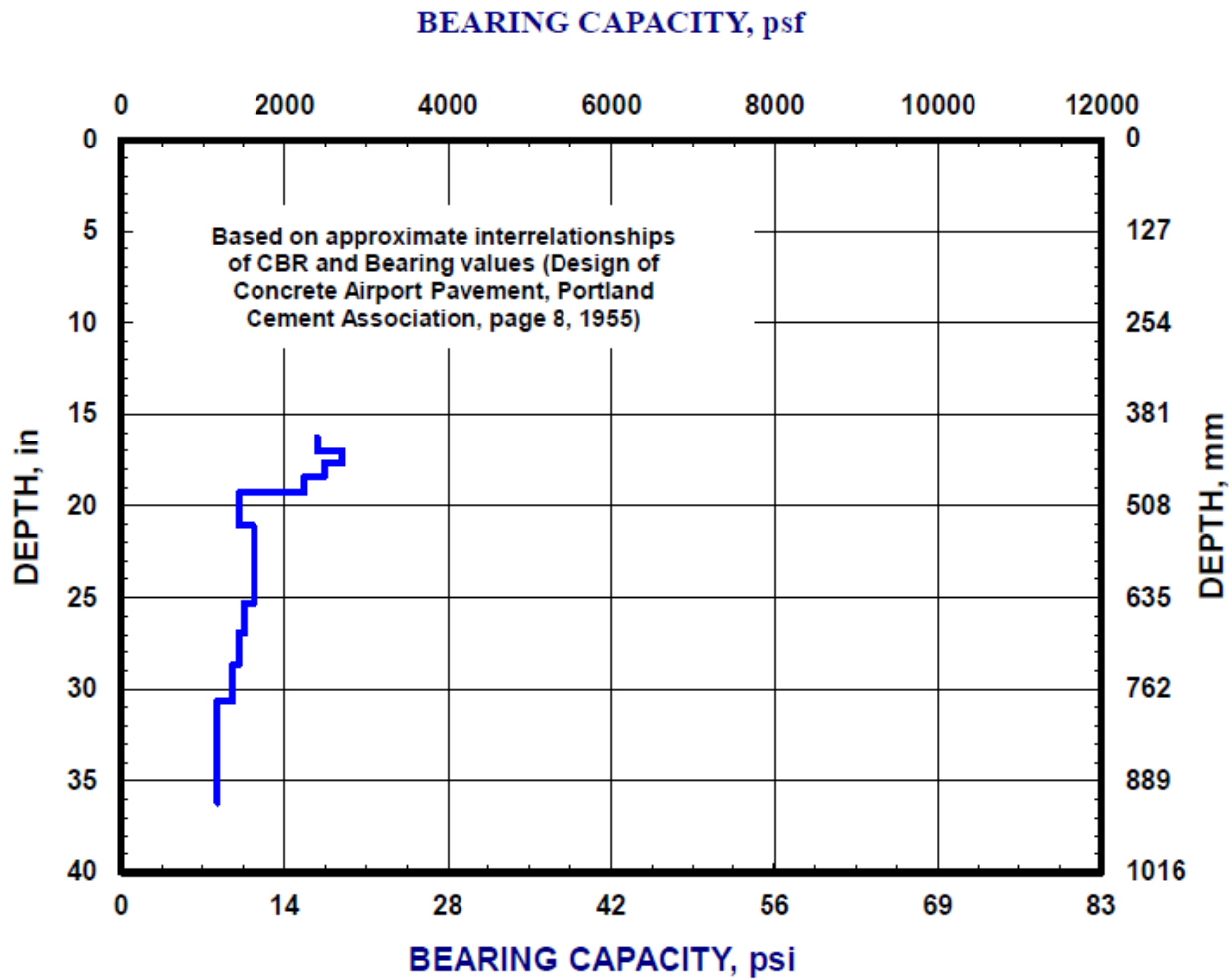
Test Results as Bearing Capacity



Test Results as Bearing Capacity



Test Results as Bearing Capacity



Other uses for Equipment

- ▶ We also used DCP for testing the strength of cement treated bases to make sure we are getting the desired strength
 - ▶ We also used coring machine for cutting holes for signing to be placed in concrete and pavement areas.
- 