



Professional Service Industries, Inc.
A & H Testing Division

ENGINEER Sandifer

PROJECT _____

OUR REPORT NO: 102-45030

LOCATION _____

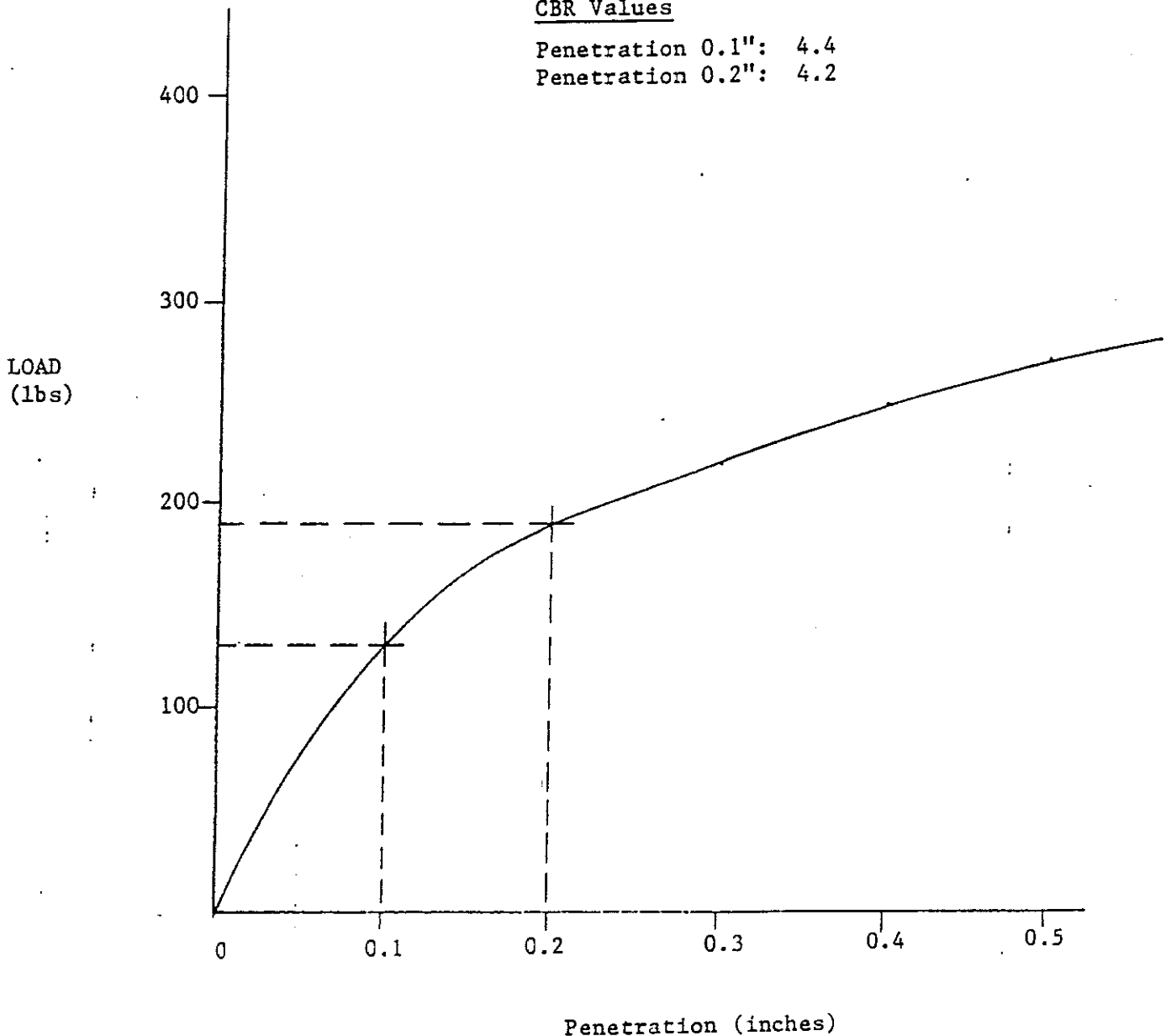
DATE May 9, 1994

CBR ASTM D-1883

Boring:	PB-1
Depth:	1' - 2'
Soil Description:	Brown and gray mottled CLAY trace Silt
Density Before Soaking (lbs/ft ³):	99.2
Moisture Before Soaking (%):	23.9
Density After Soaking (lbs/ft ³):	99.6
Moisture After Soaking (%):	24.3
Percent Expansion (%):	0.5
Surcharge Weight (lbs):	20

CBR Values

Penetration 0.1": 4.4
Penetration 0.2": 4.2



Soil Component Gradation
Unified Soil Classification System

<u>Soil Classification</u>	<u>Sieve Size</u>
Cobbles	above 3 inches
Gravel	3 inches to No. 4 Sieve
Coarse Sand	No. 4 to No. 10 Sieve
Medium Sand	No. 10 to No. 40 Sieve
Fine Sand	No. 40 to No. 200 Sieve
Fines (Silt & Clay)	Passing No. 200 Sieve
Silt	No. 200 to 0.005 mm
Clay	Passing 0.005 mm

**SAMPLING REQUIREMENTS FOR
DESIGN VALUE SELECTION**

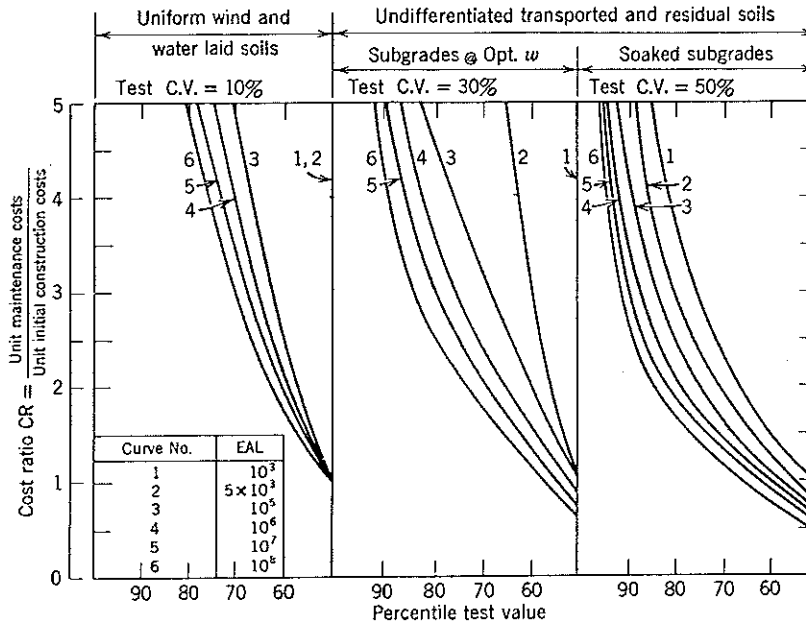


Figure 10.8. Percentile test values for least-cost design. (EAL-equivalent 18,000-lb. axle loads.)

TABLE 10.2. Typical Ranges in the Maintenance to Initial Cost Ratio^a

Traffic (ADT)	Condition	Range in CR
25-100	Readily accessible ^b	1-3
	Urban and rural ^c	2-4
	Remote location ^d	3-5
100-1000	Readily accessible	1-3
	Urban and rural	2-5
	Remote location	3-5
1000-5000	Rural	2-4
	Urban	3-5
5000-plus	All types	3-5

^a From Yoder (20).

^b For example, near an urban area and where detours are easily furnished.

^c Situations where provision of detours may be difficult.

^d Locations where road is a great distance from maintenance facilities.

Pavement Design, Yoder & Witczak, 2 Ed.

REPORT OF MOISTURE DENSITY RELATIONSHIP OF SOIL

TESTED FOR:

PROJECT:

DATE: May 9, 1994

OUR REPORT NO.: 102-45030

TEST DATA

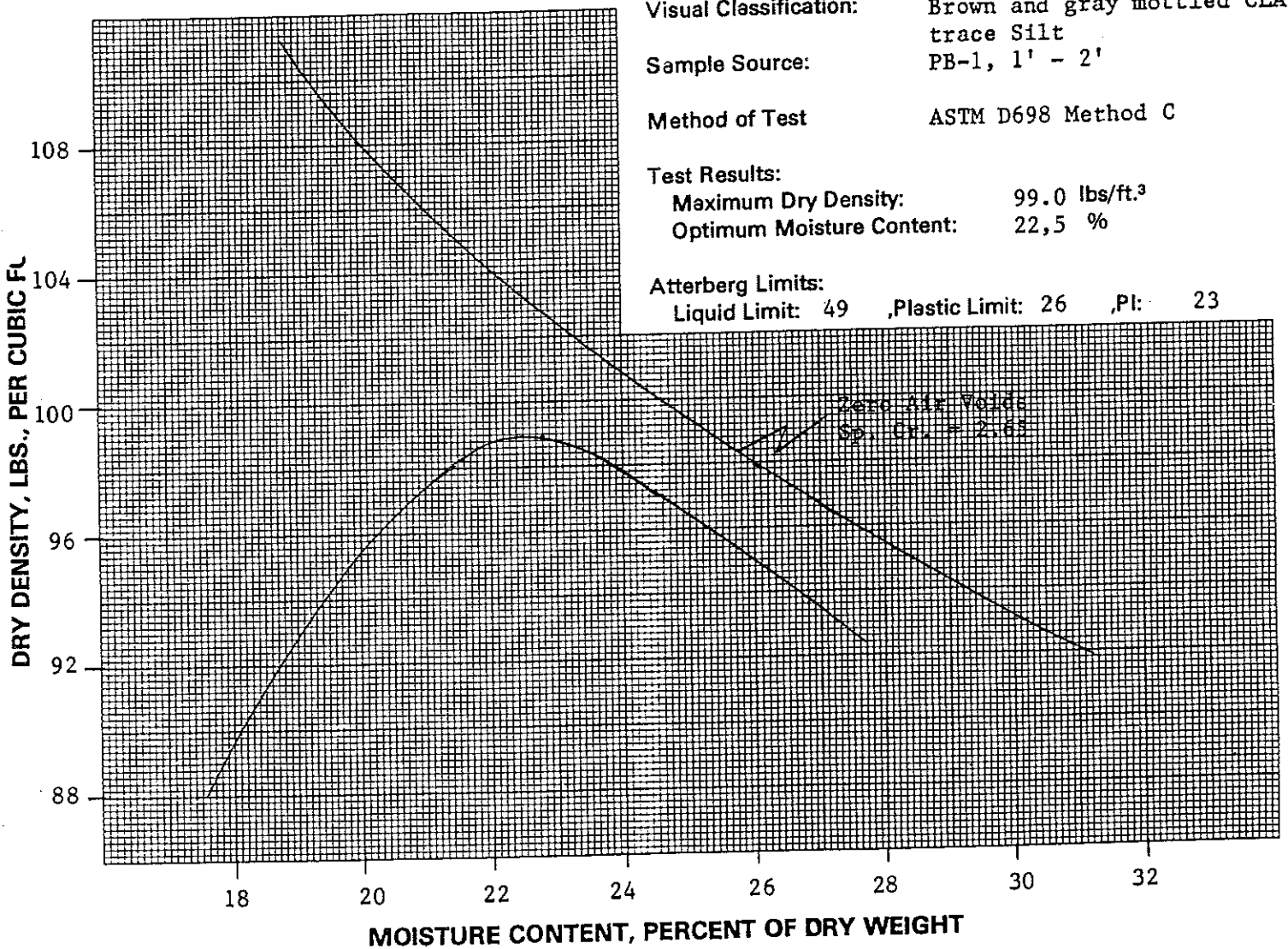
Visual Classification: Brown and gray mottled CLAY
trace Silt

Sample Source: PB-1, 1' - 2'

Method of Test ASTM D698 Method C

Test Results:
Maximum Dry Density: 99.0 lbs/ft.³
Optimum Moisture Content: 22.5 %

Atterberg Limits:
Liquid Limit: 49 , Plastic Limit: 26 , PI: 23



Respectfully submitted,
Professional Service Industries, Inc.

Ohio Compaction Curves

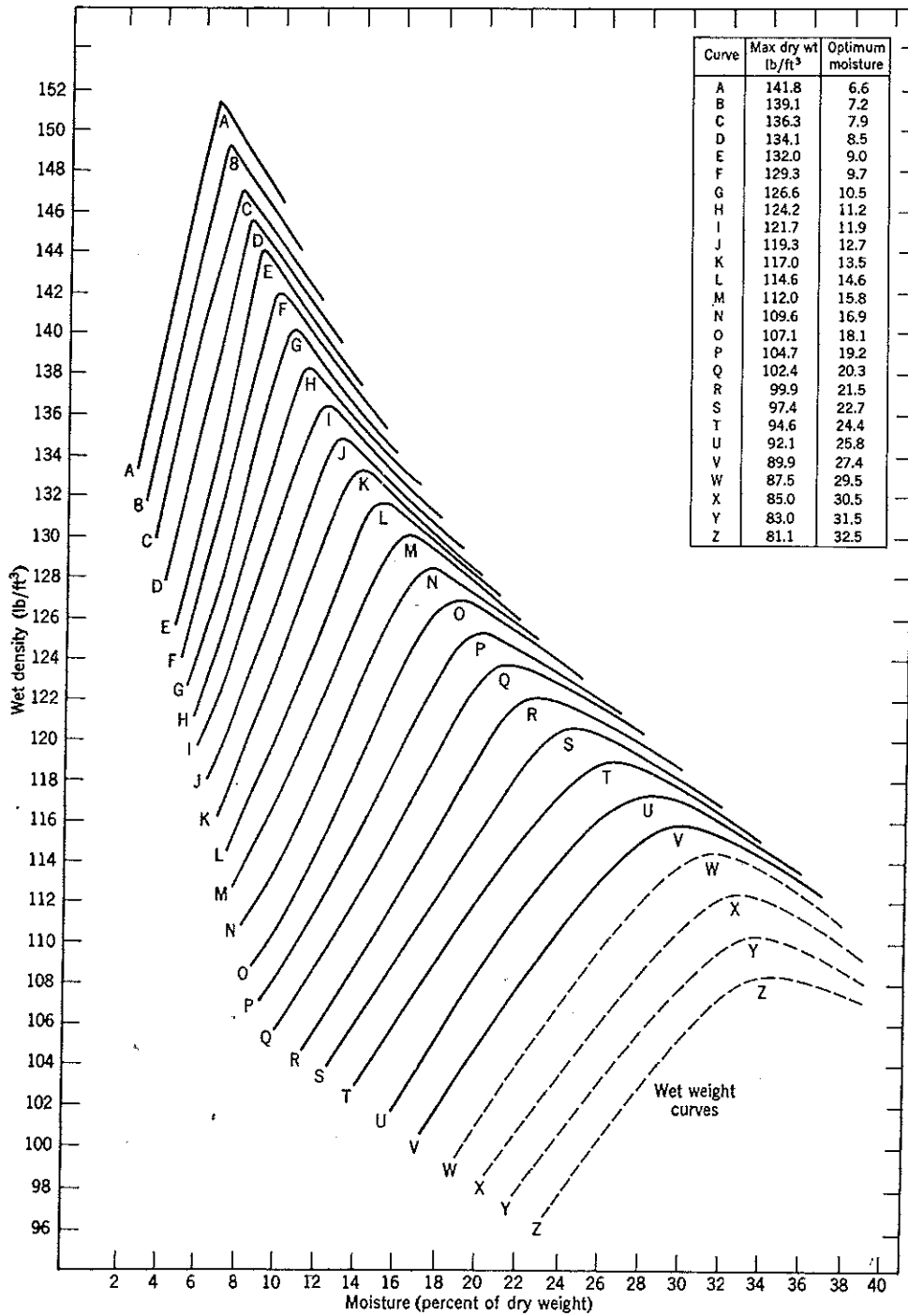


Figure 10.15. Ohio Typical Compaction Curves.

Pavement Design, Yoder & Witczak, 2 Ed.

Soil Compaction Curves

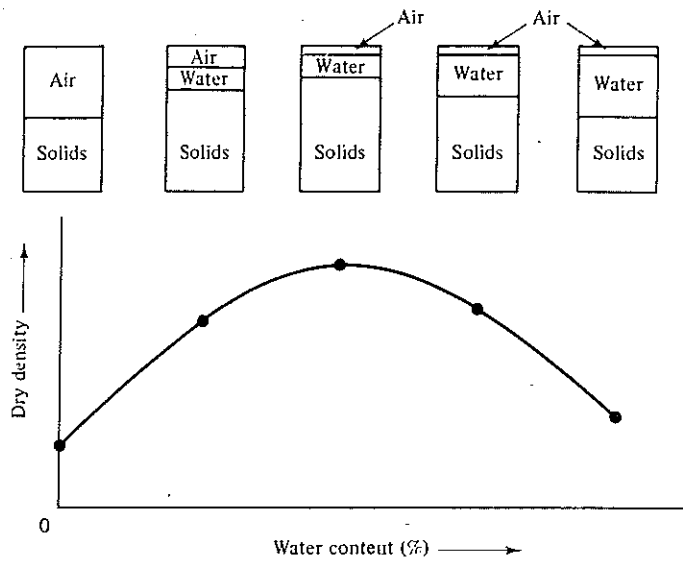


Figure 3-1 Variation of dry density with water content.

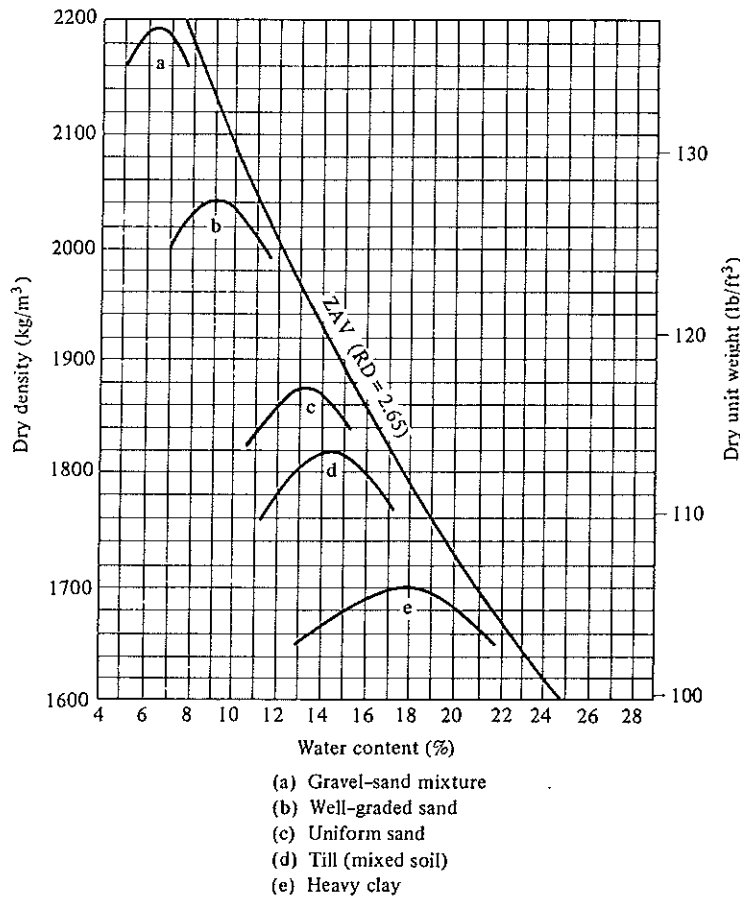


Figure 3-4 Typical compaction curves.

Highway Materials, Soils & Concrete, Atkins, 3rd Ed.

Cement Stabilization RequirementsTABLE 9.2. Average Cement Requirements^a

B and C Horizon Sandy Soils

Material Retained on No. 4 Sieve, (percent)	Material Smaller than 0.005 mm (percent)	Cement Content (percent by wt)					
		Maximum Density (lb/ft ³)					
		105-109	110-114	115-119	120-124	125-129	130 or more
0-14	0-19	10	9	8	7	6	5
	20-39	9	8	7	7	5	5
	40-50	11	10	9	8	6	5
15-29	0-19	10	9	8	6	5	5
	20-39	9	8	7	6	6	5
	40-50	12	10	9	8	7	6
30-45	0-19	10	8	7	6	5	5
	20-39	11	9	8	7	6	5
	40-50	12	11	10	9	8	6

B and C Horizon Silty and Clayey Soils

AASHTO Group Index	Material between 0.05 mm and 0.005 mm (percent)	Cement Content (percent by wt)						
		Maximum Density (lb/ft ³)						
		90-94	95-99	100-104	105-109	110-114	115-119	120 or more
0-3	0-19	12	11	10	8	8	7	7
	20-39	12	11	10	9	8	8	7
	40-59	13	12	11	9	9	8	8
	60 or more	—	—	—	—	—	—	—
4-7	0-19	13	12	11	9	8	7	7
	20-39	13	12	11	10	9	8	8
	40-59	14	13	12	10	10	9	8
	60 or more	15	14	12	11	10	9	9
8-11	0-19	14	13	11	10	9	8	8
	20-39	15	14	11	10	9	9	9
	40-59	16	14	12	11	10	10	9
	60 or more	17	15	13	11	10	10	10
12-15	0-19	15	14	13	12	11	9	9
	20-39	16	15	13	12	11	10	10
	40-59	17	16	14	12	12	11	10
	60 or more	18	16	14	13	12	11	11
16-20	0-19	17	16	14	13	12	11	10
	20-39	18	17	15	14	13	11	11
	40-59	19	18	15	14	14	12	12
	60 or more	20	19	16	15	14	13	12

^a From Portland Cement Association.

France Stone Co.
P.O. Box 1928
Toledo, O. 43603

Aggregate Grading Specifications



70 PASSING

1/4 1/2 1/10

Grd.	Mch.	Obs	4"	3 1/2"	3"	2 1/2"	2"	1 1/2"	1"	3/4"	1/2"	1/4"	3/8"	#4	#8	#16	#30	#48	#80	#100	#200		
1		1	100	90-100	100	25-60	0-15	0-5														0-1	
2		2			100	90-100	36-70	0-16	0-5														0-1
4		4				100	90-100	20-55	0-15	0-5													0-2
5		5				100	90-100	45-65	10-30	0-15	0-5												0-1
5A		5A				100	90-100	25-60	0-10	0-5													0-2
5B		5B				100	90-100	30-40	10-35	0-10	0-5												0-1
5C		5C				100	90-100	30-80	0-8	0-8													0-5
6		6				100	90-100	60-100	15-40	0-10													0-1
6A		6A				100	90-100	70-90	15-35	5-15													0-2
6B		6B				100	90-100	20-55	0-15	0-5													0-3
6C		6C				100	90-100	20-55	0-15	0-5													0-2
7		7				100	90-100	40-70	0-16	0-5													0-1
7A		7A				100	90-100	50-75	0-8	0-8													0-2
8		8				100	90-100	60-90	10-30	0-12													0-3
8A		8A				100	90-100	20-55	0-10	0-5													0-2
8B		8B				100	90-100	35-65	0-25	0-25													0-3
9		9				100	90-100	75-95	5-20	0-5													0-2
9A		9A				100	90-100	50-80	0-35	0-35													0-2
9B		9B				100	90-100	85-100	10-40	0-10													0-3
10		10				100	90-100	85-100	10-40	0-10													0-3
10A		10A				100	90-100	65-100	40-85	20-60													0-1
10B		10B				100	90-100	50-75	30-60	14-30													0-5
11		11				100	90-100	85-95	35-75	20-55													0-3
11A		11A				100	90-100	70-95	45-75	25-55													0-5
11B		11B				100	90-100	75-85	60-75	20-63													0-3
12		12				100	90-100	50-85	7-30	7-30													0-15
12A		12A				100	90-100	25-60	10-35	10-35													0-15
12B		12B				100	90-100	25-100	10-35	10-35													1-7
13		13				100	90-100	60-85	20-40	20-40													0-10
13A		13A				100	90-100	40-75	40-60	20-35													5-15
13B		13B				100	90-100	65-85	20-40	20-35													0-7
14		14				100	90-100	85-100	30-50	30-50													4-10
14A		14A				100	90-100	85-100	25-60	25-60													4-10
14B		14B				100	90-100	70-90	25-60	25-60													9-16
15		15				100	90-100	70-90	35-60	25-50													5-10
15A		15A				100	90-100	55-80	35-60	25-50													5-10
15B		15B				100	90-100	70-90	35-60	25-50													5-10
16		16				100	90-100	80-90	35-60	25-50													5-10
16A		16A				100	90-100	80-90	35-60	25-50													5-10
16B		16B				100	90-100	80-90	35-60	25-50													5-10
17		17				100	90-100	80-90	35-60	25-50													5-10
17A		17A				100	90-100	80-90	35-60	25-50													5-10
17B		17B				100	90-100	80-90	35-60	25-50													5-10
18		18				100	90-100	80-90	35-60	25-50													5-10
18A		18A				100	90-100	80-90	35-60	25-50													5-10
18B		18B				100	90-100	80-90	35-60	25-50													5-10
19		19				100	90-100	80-90	35-60	25-50													5-10
19A		19A				100	90-100	80-90	35-60	25-50													5-10
19B		19B				100	90-100	80-90	35-60	25-50													5-10
20		20				100	90-100	80-90	35-60	25-50													5-10
20A		20A				100	90-100	80-90	35-60	25-50													5-10
20B		20B				100	90-100	80-90	35-60	25-50													5-10
21		21				100	90-100	80-90	35-60	25-50													5-10
21A		21A				100	90-100	80-90	35-60	25-50													5-10
21B		21B				100	90-100	80-90	35-60	25-50													5-10
22		22				100	90-100	80-90	35-60	25-50													5-10
22A		22A				100	90-100	80-90	35-60	25-50													5-10
22B		22B				100	90-100	80-90	35-60	25-50													5-10
23		23				100	90-100	80-90	35-60	25-50													5-10
23A		23A				100	90-100	80-90	35-60	25-50													5-10
23B		23B				100	90-100	80-90	35-60	25-50													5-10
24		24				100	90-100	80-90	35-60	25-50													5-10
24A		24A				100	90-100	80-90	35-60	25-50													5-10
24B		24B				100	90-100	80-90	35-60	25-50													5-10
25		25				100	90-100	80-90	35-60	25-50													5-10
25A		25A				100	90-100	80-90	35-60	25-50													5-10
25B		25B				100	90-100	80-90	35-60	25-50													5-10
26		26				100	90-100	80-90	35-60	25-50													5-10
26A		26A				100	90-100	80-90	35-60	25-50													5-10
26B		26B				100	90-100	80-90	35-60	25-50													5-10
27		27				100	90-100	80-90	35-60	25-50													5-10
27A		27A																					

Frost Susceptible SoilsTable 5-3
FROST-SUSCEPTIBLE SOILS*

<i>Group</i>	<i>Description</i>
F1	Gravelly soils containing between 3 and 20 percent finer than 0.02 mm by weight
F2	Sand containing between 3 and 15 percent finer than 0.02 mm by weight
F3	(a) Gravelly soils containing more than 20 percent finer than 0.02 mm by weight, and sands, except fine silty sands, containing more than 15 percent finer than 0.02 mm by weight. (b) Clays with plasticity indices of more than 12. (c) Varved clays existing with uniform conditions.
F4	(a) All silts including sandy silts. (b) Fine silty sands containing more than 15 percent finer than 0.02 mm by weight. (c) Lean clays with plasticity indices of less than 12. (d) Varved clays with nonuniform subgrade.

*Originally published in "Engineering and Design, Pavement Design for Frost Conditions," U.S. Army Corps of Engineers, EM-1110-345-306.

Table 5-4
POTENTIAL FOR FROST ACTION OF ENGINEERING SOIL
CLASSIFICATION GROUPS*

<i>Potential Frost Action</i>	<i>Soil Classification Groups</i>	
	<i>Unified</i>	<i>AASHTO</i>
None to very slight	GW, GP, SW, SP	A-1, A-3
Slight to medium	GM, GC	A-2
Slight to high	SM, SC	A-2
Medium	CH, OH	A-7
Medium to high	CL, OL	A-6
Medium to very high	ML, MH	A-4, A-5

*From HIGHWAY MATERIALS by Krebs and Walker. Copyright © 1971 by McGraw-Hill, Inc. Used with permission of McGraw-Hill Book Company.