

REPORT ON EXPERIMENT WITH VINSOL RESIN AND HP-7 ADMIXTURES
CONSTRUCTION PROJECT M82 - 110, C1 BETWEEN BELLEVILLE AND US-112

Construction Project M82-110, C1 is located in Wayne County between the town of Belleville and US-112. Paving operations were carried out in late 1942 by A. J. Rehmus of Bay City, using fine and coarse aggregates supplied by the American Aggregates Corporation of Green Oak, and Petoskey Portland Cement. The construction consisted of two 10-foot wide concrete lanes on either side of an already existing 16-foot concrete pavement that had been widened to 20 feet and resurfaced with bituminous material. See Figure 1 for a cross-sectional view of the roadway.

The new lanes were of 9-inch uniform non-reinforced concrete with 1-inch wide expansion joints at 120-foot intervals. These joints were constructed without load-transfer devices. In order to divide the pavement slabs into shorter lengths, dummy joints were located at 20-foot intervals between the expansion joints.

Designated sections of the project were constructed with concrete containing HP-7 or Vinsol Resin and varying amounts of calcium chloride as admixtures. There are seven Vinsol Resin test sections. The first, (V-1) running from Station 207 + 06 to 208 + 05 in the left lane (L) of the new construction, contains 0.375 pounds of Vinsol Resin per barrel of cement and two pounds of calcium chloride per sack of cement. In the second section (V-2), located between Stations 208 + 05 and 209 + 05 L, the calcium chloride content has been reduced to one pound for each sack of cement, while the third section (V-3), between Stations 209 + 05 and 210 + 05 L, omits the calcium chloride entirely.

Sections V-4 through V-7 are located in the right hand lane of the new construction. The first of these, located between Stations 194 + 50 and 195 + 50 R, is a control section. The other three, extending from Station 190 + 50 to 194 + 50 R, contain concrete identical in composition

to that used in Sections V-1, V-2, and V-3.

There are three HP-7 test sections, located between Stations 213 + 40 and 213 + 99.8 L (the end of the project) and between 203 + 00 and 213 + 99.8 R. The concrete in each of these sections contained one pound of HP-7 per sack of cement and no calcium chloride. Table I presents concrete design information for each test section while Figure 1 shows the location of the sections within the paving project.

In consistency, the mixes containing HP-7 were harsh, somewhat hard to finish, and showed considerable bleeding. The concrete without Vinsol Resin or HP-7 was also somewhat harsh, but not hard to finish. There was some bleeding but this was probably due to excess water in the mix. In contrast, the Vinsol Resin admixtures tended to be wet, the wetness increasing with increases in calcium chloride content. All of these mixes finished satisfactorily but showed some bleeding later.

Beams and cylinders for flexural and compressive strength tests, and sonic beams for sonic modulus and freezing and thawing tests, were made from each of the concrete mixes used in the test sections. In addition, time-of-set determinations were carried out on each mix, using the Burggraf method.

Table II summarizes the results of flexural and compressive strength tests and Table III the results of sonic modulus tests. These results show clearly that flexural and compressive strengths are increased by HP-7 and, with one exception, decreased by Vinsol Resin. This exception occurs with the concrete containing one pound of calcium chloride per sack of cement, which has higher compressive and flexural strengths than standard concrete. Sonic moduli were decreased by all Vinsol Resin admixtures but increased slightly by HP-7.

The results obtained in the time-of-set determinations are presented graphically in Figure 2. It can be seen that Vinsol Resin decreases markedly the setting time of concrete, while Hp-7 admixture increases it somewhat.

Mr. A. Hagenbuch made a survey of this project on April 9, 1952, and found no scaling. He said very little cracking had occurred and the project as a whole was in very good shape.

A condition survey made June 24, 1954 by A.A. Smith and L. Kiwala again showed the roadway to be free of scaling throughout the entire length of the project. Because of the generally excellent condition of the pavement, no conclusions can be drawn from this project regarding the effectiveness of HP-7 and Vinsol Resin as scale preventatives. In time, however, differences may develop in the condition of the concrete pavement sections. If this occurs, evaluation of the admixtures will then be possible.

TABLE I
DESIGN INFORMATION FOR CONCRETE USED IN VINSOL RESIN AND HP-7 TEST SECTIONS

Series	Station	Design Proportions of Materials per sack of cement			Admixtures	Slump, inches	Weight per cu. ft.
		Fine Aggregate	Coarse Aggregate	Water			
V-1	207+06 to 208+05 L	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./bbl. cement 2 lb. CaCl ₂ / sack of cement	3	
V-2	208+05 to 209+05 L	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./bbl. cement 1 lb. CaCl ₂ / sack of cement	2-1/4	
V-3	209+05 to 210+05 L	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./bbl. cement No CaCl ₂	2-1/4	
HP-7-1	213+49 to 213+99.8 L	211 lb.	373 lb.	50.6 lb.	1 lb. HP-7 per sack of cement	3-1/2	152.32
HP-7-2	- 213+99.8 R	211 lb.	373 lb.	50.6 lb.	1 lb. HP-7 per sack of cement	1-3/4	149.43
HP-7-3	203+00 to - R	211 lb.	373 lb.	50.6 lb.	1 lb. HP-7 per sack of cement	2-3/4	149.03
V-4	194+50 to 195+50 R	211 lb.	373 lb.	50.6 lb.	No Vinsol Resin Emulsion or CaCl ₂	3	152.44
V-5	193+50 to 194+50 R	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./bbl. cement No CaCl ₂	2-1/2	146.43
V-6	191+00 to 193+50 R	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./ bbl. cement 1 lb. CaCl ₂ per sack of cement	2-1/2	146.50
V-7	190+50 to 191+00 R	211 lb.	373 lb.	50.6 lb.	0.375 lb. V.R.E./ bbl. cement 2 lb. CaCl ₂ per sack cement	3	144.98

TABLE II

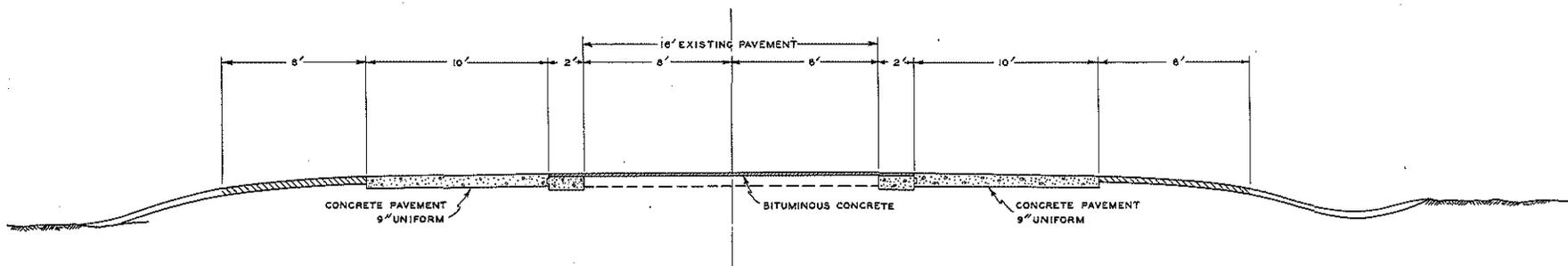
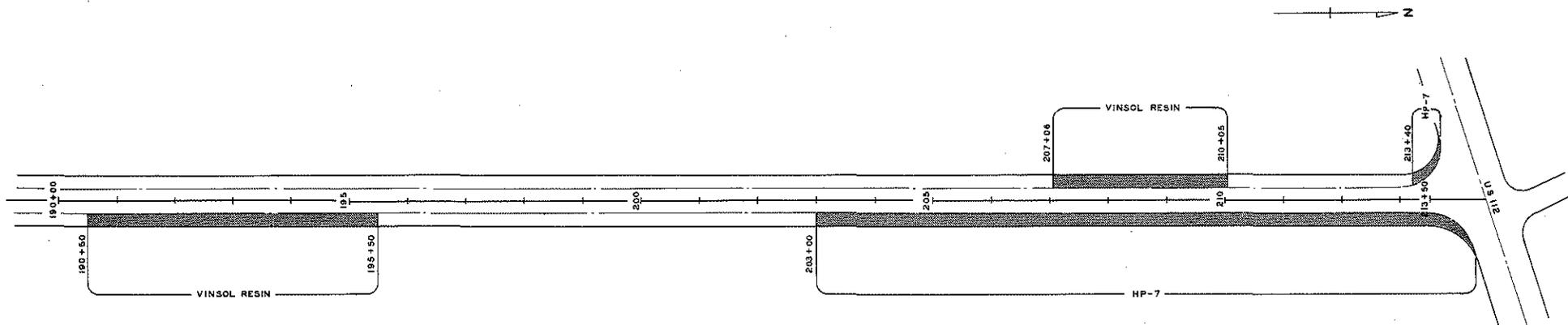
FLEXURAL AND COMPRESSIVE STRENGTHS OF BEAMS AND CYLINDERS
MADE FROM CONCRETE CONTAINING VINSOL RESIN AND HP-7

Admixture	STRENGTH			
	Flexural		Compressive	
	7 day	28 day	7 day	28 day
Hp-7	550	633	2583	4127
Vinsol Resin:				
No Calcium Chloride	335	504	1693	2988
1# CaCl ₂ / sack cement	401	622	2260	3641
2# CaCl ₂ / sack cement	330	516	1800	2433
Average.....	361	547	1917	3021
No Admixture.....	431	536	2348	3532

TABLE III

SONIC MODULUS TESTS
ON BEAMS MADE FROM CONCRETE
CONTAINING VINSOL RESIN AND HP-7

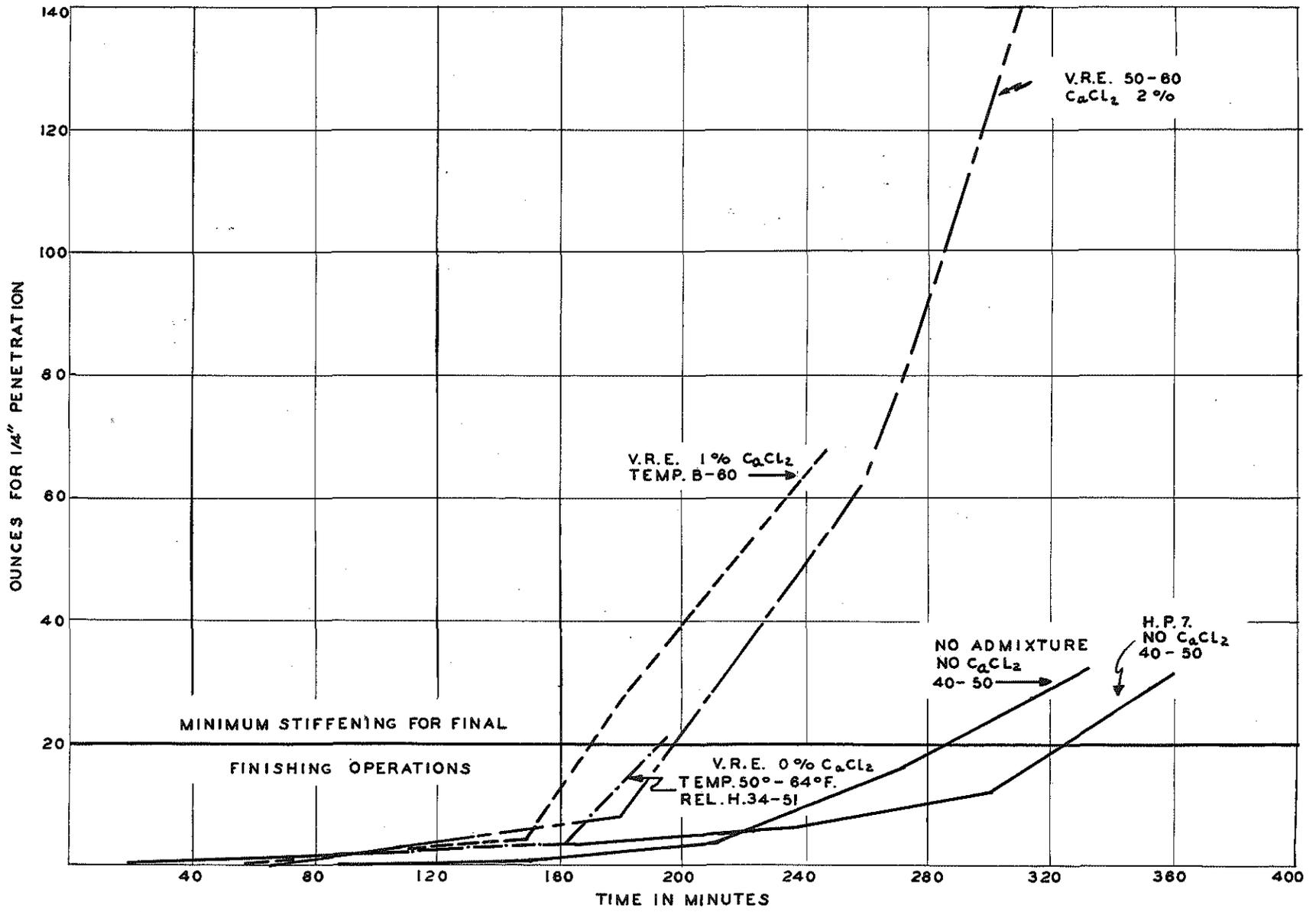
Series	Weight (gms)	Measured December, 49		Measured June, 54	
		Sonic Modulus (cps)	(10 ⁶ psi)	Sonic Modulus (cps)	(10 ⁶ psi)
V-1	10,477	2043	4.37	2088	4.57
V-2	10,791	2138	4.81	2200	5.23
V-3	10,473	2080	4.48	2110	4.66
V-4	10,397	2315	5.87	2360	5.57
V-5	10,655	2025	4.37	2075	4.59
V-6	11,129	2193	5.11	2285	5.81
V-7	10,595	2058	4.49	2100	4.68
HP-7-1	11,299	2325	6.11	2458	6.83
HP-7-2	11,717	2384	6.54	2455	7.01
HP-7-3	10,886	2188	5.21	2273	5.62
Average Vinsol Resin					
2 lb. CaCl ₂ / sack cement	-----	2051	4.43	2094	4.62
1 lb. CaCl ₂ / sack cement	-----	2166	4.96	2243	5.52
0 lb. CaCl ₂ / sack cement	-----	2053	4.43	2093	4.62
Average HP-7	-----	2299	5.95	2396	6.48
Average No Admixture	---	2315	5.87	2360	5.57



FINISHED SECTION SHOWING RELATION OF WIDENING TO EXISTING PAVEMENT WITH CAPPING
TO APPLY FROM STATION 132+93 TO 163+31 AND FROM STATION 186+80 TO 213+00

MAP SHOWING
LOCATION OF EXPERIMENTAL SECTIONS CONTAINING VINSOL RESIN AND POZZOLITH HP-7
ON M-56 BETWEEN ECORSE ROAD AND US-112
CONSTRUCTION PROJECT M82-110

FIGURE 1



TIME OF SET DETERMINATION RESULTS
 H P-7 AND VINSOL RESIN EXPERIMENTAL PROJECT, BELLEVILLE

FIGURE 2