State of Illinois
DEPARTMENT OF TRANSPORTATION
Bureau of Materials and Physical Research

FINAL REPORT

HIGHWAY INSULATING MATERIAL EVALUATION

Project IHD-8

By

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A Product Evaluation Project by
Illinois Department of Transportation
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

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March 1976

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
ILL-PR-64		

4. Title and Subtitle	5. Report Date
Final Report Highway Insulating Material Evaluation Project IHD-8	March 1976
	6. Performing Organization Code
7. Author(s) Indalecio Mascunana Research Engineer	8. Performing Organization Report No. Physical Research Report No. 64
9. Performing Organization Name and Address Illinois Department of Transportation Bureau of Materials and Physical Research Springfield, Illinois 62706	10. Work Unit No.
	11. Contract or Grant No. IHD-8
12. Sponsoring Agency Name and Address Illinois Department of Transportation Bureau of Materials and Physical Research 126 East Ash Street Springfield, Illinois 62706	13. Type of Report and Period Covered FINAL REPORT October 1972 - April 1975
	14. Sponsoring Agency Code

15. Supplementary Notes

Study conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration

16. Abstract

This report describes the experimental use of All-Weather Crete HI-45 expanded perlite-asphalt hot mix insulating sub-base to control frost penetration of the subgrade in a full scale highway construction project over a period of five years. Conclusions and recommendations concerning use of the material in highway construction and highway maintenance are presented. The first half of the study, covering two years of monitoring field data, was published in an interim report in October 1973. Field data for the second half covering the last three years of the study, is included in this report.

The final results of the study indicated that four inches of AWC (24 pcf density) subbase under a 10-inch PCC pavement, was effective in preventing penetration of freezing subsurface temperatures and frost action in the subgrade in northern Illinois. Other thicknesses and compaction densities of AWC tried in this study were ineffective when the freezing index in the area was over 600 degree-days.

17. Key Words	18. Distribution Statement
Frost action, frost heave, frost gage, frost penetration, subsurface temperature, subgrade insulation, thermocouple, insulating material, insulated pavement.	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	33	

Form DOT F 1700.7 (8-69)

ACKNOWLEDGEMENTS

The evaluation that is the subject of this report was planned by the Bureau of Research and Planning and Bureau of Design, District 10 (now District 1) and the Central Bureau of Research and Development (now Bureau of Materials and Physical Research). The construction of the AWC experimental project was supervised by District 10 personnel. The instrumentation installations, periodic field observations and measurements, and the analyses of data collected were made by the Instrumentation Development and Products Evaluation Units.

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INTRODUCTION

Purpose

This study was undertaken in October 1970 to investigate and evaluate the effectiveness of "All-Weather Crete HI-45" as a highway insulating material to control frost penetration in the subgrade, and to determine what effects the inclusion of AWC in the pavement structure has on performance.

AWC is described by the manufacturer, Silbrico Corporation, Hodgkins, Illinois as a thermo-setting insulating fill consisting primarily of a hot bituminous mixture of expanded perlite (volcanic glass) and a low penetration (15-35 pen.) roofing grade asphalt. When placed beneath a pavement structure, AWC is claimed to prevent frost penetration and weakening of the underlying subgrade soil.

This report will cover only the final analysis of the field data monitored in the AWC experimental project, and the conclusions derived from the study after five years of service. The study of an earlier AWC trial installation was discontinued after two years of service, and was included in the published "Physical Research Report No. 54, Interim Report, Highway Insulating Material Evaluation (IHD-8), October, 1973.

Preliminary Evaluation

In the past, the Illinois Division of Highway was successful in the use of an expanded polystyrene plastic foam under a 10-inch nonreinforced PCC pavement to control frost action in the subgrade. Three years of monitoring thermocouple readings and recording changes of surface cross-section, indicated that 1 1/2-inch plastic foam would be sufficient to prevent penetration of freezing temperatures into the subgrade. The encouraging result of this application led to the investigation and evaluation of AWC, which has not only good insulating physical properties but also adequate load bearing characteristics to support construction equipment and to be incorporated directly into the structural section without a protection layer.

Economic considerations were taken into account in determining whether the use of insulation or the conventional subgrade treatment of removal of frost-susceptible soil and replacement with a non-frost-susceptible one would be more expensive.

The estimated cost of AWC insulation treatment is approximately equal to polystyrene plastic foam insulation treatment and less than the conventional treatment.

The possible problem of premature icing of the insulated pavements due to differential pavement surface temperatures was of some concern to many highway engineers. However, since there have not been any reported incidents of this problem on the earlier polystyrene foam project, it was not investigated as part of this study other than to monitor traffic accidents compiled in the computerized Collision Diagram Information sheets by the Illinois Office of Transportation Safety.

In December, 1969, a short AWC trial installation was constructed by the manufacturer in their company compound in Hodgkins, just west of Chicago. The Division's research engineers assisted the manufacturer in the structural design and instrumentation of the pavement components. The installation consisted of three test sections of AWC and one control section having no insulation under a three-inch bituminous concrete pavement.

After two years of observation and monitoring field data, the results of the study indicated that with proper design consideration for thickness and density, AWC can be used effectively as a subbase to control penetration of freezing temperature in the subgrade. A three-inch AWC subbase under a three-inch bituminous concrete pavement was not adequate to control frost action in the Hodgkins tests; however, it has reduced from 1/2 to 2/3 the depth of frost penetration in the test sections. "Trial installation" as discussed in the published interim report refers to this construction by Silbrico Corporation on their property.

In October 1970, the Division of Highways constructed a fully instrumented AWC experimental project on the northbound two lanes of the major four-lane State highway (Illinois Route 43) in Tinley Park just southwest of Chicago. The project includes five AWC test sections having different thicknesses and densities, and two control sections under a 10-inch standard reinforced PCC pavement.

The results of the first two fall-winter-spring seasons of monitoring thermocouple and frost gage indicators were presented in the interim report of this study. Preliminary findings indicated that AWC can be designed to provide the thermal insulation requirement to prevent frost penetration in the subgrade and thus eliminate the problem of uneven heaving of the pavement structure. "Experimental project" as used in this report refers to this construction by the State on Ill. Route 43.

Scope

This report covers the final analysis of field data gathered from the AWC experimental project from the fall of 1970 to the spring of 1975.

The experimental project includes four 300-foot test sections, one 200-foot test section, and two 300-foot control sections in the northbound roadway of Illinois Route 43. The test sections have either two or four inches of AWC subbase compacted at 24, 28 or 32 pounds per cubic foot densities. The control sections have no insulation but have the standard four inches of bituminous aggregate mixture subbase. All the sections were paved with a 10-inch standard reinforced PCC pavement having sawed transverse joints every 100 feet.

The project was instrumented by thermocouple and frost gage indicators to monitor air and subsurface temperatures as well as frost actions in the subgrade. These indicators were monitored twice a month in the fall-winter-spring seasons of 1970 to 1973, and once a month in 1973 to 1975 seasons.

Frost heave measurements by differential leveling of the pavement cross-section at pre-determined locations were taken once a month during the cold seasons for five years. The amount of heave or settlement of the pavement surface was taken as the difference between the initial elevation immediately after construction and the elevation recorded monthly.

Pavement condition surveys were conducted to determine the amount of panel cracking that developed in the surface. The pavement condition survey was not started until the fall of 1973 when very fine panel cracks were noted to be developing in the control and test sections.

Core samples of the pavement structure were taken in July 1974 to determine the performance of the AWC material. After almost four years of service, the insulating material showed no sign of deterioration or loss of stability.

Because of some concern for premature icing on insulated pavements due to surface temperature differentials, a study was made to evaluate the traffic accident data compiled in the Office of Transportation Safety, Illinois Department of Transportation, from 1970 to 1974. The study made a comparison of traffic accidents that occurred in the northbound AWC insulated pavement and in the adjacent southbound uninsulated pavement. The prevailing conditions of the pavement surface were noted whether dry, wet or icy. Test and control pavements were about 1,500 feet long separated by a concrete median.

Conclusions

This study was initially planned to monitor and evaluate the field data of the AWC experimental project in a four-year period. The first half of the study was reported in the published interim report. In the second half, mild winters were experienced in the experimental area and the study was extended for another year with anticipation of a colder winter. Unfortunately, another mild winter took place in the area. However, enough data had been accumulated in five years that could fairly justify termination of the study. The following conclusions are the results of the analysis of all field data collected in the AWC experimental project.

(1) Test Section No. 2, which contains four inches of AWC (24 pcf density) subbase under a 10-inch PCC pavement, was effective in preventing penetration of freezing subsurface temperatures and frost action in the subgrade.

(2) Test Sections No. 1 and No. 3, which contains four inches of AWC (32 pcf and 28 pcf densities, respectively) subbase under a 10-inch PCC pavement, were also effective in preventing frost action in the subgrade, but had recorded freezing subsurface temperatures up to 20 inches below the pavement surface (6 inches below the subgrade).

(3) The absence of frost in Test Sections No. 1 and No. 3 may be attributed to lack of free moisture necessary for frost development.

(4) Test Sections No. 4 and No. 5 which contains two inches of AWC (24 pcf and 28 pcf densities) and two inches of bituminous aggregate mixture composite subbase under a 10-inch PCC pavement, were not thick enough to prevent penetration of freezing subsurface temperature.

(5) Test Sections No. 4 and No. 5 had recorded penetration of freezing subsurface temperatures up to 29 inches below the pavement surface (15 inches below the subgrade) and the presence of frost up to 23 inches (9 inches below the subgrade).

(6) Control Sections No. 1 and No. 2, which contain no insulation but only the standard 4-inch bituminous aggregate mixture subbase under a 10-inch PCC pavement had recorded penetration of freezing subsurface temperatures up to 40 inches below the pavement surface (26 inches below subgrade) and the presence of frost up to 31 inches (17 inches

below the subgrade).

(7) The freezing index values recorded during the first 2 years of the study were normal for the experimental area, but were below normal during the next 3 years. The below normal index value indicates a mild winter prevailing in the area.

(8) The result of frost heave measurements indicated no significant change of pavement cross-section in either the test or control sections.

(9) The pavement condition survey seems to indicate that the AWC insulation helped to retard the development of panel cracks in the test sections.

(10) Traffic accidents data compiled in the last five years indicated that insulating a pavement does not make it more hazardous to driving due to premature icing than a pavement not insulated. There were seven reported accidents in the adjacent uninsulated pavement and only one in the AWC insulated pavement, when the pavement surface was icy.

(11) The traffic accident study does not conclude that insulated pavements will result in lower traffic accident rates.

Recommendation

Based on the results of this study, it is recommended that four inches of AWC (24 pcf density) subbase be approved for permissive use under 10-inch PCC pavement where frost heaving is anticipated to be a problem, or as a remedial measure to correct frost heaving problems in an existing pavement. Economic consideration should take priority in the decision-making to determine which subgrade treatment would be most appropriate.

FIELD TEST PROGRAM

Experimental Design

The experimental design of this study consists of five test sections and one control section at each end, totaling 2,000 feet in length. The design included 10 inches of standard PCC pavement placed over two thicknesses (2- and 4-inches) of AWC insulation and/or bituminous aggregate mixture subbase, and a subgrade classified as an A-7-6(15) soil type. The insulation was compacted at three compaction densities (24 PCF, 28 PCF, & 32 PCF) to provide a range of insulating values that might be most effective in controlling frost action.

The experimental project is located in the northbound roadway and is part of the construction of FA Route 42 (Ill. Route 43 - Harlem Avenue), Section 3127-1, north of Tinley Park in Cook County. A layout of the project is shown in Figure 1.

Instrumentation

Electrical indicators consisting of thermocouple and frost gage electrodes were installed at pre-determined locations and levels to measure periodically the depth of freezing temperature and frost penetrations in the pavement structure. The thermocouple electrodes were spaced six inches apart, while the frost gage electrodes were spaced one inch.

The indicators were placed below the pavement in the center of each lane and along the outer edge of the insulation in the shoulder. Also, another instrument was placed horizontally below the concrete curb to determine the horizontal thermal gradient at the pavement edge. Typical cross sections showing the relative location of the instruments are shown in Figures 2 to 6.

Weather Station Data

Climatological data compiled by the National Weather Service Office at Chicago O'Hare Airport was used to determine the freezing index for the Chicago suburbs which include the experimental project.

The freezing index value is the number of degree-days between the highest and lowest points on a curve of cumulative degree-days versus time for one freezing season. It is used as a measure of the combined duration and magnitude of below 32^{o}F temperatures occurring during any given freezing season.

Studies conducted by the Corps of Engineers on frost problems indicated that the range of mean air freezing index value for the Chicago suburb would be between 600 to 700 degree-days. The design freezing index value which was defined as the

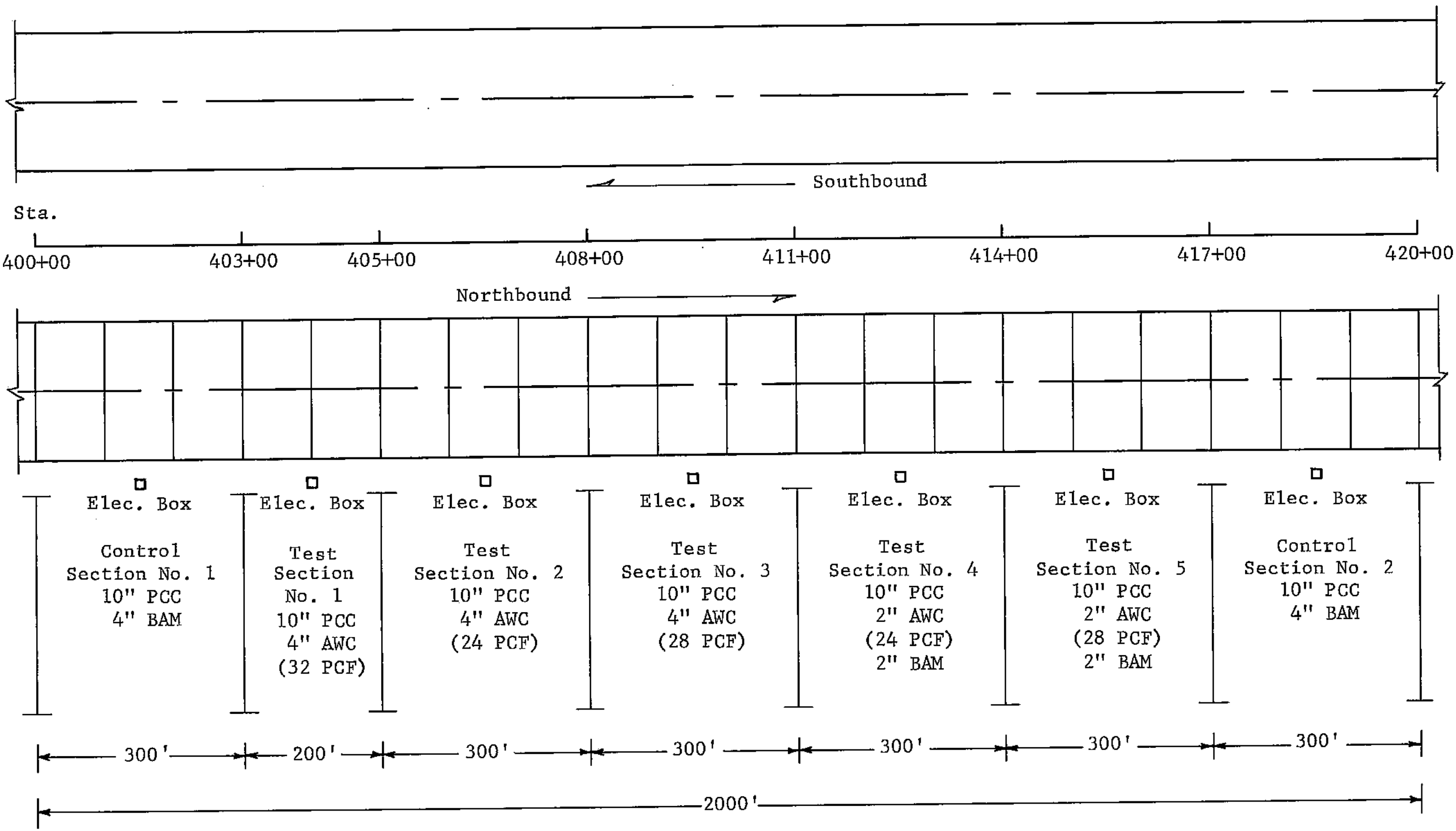

Figure 1. Layout of AWC insulation experimental project.

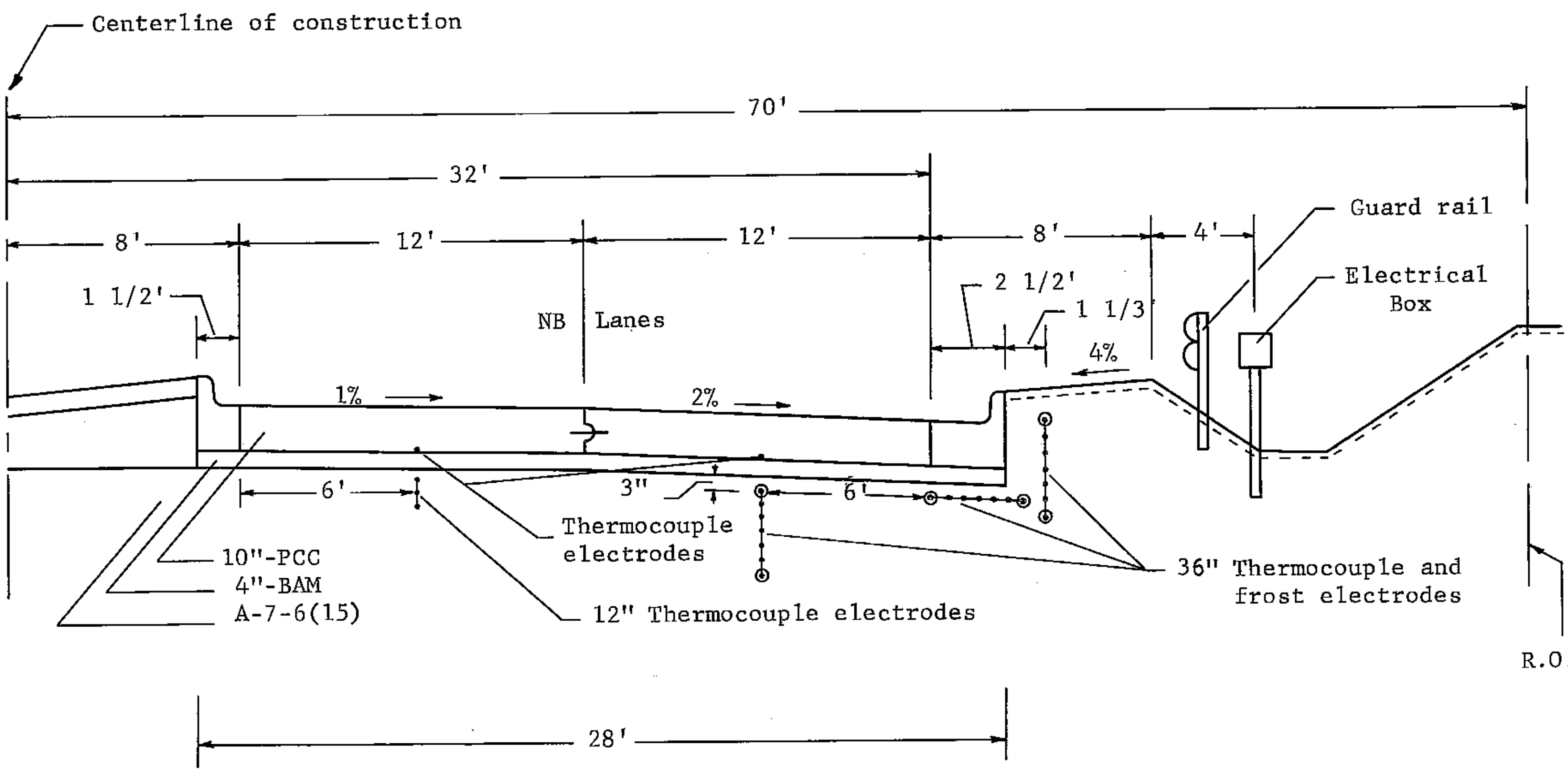

Figure 2. Typical cross section for Control Sections Nos. 1 and 2.

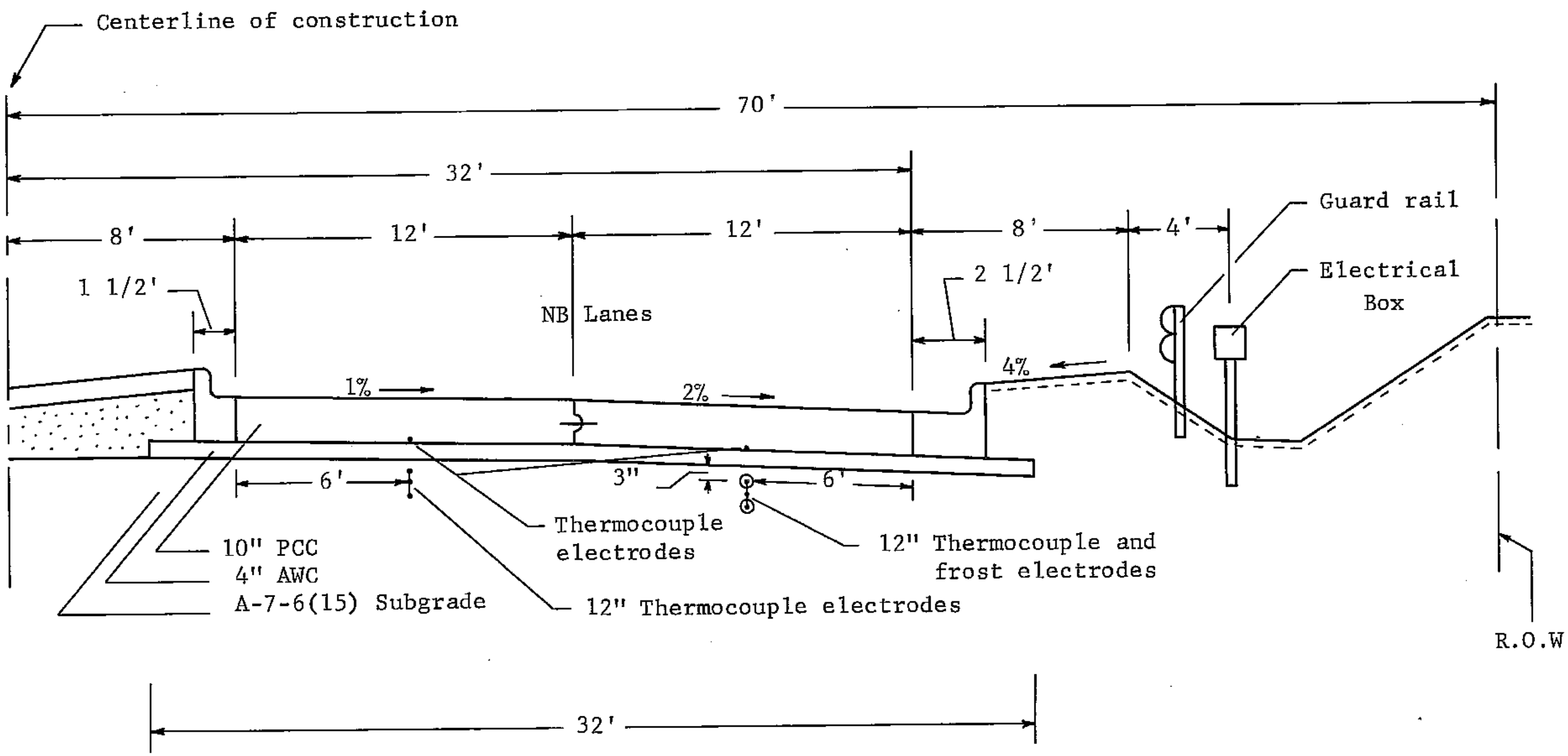

Figure 3. Typical cross section for Test Sections Nos. 1 and 3.

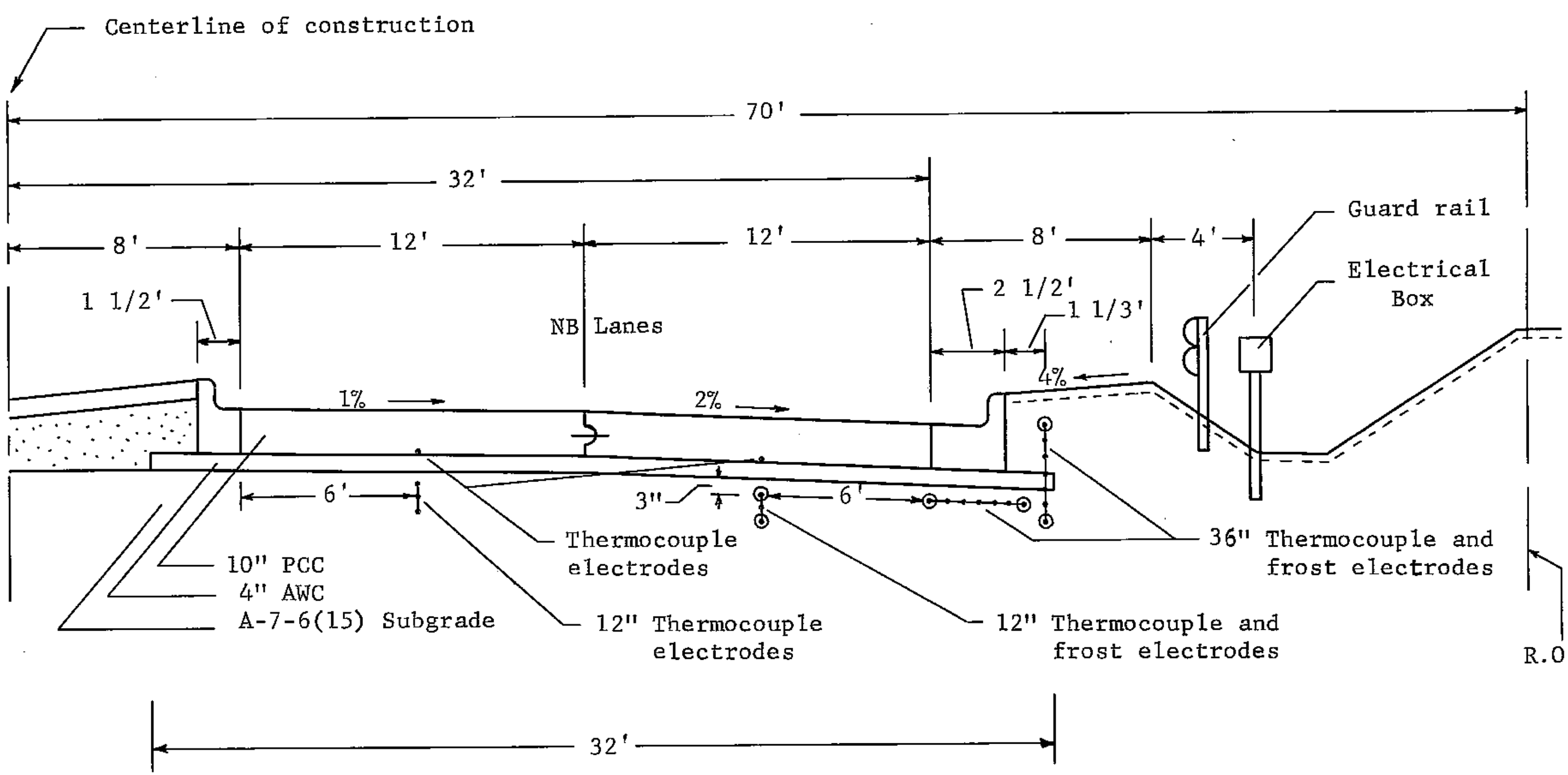

Figure 4. Typical cross section for Test Section No. 2.

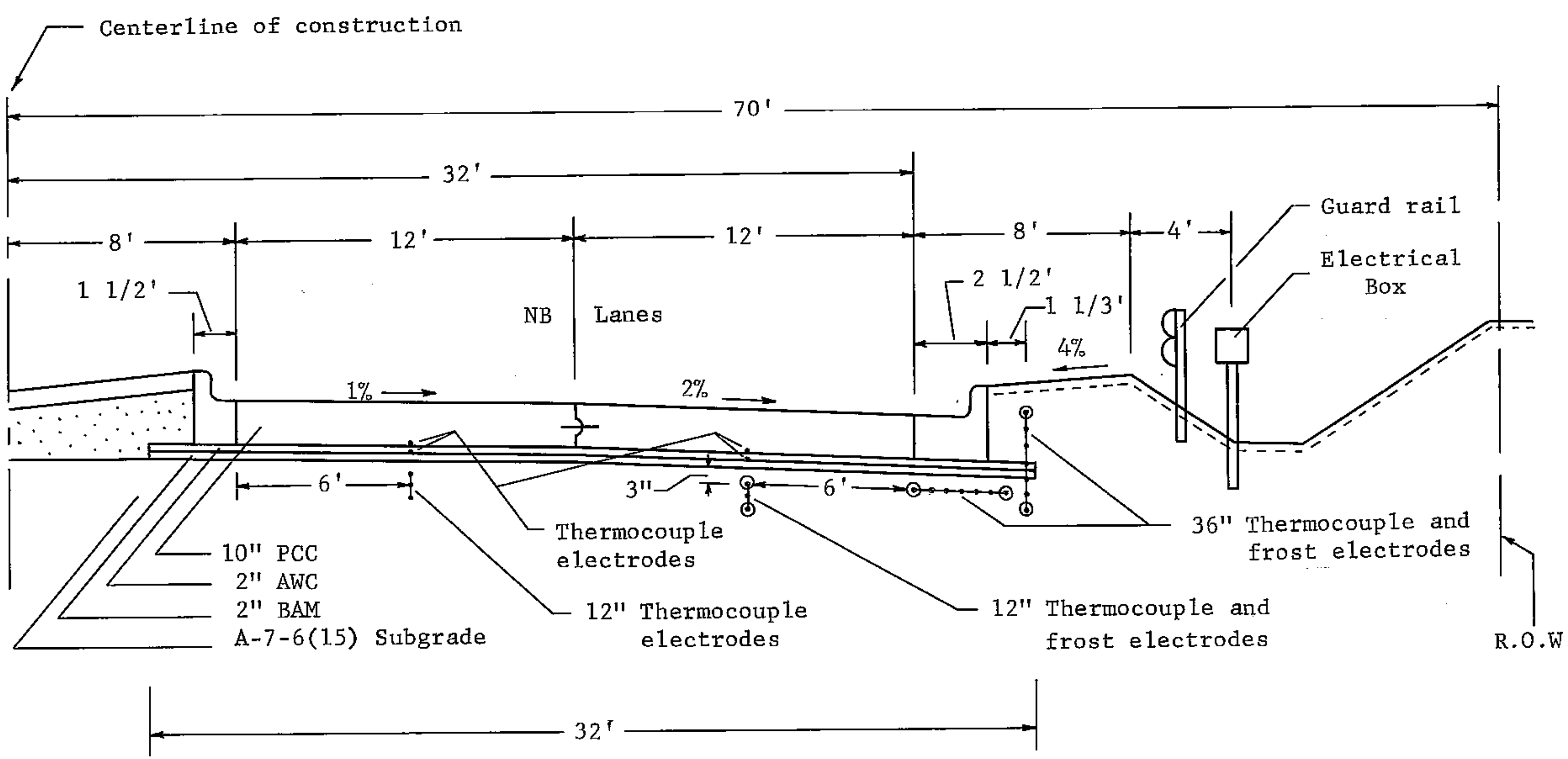

Figure 5. Typical cross section for Test Section No. 4.

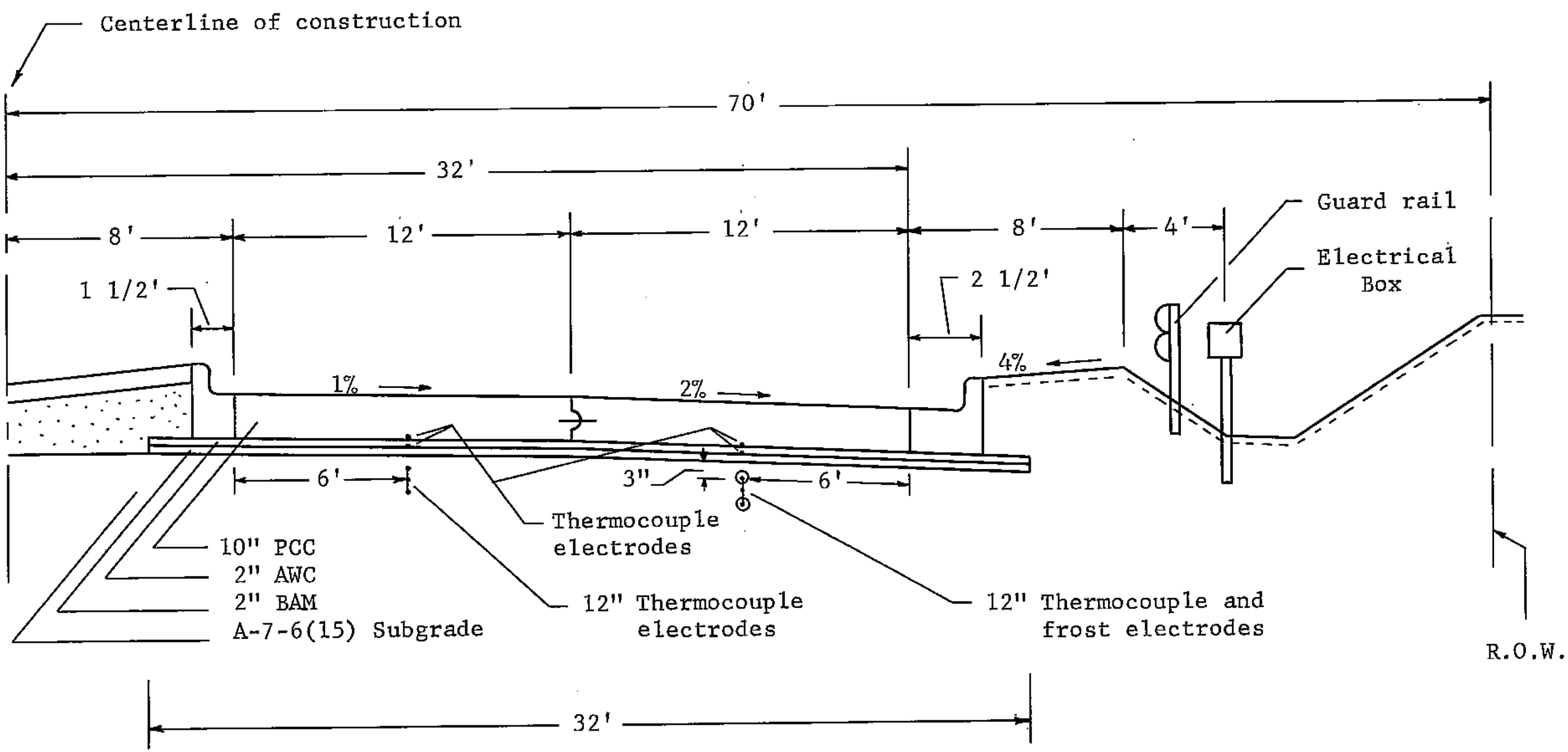

Figure 6. Typical cross section for Test Section No. 5.

cumulative degree-days of air temperature below 32°F for the coldest year in a ten-year cycle or the average of the three coldest years in a 30-year cycle, was estimated to be about 900 degree-days.

Determination of actual freezing index values in the Chicago area for the cold seasons of 1970-71, 1971-72, 1972-73, 1973-74, and 1974-75 resulted in values of 690, 660, 478, 555, and 420 degree-days, respectively. The freezing indexes of the first two cold seasons fall within the range of the mean, while the last three seasons are much lower than the mean, indicating milder winters. The determination of the freezing indexes for the cold seasons of 1972-73, 1973-74, and 1974-75 are shown in Figures 7 to 9.

FIELD TEST RESULTS

Instrumentation Recordings

Data from thermocouple and frost gage indicators were recorded twice a month during the cold seasons of 1970-71, 1971-72, and 1972-73, but only once a month for the 1973-74 and 1974-75 seasons. The recordings for the first two cold seasons were presented in the published interim report, while those of the latter three seasons are included in this report.

Thermocouple Indicators

The effectiveness of the AWC subbase in controlling penetration of freezing subsurface temperatures was determined by analyzing the limits of the recorded yearly maximum penetration of freezing subsurface temperatures of all control and test sections. Table 1 shows a summary of the recorded yearly maximum penetration of freezing subsurface temperatures in the inner lane center, outer lane center, and outer lane shoulder of each section.

From Table 1, the results indicated that after five years of monitoring thermocouple data, no freezing subsurface temperatures has penetrated the 4-inch

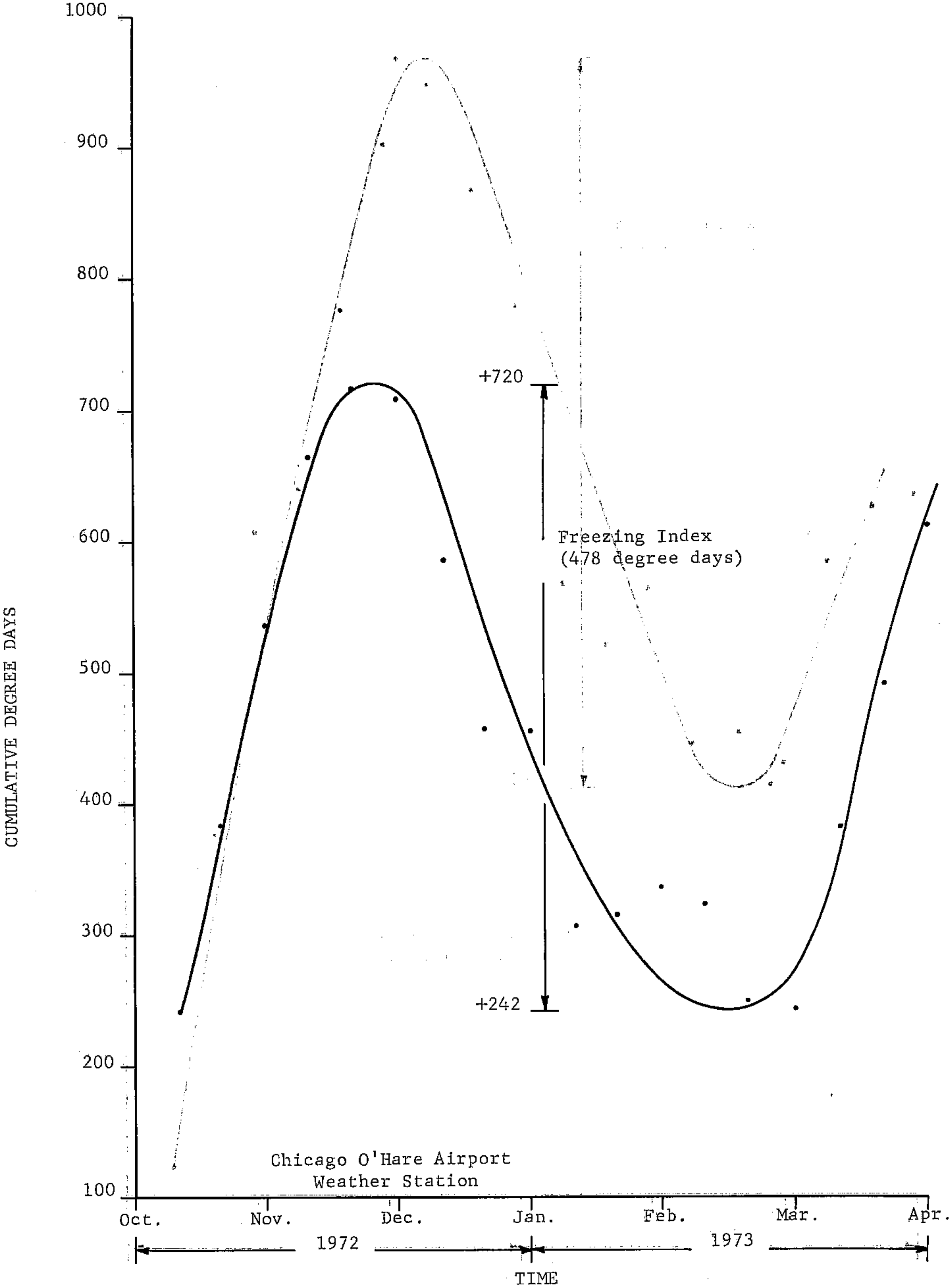

Figure 7. Determination of Freezing Index, 1972-1973.

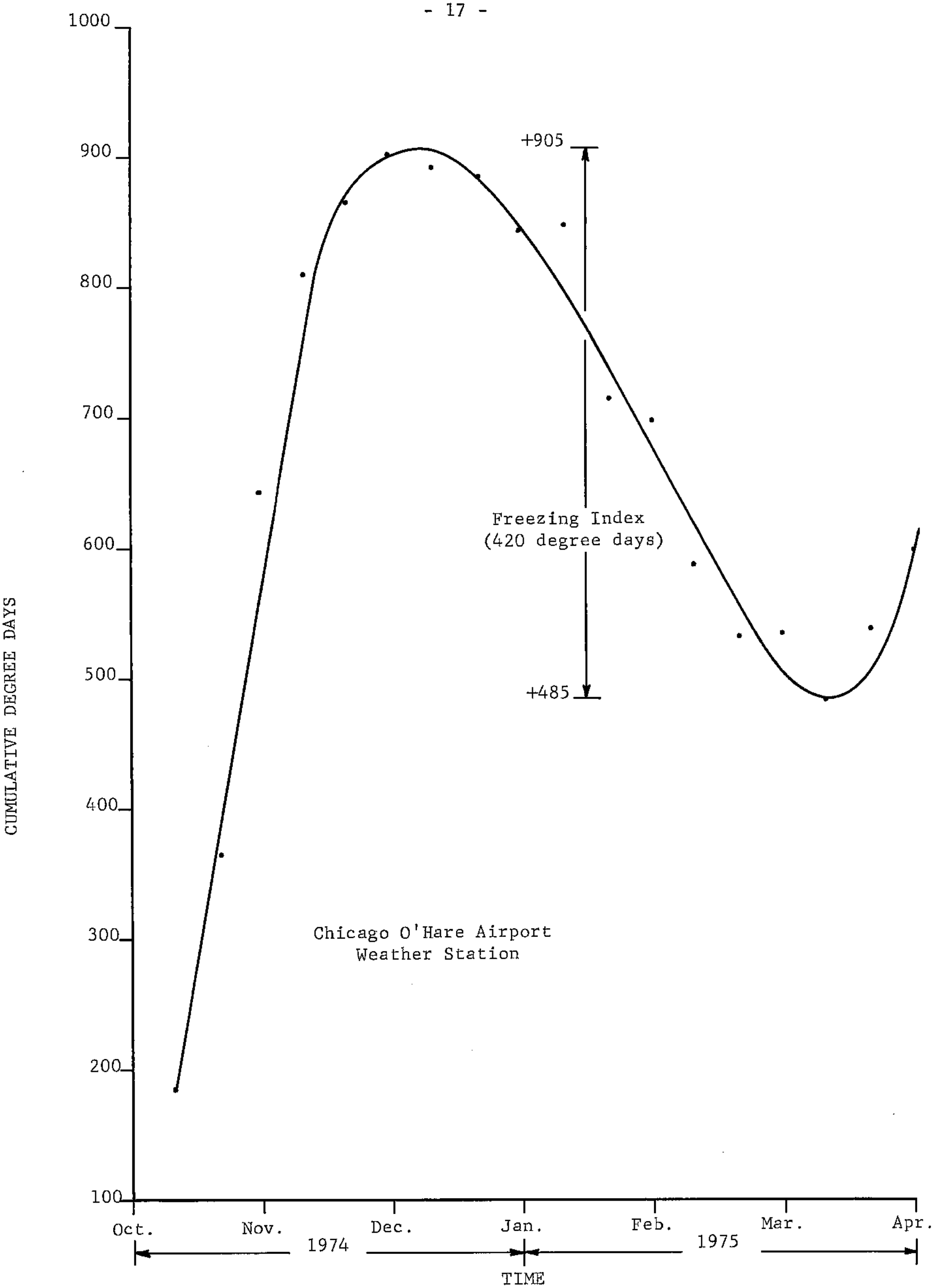

Figure 9. Determination of Freezing Index, 1974-1975.

TABLE 1

YEARLY MAXIMUM PENETRATION OF FREEZING
SUBSURFACE TEMPERATURES

Section	Depth of Penetration Below Pavement Surface (Inches) 1970-71			1971-72			1972-73			1973-74			1974-75		
	ILC	OLC	OLS	ILC	OLC	OLS	ILC	OLC	OLS	ILC	OLC	OLS	ILC	OLC	OLS
Control No. 1	40	40	-	31	28	25	20	20	11	26	25	22	18	18	27
Test No. 1	10	20	-	10	17	-	10	10	-	10	10	-	10	10	-
Test No. 2	10	10	-	10	10	12	10	10	11	10	10	8	10	10	14
Test No. 3	10	10	-	10	17	-	10	10	-	10	10	-	10	10	-
Test No. 4	29	29	-	12	17	14	10	10	3	20	25	6	10	15	0
Test No. 5	26	17	-	12	22	-	12	15	-	24	20	-	13	14	-
Control No. 2	39	37	-	29	28	20	24	19	11	26	24	11	16	16	7
Freezing Index (Degree - Days)	690 (Normal)			660 (Normal)			478 (Below Normal)			555 (Below Normal)			420 (Below Normal)		

Note: ILC - Inner lane center
OLC - Outer lane center
OLS - Outer lane shoulder

AWC subbase in either the inner or outer lanes of Test Section No. 2. Also, no freezing temperatures has penetrated the 4-inch AWC subbase in the inner lane of Test Sections No. 1 and No. 3. However, in the outer lane of Test Section No. 1, freezing temperatures were recorded up to 20 inches below the pavement surface or six inches below the subgrade during the 1970-71 season, and only up to 17 inches during the 1971-72 season in Test Sections No. 1 and No. 3. Subsequent recordings conducted in 1972 to 1975 indicated no penetration of freezing temperatures in these sections.

In Test Sections No. 4 and No. 5, freezing temperatures were recorded under the 2-inch AWC subbase ranging up to 29 inches below the pavement surface. The 2-inch AWC subbase seems to be inadequate to provide the necessary thermal subgrade protection even for mild winters such as 1974-75, although the freezing index for the 1974-75 season was only 420 degree-days. Such an index value was considered below normal for the Chicago area.

Both Control Sections No. 1 and No. 2 have recorded deeper penetration of freezing temperatures in the subgrade than the insulated test sections. It ranged from 37 to 40 inches below the pavement surface when the freezing index was 690 degree-days during the 1970-71 season, and from 16 to 18 inches when the freezing index was only 420 degree-days during the 1974-75 season.

The thermocouple data collected from the outside lane shoulder of Control Sections No. 1 and No. 2, and of Test Sections No. 2 and No. 4 were quite inacurate due to several factors. These include the insulating effect of the snow that piles on the shoulder after the snow removal, the heavy concentration of deicing salts that splashes on the shoulder with the vehicular traffic, and the unprotected embankment slope of the shoulder.

Frost Gage Indicators

Electrical resistance of a soil mass changes radically upon freezing of the soil moisture. A large increase in resistance is an indication of the presence of frost. Usually, the increase in resistance is accompanied by the sudden drop of subsurface temperature below freezing, forming ice crystals whenever free moisture is available. Table 2 shows a summary of the recorded yearly maximum frost penetration in the outer lane of each section.

From Table 2, it seems evident that no frost has penetrated the 4-inch AWC subbase in Test Sections No. 1, No. 2, and No. 3, although freezing temperatures were recorded to have penetrated the AWC subbase in Test Section No. 1 and No. 3 when the freezing index was 660 degree-days. This seems to be a case where free moisture necessary to form the ice lenses was not available in the freezing zone.

Frost penetrations up to 23 inches below the pavement surface were recorded in the composite 2-inch AWC and 2-inch bituminous aggregate mixture subbase in Test Sections No. 4 and No. 5, and up to 31 inches below the pavement surface in Control Sections No. 1 and No. 2. It is interesting to note that, when the freezing index was only 420 degree-days, no frost penetration was recorded even though freezing temperatures were present in both control sections up to 18 inches below the pavement surface.

Frost Heave Measurements

Differential levels of the pavement cross-section at pre-determined locations were taken once a month during the cold seasons. Relative changes of surface elevation from the initial leveling taken immediately after construction indicate the amount of heave or settlement of the pavement structure.

Due to premature scaling of the concrete pavement surface, especially on the outer wheelpath of both the inner and outer lanes, analysis of leveling data was limited to the center half of pavement cross-section as shown in Table 3 and 4.

TABLE 2

YEARLY MAXIMUM FROST PENETRATION
(Outer Lane Center Only)

Section	Estimated Frost Depth Below Pavement Surface (Inches)			
	1971-72	1972-73	1973-74	1974-75
Control No. 1	31	21	22	None
Test No. 1	None	None	None	None
Test No. 2	None	None	None	None
Test No. 3	None	None	None	None
Test No. 4	21	21	23	None
Test No. 5	17	None	17	None
Control No. 2	28	20	None	None

TABLE 3

AVERAGE RELATIVE ELEVATION CHANGES OF CENTER
HALF OF PAVEMENT CROSS-SECTION

Section	Station	Elevation Changes (0.01 Foot)										
		1972 - 1973					1973- 1974					
		10/17	11/28	12/12	1/30	3/6	10/23	11/20	12/11	1/24	2/20	3/19
Control 1	401 + 00	+3	+1	+4	+1	+1	+1	+4	+2	+4	+3	+2
	401 + 50	+3	+2	+2	+1	+2	+2	+3	+2	+3	+3	+2
	402 + 00	0	+1	+1	-2	-1	-1	+1	+1	+1	+1	0
Test 1	403 + 50	+2	+1	+2	+1	+2	0	0	0	0	0	-1
	404 + 00	+2	0	+1	0	0	+1	0	-1	0	0	-2
	404 + 50	+2	0	+1	+1	+1	+2	+2	0	+1	+2	-2
Test 2	406 + 00	+3	+2	+2	+2	-1	+2	+2	+3	+1	+3	+2
	406 + 50	-1	-1	0	-1	-3	0	0	+1	-1	+2	-1
	407 + 00	+1	+2	+2	+1	+5	+1	+1	+2	-2	+3	0
Test 3	409 + 00	+1	+2	0	+1	+1	-2	-1	0	-1	0	+1
	409 + 50	0	+2	-1	0	+1	-1	-1	+1	-1	+1	+1
	410 + 00	0	+2	-1	+1	0	-2	-1	-1	-2	+1	+1
Test 4	412 + 00	+3	+3	+5	+3	+3	+3	+3	-1	0	+2	+4
	412 + 50	+6	+6	+6	+6	+6	+5	+5	+2	0	+4	+6
	413 + 00	+4	+4	+5	+4	+4	+3	+3	+1	+1	+1	+3
Test 5	415 + 00	+2	+2	+3	+1	+3	0	+2	-1	+2	-1	-1
	415 + 50	+1	+1	-1	0	-1	-1	0	-1	0	-2	-1
	416 + 00	-1	-1	-1	-2	+1	-2	-1	-2	-1	-3	-2
Control 2	418 + 00	+1	+1	+3	0	+1	0	+1	-1	0	0	+1
	418 + 50	+1	+1	+3	0	+1	-1	-1	-1	0	-1	-1
	419 + 00	+1	+2	+3	-1	+1	-2	-1	-2	-1	-1	-2

TABLE 4

AVERAGE RELATIVE ELEVATION CHANGES OF CENTER
HALF OF PAVEMENT CROSS-SECTION

Section	Station	Evaluation Changes (0.01 Foot) 1974-1975 10/16	11/20	12/17	1/17	2/27	4/15
Control 1	401 + 00	+2	+1	+3	+1	+1	+2
	401 + 50	+2	+1	+3	+2	+1	+3
	402 + 00	0	-1	+2	0	-1	0
Test 1	403 + 50	-1	-2	-1	-2	-2	+1
	404 + 00	-1	-2	0	-2	-2	+1
	404 + 50	-1	-2	+2	-1	-1	+2
Test 2	406 + 00	+2	+1	+2	+4	+4	+4
	406 + 50	0	-1	-2	+1	+1	+1
	407 + 00	+1	0	-1	+2	+2	+1
Test 3	409 + 00	0	-2	-6	0	0	+1
	409 + 50	+1	-1	+1	+2	+1	+1
	410 + 00	+1	-1	+1	+1	+1	+2
Test 4	412 + 00	+1	+2	+4	+1	0	+3
	412 + 50	+3	+3	+6	+2	+2	+6
	413 + 00	+1	+2	+4	0	-1	+4
Test 5	415 + 00	-2	0	+2	-2	-3	+2
	415 + 50	-3	-1	-1	-3	-3	+1
	416 + 00	-4	-2	-2	-4	-4	-1
Control 2	418 + 00	-1	0	+1	-1	-2	+1
	418 + 50	-1	-1	0	-2	-2	+1
	419 + 00	-2	-1	-1	-3	-3	0

The results of the level measurements indicated no significant change in pavement elevation in either the test or control sections with exception of Test Section No. 4 where heaving up to 0.06 ft. was recorded.

Pavement Condition Survey

Condition survey of the experimental project started in October 1973 when the pavement had about three years of service. It was that time when panel cracks seemed to have developed in the control and test sections. Later surveys were conducted in the winters of 1974 and 1975 as shown in Table 5. Panel cracks are defined as transverse cracks contained within a 100-foot panel and believed to be caused principally by shrinkage or thermal contraction.

From the table, the results seem to indicate that at an early age (3 years of service), the AWC insulation helped to retard the development of panel cracks in the test sections. No crack developed in Test Sections No. 1 and No. 2, and only one crack each developed in Test Sections No. 3 and No. 5, inclusive. However, there were 2 cracks in Control Section No. 1 and 6 cracks in Control Section No. 2.

After 4 years and 4 months of service, there were 2 cracks in Test Section No. 1, 7 cracks each in Test Section No. 2 and No. 3, 6 cracks in Test Section No. 4, and 5 cracks in Test Section No. 5. Both uninsulated control sections had more cracks than the insulated sections, with 10 cracks for control section No. 1 and 11 cracks for control section No. 2.

TRAFFIC ACCIDENT STUDY

The data used in the traffic accident study were taken from the computerized Collision Diagram Information sheets in the Office of Transportation Safety, Illinois DOT, for the years 1970 to 1974, inclusive. The study was made to compare the traffic accidents that occurred between the AWC insulated pavement

TABLE 5

CONDITION SURVEY RESULTS

	No. of 100 Ft. Panels	Length (Feet)	Insulation Thickness (Inches)	Total No. of Panel Cracks 10/23/73	3/19/74	2/6/75
Control No. 1	3	300	0	2	4	10
Test No. 1	2	200	4	0	0	2
Test No. 2	3	300	4	0	0	7
Test No. 3	3	300	4	1	3	7
Test No. 4	3	300	2	1	2	6
Test No. 5	3	300	2	1	2	5
Control No. 2	3	300	0	6	8	11
Adjacent to Control No. 2	3	300	0	6	9	13

and the adjacent uninsulated pavement during dry, wet, and icy pavement conditions. The possible problem of premature icing on insulated pavements due to different pavement surface temperatures, was of some concern to design engineers. This concern was taken into consideration by segregating the 5-year accident data according to prevailing surface condition during the accident, as shown in Table 6.

From Table 6, the 5-year traffic accident data indicated that in the insulated pavement, there were 6 accidents that occurred when the surface was dry, and 1 each when the surface was wet and icy. In the adjacent uninsulated pavement, there were 11, 3, and 7 accidents when the surface was dry, wet and icy, respectively. In summary, 8 accidents occurred in the insulated pavement and 21 accidents in the uninsulated pavement within a 5-year period. Although the study does not conclude that insulated pavements will result in lower accident rates, it seems to indicate that insulation does not make the pavement hazardous to driving as was first feared.

IMPLEMENTATION STATEMENT

A four-inch thick AWC subbase at 24 pcf density with thermal conductivity "K" value not exceeding 0.60 at a mean temperature of 75°F was effective in preventing the development of frost in the subgrade beneath a 10-inch thick PCC pavement. This material has been approved by the State as an insulating subbase beneath PCC pavement for use in treating special frost problem areas. AWC subbase is considered an alternate to the conventional subgrade treatment of removal of frost-susceptible soil and replacement with non-frost-susceptible material, or to the use of a 1 1/2-inch expanded polystyrene plastic foam insulation ("K" value of 0.23 maximum).

TABLE 6

COMPARISON OF TRAFFIC ACCIDENTS BETWEEN
THE INSULATED AND THE UNINSULATED PAVEMENTS*

Year	Number of Traffic Accidents at Prevailing Conditions					
	AWC Insulated Pavement			Adjacent Uninsulated Pavement		
	Dry	Wet	Ice/Snow	Dry	Wet	Ice/Snow
1970	1	0	0	0	0	0
1971	2	0	1	2	1	0
1972	2	0	0	4	1	4
1973	0	0	0	4	1	0
1974	1	1	0	1	0	3
Total	6	1	1	11	3	7

* Both pavements are about 1500 feet long separated by a concrete median.