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RESEARCH UPDATE

Number U91-06

USE OF TIRE CHIPS IN A GEORGIA VERMONT TOWN HIGHWAY BASE

PURPOSE:

This update documents the use of shredded tires designed to serve as both a drainage layer and barrier to prevent contamination between a wet silty sand subgrade and a gravel base.

LOCATION:

The test section is located on Town Highway 4, known as the Oakland Station Road, in the Town of Georgia, Vermont. The Class II highway begins at Route 7 Georgia MM 2.50, one mile north of the junction with Interstate 89 and continues north 3.36 miles to an intersection with TH 1, approximately 0.35 mileswest of the intersection of VT Route 104. The test section starts 1.7 miles north of the junction with Route 7 and extends 300' north to a point opposite an eastwest property line hedgerow. The adjacent land consists of nearly flat fields which are at an elevation approximately 410' above sea level.

SITE CONDITIONS & MATERIALS:

The experimental section and the adjacent roadway consists of approximately two feet of gravel on a silty sand subgrade. Samples of the latter revealed from 24% to 43% passing the number 200 seive. A high water table commonly results in the area becoming impassible for two-wheel traffic during the spring mud season. The pumping action of traffic had resulted in contamination of the gravel with fine materials. The traffic is in the range of several hundred cars per day with much of it consisting of early morning and late afternoon commuters.

CONSTRUCTION PROCEDURE:

Two hundred cubic yards of shredded tires were purchased from Palmer Shredding, Inc., Route 7, Box 905, N. Ferrisburg, Vermont 05473 (telephone (802) 425-4031). The material consisted of 50 c.y. of large shreds which had passed through the chipper a single time and 150 c.y. of small shreds which had been chipped two or three times. The material was transported with town trucks during slack periods and

stockpiled near the test site. The materials weigh from 750 lbs. to 800 lbs. per c.y.

Construction began on July 31, 1990 and was completed on August 2, 1990. The 24± inches of base material and 6 inches of the subgrade were removed with a backhoe, working on one 12 foot lane at a time. The uncontaminated gravel was stockpiled for reuse. The rubber chips were placed with dump trucks and leveled in a 9 inch to 12 inch course with the backhoe prior to replacing the gravel. No attempt was made to measure the compression of the tire chips under the weight of the gravel but it is assumed the compacted ships made a 6 inch to 8 inch layer.

COST:

The tire chips were purchased at a cost of $1.00 per c.y. The overall cost of the construction project was not recorded.

OBSERVATIONS & DISCUSSION:

The smaller sized tire chips appeared to be better suited for the base treatment since they resulted in smaller voids. The larger chips included pieces of tire up to one third the size of the tire itself. Following the replacement of the contaminated gravel and the placement of additional material, there were no signs of further settlement or depression in the wheel paths under normal traffic or construction equipment.

An inspection of the test section on August 30, 1990 revealed the existence of some fine longitudinal cracks in the surface of the gravel roadway. All of the cracks were noted in or adjacent to the right wheel path of the southbound lane. The cracks were noted at eight locations totaling approximately 63 lineal feet with most located between station 115 and station 195. A few short transverse cracks were also noted extending off the longer longitudinal cracks. There was no detectable rutting in the wheel path areas.

The test section and adjacent roadway were free of any distress when observed on November 20, 1990. At that time, two inch diameter, slotted, PVC well monitoring pipe was installed at stations 100 and 200 along the easterly toe of the roadway. The water table was found to average 17 1/2 inches below the ground surface or 11 1/2 inches below the estimated bottom of the tire chips.

The Town's highway foreman, Mr. Clarence Bocash, who planned and supervised the use of the tire chip base, noted the test section did not freeze until quite a few days after the adjacent roadway. No

other specific problems were noted through the winter season. The experimental sections remained in very good shape during the 1991 spring thaw period. The roadway was graded approximately seven times in March and early April to maintain a drivable surface on the adjacent untreated sections.

On April 3, 1991 the roadway was inspected, photos were taken, and the water table elevation was measured. The roadway surface within the test section was visibly dry and free of any rutting. A few fine longitudinal and transverse cracks were noted between stations 125 and 300 with most noted in the southbound lane. The water table averaged 12 inches below the ground surface or 6 inches below the estimated bottom of the tire chips. The water table elevation was 5 1/2 inches higher than that recorded the previous November.

In comparison, the roadway north and south of the tire chip section was in poor condition. The surfaces were visibly wet and revealed numerous ruts, cracks, and boils. The poor areas were soft to walk on and water could be drawn to the surface with a tamping action. In general, the class II highway was in better overall shape than other years due to a milder winter with below average snowfall and a dry spring season.

PRELIMINARY CONCLUSIONS:

The experimental section with the tire ship base performed very well through the first winter/spring season. It may be assumed that the tire chips prevented the capillary rise of ground water and aided in the drainage of surface moisture from the gravel, thus preventing the mud season conditions experienced on the adjacent roadway. Part of the improved performance may also have been due to the removal of the silt contaminated portion of the gravel subbase.

FOLLOW UP:

The Town of Georgia plans to utilize tire chips in the reconstruction of additional sections of TH #4 during the 1991 season. In addition they hope to place an asphalt chip seal over a portion of the experimental section.

Monitoring will continue on the experimental section and reports will be prepared when significant information is obtained.

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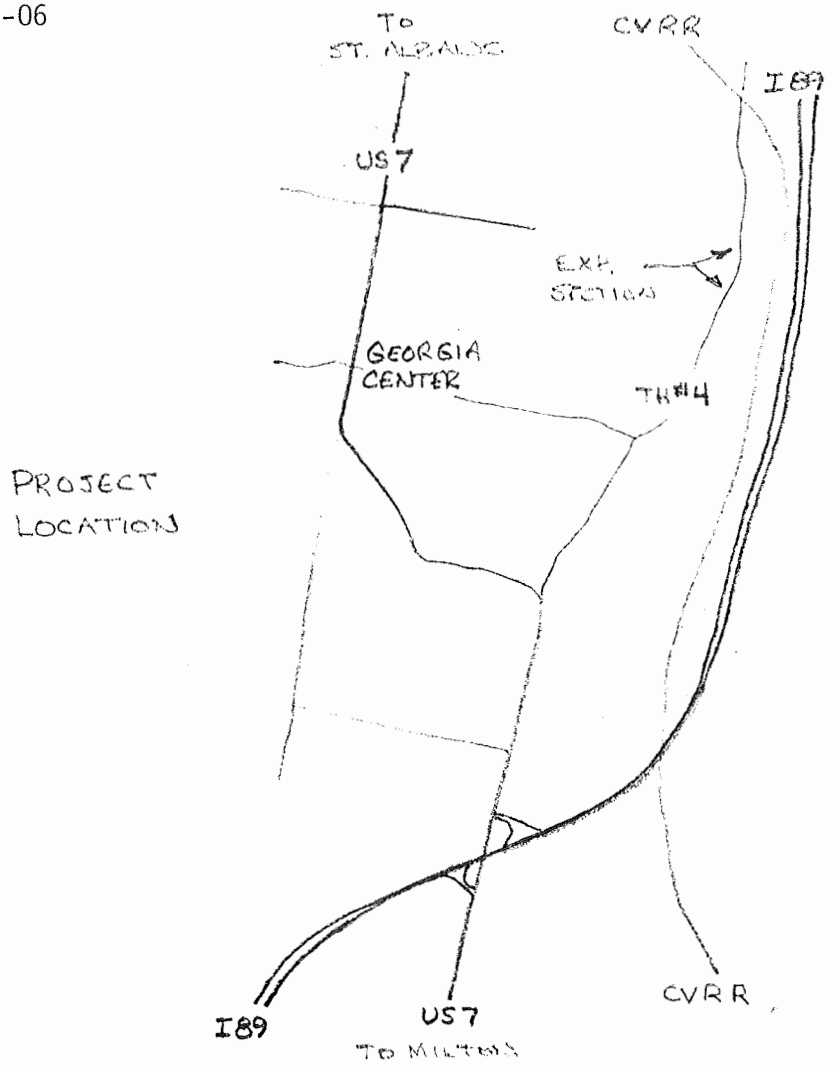

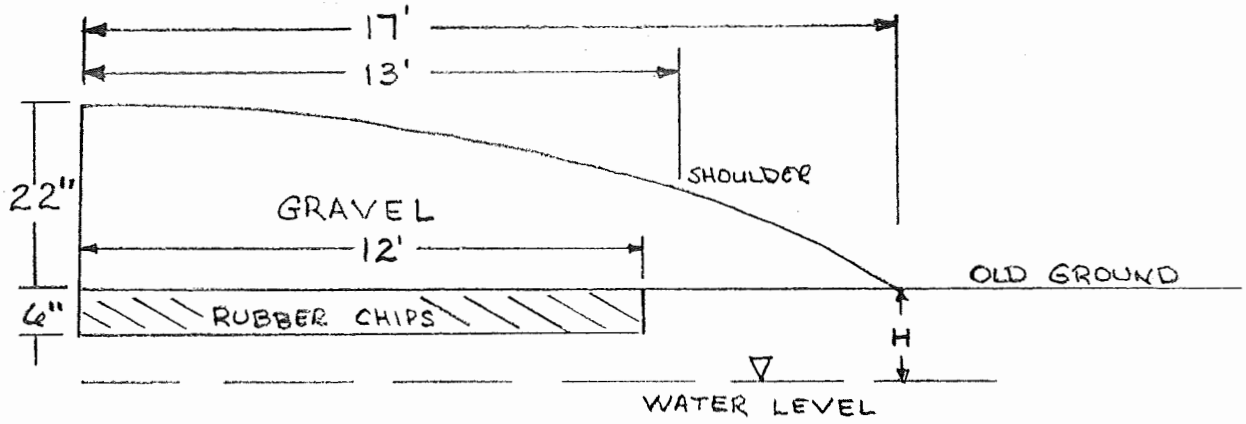

ROADWAY TYPICAL

Dumping tire chips
on Aug. 1, 1990

Leveling the tire
chips with a backhoe

Overview of the tire
chip section on
April 3, 1991

Note surface moisture
on the adjacent untreated
sections