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April 16th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1388.

Examination of SAE 9255 Pins for the
Canadian Dry Pin Track Specification.

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Origin of Material and Object of Investigation:

On February 27th, 1943, under Requisition No. 383, AEDB Lot No. 420, Dr. C. W. Drury, Director of Metallurgy, Army Engineering Design Branch, Department of Munitions and Supply, Ottawa, Ontario, submitted ten homogeneous SAE 9255 pins from a field test of the Canadian dry pin track, for examination. Six of these pins had been in service for 2,300 miles (approx.) and four for 1,800 miles (approx.). It was requested that the wear should be measured. The pins were originally 0.770 inch in diameter. Impact and bend tests and hardness readings were required in order to develop a specification for this type of pin.

Hardness:

Hardness values of the core and surface of the pins were obtained, using the Rockwell machine 'C' scale.

1,800 Miles.

Surface -

45 to 48 for three pins tested.

Core -

45 to 48 for four pins tested.

2,300 Miles.

Surface -

46 for two pins tested.

Core -

46 to 46.5 for two pins tested.

Diameter of Pins:

Three pins which had gone 1,800 miles were measured with a micrometer. Thirteen readings across the length of each pin were taken. These are listed below, in inches, starting from the rivetted end and going toward the headed end:

(A)	0.755	(B)	0.759	(C)	0.764
	.757		.761		.767
	.761		.766		.770
	.760		.756		.762
	.767		.752		.758
	.759		.757		.758
	.760		.752		.755
	.763		.752		.752
	.767		.752		.760
	.766		.755		.757
	.765		.757		.766
	.758		.763		.757
	.758		.757		.758

Range - 0.755 to 0.768 0.752 to 0.766 0.752 to 0.770

Two pins in service for 2,300 miles were measured. Ten readings were taken across the length.

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(Diameter of Pins, cont'd) -

	(1)	0.760	(2)	0.761
		.760		.770
		.764		.768
		.758		.762
		.763		.764
		.767		.750
		.754		.753
		.759		.764
		.763		.763
		.761		.769
Range	-	0.754 to 0.768		0.750 to 0.770

Impact Tests:

Impact tests were carried out on three pins which had been in service for 1,800 miles and two pins which had gone 2,300 miles. A single drop, using the 75 pound weight, was made on each pin.

Table I.

<u>Mileage</u>	<u>Height</u>	<u>Result</u>
1,800	140 cm.	Passed.
1,800	175 "	Passed.
1,800 ^a	200 "	Failed.
2,300	175 "	Passed.
2,300	200 "	Passed.

^a Failed pin hardness was 46.5 Rockwell 'C' in the core and on the surface; other pins varied from 45 to 48.

Bend Tests:

Bend tests were carried out using the Ansler Universal machine; 8-inch centres and a 12-inch radius were used. Table II indicates the results obtained.

Table II.

<u>Mileage</u>	<u>Load</u>	<u>Deflection, in inches</u>	<u>Remarks</u>
2,300	11,800	0.900	Unbroken.
2,300	11,800	0.900	"
1,800	11,850	0.900	"
1,800	11,700	0.900	"

Discussion:

The pins tested in this report were 0.770 inch diam. prior to being used. It is understood that a change in design has been effected which calls for an 0.815-inch pin. Tests on SAE 9255 pins (0.815 inch) were carried out in these Laboratories during the month of February, 1943. Actual values obtained were:

Bend Test - 0.8 inch deflection for Rockwell 49 pin.

Impact Test - 450 foot pounds on 47 Rockwell pin.

In this investigation, on 0.770-inch pins which had been in service, bend test results of 0.9 inch were obtained with pins of 45 to 48 Rockwell 'C'. Impact results of 425 foot pounds were obtained without failure. One pin of 2,300 mileage withstood 490 foot pounds (approx.)

Pins tested here and in our previous work were not higher than 49 Rockwell 'C'. For the specification it is felt that the hardness should be 48 ± 3 Rockwell 'C'. In order to allow for pins of 51 Rockwell 'C' and also pins made on a production scale, the following limits are recommended:

Surface Hardness - 48 ± 3 Rockwell 'C'.

Core Hardness - 42 Rockwell 'C' minimum.

If a rivetting tip is required, a maximum of 54 Rockwell 'C' should be allowed.*

Bend - 0.5 inch minimum deflection.

Impact - 300 foot pounds minimum.

It is felt that the above minimum results would ensure a high-quality pin for service.

* P.M. Report No. 5880, Feb. 2, 1943, issued by these Laboratories.

CONCLUSIONS:

1. Surface hardness of all the pins varied from Rockwell 'C' 45 to 48.
2. Core hardness varied from Rockwell 'C' 45 to 48.
3. Diameter of pins which had gone 1,800 miles ranged from 0.752 to 0.770.
4. Diameter of pins which had gone 2,300 miles ranged from 0.750 to 0.770.
5. Pins withstood 425 foot pounds impact without failing.
6. Bend deflection of 0.9 inch without failing was obtained.

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