TARADCOM R and D LABORATORY TECHNICAL REPORT

NO. 12451

RECAPPED TIRE COMPARISON
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RESEARCH AND DEVELOPMENT COMMAND
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ABSTRACT

A test program has been conducted to compare the wear characteristics of conventional retread and precured retread 9:00 X 20 tires. An M-35 2 1/2 ton truck with a 5000# highway load was driven 9000 miles on a combination of paved, secondary and cross country surfaced roads with each type of retread tire in this evaluation. The precured retread tires exhibited about 10% less wear than the conventional retread tires on this test based on sample means. The precured tires were also more consistent in wear resistance.

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OBJECTIVE

The objective of this program was to compare the wear rates of precured retread versus conventional retread military tires.

CONCLUSION

Precured retread tires exhibited greater tread life and more uniform wear properties than tires retreaded by the conventional hot process in this 9000 mile road test comparison program.

ACKNOWLEDGEMENTS

We would like to thank the U.S. Army Tank-Automotive Research and Development Command and in particular, Mr. Nathaniel Carr of the Tank-Automotive Systems Laboratory, Tactical Systems Division, Project Officer. Without his help and counsel, the test would have been delayed much longer.

SUMMARIZED RESULTS

The results of the tire wear tests comparing precured retread with conventional retread tires are summarized below. These results were obtained from the tread depth measurements taken 1" out from both sides of the center rib at six positions on 7 tires of each type.

1. The sample mean wear after the 9000 mile test was 0.304" for precured retread tires and 0.338" for conventional retread tires. (95% significance that precured gives less wear)
2. The sample mean wear for the 7 precured retread tires ranged from 0.232" to 0.350" depending upon measurement location and tire position on the M-35 truck.
3. The sample mean wear for the 7 conventional retread tires ranged from 0.250" to 0.514" at the same measurement locations and tire positions.
4. The rubber hardness was not a significant factor in these tests within the range of accuracy of the durometer measurements (a) no significant difference in hardness between precured and conventional retreads prior to testing (b) no significant change in tire hardness (durometer) as a result of the 9000 mile test. (Note: Tests were run from November through April, not hot weather testing.)

TEST PROCEDURE

A Government supplied M-35 2 1/2 ton truck was pay loaded to 5,000 lbs. (Photo Page 4). Tread depth measurements were taken at 6 equally spaced positions around the tire circumference (every 60°) and at 1 inch out from the center rib, and 1 inch in from the rounded shoulder, both inside and outside exterior surfaces. (Photo Page 5). Tires were inflated to 50 PSI (cold) and rechecked at the end of each 3000 mile cycle.

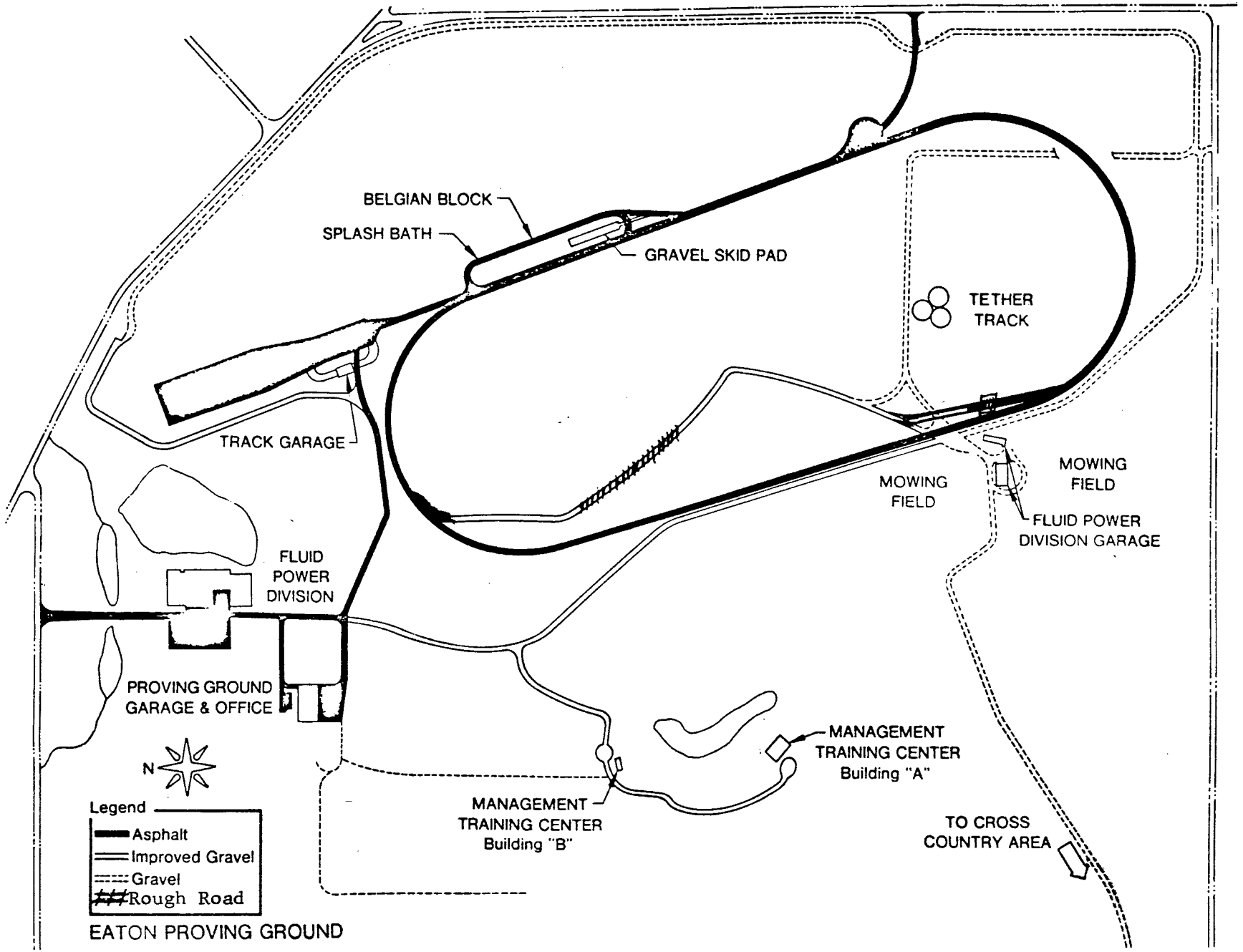
The 3000 mile cycle was divided into 3 parts, 80% hard surface, 15% secondary or gravel and 5% rough cross country with some rocky terrain. (Photo page 6). At the completion of a 3000 mile cycle, the tires were cleaned and the truck was put on a hoist overnight and measurements were taken in the morning. (Photo Page 7). This procedure was repeated each 3000 miles for a total of 9000 miles for each group of tires. The tires were photographed at the beginning and the end of the test.

Precured Retread - Photos Page 8

Conventional Retread - Photos Pages 9 & 10

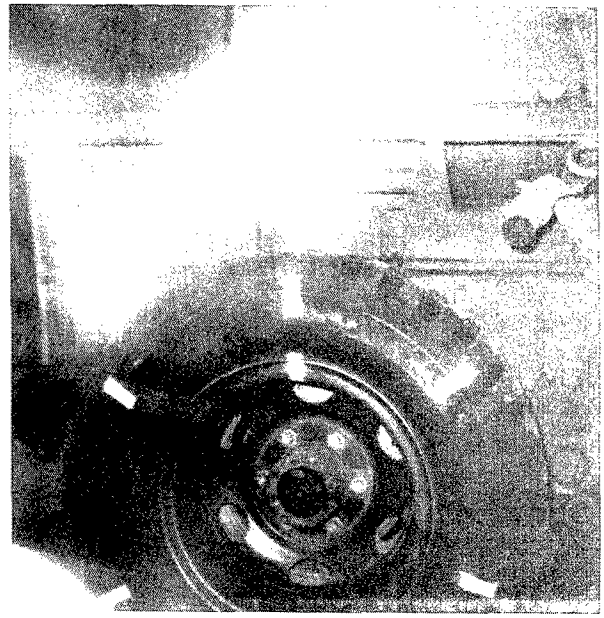
The test was conducted on Eaton Proving Ground track which consists of a 1.6 mile asphalt oval joining a .5 mile section of improved gravel and cross country road.

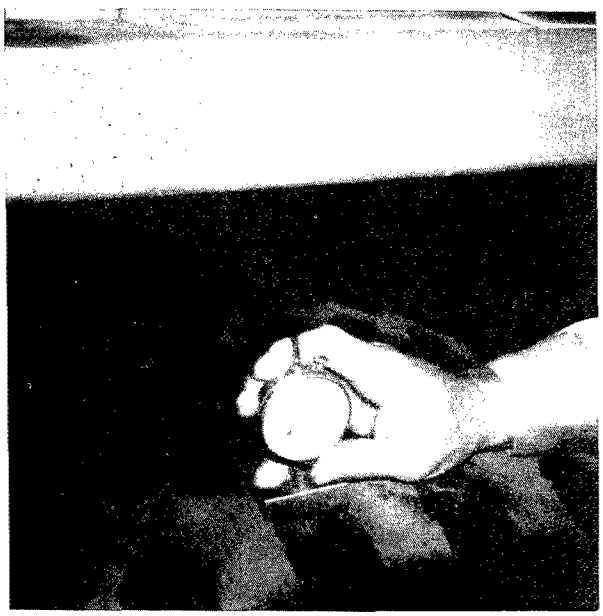
The truck was run on the asphalt oval and would exit on the north turn onto a short section of improved gravel road, then onto the cross country section and back to the improved gravel. The truck would then re-enter the track at the start of the south turn. This course would make up a 1.53 mile loop consisting of 1.03 miles of asphalt, .375 miles of improved gravel, and .125 miles of cross country. The truck was run on this course until the required number of miles on gravel and cross country road were obtained, and then run on the asphalt oval to complete the 3000 miles section of the test. At this point, the truck and tires were washed and put on the hoist. Tire pressure and measurements taken. The map on the following page shows layout of track and gravel and cross country roads.


BELGIAN BLOCK
SPLASH BATH
GRAVEL SKID PAD
TETHER TRACK
TRACK GARAGE
MOWING FIELD
MOWING FIELD
FLUID POWER DIVISION GARAGE
FLUID POWER DIVISION
PROVING GROUND GARAGE & OFFICE
N
MANAGEMENT TRAINING CENTER Building "A"
MANAGEMENT TRAINING CENTER Building "B"
TO CROSS COUNTRY AREA
Legend
Asphalt
Improved Gravel
Gravel
Rough Road
EATON PROVING GROUND

RETREADED TIRE TESTS FOR
COMPARATIVE EVALUATION

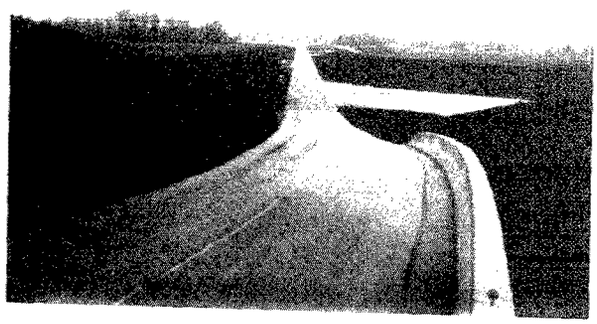
TREAD DEPTH MEASUREMENTS WERE TAKEN AT 6 EVENLY SPACED POSITIONS AROUND EACH TIRE CIRCUMFERENCE MEASURED AT 1 INCH OUT FROM THE CENTER RIB.





AT 1 INCH IN FROM THE ROUNDED SHOULDER BOTH INSIDE AND OUTSIDE EXTERIOR SURFACES. TIRE INFLATION WAS CHECKED COOL BEFORE EACH RUN AND AGAIN AT THE COMPLETION OF THE PAVED RUNS AT THE END OF THE 3000 MILE CYCLE.

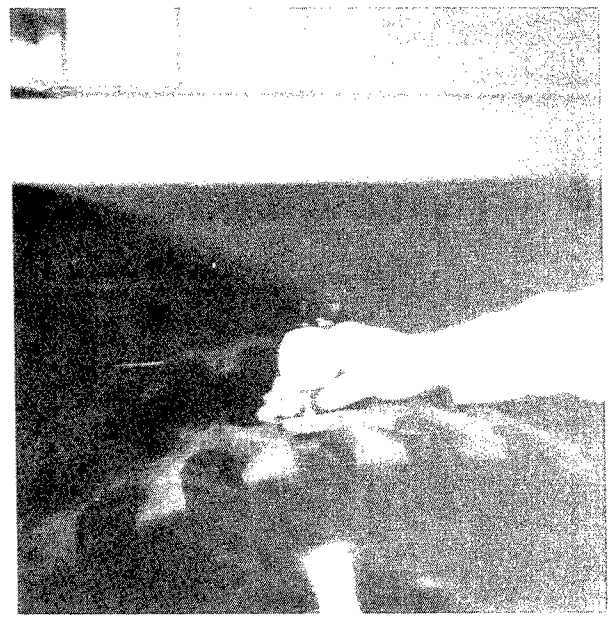
EACH 3000 MILE RUN CONSISTED OF 80% HARD SURFACE (BLACKTOP).



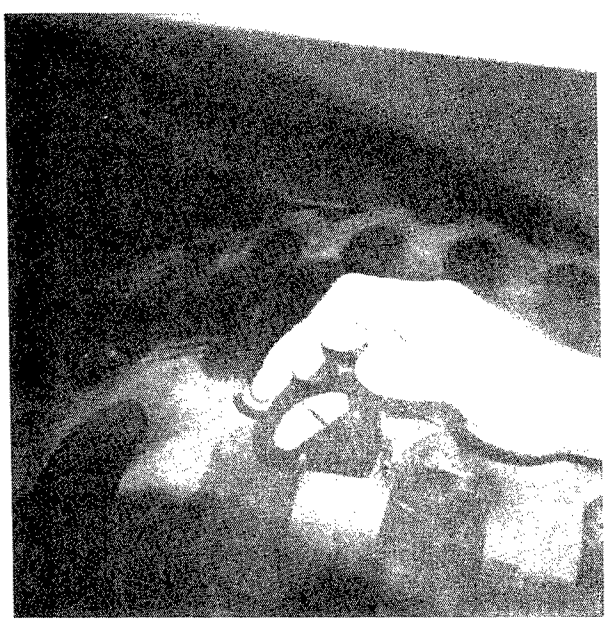
15% SECONDARY ROAD (GRAVEL)

5% ROUGH CROSS COUNTRY WITH SOME ROCKY TERRAIN.

AT THE END OF EACH 3000 MILE RUN, THE TIRES WERE CLEANED, ALLOWED TO COOL TO AMBIENT TEMPERATURE AND MEASURED FOR TREAD DEPTH AS PICTURED. AT THE SAME TIME, TIRE DUROMETER WAS CHECKED.

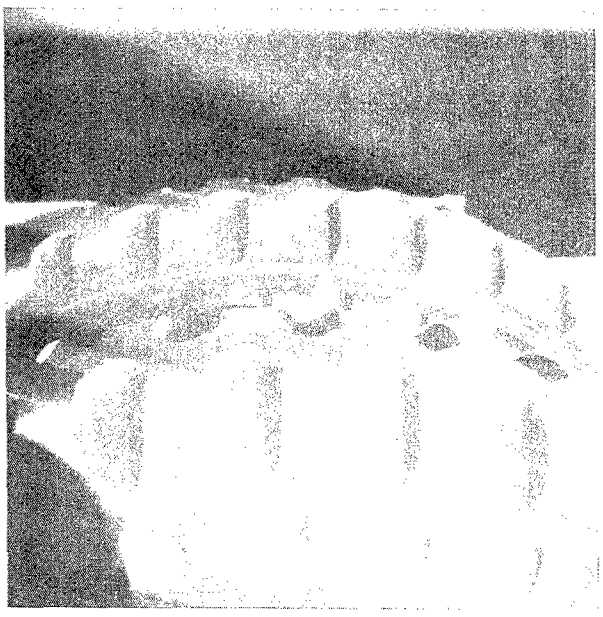


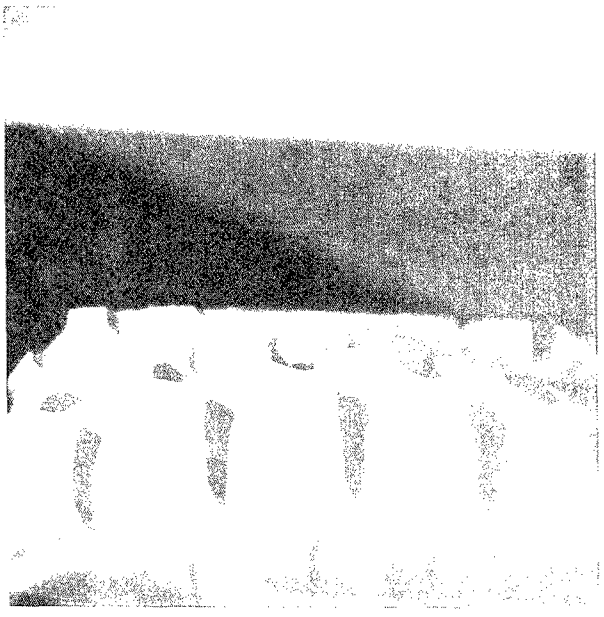
TIRE DEPTH GAUGE



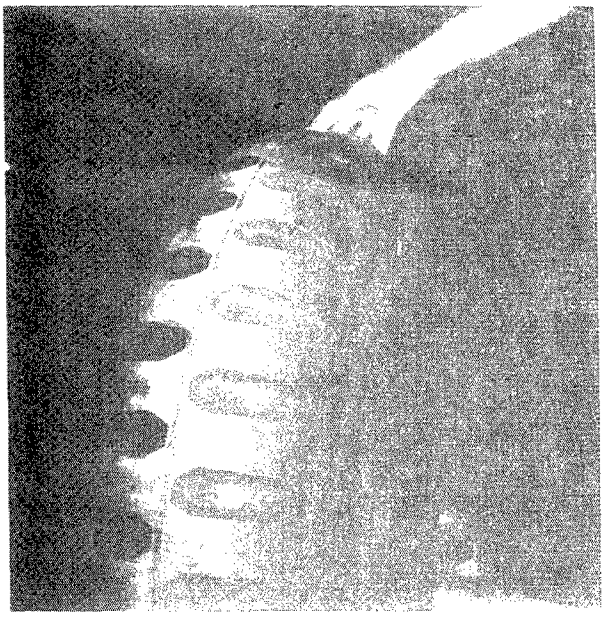
RUBBER DUROMETER GAUGE

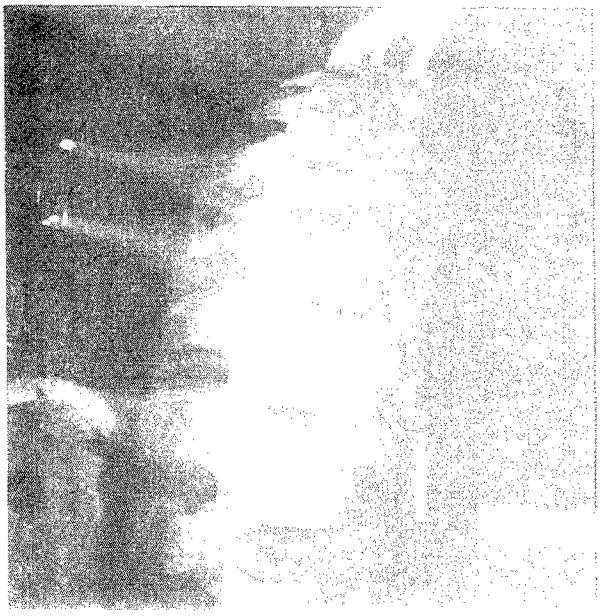
PRECURED RETREADS (COLD CAPS) PRIOR TO TEST #2 AXLE



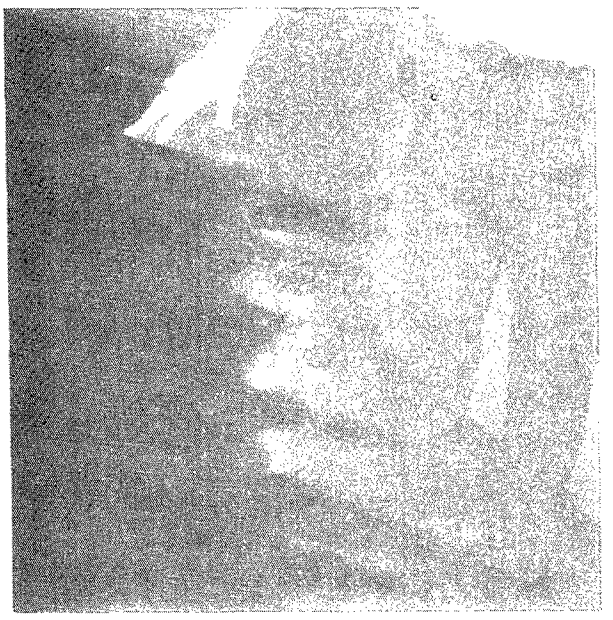


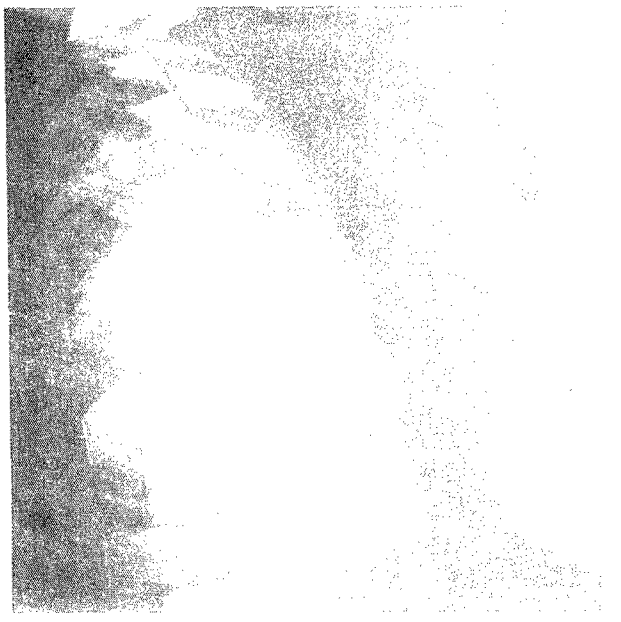
PRECURED RETREADS (COLD CAPS) PRIOR TO TEST #3 AXLE



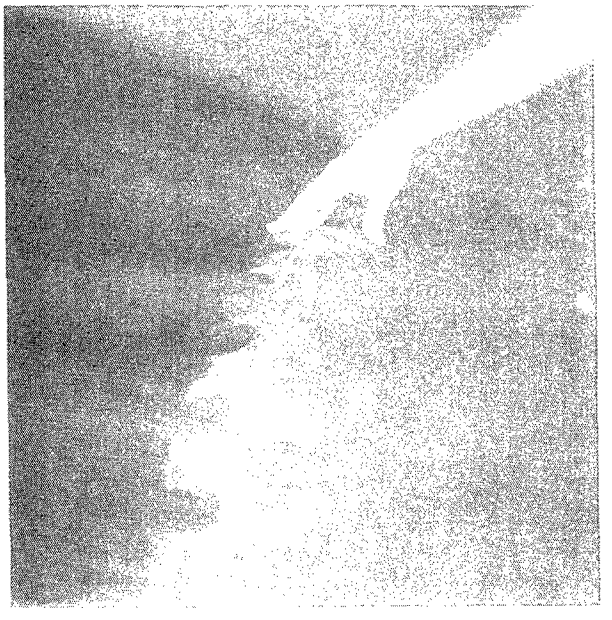


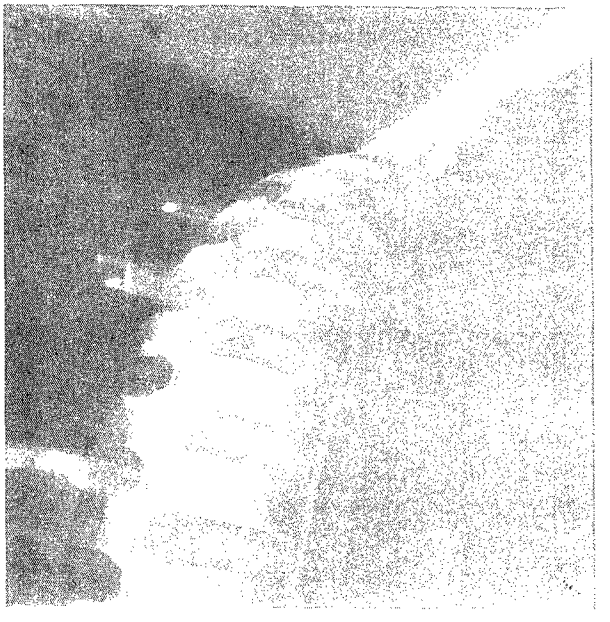
CONVENTIONAL RETREADS (HOT CAPS) PRIOR TO TEST #2 AXLE





CONVENTIONAL RETREADS (HOT CAPS) PRIOR TO TEST #3 AXLE





DISCUSSION

On receipt of the M-35 2 1/2 ton truck, we removed all tires and replaced them with (10) precured type recapped tires that were provided by the Government for test. The truck was then loaded to 5000 lbs. of weights. The tires were inflated to 50 P.S.I. and checked for tread depth per specifications of test.

Following this test preparation, we began the actual test by running the truck over a road consisting of a cross country surface, improved gravel road, and hard surface for a total of 3000 miles. The test tires were then cleaned, allowed to cool to ambient temperature and again measured for tread depth as before. At this time, the front right steering tire showed excessive wear caused by the continuous driving in the counter clockwise direction. Subsequent checks of this tire repeated this wear pattern and possibly voided any use of the test results.

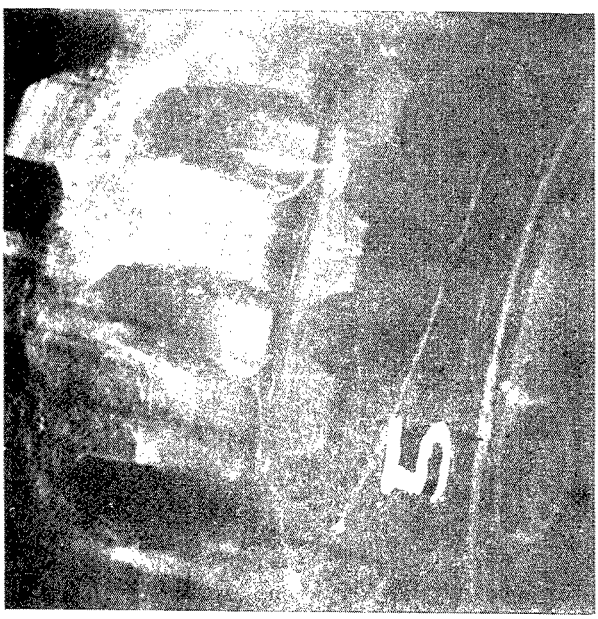
The test pattern above was repeated for two more 3000 mile runs, making a total of 9000 miles, and tread measurements were recorded as before.

The truck was then parked until the conventionally recapped tires were supplied. We received (10) tires for testing this type retread but when we mounted them on the truck, we found one tire defective. This lead us to put the good tires on the drive wheels only, using other tires for steering, and keeping the one good tire for a spare. This decision proved to be a good one because at the 6000 mile check, tire #5 (axle #2 inside left) was worn out and had to be replaced.

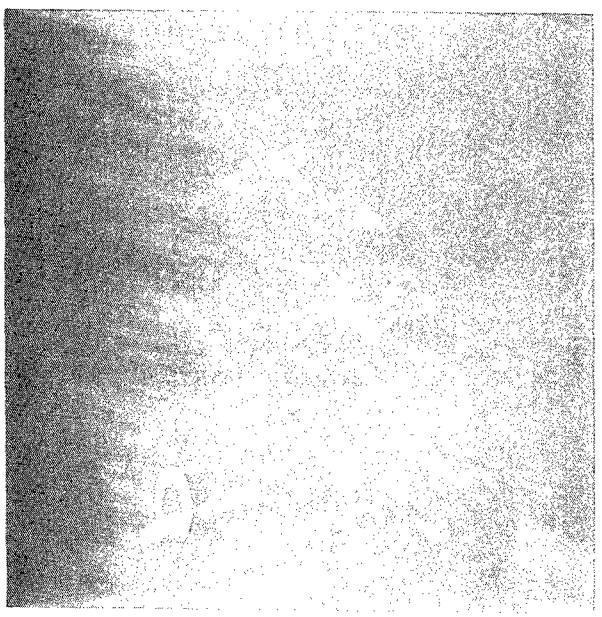
At the conclusion of the three 3000 mile runs, the tires were removed from the truck, identified and stored.

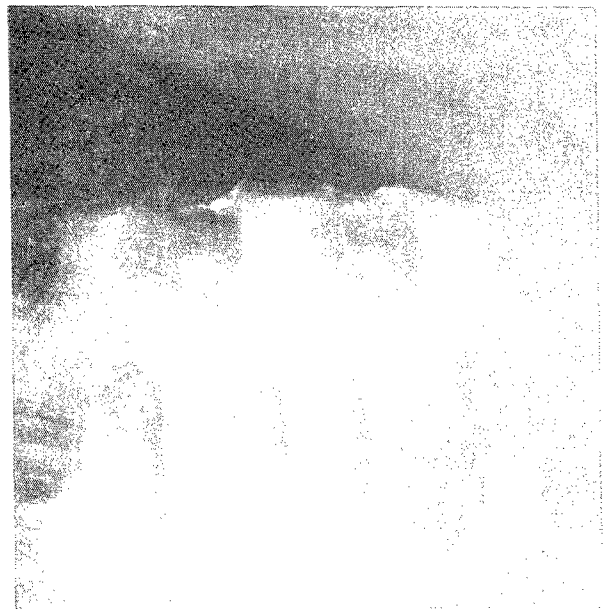
Page No's 12 thru 15 shows photographs of tires at conclusion of test.

PRECURED RETREADS (COLD CAPS) AFTER TEST #2 AXLE

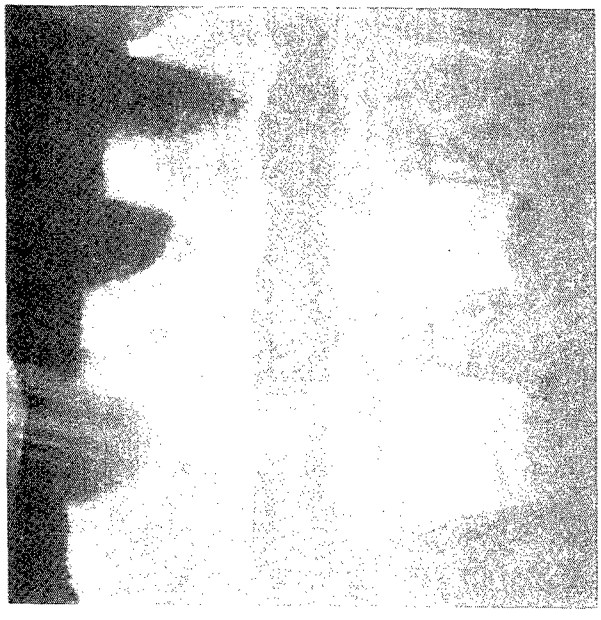


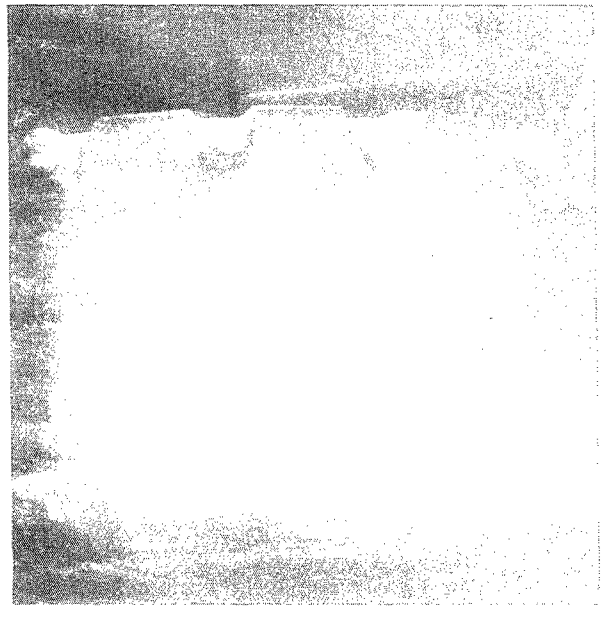
PRECURED RETREADS (COLD CAPS) AFTER TEST #3 AXLE



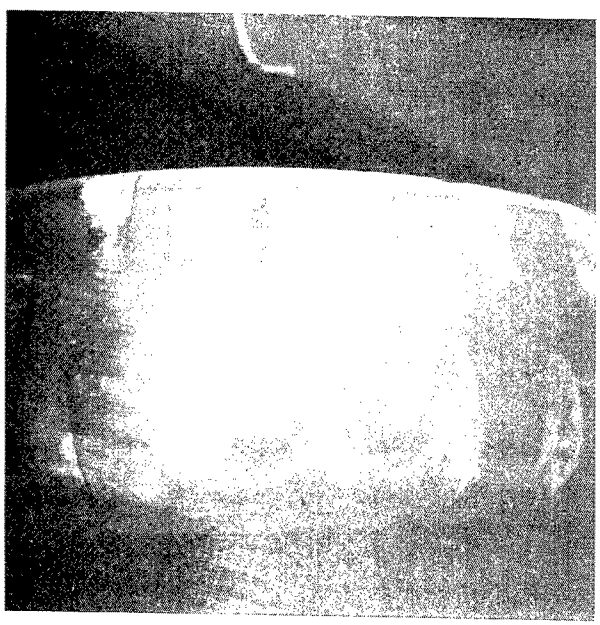


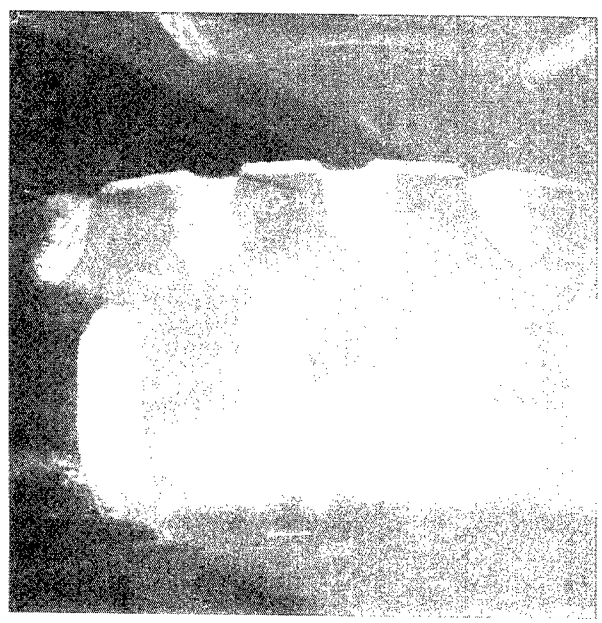
CONVENTIONAL RETREADS (HOT CAPS) AFTER TEST #2 AXLE
(#5 TIRE TERMINATED AT 6000 MI.)





CONVENTIONAL RETREADS (HOT CAPS) AFTER TEST #3 AXLE





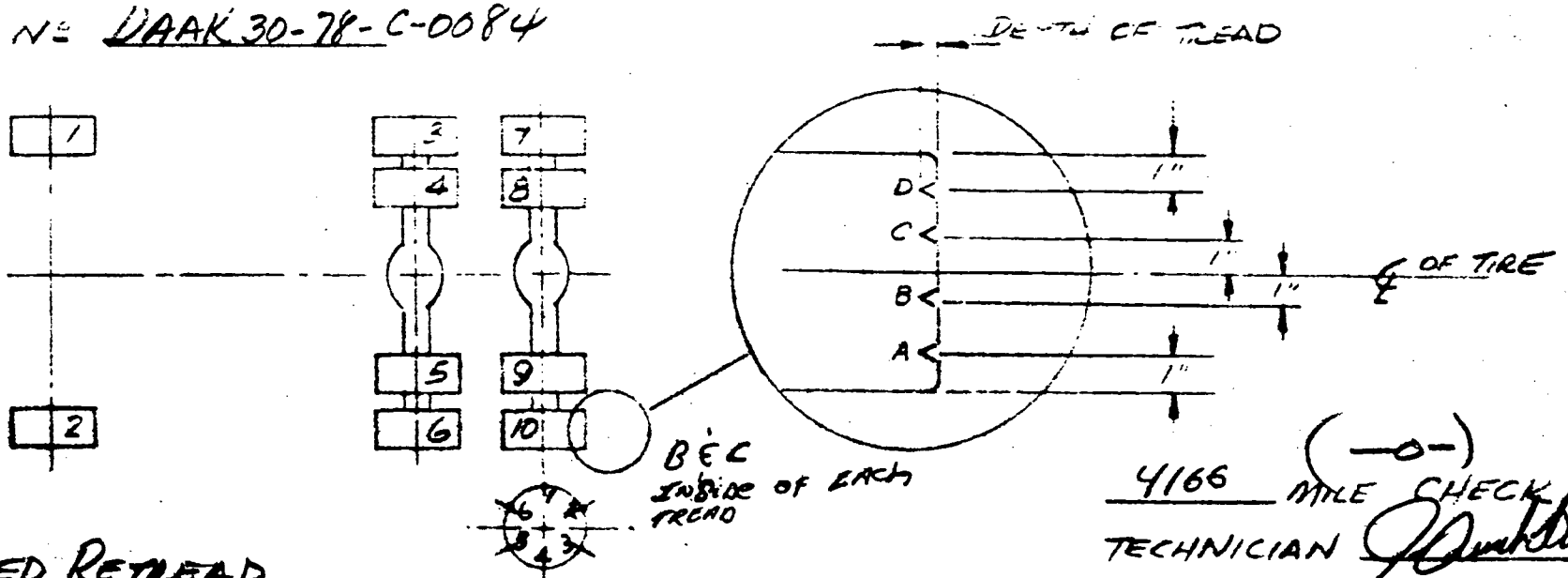
APPENDIX A

Raw Data

GOVERNMENT TIRE TEST

JOB NO. DAAK 30-78-C-0084

DATE: 11-1-80



4166 MILE CHECK (—o—)

TECHNICIAN

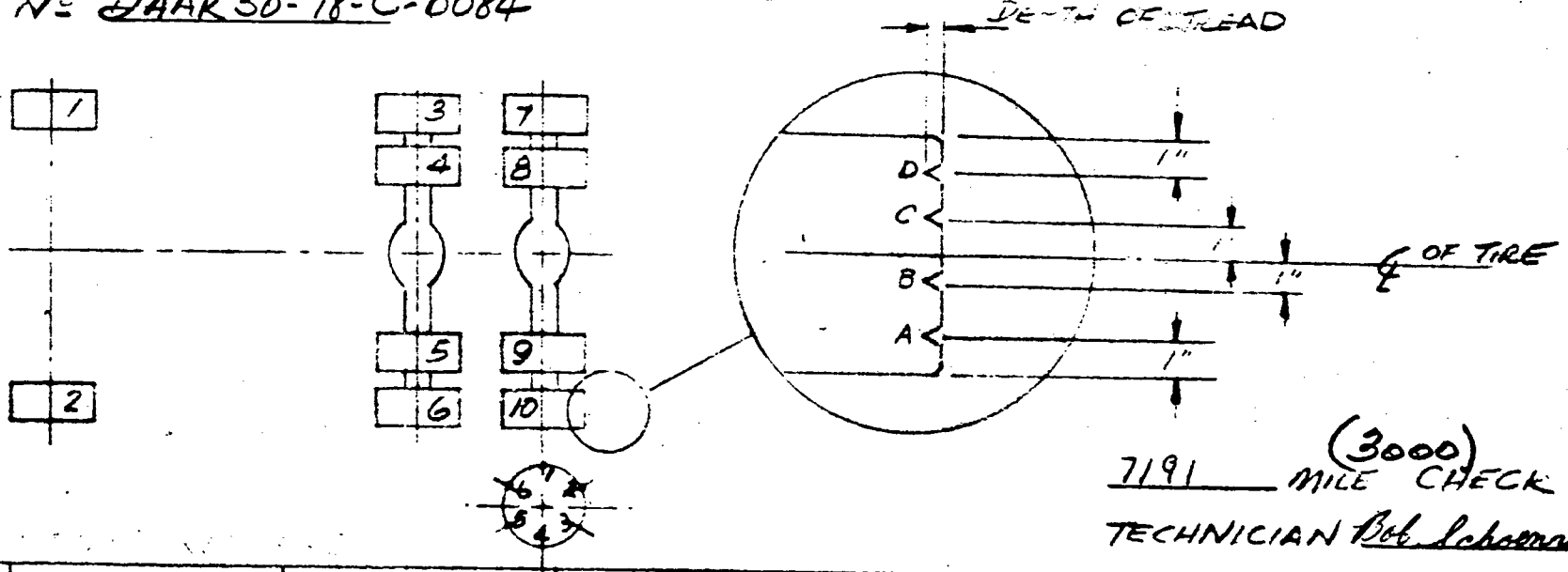
PRECURED RETREAD

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	470	440	520	500	465	457	423	510	461	449	440	426	461	458	412	503	475	442	434	492	477	446	422	488
2	500	460	466	465	520	451	481	508	519	450 ~~455~~	~~460~~	491 ~~455~~	504	475	460	496	489	453	462	480	492	465	460	487
3	490	443	425	482	492	423	413	510	500	462	440	480	500	426	446	485	505	498	464	538	519	444	423	501
4	462	465	440	432	461	458	438	480	475	480	468	500	480	458	460	505	481	483	469	513	471	471	475	510
5	500	445	445	530	503	460	444	538	473	485	472	500	472	465	467	510	480	426 ~~455~~	433	510	480	473	450	501
6	491	452	432	510	489	452	447	500	504	448	472	549	474	464	465	547	490	453 ~~481~~	452	489	442	441	434	461
7	521	~~455~~	475	529	540	460	458	503	500	480	485	502	542	472	469	510	522	481 ~~440~~	454	519	508	485	~~484~~	419
8	504	452	477	480	513	431	421	~~505~~	508	422	413	483	506	440	432	495	515	440 ~~483~~	442	515	499	444	427	487
9	507	475	482	503	489	456	426	488	628	433	426	478	471	429	461	500	495	423	456	484	498	~~450~~	480	502
10	520	459	440	481	521	463	471	485	515	422	444	508	436	478	440	495	441	472	443	492	438	472	460	507

GOVERNMENT TIRE TEST

JOB NO. DAAK30-78-C-0084

DATE: 11-27-78



7191 MILE (3000) CHECK

TECHNICIAN Bob Schoenrock

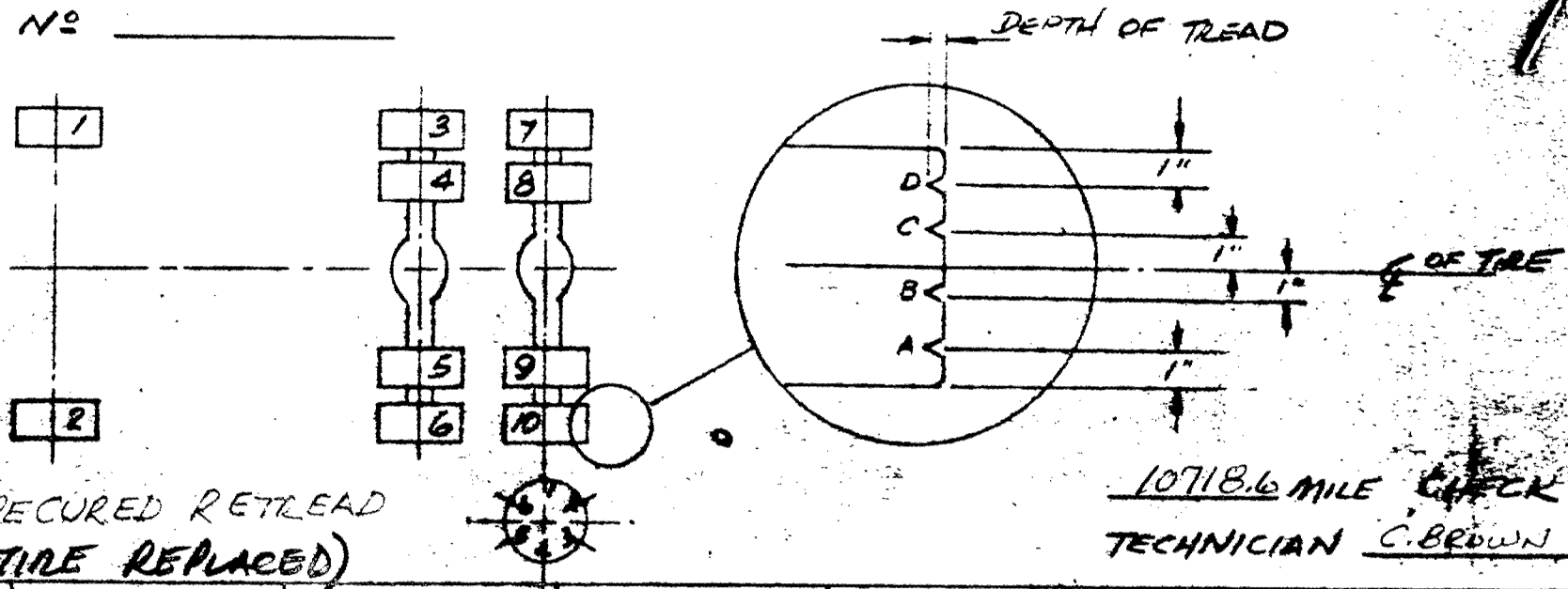
DUAL NO. POSITION

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
60 1	879		843	719	890	~~835~~	835	660	864		873	730	870		905	780	878		920	787	910		833	790
60 2	720	847	857	645	747	842	853	640	715	838	860	647	685	839	830	620	798	844	848	612	775	811	840	635
61 3	516	613	605	495	500	611	580	500	534	625	585	490	550	600	595	490	558	611	643	520	557	648	605	502
60 4	500	623	600	490	502	625	600	505	500	600	590	~~505~~ 505	495	613	612	~~485~~	495	580	581	490	475	575	560	473
62 5	517	582	622	530	507	597	636	540	542	590	575	563	524	572	645	516	505	600	625	500	510	581	595	491
61 6	527	614	586	520	527	627	583	541	524	611	575	500	510	623	573	519	491	617	570	511	490	628	557	509
60 7	560	640	637	528	561	649	627	500	538	677	657	529	551	661	660	528	544	~~648~~	647	505	540	640	662	519
61 8	510	605	600	593	533	575	582	523	545	591	602	512	545	612	607	510	573	645	619	534	520	620	510	~~605~~ 605
60 9	504	620	601	535	486	611	600	521	485	645	578	545	483	630	579	522	484	569	571	532	481	619	569	540
60 10	550	628	582	518	550	690	591	522	550	~~644~~ 649	603	519	542	642	591	507	550	687	588	510	571	660	626	520

GOVERNMENT TIRE TEST

JOB Nº _____

DATE: 12-14-78



PRECURED RETREAD

(FRONT TIRE REPLACED)

10718.6 MILE CHECK

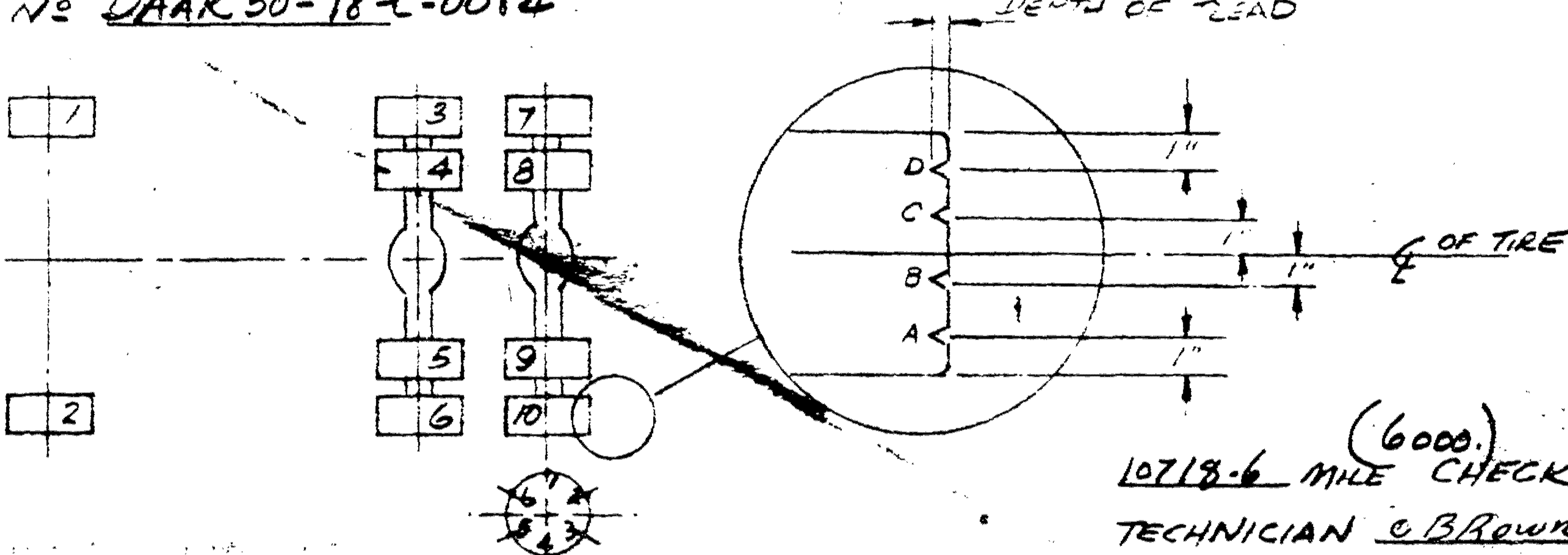
TECHNICIAN C. BROWN

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1	560	525	511	500	540	506	518	491	527	504	533	500	510	508	504	508	500	504	511	510	505	500	513	506
2																								
3																								
4																								
5																								
6																								
7																								
8																								
9																								
10																								

GOVERNMENT TIRE TEST

JOB No DAAK30-78-C-0084

DATE 12-14-78



(6000.)
10718.6 MILE CHECK

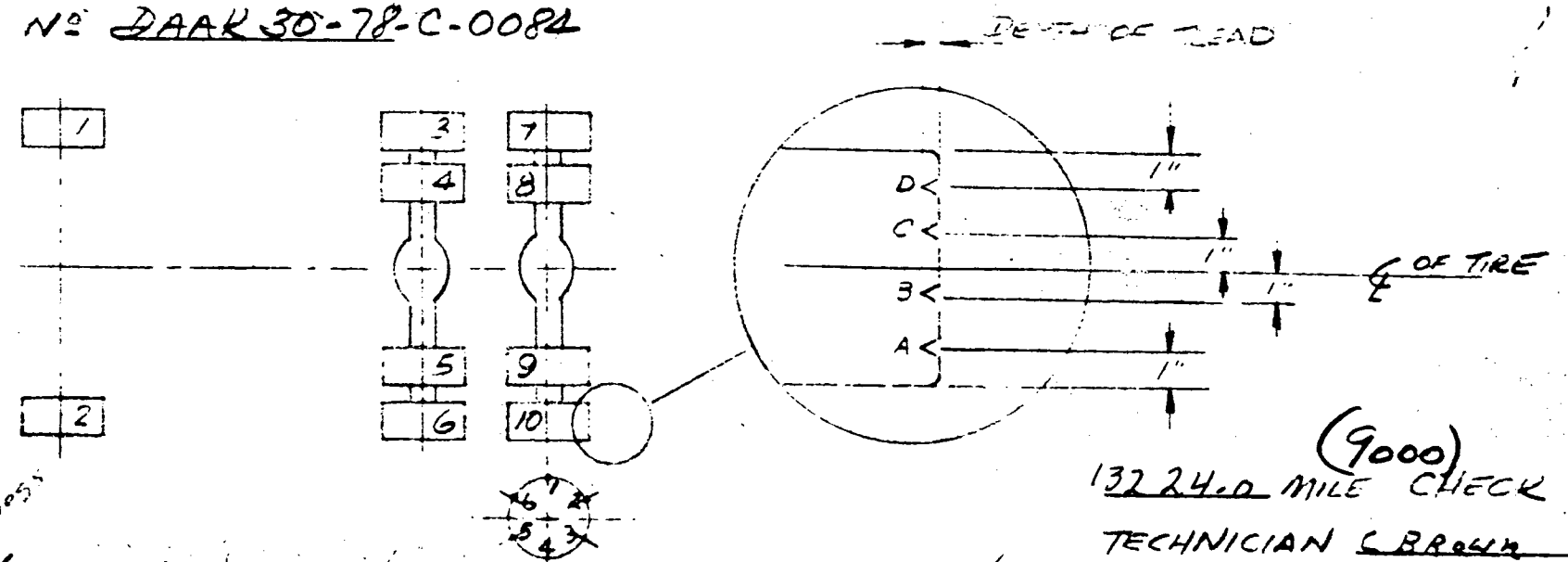
TECHNICIAN C BROWN

TIRE NUMBER	POSITION 1 A	B	C	D	POSITION 2 A	B	C	D	POSITION 3 A	B	C	D	POSITION 4 A	B	C	D	POSITION 5 A	B	C	D	POSITION 6 A	B	C	D
1			987	640			870	610			995	660			850	600			858	610			[illegible]	[illegible]
2	631	735	712	632	627	739	724	638	607	726	732	636	608	721	749	687	696	711	724	600	671	[illegible]	711	689
3	630	734	759	645	620	670	671	565	541	710	662	543	536	706	653	519	519	717	[illegible]	667	511	708	[illegible]	[illegible]
4	531	645	780	[illegible]	563	796	725	653	[illegible]	685	748	628	537	664	786	608	546	690	[illegible]	620	507	[illegible]	[illegible]	[illegible]
5	596	670	636	582	680	[illegible]	659	635	[illegible]	680	606	638	530	680	677	635	585	657	657	670	650	626	650	655
6	566	724	719	693	567	708	[illegible]	627	613	738	724	555	640	704	699	698	621	738	743	620	696	718	716	650
7	638	[illegible]	723	696	626	760	733	[illegible]	685	763	750	624	690	749	720	620	651	745	750	555	613	745	755	657
8	535	720	730	680	525	692	705	640	525	650	730	620	535	625	710	632	557	706	725	650	626	721	760	655
9	480	692	686	613	690	689	645	580	640	736	675	690	671	746	679	600	607	766	676	642	608	745	717	610
10	691	[illegible]	[illegible]	675	586	804	723	605	629	771	703	607	640	759	721	605	641	[illegible]	[illegible]	610	672	786	744	676

GOVERNMENT TIRE TEST

JOB Nº DAAK 30-78-C-0084

DATE: 1-5-79



(9000)

13224.0 MILE CHECK

TECHNICIAN C BROWN

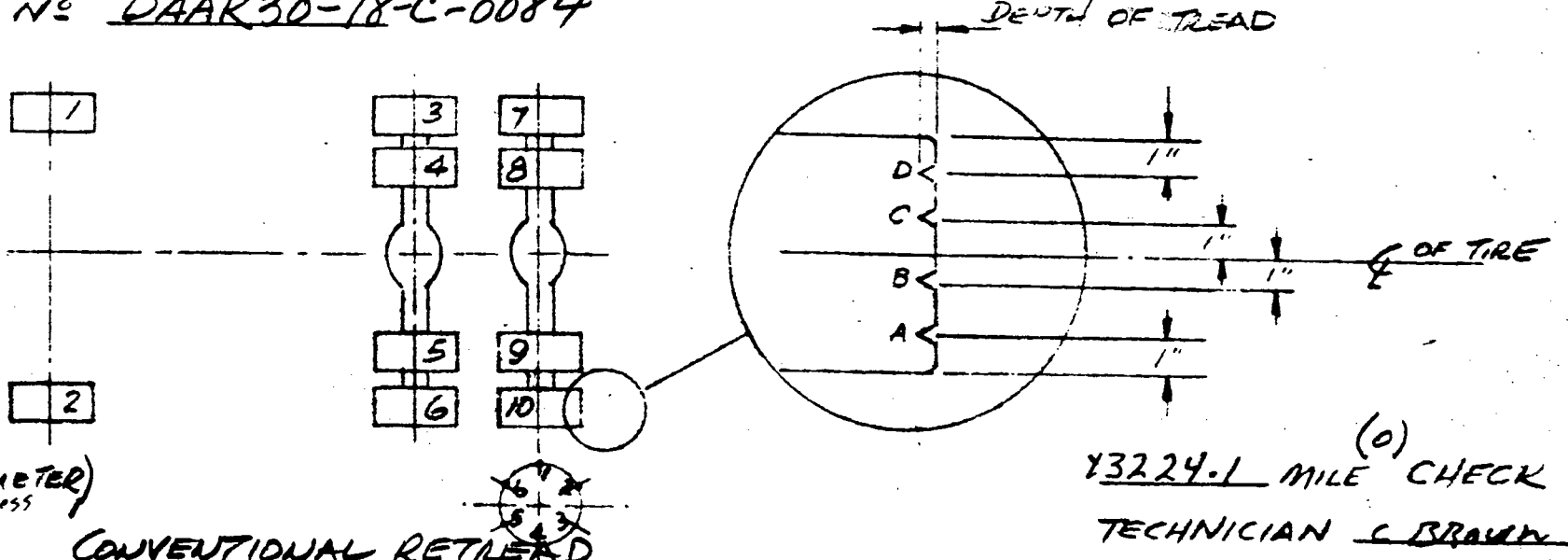
hardness ↓

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1 63	860	840	761	617	977	843	891	630	832	815	770	615	835	827	662	601	878	783	753	675	839	814	737	603
2 62	56	580	620	541	572	586	601	551	560	536	591	552	584	585	595	542	590	599	602	578	551	594	581	602
✓ 3 62	667	710	788	698	650	712	765	655	594	767	785	640	600	743	757	626	635	791	765	607	641	760	769	615
✓ 4 60	542	710	690	650	532	740	730	685	543	715	687	607	526	698	646	592	509	759	680	630	528	750	710	610
5 63	535	737	805	760	538	647	855	755	520	704	637	794	530	691	800	732	617	704	781	710	535	750	896	701
✓ 6 62	542	755	730	629	541	766	779	673	544	741	719	621	564	760	725	653	543	755	723	639	512	769	713	610
✓ 7 62	704	800	782	714	670	805	759	540	706	813	798	613	677	801	808	624	695	806	799	700	631	793	796	671
✓ 8 62	540	701	760	747	501	717	750	630	562	742	782	701	551	757	804	735	545	740	799	846	532	707	790	610
✓ 9 63	510	758	720	636	551	741	717	662	522	716	711	623	530	754	720	655	510	789	715	680	552	760	760	655
✓ 10 62	583	806	760	575	633	843	757	608	580	822	755	505	582	780	745	594	590	817	734	669	614	823	799	644

GOVERNMENT TIRE TEST

JOB NO: DAAK30-78-C-0084

DATE: 2/21/82



(GROOVEMETER) HARDNESS

CONVENTIONAL RETREAD

Y3224.1 MILE (0) CHECK

TECHNICIAN C BRAUN

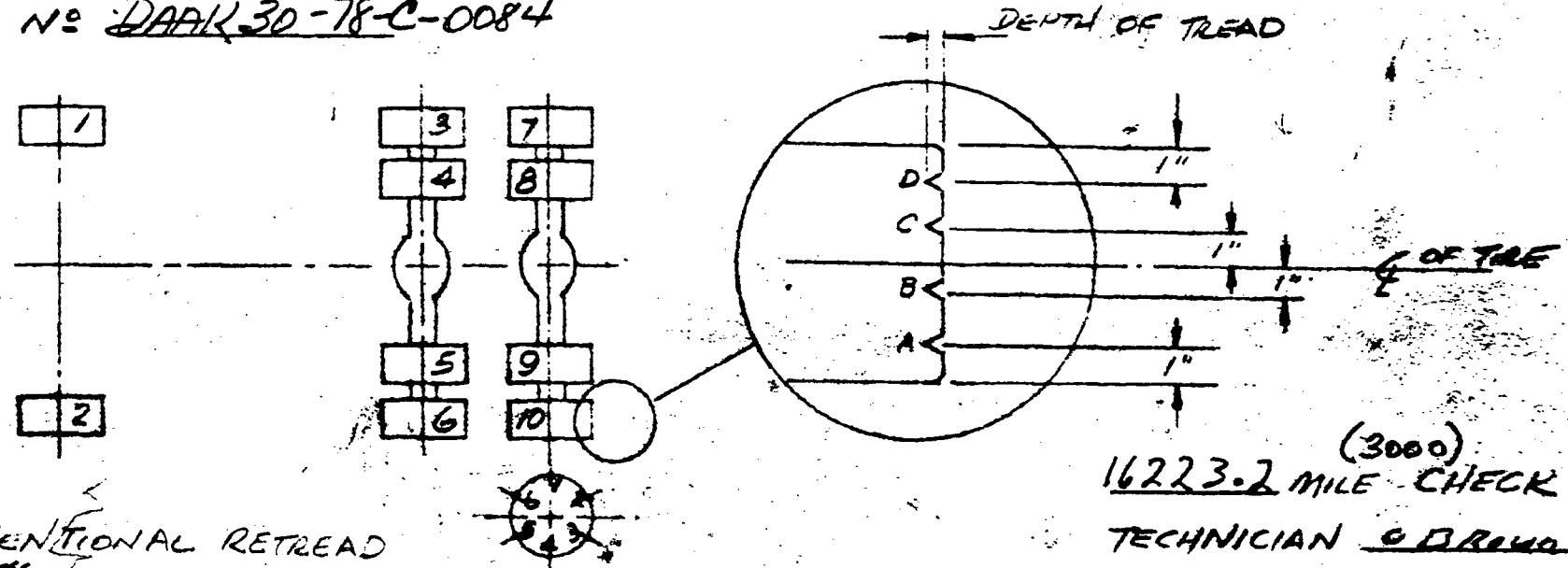
TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
✓ 1 65	596	444	451	475	487	445	452	491	470	442	460	480	486	465	451	477	494	450	457	480	460	455	460	477
✓ 2 70	485	470	455	485	483	440	460	480	472	471	450	472	473	460	465	466	470	466	466	485	463	465	457	484
✓ 3 65	475	438	434	440	461	443	430	433	457	440	430	433	483	440	436	433	490	434	439	431	470	432	434	429
✓ 4 60	400	400	400	490	377	401	409	412	400	422	407	407	410	404	409	407	400	409	400	400	402	400	404	410
5 65	490	412	407	460	470	420	405	440	504	430	415	425	465	430	410	425	490	405	403	435	487	435	411	440
✓ 6 65	501	487	494	401	505	490	495	405	490	495	445	480	427	490	400	400	490	376	385	390	465	380	385	395
✓ 7 60	427	430	424	420	440	430	430	422	450	451	415	440	430	424	425	420	440	440	423	427	442	436	420	432
✓ 8 60	422	435	425	440	433	437	425	445	430	430	419	425	445	421	420	440	460	445	424	450	455	430	427	446
✓ 9 60	432	404	390	396	410	415	406	409	395	406	411	390	430	400	400	405	407	404	400	395	419	410	404	400
✓ 10 60	411	436	424	402	490	438	435	413	401	424	435	390	411	414	408	404	435	440	421	420	432	436	413	413

22

GOVERNMENT TIRE TEST

JOB Nº DAAK30-78-C-0084

DATE. 3-7-79



(3000)

16223.2 MILE CHECK

TECHNICIAN C DReno

CONVENTIONAL RETREAD

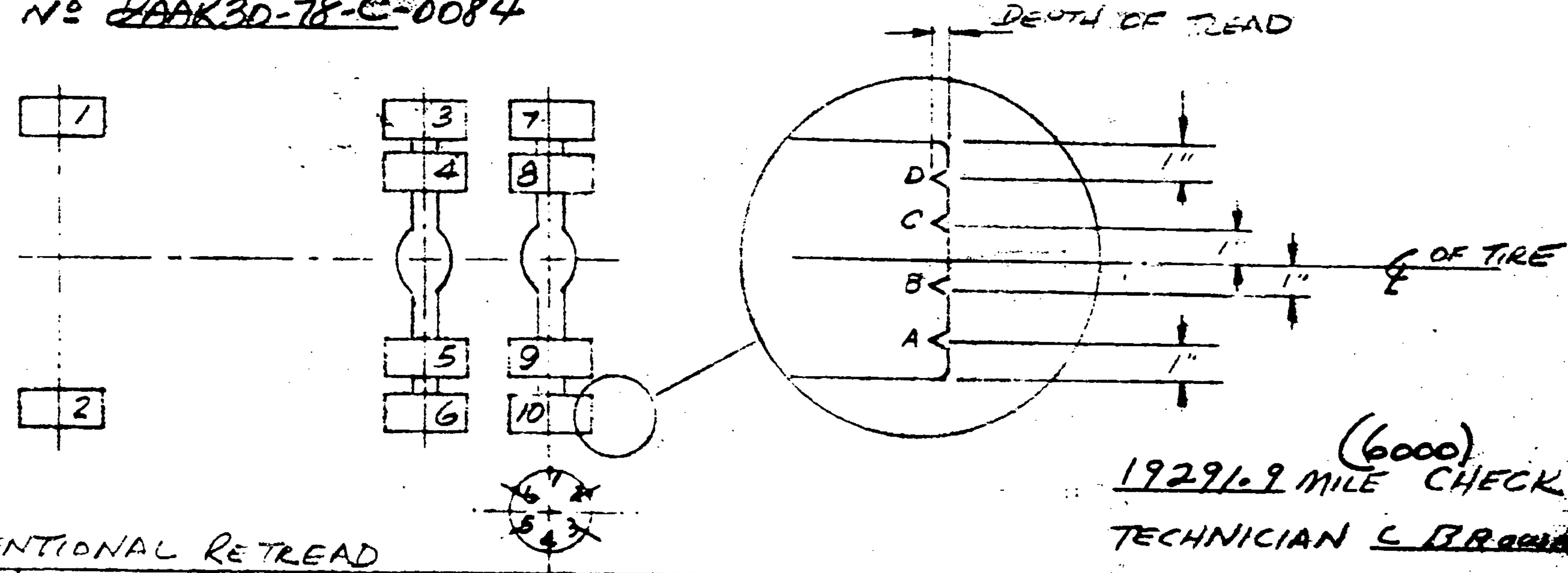
TIRE NUMBER / Hardness	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1 65																								
2 60																								
✓ 3 60	485	559	570	525	502	518	564	500	493	529	561	494	480	564	571	504	496	561	549	493	480	545	571	503
✓ 4 60	445	545	505	470	453	525	530	505	430	543	521	500	443	530	526	488	[illegible]	552	532	470	446	554	521	502
5 60	552	693	705	647	513	645	703	648	531	654	701	672	533	643	687	630	519	674	705	647	552	694	[illegible]	627
✓ 6 60	497	519	590	510	429	509	609	490	428	555	606	529	428	545	581	487	425	550	569	490	454	549	576	473
✓ 7 55	503	578	515	506	516	580	512	490	521	566	507	[illegible]	522	584	512	480	501	579	537	480	482	590	530	445
✓ 8 60	500	556	550	534	[illegible]	575	572	576	490	565	562	555	481	561	542	540	481	564	528	525	502	557	655	547
✓ 9 55	490	595	560	526	491	613	590	546	474	613	590	535	554	606	501	511	450	591	593	546	450	599	540	507
✓ 10 55	430	528	539	485	435	532	519	430	457	528	541	544	443	596	585	511	[illegible]	549	501	[illegible]	[illegible]	535	500	[illegible]

GOVERNMENT TIRE TEST

JOB Nº DAAK30-78-C-0084

DATE: 3-27-79

1



(6000)
1929.9 MILE CHECK

TECHNICIAN C BROWN

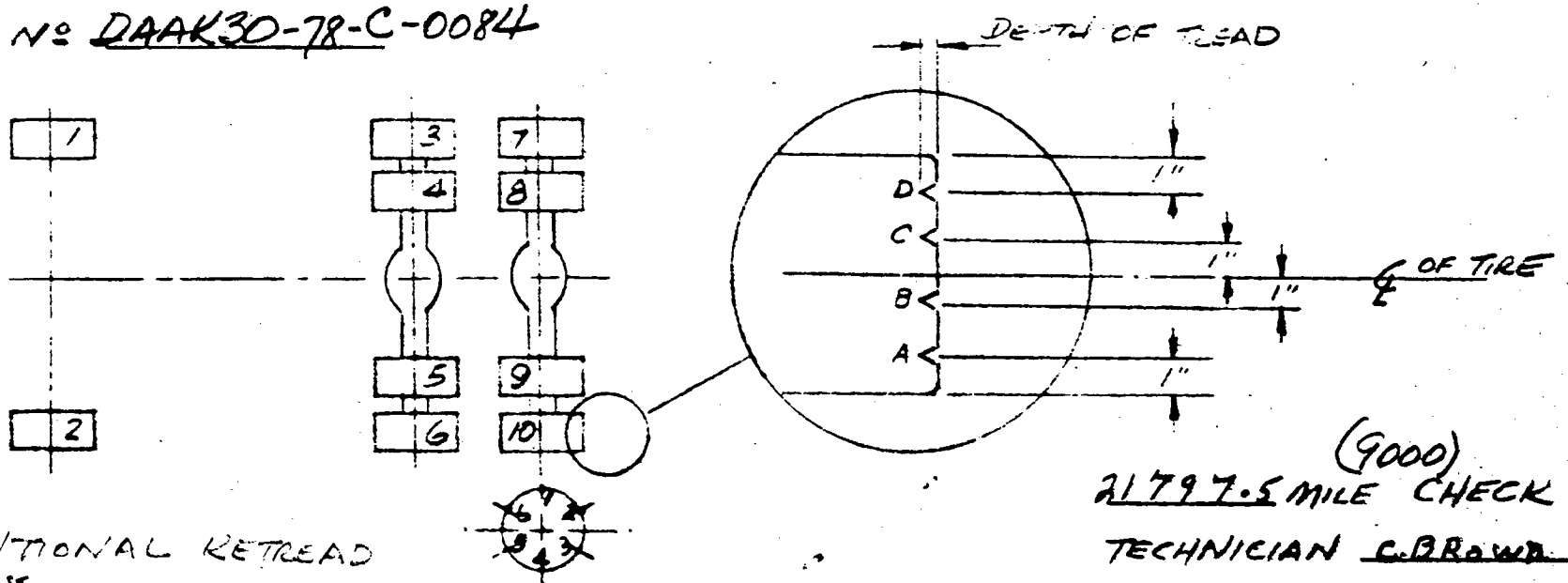
CONVENTIONAL RETREAD

HARDNESS	TIRE NUMBER	POSITION 1 A	POSITION 1 B	POSITION 1 C	POSITION 1 D	POSITION 2 A	POSITION 2 B	POSITION 2 C	POSITION 2 D	POSITION 3 A	POSITION 3 B	POSITION 3 C	POSITION 3 D	POSITION 4 A	POSITION 4 B	POSITION 4 C	POSITION 4 D	POSITION 5 A	POSITION 5 B	POSITION 5 C	POSITION 5 D	POSITION 6 A	POSITION 6 B	POSITION 6 C	POSITION 6 D
	1																								
	2																								
55	3	547	632	645	540	510	604	633	511	512	603	609	528	514	610	629	616	503	621	631	542	503	[illegible]	[illegible]	[illegible]
61	4	470	620	585	545	485	609	585	525	470	604	597	560	465	594	601	580	481	598	637	58[illegible]	492	624	593	[illegible]
70	5	670	970	980	930	652	980	985	824	639	980	981	811	613	987	990	790	656	977	983	757	661	98[illegible]	791	[illegible]
60	6	487	807	862	693	544	791	491	640	544	855	913	669	552	923	863	655	585	860	830	627	565	847	831	62[illegible]
60	7	635	900	611	61[illegible]	652	691	619	540	566	772	637	545	555	707	641	560	580	694	[illegible]	520	659	616	517	[illegible]
65	8	530	636	637	619	525	635	636	640	545	645	547	557	542	643	636	577	529	639	645	602	564	647	[illegible]	[illegible]
60	9	524	797	770	755	[illegible]	799	903	682	548	800	[illegible]	650	572	792	807	698	539	776	793	611	[illegible]	987	791	667
55	10	453	648	612	499	450	617	605	507	461	625	593	495	455	641	565	494	459	649	576	476	465	637	597	[illegible]

GOVERNMENT TIRE TEST

JOB NO: DAAK30-78-C-0084

DATE: 4-30-77



(9000)

21797.5 MILE CHECK

TECHNICIAN C.BROWN

CONVENTIONAL RETREAD

Hardness

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1 60																								
2 60																								
✓3 60	54	70	72	58	52	70	60	56	62	69	64	53	56	69	71	55	52	68	68	56	53	68	69	55
✓4 55	48	70	65	55	48	64	64	59	52	69	64	57	49	67	69	62	48	66	67	54	47	67	66	54
5																								
✓6 60	53	94	97	62	55	90	85	60	53	91	98	50	54	92	92	59	55	91	96	53	54	91	91	57
✓7 60	59	78	76	60	60	77	68	57	56	75	64	53	57	77	69	57	59	80	72	55	54	81	79	55
✓8 65	66	79	76	68	60	80	76	64	55	82	70	61	58	72	68	60	58	71	70	60	56	74	69	60
✓9 60	53	90	90	58	61	94	93	60	54	94	91	65	54	92	93	64	52	90	89	60	56	90	90	69
✓10 55	48	71	69	50	49	70	68	49	44	64	66	52	46	60	65	47	46	73	66	53	47	71	66	54

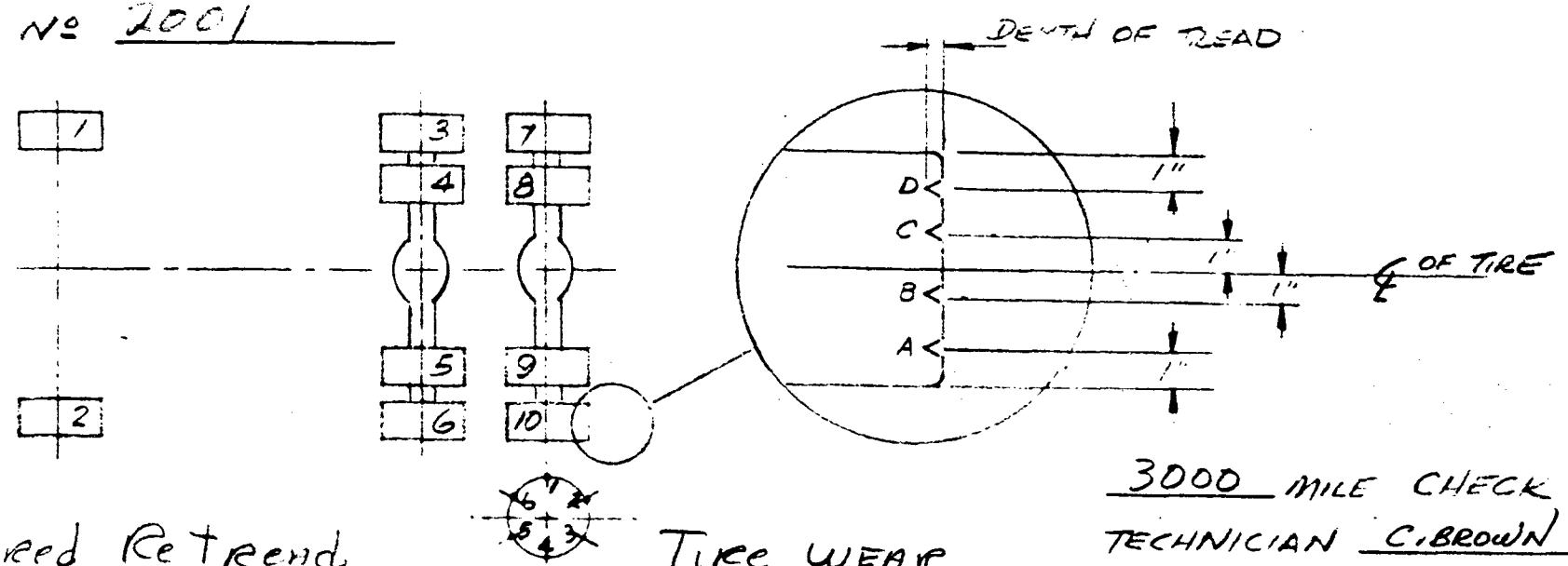
APPENDIX B

Reduced Data

GOVERNMENT TIRE TEST

JOB Nº 2001

DATE: _____



3000 MILE CHECK

TECHNICIAN C. BROWN

Precured Retread

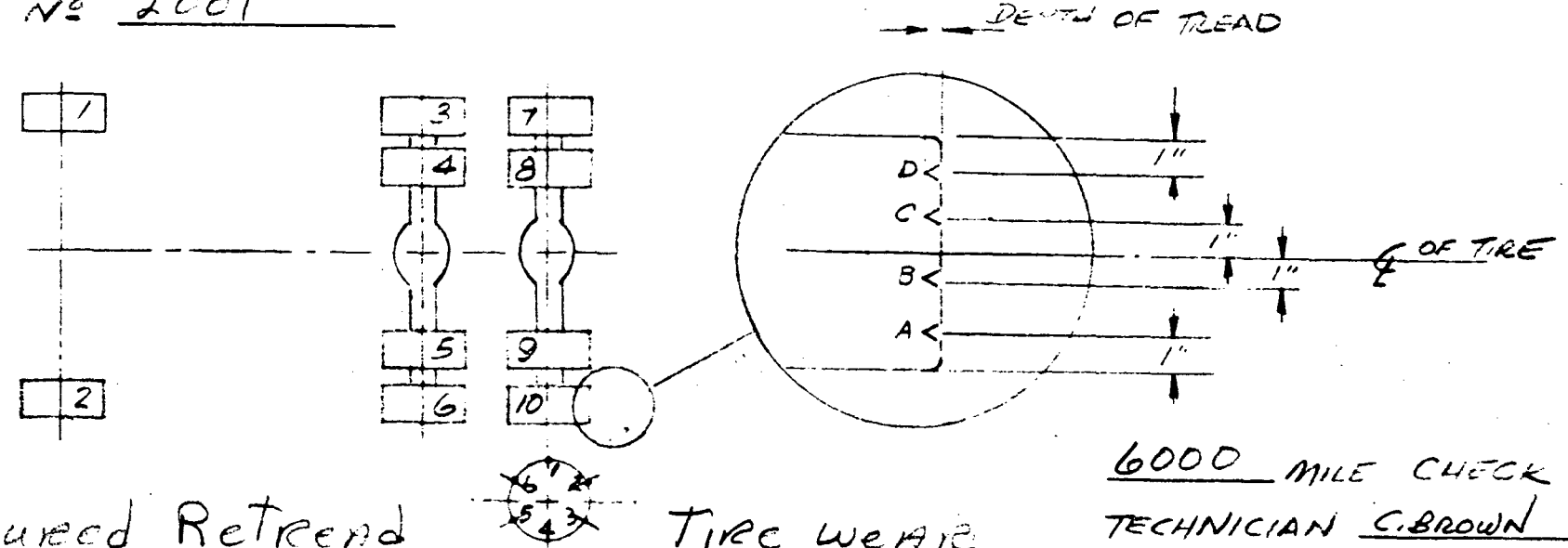
TIRE WEAR

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1																								
2																								
3		.170	.180			.188	.167			.163	.145			.174	.149			.163	.179			.204	.182	
4		.158	.160			.167	.162			.120	.122			.155	.152			.97	.112			.104	085	
5		.137	.177			.137	.192			.105	.103			.117	.178			.174	.192			.108	.145	
6		.162	.154			.175	.136			.163	.103			.159	.108			.164	.118			.187	.123	
7		.185	.162			.189	.169			.197	.172			.189	.191			.167	.193			.155	.178	
8		.153	.123			.144	.161			.169	.189			.172	.175			.205	.177			.176	083	
9		.168	.124			.155	.124			.212	.152			.201	.118			.146	.115			.169	089	
10		.169	.142			.127	.117			.177	.159			.164	.151			.215	.145			.188	.166	

GOVERNMENT TIRE TEST

JOB Nº 2001

DATE: _____



6000 MILE CHECK

TECHNICIAN C. BROWN

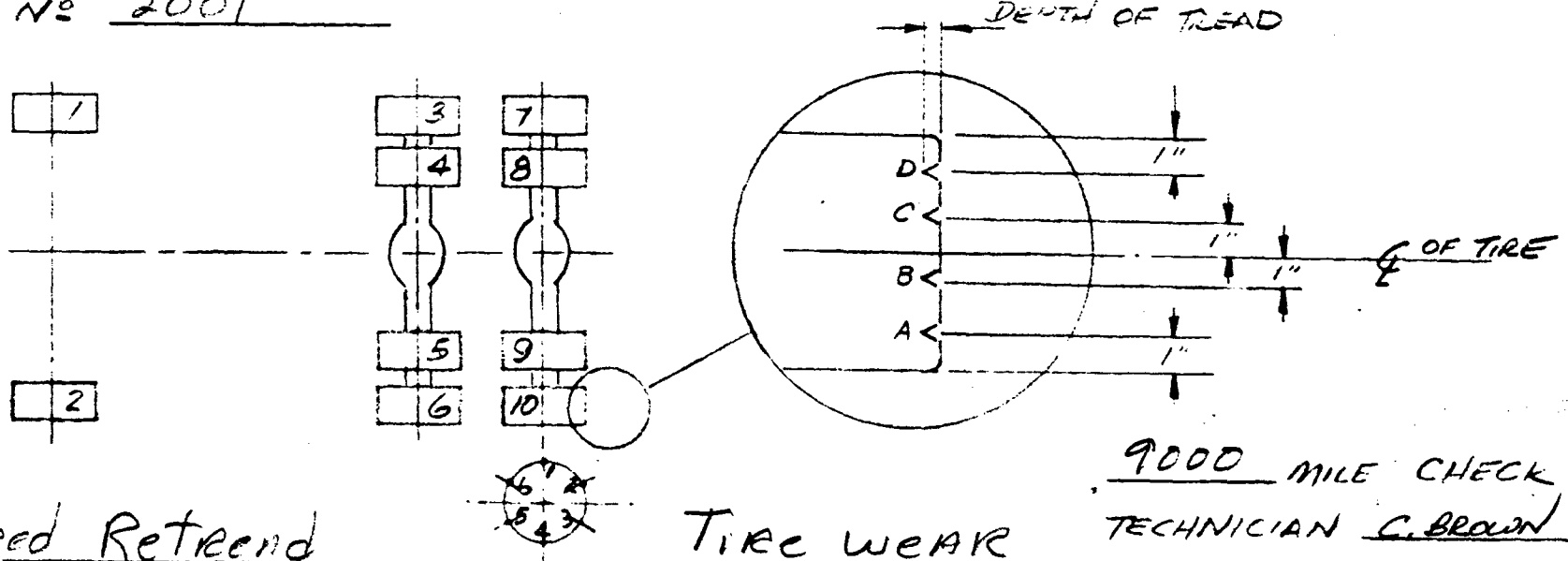
Precured Retread Tire Wear

TIRE NUMBER	POSITION 1 A	B	C	D	POSITION 2 A	B	C	D	POSITION 3 A	B	C	D	POSITION 4 A	B	C	D	POSITION 5 A	B	C	D	POSITION 6 A	B	C	D
1																								
2																								
#6		.291	.329			.247	.258			.248	.222			.280	.207			.269	.226			.261	.363	
#5		.180	.340			.338	.337			.205	.280			.206	.288			.207	.319			.200	.287	
#4		.225	.191			.223	.215			.175	.134			.225	.210			.231	.225			.203	.200	
#3		.272	.287			.277	.285			.290	.252			.237	.234			.285	.291			.327	.282	
7		.295	.258			.300	.275			.283	.265			.277	.301			.264	.296			.260	.271	
8		.268	.253			.261	.284			.228	.317			.235	.278			.266	.283			.277	.333	
9		.217	.204			.233	.169			.303	.199			.317	.218			.343	.220			.295	.237	
10		.293	.283			.348	.249			.299	.259			.281	.281			.278	.257			.314	.284	

GOVERNMENT TIRE TEST

JOB No 2001

DATE: _____



9000 MILE CHECK

TECHNICIAN C. BROWN

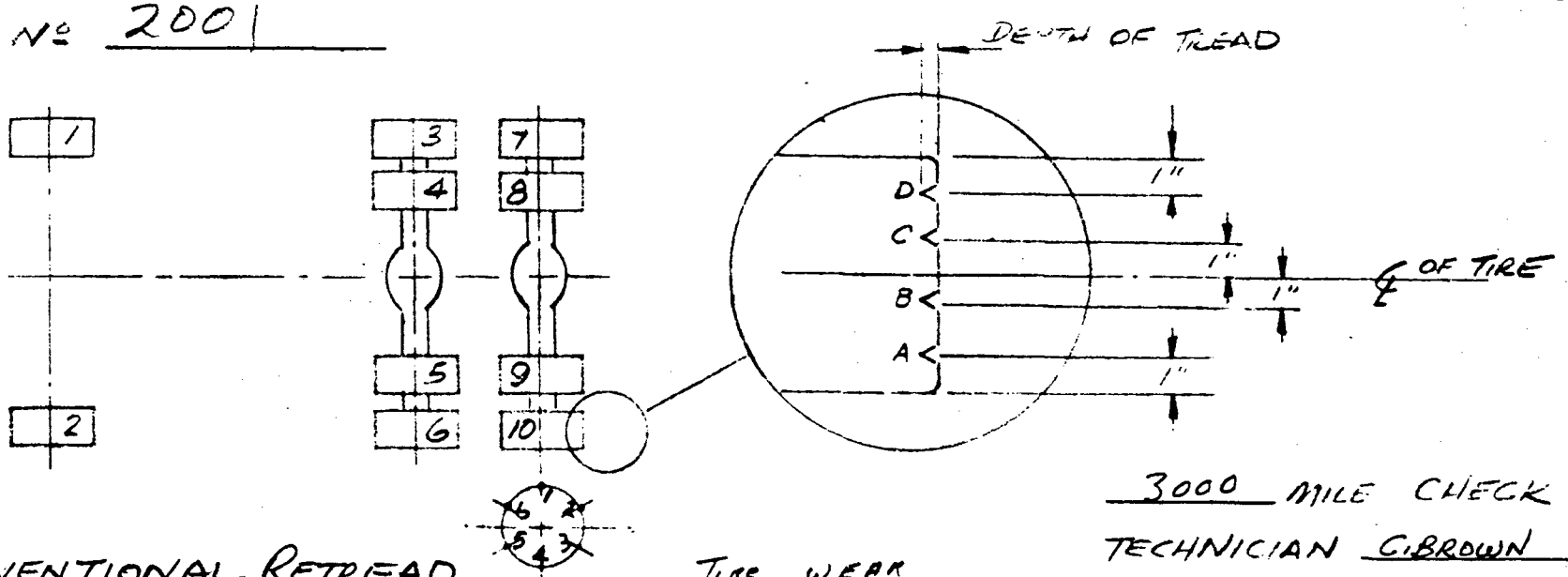
PRECURED RETREAD TIRE WEAR

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1																								
2																								
3		.327	.357			.389	.352			.325	.345			.357	.311			.357	.311			.343	.301	
4		.245	.250			.282	.292			.235	.214			.240	.189			.256	.211			.279	.235	
5		.292	.360			.187	.411			.219	.360			.236	.333			.278	.348			.277	.446	
6		.283	.298			.314	.270			.293	.247			.296	.260			.302	.271			.327	.279	
7		.345	.307			.345	.301			.333	.313			.329	.339			.325	.345			.308	.312	
8		.249	.283			.341	.329			.320	.369			.317	.369			.300	.357			.263	.363	
9		.283	.238			.295	.241			.283	.285			.325	.259			.366	.259			.310	.280	
10		.349	.320			.380	.283			.350	.311			.302	.305			.340	.291			.351	.339	

GOVERNMENT TIRE TEST

JOB Nº 2001

DATE: _____



3000 MILE CHECK

TECHNICIAN C. BROWN

CONVENTIONAL RETREAD

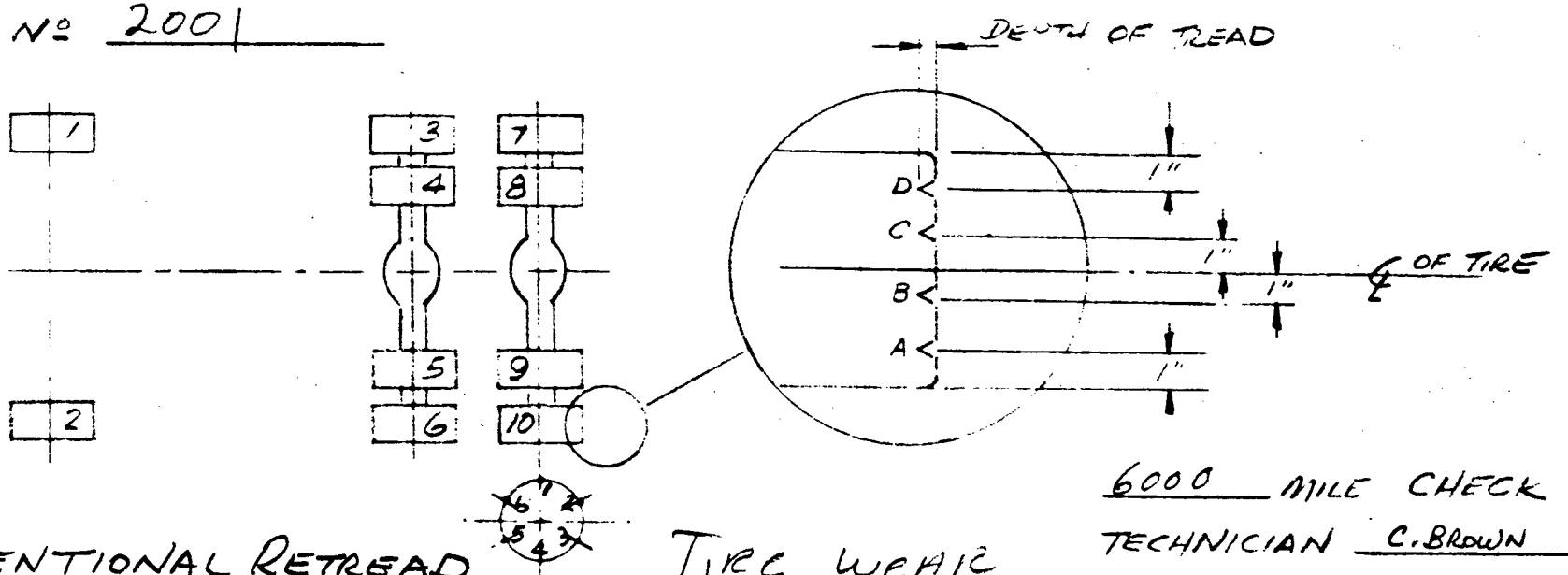
TIRE WEAR

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1																								
2											o													
3		.121	.136			.137	.100			.139	091			.124	.112			.127	093			.113	087	
4		.145	.105			.144	.121			.121	.114			.126	.139			.115	.132			.134	.117	
5		.105	.298			.225	.298			.224	.286			.223	.277			.206	.302			.239	.256	
6		032	.096			019	.114			060	.111			055	.181			.174	184			169	191	
7		.148	091			.150	092			.115	092			.155	087			.139	.110			.154	.110	
8		.123	.125			.138	.147			.135	.143			.140	.122			.144	078			.122	.129	
9		.191	.170			.198	.184			.207	.177			.206	.201			.187	.193			.189	.146	
10		092	.109			094	094			.104	086			.104	077			.107	080			.101	089	

GOVERNMENT TIRE TEST

JOB No. 2001

DATE: _____



6000 MILE CHECK

TECHNICIAN C. BROWN

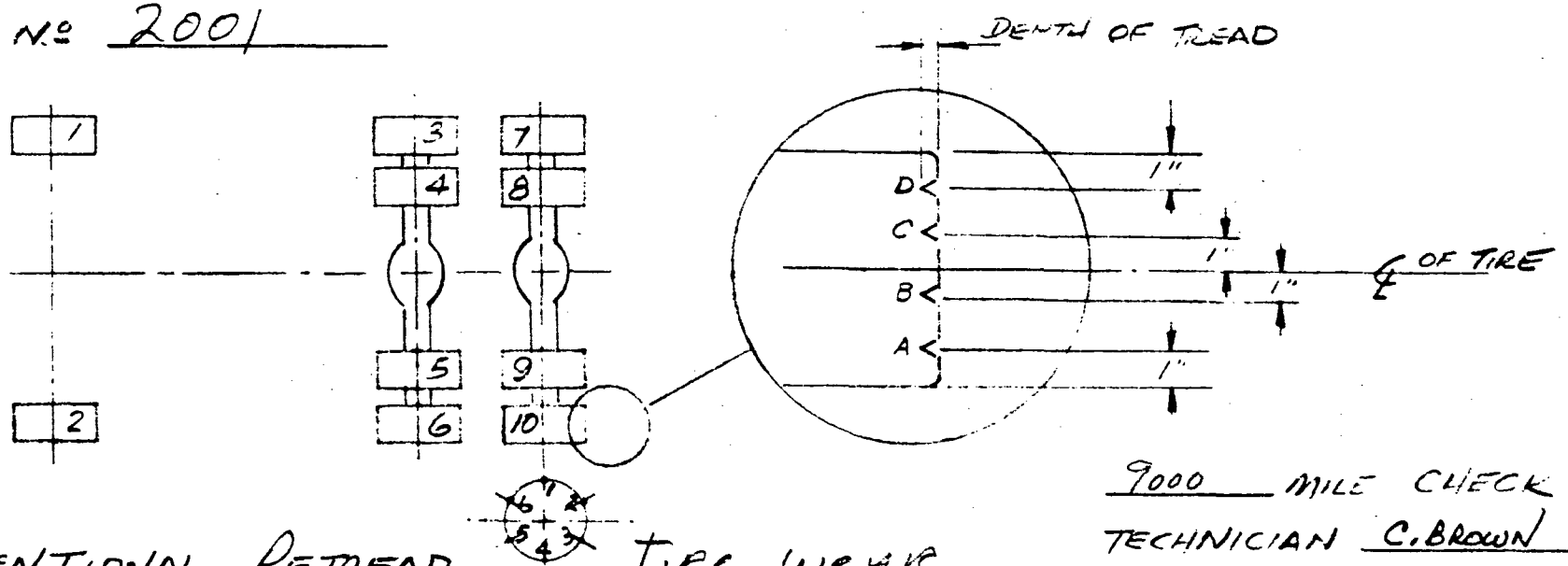
CONVENTIONAL RETREAD TIRE WEAR

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1																								
2																								
3		.194	.211			161	203			.163	.179			.170	.193			.197	.192			.200	.197	
4		.220	.185			.208	.176			.182	.190			.190	.192			.189	.227			.224	.189	
5		.558	.573			.560	.587			.550	.566			.567	.570			.570	.580			.546	.570	
6		.320	.374			.301	.396			.320	.378			.333	.463			.484	.485			.467	.446	
7		.270	.187			.261	.199			.271	.242			.278	.216			.254	.162			.240	.159	
8		.201	.207			.198	.211			.215	.179			.222	.216			.194	.221			.212	.219	
9		.383	.380			.383	.397			.394	.389			.392	.407			.372	.397			.377	.397	
10		.206	.183			.184	.180			.201	.168			.227	.157			.209	.155			.201	.179	
		I	I			O	I			O	I			O	I			O	I			O	I	

GOVERNMENT TIRE TEST

JOB NO. 2001

DATE: _____



9000 MILE CHECK

TECHNICIAN C. BROWN

CONVENTIONAL RETREAD TIRE WEAR

TIRE NUMBER	POSITION 1				POSITION 2				POSITION 3				POSITION 4				POSITION 5				POSITION 6			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
1																								
2																								
3		.269	.290			.259	.278			.256	.260			.253	.274			.246	.240			.248	.259	
4		.300	.252			.289	.234			.263	.268			.273	.281			.235	.279			.214	.256	
5																								
6		.359	.483			.412	.490			.415	.485			.435	.523			.541	.575			.532	.626	
7		.352	.392			.342	.267			.304	.225			.343	.233			.360	.304			.374	.299	
8		.284	.291			.267	.281			.291	.281			.299	.238			.265	.285			.284	.268	
9		.496	.516			.530	.524			.534	.506			.528	.532			.501	.496			.495	.496	
10		.274	.266			.277	.255			.268	.235			.189	.245			.298	.244			.276	.255	

APPENDIX C

Statistical Analysis

CONCLUSIONS

With the premise that we have identical driving cycles for the test of precured retread and conventional retread tires, the following conclusions can be drawn from the 9000 mile data.

a) In overall performance, the precured retread tire has less wear compared with conventional retread tire.

b) In overall performance, the precured retread tire has a much more uniform wear compared with the conventional retread tire.

Note: Some individual precured retread tires have more wear when compared with conventional retread tires.

RESULTS

a) The wear comparison between precured retread tire and conventional retread tire is as follows (see Appendix (a1) - (a6)):

		Precured Retread	Conventional Retread
Wear Measurements	Sample Mean	.304	.338
	Sample Std. Dev.	.042	.107
	Distribution	Normal	N/A
	Sample Size	84	84

The hypothesis that precured retread tire has less wear compared with conventional retread tire cannot be rejected at 95% significance level.

b) The wear comparison at point B between precured retread tire and conventional retread tire is as follows (see Appendix (b1) - (b5)):

		Precured Tires	Conventional Tires
Wear Measurements	Sample Mean	.313	.340
	Sample Std. Dev.	.038	.099
	Distribution	Normal	N/A
	Sample Size	42	42

The hypothesis that at point B precured retread tire has less wear compared with conventional retread tire cannot be accepted at 95% significance level.

c) The wear comparison at point C between precured retread tire and conventional retread tire is as follows (see Appendix (C1) - (C5)):

		Precured Retread	Conventional Retread
Wear Measurements	Sample Mean	.295	.335
	Sample Std. Dev.	.045	.114
	Distribution	Normal	N/A
	Sample Size	42	42

The hypothesis that at point C precured retread tire has less wear compared with conventional retread tire cannot be rejected at 95% significance level.

d) The wear comparison between precured and conventional retread tires for individual tire positions (see appendix (d1)-(g3)).

Wear Measurements

Tire Position	Point	Sample Mean		Sample Std. Dev.		Comparison	
		Precured Retread	Conventional Retread	Precured Retread	Conventional Retread	Precured Retread	Conventional Retread
3	B	.350	.255	.022	.008	0	*[1]
	C	.330	.268	.022	.015	0	*
4	B	.256	.272	.018	.021	N/A	N/A
	C	.232	.261	.033	.016	N/A	N/A
6	B	.303	.449	.014	.066	*	0
	C	.271	.514	.016	.032	*	0
7	B	.331	.346	.013	.022	N/A	N/A
	C	.320	.270	.016	.031	0	*
8	B	.298	.281	.032	.012	N/A	N/A
	C	.345	.274	.031	.018	0	*
9	B	.310	.511	.029	.021	*	0
	C	.260	.512	.018	.014	*	0
10	B	.345	.264	.023	.035	0	*
	C	.308	.250	.018	.010	0	*

Note: The hypothesis that * designated tire has less wear comparing with 0 designated tire can not be rejected at 95% significance level.

e) Comparing with precured retread tires, conventional retread tires had slightly less wear at tire position 3, 7, 8 and 10, however, it experiences much more wear at tire position 5, 6 and 9.

f) Conventional retread tires experienced significantly more wear at position 5, 6 and 9 compared with the rest.

Note: The comparisons in (a)-(c) do not include data for tire 5.

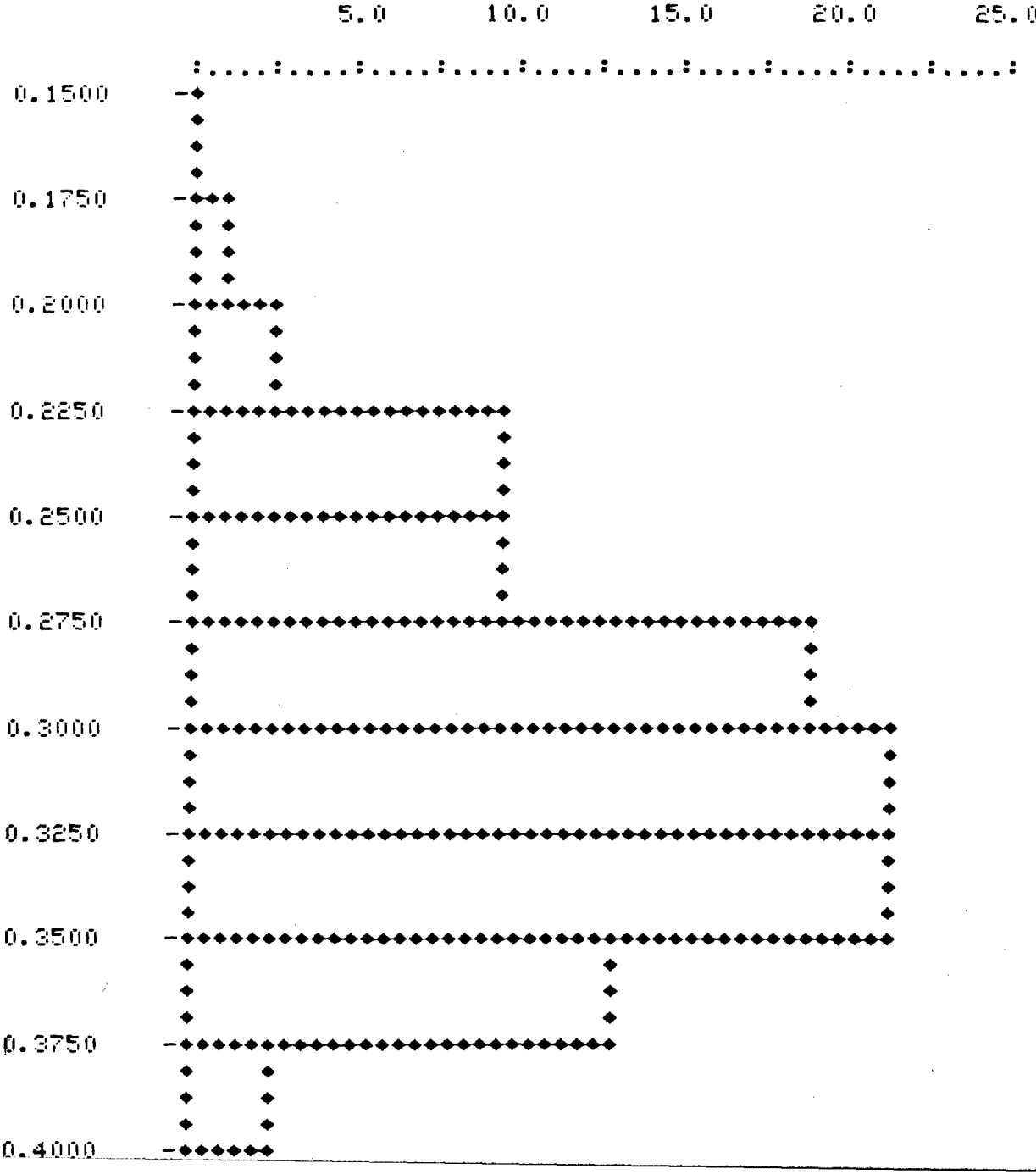
Appendix

(a1) The wear measurements (file TEMP) for all precured retread tires.

TEMP

```
100 .327,.389,.325,.357,.357,.343
110 .245,.282,.235,.240,.256,.279
120 .283,.314,.293,.296,.302,.327
130 .345,.345,.333,.329,.325,.308
140 .249,.341,.320,.317,.300,.263
150 .283,.295,.283,.325,.366,.310
160 .347,.380,.350,.302,.340,.351
170 .357,.352,.345,.311,.311,.301
180 .250,.292,.214,.189,.211,.235
190 .298,.270,.247,.260,.271,.279
200 .307,.301,.313,.339,.345,.312
210 .283,.329,.369,.369,.357,.363
220 .238,.241,.285,.259,.259,.280
230 .320,.283,.311,.305,.291,.339
```

(a2) The histogram of wear measurements for all precured retread tires.

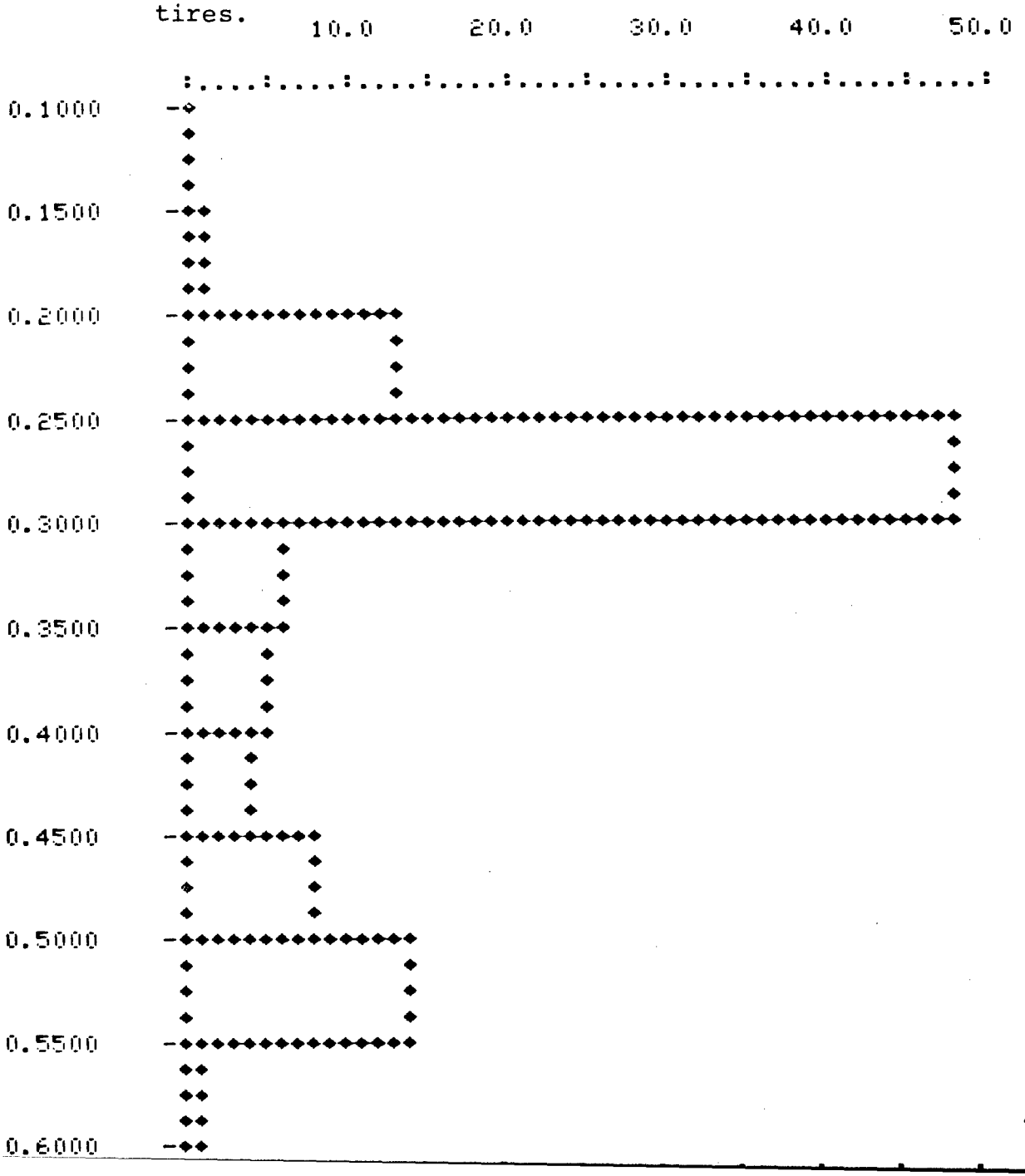


(a3) The wear measurements (file TEMP 2) for all conventional retread tires.

TEMP2

```
100 .269,.259,.256,.253,.246,.248
110 .300,.289,.263,.273,.235,.274
120 .359,.412,.415,.435,.541,.532
130 .352,.342,.304,.343,.360,.374
140 .284,.267,.291,.299,.265,.284
150 .476,.530,.534,.528,.501,.495
160 .274,.277,.268,.189,.298,.276
170 .290,.278,.260,.274,.244,.259
180 .252,.234,.268,.281,.277,.256
190 .483,.490,.485,.523,.575,.526
200 .292,.267,.225,.233,.304,.299
210 .291,.281,.281,.238,.285,.268
220 .516,.524,.506,.532,.496,.496
230 .266,.255,.235,.245,.244,.255
```

(a4) The histogram of wear measurements for all conventional retread tires.



(a5) The basic statistics of wear measurements for all conventional retread tires.

MEAN= .304139
STD. DEV.(CORRECTED)= 4.24819E-02

THE HYPOTHESIS THAT THE POPULATION IS NORMAL OF MEAN .304139 AND STD. DEV. 4.24819E-02 CANNOT BE REJECTED AT THE 95% CONFIDENCE LEVEL

K-S STATISTIC = 5.56744E-02
PROBABILITY OF A K-S VALUE OF 0.055674 OR LARGER IS .9570

(a6) The comparison of wear measurements between all precured and conventional retread tires.

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3041429	0.3376071
SAMPLE VARIANCE	0.1783241E-02	0.1147288E-01
SAMPLE STD DEVIATION	0.4222844E-01	0.1071115
SAMPLE SIZE	84	84
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.4248207E-01	0.1077549
STD ERROR OF MEAN	0.4635174E-02	0.1175702E-01

DIFF BETWEEN MEANS	-0.3346429E-01
STD ERROR OF DIFF	0.1263773E-01
T-RATIO	-2.648
DEGR OF FREEDOM [DIFF]	108.193

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
34642E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0093104

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

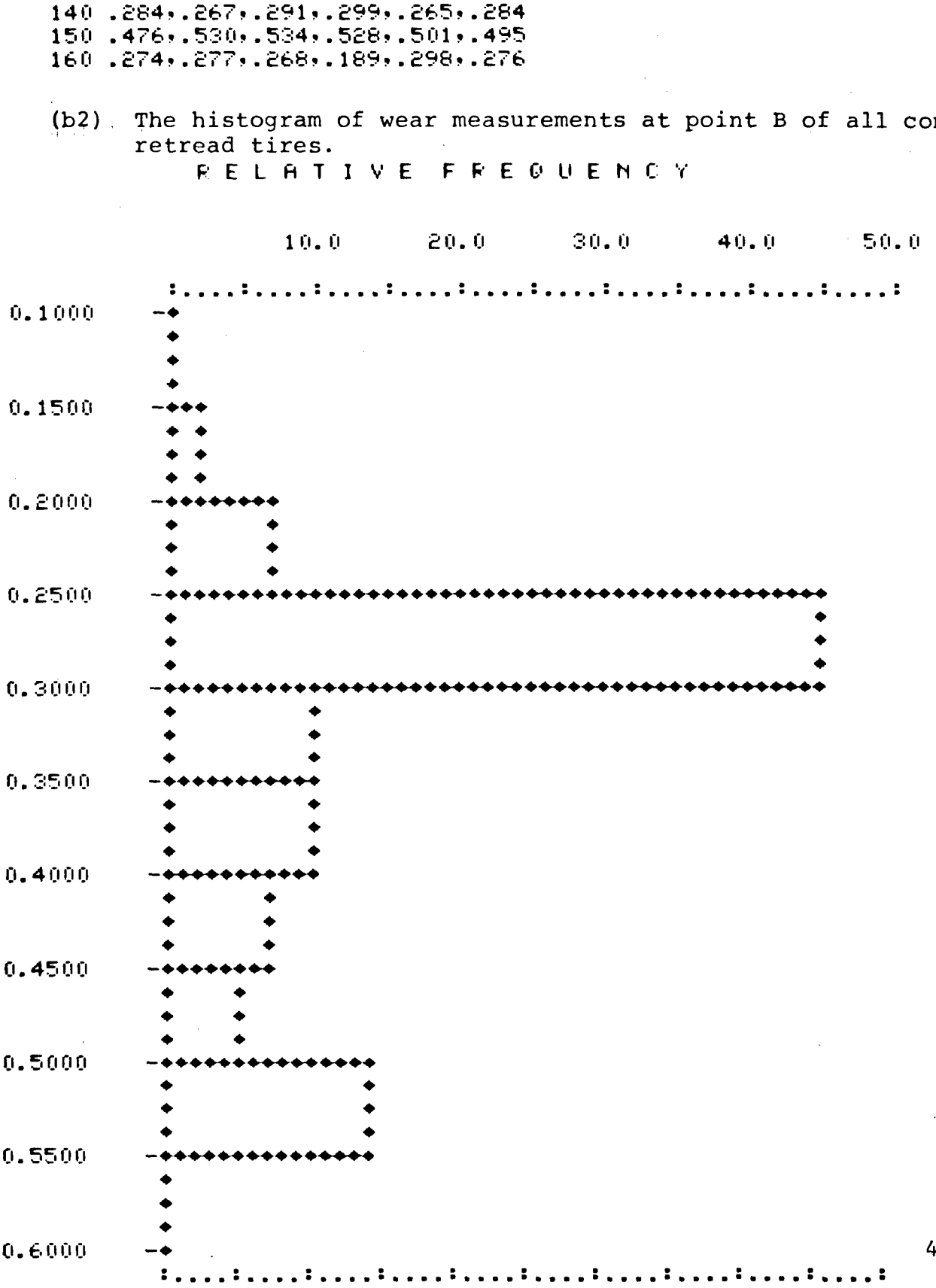
CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.4201491E-01	-0.2491366E-01
75.000	-0.4808070E-01	-0.1884787E-01
90.000	-0.5443136E-01	-0.1249721E-01
95.000	-0.5851446E-01	-0.8414107E-02
98.000	-0.6330668E-01	-0.3621895E-02
99.000	-0.6660194E-01	-0.3266297E-03
99.900	-0.7621647E-01	0.9287897E-02

(b1) The wear measurements at point B of all conventional retread tires

CM9B

```
100 .269,.259,.256,.253,.246,.248
110 .300,.289,.263,.273,.235,.274
120 .359,.412,.415,.435,.541,.532
130 .352,.342,.304,.343,.360,.374
140 .284,.267,.291,.299,.265,.284
150 .476,.530,.534,.528,.501,.495
160 .274,.277,.268,.189,.298,.276
```

(b2) The histogram of wear measurements at point B of all conventional retread tires.



(b3) The wear measurements at point B of all precured retread tires.

```
PM9B

100 .327,.389,.325,.357,.357,.343
110 .245,.282,.235,.240,.256,.279
120 .283,.314,.293,.296,.302,.327
130 .345,.345,.333,.329,.325,.308
140 .249,.341,.320,.317,.300,.263
150 .283,.295,.283,.325,.366,.310
160 .347,.380,.350,.302,.340,.351
```

(b4) The basic statistics of wear measurements at point B of all precured retread tires.

```
MEAN= .313261
STD. DEV. (CORRECTED)= 3.79589E-02

THE HYPOTHESIS THAT THE POPULATION IS NORMAL OF MEAN .313261    AND
STD. DEV. 3.79589E-02   CANNOT BE REJECTED AT THE 95% CONFIDENCE LEVEL


K-S STATISTIC = 7.38015E-02
PROBABILITY OF A K-S VALUE OF  0.073801 OR LARGER IS  .9762
```

(b5) The comparison of wear measurements at point B between all precured and conventional retread tires.

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3132619	0.3397619
SAMPLE VARIANCE	0.1406574E-02	0.9880800E-02
SAMPLE STD DEVIATION	0.3750432E-01	0.9940221E-01
SAMPLE SIZE	42	42
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.3795894E-01	0.1006071
STD ERROR OF MEAN	0.5857191E-02	0.1552402E-01

DIFF BETWEEN MEANS	-0.2650000E-01
STD ERROR OF DIFF	0.1659222E-01
T-RATIO	-1.597
DEGR OF FREEDOM [DIFF]	52.441

```
2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
65000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
                                  .1162957


CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:
```

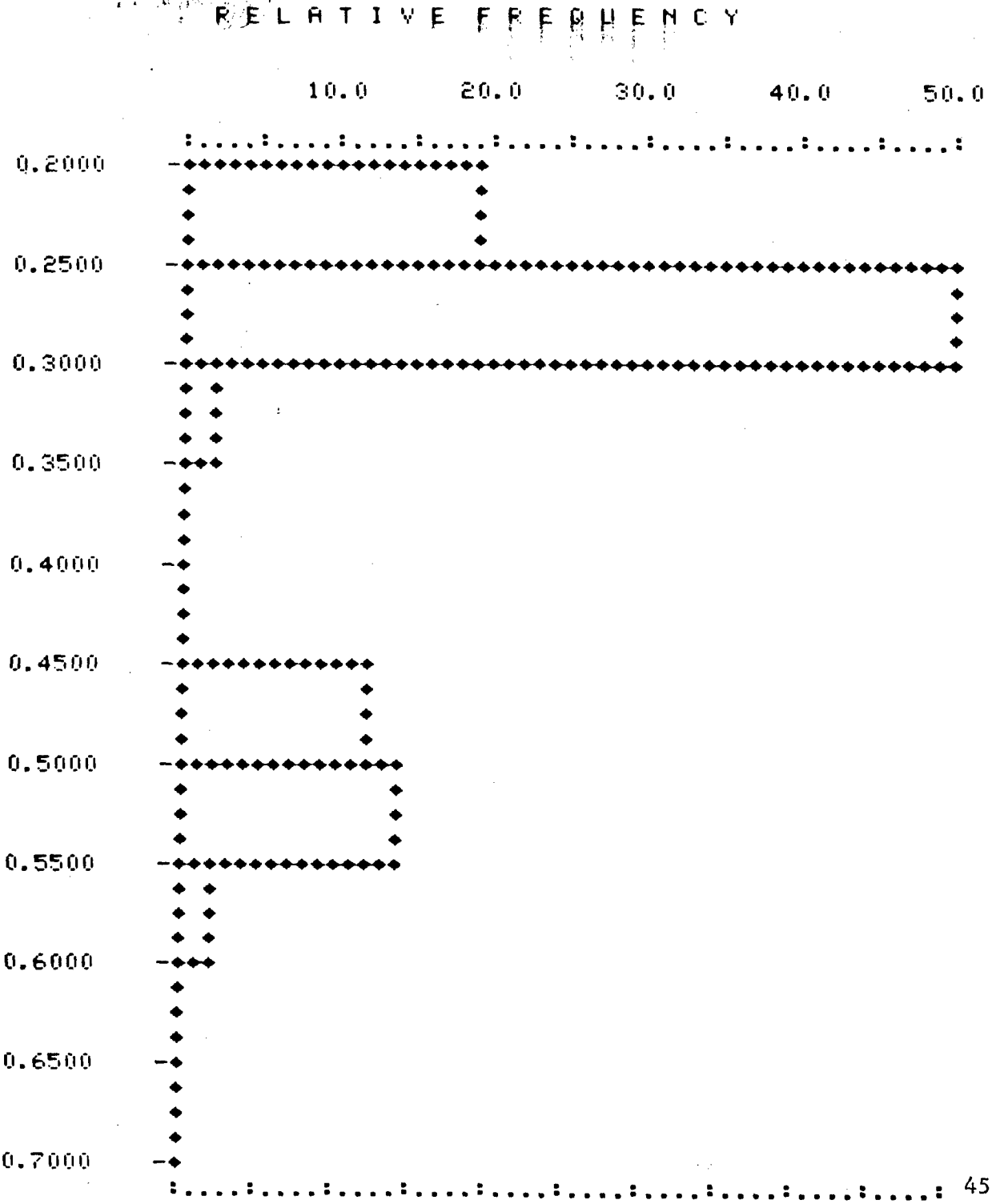
CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.3776446E-01	-0.1523554E-01
75.000	-0.4580246E-01	-0.7197539E-02
90.000	-0.5428681E-01	0.1286814E-02
95.000	-0.5979473E-01	0.6794729E-02
98.000	-0.6632506E-01	0.1332506E-01
99.000	-0.7086318E-01	0.1786318E-01
99.900	-0.8436853E-01	0.3136853E-01

(c1) The wear measurements at point C of all conventional retread tires.

```
CM9C

100 .290,.278,.260,.274,.244,.259
110 .252,.234,.268,.281,.277,.256
120 .483,.490,.485,.523,.575,.526
130 .292,.267,.225,.233,.304,.299
140 .291,.281,.281,.238,.285,.268
150 .516,.524,.506,.532,.496,.496
160 .266,.255,.235,.245,.244,.255
```

(c2) The histogram of wear measurements at point C of all conventional retread tires.



(c3) The wear measurements at point C of all precured retread tires.

```
PM9C

100 .357,.352,.345,.311,.311,.301
110 .250,.292,.214,.189,.211,.235
120 .298,.270,.247,.260,.271,.279
130 .307,.301,.313,.339,.345,.312
140 .283,.329,.369,.369,.357,.363
150 .238,.241,.285,.259,.259,.280
160 .320,.283,.311,.305,.291,.339
```

(c4) The basic statistics of wear measurements at point C of all precured retread tires.

```
MEAN= .295023
STD. DEV.(CORRECTED)= 4.51908E-02


THE HYPOTHESIS THAT THE POPULATION IS NORMAL OF MEAN .295023    AND
STD. DEV. 4.51908E-02   CANNOT BE REJECTED AT THE 95% CONFIDENCE LEVEL



K-S STATISTIC = 6.01023E-02
PROBABILITY OF A K-S VALUE OF  0.060102 OR LARGER IS  .9981
```

(c5) The comparison of wear measurements at point C between all precured and conventional retread tires.

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2950238	0.3354524
SAMPLE VARIANCE	0.1993595E-02	0.1305568E-01
SAMPLE STD DEVIATION	0.4464969E-01	0.1142614
SAMPLE SIZE	42	42
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.4519092E-01	0.1156465
STD ERROR OF MEAN	0.6973110E-02	0.1784464E-01

DIFF BETWEEN MEANS	-0.4042857E-01
^STD ERROR OF DIFF	0.1915869E-01
T-RATIO	-2.110
DEGR OF FREEDOM [DIFF]	53.236

```
2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
04285E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
                                .0395789


 CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:
```

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.5344336E-01	-0.2741379E-01
75.000	-0.6271196E-01	-0.1814518E-01
90.000	-0.7250244E-01	-0.8354699E-02
95.000	-0.7885604E-01	-0.2001105E-02
98.000	-0.8638624E-01	0.5529097E-02
99.000	-0.9161719E-01	0.1076005E-01
99.900	-0.1071732	0.2631602E-01

(d1) The wear measurements at point B of precured retread tire 3

```
PM9T3B

100 .327,.389,.325,.357,.357,.343
```

(d2) The wear measurements at point B of conventional retread tire 3

```
CM9T3B

100 .269,.259,.256,.253,.246,.248
```

(d3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3496667	0.2551667
SAMPLE VARIANCE	0.4702222E-03	0.5780555E-04
SAMPLE STD DEVIATION	0.2168461E-01	0.7602996E-02
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.2375430E-01	0.8328665E-02
STD ERROR OF MEAN	0.9697651E-02	0.3400163E-02

DIFF BETWEEN MEANS	0.9450000E-01
STD ERROR OF DIFF	0.1027646E-01
T-RATIO	9.196
DEGR OF FREEDOM [DIFF]	6.211

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
45000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0000932

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.8712569E-01	0.1018743
75.000	0.8141448E-01	0.1075855
90.000	0.7453099E-01	0.1144690
95.000	0.6935442E-01	0.1196456
98.000	0.6220451E-01	0.1267955
99.000	0.5640078E-01	0.1325992
99.900	0.3326451E-01	0.1557355

(e1) The wear measurements at point C of precured retread tire 3

PM9T3C

100 .357,.352,.345,.311,.311,.301

(e2) The wear measurements at point C of conventional retread tire 3

CM9T3C

100 .290,.278,.260,.274,.244,.259

(e3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3295000	0.2675000
SAMPLE VARIANCE	0.4999167E-03	0.2232500E-03
SAMPLE STD DEVIATION	0.2235882E-01	0.1494155E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.2449286E-01	0.1636765E-01
STD ERROR OF MEAN	0.9999167E-02	0.6682065E-02

DIFF BETWEEN MEANS	0.6200000E-01
STD ERROR OF DIFF	0.1202636E-01
T-RATIO	5.155
DEGR OF FREEDOM [DIFF]	8.723

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
20000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0008686

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.5350404E-01	0.7049595E-01
75.000	0.4708348E-01	0.7691652E-01
90.000	0.3963641E-01	0.8436359E-01
95.000	0.3426716E-01	0.8973284E-01
98.000	0.2716614E-01	0.9683386E-01
99.000	0.2164690E-01	0.1023531
99.900	0.1371466E-02	0.1226285

(f1) The wear measurements at point B of precured retread tire 4

PM9T4B

100 .245 .282 .235 .240 .256 .279

(f2) The wear measurements at point B of conventional retread tire 4

CM9T4B

100 .300 .289 .263 .273 .235 .274

(f3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2561667	0.2723333
SAMPLE VARIANCE	0.3371389E-03	0.4212222E-03
SAMPLE STD DEVIATION	0.1836134E-01	0.2052370E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.2011384E-01	0.2248259E-01
STD ERROR OF MEAN	0.8211442E-02	0.9178477E-02

DIFF BETWEEN MEANS	-0.1616667E-01
STD ERROR OF DIFF	0.1231553E-01
T-RATIO	-1.313
DEGR OF FREEDOM [DIFF]	9.879

[illegible]
.2217676

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.2482177E-01	-0.7511560E-02
75.000	-0.3131057E-01	-0.1022759E-02
90.000	-0.3874242E-01	0.6409087E-02
95.000	-0.4402632E-01	0.1169299E-01
98.000	-0.5091416E-01	0.1858083E-01
99.000	-0.5619011E-01	0.2385677E-01
99.900	-0.7504611E-01	0.4271278E-01

(g1) The wear measurements at point C of precured retread tire 4

PM9T4C

100 .250,.292,.214,.189,.211,.235

(g2) The wear measurements at point C of conventional retread tire 4

CM9T4C

100 .252,.234,.268,.281,.277,.256

(g3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2318333	0.2613333
SAMPLE VARIANCE	0.1091139E-02	0.2565556E-03
SAMPLE STD DEVIATION	0.3303239E-01	0.1601735E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.3618517E-01	0.1754613E-01
STD ERROR OF MEAN	0.1477253E-01	0.7163178E-02

DIFF BETWEEN MEANS	-0.2950000E-01
STD ERROR OF DIFF	0.1641764E-01
T-RATIO	-1.797
DEGR OF FREEDOM [DIFF]	7.228

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
95000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.1154156

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.4117607E-01	-0.1782393E-01
75.000	-0.5009230E-01	-0.8907701E-02
90.000	-0.6060451E-01	0.1604510E-02
95.000	-0.6832155E-01	0.9321550E-02
98.000	-0.7871929E-01	0.1971929E-01
99.000	-0.8695326E-01	0.2795326E-01
99.900	-0.1182846	0.5928464E-01

(h1) The wear measurements at point B of precured retread tire 6

PM9T6B

100 .288,.314,.293,.296,.302,.327

(h2) The wear measurements at point B of conventional retread tire 6

CM9T6B

100 .359,.412,.415,.435,.541,.532

(h3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3025000	0.4490000
SAMPLE VARIANCE	0.2075833E-03	0.4362333E-02
SAMPLE STD DEVIATION	0.1440775E-01	0.6604796E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.1578290E-01	0.7235192E-01
STD ERROR OF MEAN	0.6443343E-02	0.2953755E-01

DIFF BETWEEN MEANS	-0.1465000
STD ERROR OF DIFF	0.3023216E-01
T-RATIO	-4.846
DEGR OF FREEDOM [DIFF]	5.475

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE

0.1465000 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF: .0046909

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.1684699	-0.1245301
75.000	-0.1858305	-0.1071695
90.000	-0.2074193	-0.8558074E-01
95.000	-0.2242142	-0.6878576E-01
98.000	-0.2482291	-0.4477091E-01
99.000	-0.2684004	-0.2459961E-01
99.900	-0.3541594	0.6115935E-01

(i1) The wear measurements at point C of precured retread tire 6

PM9T6C

100 .298,.270,.247,.260,.271,.279

(i2) The wear measurements at point C of conventional retread tire 6

CM9T6C

100 .483,.490,.485,.523,.575,.526

(i3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2708333	0.5136667
SAMPLE VARIANCE	0.2484722E-03	0.1053889E-02
SAMPLE STD DEVIATION	0.1576300E-01	0.3246365E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.1726750E-01	0.3556215E-01
STD ERROR OF MEAN	0.7049428E-02	0.1451819E-01

DIFF BETWEEN MEANS	-0.2428333
STD ERROR OF DIFF	0.1613915E-01
T-RATIO	-15.046
DEGR OF FREEDOM [DIFF]	7.234

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE

0.2428333 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF: .0000014

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.2543113	-0.2313553
75.000	-0.2630763	-0.2225903
90.000	-0.2734102	-0.2122564
95.000	-0.2809964	-0.2046703
98.000	-0.2912177	-0.1944489
99.000	-0.2993120	-0.1863546
99.900	-0.3301119	-0.1555547

(j1) The wear measurements at point B of precured retread tire 7

PM9T7B

100 .345,.345,.333,.329,.325,.308

(j2) The wear measurements at point B of conventional retread tire 7

CM9T7B

100 .352,.342,.304,.343,.360,.374

(j3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3308333	0.3458333
SAMPLE VARIANCE	0.1608056E-03	0.4674722E-03
SAMPLE STD DEVIATION	0.1268091E-01	0.2162111E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.1389124E-01	0.2368474E-01
STD ERROR OF MEAN	0.5671077E-02	0.9669253E-02

DIFF BETWEEN MEANS	-0.1500000E-01
STD ERROR OF DIFF	0.1120962E-01
T-RATIO	-1.338
DEGR OF FREEDOM [DIFF]	8.076

[illegible]
.2176371

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.2291897E-01	-0.7081026E-02
75.000	-0.2890350E-01	-0.1096501E-02
90.000	-0.3584482E-01	0.5844826E-02
95.000	-0.4084943E-01	0.1084943E-01
98.000	-0.4746820E-01	0.1746821E-01
99.000	-0.5261261E-01	0.2261262E-01
99.900	-0.7151109E-01	0.4151110E-01

(k1) The wear measurements at point C of precured retread tire 7

PM9T7C

100 .307,.301,.313,.339,.345,.312

(k2) The wear measurements at point C of conventional retread tire 7

CM9T7C

100 .292,.267,.225,.233,.304,.299

(k3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3195000	0.2700000
SAMPLE VARIANCE	0.2712500E-03	0.9806666E-03
SAMPLE STD DEVIATION	0.1646967E-01	0.3131560E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.1804162E-01	0.3430452E-01
STD ERROR OF MEAN	0.7365460E-02	0.1400476E-01

DIFF BETWEEN MEANS	0.4950000E-01
STD ERROR OF DIFF	0.1582351E-01
T-RATIO	3.128
DEGR OF FREEDOM [DIFF]	7.569

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
95000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0166502

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.3824647E-01	0.6075353E-01
75.000	0.2965291E-01	0.6934709E-01
90.000	0.1952112E-01	0.7947887E-01
95.000	0.1208335E-01	0.8691665E-01
98.000	0.2061897E-02	0.9693810E-01
99.000	-0.5874097E-02	0.1048741
99.900	-0.3607163E-01	0.1350716

(11) The wear measurements at point B of precured retread tire 8

PM9T8B

100 .249,.341,.320,.317,.300,.263

(12) The wear measurements at point B of conventional retread tire 8

CM9T8B

100 .284,.267,.291,.297,.265,.284

(13) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2983333	0.2813333
SAMPLE VARIANCE	0.1053889E-02	0.1375556E-03
SAMPLE STD DEVIATION	0.3246365E-01	0.1172841E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.3556215E-01	0.1284783E-01
STD ERROR OF MEAN	0.1451819E-01	0.5245104E-02

DIFF BETWEEN MEANS	0.1700000E-01
STD ERROR OF DIFF	0.1543661E-01
T-RATIO	1.101
DEGR OF FREEDOM [DIFF]	6.283

[illegible] .3129823

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.5922801E-02	0.2807720E-01
75.000	-0.2656197E-02	0.3665620E-01
90.000	-0.1299611E-01	0.4699611E-01
95.000	-0.2077202E-01	0.5477202E-01
98.000	-0.3151214E-01	0.6551214E-01
99.000	-0.4023012E-01	0.7423012E-01
99.900	-0.7498388E-01	0.1089839

(m1) The wear measurements at point C of precured retread tire 8

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PM9T8C

100 .283,.329,.369,.369,.357,.363
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(m2) The wear measurements at point C of conventional retread tire 8

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CM9T8C

100 .291,.281,.281,.238,.285,.268
```

(m3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3450000	0.2740000
SAMPLE VARIANCE	0.9533333E-03	0.3066666E-03
SAMPLE STD DEVIATION	0.3087610E-01	0.1751190E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.3382307E-01	0.1918333E-01
STD ERROR OF MEAN	0.1380821E-01	0.7831560E-02

DIFF BETWEEN MEANS	0.7100000E-01
STD ERROR OF DIFF	0.1587451E-01
T-RATIO	4.473
DEGR OF FREEDOM [DIFF]	7.915

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
10000E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0028920

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.5971020E-01	0.8228980E-01
75.000	0.5108894E-01	0.9091106E-01
90.000	0.4092450E-01	0.1010755
95.000	0.3346275E-01	0.1085372
98.000	0.2340900E-01	0.1185910
99.000	0.1544742E-01	0.1265526
99.900	-0.1484744E-01	0.1568474

(n1) The wear measurements at point B of precured retread tire 9

PM9T9B

100 .283,.295,.283,.325,.366,.310

(n2) The wear measurements at point B of conventional retread tire 9

CM9T9B

100 .476,.530,.534,.528,.501,.495

(n3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3103333	0.5106667
SAMPLE VARIANCE	0.8405555E-03	0.4598888E-03
SAMPLE STD DEVIATION	0.2899234E-01	0.2144502E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.3175951E-01	0.2349184E-01
STD ERROR OF MEAN	0.1296577E-01	0.9590504E-02

DIFF BETWEEN MEANS	-0.2003333
STD ERROR OF DIFF	0.1612727E-01
T-RATIO	-12.422
DEGR OF FREEDOM [DIFF]	9.211

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE

0.2003333 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0000006

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.2116673	-0.1889994
75.000	-0.2201644	-0.1805023
90.000	-0.2298964	-0.1707702
95.000	-0.2368158	-0.1638509
98.000	-0.2458354	-0.1548312
99.000	-0.2527443	-0.1479224
99.900	-0.2774364	-0.1232303

(o1) The wear measurements at point C of precured retread tire 9

PM9T9C

100 .238,.241,.285,.259,.259,.280

(o2) The wear measurements at point C of conventional retread tire 9

CM9T9C

100 .516,.524,.506,.532,.496,.496

(o3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.2603333	0.5116667
SAMPLE VARIANCE	0.3118889E-03	0.1845555E-03
SAMPLE STD DEVIATION	0.1766038E-01	0.1358512E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.1934597E-01	0.1488176E-01
STD ERROR OF MEAN	0.7897960E-02	0.6075451E-02

DIFF BETWEEN MEANS	-0.2513333
STD ERROR OF DIFF	0.9964380E-02
T-RATIO	-25.223
DEGR OF FREEDOM [DIFF]	9.383

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE

0.2513333 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF: .0000000

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	-0.2583361	-0.2443306
75.000	-0.2635861	-0.2390805
90.000	-0.2695992	-0.2330675
95.000	-0.2738743	-0.2287923
98.000	-0.2794472	-0.2232195
99.000	-0.2837159	-0.2189507
99.900	-0.2989722	-0.2036945

(p1) The wear measurements at point B of precured retread tire 10

PM9T10B

100 .347,.380,.350,.302,.340,.351

(p2) The wear measurements at point B of conventional retread tire 10

CM9T10B

100 .274,.277,.268,.189,.298,.276

(p3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3450000	0.2636667
SAMPLE VARIANCE	0.5273334E-03	0.1201555E-02
SAMPLE STD DEVIATION	0.2296374E-01	0.3466346E-01
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.2515552E-01	0.3797192E-01
STD ERROR OF MEAN	0.1026970E-01	0.1550197E-01

DIFF BETWEEN MEANS	0.8133333E-01
STD ERROR OF DIFF	0.1859510E-01
T-RATIO	4.374
DEGR OF FREEDOM [DIFF]	8.680

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
13333E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0023680

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.6819693E-01	0.9446974E-01
75.000	0.5826949E-01	0.1043972
90.000	0.4675485E-01	0.1159118
95.000	0.3845295E-01	0.1242137
98.000	0.2747338E-01	0.1351933
99.000	0.1893957E-01	0.1437271
99.900	-0.1241022E-01	0.1750769

(q1) The wear measurements at point C of precured retread tire 10

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PM9T10C

100 .320,.283,.311,.305,.291,.339
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(q2) The wear measurements at point C of conventional retread tire 10

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CM9T10C

100 .266,.255,.235,.245,.244,.255
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(q3) The comparison between the above two sets of data

STATISTIC	PRECURED SAMPLE	CONVENTIONAL SAMPLE
SAMPLE MEAN	0.3081667	0.2500000
SAMPLE VARIANCE	0.3394722E-03	0.9866666E-04
SAMPLE STD DEVIATION	0.1842477E-01	0.9933109E-02
SAMPLE SIZE	6	6
POPULATION SIZE	INFINITE	INFINITE
ESTIM POPN STD DEV	0.2018333E-01	0.1088118E-01
STD ERROR OF MEAN	0.8239808E-02	0.4442222E-02

DIFF BETWEEN MEANS	0.5816667E-01
STD ERROR OF DIFF	0.9360971E-02
T-RATIO	6.214
DEGR OF FREEDOM [DIFF]	7.680

2-SIDED PROBABILITY THAT A DIFFERENCE AS LARGE AS THE OBSERVED VALUE
81666E-01 IS OBSERVED WHEN NO "TRUE EFFECTS" ARE ACTING ON THE DIFF:
.0004393

CONFIDENCE LIMITS ON DIFFERENCE BETWEEN MEANS:

CONFIDENCE LEVEL	LOWER LIMIT	UPPER LIMIT
50.000	0.5150923E-01	0.6482410E-01
75.000	0.4642540E-01	0.6990793E-01
90.000	0.4043157E-01	0.7590176E-01
95.000	0.3603149E-01	0.8030184E-01
98.000	0.3010293E-01	0.8623040E-01
99.000	0.2540810E-01	0.9092523E-01
99.900	0.7543653E-02	0.1087897

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RECAPPED TIRE
CONVENTIONAL RETREAD
PRECURED RETREAD

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A TEST PROGRAM HAS BEEN CONDUCTED TO COMPARE THE WEAR CHARACTERISTICS OF CONVENTIONAL RETREAD AND PRECURED RETREAD 9:00 X 20 TIRES. AN M-35 2 1/2 TON TRUCK WITH A 5000# HIGHWAY LOAD WAS DRIVEN 9000 MILES ON A COMBINATION OF PAVED, SECONDARY AND CROSS COUNTRY SURFACED ROADS WITH EACH TYPE OF RETREAD TIRE IN THIS EVALUATION. THE PRECURED RETREAD TIRES EXHIBITED ABOUT 10% LESS WEAR THAN THE CONVENTIONAL RETREAD TIRES ON THIS TEST BASED ON SAMPLE MEANS. THE PRECURED TIRES WERE ALSO MORE CONSISTENT IN WEAR RESISTANCE.

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