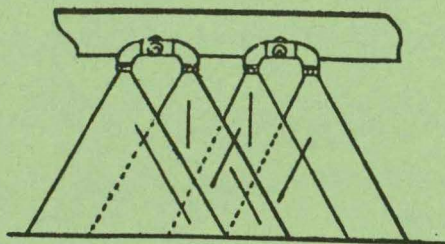


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INSPECTOR'S HANDBOOK

**SURFACE TREATMENTS
AND
BITUMINOUS SEAL COATS**



IOWA STATE HIGHWAY COMMISSION

AMES, IOWA

1969

**SURFACE TREATMENTS
AND
BITUMINOUS SEAL COATS**

Marvin Klein

INTRODUCTION

This handbook is an inspector's aid. It was written by an inspector to bring together all of the most-often-needed information involved in his work.

Much care has been taken to detail each phase of construction, with particular attention to the requirements and limitations of specifications. All applicable specification interpretations in Instructions to Resident Engineers have been included.

The beginning inspector should look to the handbook as a reference for standards of good practice. The Standard Specifications and Special Provisions should not, however, be overlooked as the basic sources of information on requirements and restrictions concerning workmanship and materials.

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SURFACE TREATMENTS AND BITUMINOUS SEAL COATS

Bituminous seal coats consist of one or more applications of binder bitumen applied over an existing wearing surface followed by embedding of cover aggregate in each layer of binder.

Bituminous surface treatments consist of one or more applications of binder bitumen applied over a newly-prepared base followed by embedding of cover aggregate in each layer of binder.

The only major difference between the two is that a bituminous seal coat is applied over an existing wearing surface (old road) while the bituminous surface treatment is applied over a newly-prepared base (new road).

INSPECTION

Plans, Proposals, and Specifications

Inspectors must be furnished a set of construction plans, proposals, and specifications. Plans indicate length, width, and depth of various components, and provide information about quantities and procedures. The title sheet designates the applicable standard specification book by date.

The inspector should familiarize himself with plans and specifications, checking contract items and quantities to verify their accuracy. The proposal — or contract — designates applicable special provisions and other supplemental specifications by number and date.

The resident or county engineer should issue copies of all documents to the chief inspector, grade inspector, plant inspector, and other key inspectors.

The individual inspector should have these copies with him in the field for ready reference.

Preconstruction Details

Before any construction work is started, the resident or county engineer and/or designated inspectors should converse with the contractor to ensure that specifications, limitations, materials, and equipment are fully agreed upon.

The inspector should check and verify that the contractor has enough signs and barricades in place, or at least available when needed.

There should be enough checkers and inspectors to examine the various phases of construction without undue delay to the contractor.

CHECKING BITUMINOUS DISTRIBUTORS

The following procedures are recommended for eliminating streaked surfaces and promoting uniform and accurate application rates of bitumen in constructing seal coats, armor coats, and surface treatments. Before any work is done, inspectors should check with the contractor to verify that:

- 1) the distributor is calibrated and identified by an IHC bin number.
- 2) the distributor nozzle size is that recommended by the manufacturer.
- 3) the angle of the nozzle slots with the spray bar is uniform for the full bar width, except for the end nozzles, where the slots may be 90° to the axis of the spray bar.
- 4) the height of the spray bar from the road surface is that recommended by the manufacturer.
- 5) some means is used to assure a reasonably constant height of the spray bar from full load to empty tank.
- 6) each bitumen-spreading unit is equipped with:
 - a) an accurate thermometer for indication of bitumen temperature in the distributor tank.
 - b) a tachometer operated by a wheel independent of the truck wheels.
 - c) a calibrated measuring stick.
 - d) a quick-opening gate in the dome of the distributor tank.

- e) quick cut-off valves at the nozzles.
- 7) the tachometer reading used is that given by the manufacturer's charts or instructions.
- 8) the spray bar pressure or pump r.p.m. used is that recommended by the manufacturer.
- 9) the contractor has the necessary manufacturer's charts and instructions.

When all of the above requirements have been satisfied, a short trial run should be made on the road to be treated (or another suitable surface). The uniformity of spray pattern should be determined by running the sprayer over a strip of building paper anchored to the road surface.

If the spray pattern from the trial run is unsatisfactory, spray bar height should be accordingly raised or lowered. Another trial run should then be made to check the effectiveness of the adjustments. Adjustments and trial runs should continue until a uniform spray pattern is attained.

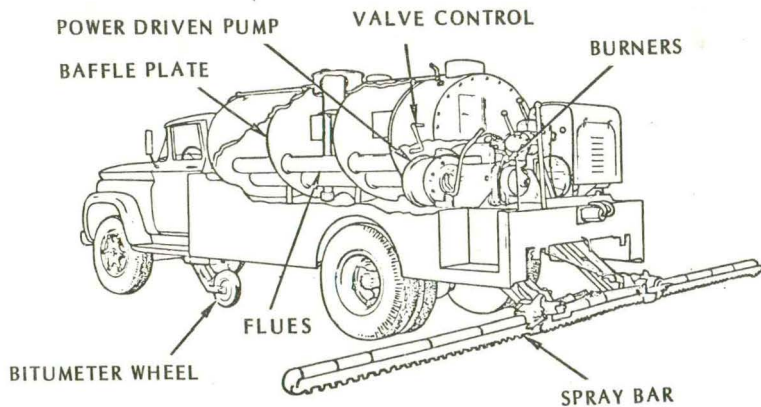


Figure 1 – Bitumen Distributor

CHECKING SPREADERS AND ROLLERS

Spreaders

The inspector should check the aggregate spreader to see that it is in satisfactory condition to do an acceptable job. It should comply with width requirements for spreading aggregate, and be equipped with an adjustment for delivering required rates. All spreaders should be equipped with a hopper with the capacity specified in current specifications.

Self-Propelled, Steel-Tired Rollers

These rollers are of a weight class specified in construction specifications. The inspector checks the diameter of the compaction roller to see that it complies with current specifications. He measures the width of the roller in inches and multiplies this figure by the required pounds-per-square-inch indicated in current specifications. The product is the required gross weight of the compaction roller. This weight must be verified by weighing on approved scales. In weighing the roller, both compaction and guide wheels should be at the same elevation; but, during weighing, only the compaction wheel should rest on the scales.

Self-Propelled and Pull-Type Pneumatic-Tired Rollers

To determine the weight of this type of roller, the inspector first measures the width in inches of the widest axle, beginning with the outside tire and measuring the total distance to the outside tire of the opposite side. He multiplies this figure by the pounds-per-square-inch required in current specifications. The product is the required gross weight of the roller. This weight should be verified by weighing on approved scales. Pneumatic-tired rollers are operated with a tire inflation pressure recommended in specifications. Spaces between the wheels are compensated for through offsetting the tires on the two axles.

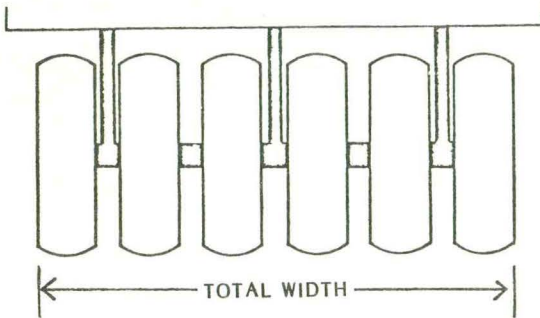


Figure 2 – Pneumatic-Tired Roller

HAND TOOLS AND POWER BROOMS

There are very few specifications for hand tools and power brooms. The contractor should supply enough hand brooms and shovels in good condition to do the job. Power brooms should be in good working order.

APPROVAL OF MATERIALS

The inspector should certify that all materials have been checked and approved by the Materials Department or by designated representatives thereof. He should have an approved report with lab number, and enter all report information in a field book.

BASE PREPARATION

The base must be thoroughly cleaned and free of foreign material. A visual check should be made, and any necessary repairs brought about.

APPLICATION RATES

Bituminous Material

The distributor must comply with specifications be-

before spreading begins. The rate of application is stated in project plans. After the base has been repaired and cleaned, a short trial run should be made on the road to determine rate and spray pattern. If ridges are noticed, spray bar height and nozzle angle should be adjusted accordingly.

Aggregate Material

Spreaders are used to distribute aggregate. The rate of spreading cover aggregate is designated in the plans. It may be lowered to eliminate an unusually large amount of unembedded particles.

SPREADING OF BITUMEN AND AGGREGATE

Bitumen

Before any bitumen is spread on the road, the inspector should determine the amount and temperature of the bitumen in the distributor. When the designated area of the road has been covered with bitumen, the inspector should again determine the amount and temperature in the distributor. The bitumen quantity must be corrected to 60° F. volume, using a correction table. The data should be recorded in the field book. No bitumen should be spread unless the road surface temperature complies with current specifications and the roadbed is free of moisture.

Base Surface Temperature

Liquid bitumens cannot be placed when a shaded portion of the road surface is cooler than the specified temperature. For uniformity, the following method of checking temperatures of shaded areas must be used on all projects:

- 1) Select a representative portion of the road surface to be covered with the liquid bitumen. If all the surface is subjected to direct sunlight, the test location should be in the sunlight. If portions of the road are shaded, the test location should be in the shade.
- 2) Lay the thermometer directly on the road surface in the test location. Shade the

GROUP 1—SPECIFIC GRAVITY AT 60°F OF 0.850 TO 0.966

LEGEND: t = observed temperature in degrees Fahrenheit

M = multiplier for correcting oil volumes to the basis of 60°F

t	M	t	M	t	M	t	M	t	M
0	1.0241	50	1.0040	100	0.9842	150	0.9647	200	0.9456
1	1.0237	51	1.0036	101	0.9838	151	0.9643	201	0.9452
2	1.0233	52	1.0032	102	0.9834	152	0.9639	202	0.9448
3	1.0229	53	1.0028	103	0.9830	153	0.9635	203	0.9444
4	1.0225	54	1.0024	104	0.9826	154	0.9632	204	0.9441
5	1.0221	55	1.0020	105	0.9822	155	0.9628	205	0.9437
6	1.0217	56	1.0016	106	0.9818	156	0.9624	206	0.9433
7	1.0213	57	1.0012	107	0.9814	157	0.9620	207	0.9429
8	1.0209	58	1.0008	108	0.9810	158	0.9616	208	0.9425
9	1.0205	59	1.0004	109	0.9806	159	0.9612	209	0.9422
10	1.0201	60	1.0000	110	0.9803	160	0.9609	210	0.9418
11	1.0197	61	0.9996	111	0.9799	161	0.9605	211	0.9414
12	1.0193	62	0.9992	112	0.9795	162	0.9601	212	0.9410
13	1.0189	63	0.9988	113	0.9791	163	0.9597	213	0.9407
14	1.0185	64	0.9984	114	0.9787	164	0.9593	214	0.9403
15	1.0181	65	0.9980	115	0.9783	165	0.9589	215	0.9399
16	1.0177	66	0.9976	116	0.9779	166	0.9585	216	0.9395
17	1.0173	67	0.9972	117	0.9775	167	0.9582	217	0.9391
18	1.0168	68	0.9968	118	0.9771	168	0.9578	218	0.9388
19	1.0164	69	0.9964	119	0.9767	169	0.9574	219	0.9384
20	1.0160	70	0.9960	120	0.9763	170	0.9570	220	0.9380
21	1.0156	71	0.9956	121	0.9760	171	0.9566	221	0.9376
22	1.0152	72	0.9952	122	0.9756	172	0.9562	222	0.9373
23	1.0148	73	0.9948	123	0.9752	173	0.9559	223	0.9369
24	1.0144	74	0.9944	124	0.9748	174	0.9555	224	0.9365
25	1.0140	75	0.9940	125	0.9744	175	0.9551	225	0.9361
26	1.0136	76	0.9936	126	0.9740	176	0.9547	226	0.9358
27	1.0132	77	0.9932	127	0.9736	177	0.9543	227	0.9354
28	1.0128	78	0.9929	128	0.9732	178	0.9539	228	0.9350
29	1.0124	79	0.9925	129	0.9728	179	0.9536	229	0.9346
30	1.0120	80	0.9921	130	0.9725	180	0.9532	230	0.9343
31	1.0116	81	0.9917	131	0.9721	181	0.9528	231	0.9339
32	1.0112	82	0.9913	132	0.9717	182	0.9524	232	0.9335
33	1.0108	83	0.9909	133	0.9713	183	0.9520	233	0.9331
34	1.0104	84	0.9905	134	0.9709	184	0.9517	234	0.9328
35	1.0100	85	0.9901	135	0.9705	185	0.9513	235	0.9324
36	1.0096	86	0.9897	136	0.9701	186	0.9509	236	0.9320
37	1.0092	87	0.9893	137	0.9697	187	0.9505	237	0.9316
38	1.0088	88	0.9889	138	0.9693	188	0.9501	238	0.9313
39	1.0084	89	0.9885	139	0.9690	189	0.9498	239	0.9309
40	1.0080	90	0.9881	140	0.9686	190	0.9494	240	0.9305
41	1.0076	91	0.9877	141	0.9682	191	0.9490	241	0.9301
42	1.0072	92	0.9873	142	0.9678	192	0.9486	242	0.9298
43	1.0068	93	0.9869	143	0.9674	193	0.9482	243	0.9294
44	1.0064	94	0.9865	144	0.9670	194	0.9478	244	0.9290
45	1.0060	95	0.9861	145	0.9666	195	0.9475	245	0.9286
46	1.0056	96	0.9857	146	0.9662	196	0.9471	246	0.9283
47	1.0052	97	0.9854	147	0.9659	197	0.9467	247	0.9279
48	1.0048	98	0.9850	148	0.9655	198	0.9463	248	0.9275
49	1.0044	99	0.9846	149	0.9651	199	0.9460	249	0.9272

Figure 3 — Volume Correction for Asphaltic Materials

area temporarily while taking the temperature. The inspector should stand with his shadow covering the thermometer. The thermometer should remain in the test location for five minutes. Temperature tests should be made as often as necessary to certify that work is done according to specifications.

Precautions

Uniform distribution of binder bitumen at transverse joints can be obtained by using masking paper at the start and at the end of each run.

Adjacent areas of bridge curbs, railings, etc., should also be covered to prevent splattering with bitumen. Experienced and alert inspectors, careful drivers, and cautious distributor operators help eliminate poor longitudinal joints.

Aggregate

At the time of spreading, aggregates should not contain more than the specified percentage of surface moisture based on dry weight. This percentage of moisture can be determined as follows:

- 1) A representative sample of the aggregate is selected.
- 2) The sample is weighed in its natural moisture condition.
- 3) The sample is air dried until the particles are surface dry.
- 4) The sample is weighed again when in a surface dry condition.
- 5) The original sample weight less the air-dried weight gives the loss of moisture.
- 6) The loss of moisture divided by the air-dried weight multiplied by 100 gives the percentage of surface moisture.

Precautions

Care should be exercised to prevent spillage and piling of aggregate. The truck weight ticket should show

all necessary project information. Aggregates must be spread within the specified time, and the inspector should observe the rate of application to insure spreading of the proper amount.

The scale inspector should:

- 1) have a copy of the spread chart.
- 2) put the correct spread for the corresponding net load on the scale ticket.
- 3) see that other project information, such as project number, county, material, and correct net weight, is on the scale ticket.
- 4) sign or initial all tickets leaving the scales with approved material.

The spread inspector should:

- 1) sign or initial each weight ticket as the truck is dumped.
- 2) check the spreading of material in the proper locations and amounts.
- 3) keep the original copy of all tickets for the project records and return other copies to the driver.
- 4) make sure that each ticket is for his project, and has been signed or initialed by the scale inspector.

BEST CO. WHERE, IOWA NO. F-1234		TRUCK NO. <u>12</u> DATE <u>6-20-1968</u>
		SOLD TO <u>Iowa State Highway Comm.</u>
		PROJECT <u>F-1-2(3)-20</u> COUNTY <u>LEE</u>
		NO. _____
MATERIAL	<u>Sorbess Material</u>	spread <u>310 ft</u>
GROSS	<u>29,200</u> LBS.	
TARE	<u>10,600</u> LBS.	
NET	<u>18,600</u> LBS.	
WEIGHER	<u>Lee</u>	CHECKER <u>JLR</u> <u>1958</u>
TRUCK DRIVER	<u>George</u>	
RECEIVED	<u>WJS</u>	<u>1958</u>

Figure 4 - Scale Ticket

ROLLING

Rolling should be done within the time limits specified. The number of passes should also conform to current specifications for the type of surface course being applied. The first passes are usually made with a pneumatic-tired roller, and the final passes by a steel-tired roller. If the aggregate is disarranged during rolling or maintenance operations (due to traffic, etc.,) to the extent that it is no longer uniformly distributed over the surface, a rotary broom should be used to return it to the part of the road being rolled. Rotary broom action should not be vigorous; it should float the loose material over the road.

YIELD CHECKS

Yield checks should be made to assure that the proper amount of material is applied. They should be recorded in the field book.

Cover aggregate yield is figured by the inspector taking the weight from the scale tickets and dividing it by the square yards covered to get the actual rate of application.

REPORTS AND RECORDS

Required Reports

Form 193, Sample Identification, should accompany every sample sent to Ames Lab.

Weekly Postcard

Not required for this type of work.

Forms Optional For Local Use

Form 53, Daily Report of Materials Used on Construction of Interstate Pavement, Base, and Shoulders, is intended for use on all flexible base and asphalt base/surface projects — including primary and secondary. The report may be prepared by the inspector on each project as information for the resident construction engineer or the county engineer to use in the preparation of estimates. It is for field use only; copies should not be sent to Ames.

FD-302 (REV. 9-17-73)
PH24294 60572

**DAILY REPORT OF MATERIALS USED ON CONSTRUCTION OF
INTERSTATE PAVEMENT BASE AND SHOULDERS
IOWA STATE HIGHWAY COMMISSION
CONSTRUCTION DEPARTMENT**

Report No. _____

Contractor _____ Project _____

County _____ Date _____

GRANULAR SUBBASE

Material							
From							
To							
Depth							
Width							
Lane							
Div.							
Tons							
Tons _____		Previous Total _____		Total to Date _____			

BASE AND SHOULDER BASE

Material							
From							
To							
Depth							
Width							
Lane							
Div.							
Tons							
Shoulder Base _____		Previous Total _____		Total to Date _____			
Base _____		Previous Total _____		Total to Date _____			

BITUMINOUS PRIMER, BINDER AND FOG COAT

Use							
Place							
Material							
From							
To							
Lane							
Div.							
Gal.							
Primer _____		Previous Total _____		Total to Date _____			
Binder _____		Previous Total _____		Total to Date _____			
Fog _____		Previous Total _____		Total to Date _____			

COVER AGGREGATE

Material							
From							
To							
Lane							
Div.							
Tons							
Tons _____		Previous Total _____		Total to Date _____			

ASPHALTIC CONCRETE

Use							
From							
To							
Lane							
Div.							
Tons							
Binder _____		Previous Total _____		Total to Date _____			
Surface _____		Previous Total _____		Total to Date _____			
Shoulder _____		Previous Total _____		Total to Date _____			
Cut Samples _____		Previous Total _____		Total to Date _____			

Remarks _____

Totals checked _____

Contractor _____

Inspector _____

Figure 5 – Form 53

Figure 6 - Diary

6-5-69	Monday	cloudy-cool	high 70 low 60		
Start 6:00 A. M.					
Stop 5:00 P. M.					
Visitors today -		Res. Engr. Jackson A.M.			
		Chief insp. Smith P.M.			
Daily Project Information					
Include all delays, shutdowns, type of work, area of work, progress, problems and solutions.					
Insp. Signature or initials					

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