ASPHALT BINDER

Section 1 – Introduction to Asphalts

WMTC Certification

- Administered by the University of Wyoming & WYDOT
- Recognized by State of Wyoming
- Valid for 5 years *(must pass all three exams)*
- Asphalt Exam (take online)
  - Multiple choice/True-False Questions (open book & notes)
  - Covers asphalt fundamentals & WYDOT Specifications
  - To Pass: 70% overall score or higher
- Density Random Number Selection Exam (take online)
  - 10 Multiple choice/True-False Questions (open book & notes)
  - Covers WYDOT testing and procedures
  - To Pass: at least 7 questions should be answered correctly
- Asphalt Testing Performance Exam covering (take at WYDOT)
  - Pass/Fail Exam: 2 tries per test (closed book & notes)

Asphalt Characteristics

- Black cementing material
- Solid or semisolid consistency
- Primarily hydrocarbons
- Consistency – temperature dependent
- Viscoelastic

Asphalt Sources

- Natural asphalt
- Petroleum asphalt

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Petroleum Asphalt Production

- Simple distillation
- Cracking

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Typical Refining Process (Asphalt Institute)

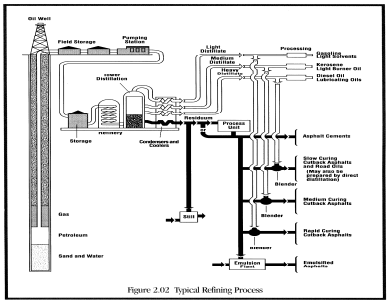

Figure 2.02 Typical Refining Process

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Asphalt Types

- Performance Graded Asphalt Binder
- Cutback asphalt
- Emulsified asphalt

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Asphalt Uses

- Performance Graded Asphalt Binder
  - Asphalt binder pavement
  - Asphalt treated base
- Cutback asphalt
  - Cold mix
  - Prime coats

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Asphalt Uses (continued)

- Emulsified asphalt
  - Chip seals
  - Fog seals
  - Slurry seals
  - Microsurfacing
  - Tack coats

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Asphalt Properties

Chemical Properties

- **Composition --- Hydrocarbons plus S, O, Mg, etc.**
- **Asphaltenes --- Solid phase**
- **Maltenes --- Liquid phase**
  - **Resins --- Heavy liquids**
  - **Oils --- Light liquids**

Chemical Properties (continued)

- **Aging changes proportions of asphaltenes and maltenes**
- **Aging is due to**
  - **Evaporation**
  - **Oxidation**
  - **Polymerization**
- **Changes during aging**
  - **Resins ⟶ Asphaltenes**
  - **Oils ⟶ Resins ⟶ Asphaltenes**

Physical Properties

- **Adhesion**
- **Temperature susceptibility**
- **Resistance to aging and hardening**

Handling and Storage

- Avoid contact
- Wear appropriate equipment
- Know and follow safe procedures
- Stay upwind of hatch
- Avoid breathing fumes

Handling and Storage (continued)

- Apply cold water or ice
- Do not wipe
- Maintain temperature below flash point
- Monitor regularly
- Avoid mixing types

Temperature/Volume

- Volume is corrected to 60°F for measurement and payment.
- To correct to 60°F you need:
  - Measured temperature
  - Specific gravity
  - Measured volume
  - Correction factor table
- Steps
  - With T and s.g. select C.F.
  - Calculate volume at 60°F
    - $V_{60} = (V_T)\ (C.F.)$

Asphalt Volume Correction Table - 1

Scope: The following table is used for Volume correction of asphaltic materials based on specific gravity and temperature. The temperature of 60°F (15.6°C) is customarily used as a standard for volume determination of asphalts. A unit volume of asphalt will change with each degree of temperature change (Coefficient of Volumetric Expansion). The correction factor varies with the specific gravity. The table below is applicable for all asphaltic materials, including emulsions (undiluted).

Example: If the specific Gravity = 0.985 at 60°F (15.6°C) and the Volume Measured = 9,000 gal. (34 066L) at 180°F (82.2°C), then read the table where 180°F (82.2°C) and 1.000 intersect (0.985 is closer to 1.000 than 0.950), and the **Correction Factor = 0.9633**. Therefore the Corrected Volume at 60°F (15.6°C) = 9,000 gal. X 0.9633 = 8670 gal. (32 817 L)

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
40	4.4	1.0095	1.0085	1.0075	1.0068	1.0061	1.0055
42	5.6	1.0086	1.0076	1.0068	1.0061	1.0055	1.0050
44	6.7	1.0076	1.0068	1.0060	1.0054	1.0049	1.0044
46	7.8	1.0067	1.0059	1.0053	1.0047	1.0043	1.0039
48	8.9	1.0057	1.0051	1.0045	1.0041	1.0037	1.0033
50	10.0	1.0048	1.0042	1.0038	1.0034	1.0031	1.0028
52	11.1	1.0038	1.0034	1.0030	1.0027	1.0024	1.0022
54	12.2	1.0029	1.0025	1.0023	1.0020	1.0018	1.0017
56	13.3	1.0019	1.0017	1.0015	1.0014	1.0012	1.0011
58	14.4	1.0010	1.0008	1.0008	1.0007	1.0006	1.0006
60	15.6	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
62	16.7	0.9990	0.9992	0.9992	0.9993	0.9994	0.9994
64	17.8	0.9981	0.9983	0.9985	0.9986	0.9988	0.9989
66	18.9	0.9971	0.9975	0.9977	0.9980	0.9982	0.9983
68	20.0	0.9962	0.9966	0.9970	0.9973	0.9976	0.9978
70	21.1	0.9952	0.9958	0.9962	0.9966	0.9969	0.9972
72	22.2	0.9943	0.9949	0.9955	0.9959	0.9963	0.9967
74	23.3	0.9933	0.9941	0.9947	0.9953	0.9957	0.9961
76	24.4	0.9924	0.9932	0.9940	0.9946	0.9951	0.9956
78	25.6	0.9914	0.9924	0.9932	0.9939	0.9945	0.9950
80	26.7	0.9905	0.9915	0.9925	0.9932	0.9939	0.9945

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Asphalt Volume Correction Table - 2

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
82	27.8	0.9895	0.9907	0.9917	0.9926	0.9933	0.9939
84	28.9	0.9885	0.9899	0.9909	0.9919	0.9927	0.9933
86	30.0	0.9876	0.9890	0.9902	0.9912	0.9921	0.9928
88	31.1	0.9866	0.9882	0.9894	0.9905	0.9914	0.9922
90	32.2	0.9857	0.9873	0.9887	0.9898	0.9908	0.9917
92	33.3	0.9847	0.9865	0.9879	0.9892	0.9902	0.9911
94	34.4	0.9838	0.9856	0.9872	0.9885	0.9896	0.9906
96	35.6	0.9828	0.9848	0.9864	0.9878	0.9890	0.9900
98	36.7	0.9819	0.9839	0.9857	0.9871	0.9884	0.9895
100	37.8	0.9809	0.9831	0.9849	0.9865	0.9878	0.9889
102	38.9	0.9799	0.9822	0.9842	0.9858	0.9872	0.9884
104	40.0	0.9790	0.9814	0.9834	0.9851	0.9866	0.9878
106	41.1	0.9780	0.9805	0.9826	0.9844	0.9859	0.9873
108	42.2	0.9771	0.9797	0.9819	0.9837	0.9853	0.9867
110	43.3	0.9761	0.9789	0.9811	0.9831	0.9847	0.9861
112	44.4	0.9752	0.9780	0.9804	0.9824	0.9841	0.9856
114	45.6	0.9742	0.9772	0.9796	0.9817	0.9835	0.9850
116	46.7	0.9733	0.9763	0.9789	0.9810	0.9829	0.9845
118	47.8	0.9723	0.9755	0.9781	0.9804	0.9823	0.9839
120	48.9	0.9713	0.9746	0.9774	0.9797	0.9817	0.9834
122	50.0	0.9704	0.9738	0.9766	0.9790	0.9811	0.9828
124	51.1	0.9694	0.9729	0.9759	0.9783	0.9804	0.9823
126	52.2	0.9685	0.9721	0.9751	0.9777	0.9798	0.9817
128	53.3	0.9675	0.9712	0.9743	0.9770	0.9792	0.9812
130	54.4	0.9666	0.9704	0.9736	0.9763	0.9786	0.9806
132	55.6	0.9656	0.9695	0.9728	0.9756	0.9780	0.9800
134	56.7	0.9647	0.9687	0.9721	0.9749	0.9774	0.9795
136	57.8	0.9637	0.9678	0.9713	0.9743	0.9768	0.9789
138	58.9	0.9627	0.9670	0.9706	0.9736	0.9762	0.9784
140	60.0	0.9618	0.9662	0.9698	0.9729	0.9756	0.9778
142	61.1	0.9608	0.9653	0.9691	0.9722	0.9749	0.9773
144	62.2	0.9599	0.9645	0.9683	0.9716	0.9743	0.9767
146	63.3	0.9589	0.9636	0.9675	0.9709	0.9737	0.9762
148	64.4	0.9580	0.9628	0.9668	0.9702	0.9731	0.9756
150	65.6	0.9570	0.9619	0.9660	0.9695	0.9725	0.9751
152	66.7	0.9560	0.9611	0.9653	0.9688	0.9719	0.9745
154	67.8	0.9551	0.9602	0.9645	0.9682	0.9713	0.9739
156	68.9	0.9541	0.9594	0.9638	0.9675	0.9707	0.9734
158	70.0	0.9532	0.9585	0.9630	0.9668	0.9700	0.9728

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Asphalt Volume Correction Table - 3

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
160	71.1	0.9522	0.9577	7962-3	0.9661	0.9694	0.9723
162	72.2	0.9513	0.9568	0.9615	0.9655	0.9688	0.9717
164	73.3	0.9503	0.9560	0.9607	0.9648	0.9682	0.9712
166	74.4	0.9493	0.9551	0.9600	0.9641	0.9676	0.9706
168	75.6	0.9484	0.9543	0.9592	0.9634	0.9670	0.9701
170	76.7	0.9474	0.9534	0.9585	0.9627	0.9664	0.9695
172	77.8	0.9465	0.9526	0.9577	0.9621	0.9658	0.9689
174	78.9	0.9455	0.9517	0.9570	0.9614	0.9652	0.9684
176	80.0	0.9445	0.9509	0.9562	0.9607	0.9645	0.9678
178	81.1	0.9436	0.9500	0.9554	0.9600	0.9639	0.9673
180	82.2	0.9426	0.9492	0.9547	0.9593	0.9633	0.9667
182	83.3	0.9417	0.9483	0.9539	0.9587	0.9627	0.9662
184	84.4	0.9407	0.9475	0.9532	0.9580	0.9621	0.9656
186	85.6	0.9397	0.9466	0.9524	0.9573	0.9615	0.9651
188	86.7	0.9388	0.9458	0.9517	0.9566	0.9609	0.9645
190	87.8	0.9378	0.9449	0.9509	0.9559	0.9603	0.9640
192	88.9	0.9369	0.9441	0.9501	0.9553	0.9596	0.9634
194	90.0	0.9359	0.9432	0.9494	0.9546	0.9590	0.9628
196	91.1	0.9349	0.9424	0.9486	0.9539	0.9584	0.9623
198	92.2	0.9340	0.9415	0.9479	0.9532	0.9578	0.9617
200	93.3	0.9330	0.9407	0.9471	0.9526	0.9572	0.9612
202	94.4	0.9320	0.9398	0.9464	0.9519	0.9566	0.9606
204	95.6	0.9311	0.9390	0.9456	0.9512	0.9560	0.9601
206	96.7	0.9301	0.9381	0.9448	0.9505	0.9554	0.9595
208	97.8	0.9292	0.9373	0.9441	0.9498	0.9547	0.9590
210	98.9	0.9282	0.9364	0.9433	0.9492	0.9541	0.9584
212	100.0	0.9272	0.9356	0.9426	0.9485	0.9535	0.9578
214	101.1	0.9263	0.9347	0.9418	0.9478	0.9529	0.9573
216	102.2	0.9253	0.9339	0.9411	0.9471	0.9523	0.9567
218	103.3	0.9243	0.9330	0.9403	0.9464	0.9517	0.9562
220	104.4	0.9234	0.9322	0.9395	0.9458	0.9511	0.9556
222	105.6	0.9224	0.9313	0.9388	0.9451	0.9504	0.9551
224	106.7	0.9215	0.9305	0.9380	0.9444	0.9498	0.9545
226	107.8	0.9205	0.9296	0.9373	0.9437	0.9492	0.9540
228	108.9	0.9195	0.9288	0.9365	0.9430	0.9486	0.9534
230	110.0	0.9186	0.9279	0.9357	0.9424	0.9480	0.9528
232	111.1	0.9176	0.9271	0.9350	0.9417	0.9474	0.9523
234	112.2	0.9166	0.9262	0.9342	0.9410	0.9468	0.9517
236	113.3	0.9157	0.9254	0.9335	0.9403	0.9461	0.9512

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Asphalt Volume Correction Table - 4

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
238	114.4	0.9147	0.9245	0.9327	0.9396	0.9455	0.9506
240	115.6	0.9137	0.9236	0.9319	0.9389	0.9449	0.9501
242	116.7	0.9128	0.9228	0.9312	0.9383	0.9443	0.9495
244	117.8	0.9118	0.9219	0.9304	0.9376	0.9437	0.9489
246	118.9	0.9108	0.9211	0.9297	0.9369	0.9431	0.9484
248	120.0	0.9099	0.9202	0.9289	0.9362	0.9425	0.9478
250	121.1	0.9089	0.9194	0.9281	0.9355	0.9419	0.9473
252	122.2	0.9079	0.9185	0.9274	0.9349	0.9412	0.9467
254	123.3	0.9070	0.9177	0.9266	0.9342	0.9406	0.9462
256	124.4	0.9060	0.9168	0.9259	0.9335	0.9400	0.9456
258	125.6	0.9050	0.9160	0.9251	0.9328	0.9394	0.9450
260	126.7	0.9040	0.9151	0.9243	0.9321	0.9388	0.9445
262	127.8	0.9031	0.9142	0.9236	0.9314	0.9382	0.9439
264	128.9	0.9021	0.9134	0.9228	0.9308	0.9375	0.9434
266	130.0	0.9011	0.9125	0.9220	0.9301	0.9369	0.9428
268	131.1	0.9002	0.9117	0.9213	0.9294	0.9363	0.9423
270	132.2	0.8992	0.9108	0.9205	0.9287	0.9357	0.9417
272	133.3	0.8982	0.9100	0.9198	0.9280	0.9351	0.9411
274	134.4	0.8972	0.9091	0.9190	0.9274	0.9345	0.9406
276	135.6	0.8963	0.9082	0.9182	0.9267	0.9339	0.9400
278	136.7	0.8953	0.9074	0.9175	0.9260	0.9332	0.9395
280	137.8	0.8943	0.9065	0.9167	0.9253	0.9326	0.9389
282	138.9	0.8934	0.9057	0.9159	0.9246	0.9320	0.9384
284	140.0	0.8924	0.9048	0.9152	0.9239	0.9314	0.9378
286	141.1	0.8914	0.9040	0.9144	0.9233	0.9308	0.9372
288	142.2	0.8904	0.9031	0.9137	0.9226	0.9302	0.9367
290	143.3	0.8895	0.9022	0.9129	0.9219	0.9295	0.9361
292	144.4	0.8885	0.9014	0.9121	0.9212	0.9289	0.9356
294	145.6	0.8875	0.9005	0.9114	0.9205	0.9283	0.9350
296	146.7	0.8865	0.8997	0.9106	0.9198	0.9277	0.9345
298	147.8	0.8856	0.8988	0.9098	0.9192	0.9271	0.9339
300	148.9	0.8846	0.8979	0.9091	0.9185	0.9265	0.9333
302	150.0	0.8836	0.8971	0.9083	0.9178	0.9258	0.9328
304	151.1	0.8826	0.8962	0.9075	0.9171	0.9252	0.9322
306	152.2	0.8816	0.8953	0.9068	0.9164	0.9246	0.9317
308	153.3	0.8807	0.8945	0.9060	0.9157	0.9240	0.9311
310	154.4	0.8797	0.8936	0.9052	0.9150	0.9234	0.9305
312	155.6	0.8787	0.8928	0.9045	0.9144	0.9228	0.9300
314	156.7	0.8777	0.8919	0.9037	0.9137	0.9221	0.9294

Asphalt Volume Correction Table - 5

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
316	157.8	0.8767	0.8910	0.9029	0.9130	0.9215	0.9289
318	158.9	0.8758	0.8902	0.9022	0.9123	0.9209	0.9283
320	160.0	0.8748	0.8893	0.9014	0.9116	0.9203	0.9278
322	161.1	0.8738	0.8884	0.9006	0.9109	0.9197	0.9272
324	162.2	0.8728	0.8876	0.8999	0.9102	0.9191	0.9266
326	163.3	0.8718	0.8867	0.8991	0.9096	0.9184	0.9261
328	164.4	0.8709	0.8858	0.8983	0.9089	0.9178	0.9255
330	165.6	0.8699	0.8850	0.8976	0.9082	0.9172	0.9250
332	166.7	0.8689	0.8841	0.8968	0.9075	0.9166	0.9244
334	167.8	0.8679	0.8833	0.8960	0.9068	0.9160	0.9238
336	168.9	0.8669	0.8824	0.8953	0.9061	0.9154	0.9233
338	170.0	0.8659	0.8815	0.8945	0.9054	0.9147	0.9227
340	171.1	0.8649	0.8807	0.8937	0.9047	0.9141	0.9222
342	172.2	0.8640	0.8798	0.8930	0.9041	0.9135	0.9216
344	173.3	0.8630	0.8789	0.8922	0.9034	0.9129	0.9210
346	174.4	0.8620	0.8780	0.8914	0.9027	0.9123	0.9205
348	175.6	0.8610	0.8772	0.8907	0.9020	0.9116	0.9199
350	176.7	0.8600	0.8763	0.8899	0.9013	0.9110	0.9194
352	177.8	0.8590	0.8754	0.8891	0.9006	0.9104	0.9188
354	178.9	0.8580	0.8746	0.8883	0.8999	0.9098	0.9182
356	180.0	0.8570	0.8737	0.8876	0.8992	0.9092	0.9177
358	181.1	0.8560	0.8728	0.8868	0.8985	0.9085	0.9171
360	182.2	0.8550	0.8720	0.8860	0.8979	0.9079	0.9166
362	183.3	0.8541	0.8711	0.8853	0.8972	0.9073	0.9160
364	184.4	0.8531	0.8702	0.8845	0.8965	0.9067	0.9154
366	185.6	0.8521	0.8693	0.8837	0.8958	0.9061	0.9149
368	186.7	0.8511	0.8685	0.8829	0.8951	0.9054	0.9143
370	187.8	0.8501	0.8676	0.8822	0.8944	0.9048	0.9138
372	188.9	0.8491	0.8667	0.8814	0.8937	0.9042	0.9132
374	190.0	0.8481	0.8659	0.8806	0.8930	0.9036	0.9126
376	191.1	0.8471	0.8650	0.8798	0.8923	0.9030	0.9121
378	192.2	0.8461	0.8641	0.8791	0.8916	0.9023	0.9115
380	193.3	0.8451	0.8632	0.8783	0.8910	0.9017	0.9109
382	194.4	0.8441	0.8624	0.8775	0.8903	0.9011	0.9104
384	195.6	0.8431	0.8615	0.8767	0.8896	0.9005	0.9098
386	196.7	0.8421	0.8606	0.8760	0.8889	0.8999	0.9093
388	197.8	0.8411	0.8597	0.8752	0.8882	0.8992	0.9087
390	198.9	0.8401	0.8589	0.8744	0.8875	0.8986	0.9081
392	200.0	0.8391	0.8580	0.8736	0.8868	0.8980	0.9076

Asphalt Volume Correction Table - 6

CORRECTION FACTORS (to determine volume at 60°F)							
Temperature		Specific Gravity at 60°F					
°F	°C	0.800	0.850	0.900	0.950	1.000	1.050
394	201.1	0.8381	0.8571	0.8729	0.8861	0.8974	0.9070
396	202.2	0.8371	0.8562	0.8721	0.8854	0.8967	0.9064
398	203.3	0.8361	0.8553	0.8713	0.8847	0.8961	0.9059
400	204.4	0.8351	0.8545	0.8705	0.8840	0.8955	0.9053
402	205.6	0.8341	0.8536	0.8698	0.8833	0.8949	0.9048
404	206.7	0.8331	0.8527	0.8690	0.8827	0.8943	0.9042
406	207.8	0.8321	0.8518	0.8682	0.8820	0.8936	0.9036
408	208.9	0.8311	0.8509	0.8674	0.8813	0.8930	0.9031
410	210.0	0.8301	0.8501	0.8666	0.8806	0.8924	0.9025
412	211.1	0.8290	0.8492	0.8659	0.8799	0.8918	0.9019
414	212.2	0.8280	0.8483	0.8651	0.8792	0.8911	0.9014
416	213.3	0.8270	0.8474	0.8643	0.8785	0.8905	0.9008
418	214.4	0.8260	0.8465	0.8635	0.8778	0.8899	0.9003
420	215.6	0.8250	0.8457	0.8627	0.8771	0.8893	0.8997
422	216.7	0.8240	0.8448	0.8620	0.8764	0.8886	0.8991
424	217.8	0.8230	0.8439	0.8612	0.8757	0.8880	0.8986
426	218.9	0.8220	0.8430	0.8604	0.8750	0.8874	0.8980
428	220.0	0.8209	0.8421	0.8596	0.8743	0.8868	0.8974
430	221.1	0.8199	0.8412	0.8588	0.8736	0.8861	0.8969
432	222.2	0.8189	0.8403	0.8581	0.8729	0.8855	0.8963
434	223.3	0.8179	0.8395	0.8573	0.8722	0.8849	0.8957
436	224.4	0.8169	0.8386	0.8565	0.8715	0.8843	0.8952
438	225.6	0.8159	0.8377	0.8557	0.8708	0.8836	0.8946

The following formulas are used to calculate the correction factors in the table above.

$$\text{Volume}_{\text{Corrected}} = \text{Volume}_{\text{Measured}} * \frac{1}{\left[\left(\frac{p_1^2 - p_2^2}{2 * p_1 * p_2}\right) + 1\right]}$$

Where p_1 = Specific Gravity @ 60° F

And p_2 = Specific Gravity @ Temp.-Measured in °F

$$= \sqrt{p_1^2 - [.000611 * (Temp_{Measured\ in\ °F} - 60°F]}$$

Reference: Perry's Chemical Engineers' Handbook, 6th edition, 1984, McGraw – Hill, R660.28P or 660.2

Temperature/Volume Example

- **Asphalt Sp. Gr. = .950 @ 60°F; asphalt volume @ 200°F = 2,000 gallons; determine the asphalt volume @ 60°F**
- **Solution:**

  C.F. = .9526 (from asphalt conversion table)

  2,000* .9526 = 1,905 gallons @60°F

Correction Factor Interpolations

- **If the specific gravity equals 0.985 at 60°F and the volume measured equals 9,000 gal at 180 °F, read the table at 180°F and interpolate between 0.9593 and 0.9633 (from the 0.950 column and the 1.000 column) as follows:**

$$0.9593 + \left(\frac{0.9633 - 0.9593}{1.000 - 0.950}\right) \times (0.985 - 0.95) = 0.9593 + 0.0028 = 0.9621$$

- **Therefore, the corrected volume at 60 equals 9,000 gal x 0.9621 equals 8659 gal.**

Partially Filled Tank

To determine partially filled volume:

- **Measure asphalt depth**
- **Calculate % of depth filled**
- **Enter table and select % of volume filled**
- **Calculate volume of asphalt**

Vol. = % of vol. filled x capacity

Partially Filled Tank

Asphalt Tank

% Depth Filled = h/H

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% Volume Table

% DEPTH FILLED	% OF CAPACITY	% DEPTH FILLED	% OF CAPACITY	% DEPTH FILLED	% OF CAPACITY	% DEPTH FILLED	% OF CAPACITY
1	0.17	26	20.66	51	51.28	76	81.54
2	0.48	27	21.78	52	52.54	77	82.62
3	0.87	28	22.92	53	53.82	78	83.69
4	1.34	29	24.07	54	55.09	79	84.73
5	1.87	30	25.23	55	56.36	80	85.76
6	2.45	31	26.41	56	57.62	81	86.77
7	3.08	32	27.59	57	58.68	82	87.76
8	3.75	33	28.78	58	60.41	83	88.73
9	4.46	34	29.98	59	61.40	84	89.67
10	5.20	35	31.19	60	62.25	85	90.59
11	5.98	36	32.41	61	63.89	86	91.49
12	7.01	37	33.65	62	65.13	87	92.36
13	7.64	38	34.87	63	66.36	88	93.20
14	8.51	39	36.11	64	67.59	89	94.02
15	9.41	40	37.35	65	68.81	90	94.80
16	10.33	41	38.60	66	70.02	91	95.54
17	11.27	42	39.86	67	71.22	92	96.75
18	12.24	43	41.12	68	72.41	93	96.92
19	13.23	44	42.38	69	73.59	94	97.75
20	14.24	45	43.64	70	74.77	95	98.13
21	15.27	46	44.91	71	75.93	96	98.66
22	16.31	47	46.18	72	77.08	97	99.13
23	17.38	48	47.46	73	78.22	98	99.52
24	18.46	49	48.72	74	79.34	99	99.83
25	19.55	50	50.00	75	80.45		

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Partially Filled Tank Example

Capacity = 8700 gallons @60°F

$$\text{\% of depth filled} = \frac{4*12+7}{7*12+9} = 0.59$$

% of capacity = 61.40 (from table)

$$\frac{61.40}{100} * 8{,}700 = 5{,}341 \text{ gallons in the tank}$$

Asphalt used?

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