

Estimating Quantities in English & Metric

Reference to 2008 NDOR Standard Specifications for Highway Construction

General Information:

Items are listed in alphabetical order.

Conversion factors are in English and metric.

R.A.P. is an acronym for Recycled Asphalt Pavement other term used bituminous millings.

Weight of RAP – 144 lbs/ft³

One gallon of emulsified asphalt or water weighs 8.333 lbs.

Armor Coat – Section 515

“Armor Coat Aggregate” – Cubic Yard (<i>meter</i>)	28 lb/yd ²	conversion factor 1.3 tons = 1 yd ³
	14.1 kg/m ²	conversion factor 1.54 Mg = 1 m ³
“Armor Coat Emulsified Asphalt” – Gallon (<i>kiloliters</i>)	0.28 Gal/yd ²	(0.9 L/m ²)

Asphaltic Concrete – Section 503, Section 1028 & Special Provision

“Asphaltic Concrete, Type “___” – Ton (<i>megagram</i>)	Tables on pages 6 & 7 for types and weight
“Hydrated Lime for Asphalt Mixtures” – Ton (<i>megagram</i>)	Multiply tons of asph. conc. by 1%

Note: No hydrated lime for “SPS”, “SPL”, “HRB” & temporary surfacing.

Asphaltic Concrete Curb – Section 505

“Constructing Asphaltic Concrete Curb” – Linear Foot (<i>meter</i>)	
Factor for 3” (75 mm) Curb	1.35 Tn/Sta (4.0 Mg/Sta)
Factor for 4” (100mm) Curb	2.00 Tn/Sta (6.0 Mg/Sta)
Factor for 6” (150mm) Curb	2.10 Tn/Sta (6.25 Mg/Sta)
Factor for Tack Coat	8 Gals/Sta (100 L/Sta)

Asphaltic Concrete For Patching – Section 516

“Asphaltic Concrete for Patching, Type “___” – Ton (<i>megagram</i>)	
“Rental of ***, Fully Operated” – Hour	
Light Patching	10 – 100 Tn/mile (6 – 60 Mg/km) 5 hrs/mile (2.5 hrs/km)
Medium Patching	100 – 150 Tn/mile (60 – 90 Mg/km) 10 hrs/mile (5 hrs/km)
Heavy Patching	150 or > Tn/mile (90 or > Mg/km) 20 hrs/mile (10 hrs/km)

Bituminous Patching of Concrete Pavement – Section 520

“Bituminous Patching” – Ton (*megagram*)

Bituminous Sand Base Course – Section 509

“Bituminous Sand Base Course Asphaltic Oil” –	Gallon	1000 Gal/Sta for (5” x 24’)
	(<i>liter</i>)	[12400 L/Sta for (130 mm x 7.3 m)]
“Bituminous Sand Base Course Emulsified Asphalt” –	Gallon	1200 Gal/Sta for (5” x 24’) 6% residual
	(<i>liter</i>)	[14900 L/Sta for (130 mm x 7.3 m) (6%)]
“Bituminous Sand Base Course” – Station		
“Mineral Filler for Bituminous Sand Base Course – Cubic Yard		**10 CuYds/Sta for (5”x24’)
(<i>cubic meter</i>)		**25 m ³ /Sta for (130mmx7.3m)
“Mineral Aggregate” – Cubic Yard (<i>cubic meter</i>)		Do not use for estimate.
“Water” – Mgallon (<i>kiloliter</i>)		1 Mga/Sta (12 kL/Sta)
“Fog Seal” – Gallon (<i>liter</i>)		0.15 Gal/yd ² (0.68 L/m ²)

** Quantity of Mineral Filler will vary depending on type of soil.

Bituminous Surface Course – Section 512

“Bituminous Surface Course” – Square Yard (<i>square meter</i>)	
“Fog Seal” – Gallon (<i>liter</i>)	0.6 Gal/yd ² (2.5 L/m ²)

Calcium Chloride, Applied – Section 309

“Calcium Chloride Applied” – Ton (*megagram*) 3 lb/yd² (1.6 kg/m² or 0.0015 Mg/m²)

Chip Seal – Special Provision

“Chip Seal Aggregate” – Cubic Yard 25 lb/yd² (aggregate weight 1.4 tons = 1 yd³)
(*cubic meter*) [11.0 kg/m² (aggregate weight 1.54 Mg = 1 m³)]
“Chip Seal Emulsified Asphalt” – Gallon (*liter*) 0.32Gal/yd² (1.4 L/m²)

Cold In-Place Recycling – Special Provision

“Cold In-Place Recycling” – Station or Square Yard (*square meter*)
“Repulverization & Aeration” - Station
“Emulsified Asphalt For Cold In-Place Recycling” – Gallon (*liter*) 3.5% weight of RAP
“Water For Cold In-Place Recycling” – MGallon (*kiloliter*) 4% weight of RAP & emulsified asphalt

Note: 1 Megagram = 1000 Liters

Cold Milling – Section 510

“Cold Milling, Class _____” – Station, Square Yard (*square meter*)

Earth Shoulder Construction – Section 304

“Earth Shoulder Construction” – Station
“Water” – MGallon (*kiloliter*) 0.25 MGal/Sta (3.0 kL/Sta)

Note: Shoulders are measured separately

Fly Ash Stabilized Bituminous – Special Provision

“Fly Ash Stabilized Bituminous” – Station
“Fly Ash” – Ton (*megagram*) 10% weight of RAP
“Water for Fly Ash Stabilization” – Mgallon (*kiloliter*) 5% weight of RAP & Fly Ash
“Fog Seal” – Gallon (*liter*) 0.24 Gal/yd² (1.1Lm²)

Note: If trimming is required. Estimate 2 applications.

Fog Seal – Section 513

“Fog Seal” – Gallon (*kiloliter*) / GSB 0.12 Gal/ yd² (0.54 L/m²)

Note: Use GSB on Interstate & District 4 projects

“Fog Seal” – Gallon (*kiloliter*) / CSS-1 & CSS-1H
Factor for mainline & shoulder 0.12 Gal/ yd² (0.54 L/m²)
Factor for open graded friction course 0.16 Gal/ yd² (0.72 L/m²)
Factor for milled surface of Asph. Conc. 0.07 Gal/ yd² (0.32 L/m²)
Factor for milled surface of Bit. Sand 0.10 Gal/ yd² (0.45 L/m²)

Foundation Course – Section 307

“Bituminous Foundation Course _____” – Square Yard (*square meter*)
In place weight = 123 lb/ft³ or 1.66 Tn/yd³ (1.98 Mg/m³)
Stockpiled Bituminous = 1.43 Tn/yd³
“Crushed Concrete Foundation Course _____” – Square Yard (*square meter*)
In place weight for 4”+1/4” trimming = 0.190 Tn/yd² (100 mm + 5 mm trimming = 0.2079 Mg/m²)
Stockpiled crushed concrete = 1.35 Tn/yd³ (1.61 Mg per m³)
Concrete Pavement in Place = [yd³ x 1.94 Tn/yd³ x 92% (10% loss)] = tons of crushed concrete available
{ [m³ x 2.31 Mg/m³ x 92% (8% loss)] = Mg of crushed concrete available}
“Aggregate Foundation Course “D” _____” - Square Yard (*square meter*)
“Aggregate Foundation Course _____” - Square Yard or Ton (*square meter or megagram*)
In place weight for 4”+1/4” trimming = (yd² x 0.2222 Tn/yd²) = Tons
[100 mm + 5 mm = (m² x 0.2415 Mg/m²) = Mg]

Gravel Embedment – Special Provision

“Gravel Embedment” – Station

“Gravel” – Cubic Yard (*cubic meter*) (*Designer’s item*)

Note: Design is usually 2” (50mm) gravel embedded in the upper 4” (100mm) & cap with 1” (25mm).

Guardrail Surfacing – Special Provision

“Surfacing Under Guardrail” – Square Yards (*square meters*)

Note: Pay item includes asphalt or concrete surface (*contractor’s option*) and subgrade preparation.

Hot In-Place Recycling – Special Provision

“Hot In-Place Recycling” – Station

“Emulsified Asphalt for Hot In-Place Recycling” - Gal 1.0% weight of RAP

HRB (High Rap Base) – Special Provision

“HRB” – Ton

“Cold Milling, Class 3” – Station

Note: Pavement determination will specify depth

Note: See asphaltic concrete table for weight and PG Binder table for type and percent & no hydrated lime

Hydrated Lime Slurry Stabilization – Special Provision

“Hydrated Lime Slurry Stabilization” – Station

“Hydrated Lime” – Ton 1.50% weight of RAP (4”x24’= 0.9 tons/sta) (5”x24’= 1.1 tons/sta)

“Emulsified Asphalt” – Gallon 1.75% weight of RAP & Lime (4”x24’= 245 gal/sta) (5”x24’= 307gal/sta)

“Fog Seal” – Gallon 0.10 Gal/yd²

Note: Include “Equipment Rental” & patching quantity

Note: Growth factor approx. $\frac{3}{4}$ ” for a depth of 3” to 5”. 1” for a depth of 6”

Intersections and Driveways – Section 302 & Section 503

“Preparation of Intersections and Driveways” – Square Yards (*square meters*)

“Placement of Asphaltic Concrete For Intersections and Driveways” – Square Yards (*square meters*)

Note: Asphaltic concrete paid for by roadway tonnage or megagrams.

Joint Sealing Asphalt to Concrete – Section 508

“Joint Sealing – Asphalt to Concrete” – Station (*one side*)

Microsurfacing – Section 514

“Microsurfacing Placement - Station

“Emulsified Asphalt for Microsurfacing” – Gallon (*liter*) 12.0% of total tons 240 Gal = 1 ton (1000L=1Mg)

“Aggregate for Microsurfacing” – Ton (*megagram*) 83.8% of total tons (*Mg*)

Note: Weight Factor is 6.6 Tn/100 ft³ (2.1 Mg/m³)

Note: Lift thicknesses are $\frac{1}{4}$ ” and calculate rut depth, if applicable.

Performance Graded Binder (**-**) – Special Provision

Use the table on page 5 to estimate the tons.

Removal and Processing of Concrete Pavement – Section 312

“Crush Concrete Pavement” – Square Yard (*square meters*)

Shoulder Subgrade Preparation – Section 302

“Shoulder Subgrade Preparation” – Station

“Water” – MGallon (kiloliter) 0.5 MGal/Sta (6.0 kL/Sta)

Note: Shoulders are measured separately

Special Surface Course – Special Provision

Note: Use this item if placing millings on driveways or under guardrail

“Special Surface Course” – Square Yard (*square meter*)

“Fog Seal” – Gallon 2 applications, 0.20 Gal/yd² for soil and 0.30 Gal/yd² for the surface
(*liter*) (2 applications, 0.91 L/m² for soil and 1.36 L/m² for the surface)

Subgrade Preparation – Section 302

“Subgrade Preparation” – Station or Square Yard (*square meter*)

“Water” – MGallon (*kiloliter*) 1.0 MGal/Sta (12.0 kL/Sta) or 0.003 MGal/yd² (0.014 kL/m²)

Subgrade Preparation for Widening – Special Provision

Note: Use for concrete pavement widening

“Subgrade Preparation for Widening” – Station (*one side*)

“Water” – MGallon (*kiloliter*) 0.5 MGal/Sta (6.0 kL/Sta)

Subgrade Stabilization – Section 303

“Subgrade Stabilization” – Station or Square Yard (*square meter*)

“Soil Binder” – Cubic Yard (*cubic meter*) 12.5 yd³/Sta for (6” x 30’) [31 m³/Sta for (150mm x 9m)]

“Water” – MGallon (*liter*) 1 MGal/Sta or 0.003 MGal/yd² (12.0 kL/Sta or 0.014 kL/m²)

Note: Quantity of soil binder will vary depending on soil conditions.

Surfacing – Special Provision

“Surfacing “___”” – Square Yard (*square meter*)

Note: Contractor’s choice for pavement type, asphaltic concrete or Portland cement concrete.

Stabilized Subgrade (8”depth) – Special Provision

“Stabilized Subgrade Type Fly Ash” – Square Yard use if PI of soil is 19 or less

“Fly Ash – Ton 66 lbs/yd² fly ash quantity is **10% of soil tons

“Stabilized Subgrade Type Lime” – Square Yard use if PI of soil is 20 or more

“Hydrated Lime” – Ton 33 lbs/yd² hydrated lime quantity is **5% of soil tons

“Water” – Mgallon 1 MGal/Sta or 0.003 Mgal/yd²

**Soil weight compacted in place, 110 lbs/ft³

Tack Coat – Section 504

“Tack Coat” – Gallon (*liter*)

Factor for existing surface 0.150 Gal/yd² (0.680 L/m²)

Factor for between lifts 0.050 Gal/yd² (0.230 L/m²)

Temporary Surfacing – Special Provision

“Temporary Surfacing “___”” – Station or Square Yard (*square meter*)

Note: Contractor’s choice for pavement type, asphaltic concrete or Portland cement concrete.

Note: Subgrade Preparation, earth shoulder construction all water applied and removal are subsidiary.

Trenched Widening – Special Provision

“Trenched Widening” – Station (*one side*)

Note: Use this item when you have an existing 24’ road widen to 28’ (2’ per side)

Widening – Special Provision

“Widening” – Station (*one side*)

Performance Graded Binder (**-**) Table

Asph. Conc. Type	PG Binder (**-)**	Gradation bands (0.5) multiply asph. conc. Tonnage by	Gradation bands (0.375) multiply asph. conc. tonnage by	Gradation bands (0.19) multiply asph. conc. tonnage
GGCRM	(58-28)	8.5%	NA	NA
GGCRMLV	(58-28)	8.5%	NA	NA
HRB	(58-34)	3.50%	NA	NA
LC	(76-28)	NA	NA	7.6%
RLC	(64-28)	NA	NA	7.6%
SPL	(58-34)	5.0%	NA	NA
SPR	(58-34)	5.0%	NA	NA
SPS	(52-34)	5.0%	NA	NA
SP4 Special	(64-28)	5.0%	5.6%	NA
SP4	(64-28)	5.0%	5.6%	NA
SP5	(70-28)	5.0%	5.6%	NA

Asphaltic Concrete Tonnage Table

Asphaltic Concrete Types

Bit	OGFC				SP4	SPR		Soil	
Sand	Bit				Special	SP4(.375)	LC	Agg	
Base	Fnd				SP4(.5)	SP5(.375)	RLC	Base	
Crse	Crse	OGFCCR	GGCRM	GGCRML	SP5(.5)	SPL	SPS	Crse	HRB

Tons per 100 Cubic Feet

6.0	6.2	6.3	6.75	6.95	7.15	7.25	7.30	7.35	7.40
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Pounds per Cubic Foot

120	124	126	135	139	143	145	146	147	148
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Tons/SqYd/Inch

Inches										
1	0.045	0.050	0.050	0.051	0.052	0.054	0.054	0.055	0.055	0.055
1.5										
2	0.090	0.093	0.095	0.101	0.104	0.107	0.109	0.110	0.110	0.111
2.5										
3	0.135	0.140	0.141	0.151	0.156	0.161	0.163	0.164	0.165	0.166
3.5										
4	0.180	0.186	0.189	0.202	0.208	0.214	0.218	0.219	0.221	0.222
4.5										
5	0.225	0.233	0.236	0.253	0.260	0.268	0.272	0.274	0.276	0.278
5.5										
6	0.270	0.279	0.284	0.303	0.313	0.322	0.326	0.329	0.331	0.333
6.5										
7	0.315	0.326	0.331	0.354	0.365	0.375	0.381	0.383	0.386	0.388
8	0.360	0.372	0.378	0.405	0.417	0.429	0.435	0.438	0.441	0.444
9	0.405	0.419	0.425	0.456	0.469	0.483	0.489	0.493	0.496	0.500
10	0.450	0.465	0.473	0.506	0.521	0.536	0.544	0.548	0.551	0.555

Asphaltic Concrete Megagram Table

Asphaltic Concrete Types

Bit						Soil
Sand	Bit	SP4 Special		SPR	LC	Agg
Base	Fnd	SP4 (12.5)		SP4(9.75)	RLC	Base
Crse	Crse	SP5		SPL	SPS	Crse

Megagrams per Cubic Meter

1.922	1.986	2.291	2.307	2.323	2.339	2.355
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Megagram per Square Meter - Millimeter

mm							
13	0.0250	0.0258	0.0298	0.0300	0.0302	0.0304	0.0306
25	0.0481	0.0497	0.0573	0.0577	0.0581	0.0585	0.0589
30	0.0577	0.0596	0.0687	0.0692	0.0697	0.0702	0.0707
40	0.0770	0.0795	0.0916	0.0923	0.0929	0.0936	0.0942
45	0.0865	0.0904	0.1031	0.1038	0.1045	0.1053	0.1060
50	0.0962	0.0994	0.1146	0.1154	0.1162	0.1170	0.1178
60	0.1154	0.1193	0.1375	0.1385	0.1394	0.1404	0.1414
80	0.1539	0.1590	0.1833	0.1846	0.1858	0.1872	0.1885
90	0.1732	0.1789	0.2062	0.2077	0.2091	0.2106	0.2120
100	0.1924	0.1988	0.2291	0.2308	0.2323	0.2340	0.2356
105	0.2018	0.2085	0.2406	0.2422	0.2439	0.2456	0.2473
120	0.2309	0.2386	0.2749	0.2770	0.2788	0.2808	0.2827
130	0.2501	0.2584	0.2978	0.3000	0.3020	0.3042	0.3063
135	0.2595	0.2681	0.3093	0.3114	0.3136	0.3158	0.3179
150	0.2886	0.2982	0.3437	0.3462	0.3485	0.3510	0.3534
180	0.3463	0.3578	0.4124	0.4154	0.4181	0.4212	0.4241
205	0.3940	0.4071	0.4697	0.4729	0.4762	0.4795	0.4878
230	0.4425	0.4572	0.5269	0.5308	0.5343	0.5382	0.5419
255	0.4901	0.5064	0.5842	0.5883	0.5924	0.5964	0.6005
280	0.5387	0.5566	0.6415	0.6462	0.6504	0.6552	0.6597
305	0.5862	0.6057	0.6988	0.7036	0.7085	0.7134	0.7183
330	0.6343	0.6554	0.7560	0.7613	0.7666	0.7719	0.7772
355	0.6823	0.7050	0.8133	0.8190	0.8247	0.8303	0.8360