AGGREGATES

Section 4 – Specifications

Supplemental Specification

- **Supplemental specifications should be always checked for updates.**

Specifications

Pit Run Subbase

- **WYDOT 803.4**
- **Shall meet liquid limit, plasticity index and gradation requirements specified**
- **Gradation – maximum size only**

Specifications (continued)

Crusher Run Subbase

- **WYDOT 803.4**
- **Crusher run base or subbase materials**
- **Gradation – maximum size only**

Specifications (continued)

Crushed Subbase

- WYDOT (803.4.2)
- Shall meet R-Value specified ≥ 60
- Fractured Faces ≥ 40%
- AASHTO T96 ≤ 50
- Liquid Limit ≤ 25
- Plasticity Index ≤ 6
- Gradation Requirements; Table 803.4.4-1
- Aggregate Properties; Table 803.4.4-2
- Soundness loss, no specification

Specifications (continued)

Crushed Base

- **WYDOT 803.4.3**
- **Shall have no moisture sensitivity of the R-Value (R-Value at 200 PSI exudation cannot be more than 5 less than R-Value at 300 PSI)**
- **Gradation**
  - **Five available: J, GR, L, K, W**
  - **Selected based on use, cost, conservation of materials**
  - **Most common: Subbase – Grading J; Base – Grading W and L**

Specifications (continued)

Crushed Base (continued)

- **Coarse Aggregate**
  - Hard, durable particles
  - Fractured Faces ≥ 50%
  - AASHTO T 96 < 50%
  - Minimum R-Value ≥ 75
  - Soundness loss ≤ 18

- **Fine Aggregate**
  - L.L ≤ 25
  - P.I. ≤ 3

Specifications (continued)

Crushed Base (Gravel Roads)
WYDOT 803.4

Coarse Aggregate

- Hard, durable particles
- AASHTO T 96 ≤ 50%
- Minimum R-Value ≥ 60
- Soundness loss ≤ 18

Fine Aggregate

- L.L ≤ 30
- P.I. ≤ 4-12

- Table 803.4.4-1: Gradation Requirements
- Frequently require that the sum of the % passing the #200 plus the PI be between 15 & 20 (for binding)

Table 803.4.4-1

Gradation Requirements: Subbase and Base

Sieve			Grading		
	J	GR	L	K	W
			% Passing		
2 in	100	-	-	-	-
1 1/2 in	90-100	-	100	100	100
1 in	-	100	90-100	90-100	90-100
3/4 in	-	90-100	-	-	
1/2 in	-	65-85	60-85	-	60-85
3/8 in	-	-	-	-	
No. 4	35-75	50-78	35-55	40-65	45-65
No. 8	-	37-67	25-50	30-55	33-53
No. 30	-	13-35	10-30	-	-
No. 200	0-15	4-15	3-15	3-15	3-12

Table 803.4.4-2

Aggregate Properties: Subbase and Base

Properties	Subbase	Crushed Base	Crushed Base (Gravel Roads)
LA Abrasion maximum loss, %	50	50	50
Liquid Limit, maximum	25	25	30
Plasticity Index	0-6	0-3	4-12
R-Value, minimum	60	75	60
Soundness ($MgSO_4$) loss for coarse aggregate, max.	-	18	18

Specifications (continued)

Pit Run Filler

- **WYDOT 803.5.2**
  - **When specified use non-plastic granular pit run filler consisting of granular materials. Ensure that 100 percent passes through a ⅜ in [9.5 mm] sieve and from 90 to 100 percent passes a No. 4 [4.75 mm] sieve. Stockpile in its own pile.**

Specifications (continued)

Reclaimed Asphalt Pavement

- **WYDOT 803.5.3**
- **Crush and screen reclaimed asphalt pavement (RAP) greater than 2 in [50mm] so all material is prepared for recycling and a uniform mixture is maintained. Handle, screen and crush material so as not to produce unnecessary fractured aggregate or cause undue degradation.**
- **Ensure 100% of RAP used passes through a 2 in sieve**

Specifications (continued)

Recycled Plant Mix Pavement

- **WYDOT 803.5.4**
- **Ensure that the combined virgin aggregate gradation meets the narrow band specifications developed during the mix design**

Specifications (continued)

Plant Mix Base

- General Discussion Special Provisions for Specification
- Gradation – Grading W unless noted on plans
- Rarely used anymore due to cost

Specifications (continued)

Cement Treated Base

- General Discussion Special Provisions for Specifications
- Coarse Aggregate – same as Crushed Base
- Fine Aggregate – same as Crushed Base
- Gradation – Special, less restrictive, more fines
- Rarely used anymore due to propensity for transverse cracking

Specifications (continued)

Asphalt Concrete – PMP

- **WYDOT 803.5**
- **Shall consist of crushed stones, crushed gravel or natural gravel**
  - **Uniform quality; crushed; sound, tough, durable particles**
  - **Coarse and Fine Aggregates shall be stockpiled in separate piles.**
  - **Pit Run Filler (if used) is stockpiled separately.**

Specifications (continued)

Asphalt Concrete – PMP (continued)

- **Aggregate**

- **Types**
  - **Five Types: Table 803.5.5-2**

- **Gradation**
  - **Four available; Table 803.5.5-1**
  - **Selected based on use, cost, and conservation of materials**

Table 803.5.5-1

Gradation Requirements: Marshall and Superpave Mixes

Sieve	% Passing, Nominal Maximum Size			
	1 in	3/4 in	1/2 in	3/8 in
1 1/4 in	100	-	-	-
1 in	90-100	100	-	-
3/4 in	65-90	90-100	100	-
1/2 in	50-85	55-90	90-100	100
3/8 in	40-75	45-85	55-90	90-100
No. 4	30-60	30-65	35-70	45-85
No. 8	20-45	20-50	20-55	30-65
No. 30	5-25	5-30	5-35	10-40
No. 200	2-7	2-7	2-7	2-7

Table 803.5.5-2

Aggregate Properties, Flexible Pavements

Properties	Agg I	Agg II	Agg III	Agg IV	Agg V
LA Abrasio maximum loss, %	35	40	40	40	40
Flat and Elongated (1 to 5 ratio) maximum, %	10	10	10	10	
Sand Equivalent minimum (2)	45	45	45	40	40
Fractured Faces minimum (1)	95/90	95/90	85/80	75/-	55/-
Fine Aggregate Angularity minimum (2)	45	45	45	40	40
Plasticity Index (2)	NP	NP	NP	NP	NP
Soundness (MgSO4) maximum loss % (3)	18	18	18	18	18

(1) "95/90" denotes that 95 percent of the coarse aggregate has one or more fractured faces and 90 percent has two or more fractured faces.

(2) Based on the minus No. 4 [4.75 mm] fraction of the composite blend.

(3) Soundness ($MgSO_4$) will be tested on coarse aggregate.

Specifications (continued)

Plant Mix Wearing Course

- **WYDOT 803.6**
- **Shall be crushed stone or gravel**
- **Shall meet the requirements for Agg I in Table 803.5.5-2**
- **Gradation – Table 803.6.1-1**

Table 803.6.1-1

Gradation Requirements: Plant Mix Wearing Course

Sieve	% Passing
½ in	100
3/8 in	97-100
No. 4	25- 45
No. 8	10-25
No. 200	2-7

Specifications (continued)

Polish Resistant Aggregate

- **WYDOT 803.6.2**
- **Limestone aggregates tend to polish when subjected to medium-to-high traffic levels.**
- **When specified on the plans, provide aggregate that meets one of the requirements in Table 803.6.2-1**

Table 803.6.2-1

Polish Resistant Aggregate Requirements

Test Method	Description	Specification
AASHTO T279	9 hour (Polish Value), minimum	32
AASHTO T 242	Skid Number, minimum (1)	40

(1) Base the skid number on historical skid numbers accumulated for a period of at least five years for a pavement that has carried traffic exceeding 3,500,000 accumulated 18-kip equivalent single axle loads.

Specifications (continued)

Micro Surfacing

- **WYDOT 803.7**
- **Used for filling transverse & longitudinal pavement depressions (rutting)**
- **Mineral aggregate shall be 100% crushed.**
- **A minimum of 95% of aggregate shall be retained on ½ in sieve**
- **Sand equivalent ≥ 65%**
- **When specified on the plans, provide aggregate that meets one of the requirements of Table 803.6.2-1**

Specifications (continued)

Micro Surfacing (continued)

- L.A. abrasion loss ≤ 30%
- Contractor shall supply information on aggregate properties and JMF
- Gradation Table 803.7-1

Table 803.7-1

Gradation Requirements:
Micro Surfacing

Sieve	% Passing
3/8 in	100
No. 4	70-90
No. 8	45-70
No. 16	28-50
No. 30	19-34
No. 50	12-25
No. 100	7-18
No. 200	5-15

Specifications (continued)

Concrete

- WYDOT 803.2.2
- Coarse Aggregate
  - Washed
  - Crushed stone or gravel
  - AASHTO M80 except deleterious materials, Table 803.2.2-1
  - AASHTO T 96 ≤ 40
  - Sodium Sulfate Loss ≤ 12%
  - Gradation; Table 803.2.2-2 and Table 803.2.2-3
  - When specified on the plans, provide aggregate that meets one of the requirements in Table 803.6.2-1

Specifications (continued)

Concrete (continued)

- **WYDOT 803.2.1**
- **Fine aggregate**
  - **Washed**
  - **AASHTO M6 except deleterious material (Table 803.2.1-1)**
  - **Gradation, Table 803.2.1-2**

Table 803.2.2-1

Deleterious Substance Limits
Coarse Aggregate for Concrete

Substance	Max. %, by weight [mass]
Shale or Coal	0.1
Clay Lumps	0.5
Material Passing a No 200 [75µm] sieve	2.0
Other deleterious substances such as friable, thin, elongated or laminated pieces	3.0
All deleterious substances combined	5.0

Table 803.2.2-3

Gradation Requirements: Coarse Aggregate for Concrete

Sieve	Classes A & B	(1) Class S	(1) PCCP
2 ½ in	-	-	-
2 in	-	-	-
1 ½ in	100	-	100
1 in	95-100	100	95-100
¾ in	-	90-100	-
½ in	25-60	-	25-60
3/8 in	-	20-55	-
No. 4	0-10	0-10	0-10
No. 8	0-5	0-5	0-5
No. 200	0-2	0-2	0-2

(1) For these, and for class A concrete used for pavement, ensure that at least 50 percent of the material retained on the No. 4 [4.75 mm] sieve has at least one fractured face.

Table 803.2.1-1

Deleterious Substance Limits: Fine Aggregate for Concrete

Substance	Max. %., by weight [mass]
Clay Lumps	1.0
Coal and Lignite	1.0
Material Passing a No. 200 sieve	4.0

Table 803.2.1-2

Gradation Requirements:
Fine Aggregate for Concrete

Sieve	% Passing
3/8 in	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	2-10
No. 200	0-4

Specifications (continued)

Chip Seal Aggregate

- **WYDOT 803.8**
- **2 different types;**
- **Table 803.8-1 for gradations requirements**
- **Table 803.8-2 for aggregate properties**

Table 803.8-1

Table 803.8-1
Gradation Requirements: Chip Seal

Sieve	% Passing	
	Type	
	B	C
1 in [25.0 mm]	–	–
¾ in [19.0 mm]	100	–
½ in [12.5 mm]	95 to 100	100
⅜ in [9.5 mm]	40 to 70	80 to 100
No. 4 [4.75 mm]	0 to 15	0 to 10
No. 8 [2.36 mm]	0 to 7	0 to 5
No. 200 [75 µm]	0 to 2	0 to 2

Table 803.8-2

Table 803.8-2
Aggregate Properties: Chip Seal

Property	Test Method	Specification
LA Abrasion loss, max., %	AASHTO T96	35
Flat and elongated (1:5 ratio), max.[1], %	ASTM D4791 (Method A)	10
Fractured Faces, min.[2], %	AASHTO T335	95/90
Plasticity Index[3]	AASHTO T90	NP
Polish Resistance	When specified, comply with Table 803.6.2-1	

[1] Flat and elongated will be tested on coarse aggregate (plus No. 4 [4.75 mm] fraction).

[2] Percentage designation such as "95/90" denotes 95 percent of the coarse aggregate has one or more fractured faces and 90 percent has two or more fractured faces.

[3] Based on minus No. 4 [4.75 mm] fraction of composite blend.

Specifications (continued)

Aggregate for Bed Course Materials

- **WYDOT 803.10**
- **Provide and use aggregate consisting of sand, gravel, crushed stone and other approved materials which 100 percent passes through a ½ in sieve**

Specifications (continued)

Gravel for Drains

- **WYDOT 803.11**
- **Use aggregate that is crushed or natural sand and gravel or other free-draining materials approved by the engineer and that meets the requirements of Table 803.11-1**

Table 803.12-1

Gradation Requirements: Gravel for Drains

Table 803.11-1
Gradation Requirements: Gravel for Drains

Sieve	% Passing Grading B
2 in [50 mm]	–
1½ in [37.5 mm]	100
1 in [25.0 mm]	95 to 100
¾ in [19.0 mm]	–
⅜ in [9.5 mm]	–
No. 4 [4.75 mm]	0 to 10
No. 8 [2.36 mm]	–
No. 16 [1.18 mm]	–
No. 100 [150 µm]	–

Specifications (continued)

Aggregate for Maintenance Stockpiles

- **WYDOT 803.12**
- **Type A, B and C**

Specifications (continued)

Type A

- Stockpile aggregate consisting of clean, hard, durable particles of gravel or sand
- Percentage of wear ≤ 40

Specifications (continued)

Type A (continued)

- Ensure 95% of material is retained on sieve before crushing
- For the fraction passing No. 4 sieve, ensure liquid limit ≤ 25 and plasticity index ≤ 3
- Table 803.12.1-1

Table 803.12.1-1

Gradation Requirements: Maintenance Stockpiles (Type A)

Sieve	% Passing, Nominal Maximum Size	
	1/2 in	3/8 in
3/4 in	100	-
1/2 in	90-100	100
3/8 in	60-90	90-100
No. 4	45-60	50-80
No. 8	30-50	33-63
No. 200	3-12	3-12

Specifications (continued)

Type B

- **Stockpile aggregate consisting of clean, hard particles of crusher- run gravel or screened stone obtained from designated portions of the pit.**

- **Ensure Plasticity Index ≤ 3**

- **Table 803.12.2-1**

Table 803.12.2-1

Gradation Requirements: Maintenance Stockpiles (Type B)

Sieve	% Passing				
	3/4 in	1/2 in	3/8 in	No. 4	No. 4 modified
1 in	100	-	-	-	-
3/4 in	95-100	100	-	-	-
1/2 in	-	95-100	100	-	-
3/8 in	-	-	95-100	100	100
No. 4	0-75	0-75	0-75	95-100	95-100
No. 200	0-15	0-15	0-15	0-5	0-12

Specifications (continued)

Type C

- **Stockpile aggregate consisting of crusher-run scoria meeting requirements of Table 803.12.3-1**

Table 803.12.3-1

Gradation Requirements: Maintenance Stockpiles (Type C)

Sieve	% Passing
3/8 in	100
No. 4	85-100
No. 200	0-10

Specifications (continued)

Aggregate for Pervious Backfill Material

- **WYDOT 803.13**
- **Use nonplastic aggregate consisting of crushed gravel, crushed rock, manufactured sands or combinations thereof.**
- **Ensure liquid limit is ≤ 30**

Specifications (continued)

Aggregate for Pervious Backfill Material (continued)

- For reinforced bridge approach fills, ensure materials used have an internal friction angle of at least 35 degrees (another way of requiring some degree of fracture)

- Table 803.13-1

Table 803.13-1

Gradation Requirements:
Pervious Backfill Material

Sieve	% Passing
2 in	100
No. 4	0 to 50
No. 30	0 to 35
No. 100	0 to 10
No. 200	0 to 4

Specifications (continued)

Aggregate for Riprap

- **WYDOT 803.14**

- **Use aggregate consisting of hard, durable, crushed, quarried, or natural stone or broken concrete.**

- **Ensure specific gravity of at least 2.4, absorption no greater than 4%, pieces are free of weak lamination and cleavages and at least 60% weigh 77 lbs.**

Specifications (continued)

Aggregate for Riprap (continued)

- Do not provide material that will disintegrate in water or weather
- Aggregate size, Table 803.14-1
- Aggregate weight, Table 803.14-2

Table 803.14-1

Table 803.14-1
Gradation Requirements: Minimum and Maximum Aggregate Size

Class	Nominal Size in [mm]	d15[1]		d50[2]		d85[3]		d100[4]
		Min in [mm]	Max in [mm]	Min in [mm]	Max in [mm]	Min in [mm]	Max in [mm]	Max in [mm]
I	6 [150]	3.7 [92]	5.2 [130]	5.7 [142]	6.9 [172]	7.8 [195]	9.2 [230]	12 [300]
II	9 [225]	5.5 [137]	7.8 [195]	8.5 [212]	10.5 [262]	11.5 [287]	14 [350]	18 [450]
III	12 [300]	7.3 [182]	10.5 [262]	11.5 [287]	14 [350]	15.5 [387]	18.5 [462]	24 [600]
IV	15 [375]	9.2 [230]	13 [325]	14.5 [362]	17.5 [437]	19.5 [487]	23 [575]	30 [750]
V	18 [450]	11 [275]	15.5 [387]	17 [425]	20.5 [512]	23.5 [587]	27.5 [687]	36 [900]
VI	21 [525]	13 [325]	18.5 [462]	20 [500]	24 [600]	27.5 [687]	32.5 [812]	42 [1050]
VII	24 [600]	14.5 [362]	21 [525]	23 [575]	27.5 [687]	31 [775]	37 [925]	48 [1200]
VIII	30 [750]	18.5 [462]	26 [650]	28.5 [712]	34.5 [862]	39 [975]	46 [1150]	60 [1500]

[1] 15% of the aggregate will be smaller than min size shown.

[2] 50% of the aggregate will be smaller than min size shown.

[3] 85% of the aggregate will be smaller than min size shown.

[4] Maximum aggregate size.

Table 803.14-2

Table 803.14-2
Gradation Requirements: Minimum and Maximum Aggregate Weight

Class	Nominal Weight lbs [kg]	W15[1]		W50[2]		W85[3]		W100[4]
		Min lbs [kg]	Max lbs [kg]	Min lbs [kg]	Max lbs [kg]	Min lbs [kg]	Max lbs [kg]	Max lbs [kg]
I	20 [9]	4 [1]	12 [5]	15 [6]	27 [12]	39 [17]	64 [29]	140 [63]
II	60 [27]	13 [5]	39 [17]	51 [23]	90 [40]	130 [58]	220 [99]	470 [213]
III	150 [68]	32 [14]	93 [42]	120 [54]	210 [95]	310 [140]	510 [231]	1100 [498]
IV	300 [136]	62 [28]	180 [81]	240 [108]	420 [190]	600 [272]	1000 [453]	2200 [997]
V	500 [226]	110 [49]	310 [140]	410 [185]	720 [326]	1050 [476]	1750 [793]	3800 [1723]
VI	750 [340]	170 [77]	500 [226]	650 [294]	1150 [521]	1650 [748]	2800 [1270]	6000 [2721]
VII	1000 [453]	260 [117]	740 [335]	950 [430]	1700 [771]	2500 [1134]	4100 [1859]	9000 [4082]
VIII	2000 [907]	500 [226]	1450 [657]	1900 [861]	3300 [1496]	4800 [2177]	8000 [3628]	17600 [7983]

[1] 15% of the aggregate will be smaller than min weight shown.

[2] 50% of the aggregate will be smaller than min weight shown.

[3] 85% of the aggregate will be smaller than min weight shown.

[4] Maximum aggregate weight.

Specifications (continued)

Filter Aggregate for Riprap 803.14.7

- Use aggregate consisting of hard, durable particles or fragments of crushed stone or natural gravel, screened or crushed

- Table 803.14.7-1

Table 803.14.7-1

Table 803.14.7-1
Gradation Requirements: Riprap Filter Aggregate

Sieve	% Passing
3 in [75 mm]	100
No. 4 [4.75 mm]	20 to 50
No. 200 [75µm]	0 to 10

Specifications (continued)

Aggregate for Flowable Backfill

- Use nonplastic aggregate with a liquid limit ≤ 25
- WYDOT 803.15
- Table 803.15-1

Table 803.15-1

Gradation Requirements: Flowable Backfill

Sieve	% Passing
3/4 in	100
No. 200	2 to 10