



Washington State Department of Transportation
State Construction Office

RECYCLED CONCRETE USAGE IN AGGREGATE MATERIALS

2019 ANNUAL REPORT

December 16, 2019

BACKGROUND

Engrossed Substitute House Bill (ESHB) 1695 passed the Washington State Legislature in 2015 and was codified into RCW [70.95.805](#) and RCW [70.95.807](#).

RCW 70.95.805 requires WSDOT and its implementation partners to collaboratively develop and establish objectives and strategies for the reuse and recycling of construction aggregate and recycled concrete materials, henceforth referred to as *recycled concrete aggregate* (RCA). It also requires the annual use of twenty-five percent of recycled construction aggregates and concrete materials on WSDOT projects, unless recycled products are not readily available or cost effective.

RCW 70.95.807 requires an annual report to the Legislature summarizing the implementation of RCW 70.95.805 and the usage of RCA on WSDOT projects. The law included specific opportunities for reuse of RCA through a reference to Table 9-03.21(1) E of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction. **Table 1** is provided below listing the potential applications of recycled concrete materials, as highlighted in yellow.

Table 1 - Maximum Allowable Percent of Recycled Material

Maximum Allowable Percent (by weight) of Recycled Material					
		Hot Mix Asphalt	Recycled Concrete Aggregate	Recycled Glass (glass cullet)	Steel Slag
Fine Aggregate for Concrete	9-03.1(2)	0	0	0	0
Coarse Aggregates for Concrete	9-03.1(4)	0	0	0	0
Coarse Aggregate for Concrete Pavement	9-03.1(4)	0	100	0	0
Coarse Aggregate for Commercial Concrete And Class 3000 Concrete	9-03.1(4)	0	100	0	0
Aggregates for Hot Mix Asphalt	9-03.8	See 5-04.2	0	0	20
Ballast	9-03.9(1)	25	100	20	20
Permeable Ballast	9-03.9(2)	25	100	20	20
Crushed Surfacing	9-03.9(3)	25	100	20	20
Aggregate for Gravel Base	9-03.10	25	100	20	20
Gravel Backfill for Foundations – Class A	9-03.12(1)A	25	100	20	20
Gravel Backfill for Foundations – Class B	9-03.12(1)B	25	100	20	20
Gravel Backfill for Walls	9-03.12(2)	0	100	20	20
Gravel Backfill for Pipe Zone Bedding	9-03.12(3)	0	100	20	20
Gravel Backfill for Drains	9-03.12(4)	0	0	20	0
Gravel Backfill for Drywells	9-03.12(5)	0	0	20	0
Backfill for Sand Drains	9-03.13	0	0	20	0
Sand Drainage Blanket	9-03.13(1)	0	0	20	0
Gravel Borrow	9-03.14(1)	25	100	20	20
Select Borrow	9-03.14(2)	25	100	20	20

Select Borrow (greater than 3 feet below Subgrade and side slopes)	9-03.14(2)	100	100	20	20
Common Borrow	9-03.14(3)	25	100	20	20
Common Borrow (greater than 3 feet below Subgrade and side slopes)	9-03.14(3)	100	100	20	20
Foundation Material Class A and Class B	9-03.17	0	100	20	20
Foundation Material Class C	9-03.18	0	100	20	20
Bank Run Gravel for Trench Backfill	9-03.19	25	100	20	20

Consistent with the RCW, WSDOT formed the RCA Working Group with its implementation partners, consisting of members of the Washington Aggregates and Concrete Association. Current members of the RCA Working Group are as follows:

Bruce Chattin	Washington Aggregate and Concrete Association
Mike Tomlinson	American Rock Products
Jim Burnet	Renton Concrete Recyclers LLC
Greg Mckinnon	Stoneway Concrete
Gabe Morelli	Kangley Rock & Recycling
Marco Foster	WSDOT, State Construction Office
Garrett Webster	WSDOT State Materials Laboratory

In addition the RCA Working Group uses other WSDOT/Construction Industry teams to communicate and solicit feedback on the subject of RCA use.

REPORTING

Contracts executed after January 4, 2016 include language requiring a minimum of twenty five percent use of RCA for aggregate related items where RCA is an option as shown in **Table 1**. Contractors are required to explain circumstances where cost or lack of ready availability deters them from meeting the twenty five percent requirement

For the current reporting period November 1, 2018 until October 31, 2019, WSDOT received and accepted sixty-eight Recycled Materials Reports. As shown in **Table 2** below, contractors reported using 566 tons of RCA out of the potential 183,114 tons of RCA eligible material used on WSDOT projects.

In addition,

1. The I-405/SR 167 project that bid prior to enactment of RCW 70.95.805 voluntarily used 22,549 tons of RCA.
2. The Alaska Way Viaduct Demolition and Decommissioning Project is actively using RCA. Current reports show usage at:
 - 9,973 tons of 1.25" Crushed RCA
 - 75,128 tons of 3" Minus Crushed RCA
 - 14,436 tons of Select Borrow

Table 2 – Recycled Concrete Aggregate Use

Summary of Recycled Concrete Usage 68 WSDOT Contracts Completed (Nov 2018 – Oct 2019)		
Material	Recycled Concrete Used (Tons)	Contract Quantities (Tons)
Coarse Aggregate for Commercial Concrete	0	2,396
Ballast	0	0
Permeable Ballast	0	785
Crushed Surfacing	566	63,714
Aggregate for Gravel Base	0	174
Gravel Backfill for Foundations	0	0
Gravel Backfill for Walls	0	8,888
Gravel Backfill for Pipe Zone Bedding	0	1,584
Gravel Borrow	0	38,040
Select Borrow	0	25,940
Common Borrow	0	41,056
Foundation Material Class A and Class B	0	0
Foundation material Class C	0	537
Bank Run Gravel for Trench Backfill	0	0
Total:	566	183,114

Table 3 summarizes the contracts that used RCA and the reasons given for contracts that did not use RCA. Of the 35 contractors that did not use RCA, all identified cost as the reason for not meeting the minimum twenty-five percent RCA usage. Reasons that RCA costs exceed native aggregate materials varied. Example justifications for not using RCA include:

- Limited available sources of RCA in some regions of the state
- Stockpile quantity is not adequate/readily available
- Trucking cost and proximity to project site
- Cost to blend RCA with native material to adjust properties
- Testing properties for the application, strength/durability
- RCA not suitable for use on some fish barrier removal projects
- The number of concrete suppliers that utilize RCA are limited in their availability

Table 3 – Summary of Recycled Materials Reports

Category	Number of Projects
Contract work included no RCA-eligible materials	33
Contract work included RCA-eligible materials	35
Of the 35 Contracts that included RCA-eligible materials:	
Met the 25% minimum RCA usage	3
Used some RCA, but didn't meet 25% usage	0
No RCA Usage	32
Reasons given for not meeting the 25% usage	
Cost (transportation due to proximity)	30
Not an option because application was below ordinary high-water mark	2

INCREASING RCA USAGE

In 2018 the RCA Working Group continued to work on identified issues that either hindered or prevented contractors from using RCA on WSDOT projects. To address those issues, the RCA Working Group established the following objectives for 2019:

WSDOT Objectives

- WSDOT will continue with the internal training effort among Project Engineers and staff to:
 - Improve knowledge of the benefits of RCA and available local sources
 - Explain the approval and acceptance procedures
 - Communicate changes
- Solicit feedback from staff and contractors regarding RCA usage to identify and diagnose challenges that are encountered on projects. Challenges will be discussed with the RCA Working Group to find solutions and make appropriate changes.
- Continued development of best practices for RCA including compaction acceptance and source approval.
- Continue to include RCA on agendas at established meetings with WSDOT, the Washington Aggregates and Concrete Association and the Associated General Contractors.
- Encourage and support recycling facilities to get listed on the QPL
- Capture success stories and lessons learned and communicate them to stakeholders.
- Consider expanding the use of RCA in concretes other than commercial concrete.
- Perform additional outreach and education with local agencies.

All of the 2019 objectives were fulfilled through collaboration with industry partners, as we continue to see the benefits of the changes implemented by the RCA Working Group in previous years.

WSDOT Internal Outreach

WSDOT continues to educate Project Engineers and staff through established meetings and

using the Construction Bulletins previously released to communicate changes. RCA usage continues to be a topic at statewide meetings for Project and Construction Engineers.

Field Density Testing

The alternative compaction testing method developed by the AGC/WSDOT Roadway Team used to determine material compaction has proven to be successful. The compaction method has been in use since 2018, and was included in the 2020 Standard Specifications.

The I-405/SR 167 Direct Connect project utilized the new compaction testing method to determine the compaction of the RCA placed. Other projects have developed a best practice that combines the two methods allowed for material compaction acceptance.

Source Approval

RCA sources listed on WSDOT's Qualified Product List (QPL) provides the locations of pre-approved local sources. Currently, 20 RCA facilities have completed the evaluation process and are approved sources. Source approvals continue to follow a three-tiered approval system based on the intended use and the ability to determine material origin.

The Qualified Products List is located at:

http://www.wsdot.wa.gov/biz/mats/QPL/QPL_Search.cfm. The applicable search parameter is Standard Specification: 9-03.21(1)B. This site also includes an interactive map of RCA sources in the state.

<https://www.wsdot.wa.gov/Business/MaterialsLab/QPL.htm>. This site includes a flowchart describing the RCA approval process.

RCA allowed in Concrete Pavement

Coarse aggregate for Concrete Pavement was added to the table of eligible material and thereby adds another application that may utilize RCA.

2020 OBJECTIVES AND STRATEGIES

WSDOT will continue to work towards reaching the shared goal of twenty-five percent annual usage statewide. Although RCA import usage is low in 2019, voluntary on-site usage also continues on WSDOT projects.

The RCA Working Group, along with AGC, will continue to work together to increase confidence in RCA, identify new opportunities, resolve issues, and encourage increased usage.

WSDOT 2020 Objectives

- Continue the internal training effort among Project Engineers and staff to:
 - Improve knowledge of the benefits of RCA
 - Promote utilizing the Qualified Products List to find available local sources
 - Alleviate contractor concerns as appropriate
- Solicit feedback from staff and contractors regarding RCA usage to identify and diagnose

challenges that are encountered on projects. Challenges will be discussed at the RCA Working Group to find resolution.

- Continue development of best practices for RCA including compaction acceptance and source approval.
- Continue to include RCA on agendas of established meetings with the Washington Aggregates and Concrete Association and the Associated General Contractors.
- Encourage and support recycling facilities to get listed on the QPL.
- Capture success stories and lessons learned and communicate them to stakeholders.
- Encourage expanding the use of RCA in concretes beyond commercial concrete and Cement Concrete Pavement.
- Consider expanding use of RCA for reinforced wall backfill
- Perform additional outreach and education with local agencies.

Design Build Objectives

- To further increase usage, WSDOT will credit proposers who demonstrate RCA use on past projects and planned use of RCA during the subject project when evaluating Design Build submittals. Valuing RCA as part of selecting and awarding a design build project will encourage innovation and lead to increased use. On site recycling will be valued as well as the utilization of imported RCA. The details are being worked out by the WSDOT/AGC/ACEC Design Build committee.

Supplier Partners - 2020 Objectives

- Continue to participate in the RCA Workgroup meetings to collaborate with WSDOT and assist with resolving issues, improving specifications and procedures.
- Continue to engage with WSDOT and AGC to educate and encourage contractors to use RCA on WSDOT projects.
- Build relationships with contractors that bid on WSDOT projects to increase confidence in RCA material.
- Improve the tracking material sources
- Begin implementing quality control plans to increase the number of Tier 2 and Tier 3 facilities.
- Work collaboratively to effectively coordinate supply and demand issues.

The three primary stakeholders – WSDOT, material suppliers and contractors – need to continue to work together to increase reliability and confidence in RCA material. To be successful contractors need to understand that RCA is cost effective, acceptable, reliable, and readily available.