



Washington State Department of Transportation
State Construction Office

RECYCLED CONCRETE USAGE IN AGGREGATE MATERIALS

2018 ANNUAL REPORT

December 20, 2018

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 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

Maximum Allowable Percent (by weight) of Recycled Material					
		Hot Mix Asphalt	Recycled Concrete Aggregate	Recycled Glass (glass cullet)	Steel Slag
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:

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| Bruce Chattin | Washington Aggregates 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 |
| David Jones | WSDOT, State Materials Laboratory |
| Rob Molohon | WSDOT, State Materials Laboratory |

The RCA Working Group meets quarterly to evaluate existing WSDOT practices and specifications. The group focuses on adjustments that allow, simplify, and encourage contractors to use RCA on WSDOT projects. Additionally, WSDOT 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 availability prevent them from meeting the twenty five percent requirement.

For the current reporting period, November 1, 2017 through October 31, 2018, WSDOT received and accepted sixty-four Recycled Materials Reports. As shown in **Table 2** below, contractors reported using 9,948 tons of RCA out of the potential 142,553 tons of RCA eligible material used on WSDOT projects. Overall utilization for 2018 has increased 8,478 tons over 2017.

In addition, the following two large projects that bid prior to enactment of RCW [70.95.805](#) have voluntarily used more than 70,000 tons of RCA:

- I-5/SR 16 HOV Connections project has utilized approximately 52,000 tons of RCA; and
- I-405/SR 167 Direct Connect project has used 22,248 tons of RCA.

Table 2 – Recycled Concrete Aggregate Use

Summary of Recycled Concrete Usage 64 WSDOT Contracts Completed (Nov 2017 – Oct 2018)		
Material	Recycled Concrete Used (Tons)	Contract Quantities (Tons)
Coarse Aggregate for Commercial Concrete	0	2303
Ballast	0	189
Permeable Ballast	0	10,490
Crushed Surfacing	4,942	55,627
Aggregate for Gravel Base	0	0
Gravel Backfill for Foundations	0	0
Gravel Backfill for Walls	0	0
Gravel Backfill for Pipe Zone Bedding	4,411	4,478
Gravel Borrow	0	13,843
Select Borrow	0	0
Common Borrow	595	55,623
Foundation Material Class A and Class B	0	0
Foundation material Class C	0	0
Bank Run Gravel for Trench Backfill	0	0
Total:	9,948	142,553

Table 3 summarizes the contracts that used RCA and the reasons given for contracts that did not use RCA. Of the thirty-six 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	22
Contract work included RCA-eligible materials	42
Of the 42 Contracts that included RCA-eligible materials:	
Met the 25% minimum RCA usage	2
Used some RCA, but didn't meet 25% usage	4
No RCA Usage	36
Reasons given for not meeting the 25% usage	
Cost (transportation and proximity)	36
Not an option because application was below ordinary high-water mark. [†]	4

[†] The material has the potential to elevate pH of a water body, which is generally not permitted.

INCREASING RCA USAGE BY REMOVING BARRIERS

In 2017 the RCA Working Group identified several 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 2018:

- Use the established quarterly WACA/WSDOT team meetings to advance the RCA related efforts and allow suppliers to have a role in developing specifications;
- Establish RCA as a regular agenda item on the AGC/WSDOT Roadway team;
- Continue the effort to use pilot projects to develop and test specifications;
- Develop a resource for contractors to make it easier to locate and gain approval for RCA sources; and
- Develop best practices for suppliers with regard to handling, documenting and approving RCA.

The RCA Working Group fulfilled all of the 2018 objectives, making significant improvements to contract specifications and WSDOT's source approval and testing procedures. In addition to the 2018 objectives, WSDOT distributed information about RCA implementation to WSDOT staff and industry partners through presentations at the Associated General Contractors 2018 Annual Meeting, multiple WSDOT Regional Design and Construction Conferences, and the WSDOT 2018 Statewide Project Engineers Meeting. WSDOT also published a Construction Bulletin to communicate changes to policies and procedures, and to encourage more use of RCA on projects. Construction Bulletins are distributed to a list of email recipients that includes all of WSDOT's contract administration staff, as well as members of the construction industry.

Following are summaries of specific changes that were developed and implemented through the RCA Working Group during the past year.

Source Approval

Listing sources on WSDOT's Qualified Product List (QPL) makes it easier for contractors to find sources and know what is required to achieve approval of their RCA source. Since 2017, the recycling industry has provided 16 facilities that have completed the evaluation process and are approved RCA sources.

The Qualified Products List (QPL) is at:

http://www.wsdot.wa.gov/biz/mats/QPL/QPL_Search.cfm. The applicable search parameter is Standard Specification: 9-03.21(1)B.

RCA stockpiles vary and can include material with varying properties, so a three-tiered RCA source approval system was proposed based on the intended use of the material and the ability to determine material origin. Implementation is currently underway and will be an industry focus in 2019.

Tier 1: *RCA materials that originate from known or unknown sources.* Any RCA material facility may be listed on the QPL as Tier 1 and preapproved for limited use once the

material passes toxicity testing. These materials may not be used as structural aggregates.

Tier 2: *RCA materials that are demonstrated to originate from WSDOT projects or other approved native aggregate sources.* To be listed on the QPL as Tier 2, the material facilities are required to develop and use a quality control plan for stockpile management, and provide acceptable toxicity testing. Tier 2 RCA material facilities may provide aggregate for all applications listed in **Table 1**, subject to specified acceptance testing requirements.

Tier 3: *RCA materials that originate from unknown sources.* To be listed on the QPL as Tier 3, the material facilities are required to develop and use a quality control plan for stockpile management, which may include segregation based on material source. Facilities must provide acceptable source approval testing and toxicity testing. Tier 3 RCA material facilities may provide aggregate for all applications listed in **Table 1**, subject to specified acceptance testing requirements.

Field Density Testing

Determining compaction of RCA using traditional methods was problematic when RCA was first used on WSDOT projects. Using information learned from the previous year, and anticipating long-term use and acceptability, the AGC/WSDOT Roadway Team developed and implemented an alternative compaction testing method suitable for RCA. The alternative test method simplifies the use of RCA in roadway construction by providing a predictable and reliable method of determining the level of material compaction.

Project Planning and Reporting

To satisfy the requirement for WSDOT to report annually on RCA utilization, the contractor is required to submit a plan showing intended RCA usage for each eligible material and a final report at the end of the project. To simplify the submittal process, a new form was created that allows the contractor to submit their utilization plan and actual quantity usage on the same form. This also allows a side-by-side comparison of what the contractor planned to use compared to what was actually used.

WSDOT Internal Outreach

Building on what was learned in previous years, WSDOT continued to educate staff to support and assist with the use of RCA in 2018. The changes made to reduce barriers were communicated to WSDOT staff through a Construction Bulletin delivered to recipients across the state. RCA was also a topic of discussion at numerous statewide meetings attended by WSDOT Project Engineers and Documentation Engineers.

2019 OBJECTIVES AND STRATEGIES

RCA usage on WSDOT projects is steadily rising, and recent specification and policy enhancements should enable further gains statewide. The RCA Working Group, along with AGC, will continue to work together to identify and resolve issues, identify new opportunities, and encourage increased usage. WSDOT and its implementation partners will focus on the following objectives in support of reaching the shared goal of twenty-five percent annual usage statewide.

WSDOT 2019 Objectives

- WSDOT will continue 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.

Implementation Partner 2019 Objectives

- Continue to participate in the RCA Workgroup meetings to collaborate with WSDOT and assist with resolving issues, improving specifications and improving procedures.
- Continue to engage with WSDOT and AGC to educate and encourage contractors to use RCA on WSDOT projects.
- Build stronger relationships between suppliers and the contractors that bid on WSDOT projects to increase confidence in RCA material.
- 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.

WSDOT holds its contractors responsible to deliver a quality product in a timely manner. The three primary stakeholders – WSDOT, material suppliers and contractors – need to continue to work together to reduce risk and increase confidence in RCA material. The parties benefit by knowing that the material is cost effective, acceptable, reliable, and readily available.