



Washington State Department of Transportation
State Construction Office

RECYCLED CONCRETE USAGE IN AGGREGATE MATERIALS

2017 ANNUAL REPORT

January 1, 2018

HISTORY

Engrossed Substitute House Bill (ESHB) 1695 passed the Washington State Legislature in 2015.

As required in RCW 70.95.807, this report fulfills the implementation reporting requirement to ***“specify and annually use a minimum of twenty-five percent construction aggregate and recycled concrete materials on its cumulative transportation, roadway, street, highway and other transportation infrastructure projects”*** unless construction aggregate and recycled concrete materials are not readily available or cost-effective. The Bill also required that ***“The department of transportation and its implementation partners must collaboratively develop and establish objectives and strategies for the reuse and recycling of construction aggregate and recycled concrete materials.”***

WSDOT established a group of **implementation partners** to assist with the effort.

Scott Ayers – Graham Construction

Jimmy Blais – Gary Merlino Construction Company

Bruce Chattin – Washington Aggregate and Concrete Association

Susan Ellis – Federal Highway Administration

Dave Erickson – WSDOT State Construction Office

Michael Fleming – WSDOT State Construction Office

Bill Grady – KLB Construction Inc.

David Jones – WSDOT State Materials Laboratory

Greg Mckinnon – Stoneway Concrete

Rob Molohon – WSDOT State Materials Laboratory

David Mounts – WSDOT Local Programs

Will Smith – WSDOT South Central Region

Denys Tak – WSDOT State Construction Office

The Implementation Team identified opportunities to use construction aggregate and recycled concrete materials on WSDOT projects. The specific opportunities for reuse of these materials were included in RCW 70.95.805 through a reference to Table 9-03.21(1)E of the WSDOT Standard Specifications for Road, Bridge and Municipal Construction. A copy of this Table is provided below with the opportunities for the use of recycled concrete materials highlighted.

Table 1
Maximum Allowable Percent (By Weight) of Recycled Material
 WSDOT Standard Specification 9-03.21(1)E

Maximum Allowable Percent (by weight) of Recycled Material					
		Hot Mix Asphalt	Recycled Concrete Aggregate	Recycled Glass (glass cullet)	Steel Slag
Fine Aggregate for Portland Cement Concrete	9-03.1(2)	0	0	0	0
Coarse Aggregates for Portland Cement Concrete	9-03.1(4)	0	0	0	0
Coarse Aggregate for Commercial 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

In addition to reviewing and affirming the information in **Table 1**, the Implementation Team developed contract specification language requiring a minimum of 25 percent use of Recycled Concrete Aggregate (RCA) for the items highlighted in **Table 1**. The Implementation Team also determined that a **Recycled Materials Report** must be submitted at the end of every project to show the amount of RCA used. If the 25 percent minimum requirement is not achieved, the contractor must submit a cost estimate demonstrating that the cost with RCA was greater than without RCA.

REPORTING

Contracts executed after January 4, 2016 include language requiring a minimum of 25 percent use of RCA for aggregate related items where RCA is an option. The reporting period for data purposes runs from Nov. 1 to Oct. 31 of the following year. For the reporting period ending October 31, 2017, WSDOT received and accepted 55 Recycled Materials Reports. As shown on **Table 2**, contractors reported using 1,470 tons of RCA out of the 55,790 tons of RCA eligible material used on WSDOT projects.

Table 2 – Recycled Concrete Aggregate (RCA) Use

Summary of Recycled Concrete Usage 55 WSDOT Contracts (Nov 2016-Oct 2017)		
Material	Contract Quantities (Tons)	Recycled Concrete Used (Tons)
Coarse Aggregate for Commercial Concrete	228	0
Ballast	0	0
Permeable Ballast	2,436	0
Crushed Surfacing	19,816	1,470
Aggregate for Gravel Base	110	0
Gravel Backfill for Foundations	688	0
Gravel Backfill for Walls	1,440	0
Gravel Backfill for Pipe Zone Bedding	423	0
Gravel Borrow	29,038	0
Select Borrow	1,460	0
Common Borrow	127	0
Foundation Material Class A and Class B	24	0
Foundation material Class C	0	0
Bank Run Gravel for Trench Backfill	0	0
Total:	55,790	1,470

Table 3 – Summary of Recycled Materials Reports

Category	Number of Projects
Contract work included no RCA-eligible materials	27
Contact work included RCA-eligible materials	28

Of the 28 Contracts that included RCA-eligible materials:	
Met the 25% minimum RCA usage	2
Used some RCA, but didn't meet 25% usage	2
No RCA usage	24

Reasons given for not meeting the 25% usage	
More costly	24
Not an option because application was below high-water	2

As shown in **Table 3**, 24 of the contractors identified cost as the reason for not meeting the minimum 25 percent usage. However, there are currently factors driving costs up that can be avoided. Reasons for the increased costs varied, but some of the common justifications included:

- Limited sources of RCA in some regions of the state
 - Lack of pre-approved sources/stockpiles
 - Significant trucking costs to import RCA compared to local aggregate supplies
- RCA has different characteristics than native aggregate related to compaction and inspection. Becoming familiar and adjusting to accommodate these differences can contribute to higher costs. WSDOT, the Association of General Contractors (AGC) and the Washington Aggregate and Concrete Association (WACA) are working on an alternate compaction testing method and inspection methods to reduce this factor.
- Costs to test RCA for contamination and strength/durability

Although the 2017 usage of RCA appears limited by the reported numbers, it should be noted that the I-5/SR16 HOV Connectors project voluntarily reincorporated approximately 30,000 tons of RCA back into the project during 2017. This was not a contractual requirement because the project was executed prior to enactment of the law. The project is producing RCA on-site by utilizing a section of roadway that was to be removed and reusing it as a base for new cement concrete pavement. A presentation on this effort will be a part of the annual WSDOT/AGC meeting in January 2018.

WORKING WITH INDUSTRY PARTNERS

In June 2017, WSDOT met with the Implementation Team to provide an update on current usage for the year and discuss issues/challenges with utilizing RCA on WSDOT projects. It was recognized by all parties that incorporating RCA requires close collaboration with all entities, including WSDOT, material suppliers and contractors.

Based on those ongoing conversations, the Implementation Team is actively working to identify opportunities and remove barriers in an effort to increase RCA usage. As described there are various reasons why RCA usage has been low. The Implementation Team is working on specific items related to material testing, stockpile management and perceived risks associated with RCA use to reduce barriers and increase future RCA use.

Generally speaking, any type of material used on WSDOT projects must be structurally sound, durable (able to last for 50+ years) and free from any sort of toxic contamination. WSDOT ensures these requirements are met through established material testing. RCA produced from unknown sources can result in stockpiles with varying material properties, making it difficult to ensure the material will consistently meet specified requirements. WSDOT is working with Washington Aggregates & Concrete Association (WACA) toward an effective testing solution suitable for RCA produced from these stockpiles.

The implementation team has made progress in reducing the testing requirements when the RCA comes from an approved source. Materials from these approved sources have already been tested for strength, durability and toxicity, so additional testing may not be necessary. A few construction projects such as the I-5/SR16 project referenced earlier, are working to take advantage of this approach.

Working in conjunction with the AGC/WSDOT Roadway Team, an alternative compaction testing method appropriate for RCA is being developed. This alternative method is currently being used on a pilot project. The Roadway Team will take what is learned from the pilot project with the goal of developing a standard process that can be used on all future projects.

Addressing the issues above does not guarantee increased RCA usage in all conditions. Sources for RCA are far more limited than for native aggregates, so the additional transportation costs may make RCA cost-prohibitive. In some cases, contractors are reporting that the raw material cost of the RCA exceeds the raw material cost of native aggregates. This is especially true when RCA is being used for non-structural applications such as fill material along roadway shoulders. Non-structural applications allow the use of more common, less expensive natural materials.

Currently, contractors are concerned about whether their RCA source will be approved, whether a sufficient supply of RCA will be available, and whether they will encounter compaction and inefficiency issues on the project site. Those risk issues translate to additional costs, which then create a situation where the use of RCA is no longer competitive with native aggregates. WSDOT is committed to working with our industry partners to address these risks.

WHAT'S NEXT?

2018 Objectives and Strategies

To identify, address and resolve issues in all areas to eliminate obstacles to using RCA and to establish a productive effort to increase the use of RCA materials as supplies and opportunities allow.

- Use the established quarterly WACA/WSDOT team meetings to advance the RCA related efforts
 - Allow suppliers to have a role in developing specifications
- Establish RCA as a regular agenda item on the AGC/WSDOT Roadway team
 - Bring in suppliers to share perspectives with contractors
 - Gather feedback from contractors as specifications are proposed
- 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
- Develop best practices for suppliers with regard to handling, documenting and approving RCA

- Examine the possibility of placing RCA stockpiles on either the WSDOT Qualified Products List or the WSDOT Aggregate Source Approval database as appropriate

CONCLUSION

The **2016 RCA** report provided very little data due to the timing of the projects.

The **2017 RCA** report provided significant data but still showed limited RCA usage. There were four projects that used RCA out of 28 with opportunities to use RCA. In addition, areas have been identified where changes and efforts can be made to increase usage in the in future.

The three primary stakeholders - WSDOT, material suppliers and contractors – are working collaboratively to implement changes and incorporate best practices from the collective experience gained by industry as this issue continues to evolve and develop over time.