

PD-20: Recycle Materials

1-10 points

Goal: Reduce lifecycle impacts from extraction, production, and transportation of virgin materials by recycling materials.

Sustainability Linkage

Recycling materials supports the environmental and economic principles of the triple bottom line by reducing the consumption of raw materials, reducing landfill waste, and encouraging cost savings.



Background and Scoring Requirements

Background

This criterion focuses on recycling of materials while *PD-19: Reduce, Reuse and Repurpose Materials* focuses on efforts to reduce and reuse materials per the descriptions and definitions provided below.

When pavements are originally constructed, the best materials available at the time are usually sourced and used during construction. As resources have diminished, that often means that the best materials available for reconstruction are already in place in the existing infrastructure. In addition to reducing waste, recycling pavements allows us to reclaim the best materials that were originally available for construction.

Programs for waste reduction in the United States have generally taken on the concept of the 3Rs: reduce, reuse, and recycle. For the purposes of this criterion, as well as for *PD-19: Reduce, Reuse and Repurpose Materials*, the key terms are defined as follows:

- **“Reducing”** is used in this tool to refer to processes that reduce the need for virgin paving and structural materials. See *PD-19: Reduce, Reuse and Repurpose Materials* for examples.
- **“Reusing”** is the reuse of a material or by-product from another industry for a new function in a transportation application. See *PD-19: Reduce, Reuse and Repurpose Materials* for examples.
- **“Recycling”** is the use of old materials for a new and similar use in a transportation application, or the salvaging and reprocessing of previously used materials from other transportation applications into a new transportation project. Examples of recycling solutions include the incorporation of reclaimed asphalt pavement (RAP) and recycled concrete aggregate (RCA); cold-in-place recycling (CIR); hot-in-place recycling (HIR); and full depth reclamation (FDR). Also included are the salvage and recycling of aggregate, rock, asphalt, concrete, wood, metal (rebar, sign posts, signal poles, etc.), and other materials that have previously been used in other transportation applications and can be incorporated into a new project. Examples include the salvage and recycling of sign posts, signal poles, luminaries, rock or concrete used as rip-rap, and asphalt millings used as a shouldering material. For bridges, an example would be using recycled steel girders from a roadway bridge for a new pedestrian structure.
- **“Existing pavement material”** is defined as all material within the project limits in the existing pavement structure (including surfacing and base material). This includes travelled lanes and shoulders, and pavement structures for physically separated bicycle and pedestrian pathways.
- **“Existing structural material”** is defined as all material within the project limits in existing non-pavement structures, such as bridges (including overpasses), retaining walls, and stormwater infrastructure such as

vaults, pipes, and culverts. All existing structural materials include their foundations, for which volumes may be difficult to estimate. Where actual weights are not available, reasonable estimates may be used or volume may be estimated. To compute volume of hollow structural sections such as prefabricated members or corrugated steel, estimate the mass of the material and adjust for material density to determine volume. Note that for typical reinforced concrete sections, the steel does not need to be separated from the composite section for purposes of volume calculations and a composite density may be used.

Scoring Requirements

Implement one or more of the methods listed below. Points for different methods are cumulative; however, this criterion shall not exceed a total of 10 points.

Requirement PD-20.1

1-5 points. Recycled Asphalt Pavement or Recycled Concrete Aggregate

Use RAP or RCA in new pavement lifts or granular base course or embankments. The recycled materials can originate from the project and be recycled onsite or offsite and returned or recycled materials can originate from an offsite source. However, no points are awarded for removing paving materials from the project and sending them offsite to be recycled for another project(s).

Points are awarded based on the origin of the source material and location of recycling activities as well as the Average Recycled Content (ARC) per the following calculation and using Tables PD-20.1.A or PD-20.1.B (on the next page) as follows below.

$$ARC (\%) = \frac{\sum r_n}{\sum W_n} \times 100\%$$

Where:

r_n is the total weight or volume of RAP or RCA.

W_n is the total weight or volume of either all existing pavement materials or all bedding, backfill, and granular embankment materials per the method of recycling used.

n represents the number of materials considered in accordance with the method used.

TABLE PD-20.1.A. POINTS FOR AVERAGE RECYCLED CONTENT (PERCENT BY WEIGHT OR VOLUME OF MATERIALS) WHEN ORIGINATING FROM PROJECT AND RECYCLED ONSITE

Recycling Method Used	Points Earned				
	1	2	3	4	5
Percent average recycled material (ARC) required for recycling in pavements (onsite recycling)	10%	20%	30%	40%	50% or more
Percent average recycled material (ARC) required for granular base course or embankments (onsite recycling)	20%	30%	40%	50%	60% or more

TABLE PD-20.2.B. POINTS FOR AVERAGE RECYCLED CONTENT (PERCENT BY WEIGHT OR VOLUME OF MATERIALS) WHEN ORIGINATING FROM ONSITE AND RECYCLED OFFSITE OR ORGINATING OFFSITE

Recycling Method Used	Points Earned			
	1	2	3	4
Percent average recycled material (ARC) required for recycling in pavements (offsite source or recycling)	20%	30%	40%	50% or more
Percent average recycled material (ARC) required for granular base course or embankments (offsite source or recycling)	30%	40%	50%	60% or more

Requirement PD-20.2

2-6 points. In-Place Asphalt Pavement Recycling

Recycle pavement materials in place using cold-in-place recycling, hot-in-place recycling, and full depth reclamation methods. Points are awarded based on the percentage of pavement area recycled compared to the entire area of existing pavement materials as shown in Table PD-20.2.A.

TABLE PD-20.2.A. POINTS AWARDED FOR IN PLACE RECYCLING

Percentage Pavement Area Recycled	Points Awarded by Method of Recycling		
	HIR	CIR	FDR
50–74%	2	3	4
75–99%	3	4	5
100%	4	5	6

Requirement PD-20.3

1-2 points. Reuse of Sub-base Granular Material

Reuse the subbase granular material of existing pavement elements as subgrade embankment or as part of the new subbase during construction of the proposed new pavement structure.

Points are awarded based on the percentage of pavement area for which sub-base material was reclaimed and reused compared to the entire area of existing pavement materials as shown in Table PD-20.3.A.

TABLE PD-20.3.A. POINTS AWARDED FOR REUSE OF SUB-BASE GRANULAR MATERIAL

Percentage Pavement Area Recycled	Points Awarded for Sub-base Reused
50–74%	1
75–100%	2

Requirement PD-20.4

1 point. Recycle Minor Structural Elements

Relocate and reuse at least 90 percent of the minor structural elements that meet current code, including existing luminaires, signal poles, and sign structures that are required to be removed and/or relocated onsite or by the agency. Signs mounted on posts are not included in this criterion. Structures that do not meet current code are not counted in the percentage.

In order to achieve credit, the minor structural elements must be moved and reused onsite or provided to the agency's Maintenance & Operations group specifically for reuse. Elements shall be counted by numbers of foundations without regard to size of the structure. In this case, a signal pole would be counted as a single structure and an overhead sign structure would be counted twice because it has two foundations.

Requirement PD-20.5

2 points. Salvage or Relocate Buildings

Salvage or move a building instead of demolishing it.

Resources

None referenced.

Scoring Sources

The project is considered to have met this criterion if the requirements above can be reasonably substantiated through the existence of one or more following documentation sources (or equal where not available):

1. A calculation that shows the computed percentage of pavement and/or structural material recycled.
2. Calculation of the percentage pavement area recycled in-place.
3. Documentation showing the origin and processing location of RAP or RCA.
4. A calculation that shows the percentage of luminaires, signal poles, and sign structures reused.
5. A payment clause or item for salvaging and relocating a building.