



## Composition Analysis Study Report

December 2021

The Mattress Recycling Council California, LLC (MRC) commissioned a composition study to evaluate the percentage of each component in each type and size of mattress and foundation in the recycling stream. The data from this study will serve the organization's goals of preparing recyclers for future changes in construction methods and commodity streams extracted from discarded mattresses and foundations. It will also provide baseline data for a life cycle assessment (LCA) study MRC is undertaking to understand the major contributors to environmental impacts arising from end-of-life management of discarded mattresses. The LCA will evaluate the environmental performance of the current baseline process for receiving, transporting and recycling discarded mattresses as well as several proposed or emerging recycling processes. The data generated from the LCA will produce numerical indicators of potential environmental burdens.

This report makes references to mattresses, foundations and units:

- Foundation – Commonly known as a box spring, foundations may be manufactured using only a wooden structure or wood structure with a metal spring supports.
- Mattress – Mattresses may be manufactured from all foam or a combination of foam and metal springs. Two types of springs are common in mattress construction. Bonnell coils are interconnected hourglass-shaped steel wire coil structures. Pocketed coils are individual steel coils encased in polypropylene or woven cotton sleeves that are sewn or adhered together.
- Unit or Units – Refers to either a mattress, a foundation or combination of both.

To evaluate the material composition of units in the recycling stream, the composition study deconstructed four units of each of size and type combination shown in Table 1.



**Table 1:** Mattress and Foundation Size and Type Combinations for the Composition Study

		Size			
		Twin	Full	Queen	King
Type	Pocket Coil Mattress				
	Bonnell Spring Mattress				
	All-foam mattress				
	All Wood Foundation				N/A
	Wood & Metal Foundation				N/A

MRC contracted with MSW Consultants (MSW) to facilitate the study and conducted it at an MRC-contracted recycling facility in California. MRC and MSW (the team) selected representative units by measuring an average depth for each size and type combination and selecting four units that measured within 2 inches of the average depth. For each unit, the team recorded the length, width, and height of each unit and the whole unit weight. A recycling facility employee fully deconstructed each unit into predetermined material categories.

Residual material was sorted into one of 16 material categories matching those in MRC's 2021 California Mattress Recycling Residue Composition Study. These categories are shown in Table 2, along with their corresponding commodity types used in MRC's California Annual Report.

**Table 2:** Material Categories

Composition Study Material Categories	Corresponding Annual Report Categories
Shoddy Felt Pad	Felt/Shoddy
Mixed Non-Woven Fibers	Other Fiber
Quilt Panels	Quilt & Toppers
Polyurethane Foam	Foam
Cotton	Cotton



Fabric Scraps	Other Fiber
Loose Plastics	Plastics
Fines	Other Non-Recoverable
Latex Foam	Foam
Coconut/Sisal/Plant Fibers	Other Fiber
Other Material	Other Non-Recoverable
Multi-Layered Foam	Foam
Wood	Wood
Pocketed Coils	Steel
Cardboard	Cardboard
Scrap Metal	Steel

After each unit was deconstructed, the team weighed and recorded the resulting materials. Table 3 shows the percentage of each material by weight that resulted from the deconstruction, as an average for all sizes of units within each construction type category.



**Table 3:** Material by Construction Type

Material Category	Bonnell Spring Mattresses	All Foam Mattresses	Pocket Coil Mattresses	All Wood Foundations	Wood & Metal Foundations
Cardboard	0.0%	0.0%	0.0%	5.1%	0.0%
Coconut/Sisal/Plant Fibers	0.0%	0.0%	0.2%	0.0%	0.9%
Cotton	0.0%	0.0%	0.0%	0.0%	0.0%
Fabric Scraps	1.0%	0.0%	0.2%	4.8%	4.4%
Fines	0.1%	0.2%	0.0%	0.0%	0.0%
Latex Foam	0.0%	0.0%	2.0%	0.0%	0.0%
Loose Plastics	0.0%	0.0%	0.0%	0.0%	0.4%
Mixed Non-Woven Fibers	5.1%	12.1%	6.3%	1.7%	5.9%
Multi-Layered Foam	0.0%	4.7%	3.3%	0.0%	0.0%
Other Material	0.4%	0.0%	0.7%	0.0%	0.3%
Pocketed Coils	0.0%	0.0%	55.7%	0.0%	0.0%
Polyurethane Foam	14.6%	83.0%	19.3%	0.2%	0.7%
Quilt Panels	15.5%	0.0%	11.8%	0.0%	1.7%
Scrap Metal	52.6%	0.0%	0.0%	0.0%	40.6%
Shoddy Felt Pad	10.8%	0.0%	0.3%	0.9%	2.9%
Wood	0.0%	0.0%	0.0%	87.3%	42.3%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Table 4 and Figure 1 show the percentage of each material category by weight that resulted from the deconstruction of mattresses.

**Table 4:** Weight of Each Material in Mattresses Only

Material Category	All Mattresses
Polyurethane Foam	26.1%
Pocketed Coils	23.4%
Scrap Metal	23.1%



Quilt Panels	11.8%
Mixed Non-Woven Fibers	5.3%
Shoddy Felt Pad	4.9%
Multi-Layered Foam	2.1%
Mixed Woven Fibers	1.3%
Latex Foam	0.9%
Fabric Scraps	0.5%
Other Material	0.5%
Coconut/Sisal/Plant Fibers	0.1%
Fines	0.1%
Cardboard	0.0%
Loose Plastics	0.0%
Cotton	0.0%
Wood	0.0%
<b>Total</b>	<b>100.0%</b>

**Figure 1:** Weight of Each Material in Mattresses Only

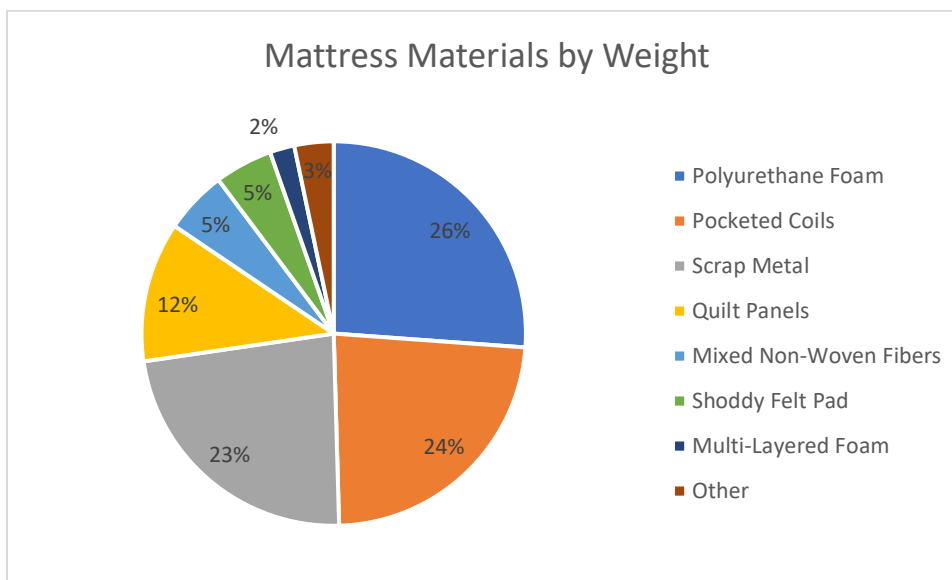




Table 5 and Figure 2 show the percentage of each material category by weight that resulted from the deconstruction of foundations.

**Table 5:** Weight of Each Material in Foundations Only

Material Category	All Foundations
Wood	60.8%
Scrap Metal	23.9%
Fabric Scraps	4.6%
Mixed Non-Woven Fibers	4.2%
Cardboard	2.1%
Shoddy Felt Pad	2.1%
Quilt Panels	1.0%
Coconut/Sisal/Plant Fibers	0.5%
Polyurethane Foam	0.5%
Loose Plastics	0.2%
Other	0.2%
Fines	0.0%
Cotton	0.0%
Multi-Layered Foam	0.0%
Mixed Woven Fibers	0.0%
Latex Foam	0.0%
Pocketed Coils	0.0%
<b>Total</b>	<b>100.0%</b>



**Figure 2:** Weight of Each Material in Foundations Only

