



Determining Packaging Dimensions that Require 2d3d Sortation Testing

Background

2d3d sortation machinery used to separate paper from containers utilizes inclined surfaces with short bursts of uphill movement to contact the packaging with pauses in the movement where the surfaces lose contact. This is repeated over and over again several times a second. During surface contact the packaging is transported uphill and during periods without contact the packaging has the opportunity to fall downhill. Light, thin packaging moves well uphill but doesn't tend to fall downhill. Heavier, three-dimensional packaging tends to fall downhill further than it was transported uphill. In this manner separation occurs.

While weight and surface area factor into the likely outcome for 2d3d separation, the most critical factor is height of the package when it is laying down. Packages tend to orient themselves so that "height " is defined as the smallest overall dimension of the package. Furthermore, 2d3d separation occurs after a package has been compressed by a trash truck so that smallest dimension of the original package is further reduced. It is that resulting dimension that affects 2d3d performance.

Through many tests, APR has determined that containers with a resulting compressed dimension greater than 2 inches (5 cm) are extremely unlikely to be missorted into the 2d stream. APR has also conducted compression tests to predict the resulting compressed dimension according to packaging type and wall thickness. The table on page 2 is the result of these tests.

Using the Table

1. Select the smallest dimension of a package's uncompressed overall height, width, or length (smallest uncompressed dimension).
2. Record the package's minimum sidewall thickness, format, and type of polymer. *Note: Only PET and PP bottles, tubs, and thermoforms are currently depicted in the table.*
3. If the smallest uncompressed dimension is less than 2 inches (5 cm), testing is required.
4. If the volume of a PET bottle is larger than 1.5l, testing is not required.
5. Enter the table using the row that corresponds to the minimum sidewall thickness and the column with the appropriate material type and format. The number at the intersection of these two is the lower limit for the smallest uncompressed dimension to avoid testing, i.e. if the packages smallest uncompressed dimension is larger than the number in the table, testing is not required. Otherwise testing is required using [SORT-S-05 Evaluation of the Two Dimensional/Three Dimensional \(2D3D\) Sorting Potential of a Whole Article](#)

Package Minimum Sidewall Thickness		Smallest Allowable Package Dimension to Avoid Testing (All package dimensions must be larger than the number shown for the appropriate sidewall thickness)					
		PET Thermoform		PET Bottle (<1.5l)		PP Tubs and Thermoforms	
		cm	in	cm	in	cm	in
0.11	0.004	15	5.8	13	5.1	12	4.6
0.12	0.005	14	5.7	13	5.0	11	4.5
0.13	0.005	14	5.6	13	4.9	11	4.5
0.14	0.006	14	5.5	12	4.9	11	4.4
0.15	0.006	14	5.4	12	4.8	11	4.4
0.16	0.006	13	5.3	12	4.8	11	4.4
0.17	0.007	13	5.2	12	4.7	11	4.3
0.18	0.007	13	5.1	12	4.6	11	4.3
0.19	0.007	13	5.0	12	4.6	11	4.3
0.20	0.008	12	4.9	11	4.5	11	4.2
0.21	0.008	12	4.8	11	4.4	11	4.2
0.22	0.009	12	4.7	11	4.4	11	4.1
0.23	0.009	12	4.6	11	4.3	10	4.1
0.24	0.009	11	4.5	11	4.2	10	4.1
0.25	0.010	11	4.4	11	4.2	10	4.0
0.26	0.010	11	4.3	10	4.1	10	4.0
0.27	0.011	11	4.2	10	4.0	10	3.9
0.28	0.011	10	4.1	10	4.0	10	3.9
0.29	0.011	10	4.0	10	3.9	10	3.9
0.30	0.012	10	3.9	10	3.8	10	3.8
0.31	0.012	10	3.8	10	3.8	10	3.8
0.32	0.013	9	3.7	9	3.7	10	3.7
0.33	0.013	9	3.6	9	3.7	9	3.7
0.34	0.013	9	3.5	9	3.6	9	3.7
0.35	0.014	9	3.4	9	3.5	9	3.6
0.36	0.014	8	3.3	9	3.5	9	3.6
0.37	0.015	8	3.2	9	3.4	9	3.6
0.38	0.015	8	3.1	8	3.3	9	3.5
0.39	0.015	8	3.0	8	3.3	9	3.5
0.40	0.016	7	2.9	8	3.2	9	3.4
0.41	0.016	7	2.8	8	3.1	9	3.4
0.42	0.017	7	2.6	8	3.1	9	3.4
0.43	0.017	6	2.5	8	3.0	8	3.3
0.44	0.017	6	2.4	7	2.9	8	3.3

0.45	0.018	6	2.3	7	2.9	8	3.2
0.46	0.018	6	2.2	7	2.8	8	3.2
0.47	0.019	5	2.1	7	2.8	8	3.2
0.48	0.019			7	2.7	8	3.1
0.49	0.019			7	2.6	8	3.1
0.50	0.020			6	2.6	8	3.1
0.51	0.020			6	2.5	8	3.0
0.52	0.020			6	2.4	8	3.0
0.53	0.021			6	2.4	7	2.9
0.54	0.021			6	2.3	7	2.9
0.55	0.022			6	2.2	7	2.9
0.56	0.022			6	2.2	7	2.8
0.57	0.022			5	2.1	7	2.8
0.58	0.023					7	2.7
0.59	0.023					7	2.7
0.60	0.024					7	2.7
0.61	0.024					7	2.6
0.62	0.024					7	2.6
0.63	0.025					6	2.6
0.64	0.025					6	2.5
0.65	0.026					6	2.5
0.66	0.026					6	2.4
0.67	0.026					6	2.4
0.68	0.027					6	2.4
0.69	0.027					6	2.3
0.70	0.028					6	2.3
0.71	0.028					6	2.2
0.72	0.028					6	2.2
0.73	0.029					6	2.2
0.74	0.029					5	2.1

Document Version History

Version	Publication Date	Changes Made
1	March 13, 2024	Original Version
2	August 30, 2024	Added hyperlink to SORT protocol where testing is required; Updated hyperlink to match new website