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## Large Aggregate Test Report April 2001

**Sample Identity:** The sample material is identified as:

Sample #	Description
Sample 1	Large Stones (3/8-1 inch minor axis)
Sample 2	Small Stones (1/8-1/4 inch minor axis)
Sample 3	ASTM # 67 Stone Distribution
Sample 4	ASTM # 57 Stone Distribution (dry)
Sample 5	ASTM # 57 Stone Distribution (wet)

### **Purpose:**

The Canty RockSizer is designed to obtain size data for the mining and aggregate industries. It is intended to provide size distribution data for particles that range in size from 1/8 inch to approximately two inches and can process material in a consistent manner on a continuous basis.

This report details the particle size distribution testing and results on stone samples in the Canty Lab comparing the RockSizer measurements to traditional off-line measurement techniques. The data presented here uses the improved Canty technology to give a full particle size distribution for the samples analyzed. Both small and large stones were tested to demonstrate the imaging system's ability to make measurements on samples that were significantly different in size and verify that the data obtained is in close agreement with established methods. Two ASTM stone distributions were then tested to demonstrate the systems ability to process samples with a distribution of particle sizes. A final test demonstrates that wet materials can also be processed.

### **Setup:**

The new rockSizer was used to present the particles to the imaging sensor for capture and subsequent analysis. The Canty system is vision based and self-contained including illumination components. Video signal is fed to the Canty Vector where our software performs the appropriate analysis. Vector contains several imaging tools and techniques in the software that allow a full analysis of the particle images. The images presented here show particle samples in freefall captured by the camera.

## **Calibration:**

A pixel scale factor of 0.0123917 in/pixel was used for the measurements presented here. This scaling allows both the large stones and the small stones to be imaged with no mechanical adjustments to the system.

## **Results and Discussion:**

The CantyVision Vector system allows visual verification of laboratory results. Single snapshots of a measurement process can be taken using the Vector in the test mode. These images usually contain a manageable number of particles that can be quickly analyzed by the Vector and visually verified by the operator. This helps the operator to ensure that the process will collect appropriate data during run time when thousands of particles may be imaged and measured.

Figure 1 shows a typical test image for sample 1. Figure 2 presents the digitized image for this sample after particle thresholding has been achieved and background has been filtered out. Table 1 lists the dimensions of the particles imaged in figure 2. It is interesting to note that particle # 1 is very small compared to the rest of the sample. This particle is possibly a chip that broke off from a larger rock during handling or may be a conglomerate of fines. Note that rocks that touch the edges of the field of view are dropped from the image before processing because their size is not totally defined.

Figure 3 shows a typical test image for sample 2. Figure 4 presents the digitized image for this sample. Table 2 lists the dimensions of the particles imaged in figure 4. As shown in the image, the data indicates that these stones are significantly smaller than the stones in the first images and contain a significant number of fines.

Run time data usually consists of measurements made on 2,000 to 10,000 particles that are imaged by a sensor and processed by the Vector. Although a number of different analyses can be performed with the data, the most common output desired is a size distribution for the particles of a given sample. Plots of percent passing by volume vs. particle minor axis size are given in figures 5 thru 9 along with corresponding sieve data. These plots show the entire spectrum of particles that were imaged by the system. Typical data points of interest taken from the plots are summarized in table 3. This information provides a quick comparison of the particle sizes in the 10, 50 and 90 % passing ranges for the CantyVision system and screen data.

Figure 1: Test Image of Sample 1, Large Stones.



Figure 2: Digitized Test Image of Sample 1, Large Stones.



Table 1: Particle Dimensions in the Test Image of Sample 1, Large Stones.

Particle #	Area (inches squared)	Perimeter (inches)	Major Axis (inches)	Minor Axis (inches)
1	0.007957	0.3457	0.1478	0.09417
2	0.4334	2.706	1.015	0.6364
3	0.4749	2.599	0.9298	0.7977
4	0.3961	2.551	0.9079	0.6869
5	0.7124	3.302	1.294	0.7874

Figure 3: Test Image of Sample 2, Small Stones.

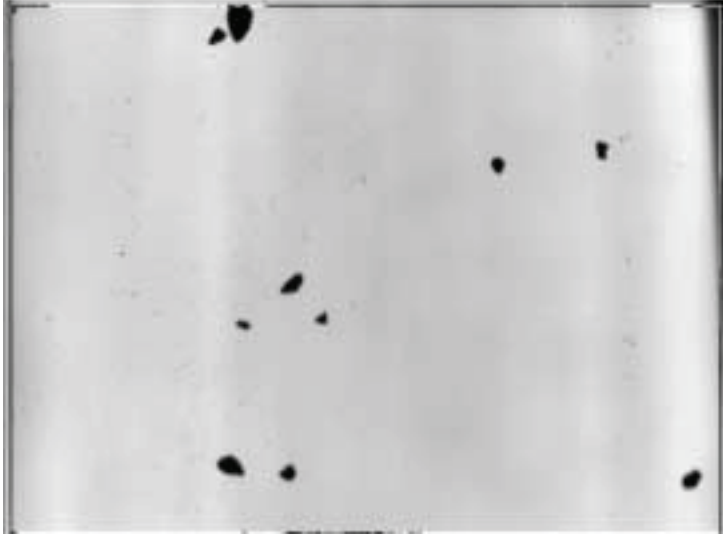


Figure 4: Digitized Test Image of Sample 2, Small Stones.



Table 2: Particle Dimensions in the Test Image of Sample 2, Small Stones.

Particle #	Area (inch squared)	Perimeter (inch)	Major Axis (inch)	Minor Axis (inch)
1	0.0002842	0.02384	0.02384	0.01192
2	0.02529	0.6079	0.2434	0.173
3	0.0005683	0.04768	0.04768	0.01192
4	0.0002842	0.02384	0.02384	0.01192
5	0.0008525	0.07152	0.03857	0.03336
6	0.001137	0.09536	0.04961	0.03431
7	0.02387	0.5841	0.2359	0.1754
8	0.0002842	0.02384	0.02384	0.01192
9	0.02501	0.5364	0.2146	0.1682
10	0.001421	0.1073	0.0549	0.04823
11	0.0002842	0.02384	0.02384	0.01192

12	0.0002842	0.02384	0.02384	0.01192
13	0.0005683	0.04768	0.02878	0.02878
14	0.001137	0.09536	0.04961	0.03431
15	0.0005683	0.04768	0.02878	0.02878
16	0.0002842	0.02384	0.02384	0.01192
17	0.04149	0.7748	0.3195	0.1969
18	0.001137	0.09536	0.04961	0.03431
19	0.0002842	0.02384	0.02384	0.01192
20	0.0002842	0.02384	0.02384	0.01192
21	0.01648	0.4649	0.174	0.1574
22	0.01506	0.453	0.1826	0.1268
23	0.0002842	0.02384	0.02384	0.01192
24	0.0008525	0.07152	0.03857	0.03336
25	0.0005683	0.04768	0.02878	0.02878
26	0.0002842	0.02384	0.02384	0.01192
27	0.0002842	0.02384	0.02384	0.01192
28	0.05286	0.8582	0.3293	0.2337
29	0.02813	0.596	0.2149	0.1905
30	0.03467	0.6914	0.2679	0.1892

Figure 5: Percent Passing by Volume for Sample 1, Large Stones.

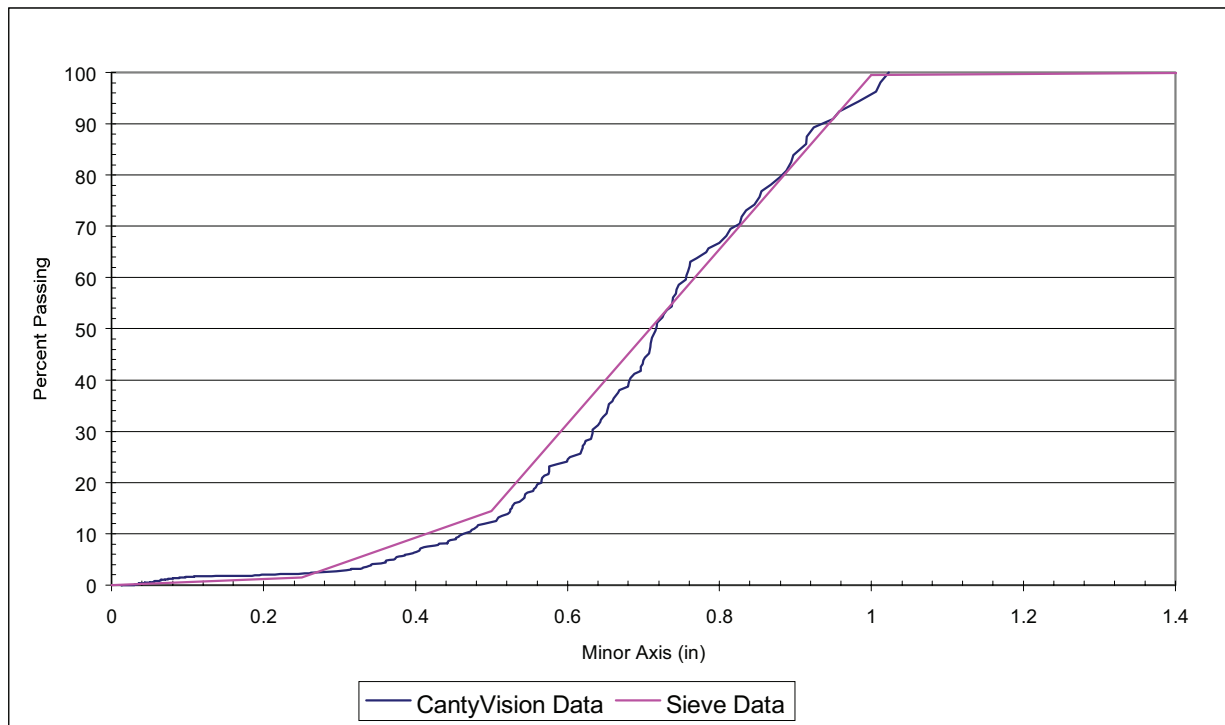


Figure 6: Percent Passing by Volume for Sample 2, Small Stones.

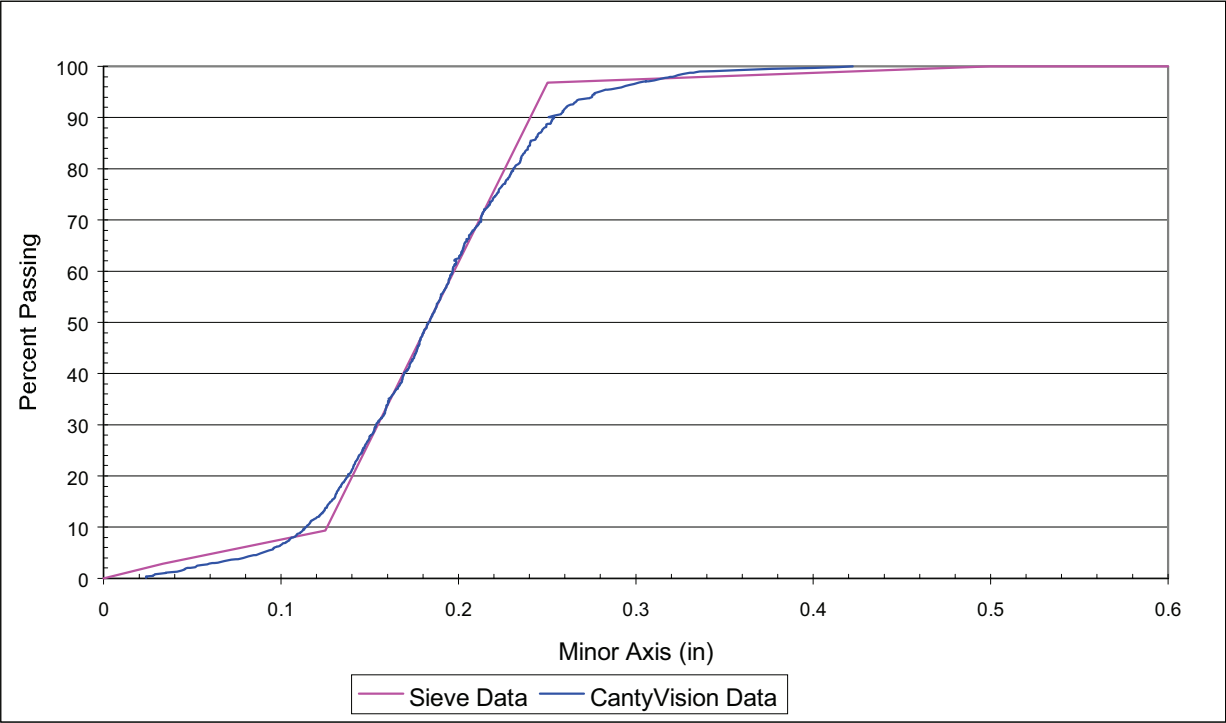


Figure 7: Percent Passing by Volume for Sample 3, ASTM 67 Stone.

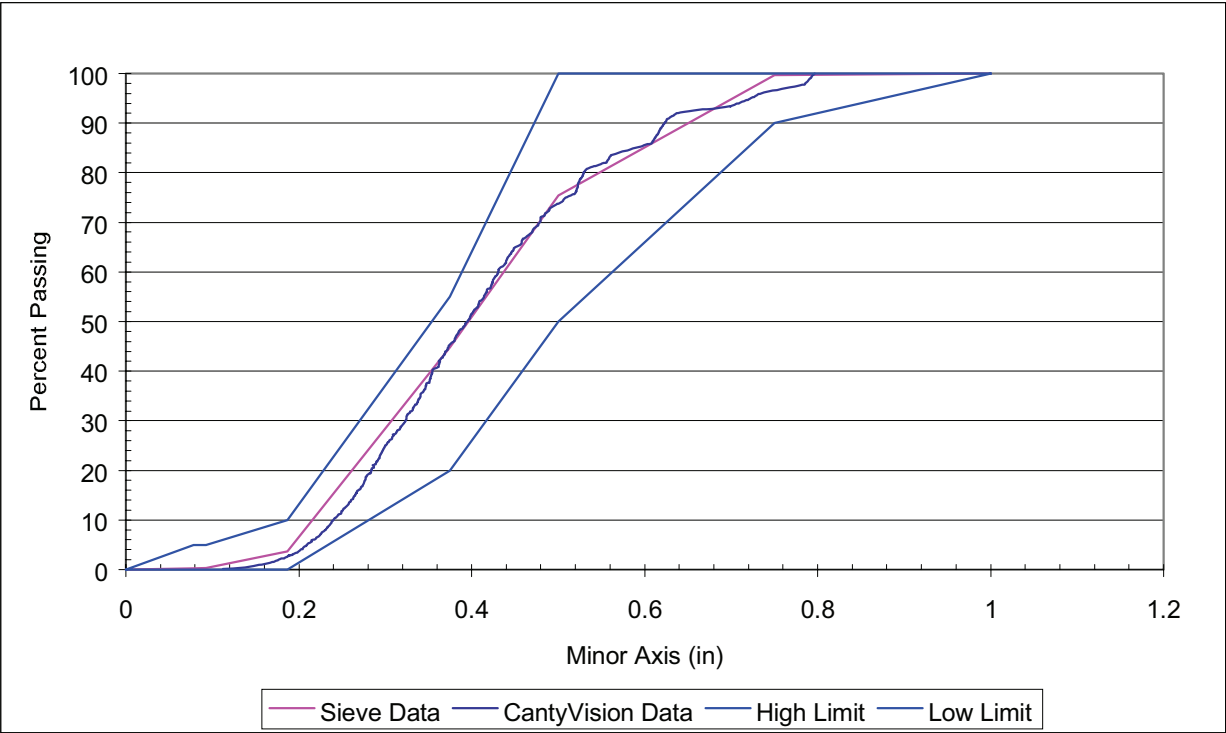


Figure 8: Percent Passing by Volume for Sample 4, ASTM 57 Stone (dry).

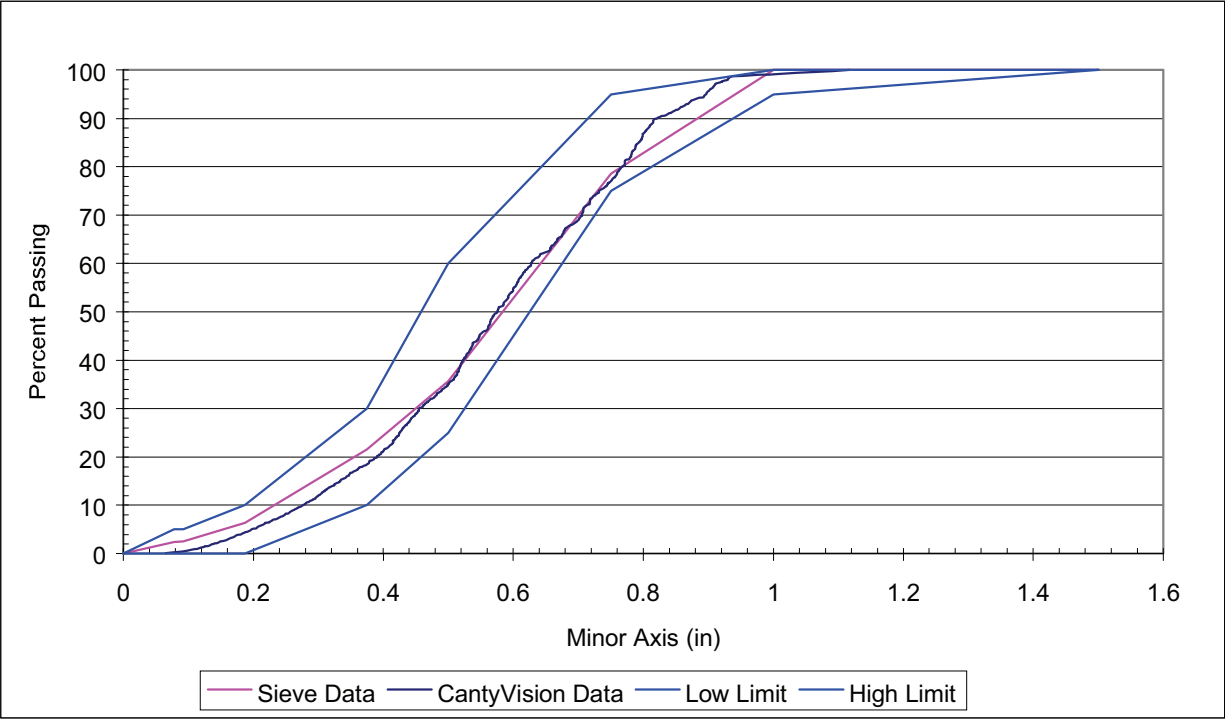


Figure 9: Percent Passing by Volume for Sample 4, ASTM 57 Stone (wet).

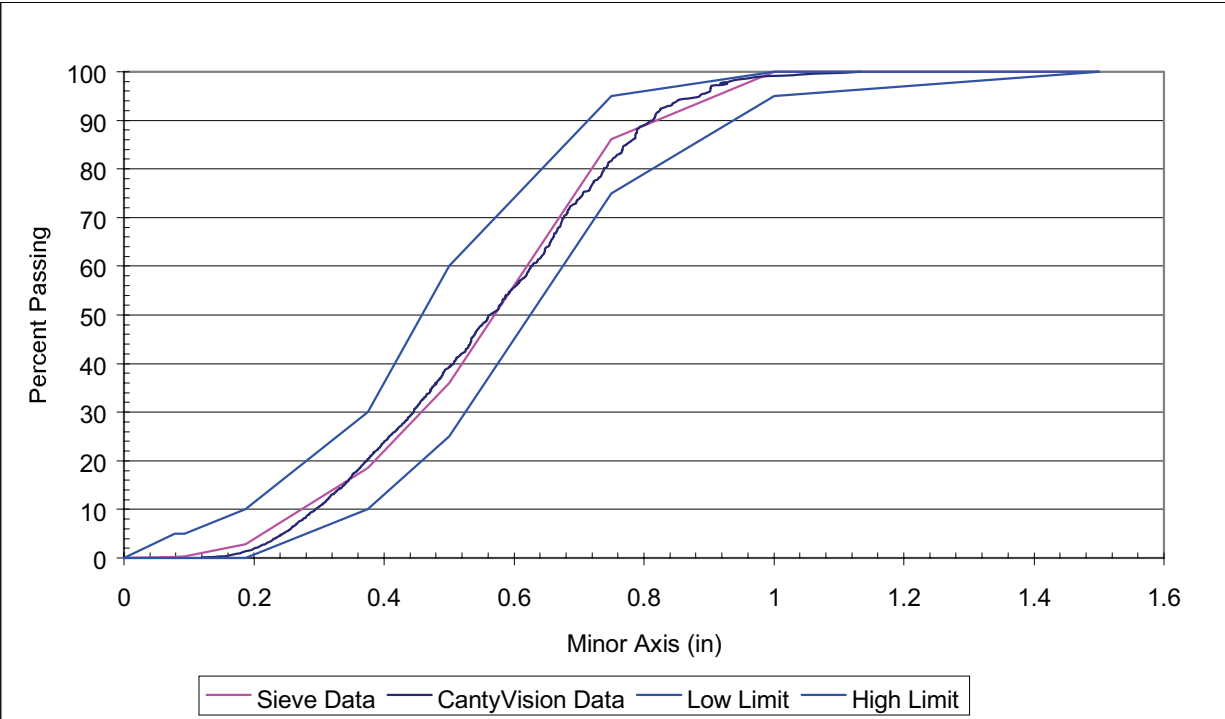


Table 3: Summary of percent passing data

	10%		50%		90%	
	Vector	Sieve	Vector	Sieve	Vector	Sieve
Sample 1	0.463	0.414	0.716	0.709	0.935	0.944
Sample 2	0.114	0.126	0.183	0.183	0.254	0.240
Sample 3	0.240	0.216	0.395	0.396	0.623	0.650
Sample 4	0.277	0.233	0.576	0.584	0.820	0.884
Sample 5	0.294	0.272	0.563	0.570	0.813	0.820

### **Conclusions:**

The Canty Rocksizer provides consistent measurements of particle sizes and reproducible results. It provides full particle size distributions for both small and large rocks that are in close agreement with traditional measurement techniques and can process both wet and dry stone samples. The system is usable both as an analytical tool for QC/QA and as an in-stream size analyzer and in that regard can provide measurement results in a matter of minutes on a continual basis.

### **Further Information:**

For further information on the Canty Rocksizer, please contact us at the address on this report or feel free to email us at [sales@jmcanty.com](mailto:sales@jmcanty.com).