IOWA STATE HIGHWAY COMMISSION
MATERIALS DEPARTMENT
PHYSICAL TESTS SECTION

FINAL REPORT OF R-257

LABORATORY EVALUATION OF GILSON PORTA SPLITTER

APRIL 26, 1972

Final Report of R-257, "Laboratory Evaluation of Gilson Porta-Splitter."

Please find attached one copy of the above subject report.

Reducing a field coarse aggregate sample down to a test sample weight by quartering has left much to be desired, because of the segregation which occurs during this process. The Gilson "Porta-Splitter" was evaluated to determine the acceptability of this device for reducing coarse aggregate samples.

R-257 has indicated very good repeatability with the "Porta-Splitter".

As a direct result of this project we will establish a field test method using this device, and purchase as many for field use next year as our budget permits.

IOWA STATE HIGHWAY COMMISSION

MATERIALS DEPARTMENT

Physical Tests Section

Final Report of R-257

LABORATORY EVALUATION OF GILSON PORTA SPLITTER

April 26, 1972

Materials Laboratory

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R-257

LABORATORY EVALUATION OF GILSON PORTA SPLITTER

1.0 INTRODUCTION

The field sample of concrete coarse aggregate (Mix 2-4) is required to be 50 pounds, and the minimum size sample for particle size determination, for this material, is 10.0 kg. (Spec. I.M. 301) necessitating a reduction in size of the original sample. This can be done by one of three methods:

1. Quartering
2. "Build-up sample"
3. Splitting

While Method 2 above is used and preferred in the Central Laboratory, it is not nearly as popular in field laboratories. Since splitters with riffles one inch in width is the only type furnished for field use by the Laboratory, the maximum size of aggregate that can be split is approximately 3/4 inch. This effectively eliminates Method 3 for concrete coarse aggregate with a maximum size of 1-1/2 inch or even 1 inch. Since sample quartering leaves much to be desired, and since the smaller splitters have been used so successfully on asphalt projects (where the maximum size of aggregate is rarely greater than 3/4 inch), it was felt that a splitter with an opening sufficiently large would provide both a faster and better method of reducing the sample size to 10 kg. Consequently a portable splitter was

obtained by the Laboratory, which has adjustable size openings in one-half inch increments, and sufficiently large to accommodate both the maximum particle size and the required field sample size (Gilson Porta Splitter).

The splitter was given preliminary testing by the Aggregate Section of the Laboratory, and later by District No. 1 Materials Department in the field, with somewhat conflicting data shown between them.

2.0 PURPOSE

The purpose of this investigation was to continue and expand the evaluation of this device, to determine the causes and resolve the differences previously encountered, and to determine if the Gilson Porta Splitter could be used successfully for reducing coarse aggregate samples in the field to the required minimum sample of 10 kg. The Bituminous Physical Section of the Laboratory was assigned the responsibility of performing the necessary tests and submitting the test data.

3.0 MATERIALS

The coarse aggregate was provided by the Aggregate Section from excess of routine samples, and supplemented as necessary with additional field samples.

A total of 28 gravel or limestone aggregates were split, and the results evaluated, including maximum size to 1-1/2 inch on 21 samples, and maximum size to 1.05 inch on 7 additional samples.

4.0 LABORATORY PROCEDURE

1. It was not necessary to determine the minus No. 200 material in this investigation, so the washing procedure

was eliminated.

2. It was permissible to perform the sieve analysis on this material in a saturated surface dry condition, so oven drying of the sample was not necessary. However, the aggregates tested were air dried sufficiently to eliminate most of the absorbed moisture.

3. A sample of approximately 50 pounds (SSD) was weighed for each test determination. (To comply with I.M. 301) The 50 pound weight of each sample produced the required minimum of 10 kg. (approximately 22 pounds) with just one splitting.

4. The size of opening of the splitter riffles was two inches for the minus 1-1/2 inch aggregate size, and 1-1/2 inch for the minus 1.05 inch aggregate samples.

5. The original 50 pound sample was evenly distributed in two pails, and one was poured into the hopper of the splitter. By regulating the discharge gate, the aggregate was dropped over the riffles so that it would not pile up or bridge over, and at the same time maintain a uniform flow of aggregate across the entire length of the discharge gate. A tapping on the side of the splitter effectively eliminated any difficulty in passing the material through the splitter. This procedure was repeated with the other portion of the sample in the other pail, and with the catch pans switched (placed on the opposite sides of the splitter).

6. The total amount of material in each pan was weighed, and a particle size distribution was completed and computed on each of the two portions. This procedure was followed on 14 determinations.

7. On seven additional samples the above procedure was altered by fully opening the discharge gate and, using one of the catch pans containing the aggregate, the sample was poured directly onto the riffles, by-passing the hopper completely. The aggregate was at a uniform level in the pouring pan, and it was inverted into the open hopper. Again the catch pans were switched after each individual pour increment.

8. On seven more samples the 50 pound field sample was placed on a metal table top and, again by-passing the hopper completely, a flat scoop of the approximate width of the riffles was used to introduce the aggregate on the splitter riffles, directly and uniformly from edge to edge. The catch pans were switched after each scoopful was poured.

9. The routine procedure for determining the sieve analysis of the coarse aggregate was used, except the sizing stopped with the No. 4 sieve. The per cent passing each sieve was reported to the nearest tenth for greater accuracy in comparing results.

5.0 CONCLUSIONS

The results of each split, using each of the three procedures (5, 7 and 8 as described above) are a part of this report, and very little evaluation is required to see that the duplication of the two fractions of each aggregate is very close. The total weight of each portion of the split is reasonably close, and the results of the particle size distribution on each half of the split sample are remarkably and uniformly close.

While there is very little basis to recommend one procedure over the other two, it is generally felt that the procedure, as described in Paragraph 7 above, is the best choice for the following reasons:

1. The average results are most accurate.
2. Procedure No. 8 involves the most work, the least accurate average results, and presents the greatest possibility of loosing fine material (minum No. 200).
3. Procedure No. 5 is a very close second, and could very well be used.

On the basis of this short investigation, there is every reason to believe that the Gilson Porta Splitter could be used successfully for reducing coarse aggregate samples in the field to the requirements of I.M. 301. It is faster than the quartering or build-up alternatives, and both of these methods would be "hard pushed" to equal the accuracy indicated on the tabulated results. Comparing the results of quartered samples was not a part of this investigation, but preliminary work performed in the Aggregate Section indicated this method was the least accurate of the three alternatives.

A P P E N D I X

GILSON PORTA SPLITTER EVALUATION

Hopper Used in Aggregate Discharge

2 Inch Opening

Sieve	Aggregate No. 1 Per cent Passing		Aggregate No. 16 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	91.3	89.5	87.8	85.8
3/4"	70.7	70.7	64.4	63.5
1/2"	46.6	47.9	44.4	43.4
3/8"	24.5	24.0	25.7	24.3
No. 4	2.0	1.7	4.9	4.4
Total (gms)	11,717	10,835	11,393	10,570

Sieve	Aggregate No. 17 (Gravel) Per cent Passing		Aggregate No. 18 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	82.0	83.7	88.1	87.2
3/4"	54.8	58.4	67.0	66.4
1/2"	36.7	39.8	46.9	47.1
3/8"	21.0	21.7	27.5	26.9
No. 4	3.4	3.4	4.1	3.9
Total (gms)	11,531	11,874	11,139	11,559

Sieve	Aggregate No. 20 (Gravel) Per cent Passing		Aggregate No. 21 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	85.5	84.8	84.6	81.7
3/4"	61.2	62.5	63.5	63.7
1/2"	38.8	39.5	42.8	43.3
3/8"	18.7	20.6	22.9	24.3
No. 4	0.3	0.4	2.8	3.2
Total (gms)	11,720	12,532	11,821	10,809

Sieve	Aggregate No. 22 (Limestone) Per cent Passing		Aggregate No. 23 (Gravel) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	87.6	86.2	87.4	89.0
3/4"	65.2	63.1	62.7	63.6
1/2"	44.3	42.3	44.2	43.5
3/8"	23.3	22.9	23.3	22.5
No. 4	2.7	2.7	3.7	3.4
Total (gms)	11,183	10,739	10,877	11,026

Sieve	Aggregate No. 24 (Limestone) Per cent Passing		Aggregate No. 25 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	83.8	81.7	92.9	92.0
3/4"	64.8	60.8	69.8	69.8
1/2"	42.9	39.4	45.4	44.6
3/8"	21.6	19.7	25.7	25.9
No. 4	4.0	3.6	5.1	4.9
Total (gms)	11,041	11,210	11,423	9,897

Sieve	Aggregate No. 26 (Limestone) Per cent Passing		Aggregate No. 27 (Gravel) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	84.2	88.0	87.2	84.3
3/4"	61.5	65.4	62.0	58.2
1/2"	42.0	43.7	43.4	40.2
3/8"	23.3	22.8	21.7	20.1
No. 4	5.2	4.8	2.6	2.5
Total (gms)	10,217	11,813	10,675	11,151

(Same as above, but with 1-1/2 inch opening and 3/4 inch aggregate.)

Sieve	Aggregate No. 13 (Limestone) Per cent Passing		Aggregate No. 15 (Gravel) Per cent Passing	
1.05"	100.0	100.0	100.0	100.0
3/4"	80.4	79.3	75.8	76.5
1/2"	49.2	50.4	51.1	52.8
3/8"	24.5	25.3	28.6	28.8
No. 4	2.1	2.0	5.6	5.8
Total (gms)	10,585	12,037	9,910	11,475

GILSON PORTA SPLITTER EVALUATION

Aggregate Poured on Riffles (Using Sampling Scoop)
With Hopper Gates Fully Retracted (Open)

2 Inch Opening

Sieve	Aggregate No. 7 Per cent Passing		Aggregate No. 10 Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	81.1	81.3	87.1	83.8
3/4"	50.0	49.8	62.1	61.7
1/2"	33.0	31.7	39.6	38.6
3/8"	19.5	19.5	25.2	22.9
No. 4	0.9	0.9	3.6	3.3
Total (gms)	11,297	11,414	11,287	11,487

Sieve	Aggregate No. 12 Per cent Passing		Aggregate No. 19 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	82.4	81.4	79.5	83.4
3/4"	57.8	54.3	61.2	65.3
1/2"	38.5	36.2	40.5	44.0
3/8"	20.4	19.6	23.4	25.5
No. 4	1.7	1.7	3.5	4.1
Total (gms)	11,673	11,441	11,740	10,701

(Same as above, but with 1-1/2" opening and 3/4" aggregate.)

Sieve	Aggregate No. 8 (Gravel) Per cent Passing		Aggregate No. 9 (Gravel & Limestone) Per cent Passing	
1.05"	100.0	100.0	100.0	100.0
3/4"	64.8	68.6	84.4	83.6
1/2"	34.9	39.3	60.0	61.5
3/8"	11.1	12.4	41.0	41.7
No. 4	0.5	0.6	8.7	9.1
Total (gms)	11,648	11,015	11,639	12,100

Sieve	Aggregate No. 11 (Limestone) Per cent Passing	
1.05"	100.0	100.0
3/4"	79.8	78.2
1/2"	49.1	46.1
3/8"	24.1	23.5
No. 4	1.9	1.7
Total (gms)	10,382	10,838

GILSON PORTA SPLITTER EVALUATION

Aggregates Poured on Riffles (Using Sampling Pan) With Hopper Gates Fully Retracted (Open)

2 Inch Opening

Sieve	Aggregate No. 2 Per cent Passing		Aggregate No. 3 Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	92.8	91.9	95.5	96.1
3/4"	70.3	72.0	71.6	72.9
1/2"	50.8	51.5	38.7	40.0
3/8"	26.7	26.2	13.2	13.6
No. 4	1.7	1.6	1.3	1.4
Total (gms)	11,053	11,576	11,774	10,969

Sieve	Aggregate No. 4 Per cent Passing		Aggregate No. 5 Per cent Passing	
1-1/2"	100.0	100.0	100.0	100.0
1.05"	96.1	95.5	89.9	90.1
3/4"	73.3	72.1	68.6	65.9
1/2"	38.7	36.1	45.3	44.4
3/8"	23.5	22.0	24.9	24.0
No. 4	1.4	1.3	2.8	2.6
Total (gms)	10,893	11,661	11,427	11,575

Sieve	Aggregate No. 28 (Limestone) Per cent Passing	
1-1/2"	100.0	100.0
1.05"	86.6	86.9
3/4"	63.0	61.2
1/2"	42.1	40.4
3/8"	22.0	20.5
No. 4	2.9	3.0
Total (gms)	10,511	11,346

(Same as above, but with 1-1/2 inch opening and 3/4 inch aggregate)

Sieve	Aggregate No. 6 Per cent Passing		Aggregate No. 14 (Limestone) Per cent Passing	
1.05"	100.0	100.0	100.0	100.0
3/4"	74.1	77.6	73.0	75.0
1/2"	51.4	53.7	46.7	48.4
3/8"	27.0	28.1	23.3	25.7
No. 4	3.3	3.3	2.7	3.0
Total (gms)	11,463	11,051	11,220	11,431