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2 CHAPTER TWO:
SAMPLING

SAMPLING TECHNIQUES

Sampling is perhaps the most important step in assuring that good quality aggregates are being used. Since a sample is just a small portion of the total material, the importance that the sample be representative of the material being delivered can not be overemphasized. Any test performed on the sample, regardless of how carefully and accurately performed, is worthless unless the sample is truly representative of the material offered for use on the project.

SAFETY

The sampling of materials can expose the technician to machinery, moving belts, large stockpiles, and other potential dangers. Proper safety practices are always the first concern. When not sure of safety the technician should stop and seek the supervisor's instructions.

SAMPLE REFERENCES

A representative sample can be obtained by following the standard procedures detailed in the latest edition of **AASHTO T2** and **ITM 207**, "Method of Sampling Stockpile Aggregate."

SIZE OF ORIGINAL SAMPLES

The key to any sample program is to obtain a representative sample. A standard sampling method must be followed to obtain uniform samples.

The following is a list of recommended minimum sizes of composite samples to be used as a guide when collecting samples.

MATERIAL	SAMPLE SIZE
No. 2 coarse aggregate	220 lb
No. 5 coarse aggregate	110 lb
No. 8 coarse aggregate	55 lb
No. 9 coarse aggregate	35 lb
No. 11 & No. 12 coarse aggregate	25 lb
No. 43 coarse aggregate	110 lb
No. 53 coarse aggregate	135 lb
No. 73 coarse aggregate	80 lb
2 in. Structure Backfill	245 lb
1 1/2 in. Structure Backfill	190 lb
1 in. Structure Backfill	135 lb
1/2 in. Structure Backfill	60 lb
All sands No. 4 & No. 30 B Borrow	25 lb

The weight of the sample depends on the maximum particle size of the material being inspected. As a rule, a larger top size material the larger the sample. A 25 lb sample of No. 2 coarse aggregate would not be as representative of the material as a 25 lb sample of natural sand.

TWO IMPORTANT DEFINITIONS TO REMEMBER

Top Size or Maximum Particle Size--The sieve on which 100 percent of the material will pass.

Nominal Maximum Particle Size--Smallest sieve opening through which the entire amount of the aggregate is permitted to pass.

SAMPLE TYPES

The technician should realize there are different types of samples. The most common sample is a stockpile sample.

Some samples need to be taken by the Producer in the processing operation to assure that the final product will be within control limits. These samples are referred to as production samples. The gradation at this point may not be the same as the stockpile sample at some facilities.

Occasionally, an investigative sample should be obtained by the Producer when looking for a very specific feature, such as a certain sieve, oversized material, etc. These tests may consist of many shortcuts and should only be used as a quick comfort level check.

Every source can have other types of samples which are unique to their operation.

METHODS OF SAMPLING

Due to the various sampling locations and the availability of equipment, there are several methods of taking aggregate samples. Uniformity of obtaining the sample cannot be emphasized enough, since it eliminates one variable in test results. The technician must remember that safety comes first.

PRODUCTION SAMPLING

Bin Sample

Sampling the top of the bin is extremely dangerous as well as a difficult, if not impossible, method to obtain a representative sample. For this reason, this method of sampling is undesirable.

Discharge Sampling of Bins or Belts

Bin samples can be taken at the discharge chute. In these cases a number of small samples should be taken at short intervals and combined to make the total sample. Each of these samples must include the entire cross section of the flow of material from the chute or belt. Continuity of operation normally will not allow the technician to control the rate of flow from the discharge chute to allow these samples to be taken easier. A mechanical deversion or slide chute system is the quickest, safest, and most accurate system for taking a belt sample; unfortunately very few mechanical systems exist.

Belt Sampling

Belt sampling consists of taking samples of materials directly from conveyor belts. The proper procedure is to:

1) Make sure that the belt is carrying a normal load of material that is not segregated;

2) Have the plant operator stop the belt, and use proper lock out procedures;

3) Take a complete cross section of the material, being careful to include all the material on the belt and only the material in the section. A template is recommended, especially on steeply inclined belts. Remove most of the sample with a scoop or shovel and the remainder with a brush; and

4) Take as many complete cross sections as necessary to obtain a sample that meets the minimum sample size.

STOCKPILE SAMPLING

Coarse Aggregate Stockpiles

Coarse aggregates are recommended to be sampled using **ITM 207**. A summary of the procedure includes the following:

1) Locate the area of the stockpile from which hauling will begin.

2) Using a front-end loader, dig into the stockpile and set aside a small pile of 10 to 15 t of material. This should be done in the same manner as if a truck is being loaded for shipment (Figs. 2.1 and 2.2). When forming the small pile, the loader bucket should be as low as possible, and the operator should roll the material from the bucket rather than dumping the material. Reducing the distance the material is allowed to free-fall will reduce the amount of segregation that may occur in the small pile (Fig. 2.3). Each additional bucket load of material should be taken and dumped in the same manner as set out above, and should be placed uniformly over the preceding one. (Fig. 2.4).

3) Thoroughly mix the small pile. Using the loader bucket, go to the end of the oblong pile and roll the material over. Keeping the loader bucket as low as possible, push the bucket into the material until the front of the bucket passes the midpoint of the original pile. The loader bucket should then be slowly raised and rolled forward thus producing a smooth mixing of the material. (Figs. 2.5, 2.6 and 2.7). Go to the opposite end of the pile, and repeat this mixing procedure. If the pile does not appear to be reasonably uniform, additional mixing should be done.

4) The pile is now ready for sampling. Do not strike off the top (Fig. 2.8). The sample will be taken at the center of the volume which is approximately one-third of the height of the pile. The sample shall consist of not less than 6 full shovels of material taken at equal increments around the pile (Figs. 2.9, 2.10 and 2.11). The shovel shall be inserted full-depth horizontally into the material and raised vertically. Care should be taken to retain as much of the material as possible on the blade of the shovel (Fig. 2.12).

Fine Aggregate Stockpiles

Fine aggregate samples normally are obtained in the same method as coarse aggregate samples, except a fire shovel or sampling tube is used to collect the material.

SAMPLING DIRECTLY FROM TRUCKS, RAIL CARS, OR BARGES

Direct sampling from the trucks, rail cars, or barges is not recommended. There are a number of factors that may influence the gradation of the material, such as segregation or particle breakdown during loading, transporting, and unloading. Therefore, material being shipped by cars or barges should be sampled at the point of delivery.

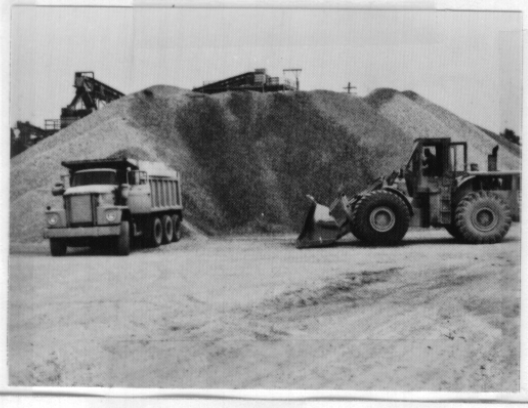
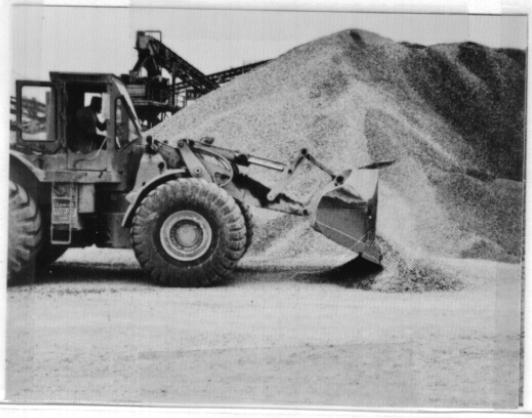


Figure 2.1

Figure 2.2



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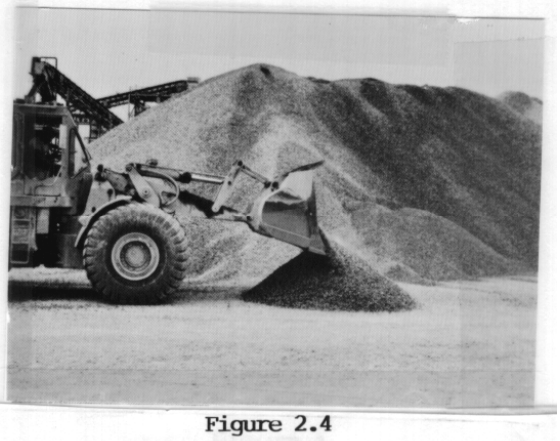
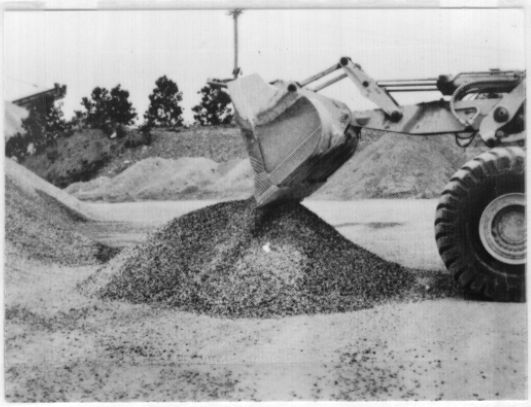


Figure 2.4

Figure 2.5

Figure 2.6



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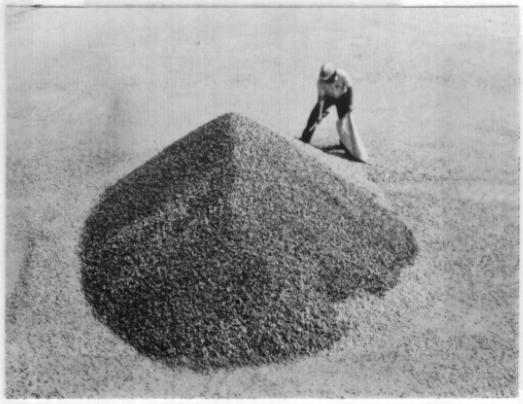

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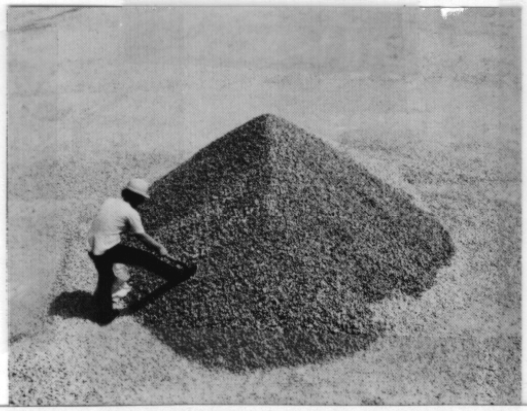

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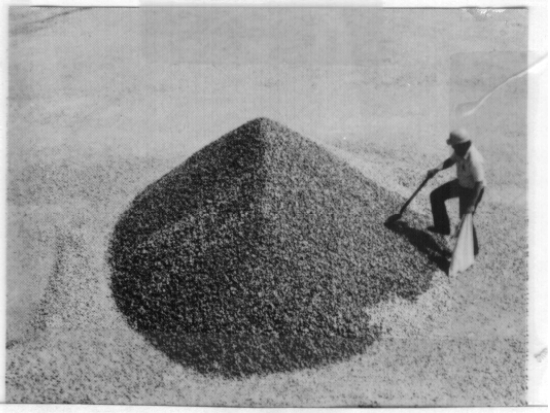

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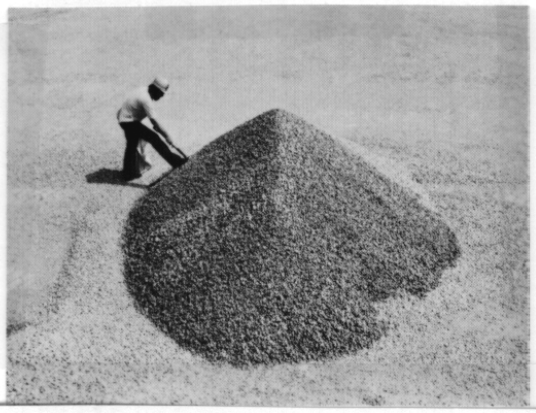

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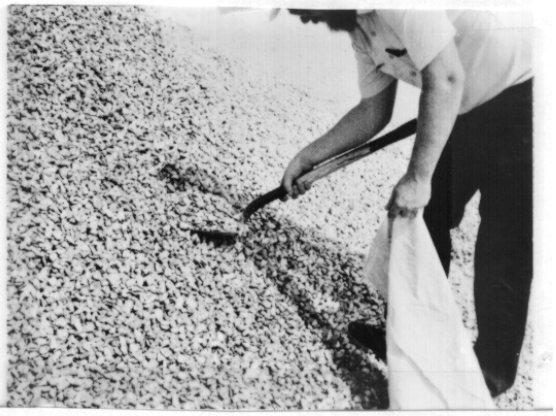

Figure 2.12