



**DETERMINING THE AMOUNT OF CHERT, SHALE,
IRON OXIDE, & COAL IN COARSE AGGREGATE**

SCOPE

This test method is for determining the amount of chert, shale (alternate method to [IM 345](#)), iron oxide and coal in coarse aggregate. For this method, chert is identified as (1) an extremely dense sedimentary rock consisting dominantly of silica and being flint-like in appearance. It is considered sound and is referred to as brown chert. (2) Chert commonly referred to as white chert may range in color from white to dark gray. This chert is softer, less dense than the brown chert and frequently has a chalk-like appearance. This type of chert is considered to be unsound.

Shale particles are lightweight, porous, and highly absorptive. These particles are usually a light color of gray and will form suction to a wetted finger. Shale is less dense than other aggregate.

Iron oxide particles usually have a reddish color due to the presence of oxidized iron. These particles are usually more dense than carbonate and may have unusual shapes.

Coal and lignite particles are usually dark to black and are commonly lightweight and can be scratched with a knife.

PROCEDURE

A. Apparatus

1. Sieves - a 3/8 in. (9.5 mm) and No. 4 (4.75-mm) sieve having wire cloth conforming to AASHTO M-92
2. Oven or hotplate
3. Balance - A balance having a capacity of at least 5000 grams, accurate to 0.1 gram

B. Sample Size

1. Obtain a representative sample by appropriate methods as detailed in [IM 336](#) to the size that will conform to IM 301 sieve analysis of applicable material. The weight of the representative sample after reduction must be large enough to yield a minimum of 2500 grams of material after sieving over the appropriate sieve size for the intended use, either the No. 4 (75-mm) or 3/8-in. (9.5-mm).

C. Sample Preparation

1. When the sample represents material intended for use in PC Concrete for bridge deck repairs, surfacing and overlays, the sample must be sieved on the No. 4 (4.75-mm) sieve. The material passing the No. 4 (4.75-mm) sieve is discarded and the amount of chert, shale, iron oxide, or coal is determined on the plus No. 4 (4.75-mm) sieve size portion of the sample.

When the sample represents material intended for other types of PC Concrete construction, the sample must be sieved on the 3/8-in. (9.5-mm) sieve. The material passing the 3/8-in. (9.5-mm) sieve is discarded and the amount of chert, shale, iron oxide, or coal is determined on the plus 3/8-in. (9.5-mm) sieve size portion of the sample.

D. Test Procedure

1. Wash and decant the sample to remove dust from the surface of the aggregate particles.
2. Spread the sample out on a flat surface. Visually examine the aggregate particles and remove the white and brown chert, shale, iron oxide or coal.
3. Dry and cool the sample to a constant mass (weight) in an oven at a temperature of 230°F ± 9°F (110 °C ± 5°C) or on a hot plate at low heat setting.
4. Weigh the total amount of each type of chert (white and brown), shale, iron oxide, or coal to the nearest 0.1 gram.

NOTE 1: If the percent of shale exceeds the specification limit; the particles shall be floated in zinc chloride to confirm the shale determination using Test Procedure D of [IM 345](#).

E. Calculations

1. Calculate the percent of each type of chert (white and brown), shale, iron oxide or coal based upon the total mass (weight) of the sample [plus No. 4 (4.75-mm)] after washing and drying.

PERCENT CHERT, SHALE, IRON OXIDE, OR COAL =

$$\frac{\text{Dry Mass (Wt.) of Chert (etc.)}}{\text{Dry Mass (Wt.) of Original}} \times 100$$