ATT-50/22, PERCENT FRACTURES
Part II, 80,000 µm Minus Aggregate

1.0 SCOPE

This method describes the procedure for checking the efficiency of crushing operations on any aggregate with a topsize larger than 25,000 µm and smaller than 80,000 µm, by determining the percent, by weight of particles which have two or more fractured faces.

2.0 EQUIPMENT

Refer to ATT-50, Part "I", Section 2.0, Equipment.

Additional equipment: 16,000 µm sieve, sample splitter
mixing pans, sample bags

Data Sheet: Percent Fractures (-80,000 µm), such as MAT 6-28

3.0 PROCEDURE

3.1 Sample Preparation

1. Obtain a representative sample of aggregate as directed in ATT-38, SAMPLING, Gravel and Sand. The approximate sample sizes required according to the aggregate topsize are shown in Table 1.

   These sizes are based on the minimum required weight of + 16,000 µm aggregate shown in Table 2 and the specified maximum percent passing (or minimum % retained) on the 16,000 µm sieve. As the percent passing the 16,000 µm sieve decreases, the sample size may be decreased as long as the minimum weight of +16,000 µm aggregate shown in Table 2 is obtained.

TABLE 1

AGGREGATE TOPSIZE (µm)	SAMPLE SIZE (kg)
40 000	75
50 000	60

2. Sieve the sample through the 16,000 µm sieve.

3. Tare one large mixing pan and record as “Wt. of Pan” on line "B", as shown in Figure 1 on MAT 6-28.

4. Weigh the material retained on the 16,000 µm sieve in the tared mixing pan. Record as “Wt. of +16,000 µm Aggregate + Pan” on line "A".

5. Calculate the “Weight of +16,000 µm Aggregate” on line "C" as follows:

   Wt. of +16 000 µm Aggregate = Wt. of +16 000 µm Aggregate & Pan - Wt. of Tare Pan

   The weight of +16,000 µm aggregate must meet the minimum sample size according to the topsize of aggregate, as shown in Table 2.

6. Tare another large mixing pan and record its weight in line "G".

7. Sieve the -16,000 µm aggregate through the 5,000 µm sieve. Discard the -5 000 µm material.

8. Weigh material retained on the 5,000 µm sieve in the tared mixing pan. Record as "Wt. of -16,000 µm +5,000 µm Aggregate + Pan on line "F".

9. Determine the "Weight of -16,000 µm +5,000 µm Aggregate" on line "H" as follows:

= Wt. of -16 000 µm +5 000 µm Aggregate & Pan - Wt. of Tare Pan

10. When the -16,000 µm aggregate is at least 1300 grams, but not too large:

    a) If the sample is clean enough to detect fractured faces, transpose the weight shown in the line "H" to line "K" and proceed with Section 3.2, Percent Fractures.

    b) If the sample is too dirty to detect fractured faces, proceed with step 12 below.

TABLE 2

AGGREGATE TOPSIZE (µm)	MINIMUM SAMPLE WT. OF + 16 000 µm AGGREGATE (g)
40 000	11 000
50 000	11 000

11. If the weight of "-16,000 µm +5,000 µm " aggregate is too large, use the sample divider to successively split this aggregate, until a sample of at least 1300 g is obtained.

12. Label and tare a drying pan. Record the tare pan weight and pan number in line "J".

13. If the "-16,000 µm +5,000 µm " aggregate is extremely dirty where it is difficult to detect fractured faces, or the sample has clay lumps (as these may add to the +5 000 µm weight):

    a) Dump the +5,000 µm material in a metal pail, cover it with water, agitate the sample, then drain the dirty water through the 5,000 µm sieve.

    b) Repeat step (a) until the aggregate is clean enough to clearly detect fractured faces, and clay lumps have been broken down.

    c) Dump the sample in the tared drying pan and dry the sample to a constant weight, as directed in ATT-14, MOISTURE CONTENT, Open Pan Method.

14. Weigh the material retained on 5,000 µm sieve in the tared drying pan. Record as "Wt. of -16,000 µm +5,000 µm Aggregate & Pan on line "I".

15. Calculate the "Weight of -16,000 µm +5,000 µm Aggregate" on line "K" as follows:

= Wt. of - 16 000 µm + 5 000 µm Aggregate & Pan - Wt. of Tare Pan

3.2 Percent Fractures

1. For both "-Topsize +16,000 µm" and "-16,000 µm +5,000 µm" fractions, manually separate the crushed particles from the uncrushed particles.

   NOTE: Any particle with two or more fractured faces is classified as a crushed particle.

2. Place the fractured "-Topsize +16,000 µm Aggregate" in the tared mixing pan and weigh. Record as "Wt. of Crushed +16,000 µm Aggregate & Pan" on line "D".

3. Determine the "Weight of Crushed +16,000 µm Aggregate" on line "E" as follows:

   = Wt. of Crushed +16 000 µm Aggregate & Pan - Wt. of Tare Pan

4. Weigh the crushed "-16,000 µm +5,000 µm Aggregate" in the tared drying pan and record the weight in line "L".

5. Determine the "Weight of Crushed "-16,000 µm +5,000 µm Aggregate" on line "M" as follows:

   = Wt. of Crushed -16 000 µm +5 000 µm Aggregate & Pan - Wt. of Tare Pan

   If this fraction was not split, transpose the result to line "P".

6. Calculate the Percent of the "-16,000 µm +5,000 µm" Aggregate (line "N") using the formula:

$$\textit{\% Fractures} = \frac{\textit{Wt. of Crushed -16 000 µm +5 000 µm Agg.}}{\textit{Wt. of -16 000 µm +5 000 µm Aggregate}} \textit{ x 100}$$

7. Determine the Total of Weight of +5,000 µm Aggregate (line "Ø") as follows:

   Total Wt. of Sample = Wt. of +16 000 µm Agg. + Wt. of -16 000 µm +5 000 µm Agg.

8. If the -16,000 µm +5,000 µm aggregate was split, calculate the "Total Weight of Crushed Aggregate (of the total fraction) on line "P" as follows:

$$\textit{Total Wt. of Crushed -16 000 +5 000 µm Agg.} = \frac{\textit{\% Fractures x Wt. of -16 000 µm +5 000 µm Agg.}}{\textit{100\%}}$$

9. Determine the "Total Weight of Crushed Aggregate" in the total sample (line "Q") as follows:

   = Wt. of Crushed +16 000 µm Agg. + Total Wt. of Crushed -16 000 µm +5 000 µm Agg.

10. Calculate the "Percent Fractures of the Total Sample" (line "R") using the formula:

$$\textit{Total \% Fractures (\%)} = \frac{\textit{Total Wt. of Crushed Aggregate (line "Q")}}{\textit{Total Wt. of +5 000 Aggregate (line "O")}} \textit{ x 100}$$

Alberta Transportation

MAT 6 - 28/22 Test Procedure ATT - 50, Part II

PERCENT FRACTURES
80 000 μm MINUS

PROJECT	2:56	CONTRACT NO.	6666 / 95
FROM	Here	SUPPLIER	R. ROADS
TO	There	PIT NAME	CHERRY
		PIT LOCATION	NW 22-76-18-5

MIX TYPE					
DATE		1-Jan-2010			
FROM - TO TEST NUMBER		1			
DESIGNATION AND CLASS OF AGGREGATE		2 - 40			

TOTAL TOPSIZE +16 000µm AGGREGATE

A	WT. OF +16 000µm AGGREGATE & PAN			14,521.8			
B	WEIGHT OF TARE PAN		g	2,483.2			
C	WT. OF +16 000µm AGGREGATE	A-B	g	12,038.6			
D	WT. OF FRACTURED +16 000µm AGGREGATE & PAN		g	9,284.9			
E	WT. OF FRACTURED +16 000µm AGGREGATE	D-B	g	6,801.7			

TOTAL -16 000µm +5 000µm AGGREGATE

F	WT. OF -16 000µm +5 000µm AGGREGATE & PAN		g	12,124.3			
G	WEIGHT OF TARE PAN		g	2,378.2			
H	WT. OF -16 000µm +5 000µm AGGREGATE	F-G	g	9,746.1			

-16 000µm +5 000µm SPLIT SAMPLE

I	WT. OF -16 000µm +5 000µm AGGREGATE & PAN		g	3,283.9			
J	WEIGHT OF TARE PAN		g	1,248.7			
K	WT. OF -16 000µm +5 000µm AGGREGATE **(min 1300 g)**	I-J	g	2,035.2			
L	WT. OF FRACTURED -16 000µm +5 000µm AGGREGATE & PAN		g	2,862.5			
M	WT. OF FRACTURED -16 000µm +5 000µm AGGREGATE		g	1,613.8			
N	PERCENT FRACTURES OF -16 000µm +5 000µm AGG.	100 M*K	%	***79.3%***			

PERCENT FRACTURES OF TOTAL SAMPLE

O	TOTAL WT. OF -16 000µm +5 000µm AGGREGATE	C+H	g	21,784.7			
P	TOTAL WT. OF FRACTURED -16 000µm +5 000µm AGG.	* NH / 100	g	7,728.1			
Q	TOTAL SAMPLE WT. OF FRACTURED AGGREGATE	E + P	g	14,529.8			
R	PERCENT FRACTURES OF TOTAL SAMPLE	100 Q/O	g	***66.7%***			

NOTE: A FRACTURED PARTICLE IS A PARTICLE WITH TWO OR MORE FRACTURED FACES.
***** Split sample only

REMARKS

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FIGURE 1