ATT-50/22, PERCENT FRACTURES
Part I, 25,000 µm Minus Aggregate

1.0   SCOPE

This method describes the procedure for determining the percent by weight of +5,000 µm particles which have two or more, and one or more, fractured faces manufactured during the crushing operation of aggregates having a topsize of 25,000 µm or less.   The procedure includes methods used to determine the total percent fractures of unsplit and split aggregates and the percent fractures in the coarse crushed aggregate.

2.0   EQUIPMENT

1 – 5,000 µm sieve	1 - mixing spoon
2 - mixing pans	1 - scoop
2 - metal pails	1 - putty knife
2 - drying pans	1 - sieve brush

Data Sheet: Percent Fractures (25,000 µm minus), such as MAT 6-26

3.0   PROCEDURE

3.1   Two or More Face Fractures

1.   Obtain a representative sample of approximately 10 kg of unsplit aggregate for single stockpiles, or 10 kg of coarse crushed aggregate for split stockpiles, as directed in test method ATT-38, SAMPLING, Gravel and Sand.

2.   Label and tare a drying plan.   Record the pan number in line "A" and the pan weight in line "C" as shown in Figure 1.

3.   Place the aggregate in a mixing pan and mix thoroughly.

4.   Use the scoop to place the mixed aggregate onto the 5,000 µm sieve.   Avoid segregation and do not overload the sieve.

5.   Sieve the aggregate thoroughly.

6.   Discard the -5,000 µm material.

TABLE 1	
AGGREGATE TOPSIZE (µm)	WEIGHT OF + 5 000 µm AGGREGATE (g)
25 000	2 300
20 000	1 800
16 000	1 300
12 500	800
10 000	300

7.   Empty the material retained on the sieve (including oversize) into the tared drying pan and weigh.

8.   Repeat steps 4 to 7 until the weight of +5,000 µm aggregate is within 10% of the weight shown in Table 1 for the corresponding topsize of aggregate.

9. If the +5,000 µm material is extremely dirty where it is difficult to detect fractured faces, or the sample has clay lumps, wash the +5,000 µm material on the 5,000 µm sieve and dry the material to a constant weight.

10. Weigh the clean material retained on the 5,000 µm sieve in the tared drying pan.   Record as "Wt. of +5,000 µm Aggregate + Pan" on line "B".

11. Calculate the "Weight of +5,000 µm Aggregate" on line "D" as follows:

    Wt. of + 5000 µm Aggregate =   Wt. of + 5000 µm Aggregate plus Pan - Wt. of Tare Pan

12. Separate the crushed particles with two or more fractured faces manufactured during the crushing operation from the uncrushed particles.

    NOTE: If one face fractures is also required, separate this material from the uncrushed particles into another pan.

13. Place the crushed aggregate in the tared drying pan and weigh.
    Record as "Wt. of Crushed (2 or More Faces) Aggregate + Pan (line "E").

14. Determine the "Weight of Crushed (2 or More Faces) Aggregate" on line "F" as follows:

    = Wt. of Crushed (2 or more faces) Aggregate plus Pan - Wt. of Tare Pan

15. Calculate the "Percent Fractures (2 or More Faces) of the +5 000 µm Aggregate" on line "G using the formula:
    For single stockpiles, the result is the percent fractures.

    $$= \frac{\textit{Wt. of Crushed (2 or more Faces) Aggregate (line "F")}}{\textit{Wt. of + 5 000 µm Aggregate (line "D)}} \times 100$$

3.2   One or More Face Fractures

The following procedure is performed if the aggregate is being split and where the coarse crushed aggregate has specification requirements for one or more and two or more fractured faces.

1. Add the one face crushed aggregate (from Note in Section 3.1, Step 12) to the crushed (2 or more faces) aggregate in the tared drying pan and weigh. Record as "Wt. of Crushed (1 or More Faces) Aggregate + Pan" on line "H".

2. Determine the Weight of Crushed (1 or More Faces) Aggregate (line "I") as follows:

    = Wt. of Crushed (1 or more faces) Aggregate plus Pan - Wt. of Tare Pan

3. Calculate the "Percent Fractures (1 or More Faces) of the +5 000 µm Aggregate" on line "J" using the formula:

    $$= \frac{\textit{Wt. of Crushed (1 or more Faces) Aggregate (line "I")}}{\textit{Wt. of + 5 000 µm Aggregate (line "D")}} \times 100$$

	PERCENT FRACTURES **25 000 μm Minus**			
Alberta Transportation	PROJECT	**SH 999:08**	CONTRACT NO.	**6624 / 06**
	FROM	**here**	SUPPLIER	**R. ROADS**
	TO	**there**	PIT NAME	**CHERRY**
MAT 6-26/22 Test Procedure ATT - 50, Part I	MIX TYPE	**(see below)**	PIT LOCATION	**NW 22-37-09-05**

MIX TYPE	**H1**	**H2**	**GBC**	
DATE	**1-Jan-2014**	**2-Jan-2014**	**3-Jan-2014**	
FROM - TO TEST NUMBER	**1**	**2**	**3**	
DESIGNATION AND CLASS OF AGGREGATE	**1 - 16**	**1 - 12.5**	**2 - 16**	

TWO OR MORE FACE FRACTURES

				AA	**BB**	**CC**	
A	PAN NUMBER						
B	WEIGHT OF +5 000 μm AGGREGATE + PAN		g	**2916.1**	**3150.4**	**2953.1**	
C	WEIGHT OF TARE PAN		g	**1600.0**	**1800.3**	**1611.1**	
D	WEIGHT OF +5 000 μm AGGREGATE	B - C	g	**1316.1**	**1350.1**	**1342.0**	
E	WT. OF CRUSHED (2 or MORE FACES) AGGREGATE + PAN		g	**2797.7**	**2805.1**	**2611.3**	
F	WT. OF CRUSHED (2 or MORE FACES) AGGREGATE	E - C	g	**1197.7**	**1004.8**	**1000.2**	
G	PERCENT FRACTURES (2 or MORE FACES)	100 F / D	%	**91.0%**	**74.4%**	**74.5%**	

ONE OR MORE FACE FRACTURES

H	WT. OF CRUSHED (1 or MORE FACES) AGGREGATE + PAN		g	**2901.3**			
I	WT. OF CRUSHED (1 or MORE FACES) AGGREGATE	H - C	g	**1301.3**			
J	PERCENT FRACTURES (1 or MORE FACES)	100 I / D	%	**98.9%**			

TOTAL PERCENT FRACTURES (SPLIT STOCKPILES)

K	% OF COARSE CRUSHED AGG. IN TOTAL COMBINED AGG.	%	**65%**	**70%**		
L	% OF NATURAL FINE AGG. IN TOTAL COMBINED AGGREGATE	%	**10%**	**30%**		
M	% RETAINED ON 5000 μm SIEVE IN COARSE CRUSHED AGG.	%	**55%**	**55%**		
N	% RETAINED ON 5000 μm SIEVE IN THE NATURAL FINE AGG.	%	**20%**	**20%**		
O	TOTAL PERCENT FRACTURES	KMG / (LN) + (KM) %	**86.2%**	**64.4%**		

NOTE: THIS PROPORTION OF COARSE CRUSHED AGGREGATE AND NATURAL FINE AGGREGATE IS ESTIMATED AT THE CRUSHING STAGE AND FINALIZED BY THE MIX DESIGN.

REMARKS

PROJECT MANAGER _____ J. ROLLINS _____   MATERIALS TECHNOLOGIST(S) _____ CAPT. KIRK _____

FIGURE 1

3.3   Total Percent Fractures (Split Stockpiles)

1.   On split stockpile paving projects, the gradation of the combined aggregate and the proportion of crushed coarse and natural fine aggregate is determined by the mix design.   The amount of uncrushed aggregate in the natural fine aggregate stockpile and the proportion of natural fine aggregate will determine the total percent fractures of the final product. During crushing, the Total Percent Fractures is based on the estimated proportions of crushed coarse and natural fine aggregate.

2.   Determine the "Total Percent Fractures (2 or More Face Fractures)" on line "O" using the formula:

$$TPF = \frac{KMG}{(LN) + (KM)}$$

TPF =   the total percent fractures in the +5 000 µm sieve fraction of the total combined aggregate (2 or more faces).

K =   the proportion of the coarse crushed aggregate split expressed as a percentage of the total combined aggregate.

L =   the proportion of the natural fine aggregate split expressed as a percentage of the total combined aggregate.

M =   the percent retained on the 5 000 µm sieve of the coarse crushed   aggregate split.

N =   the percent retained on the 5 000 µm sieve of the natural fine aggregate split.

G =   the percent fractures (2 or more faces) in the coarse crushed aggregate.

For Quality Control purposes, use the daily average Percent Retained (lines "M" and "N"). The Project Average results will be used for final acceptance of the product.

4.0   HINTS AND PRECAUTIONS

1.   If manufactured fines are added to the recombined aggregate, the percentage of +5,000 µm Aggregate in the manufactured fines is considered to be insignificant in total percent fractures determination (if meeting the minimum % passing the 5,000 µm sieve specifications).

2.   At least one (1) percent fractures test is required for each day of crushing. If specifications are not being met, the frequency should be increased.

3.   Report all percent fracture test results on the Daily Gradation Report, (such as MAT6-60) and the Weekly Gradation Report (such as MAT6-72).