F-Numbers compared to "Gap under the Straightedge"

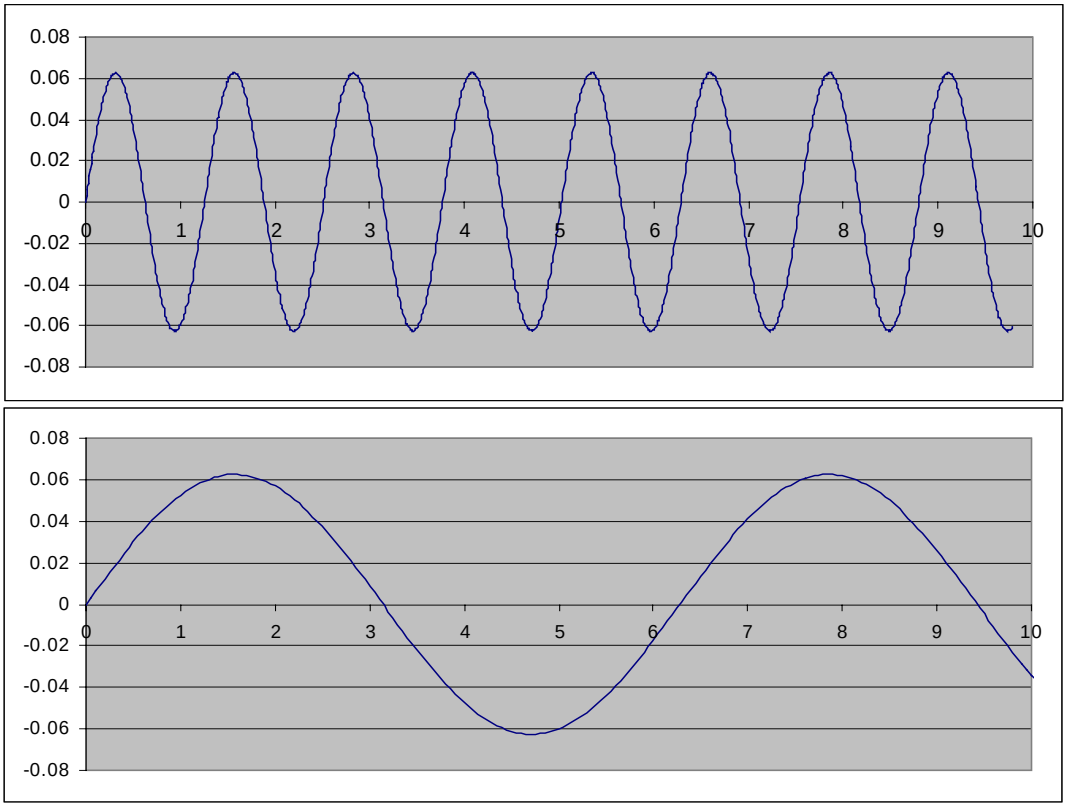
The table on the next page provides some approximations for comparison purposes between the F_F (Flatness) Number system and the "Gap under the Straightedge" system.
It should be noted that any comparison of "Gap under the Straightedge" numbers with F-Numbers can only be an approximation, because of the inherent limitations of the "Gap under the Straightedge" system.

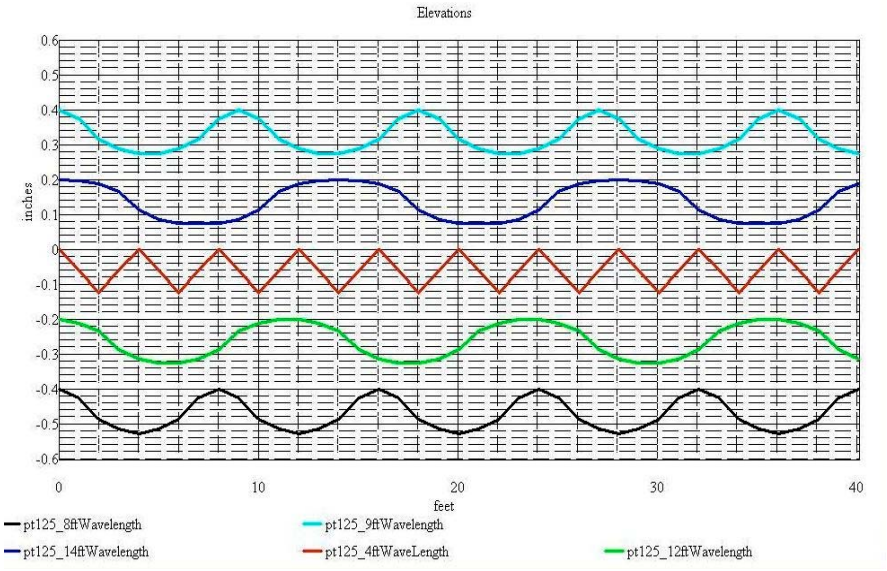
As ACI 117 points out,
"Although the 10 ft straightedge procedure has been used for more than 50 years for judging floor irregularities, the procedure has a number of serious deficiencies. These include:

- ***The difficulty in testing large areas of floors***
- ***The difficulty of randomly sampling floors***
- ***The inability to reproduce testing results***
- ***The inability using normal construction procedures to meet the tolerance limits normally specified, that is, 1/8 in. in 10 ft or 1/4 in. in 10 ft, and the widespread lack of conformance and the lack of testing for conformance of slab surfaces.***
- ***Failure of the method to predict acceptability of irregularities or roughness in the floor surface. The evaluation of roughness for a given amplitude should be based on the frequency of the wave forms.***
- ***The inability of the unleveled straightedge to evaluate levelness of the surface.***

The above is a direct quote from ACI 117.

- The last bullet points out that the "Gap under the Straightedge" method does not measure "levelness" at all, so there is no possible way to compare "Gap under the Straightedge" to F_L (Levelness) Numbers.
- The next-to-last bullet points out that the "Gap under the Straightedge" method measures only the amplitude of the irregularities in the floor, but does not measure the frequency (or wave length) of the irregularities. This is the major reason why it is difficult to compare F_F Numbers and " Gap under the Straightedge" Numbers. A floor with a surface having a sine wave 3.2 mm tall will produce a "Gap under the Straightedge" of 3.2 mm (if measured with great care), regardless of whether the wave length is 2 ft or 10 ft. Note that the two profiles below both have the same amplitude of floor surface flaws. However, one has a short wavelength and the other has a long wavelength. It is obvious that these two floors would not be perceived as having the same "flatness", yet the straightedge method does not distinguish between them.





The graph to the right was taken from our Dipstick® software, and compares five profiles, each with a gap under a straightedge of about 0.125 inches, or 3.2 mm on each profile. The "Gap under the straightedge" method would say that each of these profiles are equivalent. The F-Number system says that the top profile, with a wavelength of 9 ft, is F_F 51; the dark blue profile, with a wavelength of 14 ft, is F_F 83; the red profile with a wavelength of 4 ft, is F_F 16. The green profile, with a wavelength of 12 ft, measures F_F 81, and the bottom (black) profile, with a wavelength of 8 ft, is F_F 63.

F-Numbers are linear, so a floor that measures F_F 83.19 (the dark blue profile) is almost 5 times flatter than a floor that measures F_F 16.81. (the red profile)

Again, **the "Gap under the straightedge" method says that these are all exactly the same quality floor.**

Now that I have explained that F-Numbers can't be compared exactly to "Gap under the straightedge", here are the best approximations that I can give you. The numbers in red are listed in paragraph 4.5.6 of ACI 117. I generated the other numbers. The wavelength of flaws is generally assumed to be on the order of 8-10 ft or 2.4-3 m. I can provide sample graphs of these profiles if desired. The top profile in the picture above represents the 0.125" gap in the table below (approximately F_F 50.)

Gap, in	Gap, mm	FF
0.625	15.88	10
0.500	12.70	12.5
0.417	10.58	15
0.357	9.07	17.5
0.313	**7.94**	**20**
0.278	7.06	22.5
0.250	**6.35**	**25**
0.208	5.29	30
0.195	4.96	32
0.179	4.54	35
0.156	3.97	40
0.125	**3.175**	**50**
0.104	2.65	60
0.089	2.27	70
0.078	1.98	80
0.069	1.76	90
0.063	1.59	100

"1/8 in ten feet" →

For more information, call the Face Company at (757) 624-2121 or E-Mail dipstick@faceco.com