Under some conditions random sources of variation are pooled together into a single error term. This is done to achieve one single estimate that is presumably better than the originals and has more degrees of freedom. The intent is to increase power.

In general, I would recommend that sources not be pooled unless there is a reasonable expectation that the sources are the same. Generally, block sources of variation should not be pooled with error terms. The more common sources to pool are experimental error terms and sampling error terms. These should not be pooled unless the experimental results indicate that they represent "the same" source of variation. The fact that two sources of variation are not significantly different is not an adequate demonstration of the two sources being "the same". Historically, statisticians used a rule of thumb of an F ratio (experimental error divided by sampling error) that was not only not significant, but was also less than about 1.7. This ratio indicates that the numerator error term was less than 70% larger than the denominator error term.

In 1983 two authors (Bancroft and Chien-Pai) published the table below as an improvement on this rule of thumb. We will use this as our criteria for pooling error terms.

Pooling criteria by Bancroft and Chien-Pai (JASA,1983, 78(384):981-983).

Values are P(>F). Pool if equal to or larger than the values in the table.

	$n_1 = 4$	8	12	16	20
$n_2 = 4$	0.35	0.43	0.45	0.48	0.48
8	0.29	0.37	0.40	0.43	0.43
12	0.26	0.34	0.37	0.40	0.41
16	0.25	0.32	0.36	0.38	0.39
20	0.24	0.31	0.34	0.38	0.38

n_1 and n_2 are degrees of freedom for the numerator and denominator