

## Sequential Sampling Plans

In contrast to single sample plans, sequential plans sample the items in the lot one at a time. A single sample plan has a fixed sample size, and allows the user to make an accept/reject decision after inspecting a fixed number of samples. The sequential sampling plans don't have a fixed sample size. In some cases, however, they can allow a decision quickly, especially when quality is particularly good or particularly bad.

### The Graphical Approach

Sequential sampling plans depend on the count of conforming and nonconforming units. Each is classified as it is drawn from the lot and the inspector keeps a tally. By comparing the tally against decision criteria the inspector can make a decision.

Often, the tally uses a graphical approach with accept and reject lines drawn on the graph. The inspector plots the inspection results and makes the decision when the sequential plot crosses one of the lines. See Figure 1 for an illustration showing an inspection sequence resulting in a rejected lot.

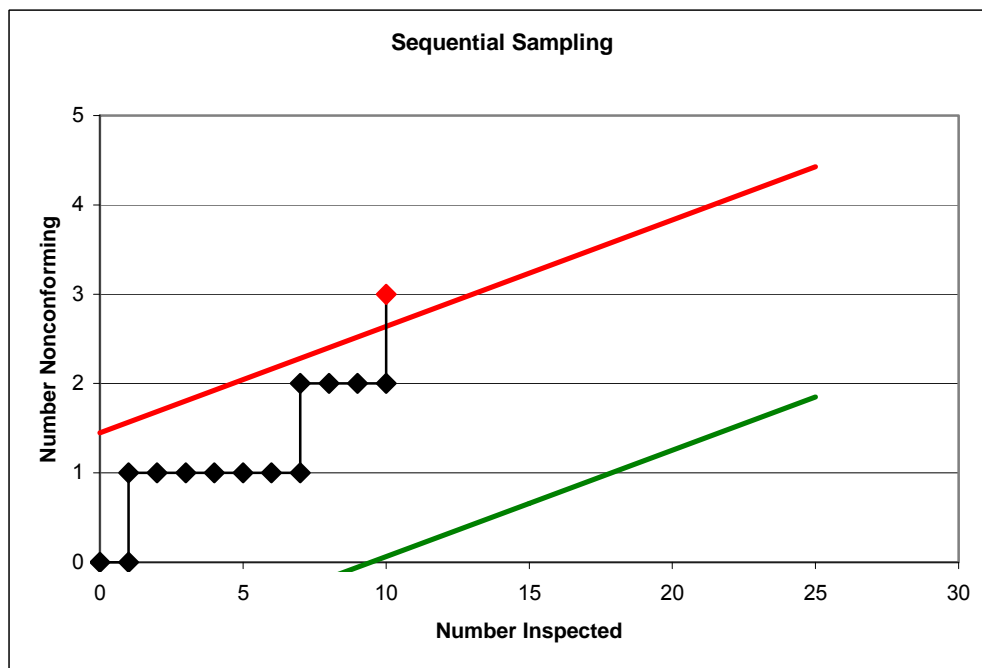


Figure 1 Sequential Sample Results Illustration

The accept/reject lines are easily calculated from two specific points that define the sampling plan. The Acceptable Quality Level (AQL) is a level of product quality that should be accepted with a high probability. Typically, this is set at 95%. The Rejectable Quality Level (RQL) is a level of product quality that should be accepted with a low probability. Typically, this is set at 10%.

A sampling plan has a probability of acceptance that changes as the product changes. The Operating Characteristic (OC) curve shows this relationship. The two points described are points on the OC as shown in Figure 2.

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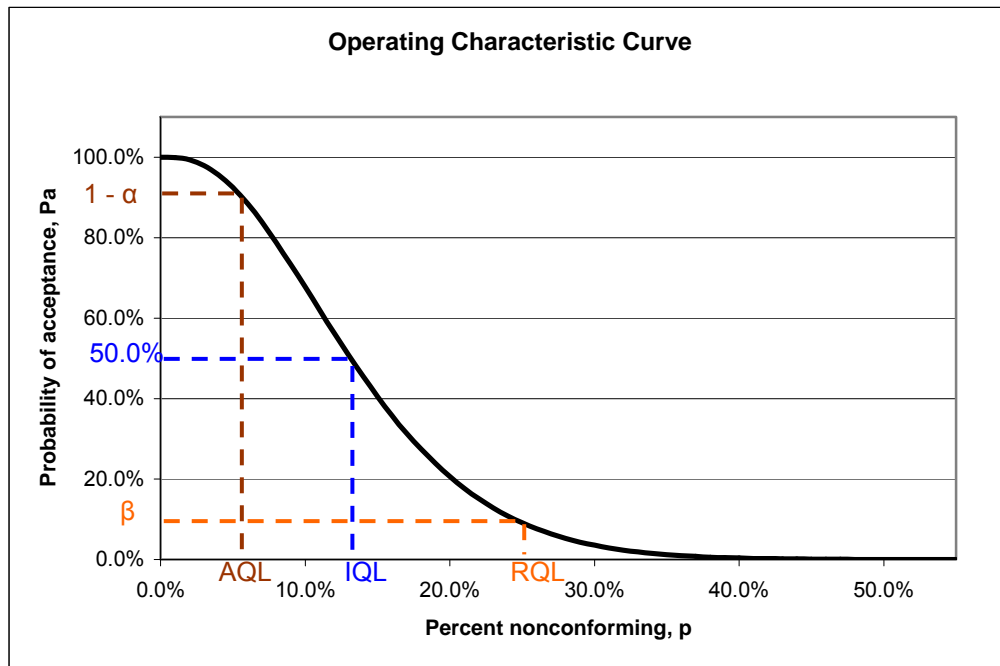


Figure 2 OC Curve

### Calculating the Lines

To illustrate the calculations, we select two points: (4.5%, 95.0%) and (24.5%, 10.0%).

The following equations show how to calculate the accept/reject lines shown in Figure 1. We need to clarify some technical issues. The Producer's Risk is the probability that an acceptable lot is rejected. We use  $\alpha$  to denote the probability of rejection, so  $1 - \alpha$  is the probability of accepting the lot with quality  $p_1$ . The lot quality is the AQL =  $p_1$ , so our sample point is (AQL,  $1 - \alpha$ ) = (4.5%, 95.0%).

Similarly, Consumer's Risk is the probability that an unacceptable lot is accepted. We use  $\beta$  to denote the probability of acceptance. The lot quality is the RQL =  $p_2$ , so our sample point is (RQL,  $\beta$ ) = (24.5%, 10.0%).

The parallel lines in our example are:

$$X_A = sn - h_1 = 0.12178n - 1.16672$$

$$X_R = sn + h_2 = 0.12178n + 1.49792$$

where

$$h_1 = \frac{\log\left(\frac{1-\alpha}{\beta}\right)}{k}$$

$$h_2 = \frac{\log\left(\frac{1-\beta}{\alpha}\right)}{k}$$

$$k = \log\left(\frac{p_2(1-p_1)}{p_1(1-p_2)}\right)$$

$$s = \frac{\log\left(\frac{1-p_1}{1-p_2}\right)}{k}$$

The lines, written in the slope intercept form, are parallel straight lines with slope 1.1278.