MIL-STD-105E (Acceptance Sampling for Attributes)

Summary

MIL-STD-105E is a standard sampling methodology that has been established for the acceptance or rejection of lots based on the evaluation of item attributes. Based on one or more samples taken from a batch or lot containing *N* units, the batch or lot is either accepted or rejected. It is similar to the ANSI Z1.4 and ISO 2859 standards.

The full MIL-STD-105E standard includes the specification of sample sizes, acceptance numbers, and rejection numbers. It also contains rules for switching between normal inspection, tightened inspection, and reduced inspection, based on the results of recent samples.

This procedure calculates required sample sizes for single, double and multiple sampling plans to be used with the MIL-STD-105E sampling methodology. It also plots operating characteristic curves and average sample number curves to compare alternative sampling plans.

Full details of the standard may be found in the publication titled Military Standard 105E: Sampling Procedures and Tables for Inspection by Attributes.

Sample StatFolio: *milstd105E.sgp*

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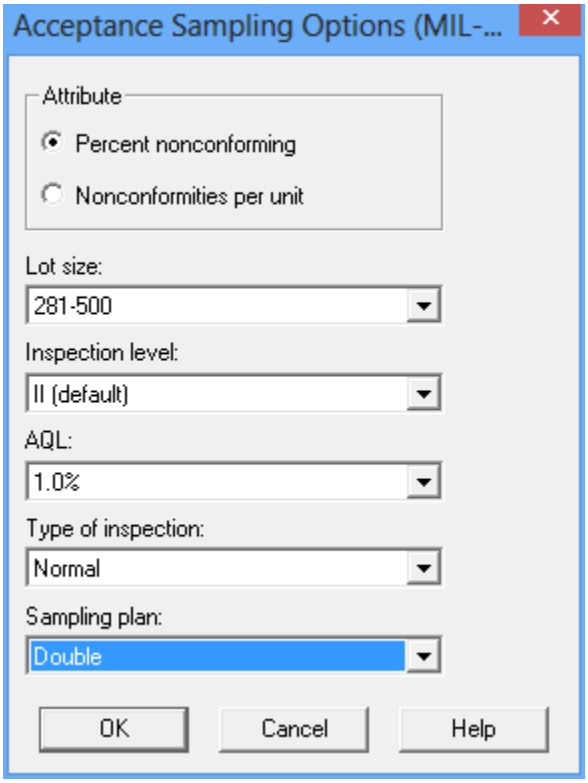
Data Input

The initial dialog box displayed when the procedure is selected is shown below:



- **Attribute:** the attribute upon which acceptance or rejection of a lot will be based. Select *Percent nonconforming* if each unit in the sample will be inspected and classified as either good or bad. Select *Nonconformities per unit* if each unit will be inspected and the number of nonconformities found in that unit tabulated.

- **Lot size:** the size of the lot or batch from which units will be randomly selected.

- **Inspection level**: the inspection level to be used. The standard describes seven inspection levels. There are 3 general inspection levels, labeled I, II, and III. The default inspection level is II. Inspection level I may be used when less discrimination is needed. Inspection level III may be used when more discrimination is needed. There are also 4 special inspection levels: S-1, S-2, S-3 and S-4. They are designed for situations when small sample sizes must be used and large sampling risks must be tolerated.

- **AQL:** the *Average Quality Limit*, which is defined as the largest acceptable value for the selected *attribute*.

- **Type of inspection**: *normal*, *tightened*, or *reduced*. When beginning a sampling scheme, normal inspection is used. Tightened inspection is implemented when recent inspection results have been poor. Reduced inspection is implemented when recent inspection has been very good. The ANSI Z1.4 standard includes rules for switching between the three types of inspection.

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- **Sampling plan**: *single*, *double* or *multiple*. A single sampling plan selects one sample of *n* units and accepts or rejects the lot based on that sample. A double sampling plan selects an initial sample of *n* units and either accepts the lot, rejects the lot, or decides to select a second sample of *n* units. If a second sample is taken, acceptance or rejection is based on the results of the two samples combined. Multiple sampling is similar to double sampling except that up to 7 samples may be selected.

Selection of Sampling Plan

Given the information provided in the data input dialog box, a sampling plan is generated by:

Step 1: Assignment of sample size code letter

Based on the lot size and inspection level, a sample size code letter is assigned. The code may be either A, B, C, D, E, F, G, H, J, K, L, M, N, P, Q, or R.

Step 2: Determination of sample size, acceptance and rejection numbers

Based on the assigned sample size code letter, the type of inspection, and the AQL, the required sample sizes, acceptance numbers and rejection numbers are determined.

Analysis Summary

As an example, consider the entries in the dialog box above. This requests that units be selected from a batch or lot containing between 281 and 500 units, and that each unit be inspected to estimate the percentage of nonconforming units. A target AQL of 1% nonconforming units is specified. Normal inspection at Level II is requested, using a double sampling plan.

When the *OK* button is pressed, an analysis window is created containing the following *Analysis Summary*:

MIL-STD-105E (ANSI Z1.4/ISO 2859)
Attribute: Percent nonconforming
Lot size: 281-500
Inspection level: II (default)
AQL: 1.0%
Type of inspection: Normal

Sampling plan: Double (code H)

Stage	*Sample size*	*Cumulative size*	*Acceptance number*	*Rejection number*
1	32	32	0	2
2	32	64	1	2

The assigned sample size code letter is H. 32 units are to be selected as the first sample. If the number of nonconforming units is 0, the lot will be accepted. If the number of nonconforming units is 2 or more, the lot will be rejected. Otherwise, a second sample of 32 units will be taken. If the number of nonconforming units in the combined sample of 64 units is then 1 or less, the lot will be accepted. If it is 2 or more, the lot will be rejected.

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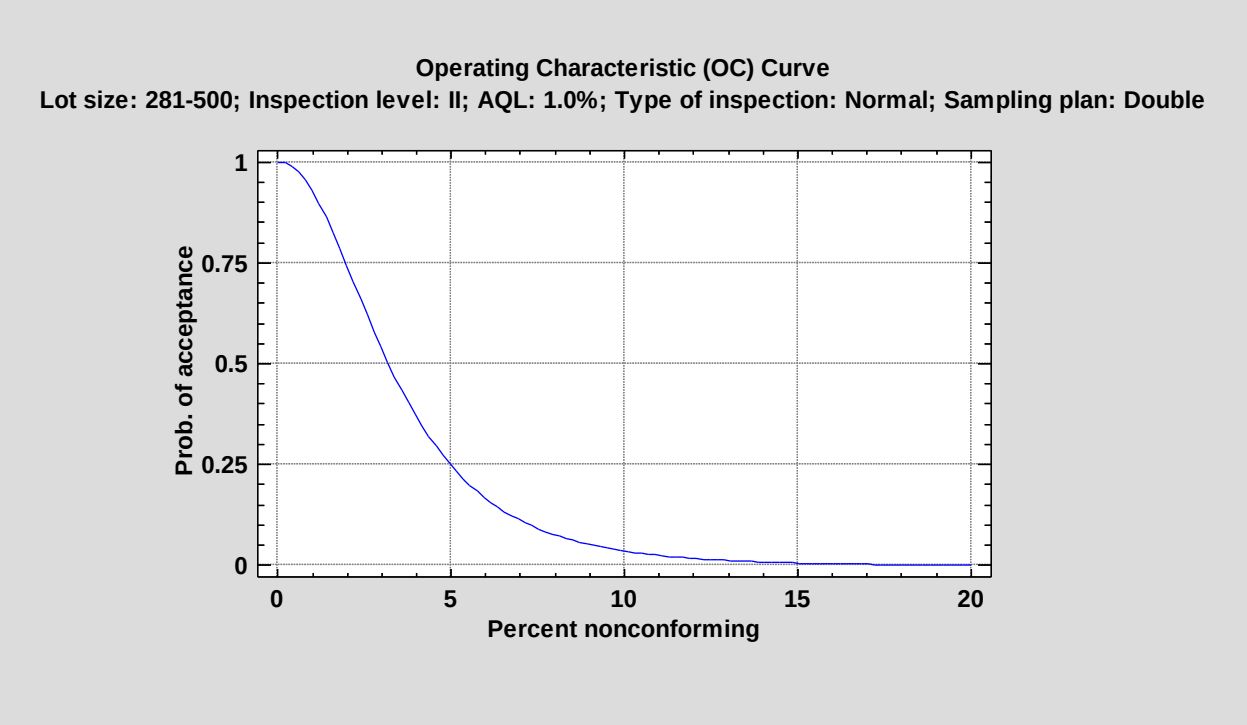
Operating Characteristic Curve

This pane displays the OC Curve, which shows the probability of accepting lots with various levels of nonconforming units.



For example, if the lot contains 5% nonconforming units, then the probability of accepting the lot is approximately 0.25 or 25%. This OC curve may be compared to that of other sampling plans.

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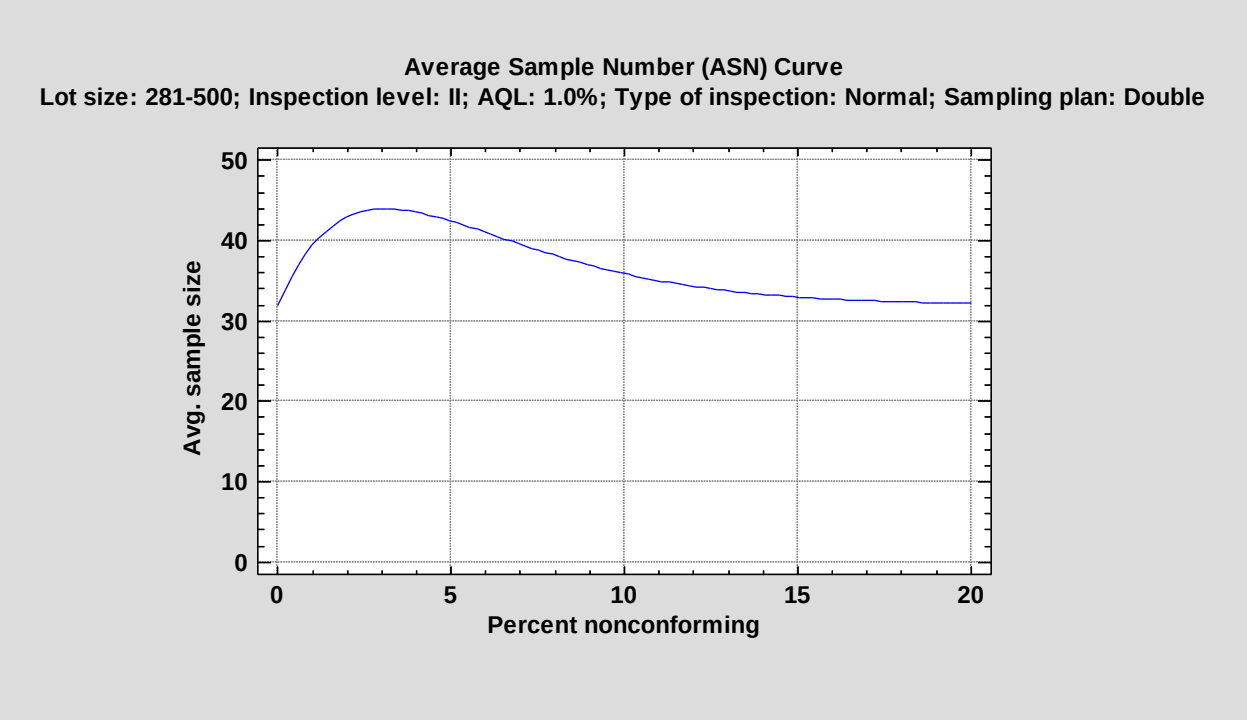
Average Sample Number Curve

This pane displays the ASN Curve, which shows the average number of units that will need to be inspected using the derived sampling plan given various values for the true percent of nonconforming units in the lot.



If the lot is very good or very bad, the average sample number is close to 32, since a decision to accept or reject the lot will usually be made after the first sample. For intermediate conditions, a second sample will often be necessary, resulting in a higher average sample number.

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