Selection of sampling plans for testing compliance with Codex Limits

Information Document submitted to
CCMAS 37th Session
Budapest 2016

- Document provides help in choosing appropriate sampling plans
- Sampling plans are examples and should not be regarded as prescriptive
- give reference to correspondent passages of the standards
- will help avoid future conflicts between importing and exporting countries
- Examples are intended for institutions specializing in sampling and compliance assessment

	Fruits/ vegetables	fats/oil	fish/fishery products	milk/milk products	meat/meat products	natural mineral waters	cereals
Qualitative/quantitative characteristics/sensory inspection	FV-Q	FO-Q	F-Q	MI-Q	M-Q	MW-Q	C-Q
food hygiene	FV-FH	n.r.	F-FH	MI-FH	M-FH	MW-FH	n.r.
pesticide residues	FV-P	FO-P	n.r.	MI-P	M-P	n.r.	C-P
contaminants	FV-C1/2	FO-C	F-C	MI-C	M-C	MW-C	C-C
residues of veterinary drugs	n.r.	FO-R	F-R	MI-R	M-R	n.r.	n.r.

n.r. = not relevant

Table 1: Code of Examples
Commodities versus provisions

Example 1: FV-Q / Visible defects in fruits

Continuous series of lots

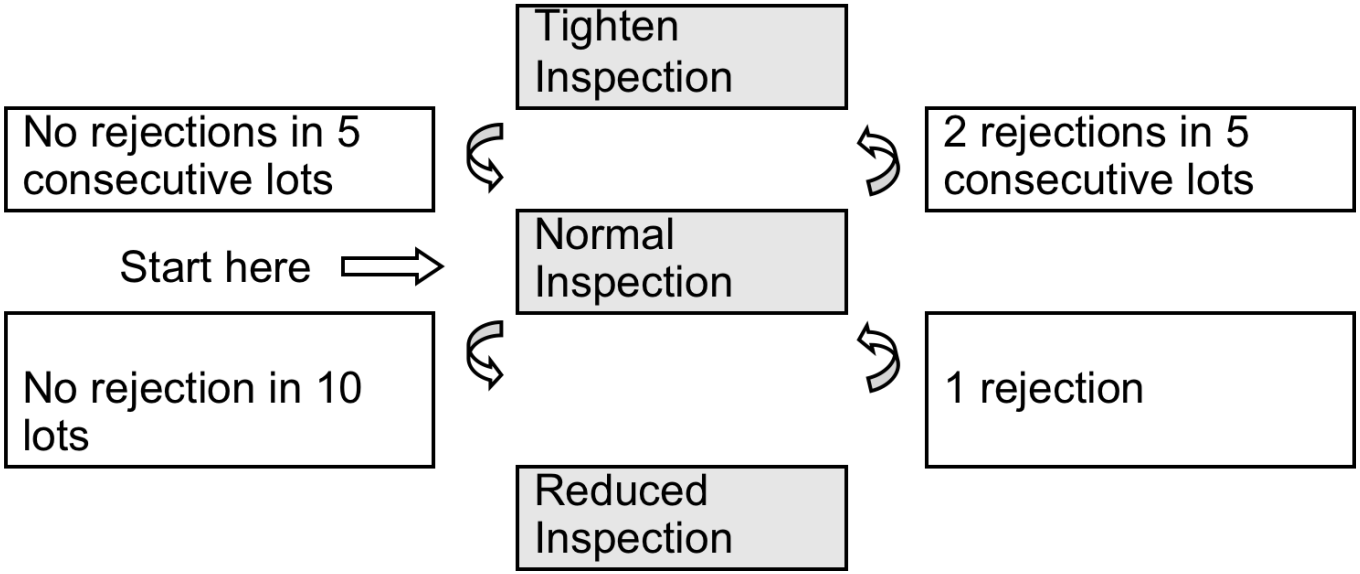
ISO 2859-1:1999: Sampling procedures for inspection by attributes

Part 1: Sampling schemes indexed by acceptance
quality limit (AQL) for lot-by-lot inspection

and

NMKL Procedure No 12, Annex – Section 4 (table 5) and Fig.1
Switching rules for inspection levels

Switching rules for inspection levels



NMKL Procedure No 12, Annex – Fig.1

Decision:

Consumer:

for given inspection level and Acceptable Quality Level (AQL), a lot is compliant if the number of items with visible defects does not exceed the Rejection number **Re**

Producer:

for given inspection level and Acceptable Quality Level (AQL), a lot is compliant if the number of items with visible defects does not exceed the Acceptance number **Ac**

Table 1 - Sample size code letters (see 10.1 and 10.2)

Lot size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	A	A	A	A	A	A	B
9 to 15	A	A	A	A	A	B	C
16 to 25	A	A	B	B	B	C	D
26 to 50	A	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	E	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1 200	C	C	E	F	G	J	K
1 201 to 3 200	C	D	E	G	H	K	L
3 201 to 10 000	C	D	F	G	J	L	M
10 001 to 35 000	C	D	F	H	K	M	N
35 001 to 150 000	D	E	G	J	L	N	P
150 001 to 500 000	D	E	G	J	M	P	Q
500 001 and over	D	E	H	K	N	Q	R

Unless otherwise specified, level II shall be used. Level I may be used when less discrimination is needed or level III when greater discrimination is required.

ISO 2859-1:1999: Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance

Table 2-A — Single sampling plans for normal inspection (Master table)

Sample size code letter	Sample size	Acceptance quality limit, AQL, in percent nonconforming items and nonconformities per 100 items (normal inspection)																										
		0,010	0,015	0,025	0,040	0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	10	15	25	40	65	100	150	250	400	650	1 000
		Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re	Ac Re
A	2	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇩	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31
B	3	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45
C	5	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	⇧
D	8	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	⇧	⇧
E	13	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	30 31	44 45	⇧	⇧	⇧
F	20	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧
G	32	⇩	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧
H	50	⇩	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
J	80	⇩	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
K	125	⇩	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
L	200	⇩	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
M	315	⇩	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
N	500	⇩	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
P	800	⇩	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
Q	1 250	0 1	⇧	⇩	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧
R	2 000	⇧	⇧	1 2	2 3	3 4	5 6	7 8	10 11	14 15	21 22	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧	⇧

⇩ = Use the first sampling plan below the arrow. If sample size equals, or exceeds, lot size, carry out 100 % inspection.

⇧ = Use the first sampling plan above the arrow.

Ac = Acceptance number

Re = Rejection number

Producer

Consumer

ISO 2859-1:1999: Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance

Example 2: MI-Q / Fat content in Milkproducts

ISO 3951-1:2013: Sampling procedures for inspection by variables –

Part 1: Specification for single sampling plans indexed by acceptance quality limit (AQL) for lot-by-lot inspection for a single quality characteristic and a single AQL

Switching rules as in example 1

Variables Plan for given (agreed) AQL

Prerequisites:

1. Lots have not been screened previously for nonconforming items.

2. Continuing series of lots of discrete products are all supplied by one producer using one production process

3. Quality characteristic must be measurable on a continuous scale

4. Measurement error is negligible, i.e. with a standard deviation no more than 10 % of the sample standard deviation s or process standard deviation σ
In the case that the measurement error is significant, it should be combined with s or σ respectively, according to ISO 3951-1:2013 Annex O

5. Production is stable (under statistical control) and the quality characteristic is distributed according to a normal distribution or a close approximation to the normal distribution

Sampling:

for the “s” method acceptance sampling plan the sample standard deviation is used

for the “σ” method acceptance sampling plan the presumed value of the process standard deviation is used. If there is sufficient evidence from the control charts (e.g. ´autocontrol´) that the variability is in statistical control, consideration should be given to switching to the “σ” method.

With the inspection level given (normally this will be II) and with the lot size, obtain the sample-size code letter using Table A.1:

Table A.1 — Sample-size code letters and inspection levels

Lot or batch size	Special inspection levels				General inspection levels		
	S-1	S-2	S-3	S-4	I	II	III
2 to 8	B	B	B	B	B	B	B
9 to 15	B	B	B	B	B	B	C
16 to 25	B	B	B	B	B	C	D
26 to 50	B	B	B	C	C	D	E
51 to 90	B	B	C	C	C	E	F
91 to 150	B	B	C	D	D	F	G
151 to 280	B	C	D	E	F	G	H
281 to 500	B	C	D	E	F	H	J
501 to 1 200	C	C	E	F	G	J	K
1 201 to 3 200	C	D	E	G	H	K	L
3 201 to 10 000	C	D	F	G	J	L	M
10 001 to 35 000	C	D	F	H	K	M	N
35 001 to 150 000	D	E	G	J	L	N	P
150 001 to 500 000	D	E	G	J	M	P	Q
500 000 and over	D	E	H	K	N	Q	R

NOTE The sample-size code letters and inspection levels in this part of ISO 3951 correspond to those given in ISO 2859-1.

For a single specification limit, enter Table B.1, B.2 or B.3 for the s-method as appropriate with this code letter and the AQL, and obtain the sample size n and the acceptability constant k.

Table B.1 — Single sampling plans for normal inspection (master table): "*s*" method

Code letter	Sample size	Acceptance quality limit % nonconforming															
		0,01	0,015	0,025	0,04	0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	10,0
		k	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*
B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0,954	0,818	0,526
C	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,163	1,046	0,853	0,580
D	6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,395	1,275	1,108	0,902	0,587
E	9	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,615	1,494	1,338	1,159	0,907	0,597
F	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,830	1,712	1,565	1,405	1,189	0,938	0,614
G	18	↓	↓	↓	↓	↓	↓	↓	↓	2,025	1,910	1,770	1,622	1,429	1,212	0,944	0,718
H	25	↓	↓	↓	↓	↓	↓	↓	2,215	2,102	1,969	1,829	1,652	1,457	1,225	1,035	0,809
J	35	↓	↓	↓	↓	↓	↓	2,399	2,289	2,160	2,028	1,862	1,684	1,476	1,311	1,118	0,912
K	50	↓	↓	↓	↓	↓	2,569	2,461	2,336	2,209	2,052	1,885	1,693	1,543	1,372	1,193	0,947
L	70	↓	↓	↓	↓	2,736	2,631	2,510	2,389	2,239	2,082	1,904	1,766	1,611	1,451	1,238	↑
M	95	↓	↓	↓	2,889	2,787	2,670	2,553	2,410	2,261	2,093	1,965	1,822	1,676	1,484	↑	↑
N	125	↓	↓	3,037	2,937	2,824	2,711	2,574	2,432	2,274	2,154	2,021	1,886	1,710	↑	↑	↑
P	160	↓	3,179	3,082	2,973	2,865	2,733	2,597	2,447	2,334	2,209	2,083	1,921	↑	↑	↑	↑
Q	200	3,310	3,215	3,109	3,004	2,877	2,747	2,603	2,495	2,377	2,258	2,106	↑	↑	↑	↑	↑
R	250	3,350	3,247	3,146	3,023	2,898	2,760	2,657	2,545	2,432	2,289	↑	↑	↑	↑	↑	↑

NOTE 1 The sample-size code letters in this part of ISO 3951 correspond to those given in ISO 2859-1.

NOTE 2 Symbols: ↓ There is no suitable plan in this area; use the first sampling plan below the arrow. If the sample size equals or exceeds the lot size, carry out 100 % inspection.

↑ There is no suitable plan in this area; use the first sampling plan above the arrow.

For a single specification limit, enter Table C.1, C.2 or C.3 for the σ-method as appropriate with this code letter and the AQL, and obtain the sample size n and the acceptability constant k.

Table C.1 — Single sampling plans for normal inspection (master table): "σ" method

Code letter	Sample size	Acceptance quality limit % nonconforming															
		0,01	0,015	0,025	0,04	0,065	0,10	0,15	0,25	0,40	0,65	1,0	1,5	2,5	4,0	6,5	10,0
		k	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*	*k*
B	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0,620	0,478	0,273
C	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0,991	0,841	0,643	0,412
D	4	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,296	1,148	0,964	0,760	0,478
E	6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,578	1,432	1,256	1,068	0,818	0,528
F	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	1,821	1,682	1,517	1,344	1,121	0,872	0,564
G	10	↓	↓	↓	↓	↓	↓	↓	↓	2,030	1,897	1,742	1,581	1,378	1,157	0,893	0,675
H	12	↓	↓	↓	↓	↓	↓	↓	2,223	2,096	1,949	1,800	1,613	1,412	1,179	0,991	0,771
J	15	↓	↓	↓	↓	↓	↓	2,410	2,289	2,150	2,009	1,835	1,650	1,439	1,273	1,082	0,879
K	18	↓	↓	↓	↓	↓	2,576	2,459	2,327	2,193	2,029	1,857	1,662	1,511	1,340	1,162	0,919
L	21	↓	↓	↓	↓	2,738	2,627	2,500	2,374	2,218	2,057	1,876	1,737	1,582	1,422	1,210	↑
M	25	↓	↓	↓	2,890	2,783	2,661	2,540	2,393	2,240	2,070	1,941	1,797	1,650	1,459	↑	↑
N	32	↓	↓	3,041	2,937	2,820	2,704	2,563	2,419	2,258	2,136	2,001	1,866	1,690	↑	↑	↑
P	40	↓	3,186	3,086	2,974	2,862	2,727	2,589	2,436	2,321	2,194	2,068	1,905	↑	↑	↑	↑
Q	50	3,319	3,222	3,113	3,005	2,875	2,742	2,596	2,487	2,367	2,247	2,094	↑	↑	↑	↑	↑
R	65	3,359	3,254	3,150	3,025	2,897	2,758	2,653	2,539	2,426	2,281	↑	↑	↑	↑	↑	↑

NOTE 1 The sample-size code letters in this part of ISO 3951 correspond to those given in ISO 2859-1.

NOTE 2 Symbols: ↓ There is no suitable plan in this area; use the first sampling plan below the arrow. If the sample size equals or exceeds the lot size, carry out 100 % inspection.

↑ There is no suitable plan in this area; use the first sampling plan above the arrow.

Decision:

If single upper or lower specification limits (U or L) are given, calculate the quality statistic

$Q_U=(U-x)/s$ or $Q_L=(x-L)/s$ Remark: for the σ-method, s is to be replaced by σ

where x the sample mean and s, the sample standard deviation.

The lot is acceptable if

Q_U or $Q_L \geq k = 1.71$ for the s-method (samples size 125)

Q_U or $Q_L \geq k = 1.69$ for the σ-method (sample size 32)

Example 3: FV-P / Pesticides Residues in Apples

Variables Plan

CAC/GL33-1999: RECOMMENDED METHODS OF SAMPLING FOR THE DETERMINATION OF PESTICIDE RESIDUES FOR COMPLIANCE WITH MRLS

Sampling:

the minimum number of primary samples to be taken from a lot is determined from Table 1

Table 1. Minimum number of primary samples to be taken from a lot

	Minimum number of primary samples to be taken from the lot
(a) Meat and poultry	
a non-suspect lot	1
a suspect lot	determined according to Table 2
(b) Other products	
(i) Products, packaged or in bulk, which can be assumed to be well mixed or homogeneous	1 see note (d) under definition of a lot, Annex 1
(ii) Products, packaged or in bulk, which may not be well mixed or homogeneous	see note (i), below
either:	
Weight of lot, kg	
<50	3
50-500	5
>500	10
or	
Number of cans, cartons or other containers in the lot	
1-25	1
26-100	5
>100	10

Note. (i) For products comprised of large units, in class A only, the minimum number of primary samples should comply with the minimum number of units required for the laboratory sample (see Table 4).

The primary samples should be combined and mixed well, if practicable, to form the bulk sample. The minimum size of each laboratory sample is given by Table 4, 1.2.

Table 4. Plant products: description of primary samples and minimum size of laboratory samples

	Commodity classification	Examples	Nature of primary samples to be taken	Minimum size of each laboratory sample
Class A, primary food commodities of plant origin				
1.	**All fresh fruits**, type 1, groups 001-008 **All fresh vegetables**, type 2, groups 009-019, **except** group 015 (dry pulses)			
1.1	**small sized fresh products** units generally < 25 g	berries peas olives	whole units, or packages, or units taken with a sampling device	**1 kg**
1.2	**medium sized fresh products** units generally 25-250 g	apples oranges	whole units,	**1 kg** **(at least 10 units)**
1.3	**large sized fresh products** units generally > 250 g	cabbages cucumbers grapes(bunches)	whole units	**2 kg** **(at least 5 units)**

Decision:

analytical results must be derived from one or more laboratory samples. The lot complies with a MRL (Pesticide Residues in Food and Feed, Codex Pesticides Residues in Food Online Database, FAO and WHO 2013) where the MRL is not exceeded by the analytical result(s).

Where results for the bulk sample exceed the MRL, a decision that the lot is non-compliant must take into account:

(i) the results obtained from one or more laboratory samples, as applicable; and
(ii) the accuracy and precision of analysis, as indicated by the supporting quality control data.

Thank you for your kind attention