

# Contents

<b>1</b>	<b>Introduction</b>	1
1.1	Aims of this book	2
1.2	Sampling procedures	3
1.3	Other publications	4
<b>2</b>	<b>Sampling Plans</b>	4
2.1	Objectives	4
2.2	Analytes and methods	7
2.3	Sampling locations and increments	7
2.4	Other considerations	8
2.5	Sampling checklist	8
<b>3</b>	<b>Different Approaches to Sampling</b>	9
3.1	Random sampling	10
3.1.1	Stockpiles of cereals	10
3.1.2	Compact solids	10
3.1.3	Manufactured products for quality control	10
3.2	Systematic sampling	11
3.2.1	Solid material in motion	11
3.2.2	Liquids	11
3.2.3	Manufactured products	11
3.3	Stratified sampling	11
3.3.1	Wagon load of scrap metals	11
3.3.2	Material lots delivered at different times	12
3.3.3	Sedimented liquid	12
3.3.4	Rivers, lakes, or reservoirs	12
3.4	Sequential sampling	12
3.5	Sampling for food surveillance studies	12
3.6	Environmental sampling	13
3.7	Composite sample preparation	14
<b>4</b>	<b>Safety</b>	14
4.1	Hazards on site	14
4.2	Hazards arising from the product	15
4.3	Protective clothing	15
4.4	Safety checklist	15

<b>5</b>	<b>Practical Illustrations of Sampling</b>	16
5.1	Sampling from a large heap	17
5.2	Sampling from packages/sacks/cans/bags	20
5.3	Sampling from drums	22
5.4	Sampling from a river, lake, or reservoir	24
5.5	Atmospheric sampling	26
5.5.1	Confined areas (boreholes, chimney stacks)	26
5.5.2	Large internal areas (factory atmosphere)	27
5.5.3	Samplers and detectors	27
5.5.4	Other safety considerations	27
<b>6</b>	<b>Equipment for Sampling</b>	28
6.1	Sampling equipment for solids	29
6.2	Manual sampling	29
6.2.1	Scoops/shovels	29
6.2.2	Pipes, spears, probes	31
6.2.3	Augers	32
6.3	Semi-automatic sampling	32
6.3.1	Pneumatically driven probe	33
6.3.2	Grab sampler/mechanical digger	33
6.4	Sub sampling – solids	33
6.4.1	Method of coning and quartering	33
6.4.2	Method of riffing	34
6.4.3	Method of rotating sample dividing	35
6.5	Investigation of the reliability of sampling methods	36
6.6	Automated sampling	37
6.6.1	Arc path cutters	38
6.6.2	Straight path cutters	38
6.6.3	Slotted belt samplers	39
6.6.4	Moving flap samplers	39
6.6.5	Integrated automatic sampling plant	39
6.7	Particle size reduction	40
6.7.1	Manual methods	41
6.7.2	Mechanical or automated methods	41
6.7.3	Crushers	41
6.7.4	Mills	43
6.7.5	Closed circuit grinding	43
6.7.6	Automated equipment for sub-sampling solids	44
6.8	Sieves or screens	44
6.8.1	Automated sieves	44

<b>7</b>	<b>Sampling of Liquids</b>	45
7.1	Volume of sample collected	45
7.2	Manual sampling	46
7.2.1	Sampling of liquids in closed containers	46
7.2.2	Sampling of liquids in open systems	47
7.2.3	Liquids flowing within closed systems	48
7.2.4	Liquids in open locations	49
7.3	Automatic sampling	49
7.4	Filtration of liquids	50
7.5	Preservation of samples	50
<b>8</b>	<b>Sampling of Gases</b>	50
8.1	Sampling plan	51
8.2	Liquefied gases in cylinders	51
8.3	Gases in storage tanks	52
8.3.1	Static gas	52
8.3.2	Gases in motion	52
8.4	Sampling from atmosphere	52
8.4.1	Grab sample	52
8.4.2	Continuous sampling	52
8.5	Sampling equipment	52
8.5.1	Probe or detector	52
8.5.2	Sampling lines	53
8.5.3	Sample containers	53
8.5.4	Absorption by impingers	53
8.5.5	Absorption by bubblers	54
8.5.6	Filters	54
8.5.7	Spot test papers	55
8.5.8	Spot detector tubes	56
8.5.9	Adsorption by columns	56
8.5.10	Diffusion sampling	57
8.5.11	Portable instruments	57
<b>9</b>	<b>Containers</b>	58
9.1	Choice of sample containers	58
9.2	Contamination from sample containers	58
9.3	Adsorption on sample containers	59
9.4	Sample containers for biological samples	59
<b>10</b>	<b>Information to be Submitted with the Sample</b>	59
10.1	Documentation	59
10.2	Labelling sample containers	60

<b>11</b>	<b>Transport and Storage</b>	60
11.1	Transportation	60
11.2	Special storage conditions	60
11.2.1	Refrigeration	60
11.2.2	Freezing	61
<b>Appendix 1:</b>	<b>Theoretical aspects</b>	61
A1.1	Statistics	62
A1.2	Normal distribution	62
A1.3	Sampling error	63
<b>Appendix 2:</b>	<b>Definitions – List of general terms used in sampling</b>	63
<b>References (Bibliography)</b>		64