

# A Guideline to Growing Your Quality Laboratory

An Instrument Guide for purchasing lab equipment and expanding your quality program by using the official *ASBC Methods of Analysis, 14th Edition* of the American Society of Brewing Chemists (ASBC). A subscription to the *ASBC Methods of Analysis* is free with your ASBC membership.

Recommended to be purchased  Optional Purchase

Volume produced (bbls x 1000) per year	<1	1-15	15-30	30-60	60-90	90+	ASBC Method of Analysis title and number
<b>General</b>							
Thermometer							Temperature control
Packaged Beer Archive Shelving							Shelf stability testing
Refrigerator / Cooler							Sample storage, reagent storage
Waterbath							Attemperate samples and media, organoleptic diacetyl testing
Lab Informatics System							Advanced process control software
<b>Raw Materials and Packaging</b>							
Crimp Gauge*							Crimp Determination Test-Crowns (Bottle Closures-6)
Torque Meter*							Removal Torque Procedures for Crown (Bottle Closures-5B)
Double-seam Gauges*							Can double-seam inspection
Double-seam Cross-section Imager*							Can double-seam inspection
Analytical Balance or Top-Loading Scale							Total Contents of Bottles & Cans By Calculation from Measured Net Weight (Fills-1), Grist (Malt-15), media and reagent preparation
Grist Sieves							Malt Modification by Friability (Malt-12), Grist by Standard Sieve (Malt-15A), Grist by Manual Sieve (Malt-15B)
Sieve Shaker							Grist by Standard Sieve (Malt-15A)
Friability Meter							Malt Modification by Friability (Malt-12)
Drying Oven							Moisture (Brewers' Grains-3 & Malt-3), Preparation of Sample (Brewers' Grains-2), Total Contents of Bottles & Cans (Fills-1)
Mash Bath							High-Dried, Caramel, and Black Malts (Malt-9), Soluble Extract (Brewers' Grains-5), Extract (Malt-4)
Universal Lab Disk Mill							Preparation of Sample (Brewers' Grains-2), High-Dried, Caramel, and Black Malts (Malt-9), Extract (Malt-4)
*package testing equipment is recommended to be purchased with associated packaging equipment							
<b>Chemistry</b>							
Hydrometer							Apparent Extract (Beer-3), Apparent Extract by Hydrometer (Wort-4), Extract (Wort-3), Soluble Extract (Brewers' Grains-5), Total Contents of Bottles & Cans By Calculation from Measured Net Weight (Fills-1), Yeast Fermentable Extract (Wort-5)
pH Meter							Beer pH (Beer-9), pH of Water Suspension (Filter Aids-2), Total Acidity (Beer-8), Wort pH (Wort-8)
CO <sub>2</sub> Meter							Dissolved Carbon Dioxide (Beer-13)
Low-Range Oxygen Meter (ppb)							Dissolved Oxygen for brite/package beer (Beer-34)
Digital Density Meter							Extract (Wort-3), Malt Extract (Malt-4), Real Extract (Beer-5), Soluble Extract (Brewers' Grains-5), Specific Gravity by Digital Density Meter (Beer-2B), Total Contents of Bottles & Cans By Calculation from Measured Net Weight (Fills-1)
Distillation Equipment						<b>Note</b>	Alcohol (Beer-4A), Diacetyl (Beer-25B) <b>Note:</b> Recommend Gas Chromatograph for Diacetyl above 90K bbls/yr
Alcohol Meter							Alcohol (Beer-4)
UV-Vis Spectrophotometer							Beer Bitterness (Beer-23) , Beer Color (Beer-10), Diacetyl (Beer-25B), FAN (Wort-12), Iron (Beer-18A, C), Total Polyphenols (Beer-35), Wort Color (Wort-4), Alpha and Beta Acids in Hops (Hops-6), Hop Storage Index (Hops-12), Thiobarbituric Acid Index (Wort-21)

continued

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<b>Chemistry (continued)</b>							
Centrifuge							Beer Bitterness (Beer-23), Color (Beer-10), Yeast Solids % by Spin-down (Yeast-5B)
Shaker Table and/or Wrist Shaker							Beer Bitterness (Beer-23), Diacetyl (Beer-25B), Beer Decarbonation by Rotary Shaker (Beer-1D), Headspace equilibration for Total Package Oxygen
Fumehood							Chemical preparation (various analytical methods)
Titration Burette							Total Acidity (Beer-8)
Turbidimeter or Haze Meter							Physical Stability (Beer-27)
Gas Chromatograph							Alcohol Determined by GC (Beer-4D), Diacetyl (Beer-25F), Lower Boiling Volatiles in Beer or Ale (Beer-29)
Foam Meter							Foam Collapse Rate-Sigma Value (Beer-22)
High-Range Oxygen Meter (ppm)							Dissolved Oxygen for wort
<b>Microbiology</b>							
Microscope							Dead Yeast Cell Stain (Yeast-3A), Differential Staining (Microbiological Control-3), Microscopic Yeast Cell Counting (Yeast-4), Presence of Bacteria (Yeast-2B), Yeast Morphology (Yeast-2A), Yeast Viability by Slide Culture (Yeast-6)
Hemocytometer							Dead Yeast Cell Stain (Yeast-3A), Microscopic Yeast Cell Counting (Yeast-4)
ATP Luminometer							Swab Surface Hygiene Using ATP Bioluminescence (Microbiological Control-1)
Autoclave or Pressure Cooker							Sterilization, Culture Media (Microbiological Control-4 & 5)
Incubator with CO <sub>2</sub> Packs, or Anaerobic Incubator							Anaerobic growth conditions, (Microbiological Control-5)
Vacuum Apparatus							Yeast Fermentable Extract (Beer-16, Wort-5), Detection of Microorganisms by Membrane Filtration (Microbiological Control-2C)
Stir plate / Hot Plate							Microbiological media preparation, sample homogenization, beer degassing, chemical preparation
Laminar Flow Hood							Sterile environment for microbiological applications
Thermocycler & PCR-related equipment							Real-time PCR for spoiler identification
<b>Sensory</b>							
Quality Assurance Analysis							True-to-brand testing
Sensory Training							Sensory webinar series, Flavor Terminology and Reference Standards (Sensory-12), Flavor Standard Spiking Calculator (Tools)
Descriptive Analysis							Descriptive Analysis (Sensory-10)
Difference Testing							Choice of Method (Sensory-3), Paired Comparison Test (Sensory-6), Triangular Test (Sensory-7), Duo-Trio Test (Sensory-8)
Threshold Sensory							Threshold of Added Substances—Ascending Method of Limits Test (Sensory-9)
Dedicated Tasting Area							Test Room, Equipment, Conduct of Test (Sensory Analysis-2)
<b>Other Useful Tools Located Online in the ASBC Methods of Analysis</b>							
Standards and other useful calculators, lab basics instructional videos, training presentations, fishbones and identification guides for all types of troubleshooting.							
<b>Getting Started—Suggested Reading</b> Visit <a href="http://asbcnet.org">asbcnet.org</a>							
<i>Brewing Microbiology, Third Edition</i> - F. G. Priest and Iain Campbell <i>Control Charting Guidelines for Quality Control in the ASBC Methods of Analysis</i> <i>Hops: The Practical Guide to Aroma, Bitterness, and the Culture of Hops</i> - Stan Hieronymus <i>Malt: A Practical Guide from Field to Brewhouse</i> - John Mallett <i>Water: A Comprehensive Guide for Brewers</i> - John Palmer and Colin Kaminski <i>Yeast: The Practical Guide to Beer Fermentation</i> - Chris White							