

### Calculations for Hop Quantity and IBU

-Do this calculation for each hop type you add and each addition. Sum them to get the total IBU.

$$IBU = oz\_Hops \times \%alpha\_acid \times \%utilization \times 15.8$$

**Hop Utilization Rates**, based on a 1050 OG, are

Boil Time	Utilization	Boil Time	Utilization
5min	5%	60min	23%
10min	8%	90min	27%
15min	12%	120min	30%
30min	16%	150min	32%
45min	21%	180min	33%

### Hops Usage and Results

Technique	Description	Results
First Wort Boiling	Add as wort hits kettle	Flavor, some aroma bitterness
Full Boil	Add at start of boil	Bitterness
Mid-Boil	Add 15-30 minutes from end	Bitterness and Aroma
End-of-Boil/Post-Boil	Add last 5 minutes	Aroma
Hop Tea	Hops boiled in water	Mostly aroma
Dry-Hopping	Hops added to secondary	Very fresh hop aroma

### Priming Sugar Amounts per 5 Gallon Batch for Various Carbonation Levels

Units	Very Low	Medium Low	Medium	Medium High	Very High
oz/5 gallon	3.0	3.75	4.5	5.25	6.0
Cups/5 gallon	0.45	0.55	0.67	0.78	0.90
grams/20 liters	80	100	120	140	160

### Extract Amounts Needed for Chosen OG and Chosen ABV

$$\text{Pounds Liquid Extract Needed} = \frac{\text{Desired } ABV}{0.71}$$

$$\text{Pounds Dry Extract Needed} = \frac{\text{Desired } ABV}{0.84}$$

$$\text{Pounds Liquid Extract Needed} = \frac{(OG - 1) \times 5}{0.037}$$

$$\text{Pounds Dry Extract Needed} = \frac{(OG - 1) \times 5}{0.044}$$

### Replacing Grains with Extract

Liquid Malt Extract: Reduce the quantity of grains to 85% of original recipe

Dry Malt Extract: Reduce the quantity of grains to 65% of original recipe