

Work Hardening Gold

If you've ever cold worked sheet or wire, you know what work hardening is. The further you reduce the metal thickness the harder it gets and less malleable it becomes. If not annealed properly, the metal fractures or becomes too hard to work.

<u>14k Y Gold Temper</u>	<u>B&S</u>	<u>Vickers</u>	<u>Tensile (PSI)</u>	<u>Sterling B&S</u>
Annealed (Dead Soft)	Dies	140	66,000	Dies
Eighth Hard	1/2	190	70,000	1
Quarter Hard	1	200	74,000	2
Half Hard	2	230	82,000	4
Hard	4	265	102,000	7

Annealing Gold

Before annealing gold (or silver), coat the piece with boric acid and alcohol. This flux coating will reduce oxidation and help minimize cleanup. The trick to proper annealing is to bring the metal up to a hot enough temperature long enough to cause annealing. Many times either the metal was not taken to a high enough temperature or the temperature was not held long enough.

The best annealing should be done in a pre-heated furnace for approximately 15 minutes at the recommended temperatures below.

For optimum malleability, Hoover & Strong karat gold alloys will require cooling in one of several different methods:

1. Quench from red heat.
2. Air cool.
3. Quench from black heat. Black heat is a description used for when the work piece no longer glows red (840°F - 930°F)
4. Cool by any method.

<u>Annealing Temperatures</u>	
10k Yellow, Green	1200°F
10k White, Red	1300°F
14k Yellow, Green	1300°F
14k White, Red	1400°F
18k Yellow	1300°F
18k White	1400°F

There are several choices for quenching medium. All 10K alloys and 14K white should be quenched into water, water plus denatured alcohol or a pickle solution based on sodium bisulfate. Quenching low karat and 14K white alloys into dilute acid solutions may result in stress corrosion. All other alloys may be quenched into the above or dilute acid solutions such as 10% sulfuric acid or 5% nitric acid.

Annealing White Gold

Nickel white alloys should be work hardened completely. Reduce the metal thickness at least 50% before annealing. Otherwise, the heating process will create unequal stress in the metal and encourage fire-cracking. It is often advisable to stress relieve the work piece at 615°F/325°C for a few seconds prior to raising to the full annealing temperature. After annealing allow these alloys to cool to black heat before quenching for maximum malleability.

Annealing Sterling Silver

Before annealing silver, coat the piece with boric acid and alcohol.

Silver should be annealed in an oven at 1200° F for 15 minutes. - 18ga (.040").

20 minutes - 8ga. If silver or gold annealing must be done by a torch, a good visual guide is:

Visible Red	900°F	Cherry Red	1400° F
Dull Red	1200°F	Bright Salmon Red	1600° F

Quench the sterling from black heat. Otherwise, the slow cooling will age-harden the metal.

SOLDER SAFETY PRECAUTIONS

ALTHOUGH WE PROVIDE CADMIUM-FREE SOLDERS, WE STILL FEEL THAT USING CADMIUM-FREE SOLDER IS A WAY OF DISGUIISING THE REAL PROBLEM:

Poor Ventilation and Poor Work Habits

The standard for proper ventilation is 6 changes of air per hour. It is also important that the inlet and outlet air be correctly positioned in the room to move the fumes away from the breathing zone of the worker. The average hood over your kitchen range pulls enough CFM (cubic feet per minute) to easily ventilate a room 8 x 8 x 10 feet. Place the hood as close to the source of contaminant as possible. The required volume of air varies with the square of the distance from the source. We recommend that you analyze your ventilation to remove any hazardous fumes from soldering instead of fooling yourself by using cadmium-free solders.

It is also imperative that you do not have your head directly over your work. Raise the object up so that you are looking directly at it instead of over it. By changing this simple work habit, the jeweler avoids breathing a lot of the the fumes when soldering. Along with proper ventilation, you will be better off following these safety precautions to avoid all fumes in your shop.

To Calculate CFM for Your Room

1. Multiply size : 8 x 8 x 10 feet = 640 CF
2. Multiply number of air changes x cubic feet.
Example - 640 CF x 6 air changes = 3840
3. Divide 3840 by 60 minutes = 64 CFM

The average range hood discharges 150-350 CFM



Proper Ventilation can be done economically with a kitchen stove hood.

Bench Tips

www.bwsimon.com

Brad Simon

Dedicated to the Advancement of Professionalism among Bench Jewelers

When carving hard waxes it is easy to judge the thickness of the wax by the amount of light showing through. To make it easier purchase a light box at an art supply store or hobby shop. Use the light box as a work table as you carve allowing the light to shine through the wax.

When repairing a break in hard carving wax use the next hardest wax as the filler as this will give you a stronger seam. For example if you are using blue wax repair the break with purple wax, if using purple wax use green wax.

To clean items of jewelry with loose stones use a small zip top plastic bag. Fill the bag half full with cleaning solution from your ultrasonic cleaner. Then place the jewelry in the bag and close it trapping as much air as possible in the top half of the bag. Place the bag in the ultrasonic cleaner. The air in the bag will allow it to float around in the tank. When clean, remove the jewelry and carefully pour out the solution. Any stones that may have fallen out will be in the bag, rather than at the bottom of the ultrasonic cleaner.

When working with platinum, cleanliness is not only next to Godliness, it is an essential work habit. Because of the high temperatures involved in soldering, other metals can easily contaminate platinum. Platinum can also become contaminated from other metals on your files, saw blades, emery paper, and buff wheels. To properly work on platinum you MUST have a clean work area and have separate tools reserved for platinum use only.

To make certain prongs are down tight on the crown of the stone, hold the mounting at eye level and turn so that you are looking at the prong from the side view. Then, hold your index finger about 1" above the stone. This will shield direct light from the stone, causing a silhouette of the stone and prong. Then, you can easily see light coming through any gaps between the stone and prong. If you cannot see any light between the crown of the stone and the prong, your prongs are down tight and no further tightening is necessary. Taping a 3 X 5 white index card on the wall in front of your bench helps too as it provides a light background to hold the stone in front of for viewing.

Small objects can be held with pliers or a ring clamp. A small pair of vice grip pliers is a useful tool to hold small parts while filing. File the teeth off the jaws before using so that you will not mar the item you are holding.

When sizing, purposely make the ring 1/8 size too small. Then, clean the solder joint on the inside of the ring only. Next, place the ring on a ring mandrel and hammer across the solder joint until the ring reaches the correct size. Finally, clean up the outside of the ring with a file, emery, and polish the ring. This will help you to be more accurate in your sizing (if you are a little too large you will need to resize). In addition, this will work-harden the sizing area making a stronger joint, and finishing and polishing will be easier.

Drill holes in the top of the side rail on your bench, large enough in diameter for your torch tips to fit into them. Keep different size tips there when not in use; it makes them easier to find when needed.

Rings with by-pass shanks are right hand and left hand specific and are not interchangeable. When creating a ring with a by-pass shank, the side of the shank closest to the hand should come from the side of little finger. The ring will then sit straight on the finger. This is because the skin joining the fingers together is lower between the little finger and the ring finger than between the ring finger and the middle finger. If the ring is created with the shank going the other way, the shank will contact the hand on the middle finger side first and cause the ring to twist while wearing it.

Use a water pick (the kind used to clean your teeth) to clean jewelry with colored stones that cannot be steam cleaned.

To clean items of jewelry with loose stones use a small zip top plastic bag. Fill the bag half full with cleaning solution from your ultrasonic cleaner. Then place the jewelry in the bag and close it trapping as much air as possible in the top half of the bag. Place the bag in the ultrasonic cleaner. The air in the bag will allow it to float around in the tank. When clean, remove the jewelry and carefully pour out the solution. Any stones that may have fallen out will be in the bag, rather than at the bottom of the ultrasonic cleaner.

Draw two pieces of wire through the hole of a draw plate at the same time to create 1/2 round wire.

When working with platinum, cleanliness is not only next to Godliness, it is an essential work habit. Because of the high temperatures involved in soldering, other metals can easily contaminate platinum. Platinum can also become contaminated from other metals on your files, saw blades, emery paper, and buff wheels. To properly work on platinum you MUST have a clean work area and have separate tools reserved for platinum use only.

To help hold wedding sets together in perfect alignment while soldering together, hold the rings together in your fingers. Next, place a small amount of super glue between the rings at their top. Then, clamp the rings as you normally would and solder the back of the shanks together. If any glue remains when finished soak in acetone to remove.

Note: Before performing this procedure make certain your soldering area is well ventilated. When heated super glue will emit toxic vapors.

Place jump rings, earring post, and other small findings on a piece of leather on your bench top. Then it will be easier to pick them up with your tweezers, as the points of the tweezers will stick down into the leather allowing you a better grip on the finding.

Always weigh stones when loose and mark the weight on the envelope even if an appraisal hasn't been requested. The customer may ask for one later. With a record of the weights, the appraiser will have them later when doing the appraisal. In addition, in the event of a theft, there will be an accurate record of what the customer owned.

To keep a coin from turning in a coin frame with tabs, take a piece of wire and roll it through a rolling mill. Then cut pieces to wedge between the coin and frame. Place one piece under each tab. The length and thickness of the piece depends on how loose the coin is, but they should be at least three times the width of the tab. Then push the tab over with a prong pusher. A brass pusher works well, but if you were concerned with slipping off and marring the coin, a wooden dowel rod in a graver handle would work or make a pusher from the plastic handle from a toothbrush.

When setting colored stones with an uneven pavilion in clusters or as side stones, set the thicker portion to the outside of the mounting where it will receive more abuse. If the stone is set with the thinner edge to the outside, it may be chipped while wearing.

Change the filters on your polishing machine regularly. This not only helps profits by accumulating more precious metal dust, but also improves the health of the workers by not having to breathe all the dust and dirt into their lungs. If dust accumulates on the wall near where the air comes out of the dust collector, you have waited too long to clean it out and replace the filter.

When channel setting place a strip of tape over the stones. This will keep them from bouncing out of place when hammering.

To solder closed a link in a hollow link bracelet, take a small section of wire that matches the color and karat of the bracelet link. Use a wire diameter that will semi-snuggly fit inside the link. Then, place some paste solder in each end of the link and insert the wire. Gently hold the link closed and heat until the solder melts. The wire will provide more surface area for the solder to flow to make a stronger joint.

Place a doormat in the doorway of the shop. Employees can wipe their feet on it as they leave the shop. This will help in removing particles of precious metal off the soles of their shoes. Replace the mat annually and send the old mat to the refiner with the polishing waste.

To bezel set small stones, place the bezels into your #30 handpiece with the stone in place. Then hold a burnisher against the bezel as you turn it slowly. The bezel will form over the stone smoothly and evenly all the way around the stone.



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Reducing the Karat of Gold

Example: 20 dwts of 22K to 10K
 $20 \text{ dwts} \times 1.201 = 24.02 \text{ dwts of alloy}$

Reducing Factors

Karat on Hand	Karat Wanted	Factor for Alloy
24K	18K	.333
24k	14k	.714
24k	10k	1.400
22k	18k	0.221
22k	14k	0.571
22k	10k	1.201
18k	14k	0.286
18k	10k	0.800
14k	10k	0.400

(if unable to use chart above)

Subtract the desired karat from the present karat. Multiply by weight of on hand to reduce. Divide by the karat desired. This equals the weight of alloy to use.

Example: 50 dwts of 22K down to 14K
 $(22-14)K \times 50 \text{ dwts} \div 14K = 25.57 \text{ dwts of alloy.}$

Raising the Karat of Gold

Example: 50 dwts of 14K to 18K
 $50 \text{ dwts} \times .666 = 33.30 \text{ dwts of 24k}$

Raising Factors

Karat on Hand	Karat Wanted	Factor for Alloy
10K	14K	.400
10k	18k	1.333
10k	22k	5.952
14k	18k	0.666
14k	22k	3.964
18k	22k	1.976

(if unable to use chart above)

Determine the weight of alloy contained in the present karat gold and divide it by the percentage of alloy in the desired karat. This indicates the total weight of the higher karat gold. Subtract the weight of the lower karat from the weight of the higher karat determined and the result is the amount of fine gold (24K) to be added to the lower karat.

HOW TO DETERMINE WEIGHTS OF METALS AND ALLOYS

USE THIS CONVERSION CHART TO CONVERT THE WEIGHT OF ONE METAL TO ANOTHER FOR CASTING OR CALCULATING A PRICE.

EXAMPLE: STERLING RING AT 1.5 DWTS X 1.256 (14K YELLOW) = 1.88 DWTS IN 14K.

Sterling Silver

To Convert To	Multiply Wt By
Fine Silver	1.013
Coin Silver	0.995
10k Yellow Gold	1.112
14k Yellow Gold	1.256
18k Yellow Gold	1.497
22k Yellow Gold	1.704
24k Fine Gold	1.866
Platinum	20.62
18% Nickel Silver	0.841
Brass	0.846
Pewter	0.702

10k Yellow Gold

To Convert To	Multiply Wt By
14k Yellow Gold	1.130
18k Yellow Gold	1.346
22k Yellow Gold	1.529
24k Fine Gold	1.675
10k Green Gold	0.953
10k White Gold	0.957
Platinum	1.855
Palladium	1.037
Lead	0.982
Brass	0.732
Sterling Silver	0.898

14k Yellow Gold

To Convert To	Multiply Wt By
18k Yellow Gold	1.192
22k Yellow Gold	1.351
24k Fine Gold	1.481
14k Green Gold	1.087
14k White Gold	0.965
10k Yellow Gold	0.885
Platinum	1.642
Palladium	0.918
Lead	0.869
Brass	0.648
Sterling Silver	0.796

18k Yellow Gold

To Convert To	Multiply Wt By
18k White Gold	0.940
22k Yellow Gold	1.140
24k Fine Gold	1.250
14k Yellow Gold	0.839
Platinum	1.377
Lead	0.729
Brass	0.544
Sterling Silver	0.668

Platinum

To Convert To	Multiply Wt By
Palladium	0.559
5% Irid-Platinum	1.002
10% Irid-Platinum	1.004
Rhodium	0.583
Sterling Silver	0.485

ANNIVERSARIES

1 Gold	13 Citrine	25 Silver
2 Garnet	14 Opal	30 Pearl
3 Pearls	15 Ruby	35 Emerald
4 Blue Topaz	16 Peridot	40 Ruby
5 Sapphire	17 Watches	45 Sapphire
6 Amethyst	18 Cat's Eye	50 Gold
7 Onyx	19 Aquamarine	55 Alexandrite
8 Tourmaline	20 Emerald	60 Diamond
9 Lapis Lazuli	21 Iolite	65 Star Sapphire
10 Diamond	22 Spinel	75 Diamond
11 Turquoise	23 Imperial Topaz	
12 Jade	24 Tanzanite	

DEFINITIONS

KARAT: a unit for expressing proportion of gold in an alloy equal to 1/24 part of pure gold. Thus 14 karat gold is 14/24 pure gold with another metal making up the rest. The usual alloy metals are silver, copper and zinc. Nickel is used in white gold.

10k =	41.6% gold	58.4% alloy
14K =	58.3% gold	41.6% alloy
18K =	75.0% gold	25.0% alloy
24K =	100% gold	

GOLD COLORS: yellow, white, pink and green are produced by variations in alloy.

Green = Silver and Zinc

Pink = Copper

White = Nickel

Yellow = Silver, Zinc, and Copper

GOLD FILLED: layer (or layers) of gold alloy joined to a base metal alloy by soldering or welding it and then rolling or drawing to the thickness required. The gold content is 1/20 or more of the total weight.

GOLD PLATE OR ELECTRO-PLATE: fine gold electrolytically deposited onto base metal. The thickness of gold may range from 7 to 100 millionth of an inch.

ROLLED GOLD PLATE: similar to gold filled, but of lower quality. The gold content is less than 1/20 the total weight.

STERLING SILVER: 92.5% silver 7.5% copper. (Coin silver contains 90% silver and 10% copper). The word comes from the "Easterlings," North German merchants who formed a Guild in London during the 13th century, minting coins of uniform weight and excellence.

NICKEL SILVER (OR GERMAN SILVER): contains no silver. It is a combination of nickel, copper and zinc which has a silver color.

JEWELERS PLATINUM: a heavy silver-white metal of 90% platinum and 10% iridium. The iridium acts as a hardening agent. Named by Spanish explorers in Columbia from the word "platina" meaning "silver of little value."

JEWELERS PALLADIUM: a silver-white metal of 95% palladium and 5% ruthenium. The ruthenium acts as a hardening agent.

PENNYWEIGHT (DWT): 1/20 of a troy ounce. The name originally applied to the weight of an Anglo-Norman penny.

TROY OUNCE: 10% heavier than the common avoirdupois ounce. There are 14.583 troy ounces in an avoirdupois pound. The name is derived from Troyes, France where the measuring system originated.

GOLD

- Gold was probably the second metal to be worked by early man, being discovered after copper. Quality gold work has been dated to 3000 BC.

- If all the gold ever found were cast into a single ingot it would only make a 20 yard cube weighing 12,000 tons.

- One ounce of gold can be flattened to a sheet that will cover a 100 square foot area or drawn to a wire almost a mile long. Gold can be made into foil that is thin enough for light to pass through it.

- Gold has a face-centered cubic crystal, similar to diamonds. It can be dissolved in several different chemical solutions.

- Soldering tools contaminated with white metals can burn pits into gold, platinum, silver, copper and brass.

GOLD PRICE HISTORY

YEAR	HIGH	LOW	YEAR	HIGH	LOW
1968	42.00	37.80	1987	502.75	396.00
1969	43.50	35.00	1988	485.30	394.20
1970	38.95	34.75	1989	417.15	356.20
1971	44.25	37.70	1990	422.75	345.85
1972	70.00	46.15	1991	403.70	343.50
1973	112.25	63.90	1992	359.50	330.25
1974	179.50	116.50	1993	407.25	326.50
1975	184.25	126.75	1994	397.50	370.25
1976	186.50	130.50	1995	396.75	324.25
1977	216.50	139.45	1996	417.00	367.50
1978	229.00	167.45	1997	369.75	283.00
1979	515.00	216.50	1998	314.50	277.70
1980	850.00	474.00	1999	326.25	252.90
1981	599.25	391.75	2000	316.60	263.00
1982	460.00	269.75	2001	292.85	250.20
1983	511.50	374.75	2002	348.30	277.80
1984	406.85	303.20	2003	417.25	319.75
1985	341.50	284.25	2004	455.75	373.50
1986	442.75	329.50	2005	537.50	411.50
			2006	725.75	522.50

CONVERSION CHART WEIGHTS & MEASURES

TO CONVERT FROM...TO	MULTIPLY
14K Weight.....10K	0.89
14K Weight.....18K	1.20
Carats.....Grains	3.08647
Carats.....DWTs	.12860
Carats.....Grams	.2
Centimeters.....Inches	.3937
Cubic Centimeters.....Cu. in.	0.061023
Cubic Centimeters.....Ounces fl. (US)	.0338
Cubic Centimeters.....Ounces fl. (Canada)	.0352
Cubic Feet.....Cu. Cm.	28.317
Cubic In.....Cu. Cm.	16.3872
DWTs.....Carats	7.778
DWTs.....Grams	1.5552
DWTs.....Ounces,Troy	.05
Feet.....Cm	30.4801
Feet.....Meters	.30480
Gallons, (Canada).....Cu. Cm.	4546.1
Gallons, (US).....Cu. Cm.	3785.4
Grains.....Grams	.06480
Grams.....Carats	5
Grams.....Grains	15.4324
Grams.....DWTs	.6430185
Inches.....Cm	2.54001
Inches.....Millimeters	25.40
Kilograms.....Ounces,Troy	32.1507
Kilograms.....DWTs	643.014
Liters.....Gals. (Canada)	.21998
Liters.....Gals. (US)	.26418
Liters.....Oz. (Canada)	35.1961
Liters.....Oz. (US)	33.8148
Meters.....Feet	3.2808
Meters.....Inches	39.37
Millimeters.....Inches	.03937
Ounces, Avdp.....Oz. Troy	.91146
Ounces, Avdp.....Grams	28.3495
Ounces, Troy.....Oz. Adp	1.0971
Ounces, Troy.....Grams	31.1035
Ounces FL. (Canada).....Cu. Cm.	28.4130
Ounces FL. (US).....Cu. Cm.	29.5737
Pounds, Avdp.....DWTs	291.666
Pounds, Avdp.....Ounces,Troy	14.583
Pounds, Avdp.....Grams	453.592
Quarts (Canada).....Cu. Cm.	1136.522
Quarts (Canada).....Liters	1.13649
Quarts (US).....Cu. Cm.	946.359
Quarts (US).....Liters	.94633
Square Centimeters.....Sq. In.	1.5500
Square Inches.....Sq. Cm.	6.45163
Square Inches.....Sq. MM	645
Square MM.....Sq. In.	.0516

THE TROY SYSTEM

1 Troy Ounce	=	31.1033 Grams
1 Troy Ounce	=	480 Grains
1 Troy Ounce	=	20 Pennyweight (DWT)
1 Troy Pound	=	12 Troy Ounces
12 Troy Ounces	=	1 Pound Troy
14.5833 Troy Ounces	=	1 Pound Avoirdupois
0.9114 Troy Ounces	=	1 Ounce Avoirdupois
32.15 Troy Ounces	=	1 Kilogram
16 Avdp Oz.-7000 Grains	=	1 Avdp Pound
Avdp weight x .823	=	Troy Weight
1 Oz. Avdp	=	.91 Troy Ounce
1 Pound Avdp	=	14.58 Troy Ounce
1 Gram	=	5.3 Karats (Roman)
1 Gram	=	15.432 Grains
1 Gram	=	0.0643 Pennyweight (DWT)
1 Gram	=	0.3215 Troy Ounce
1.5552 Grams	=	1 Pennyweight (DWT)
1.000 Grams	=	1 Kilogram
8.3495 Grams	=	1 Ounce Avoirdupois
24 Grains	=	1 Pennyweight (DWT)
5.760 Grains	=	1 Pound Troy
15.432 Grains	=	1 Kilogram
437.5 Grains	=	1 Ounce Avoirdupois
7.000 Grains	=	1 Pound Avoirdupois
1 Grain	=	0.0648 Grams
1 Pennyweight	=	24 Grains
1 Pennyweight	=	.05 Troy Ounces
20 Pennyweight	=	480 Grains
20 Pennyweight	=	1 Troy Ounce
240 Pennyweight (DWT)	=	1 Pound Troy
643.01 Pennyweight (DWT)	=	1 Kilogram
18.2291 Pennyweight (DWT)	=	1 Ounce Avoirdupois
291.666 Pennyweight (DWT)	=	Pound Avoirdupois
1 Kilogram	=	2.68 Pounds Troy
1 Kilogram	=	35.2740 Ounces Avoirdupois
1 Kilogram	=	2.2046 Pounds Avoirdupois

COMPARATIVE GAUGE TABLE

Fractional Inch	Decimal Inch	MM	B&S Gauge	DIAMOND SIZE Point	Fraction
1/100	.010	0.25	30		
	.011	0.28	29		
	.012	0.30	28		
	.014	0.36	27		
1/64	.016	0.40	26		
	.018	0.46	25		
	.020	0.50	24		
	.022	0.56	23		
	.024	0.60			
	.025	0.64	22		
	.028	0.70	21		
	.030	0.75			
1/32	.031	0.80		.003	1/300
	.032	0.82	20		
	.035	0.90			1/250
	.036	0.91	19		
	.040	1.00	18	.005	1/200
	.043	1.10			1/150
	.045	1.14	17		
3/64	.047	1.20			1/125
	.049	1.25			
	.051	1.30	16	.01	1/100
	.055	1.40		.0125	
	.057	1.45	15		
	.059	1.50		.015	1/64
1/16	.063	1.60	14	.02	1/50
	.066	1.70		.024	
	.069	1.75			
	.071	1.80		.027	
	.072	1.83	13		
	.075	2.00		.03	1/32
5/64	.079	2.00			
	.081	2.06	12		
	.083	2.10		.04	1/25
	.087	2.20			
	.089	2.25			
	.091	2.30	11	.05	1/20
3/32	.094	2.40			
	.098	2.50		.06	1/16
	.102	2.60	10	.07	
	.106	2.70		.08	
7/64	.108	2.75			
	.114	2.90	9	.10	1/10
	.118	3.00		.11	
1/8	.125	3.10		.12	1/8
	.128	3.20	8	.13	
	.138	3.50		.16	
	.144	3.66	7		
	.145	3.70		.18	
	.148	3.75			
	.149	3.80		.20	1/5
5/32	.156	4.00		.25	1/4ct.
	.162	4.12			
	.167	4.25	6		
	.173	4.30		.33	1/3ct.
	.177	4.50			
	.182	4.60	5	.40	3/8ct.
3/16	.187	4.75			
	.196	5.00		.50	1/2ct.
	.204	5.18	4		
	.207	5.25			
	.217	5.50		.60	5/8ct.
	.226	5.75	3		
	.236	6.00		.75	3/4ct.
	.246	6.25			
1/4	.250	6.50	2	1.00	1ct.
	.2756	7.00			1 1/4ct.
		7.50	1		1 1/2ct.
5/16	.3125	7.94			
	.3150	8.00			2ct.
	.3346	8.50			2 1/4ct.
	.3543	9.00			2 1/2ct.
	.3740	9.50			3ct.
3/8	.375	9.53			
	.3937	10.00			3 1/2ct.
	.4134	10.50			3 3/4ct.
	.4331	11.00			4ct.
7/16	.4375	11.13			
1/2	.500	12.700			
9/16	.5625	14.288			
5/8	.625	15.875			
11/16	.6875	17.462			
3/4	.750	19.500			
13/16	.8125	20.638			
7/8	.875	22.225			
15/16	.9375	23.812			
1	1.0	25.400			