Glass Blowing Notes 2023_09_20

General

Note: this document is meant to be read electronically, and all hyperlinks, both internal and external, should be followed.

1. Don't rush but be efficient due to limited time during which glass is workable as it cools.
    a. Plan ahead
        i. If you must stop to figure out what to do next it is better to pause before or while heating than after reheating to maximize working time
            1. Cool glass cools slower than hot glass does
            2. But don't let it get so so cool it cracks
            3. if it is not working nicely it is time to reheat
2. KEEP IT CENTERED!
3. When sitting at the bench the right hand never touches the pipe (to keep from getting burned)
4. Come out of the bench the reverse of coming in
    a. Lift left
    b. Slide right and forward
    c. Step out as you lift blow end of the pipe with left hand and transfer to the right hand
    d. Turn yourself 180 degrees (now facing the bench) and grab pipe with left hand at the center of gravity
    e. Keep turning throughout the process
    f. Because you turn right, place pipe near the outer end of the bench coming in
        i. Avoid changing direction or stopping while setting down
        ii. May want to keep pipe tilted up when coming in if you desire it to elongate such as after a new gather or before/during necking
5. Always Flash the workpiece when you go to the glory hole and when you leave the glory hole
    a. In between flashes heat the part you are going to work on
    b. A Flash heat is about 3 true seconds with the moil/punty completely in the glory hole >= 4"
6. Work from the pipe or punty toward the end, letting the completed parts "cool" and become a centered round reference for your tools to rest against.

Some steps below are amplified here to reduce repetition

Preparation

1. Know what you are going to make before you start and what tools you will need
2. Many a project is ruined because a necessary tool is not available when needed
3. Have all the tools you need in place; some tools to consider are
    a. Left to right on bench
        i. Jacks tips in
            1. Waxed
        ii. Tweezers tips out
        iii. Shears tips out
        iv. Diamond shears tips out
        v. Wet newspaper and water
    b. Usually behind you
        i. Blocks in bucket
        ii. Sophettia or steam stick in the bucket
        iii. Map torch

iv. Propane torch ?
v. Oxygen propane (Hot) torch?

c. In pipe heater
i. Pipes
ii. Punties
d. At breakoff station
e. Annealear up to temperature and has room for your workpiece
f. Table knife
g. Paddles
h. Tongs
i. Oxygen propane (hot) torch on and adjusted

4. Marver clean
5. Blowhose in place and untwisted
6. Optic cup and step

Gathering

1. Three types
   a. Coating Gather
   b. Collecting Gather
   c. Combination Gather
2. **Videos**
   a. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG" Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" Jun 24, 2020; 1:07 - 4:00
   b. https://www.youtube.com/watch?v=xz1sUH7wDvA CMOG "Glass Skills with Bill " April 9, 2020
   c. https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018); 11:00 - 12:20
      i. Using Honey as glass simulator

Coating Gather

1. Open door just wide enough to see
2. Rest pipe on sill near right side
3. Using reflection of pipe on the molten glass, dip pipe in ¾" to 1"
4. Rotate at least twice around while in the glass to make it even
   a. Do not change depth
5. Pull pipe from glass keeping tip low to allow excess glass to strip off (if desired)
6. Keep turning horizontal inside furnace until it stops trailing glass
   a. Remove pipe from furnace
      i. Keep turning
      ii. Keep horizontal
         1. Or perhaps glass end a little low to move glass off the moil
7. Use hip to close the door
8. Pipe will usually not need to be cooled unless glass is really low or you take too much t ime

Collecting Gather

1. Open door just wide enough
2. Rest pipe on sill near right side
3. Using reflection of pipe on the molten glass dip pipe in ¾" to 1"
4. Rotate twice around while in the glass to make it even
5. Push pipe back and up and speed up rotation to pick up more glass
    a. glass wraps from surface of glass around the gather (left side clockwise rotation)
6. Hold pipe horizontal to allow tail break/wind up on the pipe
7. Keep turning horizontal inside furnace until it stops trailing glass
    a. Remove pipe from furnace
        i. Keep turning
        ii. Keep horizontal
            1. Or perhaps glass end a little low to move glass off the moil
8. Use hip to close the door
9. Pipe will usually not need to be cooled unless glass is really low or you take too much t ime

Combination Gather

1. aka double gather or gather and a half
2. Coating Gather
3. exit furnace and pause 3 - 30 seconds
4. Collecting Gather
5. Use hip to close the door
6. Pipe will usually not need to be cooled unless glass is really low or you take too much t ime

Getting Into the bench

1. Facing the bench place the left end of the pipe (or punty) on the right bench arm near the end
    a. Place in on gently to prevent the piece from breking off, but do not waste time/heat
    b. Keep it turning (clockwise)
2. "Open the door" and go in
    a. Release your left hand
    b. Slide the pipe to the left with your right hand
    c. Grab the end of the pipe with your left hand
    d. Open the door by pulling toward yourself with your left hand
3. Walk around the blowing end of the pipe and turn 180 degrees
4. As you set down, gently place the left end of the pipe on the left arm, and grab the next tool you need with your right hand
    a. Probably time to reverse rotation direction
    b. Keep left end of pipe high when you want to move glass off of the pipe or to stretch the glass
5. With a blow hose
    a. Keep the hose on left of pipe at glory hole
    b. At bench hose goes from pipe, under bench arm, between you and pipe and then to your mouth
    c. Keep twists out of hose or it is very apt to cause the hose to go over the arm rather than under the arm
    d. It should not be necessary, but occasionally you may need to guide the hose under the arm using your right hand as you make the 180 degree turn
6. Come out of the bench in the reverse order getting in
    a. It is tempting to just lift the pipe and walk to the glory hole but this developes a habit that will not work well with larger/heavier workpieces
        i. Be careful not to hit the rollers or lip on the left arm
        ii. Be careful not to hook the blow-hose on the rollers or lip on the left arm
    b. on the other hand it saves a few seconds when doing goblets
7. Videos
    a. https://www.youtube.com/watch?v=0A6c1VFMyoE etgarv "Gudenrath Glassblowing: Choreography" Jun 18, 2012; 0:00 - 0:45
    b. advanced 0:45 - 1:45

Marver glass off the pipe

1. Want heat generally the same all over but cooler outer skin to contain the bubble
2. Looking for a cylinder shape with a rounded tip at least twice as long as wide
    a. perfectly round
    b. perfectly concentric with pipe
3. Move left hand to balance point
4. Then move right hand to shoulder width apart
5. Place pipe on table Pipe low, - 20 degrees marver near moil on edge of table buy turning the pipe
    c. If you lose center flip to top, place pipe on table and begin marvering as it reaches center
    d. Trying to move glass off the pipe onto the workpiece
    e. Making sure no air between glass and pipe
    f. Advanced: air marver glass off pipe just before placing on the table by holding the end of the pipe high
    g. If you get chill marks or wrinkles let the glass skin u a little more while air marvering
6. Slowly raise pipe to horizontal while turning
    h. Optionally marver glass off pipe by pulling back/turning at an angle to the table
7. If end not rounded
        i. Pull back while marvering slightly high
    i. OR –
        i. Hold pipe up at vertical and let glass slump down
        ii. Redo 6
    j. OR – marver the tip with pipe held very high
        i. If not to cold, lift pipe high and marver tip
        ii. If tip is too hot you will blow out the bottom or at best be so thin workpiece breaks off with the punty
8. Videos
    a. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG "Studio Demonstration: William Gudenrath" Aug 1, 2013; 0:49 - 1:06

Making a Neck

1. A.K.A. cutting in the Jack line
2. This where you will break the workpiece from the blowpipe
3. Looking for a concave shape not a sharp V at the bottom
4. less likely to crack when breaking off of the pipe
5. Want heat at neck
    a. Can do this by marvering the tip/bottom between multiple reheats if necessary
6. Cut in with jacks perpendicular to pipe
    a. About ¼" from end of pipe
    b. Jacks are grabbed overhand (opposite of tweezers) (tips come out from little finger end) (tweezers from thumb end)
        i. thump opposes fingers on far jack leg
    c. Make sure jacks are straight up and down
    d. Start light pressure on jacks until you establish a line
    e. Make sure both blades of the Jacks are in the same line
    f. Do not squeeze jacks at reversals of direction or will get lumpy flat spots
    g. Looking for diameter about size of a quarter
        i. too small makes opening close or difficult to open
        ii. too large or forgetting to put in the jackline makes breaking off difficult
7. Stretch and thin by pulling jacks to the right (still perpendicular to pipe)
8. Create concave shape by tilting Jacks to the right (about 45 Degrees)
    a. still pulling to right
9. repeat steps 6-8 as needed and as nearly on step
10. Create the score line jacks perpendicular at narrowest place in the neck
11. May or may not be done all in one operation/heat
12. **Videos**
    a. **https://www.youtube.com/watch?v=sSDUehGj_Zo** etgavr "Gudenrath Glassblowing: Neck" Jun 18, 2012
    b. Audio is hard to make out but important

Make a punty

1. There are many types and ways to make punties, a few are discribed below
2. Evey glass blower develops his favorite way but as experience grows so will your use of different types of punties
3. Small amount of glass on a punty rod using Coating Gather
    a. Looking for a rounded or flat point
        i. ⅛" to ¼" off end of rod
    b. Justin taps hand end of punty on floor before marvering to move glass onto the punty
    c. Dave (bullet shaped)
        i. Marver roll with handle as low as possible while pushing glass back 1 inch
        ii. Seal back with punty held low
            1. Make sure no air between glass and pipe to help keeping the moil from cooling different than the pipe (which causes cracking)

iii. Roll, pull and lift to get bullet shape about ¼" off the pipe
1. Max width is at the end of the rod
2. TBD picture from camera from wall

d. Bill Gudenrath (flat)
i. Looking for a flat tip
ii. Assistant marvers about 10 degrees high
iii. Gaffer flattens tip with tweezers

e. Jim (bullet shaped)
i. Marver into a pointed cone mostly on the rod
ii. Marver about 45 degrees high all the way around, them and push as you roll
1. larger angles leave less glass off the end of the punty rod
iii. Seal back with punty held low
1. Make sure no air between glass and pipe to help keeping the moil from cooling different than the pipe (which causes cracking)
iv. Then flatten sides
v. redo from tip to back
vi. will require reheat before use
vii. if punties are hard to get off try chilling a part of the tip before applying
1. side of file
2. side of bench

f. Ron cut off method (flat)
i. Looking for a flat tip
ii. Excess glass is cut off of the tip using diamond shears
iii. Best way for a premade punty

Attach the punty

1. Flash the workpiece
2. Want Glass cool, Punty hot (or vice versa)
a. Cool tip just a bit
b. Touch bench or blow on it
3. Attach punty using tweezers as close to center as possible
a. If punties do not want to come off slightly chill the tip on a file or the bench to reduce grip on center part of the punty
4. Center the punty
a. Roll to see and/or feel the high spot at the top with the tweezers
b. Fix by pushing down ½ of error with the tweezers

Breakoff the pipe (transfer to punty)

1. Dip hand with tweezers into water
a. Drip water into jack line
i. Contact glass with hand just above horizontal and approach from the pipe end to avoid dropping water on the workpiece

ii. Lift hand towards vertical from pipe end, allow water to drip down hand and tweezers onto the jack line

2. OR
    a. Do not use water just cool jackline with tweezers
    b. Real test of a proper Jackline on light work
3. OR
    a. Do not use water
    c. use shears to attach the puny
    d. use shears to cool the neck without water
    e. tap left end of punty on bench arm
4. Lift and put moil on bench
5. Tap pipe about 5 inches out from the moil
    a. If it does not break
        i. 2nd harder tap in a different place
        ii. more cooling of jack line
6. At the point of breaking the punty should still be warm enough to be flexible, and the neck should be stiff
    a. This helps to keep the punty from coming of the workpiece
7. Optionally use tweezers to re-center workpiece on the punty after breaking off
    a. Must work fast while punty is still hot
    b. Quick flash after break off
    c. Heat tweezers from the pipe
    d. Swap pipes with assistant and then center using tweezers
8. **At this point the bottom of the workpiece is completed and should not be heated to the extent that it can move**
9. **Videos**

https://www.youtube.com/watch?v=q5RfvR92BcQ etgvar "Gudenrath Glassblowing: Punty Making and Centering" Jun 18, 2012

Pulling A Flower

1. Preparation
    a. Tools in place
    b. Marver clean
    c. ~~Hose in place~~
    d. ~~Optic cup and step~~
    e. LARGE PADDLE AT BENCH
2. Collecting Gather small size
    a. ¾" punty
    b. Add two colors for stem on tops and sides of gather
        i. One color lightly solid
        ii. One color sparse
    c. Reheat to melt in the colors
    d. Twist on marver, optionally cut of the tip
3. Coating gather
    a. Take a light second gather but try not to let it get completely cold first
    b. Marver to trapezoidal conic section
    c. Add color for flower
        i. One color on side
        ii. One color on top
        iii. One color around the top edge (becomes flower lip
4. Form the petals
    a. Reheat to very hot
    b. Push top on marver till about 1" from punty to table
    c. At bench use tweezers grab very deep and pull out ward ~ 5 places
    d. ~2x short grabs and pulls in between each opait of the 5 previous pulls
5. Form the stem
    a. Chill tweezers
    b. Reheat
        i. Need to spin a bit to keep flower from folding
    c. Place end first on marver to freeze the outer edges
        i. spin and do this fast to keep flower from folding
    d. Go to bench
    e. Using tweezers pull outward around periphery while lifting left end of pipe (slowly to vertical)
        i. Transition to pulling down as you lift the pipe
6. Optionally twist the stem
7. Break-off
    a. Use diamond sheers to begin break-off©©©
    b. Tap off over a large paddle at bench or break off station
    c. Fire polish the end at brake-off station
    d. Put in annealer with paddle
8. **Videos**
    a. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG "Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" Jun 24, 2020; 4:00 - 6:28

b. Slightly different flower https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018)"; 5:00 - 7:00

Making A Solid Caterpillar

Excellent project to practice gathering, marvering, use of jacks, and tweezers.
Goal should be to do this with no reheats

1. Preparation
    a. tools in place
    b. marver clean
    ~~c. hose in place~~
    ~~d. optic cup and step~~
2. Get ¾" punty from pipe warmer
3. If not dull red, heat up to remove carbon and insure glass will stick to punty and prevent bubbles
    b. Quick quench to remove crude from pipe (not in furnace)
        i. Practice capping pipe to prevent steam from heating pipe and/or you
4. Collecting Gather on ¾" punty
    a. Keep it centered
    b. Hold tip down about 15 degrees while turning to "air marver " glass off of the punty
5. Marver into a long cylinder
    a. Use marver table
    b. Just wider than the punty
    c. 4 or 5 to one length to diameter ratio
6. Pull out the nose with the tweezers
    a. Move to bench
    b. Grab tip pointed at the center of punty and pull out straight
        i. Keep turning
        ii. Short grabs and pulls
    c. Turn tweezers perpendicular to punty and pull gather to slight taper
        i. Keep turning
        ii. Short grabs and pulls
7. Put in constrictions starting at the punty about every ¾ diameter with the Jacks
    a. Work from the punty towards the end
    b. About 30% deep
    c. Do not press with jacks when reversing rotation of you will get flat spots
    d. Cut in with jacks perpendicular to pipe
        i. Jacks are grabbed overhand (opposite of tweezers) (tips come out from little finger end)
        ii. Make sure jacks are straight up and down
        iii. Start light pressure on jacks until you establish a line
        iv. Make sure both blades of the Jacks are in the same line
        v. Do not squeeze jacks at reversals of direction or will get limpy flat spots
8. Put in the eyes with the tweezers
    a. Rest the head on the bench arm
    b. Spread tweezers and push into the head
    c. About ½ diameter from last constriction
9. Put in an "S" curve
    a. Stop Rotation Eyes Up
    b. Grab head gently with tweezers
    c. Lift up and back while twisting down

10. Prep for breakoff
    a. Chill and deepen 1st restriction near the punty using diamond shears
11. Remove from punty
    a. At brake off station
    b. Rest on pickup paddle horizontally
    c. Tap Knife at punty/piece junction perpendicular to the punty
    d. Tap punty with knife or other tool to break off
        i. Fingers barely hold the punty so it can vibrate
        ii. If it doesn't break off, tap harder holding at a different place
        iii. If it still does not break off chill and stress the last restriction with diamond shears
        iv. Flame polish the sharp edges
12. Do not leave space behind your piece
13. **Videos**
    a. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG" Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" November 2004; 6:25 - 8:00 "Making the Solid Caterpillar"
    b. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG" Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" November 2004; 8:00 - 10:00 "Making the Hollow Caterpillar"

Making A Tumbler (necked sphere method)

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    ~~d. optic cup and step~~
2. Get (wide) blowpipe from warmer
    a. If not dull red, heat up to remove carbon and insure glass will stick to pipe and prevent bubbles
    b. Quick quench to remove crude from pipe (not in furnace)
        i. Cap pipe to prevent steam from heating pipe and/or you
    c. Blow through pipe to prove it is not blocked and remove steam/water
3. Get 1st Collecting Gather
4. Marver 1st gather
5. Blow starter bubble
    a. Looking for
        i. Bubble about 3/4 length of glass
        ii. More glass at bottom for punty
    b. Pipe over back of marver.
    c. Keep turning.
    d. Blow and cap until bubble is the correct size, cannot deflate so 2 small blows may be better than one big blow
    e. While capped and rotating, put the pipe flat on the table. (or so you can see the tip)
        i. hold high for short round bubble
        ii. hold low for long cylinder bubble
        iii. If no starter bubble forms release cap by ear
            1. No puff, bad cap
            2. Puffs, glass was to cold
    f. Can go to the bench while waiting for glass to cool for the 2nd gather. (sit or stand)
        i. good time to make sure correct size block is available
6. Get 2nd Collecting Gather
    a. Heat – starter bubble should be cool to prevent bubble from collapsing
        i. Tapping and listening to sound can tell if piece is cold
    b. Rotate as it enters the molten glass, Same depth or slightly less
    c. Twice around
    d. Faster rotation as you push back and up out of glass to get more glass on the pipe
    e. Keep rotating
    f. Keep horizontal
        i. Or perhaps just a little down to move glass off the moil
7. If needed cool the pipe
    a. From handle end and slide toward but not up to the weld
        i. Prevents warping pipe
    b. Then slide back toward handle
8. Optional add color(s)
    a. Heat – very hot
    b. Dip, roll, etc. in frisk

c. Heat between colors
d. If you twist colors by marvering at tip, only marver in one direction
    i. then cut off the tip
e. Roll in color in both directions - Ron

9. Marver into parison shape (like a Q-tip)
    a. Bench
        i. Keep moil 3 +" from bench arm to keep from over cooling moil
        ii. Use block
            1. Optionally - use back of block to push of glass from moil if needed
                a. Good time to hold the pipe high
            2. Use opening in block on moil to center block
            3. Start at pipe, toward tip but do not push in on the end of the glass on the pipe
                a. Like on a lathe watch the workpiece for shape
    b. OR Table
        i. Start at pipe, then tip, then the middle with appropriate angles
10. Cool so bottom does not blow as thin as sides
    a. At bench use back of jacks and/or paper
    b. At table maver the tip
11. Blow to about 50% of final size
    a. Looking for Q tip shape, wall thickness maybe twice as thick at the bottom than the sides
    b. If cold reheat
        i. Heat full so that you can out in jackline
12. Put in the Jack line
    a. optionally reheat
    b. hang to start a neck
    c. then use jacks
13. Complete blowing to sphere shape with thicker bottom
    a. Reheat to jack line so you can stretch the neck
        i. optionally put on blow hose
        ii. Stretch the neck
            1. Swing to elongate neck
            2. and/Or left hand high on bench to elongate
    b. repeat marver with paper/jacks and blowing
        i. Nick/Justin - cool extra glass in the tip between blows
            1. want to stretch/thin the glass near the pipe
14. Marver into shape
    a. With wet newspaper use fingers as a shape-able block
    b. OR Jacks
        i. I note Dave only uses the jacks except when desired shape is concave
15. Prep for punty
    a. Reheat more at bottom
    b. Flatten bottom using back of jacks while gently blowing
        i. Need to be aggressive to get a shape corner
    c. Indent bottom slightly using back of the jacks against the bottom
        i. Makes room for punty and allows finished piece to sit flat on a table
    d. Cool jack line by sliding jacks up and down while turning

16. Transfer to the punty
17. Reheat
    a. This reheat will always be longer as the glass has cooled when attaching the punty and is even cooler now
    b. Don't want punty to get floppy so avoid full flash till it stiffens
    c. Extra heat on the lip as that is to be opened next (red hot)
    d. Switching between overhand and underhand spinning will change the fingers closest to the glory hole and allow them too cool
18. Thin the thick glass from the opening
    a. Pull straight out (or slightly toward center line) with tweezers all around
        i. Tweezers parallel to pipe thumb on top
        ii. Small grabs
        iii. Long pulls
        iv. Grip the tweezers close to the tips for more grip on the glass
        v. Keep the hole small
        vi. twice around 1st time tweezers cool the glass so it can be gripped
        vii. second time does most of the pulling
    b. Optional Reheat but try to avoid by working efficiently
        i. Extra heat on the lip for cutting
        ii. if you do reheat slightly chill the inside rim with the shears before cutting (helps to keep opening round
    c. Cut off with straight shears
        i. Cut glass from bottom of workpiece
        ii. Cut in 1st, then upward to go around keep cut perpendicular to punty
        iii. Start with the punty rod close to you roll away slowly as you cut but do not force the roll, let the scissors pull it around
    d. True up and drop the hole
        i. Heat to near the base
        ii. hang low to drop opening
        iii. True sides with paper or jacks
19. Stretch the glass by angling down the jacks inside to match the taper and pulling utward
20. Optionally add a lip wrap
21. Inflate using steam stick or sophietta
    a. Heat, depth to the straight (completed bottom section)
    b. Jack opening about 1" dia., and out a little
    c. And true up with back of jacks
        i. this cools lip so sophietta does not push into the bubble
    d. Stop rotation push in steam stick or blow with sophietta
        i. Rotate a little
        ii. Repeat
        iii. Grab sophietta on horizontal part of the pipe to keep from pulling opening off center
    e. **NOTE:** I found the steam tick easier to use in the beginning, but found the added temperature control of the sophietta worth the effort, especially for lipwraps with soft colors where the metal can e used to cool the wrap before inflation.
22. Use jacks to open the top and shape
    a. Heat where opening (top)

b. Keep punty 3+ inches from bench arm to keep from over cooling moil
c. Jacks on inside
    i. Jack blades should be parallel to each other (about 1" apart)
        1. control blade's width by thumb pressure on blade farthest from your palm
        2. tilt blades slightly so blade that is first touched by glass rotation is slightly higher
            a. helps to prevent flat spots/wrinkles
            b. this will require changing tilt with each change of rotation
    ii. Feel for how much pressure to use
        1. The thinner the glass the more aggressive you must open it because the jacks cool thin glass more rapidly than thin glass
    iii. Stop pressure when you stop turning while you reverse turning direction
    iv. Keep jacks parallel to axis of rotation And above center line
    v. Start with tips up to prevent folding the lip
    vi. As you progress move jacks toward parallel to floor for sides that are straight
        1. avoid over opening the lip
    vii. When almost to final form, jacks parallel to existing glass
        1. Rest jacks on cooler glass as a guide
            a. established bubble (which is on center) will guide jacks for the sides
            b. back as far as possible without making tool marks with the tips
d. Use both legs of jacks to shape the outside

23. Use Jacks to final shape
    a. reheat
    b. Flatten the lip with helper using paddle while you control the opening with the jacks
        i. inside and outside
    c. Or use the back of the jacks
24. Remove from punty
    a. Equalize temperature of piece
        i. map gas on punty
        ii. Flash heat
        iii. repeat map gas or cool outside glory hole 5 sec
        iv. Flash again
    b. Rest on pickup paddle vertically or horizontally
    c. Tap Knife at punty/piece junction perpendicular to the punty
    d. Tap punty with knife or other tool to break off
        i. Fingers barely hold the punty so it can vibrate
        ii. If it doesn't break off tap harder holding at a different place
        iii. try for flash and water drop at jack line while holding workpiece higher than jackline
        iv. If it still does not break off you are screwed
        v. Some suggest pushing down on the punty
        vi. I like to hit the punty at an upwards angle
    e. Flame polish the sharp edges
25. Put in annealer
        b. Do not leave space behind your piece
26. Videos
    a. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG" Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" November 2004; 10:39 - 20:38 "The 'Necked-sphere Process"

b. https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018); 13:00 - 21:50

Making A Roman Bottle

1. Preparation
    a. tools in place
    b. marver clean
    ~~c. hose in place~~
    ~~d. optic cup and step~~
2. Get (wide) blowpipe from warmer
    a. If not dull red, heat up to remove carbon and insure glass will stick to pipe and prevent bubbles
    b. Quick quench to remove crude from pipe (not in furnace)
        i. Cap pipe to prevent steam from heating pipe and/or you
    c. Blow through pipe to prove it is not blocked and remove steam/water
3. Combination Gather
4. Marver 1st gather
5. Blow starter bubble 50%
6. Chill tip on marver
    a. No pressure, allow bubble to stretch a little
7. Reheat
8. Rechill tip
9. Blow the tube longer
10. Stretch & cool neck
    a. If it does not want to stretch
        i. Reheat
        ii. OR swing/spin
    b. If it wants to stretch too much
        i. Marver tip to hold weight while neck stiffens
11. Blow bottom to full size
    a. Do not let bottom get to thin or it will break off with the punty
12. Put in the Jack line
13. Prep for punty
    a. Reheat more at bottom
    b. Flatten bottom using back of jacks while gently blowing
        i. Need to be aggressive to get a shape corner
    c. Indent bottom slightly using back of the jacks against the bottom
        i. Makes room for punty and allows finished piece to sit flat on a table
    d. Cool jack line by sliding jacks up and down while turning
14. Transfer to the punty
15. Open the neck
    a. Reheat
        i. This reheat will always be longer as the glass has cooled when attaching the punty and is even cooler now
        ii. Don't want punty to get floppy so avoid full flash till it stiffens
        iii. Extra heat on the lip as that is to be opened next (red hot)
    b. Flair the opening using the jacks
16. Continue as in "Making a tumbler" Remove from the punty and put in annealer
17. **Videos**
    a. https://www.youtube.com/watch?v=h81cmT6UKFI CMOG "Glassblowing" 2007 0:44 - 3:23

b. https://www.youtube.com/watch?v=t1_kEvNhlps CMOG" Foundations Vol 1: Intro to Furnace Glassblowing with William Gudenrath" November 2004; 25:39 - 35:00 "Making the Roman Bottle" Process"
c. https://www.youtube.com/watch?v=dHpu4epKerk CMOG "Watch with the Artist: Bill Gudenrath Studio Demonstration" July 8, 2015; 1:00 - 4:10
d. https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018)"; 7:00 - 11:00

Blow-Yank-Blow

Best for thin tall narrow objects.

1. Preparation
    a. Tools in place
    b. Marver clean
    c. Hose in place
    ~~d. optic cup and step~~
2. Combination Gather
    a. Marver and blow starter bubble
    b. Bubble 60% deep
    c. Chill end and form a pointed tip on marver (so that it can be pulled)
        i. No downward pressure, allow bubble to stretch
3. Reheat all
    a. Put on a blow hose and reheat
    b. Hose goes to outside (left) of pipe
4. Put blow hose In mouth and go to bench
5. Blow Yank Blow
    a. Hang and re-cool tip
        i. On bench arm or marver
    b. Small puff on way to bench
    c. Sit at bench
        i. Tube goes under bench arm and under pipe
    d. Pull a tip outward with the tweezers (so the diamond shears can get around the glass)
    e. Pull and chill a little with the diamond shears
        i. Chills tip and prevents it from blowing out
    f. Begin to put in a Jack line after starting inflation
        i. Chills neck and prevents it from blowing out
        ii. Jackline can be delayed till after BYB but reheat for jack line can be difficult with now thin workpiece
    g. Pull out tip and stretch bubble using diamond shears (1-2in)
        i. Keep this pull straight
        ii. use many small bites and keep turning
    h. (BLOW) to size/ thickness desired
        i. blow gently
        ii. Cradle tip in diamond shears, Keep turning pipe
    i. (YANK) -
        i. do not pull
    j. (BLOW) - Blow gently after stretching to round out shape
        i. Cradle tip in diamond shears, Keep turning pipe
        ii. Can use diamond shears to push against the end of the bubble if looking for a sphere
        iii. Do not blow while stretching
        iv. Keep turning pipe while stretching
            1. By releasing and re gripping
        v. Excessive long tail can be caused by
            1. Pulling instead of yanking

2. failing to chill the tip

k. Optional small repeat yank and light blow

6. Prep the bottom
   a. Reheat if necessary
   b. for a goblet cut in the jacks above mangled tip and excess glass on tip
      OR for a tumbler Leave enough glass to have a thicker bottom so it does not break off with the punty
      i. easier to cut in while rotating in opposite direction that twist was put in
      ii. now is the time to begin to flatten or pull the bottom as desired
   c. inflate bubble at the same time
   d. complete cutoff with diamond shears
      i. do not break off by striking at this step or likely to put a hole in the bottom
   e. Straighten and center as much as possible with remaining heat
7. Complete Jack line (while it is still hot)
8. Break off excess glass at tip
   a. Diamond shears in left hand
   b. Tap glass of with tweezers with right hand
9. Continue as in Making a Tumbler" Marver into shape etc
10. **Videos**
    a. https://www.youtube.com/watch?v=MTvupcSS30w yewahkem "Blow-yank-blow exercise" Posted Aug13, 2012
    b. https://www.youtube.com/watch?v=r7BnTCC2wLQ etgarv "Gudenrath Glassblowing: Blow-Yank-Blow Vase" Jun 21, 2012; 0:00 - 2:50
    c. https://www.youtube.com/watch?v=HVTZyx3bcNI CMOG "Gudenrath Glassblowing: Blow-Yank-Blow" Jun 21, 2012; 0:00 - 2:14
    d. https://www.youtube.com/watch?v=hPCk9O1jw-w jimwilt "William Gudenrath Demos B-Y-B technique" Posted Feb 17, 2011
    e. https://www.youtube.com/watch?v=dHpu4epKerk CMOG "Watch with the Artist: Bill Gudenrath Studio Demonstration" July 8, 2015; 48:20 - 58:00
    f. https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018); 21:50 - 25:50

Optical Twist

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    d. optic cup and step
2. Collecting GCombination Gather
    a. Glass needs to fit into the cup
3. Marver and blow an even thick sphere
    a. Marver short for sphere shaped bubble
        i. hold glass up while turning into a spher'ish shape to keep sides and neck thicker
    b. Blow and cap almost to tip ~ 90%
        i. Be sure glass has skinned before blow and cap, want thick sides and buble almost to the tip
            1. judge by color of glass when to blow
        ii. want a slow inflation that give thicker sides and allows you to control bubble growth
    c. Swing/loop to elongate for mold
    d. begin shaping for the mold
4. Marver with slight taper to fit in optical cup
    a. Reheat all
    b. Looking for a narrow tapered cylinder shape with thick uniform walls and a rounded tip
        i. Sides need to be even down to the tip so that the glass cools evenly, otherwise glass will twist more in the hotter thicker parts
5. Blow in the dip mold (optic cup)
    a. Reheat
        i. carry to step and cup horizontally.
        ii. Swing/hold vertical to lengthen stretch and narrow bubble to fit in optic mold only if necessary
    b. Lower to bottom of mold
    c. Inflate, do not let bubble blow above cup rim
        i. End of blowpipe needs to be inside the cup and centered
    d. Hold about 1-2 sec to not over cool the glass
    e. Cap and push down to enhance ribs
    ~~f. Swing to reduce taper to a cylinder~~
6. Put in the twist (this is a type of Blow - Yank - Blow)
    a. Reheat all
        i. Optionally put on blow hose
        ii. From this point on, minimize the length and number of reheats to reduce the melting away of the pattern from the mold
    ~~b. Marver tip and twist on bench arm to cool tip (give tools a place to grab) and lengthen (away from bench)~~
        i. therefore turn counterclockwise in glory hole
    c. Optionally pull out tip (on center) with tweezers and twist
    ~~d. Swing to lengthen~~
        ~~i. allows diamond shears on without using tweezers first~~
        ~~ii. allows more twists~~
    ~~e. optionally chill the tip with water~~

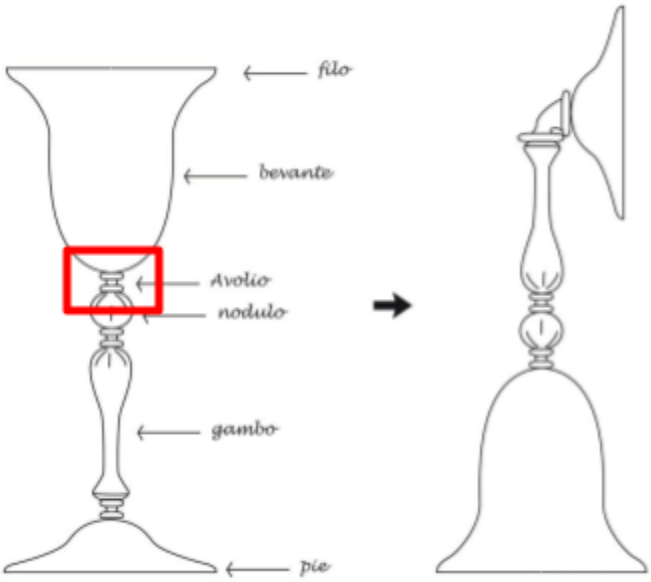
f. twist (away from bench) while cutting in with diamond shears then grip with diamond shears and begin inflation
    i. grab and release diamond scissors for an even twist
g. pull then twist (away from bench)
    i. when twist begins to rope pull with shears to lengthen and increase inflation
h. blow yank blow
i. cut off at excess glass on tip with diamond shears at last grip and break off by striking if necessary

7. Prep the bottom
    a. Reheat if necessary
    b. for a goblet cut in the jacks above mangled tip and excess glass on tip
    OR for a tumbler Leave enough glass to have a thicker bottom so it does not break off with the punty
        i. easier to cut in while rotating in opposite direction that twist was put in (toward the bench)
        ii. now is the time to begin to flatten or pull the bottom as desired
    c. inflate bubble at the same time
    d. complete cutoff with diamond shears
        i. do not break off by striking at this step or likely to put a hole in the bottom
    e. Straighten and center as much as possible with remaining heat
        i. Put in jackline
    f. Optional reheat
    g. easier to cut in while rotating in the same direction that twist was put in (away from the bench)
    h. Straighten and center as much as possible with remaining heat
8. Straighten and center as much as possible with remaining heat
    a. jacks or paper
    b. all needs to be centered but the tip MUST be centered
9. Continue as in Making a Tumbler Marver into shape etc
    a. Blow out sides
    b. Optionally flatten bottom
10. **Videos**
    a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; 3:26 - 9:50
    b. https://www.youtube.com/watch?v=dHpu4epKerk CMOG "Watch with the Artist: Bill Gudenrath Studio Demonstration" July 8, 2015; 31:20 - 40:00
    c. https://www.youtube.com/watch?v=HUoi-62Kig8 CMOG" Bill Gudenrath Live-streamed Studio Demonstration (June 20, 2018); 41:00 - 44:00

Pulled stem with dropped foot

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    ~~d. optic cup and step~~
2. Combination Gather rather large size
3. Blow Starter bubble
    a. blow 30%
4. blow the cup
    a. put on hose
    b. reheat
    c. jacks wide knob 3/4 off end (starts to cool it)
    d. blow and put in the Jack line 50% of final size
    e. use jacks to pull on now chilled knob
        i. this is a blow-~~yank~~ pull-blow for the cup
    f. may need to reheat in the middle of this
5. Make the stem
    a. Chill the bottom of the bowl using the soffietto
    b. heat the stem
    c. slowly pull the stem
6. drop foot
    a. put scissors on table
    b. flash cup and stem
    c. Combination Gather on 3/4" punty
    d. Hold vertical and drip on table
    e. cut off and flatten the center with scissors
    f. Place stem in center and push lightly down
    g. center stem
7. reheat and form foot
    a. paper with fingers on top, thumb on bottom
8. punty and continue as with any other tumbler
9. **Videos**
    a. https://www.youtube.com/watch?v=i26Wdv9LJ5Q CMOG "French Pulled-Stem Wineglass | Techniques of Renaissance Venetian-Style Glassworking'' February 4, 2019; 0:00 - 1:38

Avolio



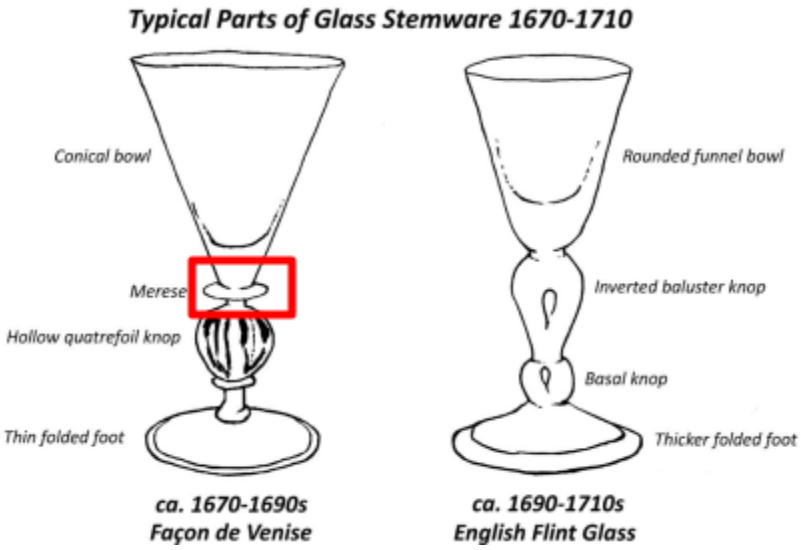
1. Looking for an hourglass or spool shape
2. Prep
    a. inform assistant so he can get and heat up a punty for a bit
    b. flash the piece
    c. heat back of jacks with the pipe or a touch-up on the piece
    d. wax the back of the jacks
3. tell assistant you are ready for the bit
    a. assistant
        i. preheats the punty
        ii. gathers about 1" deep on 1/2" punty as much as he can
        iii. approaches gaffer from the end of the piece (like a punty)
            1. tip slightly down last 3 steps to move glass off of the punty
        iv. turn till grabbed by gaffer
        v. be prepared for flip command
        vi. follow the gaffer
        vii. put away punty and pick up paddle for flattening the end
4. Cast on
    a. grab punty with jacks
    b. relax grip and ask for a flip
    c. as glass drops back to center touch center and push on to desired diameter at the cup, pull out 1" and towards self about 1-1/2"
        i. when touching push on until you get the diameter of contact you want
    d. cast on glass to cone shape as you roll pipe away from yourself
5. Cast off
    a. break stringer by continuing to roll pipe away faster but do not follow with punty
6. Shape into hourglass shape
    a. pat glass onto workpiece with back of jacks
        i. one time and fast to save heat

b. use back of jacks to form a rounded cone
    i. books from top
    ii. I prefer bottom for vision
c. cut in with tips of jack
    i. not to thin for strength
    ii. not to long for heat
d. pull out with jacks to form concave shape
    i. use jacks tips on bottom of cup as a reference
    ii. use the wide parts of the jack blades to freeze
e. assistant flattens the end with paddle

7. **Videos**

a. https://www.youtube.com/watch?v=ylD2ljBgGkI etgarv "William Gudenrath Glassblowing Instruction Knop-Avolio-Blown Foot Corning Museum of Glass" June 15, 2012 ; 0:00- 1:15
b. https://www.youtube.com/watch?v=SKWxWgHkPm jimwiltschkoglass "Guido Gerlitz - Making an Avolio " September 21, 2009

Merese



1. Looking for round flattened shape
2. steps are very similar to Avolio
3. Prep
    a. inform assistant so he can get and heat up a punty for a bit
    b. flash the piece
    c. heat back of jacks with the pipe or a touch-up on the piece
    d. wax the back of the jacks
4. tell assistant you are ready for the bit
    a. assistant
        i. preheats the punty
        ii. gathers about 1" deep on 1/2" punty as much as he can
        iii. approaches gaffer from the end of the piece (like a punty)
            1. tip slightly down last 3 steps to move glass off of the punty
        iv. turn till grabbed by gaffer
        v. be prepared for flip command
        vi. follow the gaffer
        vii. put away punty and pick up paddle for flattening the end
5. Cast on
    a. grab punty with jacks
    b. relax grip and ask for a flip
    c. as glass drops back to center touch center and pull out 1" and towards self about 1-1/2"
        i. when touching push on until you get the diameter of contact you want
    d. cast on glass to cone shape as you roll pipe away from yourself
6. Cast off
    a. break stringer by continuing to roll pipe away faster but do not follow with punty
7. Shape
    a. pat glass onto workpiece with back of jacks
        i. one time and fast to save heat
    b. use back of jacks to form slightly pointed collar

i. books from top
ii. I side for vision

c. cut in with tips of jack
i. very shallow strength
ii. not to long for heat

d. optional: blade on either side to mark center for the next piece

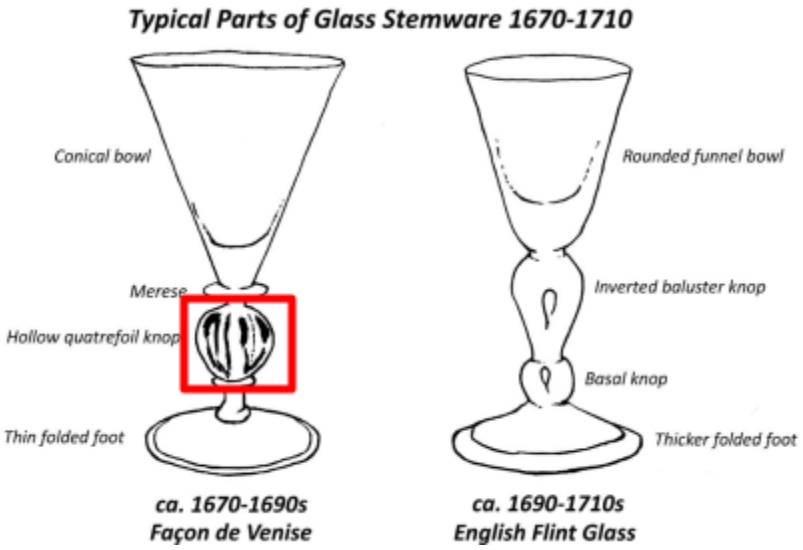
8. **Videos**

a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; 22:00 - 23:30

b. https://www.youtube.com/watch?v=k4Bm-ttJgvg etgarv "William Gudenrath Glassblowing Instruction Merese Corning Museum of Glass" September 2. 2012 ; 0:00- 1:15

c. https://www.youtube.com/watch?v=-xZvhjPwkJM CMOG "Classic Flared Wineglass" July 8, 2015; 2:46 - 3:17 & 4:07 - 4:30

Solid Knop



1. Prep the workpiece (i.e.)
    a. Make a tumbler (usually with a tapered bottom)
    b. Add an merese
2. Make the Ball
    a. Combination Gather on a ¾" punty
    b. marver off punty
    c. Stuff in optic cup
    d. Prep and attach to workpiece similar to a blown foot
    e. Shape (into a sphere)
        i. straighten with tweezer
        ii. cut in with jacks
        iii. Chill with shears and break off
    f. fire polish the end
3. **Videos**
    a. **https://www.youtube.com/watch?v=zj8je502f48** CMOG "Lidded Goblet with Aqua Chain" February 1, 2016; 3:48 - 4:57

Blown Foot

1. Prep the workpiece (i.e.)
    a. Make a tumbler (usually with a tapered bottom)
    b. Add an merese
    c. Add a knop and or stems
    d. Add an merese
2. Make the bubble
    a. moderate sized Collecting Gather on a ¾" punty
    b. marver off punty
        i. marver with tip wider for for thicker bubble at top of stem if no optic cup
        ii. marver with bottom wider for optical cup
    c. blow bubble to tip (hold up pipe)
    d. hang down on way to bench
    e. jack in a wide constriction at top
        i. Start right at end of pipe
    f. Inflate for uniform bubble
3. Place bubble on workpiece
    a. Gaffer grabs scissors
    b. Gaffer places pipe vertically on foot
    c. Assistant swings up foot bubble
    d. Gaffer grabs with shears
        i. places on work piece
        ii. push down for good connection
        iii. turn workpiece 90 degrees to center
        iv. Pull up for uniform bubble
        v. cuts off on diagonal while assistant lightly blows
            1. Let bubble stiffen before cutting off so it does not drop over part and does not get to floppy to flash on reheat
4. Open the foot bubble
    a. Reheat
    b. pull out evenly/pull to center with tweezers (may need to flatten 90 degrees from shear)
        i. Can pull attachment to center in this step also
    c. cut in line with jacks
        i. about 1 ¼" for 3" goblets
        ii. tilt and pull out while cutting in the line
    d. cool line with diamond shears
    e. break off end
    f. Reheat
        i. keep quite shallow to keep stem stiffer
        ii. use foot to block heat from the stem
    g. open with jacks repeat these steps as necessary
        i. place jack tips at junction of maurice and foot bubble and pivot up from this location to get straight sides
        ii. be sure to use long fast rolls on the bench

iii. spin rapidly when opening to use centripetal force
iv. open at least to 90 degrees to avoid ogee shaped foot, want nearly straight exponential curve

h. shape the foot
i. assistant paddles the foot
ii. Gaffer pressed foot against paddled foot
iii. widen the jacks and move out ward

5. **Videos**
a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; ~19:00 - ~21:300

Solid Tapered Stem

1. Prep the workpiece (i.e.)
    a. Make a tumbler (usually with a tapered bottom)
    b. Add an avolio
2. Make the stem
    a. Collecting Gather on a ¾" punty
    b. marver off punty
    c. Stuff in optic cup
        i. swing punty around center while in cup to increase length of ribs
    d. Prep and attach to workpiece similar to a blown foot
    e. Shape (into a teardrop taper)
        i. straighten with tweezers or diamond shears
        ii. Chill the top near the workpiece
            1. back of jacks , soffetia, or air hose
        iii. pull with diamond shears
        iv. cut in with shears and break off
    f. fire polish the end
3. **Videos (Blown Stem)**
    a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; ~21:30 - ~22:10
    b. **https://www.youtube.com/watch?v=-xZvhjPwkJM** CMOG "Classic Flared Wineglass" February 1, 2016; 3:20 - 4:07

Blown Tapered Stem

1. Prep the workpiece (i.e.)
    a. Make a tumbler (usually with a tapered bottom)
    b. Add an avolio
2. Make the stem
    a. small sized Collecting Gather on a ¾" punty
    b. marver off punty
        i. marver with tip wider for for thicker bubble at top of stem if no optic cup
        ii. marver with bottom wider for optical cup
    c. Optionally stuff in optic cup
        i. swing punty around center while in cup to increase length of ribs
    d. hang down on way to bench
    e. jack in a wide constriction at top
        i. Start right at end of pipe
    f. Inflate for uniform bubble
3. Prep and attach to workpiece similar to a blown foot
4. Shape (into a teardrop taper)
    a. straighten and center with tweezers
    b. optionally chill the top near the workpiece
        i. back of jacks , soffetia, or air hose
    c. cut in with jacks to length
    d. pull to center and cut off with diamond shears
5. center
    a. reheat
    b. center with jacks used horizontally
6. **Videos**
    a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; ~21:30 - ~22:10
    b. **https://www.youtube.com/watch?v=-xZvhjPwkJM** CMOG "Classic Flared Wineglass" February 1, 2016; 3:20 - 4:07

Air Twist Goblet

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    ~~d. optic cup and step~~
    e. Optional n-fin mold
2. Small Collecting Gather on blow pipe
3. Marver with block
4. Blow Starter bubble
    a. Bubble 75%
5. Cool then gather over
6. Marver with block
7. Optionally mark n channels with the fin mold
8. Cut n channels as deep as possible with multiple use of the jack blades
    a. Not all the way to the bubble
9. using tweezers stretch about 150%
10. ~~reinforce the channels with a knife~~
    ~~a. especially near the bubble~~
11. form a dam
    a. heat tip
        i. optionally use hot torch
    b. flatten back to channels
12. gather over all to trap air in channels
    a. very shallow angle in furnace to trap more air
    b. roll on surface rather than plunge
    c. strip in furnace then outside
13. marver on table to cool and lengthen
14. cut off above bottom of bubbles with jacks and diamond shears
    a. may need to raise left end of pipe for control
15. twist the air bubbles before they disappear using diamond shears
16. put in a jackline
    a. put on blow hose
    b. reheat
        i. optionally blow in furnace
    c. blow on way to bench
    d. blow yank blow with twist
    e. trim excess
17. continue
    a. reheat
    b. repeat
18. Flare the stem bottom
    a. cut off
    b. heat the end
        i. optionally use hot torch

   c. push into flare into a maurice
19. Continue as in dropped foot
   a. Cup will be thick and ned extra work to thin
20. **Videos**
   a. https://www.youtube.com/watch?v=4xvoT0IlD-k CMOG "Bring the Heat: Chris Rochelle makes glass goblets with mesmerizing air-twist pattern stems" November 14, 2020;
   b. https://www.youtube.com/watch?v=eq5huA4T8aU CMOG "Air Twist Stem" October 18, 2007
   c. https://www.youtube.com/watch?v=dMDvXFgE0IA etgarv "Gudenrath Glassblowing: Air Twist Goblet" June 22, 2012

Air Twist Stem

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    ~~d. optic cup and step~~
    e. Optional n-fin mold
2. small Collecting Gather on ¾" punty
3. Marver with block
4. optionally mark n channels with the fin mold
5. cut n channels as deep as possible with multiple use of the jack blades
    a. using tweezers stretch about 150%
~~6. reinforce the channels with a knife~~
    ~~a. especially near the bubble~~
7. form a dam
    a. heat tip
        i. optionally use hot torch
    b. flatten back to channels
8. gather over all to trap air in channels
    a. very shallow angle in furnace to trap more air
    b. roll on surface rather than plunge
    c. strip in furnace then outside
9. marver on table to cool and lengthen
10. cut off above bottom of bubbles with jacks and diamond shears
    a. may need to raise left end of pipe for control
    b. continue twisting and pulling
    c. must cut over bubbles or they will push up and away from jacks
11. twist and pull to size
    a. reheat
    b. chill narrow part of stem on marver
    c. optionally chill the tip
    d. continue twisting and pulling using diamond shears
12. Smooth and straighten (optional if roping occurs)
    a. reheat
    b. marver the whole length on table
    c. repeat 11 and 12 till size and shape desired
13. reheat and put in a jackline
14. Flare the stem bottom
    a. heat the end
        i. optionally use hot torch
    b. push into flare into a maurice with back of jacks
    c. shape against paddle with the wide part of the jack blades
15. Extra notes:
    a. when attaching to cup
        i. heat both ends with a torch

ii. use wide part of tweezers to align stem to ovoleo

16. **Videos**
    a. https://www.youtube.com/watch?v=4xvoT0IlD-k CMOG "Bring the Heat: Chris Rochelle makes glass goblets with mesmerizing air-twist pattern stems" November 14, 2020;
    b. https://www.youtube.com/watch?v=eq5huA4T8aU CMOG "Air Twist Stem" October 18, 2007
    c. https://www.youtube.com/watch?v=dMDvXFgE0IA etgarv "Gudenrath Glassblowing: Air Twist Goblet" June 22, 2012

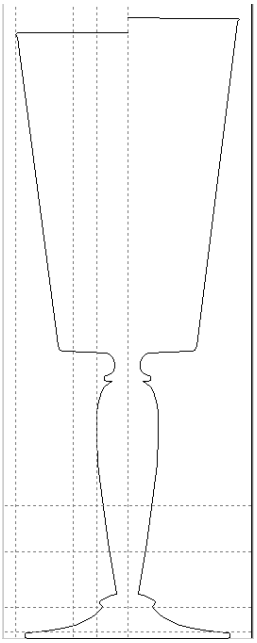
Solid Twisted Stem with knop

1. Collecting Gather on a ¾" punty
2. marver off punty to ~ 2x diameter
3. Start the knop
    a. shallow Jack lines at pipe and about ¼" off pipe (Stuff in optic cup
    b. Ball will stretch when pulling the taper
4. Start the twist with tweezers
    a. use jacks or tweezers to cut in 2 or 4 lines below the lower jackline
    b. alternate until they are deep
    c. begin twist
5. finish the twist and pull the taper using the diamond shears
    a. heat the lower part of the twist only
        i. assists in taper
        ii. reduces knop stretching
        iii. I like lose fat twists over tight flat twists
6. reheat cut in and push back the knop
7. Measure and cut to length + ⅜ " (for the faux merese)
8. Torch and push on the faux merse
9. **Videos (Blown Stem) TBD**
    a. https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; ~21:30 - ~22:10
    b. **https://www.youtube.com/watch?v=-xZvhjPwkJM** CMOG "Classic Flared Wineglass" February 1, 2016; 3:20 - 4:07
10. **NOTE:** Attempted same with buble 1st but need to close at knop so trapped air doesn't escape during twist verses not wanting the the Knop to stretch when pulling the taper

Goblet by assembly method

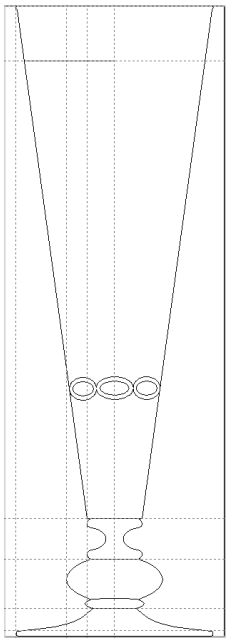
1. Preparation
    a. Put ceramic plate in pick up box
    b. Turn on pickup box to 987 degrees
2. Start the same as a normal goblet but after the merese or Avolio transfer to a punty and open the cup
3. Break off into the pickup box
    a. Warm the Avolio with MAP gas
    b. Flash
    c. hold vertical 1" over bench in case of an early break
    d. chill punty line with slight pressure with scissors
    e. Carry over to pick up box as assistant opens it
    f. Break off onto ceramic plate
4. Build the stem and foot on the pipe
    a. When making blown optic stem
        i. after optic cup heat mostly the bottom
        ii. pull stem before cutting in the jack line
        iii. reheat
        iv. pull and cut stem
        v. reheat
        vi. cut in 2nd jack line closer to bottom
        vii. paper marver straight
5. Transfer stem and foot to punty
6. Assistant turn up pick u box to ~1010
7. Prep the bottom
    a. heat stem top and marver to a point
8. Pick up the cup
    a. Flash
    b. torch stem top
    c. Open pick up box
    d. hold punty with tweezers and stab the cup ip boxpoint small Collecting Gather on ¾" punty
    e. turn and center
9. Center it all up
    a. Reheat
    b. Center junction with flats of tweezers
    c. flash
    d. Reheat
    e. center foot on punty if neded
    f. center cup with jacks
10. Put in annealer in normal way
11. **Videos**
    a. https://www.youtube.com/watch?v=K1R3VM46P4k CMOG "Goblet Oddities with William Gudenrath, Summer 2021 Studio Live Stream" July 14, 2021; 31:24 - 41:12
    b. https://www.youtube.com/watch?v=mN-ovQnatLI&list=RDLVmN-ovQnatLI&start_radio=1&rv=mN-ovQnatLI&t=6 Vetro Vero Glassblowing Studio "Epic Optics: Hand Blown Glass Diamond-Pattern Tulip Goblet with Michael Schunke" June 20, 2020;

Goblet #2 Notes by assembly method



1. After color is added
2. Block back into parison shape (like a Q-tip) using #5 block
    a. reheat
    b. gently push up and reform shape without distorting pattern
3. re-create or enlarge the starter bubble
    a. reheat
    b. inflate
4. Blow bubble in #6 block
    a. put on blow hose
    b. reheat
    c. use block to control thickness and move buble toward the tip
5. Reheat and start jackline
6. Thin out the cup
    a. reheat
    b. hold vertically with the tip on the marver to keep button thicker and inflate
7. Taper the cup
    a. reheat to top of the equator of the bubble
    b. swing till tapered
    c. use jacks to finish shaping
8. Continue as in "Making a Tumbler" inflate, shape bottom etc.

Goblet #3 Notes by assembly method



1. This is a Blow-Yank_Blow as it is long and narrow
2. Taking a second gather over a small starter bubble before the blow-yank-blow helps to get the cup to full length, and get sufficient glass for the length..
    a. Too big of a starter bubble can split into two bubbles.
3. Blocking and mild flattening with the jacks before adding color (fatter than normal due to the larger gather with 1.5 length to diameter ratio) helps to get the bubble out to the end.
4. I find it difficult to blow the bubble out to the 60-70 for BYB using the marver helps.
5. Don't Try to get all the length in the 1st Blow-Yank-BLow. Need to BYB in stages (preferably in the same heat) allowing glass nearer to pipe to cool or else glass pulls to thin and too narrow.
6. Never inflate wider than the final diameter.
7. Stretching with gravity on the way to the bench and chilling the upper sides during blow-Yank-blows seems to be working better
8. Need to cut off the bottom almost to size rather than mashing a too small tip into the desired size.
9. Put the outside punty on very hot to weld it on. I kept losing this punty and it is easy to take off using shears.
10. **Videos**
    a. https://www.youtube.com/watch?v=lo4uArH3W0k CMOG "Tall Flute | Techniques of Renaissance Venetian-Style Glassworking" 2019;
    b. https://www.youtube.com/watch?v=lo4uArH3W0k CMOG "Spanish Wineglass | Techniques of Renaissance Venetian-Style Glassworking" 2019; 2:55 - 3:20.

Solo Double Bubble Cup TBD INCOMPLETE video?

This discussion is mostly about changes for solo, choreography and keeping it all warm so it does not crack.

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    d. optic cup and step if doing optic on any of the parts
2. Make a tumbler
    a. stop at punty step
    b. optionally point the bottom to help center the merese
3. Add a merese
    a. heat the workpiece
        i. flash - equalize - flash
        ii. equalize is to hold outside glory hole the same amount of time as a flash
        iii. note make sure cup is solid or will push in bottom
    b. put pipe in bench clip
        i. cup will go off center if you use the rails
    c. get a bit on ½" punty
    d. move punty to left hand
    e. put pipe on bench rails with right hand
    f. put bit on pipe from outside the bench
    g. put punty in container
    h. flash heat the bit flash
    i. form the merese
4. Add a knop
    a. flash - equalize - flash
    b. put the pipe in overhead holder
    c. make the bit
        i. Combination gather on ¾" punty
        ii. Marver off short fat at bottom
        iii. Stuff in cup
        iv. Elongate broad neck by holding down and using jacks on the bench rails
    d. Drop the stuffed bit
        i. Swap punty/pipe in overhead holder
        ii. flash - equalize - flash workpiece
        iii. put pipe in bench clip
        iv. heat the bit
        v. allow it to droop while picking up the shears
        vi. place and push down on workpiece
        vii. cut off on diagonal
    e. Finish the knop
        i. put punty in container
        ii. flash heat the knop flash
        iii. jack off to a round knop

iv. flash and fire polish the knop

5. Add a 2nd merese
    a. see above
6. Blown Foot
    a. flash - equalize - flash
    b. put the workpiece pipe in overhead holder
    c. make the foot bubble as normal
    d. Drop the foot
        i. swap pipes in overhead holder
        ii. flash - equalize - flash workpiece
        iii. put workpiece pipe in bench clip
        iv. heat the foot bubble
        v. allow it to droop while picking up the shears
        vi. place and push down on workpiece
        vii. cut off on diagonal
    e. Finish the foot
        i. put the foot pipe in container
7. finish the tumbler as normal
    a. hang workpiece while making the punty
    b. optionally put punty on yoke adjustment and just into the door while flash workpiece

Christmas Ornament

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    d. optic cup and step
    e. Shears at breakoff station
    f. Diamond shears at breakoff sttion
2. Small Collecting Gather
3. Marver and blow an even thick sphere
    a. Marver short for sphere shape
        i. hold glass up to shorten
    b. Blow and cap almost to tip 80%
        i. Be sure glass has skinned
    c. Swing on way to reheat to begin shaping for the mold
4. Marver with slight taper to fit in optical cup
    a. Reheat all
    b. Looking for a short narrow tapered cylinder shape with a rounded tip
        i. Sides need to be even down to the tip so that glass cools evenly, otherwise glass will twist more in the hotter thicker parts
5. Blow in the dip mold (optic cup)
    a. Reheat
        i. Swing/hold vertical to stretch and narrow bubble to fit in optic mold
    b. Lower to bottom of mold
    c. Inflate do not let blow above cup rim
        i. End of blowpipe needs to be inside the cup
    d. Hold about 1 sec to not over cool the glass
    e. Swing to reduce taper to a cylinder
6. Put in the twist
    a. Reheat all
        i. Optionally put on blow hose
        ii. From this point on, minimize the length and number of reheats to reduce the melting away of the pattern from the mold
    b. Marver and twist on marver table
        i. moving to side of tip will increase the twist
7. Neck and blow to a sphere
    a. Reheat if required
        i. Ideally this reheat does not exist
    b. Neck is very deep almost closed to reduce hole size for hook
    c. May need to cool tip with back of jacks to keep tip from over blowing
8. Breakoff
    a. At breakoff station chill the neck with scissors
    b. Tap to break off
9. Add the hook
    a. Get a bit

i. Grab punty high with left hand
ii. gab moil with diamond shears to heat them up
    1. and guide the bit in the next step
iii. Press bit over hole
iv. Stretch the bit with left hand while holding down with warmed diamond shears
v. Further stretch the bit by partially grabbing with shears and pulling up
    1. Attach excess to bit
vi. Snip off the bit

b. Make the loop
    i. Twist backwards low om thread
    ii. Twist forwards near end of thread
    iii. Stick end of thread into base
    iv. open hole with tweezers
        1. Small hole will get stuck on tweezers
    v. Torch sharp ends
c. Put in annealar with tweezers

Horse pulling

1. At end of bit pull lower and upper lip
2. At end of bit pull lower and upper lip
3. Above this pull two ears
4. Use diamond scissors and pull out the neck
5. flatten out the mane
6. pull front legs
7. pull back legs
8. use diamond scissors pull out and twist tail

Adding Color

Paper Weights

These are typically used for paperweights, but could be used for blown objects

Spiral (frit)

1. Gather, marver and reheat
2. Optionally roll in background color and melt in
3. Pat in spiral colors on opposite sides and melt in
4. Flatten the sgather
5. Cut in and mark center with jacks from the end
6. grab end with tweezers and twist with the pipe

Hot Mess (frit)

1. Gather, marvel and reheat
2. Optionally roll in background color and melt in
3. Add additional colors and melt in
4. Dimple end with Jacks
5. Cut in n times with shears
6. grab fingers with tweezers and shape as desired

Hills and Valleys (frit)

1. Gather, marvel and reheat
2. Optionally roll in background color and melt in
3. Pat in spiral colors and melt in
4. Flatten the side colors
5. Optionally cut in and mark center with jacks from the end
6. grab end with tweezers and twist with the pipe
7. block
8. add wonky thick wrap
9. block

Heart Paper Weight

These are typically used for paperweights, but could be used for blown objects

1. Gather, marver and reheat
2. Optionally roll in background color (pink) and melt in
3. Roll in color (red) and melt in
4. Marver the sides
5. Put slight Twist at the tip with the tweezers
6. Cool and Gather over
7. Marver off pipe and then begin to flatten
8. Use paper to make round bulbous shape
9. begin large jackline
10. Reheat, pull tip from the top with tweezers
11. Separate and put in line from the bottom using the Tagliol
12. Cut in very narrow neck with jacks
13. Videos
    a. https://www.youtube.com/watch?v=LN-0lJxhlhE Eric Blows Glass "Making a Glass Heart - Full" December 8, 2022

Making a Frit Wrap

1. Prep frit on marvel
    a. Use 0 or 00 sized frit
2. Begin as in "Making a Tumbler" inflate, shape bottom etc. until Thin the thick glass from the opening
3. Using thumb to shape opening to protrude
4. Size center and flatten opening
    a. opening should be ¾" to 1 " in diameter
5. Reheat
6. Dip opening vertically in frit
7. Melt in frit
8. Repeat 7-8 n times
9. Continue as in "Making a Tumbler" inflate, shape bottom etc.

Making a Edge (Lip) Wrap Neck

Assistant

1. Make
    a. Get chunk of color bar on putty
    b. preheat the color bar in the garage or pickup box
    c. prep punty with thin flat glass to pick up
    d. can tip rod when picking up with the punty
2. Use
    a. pickup, heat, and marver to about a 25 degree point
        i. Heat bit throughout but heat tip screaming hot
    b. must be timed with Gaffer being ready for the bit
    c. Present bit level and at 45 degrees from behind the gaffer
    d. After gaffer is done bend tip over, heat, reshape and put into the garage

Gaffer

1. Using thumb to shape opening to protrude
2. Size center and flatten opening
    b. opening should be ¾" to 1 " in diameter
3. Grap bit with scissors
4. Apply bit just below the top on your side
5. pull to desired diameter of wrap
6. roll workpiece away from you
7. Continue till all the way around
8. pull to thin as overlap occurs
9. Cut off bit and a bit of fat attach point with shears nearly parallel to opening plane
10. press wrap onto workpiece with side of scissors
11. reheat
12. round hole and flatten for steam stick
13. for soft colors chill the color inside before using steam stick
14. for stiff colors heat the color only before before heating the rest of the cup for inflation
15. Videos

a. https://www.youtube.com/watch?v=z70022fqXbU etgarv "Gudenrath Glassblowing: Prepare Lip Wrap" September 7, 2012

b. TBD the wrap itself https://www.youtube.com/watch?v=z70022fqXbU etgarv "Gudenrath Glassblowing: Prepare Lip Wrap" September 7, 2012

Wrap Feather pattern TBD videos

This begins the same as an optic twist.

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    d. optic cup and step
2. Collecting Gather OR Combination Gather
    a. Glass needs to fit into the cup
3. Marver and blow an even thick sphere
    a. Marver short for sphere shaped bubble
        i. hold glass up to shorten and slump to neck to keep sides and neck thicker
    b. Blow and cap almost to tip ~ 90%
        i. Be sure glass has skinned before blow and cap want thick sides
        ii. use moderate pressure that allows you control bubble growth
    c. Swing/loop to elongate for mold
    d. begin shaping for the mold
4. Marver with slight taper to fit in optical cup
    a. Reheat all
    b. Looking for a narrow tapered cylinder shape with thick uniform walls and a rounded tip
        i. Sides need to be even down to the tip so that glass cools evenly, otherwise glass will twist more in the hotter thicker parts

This is where it differs from optic twist

5. Blow and chill in the dip mold (optic cup)
    a. Reheat
        i. Swing/hold vertical to lengthen stretch and narrow bubble to fit in optic mold
    b. Lower to bottom of mold
    c. Inflate, do not let bubble blow above cup rim
        i. End of blowpipe needs to be inside the cup and centered
    d. Hold Stay in mold long enough to chill the glass
6. Put on the wrap
    a. flash so wrap will stick to workpiece
    b. place pipe on twirler
        i. extend to left so moil is in line with pipe stand
        ii. stop turning when assistant is ready
    c. assistant places colored bit on pipe stand, touches moil and pulls back for desired thickness
    d. roll pipe away from yourself
        i. faster for thinner
        ii. slower for thicker
    e. when wrap gets to bottom of cup reverse back and forth to break off the wrap
7. spin off the bridges between th optic ridges
    a. put pipe in glory hole with moderate turn rate
    b. increase to fast turn rate as wrap heats up
8. Put in a gentle twist
    a. Continue Reheat

   b. Marver side on table but do not move pipe across the surface
      i. as twist develops at moil end raise the angle to twist further down
9. Blow - Yank - Blow)
   a. Reheat all
      i. Optionally put on blow hose
   b. Cut in tip with the jacks to form the twists into a point at the center
   c. Blow Yank BLow
   d. Cut in jackline
   e. cut off tip with diamond shears
10. Continue to expand bubble
   a. use hose and paper
   b. expand at top 1st, use paper to prevent bottom from blowing out
11. Continue as in "Making a Tumbler" inflate, shape bottom etc.

Fern pattern TBD videos?

1. Preparation
    a. tools in place
    b. marver clean
    c. hose in place
    ~~d. optic cup and step~~
2. Get blowpipe from warmer
    d. If not dull red, heat up to remove carbon and insure glass will stick to pipe and prevent bubbles
    e. Quick quench to remove crude from pipe (not in furnace)
        i. Cap pipe to prevent steam from heating pipe and/or you
    f. Blow through pipe to prove it is not blocked and remove steam/water
3. Combination Gather
4. Marver 1st gather to flat cylinder
5. round tip with a block
6. Blow small Starter bubble
    a. Bubble 10%
    b. may lose this bubble in the step below
7. Let cool
8. Add "VW" pattern (or other color pattern i.e. pick up from cup or marvel)
    a. Flash so bit will adhere
    b. take bit from assistant at right and vertical
    c. Touch ½ way between bubble and tip raise and then touch ½ way down the tip
    d. repeat with top getting lower diagonally until VW pattern is completed
    e. cut off bit
    f. this must go very fast to avoid bot cooling and getting thicker
9. repeat step 7 for other side
10. pick the pattern
    a. reheat very hot
    b. start pick right in the middle of the VW farthest from the gaffer
        i. start about same depth into clear glass as color bit
        ii. then just below surface
        iii. point pick in direction of movement
    c. pull through middle of left side of VW
    d. continue pulling through centers until through all of vw, continue in spiral toward center and ¾ way around the pipe
11. repeat for other side
12. Block into parison shape (like a Q-tip)
    a. reheat
    b. put on blow hose
    c. gently push up and reform tip without distorting pattern
    d. block till pattern is flat
    e. re-create the starter bubble if necessary
13. Blow bubble
    a. reheat
    b. use hose and paper or jacks

c. expand at top 1st, use paper to prevent bottom from blowing out

14. Continue as in "Making a Tumbler" inflate, shape bottom etc.

WigWag TBD video

1. place cane on (alternate) slots on cane holder
    a. about 15- 4" double spaced canes
    b. use too much cane (or use pi dividers)
    c. Assistant warms up canes
2. Start a bubble as if for an Optical Twist
    a. Bubble nearly to bottom
    b. But marvel to a flat cylinder
3. Roll up cane
    a. let glass cool
    b. warm outside to melting with very little or no movement
    c. roll up glass off of plate, stop when last spacing looks good
    d. make adjustments with tweezers
4. barley reheat and marvel the loose cane ends onto the moil and the tip
5. Reheat marver and flatten the canes into the gather
    a. if just twisting do this now on the marver
6. Cut in a knob on the end to twist with
7. Put in wig
    a. start just off pipe
    b. hot torch center of wig ~20 sec
    c. grab knob with shears and roll pipe away from self
8. Put in wag
    a. move over about an inch
    b. hot torch center of wag ~20 sec time varies with bubble thickness
        i. center torch where the untwisted cane is meets the twisted cane
    c. grab knob with shears and roll pipe towards self
    d. keep the moil warm
9. NOTE: Look at previous twist moving from the pipe to the tip of the bubble
    a. if twist is down then horizontal, the next twist is pipe towards you
    b. if twist is up then horizontal, the next twist is pipe away from you
10. Continue wig-wag until you get to the knob then cut off the knob
11. Reheat and marver the canes until the surface is flat
12. inflate
    a. reheat and push lightly into teardrop shape using a block
    b. use several heats moving heat back along the gather
13. Continue as in "Making a Tumbler" inflate, shape bottom etc.

Pickup Colorbar on Pipe

Collar Method (inlay, colored glass on inside of cup)

1. Preheat the color bar in the garage or pickup box
2. Make a collar on the blowpipe
    a. Gather very small as if for a punty
    b. Hold pipe up to move glass onto pipe
    c. Blow out buble into glory hole
    d. Marver glass back onto the pipe with back of jacks
    e. Open the hole with the tips of the jack
    f. Adjust collar size
        i. Use back of jacks on outside to make smaller
        ii. Use blades of jacks on the pipe toward the end to make large
3. Pickup the color bar
    a. Touch bottom corner of collar on near side of the color bar
    b. Press down and flip up the color bar onto the end of the pipe
4. Heat the color bar
    a. Warm up in flame inside garage ~ 25 sec
    b. Heat in glory hole ~ 10 sec
    c. Brush off kiln wash and dust
    d. Heat till thoroughly molten
    e. Marvel into a cone
5. Continue from here
    a. Cool and then gather over as needed
    b. Inflate as desired
6. **Videos**
    a. https://www.youtube.com/watch?v=zRy9gxkTK3U Kugler Colors "How to use Kugler rods" September 14, 2019; 0:00 - 2:32, 3:42-4:40

Jim's Method (Inside Veneer, colored glass sandwiched between clear glass)

1. Preheat the color bar in the garage or pickup box
2. Make a small truncated cone of clear glass
    a. Gather very small as if for a punty
    b. Marver clear glass into a cone
3. Pickup the color bar
    a. touch tip of cone to edge of color chip
4. Marvel back over the cone like an overlay
    a. Warm up in flame inside garage ~ 2 sec
    b. Heat in glory hole ~ 10 sec
    c. Brush off kiln wash and dust
    d. Melt color into a ball
    e. Marver color to extend the cone
    f. Hold up on way to bench
    g. At bench use back of jacks to flatten and start overlay

h. Reheat continue overlay on marver
i. Reheat Shape use #4 block

5. 1st gather
    a. Shape with #5 block
    b. Starter Bubble
        i. Hose on
        ii. reheat
        iii. Blow starter bubble
6. 2nd gatherblock
    a. Hose off
    b. gather
        i. Optional strip
    c. Shape with #6 or #8 block
7. Optionally add color to outsider
8. Inflate
    a. Hose on
    b. Inflate into #8 block
    c. Start Jackline
    d. reheat
    e. Inflate use paper to cool tip
        i. **NOTE: This method has always challan** nThis method has often resulted in to thick glass
9. Continue as in "Making a Tumbler" inflate, shape bottom etc.
10. NOTE: I have found gather and a half before inflation works better for me, else I have too much glass and cups are to thick.

Wrap and Rake

1. Optionally Pickup Colorbar on Pipe
2. Combination Gather
3. Marver 1st gather to flat cylinder
4. Put on the wrap
    a. flash so wrap will stick to workpiece
    b. place pipe on twirler
        i. extend to left so moil is in line with pipe stand
        ii. stop turning when assistant is ready
    c. assistant places colored bit on pipe stand, touches moil and pulls back for desired thickness
    d. roll pipe away from yourself
        i. faster for thinner
        ii. slower for thicker
    e. when wrap gets to bottom of cup reverse back and forth to break off the wrap
5. Rake
    a. Reheat surface as hot as possible with as little movement in the core as possible
    b. start pick at middle of the gathers's tip
    c. start about same depth into clear glass as color bit

i. then just below surface
ii. point pick in direction of movement

d. pull to the moil n times

6. Continue as in "Making a Tumbler" inflate, shape bottom etc.
7. **Videos**
   a. https://www.youtube.com/watch?v=qfjqSGhRYRk TomRyderArt "Blown Glass Wrap and Rake Vase" November 22, 2016 (dual color wrap)
   b. https://www.youtube.com/watch?v=g-1pIouV8L8 Tims Handblown Glass "Glassblowing: Wrap And Rake" October 22, 2015

Wrap and Rake bottom half of cup

1. Optionally Pickup Colorbar on Pipe
2. Combination Gather
3. Marver
   a. Marver to flat cylinder
   b. Round tip with block
   c. add a starter buble about 15%
   d. add a landing place for the color bit
      i. pull tip with tweezers
      ii. pull tip with diamond shears and then cut of
      iii. Fire polish the tip
4. Put on the wrap
   a. Cool so glass will not wobble while wrapping
   b. flash so wrap will stick to workpiece
   c. place pipe on twirler
      i. extend to left so tip is in line with pipe stand
      ii. stop turning when assistant is ready
   d. assistant places colored bit on pipe stand, touches moil and pulls back for desired thickness
   e. roll pipe toward yourself
      i. faster for thinner
      ii. slower for thicker
   f. when wrap gets to middle of the cup reverse back and forth to break off the wrap
5. Rake
   a. Reheat surface as hot as possible with as little movement in the core as possible
   b. start pick at the end of the wrap in the middle of the cup
   c. start about same depth into clear glass as color bit
      i. then just below surface
      ii. point pick in direction of movement
   d. pull to the tip n times
6. Continue as in "Making a Tumbler" inflate, shape bottom etc.
7. **Videos**
   a. https://www.youtube.com/watch?v=qfjqSGhRYRk TomRyderArt "Blown Glass Wrap and Rake Vase" November 22, 2016 (dual color wrap)
   b. https://www.youtube.com/watch?v=g-1pIouV8L8 Tims Handblown Glass "Glassblowing: Wrap And Rake" October 22, 2015

Pick Up Cane From Optic Cup Method 1

1. Place cane in slots of an optic (symmetric patterns make blowout easier)
    a. About 2"-3" long
    b. Assistant warms up canes with hot torch
2. Start a bubble as if for an Optical Twist
    a. Bubble nearly to bottom but a little higher than for an optic cup ~80%
3. Marver and blow an even thick sphere
    a. Marver short for sphere shaped bubble
        i. Hold glass up while turning into a spher'ish shape to keep sides and neck thicker
        ii. Marver to re-center
    b. Blow and cap shorter than for an optic twist ~ 80%
        i. Be sure glass has skinned before blow and cap, want thick sides and buble almost to the tip
            1. Judge by color of glass when to blow
        ii. want a slow inflation that give thicker sides and allows you to control bubble growth
    c. Swing/loop to elongate for mold
    d. Begin shaping for the mold
4. Marver with slight taper to fit in optical cup
    a. Reheat all
    b. Looking for a narrow tapered cylinder shape with thick uniform walls and a thicker rounded tip
        i. Sides need to be even down to the tip so that the glass cools evenly, otherwise glass will twist more in the hotter thicker parts
5. Pick up the canes from the optic cup
    a. Reheat
        i. Carry to step and cup horizontally.
        ii. Swing/hold vertical to lengthen stretch and narrow bubble to fit in optic mold only if necessary
    b. Lower to bottom of mold
    c. Inflate, do not let bubble blow above cup rim
        i. End of blowpipe needs to be inside the cup and centered
    d. Hold about ~5 sec to let canes adhere to bubble
    e. Carefully lift pipe and check all canes are attached
        i. if not press into cup again and reblow
6. Control the ends of the canes
    a. Reheat
    b. Mavrer dangly came tips into the moil
    c. Marvel the ends of the canes at the tip
7. Marver in the canes
    a. Reheat
    b. Marver on table
    c. Repeat until glass is flat when you roll it on the marver
8. Optionally twist the pattern on the marver start at moil and work to tip
9. Continue as in Blow - Yank - Blow
10. **Videos**
    a. **https://www.youtube.com/watch?v=YHIDsathiTY** CMOG "Live-streamed Studio Demonstration: William Gudenrath" June 18, 2014; 13:34-20:40
    b. https://www.youtube.com/watch?v=f6Xeyc-Ne9s CMOG "Faux Reticello" February 1, 2016; 1:16 - 2:26

Pick Up Cane From Optic Cup Method 2 (JIM)

1. Place cane in slots of an optic (symmetric patterns make blowout easier)
    a. About 2"-3" long
    b. Assistant warms up canes with hot torch
2. Combination Gather
3. Marver 1st gather to a short flat cylinder
4. Blow small Starter bubble
    a. Bubble 10%
    b. may lose this bubble in the step below
    c. I like to keep replacing it
5. Marver with slight taper to fit in optical cup
    a. small enough to not contact canes on way into cup
6. Pick up the canes from the optic cup
    a. Reheat
        i. Carry to cup horizontally.
    b. Lower to bottom of mold
    c. Inflate only if necessary
    d. Hold about ~5 sec to let canes adhere
    e. Carefully lift pipe and check all canes are attached
        i. if not press into cup again and re-blow
    f. **NOTE:** narrow canes are hard to pick up
    g. **NOTE:** non-symmetric or different color canes are hard to blow out evenly
7. Control the ends of the canes
    a. Reheat only till cane begins to move
    b. Marver dangly came tips into the moil
    c. Marver the ends of the canes at the tip
8. Marver in the canes
    a. Reheat
    b. Marver on table
    c. Repeat until glass is flat when you roll it on the marver
9. Optionally twist the pattern on the marver start at moil and lift up to tip
10. cut off tip to close pattern
    a. jack
    b. diamond shears
        i. optionally add more twist
11. Block into parison shape (like a Q-tip)
    a. reheat
    b. gently push up and reform tip without distorting pattern
    c. re-establish starter bubble
12. blow out into block
    a. put on hose
    b. reheat
    c. blow into block about 50-60 %

13. start jack line
    a. rehear
    b. stretch until it starts to neck on the way to the bench
    c. blow with hose and start the jack line
14. Blow out using marvel table to chill and keep bottom thicker
15. Optionally swing to elongate and taper
16. shape sides
    a. reheat
    b. reinforce jack line and shape from jacline towards the tip
    c. may require several reheats
17. shape the end
18. Continue as in Blow - Yank - Blow
19. **Videos**
    c. https://www.youtube.com/watch?v=f6Xeyc-Ne9s CMOG "Faux Reticello" February 1, 2016; 1:16 - 2:26

Pick Up Cane From A Cane Plate

1. Place cane in slots of a cane plate
    a. About 3"-4" long
    b. Assistant warms up canes with hot torch
2. Using Pi divider to determine needed diameter
    a. leave divider open of end of marver
3. Combination Gather
4. Marver 1st gather to a short flat cylinder
5. Blow small Starter bubble
    a. Bubble 10%
    b. may lose this bubble in the step below
    c. I like to keep replacing it
6. Marver to diameter of the pi divider
7. Assistant heats up the canes on the plate
    a. If cane is greater than ⅜" in diameter, heat needs to be introduced slowly to present cracking and checking of the canes
8. Pick up the canes from the cane plate
    a. Cool then reheat
        i. Core cool
        ii. Skin hot
    b. Allow to droop
    c. Flip when gather droops to horizontal place on plate just to the right of the left side
    d. Complete pickup by rolling left then right
    e. **NOTE:** non-symmetric or different color canes are hard to blow out evenly
    f. Immediately try to make any adjustments with tweezers
9. Control the ends of the canes
    a. Reheat only till cane begins to move
    b. Marver dangly came tips into the moil
    c. Marver the ends of the canes at the tip
10. Continue as in Pick Up Cane From Optic Cup Method 2 (JIM)
11. **Videos**
    d. https://www.youtube.com/watch?v=3LqF05S9Z-o CMOG "Beaker | Techniques of Renaissance Venetian-Style Glassworking" February 4, 2019; 2:55 - 2:26

Pulling Cane TBD video

1. pick up about 2 ½ - 3 inches of color on ¾ " punty
    a. cut off excess clear glass (especially if color is stiff)
    b. after pickup push onto the punty (especially if color is stiff)
2. marvel to about 1" (thickness of the color bar) tapering to about ¾"
    a. it can really speeds things up if the assistant holds a tag perpendicular to the table if the end is uneven
    b. you may want to Flip stiff colors from another punty to ensure all of the color gets heated
    c. Pull/push stiff color over the moil (especially if color is stiff)
3. 1st Gather
    a. Cool and gather over
    b. do not stay in furnace long or color may strip into furnace
    c. Gather normal but wrap up the last on the middle of the gather, avoid clear glass on the end of the color
    d. carry the punty high to migrate clear glass from the tip
    e. while color core is cool push clear on tip back with back of block
    f. Use block to move glass to the middle
    g. always table marver so tip is narrower than moil before gathering
        i. keep color near tip and cool the tip a little by marvering back clear glass
        ii. press straight down on table if necessary
        iii. marvel back the glass by holding about 45 degrees
        iv. marvel the sides while pushing forward
4. 2nd … Gathers
    a. Repeat above
5. Heat soak & Prep for the pull
    a. want hot all over, but cooler at the tip and at the pipe to control the stretch
        i. pipe end tends to take care of itself
            1. but can use water on 2nd to last heat (especially if color is stiff)
    b. Looking for fatter at the tip with very little clear over the color at the tip
    c. Chill tip on 2nd to last heat
    d. Tell assistant to get a post on punty ready
        i. Glass barely off punty
        ii. same size or slightly smaller than tip
        iii. make sure assistant cools the pipe
    e. alternatively post may be made on drill attachment for spireled cane
6. the pull
    a. Optionally chill tip in water
    b. Flatten and chill tip by tapping on the floor
    c. Assistant presents collar with handle on floor vertically
        i. gaffer grabs low and slides hand up
    d. Gaffer sticks glass to collar and then takes both pipes
        i. mash out glass on the post for wide contact
    e. Play with gravity to begin elongating EVENLY
    f. Hand back collar??? punty back to assistant at end of the ladders
        i. gaffer should have the hot reservoir of glass on his punty
    g. gaffer walks back with glass controlling the pull
        i. both keep flipping glass over and back over

ii. gaffer may need to call out flips to assistant

h. if glass is stretching to thin cool it

i. stop pulling

ii. 3rd person air hose

iii. snake on the floor

7. Place on ladders
8. Break to desired size
9. For ballottina Compound canes, it is easier to pick up the line of canes if they are all cut exactly to the same length when cold.
10. For Helix Compound canes, pickup 10 canes, 6 inches long, spaced every 5th slot on the steiner plate work well.
11. For Cup 6" long by x 6" wide => 2 dia, 3.5 blown

Pulling Cane-ish Stems

1. Prepare gather
    a. Collect and case desired color(s) on a ¾ " punty
    b. Begin the taper
        i. marver
        ii. gravity
        iii. cut in a ball and pull (and optionally twist)
    c. Marvel surfaces smooth
2. Heat soak all of gather
3. Pull the taper
    a. Slightly chill the tip with air
    b. pull and optionally twist with diamond shears
        i. if pulling without enough taper hesitate to allow thinner glass to stiffen more than thicker glass
        ii. if pulling too thin at tip move shears up the taper
4. Cut off the tip
    a. Note we do not put in false merese at this time or the stem will bend in the garage
5. Put in curved top jackline
    a. Heat and marvel smooth
    b. measure and mark with shallow jack line
    c. hot torch over the jack line
    d. cut in the curved jack line
6. Knock off into annealer
    a. Heat
    b. paper straight
    c. water and or file at jack line
    d. tap off into annealer or garage
7. repeat steps 2-7 till out of glass

Buying Colored Glass

1. Avoid pastels
    a. Blue , purpl,e red and duro(stiff) are good
2. Olympic https://glasscolor.com/
    a. 1st
    b. Gaffer 31-80
        i. white duro 70
        ii. black duro 70
    c. Reichenbach 31- 84 large selection
        iii. have off spec
3. hotglasscolor.com https://hotglasscolor.com/
    a. Kugler 20, 33-87
    b. Duro ???
4. Least to most stiff
    a. Opal
    b. Enamel
    c. Duro
5. In general dark colors are soft
    a. translucent darks are really soft
6. Color combinations
    a. White
        i. any color
    b. Lapis Blue
        i. Copper Blue
        ii. White
        iii. Heliotrope
    c. Christmas Red
        i. Both Greens
        ii. Black
        iii. White
        iv. Strawberry
    d. Canary Yellow
        i. White
        ii. Copper Blue

Notes on some of the colors

1. R-095-R Opal Black
    b. very very soft
2. R-219_R Gold Green
    a. very soft
3. R-061-R Enamel White
    a. stiff
4. G-184-R Canary yellow
    a. soft
    b. fast transition from workable to unworkable
5. R-091-R Lapis Blue
    a. soft
6. R-315-R Christmas Red
    a. slightly soft
7. R-029-R New Emerald Green
    a. very soft

TBD

References to shmid books

references to kent state videos

Using the pipe cooler

when not

try not to use loose heat

usually with alow furnace

bak to front

not to weld line

dont take to long

Starter bubble/ standard setup??

how far to heat when doing bottom

how far to heat when opening

when tools

more on Sand casting

standard setup depth of bubble and reference throughout when not different

notes on using blow hose

note self handle in https://www.youtube.com/watch?v=HVTZyx3bcNI 5:00 plus

blow squish blow https://www.youtube.com/watch?v=T42QN83Svmg CMOG "Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II" August 1998; ~17:00
for bowls and plates

Notes on using wooden mold Notes on making wooden molds
go thru studio demos for more video references and steps

"Introduction to Venetian Techniques with William Gudenrath | Master Class Series, Volume II"

17:00 blow squish blow 19:00

19:00 blown foot 22

22 merece 23

Ideas for projects

1. Schreck
    a. Push in cavities from the 4 sides
    b. Offset on sides AC from side BD
2. Ground pattern
    a. Cover bubble with colored glass ???
    b. Pull into long/narrow
    c. Leave neck
    d. Cold works vertical lines into clear
    e. Pickup with donut
    f. Gather over all
    g. Blow
3. Small Cup with Two Handles
4. Kuttrolf Stem
5. Flared Wineglass with Wings
6. twisted stem 22 point Goblet Oddities with William Gudenrath, Summer 2021 Studio Live Stream 30min

Glass Sand Casting

1. Made a quick positive
    (a) Cnc
    (b) Scrap plywood 60 degree for draft
    (c) Not sure what detail would work
2. Press into moist sand
3. Add in color on high features
    (a) Without help I would have added to little powdered glass
4. Acetylene touch set to rich to make soot as a mold release
5. Pour in glass
    (a) Wanted thin but this was forgotten
        i. For use in stained glass
6. Add color frit on background
    (a) Heat got me but Justin suggested and helped using a scoop
7. Thanks to Dave Justin and Jim ar bysitine