STUDIO TIPS

Writing Firing Schedules for Fusing & Slumping

Kilnforming is rich with beautiful variations. Diverse glass styles, unique kilns, and one-of-a-kind designs mean there is no universal firing schedule.

Whether you want to slump, tack fuse, or full fuse your glass, best results will typically come from tailoring your schedules to meet the specifics at play in any given project.

Thankfully, that isn't hard! This article will guide you through the process step by step. Just take your time, answer the key questions about your project, follow the flowchart accordingly, and you'll be able to achieve studio success with all sorts of projects—again and again.

8-STAGE FIRING SCHEDULE

This example is based on a glass lay-up of 6mm (2 × 3mm) sheet glass with even thickness, no insulating components, and no transparent pink, purple, or coral styles.

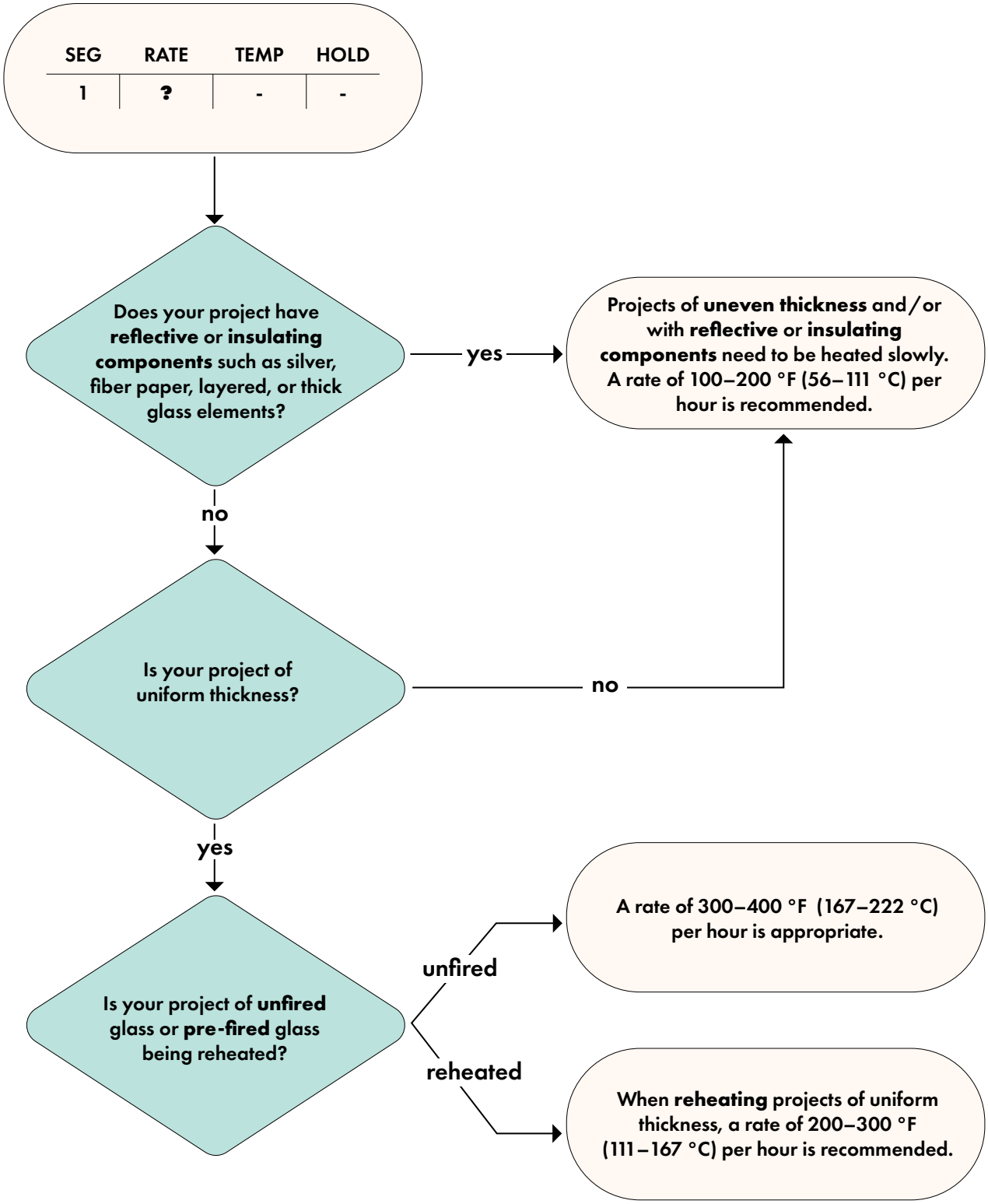
RATE FAHRENHEIT / CELSIUS	TEMPERATURE FAHRENHEIT / CELSIUS	HOLD HOURS : MINUTES	
400 °F / 222 °C	1225 °F / 663 °C	0:45	**1: Initial Heat** Room Temp → 1000–1250 °F (538–677 °C) **2: Pre-rapid Heat Soak** Hold at 1000–1250 °F (538–677 °C)
600 °F / 333 °C	1490 °F / 810 °C	0:10	**3: Rapid Heat** 1000–1250 °F (538–677 °C) → Process Temp **4: Process Soak** Hold at Process Temp 1000–1700 °F (538–927 °C)
AFAP*	900 °F / 482 °C	1:00	**5: Rapid Cool** Process Temp → 900 °F (482 °C)
100 °F / 56 °C	700 °F / 371 °C	0:01	**6: Anneal Hold** Hold at 900 °F (482 °)
AFAP*	75 °F / 24 °C	0:01	**7: Anneal Cool** 900 °F (482 °C) → 700 °F (371 °C) **8: Final Cool** 700 °F (371 °C) → Room Temp

*AFAP = As Fast as Possible

Stage 1—Initial Rate of Heat

Projects Under 11 mm Thick*

Room Temperature → 1000–1250 °F (538–677 °C)



*For Projects 12 mm thick or thicker, skip to page 3.

✪ **PRO TIP:** When slumping a checkerboard style design, slow the *Initial Rate of Heat* to 100 °F (56 °C) / hr.

Stage 1—Initial Rate of Heat

Projects 12 mm or Thicker

Room Temperature →1000–1250 °F (538–677 °C)

SEG	RATE	TEMP	HOLD
1	?	-	-

Is your project of **uneven thickness**, and/or have **reflective** or **insulating components** such as silver, fiber paper, layered, or thick glass elements?

yes → To find the ***Initial Rate of Heat***, use the ***Final Cooling Rate*** found on the ***Annealing Thick Slabs*** chart for TWICE the actual thickness of your piece.

no → For projects from 12–20 mm thick, a rate of 200 °F (111 °C) per hour is appropriate. For projects 20 mm, and over, use the ***Final Cooling Rate*** found on the ***Annealing Thick Slabs*** chart for the ACTUAL thickness of your piece, or thicker.

✪ **PRO TIP:** Your kiln is a variable that must also be considered when writing your own firing schedules. If you have roof elements that are closer than 5″ (12.7cm) to your project, it is safest to use a more conservative initial rate of heating in every instance to avoid thermal shock. Try reducing all suggested initial rates of heating by 25%.

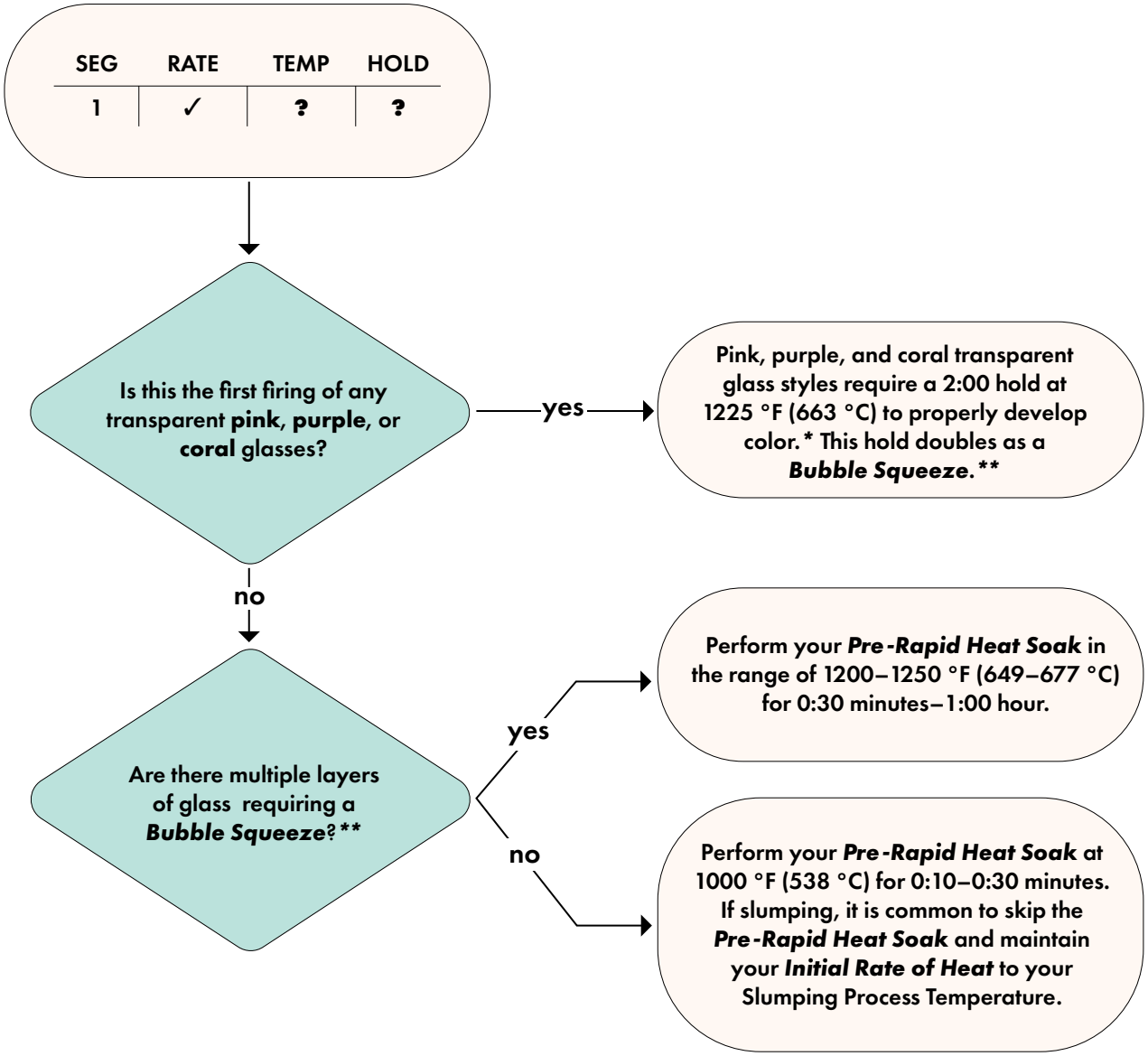
Annealing Thick Slabs (Fahrenheit, rates in degrees-per-hour)

THICKNESS	RATE	TEMP	ANNEAL HOLD h:min	1ST COOLING RATE	TEMP	HOLD	2ND COOLING RATE	TEMP	HOLD	FINAL COOLING RATE	TEMP	HOLD	TOTAL
0.25″/ 6 mm	AFAP*	900	1:00	150	800	0:00	270	700	0:00	900	70	0:00	≈3:00
0.5″/ 12 mm	AFAP	900	2:00	100	800	0:00	180	700	0:00	600	70	0:00	≈5:00
0.75″/ 19 mm	AFAP	900	3:00	45	800	0:00	81	700	0:00	270	70	0:00	≈9:00
1″/ 25 mm	AFAP	900	4:00	27	800	0:00	49	700	0:00	162	70	0:00	≈14:00
1.5″/ 38 mm	AFAP	900	6:00	12	800	0:00	22	700	0:00	72	70	0:00	≈28:00
2″/ 50 mm	AFAP	900	8:00	6.8	800	0:00	12	700	0:00	41	70	0:00	≈47:00
2.5″/ 62 mm	AFAP	900	10:00	4.3	800	0:00	8	700	0:00	26	70	0:00	≈70:00
3″/ 75 mm	AFAP	900	12:00	3	800	0:00	5.4	700	0:00	18	70	0:00	≈99:00
4″/ 100 mm	AFAP	900	16:00	1.7	800	0:00	3.1	700	0:00	10	70	0:00	≈170:00
6″/ 150 mm	AFAP	900	24:00	0.75	800	0:00	1.3	700	0:00	4.5	70	0:00	≈375:00
8″/ 200 mm	AFAP	900	32:00	0.42	800	0:00	0.76	700	0:00	2.5	70	0:00	≈654:00

See our Annealing Thick Slabs charts in °F and °C at bullseyeglass.com.

Stage 2—Pre-Rapid Heat Soak

Hold at 1000–1250 °F (538–677 °C)



✪ **PRO TIP:** Some styles of glass are more sensitive to extended time in this temperature range. When working with transparent red, yellows, oranges (cadmium-bearing styles), hold for 1:00 or less when a ***Bubble Squeeze*** is required. See ***Heatwork & Cadmium-Bearing*** Glass.

*See ***Properly Pink, Purple and More***.

****Bubble Squeeze:*** A soak in the 1150–1250 °F / 621–677 °C range often used to remove air from between layers, reducing the number and size of bubbles in the finished piece.

The Remainder of the Firing Schedule

8-STAGE FIRING SCHEDULE

This example is based on a glass lay-up of 12mm (4 × 3mm) sheet glass of uniform thickness, no insulating components, and no transparent pink, purple, or coral styles.

RATE FAHRENHEIT / CELSIUS	TEMPERATURE FAHRENHEIT / CELSIUS	HOLD HOURS : MINUTES	
200 °F / 111 °C	1225 °F / 663 °C	1:00	**1: Initial Heat** Room Temp → 1000–1250 °F (538–677 °C) **2: Pre-rapid Heat Soak** Hold at 1000–1250 °F (538–677 °C)
600 °F / 333 °C	1490 °F / 810 °C	0:10	**3: Rapid Heat** 1000–1250 °F (538–677 °C) → Process Temp
AFAP*	900 °F / 482 °C	2:00	**4: Process Soak** Hold at Process Temp 1000–1700 °F (538–927 °C)
100 °F / 56 °C	800 °F / 427 °C	0:00	**5: Rapid Cool** Process Temp → 900 °F (482 °C)
180 °F / 100 °C	700 °F / 371 °C	0:00	**6: Anneal Hold** Hold at 900 °F (482 °C) **7: Anneal Cool** 900 °F (482 °C) → 700 °F (371 °C)
600 °F / 333 °C	70 °F / 21 °C	0:00	**8: Final Cool** 700 °F (371 °C) → Room Temp

*AFAP = As Fast as Possible

RAPID HEAT: **Stage 3**

Once your project exceeds 1000 °F (538 °C), it is no longer at risk of thermal shock. A heating rate of 600 °F (333 °C)/hour is generally appropriate for most projects.

PROCESS TEMPERATURE & HOLD: **Stage 4**

Your process temperature depends on the desired outcome and the specific firing characteristics of your kiln. By carefully observing previous firings and adjusting process temperatures and hold times as needed, you can achieve consistent, repeatable results. For more information, see ***TechNote 4: Heat & Glass*** and ***Suggested Slumping Schedules***.

ANNEALING: **Stage 5 → 8**

Refer to Bullseye's ***Annealing Thick Slabs*** chart (available in °F and °C) to determine the appropriate annealing schedule. Identify the thickest area of your piece and follow the schedule that corresponds to, or slightly exceeds, that thickness. For projects with uneven thickness (e.g., tack-fused), anneal for at least ***twice the thickness of the thickest area***. Over-annealing is not harmful, so it's better to err on the side of caution.

BUT WHAT IF?

As you may already know, kilnforming is a diverse and complex art filled with variables. There is rarely a single "correct" way to create a piece. Multiple approaches can produce similar outcomes.

This guide focuses on the most common variables we've encountered, but there are others to consider. As you gain experience and begin writing your own firing schedules tailored to your kilns and projects, you'll become more confident in making adjustments based on observations and past results. Every kiln, environment, and project is unique. Our goal is to equip you with the knowledge and confidence to succeed no matter the variables involved.

We can't wait to see what you make!