



Texas Tech University

Shear Force Analysis – Warner Bratzler Shear

Cooking Steaks

1. Thaw steaks in Teaching/Research walk-in cooler located in AFS kitchen at 2-5°C. Steaks must be set out the day before as thawing takes 18 to 24hr. Thawing more rapidly at room temperature results in increased purge.
2. The Silex grill must be turned on 45-60 minutes before you plan to start cooking (no exceptions). Use the following settings:
 - **Old Silex settings: See attachment** Left to right on grill knobs = 2 $\frac{3}{4}$, just over 250 (between 250 and 260), at 4; Make sure lever on lid is oriented in the **right position**.



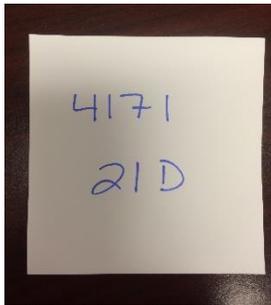
- **New Silex settings:** 125 on Top; 130 on Bottom
3. Be sure to spray with non-flavored cooking spray to prevent plate cracking and leave the lid open during the warm-up period.
 4. Set up the pre-cook weigh/temperature station. You will need a scale, thermometer, data sheet, tags to write IDs on, red trays, small metal tray to “stage” steaks on while waiting to put on the grill.



5. Get a tray of steaks (15 steaks) out ~30 minutes prior to grill placement. Take the internal temperature of each steak in the geometric center of the steak and record. Temps should be between ~5-10°C. If steak temperature is below 2°C, this will affect end point temperature. Let those steaks sit out temporarily until temperature raises.



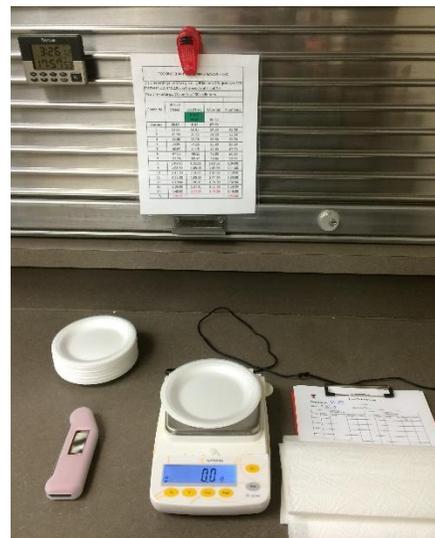
6. Place the 10 starter steaks on the Silex grill in the consumer steak arrangement (top row: 3; middle row: 4; bottom row: 3) and start the timer. Close the lid at 30 seconds on the timer and follow the time schedule until completion (see Attachment).
7. From this point, you have 5 minutes only to weigh 4 steaks.
8. Set a clean plate on the scale and zero the scale in grams. Dry the plate after each steak and zero the scale.
9. Remove the steak from its packaging. Weigh each steak without its identification tag in grams and record. Using the precut sheets of never-tear/no-cut paper, write the ID number AND aging period from the label on the slip of paper.



10. Once you have 4 steaks weighed, place all 4 steaks on the Silex grill with their tags on the red tray above **in order of their position on the grill** to maintain identification. *A fifth steak can be weighed/cooked by placing perpendicular to the other steaks along the top/back of the grill. **Be sure to follow IDs precisely.*** The first 4 steaks will be placed on the grill **at 6:15 on the timer** following a set of starter steaks. The starter round **CANNOT** be skipped as this helps ensure the cycling of the Silex grill heating elements. Once the steaks are on the grill, move the red tray to “cooked side” of the grill (the right side).



11. Follow the posted (attached) cooking time schedule. **There is no variation to this schedule.** You will have 5 minutes to weigh the next 4 steaks and create ID tags by writing the ID number and aging period on each tag.
12. When steaks are finished cooking, remove them in order from the grill. Place them on the red tray above their corresponding tag. Move the red tray to the post cook temperature/weigh station.



13. Allow the steaks to set during the prescribed 3 minute resting period. Take the internal temperature of each steak in the geometric center and record.
14. Set a clean plate on the scale and zero the scale in grams. Dry the plate after each steak and zero the scale. Weigh each steak individually without their tags and record.



15. Place all cooked steaks on a metal tray on top of their ID and cover the tray with saran wrap. Store trays in the cooler at 2-5°C overnight until time to shear.



Coring/Shearing Steaks

1. Set up Warner Bratzler Shear machine or the United Testing Machine.



2. Slice off a very small portion of either end of the steak to identify fiber direction.



3. Record degree of doneness. Use the NBCA color chart (attached).
4. Take 6 cores from each steak parallel to the longitudinal orientation of the muscle fibers. Check each core to make sure they are devoid of connective tissue or fat. Place six cores on a plate with the ID tag that accompanied the steak.



5. Shear each of the six cores and record values. Be sure to re-set shear machine to zero before each core is sheared. Clean shear knife between each sample.
6. Dispose of all meat once all shear values have been recorded in double bagged trash bags.
7. Clean shear machine by dis-assembling, washing, and re-assembling.
8. After entering data, check each point for accuracy.
9. Make copies of data and store in a properly labeled binder in the lab.

Silex S-143K (old Silex) settings:

Left knob = top plate ratio (range 0-3)

- #2.75 equivalent to upper plate power/temperature combination functioning at 92% of the lower element
- Too high (i.e. set at #3) will overcook the top of product

Middle knob = temperature

- MSA protocols recommend 220-230
- TTU shear temp 250-260

Right knob = weight (range 1-10)

- MSA protocols recommend #8
- TTU shear setting = #4
- 1 = most pressure; 10 = least pressure

Weight reduction lever (located in middle of top grill plate (near handle): **Use option 2 (lever to right)**)

- Lever to left:

Lid will close if forced, otherwise there be about a ~2 in. gap



- **Lever to right:**

All weight of lid is exerted



- Lever straight up:

Lid closes completely
But not all weight is exerted



COOKING CHART FOR 25MM STEAK ON SILEX

Old Silex settings: Left to right on grill knobs = 2 ³/₄, 250-260, at 4; lever on lid is shifted to the right.

New Silex settings: 125 on Top; 130 on Bottom

Round No.	Unload Steaks	Load Next	Close Lid	Final Temp
		START 00:00	00:30	
Starters	05:00	6:15	07:00	
1	12:00	13:15	14:00	15:00
2	19:00	20:15	21:00	22:00
3	26:00	27:15	28:00	29:00
4	33:00	34:15	35:00	36:00
5	40:00	41:15	42:00	43:00
6	47:00	48:15	49:00	50:00
7	54:00	55:15	56:00	57:00
8	1:01:00	1:02:15	1:03:00	1:04:00
9	1:08:00	1:09:15	1:10:00	1:11:00
10	1:15:00	1:16:15	1:17:00	1:18:00
11	1:22:00	1:23:15	1:24:00	1:25:00
12	1:29:00	1:30:15	1:31:00	1:32:00
13	1:36:00	1:37:15	1:38:00	1:39:00
14	1:43:00	1:44:15	1:45:00	1:46:00
15	1:50:00			1:53:00

BEEF STEAK COLOR GUIDE

Degrees of Doneness



The Official Guide published by the American Meat Science Association in cooperation with the National Live Stock and Meat Board and the U.S. Department of Agriculture/ARS.