

Cooking using the sous vide technique

Goal

To ensure food is safe to eat when prepared using the sous vide method.

The Act requires that:

- Food must be processed and handled in ways that minimise the contamination or deterioration of food.
- There must be procedures in place that prevent, eliminate or reduce hazards during the production, processing and handling of food.
- Food must be safe and suitable.

Why?

- Lower temperature cooking takes longer to kill harmful microbes and if the temperature is too low, harmful microbes will grow rather than be killed.
- Harmful microbes may survive and grow when using the sous vide cooking method if the internal food temperature and time combinations are not met.

How this is done

Sous vide is a method of cooking vacuum packed food at precise (and often low) temperatures, often for long periods of time. To make sure that sous vide cooked food is safe to consume temperature control is **extremely important**.

The procedures in this template only apply to sous vide cooking of meat and poultry cuts. It does not cover whole birds (e.g. chicken or duck) because their shape and cavities prevent even cooking.

The procedures do not apply to cooking fish using the sous vide method or to sous vide cooking in a steam oven.

This procedure provides requirements for the safe preparation of food using the sous vide method. It doesn't replace the need to follow other relevant procedures in the Food Control Plan (FCP). Refer to *Additional food safety information for sous vide procedure* for further information and explanation about safe sous vide practices.

If you want to sous vide foods using different time/temperature combinations, or sous vide other foods or use equipment such as steam ovens you will need to develop a procedure that outlines your method and shows that your way is valid. You will need to have your procedure evaluated by a recognised evaluator, and register your plan as a custom food control plan.

Preparation

- Ingredients must be handled hygienically.
- Equipment must be regularly maintained and cleaned and, where necessary, sanitised before use – see Maintenance and Cleaning.
- A vacuum sealer used for raw food must not be used for ready-to-eat foods, unless there is a cleaning and sanitation step in-between to minimise cross-contamination.
- Food must be prepared into serving portions of equal size, thickness and shape. If you are using your proven process the portions sizes must be no bigger than the size you've specified in your process.
- Food must be vacuum packed in sous vide specific vacuum packs and there must be no creases in the vacuum-sealed pack.
- Resealable sandwich bags must not be used.
- The vacuum-sealed food prepared for sous vide cooking must be refrigerated at 5°C or lower if not put in the water bath immediately.

How this is done

Setting up the water bath

- Cooking equipment must have adequate heating capacity for the intended volume of food, and accurate and consistent temperature control.
- The water bath must be pre-heated to a temperature that will ensure the food reaches the desired cooking temperature as rapidly as possible.
- Vacuum-sealed food must be completely submerged in the water bath and packs must be evenly distributed to allow for good water circulation.
- There must be good water circulation in the water bath.
- Chilled foods must not be added to the water bath part way through a cook, as this will cause the water bath temperature to lower.
- You must change the water in the water bath every time you cook sous vide.



We recommend you set your water bath temperature a few degrees higher than the internal product temperature you wish to achieve

Cooking

- The water bath temperature must be monitored and recorded regularly during cooking and must be measured with a calibrated thermometer. Take temperature readings at various spots in the water bath to confirm that it is at or above the specified temperature.
- If cooking at the lower temperatures, it is particularly important that the water bath temperature does not drop below 55°C for red meat and 60°C for poultry at any time. If using a proven method it should not drop below the specified temperature.
- You must check that the centre of the thickest part of the food has reached the selected internal food temperature prior to the start of holding time. It must take no longer than 4 hours to reach the selected internal temperature.
- When checking the internal temperature of the food, the vacuum seal must not be broken and you must follow hygienic practices. See *Additional food safety information for sous vide procedure* and *Checking temperatures*.
- For every batch of food, the internal temperature of the food must be measured at the start and end of the cook and on a regular basis during the cook, unless you are following a proven cooking method

How this is done

- If you are following a proven cooking method measure the water bath temperature and time according to the proven process. Check the accuracy of your proven method by measuring the internal temperature at the centre of the thickest part of the food from the pack that is the slowest to heat (e.g. the thickest piece of meat located at the slowest heating point in the water bath). See *Proving a cooking method for sous vide*
- Once the centre of the thickest part of the food has met the internal food temperature chosen from the table, it must be held for the holding time corresponding to the chosen internal food temperature in the *Internal Temperature and Holding Times* table.
- You must make sure that the internal food temperature does not drop below the lowest temperature in the table at any stage during the holding time of your cook. That is 55°C for red meats for *Cook-Serve*, 60°C for poultry for *Cook-Serve* and 60°C for any *Cook-Chill* foods.
- When cooking sous vide the vacuum packed bags must be kept below the water surface.
- If you are using a proven process and there are any problems or changes (e.g. to the food, equipment or cooking times and temperatures), you will need to repeat the process of proving your time and temperature combinations



The **internal product temperature** is the minimum that must be achieved and maintained for at least the corresponding time at the slowest heating point of the largest product (this will be determined based on the products shape and size).

Holding time and internal temperature combinations

1. Cook-Serve time and temperature combinations are designed to achieve a 6 log₁₀ reduction in the concentration of Salmonella and must only be applied to foods that are:

- served immediately after sous vide cooking; or
- cooled quickly to 5°C or less after sous vide cooking, stored and used within 2 days.

When using the Cook-Serve time and temperature combination:

- Red meat products must be held at a water bath temperature of 55°C or higher during the holding time.
- Poultry products must be held at a water bath temperature of 60°C or higher during the holding time.

2. Cook-Chill time and temperature combinations are designed to achieve a 6 log₁₀ reduction in the concentration of Listeria monocytogenes and must only be applied to foods that:

- are served immediately after sous vide cooking; or
- are cooled quickly to 5°C or less after sous vide cooking, stored and used within 5 days.

When using the Cook-Chill time and temperature combination red meats and poultry must be held at a water bath temperature of 60°C or higher during the holding time.

How this is done

Internal temperature and holding times

Internal food temp °C	Cook-Serve: Serve immediately or within 2 days of cooking.		Cook-Chill: Serve immediately or within 5 days of cooking.
	All meats except poultry Time (mins/hours)	Poultry Time (mins)	Red meat and poultry Time (mins/hours)
TEMPERATURE DANGER ZONE*	55	420 mins / 7 hrs	
	56	296 mins / 4hrs 56 mins	
	57	208 mins / 3hrs 28mins	
	58	147 mins / 2hrs 27mins	
	59	104 mins / 1hr 44mins	
	60	73 mins / 1hr 13mins	56 mins / 91mins / 1hr 31mins
	61	52 mins	40 mins / 63 mins / 1hr 3mins
	62	36 mins	29 mins / 44 mins
	63	26 mins	21 mins / 30 mins
	64	18 mins	15 mins / 21 mins
	65	13 mins	11 mins / 15 mins
	66	9 mins	8 mins / 10 mins
	67	7 mins	6 mins / 7 mins

*Minimum time once product has reached this temperature.

When food is removed from the water bath at the end of the holding time it must be:

- kept in its vacuum sealed packaging until it is ready to be used; and either
 - served immediately; or
 - taken from the bag and seared (or cooked in some other way) and served immediately; or
 - kept in the bag, cooled quickly and stored at 5°C or less for up to 2 days if using the *Cook-Serve* method; or
 - kept in the bag, cooled quickly and stored at 5°C or less for up to 5 days if using the *Cook-Chill* method.

Cooling and storing sous vide food (Cook-Serve and Cook-Chill)

Once the food is cooked it must be cooled from 60°C to 21°C in two hours and then from 21°C to below 5°C in a further four hours.



If you don't have access to equipment such as a blast chiller you can quickly cool sous vide products using a slurry of half ice and half water. If the ice melts, add more.

See also - *Additional food safety information for sous vide procedure, Chilled and frozen food storage and Reheating prepared food.*



Temperature Danger Zone: Temperature control is **extremely important** if operating between 55°C and 60°C. Some harmful organisms can tolerate temperatures close to these and so can potentially survive if the temperature drops. Provided the procedure is followed this hazard should be managed.

What if there is a problem?

If a vacuum cannot be made (i.e. too much air in the vacuum bag), or the vacuum bag leaks

- check the vacuum machine to see if it is working properly; and
- that the vacuum bags do not have holes.

If the food is taking a long time to reach the selected internal food temperature, check for the following:

- The water bath is operating at the selected temperature.
- The water bath is not overfilled with water and/or food.
- There is good circulation of water after the food has been placed in the water bath; and
- The food is totally immersed.

If the internal food temperature drops during cooking, then the food must be cooked for the holding time in the table that corresponds to that lower temperature. For example, you are cooking poultry for immediate consumption at 62°C for 29 minutes. When you check the temperature at the end of the cook time it reads 60°C. You must now cook the food for another 27 minutes making a total cook time of 56 minutes.

If the food has not been cooked at the proven temperature, or has dropped below the minimum temperature in the table then you must discard it. For example poultry that is held below 60°C for any length of time during the holding time must be discarded.

If your sous vide food has not been cooled from 60°C to 21°C in two hours and then from 21°C to below 5°C in a further four hours (total of six hours maximum) it must be thrown away.

If there is a maintenance problem stop using the water bath and throw away any affected food. See *Maintenance*.

During chilled storage, if the vacuum-sealed bags bloat up, do not open the bag as this could indicate the presence of harmful bacteria and food spoilage. As other foods or surfaces could be contaminated by the harmful bacteria, these bags must be thrown away.

Write it down

You must write down in the Sous vide control sheet the checks made to confirm that food has been cooked, including:

- Water bath temperature just before the product is added to the water bath
- Time taken for the food to reach the selected internal product temperature (come up time)
- Length of holding time once food reaches the selected internal product temperature
- Internal temperature of the product at the start and end of holding time
- Time taken to cool the food

You must write down your actions when something went wrong with the cooking process (e.g. when the product was not up to temperature at the end of the holding time).
holding time

You must write down your actions when something went wrong with the cooking process (e.g. when the product was not up to temperature at the end of the holding time).

Proving a cooking method for sous vide

This is what you must do if you regularly cook meat and poultry dishes using the sous vide method and don't want to check the internal temperature each time you cook.

The Act requires that:

- Food must be processed and handled in ways that minimise the contamination or deterioration of food.
- There must be procedures in place that prevent, eliminate or reduce hazards during the production, processing and handling of food.
- Food must be safe and suitable.

The following process will enable you to demonstrate that a standard sous vide cooking procedure will properly cook the food each time it is cooked.

You must use the same equipment (i.e. water bath filled with same amount of water), the same standard ingredients (type, weight, size, thickness etc) and the same number of packs in the water bath each time you sous vide. You must use a calibrated thermometer for your temperature checks.

1. Follow the *Cooking using the sous vide technique* pages.
2. Identify the key control points for your sous vide procedure.

This will include:

- the required water bath temperature when you put your food in,
- the selected internal food temperature. See Internal temperatures and holding times table.
- the length of time it will take your food to reach the required internal temperature after it's been put in the water bath (the come up time).
- the required holding time to safely cook your food once it has reached the selected internal temperature.

3. You must check the temperature of the thickest part of the food item with a probe thermometer to determine the time it has taken to reach the selected internal food temperature (the come up time), and ensure that the temperature is maintained for the respective holding time. The come up time must be less than 4 hours. Choose the food located at the slowest heating point of the water bath.

4. You must repeat the cooking method in steps 1 - 3 above for at least three separate batches. The come up time for your proven process will be the longest time recorded for the 3 batches. You need to be confident that the selected internal food temperature will always be met at the end of the come up time.

5. You must write down the results of each of your time and temperature checks in the *Proving a cooking method for sous vide* table.

6. If there any problems you will need to repeat the above process until you are again confident the required temperature will be consistently achieved.

7. If you change the size of the cut, or try a new type of meat you will need to follow the above steps to establish a new process.

8. Once you have established a proven method you must make sure you and/or any staff using the proven method follow it carefully. Each week you must check and record the time and temperature combinations for your proven method. You can use the Sous vide control sheet, your own control sheet or record system or a data logger.

If your weekly check finds that the water bath temperature is not being met, or the internal food temperature is not high enough at the start, during or at the end of the cook, then you must adjust your process. For example, cook at a higher temperature in the table, or cook for longer

If you don't want to check the revised time and temperature combination each time you cook you will need to follow the above steps to establish a new proven process.

If your weekly checks demonstrate that you have established a stable process you can decrease the frequency of your check to fortnightly.

Internal temperature and holding times				
Internal food temp °C	Cook-Serve: Serve immediately or within 2 days of cooking.		Cook-Chill: Serve immediately or within 5 days of cooking.	
	All meats except poultry Time (mins/hours)	Poultry Time (mins)	Red meat and poultry Time (mins/hours)	
TEMPERATURE DANGER ZONE*	55	420 mins / 7 hrs	Poultry must not be sous vide at temps lower than 60°C	If storing sous vide red meat or poultry for longer than 2 days do not cook at temperatures lower than 60°C
	56	296 mins / 4hrs 56 mins		
	57	208 mins / 3hrs 28mins		
	58	147 mins / 2hrs 27mins		
	59	104 mins / 1hr 44mins		
	60	73 mins / 1hr 13mins	56 mins	91mins / 1hr 31mins
	61	52 mins	40 mins	63 mins / 1hr 3mins
	62	36 mins	29 mins	44 mins
	63	26 mins	21 mins	30 mins
	64	18 mins	15 mins	21 mins
	65	13 mins	11 mins	15 mins
	66	9 mins	8 mins	10 mins
	67	7 mins	6 mins	7 mins

*Minimum time once product has reached this temperature.

Additional food safety information for sous vide procedure

It is recommended that the food business follow this guidance to help them meet the sous vide procedure.

The guidance material includes recommendations for food businesses to follow to ensure food safety hazards are controlled. The guidance material should be used in conjunction with the Cooking using the sous vide technique.

1. Vacuum sealing

- To test the vacuum seal submerge the vacuum pack food in water. Air bubbles or bloated bags indicate air is present.
- Sous vide specific vacuum bags are single use, heat resistant and thaw resistant and thick enough to be resistant to punctures from bones and sharp food edges.
- Resealable sandwich bags cannot draw a vacuum so are unable to achieve good contact between the food and water bath, and they may not be as heat resistant, or thick enough to resist punctures from sharp edges.
- Creases in the vacuum-sealed bags can reduce heat transfer to the food and even heating.
- Once opened, do not reseal the vacuum bag. Exposing the food to air will introduce microbes which may affect the shelf life or safety of the food.

2. Preparation

- Making sure each vacuum bag contains foods of similar size and weight will achieve consistent cooking through a batch.

3. Water bath

- Do not overload the water bath, and if you have proven the process, make sure you don't add more packs than were used for proving the process.
- Good water circulation will prevent cold spots forming. This

can be done by using an automated stirrer for example. The cold spots can significantly lower the water temperature.

- Plates or wire racks can be used to keep vacuum packed bags below the surface.
- Place the largest vacuum packed bag in the coolest part of the water bath to monitor the temperature of the batch. Once that bag has been held for the required temperature and holding time, then the entire batch will have been cooked.
- If the water bath level drops during a cook and the vacuum sealed foods rise to the water surface, add warm water at a temperature that is not less than the set water bath temperature.

4. Temperature measurements

- The internal temperature of the food you are cooking is checked because you will not be able to tell from the look and feel of the food whether it has been thoroughly cooked.
- The internal temperature of the food can be measured by a needle temperature probe, inserted into a vacuum pouch through closed cell foam tape or thermocouple feed-through connector. Refer to insert below

5. Holding times and temperatures

- The holding times specified in the *Internal Temperature and Holding Times* table are the minimum holding time for the food. The food may be held longer if required.

6. Cleaning and maintenance

- The water bath can be cleaned with a water/vinegar solution at 71°C for 25 minutes as required.
- Routine maintenance will make sure that all components are in good working condition.



How to measure the internal product temperature without breaking the vacuum seal

1. Place some closed cell foam tape on the thickest part of the vacuum sealed food product.
2. Insert the needle temperature probe into the closed foam tape until the tip has reached the middle of the food.
3. If the temperature reading is not at the required temperature, leave the probe in the food and place the food back into the water bath.
4. Check if any juices have leaked from the vacuum sealed bag. If there are signs of leakage you must remove the bag from the water bath.

Developing your own sous vide procedure

If you want to cook sous vide in ways that aren't described in this procedure you can. You will need to develop a procedure that outlines your method and shows that your way is valid and have your procedure evaluated by a recognised evaluator. Refer to **Significant amendments** on the *Getting Started with the template* page.

If you do want to develop your own procedure you may find the following references helpful

- *Review of microbial pathogen inactivation relevant to sous vide cooking at temperatures below 55°C*. Aug 2016
- *Standardising D and Z values for cooking raw meat*. March 2017
- *Guidelines for restaurant sous vide cooking safety in British Columbia*. Jan 2016