

Numeracy By Measure

Building the Workplace Measurement Skills
of VET Practitioners



Smallgoods Packing

MANUFACTURING MEASURES

Many jobs require workers to work with measurements. Measurement underpins the success and welfare of a modern workplace and touches almost every part of working life. To develop and sell products and services, to manage quality and safety, and to enhance productivity workplaces need to measure processes, products and performance.

The example used in this Snapshot is a job task performed by process workers at a smallgoods manufacturer. The job task involves following a Standard Operating Procedure to slice and package smallgoods. It includes understanding and working with a range of measures, including temperature, weight, linear dimensions and time.

The numeracy skills required include the ability to read, interpret and understand the mathematical information in written instructions and specifications (and oral if

instructions are also given verbally) – the application of ACSF numeracy indicator .09, *identifying mathematical information and meaning in activities and texts*.

The numeracy skills also include the ability to use and apply a range of mathematical skills to undertake the task, including using tools to measure and then compare the results with specified tolerances – the application of ACSF numeracy indicator .10, *using and applying mathematical knowledge and problem solving processes*.

The numeracy skills also include the ability to record measurements and communicate orally with supervisors and the work team – the application of ACSF numeracy indicator .11, *communicating and representing mathematics*.

Workers responsible for undertaking such measurement tasks must also have a range of other complementary skills, such as the

skills to work safely (follow safety procedures, identify and report hazards), follow safety procedures and the skills to follow workplace procedures (identify what must be measured and what tools to use, how often and when, where and how it

needs to be recorded, identify the need to take action and take appropriate action). Other skills may include those needed to explain measurement information to other workers, supervisors or customers.

THE CONTEXT

A process worker needs to be able to understand and follow a Standard Operating Procedure to slice and package roast beef in a smallgoods factory. An excerpt of a Standard Operating Procedure illustrating the types of measurement information involved is shown on the next page.

The ability to use and interpret measurements using the following measurement tools is needed to complete this task:

- A thermometer for measuring internal temperature.
- A watch or clock and a calendar for checking times and calculating use-by dates.
- A ruler for checking and measuring linear dimensions of meat slices.
- Scales for weighing slices.

PROCESSING INSTRUCTIONS

1. Product to be held in Blast Chiller no less than 12 hours before slicing.
2. Move cage with Roast Beef to Shingled Meat Room.
3. Check internal temperature. The optimum internal temperature of logs before slicing should be between 0 to +4°C. If above 4°C, move to Blast Freezer for 30 to 60 minutes. When temperature is satisfactory, return product to Shingled Meat Room & record on 'Temperature Control Check Sheet'.
4. Fit logs on slicer (end of logs may need trimming to get gripper to hold).
5. Check weight of slices as per procedure 5-09-07.
6. The net weight of 7 slices should be between 100 and 105 grams.
7. Adjust slices if net weight is outside those specifications.
8. Place 7 slices in the moulded bottom film on Tiromat machine.
9. Avoid meat contacting the sealing edges of the film
10. Place loose packs in the plastic bin (remove sliced product and re-package).
11. Assemble the box for Roast Beef, place 8 labelled packs and fold the box.
12. Place folded box inside the tape machine.
13. Stack boxes on the pallet and move to Despatch Chiller.

Time

Temperature

Linear dimensions

Weight

QUALITY CHECKS

- Log internal temperature before slicing: 0 to 4°C
- Net weight: 100-105 grams
- Slice thickness: approx. 2 mm
- Unit size: approx. 105 mm
- Unit per package: 7 slices
- Correct use-by date (refer to daily use-by date listing)
- Correct label positioning - visual inspection
- Digital scales accuracy ± 0.001 kg

ACSF NUMERACY MAPPING

The process of mapping the numeracy skills demands of a job task to the ACSF is imprecise. That is, there is no absolute right or wrong. Professional judgement is needed. Consult the ACSF as you reflect on the numeracy skills mapping presented in this Snapshot. Do you follow and agree with the logic? What is your reasoning?

This task maps to **ACSF numeracy level 3**, with the mathematical content mainly related to the focus area *Mathematical knowledge and skills: measurement and geometry*. A worker needs to be at **exit** numeracy level 3 to successfully and competently undertake a task such as this – that is, they need to be working at ACSF numeracy level 4.

At level 3, the first indicator specifies that tasks at this level require the interpretation of mathematical information that ‘may be partly embedded in a range of familiar, and some less familiar, tasks and texts’. Similarly, the second indicator describes the mathematical application aspects as using ‘a variety of developing mathematical and problem solving strategies’ while the third indicator describes the use of ‘a combination of both informal and formal oral and written mathematical language and representation’. The whole task covers all three indicators at ACSF numeracy level 3.

To undertake the whole task requires the understanding and application of a range of measures and measurement activities including temperature, linear dimensions, weight and time. Individually some of these components of the task are at level 2. However, as the job task demands the combination of all of these measurement skills and their application across a number of different but related processes, it requires using higher level skills aligned to ACSF numeracy level 3.

In particular this applies to the second indicator and the application of a range of mathematical and problem solving strategies. These are summarised in the table below. At level 2 the specification of skills is limited.

ACSF numeracy indicator .10, <i>using and applying mathematical knowledge and problem solving processes</i>	
<p>At ACSF numeracy level 2 this includes:</p> <ul style="list-style-type: none"> Selects and uses appropriate familiar mathematical problem solving strategies to solve problems in familiar contexts <p>Relies substantially on hands-on (concrete) and real life materials, personal experience and prior knowledge to:</p> <ul style="list-style-type: none"> make estimations and check reasonableness of processes and outcomes in relation to the context 	<p>At ACSF numeracy level 3 this includes:</p> <ul style="list-style-type: none"> Selects from and uses a variety of developing mathematical and problem solving strategies in a range of familiar and some less familiar contexts <p>Draws on a combination of hands-on, in-context materials, personal experience, mathematical and other prior knowledge to:</p> <ul style="list-style-type: none"> use developing estimation, and other assessment skills, to check and reflect on the outcome and its appropriateness to the context and task

At level 3, however, there is a need to be able to select and use a ‘variety of developing mathematical and problem solving strategies’ and check and reflect on the outcome and its appropriateness to the context and task. This job requires mathematical knowledge and understanding to assist problem solving and reflection abilities.

Therefore, although there are some elements that map to level 2, collectively the requirements are at ACSF numeracy level 3.

The following pages illustrate and explain the unpacking and mapping of three of the measures required in this task (temperature, linear dimensions and weight) to the relevant ACSF numeracy indicators, focus areas and performance features.

TEMPERATURE

In this job task the understanding and use of temperature is crucial to the safety and quality of the finished product. Misunderstandings of temperature specifications and related measurements could have significant health ramifications. An example of a temperature specification from the Standard Operating Procedure is shown below.

Check internal temperature. The optimum internal temperature of logs before slicing should be between 0 to +4°C. If above 4°C, move to Blast Freezer for 30 to 60 minutes. When temperature is satisfactory, return product to Shingled Meat Room & record on 'Temperature Control Check Sheet'.

The following table shows how the measurement of temperature applies to this task and aligns to ACSF numeracy level 3.

ACSF numeracy indicator 3.09	
Focus areas and performance features	Comment
<p>Explicitness of mathematical information</p> <ul style="list-style-type: none">• Interprets and comprehends a range of everyday mathematical information that is embedded in familiar and routine texts <p>Complexity of mathematical information</p> <ul style="list-style-type: none">• Interprets and comprehends familiar and routine temperature measures	<p>The worker needs to be able to read and understand the Standard Operating Procedure and the verbal instructions of a supervisor in relation to the temperature specifications. There are technical terms to interpret such as 'optimal internal temperature', along with the need to comprehend the meaning of phrases such as between '0 to +4°C' and 'If above 4°C'.</p>

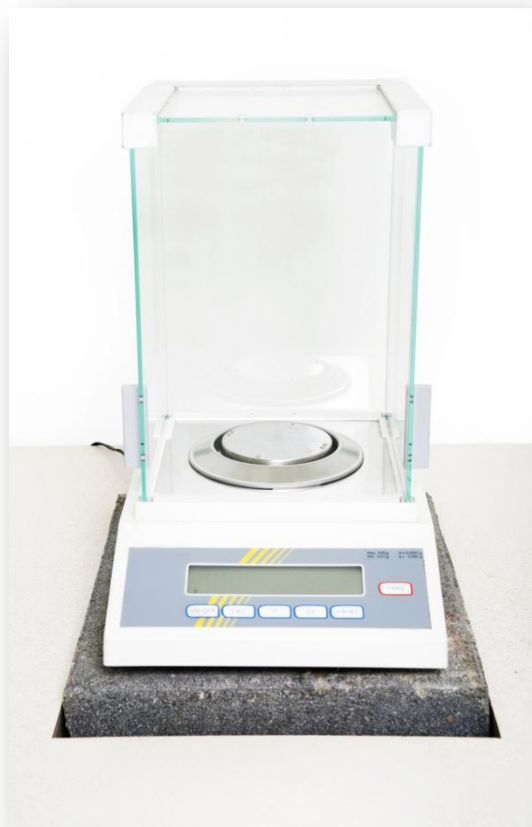
ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<p>Problem solving processes including estimating and reflecting</p> <ul style="list-style-type: none"> • Uses developing estimation, and other assessment skills, to check and reflect on the outcome <p>Mathematical methods and use of tools</p> <ul style="list-style-type: none"> • Selects and uses appropriate tools, hand held devices <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> • Measures, estimates and calculates temperature 	<p>The worker needs to use a thermometer to measure the temperature of the product and compare this temperature with the given range. Then they need to take action depending on whether the required tolerance has been met or not. This includes estimation skills to check and reflect on the measured temperature related to the specification.</p>

ACSF numeracy indicator 3.11	
Focus areas and performance features	Comment
<p>Written mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level <p>Oral mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical information</p> <ul style="list-style-type: none"> • Interprets and comprehends familiar and routine temperature measures 	<p>The worker needs to record the temperature measurement in the Temperature Control Check Sheet.</p> <p>They must also be able to discuss the results and how they were obtained with supervisors and other workers, which involves using a range of informal and formal oral mathematical language in relation to temperature.</p>

WEIGHT

In this job task the understanding and use of weight is also crucial to product quality. The skills needed include the ability to do estimations and calculations, as well as reading digital scales where weight is specified in decimals of kilograms but where the Standard Operating Procedure specifies weight in grams. An example of a weight specification from the Standard Operating Procedure is shown below.

5. **Check weight of slices as per procedure 5-09-07.**
6. **The net weight of 7 slices should be between 100 and 105 grams.**
7. **Adjust slices if net weight is outside those specifications.**
8. **Place 7 slices in the moulded bottom film on Tiromat machine.**



The information below shows how the measure of weight applies to this task and aligns to ACSF numeracy level 3.

ACSF numeracy indicator 3.09	
Focus areas and performance features	Comment
<p>Explicitness of mathematical information</p> <ul style="list-style-type: none"> Interprets and comprehends a range of everyday mathematical information that is embedded in familiar and routine texts <p>Complexity of mathematical information</p> <ul style="list-style-type: none"> Interprets and comprehends familiar and routine mass measures 	<p>The worker needs to be able to read and understand the Standard Operating Procedure and the verbal instructions of a supervisor in relation to the specifications to weight. They need to interpret mathematical information about the weight range for seven slices and what actions need to be taken if the specification is not met.</p>

ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<p>Problem solving processes including estimating and reflecting</p> <ul style="list-style-type: none"> Uses developing estimation, and other assessment skills, to check and reflect on the outcome <p>Mathematical methods and use of tools</p> <ul style="list-style-type: none"> Selects and uses appropriate tools, hand held devices <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> Measures, estimates and calculates temperature 	<p>The worker needs to be able to use digital scales to weigh seven of the slices, where the net weight is specified in grams (g), using a readout in decimals of kilograms (kg). Then they need to be able to check and reflect on the result and take action depending on whether it meets the required tolerance or not. If it does not meet the specification the worker needs to be able to adjust the thickness of the slices and repeat the measurement. An assumption here is that the worker can divide the range from 100 to 105 grams by 7.</p>

Working through this PD resource will support you to confirm and strengthen your own measurement skills.

ACSF numeracy indicator 3.11

Focus areas and performance features	Comment
<p>Written mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level <p>Oral mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical information</p> <ul style="list-style-type: none"> • Interprets and comprehends familiar and routine temperature measures 	<p>The worker needs to record information about weights.</p> <p>They must also be able to discuss the results and how they were obtained with supervisors and other workers, which involves using a range of both informal and formal oral mathematical language in relation to weight.</p>

LINEAR DIMENSIONS

In this job task the understanding and use of the linear dimensions of length and thickness is also crucial to product quality. An example of a specification for linear dimensions from the Standard Operating Procedure is shown below.

- **Slice thickness: approx. 2mm**
- **Unit size: approx. 105mm**

The information below shows how the measurement of length and thickness apply to this task and aligns to ACSF numeracy level 3.

ACSF numeracy indicator 3.09	
Focus areas and performance features	Comment
<p>Explicitness of mathematical information</p> <ul style="list-style-type: none"> • Interprets and comprehends a range of everyday mathematical information that is embedded in familiar and routine texts 	<p>The worker needs to be able to read and understand the Standard Operating Procedure and the verbal instructions of a supervisor in relation to the length and thickness specifications. There is also a need to be able to interpret mathematical information such as 'slice thickness' and 'approx 2 mm'.</p>

ACSF numeracy indicator 3.10	
Focus areas and performance features	Comment
<p>Problem solving processes including estimating and reflecting</p> <ul style="list-style-type: none"> • Uses developing estimation, and other assessment skills, to check and reflect on the outcome <p>Mathematical methods and use of tools</p> <ul style="list-style-type: none"> • Selects and uses appropriate tools, hand held devices <p>Mathematical knowledge and skills: measurement and geometry</p> <ul style="list-style-type: none"> • Measures, estimates and calculates length 	<p>The worker needs to be able to estimate and check whether the meat slices meet the specified requirements for thickness and length. This includes the ability to visually estimate the dimensions as well as to measure them and check that the required tolerances are being met. The relationship between these linear dimensions and the tolerances for the weights also needs to be known and acted upon.</p>

ACSF numeracy indicator 3.11

Focus areas and performance features	Comment
<p>Written mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both formal and informal symbolism and conventions relevant to the mathematical knowledge of the level <p>Oral mathematical language</p> <ul style="list-style-type: none"> • Uses a combination of both informal and formal oral mathematical and general language to present and discuss the mathematical and problem solving process and result <p>Complexity of mathematical information</p> <p>Interprets and comprehends familiar and routine temperature measures</p>	<p>The worker needs to record information about thickness and length.</p> <p>They must also be able to discuss the results and how they were obtained with supervisors and other workers, which involves using a range of both informal and formal oral mathematical language in relation to linear dimensions.</p>

Working through this PD resource will support you to confirm and strengthen your measurement teaching skills.

ABOUT THIS RESOURCE

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners is a professional development resource to support the development of VET practitioner numeracy proficiency skills and numeracy training skills. It has been developed in response to a National Centre for Vocational Education and Research (NCVER) report titled *Seeking the N in LLN*. This report found that there may be a need to increase the capacity of the vocational education and training (VET) workforce to meet the numeracy skills needs of existing workers in Australia. A copy of the full report is available for download at www.ncver.edu.au.

Numeracy by Measure: Building the Workplace Measurement Skills of VET Practitioners includes a [Guide](#) with professional development activities and six Snapshots exploring different workplace numeracy skills based on measurement. This is one of the Snapshots.

Measurement topics covered in the Snapshots include:

- [Bicycle Fitting](#)
- [Cabinet Fitting](#)
- [Health Monitoring](#)
- [Shoe Fitting](#)
- [Smallgoods Packing](#)
- [Tyre Wall Markings](#)

VET practitioners interested in increasing their awareness of numeracy skills in the workplace may also like to access the companion resources [Numeracy in Focus: Building VET Practitioner Awareness of Numeracy in the Workplace](#) and [Numeracy in Practice: Building Workplace Numeracy Proficiency and Training Skills of VET Practitioners](#).

[Numeracy by Measure](#), [Numeracy in Practice](#) and [Numeracy in Focus](#) are available for download from www.oggiconsulting.com/resources/.

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