

The Measurement Standards Laboratory

Apprentice Framework

Intro

The Measurement Standards Laboratory (MSL) apprenticeship is a development role for selected individuals with the right qualities and mindset for completing the 24 month programme. The purpose of this role is to develop Metrology Technicians within New Zealand and the apprenticeship programme is designed to kickstart a candidate's career in a technically demanding work environment.

This document provides apprentices, assessors, employers and training providers an overview of the framework that supports the apprentice programme. This document does not seek to describe the processes, roles and responsibilities within the delivery of the programme.

Summary of apprenticeship programme

- First 6 months
 - Gain an understanding of basic measurement principles
 - Gain an understanding of measurement uncertainty and statistics
 - Complete online training modules
 - Gain a working knowledge of MSL's Quality Management System and the procedures it supports
 - Observe and partake in calibrations
 - Build strong working relationships within their assigned team and across MSL
 - Become a participating member of the team
 - Gain an understanding of the principles of programming
 - Provide a presentation to MSL
- 6 months to 18 months
 - Work placement #1
 - Undertake a module with a tertiary education provider
 - Project #1 – Calibration of section equipment including procedure & report design and uncertainty analysis
 - Shadow laboratory H&S work area inspections
 - Commercial reality training with industry representative
 - Work placement #2
 - Undertake a module with a tertiary education provider
 - Project #2 - Shadow the characterising of an instrument at MSL incl. risk assessment
 - Provide a presentation to all MSL
 - Shadow MSL internal audit
- 18 months to 24 months
 - Final project – Complete the characterisation of an MSL instrument including uncertainty analysis and risk assessment
 - Mentor any new apprentice to share knowledge and experience
 - Work placement #3
 - Undertake a module with a tertiary education provider
 - Conduct laboratory H&S work area inspection
 - Undertake H&S legislation training session
 - Preparation for the job market (CV, Mock interview, Brand)
 - MSL apprenticeship graduation

Expectations of the Apprentice over the programme duration

- Carry out routine calibrations for practice and commercial jobs, including analysis and reporting
- Maintain a portfolio of work evidence
- Submit portfolio and supporting information to assessors 1 week in advance of assessment
- Provide regular updates to apprentice blog every 3 – 4 months
- Attend an industry conference
- Attend work placements in various locations around New Zealand

- Maintain a professional standard of behaviour

Apprentice performance tracking and assessments

The assessment plan has been designed to ensure that:

- On completion of the 24 month programme, the candidate has the necessary knowledge, skills, and behaviours to be employed in a technical role
- The assessments are appropriate, feasible and consistent
- The process adds value to both the apprentice and future employers

The approach to assessment has adopted the following broad principles:

- The assessment process will build on, and complement, the learning and development activities undertaken by the apprentice
- It should encourage continuing professional development
- It should position the apprentice for a career and encourage progression opportunities

The final assessment must have independence and requires the apprentice to demonstrate that they have the necessary skills and competencies and can work safely and confidently as a Metrology Technician.

Work placement feedback:

- Workplace supervisor to complete form included in Appendix 3
- Assessors to review and consider during assessment

Project feedback:

- Project supervisor to complete feedback form included in Appendix 4
- Assessors to review and consider during assessment

Formal assessments will involve a review of behaviours, skills, knowledge and the technical portfolio along with any other supporting material. The aim is for the candidate to reach the level of “Effective in Role” in all areas by the end of their 24 month period.

- The assessment forms for behavioural attributes are included in Appendix 1
- The assessment forms for skills and knowledge are included in Appendix 2
- 1st and 2nd assessments to be carried out by head of technical section and one other technician from a different section. The final assessment to include an industry representative.
 - 1st Assessment (8 months)
 - 2nd Assessment (16 months)
 - Final assessment (24 months)

Appendices

- Appendix 1 – Behavioural assessment
- Appendix 2 – Skills and knowledge assessment
- Appendix 3 – Work placement feedback form
- Appendix 4 – Project feedback form

Appendix 1 – Behavioural assessment

“The way one acts or conducts oneself”

BEHAVIOURAL ATTRIBUTES	DESCRIPTION
1) Concentration on Quality	Candidate displays a focus on quality and a high level of attention to detail and accuracy.
2) Logical Thinking	Candidate can process information using clear reasoning to reach sound conclusions and evaluate possibilities.
3) Curiously Motivated	Candidate is self-motivated and inquisitive. Shows the confidence to investigate issues, speak up and ask questions.
4) Growth Mindset	Candidate reflects on skills, knowledge and behaviours and seeks development opportunities and continuous improvement.
5) Team Interactions	Candidate works effectively in teams. Integrates and collaborates easily, listens well, supports other people, consider implications of their actions on others and holds a positive and respectful attitude. Shows a commitment to equality and diversity.
6) Professional Ethics	Candidate acts professionally, ethically and conscientiously by adhering to relevant legislation, regulations, standards, and organisational procedures. Demonstrates integrity and accountability.
7) Time Management	Candidate plans and manages time effectively and prioritises workloads to meet deadlines and customer requirements.
8) Commercial Awareness	Candidate recognises the relevance of time/cost efficiency and the need to meet both business and customer requirements.

For this assessment, the assessors interview the candidate’s supervisor to gain an understanding of the level of behavioural progress displayed by the candidate in their everyday interactions. Discussion of opportunities for further development are also useful.

1) CONCENTRATION ON QUALITY

Candidate displays a focus on quality and a high level of attention to detail and accuracy. Please circle the appropriate level achieved.	DEMONSTRATES MASTERY	DEMONSTRATES POTENTIAL	EFFECTIVE IN ROLE	DEVELOPING	REQUIRES IMPROVEMENT
	Outstanding performance that always exceeds expectations, demonstrated for an extended, sustainable period of time.	Very strong performance that exceeds expectations in most situations and meets expectations in all others.	Consistently strong performance, always meets expectations, occasionally exceeds expectations.	Indicates good but inconsistent performance, meeting some, but not all requirements or expectations.	Major gaps in performance against requirements or expectations. Immediate and substantial improvements must be made.
Preparation notes and questions:					
Justification/evidence provided:					
Areas for development:					
Assessor/Employer comment(s):					

2) LOGICAL THINKING

Candidate can process information using clear reasoning to reach sound conclusions and evaluate possibilities. Please circle the appropriate level achieved.	DEMONSTRATES MASTERY	DEMONSTRATES POTENTIAL	EFFECTIVE IN ROLE	DEVELOPING	REQUIRES IMPROVEMENT
	Outstanding performance that always exceeds expectations, demonstrated for an extended, sustainable period of time.	Very strong performance that exceeds expectations in most situations and meets expectations in all others.	Consistently strong performance, always meets expectations, occasionally exceeds expectations.	Indicates good but inconsistent performance, meeting some, but not all requirements or expectations.	Major gaps in performance against requirements or expectations. Immediate and substantial improvements must be made.
Preparation notes and questions:					
Justification/evidence provided:					
Areas for development:					
Assessor/Employer comment(s):					

3) CURIOUSLY MOTIVATED

<p>Candidate is self-motivated and inquisitive. Shows the confidence to investigate issues, speak up and ask questions.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

4) GROWTH MINDSET

<p>Candidate reflects on skills, knowledge and behaviours and seeks development opportunities and continuous improvement.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

5) TEAM INTERACTIONS

<p>Candidate works effectively in teams. Integrates and collaborates easily, listens well, supports other people, consider implications of their actions on others and holds a positive and respectful attitude. Shows a commitment to equality and diversity.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

6) PROFESSIONAL ETHICS

<p>Candidate acts professionally, ethically and conscientiously by adhering to relevant legislation, regulations, standards, and organisational procedures. Demonstrates integrity and accountability.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

7) TIME MANAGEMENT

Candidate plans and manages time effectively and prioritises workloads to meet deadlines and customer requirements. Please circle the appropriate level achieved.	DEMONSTRATES MASTERY	DEMONSTRATES POTENTIAL	EFFECTIVE IN ROLE	DEVELOPING	REQUIRES IMPROVEMENT
	Outstanding performance that always exceeds expectations, demonstrated for an extended, sustainable period of time.	Very strong performance that exceeds expectations in most situations and meets expectations in all others.	Consistently strong performance, always meets expectations, occasionally exceeds expectations.	Indicates good but inconsistent performance, meeting some, but not all requirements or expectations.	Major gaps in performance against requirements or expectations. Immediate and substantial improvements must be made.
Preparation notes and questions:					
Justification/evidence provided:					
Areas for development:					
Assessor/Employer comment(s):					

8) COMMERCIAL AWARENESS

<p>Candidate recognises the relevance of time/cost efficiency and the need to meet both business and customer requirements.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

Appendix 2 – Skills and knowledge assessment

“The ability to perform an action with determined results using skills acquired through experience or education”

KNOWLEDGE / SKILL AREA	DESCRIPTION
9) Measurement Infrastructure	Candidate understands the principles of metrology and their application within industry, law, science and society, including measurement units, traceability and uncertainty.
10) Quality System	Candidate is familiar with ISO quality standards as well as quality assurance, inspection, accreditation and audit systems. Can explain why these are important in Metrology.
11) Practical Skills	Candidate demonstrates technical dexterity, workshop skills, basic electronics and programming. Shows competence in fault-finding and debugging.
12) Measurement Practice	Candidate plans and performs measurement tasks to ensure verifiable results, using measurement tools, equipment, instrumentation and software programs correctly. Follows specified procedures and methodologies and acts when non-conforming tools, equipment, instrumentation, materials and software programs have been identified.
13) Data analysis	Candidate can retrieve, analyse, interpret, validate and record measurement results and data. Recognises trends as well as data irregularities and can identify probable sources.
14) Measurement Uncertainty	Candidate can identify sources of uncertainty, draft an appropriate model equation and calculate measurement uncertainty for a common instrument calibrated by a 2 nd tier laboratory.
15) Problem Solving	Candidate follows an analytical approach to solving problems through data collection, analysis and interpretation.
16) Communication Skills	Candidate communicates facts, concepts, theories and outcomes using discussion, presentation skills and written reports.
17) Compliance Requirements	Candidate understands and complies with relevant Health and Safety policies and procedures and requirements relating to safe working practices. Candidate also understands and complies with statutory regulations, national and international standards, industry requirements and organisational procedures.

Prior to this assessment, the candidate submits their portfolio of evidence to allow the assessors time to form questions about each of the knowledge and skill areas. During the assessment they may ask the candidate for explanations or demonstrations in order to assess the level of progress and identify areas for development.

9) MEASUREMENT INFRASTRUCTURE

<p>Candidate understands the principles of metrology and their application within industry, law, science and society, including measurement units, traceability and uncertainty.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

10) QUALITY SYSTEM

<p>Candidate is familiar with ISO quality standards as well as quality assurance, inspection, accreditation and audit systems. Can explain why these are important in Metrology.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

11) PRACTICAL SKILLS

<p>Candidate demonstrates technical dexterity, workshop skills, basic electronics and programming. Shows competence in fault-finding and debugging.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

12) MEASUREMENT PRACTICE

<p>Candidate plans and performs measurement tasks to ensure verifiable results, using measurement tools, equipment, instrumentation and software programs correctly. Follows specified procedures and methodologies and acts when non-conforming tools, equipment, instrumentation, materials and software programs have been identified.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p> <p>Outstanding performance that always exceeds expectations, demonstrated for an extended, sustainable period of time.</p>	<p>DEMONSTRATES POTENTIAL</p> <p>Very strong performance that exceeds expectations in most situations and meets expectations in all others.</p>	<p>EFFECTIVE IN ROLE</p> <p>Consistently strong performance, always meets expectations, occasionally exceeds expectations.</p>	<p>DEVELOPING</p> <p>Indicates good but inconsistent performance, meeting some, but not all requirements or expectations.</p>	<p>REQUIRES IMPROVEMENT</p> <p>Major gaps in performance against requirements or expectations. Immediate and substantial improvements must be made.</p>
	<p>Preparation notes and questions:</p>				
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

13) DATA ANALYSIS

<p>Candidate can retrieve, analyse, interpret, validate and record measurement results and data. Recognises trends as well as data irregularities and can identify probable sources.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

14) MEASUREMENT UNCERTAINTY

<p>Candidate can identify sources of uncertainty, draft an appropriate model equation and calculate measurement uncertainty for a common instrument calibrated by a 2nd tier laboratory.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

15) PROBLEM SOLVING

<p>Candidate follows an analytical approach to solving problems through data collection, analysis and interpretation.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Preparation notes and questions:</p>					
<p>Justification/evidence provided:</p>					
<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

16) COMMUNICATION SKILLS

Candidate communicates facts, concepts, theories and outcomes using discussion, presentation skills and written reports. Please circle the appropriate level achieved.	DEMONSTRATES MASTERY Outstanding performance that always exceeds expectations, demonstrated for an extended, sustainable period of time.	DEMONSTRATES POTENTIAL Very strong performance that exceeds expectations in most situations and meets expectations in all others.	EFFECTIVE IN ROLE Consistently strong performance, always meets expectations, occasionally exceeds expectations.	DEVELOPING Indicates good but inconsistent performance, meeting some, but not all requirements or expectations.	REQUIRES IMPROVEMENT Major gaps in performance against requirements or expectations. Immediate and substantial improvements must be made.
	Preparation notes and questions: 				
Justification/evidence provided: 					
Areas for development: 					
Assessor/Employer comment(s): 					

17) COMPLIANCE REQUIREMENTS

<p>Candidate understands and complies with relevant Health and Safety policies and procedures and requirements relating to safe working practices. Candidate also understands and complies with statutory regulations, national and international standards, industry requirements and organisational procedures.</p> <p>Please circle the appropriate level achieved.</p>	<p>DEMONSTRATES MASTERY</p>	<p>DEMONSTRATES POTENTIAL</p>	<p>EFFECTIVE IN ROLE</p>	<p>DEVELOPING</p>	<p>REQUIRES IMPROVEMENT</p>
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<p>Areas for development:</p>					
<p>Assessor/Employer comment(s):</p>					

Appendix 3 – Work placement feedback form

Apprentice:		Placement Dates:	
Supervisor:		Organisation:	
BEHAVIOURAL ATTRIBUTES			
The attributes we'd like the apprentice to display include self-motivation, curiosity, attention to detail, enthusiasm, respect for others, proactiveness and professionalism.			
Can you comment on whether the apprentice showed any or all of these attributes?			
To assist us in preparing the apprentice for future technical positions, which attribute(s) could the apprentice enhance? and how?			
TECHNICAL SKILLS			
Practical skills include choosing the right tool for the job, using instruments correctly and working in a safe manner as well as collecting data, analysing results and writing reports.			
How did the apprentice demonstrate their technical skills in your environment?			
Are there any particular skills you'd like the apprentice to develop?			
KNOWLEDGE BASE			
Metrology is a vast subject covering basic principles, traceability, sources of uncertainty, documentary standards, technical procedures and software programming.			
Can you summarise your view of the apprentice's metrology understanding?			
Which area of knowledge would you recommend the apprentice focus on in further learning?			
OVERALL IMPRESSION			
Describe your enduring impression of the apprentice . . .			

Appendix 4 – Project feedback form

Apprentice:		Supervisor:	
Project:			
PROJECT GOALS:			
Research How well did the apprentice research the subject?			
Methodology Was a methodical approach used?			
Technical aptitude Did the apprentice display technical skills necessary to complete the project?			
Innovative thinking Comment on an innovative approach initiated by the apprentice during the project.			
Measurement uncertainty Comment on the approach used to evaluate measurement uncertainty.			
Environmental consideration Was appropriate consideration given to environmental effects?			
Reporting Can you comment on how well the project was documented?			