

**Australian Flexible Learning Framework**

supporting e-learning opportunities



**Australian Government**  
**Department of Education,  
Science and Training**

# Trainer Guide

## Furniture Making and Design Toolbox

*“Modern Edge Furniture”*

### *Series 8 Flexible Learning Toolbox*



**MODERN EDGE  
FURNITURE**

#### Supporting:

- LMF30302 Certificate III in Furniture Making
- LMF30402 Certificate III in Furniture Making (Cabinet Making)
- LMF30502 Certificate III in Furniture Making (Wood Machining)

### **LMF02 Furnishing Training Package**

14/10/2005 Version 1.1



**flexible  
learning  
Toolboxes**

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*Part of the Australian Flexible Learning Framework*

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## About this Trainer Guide

This guide for the Furnishing and Design Toolbox “*Modern Edge Furniture*” has been developed to support you in delivering the units:

- LMFFM3011A – Produce manual and computer-aided production drawings
- LMFFM3031A – Set up, operate and maintain CNC machining and process centres.

It explains the structure and features of the Toolbox and offers suggested customisation and delivery strategies to help maximise the learning experience for your online learners. These strategies will help you take full advantage of the collaborative learning environment that can be achieved through facilitated discussions and information sharing amongst the learners.

The delivery strategies detailed in this guide are by no means exhaustive and you are encouraged to use your creativity to develop additional meaningful learning experiences for your learners.

## Purpose

The online learning objects (tasks) developed for this Toolbox assist in providing relevant and up-to-date training for units of competency in qualifications within the LMF02 Furnishing Training Package, for example:

- LMF30302 Certificate III in Furniture Making.
- LMF30402 Certificate III in Furniture Making (Cabinet Making).
- LMF30502 Certificate III in Furniture Making (Wood Machining).

The Toolbox addresses the elements and performance criteria for two units of competency:

- LMFFM3011A – Produce manual and computer-aided production drawings.
- LMFFM3031A – Set up, operate and maintain CNC machining and processing centres.

The Toolbox focuses on developing **foundational** knowledge and skills in manual and CAD drawing and CNC machine operation.

Given the range of CAD software and CNC machines available, this Toolbox does **not** provide step-by-step instructions on using either CAD or CNC software. Rather, it provides learners with opportunities to familiarise themselves with and practice using the skills, knowledge and techniques covered in the competencies.

It is recommended that you supplement the content with practical tasks and workplace contexts.

Each task in the Toolbox has been designed as a ‘stand-alone’ component. That is, there is no scaffolding from one task to the next. Therefore, each task presumes that the learner has not completed any other units within the Toolbox. This has resulted in the repetition of some resources across the tasks. It is important that you consider this aspect of the Toolbox as you deliver each or all of the tasks.

## Target audiences

This online resource provides a flexible source of formal training material that can be used for rural and distance learners who have little opportunity to travel to a registered training organisation (RTO). Urban learners will benefit from online training as an alternative or supplement to face-to-face classes.

The two units of competency within the Furnishing and Design Toolbox “*Modern Edge Furniture*” have been identified through consultation with the Manufacturing Industry Skills Council as priority areas for development.

Learners will either be new to the furnishing industry or already employed and wishing to up-skill. The online learning materials will provide flexible access for these learners.

It is expected that the target learners will most likely range from individuals with low language, literacy and numeracy skills to those who are educated beyond AQF level 1. The majority of these learners will be in the 15-19 year age group although there will be some mature-age candidates. It is anticipated that learners working through these learning resources:

- may have learning difficulties associated with low literacy or non-English speaking backgrounds and will need access to additional support
- are likely to already be working in the furnishing industry and looking to up-skill or specialise, for example: gain the skills and knowledge to operate CNC machinery
- may already have a significant level of on-the-job experience in the furnishing industry and will be either seeking to acquire a formal qualification to improve their work opportunities or required by their workplace to undertake further training, for example: computerised drawing and CNC machinery
- could be continuing their training after entering the furnishing industry through a traineeship or pre-apprenticeship
- may be completing the training to become proficient in using CNC machinery
- may have limited experience of using online learning but high level experience in using computerised equipment in their workplace.

The learning materials will provide flexible delivery options to different Trainers/Facilitators within the furnishing industry such as:

- Workplace Trainers/Supervisors working in a one to one or group training situation.
- Vocational Trainers and Assessors in an educational or workplace setting who deliver training, conduct assessments, and issue qualifications.
- Supervisors/Line Managers who are involved in implementing training in the workplace and assessing its effectiveness.
- New practitioners, part-time and full-time, casual and sessional.
- Existing practitioners seeking higher levels of knowledge and skills.

### ***Underpinning ideas***

The Toolbox has been developed using an action-based learning approach. Learners working through the tasks and resources in this Toolbox will take on the role of an employee who works for Modern Edge Furniture, a company that specialises in furniture making using state-of-the-art CNC machinery. Modern Edge uses the latest work processes to design and manufacture quality furniture for their clients.

As learners work through the tasks and resources they are presented with situations, problems and examples typical of the furniture making industry. Discussion opportunities are provided where learners can be encouraged to compare the Modern Edge experience with their own experiences, either in the workplace or their place of study.

The project provides learners with the opportunity to apply their Modern Edge experience with their individual experiences to further develop their knowledge and skills.

### ***Design objectives***

The Toolbox has been designed according to these two main objectives:

- 1 Create activities that can be used either in the workplace or a place of study which will cater for the varied needs of the target audience.
- 2 Offer different levels of learning to allow the learners to decide what they need to learn about in each area.

In regard to these objectives:

- Projects and some resources (ie Example, Documents and Activity) can be customised to suit contextual needs.
- Collaborative activities such as discussions are included in each Task.
- Each Task page is divided into two columns: one for the information relating to the task and one for the resources that support that task. Learners can access resources if needed or continue working through the task. Learners can also go straight to the Project depending on their level of knowledge and skills.

### **Organising structure and key features**

The performance criteria for the two units of competency within this resource have been broken down into seven stand-alone learning objects (tasks).

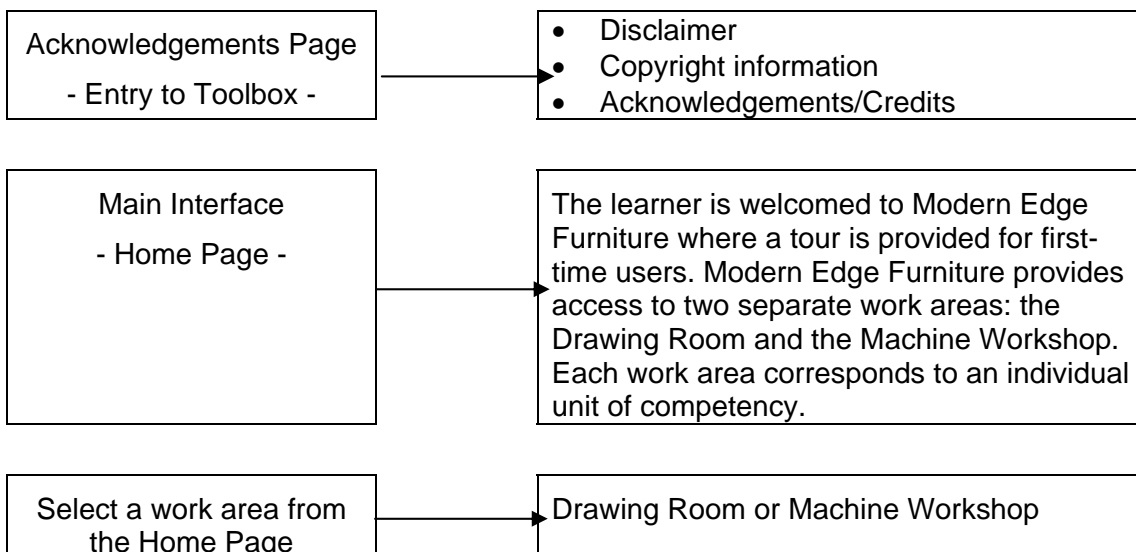
Each of these tasks requires the learner to complete one main project.

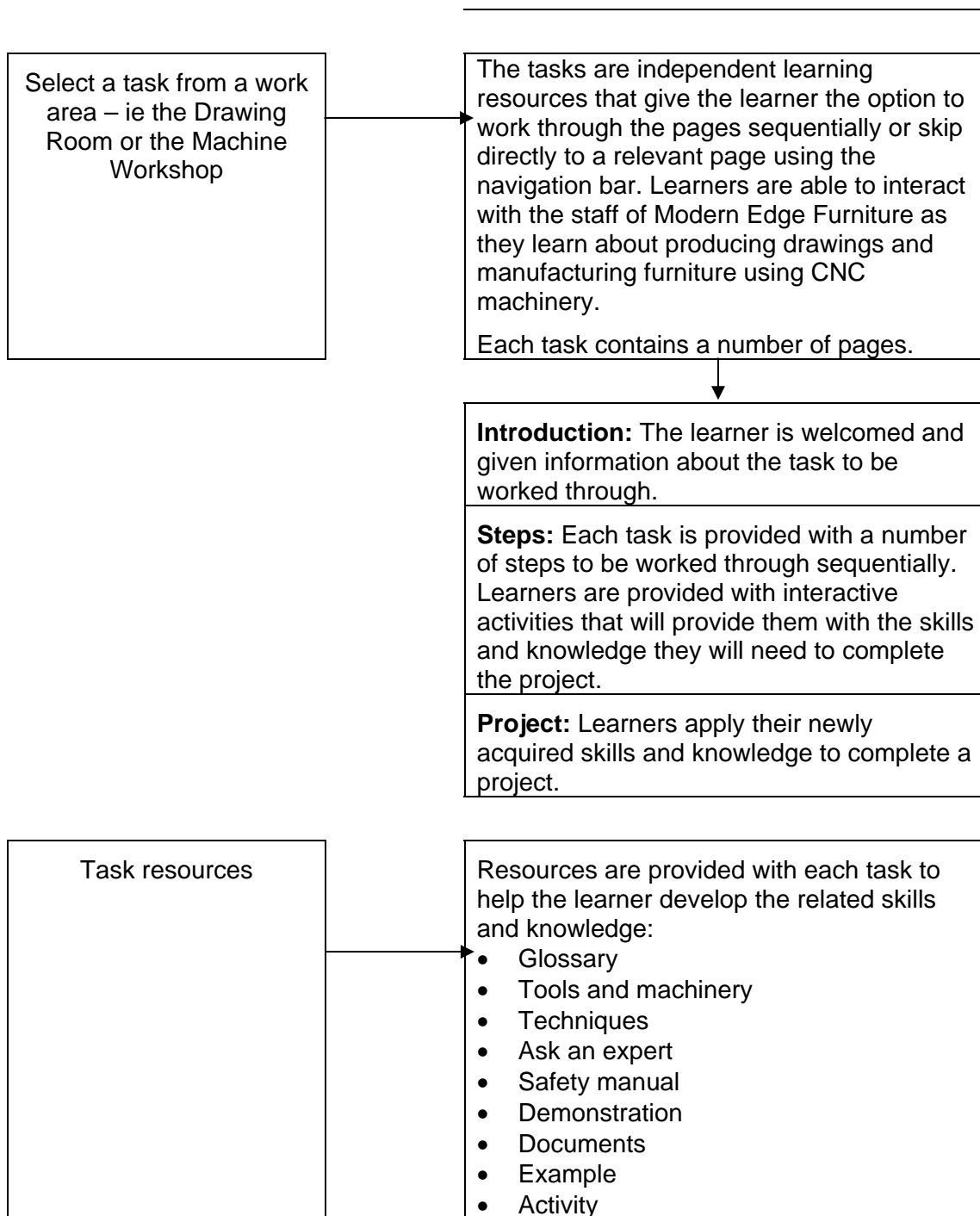
A learner with prior knowledge may choose to complete the project without working through the steps provided with links to supporting resources.

You may choose to assess these projects and use them to form part of the evidence collection process for assessment of competency.

You are encouraged to customise the projects to suit client needs as required, for example: in ‘Task 1: Be prepared!’ for unit **LMFFM3031A - Set up, operate and maintain CNC machining and process centres**, the cutting plan could be modified to suit a particular piece of furniture.

The Toolbox contains seven tasks organised in two main work areas for the learner to access.





The following key principles inform the design of the tasks:

- Resources are presented in formats that are authentic to the furnishing industry and relevant to their use in the tasks contained within the Toolbox product.
- All tasks draw on content that can be used across a range of qualifications within the Furnishing Training Package (LMF02).
- Each task includes a project which has been designed to encourage learners to apply knowledge to solve problems and/or complete tasks. Resources

have been provided to help them successfully complete these tasks.

- Learners will demonstrate their skills and knowledge by completing authentic and meaningful tasks that relate to the furnishing industry.
- The tasks provide learning materials that will enable learners to keep abreast the changing technology and manufacturing processes within the furnishing industry, for example: the operation of CNC machinery.

## Units of competency

<b>Training Package:</b> LMF02 Furnishing Training Package		
<b>National Code</b>	<b>Unit of competency</b>	<b>Hours</b>
LMFFM3011A	Produce manual and computer-aided production drawings	52 hours
LMFFM3031A	Set up, operate and maintain CNC machining and process centres	56 hours

### *Unit information for:*

#### **LMFFM3011A - Produce manual and computer-aided production drawings**

This unit covers the competency to produce production drawings using both manual and computer-aided methods.

#### **National Code    Element Name**

#### **LMFFM3011A/01 Identify object to be drawn**

- 1.1 The purposes and any operational characteristics of object to be drawn are identified.
- 1.2 Production materials and method are identified.

#### **LMFFM3011A/02 Establish drawing criteria and limitations**

- 2.1 Type of drawing to be completed is identified.
- 2.2 Drawing requirements are established and documented identifying dimensions, angles, shapes and finished sizes.
- 2.3 Drawing conventions and specifications to be noted on the drawing are identified.
- 2.4 Appropriate medium for drawings is identified and selected.

#### **LMFFM3011A/03 Quantify and draft initial drawing**

- 3.1 Dimensions are plotted from criteria and documented specifications.
- 3.2 Dimensional points are connected to match appropriate drawing views.
- 3.3 Any production notes or special requirements are noted.
- 3.4 Drawing conventions and specifications are noted on the documentation.

#### **LMFFM3011A/04 Complete drawing**

- 4.1 Angles, shapes and dimensions are checked against specifications and sample.
- 4.2 Adjustments are made to the drawing within scope of authority.
- 4.3 Drawing is checked for compliance with workplace documentation requirements.

**Unit information for:**

**LMFFM3031A – Set up, operate and maintain CNC machining and process centres**

This unit covers the competency to set up, operate and maintain CNC machining and processing centres to produce furniture or components.

**National Code    Element Name**

**LMFFM3031A/01 Prepare for work**

- 1.1 Work instructions are used to determine job requirements, including: design, quality, materials, equipment and quantities.
- 1.2 Workplace health and safety requirements, including personal protection needs, are observed throughout the work.
- 1.3 Material for machining is selected and inspected for appropriate quality.
- 1.4 Procedures are determined for minimising waste material.
- 1.5 Procedures are identified for maximising energy efficiency while completing the job.

**LMFFM3031A/02 Set up for machining and processing**

- 2.1 CNC program is set to job requirements.
- 2.2 Safety equipment, including emergency stops, gauges, guards and controls are checked.
- 2.3 Machining and processing settings and adjustments are made in accordance with job requirements and machining and processing and tool manufacturers' instructions.
- 2.4 Machining and processing, cutting tools and jigs are checked for safe and effective operation.
- 2.5 Trial runs are conducted to check machining and processing operation and quality of finished work.
- 2.6 Final adjustments are made to CNC programs and equipment according to workplace procedures.

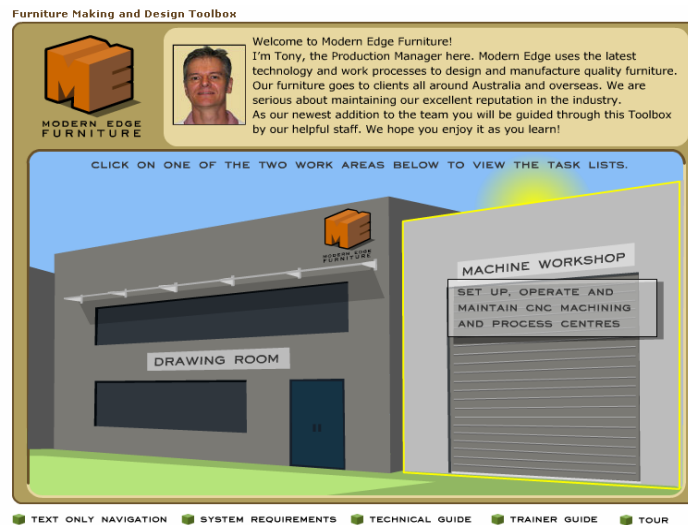
**LMFFM3031A/03 Operate machining and processing centres**

- 3.1 Machining and processing centres are operated and monitored to ensure product quality and output.
- 3.2 Waste quantities are checked and minimised.
- 3.3 Problems with the required work are identified and reported to appropriate persons.
- 3.4 Items that do not meet quality requirements are repaired, recycled or discarded according to workplace procedures.
- 3.5 Any authorised changes in working procedures are followed.

### **LMFFM3031A/04 Clean up work area and maintain equipment**

- 4.1 Material that can be reused is collected and stored.
- 4.2 Waste and scrap are removed following workplace procedures.
- 4.3 Equipment and work area are cleaned and inspected for serviceable condition in accordance with workplace procedures.
- 4.4 Operator maintenance is completed in accordance with manufacturers' specifications and site procedures.
- 4.5 Unserviceable equipment is tagged and faults identified in accordance with workplace procedures.
- 4.6 Equipment and tooling is maintained in accordance with workplace procedures.

## Home page



1 This is the home page of Modern Edge Furniture. There are two main work areas:

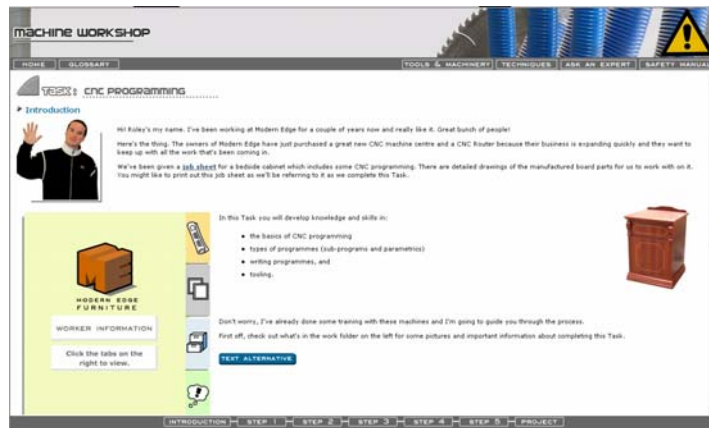
- **The Drawing Room:** This area relates to the unit 'LMFFM3011A - Produce manual and computer-aided production drawings'. There are **two** tasks for the learner to work through.
- **Machine Workshop:** This area relates to the unit 'LMFFM3031A - Set up, operate and maintain CNC machining and process centres'. There are **five** tasks for the learner to work through.

To access the tasks, move your mouse across the work area and click to see the list of tasks within that particular work area.

2 Links are provided to:

- Text only navigation.
- System requirements.
- Technical Guide.
- Trainer Guide.
- Tour (for first time users).

## Task Page



Once the learner selects a task, a new screen for that particular task appears. Each task is completely self-contained. Simple and easy to use navigation enables access to the task content as well as the reusable external resources that support it.

Each task has:

- **Introduction**  
This page introduces the task to the learner and identifies what they will need to do. Suggestions are given on how to work through the task.
- **Steps**  
For learners who are new to the task topic, it is recommended that they start at Step 1 of a series of steps provided. Learners with previous knowledge have the option to bypass these steps and go straight to the Project.
- **Project**  
Each task has a project for the learner to complete and include in their portfolio of evidence. The Trainer/Assessor may decide to use the project as part of the assessment for the topic.
- **Resources**  
A variety of external resources are available for each task, namely:
  - **Glossary**  
A comprehensive listing of terms and definitions.
  - **Tools and machinery**  
Information about the tools and machinery used in the furniture making industry.
  - **Techniques**  
Information relating to the different techniques used in the furniture making industry, for example: the common storage methods for goods and materials.
  - **Ask an expert**  
Modern Edge Furniture employees Max, Tony and Phil answer frequently asked questions.
  - **Safety manual**  
The safety manual covers a range of information relating to occupational health and safety, for example: OHS Law, Manual Handling and Hazards.
  - **Demonstration**  
Demonstrations which include vision and sound are provided for key points of interest.

- **Documents**  
The printable documents provided can be kept as resources, customised or used as discussion points.
- **Example**  
Examples of procedures and processes create a clear idea of how a process or procedure can work.
- **Activity**  
In the Drawing Room, learners can practice their drawing skills using the Activity sheet.

### **Access and equity**

The online tasks cater to remote and isolated learners and provide them with equality of access to learning opportunities.

The level of language used and the inclusion of an online glossary of terms meet the needs of learners with low literacy skills and those that use English as a second language.

Every effort has been made to meet the Web Accessibility requirements of W3C to accommodate the needs of people with disabilities. Text alternatives are provided for all interactive learning resources to assist learners with access to low specification equipment as well as those who may have visual and auditory impairments.

## **Getting started**

### **Tools required**

Users will need a computer (PC or Mac equivalent) with the following software and hardware:

#### **Hardware**

- 600 MHz or Pentium III or equivalent running Windows 2000/ME/XP  
or  
Macintosh PowerPC 500 MHz or above running OS9 or OSX
- 128 MB of RAM
- 800 x 600 screen resolution (1024 x 768 recommended) with minimum 16 bit colour
- CD ROM drive
- Sound card and speakers or headphones
- Internet access 28.8 Kbps or above (to follow links)

#### **Software**

##### **PC Users**

- Microsoft® Windows® 98 or higher
- Microsoft® Internet Explorer 6 or higher  
or  
Netscape® Navigator 6.2 or higher

##### **Macintosh Users**

- Mac OS® 9 or higher
- Netscape® Navigator 6.2 or higher

#### **Users also need:**

- Microsoft® Word (or an equivalent program), to open and use downloadable documents and worksheets
- Microsoft® Excel (or an equivalent program), to open and use downloadable spreadsheets
- A valid email address
- CSS support enabled (this is not essential, but is recommended for enhanced display)
- JavaScript enabled (this is not essential but is recommended for enhanced functionality).

### **Preparing learners for the resources**

It is important to prepare learners to use the materials. It is recommended that you consider the following tips when introducing the use of Toolbox into your curriculum.

- As a workplace trainer or supervisor, it is important to set aside adequate time to familiarise yourself with the Toolbox and its resources so you can properly support your learners. Teachers have reported the greatest successes when they had familiarised themselves with the Toolbox, integrated it with their course, developed student activities and additional material and thus guided the learners through using the Toolbox.
- It is also important to plan ahead and obtain management support, set realistic timeframes for implementation and gain support from the learner's employer before introducing the Toolbox.
- Make sure that you are aware of legislation which may impact on flexible delivery of the Toolbox, for example, learners working at home, traineeship agreements, apprenticeship agreements and enterprise-based arrangements.
- It is recommended that you encourage learners to work through the 'Tour' that's accessible from the home page before beginning any of the tasks in the Toolbox.

- If you choose to have the learners participate in collaborative activities using the discussion forum, you will need to set up discussion threads prior to commencing the activity. Learners will need to be advised of the requirements for the discussion activities as these instructions will not be included within the Toolbox.

### **Description of any special tools/documents provided**

A Tour of the Toolbox for first time users is provided. It can be accessed from the bottom of the Home Page and describes the different areas of the Toolbox, how to access each area and ways of navigating the Toolbox.

Where relevant, answers to project questions have been included in each task section in this Guide.

### **Aspects learners/users may find difficult**

As CNC machines and CAD software can vary significantly from place to place, this Toolbox has concentrated on providing generic knowledge and skills related to these two tools.

While the tasks and resources provided are aimed at developing basic skills, some learners may still find it challenging to use the tools skilfully, given the complexity of these tools. To take full advantage of what the Toolbox offers, you should be very familiar with the tasks in order to adequately direct and support learners through the resources and activities.

There are three 'Have a go!' activities which learners may require additional support for.

#### **In the Machine Workshop:**

*Task 1: Be prepared!*

Step 3: Optimising a cutting plan activity.

It is important that learners clearly understand the instructions provided for this activity as it requires attention to detail to successfully complete it.

Step 5: Organising a workspace.

This activity requires learners to type their answers in the space provided. Learners who have difficulty typing may need support and encouragement. For example, a 'buddy' could do the typing while the learner says the answers aloud. Alternatively, parts of the checklist in the resources column can be copied and pasted into the space provided.

#### **In the Drawing Room**

*Task 2: Size up, draft and finalise drawing.*

Step 1: General assembly

There is a timer included in this activity allowing learners a certain amount of time to complete each part. Some learners may require additional support and encouragement to successfully complete this activity.

### **Description of available customisation methods**

This Toolbox uses Flash, HTML, Cascading Style Sheets (CSS) and Microsoft® Word and Excel documents which can be customised depending on your level of development skills. Please refer to the **Technical Guide**, accessible from the Home Page, for further information on specific customisation methods.

To customise most resources in this Toolbox, you will need access to one or more of the following software programs:

- Macromedia Dreamweaver
- Microsoft® FrontPage
- Macromedia HomeSite
- Microsoft® WordPad.

Both the Home Page and the Tour have been developed using Macromedia Flash. A text-only Home Page which uses HTML and which can be easily customised, has been provided. A Microsoft® Word document version of the Tour which can easily be customised is also provided.

Some interactions have been built in Macromedia Shockwave and Macromedia Flash. These interactions can be customised only by someone with knowledge of these applications. They can be deleted or completely replaced if they do not suit the target audience.

Customisable text alternatives are provided for all Flash interactions.

The following recommendations apply:

- Retain the original files in your CD ROM format so that you always have an original copy of the Toolbox as a backup.
- Check the license details of the Toolbox to ensure that any customisation undertaken does not contravene the conditions of the license.

### **Customising a Toolbox for single unit delivery**

If you only want to offer one unit from the Toolbox, or limit access to certain tasks, you can disable the links to the tasks that you do not wish learners to access. Please refer to the **Technical Guide** for more information on how to do this.

### **Resource files**

Resources are available to help the learner understand the different aspects of manual and CAD drawing and CNC machinery used in the furniture making industry.

Four sets of resources are accessible to learners from the top right hand side of all task pages:

- Tools & Machinery
- Techniques
- Ask an Expert
- Safety Manual

The resources found in 'Tools & Machinery', 'Techniques' and 'Ask an Expert' are different for the Drawing Room and the Machine Workshop. The Safety Manual is the same for both the Drawing Room and the Machine Workshop.



The resources are listed in the table below:

<b>DRAWING ROOM</b>		
<b>Tools &amp; Machinery</b>		
<b>Manual drawing</b> <ul style="list-style-type: none"> <li>• Workspace</li> <li>• Drawing paper</li> <li>• Rulers, lines, angles</li> <li>• Pencils and erasers</li> <li>• Curves, circles, ellipses</li> <li>• Compass and dividers</li> </ul>	<b>Computer Aided Design</b> <ul style="list-style-type: none"> <li>• CAD</li> <li>• CAD/CAM and CNC machines</li> <li>• Layers</li> </ul>	
<b>Techniques</b>		
<b>Drawing methods</b> <ul style="list-style-type: none"> <li>• Sketching technique hints</li> <li>• Types of lines</li> <li>• Position of paper</li> <li>• Plotting dimensions</li> </ul>	<b>Drawing conventions</b> <ul style="list-style-type: none"> <li>• Full size set-out</li> <li>• Title blocks and margins</li> <li>• Dimensions</li> <li>• Guide lines and lettering</li> <li>• Line work</li> <li>• Scale drawings</li> <li>• Sectional drawings</li> </ul>	
<b>Ask an Expert</b>		
<b>Tania</b> <ul style="list-style-type: none"> <li>• How to minimise fatigue</li> <li>• About freehand sketching</li> <li>• Manual or CAD?</li> <li>• Types of materials</li> </ul>	<b>Tony</b> <ul style="list-style-type: none"> <li>• How does drawing communicate?</li> <li>• What is quality assurance?</li> <li>• What are the advantages of using CAD?</li> </ul>	<b>Phil</b> <ul style="list-style-type: none"> <li>• How do you determine job requirements?</li> <li>• How is planning your work sequence useful?</li> <li>• What are some common construction methods?</li> </ul>
<b>MACHINE WORKSHOP</b>		
<b>Tools &amp; Machinery</b>		
<b>Machinery</b> <ul style="list-style-type: none"> <li>• Parts of a CNC machine</li> <li>• Different types of machines</li> <li>• CAD/CAM</li> <li>• CNC work tables</li> </ul>	<b>Tools</b> <ul style="list-style-type: none"> <li>• Router tools</li> <li>• Drilling tools</li> <li>• Tool offsets</li> <li>• Tool configuration</li> <li>• Direction of cut</li> <li>• Cutting speed</li> <li>• Feed speed</li> <li>• Jigs</li> <li>• Measuring router tools</li> <li>• Equipment for installing router tools</li> <li>• Tags</li> <li>• Areas of maintenance</li> <li>• Common CNC machining problems</li> </ul>	<b>Materials</b> <ul style="list-style-type: none"> <li>• Part names</li> <li>• Shop rods</li> </ul>
<b>Techniques</b>		
<b>CNC Programming</b> <ul style="list-style-type: none"> <li>• Programming codes</li> <li>• Parts of a program</li> <li>• G codes</li> <li>• M codes</li> <li>• Cartesian coordinate system</li> </ul>	<b>CNC operation</b> <ul style="list-style-type: none"> <li>• Zero return</li> <li>• Running maintenance</li> <li>• Service cards</li> <li>• Lubricating CNC machines</li> <li>• Cleaning CNC machines</li> </ul>	<b>Materials</b> <ul style="list-style-type: none"> <li>• Material storage</li> <li>• Material defects</li> <li>• Quality assurance</li> </ul>

<ul style="list-style-type: none"> <li>• Parametric programming</li> <li>• Types of programming</li> <li>• Parametric drilling program</li> <li>• Other types of information</li> </ul>		
<b>Ask an Expert</b>		
<b>Max</b> <ul style="list-style-type: none"> <li>• About cutting lists</li> <li>• About cutting plans</li> <li>• About guides and catalogues for CNC</li> <li>• How do you conduct a trial run?</li> </ul>	<b>Tony</b> <ul style="list-style-type: none"> <li>• About basic principles of CNC operation</li> <li>• About the use of CNC today</li> <li>• About advantages/disadvantages of using CNC</li> <li>• About diagnostic software</li> </ul>	<b>Phil</b> <ul style="list-style-type: none"> <li>• How to organise your workspace</li> <li>• About planning a work sequence</li> <li>• What are some common programming errors?</li> <li>• About maintenance terms</li> </ul>
<b>DRAWING ROOM AND MACHINE WORKSHOP</b>		
<b>Safety Manual</b>		
<b>OHS Law</b> <ul style="list-style-type: none"> <li>• Legislation</li> <li>• Duties of employees</li> <li>• Duties of employers</li> <li>• OHS representatives</li> <li>• Reporting accidents</li> </ul>	<b>Manual handling</b> <ul style="list-style-type: none"> <li>• Lifting heavy objects</li> <li>• Safe carrying methods</li> <li>• Personal protective equipment</li> <li>• Material safety data sheets</li> </ul>	
<b>Hazards</b> <ul style="list-style-type: none"> <li>• What is a risk?</li> <li>• What is a hazard?</li> <li>• Hazard control</li> </ul>	<b>CNC machine safety</b> <ul style="list-style-type: none"> <li>• Machine safety system</li> <li>• Machine safety rules</li> <li>• Tool safety rules</li> <li>• Personal safety rules</li> </ul>	

Other resources included in the Toolbox are accessible only from the resources section in the right hand column on each task page. These include:

<b>DRAWING ROOM</b>	
<b>Demo</b> <ul style="list-style-type: none"> <li>• Manual drawing</li> </ul>	<b>Example</b> <ul style="list-style-type: none"> <li>• Inverse sketches</li> <li>• Job specifications</li> <li>• General assemble</li> </ul>
<b>Documents</b> <ul style="list-style-type: none"> <li>• Drawing checklist</li> </ul>	<b>Activity</b> <ul style="list-style-type: none"> <li>• First 8 Lines rule</li> <li>• Presentation requirements</li> </ul>
<b>MACHINE WORKSHOP</b>	
<b>Demo</b> <ul style="list-style-type: none"> <li>• CNC slideshow</li> <li>• Data entry slideshow</li> <li>• Maintenance program</li> </ul>	<b>Example</b> <ul style="list-style-type: none"> <li>• Routing program: bedside cabinet</li> <li>• Installing router tools</li> <li>• Panel raising cutterhead</li> <li>• Major problems</li> <li>• Minor problems</li> <li>• Maintenance request form</li> </ul>
<b>Documents</b> <ul style="list-style-type: none"> <li>• Cutting list: bedside cabinet</li> <li>• Technical information for tooling</li> <li>• Reporting procedures</li> </ul>	

- Monitoring checklist
- Reporting procedure

### ***Approach to competency assessment***

Assessment for both units of competency will include both practical and theoretical assessment tasks. Each task has an accompanying project to be completed by the learner. Completed projects could be included in the learner's portfolio to be submitted to the Trainer/Assessor as part evidence of competency.

It is the Trainer/Assessor's role to decide whether the projects provided will be used alone or in conjunction with other methods of assessment. You may choose to adapt, supplement or modify these tasks and activities to fit your overall approach.

Most of the learners will already be employed in the furnishing industry and this will enable them to complete workplace assessments.

Discussion points could also form the basis of the assessment projects. They provide an opportunity for exploration, investigation and comparison which could be tailored to suit particular needs.

## Activities: Drawing Room

### Task 1: Identify objects to be drawn

**Unit:** LMFFM3011A – Produce manual and computer-aided production drawings

#### Element

LLMFFM3011A/01: Identify object to be drawn.

#### Performance criteria

- 1.1 The purposes and any operational characteristics of object to be drawn are identified.
- 1.2 Production materials and method are identified.

This task introduces the learner to the processes and procedures required at the start of drawing production. Giada, an apprentice at Modern Edge, guides the learner as they are introduced to a range of the fundamental requirements to producing drawings in the furniture making industry. As the task is worked through, the learner will acquire knowledge and skills in:

- 1 Occupational Health and Safety issues
- 2 determining job requirements
- 3 identifying drawing materials
- 4 sketching.

#### Supporting resources

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Activity

#### Special features

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: Learners find out how to 'Prevent injury at your workplace' in a descriptive interaction.
- 3 Step 1: In the Safety Manual learners can view interactions about correct manual handling steps to follow when lifting and carrying heavy objects and about hazard control.
- 4 Step 1: In 'Ask an Expert', Tania takes the learner through ways of 'Minimising fatigue and discomfort' when sitting at a workstation.
- 5 Step 2: In 'Techniques' the learner can practice identifying some common drawing methods and conventions.
- 6 Step 4: Learners can practice drawing inverse sketches using the 'Activity'.

## Practical requirements

For learners to work through this unit they will need access to drawing equipment used for manual drawing either in their workplace or place of study.

## Assessment suggestions

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace.

You may decide to use the project as part assessment of this unit.

## Alternative approaches

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example: Learners could be asked to discuss, either online or in class, what kind of Occupational Health and Safety issues they think are the most important ones to consider when doing manual drawings or using CAD. These could be included in their Evidence Portfolio.

Step 2 introduces the learner to what is necessary for determining job requirements. In discussions, either online or in class, learners could be asked to describe the processes and procedures they follow in their workplace.

You may need to collaborate with the learner's employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

## Project answers

### *Task: Identify object to be drawn*

### *Activities for a place of study*

#### 1 **Employees**

- Following health and safety policy and procedures.
- Wearing protective clothing, accessories and grooming yourself appropriately.
- Maintaining equipment and operating it correctly.
- Reporting hazards.
- Reporting work-related injuries or harm to health.
- Co-operating with employers so that employers are able to carry out their duties under the OHS Act.

#### **Employers**

- Having OHS policy and procedures that workers are required to follow.
- Providing OHS information, instruction, training and supervision.
- Consulting and co-operating with employees and OHS officials.
- Protecting employees from hazards.

- Ensuring a safe work environment and substances used.
- Reporting of accidents.

### **OHS Representatives**

- Inspect the workplace.
  - Investigate accidents and dangerous occurrences.
  - Investigate risk of serious injury to, or harm to the health of, any person.
  - Keep informed on current occupational safety and health information.
  - Report hazards to the employer.
  - Refer matters to the occupational safety and health committee (if present in your workplace).
  - Consult and co-operate with the employer.
  - Liaise with employees.
- 2 List ten hazards to avoid injury to yourself in an office environment.
- Slippery floors.
  - Open cabinet/desk drawers.
  - Upper back and neck pain.
  - Overuse of hands/wrists/arms.
  - Stairs.
  - Eye strain.
  - Fingers, hair, clothing caught.
  - Not enough breaks/stretching.
  - Trip/fall over power cord.
  - Headache from eye strain.
  - Too much/not enough lighting.
  - Awkward seat position/height.
- 3 List three points that describe what drawing is in relation to communicating ideas.
- A form of communication just the same as speaking is a form of communication.
  - The process of placing your ideas on paper.
  - A skill that can be used in many work situations.
- 4 Identify 7 points you should consider during the drawing process.
- The types of drawing required.
  - The drawing method best suited to the type and style of drawing.
  - The medium that is to be used to construct the drawings.
  - Drawing conventions and specifications that are to be shown on the drawings.
  - Angles, curves and dimensions shown on specifications and samples.
  - Choice of materials.
  - A method of constructing the object.
- 5 Briefly explain why it is important to plan your work sequence.  
Planning will help you to find ways to eliminate unnecessary work organise your activities and increase your productivity.
- 6 What four questions should you ask yourself to determine the job requirements of a project?
- What will the object look like and what is its purpose?
  - Are there moving parts?
  - What materials will the object be made from?
  - How will it be cut and constructed?

## **Activities for the workplace**

### **1 Employees**

- Following health and safety policy and procedures.
- Wearing protective clothing, accessories and grooming yourself appropriately.
- Maintaining equipment and operating it correctly.
- Reporting hazards.
- Reporting work-related injuries or harm to health.
- Co-operating with employers so that employers are able to carry out their duties under the OHS Act.

### **Employers**

- Having OHS policy and procedures that workers are required to follow.
- Providing OHS information, instruction, training and supervision.
- Consulting and co-operating with employees and OHS officials.
- Protecting employees from hazards.
- Ensuring a safe work environment and substances used.
- Reporting of accidents.

### **OHS Representatives**

- Inspect the workplace.
- Investigate accidents and dangerous occurrences.
- Investigate risk of serious injury to, or harm to the health of, any person.
- Keep informed on current occupational safety and health information.
- Report hazards to the employer.
- Refer matters to the occupational safety and health committee (if present in your workplace).
- Consult and co-operate with the employer.
- Liaise with employees.

2 Learners to provide answer relevant to their work place.

3 Learners to provide answer relevant to their work place.

4 Identify 7 points you should consider during the drawing process.

- The types of drawing required.
- The drawing method best suited to the type and style of drawing.
- The medium that is to be used to construct the drawings.
- Drawing conventions and specifications that are to be shown on the drawings.
- Angles, curves and dimensions shown on specifications and samples.
- Choice of materials.
- A method of constructing the object.

5 Learners to provide answers relevant to their work place.

6 What four questions should you ask yourself to determine the job requirements of a project?

- What will the object look like and what is its purpose?
- Are there moving parts?
- What materials will the object be made from?
- How will it be cut and constructed?

## **Task 2: Size up, draft and finalise drawing**

**Unit:** LMFFM3011A – Produce manual and computer-aided production drawings

### **Element**

LLMFFM3011A/02: Establish drawing criteria and limitations.

LLMFFM3011A/03: Quantify and draft initial drawing.

LLMFFM3011A/04: Complete drawing.

### **Performance criteria**

- 2.1 Type of drawing to be completed is identified.
- 2.2 Drawing requirements are established and documented identifying dimensions, angles, shapes and finished sizes.
- 2.3 Drawing conventions and specifications to be noted on the drawing are identified.
- 2.4 Appropriate medium for drawings is identified and selected.
- 3.1 Dimensions are plotted from criteria and documented specifications.
- 3.2 Dimensional points are connected to match appropriate drawing views.
- 3.3 Any production notes or special requirements are noted.
- 3.4 Drawing conventions and specifications are noted on the documentation.
- 4.1 Angles, shapes and dimensions are checked against specifications and sample.
- 4.2 Adjustments are made to the drawing within scope of authority.
- 4.3 Drawing is checked for compliance with workplace documentation.

This task introduces the learner to the different types of drawing and drawing requirements of the furniture making industry. Steve, who works at Modern Edge, has designed a task that guides the learner through the different aspects of manual drawing and makes some comparisons with CAD drawing. As the task is worked through, the learner will acquire knowledge and skills in:

- 1 the different types of drawings and project requirements
- 2 drawing conventions and documentation
- 3 drafting, checking and completing drawings.

### **Supporting resources**

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example
- Activity

### **Special features**

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: Learners can view a 'Demo' of the different types of manual drawing used in the furniture making industry.

- 3 Step 1: In 'Techniques' the learner can try interactions that demonstrate different ways of creating 90° lines. Here they can also try an interaction that goes through the steps taken to draw a full size set-out.
- 4 Step 1: Learners can 'Have a go!' at identifying the correct order for assembling a piece of furniture.
- 5 Step 2: There are two 'Activities' for the learners to practice the use of drawing conventions.

### **Practical requirements**

For learners to work through this unit they will need access to drawing equipment used for manual drawing either in their workplace or place of study. If they are doing any CAD activities they will need access to a computer and the necessary software.

### **Assessment suggestions**

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

The Activities in the resources section could be included as part of assessment.

Two options for the project have been provided. Both of these projects are manual drawing projects and should not be attempted until learners have had sufficient practice and support in the various drawing techniques used. You need to become familiar with what is required in the projects and be sure that learners are ready to do them before assigning any.

Learners may complete either one or both of the projects for this task. The project could be customised to suit the learner's workplace.

You may like to design CAD templates and projects that could be used in conjunction with this task.

You may decide to use the project as part assessment of this unit.

### **Alternative approaches**

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example: In Step 1 there is an 'Example' of job specifications for a kitchen. Learners could be asked to discuss, either online or in class, the types of job specifications they have used in their workplace. Learners not in a workplace could be asked to determine sets of job specifications for other rooms or relevant situations. These could be included in their Evidence Portfolio.

Step 1 introduces the learner to the different types of drawings used in the furniture making industry. Learners could be asked to collect examples of their own, either what they have used in their workplace, or from their place of study. These examples could be collected and circulated as a quiz to all learners who need to identify each type of drawing, their uses and characteristics.

Step 3 introduces some aspects of CAD drawing. As the CAD software and computer may vary in each workplace or place of study, there could be some discussion of these differences. At this point, you could also design relevant CAD activities.

You may need to collaborate with the learner's employer and seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

## Activities: Machine workshop

### Task 1: Prepare for work

**Unit:** LMFFM3031A – Set up, operate and maintain CNC machining and process centres.

#### Element

LLMFFM3031A/01: Prepare for work

#### Performance criteria

- 1.1 Work instructions are used to determine job requirements, including: design, quality, materials, equipment and quantities.
- 1.2 Workplace health and safety requirements, including personal protection needs, are observed throughout the work.
- 1.3 Material for machining is selected and inspected for appropriate quality.
- 1.4 Procedures are determined for minimising waste material.
- 1.5 Procedures are identified for maximising energy efficiency while completing the job.

This task introduces learners to the importance of preparing for work tasks efficiently and accurately. The learner is required to get everything ready in preparation for starting the production process of making a bedside cabinet. As the task is worked through, the learner will:

- 1 investigate OHS issues
- 2 interpret a cutting list
- 3 optimise a cutting plan
- 4 select quality materials for the job
- 5 set up an efficient workspace.

#### Supporting resources

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example

#### Special features

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: 'Billy-Ray' hasn't thought about his personal safety before he started using the surface planer! The learner is required to identify seven safety hazards.

- 3 Step 1: In the Safety Manual learners can view interactions about correct manual handling steps to follow when lifting and carrying heavy objects and about hazard control.
- 4 Step 2: In 'Ask an Expert' learners can view an interactive cutting list which explains the different parts of the list.
- 5 Step 3: Learners can have a go at designing a cutting plan. This interaction requires the learner to place all components on a sheet of MDF board to minimise waste material. When all the pieces are in place, the learner is able to read a final checklist and then make any corrections if they need to. Their answer can then be printed out to place in their Evidence Portfolio. Once they have printed out their answer, they are then able to check their answer to see how they went.
- 6 Step 4: In 'Techniques' learners can use an interaction to practice identifying some common material defects.
- 7 Step 5: Learners can 'Have a go!' at organising a workspace. The learner is presented with seven images of workspaces. They need to decide which ones need to be organised and type in their answers explaining what needs to be done. This interaction can be printed and kept as evidence.

### **Practical requirements**

For learners to work through this unit they will need access to a machine workshop with CNC machinery, either in their workplace or place of study.

### **Assessment suggestions**

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace jobs.

You may decide to use the project as part assessment of this unit.

### **Alternative approaches**

Learners who are already employed in a workplace could adapt the job to make a bedside cabinet to fit in with their current workplace tasks. For example: Step 3 of this task requires the learner to optimise the cutting plan for the bedside cabinet and include their answer in their Evidence Portfolio. To make this activity more realistic and relevant to their workplace tasks, the learner may prefer to optimise a cutting list already set up for a job in their workplace.

In Step 3, learners are provided with information and an activity related to optimising a cutting plan. If access to a suitable CNC machine is available, learners could practise optimising a number of cutting plans using CNC programs.

In Step 4 of this task, a resource giving information on the various kinds of material defects that are found on timber is provided. In a workplace, this resource could be used as the basis for a 'treasure hunt' to find real examples of the defects described.

In Step 5, learners are provided with information and an activity related to organising a workspace. In a workplace, learners could conduct an analysis of how well

workspaces are organised. They could interview other workers on how they organise their work spaces and develop a list of tips which could be circulated to other learners as a useful resource.

You may need to collaborate with the learner’s employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

### Project answers

Most answers to the project will be specific to the context in which the learner is situated. Some answers are included below to assist in the assessment process.

#### Project: Activities for a place of study

1.

$660 \times 400$	$660 \times 400$	$378 \times 380$
		$378 \times 380$
$660 \times 400$	$660 \times 400$	$100 \times 378$
		$425 \times 378$
$450 \times 400$	$450 \times 400$	$100 \times 378$
		$425 \times 378$
$378 \times 380$	$378 \times 380$	
$100 \times 378$	$100 \times 378$	

**1 sheet = 2 cabinets**  
**25 sheets = 50 cabinets**

## **Task 2: CNC Programming**

**Unit:** LMFFM3031A – Set up, operate and maintain CNC machining and process centres.

### **Element**

LLMFFM3031A/02: Set up for machining and processing

### **Performance criteria**

2.1 CNC program is set to job requirements.

This task introduces the learner to the basics of CNC programming. The learner helps Roley, a worker at Modern Edge Furniture, to develop CNC programs for a bedside cabinet. As the task is worked through, the learner will acquire knowledge and skills in:

- 1 CNC programming basics (1 and 2)
- 2 the types of CNC programs (including sub programs and parametrics)
- 3 writing CNC programs
- 4 selecting CNC tooling.

### **Supporting resources**

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example

### **Special features**

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive information folio for workers including 'News' and 'What you should already know' segments. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: In 'Ask an Expert' Tony presents a slideshow on the use of CNC machinery today. The learner can find out how traditional methods of furniture manufacturing compare with modern Nested Based Manufacturing (NBM).
- 3 Step 1: In 'Ask an Expert' Tony takes the learner through the basic principles of CNC operation.
- 4 Step 1: Learners can view a 'Demo' of how information is coded in CNC programming.
- 5 Step 2: In 'Techniques' learners can try interactions that demonstrate how codes produce movement for absolute and incremental programming.
- 6 Step 3: In 'Techniques' learners can do an interaction that shows how sub programs are integrated into main programs on CNC machines.
- 7 Step 4: The fundamentals of the data entry process for CNC programming are explained in an interactive 'Demo'.
- 8 Step 4: Learners can 'Have a go!' at correctly ordering the steps used to create a program for a CNC router.

- 9 Step 5: An interaction demonstrates four factors to consider when selecting tooling for CNC machines.

### **Practical requirements**

For learners to work through this unit they will need access to a machine workshop with CNC machinery and CNC programming software, either in their workplace or place of study.

### **Assessment suggestions**

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. These projects require the use of CNC machinery and CNC programming skills to complete. They should not be attempted until learners have had sufficient practice and support in the use of CNC machinery and CNC programming skills. You need to become familiar with what is required in the projects and be sure that learners are ready to do them before assigning any.

Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace.

You may decide to use the project as part assessment of this unit.

### **Alternative approaches**

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example, using the information on writing different kinds of programs in the task, learners could practice writing programs for the jobs they are working on. These could be included in their Evidence Portfolio.

Activities could be adapted to be relevant to the specific CNC machinery and programming setup that learners have access to. For example: in Step 4 of this task, the learner is required to order the steps to follow when creating a CNC program. The learner could use this as a basis for writing the steps they take to write CNC programs in their workplace or place of study.

You may need to collaborate with the learner's employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

## Project answers

Most answers to the project will be specific to the context in which the learner is situated. Some answers are included below to assist in the assessment process.

### Project: Activities for the workplace and for a place of study

1 Program the shape in Incremental mode.

**G91** G01 X180. Y-40.;

X40. Y260.;

G02 X-60. Y60. R60.;

G01 X-125. Y-20.;

G02 X-35. Y-35. R35.;

G01 Y-225.;

2 Program the shape in Absolute mode.

**G90** G01 X190.;

X140. Y200.;

X80.;

G02 X40. Y160. R40.;

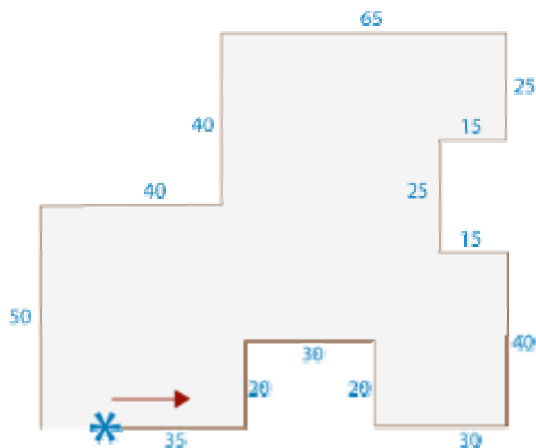
G01 Y120.;

X-30.;

X0. Y0.;

3 Draw the relevant shapes for each program listed.

Drawing 1 – Incremental





## **Task 3: Set up for machining**

**Unit: LMFFM3031A – Set up, operate and maintain CNC machining and process centres.**

### **Element**

LLMFFM3031A/01: Set up for machining and processing

### **Performance criteria**

- 2.1 Safety equipment, including emergency stops, gauges, guards and controls are checked.
- 2.2 Machining and processing settings and adjustments are made in accordance with job requirements and machining and processing and tool manufacturers' instructions.
- 2.3 Machining and processing, cutting tools and jigs are checked for safe and effective operation.
- 2.4 Trial runs are conducted to check machining and processing operation and quality of finished work.
- 2.5 Final adjustments are made to CNC programs and equipment according to workplace procedures.

This task introduces learners to setting up for machining and processing on CNC machines. Amanda, a machine operator at Modern Edge Furniture, guides the learner through the processes and procedures used in setting up a CNC machine. As the task is worked through, the learner will:

- 1 investigate CNC machine safety procedures
- 2 make machining and processing settings and adjustments
- 3 check cutting tools and jigs
- 4 conduct trial runs and make final adjustments.

### **Supporting resources**

- Glossary
- Tools and Machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example

### **Special features**

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: In the 'Safety Manual' learners can do an interaction which explains built in safety systems on new CNC machines.
- 3 Step 3: In 'Tools & Machinery' learners can use an interaction to find out about seven factors that influence the maximum feed rate on a CNC machine.

- 4 Step 3: The fundamentals of the data entry process for CNC programming are explained in an interactive 'Demo'.
- 5 Step 3: Learners can have a go at determining the recommended feed speed for a tool required for a specific job. A 'Job card' specifying job requirements and a feed speed graph from a technical information sheet for tooling are provided. Given three options the learner must interpret this information and choose the best feed speed option for that job.
- 6 Step 4: In 'Ask an Expert' Phil presents an interaction which demonstrates four common CNC programming errors.
- 7 Step 4: The learner can 'Have a go!' at modifying a CNC program by identifying the types of programming errors.

### **Practical requirements**

For learners to work through this unit they will need access to a machine workshop with CNC machinery and CNC programming software, either in their workplace or place of study.

### **Assessment suggestions**

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. These projects require the use of CNC machinery and CNC programming skills to complete. They should not be attempted until learners have had sufficient practice and support in the use of CNC machinery and CNC programming skills. You need to become familiar with what is required in the projects and be sure that learners are ready to do them before assigning any.

Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace.

You may decide to use the project as part assessment of this unit.

### **Alternative approaches**

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example: Step 3 of this task requires the learner to determine the recommended feed speed of a tool used for a specific job. They need to interpret a graph from a technical tooling information sheet to do this. To make this activity more relevant to their workplace tasks, the learner could access technical information sheets for the tools they are using to determine recommended feed speed for the job they are doing.

In Step 2 of this task, resources on measuring and installing router tools are included. If there is access to a CNC machine, learners could practice these procedures. Alternatively, as machines may vary, they could practice and describe the procedures to use on the available machines.

In Step 4 of this task, the learner is given an opportunity to practice identifying types of programming errors within a program. In the activity, once the type of error is identified, the line of programming is automatically corrected. In a workplace or place of study this could be adapted to incorporate real situations of programming errors.

The learner could identify and correct the error on the programming software they are using.

You may need to collaborate with the learner's employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

### **Project answers**

Most answers to the project will be specific to the context in which the learner is situated. Some answers are included below to assist in the assessment process.

### **Activities for a place of study**

- 1 The regulations should summarise the following:
  - Emergency stop button to stop machine in case of emergency.
  - Pedal control to protect against accidental operation.
  - Safety trip devices such as Trip wire, infra-red beam or contact mat to stop machine in case of emergency to protect the operator from moving parts of the machine.
  - Guard to prevent or reduce access to cutters during machining operation as well as reduce the risk of airborne chips or tool fragments.
  - Sound proof casing to reduce noise emissions and protect the operator from the risk of flying objects or tool fragments.
  - Guard fence to enclose the machine and protect the operator from moving parts. The guard may be of an open type or mesh guard.
- 2 A dry run is essential to ensure the program is correct. If a wrong code is entered into the machine, the machine will carry out the error exactly as it has been told. This is not only dangerous but is almost always very expensive to repair, especially if the tool cuts into the table or worse.
- 3 When removing components or waste from the machine table whilst in operation you must take care not to come in contact with moving parts of the machine. You should never reach into a CNC machine while it is running. When removing waste components from the table always use some sort of push stick. You should make it common practice to stand clear of the machine whilst it is in operation and warn others of the dangers of being too close.
- 4 Learners to demonstrate installing tooling and entering data for a drill bit and router cutter.
- 5 Learners to demonstrate three safe methods of proving a program.
- 6 Learners to demonstrate a method of modifying an existing program.

### **Activities for the workplace**

- 1 A dry run is essential to ensure the program is correct. If a wrong code is entered into the machine, the machine will carry out the error exactly as it has been told. This is not only dangerous but is almost always very expensive to repair, especially if the tool cuts into the table or worse.

- 2 Learners to provide a checklist relevant to their work place.
- 3 When removing components or waste from the machine table whilst in operation you must take care not to come in contact with moving parts of the machine. You should never reach into a CNC machine while it is running. When removing waste components from the table always use some sort of push stick. You should make it common practice to stand clear of the machine whilst it is in operation and warn others of the dangers of being too close.
- 4 Learners to demonstrate installing tooling and entering data for a drill bit and router cutter in their work place.
- 5 Learners to demonstrate three safe methods of proving a program in their work place.
- 6 Learners to demonstrate a method of modifying an existing program in their work place.

## **Task 4: Operate machinery**

**Unit:** LMFFM3031A – Set up, operate and maintain CNC machining and process centres.

### **Element**

LLMFFM3031A/03: Operate machining and processing centres

### **Performance criteria**

- 3.1 Machining and processing centres are operated and monitored to ensure product quality and output.
- 3.2 Waste quantities are checked and minimised.
- 3.3 Problems with the required work are identified and reported to appropriate persons.
- 3.4 Items that do not meet quality requirements are repaired, recycled or discarded according to workplace procedures.
- 3.5 Any authorised changes in workplace procedures are followed.

This task introduces learners to the processes and procedures required to operate and monitor CNC machine centres. Giada, a trained CNC machine operator guides the learner as they learn about a range of relevant processes and procedures. As the task is worked through, the learner will learn about:

- 1 operating and monitoring CNC machines
- 2 identifying machining problems
- 3 quality procedures and requirements.

### **Supporting resources**

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example

### **Special features**

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 2: In 'Ask an Expert', Tony discusses diagnostic software used on many new CNC machines and presents an interaction, some examples of problems that that can occur on CNC machines, their possible causes and solutions.
- 3 Step 2: In 'Tools & Machinery' learners can investigate the causes and solutions of some common machining problems in an interaction.
- 4 Step 2: Learners can 'Have a go!' at working out what the causes and solutions to some common machining problems are.
- 5 Step 3: In 'Techniques' learners can practice identifying material defects in an interactive activity.

## Practical requirements

For learners to work through this unit they will need access to a machine workshop with CNC machinery and CNC programming software, either in their workplace or place of study.

## Assessment suggestions

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. These projects require the use of CNC machinery to complete. They should not be attempted until learners have had sufficient practice and support in the use of CNC machinery. You need to become familiar with what is required in the projects and be sure that learners are ready to do them before assigning any.

Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace.

You may decide to use the project as part assessment of this unit.

## Alternative approaches

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example: Step 1 of this task provides a checklist that can be used for monitoring the machining process on a CNC machine. This checklist could be used as the basis for learners carrying out monitoring procedures in their workplace. A facilitator or supervisor could customise and use the checklist to observe a learner during the machining process. They could add any other relevant monitoring activities that are carried out during the machining process.

In Step 2 of this task, the learner is provided with information on the causes and solutions for some common machining problems and given an opportunity to practise identifying possible causes and solution to such problems. In a workplace this activity could be supplemented by one which requires learners to develop a list of machining problems, their causes and solutions.

In Step 3 of this task, a resource giving information on the various kinds of material defects that are found on timber is provided. In a workplace, this resource could be used as the basis for a 'treasure hunt' to find real examples of the defects described.

You may need to collaborate with the learner's employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

## Project answers

### Activities for a place of study

#### 1 Example 1:

Set the program in automatic mode or as a safety option, choose the **single stepping** function. The single stepping function allows you to check each line (or

block) of code in the program. By using the **override switch** on the machine you can manually control the rate of motion. The machine will perform each motion according to each line of programming. As each line of program is executed you can check for errors.

### Example 2:

Switch to 'dry run' (trial run) mode and use the **jog feed control**. After switching the machine into dry run mode you will have complete control of the motion rate. The jog feed control slows down the motion rate of the machine. For example, if you are concerned about an area of the program, the jog feed control can be turned down – even to the point where the axes creep along and almost come to a stop. This allows you to control the motion rate and fix it at a comfortable setting.

- 2 If you don't keep an eye on the components being produced you may not notice when the material being used burns or components are not the correct size. Checking and minimising waste is also part of the monitoring process. Waste such as wood dust and wood shavings are removed by a dust extraction system attached to the CNC machine. An operator needs to monitor the operation of the dust extraction system and brush the machine down between each cycle. If you are watchful, components will not need to be done again and the production run will proceed smoothly.
  
- 3
  - Maintain workspace – don't overcrowd work area with components.
  - Clean table of dust and wood chips.
  - Ensure work piece is hard up against stops.
  - Check components for bows or twists. Are they seated correctly on table?
  - Check quality of material. Are they free of knots, checks, splits and other defects?
  - Check vacuum pressure is constant.
  - Check component does not slip during machining operation.
  - Check constantly for warning lights or alarms (for example, vacuum light).
  - Ensure dust extraction is functioning properly.
  - Check air pressure and oil lamps where applicable.
  - Check quality of finish cut (ensure the cutter has not sustained damage during machining operation).
  - Remove off-cuts with pushstick when it is safe to do so to ensure they do not become projectiles.
  
- 4 (a) **Repair** - It's often possible to repair damaged components without affecting the quality of the finished product. For example, a defective component can be repaired and placed in an unseen position, provided the strength of the product is not compromised.
 

(b) **Recycle** - Where components have a major defect on the surface or have been incorrectly machined it may be possible to reuse the component on another job. For example, if a component has been cut too short for a particular part of the product it still might be big enough to be used as another part somewhere else. Another example could be the unused centre part of an MDF panel which has been machined for a glass door.

(c) **Discard** - If components are too small to safely run through the machine or it is not possible to salvage any part of the component, they should be discarded.

Also, solid timber boards with big cracks or large gum veins cannot be used and should also be discarded.

- 5 The tool has a gap on the cutting edge.
- 6 Insufficient vacuum to hold material or tool is blunt.
- 7 The tool is blunt or feed speed is too slow.

### **Activities for the workplace**

- 1 Learners to provide answer relevant to their work place.
- 2 If you don't keep an eye on the components being produced you may not notice when the material being used burns or components are not the correct size. Checking and minimising waste is also part of the monitoring process. Waste such as wood dust and wood shavings are removed by a dust extraction system attached to the CNC machine. An operator needs to monitor the operation of the dust extraction system and brush the machine down between each cycle. If you are watchful, components will not need to be done again and the production run will proceed smoothly.
- 3 Learners to provide answer relevant to their work place.
- 4 Learners to provide answer relevant to their work place.
- 5 The tool has a gap on the cutting edge.
- 6 Insufficient vacuum to hold material or tool is blunt.
- 7 The tool is blunt or feed speed is too slow.

## **Task 5: Clean up work area**

**Unit:** LMFFM3031A – Set up, operate and maintain CNC machining and process centres.

### **Element**

LLMFFM3011A/04: Clean up work area and maintain equipment

### **Performance criteria**

- 4.1 Material that can be reused is collected and stored.
- 4.2 Waste and scrap are removed following workplace procedures.
- 4.3 Equipment and work area are cleaned and inspected for serviceable condition in accordance with workplace procedures.
- 4.4 Operator maintenance is completed in accordance with manufacturers' specifications and site procedures.
- 4.5 Unserviceable equipment is tagged and faults identified in accordance with workplace procedures.
- 4.6 Equipment and tooling is maintained in accordance with workplace procedures.

This task introduces learners to a range of maintenance procedures which are part of cleaning up the work area and maintaining CNC equipment. Steve, a worker at Modern Edge guides the learner through the processes and procedures of general maintenance requirements for CNC machines. As the task is worked through, the learner will learn about:

- 1 general maintenance procedures
- 2 operator maintenance
- 3 inspecting and tagging faults.

### **Supporting resources**

- Glossary
- Tools and machinery
- Techniques
- Ask an expert
- Safety manual
- Demonstration
- Documents
- Example

### **Special features**

Interactive learning activities have been provided where possible to engage learners whilst at the same time providing relevant 'real life' situations. This task provides the following interactive activities:

- 1 An interactive notice board outlining five aspects to consider when preparing for a job. This could be contextualised to include information relevant to a particular workplace or RTO.
- 2 Step 1: The fundamentals of developing a maintenance program are explained in an interactive 'Demo'.
- 3 Step 2: In the Safety Manual learners can view interactions about correct manual handling steps to follow when lifting and carrying heavy objects.
- 4 Step 3: Learners can 'Have a go' at identifying whether a problem is a major or minor one.

## Practical requirements

For learners to work through this unit they will need access to a machine workshop with CNC machinery and CNC programming software, either in their workplace or place of study.

## Assessment suggestions

Assessment is based within the workplace and is, therefore, outside the scope of this Toolbox. The organisation of workplace assessment is the responsibility of the RTO and the online teacher, in collaboration with the learner's workplace supervisor.

Discussion points included in the task and activities could be customised and included as part of assessment.

Two options for the project have been provided. These projects require the use of CNC machinery to complete. They should not be attempted until learners have had sufficient practice and support in the use of CNC machinery. You need to become familiar with what is required in the projects and be sure that learners are ready to do them before assigning any.

Learners may complete the project for this task either in their workplace or in their place of study. The project could be customised to suit the learner's workplace.

You may decide to use the project as part assessment of this unit.

## Alternative approaches

Learners who are already employed in a workplace could adapt the activities in the task to fit in with their current workplace tasks. For example: Step 1 of this task provides an explanation and example of a service card. To make this activity more relevant to their workplace tasks, learners could be asked to locate service cards in use and copy them. These could then be collected and distributed to other learners for interpretation and discussion.

In Step 2 of this task, several resources are provided outlining the maintenance tasks and procedures to be carried out when using CNC machines. In a workplace situation learners could describe the different maintenance tasks they are required to do and the procedures they must follow to carry out these tasks. They could also find out what the procedure for requesting maintenance is.

In Step 3, learners are given the opportunity to identify whether a problem is a major or minor problem. This activity could be easily adapted and extended to include examples of other major and minor problems. A list could be compiled and given to learners to decide, either individually or in groups, which problems are major and which are minor.

You may need to collaborate with the learner's employer to seek approval for inclusion of any project documentation that learners have produced and subsequently provided in their evidence portfolio.

## Project answers

### Activities for a place of study

- 1 Learners to perform a periodic maintenance routine on a CNC machine as specified by the manufacturers' maintenance manual.

- 2 **Preventative maintenance** is organised and ongoing. It involves lubricating, repairing, replacing and adjusting machine parts. The aim is to keep the machinery in good working order and avoid unplanned machine downtime. Preventative maintenance is usually carried out by trained maintenance employees according to a carefully planned schedule.

**Running maintenance** is usually carried out by the operator and involves tasks like:

- sharpening or replacement of tooling.
  - keeping moving parts like fence mechanisms and guard arms free of surface rust with a light application of oil.
  - keeping the machine or equipment clean.
  - lubricating moving parts on a regular basis.
  - making minor adjustments.
  - draining air filters.
  - topping up oil levels in the air preparation unit.
- 3 Minor problem:
- Oil level in air preparation unit is low.
  - Air filter is dirty.
  - Vacuum cup is damaged.
  - Hydraulic oil level is low.
  - Water in air filter is high.

Major problem:

- Emergency foot cord is not working properly.
  - Cabling is frayed.
  - Hydraulic valve has a leak.
  - Fuse has blown.
  - Guard is damaged.
- 4 **Electrical:** Electrical maintenance relates to any electrical components of a CNC machine such as electrical switches, fuses and cabling. Running maintenance on electrical components is restricted because of safety considerations. If a machine breaks down because of electrical problems, a qualified electrician should be called in.

**Pneumatic:** Pneumatic maintenance relates to any parts of a CNC machine that is operated using air or air pressure. For example, air filters and air preparation units. All other pneumatic problems should be diagnosed and repaired by a qualified maintenance person.

**Mechanical:** Mechanical maintenance relates to any moving parts on a CNC machine such as fence slides or guard mechanisms. A preventative maintenance schedule will usually include regular lubrication of bearings and other working parts of the machine. This can be done as part of running maintenance by operators. Keeping machine parts clean of dust and oil build-up is also part of running maintenance in this area.

**Hydraulic:** Hydraulic maintenance relates to any CNC machine component that operates using water, oil or other liquids. Apart from checking hoses, connections and hydraulic oil level in the reservoir, hydraulic problems should be diagnosed and repaired by a qualified person in that field.

- 5 **Locking Out:** Locking out equipment or machinery is the most effective way of preventing accidental operation while maintenance is carried out. Locking out is effective because it uses a “one key per lock” and “one lock per person” system.

**Tagging:** There are two types of signs or **tags** used to warn workers that machines cannot be used: **Danger** tags and **Out Of Service** or **Caution** tags. These tags are used to indicate that the situation may constitute a hazard. They must be used in specified ways and whenever a machine or equipment has been identified as faulty or has broken down.

### Activities for the workplace

- 1 Learners to perform a periodic maintenance routine on a CNC machine as specified by the manufacturers’ maintenance manual in their work place.
- 2 **Preventative maintenance** is organised and ongoing. It involves lubricating, repairing, replacing and adjusting machine parts. The aim is to keep the machinery in good working order and avoid unplanned machine downtime. Preventative maintenance is usually carried out by trained maintenance employees according to a carefully planned schedule.

**Running maintenance** is usually carried out by the operator and involves tasks like:

- sharpening or replacement of tooling.
  - keeping moving parts like fence mechanisms and guard arms free of surface rust with a light application of oil.
  - keeping the machine or equipment clean.
  - lubricating moving parts on a regular basis.
  - making minor adjustments.
  - draining air filters.
  - topping up oil levels in the air preparation unit.
- 3 Minor problem:
- Oil level in air preparation unit is low.
  - Air filter is dirty.
  - Vacuum cup is damaged.
  - Hydraulic oil level is low.
  - Water in air filter is high.

Major problem:

- Emergency foot cord is not working properly.
  - Cabling is frayed.
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  - Fuse has blown.
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- 4 **Electrical:** Electrical maintenance relates to any electrical components of a CNC machine such as electrical switches, fuses and cabling. Running maintenance on electrical components is restricted because of safety considerations. If a machine breaks down because of electrical problems, a qualified electrician should be called in.

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**Hydraulic:** Hydraulic maintenance relates to any CNC machine component that operates using water, oil or other liquids. Apart from checking hoses, connections and hydraulic oil level in the reservoir, hydraulic problems should be diagnosed and repaired by a qualified person in that field.

- 5 Learners to describe what procedure is used in their workplace to lock out and tag faulty equipment/machinery.

## Preparing learners to use the materials

It is important to include ways of preparing learners to use the materials. The following tips for trainers and learners highlight important information you should consider when introducing the use of Toolboxes into your curriculum.

- As a workplace trainer or supervisor, it is important to set aside adequate time to familiarise yourself with the Toolbox and its resources, so you can properly support your learners. Trainers have reported the greatest successes when they had familiarised themselves with the Toolbox, integrated it with their course, developed student activities and additional material and thus guided the learners through using the Toolbox.
- It is also important to plan ahead and obtain management support, set realistic timeframes for implementation and gain support from the learner's employer before introducing the Toolbox.
- Make sure that you are aware of legislation which may impact on flexible delivery of the Toolbox. For example, learners working at home, traineeship agreements, apprenticeship agreements and enterprise-based arrangements.
- In a 2003 evaluation of Toolboxes<sup>1</sup>, the overall message from Trainers that 'structure means success' reflects their recognition that effort is required to integrate the Toolbox into their teaching delivery, just as it is building in any new teaching resource. Flexible delivery is not about leaving learners alone to learn for themselves, but about using a new medium as a part of an overall teaching delivery structure that is well defined.
- Feedback from the same evaluation of Toolboxes suggested that orientation sessions appeared to be a feature of the more successful trials. Providing orientation to the Toolbox in a practical, face-to-face session with learners actually using the Toolbox is clearly a key to a successful use. It provides a mixture of technical and pedagogical assistance that aligns the Toolbox with the curriculum and the course.
- Strongly encourage learners to work through the Tour before they begin working on the Toolbox, so they can familiarise themselves with the resources used in the activities.
- If you choose to include discussion board exercises, you will need to set up discussion threads prior to commencing the activity. You will also need to advise learners of these requirements if you have not included instructions in the Toolbox content.
- You should also encourage learners to use the discussion board to ask for assistance if they are unsure of where to find a resource. You may need to provide instructions to the learners on how to use communication tools such as e-mail, discussion board or chat.

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<sup>1</sup> "Evaluation of the Usage of National Flexible Learning Toolboxes (Series 3) Report".  
[http://flexiblelearning.net.au/toolbox/documents/docs/Usage\\_Toolboxes\\_Series3\\_FINAL.doc](http://flexiblelearning.net.au/toolbox/documents/docs/Usage_Toolboxes_Series3_FINAL.doc)

- If you are delivering the program online, email will be the primary method of communication with your learners, so ensure that **you** have a clear system of email folders for managing the traffic.
- Send a **weekly email** to all learners with reminders of the tasks that should be completed, the tasks in progress with reminders for times of chats or forums during that week. Alerting learners to activities for which they should be undertaking individual learning (eg in learning tasks and learning packs) prior to a group activity in the week to come can also be helpful. You might comment on the quality of work in the preceding week and provide tips and encouragement for the task at hand.
- Be clear about **timeframes** by setting targets for learning. These can help you with your 'online lesson' planning. You will need to set frameworks so that learners know what to do, and when to do it.
- If you manage a very large group of learners, create a sense of community online by setting up **study groups** of 4 – 8 learners, all of whom begin the Unit at more or less the same time. This makes it easier for learners to gain the benefits of social learning and to form networks as they study.
- Once you have set up the study group, facilitate an **online 'icebreaker'** activity when learners start the Unit. You could include ideas for facilitating this activity within the Trainer Guide.
- Plan ahead and be clear to your learners about which **group work activities** that you expect them to complete.
- When learners are about to start an online group activity, send them an email with instructions on what teams they will be in or whose job it is to start a round robin activity. **Do not presume learners will work it out.**
- Establish whether your learners have completed any previous units online. This way you can gauge how much support you will need to provide to coach learners to develop online **learning skills**, as well as the content in the units. You will probably find learners require different levels of support. In the first few weeks get a clear picture of how each learner is coping to enable early intervention.

## Collaboration and interaction

Teaching in an online environment focuses on facilitating and guiding the learner's progress. Learners have significant learning resources available to them in the Toolbox, in the workplace, and on the World Wide Web. Helping learners navigate this information and pinpoint the relevant materials to meet performance criteria is the central role. It requires clear statement of learning objectives and regular feedback on learner progress. Email and bulletin board are powerful communication tools when applied in this context.

Toolboxes are designed to encourage learner collaboration through communication tools. It is the trainer's decision as to how to get feedback about this collaboration. The activities (learning objects) are customisable depending on requirements. For example, a Trainer might set up a bulletin board discussion around the differences and similarities between manual and CAD drawing. A start and finish date might be

set for the discussion, and a proportion of final assessment weighted to participation. Learners may be notified of these requirements by email, as well as through an initial posting on the bulletin board. The bulletin board is a useful record of learner contributions for assessment purposes (along with other tools.)

## Communication activities

### Starting together as a group – online icebreakers

- You can use an online icebreaker in a computer training room or with learners who are at different locations.
- If you intend for your learners to collaborate online (using email, a learning management system, or a web discussion board) it's important to give them a chance to get familiar with each other by using the medium, before they get down to the serious part.
- Set group projects based on the Discussion sections in each Task.

The Discussion topics included in each Task can be used for group work.

A group could:

- work together to determine answers to the discussion section questions and topics identifying how the topic relates to their workplace or place of study, then report back to the group as part of their own review process, or
- if they are in the same workplace, work together to identify any issues or problems related to the discussion topic, and then work on it as a team within their organisation.

Some advantages of this approach are:

- It can facilitate social learning, especially useful if Learners are geographically dispersed or isolated.
- Learners gain practice using online communication tools in a practical task-focused way.
- It can be integrated with assessment of underpinning skills such as communication skills, and of the Key Competencies.

Here are some practical suggestions for implementing group projects:

- Limit teams to no more than 3 or 4 learners.
- Set a date for completion of the group project.
- Consider asking learners to write a self assessment and peer assessment of their contribution to the group process – this will encourage learners to reflect on their collaborative skills, as well as providing you with more information if you are considering using the group work as an assessment item.
- Provide guidelines as to how you expect your Learners to collaborate, eg entirely online, or through a mix of face-to-face meetings and online communication.

### Other group activities – problem solving

In the furniture making industry there are many opportunities for applying problem solving skills. Given the range of different circumstances that learners may experience in their workplace or place of study there are probably many examples of problems that could form the basis of problem solving activities for groups. For example:

- Groups could discuss any problems or difficulties that they have experienced in CNC programming, either online or in class, and how the situation was resolved. As a group they could choose one or more problems and send it to other groups with the aim of determining relevant solutions. These can then be compared with how the problem was actually solved. Groups could collect and compile examples and exchange them with other groups. These could be kept as references for each learner.
- Similar activities could be constructed around problems and issues to do with operating and monitoring CNC machines and CAD drawing.

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