General Principles of Shop Safety
Tools and Machines

Info in red font is for the benefit of the teacher (ideas for differentiated learning etc). Delete text in red font from the copies that are distributed to students.

Version History:

V #	Date	Author	Short Listing / Description of Changes
1	Apr. 29/12	D.B. McCowan	-Initial Version
2	Apr. 30/12	D.B. McCowan	-borrowed section 1 text from McCowan_Tools_Concepts.doc -uploaded McCowan_1.3_Safety_Mach_Tools_Ap30_12.doc to OCTE Safety Portal
3	June 3/12	D.B. McCowan	Additions denoted by *** Uploaded to OCTE portal June 8

1 This Lesson is Important Because

Tools enable us to get a job done. Tools enhance our abilities – to help us do things that we could not otherwise do. Just knowing which tool to use in a given situation is oftentimes a skill in itself. Using a tool safely, accurately, effectively and efficiently takes practice. You must practice to become skilled at using a tool, whether the tool is a hammer or a band saw or a software application. *** In your own choice of career, you will be required to use at least a small set of tools. In this lesson you will practice identifying tools that you may eventually use in your choice of career. You must think critically about your safety and the safety of those around you before using any machine or tool. There are two over-riding issues in the use of tools and machines.

QUESTION (THINKING -- Finding information): CURRICULUM CONNECTION

Identify the Expectation in the Course Curriculum that appears to most closely relate to this lesson. Find one concept in this particular Expectation that is not adequately covered in this lesson as written in sections 2 and 3 below.

*** Expectation D1.2
For example, ventilation of the workspace is not adequately addressed below. So, lead the students to use their thinking and communication skills to propose adequate wording to address this inadequacy.

***** DL-H – Give these students all ten items in section 2 and all fourteen items in section 3 in one long jumbled list. Ask them to categorize each of the 24 items as either `mostly about the machine` or `mostly about the person`. They should realize that putting the items in a table with rows and columns makes the information processing more convenient and easier.**

2 The Machine / Tool Must be Ready for You to Use It

1. The machine is not "locked-out".
2. Guards are secured in place and, when necessary, are adjusted according to the work-piece. Guards that move when the machine is operated immediately return to their original position when the operation is complete.
3. Handles are secure.
4. Cutting edges are sharp and are otherwise not damaged. Cutting tools have been properly installed and adjusted.
5. Fences, jigs, fixtures, tool-rests, workpiece beds, depth gauges and other 'helper' parts are in good working order and are properly adjusted.
6. Electrical equipment is dry and properly grounded.
7. There are no loose parts.
8. The machine is the best choice for your particular task.
9. Machine speed has been adjusted for the task.
10. Use your senses. Does the machine sound normal? Are any parts wobbling? Can you see sparks or hear crackling? Can you smell something burning? Can you feel an abnormal vibration?

3 You Must be Ready to Use the Machine / Tool

1. You are aware of the purpose, required operating environment and limitations of the machine.
2. You have been trained to use the machine and have obtained permission to use it at this time.
3. You are wearing the necessary personal protective equipment such as safety glasses and hearing protection.
4. If there is any risk of a glove being pulled into rotating equipment, you are not wearing gloves.
5. Your hair is tied back, jewellery is removed and shirt is tucked in.
6. Nothing can fall out of your pockets.
7. If necessary, push sticks are in your hand. You are otherwise in absolute control of both the machine and the material you are working on.
8. You know exactly where the STOP button is.
9. You have studied and understand the MSDS of any hazardous material to be used in the operation.
10. You have reviewed the procedure for achieving what you want to achieve on the machine.
11. Measuring instruments are close at hand, cleaned, and have already been calibrated if necessary.
12. Your five senses are all at high alert and you are mentally prepared to use the machine.
13. You know “what to watch for” and are prepared to act properly in the case of a problem or an emergency.
14. You are physically prepared to use the machine, eg proper footing for balance.

4 Making Connections: General Principles and the Drill Press

***** DL-L:**
For these students prepare this table for them – but in a matching quiz format. In other words, give them the Top 6 for Drill Press in column 2 and give them a sample explanation in column 3, but jumble them up in a matching quiz.

You are being trained to use the drill press. Refer to the list above, "*The Machine Must be Ready*..." and pick the six most significant issues in relation to the drill press. Enter these in column 2 of the table below, with the most critical in row #1 and least critical in row #6. Be prepared to defend your choice of the top 6 – use column 3 to record your rationale and otherwise demonstrate that you know about, understand and appreciate the purpose and power of a drill press and that you respect its hazards and risks.

Drill Press Safety Concerns – The Top Six		
1 **#**	**2** **List the Top 6 concerns from "*The Machine Must be Ready*..." List**	**3** **Explain this issue in the context of the Drill Press. Show that you seriously understand the issue in column 2**
1		
2		
3		
4		
5		
6		

5 Class / Group Discussions – Learning Strategies and Information Processing

***** Divide the class into 4 groups, one group assigned to each of the 4 questions below. The purpose is to get students to realize that they need to take their own safety very personally and to dig deep into safety for every situation in which they are immersed.**

***** DL-L – For these students, some of the ideas in each of the sample answers in red font below could be put into a matching quiz – which statement is a partial answer to which question, for example, or in a True / False quiz.**

1. Is it possible (or even useful) to memorize a list of 10 issues regarding the readiness of the machine (section 2 above) and a list of 14 issues regarding the readiness of you the user (section 3 above)?
    a. Memorizing is not wise learning. Knowing the principles is certainly fundamental knowledge – but don't memorize for the sake of a test – and there will be a knowledge test. You should come to understand and appreciate these principles as parts of an overall machine / user system. And you, the user, are at the centre of that system.

2. What can you do to make your learning about machine / tool safety easier?
    a. Practice over and over again. Practice knowing the machine – its parts, features and its functions. Practise thinking about the hazards of the machine and the risks of using it. Practise using the machine in a variety of supervised situations. Make a list of things that can go wrong with respect to a particular machine and what you can do to prevent or correct the problem.

3. Is it possible (or even useful) for you to be an expert on every machine in the industry in which you are interested?
    a. Probably not. You will appear to be more knowledgeable if you demonstrate that have made your own connections between machines. There are classes or families of machines. There are machines that turn a cutter. There are machines that turn a workpiece while you hold the cutter. There are machines that push things into a cutter. There are machines that produce heat. There are machines that you can walk away from after you turn it on because they were designed as "automatic". There are machines that you must closely monitor constantly while it is running. There are machines that put things together (typically through turning / pushing).

4. *** Which two points in sections 2 and 3 most closely relate to ergonomics?
    a. Ergonomics is all about the human / machine interface. So, certainly handles must be secure. Also, you must be physically prepared to use the machine. If you will be at the machine for a while, you may need to be sitting in a chair as long as you can operate the machine safety and effectively. The relationship (height, lateral

distance) between the chair and the user-accessible parts of the machine must be appropriate. An inappropriate push stick may be a hazard in itself. Use a push stick that was design for use with this particular machine.

6 Assignment: Your Collection of Tools – 100 Marks

*** DL-M and DL-H – Most students should be able to re-organize a jumbled paragraph (such as the assignment below) into a more orderly list of `things to do` -- and then do the assignment according to their own plan of attack. A numbered list would be appropriate.

*** DL-L: Give these students a numbered list showing a suggested order in which they could tackle the assignment

Every student will create a one page table (of rows and columns) organizing a range or variety of at least 10 tools that all have ***something*** in common. ***Choose a set of tools that you may be interested in using in the context of your future career.*** The tools selected may all belong to one broadbased technology (sector of the world of work), or they may all be automotive tools (a sub-set of Transportation Technology) or they may all be hand-operated wood working tools (a sub-set of Construction Technology) or they may all be power tools for working sheet metal or they may all be used for cutting something etc. Every tool in the table (one tool per row) must be described in terms of at least three important characteristics such as function, how it works, limitations of use (speed, material etc.), hazards, associated risks and related safety issues. Very specific similarities and differences between tools must also be described for at least two pairs of closely related tools – that is, "drill down" into precise details of why this particular tool would be used in a given situation as opposed to the other tool in the pair. For example, in what situations would a block plane be used instead of a jack plane? Discuss deeper technical details such as how the construction of the block plane (for example) makes it such a specialized plane. You are encouraged to do as much research as you need or wish.

Your assignment will be evaluated against this rubric for Thinking and Communication – **Written_Report_Rubric.doc**. The criteria for the assignment are immediately above.

6.1 Partial Sample – Tools for Cutting

*** DL-H – These students should be able to develop this table format on their own.

#	Tool	Details
1	Hand Cross-cut saw	**Purpose**: To cut dimensioned lumber across the grain **How it works**: Severs the fibres of wood laterally across the grain **Techniques:** For the cleanest cut, first use a knife and straightedge to sever the top-most fibres. Clamp another scrap board to the underside to minimize splintering. Be gentle and use long smooth strokes – it is not a race. **Limitations**: For finer more precisely controlled cuts, use a back-saw

#	Tool	Details
		*** Risk: Cut finger
2	Hand Rip saw	**Purpose**: To cut dimensioned lumber along the grain **How it works**: Slices more-or-less along the grain of the wood partially by splitting or tearing fibres away from one another longitudinally **Limitations:** This coursely-toothed saw can be used more aggressively in long smooth strokes. *** Risk: Cut finger
3	Hack Saw	**Purpose**: To cut metal generally thicker than 0.050" **Techniques:** Hold the workpiece and the saw such that as many teeth as possible are contacting the metal at a given point in time **Limitations:** For thinner materials, use tin snips or a metal shear of adequate capacity (ability to shear a certain material of a certain thickness) *** Risk: If the blade is not tight, it could pop off and hit you in the face.
4		
5		

7 Safety Reminder

Even a hand tool can cut off your fingers if used carelessly.

8 Self and Peer Assessment

8.1 Inputs / Knowledge / Understanding I Still Need For This Module

Give each issue a number for future reference:

1.
2.
3.

8.2 Peer Assessment

NOTE: In the feedback, the Peer Assessor must "make the student think" – not give the student the answer! Be sure to include comments justifying the assessment value that you are giving. Peer Assessor must put his / her comments in red font.

Assessor's Name and Additional Notes: