# EVALUATING
# ACADEMIC READINESS
# FOR APPRENTICESHIP TRAINING
**Revised for**
# ACCESS TO APPRENTICESHIP

## COMMUNICATIONS SKILLS
## EVALUATION OF INFORMATION

## AN ACADEMIC SKILLS MANUAL
**for**
The Motive Power Service Trades
This trade group includes the following trades:
Automotive Service Technician, Heavy Duty Equipment Mechanic,
Motive Power Parts Person, Transmission Mechanic,
Truck & Coach Technician, and Truck & Trailer Service Technician

***Workplace Support Services Branch***
***Ontario Ministry of Training, Colleges and Universities***

***Revised 2011***

In preparing these Academic Skills Manuals, we have used passages, diagrams and questions similar to those an apprentice might find in a text, guide or trade manual.

**This trade material is not intended to instruct you in your trade. It is used only to demonstrate how understanding an academic skill will help you find and use the information you need.**

# COMMUNICATIONS SKILLS
# EVALUATION OF INFORMATION

***An academic skill required for the study of the Motive Power Service Trades***

## *INTRODUCTION*

***Evaluation of information*** *means careful consideration of information in order to make a judgment about its purpose, meaning, or accuracy.* We evaluate information to understand and solve a problem, to plan a job, or to choose a material, a tool or a method to do a job. As you learn your trade, and as you work, you will use this skill to make the best possible decisions about how to use information.

In order to make the best choices you need the best information. During training, and on the job, you will have many sources of information including textbooks, manuals, tables, diagrams as well as your teachers, supervisors and co-workers. You will decide if the information you have been given is accurate, or if it is just someone's opinion. And, you will decide how to use that information.

You also *evaluate information* to help you make decisions as you proceed. For example, you apply troubleshooting charts to identify problems associated with oil analysis, air conditioning systems and air brake systems. You gather and evaluate information to perform various diagnoses such as hydraulic system, pump testing and specific gravity tests, or to identify the most efficient use of materials to minimize waste.

In this unit, we will examine evaluation of information under the following headings:

- Getting the right information
- Selecting relevant information
- Cause and effect
- Fact and opinion

## *PART I*
## *GETTING THE RIGHT INFORMATION*

In order to work through a project in an organized and effective way, you need to assess or ***evaluate*** the steps required to reach your goal successfully. Start by thinking about and planning the entire project before you begin any work**.**

> **Example:** You have a job to complete. Before you actually start disassembling an engine or testing a unit injector, you have to think about the whole project. You need to plan how you will proceed from the beginning of the job through to the end. Identifying safety or problem areas is probably a good first step. Next, you have to

organize information, tools, materials, and equipment. Once you have the relevant information, make a list in your head or on paper of how to proceed with the job. Now you are ready to start working.

Approach your work systematically. The first step in a systematic approach is to *evaluate* your situation. Assess the job to identify safety or problem areas. Next, organize the information, tools, materials, and equipment. The goal is to think about and plan the project *before you begin*.

***The Right Information***

Once your purpose is clear, you can gather the right information from the right texts and manuals, manufacturers' guides and suppliers. Choose the table or text that applies to the job.

**Examples:** Even if you work in Ontario, exhaust emissions of diesel and gasoline engine must comply with US EPA standards for the year the vehicle was produced.

If you are working with metric tools, you need metric guides - not U.S. or Imperial systems.

**Making evaluated choices**

When you have found information that seems relevant, you have to evaluate whether it is exactly what you need.

**Example:** Workplaces are supplied with safety equipment such as fire extinguishers. The choice of safety equipment is based on evaluating your working conditions and matching the equipment to the situation. To determine the class or type of fire extinguisher needed on the work site, you need to know information such as:

- the square footage of the work area,
- the presence of heat, combustibles, flammable products, chemicals, liquids, gases, etc. and
- legal requirements such as up to date regulations and fire and safety codes for your jurisdiction (your city, county or province).

Next, you need information about types or classes of fire extinguishers such as the following:

- size,
- discharge times,
- approximate range of extinguisher, and
- the types of extinguisher used for different types of fire.

Now you can evaluate the situation and make a decision as to which types of fire extinguishers are required.

*The right choice is based on an evaluation of all the information gathered*.

General steps used in making sound decisions include:

1. evaluate the situation,

2. get up-to-date information,
3. make sure you understand the information, and
4. use it to make your decision.

Passage 1, below, about cleaning rear axle components. Several areas require you to make evaluations. We will look at these at the end of the passage. **Answer the questions that follow**. **Answers are at the end of this skills manual.**

**Passage 1**
**Cleaning Components: Rear Axle**

Assess your reasons for rear axle gearing removal. Examine all components thoroughly as you disassemble, and use correct cleaning methods and agents. Examine cleaned parts carefully to assess whether to replace, repair or reuse. When disassembling for overhaul, refer to the appropriate chart to analyze possible causes of failure and their solutions.

When cleaning parts with ground or polished surfaces, use diesel fuel or kerosene and dry with compressed air. Most manufacturers do not recommend hot tank cleaning solutions or water and alkali solutions for these surfaces. Carefully scrape away all old gasket material from sealing surfaces, making sure that you do not deeply scratch, score or gouge these surfaces in the process. After cleaning and drying, dip parts in light oil and wrap in greaseproof paper to prevent rust if not reassembling immediately.

Steam clean only completely disassembled drive units. If the unit is assembled, water may be trapped within the cored passages or between close fitting parts. Steam cleaning is used for the exterior of axle housings, provided internal components are not affected. If internal components are steam cleaned, it removes protective oil films.

Non-ground or polished surfaces such as the differential carrier castings (cast iron) and cast brackets can be hot tanked to remove scale buildup. Use a mild alkali solution; the time depends on the degree of scale. Rinse thoroughly in clean, hot water or with steam.

**Questions:**

1. After reading Passage 1, you can determine the correct cleaning method for rear axle gearing.

   **T F**

2. Why is the correct cleaning method important?

   a) to prevent rust to component parts
   b) to remove sludge, dirt and other matter from parts
   d) to make careful examination of parts possible
   d) all of the above

3. Which method should you choose to clean non-ground surfaces?

   a) steam cleaning but only for external parts
   b) diesel fuel or a detergent solution
   c) hot tank with mild alkali solution
   d) the same method as ground surfaces

4. Technician A says that you should dip all cleaned parts in light oil and wrap in greaseproof paper before reusing. Technician B disagrees. Who is right?

**Evaluation**
This passage describes a method of problem solving through evaluation. The opening sentence tells you to assess the reasons for doing the job. Whatever the reason is, it is the problem. You are looking for the solution.

To find the solution you must follow a complicated process that includes examining and evaluating all of the parts that may be the cause of the problem and then deciding whether to repair, replace or reuse the parts.

This places a requirement on you. You need to determine the right method, the right cleaning solutions and degree of care for each step so you get the best results. If you gouge a surface or trap water in close fitting parts, it can affect the performance of parts, the length of their life or both.

You will have to make evaluations at every step of the procedure.

You need to evaluate any task as you make decisions about how to handle a repair. The evaluations include, but are not limited to, the following:

- the purpose of the task,
- the condition of each part you examine as you carry out the task,
- the manufacturers' recommendations,
- where to find complete information, and
- your own skill and knowledge.

You need answers to such questions and so you look for the standards, the manufacturers' guides and codes which tell what is restricted or prohibited, what is allowed and where.

Generally, if you are aware of what kinds of problems might occur, you can be prepared to either avoid or correct them. You will evaluate your work as proceed. That way, if you have a problem you don't know how to correct, you can find instructions or advice from texts or other workers. And you will evaluate that information to see if it will help you solve your problem.

**Learning one step at a time**
Passage 1 reminds us that it is important to assess or evaluate our skill, experience and knowledge in any area. The quality of the end product, depends on the technician's skill, experience and knowledge about how a material behaves or how a tool is used.

Evaluation of your understanding as you learn and then practice new skills is important. You assess how well you know the theory of a skill and then assess your practice of the skill to ensure that you understand and can carry out a task using the skill.

This is a gradual learning process, of – study – evaluate – practice – evaluate. It takes time but the results will be worthwhile. It is the step by step learning that all skilled trades people go through.

**In Brief**
You evaluate any task as you make decisions about how to handle it. The evaluation includes, but is not limited to, the following:

- the purpose of the task,
- the understanding of each factor affecting the task,
- the manufacturers' recommendations,
- where to find complete information, and
- your own skill and knowledge.

**Following up**
When information leaves you with one or two unanswered questions, you need to search for answers.

> **Example:** You read this:
> The experience of the welder often has a bearing on the size of the electrode. In particular, for out-of-position welding, the welder's skill determines the size of the molten pool that he/she can control.
>
> Now you need to know, how is the size of the molten pool controlled? Finding the answer should lead you to the right sources to find out what controls molten pool size.

When you look for answers to questions, you accomplish two things:

1) You do the job you've been hired to do with the right tools, equipment and metals.
2) You develop your research skills, which increases your knowledge of the trade.

You may get information that tells you that you need to evaluate your experience and /or be prepared to try, or to try again.

> **Example:**
> Before attempting any operation involving major disassembly of the engine or gear case, consider your own skills and assess your tools.

You may need to evaluate how information applies to you; you have to evaluate what you know.

> **Example:**
>
> The places to be welded may be difficult to get at or they may not require highest quality welds. You may use a set up other than the one recommended in the data chart.

**Observing What's Important**
*Evaluating information means being observant.* Trade materials use a variety of methods to emphasize important information. You may see words such as **NOTE:** or **Caution**. You may see boxed information, different sizes or types of print, or symbols such as ▸, !, or ▪. *These are signals* used to catch your attention so you read the information that comes next carefully.

Use the signals to make sure you observe all essential points or steps. Look over the material first to note the ***highlighted information***. Signals give advance warning about an important safety issue or an essential procedure. Reread these points and make sure you follow any instructions.

**Examples:**

- **Never** clean aluminum parts with a solution containing an *alkali!*

WARNING: Do NOT interchange thread types. Damage will result to the bolt or to the threads of the part.

> **Never** look at an arc. **No** distance is safe unless your eyes are protected by approved lenses.

The ♦, **bold print**, CAPITAL LETTERS, coloured type, and the box make information stand out. Pay attention! The information is designed to keep you safe and your materials in good shape.

***PART II***
**SELECT RELEVANT INFORMATION**
As you read and become familiar with technical information, your ability to identify and select the right information improves. :

- You distinguish between general rules that apply to most situations and unique situations where you have to figure out the best way to proceed.
- You notice that patterns and principles you use today on the job can also apply to future situations.
- You see the *relevance* of information you encounter.

***Charts and Tables***
Charts and tables give you quick information. They are designed to be orderly, simplified, and usually in a list format. You can see all the information and select what fits your situation.

Tables can guide you in selecting a drill bit, or tell you what pressure settings you need. Tables rate tools to help you decide which to use for a job, or ones you might want to buy. Tables also compare materials, or can show you the advantages and disadvantages of a procedure or product.

***NOTE:*** *Information in a table should be reliable, but it may not cover all the information you need. If it doesn't, make sure to use a number of sources to get a complete picture. Be sure you use current tables and up-to-date information suitable for the task.*

Table 1 below illustrates the clear and simple organization of tables. The row headings clearly tell you what the numbers mean. The table allows you to find what you want quickly.

Glance over everything before reading so you know what is being compared.

Table 1 below lists chain grade, trade size and safe working load limits. Look at the clear and simple organization, and be sure to read the footnotes (at the bottom). **Read Passage 2 and Table 1. Answer the questions that follow. Answers are at the end of this manual.**

**Passage 2**
**Lifting Slings**

Heavy duty component parts and engines must be safely removed and installed to avoid serious injury, damage or death. All procedures must be followed; the sling must be strategically and safely bolted into position. Slings commonly used for heavy equipment are the chain-fall and web type. All are rated for safe working loads and hooks have the safe working limits cast into the metal. Under no circumstances can these loads be exceeded.

Table 1 gives grades, identification and applications of chain falls.

**Table 1: Grades of Industrial Chain Sizes and Applications**

| Grade | Link Identification | Recommended Application |
|---|---|---|
| Grade 80<br>or<br>Alloy Chain | A, 8, 80 or 800 | Overhead lifting, slinging, load binding. Flail chains, choker chains, skidder chains |
| Grade 70<br>or Transport Chain | 7, 70 or 700 | Trucking railways, logging, construction, towing, deck lashing, etc. |
| Grade 50 or High Test Chain | 4 or 5 | Load bindings, cargo lashing, logging and farm operations, towing, etc. |
| Etc. | | |

**Note:** See Figure 1, (omitted here) for details on chain connector links that are suited or **not** suited for each grade of chain. All lifting equipment (chains, steel cables, lifting hooks – see list) must be clearly marked with safe working limit and be in safe working order.

**Questions:**

1. Grade 70 or Grade 50 could be used for the same type of logging operation.

   **T F**

2. Which of the following is the most accurate statement?

   a) Hooks and chain connector links have safe working limits cast into the metal.
   b) Chain connector links are suited to chain provided they are the same size and grade.
   c) Safe working load means the maximum working load.

3. Provided you know the safe working load of chain and slings, you can safely use them to remove or install heavy components.

   **T F**

Service manuals and other trade materials provide information in charts or tables. In Table 1, you see the following information:

- the grade of industrial chain,
- how it is identified on the links, and
- some applications for each grade.

Did you also read the **Note** at the bottom of the table the first time through? If not, read it now. To evaluate *how*, *when* or *whether* to use any information, it is important to *cover everything available to you.* The note at the bottom provides more details.

Be sure to read all notes and decide how or if they apply to your job. The note gives you this information:

- where to find details on chain connector links,
- what details you will find, and
- guides for safety.

**Notes with tables**

Notes, or footnotes, that are with tables include essential information. You will have to read and follow the directions found in a table, at the bottom of the table and in the guides. Much more information is available to you when you combine footnotes with the table details. When you have more information to work from, you can decide how or if they apply to your assignment. You can *evaluate*. There is always a good reason for footnotes, so make sure you get all the details.

*Notes explain terms or abbreviations.*

**Example:**
***Note:*** OD stands for Outside Diameter.

*Notes point out exceptions to a use*.

**Example:**
**Note:** Some metals are excluded from this use because of corrosion.

*Notes guide you to the information you need.*

**Examples:**
**NOTE:** See Chart 5 for Imperial. – Metric conversions

See the Welder's Guide for complete information.

*See Manufacturer's Guide that accompanies this tester.*

*Notes guide you to make correct adjustments.*

**Example:**
The size of retaining nuts and bolts on very large bore engines makes it impossible to tighten them manually. Use a hydraulic tensioner device.

*Notes may tell you where to find more details*.

**Examples:**
*See Figure 3-1 for a cross section of this diagram.*

### *How And When To Use Information*

To decide *how and when* to use information, it is important to evaluate whether it is relevant to a specific situation. The information must:

- be reliable,
- be complete, and
- answer all the questions about the situation.

You may need to read from more than one source to get the information you need. When you have enough information to work from, you can decide how it applies to your task.

### *Diagrams and Text*

**Passage 3** below describes the difficulties of getting a perfectly round hole when drilling through thin metal and what can be done about it. As you carefully read, think about tool selection and drilling techniques. In short, *evaluate what you read*.

**Read Passage 3 and answer the questions that follow. Answers are at the end of this unit.**

**Passage 3**
**Drilling Thin Material**

Drilling holes in sheet metal is difficult, and the results may be damaged work. This is especially true with standard twist drills over 12.7 mm (½ in) in diameter. The standard twist drill has a tendency to "hook" into the thin metal. This "hooking" action is caused by the rake angle created by the helix of the flutes and the drill point. A clean, round hole is not produced by the standard twist drill (See Figure 1).

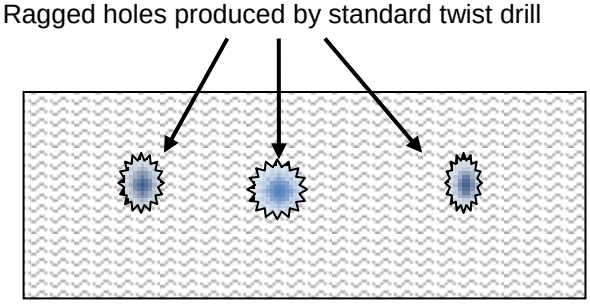


**Figure 1:** Standard twist drill should not be used to drill holes in sheet metal.

Special drills and specially ground twist drills should be used when drilling thin material.

A low helix drill or a straight-fluted drill, which has no rake angle, improves the quality of drilled holes in thin materials. A standard twist drill can be modified by grinding a short flat on the lip of the drill to remove the rake angle if a straight-fluted or low helix drill is not available.

Another factor affecting the quality of the hole is the manner in which the drill point is ground. Grind so there is a small point in the centre to position the drill in the punch mark. Then grind the rest of the drill point to an angle of 5° from the flat with a lip clearance of about 12°. As the drill point penetrates the work, the outer edges act as a trepanning tool and result in a round, almost burr-free hole.

**Questions:**

1. A specially ground twist drill will produce approximately the same results as a standard twist drill.

   **T F**

2. By referring to Figure 1, you can understand how "the rake angle created by the helix of the flutes and the drill point" creates the "hooking" action.

   **T F**

3. Which topic below does Passage 2 give you the *least* information about?

   a) how to modify a standard twist drill
   b) how to produce a burr-free hole in thin material
   c) the causes of "damaged work"

4. Passage 2 gives enough information for you to understand helix of the flutes and trepanning tool.

   **T F**

You need to get the expected results from a project – drilled holes of the right size and quality. You need to avoid damage to tools, to the material and other classes of problem. To do all of this, you depend on a clear understanding of clamping, drilling, equipment and materials. *Your purpose is to select the right information to come to this understanding.*

Passage 3 is an evaluation of a drilling operation and a type of problem. It directs you to Figure 1 to show you the problem. The passage describes the problem, looks at the cause and offers a solution.

In a passage like this, someone has evaluated a task and a problem you might face. This kind of evaluation will direct you to correct procedures, directions, tools and materials. It may help you to do a job efficiently or to avoid a problem you might otherwise encounter.

## *PART III*
## *CAUSE AND EFFECT*

*When we refer to **cause and effect,** we are evaluating a relationship between two events*. We want to see if one event is responsible for causing another event to happen. The connection between the two happenings can be established:

- by careful evaluation based on repeated observation,
- by referring to recognized standards and manuals, and
- by talking to respected supervisors and workers in the trade.

Safety on the job often means being aware of cause and effect. If a careless step can cause you harm, you should know the effects of that action. Safety warnings often highlight the cause and effect relationship in some way, especially if the effects are serious.

A warning might tell you to avoid doing something that can *cause* a danger. The warning may also state the consequences *effects* and general safety directions.

**Example:**
Avoid contact with wires strung for temporary lighting. Frequent relocation of circuits can loosen connections. This can break insulation or create other hazards.

Remember that electricity is ***always*** a potential source of danger. Consider all electrical wires and equipment live until they are tested.

Recognizing cause and effect relationships can help you understand:

- what action causes a problem,
- what action solves a problem without creating a new one, and
- what action can prevent a problem from happening in the first place.

A problem happens because something causes it. When you search for the cause of a problem, look at the relationships between actions that are closely related to the problem. As you search for solutions, think about how to change the factors that have caused the problem. When planning a project, think ahead to the logical order of procedures so that you can avoid any action that has the potential to cause a problem.

**Who (or what) caused it?**
In the sentence below, it is clear what happened.
*Fred threw a snowball and it went through the shed window.*

Fred threw a snowball. The result, or effect was, it broke the shed window. You can reverse the order of the sentence and still make sense of the relationship: *The window was broken because Fred threw a snowball through it.*

**Example:**
*Do not spin the drill bit too fast or press too hard.*
*This will result in overheating which can quickly soften and ruin the bit.*

In this example:

- The first sentence gives you a cause – a drill bit that spins *too fast* or has too much pressure applied.
- The second sentence tells you the effect of the action – overheating and softening of the bit.

We can reverse the order of the sentences and still make sense of what happened:

*A drill bit can soften and be ruined if it overheats from spinning too fast or being pressed too hard.*

But we cannot reverse the order of the relationship and still make sense. In other words, the result is not the cause. We cannot say:

*A drill bit which softens and is ruined from overheating **will cause** the bit to spin too fast and with too hard a pressure*.

And, we cannot say: "*A broken window caused a snowball to be thrown."*

It doesn't make sense if you mix up the cause and result. Events occur because of a cause and effect relationship. Keep this in mind as you troubleshoot. As you search for solutions to problems, remember to note the order of the actions even if the *sentence order* is changed.

**Take two directions to study cause and effect**
In practice, we often work in two directions - backwards and forwards - when we talk about cause and effect. Sometimes we know what happened (the *effect* or *result*), but we don't know why (the *cause*). Sometimes we know what action we are taking (the *cause*), but we don't know the effects or results of it.

**Example:** As you are driving on a winter's night along an unfamiliar concession road, think ahead. Predict the likely results of your actions. You may do any of the following:

a) skid into a ditch,
b) miss a turn and get lost,
c) hit an icy patch and spin, or
d) be lucky and arrive safely.

You have worked from your present actions forward to predict the probable or possible effects. The purpose in doing this is to evaluate the likelihood of an event taking place - of *a, b, c, or d.* When you evaluate the effects of what you are doing now, you can change your behaviour to avoid or prevent a problem.

**Example:** Knowing that improper care and/or use of precision tools will reduce their value as accurate measuring tools, you can adopt practices that will avoid this result. You can evaluate your own practices compared to recommended (proper) handling and use. So when caring for precision tools:

- handle with the same care as for precision instruments,
- check ends and corners for wear,
- use only for measuring - never as a screwdriver of lever, and
- observe how experts handle and store this and other tools.

Passage 4 outlines a relationship between cause and effect. The purpose is to understand and, therefore, avoid poor or ruined work. **Read Passage2 and study Table 2. Answer the questions that follow. Answers are at the end of this skills manual.**

**Passage 4**

**Pneumatic Tool Maintenance**
Tools and equipment cannot operate correctly unless you take proper care of them. Although air tools do not require much upkeep, basic maintenance will prevent problems. For example, storing a tool with water in it will cause moisture to gather in the lines and to be blown into the tool when next used. In addition, rust will form resulting in a shortened life for this tool.

Maintain tools and equipment. *More tools are ruined because of poor care than by any other single cause!* If a tool is not functioning properly, fix it.

The most common causes of pneumatic or air tool malfunction are the following:

- poor or lack of proper lubrication,
- excessive air pressure or lack of it, and
- excessive moisture or dirt in air lines.

See Table 2 for a troubleshooting guide.

Follow the recommended air pressure for all air tools. An overworked tool will wear out faster. It may cause a series of problems as well: if a tool with worn parts is used, it will use more air pressure; the air compressor may become overworked and put out air that is not clean or dry which may shoot back into the tool. And so on....

**TABLE 2 TROUBLESHOOTING GUIDE FOR AIR DRILLS**

| Problem | Probable Cause | Recommended Action |
|---|---|---|
| Tool does not run, air flows freely from exhaust, spindle turns freely. | Rotor vanes stuck with dirt or varnish. | 1. Check for dirt in inlet.<br>2. Pour liberal amount of air tool oil in air inlet.<br>3. Operate trigger in short bursts.<br>4. Disconnect air supply; then turn empty and closed drill chuck by hand. Reconnect air supply.<br>5. If still not operating, have tool checked by authorized service centre. |

**Questions:**

1. According to this passage, a technician or mechanic could avoid most of the causes of ruined tools and equipment.

   **T F**

2. Which is the most likely cause of shortened pneumatic or air tool life?

   a) the formation of rust
   b) storing the tool with water in it
   c) reduced or excessive air pressure
   d) all of the above

3. If you cannot fix an air drill yourself, you should replace it immediately.

   **T F**

4. Which is **not** a common source of a ruined pneumatic tool?

   a) frequent use
   b) lack of air pressure
   c) dirt or varnish in the rotor vanes
   d) worn out parts

Passage 4 is a general guide to the proper care of air tools. It describes areas where problems could occur and what to look for. Once you know about common problems and their causes, you can avoid creating them. If they do occur, you know a good place to start your search for a cause and a solution.

***Troubleshooting Guides***
Troubleshooting guides list common causes of problems and solutions so you can find and solve them without a major investigation. Table 2 is an example of a cause and effect guide found in your trade.

Look for the places the problem could have occurred. As you eliminate possible causes, narrow in on the most likely ones. This process will help you find the cause of tool malfunction in a logical manner. The cause will lead you to the solution such as a changed method, a different technique, or a tool replacement.

***Test Your Abilities***
Evaluate the situation and yourself.

If the troubleshooting process leads you to the limits of your own expertise, you may have to find another source of information. Tables and manuals can help you make this assessment.

> **Example:** Under the heading, *Recommended Action* in **Table 2,** step # 5, you read this: *have tool checked by an authorized service centre*. Now, you know to go to a service centre for more help.

Directions in manuals may say something like:

- *if the tool is not functioning properly...*
- *Maintain tools...*
- *use proper lubrication*

These directions assume that you know what *functioning properly, maintaining tools,* and *proper lubrication* mean, and that if you don't know, you will find out. An important part of evaluating a situation is to know when you have to look something up, or when you have to find further information. It also means knowing where to go for help.

**Looking for more causes**
Be aware that there may be more than one cause of a problem. A problem such as a poorly maintained air drill may be the cause of another problem such as an overworked air compressor. If you have not lubricated the air drill properly, or you used the wrong type or quantity of oil, this problem may lead to another problem in the compressor.

***PART IV***
***FACT AND OPINION***

*A **fact** is based on something that can be measured or proven.* When you can explain a statement based on solid information, you are presenting a fact.

**Examples:**
The Maple Leafs did not win the Stanley Cup last year.

Reverse or back flushing is a salvage operation. Back flushing can cause loosened scale particles to clog the system. These particles can cause damage to internal seals, water pump and thermostat areas.

*An **opinion** is based on an unproven belief*. When we base a choice on an opinion, we need to look closely to find our reasons for thinking the way we do.

**Examples:**
Fords are better than Hondas.

The Maple Leafs will win the Stanley Cup.

**Know the difference**
When you evaluate information, you need to look closely at your reasons for thinking the way you do.

**Example:** Are tools produced for professional use better than tools produced for ordinary use? In what ways? For which situations? Explain your answers.

If you can explain the answers to these questions by drawing on facts that support what you say, your answer will be true.

If you explain your answer by saying "I think " or "I heard that …", you are stating an opinion. It may or may not be true.

When someone tells you something is wrong with a finished product, they are probably providing you with valuable information. It's your job to evaluate this information. Can you get reliable details about where and when the product failed, with an accurate description? Or, is it an opinion? Something like, "The steering still seems funny." In evaluating any situation, keep an open mind, ask questions and get information from a variety of quality sources.

**Know your sources**
Table 2, *The Trouble Shooting Guide*, is an example from a repair manual that includes directions to use *recommended* air pressures and *authorized* service centres.

It is important when you evaluate information to find out who wrote it. A maintenance manual provided by the manufacturer is a very reliable source. An article in a respected trade magazine is another. A chat room on the internet may not contain dependable information. *An important rule is to only use reliable sources to provide your information.*.

You will seek advice from experts and experienced professionals. But even the time-honoured practices of seasoned trades people come under occasional review that can lead to a new and better way of doing things. You need to learn and respect traditional methods but be open to new

ideas. New and better ideas can only develop by someone carefully observing the actual relationship between cause and effect in the work site.

***Language***
Just as some words make a cause and effect relationship very clear, some words and phrases make rules and codes very clear. In some situations, the language tells you that there is no room for opinion.

Words such as *never, always, must (not), shall (not), are prohibited,* make it very clear that the *information presented is not open to opinion, debate or evaluation.* Your experience may not give you enough information to understand or evaluate the reasons for every direction. The language tells you what to do; it tells you there is no decision-making necessary.

**Examples:**
**Do not** perform any of the following repairs until you read and understand all OEM information.

Gasoline must never be used as a cleaning agent. It presents an extreme fire hazard.

Employees must wear approved safety equipment.

Always maintain and use tools properly. A defective tool is a dangerous tool.

Words like *should be, ought to, is recommended* and *make a reasonable effort,* offer suggestions or offer opinions. They offer advice that you will consider and evaluate. There may be some room for decision-making based on opinion:

**Examples:**
Tools should be good quality.

In some cases, two people ought to work together.

A metatarsal type safety shoe is recommended.

Make a reasonable effort to contain the fire.

You need to evaluate these directions before you proceed. If it states that *two people ought to work together,* is it dangerous if only one does the job? Is it slower, but safe? What is *a reasonable effort*? How safe would it be?

**In Brief**
As you learn about your trade, make observations with a clear, open mind. Constantly conduct small experiments to test your ideas or materials. Assess your skill level in carrying out a project.

What do you still need to learn? Based on your experiments and observations, you will learn to make evaluations based on useful facts, not haphazard options.

## *CONCLUSION*

The steps in a procedure may be straightforward, but you still have to evaluate information as you make decisions about materials, equipment, costs and time or when you look for trouble spots. To solve most problems, you first need a clear understanding of how something is supposed to work. Through experience, you will discover causes of and solutions to problems. You will also learn to use experience to evaluate the effectiveness of each solution as you try it.

Materials, installation techniques, equipment and codes are constantly changing in the trades. You have to keep up with these changes. You have to differentiate between someone's opinion and reliable facts. Check with inspectors, suppliers and manufacturers to learn about the latest products and information. Learn to recognize the relevance of the information you read by evaluating how it to your trade and to the job you are doing.

Sound decisions depend on knowing your sources and on your ability to take advantage of all the available resources. Information can come from written material, from lessons with experts and from your own experience. Learn to evaluate what you learn so you can choose the information that best fits the situation.

***Summary***

1. **Evaluate the situation from every angle** and choose information, products and rules that fit the job.

2. **Understand the relationship of the information in a table, diagram and the text.** Use it all and relate it all to what you are doing or learning.

3. **Assess your skills, experience, information, and how you are applying the information.** Evaluation is one of the best learning tools we have.

4. **Understand what cause is, and what effect is**. Work backwards to find cause and work forward to predict the effect, or the result. Your object is to prevent problems.

5. **Weigh the facts you have available and make appropriate choices at every step.**

6. **Learn the difference between fact and opinion**.

## ANSWER PAGE

### *PART I* Passage 1, Cleaning Compounds: Rear Axle

1. After reading Passage 1, you can determine the correct cleaning method for rear axle gearing.

   **F** This passage tells you to choose correctly and gives you a general guide for several types of surfaces and for several specific components. This information does not provide enough detail for you to determine the correct cleaning method for each situation.

2. Why is the correct cleaning method important?
   **d)** all of the above

   Each of Answers a), b) and c) are suggested in Passage 1. The incorrect cleaning method can cause rust. Steam cleaning may remove protective oils and cause rust, as well as other problems (Answer a). The correct cleaning method will remove sludge, dirt, scale etc. found on particular parts without damaging them (Answer b). Correct cleaning of parts allows you to see and, thus, assess its condition (Answer c).

3. Which method should you choose to clean non-ground surfaces?
   **c)** hot tank with mild alkali solution

   Paragraph four briefly describes Answer c) as a cleaning method for non-ground and polished surfaces such as differential carrier castings (cast iron) and cast brackets.

4. Technician A says that you should dip all cleaned parts in a light oil and wrap in greaseproof paper before reusing. Technician B disagrees. Who is right?

   Technician B. The passage tells you that ground or polished surfaces that are cleaned but not ready to be used immediately should be treated as Technician A states. It does not state this for *all* cleaned parts.

### *PART II* Passage 2, Lifting Slings<br>Table 1: Grades of Industrial Chain Size and Applications

1. Grade 70 or Grade 50 could be used for the same type of logging operation.

   **F** To evaluate a use or application, you need to have more details than you have here. The recommended application of *logging* does not describe what the operation is, what weights, grades are involved. Therefore, you cannot say if Grade 50 and 70 could be used for the *same type* of operation.

2. Which of the following is the most accurate statement?
   **c)** Safe working load means the maximum working load.

   Passage 2 clearly states that the safe working load is to be exceeded *under no circumstances.* This means at no time and for no situation (Answer c). Though hooks have safe working limits cast into the metal, we don't know if this is true for chain connector links (Answer a). Similarly, we don't know if connector links and chain of the same size and grade of would be suited to each other (Answer b).

3. Provided you know the safe working load of chain and slings, you can safely use them to remove or install heavy components.

   **F** This question asks you to assess when and how to use equipment. Safe use includes knowing the ratings for safe working loads; however, it is not limited to this. Safe use includes following all procedures related to this equipment, knowing how to use and attach slings (Paragraph one). It also means knowing that all parts of the equipment have been inspected for safe working condition. This last detail is found in the footnote at the bottom of Table 1. The question also asks you to pay attention to all the details when you read so you work with all the right data.

**Passage 3, Drilling Thin Material**

1. A specially ground twist drill will produce approximately the same results as a standard twist drill.

   **F** Paragraph one states, "A clean round hole is not produced by a standard twist drill and that special drills and specially ground drills should be used." **Note** here that paragraph one, sentence two, also states that the damage is "especially true with standard twist drills ***over 12.7mm*** in diameter. Does this mean that drills of a smaller diameter would ***not*** cause damage? Would cause less damage? You should check this out.

2. By referring to Figure 1, you can understand how, "the rake angle created by the helix of the flutes and the drill point", creates the "hooking" action.

   **T or F** The answer will depend on several factors: Your knowledge of the terms "rake angle" and "helix of the flutes", a particular tool (drill), and the relationship of a drilling action on a material. By referring to Figure 1, you can see the effects of the hooking action (a ragged hole). Whether it clearly shows *how* this occurs is a question only you can answer.

3. Which topic below does Passage 2 give you the *least* information about?
   **c)** the causes of "damaged work."

   You read about one type of damage and one cause of this type. You don't find information about any other types. There may be dozens more causes for "damaged work" than this passage describes.

4. Passage 2 gives enough information for you to understand rake angle and low helix drill.

   **F** There's really nothing in Passage 2 to explain, describe or illustrate either term above. This goes back to the answer to question 2. **Note**: Figures 2 and 3 that are omitted here would illustrate this and help you out.

***PART III*** **Passage 4, Pneumatic Tool Maintenance**
**Table 2: Troubleshooting Guide for Air Drills**

1. According to this passage, a technician or mechanic could avoid most of the causes of ruined tools and equipment.

   **F** It seems from this passage that a mechanic could avoid most of the causes of damage to pneumatic/air drills. The care may also apply to other tools in this class. Can you apply the same information to prevent damage to *other tools* and *equipment*? You will need more sources of information before answering True.

2. Which is the most likely cause of shortened pneumatic or air tool life?
   **d)** all of the above

   Answers a), b) and c) are all given as causes of problems that result in shortened tool life. Answer b) will likely result in rust (Answer a) which then leads to a shortened tool life. The wrong amount of air pressure (Answer c) results in overworking the tool that results in shortening its life.

3. If you cannot fix an air drill yourself, you should replace it immediately.

   **F** You may have to replace this tool; however, Table 2 (in Column 3, number 5) tells you to take this tool to an authorized service centre if the recommended actions do not result in correction of the problem.

4. Which is **not** a common source of a ruined pneumatic tool?
   **a)** frequent use

   The only answer not stated is Answer a). Passage 3 states that proper care will prevent a list of problems, all of which can damage or ruin pneumatic tools. The dealer, manufacturer or supplier can give you the expected length of life of any tool.