EVALUATING
ACADEMIC READINESS
FOR APPRENTICESHIP TRAINING
Revised for
ACCESS TO APPRENTICESHIP

COMMUNICATIONS SKILLS
CLASSIFICATION OF INFORMATION

AN ACADEMIC SKILLS MANUAL
for
The Construction Trades: Mechanical
This trade group includes the following trades:
Electrician, Network Cabling, Painter& Decorator,
Plumber, Steamfitter, Sprinkler &Fire Protection, and
Refrigeration/Air Conditioning

Workplace Support Services Branch
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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 related 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
CLASSIFICATION OF INFORMATION

An academic skill required for the study of the Construction Trades: Mechanical

INTRODUCTION

Classification *of information is a system that groups items together based on shared qualities or features, or uses.* When information is divided into topics, when tools are stored by how they are to be used or when fasteners are sorted by size, each collection is classified into a group according to characteristics they have in common.

Classification indicates an underlying similarity in grouped items. If you recognize features in a new material or tool that are similar to features you are familiar with, you will find it easier to figure out how it works and where to use it. By classifying information you learn to see common patterns in the different techniques you are learning. Being able to classify new information assists you in organizing things, finding material, and making good choices.

In this skill sheet, we look at the following aspects of classification:

- Classifying into Categories
- Using Categories to Get Organized
- Using Classification

PART I
CLASSIFYING INTO CATEGORIES

Belonging to a group
A "tool" is a grouping or category. It is a broad, general category. If someone asked you for a tool, you could hand over scissors, pliers or a wire stripper. You could not make a wrong choice because *any* tool fits the category.

Example:

If someone asked for a screwdriver (a type or class of tool), you'd choose a screwdriver. *Screwdrivers* are a smaller, more specific category, so you would choose a screwdriver and exclude every other tool.

If someone asked for a screwdriver and there were dozens to choose from, you would have to ask, "Which one do you want?"

Which one?
When you ask *which one*, you are asking for more information. Because you need to select the right tool, you need a *list of features* or *criteria* that describes that tool. The answer to your question will provide a list. It will be something like this: "I need the Phillips, number 3, the one with the chipped, insulated handle." With these words to guide you, you can match the screwdriver to the description and hand it over.

You can make the right choice. There is probably only one screwdriver that matches the list (the given criteria), chipped handle and all.

Note*: We use the terms "given criteria" and "list of features" to mean the same thing.*

Classification involves a process, moving from a broad category of information that gradually narrows to descriptions that apply only to one type or one item only.

From general to one
To make the right choice, we moved in three steps:

1. from a very broad category which included all types of tools;
2. to a narrower category which included screwdrivers only;
3. to a list of features that described one item: Phillips number 3, insulated, chipped handle.

Example: Classification may apply to a lesson about *wiring systems* in this way:

- First, you learn about the *types of wire* used in this trade.
- You then focus on *one type* such as aluminum or copper.
- The next step may be information which examines one type of wire (No. 4 AWG or No. 14 AWG) belonging to the category of copper wire.

There is a good reason for these steps. Whether you are learning about a system or caring for tools, you need to understand what to expect from a group of items so you can predict results. You need to understand what type of product is best suited to the job and what type is not appropriate. You need to know what is considered odd or unusual behavior in any group of products. This knowledge prepares you to react when something unexpected happens so you can look for the causes. It lets you work from broad patterns in a logical way.

The right information
To make the right choice, we need to work from information. When you ask questions about a job or a tool, the answers will describe the conditions.

Example: You are plumbing a new building. Before you do anything, you need information. What will the building be used for? What codes will I need? What type of materials is being used? Are there any special problems or considerations with the structure or anything else, such as cost?

The answers to these questions outline the conditions. The answers will guide you in your choices for each step of the project. You can select the right information, tables, diagrams, safety guides and tools. You can choose the right products and techniques cuts for this situation. You can make appropriate choices by matching information to the finished product. You can see that the finished product sets the conditions for all the choices.

When you read Passage 1 about the characteristics of switches you can understand why a particular switch is used in one situation and not in another. You see that the characteristics of a switch are what make it useful for some purposes but not others. Note how classification using the category of characteristics is used to teach you about switches. Look for information that moves from a general, broad category to smaller categories (or groups).

Read Passage 1. Note how classification is used to describe first all switches and then the different types of switches. Note how passage starts with general information (all switches) and then moves to information about specific or individual items (the different types of switches).

Passage 1
Switches

A switch is a device that controls the flow of power in an electrical circuit. When on, electricity flows through the circuit from its source to a point of use.

There are many kinds of switches, including dimmer, pilot-light, time-clock, and silent switches. Most residential switches are toggle switches. They are stamped with code letters and numbers that provide information about the type of current, wire and amount of power they can handle. It will also tell you if they are CSA approved. Learning to read these codes properly will ensure you have the correct product.

Toggle switches, also referred to as *snap switches,* are mainly used in residential wiring. They come in a variety of types: single-pole switches, three-way switches, double-pole switches, and four-way switches.

A ***single-pole switch*** has two terminals. It alone controls the circuit. The incoming hot wire is hooked to one terminal screw. The outgoing hot wire is connected to the other screw. The easiest switch/light wiring hook up is probably the single-pole switch controlling a light fixture.

Three-way switches are switches with three terminal screws. One terminal will be marked COM, or common. *And so on...*

This passage uses classification to guide you through a trade description systematically. Step-by- step, it divides information into smaller groupings with added details. We can see that everything belongs to the same *classification* – in this case, switches.

Paragraph one and two give you this information:

- a definition of the term,
- a list of different categories of the product, and,
- how to recognize the different categories.

Paragraph three is about only one category of switch, the toggle switch. It has this information:

- two characteristics of this category, and
- a short description of four types of switch in this category,

Paragraph four describes one of these types. You get this information about the new category:

- how it is set up,
- how it functions,
- how it is hooked up, and
- an example of the easiest one to hook up:

Paragraph five describes another category of toggle switch and should contain the same type of information as Paragraph four. And so on …

What is the situation?

When you have to choose the correct switch to install, classification questions will direct your project:

- What type of current or wire is the switch supposed to handle?
- What is the required voltage?
- What standards will guide you?
- What are cost considerations?

You can select the right information, tables, diagrams and safety guides. You make appropriate choices by matching information to the customer's objectives. Note too, that the customer's objectives may set the conditions for many of the choices.

When you read Passage 2 about conduit wiring, you can understand why a tradesperson would choose a particular conduit and reject another. You can understand the characteristics of conduit wiring systems and gain a sense of what to expect from the particular types you will work with. Note how classification is also used to teach you about conduit. Look for information that moves from a general, broad category to smaller categories (or classifications).

Read Passage 2 and answer the questions that follow. Answers are at the end of this skill manual.

Passage 2
Conduit Wiring

Conduit should be installed in compliance with current codes and standards. Conduit wiring systems provide mechanical protection to electrical circuits. They are used for both surface and underground wiring and include uses in hazardous areas where corrosive materials are present and where vibration, water, dust or vapours are present. Metallic conduits offer both a high degree of fire protection and can safely contain overloaded or short-circuited conductors. With conduit wiring, conductors within the system can be removed without dismantling the system.

Different types of conduit are available: for example, *rigid, EMT, rigid aluminum, rigid PVC, flexible, PVC flexible, metallic flexible, non-metallic flexible* and *liquid tight flexible*. Each type has specific properties and uses.

Rigid or **Thickwall:** Produced in aluminum or steel, this type provides the greatest mechanical protection to conductors. It is available in coatings that reduce damage caused by corrosive chemicals. It must be supported in approved manner at approved intervals.

Electrical metallic tubing (EMT) or **Thinwall:** Made of lightweight steel tubing, this type is more easily installed and does not require as much physical strength in installers. It does not provide as much mechanical protection as rigid thickwall. When coated with PVC, it reduces corrosive chemical and vapour damage.

Rigid aluminum: Lightweight, non-magnetic and rustproof, this type will not stain or mark surfaces. High electrical conductivity provides safe ground circuit for system. Safely used near explosive gases or vapours. Easily handled, but requires care and recommended tools to avoid kinks or flattening when bending.

Rigid polyvinylchloride (PVC): Lighter in weight than steel or aluminum, non-magnetic, rustproof, it will not stain surfaces on which mounted. Does not conduct electricity, so has no voltage limits. Very durable, resistant to aging, corrosion, moisture, condensation, exposure to ozone, sunlight and underground installations. Easily handled and resistant to blows.

Metallic flexible: And so on...

Questions:

1. Which type of conduit would **not** be suitable where light weight is required?

   a) rigid (thickwall)
   b) electrical metallic tubing (EMT)
   c) rigid aluminum
   d) rigid polyvinylchloride (PVC)

2. All conduit could be described as follows:

   Conduit provides a high degree of fire protection can safely contain overloaded conductors and can be used for both surface and underground applications.

   T F

3. Conduit wiring systems offer mechanical protection to electric circuits.

   T F

4. Which of the following lists characteristics of rigid or thickwall conduit?

   a) provides mechanical protection to conductors, lightweight, reduces damage from vapours
   b) easily installed, unlikely to kink, must be supported
   c) produced in aluminum or steel, must be supported, offers greatest mechanical protection

These questions ask you to understand some of the properties common to all conduit and some of the qualities of specific ones. Each type of conduit may have one or two characteristics similar to another, and each may be manufactured in a similar way. To install the right conduit correctly, you need to understand the different types, their ability to do something and the right installation method.

Why do you need to classify things like this? You do it so you know what to do with an item, machine, or product:

- when to use it,
- when **not** to use it,
- how long it will function, and
- what conditions are best or worst for it.

You match the characteristics of a tool or product to the right category (or situation) for its use.

Look from all angles

You often have to look at the right choice from two directions.

- You need to understand what a tool or product is designed to do to know the class of job it's correct for.
- You need to know the requirements of a job to know the class of tool or product that's correct.

This may sound like going in circles, but whichever way you look at it, making the right choice is essential to the quality of the completed project.

Sometimes you go through the process of finding information, only to discover you must compromise.

> **Example:** You may start with the best choice, but find that the price has just shot up. With some more information about various products, with help from your supplier, discussion with your supervisor and customer, you can choose the next best thing.
>
> But you need to understand your reasons for this choice – how "the next best thing" will perform, delivery time and what it will cost. You must be sure it suits all the conditions and the purpose.

We've looked at the right choice from two directions.

1. When you understand what something is designed to do, you know where it can be correctly used.
2. When you know the specific requirements of a job, you can find the class of material that is best.

Whichever way you look at it, making the right choice is essential to the quality of the completed project.

Ask questions

The success of your efforts depends on information. Start with information about the job you are doing: like the type of fabrication and the conditions of the operation. Then choose the products and tools based on information about their characteristics. Understand which situation will call for which material, technique or tool. When you ask questions, you address all of the requirements.

PART II
USING CATEGORIES TO GET ORGANIZED

We all use classification to separate people, things and information into groups and categories. Sorting by categories tells us

1. where to find things - things that are alike are found together: socks are in the socks drawer, tools are in your toolbox, and instructions are in your blue manual;
2. how to use things;
3. how to make good choices; and,
4. how to set priorities.

When you classify things, you organize them in your mind and you get a sense of the big picture. You can start with a general idea – class or type – before dealing with each individual detail.

> **Example:** If we have to work in a confined space, we need to know what "confined space" means, and how it might affect us. Once we know the picture, we can deal with the details such as the specific conditions and equipment, correct lock out, entry and exit procedures and the right safety gear.
>
> **Example:** You are working on a conveyor and your customer makes it clear that she does not want another burned out motor. This alerts you to check on all aspects of the safety devices. "*Safety devices"* becomes your new category or grouping; it is the given situation.

You need to have a lot more information before you start selecting tools, wiring diagrams, and before you tell your customer how long it is going to take. The logical start is through *classification.*

Read Passage 3 and take note of the pattern of *categorizing, grouping or classifying*.

Note *that Passage 3 may not contain or explain details needed for your trade.*

> **Passage 3**
> **Overload Safety Devices**
>
> Today's components are costly, and downtime is both costly and inconvenient. Safety devices play an essential part in protecting against the conditions such as low voltage, high ampere draw and overheating which can cause damage or disruption. Safety devices are designed to cut off a load (motor) immediately if a current rating is exceeded. If the motor is not cut off, it may be damaged or destroyed. Two types of overload safety device are described below:
>
> **Fuse –** This is the simplest type. Designed to carry a designated load, the fuse acts to break the circuit in the event of a higher load. It is effective against large overloads but less so against small overloads.
>
> The second type of overload device protects against both small and large overloads. It includes the two categories of thermal and magnetic overloads.

Thermal Overload – This device is activated by heat. It may operate in two ways: a *pilot duty device* can break the control circuit and lock the motor out. It is common on motors larger than three-horsepower. This device may be operated by a bimetal element (with or without heater) or by a thermal overload relay. The second way of operation may be a *line voltage device* that can break the power line to the load (motor or component).

Magnetic Overload – This is operated by magnetism directly proportional to the current draw. Thus, it can be designed to energize only on a high current draw.

Look again at Passage 3: Note the information that applies to *all types* of overload safety devices:

- what they are designed to do, and
- how they do it.

From this we can understand:

- a category of protection (related to current draw),
- the *general method* (cutting off the load from current), and
- the *result* (power to load – motor which rotates fan, compressors, etc. is stopped).

The general classification prepares you for the more specific categories: the definitions, details and descriptions of three types of safety switches. Look back to the passage and note how each of paragraphs two, three and four describes a different type (category) of switch.

Which one to choose?
If you have asked and answered all the questions, you will have you a complete list of conditions and factors for choosing a welding method. Your question and answer list will guide your task.

A decision may involve comparing two (or more) lists:

- One list may describe the situation you are facing,
- the other list may describe the features of a material.

The choice you make will depend on your understanding of both the situation and that material. Each result you get depends on the kind of information you select to answer the "which one" question you encountered on page one of this unit.

Classification in Tables and Charts
Tables and charts in your trade serve a variety of purposes. One purpose is to group (classify) information so you can do something with it. By organizing in this way, you get an overview of the situation.

Table 1, a troubleshooting chart for compressors in cooling systems, is divided by category of problem. Each category of problem is followed by the possible causes and solutions for each. This information is organized in a table so that, at a glance, in a small amount of space, you can extract the details you need.

***Note**: Always read all information related to a table. Often, important or essential explanations and details are placed below the chart. Match any symbols (*, **, †) in the table to the information found it the table below it.*

TABLE 1: Troubleshooting Chart

PROBLEM	CAUSE	SOLUTION
Compressor and condenser fan will not start	Power failure	Call Hydro or hydro company
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	Defective thermostat, contactor, transformer or control relay	Replace component
	Insufficient line voltage	Determine cause and correct
Compressor will not start, but condenser fan runs	Faulty wiring or loose connections in compressor circuit	Check wiring. Repair or replace
	Compressor motor burned out, seized or internal overload open	Determine cause. Replace compressor
	Defective run/start capacitor, overload or start relay	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker. Determine cause
Three-phase scroll compressor* makes excessive noise and (perhaps) low pressure differential	Scroll compressor is rotating in the wrong direction	Correct the direction of rotation by reversing the 3-phase power leads to the unit
Et cetera . . .	. . .	. . .

* Applies to 557AO48, 060 and 557AO36-060 units only

Look for tables that rate features or grades of tools and equipment. Ratings and grades help us identify features of a category and assess qualities which might affect efficiency or durability. Tables let us compare products, systems or costs. They show advantages and disadvantages. Conditions, type of materials, what manufacturers recommend and why, will all be part of this reading. It will all help you make the best possible choice for a given situation and conditions.

The Language of Classification

The language of classification gives you valuable information. It indicates which category a material, design, or technique fits into. This will make some job decisions easier.

Classification is used to limit your choice to one type or category only. You may not know why you should only choose from a certain category or follow a particular procedure, but the directions tell you how to act**.**

Examples:
Connect all cable segments, including all pairs of wire, with the specified type of pluggable connectors.

Always splice pairs of wires rather than single wires.

Welding is *the most important* metal-joining process

Classification can point you to what you should avoid. Restrictions like these direct you to only choose materials or techniques that are allowed and to comply with all relevant codes. You classify materials and operations so you can match codes and standards to appropriate actions.

Examples:
Caution!
Do not clean, oil, adjust or repair *any* machine while it is running. Stop the machine and lock the power switch in the "off" position.

When working with other workers, *only one* should operate the switches.

Classification often defines what you must do. Look at the example below:

Rigid conduit must be supported by straps, clips or hangers that are approved. It must be supported at intervals regulated by the appropriate Canadian Electrical Code.

Classification can instruct you in how to proceed. To follow directions, you need to know which things are included in the general classification term (solvents, industry standards, safety codes) and which the details you need to classify. Then you can apply the instructions properly.

Examples:
Clean air regulations prohibit the use of some solvents. Check local regulations.

All work must comply with up to date industry standards and safety codes,

Classification can define a category of items, and what you must know about its use, safety, and handling etc.

Example:
Controlled products fall into six classes of hazards. Each class is identified by a symbol. For each class, identify uses, ingredients, hazards, clean up, etc...

Classification identifies problems and causes. Once you have know where to look for the causes of a problem you can begin to classify specific details of the cause of a particular problem.

Examples:
Using incorrect lubricant fluids could result in tool failure.

If the process of gathering and organizing information seems long, remember the purpose: To make the right choices to meet the standards of your trade.

PART III
USING CLASSIFICATION

Use classification to get the right result. What are the results of a wrong or poor choice?

> **Example:** What results can you expect from cutting tools if you use a lubricant only when you happen to think about it? What if you've stored the lubricant in a rusty container? To maintain the life and performance of tools, you need information about the right type of lubricant, how often to use it, and how to store it.

Getting the wrong information

If you are not using the right information the result of your choice could be very different from the desired one. Tools may be well designed and manufactured, but choosing the wrong lubricant could result in corrosion of metals and excessive wear to parts. In fact, it could result in tool failure.

Getting the right information

Understanding information often involves sorting out one set of details from another. When you read, pay attention to special instructions, manufacturer's directions or textbook directions that use classification to point out or tell you how to proceed.

> **Example:**
> Clean air regulations prohibit the use of some solvents. Check local regulations.

Solvents are a class of liquids. To follow the directions above, you need to know what liquids are included in the term *solvents*, and which ones are regulated by local codes (by-laws or ordinances). You then need to read the workplace regulations.

Examine it all to ensure you meet the criteria.

> **Example:** Suppose you must decide on a type of connecting hardware.
>
> 1. Understand the situation. The hardware used on a job must do the following:
>   - meet industry standards
>   - meet the customer's needs
>   - come in at the right cost
>
> 2. Understand the factors or group of factors to get you these results. So, you list the factors that relate to the list above. It will include, but not be limited to the following:
>   - whether components will be reconfigured
>   - the existing technology
>   - the future needs of customers
>
> 3. Assemble information for a detailed, complete list of conditions and product factors. You can then relate this list to the next task:
>   - find the right hardware
>   - decide how to install and co-ordinate systems

4. Search for the recommended connecting hardware. This will start you on your third list. You will find information about these topics:
   - types of hardware
   - their characteristics
   - which types suit these particular requirements
   - advantages/disadvantages of various types

As you read to understand characteristics of products and equipment, you will learn how to avoid defects. When you have collected and assessed information, you can find the right fit. You can investigate the range of choices and select the best one.

At some point, you will put two (or several) lists of information together to make a choice. You may also have to decide which feature on your list is the most or least important. Often, you will need one, two or more sources to complete your task.

What is the situation?
To make the right choices, do the following:

- look at a requirement or group of requirements,
- understand them, and
- choose a product or process to suit the requirements.

You need to be sure you create solutions, not problems. You will want to avoid:

- redoing the job
- damage to any part or tool
- creating safety risks
- finding yourself with the wrong tools or short of material

Passage 5 describes categories of cable used outdoors. Look at the categories, and then the features or group of features to decide which cable would suit a set of conditions.

Read Passage 5, and answer the questions that follow. Answers are at the end of this skill manual.

Passage 5

Outside Installations
Cables and equipment installed outside need to be secured against wind conditions of up to 135 mph. Metallic supports and fasteners used to secure cable in position should be resistant to corrosion. Avoid sheath damage by following specified bending methods and specifications. Discard and remove any cable ends damaged during pulling.

Various types of sheath protect the conductors while various types of outer coverings protect the cables.
Outside plant cable and wire is of two types: *metallic* and *fibre optic*. *Metallic cable* (copper or aluminum conductors) is commonly available in several types. Two types are *Plastic Insulated Cable* (PIC) *filled* or *PIC air-core*. A description of types of PIC cable in alpeth and reinforced sheath follows:

Alpeth sheath (air core): Designed mainly for aerial use. Not suitable for buried installation where subject to wildlife damage or where subject to rockfall damage.

Alpeth sheath (air core), unsoldered mechanical protection: Mainly in aerial use, requires supporting strand. Used where subject to wildlife damage as provides additional sheath protection. Not suitable for buried installation.

Bonded Stalpeth sheath (air core): Designed for use in ducts with minimum risk of lightning. Sheath of corrugated aluminum, corrugated steel and polyethylene jacket bonded to the steel by a copolymer coating on the steel.

ASP sheath (filled) nonscreened: This sheath minimizes moisture penetration in buried PVC cable. Foam skin insulation, ASP sheath used for mechanical protection. Unsoldered mechanical-type protection over ASP sheath gives additional mechanical protection.

PIC Steampeth cable: Designed for high temperature areas such as steam tunnels. Sheath survival up to 230°F, recommended in PIC (though available in pulp conductor insulation) to prevent failure at high temperatures.

Questions:

1. Which type of PIC would you choose for buried installations?

    a) Alpeth sheath (air core)
    b) Bonded Stalpeth sheath (air core)
    c) ASP sheath (filled) nonscreened
    d) PIC Steampeth cable

2. Which describes characteristics of PIC Steampeth cable?

    a) corrosion resistant, mainly for aerial applications
    b) designed for buried installation, additional sheath protection at high temperatures
    c) sheath survival up to 230°F, designed for high temperatures

3. Both *Alpeth sheath (air core)* and *Alpeth sheath (air core), unsoldered mechanical protection* offer protection against wildlife damage.

    T F

4. Any type of cable installed outside should withstand (stand up against) winds up to 135 mph.

    T F

Make sure you understand the factors or group of factors that affect your goals. Make sure you look at the following:

- product features (question 3),
- what a product can't do (question 2),
- what a product can do (question 1),
- problems which result from wrong choices or actions (question 4).

In Passage 4, you had information in front of you from which to work. As you looked for answers, you may have underlined words or made notes in the margins to help you eliminate

details that don't apply or to highlight something important. Regardless of how you approached this passage, your object is to match the given products and materials to the situation.

To make the right choice, you need to do the following:

- look at a requirement or group of requirements,
- understand them,
- choose a product or process to suit the requirements.

Organize the information

The process of pulling information together will help you make your decisions. Take the time to consider each factor and to understand it. Keep asking questions. Consider the details you would pull together to answer your supervisor's questions. Make sure you cover all possibilities to fit the requirements of a job.

Headings

Apply classification of information to your own notes to organize information. Underline or highlight what is relevant to your project or studies. Eliminate or set aside details that are not. Enter details under headings in a notebook. This is classification of information applied to your own notes.

> **Example:** You can group information about things like industrial systems or types of conductors together. As you proceed through a course or a job, you can add to this information in a logical, ordered way. It will help you keep the big picture clearly in sight. As you develop the big picture, it's easier to sort and understand the details about individual items.

Organize your thoughts

You need to organize information methodically. By classifying information, you can learn why a principle or technique applies to a group of situations or why it applies to one situation only. You can identify types of problems, determine their causes and find solutions. You understand and why a recommended welding technique failed to make a good weld. You can record what changed and whether or not you need to change a product or procedure.

CONCLUSION

Your job is to assemble information as thoroughly as possible to help answer the question: "Which is the best choice for this situation?" By starting from broad categories and working toward the specifics of single products, you can investigate the range of choices and select the best one.

Work from reliable sources found in text and trade books, tables, manufacturers, suppliers and the experts in your field. As you tackle a new topic or chapter, look at how *classification* teaches you your trade. Use it yourself to move from broad, general information (about welding or engines) that applies to all items in the category. Then move to information that focuses on and describes individual categories or types. Continue to learn in this way until all the details about each item are covered.

Summary

1. **Classification is a process**. A general, broad group or category contains a large number of items. A narrower category will hold fewer items.

2. **Match a list of features against a list of requirements**. Match products, information, and methods to a list of features. The question, "*which one",* narrowly defines the items that will fit.

3. **Use questions in your research to find relevant factors and conditions**. Look for the items that fit the grouping or classification.

4. **Know your purpose for classifying information**. Some of the details fit what you want; others can be eliminated because they do not fit the criteria.

5. **Classify features and conditions to determine errors, inappropriate or unsuitable choices**. Your own experience, knowledge and access to experts will help direct your search.

6. **You may have to decide which feature is the most important**. A choice may mean a compromise or a balance of factors.

7. **Understand characteristics of products**; understand the advantages and disadvantages of features. This will help you understand why something is a good choice, the best choice or *the only choice* for a particular situation.

ANSWER PAGE

PART I **Passage 2, Conduit Wiring**

1. Which type of conduit would **not** be suitable where lightweight is required?
   a) rigid (thickwall)

   Different types of conduit have different applications because of their different design and manufacture. This question asks you to eliminate a type because of its weight. Rigid thickwall is the only type that is not described as being light in weight and is described as needing to be supported in the "approved manner at appropriate intervals." We can assume, then, that rigid conduit would not be suitable for lightweight applications.

1. All conduit could be described as follows:
   Conduit provides a high degree of fire protection, can safely contain overloaded conductors, and can be used for both surface and underground applications.

   F The passage states that *metallic conduits* offer a high degree of fire protection and can safely contain overloaded conductors. It does not say that non-metallic types have this ability. False is the correct choice.

2. Conduit wiring systems offer mechanical protection to electric circuits.

   T The first sentence in Passage 1 states this. The descriptions of the various types of conduit do not suggest any restrictions to this statement. However, check this out by finding specific information on non-metallic types.

3. Which of the following lists characteristics of rigid or thickwall conduit?
   c) produced in aluminum or steel, must be supported, offers greatest mechanical protection

   Some categories of conduit share characteristics. Through a process of elimination, match a product to a list of characteristics to find the answer. You do this to match a product to the right category of conditions where it will be suited or to match a product to the installation guides.

PART III **Passage 5, Outside Installations**

1. Which type of PIC would you choose for buried installations?
   c) ASP sheath (filled) nonscreened

   This asks, "which one" or "which type" can do a certain type of job. Eliminate the wrong choices (uses) to find the correct cable. ASP sheath is the only type of PIC that is described as offering protection to buried (PVC) cable. This question asks you to identify a condition (buried installation) and then look for a cable designed for this specific application.

2. Which describes characteristics of PIC Steampeth cable?
   c) sheath survival up to 230°F, designed for high temperatures

   This question asks you to identify a product by its list of features or characteristics. You would do this to understand where this product would be used. Use the same process of elimination as in question 1 to identify wrong choices.

3. Both *Alpeth sheath (air core)* and *Alpeth sheath (air core), unsoldered mechanical protection* offer protection against wildlife damage.

   F These two types of cable have some common characteristics. They are both suitable for aerial use. However, the first is **not** suitable for buried installations *where wildlife or rockfalls are present*. In other words, the cable may be damaged by wildlife or rockfalls. It may be suitable if these two conditions are not present, but check this out. The second cable type is **not** suitable for buried installations, but can be used where wildlife is present as it offers protection against this kind of damage.

4. Any type of cable installed outside should withstand (stand up against) winds up to 135 mph.

   T The first paragraph states that outside installations need to withstand these wind conditions. This applies to all types of cable and equipment for an outside application. This question asks you to read accurately so that you avoid a type of problem. Information applying to all categories of service, products or installation often appears at the beginning. Because it may not be repeated, you need to look over the whole passage.