CHARTS & GRAPHS

The terms *chart* and *graph* are used interchangeably outside of the scientific and mathematical disciplines. The terms describe tools that present information in a visual format; they also include diagrams, tables and schedules and are often used to show relationships between mathematical data.

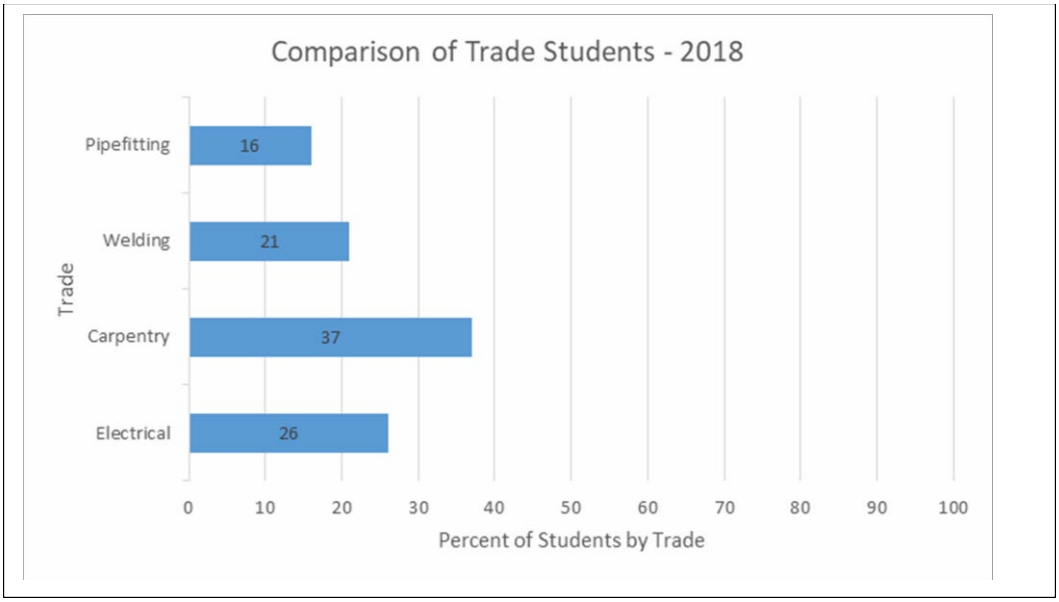
Three common tools are bar graphs, line graphs and circle graphs. Circle graphs are often called pie charts.

KEY POINTS

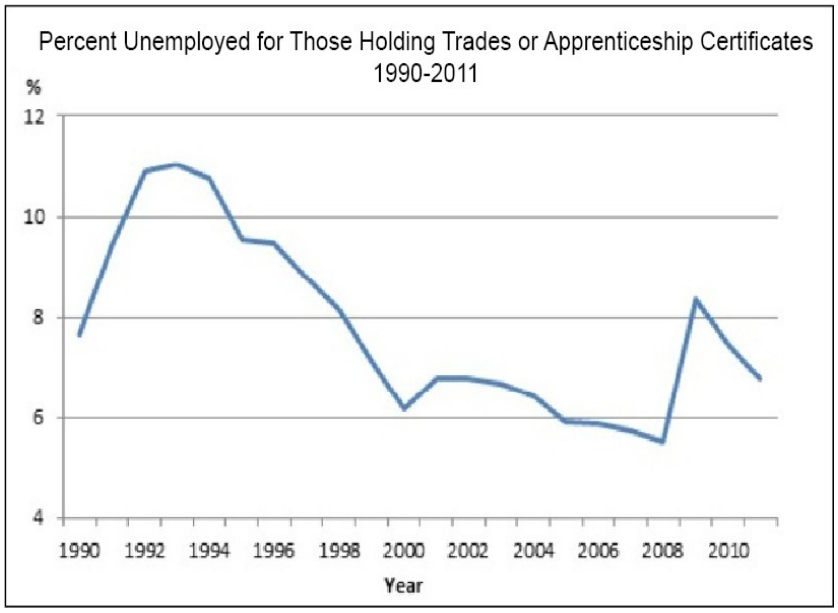
Charts and Graphs

- include diagrams, tables, schedules and other tools
- present information in visual format
- often show relationships or comparisons between or among data
- may present information using scales or units
- usually have titles that indicate the purpose of the display and what is being represented
- usually have a legend or labels that explain the meaning of colours or shading, if there are any used
- charts and graphs may use reference lines known as x and y *axis.* The axes are fixed lines used to show the position of a point. For example you may look at a graph that plots distance on the y axis against time on the x axis

Bar charts/graphs use bars to represent categories and the height or length of the bars to show quantity. **(NOTE**: in this graph the *Y axis* represent trades and the *X axis* represents percent of students training in each trade shown.)



Line graphs are graphs with points connected by lines to show how something changes in value - over time or as something else changes.

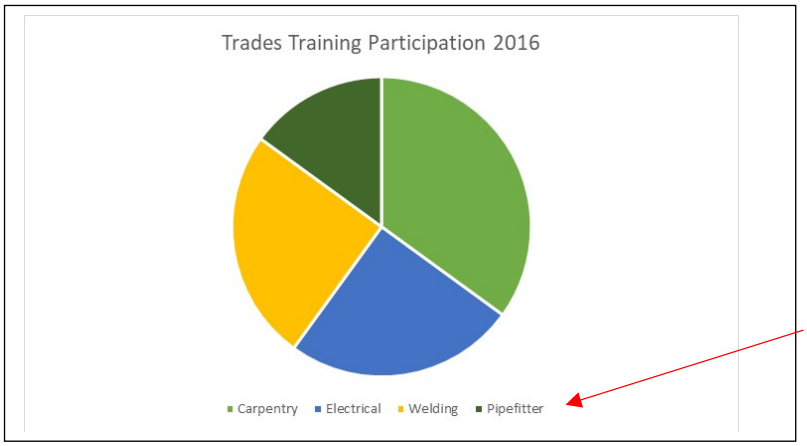


Statistics Canada, Chart 6.5 – Percent Unemployed for Those Holding Trades or Apprenticeship Certificates, 1990-2011. Reproduced and distributed on an "as is" basis with the permission of Statistics Canada

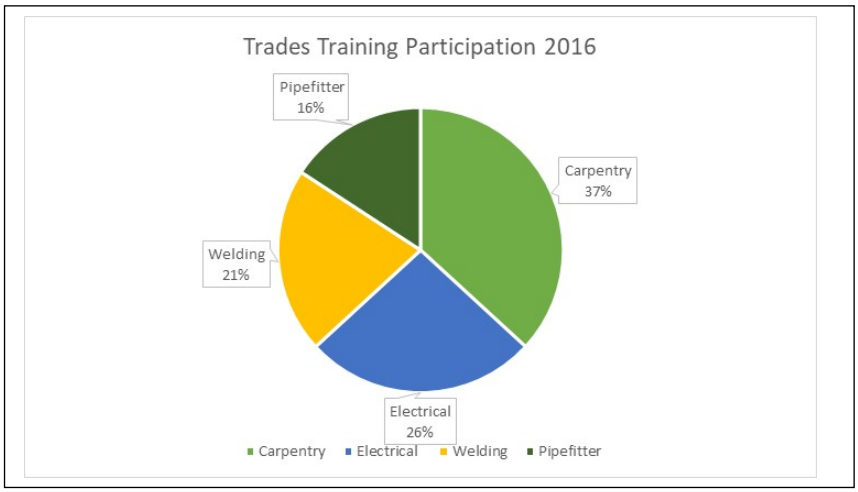
Pie Charts:

- are circles divided into wedges, like a pie
- the circle = 100% of the data in the pie chart
- sections represent fractions of the data presented
- enable comparison of sizes or relationships amongst categories
- may use numbers near or in the circle, or shown in a legend, to show amounts
- may use colours to describe the size of the wedges
    - when colours are used, without numbers, you are only able to estimate the relationships amongst the data

Sample Pie Chart – No numerical data shown



Sample Pie Chart – Numerical data shown



STEPS

1. Decide what you need to find out.

2. Identify what the chart/graph represents by looking for the title and any information in a legend or labels on the axes or in notes below the chart/graph.

3. Identify the type of chart/graph you are looking at.
   a. **Line graph**
      - check the title and labels for each axis to see what is being compared
      - read across the X axis (horizontal) to find the data grouping you are looking for
      - read straight up the graph until you find the point on the line that is directly above the data grouping you are looking at
      - read back to the left, level with the point on the line, to find the value of the point of the line on the Y axis (vertical)
      - if you find you are between 2 data points on the Y axis, make your best estimate as to the value of the point

   b. **Bar graph**
      Bar graphs may display information vertically or horizontally.
      - check the title and any labels on each axis to see what is being compared
      - scan the axis to find the data grouping you are looking for
      - scan up or along the bar related to the data grouping, until you get to the end of the bar
      - scan back to the data that is level with the top of the bar you are interested in, to find the value of the end of the bar
      - if you find you are between 2 data points on the axis, make your best estimate as to the value of the point

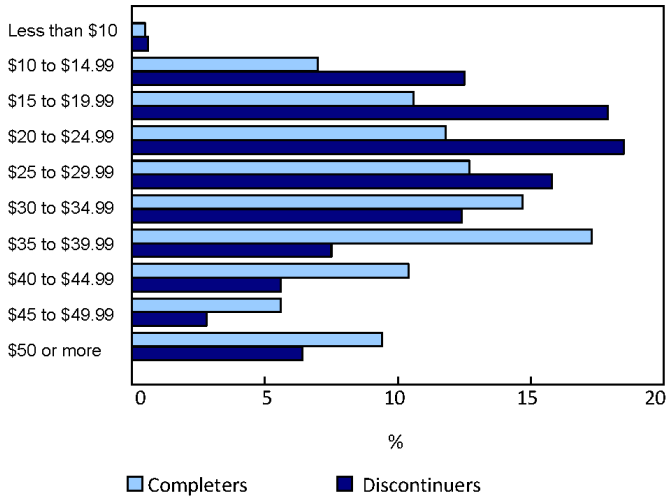
c. **Pie chart**
   - check the title, legend, numbers, or labels shown on or near the circle to see what is being compared.
   - Read the value of the segment(s) of the chart you are interested in.

4. Decide what information you can draw from the chart/graph:
   a. Are there increases or decreases in values?
   b. Can you identify trends or make predictions?
   c. Is there anything unexpected in the data, such as a spike or a gap, which indicates there may be a problem that should be addressed or a change that needs to be made?
   d. Are there notes that clarify any of the information?

EXAMPLE

Research has shown that one benefit of completing an apprenticeship program is a higher average annual income, compared with those who did not complete.

Chart 1
Distribution of grouped hourly wages for paid employees by apprentice status, Canada



Note(s): Use results for "Less than $10.00" category with caution.
Source(s): National Apprenticeship Survey, 2015.

Statistics Canada (March 29,2017). Chart 1 Distribution of grouped hourly wages for paid employees by apprentice status, Canada [Chart]. In Completing an apprenticeship in Canada yields benefits 2015. Retrieved from: https://www150.statcan.gc.ca/n1/en/daily-quotidien/170329/dq170329b-eng.pdf?st=pEtox4cZ.

- The bar graph above has a title that explains what information you can find in the graph.
- There are notes included below the graph that clarify how complete the information is.
- A conclusion that might be drawn from the graph is that, in all trades, individuals who complete their trades training are more likely to be paid higher wages.
- A caution in making a conclusion from the data in the graph is that, as the notes explain, the data in the less than $10.00 category is not as reliable as the data in the other categories.

Think you understand how graphs and charts work? Try it yourself on the next page.

USING THE SKILL

In the Workplace: Chart and graphs provide a graphical illustration of data and quickly convey important information that can be used to inform workplace activities.

QUESTIONS

Use the bar chart on the next page to answer these questions:

1. For what years is the data in this chart most relevant?

2. What organization produced the chart?

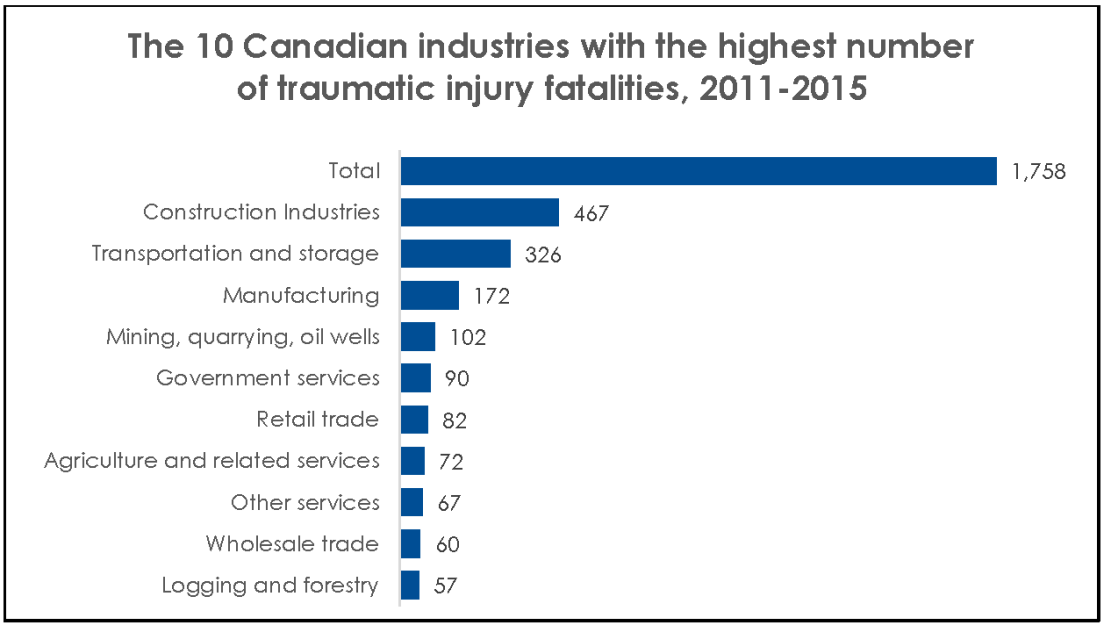
3. What information is found on the y axis?

4. What percentage of the workforce is included in the data in this bar chart?

5. Which fatalities are not included in the data represented in the chart?

6. What is the total number of fatalities reported by the three industries with the fewest fatalities?

7. What is one conclusion you might make, based on the information in the chart?



Source: Association of Workers' Compensation Boards of Canada (AWCBC)
Note: Excludes fatalities that were "Not coded" by occupation. Workers' compensation numbers do not fully capture the whole work force. As of 2015, 85 per cent of workers in Canada were covered. Among provinces, this coverage ranges from 73 per cent in Nova Scotia to 98 per cent in British Columbia.

REFLECTION

How do you use graphs and charts at work? When do you use them?

ENTRY FORMS

Entry forms are widely used to collect or retrieve information. Errors in completing entry forms or in retrieving information from them can cost time and money. Examples of entry forms include applications, incident reports, invoices, and order forms. Entry forms may be paper or electronic and they have common elements. Understanding what the common elements are will help you to avoid errors and complete tasks using entry forms, efficiently.

KEY POINTS

Entry Forms:

- may be digital or printed documents
- are used to collect information in a compressed format and to present information in a short, efficient format that can be quickly reviewed
- are often poorly-designed and not user friendly
- may have legal implications

Common features of entry forms:

- Categories or sections that organize information, such as, personal information, work history, etc.
- sections may or may not be labelled
- Directions on how to complete and submit the form.
- Rows and columns.
- Abbreviations and acronyms used to save space.
- References and acronyms that are job- or organization-specific, need to be learned.
- Sections that you are NOT supposed to fill out, often indicated by shading.

STEPS

1. When entering information into a form, read all the directions before you start.
2. Scan the form to identify sections that you need to complete and any that will be filled out by someone else.
3. Note the preferred format for times or dates (e.g., 1 PM or 13:00 PM) (e.g., dd/mm/yyyy, mm/dd/yyyy, etc.).
4. Determine how the form will be used and if it is a legal form, such as a logbook or incident report

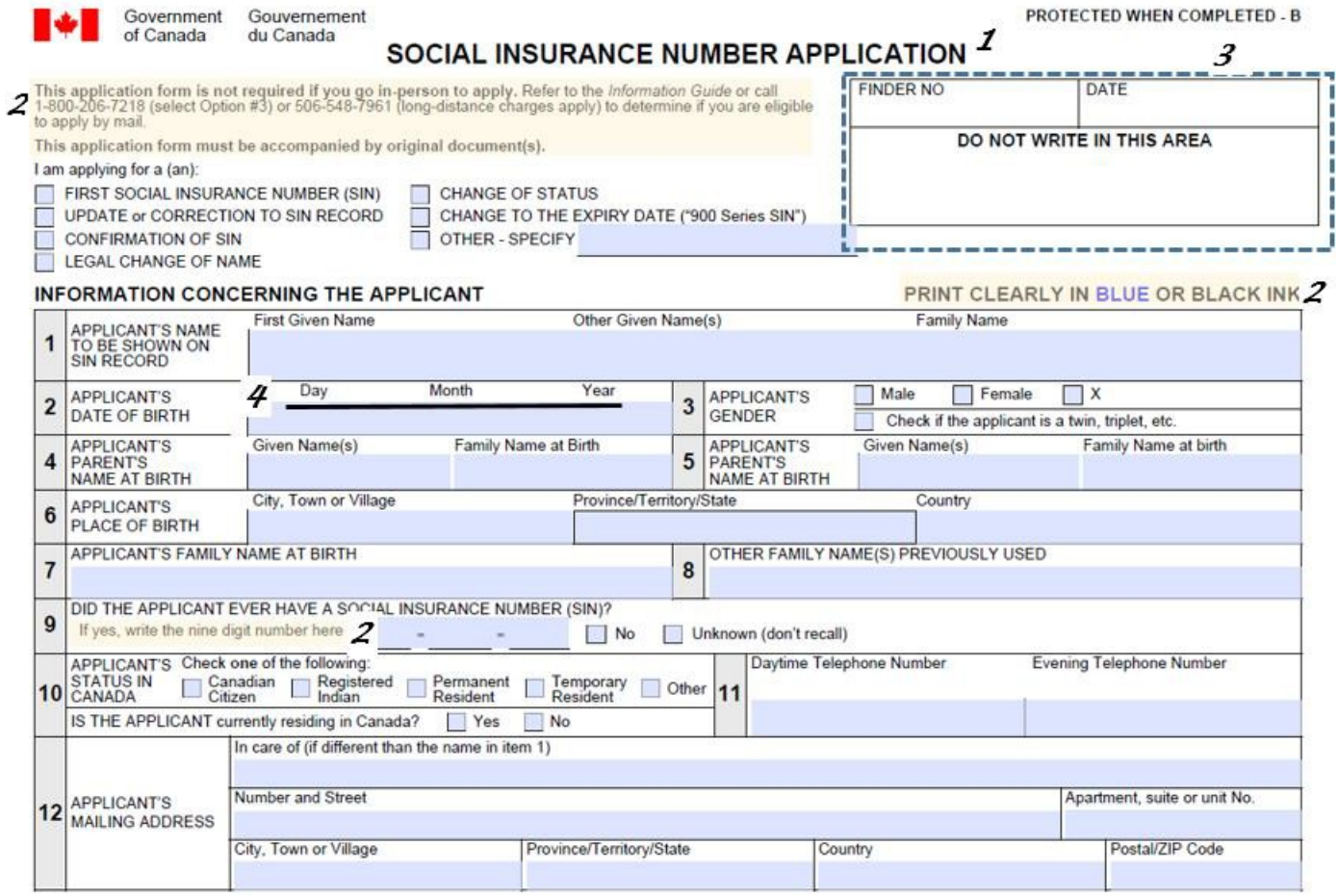
Purpose(s) of Form	Examples
Collect information	Order form, application form, medical history form
Draw conclusions / make decisions	Customs form, assessment form
Document events	Time card, accident report, medical chart, logbook
Check information	Bills and invoices, claim forms, treatment option form
Provide instruction	Process instructions, recipes

5. Double-check what you wrote and correct any errors. Make sure you completed all required sections.

EXAMPLE

In order to work in Canada, you must have a social insurance number (SIN) and in order to receive a SIN you must complete an entry form either online or in paper format. The features of the SIN form shown below have been marked, to help you identify them.

1. The SIN is an application form. The purpose of the form is to collect information.
2. The directions have been highlighted in yellow.
3. The section of the form to be filled out by someone else has a dashed line around it.
4. The desired format of dates has been underlined.



Government of Canada / Gouvernement du Canada

PROTECTED WHEN COMPLETED - B

SOCIAL INSURANCE NUMBER APPLICATION 1

2 This application form is not required if you go in-person to apply. Refer to the *Information Guide* or call 1-800-206-7218 (select Option #3) or 506-548-7961 (long-distance charges apply) to determine if you are eligible to apply by mail.

This application form must be accompanied by original document(s).

I am applying for a (an):

- ☐ FIRST SOCIAL INSURANCE NUMBER (SIN)
- ☐ UPDATE or CORRECTION TO SIN RECORD
- ☐ CONFIRMATION OF SIN
- ☐ LEGAL CHANGE OF NAME
- ☐ CHANGE OF STATUS
- ☐ CHANGE TO THE EXPIRY DATE ("900 Series SIN")
- ☐ OTHER - SPECIFY

3

FINDER NO	DATE
DO NOT WRITE IN THIS AREA	

INFORMATION CONCERNING THE APPLICANT

PRINT CLEARLY IN BLUE OR BLACK INK 2

1	APPLICANT'S NAME TO BE SHOWN ON SIN RECORD	First Given Name / Other Given Name(s) / Family Name
2	APPLICANT'S DATE OF BIRTH	4 Day / Month / Year
3	APPLICANT'S GENDER	☐ Male ☐ Female ☐ X — Check if the applicant is a twin, triplet, etc.
4	APPLICANT'S PARENT'S NAME AT BIRTH	Given Name(s) / Family Name at Birth
5	APPLICANT'S PARENT'S NAME AT BIRTH	Given Name(s) / Family Name at birth
6	APPLICANT'S PLACE OF BIRTH	City, Town or Village / Province/Territory/State / Country
7	APPLICANT'S FAMILY NAME AT BIRTH	
8	OTHER FAMILY NAME(S) PREVIOUSLY USED	
9	DID THE APPLICANT EVER HAVE A SOCIAL INSURANCE NUMBER (SIN)? If yes, write the nine digit number here 2 ___ - ___ - ___	☐ No ☐ Unknown (don't recall)
10	APPLICANT'S STATUS IN CANADA — Check one of the following:	☐ Canadian Citizen ☐ Registered Indian ☐ Permanent Resident ☐ Temporary Resident ☐ Other
	IS THE APPLICANT currently residing in Canada?	☐ Yes ☐ No
11		Daytime Telephone Number / Evening Telephone Number
12	APPLICANT'S MAILING ADDRESS	In care of (if different than the name in item 1) / Number and Street / Apartment, suite or unit No. / City, Town or Village / Province/Territory/State / Country / Postal/ZIP Code

Source: Employment and Social Development Canada [Government of Canada]. *Application for a Social Insurance Number* [NAS-2120-(05-19)]. https://catalogue.servicecanada.gc.ca/content/EForms/en/Detail.html?Form=NAS2120. The content may not be current. This partial reproduction is from an official source published by the Government of Canada and is neither affiliated with, nor endorsed by the Government of Canada. Used with Permission.

USING THE SKILL

In the Workplace: Workers use incident reports to document the details of an unusual event that occurred at work, such as an injury to a fellow worker. The details are recorded, as soon as possible, by all people who witnessed the event.

QUESTIONS

Read the description below of an incident that occurred on a job site. Use the information to complete the incident report form that follows.

Tips for writing an incident report:

- Use simple words and describe the event in chronological order.
- Be accurate and honest.
    - Incident reports can be used when dealing with liability or other legal issues, so don't write something you're not sure of.

REFLECTION

How do you use entry forms at work? When do you use them?

Incident Description

On July 16 2018 Jo Walsh was hurt on the job while she was working on an apartment construction site where she was the electrician installing fire alarms. In one of the units there was some left over drywall stacked against a wall and when she walked by it suddenly fell and hit her on the right shoulder. There was a big stack of it and it caused a lot of bruising and swelling. She hasn't been able to move her shoulder properly since then. The apartments are at 11066 East Howe St. and she was in unit 625. It was actually the last unit where she had to install an alarm. Jeff Walker, a plumber, was working in the unit next door and heard Jo yell when the material fell. He went in to check on what had happened, and lifted the drywall out of the way and called EMS because he wasn't sure how badly Jo was hurt. EMS wasn't sure either and thought she definitely needed an x-ray and to have a doctor check her shoulder so they took her to City Centre Hospital. This all started near the end of the day at about 5 pm. The drywallers shouldn't leave unused drywall stacked lengthwise like that. It's too easy for it to fall over and cause an injury. If they are going to leave material behind they should make sure it is supported so it won't fall.

Krista Stewart - Foreperson

July 20, 2018

Legal reference form # (office use only):			
INCIDENT REPORT FORM	Incident rept. form #:		
	Incident report form date (dd/mm/yy):		
TYPE OF INCIDENT			
Environmental Incident - Description	Health & Safety Incident - Description		
Exact location of incident/accident/near miss		Date, hour, shift of incident/accident/near miss	
Name of Person	Occupation	At time of incident, working at	
Part of body affected by injury	Type of injury	If fatal - Describe	
	☐ Near miss ☐ Minor injury ☐ Fatal occurrence ☐ Other		
First Aid Details			
Cause of incident/accident/near miss			
Suggested preventive/corrective action to avoid similar incident/accident/near miss in future			
REPORT PREPARED BY (NAME & SIGNATURE REQUIRED)		**DATE** (dd/mm/yy)	
Submit completed form to site Occupational Health & Safety Officer			

FLOWCHARTS

Flowcharts are often used at workplaces to show the steps that need to be taken, and the order in which they need to be taken, to complete a task or respond to an emergency or other critical situation. Flowcharts are also useful for providing a visual description of a process or procedure.

KEY POINTS

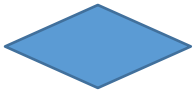
Flowcharts:

- are diagrams that represent actions or movements to be taken to complete a process
- are intended to show a complete process "at a glance"
- can help simplify complex procedures into easier-to-follow, step-by-step images
- are usually read left to right and top to bottom

Common features of flowcharts are:

- titles to indicate what process is being described
- short, concise text
- abbreviations to save space
- standardized symbols that represent different actions or steps in a process

Common flowchart symbols:

Symbol	Name	What it means
	Start/Stop	A circle, oval or rounded rectangle starts or ends the process.
	Step/Task	A rectangle means a step in the process or a task. Slanted rectangles usually mean sub-steps or sub-processes.
	Process Direction	Arrows and lines indicate the order of the steps.
	Decision Point	A diamond shape means that you need to make a choice or decision.

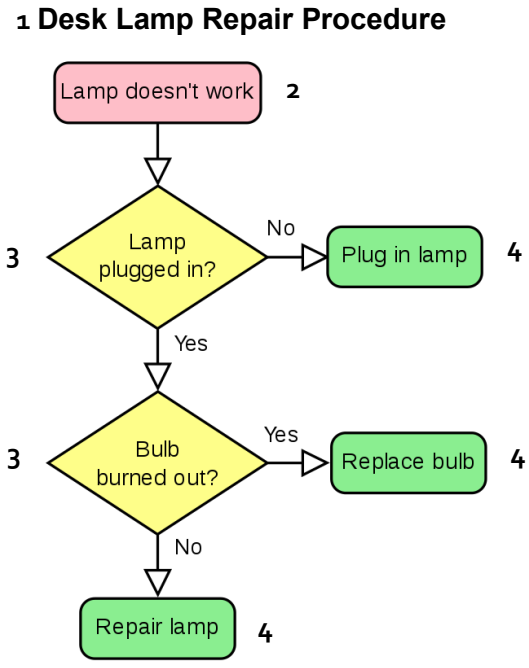
STEPS

1. Check the title to make sure the flowchart refers to the process you need to understand.
2. Look for the start (often at the top of the page). If formal symbols are being used the start will be shown as a circle, oval or rounded rectangle.
3. Scan the flowchart for steps that you must complete and for what comes before and after your responsibilities.
4. Follow the process.

EXAMPLES

The flowchart below contains a number of the common elements of a flowchart.

1. There is a title - Desk Lamp Repair Procedure
2. The start of the process is described in a rounded rectangle shape. In the case of this flowchart, the first step is only taken, if the lamp doesn't work.
3. There are 2 decision points, shown in diamond shapes. In the first, the user needs to decide if the lamp is plugged in in the second, if the bulb is burned out.
4. There are 3 possible ends to the flowchart and each is shown as a rounded rectangle. If the lamp is not plugged in and it works once it is, the process ends. If the bulb is burned out and it the lamp works after the bulb is replaced, the process ends. If the lamp does not work after being plugged in and having the bulb changed, the process ends with the instruction to get the lamp repaired.



Think you understand how to read flowcharts?

Try it yourself on the next page.

USING THE SKILL

In the Workplace: Flowcharts can help workers to follow processes and make important decisions, so that they are more effective, efficient, and safe, on the job.

QUESTIONS

Test your understanding of how to read flowcharts by locating the answers to the following questions in the flowchart on the next page.

1. What title would you give to this flowchart?

2. What is the process being described by this flowchart?

3. What symbol should be used with the text "*Owner hires design professional (DP) to modify a building"*?

4. What happens if the application is incomplete?

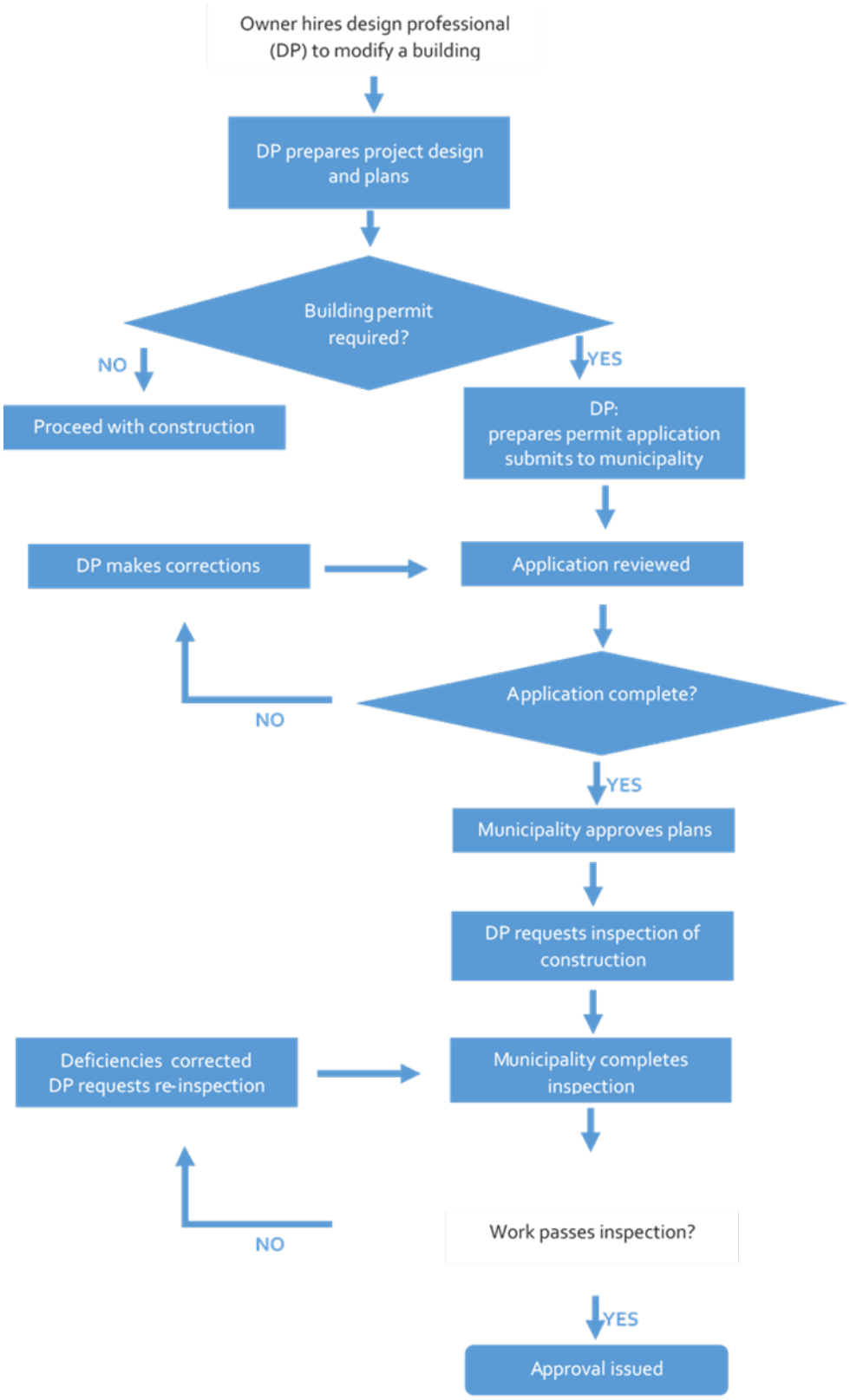
5. Who performs the inspection?

6. What should the DP do if the work does not pass inspection?

7. What symbol should be used with the text "*Work passes inspection?"*

REFLECTION

How do you use flowcharts at work? When do you use them?


Owner hires design professional (DP) to modify a building
DP prepares project design and plans
Building permit required?
NO
YES
Proceed with construction
DP: prepares permit application submits to municipality
DP makes corrections
Application reviewed
Application complete?
NO
YES
Municipality approves plans
DP requests inspection of construction
Deficiencies corrected DP requests re-inspection
Municipality completes inspection
NO
Work passes inspection?
YES
Approval issued

NAVIGATING REGULATIONS

Regulations, according to dictionary.com, are rules or directives made and maintained by an authority, for example, planning regulations. Being able to navigate regulations accurately and efficiently can save time and money, and help prevent workplace accidents. They also help workers and employers to understand and comply with laws. Breaking the law, as defined in a regulation, may have serious consequences including fines or jail.

KEY POINTS

Regulations:

- are descriptions of legal requirements that must be followed by employers and employees and, in some cases, by the general public. Examples include regulations related to:
  - treatment of workers
  - workplace safety requirements
  - building, electrical, or plumbing code
  - registered trade designations
  - use of parks and other public lands
- are complex documents
- often contain specialized legal wording (where this; then that; no person shall; in accordance with; subject to; shall be deemed; etc)
- use other words in specific ways that are signals or clues that help with understanding the content. For example,
  - a list of requirements connected by the word "**and,**" means <u>all</u> of the requirements in the list must be met
    - every supervisor must do part 1 **and** part 2
  - a list of requirements connected by the word "**or,**" means <u>only one</u> of the requirements in the list must be met
    - every supervisor must do part 1 **or** part 2
  - other signal words include: unless, except, shall, must, and may
- use many of the same formatting and numbering conventions of other common documents, such as, contracts. These include:
  - tables of contents
  - indexes
  - glossaries
  - headings and sub-headings
  - sections and sub-sections
  - font formatting such as **bold** or *italicized* font
  - a numbering system
    - numbering systems may include Roman numerals e.g. Section **VI**
- are frequently updated and it is the responsibility of employees and employers to stay current.

STEPS

1. Decide what information you are looking for. Write it down if that will help.
2. Skim the table of contents for sections and scan for relevant key words.
3. If available, check out the "how to" section at the beginning of the document that includes definitions and tips on how to interpret regulations.
4. Reading regulations requires concentration and focus. Once you've found the relevant regulation, it could help to read it aloud.
5. It may also help to break down the regulation into steps by writing a list or drawing a chart or diagram.

EXAMPLES

Understanding how regulations are formatted will help you find the information you need quickly. Look at the excerpt from the *Canada Occupational Health and Safety Regulations* on the next page. The following formatting clues can be identified:

- English text is on the left; French text is on the right.
- The document is divided into Part 1 and Part 2.
- Part 1 has no title, but Part 2 is titled "Permanent Structures."
- "Parts" are further divided into "Divisions." For example, "Temporary Heating" is located in Part 2, Division 1.
- Decimal points are used to number topics. For example, "Temporary Heating" is numbered as 2.17, meaning it is the 17th topic in Part 2.

TABLE OF PROVISIONS		TABLE ANALYTIQUE	
Canada Occupational Health and Safety Regulations		**Règlement canadien sur la santé et la sécurité au travail**	
1.1	Part I	1.1	Partie I
1.2	Interpretation	1.2	Définitions
1.3	Prescription	1.3	Objet réglementaire
1.31	Application	1.31	Application
1.5	Records	1.5	Dossiers
1.6	Inconsistent Provisions	1.6	Incompatibilité
1.8	Alternate Media	1.8	Médias substituts
2.1	**PART II** Permanent Structures	2.1	**PARTIE II** Ouvrages permanents
2.1	Interpretation	2.1	Définitions
2.2	**DIVISION I** Buildings	2.2	**SECTION I** Bâtiments
2.2	Standards	2.2	Normes
2.3	Doors	2.3	Portes
2.4	Clearances	2.4	Hauteurs libres
2.5	Floor and Wall Openings	2.5	Ouvertures dans les planchers et les murs
2.6	Open-top Bins, Hoppers, Vats and Pits	2.6	Compartiments, trémies, cuves et fosses dont la partie supérieure est ouverte
2.7	Ladders, Stairways and Ramps	2.7	Échelles, escaliers et plans inclinés
2.11	Docks, Ramps and Dock Plates	2.11	Quais, plans inclinés et débarcadères
2.12	Guardrails	2.12	Garde-fous
2.13	Toe Boards	2.13	Butoirs de pied
2.14	Housekeeping and Maintenance	2.14	Ordre, propreté et entretien
2.17	Temporary Heating	2.17	Chauffage temporaire

Source: Department of Justice (Government of Canada). *Canada Occupational Health and Safety Regulations (SOR/86-304).* Retrieved from https://laws.justice.gc.ca/PDF/SOR-86-304.pdf. This partial reproduction is from an official source published by the Government of Canada and is neither affiliated with, nor endorsed by the Government of Canada.

Think you understand how to read regulations?
Try it yourself on the next page.

USING THE SKILL

In the Workplace: many trades have regulated codes that must be followed. Completing work safely and correctly relies, in part, on being able to find and understand information in these regulations.

QUESTIONS

On the next two pages is an excerpt from the *Alberta Plumbing Code Regulation* table of contents. Use the table of contents to answer the following questions.

1. The plumbing code has 8 main sections. Some of the sections have sub and sub-sub sections as well. How many sub and sub-sub-sections are in section 1?

   sub sections _____

   sub-sub-sections _____

2. What kind of plumbing systems are not covered by this regulation? In what section did you find the answer?

3. Can plumbing systems equipment be used without proof of certification? In what section did you find the answer?

4. Does the code guarantee that equipment that meets required regulation and code standards is in good working order? In what section did you find the answer?

REFLECTION

How do you use regulations at work? When would you use them?

ALBERTA REGULATION 119/2007

Safety Codes Act

PLUMBING CODE REGULATION

Table of Contents

Interpretation

1(1) In this Regulation,

(a) "Act" means the *Safety Codes Act*;

(b) "certification body" means an organization accredited by the Standards Council of Canada as a certification body;

(c) "Code" means the National Plumbing Code of Canada declared in force by this Regulation.

(2) The definitions in the Act and the Code apply to the words used in this Regulation.

(3) References to the following expressions in a code that is declared in force by this Regulation are to be read as references to the "Alberta Building Code as declared in force by the *Building Code Regulation* (AR 31/2015)":

(a) "National Building Code of Canada";

(b) "NBC".

(4) References to the following expressions in a code that is declared in force by this Regulation are to be read as references to the "Alberta Fire Code as declared in force by the *Fire Code Regulation* (AR 32/2015)":

(a) "National Fire Code of Canada";

(b) "NFC".

AR 119/2007 s1;154/2012;208/2016

Exemption

2 This Regulation does not apply to plumbing systems that are private sewage disposal systems.

Approved equipment

3(1) If the Code requires approved equipment, that equipment must meet the requirements of subsection (2).

(2) No person shall, for use in Alberta, manufacture, install, sell or offer for sale any equipment related to plumbing systems unless the equipment has been

(a) tested and certified by a certification body, or

(b) inspected and approved by a certification body and the equipment bears evidence of having been accepted in the manner authorized by the certification body.

Plumbing Code

4(1) The National Plumbing Code of Canada 2015, published by the National Research Council of Canada, is declared in force as amended or replaced from time to time.

(2) to **(17)** Repealed AR 208/2016 s3.

AR 119/2007 s4;154/2016;208/2016

Crown disclaimer

5 The Code declared in force by this Regulation and any code or standards referenced in that Code do not make or imply any assurance or guarantee by the Crown in right of Alberta with respect to life expectancy, durability or operating performance of equipment or materials referenced in the codes or standards.

AR 119/2007 s5;208/2016

Repeal

6 The *Plumbing Code Regulation* (AR 219/97) is repealed.

7 Repealed AR 227/2012 s6.

Coming into force

8 This Regulation comes into force on September 2, 2007.

Source: http://www.qp.alberta.ca/1266.cfm?page=2007_119.cfm&leg_type=Regs&isbncln=9780779724178
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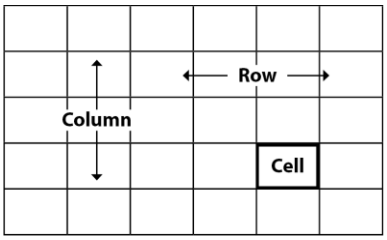
TABLES & LISTS

Tables are made up of lists and are one of the most common structures used to organize information. They are not meant to be read in detail. They are used to help people quickly find specific information or easily compare and contrast information.

KEY POINTS

Tables:

- are an arrangement of information that is displayed in rows and columns and cells
- are typically read top to bottom and left to right.
- contain two or more columns of information related to each other across the row.



Lists:

- The most basic table is a list with one column and two rows.
- The 1st row is the title (can also be called a label or heading)
- The 2nd row contains items that can be organized in different ways such as alphabetically or by importance
- The title of the list indicates the relationship between the items
    - In the example to the right, the relationship amongst the items is that they are all gasses.

GASES
Butane
Methane
Octane
Propane

Intersecting table:

- Contain three separate lists of information in one display
- Information is found in the intersecting cell where a row and column meet. The intersection relates two types of information to each other.
- Is a type of table in which the information you require is found by looking down and across to a third location.

	Monday	Tuesday	Wednesday	Thursday	Friday
7:00 am-7:30 am	Prints		Prints		Prints
8:00 am-8:30 am	Electronics		Electronics		Electronics
9:00 am-9:30 am		Electronics		Electronics	
10:00 am-10:30 am	Electrical Theory	Installation Methods	Electrical Theory	Installation Methods	Electrical Theory
11:00 am-11:30 am	Instrumentation		Instrumentation		Installation Methods
12:00 pm-12:30 pm		Electrical Theory		Electrical Theory	
1:00 pm-1:30 pm	Canadian Electrical Code	Prints	Canadian Electrical Code	Prints	Canadian Electrical Code
2:00 pm-2:30 pm					
3:00 pm-3:30 pm	Installation Methods	Instrumentation		Instrumentation	
4:00 pm-4:30 pm			Installation Methods		

STEPS

1. Determine what information you are trying to find.
2. Scan the row and column headers and find the point where they meet (or intersect) in the table.
3. Double-check that this is the information you are looking for.

EXAMPLE

Tables can be used to organize jobs with many steps. For example, the table below shows the tasks to be completed to install an in-ground pool.

TASK	WORKER	# WORKERS	DAY	MATERIAL COSTS
Excavate	Machine operator	2	5	1,500
Frame walls	Mason	4	6	800
Install plumbing	Plumber	2	3	700
Install electrical	Electrician	2	2	500
Pour concrete	Mason	2	4	2,000
Install pump & filter	Plumber	1	1	3,000
TOTALS		**13**	**21**	**8,500**

This one small table contains a wealth of information about what needs to be done to install the pool.

It describes, with very few words:

- what types of skilled workers are needed for the project,
- how many of each worker is required,
- how many days each task will take,
- the cost of any materials needed to complete each task

With this information it is possible to answer questions related to the job such as how many electricians will be needed, how much will the plumbing materials cost, how many days will it take in total to install the pool. If you had to read all this in a page of text it would take considerably longer to find the information.

Think you understand how tables and lists work?

Try it yourself on the next page.

USING THE SKILL

In the Workplace: Safety bulletins contain important information related to maintaining safe conditions on the jobsite to reduce accidents, injuries and lost time.

QUESTIONS

Locate the answers to the following questions in the table and write them in the space provided.

1. How many columns and rows does the table have?

2. Aside from the table format, what are two other formatting clues that will help you find information quickly?

3. You have been asked to find the lockout guidelines for materials in the supply lines of bins and silos. Highlight the row in which you would find the information.

4. Kinetic energy sources are used at your workplace. What is the most important thing you need to explain to co-workers about what must be done to lockout kinetic energy sources?

5. In your own words, summarize the lockout guideline for Electrical Energy.

REFLECTION

How do you use tables and lists at work? When do you use them?

Health & Safety ONTARIO
YOUR PARTNERS IN PREVENTION

Lockout

Figure 1

Energy forms, energy sources, and general lockout guidelines

Energy Form	Energy Source	General Lockout Guideline
Electrical Energy	▪ Power transmission lines ▪ Machine power cords ▪ Motors ▪ Solenoids ▪ Capacitors (stored electrical energy)	▪ Turn off power at machine first (i.e., at point of operation switch) and then at the main disconnect switch for the machine ▪ Lock and tag main disconnect switch (or remove fuses from box, and then lock and tag box) ▪ Fully discharge all capacitive systems (e.g., cycle machine to drain power from capacitors) according to manufacturer's instructions
Hydraulic Energy	▪ Hydraulic systems (e.g., hydraulic presses, rams, cylinders, hammers)	▪ shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves ▪ Bleed off and blank lines as necessary
Pneumatic Energy	▪ Pneumatic systems (e.g., lines, pressure reservoirs, accumulators, air surge tanks, rams, cylinders)	▪ Shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves ▪ Bleed off excess air; if pressure cannot be relieved, block any possible movement of machinery
Kinetic Energy (energy of a moving object or materials moving object may be powered or coasting)	▪ Blades ▪ Flywheels ▪ Materials in supply lines of bins or silos	▪ Stop and block machine parts (e.g., stop flywheels and ensure that they do not recycle) ▪ Review entire cycle of mechanical motion, ensure that all motions are stopped ▪ Block material from moving into area of work; blank as required
Potential Energy (stored energy that an object has the potential to release due to its position)	▪ Springs (e.g., in air brake cylinders) ▪ Actuators ▪ Counterweights ▪ Raised loads ▪ Top or movable part of a press or lifting device	▪ If possible, lower all suspended parts and loads to the lowest (rest) position ▪ Block parts that might be moved by gravity ▪ Release or block spring energy
Thermal Energy	▪ Supply lines ▪ Storage tanks and vessels	▪ Shut off, lock (with chains, built-in lockout devices, or lockout attachments) and tag valves ▪ Bleed off excess liquids or gases; blank lines as necessary

4 | © 2011, Safe Workplace Promotion Services Ontario, publicly known as Workplace Safety & Prevention Services.
1 877 494 WSPS (9777) | 905 614 1400 | www.wsps.ca

Workplace Safety & Prevention Services
A Health & Safety Ontario Partner

Source: Workplace Safety & Prevention Services (2013). Lockout [PDF. Revised June 2011]. Retrieved from http://www.wsps.ca/WSPS/media/Site/Resources/Downloads/WSPS_Lockout_2013_Final-loRs.pdf?ext=.pdf . Document adapted from source. Content may not be current.

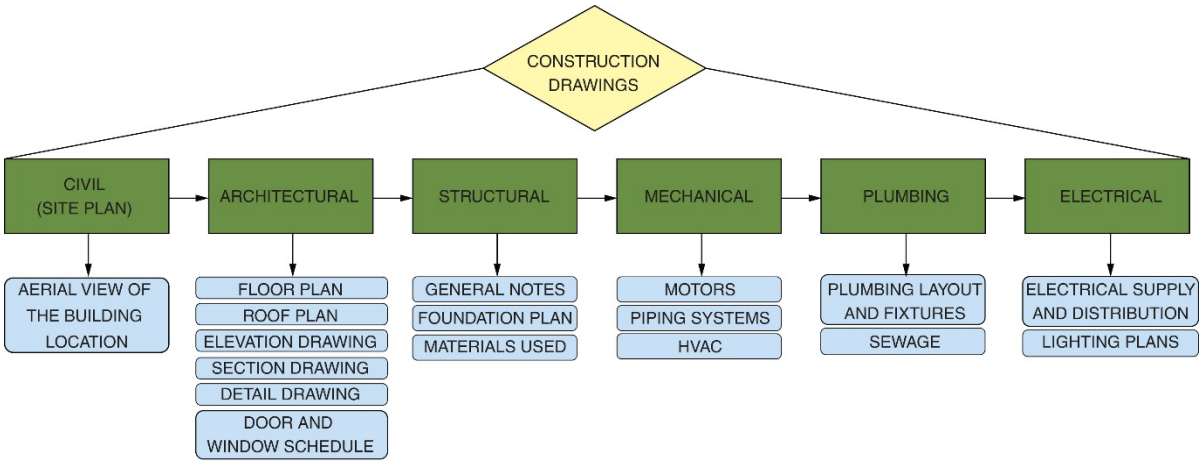
TECHNICAL DRAWINGS

Contractors, estimators, builders and tradespersons all rely on technical drawings for the information they need to construct and/or manufacture a product.

KEY POINTS

Technical Drawings:

- visually communicate how something is, or is to be constructed, or how it functions
- include a variety of plans that communicate how to build or repair things
- are accurate drawings that may show anything from a complete house design to how to fit small parts together
- use a system called the **Alphabet of Lines**, as part of how information is communicated
    - line styles describe the features of a site or buildings or the parts or fixtures of a construction project, shown in a set of technical drawings
    - line features vary by thickness, degree of darkness, solid or broken
    - thin, light lines are less important than thick dark lines
- include all of the common drawings used on a construction project such as those described in the chart below
    - Note that "blueprints" refers to reproductions of original technical drawings that used to be blue due to the process used to create them. Today they are usually white.



Source: Copyright National Center for Construction Education and Research, 2015. Used with permission.

Title Blocks, Scale, Revision Records, and Legends

- Title blocks commonly run horizontally across the bottom of the page or vertically on the right side of the page
- Scale may be shown as part of the title box or stand-alone
- Revision records will be in a separate box labelled as revisions
- Legends show symbols used in the drawing

Component	Description
TITLE BLOCK	
North point	Shows which way is north in relation to what is being built
Project name	Clear description of the project such as New house at
Project address	Correct location of the project
Project number (Job number)	A reference number for the project, given by the company preparing the drawing
Drawing title	Describes drawing and what is shown e.g. Roof Plan
Scale	The scale at which the drawing was plotted/printed. Take all measurements for construction purposes from the dimensions written on the drawing, not the scale.
Date	When the drawing was created
Drawing number	Number given for identification and for reference. Shown on every page of a drawing.
Revision	A letter or number indicating a change has been made and the revised drawing was resubmitted
Contact information	Contact information for the person or company that prepared the drawing(s)
Other information	Any extra information the company/individual preparing the drawing believed was needed for clarification.
REVISIONS RECORD	
Revisions record	A separate block on the drawing with date, a brief description, and approval, for each revision made. Always check the revision number and record to ensure you are looking at the most recent drawing.
LEGENDS	
Legend	Description of any symbols used in a drawing

See the examples on the next page.

C	New links added to G823.	DJ	05/09/13
B	Removed G832. Added new reinforcement to G84 and G812. Added new G848	DJ	02/09/13
A	Ground beam B82 revised.	DJ	01/09/13
REV	DESCRIPTION	BY:	DATE:
STATUS:	CONSTRUCTION ISSUE		

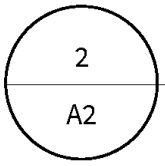
CLIENT:	UHUB DEVELOPMENTS 56 New Hope Road London, ON C1B 3A5
ARCHITECT:	EDMUNDS ARCHITECTS 124 Logan Street London, ON C3L 7V3

SITE:	31 ROGERS ROAD BLOCK A AND B		
TITLE:	RC DETAILS AND SECTIONS OF GROUND BEAMS		
SCALE AT A0: 1:50, 1:100	DATE: 05/09/13	DRAWN: DJ	CHECKED: DJ
PROJECT NO: 24567	DRAWING NO: AO/248	REVISION: C	

TITLE BLOCK

REV	DATE	DESCRIPTION	APP.
REVISIONS			

REVISION RECORD

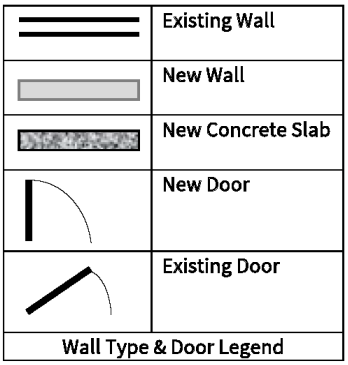


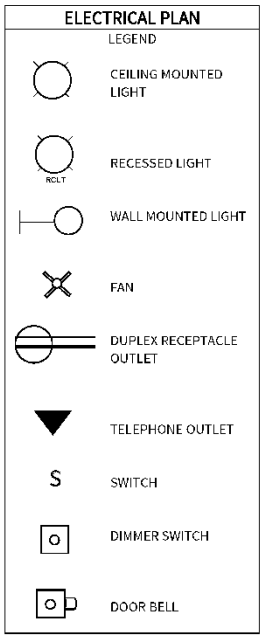
REFLECTED CEILING PLAN

SCALE: ½" = 1'-0"

SCALE

Source: Janicki, D. (n.d) Construction form template.[Image]. Retrieved from: https:/www.yourspreadsheets.co.uk/title-blocks-for-cad.html. Content has been modified from source.





LEGENDS

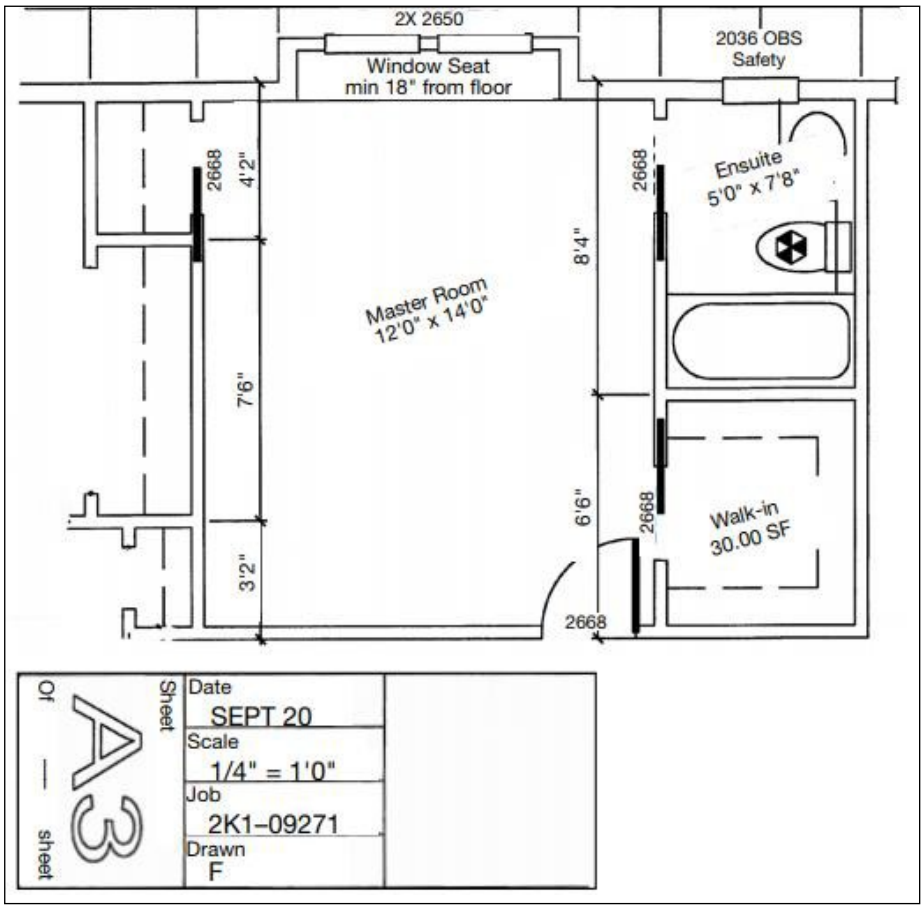
STEPS

1. **Read the title block and any revision records.**
2. **Determine the view.** In 2 dimensional (2D) drawings, there can be three perspectives:
    a. Plan View: bird's eye view from above
    b. Elevation View: view from the side
    c. Section View: view of something as if it were cut in half
3. **Review the legend.**
4. **Read the lines.**
5. **Read the dimensions of the lines** that are relevant to the work you need to do.

EXAMPLES

If you followed the steps above, you would find this information in the drawing example shown below.

1. The title block shows date, scale, job number, page number and drawing number. There is no revision record shown.
2. The drawing is a Plan View (from above - sometimes called Aerial or Top view).
3. There is no legend.
4. The scale shown is ¼" = 1' so ¼ inch on the drawing equals 1 foot in in the physical space.
    - Remember - do not rely on the scale for the dimensions you need. Read the dimension lines on the drawing for any construction purposes.
5. The drawing uses imperial measurements. You may need to convert to metric, in order to complete your work.



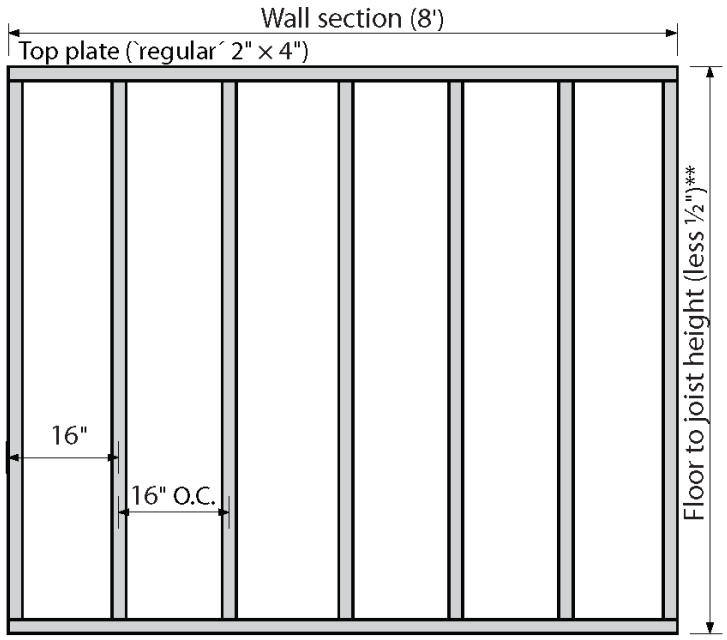
Source: Human Resources and Skill Development Canada. (2010). Technical Drawing. [Image]. In Trades math workbook. (p. 16). Retrieved from: http://506tc.org/_pdf/Trade-Math-Workbook.pdf.

EXAMPLES

Tradepersons use technical illustrations, such as diagrams and schematics, when assembling, installing, maintaining or repairing.

Technical illustrations are visual illustrations that explain how something works in a simple way. Technical illustrations may show the relationship between different parts, such as in a process or system. Similar to technical drawings, technical illustrations provide useful technical information and detailed specifications, such as measurements and information about component location or placement.

Technical illustrations may be two or three-dimensional and may contain authentic or realistic images. Technical illustrations provide information through key visual features. Leader lines indicate the specific location of a measurement or show the start and end-points of a particular component. Other lines and directional arrows may indicate the flow of information within a process or system. Technical illustrations use specific colour, shading, shape and size to distinguish important features, and for drawing attention to similar or contrasting information.



Source: ITA-Youth Explore Trades Skills (2013) *Carpenter Activity Plans* (p.64). This work is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.

Think you understand how to read technical drawings?
Try it yourself on the next page.

USING THE SKILL

In the Workplace: technical drawings are used as part of build and repair processes.

QUESTIONS

Use the drawing on the next page to answer the following questions.

1. What is the length of the rim joists?

2. How long is the floor at the mid-point?

3. How many blocks are needed to build this floor?

4. How wide is each joist spaced apart, centre-to-centre, within the floor frame?

5. How long is each joist cut to build the floor as shown?

6. What is the length of each 4" x 6" beam as shown in the drawing?

7. Measuring from the outside edge of the first joist, at what measurement is the lead edge of the second joist marked on the rim joist to ensure the correct spacing of all remaining joists and build the floor as shown?

8. Circle the blocking shown in the drawing.

9. Based on the information provided or shown in the drawing, which of the following statements is true?

    a) Rim joists are cut to length to fit identically sized blocking.
    b) The length of the 4" x 6" beams cannot be found using this drawing.
    c) 8 ft. joists are cut to a different length to assemble the floor between the 12 ft. rim joists.
    d) The distance between the joists is the same for the entire floor.

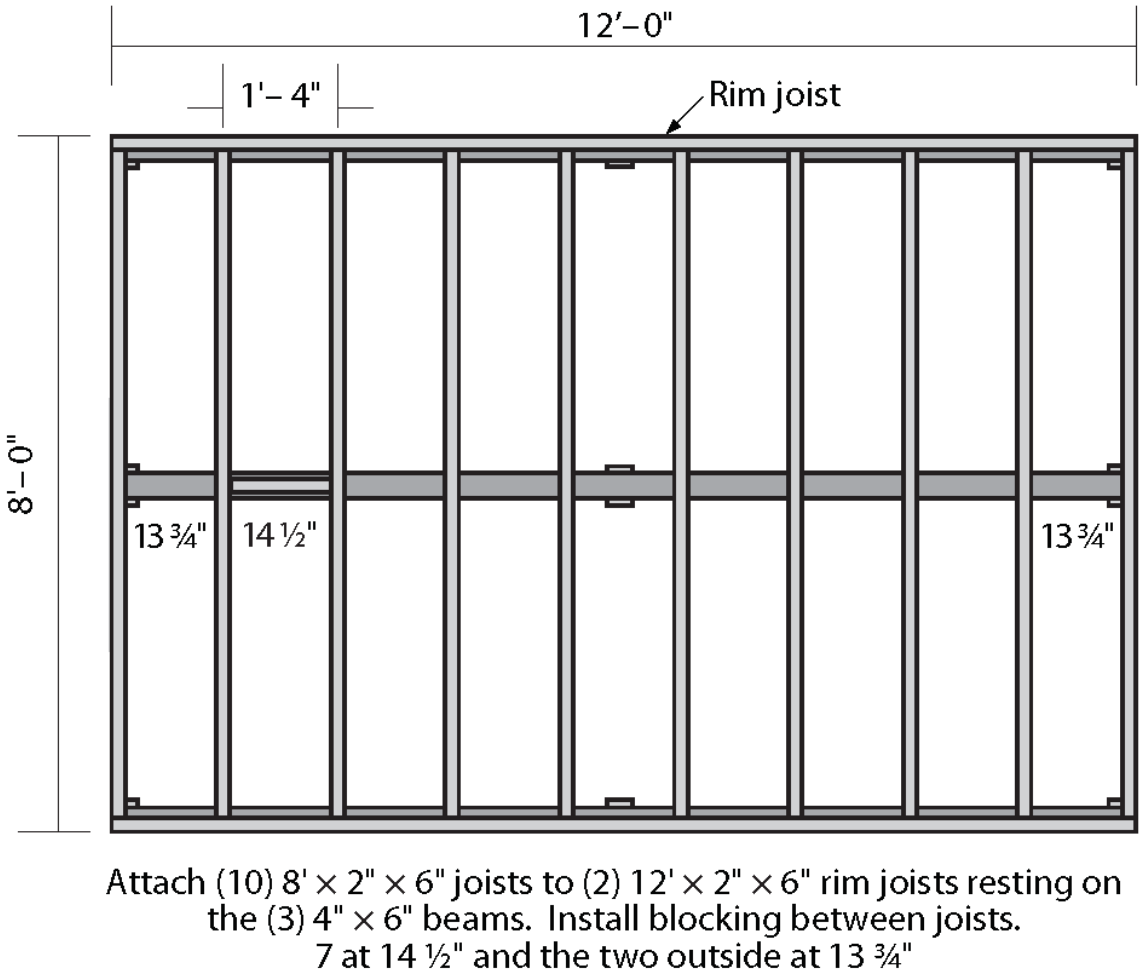


Figure 6—Sample drawing illustrating basic measurements and spacing between joists for a floor

Source: ITA-Youth Explore Trades Skills (2013) *Carpenter Activity Plans* (p.44).
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REFLECTION

How do you use technical drawings at work? When do you use them?