



on your

**TALENTS**

## Essential Skills Activities for Trades

Because you're training for more than a trade.  
You're training for a career.

Funded by the Government of  
Canada's Sector Council Program

Canada

The Construction Sector Council is a national organization committed to the development of a highly skilled workforce – one that will support the future needs of the construction industry in Canada. Created in April 2001, and financed by both government and industry, the CSC is a partnership between labour and business.

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For more information contact:

The Construction Sector Council  
220 Laurier Ave. West, Suite 1150  
Ottawa, Ontario, K1P 5Z9  
Phone: 613 569-5552  
Fax: 613 569-1220  
[info@csc-ca.org](mailto:info@csc-ca.org)

Funded by the Government of Canada's Sector Council Program

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Developed by the BC Construction Industry Skills Improvement Council

## Introduction

### Who should use these activities?

This collection of workplace activity sets is designed for educators who are interested in linking academic skills with workplace applications and providing students with authentic career information.

### Why use these activities?

Construction trades careers require physical skills AND strong Essential Skills, in particular, Reading Text, Document Use and Numeracy. These activities simulate workplace situations and demonstrate how Essential Skills are used on construction trades work sites.

- Teachers have an opportunity to reinforce the importance of what they do in the classroom with the world of work.
- Students have an opportunity to apply skills and at the same time learn about requirements for trades careers.

### How can the activities be used?

The activities can be used singly, in groups or as a complete series. Levels of difficulty, trade topics and combination of Essential Skills vary. The following are a few ideas for using the activities in instructional settings:

- Use as an extension activity tied to a lesson. For example, connected to a math or English topic.
- Assign one or more activities as homework or as part of a project.
- Ask individuals or groups who may be considering construction careers to complete selected activities. For example, Pipe Data for someone interested in the plumbing trade.
- Encourage students to evaluate their skills as part of a career exploration curriculum.

### How do I download these materials?

Visit [www.csc-ca.org](http://www.csc-ca.org).

Pages can be printed back to back.



### How are the activities organized?

Three of the nine Essential Skills that workers use every day are emphasized in this collection of activities. They are Reading Text, Document Use and Numeracy. Workers use these skills in combination on the job, and for this reason these skills are combined in the activities.

Math teachers will find activities involving Numeracy to be useful illustrations of math applications. Numeracy is the ability to think in numbers and use math operations to solve problems. *Measurement on the Job* (A1) is straightforward, and asks questions using a measuring tape. *Calculating Fitting Allowances* (B1) is an activity that uses complex math and is combined with reading a drawing to find missing measurements.

Reading Text activities involve blocks of continuous text organized in sentences and paragraphs. These activities focus on the task of finding information that a tradesperson might typically need to solve a problem or learn about a topic. *Blueprint Theory* (A2) requires reading skills to locate the correct part of a passage. *Repair Procedures* (E1) requires integration of information and inference which are skills associated with reading technical materials.

Students and educators will be interested in the Document Use activities. In the workplace, information is displayed in a wide range of formats that have a visual component. Tables, maps and diagrams convey information with words, numbers, pictorial elements and spatial relationships. Unpracticed students may find Document Use activities challenging. *MSDS* (C1) focuses on this skill, but you'll find Document Use questions throughout the activities.

Finally, *Respirator Protection Information* (D1) and *Bending Guidelines and Techniques* (E2) integrate Reading Text, Document Use and Numeracy in their activities.

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## NUMERACY

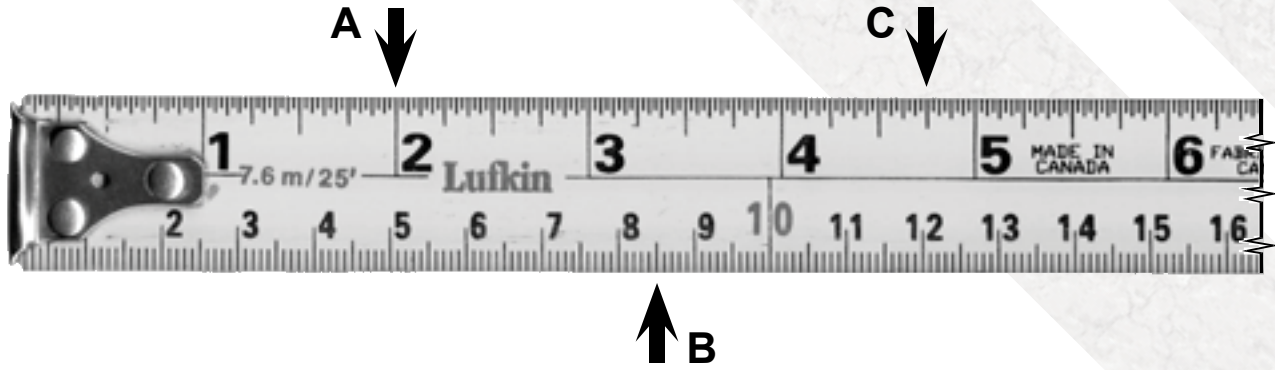
Numeracy involves using numbers and thinking in quantitative terms. On the job, math is used to get the work done accurately and on time and to solve workplace problems. In the construction industry, you will need to combine numeracy with other skills such as Reading and Document Use to measure, schedule, budget and estimate. This work situation may not be familiar to you, but the activity is designed to demonstrate Numeracy skills, not your background knowledge. Numeracy, especially measurement and calculation, is often considered one of the most important Essential Skills for construction occupations.

### Measurement on the Job

Many young people are surprised to find out that much of the measuring on construction projects use the Imperial system. Accuracy to  $\frac{1}{16}$  or  $\frac{1}{32}$  of an inch may be required for some tasks while others require “ball park” estimations. Look at the Measuring Tapes and Drawing to answer the questions below.

- What are the measurements shown at A, B and C on Measuring Tape 1?  
 A \_\_\_\_\_      B \_\_\_\_\_      C \_\_\_\_\_  
*Numeracy and Document Use*
- Locate the following measurements on Measuring Tape 2.  
 Mark the tape with arrows and the letters D, E and F.  
 D 35 inches (35 ")      E 92.4 centimetres (92.4 cm)  
 F 3 feet 2 inches (3' 2")  
*Numeracy and Document Use*
- Use the measuring tapes and a pen or piece of paper to estimate the length of the line in inches.  
 \_\_\_\_\_  
*Numeracy and Document Use*
- Estimate the outside perimeter of the finished building shown on the drawing.  
*Numeracy and Document Use*

### Measuring Tape 1

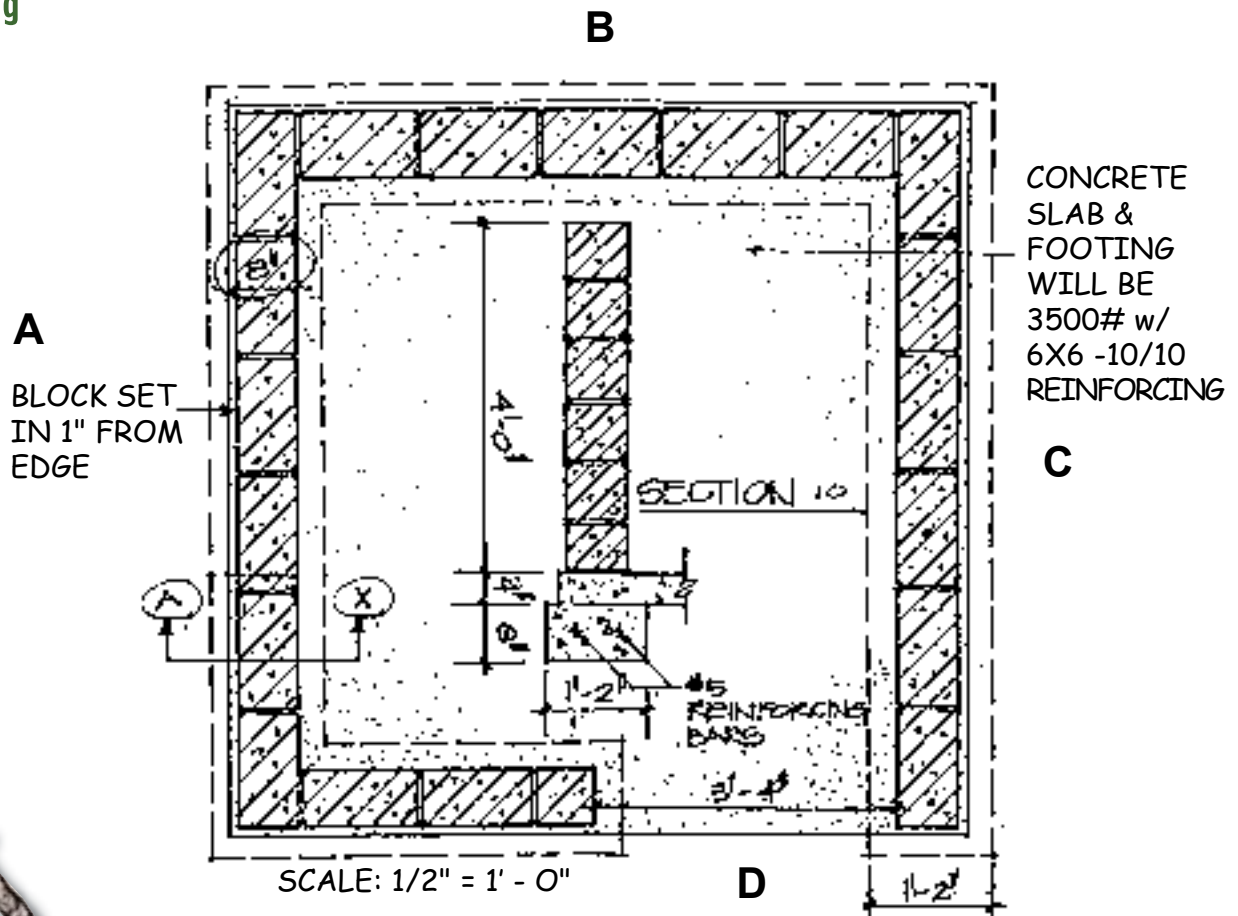


### Measuring Tape 2

Only a section of the tape is shown.



### Drawing



## READING AND DOCUMENT USE

Some reading materials require more than one Essential Skill. A combination of Reading text and Document Use are often needed to find information. Reading means reading material that is in the form of sentences and paragraphs. Document Use tasks involve locating information in different visual displays that include words, numbers and drawings. This work situation may not be familiar to you, but the activity is designed to demonstrate Reading and Document Use skills, not your background knowledge.

### Blueprint Theory

Apprentices in construction trades learn how to read blueprints in technical training. At one time, technical drawings were made from negative images that resulted in blue lines on a white background. Although most prints are no longer blue, they are still one of the most important documents on the job site. Look at the Basic Blueprint Theory page.

- 1 What do the following 3 symbols mean?

*Document Use*



- 2 Draw the line used to show a movable part.

*Reading and Document Use*

- 3 Give 2 reasons why the styles of lines may vary.

*Reading*

- 4 Name 4 parts of drawings and related documents that use symbols and abbreviations.

*Reading*





## BASIC BLUEPRINT THEORY

### Break Lines

Break lines are used to 'break out' a section for purposes of clarity, or to eliminate unimportant sections, therefore allowing the important portions to be drawn to a larger scale. There are three types of break lines, called short break line, long break line, and cylindrical break line. Short break lines are often drawn as fine, ragged lines done freehand. See illustration #1-1H.

### Phantom Lines

The phantom line is used to indicate an alternate position, such as the open or closed position of a handle, a door, or a moving part. The phantom line is often used to indicate the location of an existing part or object in relationship to the new one, or to indicate the repeated detail of an object or part when it is not necessary for clarity purposes to draw it in. See illustration # 1-1

### Section Lines

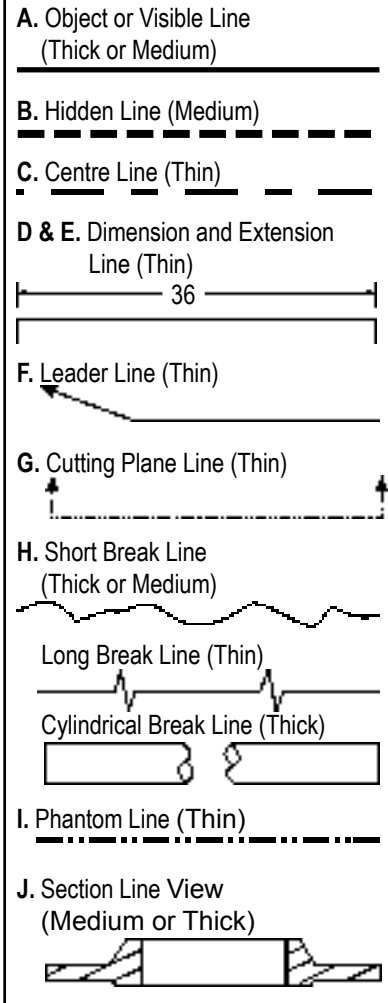
Section lines or section lining is used to give tone to sectioned surfaces. Section lines are most often drawn as thin parallel lines at an angle of approximately 45° to the principal surfaces or axis of the part. See illustration #1-1J. Different section lining denotes the conventional symbol of the material being cut. Different symbols are used to represent different materials including wood, concrete or steel, to name a few.

**Note: In practice, draftpersons use each of these lines to develop a drawing. For hand drawn prints the styles will vary and therefore the lines or the use of the lines will vary as well. With electronic drafting, these lines, symbols and arrowheads will vary somewhat from program to program.**

## Alphabet of Lines

Illustration #1-1 –

### Line Description & Function



## Symbols and Abbreviations Used on Drawings

Illustration #11-2 – Common Symbols

Symbols and abbreviations are used on drawings to save time and conserve space. Abbreviations are used extensively in the bill of materials to describe the different materials and parts that will be used to make the object as specified on the drawing. As well as the bill of materials, symbols and abbreviations are used in the drawing notes,

the revision chart, the specifications, and the title block of the drawing. The reader of the drawing must be able to comprehend the symbols and abbreviations used, or difficulty may be experienced in understanding the drawing. Some of the more common symbols are shown in illustration #1-2.

And	⊕	Equal	=	Channels	[ ]	Structural Tee	T
At	@	Revision	①	Angle(s)	∟	Feet and Inches	' "
Centerline	⊘	Plate	Ⓟ	Back-to-Back Angles	∟∟	Degree of Finish	☑
Perpendicular	⊥	Pitch	1/2	Round or Diameter	∅	Plus or Minus	±
Mark Number	MK	Wide Flange	WF or W	Square	⊠	Parallel	

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## NUMERACY AND DOCUMENT USE

Some reading materials require more than one Essential Skill. Numeracy involves using numbers to make calculations but locating the numbers to set up the problem often requires Document Use skills. In the construction industry, you need to combine Numeracy with Document Use to measure, schedule, budget and estimate.

This work situation may not be familiar to you, but the activity is designed to demonstrate Numeracy and Document Use skills, not your background knowledge.

### Calculating Fitting Allowances

Plumbers add and subtract fractions to calculate the lengths of pipe that will be cut, threaded and joined using fittings. Fittings such as elbows and tees are used to change direction in a piping system. For example, a 90° fitting or elbow changes the direction by 90° and a 45° elbow changes the direction by 45°.

Piping diagrams usually show the measurements for pipe as centre to centre. Centre to centre (c-c) means the measurement from the centre of the fitting on one end of the pipe to the centre of the fitting on the other end of the pipe. Because pipe cannot actually run to the centre of a fitting, the end to end (e-e) measurement of the pipe must be calculated. The e-e measurement is the actual size of the pipe that needs to be cut and then threaded. The thread make-up is the threaded section at each end of the pipe that threads or screws into the fitting.

Use the piping diagram to complete the table with the c-c measurements and e-e measurements for J, K and L. The pipe size is ½".

Hint: A 45° triangle has two equal sides.

*Document Use and Numeracy*

$$e - e = c - c \text{ measurement} - \text{Dimension A} - \text{Dimension B} + 2 \times (\text{thread make-up})$$

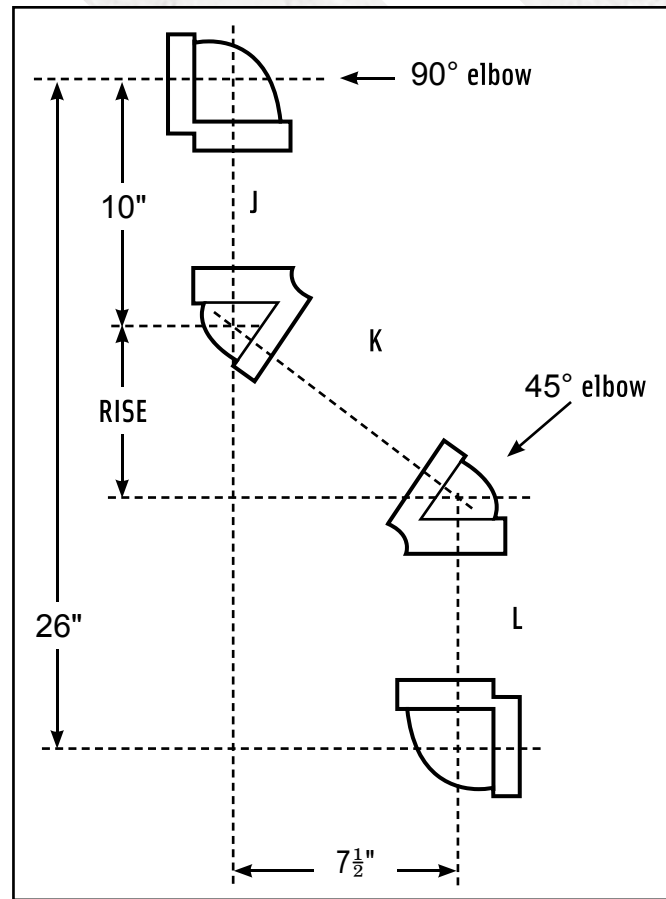
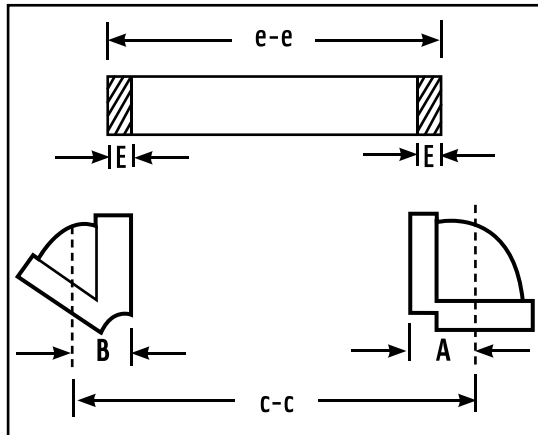
	c - c (centre to centre)	e - e (end to end)
J	10"	
K	*	
L		

\*Hint: Use Pythagorean Theorem ( $a^2 + b^2 = c^2$ ) to calculate c - c.



### Piping Definitions

- c-c measurement from centre of fitting to centre of fitting
- e-e: length of pipe that needs to be cut
- A: takeoff for a 90° elbow or tee
- B: takeoff for a 45° elbow or tee
- E: thread make-up



Measurements for Fittings				
Pipe Size	Dimension A	Dimension B		Thread Make-up E
		45°	22.5°	
1/2"	1 1/8"	7/8"		1/2"
3/4"	1 5/16"	1"	7/8"	9/16"
1"	1 1/2"	1 1/8"	1"	11/16"
1 1/4"	1 3/4"	1 5/16"	1 1/8"	11/16"
1 1/2"	1 5/16"	1 7/16"	1 1/4"	11/16"
2"	2 1/4"	1 11/16"	1 7/16"	3/4"

## Pipe Data

Steamfitters and Pipefitters refer to handbooks when assembling fittings and pipes. Look at the information about Selection/Solvent Cementing.

- 1 What is the most common method used to join PVC pipe and fittings?  
*Reading Text*
- 2 What is the widest applicator brush that should be used when cementing 150 millimeter pipe? Give the answer in millimeters.  
*Document Use*
- 3 A pipefitter, working outside in temperatures just below freezing (0 degrees C) has cemented the joint of a 200 mm pipe. For how many hours does he have to be careful how he handles this joint?  
*Numeracy and Document Use*
- 4 Solvent cement is used to join a 250 millimeter pipe and fitting. If the temperature is 15 degrees C, how many hours must pass before line pressure can be applied?  
*Document Use*



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<b>PIPE DATA</b>	<b>Selection/Solvent Cementing</b>	<b>75</b>
<p><b>Selection &amp; Usage</b>  <b>Reinforced Thermosetting Resin Pipes (RTRP).</b>  <i>RTRP pipe and fittings are supplied in various colors depending on the manufacturer. It is used in all types of industrial and commercial applications.</i></p> <p>The methods used to join RTR piping include: butt, bell and spigot adhesive bonding, flanged and threaded connections.</p> <p>It is supplied in rigid lengths and has maximum operating temperatures of:</p> <ul style="list-style-type: none"> <li>• Glass Reinforced Epoxy 300 degrees F (149 degrees C).</li> <li>• Glass Reinforced Polyester 225 degrees F (107 degrees C).</li> <li>• Glass Reinforced Vinylestes 250 degrees F (121 degrees C).</li> <li>• Glass Reinforced Furan 300 degrees F (149 degrees C).</li> </ul>	<p><b>Solvent Cementing</b>  <i>Solvent cementing is the most common method used to join thermoplastic (ABS, PVC, and CPVC) pipe and fittings. The following give a brief description of the steps involved in the assembling of a solvent cement joint:</i></p> <ol style="list-style-type: none"> <li>1. Cut the pipe squarely with a miter box and hand saw or with a plastic pipe cutter.</li> <li>2. Remove all burrs and ridges from the pipe end. <b>Ridges or raised beads on the pipe will have a tendency to wipe away the cement when fitting the joint together.</b></li> <li>3. Wipe the end of the pipe and socket of the fitting to remove any dirt, moisture or grease.</li> <li>4. Select the appropriate applicator for the size of pipe used. See table #13.</li> <li>5. The joining surfaces must be softened by the use of primer, cement or a combination of both primer and cement.</li> </ol> <p><i>Note: Primer is not required on ABS.</i></p>	

<b>PIPE DATA</b>	<b>Solvent Cementing</b>	<b>76</b>																																																			
<p><b>Solvent Cementing</b></p> <ol style="list-style-type: none"> <li>6. Apply sufficient cement to pipe and fitting to fill the gap space in the joint. See illustration #14.</li> <li>7. Assemble the pipe and fitting while the cement is still wet and fluid. Twist the pipe slightly while assembling, and when bottomed, hold for approximately 30 seconds to prevent push out from the tapered fitting.</li> </ol>	<ol style="list-style-type: none"> <li>8. Wipe off any excess cement from the assembled joint. Handle the joint with care during set time. Table #14 gives initial set times for various pipe sizes and temperatures.</li> </ol>																																																				
<b>APPROPRIATE APPLICATOR BRUSH SIZE</b>																																																					
<table border="1"> <thead> <tr> <th colspan="2">Nominal Pipe Size</th> <th colspan="2">Maximum Width</th> <th colspan="2">Minimum Length</th> </tr> <tr> <th>Inches</th> <th>Millimetres</th> <th>Inches</th> <th>Millimetres</th> <th>Inches</th> <th>Millimetres</th> </tr> </thead> <tbody> <tr> <td>1 to 1½</td> <td>25 to 32</td> <td>1</td> <td>25</td> <td>1½</td> <td>40</td> </tr> <tr> <td>1½ to 2</td> <td>40 to 50</td> <td>1½</td> <td>40</td> <td>2</td> <td>50</td> </tr> <tr> <td>3</td> <td>80</td> <td>2½</td> <td>65</td> <td>3</td> <td>80</td> </tr> <tr> <td>4</td> <td>100</td> <td>3</td> <td>80</td> <td>3½</td> <td>90</td> </tr> <tr> <td>6</td> <td>150</td> <td>5</td> <td>125</td> <td>5½</td> <td>140</td> </tr> <tr> <td>8</td> <td>200</td> <td>6</td> <td>150</td> <td>6</td> <td>150</td> </tr> </tbody> </table>						Nominal Pipe Size		Maximum Width		Minimum Length		Inches	Millimetres	Inches	Millimetres	Inches	Millimetres	1 to 1½	25 to 32	1	25	1½	40	1½ to 2	40 to 50	1½	40	2	50	3	80	2½	65	3	80	4	100	3	80	3½	90	6	150	5	125	5½	140	8	200	6	150	6	150
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6	150	5	125	5½	140																																																
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Table #13 – Applicator Brush Sizes																																																					

<b>PIPE DATA</b>	<b>Solvent Cementing</b>	<b>77</b>			
<b>Set and Cure Times</b>					
<b>INITIAL SET AND CURE ITEMS</b>					
<b>Initial Set Time</b>					
Temperature Range	½" to 1½" (15 mm to 32 mm)	1½" to 3" (40 mm to 80 mm)	3½" to 8" (90 mm to 200 mm)	10" to 14" (250 mm to 350 mm)	16" to 24" (400 mm to 600 mm)
60° - 100°F 15° - 40°C	15 MIN.	30 MIN.	1 HR.	2 HR.	4 HR.
40° - 60°F 5° - 15°C	1 HR.	2 HR.	4 HR.	8 HR.	16 HR.
0° - 40°F -20° - +5°C	3 HR.	6 HR.	12 HR.	24 HR.	48 HR.
<b>Cure Times</b>					
60° - 100°F 15° - 60°C	1 to 6 HR.	2 to 12 HR.	6 to 24 HR.	24 HR.	48 to 72 HR.
40° - 60°F 5° - 15°C	2 to 12 HR.	4 to 24 HR.	12 to 48 HR.	72 HR.	120 HR.
0° - 40°F -20° - +5°C	8 to 48 HR.	16 to 96 HR.	48 to 192 HR.	192 HR.	240 to 336 HR.
<p>Note: 1. Initial set time indicates joints will withstand normal installation and handling stresses.                  2. Cure times indicates required time before testing or before line pressure can be applied.                  3. 50% more cure time is required in damp or humid conditions.</p>					
Table #14 – Set and Cure Times					

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## DOCUMENT USE

Document Use tasks involve information displays that use combinations of words, numbers, pictures and table formats. Examples in the construction industry include technical drawings, standardized forms, signs and safety symbols.

This work situation may not be familiar to you, but the activity is designed to demonstrate Document Use Skills, not your background knowledge.

Document Use is considered one of the most important Essential Skills for construction occupations.

## MSDS

Tradesworkers sometimes use materials that are hazardous when performing tasks such as laying blocks, spraying paint or joining wood. Look at the page from the Material Safety Data Sheet (MSDS).

- 1 What is the product name of this refractory cement?  
*Document Use*
- 2 What percentage of the product is aluminium oxide?  
*Document Use*
- 3 List three medical conditions that increase the hazards of using this product.  
*Document Use*
- 4 What is the level of fire hazard for this product?  
*Document Use*
- 5 What protective equipment is recommended?  
*Document Use*



RHI REFRACTORY

**MATERIAL SAFETY DATA SHEET** *acc. to ISO/DIS 11014*

Page 1/4

Printing date 03/08/2005

Reviewed on 03/08/2005

**1 Identification of substance**

- **Product details**
- **Trade name: COMPRIT 94 CD**
  - **Application of the substance/the preparation:** Refractory Product
- **Manufacturer/Supplier:**  
RHI Canada Inc.  
4355 Fairview Street, Burlington, Ontario L7L 2A4 Canada Tel: (905)639-8660
- **Information department:** MSDS Technical Information: (905)639-8660
- **Emergency information:** CHEMTREC 24 Hours Emergency Phone Number: 1-800-424-9300

**2 Composition/Data on components**

- **Chemical characterization**
  - **Description:** Unshaped product for refractory use on basis of

**Dangerous Components:**

1344-28-1	aluminium oxide	75-100%
65997-16-2	high alumina cement	10-20%

**3 Hazards identification**

- **Hazard description:** Irritant
- **Medical conditions aggravated by exposure to the product:** Asthma, chronic lung disease, and skin irritation.
- **Carcinogenicity Information:** No ingredient in this product is found on the NTP, IARC or OSHA lists of known human carcinogens.
- **Classification system:** The classification was made according to the latest editions of international substances lists, and expanded upon from company and literature data.
- **HMIS Classification**

			1	Health = 1
			0	Fire = 0
			0	Reactivity = 0

**4 First aid measures**

- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:** Immediately wash with water and soap and rinse thoroughly.
- **After eye contact :** Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- **After swallowing:** If symptoms persist consult doctor.

**5 Fire fighting measures**

- **Suitable extinguishing agents:** CO<sub>2</sub>, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.
- **Protective equipment:** Wear self-contained breathing apparatus.

### Product Label

Bricklayers read labels for products used to lay bricks, concrete blocks, stone and similar materials. For example, refractory cement is used to build and repair the bricks lining a kiln. Look at the Refractory label.

- 1 What is the product name of this refractory cement?  
*Reading Text*
  
- 2 Where should this product be stored?  
*Reading Text*
  
- 3 This bricklayer has a question about the product, but the answer cannot be found on the label. Where is more information available?  
*Reading Text*
  
- 4 Which temperature(s) are best for mixing this product? Mark with a check. (✓)  
*Numeracy and Reading Text*

Temp	Check
53° F	
7° C	
11° C	
48° F	

- 5 The product is going to be baked out or fired. What is the maximum rate of heat increase per hour to reach operating temperatures?  
*Reading Text*

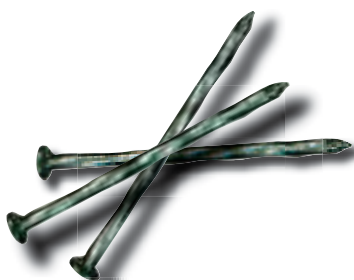


Photo - CMHC

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# REFRACTORY

**REFRACTORY**

**COMPRIT 94 CD**

WATER REQUIREMENT PER BAG

LT 203285A

**CAUTION**

**ATTENTION**

**KEEP DRY**      **TENIR AU SEC**

25kg/55 lbs  
25kg/55 livres

## REFRACTORY

### CAUTION:

Store in dry place. Required mixing water quantity on face of bag. For best results mix, place and cure at 10 degrees C (50 degrees F) or higher. Minimum curing time 48 hours before firing. Commence bake out with minimum fire. Increase temperature at the maximum rate of 50 degrees C (90 degrees F) per hour to operating temperature. Hold at operating temperature for a minimum of one hour each 25mm (one inch) of lining thickness.

### MISE EN GARDE :

Entreposer dans un endroit sec. La quantité d'eau requise pour mélanger est inscrite sur l'autre côté du sac. Pour de meilleurs résultats, mélanger, placer et sécher à au moins 10°C (50°F) ou plus, 48 heures minimum de séchage avant la cuisson. Débuter la cuisson avec un minimum de chaleur. Augmenter la température à un taux maximum de 50°C (90°F) par heure jusqu'à la température d'opération. Maintenir à la température d'opération pour un minimum d'une heure pour chaque 25mm (un pouce) d'épaisseur du revêtement.

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## NUMERACY AND DOCUMENT USE

Some reading materials require more than one Essential Skill. Numeracy involves using numbers to make calculations but locating the numbers to set up the problem often requires Document Use skills. In the construction industry, you need to combine Numeracy with Document Use to measure, schedule, budget and estimate.

This work situation may not be familiar to you, but the activity is designed to demonstrate Numeracy, Document Use and Reading Text skills, not your background knowledge.

### Respirator Protection Information

Painters and Decorators read information about how to protect themselves when using hazardous products. Look at the Respirator Protection Information page.

- 1 Which Airline – continuous flow respirator has the lowest protection factor?  
*Numeracy and Document Use*
- 2 What situation requires a full facepiece positive pressure respirator?  
*Reading Text*
- 3 If the exposure limit for a substance is 100 ppm, what is the MUC when using a full facepiece, air purifying respirator?  
*Numeracy and Document Use*



Interested in a career as a  
Painter and Decorator?

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[www.careersinconstruction.ca](http://www.careersinconstruction.ca)

## Respirator Protection Information

### 8.34 Protection factors

A respirator must not be used for protection against concentrations of an air contaminant greater than the maximum use concentration (MUC), which is the concentration determined by multiplying the exposure limit for the air contaminant by the appropriate respirator protection factor selected from Table 8-1, or as otherwise determined by the Board.

**Table 8-1: Respirator protection factors**

Respirator type	Protection Factor
<b>Air purifying</b>	
Non-elastomeric or paper type (disposable)	5
Half facepiece	10
Full facepiece	50
Full facepiece powered (PAPR) equipped with HEPA filters for exposure to asbestos	100
Loose-fitting facepiece powered (PAPR)	25
<b>Air supplying</b>	
<b>Airline - demand (negative pressure)</b>	
Half facepiece	10
Full facepiece	50
<b>Airline - continuous flow</b>	
Loose-fitting facepiece/hoods	25
Half facepiece	50
Full facepiece	1,000
Helmet/hood	1,000
<b>Airline - pressure demand (positive pressure)</b>	
Half facepiece	50
Full facepiece	1,000
Full facepiece, with egress bottle	10,000
<b>Self-contained breathing apparatus (SCBA)</b>	
Demand (negative pressure)	50
Pressure demand (positive pressure)	10,000

Other factors such as warning properties and cartridge limitations must also be taken into account when determining the maximum use concentration.

### 8.35 IDLH or oxygen deficient atmosphere

- (1) If a worker is required to enter or work in an IDLH (Immediately dangerous to life or health) or oxygen deficient atmosphere the worker must
  - (a) Wear a full facepiece positive pressure respirator which is either an SCBA, or an airline respirator with an auxiliary self-contained air cylinder of sufficient capacity to permit the worker to escape unassisted from the contaminated area if the air supply fails, and
  - (b) Be attended by at least one other worker stationed at or near the entrance to the contaminated area who is similarly equipped and capable of effecting rescue.

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## Setting Up a Ladder

Painters & Decorators, Roofers, Exterior Finishers and other trades workers refer to safety information. Look at the Setting up a ladder page.

- 1 When does a worker inspect a ladder?

*Reading Text*

- 2 Which Standard applies to ladders?

*Reading Text*

- 3 How high above the top of a wall must the ladder extend?

*Document Use*

- 4 Why is it important that the worker check the material that the ladder is made of?

*Reading Text*

- 5 The worker is placing a ladder against a 6 metre high wall. How far is the base of the ladder from the wall?

*Numeracy and Document Use*

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# Setting up a ladder

Inspect each ladder before use. Ladders with loose, broken, or missing rungs, split or bent side rails, or other defects must be identified and removed from service.

Only use CSA or ANSI Standard approved heavy duty ladders or job-constructed wooden ladders built to WCB Standard: LDR 1-2004.

Ladder tops must rest against a firm structure.

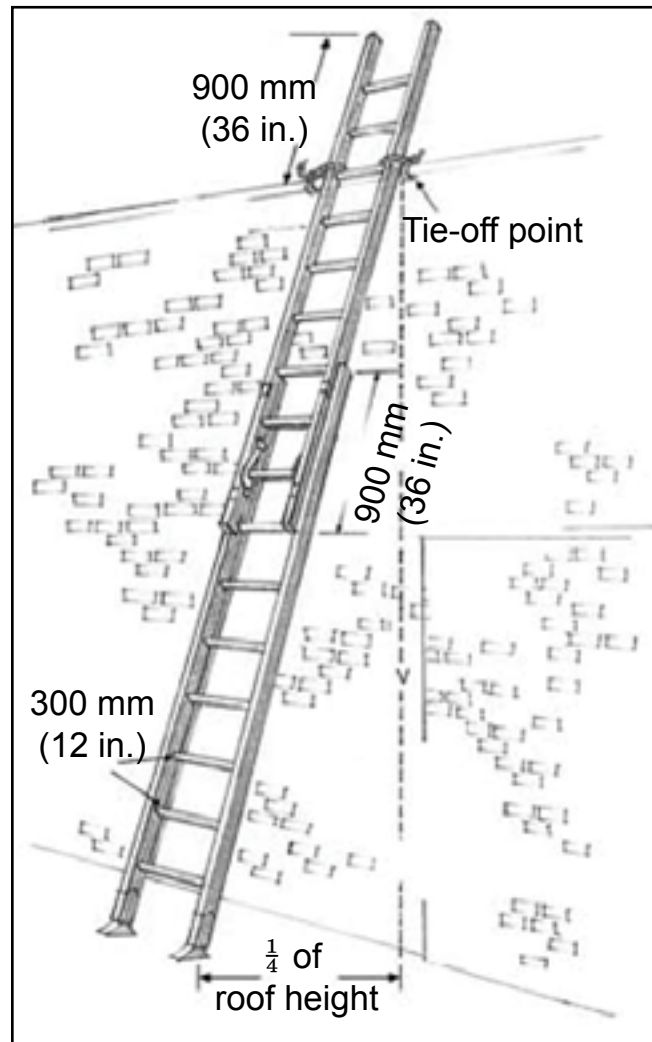
Ladders (other than stepladders) must extend approximately 1 m (3 ft) above a safe landing or parapet wall.

Ladders must be set up with a 4 vertical to 1 horizontal slope.

Ladders must be tied, blocked, or otherwise secured to prevent them from slipping.

The base of a ladder's side rails must rest on a firm, level foundation.

Watch for overhead power lines before erecting a ladder. Metal, including wire-reinforced wooden ladders, must not be used near energized electrical conductors.



## READING

Reading means reading material that is in the form of sentences and paragraphs. Examples in the construction industry include training manuals, safety information, notices and work orders.

This work situation may not be familiar to you, but the activity is designed to demonstrate Reading skills, not your background knowledge.

Reading is an important Essential Skill for construction occupations.

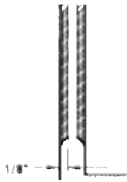
### Repair Procedure

Boilermakers repair boilers, vessels, tanks, heat exchangers and other heavy-metal structures. Look at the Repair Procedure.

- 1 Name 2 tools that could be used to make the cut in the tube.

*Reading Text*

- 2 Highlight, underline or circle the procedure that is illustrated.



*Document Use and Reading Text*

- 3 What does the boilermaker need to do before removing the temporary dam?

*Reading Text*

- 4 How does the boilermaker make sure of the correct heat number for the new tubing?


*Reading Text*

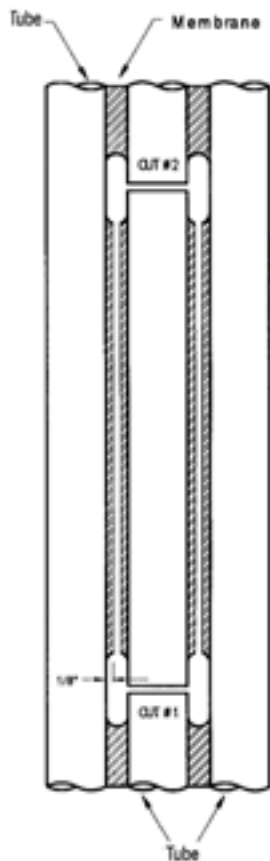


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**Boilermaker?**

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 <b>CIMS LTD</b> Canadian Industrial Mill Services Ltd.	Customer:		Job No.:		Sheet 1 of 1
	Plant / Location:				Repair Proc
	Prepared by:	R. Sundstrom	Date:		CIMS-RP11
	Approved by:		Date:		Rev.:
<b>WATER WALL TUBE SECTION REPAIR PROCEDURE</b> (CARBON STEEL MATERIAL)					



1. Verify tube section location, length (owner requirement), tube material specification and welding procedure specification (WPS) with supervisor.
2. Mark cut lines #1 and #2 and slot tube membrane material on either side of cut lines by air-arcing to facilitate tube cutting operation.
3. Cut membrane from cut #1 to cut #2 with air-arcing equipment or cutting torch, leaving a minimum 1/8" of the existing membrane on the adjacent tube.
4. Make lower tube cut (cut #1) with disk grinder or reciprocating saw.
5. Insert sheet metal blocking plate into cut #1 to prevent debris from entering system below.
6. Make upper tube cut (cut #2) with disk grinder, reciprocating saw or cutting torch.
7. Remove damaged tube section and insert **TEMPORARY DAM** (sponge) into lower tube opening or cover, to prevent entry of foreign material.  
 Note: (a) Sponge(s) must be obtained from supervision / quality control and returned to same by the end of the shift.  
 (b) Sponge(s) must be signed out and signed back in on posted Sponge List by person performing the work.
8. Prepare existing tube ends with milling machine or grinding equipment for bevel edge and, grind / buff adjacent area to clean metal for welding.
9. Prepare new tube material for welding. Confirm material specification and heat number markings with supervisor / quality control.  
 Note: (a) Heat numbers must be visible on all tube material.
10. **REMOVE TEMPORARY DAM (sponge) IN LOWER TUBE OPENING. Vacuum filings and debris from dam(s) prior to removal to prevent entry into the tube when the dam is pulled out.**
11. Purge new tube section and existing lower tube to header run in the presence of QC Inspector / Supervisor to verify that the system is clear prior to tube section fit-up and welding.  
 Note: (a) Purge verification must be signed off by witnessing QC Inspector or Supervisor.  
 (b) Alternatives to purging prior to fit-up must be approved by mill owner and documented.
12. Install water soluble dams in existing tube openings (as required) prior to fit-up in order to prevent drafts while welding.
13. Fit new tube section and tack weld in place. Obtain visual inspection by QCI / supervisor.
14. Weld out both joints and obtain visual inspection by QCI / Supervisor.
15. Perform non-destructive testing of welds (RT, UT, MPT, LPT) as required.
16. Fit and weld (both sides) new membrane material to seal repaired tube section and obtain visual inspection by QC Inspector / Supervisor.
17. Perform non-destructive testing of welds (MPT, LPT) as required.

## Bending Guidelines and Techniques

Ironworkers fabricate, install and service concrete reinforcing materials used in the construction of buildings and other structures. Rebar, reinforcing steel, is cut and bent to fit the shape of concrete forms. Look at the Bending Guidelines and Techniques page.

- 1 There are two recommended bends for end hooks. What are these bends?  
Look at Table 7-3.



*Document Use*

- 2 For a 25M bar size, what is the A or G (MM) for 180° hooks?

*Document Use*

- 3 What should be used to get smooth bends when hand bending?  
Look at the top of the page.

*Reading Text*

- 4 How can the ironworker prevent a rod from cracking while bending it?

*Reading Text*

- 5 a) Highlight, underline, or circle the words at the top of the page that tell you the minimum pin diameter required for a 15M bar.

*Reading Text*

- b) The Standard Hooks table is a guide to making calculations for bends. Highlight, underline, or circle the numbers in the table that tell you the minimum pin diameter required for a 15M bar.

*Numeracy and Document Use*



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## Bending Guidelines and Techniques

Make bends around pins with a diameter of not less than six times the bar diameter for 10M through 25M bars and eight times the diameter for 30M and 35M bars. It is uncommon to bend 45 and 55M bars, but if required, use a pin diameter of 10 times the bar diameter. By using the minimum pin diameter the bends will not be too sharp. (Bars are weakened by sharp bends.) Always follow the standard hook details in Table 7-3 for end hooks and stirrup and tie dimensions.

To get smooth sharp bends when hand bending, slip a cheater pipe over the rod. The pipe gives you a better hold on the rod itself and makes the operation smoother.

To prevent the rod from cracking while bending, bend it gradually, not with a jerk.

**Table 7-3**

<b>STANDARD HOOKS</b>					
<b>RECOMMENDED END HOOKS</b>					D = Pin diameter d = Bar diameter
BAR SIZE	D (MM)	180° HOOKS		90° HOOKS	d (MM)
		A or G (MM)	J (MM)	A or G (MM)	
10M	6d	140	90	180	11.3
15M	6d	180	130	260	16.0
20M	6d	210	160	310	19.5
25M	6d	280	200	400	25.2
30M	8d	390	300	510	29.9
35M	10d	550	430	640	35.7

**180°**

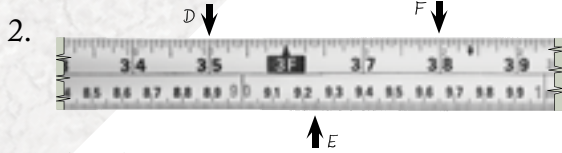
**90°**

Millimeters  
10  
20  
30  
40  
50  
60  
70

## Answer Key

### Measurement on the Job - Answers to A1

1. A= 2 inches; B= 8.5 cm; C=  $4\frac{3}{4}$  inches



3. 5 inches

4. 32 ft

### Blueprint Theory - Answers to A2

1. Degree of Finish, Wide Flange, Centerline

2. Phantom Line



3. Individual style, computer programs indicate materials differently

4. Any 4 of: bill of materials, drawing notes, revision chart, specifications, title block

### Calculating Fitting Allowances - Answers to B1

	c - c (centre to centre)	e - e (end to end)
J	10"	9"
K	$10\frac{5}{8}$ "	$9\frac{7}{8}$ "
L	$8\frac{1}{2}$ "	$7\frac{1}{2}$ "

### Pipe Data - Answers to B2

1. Solvent cement

2. 125 millimeters

3. 12 hours

4. 24 hours

### MSDS - Answers to C1

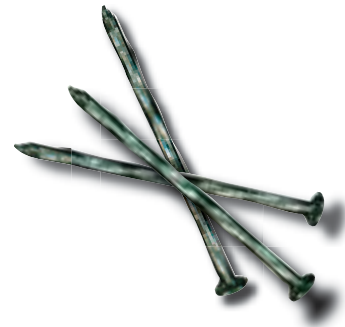
1. COMPRIT 94 CD

2. 75 - 100%

3. asthma, chronic lung disease and skin irritation

4. 0 or none

5. self-contained breathing apparatus



**Product Label – Answers to C2**

1. COMPRIT 94 CD
2. dry place
3. MSDS (Material Safety Data Sheet)
4. 53° F and 11° C
5. 50° C per hour, 90° F per hour

**Respirator Protection Information – Answers to D1**

1. loose fitting facepiece or loose fitting hood
2. One of the following:
  - IDLH atmosphere (Immediately Dangerous to Life or health)
  - oxygen deficient atmosphere
3. 5,000 ppm

**Setting up a Ladder – Answers to D2**

1. before use.
2. LDR 1-2004
3. approximately 1 m (3 ft), 900 mm (36 in.)
4. Because metal, including wire-reinforced wooden ladders, must not be used near energized electrical conductors.
5. 1.5 metres

**Repair Procedure – Answers to E1**

1. disk grinder, reciprocating saw
2. See 3. Cut membrane from cut #1 to cut #2 with air-arcing equipment or cutting torch, leaving a minimum of 1/8" of the existing membrane on the adjacent tube.
3. vacuum filings and debris from the dam(s)
4. Check heat numbers on all tube materials. Confirm with the supervisor/quality control.

**Bending Guidelines and Techniques – Answers to E2**

1. 180°, 90°
2. 280 mm, 280 millimetres
3. a cheater pipe
4. bend it gradually, not with a jerk.
- 5 a) not less than six times the bar diameter, b) 6d



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For more information contact:

The Construction Sector Council  
220 Laurier Ave. West, Suite 1150

Ottawa, Ontario, K1P 5Z9

Phone: 613 569-5552

Fax: 613 569-1220

[info@csc-ca.org](mailto:info@csc-ca.org)

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