



## Board/Authority Authorised Course Civil Engineering Concepts 2

School District/Independent School Authority Name	Kamloops/Thompson
School District/Independent School Authority Number	#73
Developed by	Briar Beers
Date Developed	December 2013
School Name	NorKam Secondary School
Principal's Name (District)	Sheryl Lindquist
Superintendent Approval Date (for School Districts only)	
Superintendent Signature (for School Districts only)	
Board/Authority Approval Date	
Board/Authority Chair Signature	
Course Name	Civil Engineering Concepts 2
Grade Level of Course	11 and 12
Number of Course Credits	4
Number of Hours of Instruction	120
Prerequisite(s)	Completion of Grade 10



## Synopsis

This course has been developed to support and provide students with an opportunity to explore the basic concepts that would be studied and used in practice by students and graduates of the Civil Engineering Technology and Civil Engineering Degree programs. The sampler is used to allow students to understand what these programs will be like and what type of work is available in these professions. In the Civil Engineering Concepts 2 course, students will be exposed to many of the standard topics they would be exposed to in the Civil Engineering/Technology Program and in the workplace. This course is intended to assist students in their post-secondary education choices by exposing them to some options, as well as give those who do end up attending the Civil Engineering Degree or Diploma Programs a head start to help them be successful.

## Rationale

This course will:

1. Provide students with an overview of safety requirements in BC and in the industry in general.
2. Prepare students to work in any situation where safety is a factor.
3. Provide students with enough information so they are able to protect themselves and know their rights as employees so they remain safe.
4. Provide students with practical field level knowledge about concrete and concrete testing.
5. Provide them with the skills so that they are prepared for any concrete or soils course in post-secondary education systems.
6. Provide students with enough background knowledge of potential jobs, related to concrete and soils testing, that they are able to determine if it is something they are interested in.
7. Provide students with as much hands on, practical, learning as possible, by providing the tools used in the workplace in order to gain a working knowledge.

Unit/Topic	Title	Time
Unit 1	Safety in the Workplace	25 hours
Unit 2	Construction Certifications	25 hours
Unit 3	Introduction to Concrete Technology	50 hours
Unit 4	Introduction to Soil/Aggregate Testing	20 hours
	Total Hours	120

## Unit 1 – Safety in the Workplace

**Objective:** In this unit is to develop students’ greater understanding of the importance of safety. They will know many of the different safety measures taken on construction sites, as well as in offices, schools, and homes. They will learn to be proactive when it comes to safety, instead of reactive. The students will learn about safety through statistics, discussions, videos and case studies.



## Prescribed Learning Outcomes

After completion of the course, students will be able to:

1. Define and understand many general safety procedures and rules.
2. Understand how to read and know where to go for safety documentation, statistics.
3. Complete, understand, and review the following:
  - Field Level Hazard Assessment (FLHA)
  - Job Hazard Assessment (JHA)
  - General site inspections
  - Incident Report
4. Be able to lead the class through a tool box talk/tailgate meeting.
5. Recognize and describe Personal Protective Equipment (PPE) and when different items should be used.
6. Recognize hazards and learn to be proactive rather than reactive.
7. Define and understand:
  - Incident
  - Near miss
  - Occupational illness
  - Critical injury
  - First Aid incident
  - Medical Aid incident
  - Lost time injury
8. Identify and differentiate between First Aid Incident, Medical Aid Incident, and Lost Time injury Incident.
9. Identify and explain the three main types of incidents and their prevention.
  - Falls
  - Struck by/or against something
  - Overexertion
10. Understand your right to refuse unsafe work.
11. Understand and be able to review and use safe work procedures.

## Unit 2 – Construction Certification

**Objective:** This unit provides students with industry standard certifications that can be used on the job. They will learn about certification requirements and be certified in Fall Arrest, Aerial Lift Platforms, WHMIS, Confined Space Entry, and H2S Alive.

## Prescribed Learning Outcomes

At the completion of this unit, students will:

1. Understand many on-site job requirements and the process to obtain certification.
2. Complete training and certification in Confined Space Entry and be able to:
  - Identify confined spaces
  - Understand the responsibilities for the confined space entry program
  - Complete a hazard assessment



- Follow safe work procedures
  - Test atmosphere
  - Make the atmosphere safe
  - Be a standby person
  - Rescue from the confined space
  - Know how to use an entry permit
  - Use required PPE
  - Understand the coordination of work activities
3. Complete training and certification in Fall Arrest (8 hours) and be able to:
- Understand relevant legislation and industry best practices
  - Follow fall protection procedures and plans
  - Understand and define the difference between fall arrest and fall restraint
  - Understand the different protection designs depending on the required work and configuration, including vertical, horizontal and combination protection set ups
  - State clearance requirements
  - Demonstrate how to inspect and use a full body harness.
  - Understand the differences in body harnesses
  - Demonstrate how to inspect and use connecting means, such as lanyards, self-retracting devices, carabiners, personal energy absorbers
  - Understand and explain correct ladder climbing techniques
  - Explain proper fall protection equipment care and storage.
4. Complete training and certification in Aerial Lift Platform (man lift- 8 hours) and be able to:
- Understand the responsibilities, safety rules, and potential hazards
  - Complete a pre-operational inspection
  - Complete a jobsite inspection
  - Complete a functions test
  - Understand and explain the fuelling, what types of fuel they use, and how to fuel them
  - Understand and explain maintenance
  - Demonstrate:
    - Visual inspection
    - Start up
    - Travelling
    - Work positioning
    - Exiting
    - Parking
    - General safety
5. Complete training and certification in WHMIS (1.5 hours) and be able to:
- Understand the different types of hazards and identify symbols
  - Understand and identify how to store hazardous products
  - Identify WHMIS labels and understand what they mean
  - Identify PPE and when it is required
  - Understand how to respond to emergency situations related to WHMIS products



### **Unit 3 – Introduction to Concrete Technology**

Objective: When this unit is complete, students should have a basic understanding of the Portland cement concrete. Students will also understand and be capable at complete concrete testing of fresh, wet concrete as well as cured concrete cylinders.

#### **Prescribed Learning Outcomes**

Upon completion of this unit, students will be able to:

1. Define common words related to concrete:
  - Portland cement
  - Cement
  - Aggregate
  - Concrete
  - Grout
  - Composite cements
2. Identify and explain the use of admixtures in concrete and how they change the concrete.
3. Complete sieve analysis for aggregates.
4. Understand and explain the basic procedures in batching concrete, transporting, and handling on-site.
5. Explain and identify different procedures for placing concrete.
6. Explain and identify different curing methods.
7. Demonstrate on-site concrete sampling tests:
  - Air test
  - Slump test
  - Checking temperature
  - Create testing cylinders
8. Explain what the typical standards are and determine if tested concrete meets those specifications.
9. Demonstrate laboratory testing including:
  - Storing and curing of cylinders
  - Compressive strength testing
10. Understand and explain the water/cement ratio and how that affects the strength of the concrete.

### **Unit 4 – Introduction to Soil/Aggregate Testing**

Objective: This unit will provide students with exposure to the basics of soil and aggregate testing along with some general background knowledge of the materials. Students will learn the basics of on-site compaction testing as well as complete some lab testing on soils to determine basic properties.

#### **Prescribed Learning Outcomes**

At the completion of this course, students will be able to:

1. State basic soils and aggregates and general uses
2. Read and understand soil testing summary sheets



3. Understand and demonstrate lab testing, including:
  - Sieve analysis
  - Moisture content
  - Standard proctor

### **Instructional Component Prescribed Learning Outcomes**

- Direct instruction
- Indirect instruction
- Interactive (peer) instruction
- Independent instruction
- Modeling
- Practical creativity
- Brainstorming
- Group work
- Analysis of own and classmates' project work
- Project-based learning

### **Learning Resources**

- Teacher handouts
  - Notes
  - Workbooks
- Guest speakers from the community in related fields
- Field trips
- Textbooks
- CSA Standards

### **Assessment Component**

The assessment breakdown is located below. As much as possible, the assessment for all units will be as practical and hands-on as possible. Completing activities hand-on, in laboratories, and then submitting projects and reports based on that information will be one of the main sources of assessment. There will be some quizzes to reiterate some important and crucial information will be conducted as necessary.

<b>Unit</b>	<b>Title</b>	<b>Assessment</b>	<b>Percentage</b>
Unit 1	<b>SAFETY IN THE WORKPLACE</b>	<ul style="list-style-type: none"> <li>• Research</li> <li>• Quizzes</li> <li>• Presentations</li> <li>• Class discussions</li> <li>• Written Assignments</li> <li>• Unit Test</li> </ul>	25%



Unit 2	<b>CONSTRUCTION CERTIFICATIONS</b>	<ul style="list-style-type: none"> <li>• Completion of certification by outside qualified sources</li> <li>• Completion of certification 5% per course</li> </ul>	20%
Unit 3	<b>INTRODUCTION TO CONCRETE TECHNOLOGY</b>	<ul style="list-style-type: none"> <li>• Demonstration of practical skills</li> <li>• Completion of Labs</li> <li>• Written reports and projects</li> <li>• Quizzes</li> <li>• Written assignments</li> </ul>	40%
Unit 4	<b>INTRODUCTION TO SOILS</b>	<ul style="list-style-type: none"> <li>• Demonstration of practical skills</li> <li>• Completion of Labs</li> <li>• Written reports and projects</li> <li>• Quizzes</li> <li>• Written assignments</li> </ul>	15%
	<b>Total</b>		<b>100%</b>

## Facility Requirements

### Classroom Area

- Minimum 30 square feet per student.
- Comfortable seating and tables suitable for learning.
- Compliance with the Local and National Fire Code and occupational safety requirements.
- Meets applicable municipal zoning bylaws for technical instruction and education facilities.
- Overhead and multimedia projectors with a projection screen and associated computer tablet equipment.
- Whiteboard with marking pens and erasers.
- Lighting controls to allow easy visibility of the projection screen while allowing students to take notes



- Windows must have shades or blinds to adjust sunlight.
- Heating/air conditioning for comfort all year round.
- Acoustics in the room must allow audibility of the instructor.

#### **Shop/Lab Area**

- Area capable of holding 7-10 students mixing concrete and performing laboratory concrete and soils/aggregate testing
- Enough counter space to hold equipment
- Temperature controlled area or container to store and cure concrete cylinders
- Storage area for supplies such as cement, aggregates, buckets, etc.
- Adequate heating, lighting and ventilation
- First-aid equipment

#### **Student Facilities**

- Adequate eating area as per WorkSafeBC requirements (4.84 OHS Regulation and Guidelines)
- Adequate washroom facilities as per WorkSafeBC requirements (4.85 OHS Regulation and Guidelines)
- Minimum 10 cu. ft. personal storage lockers

#### **Instructor's Office Space**

- Adequate office space for student consultation
- Desk and filing space
- Computer
- Internet access
- Printer access
- Adequate storage facilities for material and training aids
- Access to photocopier/scanner
- Telephone

#### **Tools and Equipment**

**Required Shop Equipment:** Equipment List is based on the standard class size of 25 students. The facilities must be suitable for instructional use.

- 1 – Concrete Compression Machine
- 4 – Concrete Air Meter
- 4 – Rubber mallet
- 4 – Steel Slump Test Set (including pan, steel cone, tamping rod, wooden handle brush, trowel)
- 10 – Aluminum Scoops
- 2 – Deluxe Concrete Box
- 100 – Black plastic concrete 4x8" molds
- 30 – Rubber concrete capping pads
- 100 – Sponges
- 2 – Wheelbarrow mixers





- 10 – Thermometers
- 2 – Proctor Penetrometer Set
- 1 – Vibratory Sieve Shaker
- 1 set – 8” Test Sieves (0.075mm, 0.150mm, 0.300mm, 0.600mm, 1.18mm, 2.36mm, 4.75mm, 9.5mm, 12.5mm)
- 1 set – Sieve cover and bottom pan
- 2 – Standard compaction mold
- 2 – Standard compaction hammer
- 1 – air compressor
- WD-40
- Rubber gloves

#### **Required Student Tools (supplied by student)**

- Contact Training Facility for recommended tools and equipment that students need to supply.

#### **Required Reference Materials**

Contact Training Facility to required reference material.

#### **Reference Materials**

Industry Training Authority (ITA), [www.itabc.ca](http://www.itabc.ca)

BC Construction Industry Training Organization [www.bccito.com](http://www.bccito.com)

WorkSafeBC, Workers’ Compensation Board of BC (WCB), [www.worksafebc.com](http://www.worksafebc.com)

Workplace Hazardous Materials Information System (WHMIS) and First Aid

<http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php>

#### **Codes**

- National Fire Code of Canada <http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-fire-code.html>
- BC Ministry of Housing [www.housing.gov.bc.ca/building](http://www.housing.gov.bc.ca/building) Queen’s Printer for BC Code books <http://www.bccodes.ca/default.htm>
  - BC Building Code
  - BC Fire Code
  - BC Electrical Code
- National Fire Protection Association [www.nfpa.org](http://www.nfpa.org)
  - NFPA 80 – Standards for Fire Doors and Fire Windows
  - NFPA 101 – Life Safety Code
- Canadian National Building Code <http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-building-code.html>