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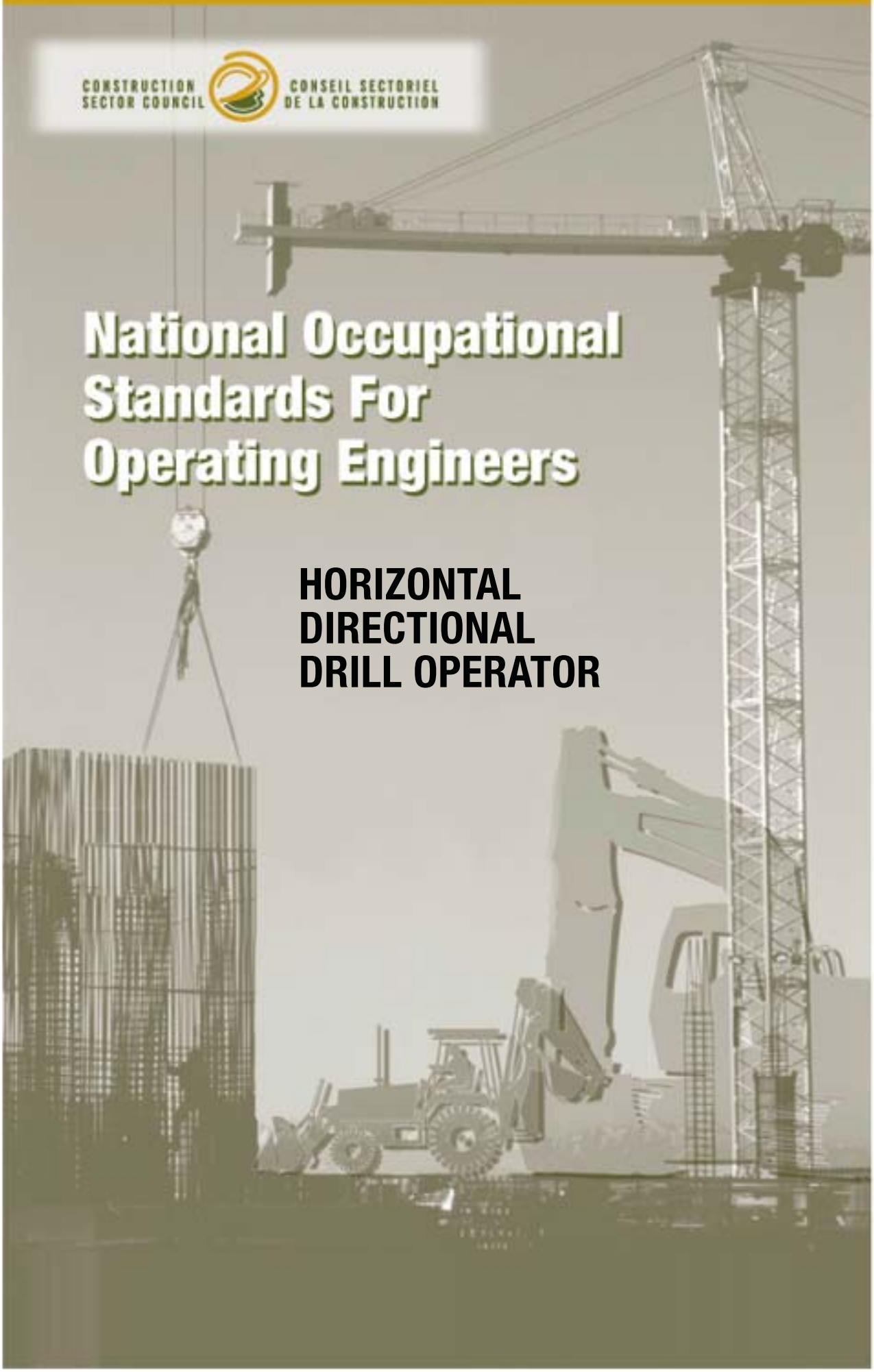

National Occupational Standards For Operating Engineers

HORIZONTAL DIRECTIONAL DRILL OPERATOR

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Every effort has been made to make this manual complete and as accurate as possible. The authors shall have neither liability nor responsibility to any person or entity with respect to any loss or damages in connection with or arising from the information contained in this manual.

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Canada

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Introduction

The Construction Sector Council (CSC) is one of 40 sector councils in Canada. Sector councils are industry-led, labour/management partnership organizations designed to address human resource development issues within specific industries.

The primary objective of the CSC is the development of a highly-skilled workforce and a safe workplace environment, contributing to the organizational productivity and individual prosperity of the members of the construction industry. The development of national occupational standards for operating engineer occupations is one of the many ways the CSC is meeting this objective.

The CSC acknowledges all of the subject matter experts who provided their valuable time and efforts toward the definition and validation of these national occupational standards. Without their combined contributions, the development of these occupational analyses (OAs) would not have been possible. A complete list of the subject matter experts can be found at the back of this document.

An OA has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations
- to identify those tasks that are performed by skilled workers in every province and territory
- to develop instruments for use in the assessment and training leading to the certification of skilled workers
- to facilitate the mobility, in Canada, of trainees and skilled workers
- to supply employers and employees, and their associations, industries, training institutions, and governments with analysis of the tasks performed in particular occupations

Therefore, the standards define the skills, knowledge, and abilities required for an occupation and against which the qualifications of an individual in that occupation can be assessed.

The vision of the Construction Sector Council is to reach a point where operators who demonstrate the skills, knowledge, and abilities in the national occupational standards will possess the nationally recognized credentials and those credentials will assist the operator in obtaining employment anywhere in Canada.

Foreword

Operating engineer occupations can be grouped into three broad areas—hoist and crane operators, construction heavy equipment operators, and industrial equipment operators. Within each of these broad categories, there are several operating engineer occupations.

1. Hoist and Crane Operators

Crane operators' work tends to be centred in the construction industry. Operators work on a broad range of building sites including high-rise residential, institutional, and commercial structures, as well as most large industrial sites and many types of heavy engineering projects. The Statistics Canada Labour Force Survey (LFS) identifies around 4,000 crane operators in the construction industry across Canada. There are cyclical variations in employment, with low levels below 3,000 jobs in the mid-1990s and peak levels near 5,000.

2. Construction Heavy Equipment Operators

Heavy equipment operators are largely concentrated in the construction industry. Operators work on a variety of jobs from residential, institutional, and commercial structures to most large industrial sites and most types of heavy engineering. The LFS identifies around 37,000 equipment operators employed in the construction industry across Canada. This occupation is one of the larger trades in the industry, comparable in size to the workforce for electricians, pipe trades, and masonry trades. There are cyclical variations in employment, with low levels below 27,000 jobs in the early 1990s and peak levels near 40,000.

3. Industrial Equipment Operators

Industrial equipment operators encompass a variety of occupations ranging from forklift operators and environmental workers to tractor trailer drivers. The demand for environmental workers is increasing as knowledge, awareness, and regulations proliferate. Forklift training has taken on added importance due to safety regulations that require trained or certified forklift operators.

The mobility and accessibility of operating engineers is difficult if not impossible if there are no jurisdictional agreements on national occupational standards. The project to develop occupational analyses for national occupational standards for 29 operating engineer occupations began in January 2004 and was completed in March 2005.

Development of the Occupational Analysis

A draft analysis was developed by a knowledgeable team of consultants (process experts) who, with the assistance of a committee of subject matter experts in the field, identified all the tasks performed in the occupation. In order to facilitate an efficient and effective process, the 29 occupations were grouped according to commonalities. Profile meetings, with both process and subject matter experts, were held for each grouping between January and March 2004 in:

- Edmonton, Alberta
  - Excavating, Feb 5 & 6
  - Paving, Feb 9 & 10
- Morrisburg, Ontario
  - Grading, Feb 24 & 25
  - Crane and Hoisting, Mar 1 & 2
  - HAZMAT, Mar 3 & 4
  - Plant Operations, Mar 23 & 24
  - Concrete Pumping, Mar 25 & 26
- Montreal, Quebec
  - Hauling, Feb 26 & 27
- Vancouver, British Columbia
  - Utilities, Mar 16 & 17
  - Material Handling, Mar 18 & 19
- Quebec City, Quebec
  - Profile Completion Forum, Mar 29 – 31

The draft OAs were then distributed to more subject matter experts and stakeholders across Canada for review and input between June and September 2004. They were also posted on a website where subject matter experts were invited to provide feedback.

The combined input from the review was collated in October 2004. Recommendations were assessed and incorporated into the final draft, which included the identification of common core tasks performed in all occupations. Validation meetings were held for each grouping, with process and subject matter experts, between October 2004 and January 2005 in:

2004:

- Saskatoon, Saskatchewan
  - Utilities, Oct 20 – 22
  - Material Handling (including HAZMAT), Oct 26 – 29
- Halifax, Nova Scotia
  - Grading, Nov 2 – 5
- St John's, Newfoundland
  - Crane and Hoisting (including Concrete Pump), Nov 15 – 19
- Winnipeg, Manitoba
  - Excavating, Nov 23 – 25
  - Hauling, Nov 30 – Dec 3

2005:

- Vancouver, British Columbia
  - Paving, Jan 5 – 7
  - Plant Operations, Jan 10 – 12
- Victoria, British Columbia
  - Validation Forum, Feb 21 – 23

The OAs were then edited, translated, and published in both official languages.

Scope of the Occupational Analysis

This occupational analysis identifies all of the tasks that a qualified operator must be able to perform. The performance of these tasks is dependent on a range of related activities, described in the body of the analysis as subtasks. The analysis is composed mainly of tasks that operators perform frequently, including such tasks as cleaning, driving, and maintenance.

Most operators have a range of experience on different types of equipment. Regardless of the type of equipment, the duties of the operator remain relatively constant. Accomplishment of the operator's tasks depends largely on knowledge of the equipment and its components, experience in a wide variety of situations, and an ability to determine the most appropriate means of proceeding with the work.

Though not described in the analysis, other important attributes of operators include mechanical aptitude, mathematical ability, excellent vision, and a high degree of physical co-ordination. Operators are also often called upon to perform their jobs in extremely difficult conditions.

Although this analysis is not a training document, it is worthwhile noting that aspiring operators may find it useful to reflect on their own abilities to deal with lengthy periods of physical restriction and isolation coupled with frequent subjection to pressures of time and productivity. Operators are often required to demonstrate the ability to concentrate for long periods of time while enduring physical discomfort and inclement weather conditions.

Heavy equipment is used in virtually every facet of the construction sector. In some cases, an operator may work for years on a single site, such as a plant, and may, during that time, operate only one type of equipment and therefore perform similar and relatively constant tasks. Operators who work for contractors may rarely work on the same site more than once and may perform a tremendous variety of tasks using a wide range of equipment types and sizes. The work of an operator often overlaps with that of other equipment operators.

Structure of the Occupational Analysis

To facilitate the understanding or the nature of the occupation, the work performed is divided into the following divisions:

A. BLOCK	the largest division within the analysis and reflects a distinct operation relevant to the occupation
B. TASK	the distinct activity that, combined with others, makes up the logical and necessary steps the operator is required to perform to complete a specific assignment within a BLOCK
C. SUBTASK	the smallest distinct, measurable, and observable activities into which it is practical to divide any work activity; combined with other SUBTASKS, these fully describe the logical steps required to complete a TASK

The importance of a task describes the benefits that operators, employers, and the public receive as a result of an operator's ability to perform the task.

Trends are any shifts or changes that are occurring in the industry and affect the task.

Supporting Knowledge and Abilities are the elements of skill and knowledge that an individual must acquire to perform the task adequately.

Tools and Supplies are those items that are needed to perform the skill.

BLOCK A PROFESSIONALISM
Task 1 Acts Professionally

This task is important because it helps to:

- present positive image of industry
- demonstrate personal integrity and competence
- instill confidence and maintain relations with general public, site personnel, owners/clients, and their clients
- maintain employment and advance in industry

Trends:

- Employers and employees are placing more emphasis on company/personnel fit in relation to attitudes and values.
- There is less tolerance for unprofessional behaviour, including workplace violence, substance abuse, and harassment.
- There is increased awareness of the importance of a balanced lifestyle.
- There is an increasing demand for knowledgeable and experienced operators that have the interpersonal skills and desire to advance to supervisory and management levels.
- Individuals need to continually upgrade their knowledge and skills because of technological advances and new methodologies.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
1.01	Demonstrates work ethic	Knowledge of: • principles of work ethic and expectations, such as be punctual, prepared for work, co-operative, honest, productive, and respectful Ability to: • follow principles of work ethic in all situations	
1.02	Is aware of factors affecting personal health	Knowledge of: • factors affecting personal health • own current mental, emotional, and physical state • own limitations • factors/situations/conditions that cause stress in professional and personal life • working conditions on construction site • impact of fatigue on job performance	
1.03	Resolves problems or disagreements with others	Knowledge of: • company policies and procedures • applicable legislation, such as harassment • conflict resolution techniques	

Ability to:
- communicate effectively
- use calm approach
- be open-minded and flexible
- determine cause of problem or disagreement
- discuss and resolve issues
- walk away from conflict if necessary

1.04 Participates in professional development

Knowledge of:
- industry trends
- areas requiring ongoing learning, such as new equipment, technologies, techniques, and industry practices

Ability to:
- assess own knowledge and skills
- acquire information about training opportunities
- learn through various methods, such as on-the-job training, reading, courses, co-workers

1.05 Works with others

Knowledge of:
- own role and responsibilities
- roles and responsibilities of others in industry

Ability to:
- work as team member to achieve common goals
- keep open mind
- participate in workplace meetings
- communicate clearly and accurately
- co-ordinate job-related activities
- co-operate with others

1.06 Works independently

Knowledge of:
- company policies and procedures, such as work-alone plan
- applicable legislation, such as responsibilities of supervisor/owner and site personnel
- own role and responsibilities
- own capabilities and limitations
- work assignment, location, and working conditions

Ability to:

- confirm and clarify assignment
- take initiative, such as anticipate and prepare for next steps in job
- identify and resolve potential and actual problems
- communicate with other site personnel
- co-ordinate work with others
- complete assignment

BLOCK A PROFESSIONALISM
Task 2 Uses Communication Skills

This task is important because it helps to:

- work safely and efficiently
- reduce errors and miscommunication
- comply with applicable legislation and insurance requirements
- represent company and industry in professional manner
- summon help in emergency
- prevent injury, save lives, and limit damage to equipment and property

Trends:

- There is an increased use of communication devices to increase productivity and improve safety.
- There is an increasing legislative requirement for documentation and participation in job site meetings.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
2.01	Speaks and listens effectively	Knowledge of: • importance of effective communication • industry terms • roles of individuals on job site, such as supervisor, inspector, other tradespeople Ability to: • listen carefully to what is said • confirm understanding, such as repeat or paraphrase instructions • communicate message clearly and accurately to others • exchange information with others, such as supervisor, signaller, general public, inspectors, other operators and tradespeople	
2.02	Uses documentation	Knowledge of: • company policies and procedures • applicable legislation, such as Access to Information Act • own role and responsibilities • types of documentation required, such as log books, safety reports, maintenance reports, inspection reports, time cards • importance of complete, legible, and accurate documentation • where documentation is stored • industry terms	

		Ability to: • access and store documents as required • provide complete, legible, and accurate information in documents in timely manner • read and interpret equipment inspection documentation from previous shifts before conducting pre-operational inspection	
2.03	Communicates using signals	Knowledge of: • company policies and procedures • applicable legislation • role and responsibilities of signallers • signallers on job site • audible and warning signals used on job site • hand signals Ability to: • identify and work with signallers • communicate using audible signals, such as back-up alarm, site emergency horn • communicate using hand signals	
2.04	Uses electronic communication equipment	Knowledge of: • manufacturers' specifications and operating instructions • company policies and procedures • applicable legislation • types of communication equipment used on job site Ability to: • check communication devices to verify operating condition, such as complete radio check • deliver and receive messages using communication equipment • follow communication protocol	*Communication devices*

BLOCK B SAFETY
Task 3 Interprets Applicable Legislation and Policies

This task is important because it helps to:

- ensure health and safety of workers and public
- comply with applicable legislation
- prevent damage to property and environment
- decrease potential of litigation

Trends:

- There is an increasing amount of training and documentation required by amended and new legislation.
- There is an increasing demand for standardized national legislation to reduce confusion and duplication caused by differences between jurisdictions. Lack of standardized legislation may lead to fatalities and accidents, and to damage of equipment, property, and the environment.
- There is an increasing expectation that operators will be knowledgeable about relevant legislation.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
3.01	Interprets federal, provincial/territorial, and municipal legislation	Knowledge of: • applicable federal, provincial/territorial, and municipal legislation, such as Highway Traffic Act, Occupational Health and Safety Act • where relevant legislation can be located Ability to: • locate relevant sections in legislation • read legislation • seek clarification of legislation	
3.02	Interprets permits, licences, and insurance requirements	Knowledge of: • applicable permits, licences, and insurance requirements • authorities having jurisdiction Ability to: • locate permits, licences, and insurance documentation, such as over-dimensional permits, ground disturbance permits, air emissions permits, water use permits • read permits, licences, and insurance documentation • seek clarification on permits, licences, and insurance documentation	*Permits, licences, insurance documentation*

3.03	Interprets environmental legislation	Knowledge of: • relevant environmental legislation • authorities having jurisdiction, such as department of fisheries, ministry of environment, municipality • potential environmental damage caused by construction activities Ability to: • locate applicable permits on job site • read environmental legislation • seek clarification of environmental legislation
3.04	Interprets company policies and procedures	Knowledge of: • where copies of company policies and procedures can be located Ability to: • read company policies and procedures • stay current with company policies and procedures • seek clarification on company policies and procedures

BLOCK B SAFETY
Task 4 Works Safely

This task is important because it helps to:

- protect self and others from injury or death
- comply with applicable legislation
- prevent damage to equipment and environment
- reduce unscheduled downtime

Trends:

- Legislation relating to PPE and training is frequently being amended to protect employees, employers, the environment, and the general public.
- The industry is involved in improving safety on job sites to reduce accidents.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
4.01	Uses personal protective equipment (PPE)	Knowledge of: • company policies and procedures • applicable legislation • PPE required/recommended by manufacturers' manuals • PPE required for construction sites, such as footwear, hard hats, safety vests, safety glasses • PPE required for specific conditions, such as breathing apparatus for hazardous breathing conditions, dielectric boots and gloves for protection from electrical shock • inspection, care, and use of PPE Ability to: • identify PPE required for job site and situation • ensure PPE meets safety standard requirements, such as Canadian Standards Association (CSA) • inspect PPE for damage, and repair or replace as necessary • ensure PPE fits correctly	*Steel-toed footwear, hard hat, safety gloves, appropriate safety glasses, high visibility vest, hearing protection, breathing apparatus, fall protection, and other applicable PPE*
4.02	Completes required health and safety training	Knowledge of: • manufacturers' specifications, such as recommended operating procedures • company policies and procedures • applicable legislation	

Ability to:

- take required health and safety training, such as confined space entry, Workplace Hazardous Materials Information System (WHMIS), first aid, cardiopulmonary resuscitation (CPR)

BLOCK B SAFETY
Task 5 Complies with Site Emergency Plan

This task is important because it helps to:
- protect self
- prevent property damage
- ensure safety of public and job site personnel
- evacuate and secure area efficiently and effectively

Trends:
- Emergency exercises and preparedness activities are becoming more common.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
5.01	Prepares for emergencies	Knowledge of: • manufacturers' specifications, such as equipment emergency shut-down procedure • company policies and procedures • site emergency response plan, such as evacuation routes, procedures, contact protocol • types of fires, i.e., Class A, B, C, and D • types of extinguishers • potential and actual hazards on work site • location of fire extinguishers and first aid stations (on equipment and site) and how to use them • inspection requirements for safety equipment and supplies, such as fire extinguisher, first aid kit Ability to: • take emergency response training, such as emergency response exercises, first aid, CPR	*Site emergency response plan, fire extinguishers, fire blankets, respirators, masks, fire hoses, first aid kits, stretchers, WHMIS book, and other related tools and gear*
5.02	Responds to emergencies	Knowledge of: • manufacturers' specifications, such as equipment emergency shut-down procedure • company policies and procedures • site emergency response plan, such as evacuation routes, procedures, contact protocol • types of fires, i.e., Class A, B, C, and D • types of extinguishers • potential and actual hazards on work site • location of fire extinguishers and first aid stations (on equipment and site) and how to use them	*Fire extinguishers, fire blankets, respirators, masks, fire hoses, first aid kits, stretchers, and other related tools and gear*

- inspection requirements for safety equipment and supplies, such as fire extinguisher, first aid kit

Ability to:

- follow emergency plan
- communicate or follow instructions
- assess risks and determine course of action
- operate emergency equipment and supplies

BLOCK C EQUIPMENT
Task 6 Describes Equipment and Attachments

This task is important because it helps to:

- use equipment and supplies properly and safely
- select correct attachments, tools, and supplies for different working conditions

Trends:

- Operators are spending more time with manufacturers and suppliers learning about products.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
6.01	Describes types and sizes of horizontal directional drills	Knowledge of: • manufacturers' specifications • capacities and capabilities	*Manufacturers' manuals and literature*
6.02	Describes components and operating systems of horizontal directional drills	Knowledge of: • major components, such as support vehicle (e.g., truck, van), float or trailer, horizontal directional drill equipment, drilling[JS1] fluid [JS2]mixer, drilling fluid recycler, electronic tracking system • additional support components for large horizontal directional drills, such as power packs, drilling fluid return systems • operating systems, such as hydraulic, electric, lubrication • functions of major components	*Manufacturers' manuals and literature*
6.03	Describes drilling supplies associated with horizontal directional drills	Knowledge of: • supplies required for drilling, such as chalk, rod grease, additives for drilling fluid, coolant, absorbants for leaks and emergency spills, C-cell batteries, cleaning fluid for threads on drill head, spray paint, pH test kit	*Manufacturers' manuals and literature*
6.04	Describes functions and types of drill controls	Knowledge of: • controlled functions, such as rotation, thrust, fluid pressure • variation in locations and styles of controls (such as joy sticks, buttons, switches) in different makes and models	*Manufacturers' manuals and literature*

6.05	Describes attachments	Knowledge of: • types and sizes of attachments (including down-hole tools), such as drill bits, drill heads, reamers, swabs[mab4] • types of drill bits • appropriate drill bit to use for different ground conditions, such as duckbill for sand or clay, drag bit with carbide tips for shale or rock • sizes of drill heads • sizes and types of reamers • appropriate reamer to use for different ground conditions, length of bore, and product sizes • appropriate swab to use for cleaning bore	*Manufacturers' manuals and literature*
6.06	Describes mixers and drilling fluids	Knowledge of: • manufacturers' specifications for mixers and fluids • properties of drilling fluids, such as viscosity, biodegradability • formulas for drilling fluids • proper mixture of drilling fluids to use according to ground conditions	*Manufacturers' manuals and literature, drilling fluid formulas*
6.07	Describes rigging equipment	Knowledge of: • manufacturers' specifications • applicable legislation • types of rigging hardware, such as spreader bars, lifting and equalizing beams, chain spreaders, shackles • types of slings, such as synthetic, wire rope, lifting chain • configuration of rigging, such as basket, multi-legged bridle, choking • capacity and appropriate use of rigging hardware	*Manufacturers' manuals and literature*

BLOCK D MAINTENANCE
Task 7 Performs Pre-Operational Inspection and Daily Service with Engine Off

This task is important because it helps to:

- ensure continuous and safe operation of equipment
- meet manufacturers' specifications, company policies and procedures, and applicable legislation
- prevent damage to equipment
- reduce unscheduled downtime

Trends:

- Pre-operational checks can be completed more quickly due to improved technology.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
7.01	Inspects and services engine lubrication system	Knowledge of: • manufacturers' specifications, such as correct engine oil • company policies and procedures • applicable legislation • engine lubrication system, components, and functions • normal operating conditions • spill kit procedures Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as add engine oil • use spill kit • perform or arrange for repair or replacement of defective components, such as filler cap	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, spill kit, engine oil*
7.02	Inspects and services electrical system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • electrical system, components (such as alternator, starters, regulators, wiring, fuses), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, distilled water*

		• select and use appropriate tools • perform or arrange for service • perform or arrange for repair or replacement of defective components, such as alternator belt	
7.03	Inspects and services hydraulic system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • hydraulic system, components (such as hydraulic fluid, filters, lines, pumps, fittings), and functions • normal operating conditions • spill kit procedures Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • read sight gauges, such as oil level • select and use appropriate tools • perform basic service, such as adjust hydraulic fluid levels • use spill kit • perform or arrange for repair or replacement of defective components, such as lines	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, hydraulic oil, spill kit*
7.04	Inspects and services cooling system	Knowledge of: • manufacturers' specifications, such as correct belt tension • company policies and procedures • applicable legislation • cooling system, components (such as belts, hoses, radiator, coolant), and functions • normal operating conditions • spill kit procedures Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as adjust belt tension, add coolant • use spill kit • perform or arrange for repair or replacement of defective components, such as hoses, belts	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, coolant, spill kit*

7.05	Inspects and services air intake system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • air intake system, components (such as air filters, air intake system, turbo chargers), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as empty pre-cleaner, change air filters • perform or arrange for repair or replacement of defective components, such as pre-cleaner, intake hoses	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*
7.06	Inspects and services fuel system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • fuel systems, components (such as fuel pump, injector lines, fuel filters, water separator), and functions • normal operating conditions • spill kit procedures Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions (such as leaks) through visual inspection • select and use appropriate tools • perform basic service, such as refuel vehicle, drain fuel separator, change fuel filters • use spill kit • perform or arrange for repair or replacement of defective components, such as lines, fuel pump	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, spill kit*

7.07	Inspects and services suspension system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • suspension system, components (such as fittings, air bags, springs, hangers), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as grease and change fittings • perform or arrange for repair or replacement of defective components, such as air bags, springs	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, grease gun*
7.08	Inspects and services load-bearing structure	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • load-bearing structure, components (such as deck, chassis), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • perform or arrange for repair or replacement of defective components, such as bolts, welds	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE*
7.09	Inspects and services operator station	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • operator station, components (such as instrument panels, operating controls, communication devices), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*

		• select and use appropriate tools • perform basic service, such as clean windows and mirrors, adjust mirrors, clean operating controls • perform or arrange for repair or replacement of defective components, such as controls	
7.10	Inspects safety equipment	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • required safety equipment, such as reflectors, fire extinguisher, pylons, decals • caution, warning, and hazard decals, lights, and symbols • normal operating conditions Ability to: • locate components to be inspected • ensure that safety equipment is on board and securely mounted • identify service needs, defects, and hazardous conditions through visual inspection • arrange for repair or replacement of defective or missing components, such as fire extinguisher	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, safety equipment*
7.11	Inspects and services power source for drill and support vehicle	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • power system, components (such as diesel, electric), and functions • normal operating conditions • refuelling procedures • risk of static build-up during refuelling • spill kit procedures Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as refuel equipment, remove contamination from sediment bowls	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, spill kit*

		• arrange for repair or replacement of defective components, such as hoses, power supply cable • use spill kit	
7.12	Inspects and services drilling system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • drilling system, components (such as vices, thrust drive chains, carriage rack, rotational gear box), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as lubricate vices and thrust drive chains, drill fluid swivel and carriage rack • perform or arrange for repair or replacement of defective components or related equipment, such as drive spindles, jaws in vices, thrust drive chains	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE*
7.13	Inspects and services stabilizing system	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • stabilizing system, components (such as outriggers, pads, mats, stabilizer jack, cylinders), and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as grease pins and bolts • perform or arrange for repair or replacement of defective components, such as pins, bolts, hoses, fittings	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE*

7.14	Inspects and services attachments	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • attachments (such as drill heads, reamers, swabs), components, and functions • normal operating conditions Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as clean and inspect reamers, lubricate swivels • perform or arrange for repair or replacement of defective components, such as carbide teeth, welding cracks in reamers	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, grease gun*
7.15	Inspects and services tracking system	Knowledge of: • manufacturers' specifications • company policies and procedures • tracking system, components, and functions • where batteries are used, such as sonde, receiver, locator • proper size, type, and installation of batteries Ability to: • locate components to be inspected • identify service needs, defects, and hazardous conditions through visual inspection • select and use appropriate tools • perform basic service, such as verify that batteries have been charged and tested, calibrate tracking device • perform or arrange for repair or replacement of defective or dated components, such as software on locator	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, batteries, charger*

BLOCK D MAINTENANCE
Task 8 Performs Pre-Operational Inspection and Daily Service with Engine On

This task is important because it helps to:

- identify problems not evident when engine is off
- ensure that equipment is ready to operate
- prolong equipment life
- prevent unscheduled downtime

Trends:

- Operators need to interpret more feedback due to increased automation in monitoring and warning systems.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
8.01	Starts and warms up engine	Knowledge of: • manufacturers' specifications • company policies and procedures • monitoring and warning systems, components, and functions • normal operating conditions • battery-boosting procedures • impact of weather and seasonal conditions on start-up procedures and equipment functions and fluids Ability to: • adjust start-up procedures according to weather conditions, such as use block or fuel heater • boost batteries • interpret information from gauges, lights, and sensors • arrange for repair or replacement of defective components, such as light bulbs, fuses • inspect and test strike alert	*Manufacturers' manuals and literature, PPE, basic tools and supplies, starting aids*
8.02	Checks operating controls	Knowledge of: • manufacturers' specifications • company policies and procedures • types of operating controls, such as wireless remote, remote with umbilical cord Ability to: • cycle functions • ensure that remote control batteries are charged • identify service needs, defects, and hazardous conditions	*Manufacturers' manuals and literature, PPE, basic tools and supplies*

		• select and use appropriate tools • perform basic service, such as clean remote control • arrange for repair or replacement of defective components	
8.03	Cycles equipment functions	Knowledge of: • manufacturers' specifications • company policies and procedures • equipment controls • normal operating characteristics • impact of weather and seasonal conditions on functions and fluids Ability to: • activate all functions (such as rotation, thrust, drilling fluid, rod loader) according to weather conditions and manufacturers' instructions • inspect rod breaking components • identify problems with functions, such as listen for unusual sounds • select and use appropriate tools • perform or arrange for required maintenance	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*

BLOCK D MAINTENANCE
Task 9 Complies with Scheduled Maintenance Requirements

This task is important because it helps to:

- ensure continuous and safe operation of equipment
- prevent damage to equipment
- reduce unscheduled downtime
- validate manufacturers' equipment warranties
- meet manufacturers' specifications, company policies and procedures, and applicable legislation

Trends:

- There is increased awareness of the consequences of not complying with scheduled maintenance requirements.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
9.01	Arranges for or performs scheduled maintenance	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • factors affecting need to alter maintenance schedule, such as where equipment is being used, weather conditions Ability to: • comply with safety requirements • read indicators that signal need for replacement of components, such as air filter • read equipment maintenance documentation • select and use appropriate tools • arrange for or perform scheduled maintenance and service, such as change air, oil, and fuel filters	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, tools for maintenance work, torque wrench*

BLOCK E OPERATING PROCEDURES
Task 10 Plans Work Procedures

This task is important because it helps to:

- ensure proper installation of product
- prevent strike damage
- prevent unscheduled downtime
- ensure that work is done to specifications

Trends:
N/A

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
10.01	Assesses site hazards	Knowledge of: • job specifications • company policies and procedures • applicable legislation, such as Occupational Health and Safety • authorities having jurisdiction • factors that affect stability of equipment, such as ground and supporting conditions • actual and potential dangers, such as underground utilities; locations of other equipment, personnel, and vehicular traffic • indicators of presence of utilities • colour codes used for local markers Ability to: • inspect site visually • interpret local markers and determine location of utilities to find pilot hole • communicate with site personnel and authorities having jurisdiction • determine appropriate PPE[JS6]	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, utility locate document, site plan*
10.02	Discusses environmental concerns of site with site personnel	Knowledge of: • company policies and procedures • applicable legislation, such as transportation of dangerous goods, spill reporting • environmental concerns • site characteristics and boundaries Ability to: • identify actual and potential environmental concerns, such as proximity to water courses, allowable noise levels, fuel leaks, hazardous materials	*PPE, site plan*

		• communicate questions and concerns with employer, site personnel, or authorities having jurisdiction	
10.03	Determines types and properties of soil	Knowledge of: • types of soil, such as sand, clay, shale, drilling fluid, till • properties of different soil types, such as density, presence of jagged edges, hardness, water content Ability to: • identify types and properties of soil	*PPE, soil reports, geological surveys*
10.04	Reviews job specifications and safety considerations with site personnel	Knowledge of: • job specifications • horizontal directional drilling procedures • applicable legislation • industry terms • actual and potential site hazards • job- or site-specific PPE and training • adjustments in depth of pilot hole that need to be made because of location of utilities • other construction equipment on site • roles of personnel on site, such as foreman, locator, inspector, other tradespeople Ability to: • determine relevant safety information, such as job- or site-specific PPE needed, traffic patterns, procedures • confirm details of job to be completed, such as positioning of equipment • sequence job tasks to co-ordinate activities with other site personnel • read utility locate document and site plan • work with locator to determine adjustments to pilot hole path	*Job- or site-specific PPE, markers, site plan, proposed pilot hole path, utility locate document*
10.05	Determines set-up location for drill equipment and support vehicle	Knowledge of: • restrictions (such as public roadway, private property), obstacles, and hazards, such as overhead utility wires • accessibility to drill equipment by other required equipment • ground conditions	*PPE, site plan*

		• proposed pilot hole path, including start and end locations • location of survey markers, construction grades, and stakes Ability to: • set up support vehicle as close as possible to drill equipment • create stable and level ground conditions, such as use mats or temporary pads • ensure proper clearances for support equipment	
10.06	Determines proper drilling fluid mixture	Knowledge of: • soil types and properties • formulas for drilling fluids Ability to: • select appropriate formula for soil type and properties	*PPE, drilling fluid formulas*

BLOCK E OPERATING PROCEDURES
Task 11 Operates Horizontal Directional Drill

This task is important because it helps to:
- protect environmentally sensitive areas
- minimize disturbance of surface
- minimize disruption to vehicular and pedestrian traffic

Trends:
- Equipment is becoming more specialized and easier to operate.
- Advances in technology are making it more challenging for operators to keep up to date.

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
11.01	Complies with equipment safety requirements	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • safety controls, functions, and safety equipment, such as fire extinguisher • caution, warning, and hazard decals, lights, and symbols Ability to: • use safety controls and safety equipment • respond to caution, warning, and hazard decals, lights, and symbols	*Manufacturers' manuals and literature, PPE, fire extinguisher, roadside safety equipment, first aid kit*
11.02	Follows procedures for equipment set up	Knowledge of: • manufacturers' specifications • company policies and procedures • permit requirements, such as use of barricades • actual and potential site hazards • correct positioning and stabilizing of drill equipment and support vehicles • length of supply lines required • type and amount of supplies required for drilling operation • hand signals Ability to: • hook up drilling fluid supply lines • install drill head assembly • position equipment correctly • maintain stability of equipment • use and respond to hand signals	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, drilling supplies*

11.03	Performs physical work	Knowledge of: • company policies and procedures • proper lifting techniques Ability to: • lift heavy items • manipulate heavy tools, such as pry bars • use rigging equipment • hold heavy items up for extended periods of time • manipulate equipment, attachments, and tools in confined work space	*PPE, basic tools and supplies*
11.04	Uses safe rigging techniques	Knowledge of: • manufacturers' specifications for rigging hardware and slings • applicable legislation, such as Occupational Health and Safety • load assessment, such as weight, dimension • appropriate rigging hardware and slings • rigging configurations • load hook-up points Ability to: • select appropriate rigging and slings for load • inspect rigging components for wear and defects • identify best rigging configuration • inspect hook-up points before lifting	*Manufacturers' literature for rigging hardware and slings, PPE, basic tools and supplies*
11.05	Mixes drilling fluid	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • appropriate formula for ground conditions Ability to: • follow formulas • operate mixer	*Manufacturers' manuals and literature, PPE, basic tools and supplies, drilling fluid formulas*
11.06	Checks flow of drilling fluid before commencing drilling operations	Knowledge of: • desirable flow of drilling fluid • hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies*

		Ability to: • activate drilling fluid pump • verify flow visually • use and respond to hand signals	
11.07	Commences drilling operations	Knowledge of: • manufacturers' specifications • company policies and procedures • when to have starter hole dug • starting point • thrust, rotation, and pressure of drilling fluid flow • expected behaviour of drill head when drilling • hand signals Ability to: • commence drilling operations • adjust drilling procedures to suit conditions • use and respond to hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies*
11.08	Drills pilot hole	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • pilot hole markers • procedures for adding drill rods • information needed from locator • options for dealing with obstructions, such as digging out obstruction, pulling back, redirecting drill head • industry terms • hand signals Ability to: • use two-way radio • follow procedures for adding drill rods • follow markers • interpret information from locator, such as depth, pitch, roll of drill head • adjust pilot hole based on information received • make adjustments within allowable tolerances to deal with obstacles • follow signals from locator	*Manufacturers' manuals and literature, PPE, basic tools and supplies, water, markers, two-way radio*

11.09	Optimizes equipment capabilities	Knowledge of: • manufacturers' specifications • company policies and procedures • job specifications • location, style, and patterns of controls • capabilities and limitations of equipment, such as rotation, thrust • factors that affect operating techniques, such as soil conditions • equipment performance indicators, such as engine load, rotation pressures, forward/ reverse thrust • hand signals Ability to: • optimize equipment capabilities • use operating controls in manner that is smooth and co-ordinated • respond to equipment performance indicators • use and respond to hand signals	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, drilling fluids*
11.10	Monitors equipment performance	Knowledge of: • manufacturers' specifications • normal operating characteristics • operator aid devices on equipment • monitoring and warning systems Ability to: • read and interpret information from gauges, symbols, and operator aid devices • use senses to monitor performance • troubleshoot equipment problems	*Manufacturers' manuals and literature, PPE*
11.11	Troubleshoots equipment problems	Knowledge of: • manufacturers' specifications • company policies and procedures • previous problems and solutions • problem-solving process • mechanical operation of equipment • equipment systems • normal operating characteristics Ability to: • identify possible sources of problems and solutions • implement solutions	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*

		• communicate problems accurately to others, such as mechanic, foreman	
11.12	Monitors activities of other personnel, equipment, and traffic	Knowledge of: • manufacturers' specifications • company policies and procedures • actual and potential site hazards • equipment blind spots and when to consult locator • boundaries needed between crews for safety • hand signals Ability to: • be aware of movements in work area while performing tasks • avoid collisions • work with locator • communicate with work crews	*Manufacturers' manuals and literature, PPE*
11.13	Prevents equipment and supplies from freezing up	Knowledge of: • manufacturers' specifications • company policies and procedures • when to add coolant, such as during interruptions in drilling operations, in freezing temperatures • appropriate type of coolant to use • hand signals Ability to: • add coolant to drilling fluid pump • determine when sufficient coolant has been added to displace drilling fluid in areas that could freeze • set up shelter around equipment • use and respond to hand signals	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, coolant*
11.14	Keeps work station clean	Knowledge of: • manufacturers' specifications • company policies and procedures • impacts of housekeeping on efficiency of work and safety • housekeeping practices • proper storage and locations for tools Ability to: • clean and tidy work stations	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, hand cleaner, squeegee, scraper, broom*

11.15	Finishes pilot hole	Knowledge of: • manufacturers' specifications • company policies and procedures • when to raise pitch of drill head in preparation for exit • location of end marker • appropriate time to shut off drilling fluid • hand signals Ability to: • shut off drilling fluid just prior to exit • exit at marker • use and respond to hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies*
11.16	Prepares equipment for pull back	Knowledge of: • manufacturers' specifications • company policies and procedures • factors to consider, such as size of product, size of pilot hole, soil conditions • procedures for reaming, swabbing, and pulling product with or without reamer • hand signals Ability to: • remove drill head • determine attachments required for pull back • install reamer, pull head, or both • connect product to pull head • use and respond to hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies, break-out tools*
11.17	Performs pull back	Knowledge of: • manufacturers' specifications • company policies and procedures • procedures for pulling back with reamer only, with reamer and product, and with product only • impact of type and size of product on pull back • impact of soil conditions on pull back • hand signals Ability to: • perform pull-back procedures • adjust pull-back procedures to suit product and soil conditions • use and respond to hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies*

BLOCK E OPERATING PROCEDURES
Task 12 Follows Shut-Down Procedures

This task is important because it helps to:

- ensure that equipment is ready for next shift
- prevent unscheduled downtime
- prevent vandalism and unauthorized movement of equipment

Trends:
N/A

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
12.01	Cleans equipment before parking	Knowledge of: • manufacturers' specifications • company policies and procedures • importance of cleaning tracks and attachments • hand signals Ability to: • clean tracks and attachments according to manufacturers' specifications and company policies and procedures • use and respond to hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies*
12.02	Parks equipment in appropriate location	Knowledge of: • manufacturers' specifications • company policies and procedures, such as parking guidelines • applicable legislation • suitable and safe parking locations, such as dry and clean surface, level, away from fuel storage and water courses, secure area • hand signals Ability to: • identify appropriate parking location • park equipment according to company policies and procedures • use and respond to hand signals	*Manufacturers' manuals and literature, PPE*
12.03	Shuts down and secures equipment	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • hand signals	*Manufacturers' manuals and literature, PPE, basic tools and supplies, locks*

		Ability to: • shut down equipment according to manufacturers' specifications, such as turn off master switch, remove key • secure equipment against movement, theft, and vandalism • secure equipment when rods are in ground, such as put up barricade • use and respond to hand signals	
12.04	Performs housekeeping tasks	Knowledge of: • manufacturers' specifications • company policies and procedures • housekeeping practices, such as return items to proper storage place, pick up debris Ability to: • follow housekeeping practices, such as keep hand controls free of grease and oil, clean windows in van or truck, clean tracks and reamers • clean items, such as windshields, rails, steps, instrument panel • sweep floor • remove garbage	*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, broom, paper towels*
12.05	Performs post-operational inspection	Knowledge of: • manufacturers' specifications • company policies and procedures • applicable legislation • normal operating conditions Ability to: • perform circle check • identify existing or potential problems with equipment • communicate concerns to appropriate personnel, such as supervisor, mechanic	*Manufacturers' manuals and literature, PPE*

BLOCK F TRANSPORTATION
Task 13 Transports Equipment

This task is important because it helps to:
- comply with transportation legislation
- ensure safety of public and equipment

Trends:
N/A

	Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
13.01	Walks drilling equipment to next location	Knowledge of: • manufacturers' specifications • company policies and procedures • whether next bore shot is close enough to walk equipment • hand signals Ability to: • walk equipment with levers or remote control (i.e., walking box) • use and respond to hand signals	*Manufacturers' manuals and literature, PPE*
13.02	Assists with loading and unloading	Knowledge of: • manufacturers' specifications • specifications of equipment and attachments, such as weight, dimensions • company policies and procedures • applicable legislation, such as transportation • safe load distribution • loading/unloading procedures • blocking • hoisting equipment or lifting device, such as mobile crane, boom truck • rigging techniques • weather conditions • hand signals Ability to: • assess hazards in loading area, such as uneven ground, utilities • lower carriage • assist in disassembly for transport • follow loading or unloading procedures	*Manufacturers' manuals and literature, PPE, basic tools and supplies, oversize load signs, flags, lights*

- position load for correct weight distribution
- attach warning flags and reflectors
- clean deck
- use and respond to hand signals

Horizontal Directional Drill Operator DACUM Chart

Block	Task	Subtask					
A. PROFESSIONALISM	**1. Acts Professionally**	1.01 Demonstrates work ethic	1.02 Is aware of factors affecting personal health	1.03 Resolves problems or disagreements with others	1.04 Participates in professional development	1.05 Works with others	1.06 Works independently
	2. Uses Communication Skills	2.01 Speaks and listens effectively	2.02 Uses documentation	2.03 Communicates using signals	2.04 Uses electronic communication equipment		
B. SAFETY	**3. Interprets Applicable Legislation and Policies**	3.01 Interprets federal, provincial/ territorial, and municipal legislation	3.02 Interprets permits, licenses, and insurance requirements	3.03 Interprets environmental legislation	3.04 Interprets company policies and procedures		
	4. Works Safely	4.01 Uses personal protective equipment (PPE)	4.02 Completes required health and safety training				
	5. Complies with Site Emergency Plan	5.01 Prepares for emergencies	5.02 Responds to emergencies				

Block	Task	Subtask					
C. EQUIPMENT	**6. Describes Equipment and Attachments**	6.01 Describes types and sizes of horizontal directional drills	6.02 Describes components and operational systems of horizontal directional drills	6.03 Describes drilling supplies associated with horizontal directional drills	6.04 Describes functions and types of drill controls	6.05 Describes attachments	6.06 Describes mixers and drilling fluids
		6.07 Describes rigging equipment					
D. MAINTENANCE	**7. Performs Pre-operational Inspection and Daily Service with Engine Off**	7.01 Inspects and services engine lubrication system	7.02 Inspects and services electrical system	7.03 Inspects and services hydraulic system	7.04 Inspects and services cooling system	7.05 Inspects and services air intake system	7.06 Inspects and services fuel system
		7.07 Inspects and services suspension system	7.08 Inspects and services load-bearing structure	7.09 Inspects and services operator station	7.10 Inspects safety equipment	7.11 Inspects and services power source for drill and support vehicle	7.12 Inspects and services drilling system
		7.13 Inspects and services stabilizing system	7.14 Inspects and services attachments	7.15 Inspects and services tracking system			

Block	Task	Subtask					
D. MAINTENANCE, cont'd	**8. Performs Pre-operational Inspection and Daily Service with Engine On**	8.01 Starts and warms up engine	8.02 Checks operating controls	8.03 Cycles equipment functions			
	9. Complies with Scheduled Maintenance Requirements	9.01 Arranges for or performs scheduled maintenance					
E. OPERATING PROCEDURES	**10. Plans Work Procedures**	10.01 Assesses site hazards	10.02 Discusses environmental concerns of site with site personnel	10.03 Determines types and properties of soil	10.04 Reviews job specifications and safety considerations with site personnel	10.05 Determines set-up location for drill equipment and support vehicle	10.06 Determines proper drilling fluid mixture
	11. Operates Horizontal Directional Drill	11.01 Complies with equipment safety requirements	11.02 Follows procedures for equipment set up	11.03 Performs physical work	11.04 Uses safe rigging techniques	11.05 Mixes drilling fluid	11.06 Checks flow of drilling fluid before commencing drilling operations
		11.07 Commences drilling operations	11.08 Drills pilot hole	11.09 Optimizes equipment capabilities	11.10 Monitors equipment performance	11.11 Troubleshoots equipment problems	11.12 Monitors activities of other personnel, equipment, and traffic

Block	Task	Subtask				
E. OPERATING PROCEDURES, cont'd	**11. Operates Horizontal Directional Drill, cont'd**	11.13 Prevents equipment and supplies from freezing up	11.14 Keeps work station clean	11.15 Finishes pilot hole	11.16 Prepares equipment for pull back	11.17 Performs pull back
	12. Follows Shut-down Procedures	12.01 Cleans equipment before parking	12.02 Parks equipment in appropriate location	12.03 Shuts down and secures equipment	12.04 Performs housekeeping tasks	12.05 Performs post-operational inspection
F. TRANSPORTATION	**13. Transports Equipment**	13.01 Walks drilling equipment to next location	13.02 Assists with loading and unloading			

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