# Seismic Drilling Inspection Checklist

Date of inspection: _____ Project name: _____ Prime contractor/owner: _____

Project manager: _____ Drilling employer: _____ Drillpush/supervisor: _____

Location: _____ Project type: _____ Type of drill: _____

Driller: _____ Helper: _____ Blaster ticket no. _____

Explosives used: _____ Charge size: _____ Average shot hole depth: _____

***The following checklists are not a complete listing of requirements. They were developed to assist employers and workers with training, equipment, and documentation requirements for seismic drilling operations.***

| | **OHS Regulation/ *Workers Compensation Act*** | ☑ |
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| **Blasters**<br>*This section covers the requirements for all Seismic Blasters, in both conventional and heli-portable operations.* | | |
| **Certification**<br>• In some circumstances, the driller's helper will also be a certified blaster. One blaster must be designated as the Blaster of Record.<br>• The Seismic Shooter on a recording crew conducting the detonation phase of the blasting must also be certified.<br>• Seismic Blasters may have more than one WorkSafeBC code assigned to their blasting ticket, based upon additional training and certification. | | |
| ❑ The Blaster must be certified by either WorkSafeBC or Enform as having a Seismic Blasting designation.<br>❑ For WorkSafeBC tickets only:<br>• The Seismic Blasting code is 6.<br>• The initiation system must reflect the type of system being used: electric, electronic, or unrestricted.<br>• The endorsement must reflect the work being done: Seismic Shooter, Seismic Loader, or Seismic Shooter/Loader.<br>❑ For Enform tickets:<br>• Enform tickets have the Seismic Blaster/Loader designation only.<br>• Ensure that the actual certificate is presented, not the Enform course attendance record. | OHS 21.8<br>OHS 21.5(1)-(3) | |
| ❑ **Records** – The employer:<br>• Must make a record of all Blasters' certificates<br>• Must ensure that Blasters understand their duties | OHS 21.11 | |
| ❑ **Custody of the certificate**<br>• The certificate must be kept in a safe place at the workplace.<br>• It must be presented to an Officer upon request during an inspection. The original certificate is the only acceptable proof of certification.<br>• The blasting ticket must be readily available in the cab of the drill or carried by the Blaster.<br>**Note**: If the original certificate is not readily available at the worksite for review, the Officer must suspend blasting operations until the certificate is produced. | OHS 21.12 (1)-(3) | |

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| ❑ **Suspension of a Blaster's duties**<br>• A Blaster's certificate may be seized by an Officer if there is reason to believe that any person (including the Blaster) has been endangered by the Blaster's actions or omissions. For details, see Guideline G21.15.<br>• If a Blaster has failed to comply with the blasting requirements of the Regulation or with a manufacturer's recommendations for safe blasting practices, the employer must investigate the incident and may suspend the Blaster's duties. | OHS 21.15<br>OHS 21.13 | |
| ❑ **Training of Blasters and Blaster's helpers** – Any worker who handles explosives must receive training in the proper handling of the explosives, including:<br>• Loading holes<br>• Proper use of loading poles (no ramming of pole with a charge)<br>• Detonators (ensuring that the stinger is not contacting the detonator; setting detonators; uncoiling detonator leg wires with no throwing of leg wires)<br>• Lowering in charges (hand over hand; no dropping)<br>• Details of the drilling and loading program<br>• Hazards related to mishandling and fire<br>• Safe work procedures in the event of an explosion or fire<br>❑ Other training:<br>• Forest Fire Fighting (G600 Standard)<br>• New and young worker orientation and training<br>• Rigging training | OHS 21.7<br>OHS 3.23(1) & (2)(a)-(m)<br>OHS 26.3.1(1)(a) & (b), (2), (3)<br>OHS 15.2 | |
| **Drill Logs and Recording Logs** | | |
| ❑ **Drill logs** are made by the Blaster of Record. They document the following:<br>• Loading details – type of explosive, charge size, and depth of shot hole<br>• Program and date<br>• Any relevant line details, including the names of assistants to the Blaster<br>**Note**: The Canadian Association of Geophysical Contractors (CAGC) and WorkSafeBC have developed a standardized logbook for Seismic Blasters that covers the essential details for seismic blasting.<br>❑ **Recording logs**<br>• The Seismic Shooter will be shooting shot holes that have been loaded by another Blaster and will not have access to that Blaster's logbooks. Because of this, the Seismic Shooter must be able to communicate directly with the Seismic Recorder, who will have copies of the program loading logs available for review prior to detonation.<br>• Any anomalies with the loading of a shot hole or charge must be communicated to the Seismic Shooter prior to detonation.<br>• The Seismic Shooter must communicate any anomalies with the detonation of the shot hole back to the Seismic Recorder to ensure that proper records are kept and that corrective actions are taken as needed.<br>• Any shot hole that misfires is considered a potentially dangerous incident. The employer must conduct an investigation and take corrective action based upon misfire safe work procedures. | OHS 21.4(1)-(4)<br>*Blasting log*<br><br>OHS 21.73(1)<br>*Misfire safe work procedures; safe entry*<br><br>OHS 21.74<br>*Blast site exam*<br><br>OHS 21.75(1)<br>*Unfired explosives*<br><br>OHS 21.76(1)<br>*Removing loose material* | |

| | OHS Regulation/ *Workers Compensation Act* | ☑ |
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| **Blasting Incidents** | | |
| ❑ Any dangerous incident involving explosives requires immediate action on the part of the employer, whether or not an injury occurs. The employer must:<br>• Immediately report the incident to WorkSafeBC.<br>• Investigate the incident and provide a copy of the report to WorkSafeBC (the CAGC has developed a standardized form to assist employers with this). The report must include all of the relevant details of the incident and corrective actions taken by the employer. | OHS 21.3(1)<br><br>OHS 21.3(2)(a)-(f)<br>*Report details* | |
| ❑ Misfire shot holes can be left if the following conditions are met:<br>• The shot hole cannot be detonated safely or conventionally.<br>• The shot hole is an isolated location (see definition of "isolated" in the "Blasting" section).<br>• The charge is at a safe depth to minimize risk of injury to workers or others. (The determination of safe depth is based upon a risk assessment that includes the size of charge, the type of explosive, and the nature of the overburden material that covers the charge.)<br>• The location is marked effectively. (A metal marker tag has been developed by the CAGC and explosives manufacturers for this purpose. The tag is buried and recorded.)<br>• A permanent record is kept: the misfire shot hole is recorded in the program recording logs and reported to the BC Oil and Gas Commission (BCOGC) for entry into their database.<br>**Note**: For more information, refer to the CAGC *Misfired Charges Best Practices* (January 2006). | OHS 21.84(3)(a)-(e)<br><br>OHS 21.74 & 21.75(1) & (2)<br>*Additional misfire requirements* | |
| **Storage of Explosives** | | |
| ❑ **Detonators**<br>• Must be stored separately from explosives, fuses, or igniters and protected from damage (a type 6 magazine may be used as a day box, however)<br>• Must not be stored overnight unless approved by Natural Resources Canada, Explosives Regulatory Division (NRC/ERD). | OHS 21.16(1) & (2) | |
| ❑ **Magazines**<br>• Workers must know the magazine location and any restrictions on entry into the magazine area (there must be proper signage).<br>• Interiors must be kept scrupulously clean (no storage of equipment or clothing in the magazine), dry, and away from any potential ignition sources.<br>• No open flames and no smoking are allowed within 50 ft (15 m) of a magazine.<br>• Explosives boxes must be burned or disposed of following manufacturer's instructions.<br>• Drill magazines must be built to type 6 standards and flight magazines to type 10 standards.<br>• NRC/ERD requires a 24-hour verification system using an iButton or remote monitoring system.<br>**Note**: For more details on magazine standards, please refer to the NRC/ERD *Storage Standards for Industrial Explosives* (March 2008). | OHS 21.18(1)<br>OSH 21.19(1)-(3)<br>OSH 21.40(1) & (2)<br>OSH 21.41(1) & (2) | |

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| **Transportation of Explosives** | | |
| ❑ **Vehicle operation**<br>• Vehicles must be in good mechanical condition.<br>• No passengers are allowed other than those handling explosives. | OHS 21.21(1) & (2) | |
| ❑ **Separation from flammable materials**<br>• Reasonable quantities of flammable materials are allowed on vehicles, provided they are contained in a manner so as not to ignite or explode.<br>• There must be at least 2 ft of separation between propane tanks and magazines on drills. | OHS 21.23 | |
| ❑ **Transportation of explosives in a vehicle**<br>• Explosives must be kept separate from the passenger compartment, in a locked fire-resistant fixed container or compartment. Options for separation include:<br>– A solid wood or other suitable barrier partition 15 cm (6 in) thick, extending at least 15 cm (6 in) above the highest level to which explosives are packed in the vehicle, or<br>– A minimum distance of 60 cm (2 ft) between containers, or<br>– As permitted in Schedule IV of the Explosive Regulations under the *Explosives Act (Canada).*<br>• Electric detonators must be kept separate from explosives, in their original containers with leg wires shunted.<br>• Any vehicle having 10 kg or more of explosives requires four placards appropriate to the Transportation of Dangerous Goods (TDG) hazard rating.<br>• Any vehicle transporting 75 kg or more of explosives requires an Emergency Response Action Plan (ERAP).<br>• Any vehicle transporting explosives, including seismic drills, must carry *two* fire extinguishers with the appropriate rating: 20 BC<br>❑ No explosives may be transported on water trucks with open-flame heaters unless all the following conditions are met:<br>• The distance between the heating tube and the outside of the tank is at least 14 in.<br>• The heater fire box fully contains the fuel.<br>• Detonator storage is on the opposite side of the vehicle from the explosives storage. | OHS 21.24(1)-(3)<br>OHS 21.84(5)<br>OHS 23.10(1)<br>Table 23-1 | |
| ❑ **Transport on a mobile drill rig** is permitted only if all the following conditions are met:<br>• Detonators and explosives are carried in separate containers built to either type 6 or type 10 magazine standard, with two hooded locks.<br>• The containers are:<br>– Located 2 ft apart, with doors facing away at least 90° apart<br>– Located above the vehicle deck and protected from damage and heat sources<br>– Kept locked when outside the blast area, and securely closed (with a spring-loaded pin) when in the blast area<br>– Attended at all times by the Blaster or qualified person when loaded with explosives | OHS 21.25(a) & (b) | |
| ❑ **No contact with metal** – Contact between explosive packages and metal is prohibited. They must be kept apart with non-conductive materials. | OHS 21.27 | |

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| ❑ **Emergency procedures required** – Before transporting explosives, the employer must develop appropriate written safe work procedures, and workers must be instructed in these procedures. | OHS 21.28 | |
| ❑ **Safe operation of vehicles** – Vehicles carrying explosives must be operated in a safe manner, consistent with road and weather conditions. This means:<br>• Following manufacturer's instructions and directions, tolerances and allowances<br>• Maintaining control of the vehicle and not pose a risk of injury to self or others<br>• Maximum speed of 90 km per hour (55 miles per hour)<br>• Maximum load of 80% of gross vehicle weight (GVW)<br>• No transporting of explosives on a trailer | OHS 21.29(a) & (b)<br>OHS 21.30<br>OHS 21.32 | |
| ❑ **Firefighting equipment** – Vehicle transporting explosives must have at least two fire extinguishers (20 BC rating). | OHS 21.31(1)<br>OHS 23.10(1) | |
| **Explosives Handling** | | |
| ❑ **Safe handling procedures**<br>• Explosives and detonators must be kept and handled separately until the last most practicable moment before they are brought together (no pre-priming of charges).<br>• They must be handled in accordance with manufacturer's specifications.<br>• Defective explosives must not be abandoned but must be handled and disposed of according to manufacturer's specifications.<br>• Workers must not carry explosives in their clothing (e.g., no detonators in pockets). | OHS 21.21, 21.36, 21.37, and 21.39<br>OHS 21.45<br>OHS 21.46 | |
| ❑ **Ignition sources**<br>• Smoking is prohibited within 50 ft of storage locations, handling areas, or loaded holes.<br>• There must be no open flame within 50 ft of storage locations, handling areas, or loaded holes unless the Blaster of Record consents. | OHS 21.40(1) & (2) | |
| ❑ **Handling and disposal of explosive containers**<br>• Handle explosive containers or containers with potential explosive residue with care. Keep them from heat or flame.<br>• Dispose of all empty explosive containers by burning according to the manufacturer's recommendations. | OHS 21.41(1) & (2) | |
| ❑ **Loading tools** must be constructed of non-sparking materials such as wood or plastic. | OHS 21.48 | |
| ❑ **Electrical storms** – At any sign of lightning or thunderstorm, blasting must be suspended, the danger area cleared, and the blast area guarded. | OHS 21.49 | |

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| **Blasting** | | |
| ❑ **Electrical initiation**<br>• Take precautions to prevent premature detonation by sources of electricity.<br>• Keep blasting circuits on the ground with bare connections elevated to prevent current leakage.<br>• DO NOT use electrical detonators when extraneous current exceeds 50 mA (milliamperes) (near power lines).<br>• Take precautions against static electricity to prevent premature detonation. For example, avoid synthetic clothing; use brass zippers on clothing.<br>• Do not throw detonator leg wires in the air or drag them on the ground.<br>• Make sure the person handling explosives has been properly grounded. | OHS 23.58(1) & (2)<br>OHS 21.59<br>OSH 21.60(1) & (2) | |
| ❑ **Radio frequency precautions**<br>• During electrical blasting, the minimum distances from the explosive initiator and the radio transmitter found in the *Institute of Explosives Safety Guide* must be maintained.<br>• Where radio transmitters cannot be controlled (e.g., along public roads and highways), put up warning posters alerting motorists to turn off radio transmitters.<br>**Note**: OnStar systems are difficult to disable. For instructions on rendering OnStar systems ineffective, see the CAGC bulletin "OnStar Systems and Explosives." | OHS 21.61<br>OHS 21.62 | |
| ❑ **Circuit testing** – Before firing, test all electrical circuits with an instrument acceptable to WorkSafeBC and enter the measured resistance in the logbook. | OHS 21.63 | |
| **Drills and Drilling** | | |
| ❑ **No drilling** within 20 ft of a loaded shot hole. | OHS 21.43(b) | |
| ❑ **Loaded shot holes may be left unattended** only under the following conditions:<br>• The location is isolated (see the definition in OHS 21.1).<br>• Leg wires are shunted together and are coiled as close to the ground as possible, no higher than 6 inches above the surface.<br>• Drill cuttings are levelled and spread out.<br>• Holes are identified and recorded in the blasting log, and are shot within 30 days after the last holes on the program are loaded<br>• In non-isolated areas such as farmland or areas along roads or access trails, one or more workers must be assigned to patrol the area of loaded holes during daylight hours, to prevent damage or tampering. | OHS 21.84(1) | |
| ❑ **Driving over loaded shot holes**<br>• This is allowed only if there is no alternative route or if bypassing the hole is not practicable because of obstructions to travel.<br>• The operational plan must minimize the requirement to drive in the loaded area (for example, by driving in and then loading holes while going out).<br>• Safe work procedures must be developed and communicated to all workers before work starts.<br>• Loaded holes must be shunted and no higher than 6 inches above the surface, while explosive charges are at least 20 ft deep.<br>• All radio transmission equipment must be turned off while driving over loaded shot holes, and transmission capability disabled by disconnecting the radio microphone (either detach it from the radio or install a control switch). | OHS 21.84(5) | |

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| ❑ **Drills – power lines and stability**<br>• Lower the drill mast when near power lines (to avoid violating the limits of approach or making contact) or when the stability of the drill could be compromised (for wheeled and tracked equipment) (consider the safe operating limits for maximum stability of the machine).<br>• Unless otherwise specified by the manufacturer, the maximum slope is 35% for rubber-tired equipment and 40% for tracked equipment.<br>• If the drill lacks sufficient braking power, or if the condition of the seismic line or trail prevents proper control over the drill on the slope, the drill must be properly snubbed or assisted by a tow vehicle to negotiate the grade. A written safe work procedure is required for snubbing. | OHS 23.27(a) & (b)<br>OHS 26.16(2) & (3)<br>OHS 16.38(1)<br>OHS 23.23 | |
| ❑ **Attending the drill, emergencies, and working alone**<br>• During drilling, two workers must be present at the drill.<br>• The workers must maintain visual and verbal contact.<br>• If drillers work alone or in isolation, procedures must be in place to check on their well-being regularly and to respond to any emergency. Emergency evacuation drills are required. | OHS 23.28(2)<br>OHS 4.20.2(1)-(3)<br>OHS 4.21(1)-(6), 4.22<br>OHS 4.13(1)-(3)<br>OHS 4.14(4) | |
| ❑ **Mobile drill logbooks**<br>• For any maintenance, repair, or modification, *pre-use or start-of-shift* inspection records must be maintained and made available to the operator and maintenance personnel.<br>• Problems identified that could affect the safe operation of the drill must be reported to the supervisor and corrected before the drill is used. *This includes the mast and all hoisting equipment with a rated capacity of 2,000 lbs or more.* | OHS 16.3(3)<br>OHS 16.34(1)-(3)<br>OHS 14.14(a)<br>OHS 14.13(1)-(4)<br>OHS 14.35(1)-(3) | |
| ❑ **Drills and hoisting requirements**<br>• All drills with a hoisting capability must be permanently identified with manufacturer's name, model, and serial number.<br>• Hoists not commercially manufactured must not be used unless engineering documentation signed by a Professional Engineer, including technical specifications and instructions for use, is available at the workplace. | OHS 14.2<br>OHS 14.3(1)-(4) | |
| ❑ **Rated capacity of the hoist**<br>• The rated capacity of the hoist must be marked on the superstructure and load block. The capacity of the hoist must not exceed the capacity of the support structure of the hoist.<br>• Certification by a Professional Engineer is required if the original capacity of the hoist is not available or is unknown, if the hoist is in deteriorated condition, or if modifications to the original design have been made.<br>• The hoist/structure must be recertified by a Professional Engineer if an untoward event occurs, such as contact with high voltage, shock load, loss of load, brake failure, collision or upset, and so on. | OHS 14.5(1)<br>OHS 14.11(1)<br>OHS 14.16(1) & (2)<br>OHS 16.20(1)<br>OHS 14.16.1 | |

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| ❑ **Controls**<br>• Controls must be maintained in good condition.<br>• The functions of all controls must be clearly identified.<br>• All controls must return to neutral when pressure is released.<br>• All drills must be equipped with an emergency stopping device that is clearly identified and within reach of the operator. The device must be tested daily.<br>• The operating controls of remote-control mobile drills must not be positioned in such as way as to endanger the operator who is accessing or using the controls (i.e., operators must not be able to access the controls from outside of the unit and then potentially drive the unit over themselves). | OHS 14.28(1) & (2)<br>OHS 16.18(1) & (2)<br>OHS 23.28(1)<br>OHS 4.3(1)(a) | |
| ❑ **Mobile drill rig servicing**<br>• Do not perform servicing when equipment is running.<br>• Maintain off-road equipment in safe condition for their intended use, taking into account travel surface, slope, and activities being performed. | OHS 16.3(5) & (6) | |
| ❑ **Competency of operators** – Operators must:<br>• Receive instruction in safe operation of equipment<br>• Demonstrate to a qualified supervisor or instructor competency in operating the equipment<br>• Have air brake validation, if applicable<br>• Be familiar with the operating instructions of the equipment<br>**Note**: Trainee operators can work under the supervision of an instructor or supervisor. | OHS 16.4(1)(a)-(e) | |
| ❑ **Mobile equipment operating standards** – The mobile drill must be used, inspected, and maintained in accordance with applicable standards listed in the Regulation.<br>❑ An **automatic backup alarm** is required when the operator cannot see directly behind the unit. The alarm must:<br>• Activate when the unit is placed in reverse<br>• Be equipped with adequate lights if the unit is to be used after dark<br>• Illuminate the direction of travel and working area around the drill and cab instruments<br>❑ **Rearview mirrors** are required that provide the operator with an undistorted view to the rear of the drill. The windows must meet the following standards:<br>• Windows must be made of safety glazing meeting ANSI-Z26.1-1990.<br>• Windows manufactured after 2002 must be identified with the manufacturer's name.<br>• Applicable standard polycarbonate windows must also have the right thickness and grade.<br>• The operator's vision must not be obscured due to cracks, scratches, and so on in the windows. | OHS 16.7<br>OHS 16.8<br>OHS 16.9(1) & (2)<br>OHS 16.10(1) & (2)<br>OHS 16.11(1)-(4)<br>OHS 16.12 | |

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| ❑ **Braking requirements**<br>• Mobile drill braking systems must meet either of following standards:<br>– SAE J1473 October 1990 for rubber-tired equipment<br>– SAE J1086 or SAEJ/ISO 11512 March 1996 for tracked equipment<br>• Drills used on any slope over 20% must have a braking system meeting the SAE J1178 standard.<br>• Parking brakes must not require gas or fluid, and must be easily accessible by the drill operator.<br>• Any mobile drill that relies upon engine power for stopping must be equipped with a secondary braking system that will bring the unit to a safe stop in case of power failure. | OHS 16.13(1)(a), (b), (g)<br>OHS 16.13(3)-(5) | |
| ❑ **Steering requirements**<br>• Any mobile drill that relies upon engine power for steering must be equipped with a secondary steering system that will enable the operator to steer to a safe stop in case of power failure. The secondary steering system must meet the SAE J1511 or ISO 5010 standard.<br>• No steering wheel knobs are allowed if the reaction force could be hazardous to the operator. | OHS 16.14(1) & (2) | |
| ❑ **Safe starting** – Mobile drills must be protected against engine starter engagement when the engine is coupled to the wheels or tracks. | OHS 16.16 | |
| ❑ **Escape from cab** – All drills with only one cab entrance door must have a secondary means of escape that:<br>• Is clearly marked inside and outside the cab<br>• Is not located on the same surface as the cab entrance door<br>• Is usable regardless of the position of the drill<br>• Does not pose any other hazards to the operator<br>• Can be opened from the inside and outside without the use of tools<br>• Provides a clear opening for the operator to exit the cab in an emergency<br>• Is tested regularly by the operator to ensure that it is working and that the operator can fit through the door | OHS 16.17(1)(a)-(f) | |
| ❑ **Drills and cab guarding**<br>• Operators of mobile drills must be protected from falling, flying, or intruding objects by means of suitable cabs, screens, deflectors, or guards.<br>• These structures must meet the requirements of the applicable standard outlined in OHS 16.21(2). | OHS 16.21(1) & (2) | |

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| ❑ **Rollover protective structures (ROPS) and seatbelt requirements**<br>• All drills that allow the operator to ride on the unit must be equipped with a suitable certified ROPS.<br>• The certification must be permanently mounted to the ROPS and must contain the Professional Engineer's name, the model number or identifier, the maximum weight of the machine, and the standard to which it conforms.<br>• Any modifications to the ROPS must be certified by a Professional Engineer.<br>• The ROPS must be designed and installed so as to not negatively impact the visibility of the operator.<br>• ROPS used in cold environments must be constructed with cold rolled steel such that the ROPS is rated at –40°C.<br>• Seatbelts must be installed, maintained in good condition, and worn by the operator and any passengers whenever the drill is in motion or could become unstable. | OHS 16.22(2)<br>OHS 16.22(1)(f)<br>OHS 16.23(a)-(d)<br>OHS 16.24(1) & (2)<br>OHS 16.25(1)(a)-(e)<br>OHS 16.25(2)<br>OHS 16.26<br>OHS 16.32(1) & (2)<br>OHS 16.33(1) | |
| ❑ **Mobile drills and guarding**<br>• Operators on mobile drills must be protected from moving parts on the drill (guarding).<br>• The drill controls must not permit operation from outside the cab. (This also applies to units without a cab that operators walk behind or beside – the operator must not be able to operate the controls in a manner that would cause them to drive over themselves with the drill.)<br>• Drillers and Helpers must be protected from all contact with hazardous power transmission parts (which includes the rotating drill steel) by ensuring that they cannot access the hazardous point of operation. This maybe done by installing guard covers or by installing two-handed controls on the drill. | OHS 16.27(a)-(b)<br>OHS 16.28<br>OHS 12.2(a)-(c)<br>OHS 12.11(1)(d)<br>OHS 12.16 | |
| ❑ **Seating and rider restrictions**<br>• The operator's seat must be in a safe location and securely mounted so that the drill can be operated safely.<br>• Rough-terrain equipment must have seats that provide lateral restraint.<br>• Only authorized persons are allowed on the equipment while it is in motion. | OHS 16.29(1) & (2)<br>OHS 16.30 | |
| ❑ **Securing tools, equipment, and the drill**<br>• The drill cab and deck must be kept free of materials, tools, or other objects that could become lodged under controls, become tripping hazards, or become a projectile in the event of an upset incident.<br>• The drill controls must not be left unattended unless the drill has been secured against inadvertent movement (e.g., by using the parking brake, placing the transmission in park, or chocking the wheels if necessary). | OHS 16.35<br>OHS 16.36(1) | |
| ❑ **Assistance on steep grades**<br>• If the grade of the slope or condition of the terrain may result in the drill's not having sufficient baking capacity to maintain safe control of the unit, the drill must be properly snubbed by cable to a suitable vehicle to ensure the safe negotiation of the grade.<br>• Any snubbing of equipment requires the preparation of appropriate safe work procedures for the operation. The procedures must identify the risk associated with the work, the steps to be followed, the equipment needed (rigging), and the number of workers involved. | OHS 16.38(1)<br>OHS 23.23(2)<br>OHS 23.5(1)-(3) | |

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| **Rigging-Heli-Portable** | | |
| ❑ **Training** – Riggers must be trained and qualified or work under the direction of a qualified rigger. | OHS 15.2<br>WCA 115(2)(e) | |
| ❑ **Rigging practice**<br>• Loads must be safely landed and stable before being unhooked.<br>• The load applied to the rigging must not exceed the working load limit (WLL).<br>• All components must be identified with manufacturer's ID, product ID, and WLL.<br>• All load hooks must have a safety latch or other effective means of retention, and all shackles must be secured against being dislodged.<br>• Wire rope clips must be used and installed according to manufacturer's instructions or Table 15-2 in Part 15 of the Regulation.<br>• Wire rope rejection criteria apply. All rigging must be inspected before use, and defective equipment removed from service.<br>• No makeshift fittings may be used unless their WLLs are certified by a Professional Engineer.<br>• The rating of a multi-leg sling is limited to the WLL of the weakest component.<br>• Any sling found to be defective or damaged must be immediately removed from service (inspection and rejection criteria for wire rope, chain, or synthetic material). | OHS 15.3<br>OHS15.4(2)<br>OHS 15.10(1) & (2)<br>OHS 15.11(1) & (2)<br>OHS 15.22(2)-(4)<br>OHS 15.25(a)-(f)<br>OHS 15.31<br>OHS 15.32<br>OHS 15.33(1)-(3)<br>OHS 15.43(1) & (2)<br>OHS 15.48<br>OHS 15.54(a)-(j) | |
| ❑ **Communication for heli-portable operations** – There must be effective communication between the air and ground crews:<br>• Only internationally recognized hand signals may be used.<br>• The signaller must be identified by means of high-visibility apparel.<br>• The worker exposed to the hazards of the lifting operation must know and understand the hand signals. | OHS 29.5(1) & (2) | |
| ❑ **Airlifted loads**<br>• No loads flown may be flown over workers.<br>• Workers must move to a safe area when there is a hazard from an airlifted load.<br>• Traffic control that meets the requirements of Part 18, Traffic Control, of the Regulation must be in place whenever airlifted loads are flown over travelled roadways.<br>• Workers must not be exposed to undue risk from roto wash and debris being thrown around, including the hazard of dangerous trees being blown onto workers in the landing zone. | OHS 29.9(1) & (2)<br>OHS 29.10<br>OHS 29.11<br>OHS 26.11(1) & (2) | |
| **Exposure Monitoring and Control** | | |
| ❑ **Exposure monitoring** – Any time a worker maybe exposed to a hazardous substance, the employer must ensure that a survey is conducted for potential exposure through inhalation, ingestion, and skin contact. If the initial survey indicates that there is any risk of an airborne contaminant (such as silica dust, which is a common airborne contaminant when drilling in rock):<br>• Air sampling must be conducted.<br>• Monitoring and assessment must be conducted using acceptable recognized occupational hygiene methods.<br>• The results of the survey must be provided to affected workers. | OHS 5.53(1)-(5) | |

| | OHS Regulation/ *Workers Compensation Act* | ☑ |
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| ❑ **Exposure control**<br>• The employer must develop an exposure control plan whenever exposure monitoring indicates that a worker maybe exposed to an air contaminant in excess of 50% of the exposure limit for the contaminant.<br>• The plan must incorporate the following elements:<br>– Statement of purpose and responsibilities<br>– Hazard identification and risk assessment and control<br>– Education and training of workers<br>– Hygiene and decontamination facilities<br>– Health monitoring when required<br>– Documentation<br>• The primary control expected for silica dust is an engineering control: either drilling with water or a vacuum or Venturi system (discharge system).<br>**Note**: Sampling on heli-portable and conventional drills using hammer functions without adequate dust suppression systems have yielded exposure values well over the permissible concentration for silica. | OHS 5.54(1)-(3)<br>OHS 5.55(1)(b)<br>OHS 12.85(a) | |
| **Responsibilities for Seismic Drilling** | | |
| ❑ **Responsibilities of supervisors**<br>• Ensure that all mobile drill operators have demonstrated competence.<br>• Do not operate or allow a worker to operate any equipment that is or that could create an undue risk to the health and safety of a worker, or that is in violation of the Regulation.<br>• Ensure the health and safety of workers under their direct supervision.<br>• Be knowledgeable about the work being done and the applicable sections of the Regulation.<br>• Comply with the Regulations and communicate hazards to workers. | OHS 16.4(1)<br>OHS 16.6<br>WCA 117(1) & (2) | |
| ❑ **Responsibilities of the mobile drill operators/workers**<br>• Operate the equipment safely, maintaining full control and complying with the applicable laws and regulations for the equipment.<br>• Do not work while impaired by drugs or alcohol or by physical or mental factors.<br>• Take steps to ensure their safety and the safety of others impacted by their work.<br>• Carry out their work in accordance with established safe work procedures and with the Regulation.<br>• Use and wear personal protective equipment (PPE).<br>• Do not engage in horseplay.<br>• Report to their supervisor any violation of the regulations, any defective equipment, or any hazards that could impact them or others. | OHS 16.5<br>OHS 4.19(1)<br>WCA 116(1) & (2) | |

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| ❑ **Responsibilities of employers**<br>• Ensure the health and safety of their workers and any other workers employed at the worksite.<br>• Comply with the Regulation.<br>• Correct or eliminate any hazards at the worksite.<br>• Communicate hazard information to their workers and ensure that workers comply with the Regulation.<br>• Establish and maintain occupational health and safety programs and policies.<br>• Provide and maintain any required PPE and ensure that they are being used by workers.<br>• Provide adequate instruction, training, and supervision to workers to ensure that their work is carried out without undue risk.<br>• Provide a copy of the *Workers Compensation Act* and the Occupational Health and Safety Regulation to the workplace.<br>• Do not allow any worker to work while impaired by drugs, alcohol, or fatigue. | WCA 115(1) & (2)<br>OHS 4.19 & 4.20 | |
| ❑ **Responsibilities of owners and prime contractors**<br>• **Owners** must:<br>– Maintain their land and premises in a safe condition.<br>– Provide to the prime contractor or employer any hazard information regarding workplace hazards and control.<br>– Comply with the Regulation.<br>• **Prime contractors** – In a multiple-employer worksite, the role of the prime contractor is defined specifically by a written agreement. Without a written agreement, the role defaults to the owner (this is not a master service agreement). The prime contractor has two key roles:<br>– Ensure that the activities in relation to health and safety are coordinated (planning and communication, hazard assessment and control).<br>– Ensure that a system of compliance with respect to the Regulation and the *Workers Compensation Act* is in place (this involves site inspections and enforcement of the occupational health and safety requirements of contractors). | WCA 119(a)-(c)<br>WCA 118(1)-(3)<br>OHS 23.4(1)-(4) | |
| ❑ **Responsibilities of suppliers** – (See the definition of "supplier" in section 106 of the *Workers Compensation Act.*) Suppliers must:<br>• Ensure that any tool, equipment, machine, or device is safe when used in accordance with directions provided, and complies with the Regulation<br>• Provide directions for safe use<br>• Ensure that the product supplied is properly labelled | WCA 120(a)-(e) | |

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The Canadian Association of Geophysical Contractors (CAGC) has developed additional resources for conducting seismic drilling inspections:

- *Safe Operating Procedures for Seismic Blasting and Drilling*
- *Misfired Charges Best Practices*
- *Misfired Charges Checklist*

Issues outside the scope of the OHS Regulations involving magazines and storage of explosives are to be referred to:

Natural Resources Canada
Explosives Regulatory Division
214–755 Lake Bonavista Drive SE
Calgary, AB T2J 0N3
Phone: 403-292-4689