

ONTARIO ASSOCIATION OF FOUNDATION SPECIALISTS

SAFETY PROCEDURES

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LOCATION OF UNDERGROUND SERVICES

1. Foundation Contractor's Superintendent must be aware of all services that may affect the work.
2. Stake-outs of all nearby services must be completed prior to commencement of work.
3. Proof that locates were completed are required.
4. Clearly marked stakes must indicate the service.
5. In the case of any uncertainty as to specific location of services, the work is not to commence until the service is exposed or located by other means.
6. The service must be located by hand excavation and visual inspection if close to the work. If the stakes are within a distance equal to the stake-out tolerance (typically 1m) plus a safety margin equal to the width of the service, then hand-excavated test pits shall be required prior to commencement of foundation work.
7. Services that are known to be close to the foundation elements may require some type of special protection. Contact the appropriate authority to agree on such measures.
8. If unanticipated services are encountered, work shall cease at that location until the service has been identified and deemed safe.

PROCEDURES FOR DRILLING OPERATIONS

GENERAL

1. Ensure that all personnel remain clear of the swing radius of equipment. Be aware of and avoid the operator's blind spots.
2. Equipment shall not be operated within 1 metre (3.3 feet) of any electrical lines with voltages from 300 to 750 volts. The minimum allowable distance increases to 3 metres (10 feet) for lines from 750 to 150,000 volts, 4.5 metres (15 feet) for lines with 150,000-250,000 volt and 6 meters (20 feet) from lines over 250,000 volts. Assume that every electrical line is energized at all times.
3. An effective means of communication between the workers shall be established and maintained. The operator and front end man shall agree on the type of communication to be used prior to starting work. Hand signals must be used when verbal communication is not effective. All workers shall be familiar with machine operation hand signals, however, the Operator shall accept signals only from the designated signalman except for an emergency stop signal, which may be given by any worker. Signals are shown in Appendix D.
4. When open-hole drilling is being performed, soil conditions shall be carefully observed during drilling of each hole. If loose or caving material is observed which may endanger the surrounding work area, measures such as liners and/or drilling slurry shall be introduced. These measures will remain in place until the holes have been backfilled above the loose or caving material.
5. Avoid approaching the hole unnecessarily. Added precautions should be observed during work that may disturb the ground surface such as liner placement and removal.
6. Before pouring concrete check to see that no one is in the caisson or an adjacent caisson. Discuss the soil conditions with the project engineer to determine a safe working distance between holes under construction.
7. When replacing worn teeth on an auger use safety glasses and the proper installation tools. Never clean an auger pinhole with your fingers. Use a wood dowel or piece of reinforcing steel that will keep your fingers clear of being pinched.
8. After any suspension of drilling always check that the shaft is clear prior to resuming operations.

GROUND PROCEDURES DURING DRILLING OPERATIONS

1. The area surrounding a hole being drilled or an open drilled hole is designated as a restricted area. Access shall be limited to authorized, trained personnel and such personnel are to avoid approaching the hole unnecessarily.
2. Where there is a liner in the hole extending 1.0 m or more above grade, the liner serves as an acceptable guardrail.
3. No one shall approach within 1.8 metres (6 feet) from the edge of a hole during or after drilling unless they are directly involved in the operation. Workers involved in the operation shall not come within 1.8 metres of the edge of a hole being drilled or a drilled caisson without a liner extending at least 1.0 m above grade unless the worker is protected against falling into the hole. Protection shall entail wearing a fall arrest/fall restricting system or, when drilling in Type 1 or Type 2 soils, the use of a guardrail placed around the hole. Examples of suitable guardrails are shown in Appendix A.
4. Fall arrest systems shall be anchored to temporary fixed supports. For fall arrest systems, fixed supports must be capable of withstanding a static force of 8 kN (1800 lb.). Fall restricting systems must be capable of withstanding a static force of 6 kN (1350 lb.) Examples of acceptable fixed supports are shown in Appendix B.
5. Workers should approach the equipment within the operator's view and be mindful of his blind spots. Workers should stay away from working equipment and the swing area, until they have the operator's attention. The drill operator and the front end man are to cease operations if someone enters the restricted area without proper protection. Operations are not to continue until the person has been escorted out of the restricted area.
6. When setting soldier piles or rebar cage the workers shall be protected from falling by a fall arrest/fall restraint system unless the pile or cage once placed in the hole makes a fall impossible.
7. An effective means of communication between the workers shall be established and maintained. All workers shall be familiar with machine operation hand signals.
8. Adequate protection shall be placed surrounding any open holes or an adequate cover shall be placed over the open hole when left unfilled during such periods when the hole is not being worked on. Examples of suitable hole covers are shown in Appendix C.
9. All workers are to be trained in fall protection. All geotechnical inspection personnel must be trained by their employers.

CAISSON ACCESS AND EGRESS

1. These procedures are intended to be followed only if workers are required to enter the mechanically augered caisson hole for purposes of hand cleaning and/or inspection.

The Ontario Association of Foundation Specialists does not promote nor recommend the practice of hand cleaning and visual inspection of the base of caissons. This procedure has been prepared in recognition that such work is specified and must be done to comply with contract specifications in many instances.

2. The minimum size caisson which a worker shall be permitted to enter is one in which the casing or liner is at least 36-inches in diameter.
3. If the caisson is drilled without the use of a casing liner, then a temporary steel safety liner with a diameter which is not less than 150 mm. less than the diameter of the drilled hole shall be installed. The liner shall extend to within 1.2 m of the base of the caisson in overburden or to the top of the rock in the case of caissons with rock sockets. The casing shall extend a minimum of 0.3 metres above ground (1.0 m above ground if casing is to serve as a guardrail).
4. Caissons shall be checked for oxygen content and combustible or toxic gases. **If gas is detected or the oxygen content is not within accepted limits, then no worker shall enter the caisson.** Caisson shall be checked continuously when a worker is in the caisson and also shall be rechecked after any suspension in operations. Air monitoring devices shall only be used by personnel trained in the use of such devices.
5. The caisson shall be dewatered if not dry, using submersible pump(s). If the inflow of water requires, the casing shall be seated so as to cut off excessive inflow. Dewatering shall continue as necessary during down-hole operations. If caisson cannot be dewatered adequately, no person shall enter the hole.
6. A ladder may be used to provide access to caissons that are no more than 9 metres deep, or a hoisting device may be used. For caissons exceeding 9 metres in depth a hoisting device shall be used.
7. When a hoisting device is used, the worker is to be lowered into and lifted out of the caisson using a steel mucking bucket with anti-tipping latch. The mucking bucket shall be of an engineered design, with a drawing available on site, stamped by a Professional Engineer. Shackles, rather than hooks, shall be used to attach cables to mucking buckets.
8. Inspect mucking buckets thoroughly before each use. Check for cracks in handles and faulty latches.
9. Where a crane is utilized for access, it shall be equipped with at least one winch with power-up and power-down capabilities. The line from this winch shall be used to hoist or lower the bucket. The crane shall be positioned in the appropriate place before down-hole operations begin. Ensure that there is adequate cable on the drum to reach the bottom of the hole. The bucket shall be lowered in a dry run to make sure that at least 3 wraps are left on the drum when the bucket is at the bottom.
10. In all instances where a crane is used for access and in instances where a ladder is used to

access an excavation exceeding 4.5 metres in depth, a vertical lifeline line shall be employed attached to an adequate fixed support which is capable of resisting any fall arrest loads, such as the drill rig, the top of steel liner, or other adequate temporary fixed supports. Examples of such fixed supports are shown in Appendix B. Fixed supports for fall arrest purposes must be capable of withstanding a static force of 8 kN (1800 lb).

11. The worker preparing to enter the caisson shall wear a full body harness. Where a ladder is being used for accessing excavations shallower than 4.5 metres a safety rope shall be attached to the main "D" ring of the harness. Where a hoisting device is being used for access or where a ladder is used in excavations exceeding 4.5 metres, a fall arrest system shall be utilized. The fall arrest system shall consist of either a self-retracting lifeline device or a short lanyard and approved rope grab (Class ADP preferred) attached to the main "D" ring of the harness, with the rope grab attached to a CSA approved vertical lifeline, so arranged that the load on the worker in the event of a fall will not exceed 8 kN (1800 lb.). If a rope grab is used the worker shall maintain it at or above shoulder height to minimize free fall distance in the event of a fall. Checks of the fall arrest system shall be made by a competent worker before each use.
12. A signalman shall be positioned at the top of the caisson and he shall maintain visual communication or some other means of communication with the worker in the caisson and visual contact with the crane operator where a ladder is not the means of access. Appropriate lights shall be provided when natural lighting does not provide clear visual contact.
13. Where a crane and bucket is being used, the worker shall be lowered into the caisson in a slow, controlled manner. Lowering shall stop when he/she signals that the bottom has been reached. When the worker leaves the bucket at the base of the caisson he shall continue to wear his/her full body harness and shall not disconnect the fall arrest system from the harness. When exiting the caisson, the worker shall be raised using the bucket in a slow, controlled manner as for lowering.
14. The worker shall not remain in the hole while the bucket is raised or lowered.
15. Muck removed from the base of the caisson shall be dumped well away from the top of the hole.
16. When exiting the caisson using a crane and bucket, the down-hole worker shall be hoisted only as high as necessary to clear the caisson and the bucket shall be swung away from the caisson hole.
17. The inspector shall be permitted to enter the caisson to do final inspection utilizing the same techniques as used for the worker doing the base cleaning.
18. After any suspension in work always check that the drilled shaft is clear and air-tested prior to resuming operations.
19. In the event that a worker becomes disabled while in the caisson, the procedures detailed under "RESCUE OF WORKER FROM A CAISSON" shall be followed for recovery of the worker.
20. A copy of this procedure will be kept available on site and copies shall be made available to all workers that are involved in caisson cleaning or inspection procedures.

RESCUE OF WORKER FROM A CAISSON

1. If a worker loses consciousness or is injured in the hole, do not attempt to go down the hole to rescue the unconscious worker. Advise the supervisor immediately.
2. If the worker in the caisson is unconscious, simultaneously with initiating the rescue operation, have someone call 911 for assistance.
3. The injured worker shall not be left alone or unattended.
4. Supervisors are required to manage and coordinate activities until emergency services arrive on site. They are also to notify head office and maintain communications with all parties.
5. A person is to be designated by the supervisor to direct emergency vehicles.
6. If the worker is unconscious test for gas to determine what is the cause.
7. The use of either a winchable retractable lifeline device or a dedicated hand winch mounted on the drill rig facilitates recovery of a disabled worker. Alternatively a winch line from the drill rig or crane may be employed.
8. A secondary means of hoisting the worker shall be available in the event that the crane or drill rig breaks down.
9. On recovery of the worker, perform artificial respiration and first aid, if necessary.
10. Do not send workers down any other caissons until cause of accident is established and you are sure that it is safe to continue operations.

DESCRIPTIONS OF SOIL TYPES

Type 1 soil most closely exhibits the following characteristics:

- (a) is hard, very dense and can be penetrated only with difficulty by a small sharp object
- (b) has a dry appearance
- (c) has no signs of water seepage
- (d) can be excavated only by mechanical equipment

Type 2 soil most closely exhibits the following characteristics:

- (b) is very stiff, dense and can be penetrated with moderate difficulty by a small sharp object
- (c) is difficult to excavate with hand tools
- (d) has a low to medium natural moisture content and has a damp appearance after it is excavated
- (e) has no signs of water seepage

Type 3 soil most closely exhibits the following characteristics:

- (a) is stiff, compact and can be penetrated with moderate ease by a small sharp object
- (b) is moderately difficult to excavate with hand tools
- (c) exhibits signs of surface cracking
- (d) has signs of localized water seepage
- (e) includes previously excavated soil, rock or other material

Type 4 soil most closely exhibits the following characteristics:

- (a) is firm to very soft, loose to very loose and is easy to excavate with hand tools
- (b) is cohesive soil which is sensitive and upon disturbance is significantly reduced in internal strength
- (c) is dry and runs easily into a well-defined conical pile
- (d) has a wet appearance and runs easily or flows
- (e) includes Type 1, 2 or 3 granular soil below the water table
- (f) exerts substantial hydrostatic pressure when a support system is used
- (g) includes previously excavated soil, rock or other material which exhibit any characteristic of this subsection

DRILLING PROCEDURES TO PREVENT CAVING OR LOSS OF GROUND

Special techniques are required when drilling through layers consisting of very loose soil or if there is significant water seepage (Type 3 or Type 4 soils). Special techniques include temporary casing, mud drilling and polymer or bentonite slurry drilling. Under no circumstances shall a void be allowed to form around the drilled hole. If there is significant water seepage causing loss of ground, a temporary casing will be used to seal these layers. Mud drilling or slurry drilling procedures may also be used to prevent cave-in and water penetration. If a worker is required to place a pump into the drilled hole he shall wear a fall arrest system or remain behind a guardrail. A guardrail may only be used as an alternative to a fall arrest system if the soil is Type I or Type 2, or the hole is supported with a steel casing extending at least 1.0m above ground. When drilling in Type 3 or Type 4 soils, fall protection shall entail workers within 1.8 m (6 feet) of the edge of open holes or holes being drilled wearing a fall arrest system

PROCEDURES THROUGH UNSTABLE GROUND

1. **TEMPORARY STEEL CASING:** The casing is placed into the drilled hole. The casing is advanced by a vibratory hammer or twisting with the kelly bar until it is seated into a stable layer. The casing provides support to any unstable layers. The material inside the casing is removed and any remaining length of the hole is drilled open with an auger.
2. **MUD DRILLING AND STEEL CASING:** The auger is advanced through the unstable layer without removing any material from the hole. The native material is mixed with water to create a drilling mud. The level of the drilling mud is maintained above the unstable layers to provide a positive pressure or head. The temporary casing is placed through the mud and seated into a stable layer. The drilling mud is bailed out of the casing and any remaining length of the hole is drilled open with an auger.
3. **POLYMER OR BENTONITE SLURRY:** When unstable layers are encountered, a polymer or bentonite slurry is introduced into the drilled hole. The level of the slurry must be maintained 1.5 metres above the static water level. The remainder of the hole is drilled with buckets or augers. The slurry is cleaned with a twist bailer. Concrete or weak mix is placed by tremie or pumping.

The above techniques are typical procedures. Variations may be required to deal with site specific conditions.

CRANE & HOISTING OPERATIONS

GENERAL

1. The procedures enumerated below apply to cranes utilized for pile driving and caisson operations.
2. Pre-operation checks shall be performed daily before work begins to ensure that the machine is in safe working order. Check is to include visual inspection of boom.
3. No crane shall be subjected to a load greater than its rated load carrying capacity. Lifting charts are to be provided in all cranes. If the charts are missing or inappropriate, it is the operator's responsibility to notify his supervisor and have them replaced.
4. All crane rigging shall be suitable for the load being lifted and all cables and rigging shall be visually inspected daily for torn strands and visible wear by a competent worker. Slings and rigging shall be inspected before each lift. If excessive wear is detected it is to be taken out of service immediately.
5. A log book shall be kept with each crane and the operator shall be responsible for making the appropriate entries in the log book. The log book shall be signed off by the operator monthly. If the operator is changed, the new operator shall do a pre-operation inspection and note same in the log book.
6. A signal person shall be positioned in full view of the operator where the operator's view of the intended path of travel or any part of it or of the crane load is obstructed or where a person may be endangered by any part of the crane or its load. Standard crane signals must be used by all workers.
7. An effective means of communication between the workers shall be established and maintained. The operator and front end man shall agree on the type of communication to be used prior to starting work. Hand signals must be used when verbal communication is not effective. All workers shall be familiar with machine operation hand signals, however, the Operator shall accept signals only from the designated signalman except for an emergency stop signal, which may be given by any worker. Signals are shown in Appendix D.
8. Every hoisting hook shall be equipped with a safety catch.
9. Where ground conditions are not adequate to resist unreasonable settlement, crane mats shall be utilized to distribute the load of crawler cranes. If outriggers or other stabilizing devices are fitted to the equipment they shall rest on firm ground or mats and pads to prevent unreasonable settlement or deformation.
10. Extreme caution shall be exercised when walking with a suspended load.
11. No smoking, welding or open flame shall be allowed within 20 feet of any equipment being refuelled.

12. During hoisting, tag lines or similar devices shall be used where necessary to control rotation of the load. Only workers who are competent and familiar with the specific hazards of the operation shall be in the work areas where these operations are being carried out.
13. Walk with care - watch your footing. Never walk or work under crane booms or suspended loads. Remove slings in a manner so as not to endanger workmen.
14. When entering crane cab under wet conditions, operator should scrape off boots to avoid slipping on foot pedals. Do not leave the crane by jumping off the tracks – use proper 3-point contact procedure when alighting.
15. No suspended load should be left unattended by the operator. Never leave any of the equipment with the motor running unless the master clutch is disengaged.
16. To stand on the walkway or in the cab of the crane talking to the operating engineer is Strictly Prohibited.
17. Never stand or sit on the crawlers of the crane. The operator may not know that you are there.
18. When operating a crane on slippery surfaces such as hard-packed snow or ice, extreme caution shall be exercised to prevent sliding.
19. Cranes shall not be operated anywhere near a power line unless the operator has a signalman to warn him when any part of the boom, cable or load is approaching the minimum safe distance from the power line.
20. Unless the owner of a power line has disconnected the electrical supply to a power line, the minimum safe distance from power lines is:
 - a. **300 to 750 volts - 3.3 feet (1 metre)**
 - b. **750 to 150,000 volts - ten (10) feet (3 metres)**
 - c. **150,000 to 250,000 volts - fifteen (15) feet (4.5 metres)**
 - d. **Over 250,000 volts - twenty (20) feet (6 metres)**If status of a power line is unknown, assume line is energized and investigate to determine voltage.
21. When moving/swinging equipment be sure that all cables are secured, especially near power lines. The signalman shall alert the operator if any part of the equipment or load approaches the minimum distance outlined above.
22. DO NOT ride the hook of the pile line or any sling.
23. In jurisdictions where crane operator licensing is the law (this includes the Province of Ontario), cranes must only be operated by persons who hold a proper Certificate of Qualification or License. (This rule does not apply to a apprentice being instructed by a licensed operator.)

PROCEDURES FOR PILE DRIVING

1. Where the boom, counterweight or other principal part of a crane has been modified to accept equipment related to pile driving (i.e. leads, hammers, etc.), the modification shall be the subject of an engineered drawing.
2. No person shall stand under the kicker (the strut between the crane and the pile leads).
3. When driving piles in a side batter configuration, ensure that the equipment is suitable for the intended batter.
4. A signal person shall be positioned in full view of the operator before any pile driving equipment is relocated at the work site. Standard crane and pile driving signals must be used by all workers. The operator shall accept signals only from the designated signalman except for an emergency stop signal, which may be given by any worker. Standard Signals are shown in Appendix D.
5. Piles or sheet piling stored on the ground shall be adequately supported by blocking. Pipe piles must be stacked in well supported and braced racks or frames, unless other provision is made to prevent their movement.
6. During hoisting, tag lines or similar devices shall be used where necessary to control rotation of the load. Safety lugs must be welded to steel piles to prevent the pile line from slipping. Piles or sheet piling shall be adequately supported during placing or removal. Only workers who are competent and familiar with the specific hazards of the operation shall be in the work area where these operations are being carried out.
7. Ensure that all foreign material such as frozen earth or tack-welded steel is removed from the piles before being spotted for driving.
8. If a worker is required to climb the driving lead, the operator of the equipment will apply all brakes and necessary safety switches to ensure no uncontrolled motion of the equipment.
9. All workers shall wear eye-protection and hearing protection.
10. Secure all shackles with steel wire or other means.
11. Workers required to take pile refusal measurements shall be made aware of potential hazards.

DRIVING LEAD CLIMBING PROCEDURE

If operations necessitate a person to climb the driving lead, the following safety precautions must be strictly adhered to:

1. The person climbing shall don the full body harness with climbing and positioning lanyards attached.
2. The climbing person will attach the double-legged lanyard (Y-shaped) webbing end or two single lanyards, to the dorsal or sternal ring of the harness.
3. He will approach the leads and reach up above his head and attach one of the lanyard locking snaps to the lead in one of the 1" dia. holes drilled for this purpose. (Make sure that the attachment points are chosen wisely, the life of the person climbing will depend on it if there is a fall.)
4. Climb upward to a point where the first lanyard snap is located at about waist level, stop climbing, reach up with the second lanyard locking snap and fasten it securely to a 1" hole. Reach out to the first lanyard locking snap and unhook it after ensuring that the second lanyard locking snap is securely fastened. Continue to climb upward to a point where the second lanyard snap is located at about waist level, stop climbing, reach up with the first lanyard locking snap and fasten it securely. Reach out to the second lanyard locking snap and unhook it.
5. Repeat this method of climbing until the desired height location is reached. Securely anchor off using a regular lanyard attached to the two (2) D-rings, one on each side of harness or a lanyard attached to a front D-ring, and perform the task required. Keep one lanyard attached to the lead above your head at all times when performing task.
6. Upon completion of task, begin to descend to a point where the secured lanyard locking snap is still reachable overhead, stop descending, reach out and attach the other lanyard snap at about waist height. Reach up and unhook the first locking snap.
7. Continue to descend until the second attached locking device is still reachable overhead. Stop descending, reach out and re-attach the first locking snap at about waist height. Reach out and unhook the second locking snap.
8. Repeat this descent method until ground level is reached. At that point, unattach all lanyard locking snaps and stand clear of the leads before removing safety gear.
9. Remove all safety gear and return it to the safe, dry storage location away from sunlight and exposure to petroleum products. If at any time the safety gear is damaged or broken, it shall be removed from service.

LEAD CLIMBING RESCUE PROCEDURE

Note: This procedure utilizes an engineered controlled descent device, a device which employs a friction system to pay out rope at a controlled slow rate.

If someone who has climbed the lead becomes incapacitated and requires rescue, proceed as follows:

1. First, take a few seconds to view the situation to discern if, by ground observation, some simple directions can assist the endangered climber to reposition himself to a secure location and not require rescue.
2. If, by observation, rescue is required, call 911 and proceed with the rescue operation pending arrival of 911 personnel. Retrieve the rescue rope with the engineered controlled descent device. Give the front end of the rescue rope with the attached hook and descent device installed to the person making the ascent. The bottom end of the rope is to remain on the ground.
3. The person to perform the rescue climb must don the harness and two-legged lanyard. He will attach the rescue rope and assembly to himself and begin to ascend, utilizing the two-legged lanyard as follows: at ground level, reach up and attach one of the lanyard locking snaps in a 1" diameter hole near the extent of his reach. Climb up until the attached snap is at about waist level. Stop climbing, reach up and attach the second lanyard snap and fasten it in a 1" diameter hole within reach. Reach out and unhook the first snap and continue to climb.
Never unhook a lanyard locking snap until the other is securely fastened.
4. The rescue person shall climb and securely attach the snap at the tend of the rope from the controlled descent device in the 1" diameter hole above the incapacitated person.
5. Attach a 4' or 5' lanyard to the incapacitated person from the dorsal or sternal ring of his harness through the bottom eye of the device.
6. After ensuring that the system is holding and the incapacitated person is securely supported by the rescue system, the rescuer should release or cut the incapacitated persons' original lanyard and release the rope from around the locking hook of the device.
7. The incapacitated person will start to descend slowly.
8. If the rate of descent is too slow, the rescuer may apply some pressure by placing his hand around the device and pulling down, to increase the speed of descent.
9. The rescuer shall descend using the procedures outlined in the double lanyard ascent procedure, reversed, until he reaches the ground.
10. The worker on the ground must be alert and ensure that the rescue rope is not being tangled and/or twisting around the incapacitated person as he is lowered, until he reaches the ground.
11. Check all safety equipment for imperfections, if one is found "**REPORT IT**" before you store it. If none are found return the safety equipment to the clean dry storage location until it is needed again.
12. Any harness and lanyards that have been subjected to a fall must be replaced even if they look fine. It should be immediately removed from service.

13. Workers shall be trained in the Lead Climbing Rescue procedure. – One person from the crew shall be designated as the rescuer. This person shall not be the person who normally climbs the lead. This worker shall be trained in the use of the device.
14. This procedure may be modified if necessary to suit the specific type of controlled descent device used.

VIBRATORY HAMMERS

1. Crane operators must inspect boom sections for cracks or other damage on a daily basis.
2. Check all bolts and suspension cables on a daily basis.
3. When the hammer is shut off the boom will vibrate. When extracting piling shut off the hammer when the bottom of the casing or pile is still partially socketed in the ground.
4. Stay away from casing or pile when the hammer is vibrating. Be aware that the ground may become unstable from vibrations.
5. Always use a pile line attached directly to the casing or pile.
6. Check pile tops, handling holes, and splices of casings for damage from driving. Do not use a casing with cracks.
7. Secure all shackles with steel wire or other means.

APPENDIX A

GUARDRAILS

EXAMPLES

1. Engineered 3-sided modular frame of HSS sections
2. Engineered modular frames expandable to suit hole size.
3. Oversized liner section.
4. Piece of culvert pipe.
5. Scaffold frames, suitably anchored.
6. Wooden framed enclosure with posts in ground.

APPENDIX B

TEMPORARY FIXED SUPPORTS

EXAMPLES

The fixed support utilized for workers to tie-off to should be located away from the swing area of the drill and auger.

1. Precast concrete block with attachment point.
2. Concrete-filled liner section with attachment point.
3. Jersey Barrier with attachment point.
4. Auger screwed into ground 1 flight.
5. Existing structural members where available.
6. Adjacent installed soldier piles.
7. Man-winch on machine.

APPENDIX C

TEMPORARY HOLE COVERS

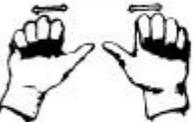
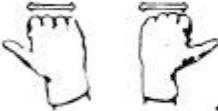
1. Steel plate
2. Steel circular donut with grating over hole.
3. Plywood and lagging, secured or weighted down.
4. Other devices, such as:
 - extended casing in lieu of cover
 - auger position over top of hole, making access impossible
 - adequate fence or guardrail

APPENDIX D

CRANE & PILEDIVING SIGNALS

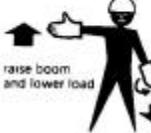
Hand Signals for Hoisting Operations

<p>Load Up</p>  <p>1</p>	<p>Load Down</p>  <p>2</p>	<p>Load Up Slowly</p>  <p>3</p>	<p>Load Down Slowly</p>  <p>4</p>
<p>Boom Up</p>  <p>5</p>	<p>Boom Down</p>  <p>6</p>	<p>Boom Up Slowly</p>  <p>7</p>	<p>Boom Down Slowly</p>  <p>8</p>
<p>Boom Up Load Down</p>  <p>9</p>	<p>Boom Down Load Up</p>  <p>10</p>	<p>Everything Slowly</p>  <p>11</p>	<p>Use Whip Line</p>  <p>12</p>

<p>Use Main Line</p>  <p>13</p>	<p>Travel Forward</p>  <p>14</p>	<p>Turn Right</p>  <p>15</p>	<p>Turn Left</p>  <p>16</p>
<p>Shorten Hydraulic Boom</p>  <p>17</p>	<p>Extend Hydraulic Boom</p>  <p>18</p>	<p>Swing Load</p>  <p>19</p>	<p>Stop</p>  <p>20</p>
<p>Close Clam</p>  <p>21</p>	<p>Open Clam</p>  <p>22</p>	<p>Dog Everything</p>  <p>23</p>	<p>Construction Safety Association of Ontario 21 Voyager Court South Etobicoke, Ontario Canada M9W 5M7 (416) 674-2726</p> <p>V2</p>

No response should be made to unclear signals!

PILE DRIVING SIGNALS

<p style="text-align: center;">BOOM SIGNALS</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>raise boom</p> </div> <div style="text-align: center;">  <p>lower boom</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">  <p>raise boom and lower load</p> </div> <div style="text-align: center;">  <p>lower boom and raise load</p> </div> </div> <p style="text-align: center; font-size: small;">flex fingers during load movement</p>	<p style="text-align: center;">SWING</p> <div style="text-align: center;">  <p>point finger in direction of swing of boom</p> </div>	<p style="text-align: center;">CRAWLER OR TRAVEL SIGNALS</p> <div style="text-align: center;">  <p>travel both tracks forward or backward as indicated by revolving fist</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>travel track this side in direction indicated by revolving fist – lock track on side indicated by raised fist</p> </div>	<p style="text-align: center;">GENERAL</p> <div style="text-align: center;">  <p>STOP arm extended with closed fist</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>DOG EVERYTHING clasp hands</p> </div>	
<p style="text-align: center;">KICKER</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>to extend kickers, use open hand and motion away from machine</p> </div> <div style="text-align: center;">  <p>to retract kickers use open hand and motion toward the machine</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;">  <p>to lower kickers use open hand and motion downwards</p> </div> <div style="text-align: center;">  <p>to raise kickers use open hand and motion upwards</p> </div> </div>	<p style="text-align: center;">LEADS</p> <div style="text-align: center;">  <p>to hoist use 2 fingers pointing upward in rotating motion</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>to lower use 2 fingers pointing downward in rotating motion</p> </div>	<p style="text-align: center;">PILE</p> <div style="text-align: center;">  <p>to lower pile, touch hand to elbow and use down signal</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>to hoist pile, touch hand to elbow and use hoisting signal</p> </div>	<p style="text-align: center;">HAMMER</p> <div style="text-align: center;">  <p>to hoist hammer, touch hand to hat and use hoisting signal</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>to lower hammer, touch hand to hat and use down signal</p> </div>	<p style="text-align: center;">PILE, HAMMER, LEADS</p> <div style="text-align: center;">  <p>to lower pile, hammer and leads together, use both hands palms downward in down motion —</p> </div> <div style="text-align: center; margin-top: 10px;">  <p>to raise pile, hammer, and leads together, use both hands palms upward in upward motion.</p> </div>