Workshop Summary Report:
Safe Drill Rig Operation

Workshop Date: December 7-8th, 2016

Workshop Location: CSA Conference Centre, Mississauga, Ontario

Report Date: February 23, 2017

Workshop design and delivery by CSA Group

Contents

1.0 Introduction

The Eastern Canadian and Western Canadian Chapters of the International Association of Foundation Drilling (ADSC) retained CSA Group to conduct a two-day workshop on **December 7-8th, 2016** for the purpose of engaging stakeholders at a national level to support the development of requirements for the Canadian drilling foundation industry. The main focus of the multi-stakeholder workshop was an in-depth review of the scope and technical requirements of the document prepared by the ADSC (See Annex B). Identification of other Canadian drilling foundation industry standards needs was also a key objective.

The workshop, entitled "Safe Drill Rig Operation", was facilitated by Andrea Holbeche, Project Manager, Worker and Public Safety Standards and Candace Sellar, Program Manager, Worker and Public Safety Standards, both of CSA Group.

This report i) defines the workshop approach and processes employed; ii) summarizes key dialogue and observations made during the workshop; iii) outlines stakeholder feedback on the ADSC document including key items to include in the scope; and iv) describes the desired next steps.

2.0 Workshop Overview

2.1 Objective

The purpose of the workshop was to gather feedback from workshop participants in order to best meet stakeholder needs with respect to the following objectives:

- identification of industry needs with respect to harmonized safety requirements;
- participant agreement on scope of requirements to be discussed;
- in-depth stakeholder review of the ADSC document; and
- identification of points of consensus/points of difference throughout.

2.2 Structure and Process

CSA Group was retained by the Eastern and Western Chapters of the ADSC to act as a neutral, 3rd party in the design and delivery of the workshop. CSA is an independent, accredited standards development organization, dedicated to safety, social good, and sustainability. CSA develops standards in over 54 distinct technology areas designed to:

- enhance public safety and health;
- advance the quality of life;
- help to protect the environment; and
- facilitate trade.

A pre-workshop survey was used to collect information to support the workshop design and to identify key participants to invite to the workshop. Key stakeholders were invited to participate on the survey. Additionally, the survey was open to all interested participants and outreach was conducted to relevant industry/regulatory associations, the CSA Communities of Interest, and CSA technical committee members within related industries.

The survey was specifically designed to obtain feedback on the ADSC document in terms of:

- alignment with requirements and general work practices in various jurisdictions;
- suitability for use as a seed document to develop a national standard on safe drill rig operation; and
- most important areas of focus (breadth of scope).

A high-level summary of the stakeholder responses to the questionnaire is provided under the *Context Setting* section (Section 2.4) of this report, and complete survey results are found in Annex C.

Participants who were invited to attend the workshop were asked to complete a pre-workshop "homework" assignment in order to gather detailed, section-by-section feedback on the ADSC document and to assist workshop participants in preparing for the workshop. A copy of the pre-workshop "homework" feedback is included in Annex D.

In general, the workshop was designed to ensure workshop participants had a common understanding of the workshop purpose and framework. The agenda was designed to provide open and transparent discussion to enable workshop participants to reach consensus on key safety requirements and potential next steps.

Note: In the context of this workshop, based on CSA standards development principles, consensus was defined as: 'Substantial agreement... More than a simple majority, but not necessarily unanimity'.

The workshop followed a non-accredited process that was modeled on the CSA standards development principles of:

- independence and neutrality;
- ability to bring together stakeholders and reach general agreement;
- participant expertise; and
- transparency and openness.

Important components of the workshop included:

- reviewing the workshop's objectives, assumptions, and format;
- confirming participants' expectations of the workshop;

- background presentations from the ADSC members and general information about the CSA standards development process;
- reviewing the pre-workshop survey;
- detailed review of participant feedback from the pre-workshop "homework" assignment;
- building consensus through group discussion and breakouts; and
- outlining the recommended next steps.

Throughout the workshop, the participants adopted a five-finger voting system ("high five") as a rapid means of assessing the level of consensus on a given issue. In this voting system, participants hold up 1 to 5 fingers based on their agreement with a proposal (with 1 finger ="I hate it" ranging to 5 fingers = "full agreement").

For the portion of the workshop devoted to the detailed, technical review of the ADSC document (Section 3.2), Jason Bindseil (Eastern Canadian Chapter of the ADSC) agreed to act as Technical Facilitator.

2.2 Participants

To ensure the credibility of the workshop output, key individuals representing a balanced set of stakeholder interests were invited to participate. Individuals from 29 organizations received workshop invitations, and of those, 17 accepted the invitation, with 18 individual participants registered to attend the workshop (and an additional 2 individuals from two organizations who completed the pre-workshop "homework" assignment, but were unable to attend).

Workshop participants represented the following key stakeholder categories:

- owner/management;
- contractors;
- manufacturers;
- labour (e.g. operators);
- regulatory; and
- other (e.g., inspection, consulting, trainers, etc).

A complete list of individual workshop attendees has been included in Annex A of this report)

The workshop was facilitated by CSA Group representatives from the Worker and Public Safety Standards Program; Andrea Holbeche (Project Manager) and Candace Sellar (Program Manager).

2.4 Context Setting

2.4.1 History of the Project

Background on the development of the ADSC document and an overview of key points considered was provided by Andrew Sneddon (Graham Piling Services). Kevin Sharp (Western Canadian Chapter of the ADSC/NorthStar Sharp's Foundation Specialists) provided an overview of the Eastern and Western Canadian Chapters of the ADSC's work between the ADSC's decision to retain CSA group as a neutral 3rd party through to delivery of the workshop.

2.4.2 Overview of pre-Workshop Survey Results

Andrea Holbeche (CSA Group) provided a brief overview of the key points from the pre-workshop survey. In total, 24 individuals participated in the survey. Survey participants represented a wide variety of stakeholder categories, including owner/management, manufacturer, operators, regulatory (occupational health and safety, apprenticeship), inspection, consulting, and trainer/educators. Survey participation also included broad geographic representation from several Canadian jurisdictions (Ontario, BC, Alberta, Québec, Northwest Territories, Saskatchewan, and Manitoba), as well as the USA.

Survey question Q4: **Does the document align with the requirements and general work practices in your jurisdiction?**
Survey results: 61% of participants responded 'Yes'

Sample of Survey Comments:

- *There are sections of good alignment and then there are aspects that could do with more detail.*
- *It is missing large groups of types of rig capable of drilling or re-drilling holes.*
- *Does not allow for entry into the shaft for inspection...we still do this occasionally in Ontario.*
- *Ontario Regulations as of July 1st, 2016 ... are aligned with OHSA and College of Trades for Operators qualifications and also with new regulations for the Drill Rig drilling platform and site assessment for the province of Ontario.*

Survey question Q5: **Does the document provide a good foundation to develop a national standard on safe drill rig operation?**
Survey results: 72% of participants responded 'Yes'

Sample of Survey Comments:

- *The document [...] misses areas where there should be much more detailed information. But there are some good points that maybe used as a starting point.*

- *In general yes, but provisions need to be made for entry into the shafts.*
- *Does not address Drill Rig Operation.*

Survey question Q6: **Is the scope of the document sufficient for a national standard?** Survey results: 56% of participants responded 'Yes'

Sample of Survey Comments:

- *It's a very strong start. I would like to see more specifics on some of the topics, but we are well underway to something great. It's been a long time coming.*
- *Needs further work on all techniques of drilling.*
- *Misses operator qualifications and training standards for on the job and also theory. Although, it touches on the drill rig platform, I didn't see much detailed information regarding traveling the drill rig on site, other than very basic requirements.*

3.0 Workshop Outcomes – Consensus Building

3.1 Breakout Sessions

3.1.1 Breakout 1 - Scope of Requirements to be Considered

The first breakout occurred after review of the pre-workshop survey results, in which participants were randomly divided into four groups (A-D). Within the context of the ADSC document and key priorities for the industry, each group was tasked with answering the following question: **What aspects of safe drill rig operation are most critical to address?**

One member from each breakout group was asked to present on the key points from the breakout discussion. The following summarizes the key points as presented by each of the breakout groups' spokesperson.

- ***Group A Summary:***

The spokesperson for Group A identified the following key points:

- Operator *training / certification* is considered key to the whole document.
- *Safe operation* requires consideration of the site conditions and requires expansion in the document. Operators are routinely asked to drive the equipment anywhere on the site and this should be reflected in the requirements. It was noted that requirements for geotechnical review and identification of problem areas on a job site vary by province (e.g., the requirements are not as strict as those in Ontario).
- The scope needs to include the *type of drilling and the type of equipment being used*.
- The requirements should include mandatory case installation and standard minimum amount for each and every hole.

- Yearly *equipment inspection* should be required.
- An engineer should be required to determine the minimum safety factor (i.e., the operator should not be determining this).
- Consideration should be given as to how protection of rotating shafts (guards) is addressed (it was noted this is a law in Ontario).

- ***Group B Summary:***

The spokesperson for Group B identified the following key points:

- *Constructability* is a key focus and should be the main starting point for all safety.
- Constructability (including *geo-technical requirements, site conditions, and what is being installed)*, determines the technique, equipment, and methods used to complete the work.
- Risk factors are higher for bigger and more complicated equipment.

- ***Group C Summary:***

The spokesperson for Group C identified the following key points:

- Requirements for *working platform* and *varying pressure calculation* should be included.
- *Drill operator training*, including how an operator should be trained, is an area of key focus.
- The ADSC document does not include the actual procedures for drilling the shaft. This is important, and could be considered a separate document in itself.
- Overall, Group C had a positive impression of the document, but were unsure of which technologies were covered and why.

- ***Group D Summary:***

The spokesperson for Group D identified the following key points:

- Stability of the work platform, including design, inspection, maintenance, and reevaluation of the platform throughout the duration of the project was identified as a key point.
- It is critical to ensure that the machine is operated within the capabilities of the machine. This point is linked to operator training/certification.
- Group D discussed the scope of the document: should this be a broad document in focus, or, focused on one drilling aspect? The group supported a document of broader scope.

Following the presentation from each of the breakout groups, the larger group discussed the aspects of safe drill rig operation that are most critical to address. Key points from the larger group discussion are noted below.

- The intended focus of the ADSC document is on kelly bar drilling and auger drilling. There is a need to clarify this focus in the document scope.
  Note: The ANSI standard, which the ADSC document was based on, was also focused on kelly bar drilling. There is also an ANSI pile driving standard.

- While a focus on kelly bar and auger drilling was preferred, the participants noted that there could be a future opportunity to develop an entire suite of complementary standards for other equipment.
- It was noted it is not possible for the geotechnical engineer to understand the full landscape of the job at the time of writing the site investigation.
- It was noted that with respect to soils investigation, commercial issues need to be separated from safety issues.
- The participants indicated that it may be useful to review alignment with any other CSA standards on the requirements for site investigation.
- There was general support separating drilling procedures into a separate document (noting it would be useful to cross-reference the different documents for different drilling procedures).
- The scope of the standard dictates what is going to be in the whole standard and should be revised to provide clarity on what is excluded (i.e. scope limitations).

Discussion Outcome:

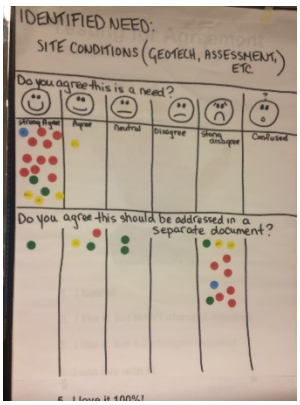
- The following key gaps (identified needs) were identified:
  - training/operator qualifications;
  - site conditions (geotechnical, assessment, etc.);
  - additional types of equipment (beyond those covered in this scope of the ADSC document);
  - stability (pad); and
  - drilling procedures.
- Participants were asked if they would support moving on to the agenda item to complete the detailed technical review of document, acknowledging that there are significant items not currently addressed in the scope, given that the road map exercise planned for Day #2 of the Workshop would circle back to these items.
- A 'high five' was completed, and the participants did not support looking at the ADSC document without further scope discussion. It was suggested and agreed to that the road map exercise would be completed before the in-depth document review, for the purpose of reaching consensus on how the key gaps (identified needs) would be addressed.

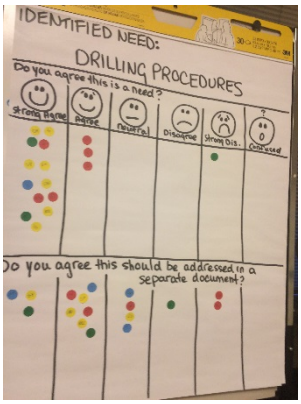
3.1.2 Breakout 2 – Roadmap

The road map exercise was conducted with the intention to review how critical aspects of safe drill rig operation should be addressed. Participants were asked to provide ranked votes for the identified needs (key gaps) noted in Breakout 1 (Scope).

For each identified need, participants were asked to place a 'dot' to indicate their responses to the following questions:

- Do you agree this is a need? (Ranked vote from strongly agree to strongly disagree.)
- Do you agree this should be addressed in a separate document? (Ranked vote from strongly agree to strongly disagree.)





During the 'dotmocracy' exercise, participants were also encouraged to highlight other gaps that were not addressed in the "identified needs". Results of the 'dotmocracy 'exercise were discussed by all participants as a group, as summarized below.

Identified Need #1: Training / Operator Qualifications

- Do you agree this is a need? Result: 17 votes on the "agree" end of the spectrum (i.e. strongly agree or agree)
- Do you agree this should be addressed in a separate document? Result: 5 votes on the "agree" end of the spectrum / 4 "neutral" / 8 on the "disagree" end of the spectrum.

Key Discussion Points:

- Clarification on what was meant by the question "should this be addressed in a separate document" was provided (i.e., this would not necessarily be a standard, but could be an industry best practice, or a regulatory document).
- It was suggested that operator qualifications should fall under the requirements of the authority having jurisdiction (AHJ) (i.e., provincially).
- It was suggested that the standard set the basis for qualification of the operators, including a "minimum standard" or a certain level of competency.
- It was observed that the ADSC document currently focuses on qualification versus the concept of competency.
- It was proposed that the definition for "competent person" should be based on existing regulatory definitions (e.g., the definition in the Ontario OH&S Act and Regulations, "Green Book").
- It was asked if specific drill rig training needed to be provided.
- There was discussion regarding the distinction between training versus qualifications versus competencies, and which of these may be most appropriate to address in a standard.

Discussion Outcomes:

- *Agreement was reached to include a definition of competent person*.
- *Agreement was reached that minimum competency should be included (keeping in mind that the AHJ may have other/additional requirements).*

- *Agreement was reached to include minimum operator qualifications.*

Identified Need #2 – Site Conditions (geotechnical investigations, site assessments, etc.)

- Do you agree this is a need? Result: 17 agree
- Do you agree this should be addressed in a separate document? Result: 4 agree / 2 neutral / 11 disagree

Key Discussion Points:

- One participant expressed that the site conditions might not be adequately addressed in the current document.
- It was proposed that the ADSC document should reference the Canadian Foundation Engineering Manual.
- It was commented that it is fine to have a listing of what should be referenced in the report; unforeseen soil conditions should be covered in the contracts.
- It was suggested that to have that burden on the soils report will result in some pushback from the Canadian Geotechnical Society (CGS). It was asked if this document would be used contractually (and responded that if it was in the tender documents, then yes it would be used).
- It was suggested that the ADSC document might currently be too prescriptive (as it can go into a specification).
- It was observed that some of the requirements seem to be more of a commercial nature instead of safety related.
- It was emphasized that knowledge of prior excavations and fills is critical.
- It was commented that each shaft is a job onto itself (where the geotech is completed doesn't completely align with where work is conducted). Sufficient coverage over the geotechnical assessment is tied into safety.
- It was noted that the ADSC document includes some requirements that may only apply to specific sites.

Discussion Outcome:
Agreement was reached that Section A of the ADSC document might be too prescriptive and that Section B could be enhanced to include further detail.

Identified Need #3 – Additional types of equipment covered that are not currently in scope

- Do you agree this is a need? Result: 10 agree / 7 disagree
- Do you agree this should be addressed in a separate document? Result: 9 agree / 5 neutral / 3 disagree

Key Discussion Points:

- It was noted that the introduction refers to all sorts of different equipment, which is in contrast to what the scope is supposed to be focused on (kelly bar drilling with an auger).

There needs to be alignment between the introduction and the scope – to make the content consistent.

- It was clarified that continuous flight auger (CFA) and drilled shafts were intended to be covered in the ADSC document by the ADSC subcommittee when it was developed; crane and micropiles were not included.
- It was noted that there might be an issue with terminology. Specifically, in industry a drilled shaft is not a CFA pile; a drilled shaft is a drilled kelly shaft. There was general agreement that there is a need for clarity of terminology, in the context of what is addressed by the document.
- It was observed that the ADSC document is not that far off being a CFA document as well, drill shafts are also probably covered in the document.
- It was confirmed that this document intentionally doesn't currently deal with air flush or water flush, pressurized grout, etc.
- A high five exercise was conducted in the room to assess whether or not the current scope of the ADSC document should be limited to drill shaft and strong support was expressed to limit the ADSC document accordingly (one individual expressed strong opposition).
- A high five exercise was also conducted to determine if other documents needed to be developed for other technologies not currently in the ADSC document and agreement was reached that there is a need to address the following:
  - *CFA*
  - *Micropiles*
  - *Anchors*
  - *Soil mixing*
  - *Cutter soil mixing*
  - *Diaphragm walls*
  - *Displacement piles (FDP)*
  - *Down the hole, DTH*
  - *Drill displacement steel piles*
  - *Driven Steel, Concrete and Timber Piles*
  - *Drilled Cast in Place Piles*
  - *Helical Piles, Anchors and Piers*
  - *Macropiles (may need to be defined)*
  - *Drilled Displacement Steel Piles (DDSP)*
  - *Expanded Base Piles (Franki Piles)*
  - *Vibro compaction*
  - *Vibro-concrete*
  - *Vibro displacement*
  - *Dry Soil Mixing*
  - *Wet Soil Mixing*
  - *Wick Drains*
  - *Soilfrac compensation grouting*

- *Jet grouting*
- *Chemical Grouting*

Discussion Outcome:

- *Agreement was reached by workshop participants that the scope of the current ADSC document be clarified to limit the scope to drill shaft.*
- *Agreement was reached that other documents should be developed for other technologies that are not within the scope of the ADSC drill shaft document.*
  - *CFA*
  - *Micropiles*
  - *Anchors*
  - *Soil mixing*
  - *Cutter soil mixing*
  - *Diaphragm walls*
  - *Displacement piles (FDP)*
  - *Down the hole, DTH*
  - *Drill displacement steel piles*
  - *Driven Steel, Concrete and Timber Piles*
  - *Drilled Cast in Place Piles*
  - *Helical Piles, Anchors and Piers*
  - *Macropiles (may need to be defined)*
  - *Drilled Displacement Steel Piles (DDSP)*
  - *Expanded Base Piles (Franki Piles)*
  - *Vibro compaction*
  - *Vibro-concrete*
  - *Vibro displacement*
  - *Dry Soil Mixing*
  - *Wet Soil Mixing*
  - *Wick Drains*
  - *Soilfrac compensation grouting*
  - *Jet grouting*
  - *Chemical Grouting*

The participants suggested that if a CSA Technical Committee were to be established, that it would be beneficial to provide the above list of technologies to the TC to define / bundle (in appropriate and cohesive groupings to prioritize) for consideration for future standards development activities.

Identified Need #4 – Stability (Pad)

- Do you agree this is a need? Result: 17 agree
- Do you agree this should be addressed in a separate document? Result: 5 agree / 12 disagree

Key Discussion Points:

- It was commented that stability is addressed in some respects, but the term (and specific reference to) stability is not explicitly addressed.
- It was observed that both site stability and rig stability should be addressed as two separate components.
- It was noted that how to calculate the bearing pressure is also not currently addressed in the ADSC document.
- It was suggested that the intended path of travel should be addressed in the ADSC document (currently, a safe distance is referenced).

Discussion Outcome:

- *Agreement was reached in the room to enhance the content on site stability.*
- *Agreement was also reached that the topic of rig stability needs to be included as it is not currently addressed in the document.*

Identified Need #5 – Drilling Procedures

- Do you agree this is a need? Result: 16 agree / 1 disagree
- Do you agree this should be addressed in a separate document? Result: 10 agree / 4 neutral / 3 disagree*

  **It was noted that now that the scope of the ADSC document has been clarified to be limited to kelly bar drilling (see Identified Need #3, above), then many of the dots might be adjusted. A simple show of hands confirmed that drilling procedures should be included/enhanced in the ADSC document (if practicable, consider consolidating into one section/clause).*

Key Discussion Points:

- It was commented that a soil and water (effluent) management plan should be included somewhere in the document.
- Participants discussed if any content/requirements on changing site conditions and how often the pad is required to be reevaluated due to environmental changes (e.g., weather) should be included in the ADSC document and whose responsibility it would be for assessing these changes.
- It was asked if a daily or weekly checklist should be required.
- Workshop participants discussed if minimum casing installment requirements should be specified when drilling in soil.

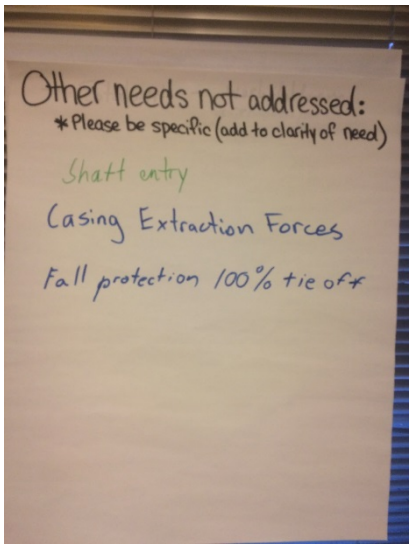
Discussion Outcome:

- *Agreement was reached that drilling procedures should be included / enhanced in the ADSC document.*
- *Agreement was reached to address soil and effluent management plans in the ADSC document. Agreement was reached that a checklist or content on assessing changing site conditions be added to the ADSC document.*

Actions:

- ***Action*** *– It was offered that the Ontario piling contractors have a check sheet and wording that can be considered. Andrew Sneddon also has a check sheet that can be considered as a seed/reference document.*
- ***Action*** *- If participants have any best practice documents that they would like to share with workshop participants, (e.g., Large Diameter Open Hole Drilling – Kevin Sharp), then these can be provided to Andrea Holbeche (CSA Group) for distribution to the group.*

Other unaddressed needs that were identified by participants:



- ***Shaft Entry*** – It was confirmed that it is addressed under article n); however, it is not permitted. This does not align with practice in some jurisdictions – i.e., in Ontario this still happens occasionally.
- ***Casing Extraction Forces*** – It was requested that casing extraction forces be addressed within the document, and noted that there are existing standards that can provide guidance (e.g., FPS document that addresses to some degree the extraction forces, related to bearing pressures) that can be referenced.
- ***Fall protection 100% Tie-off*** – It was suggested that a requirement for 100% tie-off be included in the ADSC document, however this should consider other appropriate controls, such as barriers. It was suggested that this proposed requirement be reviewed in the context of the current document requirements pertaining to safe working distance around the drill rig (marshalled by a swamper).

3.2 Review of ADSC document

Jason Bindseil (Eastern Canadian Chapter of ADSC) acted as Technical Facilitator during the review of the ADSC document. Key points and consensus items aligning with each section of the ADSC document are summarized below.

Execution Plan/Scope

- Regarding dedicated drill rigs, it was suggested that some manufacturers have lifting capabilities already written into the machine operator's manual, while other manufacturers give narrow lifting capabilities or restrict lifting to exclude anything other than the tool and what services the actual shaft. This was considered a global argument (re: drill rigs with the ability to hoist versus cranes).
- There is consensus that the person sitting in the operator's seat needs to be trained and certified. It is also generally agreed that a crane operator is not a drill rig operator; however,

it was noted that a drill rig operator can do some hoisting, and should have some hoisting training/certification to acknowledge that.

- It was noted that some drill rig training programs have up to 50 hours or so of hoisting training (including ground pressures, hoisting and rigging math) though this is not as robust as a crane operator training ticket.
- It was discussed whether or not a crane mount vertical (CMV) drill would be addressed in this particular document. It was confirmed that it is addressed and acknowledged that it might not be adequately covered.
- As per the discussion on Identified Need #3, above, it was agreed that a clause needs to be added to the scope clarifying what is, and what is not explicitly addressed. One participant expressed concern regarding adding too many exclusions as it may make the ADSC document unusable.
- As noted above, the "Execution plan" is included as introductory material and there was consensus that this needs to be brought forth to main body (so that it is included in requirements).
- There was agreement to remove the term "daily" in last paragraph: *"Copies of the plan and these JSA's shall be signed ~~daily~~ & maintained at the project site and available for review until the drilled shaft operations are completed."*
- It was agreed that this section needs to be reviewed in context with the rest of the document for consistency.

A. Site Investigation

- It was noted that some of the items identified are safety related, whereas others are more of commercial concern. For example, actual elevation levels and time-related boring issues are more commercial issues than safety.
- It was discussed that environmental hazards exist in other documents (phase 1, phase 2 assessment, risk assessment) and is not included in geotechnical reports.
- In terms of excavations and fill, it was noted that this usually needs to be from the owner or the general contractor.
- It was asked if the distance from boreholes to the job/number of boreholes needs to be addressed.
- It was suggested that references to the following existing documents should be added (perhaps in a note):
  - Canadian Foundation Engineering Manual (this is a guideline, referenced by structural engineers) ;
  - CAN/CSA Z769 Phase II Environmental Site Assessments; and
  - ASFE.

- There was a suggestion to subdivide this section into what is actually needed and what is additional "nice to have" information.
  - Published geological maps are not typically included in geotechnical reports.
  - It was noted that often the geotechnical doesn't do the environmental, so may be best to separate these (move applicable items to section B).
  - Geotechnical reports for MTO (or other major agencies) are structured into two reports: i) foundation investigation report, and ii) foundation investigation and design report. In this application, the design report is not provided within the contract package (available for viewing, published by the agency).

B. Pre-commencement Site Conditions

- In section B.1,
  - there was agreement to replace the terms "Client/Engineer/Principal Contractor/General Contractor" with the term "Constructor".
  - there was a suggestion that, the following definition of "Constructor" (as per the Ontario regulations) might be a good starting point: *"A person who undertakes a project for an owner and includes an owner who undertakes all or part of a project by himself or by more than one employer."*
  - there was agreement to revise 3.0m requirement in the first bullet point of B.1 to be less prescriptive (i.e., using a safe distance beyond).
- In section B.2, there was agreement that:
  - more specific language is needed around the working platform (suggested to reference Ontario regulations on this topic). It might be useful to reference the new regulation in Ontario, which requires a certified work platform before the machine shows up.
  - consistent language for work platform is required. The ADSC document currently also uses the terminology "Piling/Grade Platform". It was noted that 'Work Platform' is a more common term in Canada and suggested to revise accordingly.
  - the text "capable of supporting the proposed Drilling Rig in working mode" should be revised to include during assembly and disassembly, as this can be higher than in the working mode.
  - Ontario regulation 156.4 which includes set-up should be referred to. There was general agreement that what is included in the Ontario regulation would be beneficial and appropriate to include here as a requirement for potential national standard.
- The workshop participants discussed a suggestion (from the pre-workshop homework) to add the following as a new section B3: *"Prior to initiating drilled shaft operations, the drilled shaft contractor shall develop a written site-specific safety plan (Plan) and Job Hazard Analyses (JHAs) for unique drilled shaft activities. The Plan shall include, but not be limited to procedures for emergency action, the location of utilities (both above and below grade),*

designated areas for equipment operations and materials storage, assembly and disassembly sequences for drilled shaft equipment, operation of drilled shaft equipment, the handling of materials and equipment, task-specific training, personal protective equipment and project demobilization. The Plan shall be reviewed and approved by the Project Constructor." The workshop participants were in agreement with the technical intent of the proposed addition.

C. Permits

- It was noted that the Constructor rather than drilling contractor is responsible for the utility locates.
- It was observed that the terminology is in this section is unclear. This section really should reference permits and appropriate site documents: permits, license, and permissions as well as make use of the term "utility locate".
- It was reported that the intent of this section was to relate to all parties involved with the build ("Constructor", as noted above). It was noted there is a lack of clarity on what is meant by 'primary & secondary'. It was suggested that CSA Z247: Damage prevention for the protection of underground infrastructure, be reviewed with respect to applicability to the ADSC document.
- It was agreed that references to work schedule and time of a bid award should be modified such that: *"The constructor shall allow for adequate time to both assess and address any safety concerns on the project".*

D. Drilling Equipment Selection

- General agreement was reached that the ADSC document is for the installation of drilled shafts and that the equipment selection is appropriate for the scope of work.
- It was noted that Ontario regulations apply for 50 kN·m and above, and that this may be relevant in the context of operator qualifications.

E. Delivery and Storage of Reinforcing Steel, Casing and Tooling

- There was general agreement that Sections E and F could be combined into a single section.
- In section E.1, it was agreed that the reference to free draining should be removed and replaced with 'free of excess water accumulation' (it was also noted- asphalt or concrete are not free draining but would be considered appropriate in this context). The technical intent is already covered in section F.9.

F. Materials Handling to Points of Final Use

- There was a general comment that references to winch lifting rates in the ADSC document should be updated to load chart or as per manufacturer's /engineer's recommendation.
- Under section F.1, there was agreement on the following revisions
  - "Drilling contractor" instead of "piling contractor".

- Revise to remove list of equipment and replace with "other mechanized equipment".
- *"The drilling Contractor shall comply with the manufacturer's specifications, limitations and minimum maintenance requirements applicable to the operation of Drill Rigs, ~~cranes, forklifts, front end loaders, boom trucks~~ and other mechanized equipment used to handle / lifting / hoisting / off load material or tooling. Regular maintenance records / inspections and daily inspection sheet should be completed before and at regular intervals during the project."*

o There was agreement to revise section F.2 as noted below:

- *"Only rigging and equipment of adequate capacity and configuration ~~and with current certification from third party assessor~~ shall be used when handling / lifting / hoisting/ off-loading material or tooling with a proper tag line, and with a competent rigger aiding in the lift. Rigging and equipment shall be regularly inspected and documented to confirm it remains safe for use."*

o There was agreement to revise the first sentence of section F.3 as follows (i.e. it is not permitted to lift in excess of winch lifting rates):

- *"Reinforcing steel cages ~~for larger & heavier cages in excess of recommended winch lifting rates~~ shall be ~~designed~~ determined by a structural engineer ~~by a registered Professional Engineer~~ so as to withstand the forces applied to them when lifted horizontally or from a horizontal to vertical position. The cage fabricator shall ensure the cage is assembled in accordance with the approved cage shop drawing design."*

o There was general agreement to maintain section F.5 as is, including reference to rigging experience.

G. Piling Equipment

o There was a general point noted as to the terminology in the document, where the term "piling" is used versus the term "drilling" (e.g., Section G Piling equipment should be Drilling equipment).

o There was a suggestion to look at CSA Z150 as a seed document for consideration with respect to periodic and annual inspection. CSA Z150 includes specific components that shall be inspected in periodic and annual inspections, as well as specifies what is required to undergo non-destructive testing (NDT). CSA Z150 should be reviewed for applicability to the ADSC document.

o There was consensus that inspection of components requiring inspection shall be in accordance with manufacturer's recommendations.

o It was agreed to remove the reference to piling foreman in both instances of section G.3.

o There was agreement on the following revision to section G.3: *"Any defective or "REPAIRED" items will be recorded and reviewed by the Equipment Operator~~, & or Piling~~*

~~*Foreman*~~*, to ensure broken/ damaged items are recorded and repaired prior to the operation of the equipment. When required* ~~*possible*~~ *any damaged or broken items should be immediately replaced or repaired before the Drill Rig returns work. The* ~~*Piling Foreman & or*~~ *competent person* ~~*Mechanic*~~ *shall review the inspections and be the sole person responsible for deciding if the equipment is safe to work and sign off on these repairs being concluded and the equipment is fit for use*".

- There was agreement that items to be recorded should include logbook documentation, and possible tagging as required. As above, there was a suggestion to review this requirement against Z150 Clause 5.4.3 for possible seed wording.
- There was general agreement that CSA Z150 Clause 6.1.1 should be used as seed material for operator qualifications (in line with intent as noted in roadmap to include operator qualifications). Workshop participants agreed the level of detail/technical qualifications in CSA Z150 is consistent with intent for operators in this document.
- There was agreement to include manufacturer's recommendations in section G.6.
- There was agreement that section G.9 should take into account the local conditions and expected weather forecast.

H. Specific Drill Rig Requirements

- It was noted that the "Execution Plan" in the Introduction needs to be brought into the document as this contains the JSA requirement (as this is currently not stipulated in main body of the document). The workshop participants agreed that there should be consideration given to the possible inclusion of a sample JSA in document.
- In section H.2, there was agreement that review of logbook is required prior to operation at start of shift.
- In section H.7, it was noted that a second locator is not required in all jurisdictions. Modify this to a "should" have a second locator.
- There was general agreement that the last sentence of H.14 should be removed (not appropriate for operator to apply in absence of manufacturer's safety factor). There was also agreement to revise the first sentence of section H.14 as noted below:

  The use of an auxiliary winch ~~*on dedicated, self contained, hydraulic and/or friction clutch/friction brake drilled shaft installation equipment*~~ *shall be within the limits established by the equipment manufacturer.* ~~*If a safety factor has not been applied by the Manufacture then a suitable factor shall be applied by the operator*~~
- There was consensus that H.16 should be deleted and stability added into section H.15.
- There was agreement to revise section H.15 as follows:

  "Before using the winch all possible operation that may require hoisting shall be assessed against the winch capacity in consideration of the stability chart or load chart."

- It was noted that definitions for stability chart and load chart are needed.

- There was agreement to revise section H.17 as noted as noted below:

  "The use of a multi-part load block to increase the capacity of any ~~auxiliary~~ winch line on a dedicated, self-contained, hydraulic and/or friction clutch/friction brake drill rig is prohibited without written authorization from the equipment manufacturer or professional engineer."

- There was an agreement that the requirement in section H.18 shall be completed by P. Eng or the manufacturer. (It was noted that this applies to mobile crane with drill attachment, which is why this is in section H.)

I. Cranes

- There was agreement that all of section I should be deleted and replaced with a statement to the effect of: *"Service cranes on shaft drilling sites shall comply with CSA Z150."*

J. Shaft Drilling

- There was consensus to revise section J.1 as below:
  "The Drill Rig operator shall only take direction from one ~~the~~ designated competent person ~~swamper/Foreman~~."
- There was consensus to revise section J.2 as below:
- *"Once erected the Drill Rig shall travel ~~track~~ to pile position under the sole direction of the designated competent ~~piling~~ person ~~(swamper/foreman)~~. At all times hazards such as soft ground/underground utilities/overhead obstructions should be avoided and a suitable route planned in advance as per site specific safety plan ~~determined~~."*
- There was consensus to revise J.3 as below:
  Revise to: *"before commencing any drilling for the day, locates and permits should:"*
- There was agreement that section J.15 is already covered elsewhere and that J.15 should be deleted.
- There was consensus to add the following to section J.11:
  "Such covers should be capable of withstanding 500KG in the middle and have at least 250mm overlap over the pile hole or as per applicable jurisdictional requirements."
- There was general agreement to remove section J.10 (However, it was noted that this is a practice used).
- There was agreement to add stability to section J. 16 as for decisions noted for section H.15 above.
- There was agreement to delete section J.17.
- There was agreement that section J.18 applies as per engineer or manufacturer's instructions.
- There was agreement to replace "qualified signal person" with "competent signal person" in section J.19.

- There was agreement to revise section J.22 as noted below:
  "The swing radius of the drilling equipment shall be barricaded or properly delineated to identify all swing radius area and maintain entry at proper clearances to be determined and established in the SSSP ~~a minimal of 1.5 x the Height of the equipment being used~~ and so noted in the daily tailgate, pre-job safety meeting."
- There was agreement to delete section J.24.

K. Reinforcement Placement

- In general, it was noted that "piling cages" should be changed to "reinforcement" (noting that it should be double checked to confirm that nothing was specific to cages only, and if rewording is required).
- There was agreement to revise section K.2 to specify "load chart or stability chart, as applicable" (similar to section H.14 above).
- There was agreement that section K.4 should be revised to reference "suitable slings" (i.e. delete "nylon") and delete "metal on metal should never be adopted".
- There was agreement that "drill rig shall not be sideloaded" should be added to section K.5.
- There was agreement that in section K.7 (and in all other instances in the document), "swamper" should be replaced with "competent person".
- There was agreement to replace the word "employed" with "used" in section K.8.
- There was consensus to delete section K.12.

L. Concrete Placement

- There was agreement to delete section L.1.
- There was agreement to add the following to section L.2:
  "*made aware of site hazards and sign on to JSA*".
- There was agreement to revise "designated person" to "one competent person" in section L.3.
- There was agreement to revise "grade/platform" to "working platform" in section L.5.
- There was agreement to add the following to section L.10:
  "pump shall not be used without a working pressure gage."

M. Casing Extraction

- There was agreement on the following revisions to section M.1:
  - replace "crane" with "equipment"; and
  - add "stability or load chart" to "lifting capacity or the working loads".
- For section M.2 there was discussion to include an Annex containing detail on how extraction load is determined. **Action:** Richard Heslop indicated he may be able to provide reference material that could be considered as seed material for this annex (also relates to section M.5).

N. Drilled Shaft Entry

- It was noted that there is not consensus among workshop participants on this practice (it is prohibited by section N, however this still occurs at times in Ontario).
- This item should be subject to further review.

O. Pressurized Lines and Hoses

- There was agreement to revise the following sections of O. as noted:
  - Section O.2 REPLACE: "air flow reduction valve" with "check valve"
  - Section O.6 – DELETE: second sentence of O.6. (Note: this is already covered in O.7)
  - Section O.8 –
    - REPLACE: "working pressure of hoses" with "rated capacity of hoses".
    - REPLACE "greater than or equal to" with "greater than".
- There was agreement that further review of applicable requirements in section O.10 for GFCI should be completed (the workshop participants did not feel they have specific expertise needed for this section).

P. Fall Protection

- There was agreement to add a requirement to section P for tie-off as detailed below: *"100% tie off shall be required within 6 feet of open hole or when guard or liner is less than 42" above grade".*
- It was noted that some jurisdictions base this requirement on 36" (i.e., less stringent). There was not unanimous agreement on 42" height as some felt the jurisdictional requirement for 36" is sufficient. It was noted that the 6 ft requirement may be subject to local AHJ requirements as well.

Q. Using Drilling Fluids

- There was agreement to add a general requirement in section Q1 to adhere to manufacturer's recommendations.
- There was agreement to revise "great fall risks" to "fall risks" in section Q.3.
- There was agreement to correct section Q.5 as noted:
  "ensure all open ended discharge hoses.."

R. Drill Tool Inspection and Attaching Procedure

- There was agreement to revise section R.3 as noted:
  "Only hand signals from a single competent person…"
- There was agreement to revise section R.4 as noted:
  "Watch for pinch points. Be aware of where you put your hands. Use hand tools where ever possible."
- There was a general note include requirement for appropriate PPE as per AHJ in document.

S. Working Close to Overhead Power Line

- There was agreement that in Section S., from second paragraph of section S.1 and onward term "limits of approach" should be used, for example:
  "After first checking the worksite, you may find that the limits of approach from the electrical conductor cannot be maintained. If the inadvertent movement by a worker or equipment may result in either coming closer than these limits of approach you must follow these steps before proceeding with work."

T. Gas Mitigation Whilst Drilling

- There were no comments or changes requested by the workshop participants.

U. Working Over/Near Water

- It was noted that this section should be reviewed by those familiar with working over/near water.
- It was suggested that ANSI B30.8 Floating cranes and floating derricks should be considered as a reference.

V. Working Near Transport Routes

- This section requires greater detail in terms of technical requirements. This should include context of local jurisdictional requirements for protection of the public (see Section 64 and 65 of Ontario OH&S Act and Regulations, "Green Book").
- There was consensus that detailed requirements should be included under each of the section headings V.1, V.2, and V.3, and that casing selection, rig selection, splashing pedestrian, work safe zones, safe access, etc., should be included.

W. Pre-work Job Site Risk Assessment

- It was suggested that sample forms could be provided as seed material (perhaps include multiple forms in annex).
- It was noted that this section is missing a requirement. There was agreement to add the following to section W.1:
  "A pre-work job site risk assessment shall be completed."

4.0 Next Steps

As a follow-up to the workshop, next steps will include:

- A workshop report will be developed and shared with all workshop participants.
- The Eastern and Western Chapters of the ADSC and CSA will discuss potential next steps for transitioning the ADSC document into a CSA National Standard (noting that there was consensus from the Workshop participants that a CSA standard should be developed based on the workshop outcomes).

- It was identified during the workshop that trade designation (i.e., Red Seal) would be a priority for the industry, and it was noted that in Ontario there are activities already underway comparing equivalent hours for crane operator versus drill rig operators.

5.0 Participant Feedback

Workshop participant feedback was collected at the end of the workshop using an exit questionnaire. Questions solicited input on the clarity of the workshop goals and objectives, organization and facilitation, value to the participant's organization, and the clarity of the path forward. A summary of the stakeholder responses to the workshop exit questionnaire has been included in Annex E. Some additional comments of interest provided by workshop participants on the exit questionnaire have been highlighted below:

Participant Comments

- *"This workshop was very beneficial and educational."*
- *"Good meeting, appreciate the group and their efforts to participate. Look forward to developing this into a CSA standard."*
- *"Excellent facilitation of a difficult group, ensured that all voices were heard even if consensus was not achieved."*
- *"This appears to have a long way to go to get to consensus that would satisfy all parties, i.e. contractor vs. union vs. regulators that a CSA standard is required. I think there are such regional differences as well as special interest mandates that the different stakeholders have."*
- *"Inclusion of DFI (Deep Foundations Institute) to provide includes of all "rotary foundation drill rig" techniques."*

Annex A – Workshop Participant List

- Dean Albrecht, WorkSafeBC *(attended via WebEx/teleconference)*
- Michael Baxter, Bauer Pileco
- Jason Bindseil, Eastern Canadian Chapter of the ADSC
- Tyler Bragg, Liebherr-Canada Ltd.
- Michael Cianchetti, Deep Foundations Contractors Inc
- Joe Dowdall, I.U.O.E Local 793
- Steve Delaney, OETIO
- Chris Elvidge, Terraprobe Inc.
- Stan Gonsalves, exp Services Inc.
- Richard Heslop, Keller Foundations Ltd.
- Saeed Khorsand, Ontario Ministry of Labour
- Richard Marshall, ADSC: The International Association of Foundation Drilling
- Charlie Morettie, Fleming College
- Paul Sandberg, Liebherr-Canada Ltd.
- Kevin Sharp, Western Canadian Chapter of the ADSC/NorthStar Sharp's Foundation Specialists
- Andrew Sneddon, Graham Piling Services
- Derrick Speakman, Anchor Shoring & Caissons Limited
- Laurie Parish, Zueblin

In addition to the participants listed above, the following individuals were unable to attend the workshop, but completed the pre-workshop homework assignment:

- Brent Habetler, Essential Inspections Ltd
- Jerry VanKooten, Earthline Foundations and Shoring Ltd.

CSA Standards Staff: The following CSA Standards staff were involved in the design and delivery of the workshop

- Andrea Holbeche, Project Manager (workshop design and facilitation)
- Nicki Islic, Standards Manager (workshop design)
- Candace Sellar, Program Manager (workshop facilitation)

Annex B – ADSC Document

Western Canadian Chapter of the ADSC

For consideration to becoming a Canadian Standard for Drilled Shafts

Version 5.0

May 5, 2015

Presented by:

Safety Sub-Committee of the WCC @ AGM Victoria May 7, 2015

Sub-Committee consists of:

Jeff O'Forhan GSC, NCSO, Regional Safety Manager Alberta South Keller Canada Sub Committee Chair (Lead)
Jim Whitney NCSO HSE Manager Sharps Construction Services 2006 Ltd Leduc, Alberta.
Andy Sneddon Construction Manager Earthworks, Underground & Piling Graham, Edmonton, Alberta
Cody Gravel B.Mgmt. NCSO, HR& Safety Manager Midwest Caissons (2014) INC. Acheson

This document is being used as a reference to harmonize or make good the Canadian Industry Recommended practices consistent with the various provincial and territory legislation and geographical regions of Canada and to request that this draft/review be utilized by the CSA for their involvement in creating a Canadian Standard.
This paper is for "Drilled Piles in Canada" was produced by a sub-committee which reviewed other country existing standards being referenced and utilized for operating procedures in the; USA, UK & Australia.

Research was conducted to assure that it aligned with Canadian legislations & this Draft maybe utilized as a bench mark towards developing a practiced Canadian standard.
References with this Draft are to the OHS legislations- that are the authorities governing Canadian Provinces & Territory lands with the various regulatory/quasi-judicial bodies ensuring best practices.

***DRAFT scope*:** To aid in establishing a target from which the CSA can develop a standard for safe operations with regards to the installation of drilled shafts during construction in Canada.
Purpose:
This is a proposal from which the membership of the ADSC will assist with Industry best practices so that "all" companies and industry users may benefit for safe work practices. The proposed "Paper" can be used in the final Canadian standard which is required to help in identifying potential issues and adequate mitigation steps in an administrative report. It will also establish correct or procedurally outlined adequate steps in protecting workers from hazards associated with installation of drilled shafts.

Exceptions: Whenever it is unreasonably practicable to adhere to the recommendations of this outlined document, A detailed safety report with adequate administrative control & or including (where necessary) a qualified P Eng. that has reviewed all of the details of any such scope of work and that report would sufficiently be in place for corrective steps and procedures that were identified in a Safe Work Plan/Job Safety Analysis with such documentation current to the site specific location(geography, weather or other structural requirements needed to be met.)

Where there is existing legislation that requires specific administrative engineered or other controls that legislation requires to be followed, and this document encapsulates the scope of work being performed in that legislative area of work being performed & will be the standard by which the Industry shall follow unless the job as previously indicated would need specific controls approved by any regulatory governing bodies and to include City & County By Laws, Band Resolution Decrees and other Federally needed agencies in which the area of work creates any regulatory/enforcing authority to allow & may grant exceptions to literal requirements of this draft.

Standards: This draft is intended to be presented to the CSA to aid with their approved revisions and development of a Canadian Standard.
References:

- The International Association of Foundation Drilling (ADSC), Recommended Procedures
- Legislation referencing from: BC, Alberta, Sask., Manitoba, Ontario, New Brunswick, Nova Scotia, PEI, Newfoundland & Labrador, Quebec, NWT, Yukon & Inuvialuit Territories.
- Australian standard Edition 1 January -2014-Piling work and foundation engineering sites
- American ANSI Standard ASSE A10.23-2014
- UK & Europe Standard ICE Specification for Piling and Embedded Retaining Walls - Second edition

Table of Contents

Introduction:

This document represents the initial draft of a proposal to harmonize a working standard and request the CSA review and utilize this document as needed to become a referenced Canadian standard for the Safety Requirements surrounding the installation of drilled shafts in the construction Industry for all usages.
(AKA Caissons, drilled cast in place piles, cast in place concrete piles, augured piles, auger cast piles, continuous flight auger piles, micro piles/macro piles).
The document has been drafted in consultation with various industry stakeholders and is intended to provide a common working safety standard to align the industry and improve the overall safety and performance of the companies involved in the foundation construction process utilizing research from the OHS legislation across Canada, Industry recommended developed practices, educational institutes and engineering suggested practices.

Execution Plan:

Prior to initiating drilled shaft operations, the drilled shaft contractor shall develop a written (SSSP) Site-Specific Safety Plan which will include; all job safety/hazard analysis (JSAs) for unique drilled shaft activities. The plan shall include, but not be limited to procedures for emergency action including an Emergency Contact List with names and numbers of the Project management Team and affiliated needed Emergency phone numbers (Ambulance, Fire Dept. OHS, Environmental, etc. along with permits of the location of utilities (both above and below grade), Designated areas for equipment operations and materials storage, assembly and disassembly sequences for drilled shaft equipment, operation of drilled shaft equipment, the handling of materials and equipment, task- specific training, personal protective equipment including spill kits and fire extinguishers and project demobilization. The plan shall be reviewed and approved by the project constructor.
The competent person shall review the plan and all pertinent JSAs with all workers potentially exposed to hazards posed by the drilled shaft operations. All drilled shaft related JSA's will be authored by all involved for levels of due diligence. Copies of the plan and JSAs shall be maintained at the project and available for review until the drilled shaft operations are complete.
As changes in work procedures occur, the plan and/or JSAs shall be modified as necessary. Such changes shall be communicated to all personnel involved in the drilled shaft operations. JSA, (Job safety analysis) FLRA, (Field Level Risk Assessment), Reference scope of work, Industry Recommended standards, Best Practices, Engineered & Administrative controls, etc. Site Conditions, Site layout, Laydown area, Hazard Reviews
Each committee member has been involved with submission of these examples of; protocols, SOP's or standard work practices that are being utilized and are consolidated and captured to an agreed representation that encompasses the majority of all soil and site conditions including floating barges or water work (bridge, dam structures etc.) Initiating drilled shaft operations.

All personnel involved with the work shall have shown competency in their tasks & shall have been active in the process steps and reviewed the final plan of work and all other workers potentially exposed to any hazards posed by the drilled shaft operations. Copies of the plan and these JSA's shall be signed daily & maintained at the project site and available for review until the drilled shaft operations are completed.

A. SITE INVESTIGATION

A.1 A geotechnical investigation shall be performed to identify subsurface conditions and provide geotechnical conclusions and recommendations for design and construction. The investigation shall include a field reconnaissance of the site and vicinity. A written report of the investigation shall be developed and include:

- A description of the proposed project and its location.

- A site map of the project, scaled to no less than 1":400', identifying geological conditions, topography and the location of proposed structures. Published geological maps should also be provided where available.
- The geological history, including information on prior excavations and fills.
- A discussion of geological and environmental hazards and an explanation of their potentially harmful effects on workers involved in the drilled shaft operations.
- Existing and potential groundwater conditions (i.e. Water strike depths, flow characteristics over time and seepage).
- Actual elevation levels of the borehole locations and location of the boreholes in relation to the planned structure.
- All time related boring issues such as rock drilling or obstructions.
- Engineering data addressing foundation types and parameters for proposed structures, retaining systems, grading considerations, stability of cut-slopes and constructed embankments, settlement of the site and adjacent areas due to existing conditions, proposed construction and proposed surface and subsurface drainage facilities.
- Concrete recommendations regarding sulphate and cement types for buried concrete.
- The signature, certification number and stamp of a registered Professional Engineer, who by training, education and/or experience is qualified in the practice of geotechnical or soils engineering practices.

B. PRE COMMENCEMENT SITE CONDITIONS

B.1 The Client/Engineer/Principle Contractor/General Contractor shall:

- Inform the Piling Contractor of the known locations of subsurface and / or overhead hazards on the piling area footprint plus a safe distance of 3.0m beyond (e.g. voids, tanks, utilities, contaminated soils, etc.)
- Clearly identify such hazards on the pile layout drawings or in documents such as site plans, and geotechnical reports.
- Organize and conduct a preconstruction meeting with the drilled shaft contractor to review (but not limited too)
- Safety Plans to include a Traffic Plan
- Site Access (Haul Roads / Congestion)
- Piling / Grade Platform condition
- Under Ground and Over Head obstructions
- Public / Other contractor interfaces
- Schedule and Sequence.
- Ensure all permits are in place, relevant and valid for the works to be completed

B2. Piling Contractor shall ensure that Drill Rig is not assembled or used unless the Piling/Grade Platform is level (to the extent that the equipment manufacturer's specifications) & firm (capable of supporting the proposed Drilling Rig in working mode), as well free draining (except for marshes/wetlands). ELABORATE REPORT ON PLATFORM STABILITY AND INCLUDE GEO ENGINEERING PLATFORM REPORTS AND GROUND STABILITY Signed off, by an accredited Engineer (as indicated above in 'A") and shall be the Prime/General Contractors/property owners role to adequately supply all of the aforementioned documentation, the Drilling Contractor will ensure that all required & supported information is given to the Owner, Prime/General Contractor to enable the correct support surface always be in place **prior to "ANY" commencement of work and equipment on location.**

C. PERMITS

C.1 Permits shall be in accordance to building, ground disturbance (primary & secondary current dated – within 14 days) All hot work, environmental and regional, provincial and federal required permitting are in place prior to any work equipment or manpower being put into place. The Owner/Prime/General Contractor will ensure that the aforementioned are identified and followed on their work schedule as discussed at the time of a bid award and going forward in a timely and proper manner to include adequate safety conditions are in place whether they be Engineered, Administrative or Specialized Personal Protective Equipment (PPE).

D. DRILLING EQUIPMENT SELECTION

D.1 The selection of drilling equipment and tooling should be based on the geotechnical investigation report and its findings, any client / engineer specified pile type or technique and client/engineer pile design (diameter, length & quantity). The selection should be based upon (but not limited to):

- Ground water level and flow.
- Soil types and their characteristics (loose, hard, dense)
- Designed pile diameter and depth (rig size, power)
- Access to working area.

E. DELIVERY AND STORAGE OF REINFORCING STEEL, CASING AND TOOLING

E.1 Any laydown area should be level, firm and free draining and capable of withstanding the bearing pressures imposed by both the materials / equipment and the machines used to move the items across site.

E.2 Casing pipe and assembled reinforcing cages stored on the ground shall be adequately secured by blocking or equivalent methods to prevent unplanned movement and damage.

E.2 Areas for the storage and assembly of reinforcing steel should be planned to minimize handling, but sufficiently far enough away from hazards associated with moving equipment.

E.3 Whenever possible cages and casings should be placed on timbers in order to provide a clearance off the ground. Stored materials or equipment that has potential to cause a hazard should be demarcated with barriers or tape.

F. MATERIALS HANDLING TO POINTS OF FINAL USE

F.1 The Piling Contractor shall comply with the manufacturer's specifications, limitations and minimum maintenance requirements applicable to the operation of Drill Rigs, cranes, forklifts, front-end loaders, boom trucks and other mechanized equipment used to handle / lifting / hoisting / off load material or tooling. Regular maintenance records / inspections and daily inspection sheet should be completed before and at regular intervals during the project.

F.2 Only rigging and equipment of adequate capacity and configuration and with current certification from third party assessor shall be used when handling / lifting / hoisting/ off-loading material or tooling with a proper tag line, and with a competent rigger aiding in the lift.

F.3 Reinforcing steel cages for larger & heavier cages in excess of recommended winch lifting rates shall be designed by a registered Professional Engineer so as to withstand the forces applied to them when lifted from a horizontal to vertical position. The cage fabricator shall ensure the cage is assembled in accordance with the approved cage shop drawing design.

F.4 Whenever possible and when the size or weight of cage dictates a separate execution plan should be developed to ensure the correct method of lifting is employed and including adequate tag lines..

F.5 Only a competent person with proven rigging experience should be used for any lifting or hoisting operations.

F.6 Before commencing and handling/lifting/hoisting/off loading, the immediate area of the lift point, the route to be travelled and final destination point should be surveyed for obstruction or possible hazards.

F.7 A safe lift area should be adopted into which only task briefed and experienced operatives should enter.

F.8 During any handling/lifting/hoisting/offloading the operator of the equipment should only take direction from one competent person. That person should be clearly visible to the operator during all aspects of the operation and be clearly identified to the operator..

F.9 Whenever possible lay down areas should be level hard standings free from standing water.

F.10 Unloading should be carried out to ensure the least distance necessary has to be travelled.

G. PILING EQUIPMENT

G.1 Upon arrival at site all equipment shall be inspected. All equipment should be delivered and have available an up to date third party yearly inspection certificate. All Drill Rigs shall arrive with an up to date log book and equipment manuals for the specific piece (s) of equipment.

G.2 All equipment used for drilled shaft installations shall be inspected daily before use and the inspection clearly recorded within a Drill Rig Log Book.

G.3 Any defective or “REPAIRED” items will be recorded and reviewed by the Equipment Operator, &-or Piling Foreman, to ensure broken/ damaged items are recorded and repaired prior to the operation of the equipment. Whenever possible any damaged or broken items should be immediately replaced or repaired before the Drill Rig returns work. The Piling Foreman & or competent Mechanic shall review the inspections and be the sole person responsible for deciding if the equipment is safe to work and sign off on these repairs being concluded and the equipment is fit for use.

G.4 Inspections should include but not be limited to:

- All Main Ropes and Winches
- Engine Fluid Levels

- Rotary Head Fluid Levels
- All Major Hoses (Especially Hoses at Height)
- Cat Head
- Tracks / Wheels /Undercarriage.
- Fire Extinguisher

G.5 Only modifications to the Drill Rig that have been approved by the Manufacturer or by a certified Mechanical Engineer shall be allowed.

G.6 All heavy machinery shall be operated in accordance with its manufacturer's manuals/instructions/ specifications

G.7 Fuel-operated power plants shall not be operated in enclosed work areas unless exhaust is adequately ventilated or ducted out of the confined space.

G.8 A fire extinguisher of appropriate size and type shall be maintained on the equipment. All fire extinguishers shall have current and valid inspection certificate with them.

G.9 All equipment should be parked and made safe at the end of each shift.

G.10 Regardless of energy source, the system(s) shall be locked out or tagged out to prevent accidental start up.

H. SPECIFIC DRILL RIG REQUIREMENTS

H.1 Before commencing any piling operations the site should be inspected and the piling / grade condition be noted and accepted by the Piling Foreman. If conditions are not adequate for the size and weight of the Drill Rig the client should be made aware immediately and no work permitted until satisfactory conditions prevail.

H.2 At the start of each shift the crew and support personnel shall hold a tailgate meeting at which details of the days planned operation are discussed and all JSA's necessary are reviewed and signed off.

H.3 Before erecting the mast of the Drill Rig the surrounding area should be checked by the operator for any overhead obstructions.

H.4 Whilst erecting the Drill Rig only competent piling personnel should be involved and be in the immediate surrounding area. A safe zone should be placed around the Drill Rig and marked by cones / tape / similar visual demarcation or managed by the site crew.

H.5 The Drill Rig operator shall only take direction from the designated swamper / Foreman.

H.6 The drilled shaft installation equipment shall be inspected at least once every shift prior to operation. Additional equipment inspection and maintenance cycles may be required due to extreme conditions. If conditions warrant, maintenance and inspection cycles should change to a more frequent basis. The inspections shall be documented.

H.7 Prior to any drilling operations, all overhead and underground utilities must be located. The project constructor or site owner is responsible for contacting the local One Call Center service to identify & mark all utilities and the drilled shaft contractor will be required to have a second locator called to mark utilities as well. Most "locates" permits from most provincial "One Call" are good for 14 days only.

H.8 The location of underground utility lines should be marked in accordance with local Provincial assigned "One call" call before you dig authorized locators & the marking guidelines and color codes. Markers (e.g., flags, stakes) should be suitable for the terrain and site conditions as ground disturbance identifiers are required.

H.9 Whenever feasible, engineering controls shall be used to prevent contact with such utilities. The utility owner (s) must always be consulted to determine safe working clearance distances per minimum distances and accurate mitigation to include planning for hydro vacuuming and or non-equipment & only hand exposure of all underground utilities. (See Section "S" below)

H.10 A minimum safe working clearance distance between energized overhead electrical power lines and all parts of construction equipment shall be as maintained at all times during the construction process.

H.11 All safe limits must be strictly adhered to and utility owners must be present at any time within the limits as defined, to have a pre mobilization site walk through for proper issuance of permitting.

H.12 Whenever possible the Drill Rig should be placed forward and perpendicular to the hazard so that if the Drill Rig needs to back out of danger it is moving away from the hazard

H.13 Where a boom, counterweight or other structural component of a mobile crane has been modified for attachment of drilled shaft installation equipment, the owner of the crane shall apply accepted engineering principles in demonstrating such modifications will not interfere with the safe operation of the crane. Written permission shall be obtained from the crane manufacturer for such modifications. If the manufacturer is no longer in business, then a registered (P.Eng)-Professional Engineer, with respect to the equipment involved, shall design the modifications.

H.14 The use of an auxiliary winch on dedicated, self-contained, hydraulic and/or friction clutch/friction brake drilled shaft installation equipment shall be within the limits established by the equipment manufacturer. If a safety factor has not been applied by the Manufacture then a suitable factor shall be applied by the operator

H.15 Before using the winch all possible operation that may require hoisting shall be assessed against the winch capacity.

H.16 The winch capacity shall be clearly marked on the winch and also close to the winch control lever

H.17 The use of a multi-part load block to increase the capacity of an auxiliary winch line on a dedicated, self-contained, hydraulic and/or friction clutch/friction brake drill rig is prohibited without written authorization from the equipment manufacturer.

H.18 Determination of safe lifting capacities of auxiliary hoists on mobile cranes used for drilled shaft installations shall include the suspended weight of all drill equipment attachments along with a suitable safety factor to allow for Drilling loads

I. CRANES

I.1 Before erecting any Crane the surrounding area should be checked by the operator for any overhead obstructions.

I.2 Whilst erecting the Crane only competent piling personnel should be involved and be in the immediate surrounding area. A safe zone should be placed around the Drill Rig and marked by cones / tape / similar visual demarcation or managed by the site crew.

I.3 The Crane operator shall only take direction from the designated swamper/Foreman.

I.4 Operators of cranes shall possess a certification administered by accredited with each apprenticeship & trade board testing organization / qualification by a red seal program, by each provinces appropriate regulatory bodied agency issuing these certifications.

I.5 The use of an auxiliary winch on dedicated, self-contained, hydraulic and/or friction clutch/friction brake drilled shaft installation equipment shall be within the limits established by the equipment manufacturer. If a safety factor has not been applied by the Manufacture then a suitable factor shall be applied by the operator

I.6 Before using the winch all possible operation that may require hoisting shall be assessed against the winch capacity.

I.7 The winch capacity shall be clearly marked on the winch and also close to the winch control lever

I.8 Determination of safe lifting capacities of auxiliary hoists on Cranes used for drilled shaft installations shall include the suspended weight of all drill equipment attachments along with a suitable safety factor to allow for Drilling loads

I.9 A qualified signal person shall be positioned in full view of the Crane operator before any Crane is relocated at the work site. Standard hand or voice signals shall be used. The operator shall accept signals only from the designated signalperson except for an emergency stop signal, which may be given by any worker.

I.10 No worker shall be positioned under any portion of a suspended load.

J. SHAFT DRILLING

J.1 The Drill Rig operator shall only take direction from the designated swamper/Foreman.

J.2 Once erected the Drill Rig shall track to pile position under the sole direction of the designated piling person (swamper/foreman). At all times hazards such as soft ground/underground utilities/overhead obstructions should be avoided and a suitable route determined.

J.3 Before commencing any drilling all permit requirements should be reviewed and checked. All permits should be up to date and valid for the designated piling area.

J.4 When drilling a clear safe zone should be demarcated around the piling operation and be policed by the swamper/Foreman. Only experienced personnel with a good understanding of piling should be allowed within the work zone.

J.5 The zone shall encompass the drilled shaft equipment, drilling attachments, the shaft being drilled and the materials and area necessary for the specific operation being performed, including spin-off.

J.6 Only personnel engaged in the drilled shaft installation shall be allowed inside the zone. When other contractors' workers enter the restricted access zone without approval, the drilled shaft contractor shall promptly inform the project constructor or site owner of the intrusions. The project constructor or site owner shall take reasonable steps to prevent such intrusions.

J.7 Only materials necessary for the operations being performed shall be stored in the restricted access zone.

J.8 The competent person shall ensure there is no caving in or undermining of the soil at the surface near the drilled shaft. If such conditions exist, the competent person shall promptly initiate corrective action to ensure the safety of the persons working in the restricted access zone.

J.9 Barriers shall be placed around any open hole whilst under construction.

J.10 The auger should be left in the hole close to grade level when the hole is unguarded.

J.11 Clearly identifiable pile shaft covers should be used upon completion of a pile where cut off level and steel projection allows. Such covers should be capable of withstanding 500KG in the middle and have at least 250mm overlap over the pile hole.

J.12 Whenever feasible, engineering controls shall be used to prevent contact with such utilities. The utility owner(s) must always & shall be consulted to determine safe working clearance distances per minimum distances and accurate mitigation planning for hydro vacuuming and or non-equipment & only hand exposure of all underground utilities.

J.13 Whenever possible the Drill Rig should be placed forward and perpendicular to the hazard so that if the Drill Rig needs to back out of danger it is moving away from the hazard

J.14 No one should be in contact with the drill rig and the ground during any part of the drilling operation.

J.15 The use of an auxiliary winch on dedicated, self-contained, hydraulic and/or friction clutch/friction brake drilled shaft installation equipment shall be within the limits established by the equipment manufacturer. If a safety factor has not been applied by the Manufacture then a suitable factor shall be applied by the operator

J.16 Before using the winch all possible operation that may require hoisting shall be assessed against the winch capacity.

J.17 The winch capacity shall be clearly marked on the winch and also close to the winch control lever

J.18 Determination of safe lifting capacities of auxiliary hoists on mobile cranes used for drilled shaft installations shall include the suspended weight of all drill equipment attachments along with a suitable safety factor to allow for Drilling loads

J.19 A qualified signal person shall be positioned in full view of the equipment operator before any drilled shaft equipment is relocated at the work site. Standard hand or voice signals shall be used. The operator shall accept signals only from the designated signalperson except for an emergency stop signal, which may be given by any worker.

J.20 No worker shall be positioned under any portion of a suspended load or the auger during a drilled shaft installation.

J.21 Tag lines shall be used where necessary to control suspended loads.

J.22 The swing radius of the drilling equipment shall be barricaded or properly delineated to identify all swing radius area and maintain entry at a minimal of 1.5 x the Height of the equipment being used and so noted in the daily tailgate, pre-job safety meeting (with an accurate identification method maintained for the area of work with the equipment. Workers must keep active eye contact and adequate hand signals with the driller/operator and ensure approach is done on a viewed side not the blind side of the rig and the operator,

J.23 Drilled shaft equipment operators shall be qualified (demonstrated manufacturers use of specific rig units and a level of proficiency displayed for competency) authorized by their employers designated trainer or such appointed supervisor/manager that assess the persons capability to operate such equipment.

J.24 Operators of crane-mounted drill rigs shall meet all operator physical requirements set forth in industry required Construction Safety Training and Construction Sector Council of Canada fit for duty statements and follow the Canadian Model as defined in CCA-Construction Owners Association & COAA and other provinces associations.

K. REINFORCEMENT PLACEMENT

K.1 Before commencing any lifting of reinforcement the steel ties / connections shall be inspected.

K.2 Cage weights shall be determined and assessed against the safe working load of the winch.

K.3 All lifting points shall be clearly marked / determined and the piling crew made aware of the agreed safe hoisting procedure.

K.4 Piling Cages should be lifted with suitable nylon slings. Metal on Metal should never be adopted.

K.5 Piling cages should be lifted into the vertical in a control manner and under the direction of a swamper.

K.6 When lifting large loads the immediate area should be clear of all unnecessary personnel. Positioning of personnel should be considered at all times during the lift to ensure that people are out of the drop zone.

K.7 Placing of the Cage within the bore hole should be controlled by the swamper who should give clear instruction to the Drill Rig / Crane operator.

K.8 Mechanical assistance may be employed to place the cage only when all crew members are clear of the area. These activities shall also be controlled by the swamper.

K.9 If required, spacer wheels should be attached prior to insertion. If spacers have to be placed during insertion then the whole crew shall take instruction from the swamper controlling the lift.

K.10 Any over shaft cage splicing will only take place once the two sections are stationary and the swamper instructs. The fully spliced cage shall only be finally placed when all crew members are clear of the pile shaft.

K.11 Only when the cage has been placed and is static / supported can the rigging be adjusted or removed.

K.12 Suitable gloves, Hard Hat, reflective vesting, CSA rated footwear and eye protection shall be worn at all times

L. CONCRETE PLACEMENT

L.1 Prior to commencement of piling operations the concrete mix design shall be reviewed to ensure that it is fit for purpose and the method of placement. Particular attention should be paid to flow, compaction and pump ability.

L.2 Prior to commence of each pour the Concrete Truck driver shall be made aware of any site hazards:

- Soft Spots
- Water Coverage
- Pinch Points
- Buried Piles/ Rebar

L.3 The Concrete Truck shall be guided to the pile position by a designated person.

L.4 Positioning of the Truck should take into consideration pinch points against casings or Drill Rigs.

L.5 Concrete trucks should be kept a safe distance away from the pile (especially if un cased) to avoid caving of the grade / platform.

L.6 During concrete pouring suitable hand and eye protection shall be used at all times.

L.7 If concrete is to be pumped then all hoses connections shall have safety clips and whip checks attached and all joints inspected prior to initial use and / or daily.

L.8 Hoses should be inspected for any damage such as rips / tears or signs of abuse from site traffic. Whenever possible concrete hoses should be protected when crossing access points.

L.9 All pumping operations shall be placed under the control of a single competent person. The pump operator shall only take direction from this person.

L.10 Close attention to pump pressures should be given at all times in order to avoid blockages within the lines and the potential for hose bursts.

L.11 The discharge end of the hose should be restrained or inserted within the pile shaft in order to avoid any contact with operatives due to energy release.

L.12 When washing out the pump and lines upon completion of a pour care should be exercised as to where the excess concrete is to be discharged and if clean out balls are required. This area should be demarcated and non-essential personnel moved away. The whole operation should be controlled by a single competent operative.

M. CASING EXTRACTION

M.1 General-In no case shall a crane's lifting capacity or the working loads of associated rigging be exceeded during extraction of a casing.
The operation should ensure that bouncing, shock loading or free-falling of loads will not happen.

Only competent operatives shall be used when extraction casings. Any rigging shall only be used and secured by a competent rigger.
All lifting and hoisting operations shall be completed under the sole control of one competent operative. The Crane / Drill operator shall only take direction from this sole individual

M.2 When casing are extracted with a Drill Rig:

- The operator shall ensure that the casing weight and the extraction load (friction) are within the capacity of the Drill Rig winch and the rigging
- The operator shall be prohibited from bouncing, shock loading or free-falling of loads.
- The area immediately surrounding the rig should be cleared of non-essential personnel during the extraction and a laydown area clearly defined and again clear of non-essential personnel.

M.3 When casings are extracted with a vibratory hammer suspended from a crane:

- The crane and rigging shall have a minimum rated lifting capacity of not less than 110% of the weight of the hammer and casing for the full working radius of the extraction operation.
- The rated capacity of the vibratory hammer's suspension system shall not be exceeded. The hammer manufacturer's recommendations for extraction shall be observed at all times.

M.4 When casings are extracted by impact:

- The connection between the hammer and the casing shall be rigged and secured as to prevent unintended disconnection and inspected frequently during the extraction process.
- The rated capacity of the impact hammer's suspension system shall not be exceeded. The manufacturer's recommendations for extraction shall be observed at all times.
- The crane and rigging shall have a minimum rated lifting capacity of not less than 110% of the weight of the hammer and the casing.

M.5 When casings are extracted with a Crane:

- The operator shall ensure that the casing weight and the extraction load (friction) are within the capacity of the crane and the rigging
- The operator shall be prohibited from bouncing, shock loading or free-falling of loads.
- The operator should secure any hoisting lines that are not for the extraction.

N. DRILLED SHAFT ENTRY

N.1 ***Should never be attempted at any time under any circumstance.***

N.2 ***Emergency entry should only be attempted by trained rescue crews.***

O. PRESSURIZED LINES AND HOSES

O.1 All compressed air hose connections including those connected to airlift pipes or jet pipes shall be pinned or wired together and securely tethered with an adequate length of alloy steel chain or wire rope (whip check).

O.2 Pneumatic systems powering hand tools shall be protected by an air flow reduction valve at the source to prevent uncontrolled movement of lines should a coupling become disconnected or damage occurs elsewhere in a

hose length. The valve shall be sized to the supply requirement and shall not be oversized. All such valves shall be inspected for proper operation before using the tool.

O.3 Chains or wire rope used as line restraints shall not be shortened with knots, bolts or other makeshift devices.

O.4 Hydraulic hoses shall be routed to avoid twisting, pulling, kinking, crushing, abrading or flexing to less than their specified minimum bending radii.

O.5 Hydraulic systems shall not be operated above the maximum or below the minimum temperatures or pressures specified by their manufacturers.

O.6 Hoses, fittings and related assemblies shall not be intermixed unless recognized as compatible by their manufacturers. Hoses, fittings and related assemblies shall be marked as to capacity.

O.7 Hoses, fittings and related assemblies should be marked with their manufacturer's rated capacities.

O.8 The working pressure of hoses shall be greater than or equal to the maximum designed system pressure (including potential pressure surges) of the equipment to which they are connected. Concrete hoses shall be abrasion-resistant.

O.9 Pressurized systems (air, stream or hydraulic) shall be bled and all pressure relieved before service is performed on such systems.

O.10 Electrical systems shall be properly grounded during operation. A ground fault circuit interrupter (GFCI) shall be used for additional protection from electrical shock.

P. FALL PROTECTION

P.1 Employees working in the restricted access zone during shaft construction shall be protected from falls into shafts 6 feet (1.8m) or more in depth by standard guardrails or personal fall protection systems meeting the requirements of LEGISLATIVE & REGULATORY REQUIRED CONTENT, Personal Fall Protection & fall plans.

P.2 Guardrails and hole covers shall be constructed to the requirements of LEGISLATIVE & REGULATORY REQUIRED CONTENT/Temporary Roof and Floor Holes, Wall Openings, Stairway’s, and Other Unprotected Edges.

P.3 All completed shafts shall be guarded by standard guardrails, covers or backfill material such as sand or gravel.

P.4 Whenever possible casings should be left projecting above grade in accordance with the scope of work and geographical allowances & as required by legislative/regulatory authorities to act as a temporary safety barrier

P.5 Where casings do not extend to grade, guardrails or shaft covers shall be installed so as to prevent falls into shafts from cave-ins.

P.6 Employees shall not be allowed to climb or stand on drilled shaft installation equipment until the equipment operator has applied all brakes and safety switches to prevent any unintended movement of the equipment. The applicable requirements of ALL LEGISLATIVE & REGULATORY Control of Energy Sources (Lockout/Tag-out.)

P.7 Rebar (capping) protection shall be installed to prevent impalement hazards (proper capping and other forms of protection). (To be provided by the General Contractor?)

Q. USING DRILLING FLUIDS

Q1 Refer to section O PRESSURISED LINES AND HOSE

Q2 Ensure all mixing equipment is set up on a level, firm hard standing remote from the main piling activities.

Q3 Ensure all areas that may have great fall risks (heights, platforms) have barriers or tie off points.

Q4 Ensure any temporary casing is extended above grade sufficiently to avoid persons falling into open holes.

Q5 Ensure and open ended discharge hose are secured to the casing.

Q6 Ensure good housekeeping practise are employed at all times with regards to storage, mixing and placement of fluids.

R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE

R1 Review tools required for the job and ensure the proper tools are present and have been inspected prior to use.

R2 Always ensure that the location for adding or changing out tooling is level and firm in order to prevent upsets or tipping.

R3 Ensure all ground personnel are clear of any movement of the mast. Only competent hand signals from swamper involved in the task should be followed by the operator. Eye contact should be maintained at all times between the operator and the swamper.

R4 Watch for pinch points. Be aware of where you put your hands. Use hand tools where ever possible and always wear adequate gloves at all times (right gloves for the tasks).

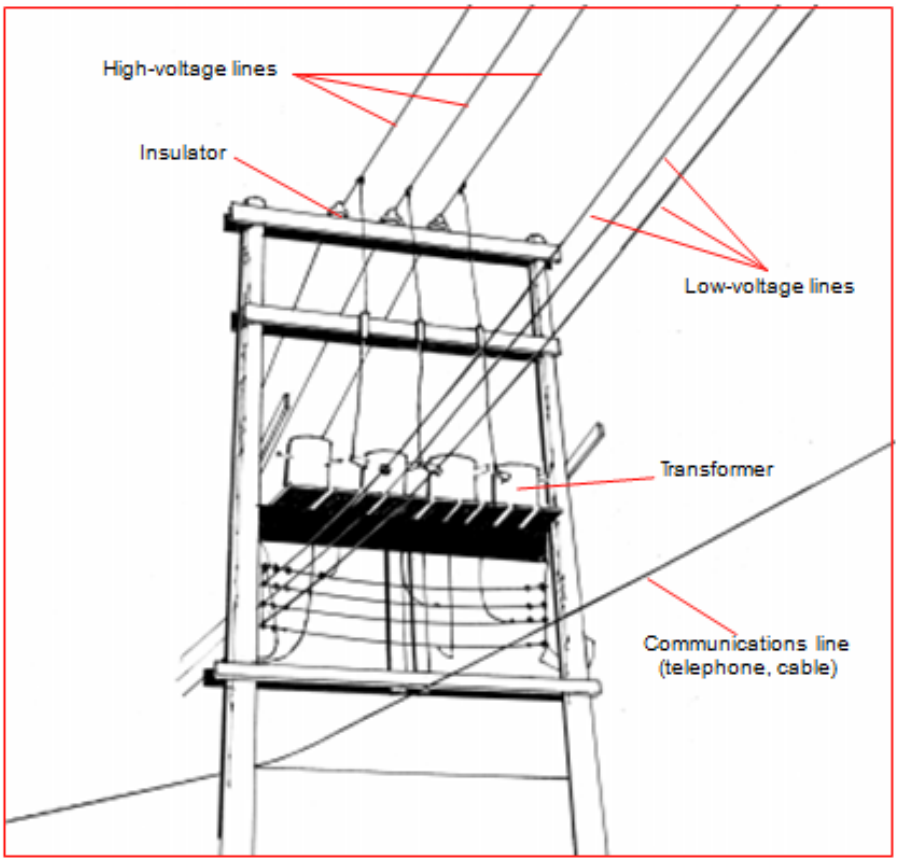
R5 Always ensure the tooling is clean and free from debris before removing or attaching. Ensure that there is no possibilities of spoil falling from height whist you complete the task.

R6 Ensure that regular inspections of all auger pins are carried out. Inspection will require removal of the pins and a visible inspection for wear or damage.

S. WORKING CLOSE TO OVERHEAD POWER LINE

S.1 Supervisors and workers must ensure that the minimum distance from electrical conductors is maintained at all times. The minimum distance is measured from the extreme outside dimension of mobile equipment, tools, or materials being handled. The outside dimension may be the tip of an extended equipment boom, a paint roller, or a long pipe that you are lifting. The electrical conductor may be a wire, a transformer, or any other energized component that conducts electricity. All workers must know the safe limits of approach to electrical conductors and not get any closer.
After first checking the worksite, you may find that the minimum distance from the electrical conductor cannot be maintained. If the inadvertent movement by a worker or equipment may result in either coming closer than these minimum distances, you must follow these steps before proceeding with work:

Always before working ensures the owner of the power system has been contacted & arrange for a worksite meeting to decide whether the energized electrical conductors can be:
Displaced or rerouted, or as needed for the owner & safety of all
De-energized (isolated and grounded), or
Visually identified and effectively guarded



Electricity is transmitted from generating stations and substations via high-voltage transmission lines at 60–500 kV (60,000–500,000 V).
These lines are located on top of large towers or poles in transmission rights-of-way. The voltage is reduced at substations in urban areas and distributed by overhead or underground distribution lines.
The high- voltage lines on utility poles on our streets are typically at 4–25 kV (4,000–25,000 V).

Get assurance in writing from the owner of the power system indicating which of the three actions will be taken and when this will be done.
The owner of the power system is required to do this.
There can be no work done within the limits of approach until one of the conditions in Step 1 has been met and the completed form (s) is/are on-site.
Ensure this information is captured or referenced in all safety management documents, daily or as work site changes require which could be several times a day because of positioning of the equipment, etc. and are in agreement with Code with

General Limits of Approach Alberta

Table 17.1 Safe limit of approach distances from overhead power lines for persons and equipment
(appears as Schedule 4 in the OHS Code)

Operating voltage between conductors of overhead power line	Safe limit of approach distance for persons and equipment
0-750 volts Insulated or polyethylene covered conductors (1)	300 millimetres
0-750 volts Bare, uninsulated	1.0 metre
Above 750 volts Insulated conductors (1) (2)	1.0 metre
750 volts-40 kilovolts	3.0 metres
69 kilovolts, 72 kilovolts	3.5 metres
138 kilovolts, 144 kilovolts	4.0 metres
230 kilovolts, 260 kilovolts	5.0 metres
500 kilovolts	7.0 metres

Notes:
(1) Conductors must be insulated or covered throughout their entire length to comply with this group.
(2) Conductors must be manufactured to rated and tested insulation levels.

General Limits of Approach Sask.

Saskatchewan 1-888-757-6937

Table 22

Table 22 - Section 465

Risk Factor		Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Voltage Phase to Phase	Voltage to Ground	Non-electical Workers, Materials, Equipment	Qualified Electrical Workers	Vehicles and Load	Limit of approach for utility tree trimmers using conducting objects exposed to energized parts	Limit of approach for utility tree trimmers using tree trimmers using rated tools to eposed energized parts	Limit of approach for utility tree trimmers using rated insulated booms
kV	kV	Metres	Metres	Metres	Metres	Metres	Metres
230	133	6.1	1.4	1.83	2.4	1.41	1.85
138	79.8	4.6	1	1.22	1.9	0.92	1.35
72	41.6	4.6	0.6	0.8	1.6	0.61	1.05
25	14.4	3	0.3	0.6	1.2	0.12	0.55
15	8.6	3	0.3	0.6	1.1	0.12	0.55
4.16	2.4	3	0.15	0.6	1.05	0.04	0.05
0.75	0.75	3	0.15	0.6	1.05	0.04	0.05

General Limits of Approach BC & Manitoba

British Columbia 1-877-520-7355

Table 19-1A

Column 1 Voltage	*Column 2 Minimum approach distance for working close to exposed electrical equipment or conductors*	
Phase to phase	**Metres**	**Feet**
Over 750 V to 75kV	3	10
Over 75kV to 250 kV	4.5	15
Over 250 kV to 550kV	6	20

Manitoba 1-888-624-9376

Column 1 Voltage	*Column 2*	
Phase to phase	**Metres**	**Feet**
750 to 150,000 volts	3	10
150,001 to 250,000 volts	4.5	15
250,001+ volts	6	20

General Limits of Approach Ontario

Ontario 1-888-664-9376

Section 188.1 of 627/05

Column 1 Nominal phase-to-phase voltage	*Column 2 Minimum Distance*	
Phase to phase	**Metres**	**Feet**
750 or more volts, but no more than 150,000	3	10
more than 150,000 volts, but no more than 250,000 volts	4.5	15
more than 250,000 volts	6	20

T. GAS MITIGATION WHILST DRILLING.

This is a step by step procedure for workers to aid and inform on how to test for and follow precautions when drilling piles in the presence of suspected hydrocarbons and hydrogen sulphide in a manner that minimizes the potential for injury to persons and damages to property and equipment.

PROCEDURES DESCRIPTION

- FLRA (Field Level Risk Assessment) to be done to identify hazards and controls and to be reviewed by Supervisor.
- Wear all required PPE, including safety glasses, steel toed boots, reflective vests, hard hats, gloves and anything else specified by site.
- Carry out combustible & toxic gas testing as per issued permit and record data.
- Move piling rig into position.
- Whenever beginning piling activities in a new area check gas levels as required with down-hole gas testing, and log the results.
- Begin drilling of pile and if there is presence of gas check shaft every 3 feet of dirt removal.
- Set casing into shaft and drill out casing, continue gas testing as required. (as above)
- Corkscrew casing into oil sand or limestone as required.
- Drill to required depth and continue gas testing as required.
- Install rebar cage.
- Pour concrete to complete the pile.
- Precautions when Drilling Shafts in Presence of Hydrocarbons
- When gases cannot be lowered or reduced-Any personnel working within 25 feet of the shaft shall wear fire retardant coveralls and hearing protection.
- There will be no source of ignition within 25 feet of open hole where there are detectable levels of combustible gases are present. In the event we have to introduce a source of ignition in order to perform work activity, the job is to be suspended (i.e. SHUT DOWN until the appropriate measures have been taken).
- Complete an FLRA. This FLRA is to be documented and reviewed with everyone at site & all crew members involved in the task. The JSA must be reviewed by client/contractor and signed before work recommences.
- Any personnel in the vicinity of the pile shaft are to remain a minimum of 3 feet away from the top of the shaft being drilled and stay behind the hole barricade
- If any personnel are required to look down the shaft, while drilling to assist the driller, they must wear a full-face shield and remain behind the hole barricade at all times.
- Down-hole Gas Testing
- Based off of the gas levels (the results) of:
- If combustible gas testing is between 0-20% LEL it is safe to continue piling
- If the combustible gas is greater than 20% LEL is present, STOP WORK, SHUT DOWN EQUIPMENT (zero energy state) and follow mitigating strategies outlined next.
- >20% LEL Mitigating Strategy:
- IF greater than 20% LEL is found during any step of this procedure continue as follows:
- Perform dissipation
- Stop work and let pile stand for 15 mins.
- Gas test the shaft to see what the new LEL level is.
- If the combustible gases are less than 20% LEL it is SAFE. Let pile stand for another 15 mins. Retest for the LEL a second time.
- If the LEL results are less than 20% AGAIN, it is now safe to continue to work on the pile shaft.
- After dissipation, if the gas level is still >20% LEL-perform either a mechanical air mover, introduce water or barite mudding procedure below. Consult with supervisor and/or site foreman to determine which method is more appropriate.
- Air Mover
- Lower the air mover into the shaft.
- Open the air flow to expel the gases and then remove the hoses.
- Retest the shaft. If the levels are lower than 20% LEL, the air mover may then be put away and work can recommence.
- If the levels are higher than 20% after the initial use of the air mover, use the air mover for an additional 3 mins.
- Retest the shaft. If the levels are lower than 20% LEL, the air mover may then be put away and work can recommence.

- If the levels are greater than 20%, continue repeating as required to lower the LEL levels below 20%.
- Note: The air mover procedure may NOT be used in the presence of toxic gases.
- If the combustible gas levels exceed 75% LEL the Barite Mudding procedure MUST be employed.
- Barite Mudding
- Fill the shaft to the top of auger box with drilling mud.
- Gas test the shaft
- If no gas is found at the top of the mud or water, turn the auger and re-test at the top of the mud or water
- If combustible gas levels are < 20% LEL continue drilling the shaft under mud and continue gas testing after each bite with the auger.
- If combustible gas levels are >20% LEL add 1 meter of mud to the pile shaft and retest gas levels or if using water with hydro vac truck fill hole gradually and retest before proceeding
- Note: Continue until there is no gas at the top of mud/or until mud is at the top of the pile or water used has reached the top of the pile hole remove water or mud with vac truck ensuring proper grounding of vac truck because of potential gas content.
- If combustible gas levels greater than 20% LEL are present when the shaft is full of mud stop and notify the Regional Safety Advisor or applicable Project – Regional Manager – superintendent before anything else.
- Cork Screw down and set casing (if required).
- Drill slowly allowing mud to flow (if required).
- Clean shaft with hydro vac truck complete with venting system. Truck must be grounded to plant grid.
- Set rebar cage.
- Pour concrete to complete the pile.
- The following additional precautions are to be taken when drilling shafts in the presence of Hydrogen Sulphide (H_2S):
- Always follow the most stringent protocol when encountering Hydrogen Sulphide (H2S), whether this is the clients', provincial OH&S, or KFL procedures.
- All personnel must review Hydrogen Sulphide (H2S).

U. WORKING OVER / NEAR WATER

U.1 In every crew, there shall be a designated signal person to direct the operation of the deck engines, winches, tow/push boat, crane and/or drill rig. The operator shall receive signals from no other person except in an emergency.

U.2 Land-based cranes or drill rigs working from floating barges or pontoons shall operate at 50% less than their rated capacities on land. An engineering survey shall be performed by a qualified person to determine allowable working loads for equipment operated on floating vessels and structures.

U.3 The manufacturer's recommended load rating and allowable list and trim values for such equipment working from the water shall not be exceeded.

U.4 All deck surfaces of the crane pontoon or barge shall be above the water and the entire bottom of the pontoon or barge shall be submerged.

U.5 Employees working over or near water, where the danger of drowning exists, shall be provided with CSA approved life jackets or buoyant work vests. When conventional fall protection is used (without exception) to prevent employees from falling into the water and the employer has effectively eliminated the drowning hazard, life jackets or buoyant work vests are not required. A temporary anchor point (such as belly wrapping jersey barriers or Lego block) which can be moved to prevent over swing with self-retractable or fall restraint horizontal life line that would not impede the travel of other trades, equipment or workers in the scope of work area.

U.6 When conventional fall protection is used, the following shall apply:

U.7 Where work over or near water is to be performed from a barge, float stage, temporary or permanent structure, template or cofferdam, walkways at least 20 inches (50.8cm) in width shall be provided across piles or other open work. Walkways shall be kept clear of trip hazards. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8m) or more above any part of a temporary or permanent structure, template or cofferdam shall be protected from falling by fall protection in the form of standard guardrails, covers, nets or personal fall protection. Or suitable stackable concrete stackable/Lego blocks to prevent workers from falling into any water way and developed and captured in a free zone in a fall plan for the working near water's edge.

U.8 Guardrails shall be constructed to the requirements of LEGISLATIVE & REGULATORY REQUIRED CONTENT, Safety Requirements for Temporary Roof and Floor Holes, Wall Openings, Stairway's, and Other Unprotected Edges.

U.9 Ring buoys 30 inch (76.2cm) diameter with 90 feet (27.4m) of line attached shall be provided and located where readily available at intervals not exceeding 200 feet (61.0m) on all structures under construction over or near water. Where employees are concentrated in groups, there shall be additional ring buoys consisting of not less than one additional buoy for each 25 employees in the group's work area. Portable standards or equivalent means to hold the ring buoys in plain view shall be provided. All floating platforms in use for drilling operations, with the exception of small work rafts or pontoons, shall be equipped with at least two ring buoys.

U.10 At least one rescue skiff, adequately sized and equipped, shall be immediately available for use at all times during work activities. Or a trained and available 3rd party recognized competent safety business included in your site specific safety plan.

V. WORKING NEAR TRANSPORT ROUTES

V.1 Working next to pedestrian walkways / access routes:

V.2 Working next to highways:

V.3 Working next to Railroads:

Training/ SOP/ JSA/and Safe Work Procedures comments additions and review to permit & plan.

TRAFFIC CONTROL PLAN

This form is to be used to assist worksite supervision in assessing the factors relating to traffic control and to assist in developing a traffic control plan which is appropriate to the worksite. The intent of this plan is to clearly direct and control the flow of the traffic in the safest manner – with as little interruption to the normal flow of traffic as possible.

This form must be completed and reviewed by the workers involved in carrying out the traffic control plan prior to the work beginning. If the traffic control plan changes then this form is void and a new plan must be documented and reviewed. Along with any applicable JSA's.

WORK-SITE INFORMATION		
Location :	Project Number :	Date :
Work-site Supervisor :	Project Manager:	
Name of Workers Responsible For Traffic Control :		
Start Date of Traffic Plan :	*Date Traffic is to be Completed* :	

SITE FACTORS (ASSESSMENT OF RISKS)	
CONSIDER : **Road Alignment** – winding, straight, hilly, banked, etc… **Road Type** – divided, undivided, number of lanes **Sight Distances** – signs, trees, buildings or other obstructions **Approaches** – hills, curves, intersections, accesses, etc… **Site Length** – total length and active length **Regulated Speed** – as designated **Traffic Volumes** - < 1000, 1000 – 700, > 700 **Traffic Type** – local, tourist, commercial, industrial, emergency, bus, etc… **Shoulders** – type, width, strength **Surrounding Land Use** – Commercial, industrial, residential **Residential Areas** – driveways, school buses, schools, etc… **Weather Conditions** – clear, icy, wet, foggy, limited visibility, etc… **Site Hazards** – rock falls, paths, steep hills, wildlife, etc…	STEP to STEP with identifying controls-

PROCEDURAL FACTORS (ASSESSMENT OF RISKS)	
CONSIDER : • Work On A Roadway • Work Off A Roadway • Work On A Shoulder Or In A Ditch • Site Access / Egress • Stationary Site • Continual Slow Moving Site • Amount Of Site Activity • Changes Of Activity As Project Progresses • Hours Of Work – Day / Night • Traffic Control During Off Hours • Emergency Vehicle Access • MV Accident Scenarios & Response • Number Of Different Traffic Control Set-ups	

TRAFFIC PLAN	
When deciding on traffic control, traffic control devices such as signs, barricades, delineators, flashing arrow boards, changeable message signs, cones and other methods should be considered before using Traffic Control Persons. Reduced speed zones are to be kept as small as possible. 30 km/h and 50 km/hour temporary speed zones should not extend any further than 1 km outside the active work area.	

CONSIDER :
• Traffic Control Supervisor
• Site / Procedural Factors
• Types Of Traffic Control devices
• Spacing Of Devices
• Advanced Warning Signs
• Transition Area(s)
• Buffer Area(s)
• Termination Area(s)
• Delineation During Off Hours
• Moving Signs
• Turning / Removing Signs
• Checking Devices
• Traffic Control Persons :
  o Locations
  o Qualifications
  o Hours Of Work
  o Communications
  o Relief
  o Site Instructions
  o Supervision	

TRAFFIC CONTROL PLAN REVIEW (To be signed by all those workers participating in the traffic control plan)		
Name (Please Print)	**Representing Company**	**Signature**

WORK-SITE FOREMAN'S APPROVAL	
Additional Comments / Notes From Any Group Discussions :	
Name of Safety Advisor (Please Print & Sign):	
Name of Work-site Supervisor (Please Print & Sign):	
Name of Project Manager (Please Print & Sign) :	
Regional Manager (please Print & Sign) :	Date :

Separate page for Drawing or attached mapping for traffic flow as per access and egress from job site and vehicular traffic on location.

W. Pre-Work Job Site Risk Assessment

Pre-work Job Site Risk Assessment

For use by project managers, co-ordinators to conduct preliminary risk identification and assessment,
Prior to mobilization of equipment & manpower to job sites or projects –review with client sub- contractors & others.

Date: _____

Location(s) of Work

Project title | Project/Work Number:

Define the projects/tasks. Consider the whole project. List the main stages in the job and then break them down into key sections.

Date | Risk assessment done by:

STEP 1: Identify major hazards **Critical equipment, tasks, environment or substances that may be present or occur during the work. Note the small numbers beside the hazard and interpret the type of action required in planning for the job.**

1 Specific detailed risk assessments need to be completed for these hazards – see Step 4(b)
2 Special controls are prescribed under various legislation and must be in place for these hazards – see Step 4 (c) & check relevant legislation
3 These hazards may require individual operator or company licences or approvals - identify this requirement in the control section, in step 4 (c)
4 These jobs are automatically High Risk Activities and require a Specific Plan to support the JSA's for that job.
5 Check specific management procedures, SOP'S, guidelines, Industry recommended practices, CSA, etc.

a. Will employees or contractors be using or working with ***(Check all applicable boxes)***

- ☐ **portable electrical equipment for construction work** [2]
- ☐ **pressurized equipment – sand, water or other blasting equipment** [2]
- ☐ **compressed gases in cylinders** [2]
- ☐ **hazardous substances** [1,2,4]
- ☐ **chain saws, lasers** [3]
- ☐ **explosives or powder actuated hand held fastening tools** [2,4]
- ☐ **formwork** [2]
- ☐ **fixed scaffolding** [3,2]
- ☐ **mobile scaffolding** [2]
- ☐ **material hoists/cranes/dogging/rigging/load shifting vehicles** [3]
- ☐ **earth moving machinery** [3]
- ☐ **equipment that produce excessive vibration** [2]

b. Does the project / job involve work... ***(Check boxes)***

- ☐ on major structural alterations and use of temporary supports [2,4]
- ☐ on or near pressurised gas distribution mains or consumer piping [2,4]
- ☐ near high voltage or exposed energised electrical installation [2,4]
- ☐ on "live" with electricity, testing or fault finding [2]
- ☐ on or near roads with vehicle traffic or mobile equipment [2,4]
- ☐ on or near a pipeline, chemical, fuel or other buried lines [2,4]
- ☐ on telecommunications towers [2,4]
- ☐ in isolation – time or place
- ☐ in or accessing a confined space [1,2,4]
- ☐ in laboratories or on laboratory equipment [2]
- ☐ near x-ray or other ionising radiation sources [2]
- ☐ around installed electromagnetic objects, transmitters etc. [3]
- ☐ on, over, or adjacent to water where risk of drowning [2,4]
- ☐ in area with artificial extremes of temperature [2,4]
- ☐ in area with potentially contaminated or flammable atmosphere [2,4]
- ☐ in penetrating through passive fire walls, structures or compartments [5]

c. Is there likely to be added risks of

- ☐ excessive dust/fumes/vapours/gases produced [2,]
- ☐ building air quality affected or contaminated [2]
- ☐ objects falling from heights onto workers or others [2,]
- ☐ objects striking equipment or vehicles [2,]
- ☐ slippery surfaces/ trip hazards created
- ☐ risk of fire/explosion[2,]
- ☐ poor ventilation /air flow into work area where work being done [2]
- ☐ a restricted work area for the project/job [2]
- ☐ access issues with general public or others [2]
- ☐ soil or local ecology erosion [2]
- ☐ stormwater drains or natural waterway damage [2]
- ☐ other:

d. Field Level Identified Specific

- ☐ working on or near Highways, Overhead utilities or underground [2, 5]
- ☐ changes to existing building or services plans [5]

Step 2: Assess the risks Consider each identified hazard/risk or category of hazards

Rate the level of risk for each hazard, based on the **LIKELIHOOD** of harm occurring, *without controls in place* and the most likely **SEVERITY** of that harm or lo

Likelihood	Potential consequences severity			
	Minor	Significant	Major	Critical
Almost certain	High	High	Extreme	Extreme
Likely	Medium	High	High	Extreme
Possible	Low	Medium	High	Extreme
Unlikely	Low	Low	Medium	High
Rare	Low	Low	Medium	High

*** For unspecified projects/jobs that present a high or extreme risk, a Safe Work Plan/JSA need to identify the mitigation processes*.**

Step 3: Control the risks

Consider how each of the hazards & risks you have identified and assessed, should be controlled using the prioritised options model at right.

1. Eliminate the hazard
2. Keep the hazard and people apart
3. Change work methods
4. Use personal protection

A.For hazards having [1] EXTRA RISK ASSESSMENT is required for these high-risk hazards.

- ☐ hazardous substance risk assessment (based on MSDS and site use)
- ☐ confined spaces risk assessment [if not already done
- ☐ atmospheric testing / monitoring prior to entry

B.For hazards having [2] LEGALLY REQUIRED CONTROLS have to be in place for these hazard /risks. Specific action or methods are required by OHS, other legislation or additional safety procedures Job Hazard Analysis/Job Safety Analysis.

Construction hazard control options include a combination of one or more of these and others to reduce the risk.

- ☐ Plan or improve special set up of work environment – layout of site
- ☐ Reschedule or consider timing of job /work activity
- ☐ FLRA-(Client specific if needed) Hazard assessment daily or as work requires changes-weather etc. *** Mandatory**
- ☐ Notify/consult with building occupants about impact of planned works
- ☐ Temporary relocation of occupants to alternative space
- ☐ Substitution of substances or use less hazardous methods
- ☐ Arrange isolation of power, utility disconnect or system components , pipe work, ducting or other services with appropriate persons (permit hot work as required)
- ☐ Use of suitable safety signage, barriers, fences or other isolation / enclosure methods to restrict unauthorized access and prevent flying /falling objects
- ☐ Provide site specific information local hazards &/or safe methods *** Mandatory**
- ☐ Check tools, equipment or vehicles in safe working order
- ☐ Confirm competency of all subcontractors & staff to be current (eg: licences, training, experience etc)
- ☐ Site Orientation for all workers & subcontractors *** Mandatory**
- ☐ Tag out, lockout procedure to be applied when & where necessary
- ☐ Ensure air flow , ventilation & quality is always maintained
- ☐ Provide information from MSDS or chemical registers to/ from contractor
- ☐ Ensure use of suitable Personal Protective Equipment & clothing, safety harnesses is enforced
- ☐ Ensure PSI work instructions or procedures are written& followed *** Mandatory**
- ☐ Notify Emergency contacts as (client required STARS/EMS) in area, etc.
- ☐ Issue of Prescribed Work Permit – Hot work, Height/roof work, Tree felling, Confined space entry ,Working in excavations

Additional emergency systems required to support this job or project

- ☐ first aid kit
- ☐ extended first aid kit
- ☐ special emergency or rescue procedures or plans
- ☐ safety shower/ eye wash station
- ☐ evacuation/ fire control - extinguishers
- ☐ chemical spill kit
- ☐ remote communication equipment
- ☐ others _____

C.For hazards having [3] **Prescribed Activity or Occupation** – These jobs require :

A. An Organization registration for the specific work

☐ TBD_____ ☐ Overhead Crane work

B. Proper training for *individuals*. (Refer to latest legislation regulations)

☐ Hazardous Gas Testing (LEL-etc.)	☐ Working near or on water	☐ Confined Space
☐ Fall protection	☐ Operators of cranes, hoists – materials or personnel	☐ Elevating work platforms
☐ Rigging or Digging		
☐ Earth & other load shifting machinery operation		

D.For hazards having [4] **Safe Work Plans (JSA/JHA's) are required**

*** For any unspecified projects/jobs that present a high or extreme risk, a Safe Work Plan should be developed.**

Job Safety Analysis or Job Hazard Assessments are required for any job involving High Risk Activities **or** for any other high or extreme risk projects/work as assessed in step 3. If unsure, contact the HSE Regional Advisor Jeff O'Forhan 403-998-0404 or Director of HS&E (Canada) Paul Belair for assistance.

Step 4: Project plan to control the major risks for this job or project

Summarize any specific controls and further specific risk assessments required for this job.

Details of HAZARD CONTROL (s) action(s) required	Responsibility	Signed

List any specific JSA/JHA's (Safe Work Plans) required by Client for development- (for high risk construction activities)

	Responsibility
1.	
2.	
3.	
4.	

To be signed by both management teams of project when risks controls are agreed & understood, with Safe Work JSA/JHA's have been identified for development for the scope of work.

Project team signatures	Print name	Company	Date

APPENDIX -

Definitions

Auger: An auger is a spiral shaped tool that feeds or moves a material or liquid from one place to another.

Casing: A steel cylindrical shell of adequate wall thickness for both Soil Retention and insertion forces that is used to construct a drilled shaft. The casing assists in advancing the excavation by supporting the walls of the shaft. A casing may be permanent or temporary. A casing is also referred to as a shell.

Casing Method: A method of shaft construction in which a cased hole is advanced and cleaned, reinforcing steel is placed and the shaft is concreted. Temporary casing (if any) is extracted during the process.

Combustible Gas: Gas that has the capability to ignite and burn readily; flammable gases.
Competent Person/General Foreman: A person who can perform rotary bored piling techniques to an industry standard. As a minimum requirement a competent person should have :
Good knowledge of the Equipment on the project
Good knowledge of the Rotary techniques to be used on the project.
Good knowledge of all safety requirements for equipment, materials and techniques
Be able to demonstrate the above by having over 3 years' experience or third party certification from an independent assessor.
One who is capable of identifying existing and predictable hazards in the surroundings or identifying working conditions that are unsanitary, hazardous or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

Dissipation: The breaking up and scattering, also known as dispersion of gas. The purpose of gas dissipation is to reduce the gas levels in the area you are working in.

Drilling Tools: A drilling tool is a purposed made rig attachment for boring extracting or perforating soils or rocks, for determining the quality of soils or the nature of the rocks or strata upon which they lie. In drill shaft installation, a drilling tool n auger is attached to a Kelly bar.

- Auger – a stem with flights attached and a drive box used for digging cohesive materials
- Digging/Clean Out Bucket – an cylindrical tube with a trap door used for collecting very loose materials.
- Coring Bucket – An open ended cylindrical tube heavily toothed at one end for hard drilling.
- Twister Bar – A bar that is attached to the Kelly bar that helps to twist and seal casing into the ground.

Drilling Mud/Polymer/Slurry: Slurry comprised of bentonite or polymers: A mixture of water and bentonite, or water and polymers, which replaces the soil during construction and provides hydrostatic pressure to support the sides and bottom of a hole, lubricate and cool the drill tools and aid in clean-out.

Drill Rig: A purpose built / made piece of equipment that is used to excavate cylindrical vertical holes.

Drill Rig Operator: A trained and experienced person who operates the drilling machine whilst taking instruction from the swamper.
Drilled Shaft: A shaft constructed by excavating a cylindrical hole with drilling tolls and a Drill Rig, placing reinforcing steel (as required) and filling the hole with concrete or other similar binding grout material.

FLRA (Field Level Risk Assessment): A form to be completed before the beginning of every task to assess potential hazards and control measures to be taken to mitigate those hazards. Crew members, including the foreman, must sign each other's FLRA.

General Contractor (GC)/Prime Contractor/(PC) Project Constructor: A person, firm or corporation, (i.e. the construction manager, general contractor, prime contractor or other entity), as designated in the project documents, responsible for supervising and controlling all construction work performed on the project.

Hydrocarbons: are common organic pollutants which are found in soil. They consist various combinations of the elements carbon and hydrogen. Whenever sol s to be extracted or drilled, as is often the case for piling,

hydrocarbons can be released into the air and, depending on the levels, can be dangerous to exposure. The primary risk associated with hydrocarbons and combustible gases is the possibility of explosions due to flammability. This it is critically important to monitor and follow guidelines if there are suspected hydrocarbons in the work area. Examples of hydrocarbons are: natural gas, methane, ethane, propane, butane and mixtures of each.

JSA (Job Safety Analysis): A risk assessment tool used to identify and control workplace hazards. A JSA is completed at the beginning of a new job or task in collaboration with the site supervisors' and contractor management.

Kelly Bar: A hollow or solid bar (square or round), typically comprised of telescoping sections, that transfers torque and crowd force from the rotary drive to the drilling tool during rotary drilling.

LEL % (Lower Exposure Limit): The minimum percentage/concentration of gas in the air to support its' Combustion, Anything below this level and the gas is too "lean" to burn.

Manager: person managing construction related work activities. Typically site based or vising personnel with direct responsibility for planning and managing construction work activities**.**

Off-gassing: is the release of chemicals from non-metallic materials at normal atmospheric pressure-materials can be releasing chemicals into the air.

Open Hole Drilling-Dry Construction Method: A method of shaft construction consisting of drilling a shaft to its design toe depth with little or no water ingress. The shaft should remain free of water for the duration of the construction process. , removing water (if any) and material from the excavation, placement of reinforcing steel and concreting the shaft in a relatively dry condition.

Permanent Casing: A casing that is incorporated into the final constructed design serves as a form and remains in place after construction.

Pile: deep foundation elements driven or screwed to a design depth or resistance. If penetration of dense soil is required, predrilling may be required for the pile to penetrate to the design depth. Types include timber, pre-cast concrete, steel H-piles, and pipe piles. The finished foundation element resists compressive, uplift and lateral loads.

Pile Cut Off Level: The design concrete level of the finished pile before insertion into the pile cap.

Pile Projection: The length of reinforcement that projects above the cut off level in order to provide a connection into the super structure.

Piling Contractor/Drilled Shaft Contractor: A person, firm or corporation, with the expertise to execute an rotary bored piling projects. as designated in the project documents, who is primarily responsible for specific construction work within their contracted scope of work.

Piling Foreman: The foreman takes on the role of ‘supervisor’ & when a contract requires that the role must be designated/identified. Alternative titles: General Foreman, Rig Foreman.

Piling/Grade Platform: The area the Drill Rig and auxiliary equipment will operate upon whist construction the piles.

Pile Layout Drawings: The drawing supplied by the client / engineer that shows the position of the piles with reference to dimensions or coordinates.

PPE (Personal Protective Equipment): Equipment or clothing worn by workers for protection from health or safety hazards associated with conditions at a worksite.

PPM (Parts per Million): A way of expressing concentration for dilute substances. One part per million is equivalent to one milligram of a substance in a liter of water (mg/l) or one milligram of a substance in a kilogram of soil (mg/kg).

Prime Contractor: (see General Contractor)

PSI (Pre-Job Safety Instruction): A document outlining the tasks for the day including possible hazards and controls to mitigate them and reviewed at the beginning of every shift. Each crew member must sign the PSI at the start of each day.

Rebar Cage: Reinforcement apparatus created out of rebar and inserted into the drilled pile for extra strength.

Reinforcement Cages: Purpose designed cylindrical reinforcement to a specified length, diameter and quantity that is inserted into the pile shaft.

Rig Foreman: See supervisor.

Rigging: Certified lifting equipment used to lift or place equipment or materials.

Seat/Seal: Placement of the entire circumference of the tip of a casing in direct contact with cohesive or competent soils which prevents the ingress of water into the bored shaft.

SOP (Standard Operating Procedure): Document providing detailed step by step information on how to perform a task.

Spin-Off: The mechanical process of removing excavated material from the auger or other drill tool by rotating the tool at speed by the drill rig operator when removed from the excavated shaft.

Supervisor: person directly supervising construction related work activities. The front line supervisor with direct responsibility for putting people to work and briefing their workers on how to carry out their work and ensure they are carrying out their work safely.

Swamper: A person who works around the piling rig at platform level adding / removing tools, direction the movement of the Drill rig and auxiliary equipment and assisting in the placement of reinforcement and concrete.

Temporary Casing/Surface Casing: A temporary casing installed to prevent sloughing of the surrounding soil near the surface of a shaft excavation. The casings primary purpose is to keep the shaft open during construction. Temporary casings are extracted upon completion of concrete placement.

Temporary Casing: A casing that serves to keep a shaft open during construction of the drilled shaft. It serves no permanent structural function and is extracted during concreting.

Tolerance: The allowable deviation from the specified verticality and plan positions which has been allowed for within the design.

Tremme-Technique: A pipe or tube (conduit) through which concrete is deposited under water, having at its upper end a hopper for filling and a bail by means of which the assembly can be handled by a crane, derrick or hoist. A technique that is used when flooding of the pile shaft has occurred due to water ingress or the use

of drilling fluids. The tremme technique is the placement of concrete under water which results in a bottom up placement of concrete within the pile shaft.
Trial Shaft: A hole for a drilled shaft constructed on the project site, but outside the proposed footing limits. It is not to be incorporated into a structure or foundation. A trial shaft is constructed prior to installing production drilled shafts according to the methods detailed in the contractor's submittals. Its function is to verify the proposed excavation methods and permit inspectors to become familiar with the excavation procedure. Upon inspection and acceptance, the trial shaft is backfilled with unreinforced concrete.

Wet Construction Method: A method of shaft construction using slurry to maintain the stability of shaft walls during excavation to final depth and placement of reinforcing steel and concrete.

Work Area: Area of operations where workers and equipment are underway.

Zero Energy State: A condition which all sources of energy have been removed or neutralized from a piece of equipment before it is left unattended. This is imp

APPENDIX -

Western Canadian Legislation BC, AB, SK, MN, & ONT:

“Competent Person”-

British Columbia (BC) does not contain a definition

Alberta (AB) "*competent person*" in relation to a person, means adequately qualified, suitably trained & with sufficient experience to safely perform work without Supervision or with minimum degree of Supervision.

Saskatchewan (SK) "*competent person*" means possessing knowledge, experience & training to perform a specific duty.

Manitoba (MN) "*competent person*" (i) is competent because of knowledge, training or experience to ensure that work is performed in a safe manner & (ii) is familiar with this ACT & Regulations that apply to the work performed at the workplace.

Ontario (ON) "competent person"25 (2) means a person who:

(a) Qualified because of knowledge, training & experience to organize the work & its performances.

(b) Is familiar with this ACT & Regulations that apply to the work &

(c) Has knowledge of any potential danger to Health & Safety in the workplace.

12. Specific Drilled Shaft Installation Equipment Requirements:

12.9. Mobile cranes operated with crane-mounted drill attachments shall comply with current *requirements.*

BC. Part 14. Cranes & Hoists. Section 14.2 (5) (a)

AB. Part 6. Mobile Cranes & Boom Trucks. Section 88. CSA standard Z150-98.

SK. None stated in Part II

MN. Part 22. Powered Mobile Equipment.

ON. Part II. General construction, cranes, hoisting & rigging. Section 151 (2) (a) CSA standard Z150-1974.

13. Fall Protection:

13.2 Temporary Roof & Floor Holes, Wall Coverings, Stairways and other Unprotected Edges.

BC. Part 4. General Conditions. Section 4.59 (1) Section 4.61. Section 4.56 (a).

AB. Part 22. Section 314 (1) (2) (3) Coverings.

SK. Part IX Section 123 (1) Section 124 (1) (2).

MN. Part 26. Section 26.12 (1)

ON. Part II Section 26.3 (2) (i) (ii)

13. Fall Protection continued:

BC. Part II. Section 11.2 (1)a

AB. Part 9. Section 139 (1)a

SK. Part VII Section 102 (2)a

MN. Part 14. Section 14.1 (1)a

ON. Part II. Section 26 (2)

13.8 Control of Energy Sources (lock-out/tag-out) for Construction & Demolition,

BC. Part 10. Section 10.3 (1) (2).

AB. Part 22. Section 311 (1) to (4).

SK. Part X. Section 139 (1) to (12).

MN. "Due Diligence Section" 2.4.2.

ON. Part II. (6) (7) (8)a.

AB. Part 8. Section 130 (1) to (4). Section 131.

SK. Part XVI. Section 255 (1) (2) (3) *a, b, c, d, e, f, g*.

MN. Part 14. Section 13.20 (1) a, b, d(i).

ON. Part II. Section 78 (1).

CSA Standards. CSA Z91-02 Health & Safety code for suspended Equipment Operators.

AB. Part 23. Section 351 (1) a, b. Section (2). Section (3). Section (4).

SK. Part X11. Interpretation: (x) “suspended powered scaffold”.

MN. Part 1. “Definitions”.

ON. Part II. Section 137 (1) (2) (8) (9) (10)a.

AB. Part 9. Section 145 (1). CSA Z259.10-M90. (3) CSA 259.1-95. (4) CSA Z259-M92. (5) CSA Z259.12-01. (6)a CSA 259.2.1-98 (6)(b) CSA Z259.2.2-98. (c) CSA Z259.2.3-99. (7) CSA Z259.2.1-98.

SK. Part VII. Section 102. (1) (2)a, b, c, d. Section 103. A, b, c, d, e, f.

MN. Part 14. Section 14.7. (1) (a) (i) CSA Z259.1-05. (ii) CSAZ259.2.1-98. (iii) CSA Z259.2.2-98. (iv) CSA Z259.2.3-99.

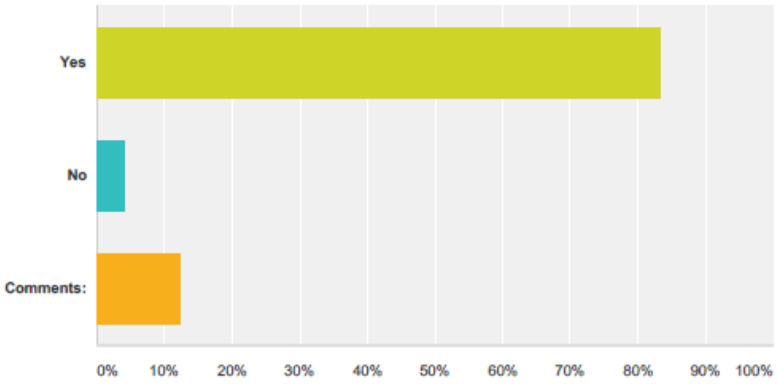
(v) CSA Z259.10.10-06. (vi) CSA Z259.11-05. (vii) CSA Z259.12-01. (viii) CSA Z259.16-04. (ix) CSA Z259.13-04.(x) CSA 10.11-1989.

ON. Part II. Section 26.6 (1) (1) (2) (3) (4) (5) (6) (7) (8).

Annex C – Pre-workshop Survey Results

Q1 Would you be available to participate in a 2-day Workshop to be held at the CSA Group office in Mississauga Ontario on December 7 - 8, 2016?

Answered: 24 Skipped: 0



Q2 Please provide your contact information

Answered: 24 Skipped: 0

Answer Choices	Responses	
Name	100.00%	24
Title	100.00%	24
Company	100.00%	24
Province	100.00%	24
Stakeholder category (e.g., Government, Industry, Operator, Foreman, Owner, other)	100.00%	24
Email Address	100.00%	24

All survey participants were required to provide their name, title, company, province, stakeholder category, and email address. Responses for the provinces represented and stakeholder categories are included below.

#	Province	Date
1	Ontario	11/21/2016 9:42 AM
2	Ontario	11/16/2016 8:28 AM
3	BC	11/1/2016 2:43 PM
4	Alberta	10/25/2016 2:50 PM
5	Québec	10/25/2016 10:30 AM
6	ON	10/24/2016 4:15 PM
7	Northwest Territories	10/24/2016 10:02 AM
8	Ontario	10/23/2016 11:33 PM
9	Ontario	10/15/2016 10:27 AM
10	Ontario	10/14/2016 8:33 AM
11	BC	10/13/2016 2:47 PM
12	Alberta	10/13/2016 9:29 AM
13	Ontario	10/12/2016 11:17 AM
14	Ontario	10/12/2016 8:18 AM
15	Ontario	10/11/2016 7:12 PM
16	Québec Alberta	10/9/2016 10:36 PM
17	Saskatchewan	10/6/2016 2:20 PM
18	Ontario	10/5/2016 10:29 AM
19	Manitoba	10/4/2016 3:46 PM
20	Alberta	10/4/2016 10:52 AM
21	Alberta	10/4/2016 9:12 AM
22	Ontario	10/4/2016 8:51 AM
23	usa	10/4/2016 8:48 AM
24	USA	10/4/2016 5:48 AM

#	Stakeholder category (e.g., Government, Industry, Operator, Foreman, Owner, other)	Date
1	Owner	11/21/2016 9:42 AM
2	Manager/Supervisor	11/16/2016 8:28 AM
3	Regulatory	11/1/2016 2:43 PM
4	Owner	10/25/2016 2:50 PM
5	General Contractor	10/25/2016 10:30 AM
6	Other	10/24/2016 4:15 PM
7	Government	10/24/2016 10:02 AM
8	Industry-owner	10/23/2016 11:33 PM
9	Labour/Training	10/15/2016 10:27 AM

10	Educator, Operator	10/14/2016 8:33 AM
11	Regulator	10/13/2016 2:47 PM
12	Supervisor	10/13/2016 9:29 AM
13	Contractor	10/12/2016 11:17 AM
14	other (geotechnical consultant)	10/12/2016 8:18 AM
15	Operator/Instructor	10/11/2016 7:12 PM
16	Superintendent	10/9/2016 10:36 PM
17	Industry	10/6/2016 2:20 PM
18	Owner	10/5/2016 10:29 AM
19	Government - Apprenticeship Authority	10/4/2016 3:46 PM
20	Manager	10/4/2016 10:52 AM
21	Manager of a Foundation Drilling Company	10/4/2016 9:12 AM
22	Industry	10/4/2016 8:51 AM
23	industry	10/4/2016 8:48 AM
24	Industry	10/4/2016 5:48 AM

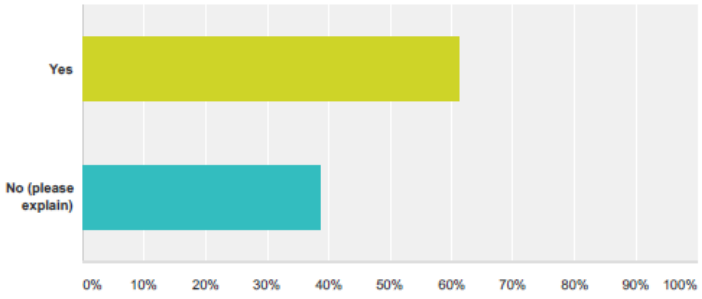
Q3 Please identify any other stakeholders that you think should be invited to participate.

Answered: 14 Skipped: 10

14 survey participants identified a total of 22 additional individuals who should be invited to receive the survey. The link to the survey was sent to those identified.

Q4 Does the document align with the requirements and general work practices in your jurisdiction?

Answered: 18 Skipped: 6

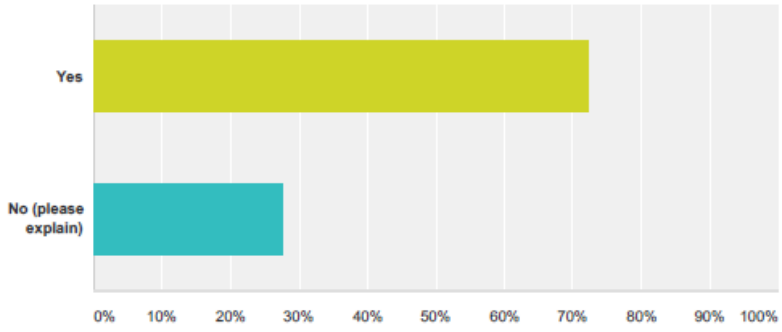


Answer Choices	Responses	
Yes	**61.11%**	11
No (please explain)	**38.89%**	7
Total		**18**

#	No (please explain)	Date
1	It is missing large groups of types of rig capable of drilling or re-drilling holes	10/25/2016 3:11 PM
2	No, Ontario Regulations are new as of July 1st, 2016 and Ontario Regulations are also aligned with OHSA and College of Trades for Operators qualifications and also with new regulations for the Drill Rig drilling platform and site assessment for the province of Ontario. There are also requirements with in OHSA that addresses the qualification of registered apprentices and also with the College of Trades there is a process to access/evaluate drill rig operators from other provinces to see if they are equivalent to Ontario's requirements.	10/15/2016 10:48 AM
3	There are sections of good alignment and then there are aspects that could do with more detail.	10/13/2016 2:53 PM
4	Basic information not addressed	10/12/2016 11:20 AM
5	The document does not allow for entry into the shaft for inspection (Section N.) We still do this occasionally in Ontario.	10/12/2016 8:29 AM
6	The document is very repetitive and and does not actually detail out the basics. It does not cover; Drill Rig Operator Training standards, Working Platform Design/Construction Standards, Drill Rig operating bearing pressure calculations (DIN),	10/5/2016 10:33 AM
7	Its a good basis to start	10/4/2016 10:58 AM

Q5 Does the document provide a good foundation to develop a national standard on safe drill rig operation?

Answered: 18 Skipped: 6

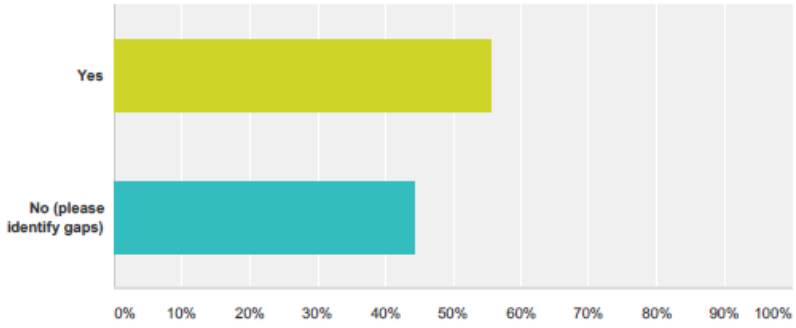


Answer Choices	Responses	
Yes	**72.22%**	13
No (please explain)	**27.78%**	5
Total		**18**

#	No (please explain)	Date
1	It is missing large quantities of relevant code and design enforced standards requirements	10/25/2016 3:11 PM
2	The document is a very basic document that has a lot of repeating the same type of terminology and misses areas where there should be much more detailed information. But there are some good points that maybe used as a starting point.	10/15/2016 10:48 AM
3	Does not address drill rig operation	10/12/2016 11:20 AM
4	In general yes, but provisions need to be made for entry into the shafts.	10/12/2016 8:29 AM
5	the document outlines some concerns regarding the safe operation of drill rigs, but does not go beyond the setup of the machine. Basically, it does not address the operation of a drill rig.	10/5/2016 10:33 AM

Q6 Is the scope of the document sufficient for a national standard?

Answered: 18 Skipped: 6



Answer Choices	Responses	
Yes	**55.56%**	10
No (please identify gaps)	**44.44%**	8
Total		**18**

#	No (please identify gaps)	Date
1	too many to list	10/25/2016 3:11 PM
2	misses operators qualifications and training standards for on the job and also theory. Although, it touches on the drill rig platform, I didn't see much detailed information regarding traveling the drill rig on site, other than very basic requirements.	10/15/2016 10:48 AM
3	Should all holes be required to be cased to a minimum depth? Should it be mandatory to use a guide wall? Proper training for inspecting kelly bars and tooling?	10/14/2016 8:52 AM
4	Requires more rigorous detail	10/12/2016 11:20 AM
5	Provisions for entry into the shaft for base cleaning and inspections must be included.	10/12/2016 8:29 AM
6	It's a very strong start. I Would like to see more specifics on some of the topics, but we are well underway to something great. It's bin a long time coming.	10/11/2016 8:15 PM
7	it is limited in scope and content	10/5/2016 10:33 AM
8	Needs further work on all techniques of drilling	10/4/2016 10:58 AM

Q7 Are there other documents or resources that should be considered in the development of a national standard?

Answered: 11 Skipped: 13

#	Responses	Date
1	Ont Reg 345/15 which seems to be covered in this document	11/17/2016 2:05 PM
2	API 4F, API 8A/B, API 9, API 6A, CSA Z150-11, API 16A These are the most common design code used for the rigs being used	10/25/2016 3:11 PM
3	I think since Ontario has taken a lead in developing on the job training standards for operators, curiculum and testing given by the Ontario government, that ties into Ontario Crane regulations, this model should be reviewed as well. Ministry of Labour, decided that there should be crane licensed requirements, based on the size of the drill rig, (according to the kns,) and training standards be developed and signed off by a qualified trainer, and then a government test. Also, contractors/owners must apply for signing authority to sign off on the operators qualifications. There is much more to the process, but that can be explained at the workshops when implemented.	10/15/2016 10:48 AM
4	Ontario Regulation 345/15 (Working Platforms)	10/12/2016 8:29 AM
5	Referring to the Occupation Health and Safety Act, s150 and s156 among other legislations in the act would be beneficial.	10/11/2016 8:15 PM
6	Drill rig regulations recently came into force in Ontario	10/6/2016 2:40 PM
7	Owener /Operator operating procedures/JTA/Quality documents Manufactures operating manuals (Liebherr, Bauer, Watson). Ontario MTCU document	10/5/2016 10:33 AM
8	Rig Technician National Occupational Analysis (NOA)	10/4/2016 3:48 PM
9	Reference to ICE standards	10/4/2016 10:58 AM
10	ANSI - A10.23 Safe Installation of Drilled Shafts	10/4/2016 9:14 AM
11	ANSI A10.28	10/4/2016 5:50 AM

Annex D – Pre-workshop Homework Summary

Section	Comments and Rationale	Revised text (proposed change to orginal text)
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*	Introduction - Execution Plan should be an outline of the necessary items which can later be expaned out in the appropriate sections. Comment regarding "All personnel involved" should be detailed in a separate section indicating each individual and their necessary compentancies.	delete
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*	In the introduction, terms such as augured piles, auger cast piles, continuous flight auger piles, micro piles/macro piles are used, and this document does not specifically address any of these foundation products.	Eliminate those terms, or add requirements specific to those terms.
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*	I believe the intent of he document addresses only safety issues , however this may lead into a constructability document that will help us deal with having to use inappropriate standards that are not applicable to drilled shafts	
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*	the scope needs to recognize that this equipment is capable of hoisting large/heavy loads. Therefor, the scope must make reference to that. This is just not a foundation drill rig but a crane. It must take into account all aspects of mobile cranes and as a suggestion, I would reference the CSA Z 150 as a guideline as well to be used at this workshop. Also, what type of drill rigs are we referring too, and the attachments. Kelly Bar, CAF, torque power, etc.	
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*	Execution Plan: The document notes that the Drilled Shaft Contractor shall develop a written site specific safety plan which would include assembly/disassembly sequences and operation instructions. These instructions are provided by the manufacturer, it should not be the responsibility of the contractor to develop these instructions.	
DRAFT SCOPE: *"Safe operations with regards to the installation of drilled shafts during construction in Canada." (page 3)*		
A. SITE INVESTIGATION	Does not mention who should be reviewing and the purpose of the report	
A. SITE INVESTIGATION	This document seems to go too deep into what the geo report should include and what should be provided	I think it should be changed to address any information as it relates to safety . Mainly as it relates to the working platform , that would include several items listed in the document.
A. SITE INVESTIGATION	Does not state who is responsible to obtain this information. General Contractor, Contactor who is responsible for the drilling/foundation. Who keeps the reports and where?	
A. SITE INVESTIGATION		
A. SITE INVESTIGATION	Geotechnical investigation should be done by P.Eng.	
B. PRE COMMENCEMENT SITE CONDITIONS	B.1 Client/Engineer/Principle Contractor/General Contractor - which one???? "Constructor" is the individual responsible for the site during construction. B2 Platform has to be analyszed, designed and certified by a GEO Engineer	B1 Constructor Shall B2 The Working Platform shall be designed and certified by a professional engineer retained by the Constructor

Section	Comments and Rationale	Revised text (proposed change to orginal text)
B. PRE COMMENCEMENT SITE CONDITIONS	B1 needs to clarify that the Client/Engineer/Principle Contractor/General Contractor is responsible for al of the bullet points that follow. B2 is confusing as written. The Client/Engineer/Principle Contractor/General Contractor should clearly be responsible for designing and providing a sound working platform for the drilled shaft contractor to work from. The drilled shaft contractor must provide the ground bearing pressures of the intended equipment used, for an accurate platform design. There is no requirement for the drilled shaft contractor to create their own site specific safety plan. This should be added.	Re-word some of the bullet points in B1 to reflect that they are requirements of the Client/Engineer/Principle Contractor/General Contractor. Re-word B2 to clearly spell out these requirements - much like the new working platforms requirements in Ontario for rotary foundation drilling equipment. ADD: C1 - Prior to initiating drilled shaft operations, the drilled shaft contractor shall develop a written site-specific safety plan (Plan) and Job Hazard Analyses (JHAs) for unique drilled shaft activities. The Plan shall include, but not be limited to procedures for emergency action, the location of utilities (both above and below grade), designated areas for equipment operations and materials storage, assembly and disassembly sequences for drilled shaft equipment, operation of drilled shaft equipment, the handling of materials and equipment, task-specific training, personal protective equipment and project demobilization. The Plan shall be reviewed and approved by the Project Constructor.
B. PRE COMMENCEMENT SITE CONDITIONS	B.1 Bullet #1- Piling contractors need to know all subsurface hazards regarding voids, tanks ect on site not just 3m beyond the piling area foot print. The drill rigs will be travelling across the entire site not just where they will be drilling.	
B. PRE COMMENCEMENT SITE CONDITIONS	This part of he document is more important than the geo report , with that said a geo report is required if design platform drawings are required as part as the IFC package	We need to discuss the need for the stamped working platform drawing from the owner or hier representative , this will get a lot of push back
B. PRE COMMENCEMENT SITE CONDITIONS	In Ontario, there are new laws which must be followed by the employer. I have attached the new foundation regulations within OHSA, that have very struck requirements for drill rig platforms.	
B. PRE COMMENCEMENT SITE CONDITIONS	Note B.2: The requirement for Geo-Engineering reports for ground stability should only be required for a certain threshold of equipment size/configuration. I woudl suggest this be 50,000 kg weight or 200 kPa track pressure to coincide with legislation.	
B. PRE COMMENCEMENT SITE CONDITIONS	Work platform to be designed to suit the selected equipment.	
C. PERMITS	Discussion of "time of bid" and "work schedule" seem to be commercial issue not safety concerns	
C. PERMITS	C1 - "include adequate safety conditions"	Change to : include adequate safety "precautions"
C. PERMITS	Seems to address items that are currently being done . However we need to ake sure the intention of the ground disturbance is not related to Utility locates	Utility locates and managing them should be the resonsibility of the drilling contractor
C. PERMITS	Need to look at Ontario's new regulation for this type of work that needs to be performed.	
C. PERMITS		
C. PERMITS	If no significant event on site, the 14 days limit can be maintained, but if any event took place, the 14 days limit is not applicable.	
D. DRILLING EQUIPMENT SELECTION	no change required , just lays out a basic equipment and how to select that equipment	

Section	Comments and Rationale	Revised text (proposed change to orginal text)
D. DRILLING EQUIPMENT SELECTION		
D. DRILLING EQUIPMENT SELECTION	Add : definition of drill rig, size / torque needs to be qualified. >50kNm. Availability of manufacturer documentation for specific equipment selected (serial no. specific). If manufacturer no longer exists, P.Eng to review and sign off on equipment specification and loadings / ground bearings, etc. Special attention needs to be paid to manufacturers which got sold to other companies. Often the manufacturer liability is not transferred to the new owner.	
E. DELIVERY AND STORAGE OF REINFORCING STEEL, CASING AND TOOLING	redundancy in written approach	E.2 the first one should be removed. E.3 Should add/insert @ …off the ground and be blocked sufficiently to prevent unplanned movement and damage.
E. DELIVERY AND STORAGE OF REINFORCING STEEL, CASING AND TOOLING		
E. DELIVERY AND STORAGE OF REINFORCING STEEL, CASING AND TOOLING		
F. MATERIALS HANDLING TO POINTS OF FINAL USE	F3 Never lift anything that is excess of lifting rating & a third party should be used to inspect cages and certify that they are in general conformance with the contract drawings. F4 define a critical lift F5 a person should not just be competent for hoisting they should be certified.	F1 Equipment Operator shall comply with the manufacturers operating instructions. F2 only rigging and equipment of adequate capacity shal be used F3 Delete F5 Certified worker for rigging and a Certified operator when operating hoisting eqipment
F. MATERIALS HANDLING TO POINTS OF FINAL USE	more specifics needed	F.5 insert between experience_____should; or supervised by a journeyman crane operator. F.8 should say: take direction from one competent person visually designated. (ie. Off colored vest). That person shall be located in clear view of the operator. That person shall be responsible for any equipment, its load, or its components that may be out of the view of the operator and shall be responsible for keeping the intended path of travel clear.
F. MATERIALS HANDLING TO POINTS OF FINAL USE	F2 - "current certification from third party assessor" for rigging inspection? F3- The size of the reinforcing steel cage that must be designed by an RPE may be needed to better clarify this paragraph.	F2 - Is that a Canadian requirement? F3 - Identify cage size by diameter, weight, length for RPE design to incorporate resistance to lifting from horizontal to vertical and include engineered lift points.
F. MATERIALS HANDLING TO POINTS OF FINAL USE	This area seems to have a mix bag of equipment. Drill Rigs, cranes, forklifts, front end loaders, Boom trucks etc, hoisting requirements, rigging, No reference to operators qualifications, for any of the equipment listed here? Again, cranes are mentioned and in order to hoist, the operators must meet the requirements within OHSA and the College of Trades in Ontario. Rigging certificates, Signals for safe operations of equipment. Perhaps, the list of tasks mentioned in the document are in the wrong grouping.	
F. MATERIALS HANDLING TO POINTS OF FINAL USE	We need to put definative size , weights and lengths of cages that would require a engineer's stamped drawing	F3 - Example : Cages with a diameter equal to or greater than 1800mm , has a weight of 7500 kgs or greater and or a length of 12m or greater must have a engineered drawing
F. MATERIALS HANDLING TO POINTS OF FINAL USE	Note F.2: Tag line and rigger to assist only when required.	

Section	Comments and Rationale	Revised text (proposed change to orginal text)
F. MATERIALS HANDLING TO POINTS OF FINAL USE	If no manufacturer specifications, P.Eng to review. Maintenance and daily inspections always as per or exceeding manufacturer specificiations. Definition required for competent person, and consideration for apprentice programs.	
G. PILING EQUIPMENT	G3 The Sole person should be defined as the competant Mechanic	G5 Any modifications to the Drill Rig must be approved by the Manufacturer or by a proffesional engineer
G. PILING EQUIPMENT	more specifics needed, suggested protocol	G.3 Should include: All defective equipment removed from service shall be tagged out to prevent re-use of said equipment. G.6 Operator's shall provide proof of having completed an equipment operator's competency course which lists them having been trained on the equipment they are operating. - whether campany or 3rd party coursed. This is a trend created by insurance companies that each OH&S body is starting to endorse. A majority of insurance providers are asking for this type of competency program in order to reduce insurance costs. Figuring it may be a viable option to add as a recommended practice.
G. PILING EQUIPMENT	G.4 - Include micro switches, limit switches and other safety devices in list	
G. PILING EQUIPMENT	G1 -"up to date third party yearly inspection certificate"	G1 - is this a Canadian requirement? Does a form exist?
G. PILING EQUIPMENT	as this suggests all drilling equipment must have 3rd party annual certification . This could have a real consequence to very small contractors that just drill very small dimeter holes	this probably should read that drill rigs that can generate greater than 20,300 N-m of torque and can drill to depths greater than 6m will have a NDT certified inspection on all components
G. PILING EQUIPMENT	Note G.5: Modifications to the drill rig by a registered P.Eng. (not necessarily a mechanical engineer). Similar to note H.13.	
G. PILING EQUIPMENT	Yearly inspection done by who ? Specify shich drill rigs are subject to these regulations (>50 kNm). Modification need to be approved, as well as inspected.	
H. SPECIFIC DRILL RIG REQUIREMENTS	duplicated in other sections	delete
H. SPECIFIC DRILL RIG REQUIREMENTS	JSA space too small for signing onto the sheet	H.2 Any site visitors shall review the site's JSA's and sign off on them before admittance. H.10 Try to remove the electrical hazard if possible should be the first thing. Shutting it off with co-ordination of the power company is the safest route not suggested. H.18 Safety factors should equal that of the hoist or mobile crane.
H. SPECIFIC DRILL RIG REQUIREMENTS	H.7 - Necessity for second locate H.14 - What governs the suitability of the safety factor applied by the operator	H.7 - Drilled shaft contractor should verify that the locates have been done and identify where utilities were located. H.14 - Established standards shall govern the application of a safety factor by the operator
H. SPECIFIC DRILL RIG REQUIREMENTS	H14- "If a safety factor has not been applied by the manufacture then a suitable factor shall be applied by the operator" The safety factor should not be at the discretion of the operator. H18- "Suitable safety factor" Needs to be defined or a minimum factor should be determined and not left for the operator to decide.	

Section	Comments and Rationale	Revised text (proposed change to orginal text)
H. SPECIFIC DRILL RIG REQUIREMENTS	It is a good start , however the title doesn't depict entirely on specific drill rig requirements , it has a lot of items that have to do with site conditions	we may have to split the items under this heading into two categories site conditions , specific rig requirements
H. SPECIFIC DRILL RIG REQUIREMENTS	The new regulations for Ontario should be reviewed and discussed. Drilling Platform needs to be engineered.. Again, some tasks maybe in the wrong area here. NO CRANE MODIFICATIONS	
H. SPECIFIC DRILL RIG REQUIREMENTS	Note H.13: Modifications shall be done are per the Manufacturers instructions or according to a design prepared by a Professional Engineer. (the current wording prohibits modifications of any crane by a P.Eng. unless the manufacturer is out of business. Note H.16: The winch capacity need not be marked on the winch. Many winches are mounted in locations that are not visible (crawler cranes, Bauer RTG series rigs etc). This would also create confusion as the hoisting capacity is based on variables such as working radius, track/outrigger extension etc and may be less than the winch capacity.	
H. SPECIFIC DRILL RIG REQUIREMENTS	H1 : Inspection of site by Piling Foreman, as well as review of the certificate signed off by the P.Eng. Damaged work platform should be re-inspected by P.Eng. H6: Inspections should be documented in the logbook. H9: by who ? H10: specify safe working clearances per utility owners. H14/15/16/17/18 : what if no manufacturer is around anymore ? H15: add and rig stability. H16: add stability review. H18: requires approval from the manufacturer (including consideration for dynamic loadings).	
I. CRANES	This section is really about Hoisting with all equipment, not just cranes I.1 and I.3 are duplicates from other sections I.5 incorrect I.6 incorrect I.7 Incorrect I.8 Modification of a crane by adding a drill attachment mus be reviewed by a P. Eng 1.9 duplicated	I.5 delete I.6 delete I.7 Delete, Add the load chart must be used and referred to for every lift.
I. CRANES	I.3 should match I.9 in saying from a qualified signal person	
I. CRANES	I.7 - Controls are not commonly labeled, parts of line are a factor	
I. CRANES	This section should primarily be intended to address the use of a mobile crane with a drill attachment used to excavate a drilled shaft. However the use a mobile crane as an auxiliary piece of equipment is also common. There perhaps should be some distinctions made. As such perhaps H3 should be inserted in this section.	Eliminate I5, I6, and I7 as they apply to a dedicated drill rig.
I. CRANES	I5-Suitable safety factors should not be left for the operator to choose. A minimum factor should be decided on. I8- same as I5	
I. CRANES	this is a drill rig document , not a crane	remove any items that relate to cranes

Section	Comments and Rationale	Revised text (proposed change to orginal text)
I. CRANES	there is not enough information being covered in this ADSC document. This equipment is to be considered a crane, which is capable of lifting, swinging, travelling, booming, hoisting loads. Therefore, all aspects of crane related duties of the operator must be incorporated into this standard, under this section of cranes Once again, I could reference what is in Ontario for crane operation such as, Protect Self and Others, Conduct Pre-Operational Inspection, Prepare and Transport, Plan Lifts, Assemble and Dismantle Cranes, Plan Lifts, Perform Rigging, Set Up Cranes, Operate Hydraulic, and Lattice Boom cranes, Maintain Cranes, but we could review mobile crane CSA Z-150 as well. The new Foundation Drill Rig program covers, Safe Work Practices, Communication, Pre-op Inspection, site Assessment, Drill Rig Set Up, Drill rig Operation, equipment Maintenance, Drill rig Securing (all in school 40 hours) On the job competencies as well must be demonstrated and signed off by a competent person. Load Charts, Rigging, setup etc, All these areas are tested on a Government Ministry test. I don't have enough space to continue to explain. Industry requested that we ensure that there is a crane license as a pre-requisite, along with specific training on the drill rig.	
I. CRANES	Note I.7: Same comment as H.16: The winch capacity need not be marked and may lead to an overestimate of the hoisting capacity. The hoisting capacity depends on the working radius, amount of counterweght installed etc and may be less than the winch capacity.	
I. CRANES	Cranes are covered in the Z-150 ? I3: make designation of person consistent throughout the document and specify qualifications. I4: considerations for jurisdictions without certifications (sign off by employer ?) I6/7/8: considerations for stability and dynamic loadings. I9 & I10 should be added to section H also.	
J. SHAFT DRILLING	J.1 indicate one person that gives the drill operator direction. J.11 hole covers do not meet all codes. Safety railings/fences must be put in place. J.14 wrong section, move to electrical Hazards J.15 to J.20 are repeated. J.23 Drill rig operators shall be certified J.24 Crane with drill attachements must be operated by a certified hoisting Operator.	J.4 While drilling, a safe zone must be demarcated around the piling operation and be enforced by the site foreman. Only designated individuals involved in the drilling operationsshall be allowed within the work zone. J.23 Drill rig operators shall be certified.
J. SHAFT DRILLING	well written	
J. SHAFT DRILLING	J.9 - At what point shall the barrier be removed, during K - Reinforcement Placement or I - Concrete Placement J.11 - Strength should be expressed proportionally J.24 - Operators of crane mounted drill rig shall…	J.11 - 360kg's/m2 J.24 - All operators shall…
J. SHAFT DRILLING	J17 is most likely not doable, but the information must be in the operators manual	Eliminate J17

Section	Comments and Rationale	Revised text (proposed change to orginal text)
J. SHAFT DRILLING	Note J.14: Drilling operations require personnel to be in contact with the drill rig. There are tool boxes, pneumatic tools etc that are located on the rigs. Note J.17: Similar comments as above regarding marking of winch capacity. Note J.22: Many sites in downtown areas are much less than 1.5 x the height of the rig in total width and/or length. It is not possible to have an exclusion zone of this size.	
J. SHAFT DRILLING	J2: replace track with manouver / locate. J4: experienced personnel should included consideration for apprentice also. J5: drilling attachments and drilling tools. J8: Consideration should be taken to caving in of the shaft below the surface. J9: can barriers be removed during drilling operation ? J14: add word simultaneously. J16/17/18: consider stability. J22: where does 1.5 x height of the equipment come from ? Where is height measured, will require definition. J23: add sign off by employer if no local requirement for license.	
J. SHAFT DRILLING	All personell on site should be informed about contaminated soils on site and what the health risks are. J8- Minimum casing depth for all holes. J10- Any uncased hole should have baracades in case of caving. J15 Suitable safety factor should not be decided by operators. J18- Suitable safety factor needs to be defined	
J. SHAFT DRILLING	I have concerns with this whole section. You list winch capacities here: J.15. J.16 J.18 J;19 J;22 J: 23 J;24 fall short of qualifications. It is not so much on the winch capacity, what about the load chart and how to interpret that? That dictates what can be lifted safely by the rig, which takes into account all other factors, hoist lines, set up, size of wire rope, degree offset etc.	
J. SHAFT DRILLING	need to qualify if it is a truck or track rig , however the rig should be positioned on the hole if able , then boomed up	tracking or moving between shafts can be done if it is permissable in the operators manual and the ground conditions are stable and proved to be able support the loads
K. REINFORCEMENT PLACEMENT	Note K.4: Steel chains/chokers are suitable for hoisting cages if suitable attachment points have been provided for them. Note K.9: Spacer wheels typically do not withstand the flexure of a cage being hoisted and must be installed during insertion.	
K. REINFORCEMENT PLACEMENT	Add consideration for lifting beams. K2: consider stability. K4: not only restrict to Nylon slings. Metal on Metal should be removed, cage can be lifted with appropriately sized clevises. K5: add as per manual, consider stabiliy and avoid sideloading of drill rig. K7: swamper designation as front end person. K9: add cage to be secured with bar or sling during spacer installation.	
K. REINFORCEMENT PLACEMENT	Steel beams are not mentioned K1 lift points must be indicated on shop drawings. K.12 wrong section.	
K. REINFORCEMENT PLACEMENT	grammar check	K.5 control corrected to "controlled"
K. REINFORCEMENT PLACEMENT	K4 - Eliminates the use of any rigging except a synthetic web sling. Is this the intent?	Eliminate K4

Section	Comments and Rationale	Revised text (proposed change to orginal text)
K. REINFORCEMENT PLACEMENT	item K.7 remove any reference to a crane	this is a drill rig standard not a crane standard , remove all reference to cranes
L. CONCRETE PLACEMENT		
L. CONCRETE PLACEMENT	Refer to CSA - A23 standard. L1: concrete mix design review by P.Eng. L2: add truck route / position to be discussed with driver of truck by foreman/supervisor before entering the site. L7/8/9/10/11/12: Add inspection fo pump equipment. Add operation of pump equipment per manufacturer specs.	
L. CONCRETE PLACEMENT	L5- Minimum casing depth for all holes should be considered to eliminate this hazard. L10- All pumps must have a working pressure guage or the pump shall not be used until a working guage is installed	
L. CONCRETE PLACEMENT	what type of equipment are we using here? Again way to vaque regarding experience of the operator and type of work being performed and on what equipment. No communication plan and you have listed multiple workers who must communicate with each other and have the required skills.	
M. CASING EXTRACTION		
M. CASING EXTRACTION	Add section for casing installation, including permanent casings and temp/sectional casing. M1: replace crane with drill rig. Definition crane and drill rig are different. M2: add consideration for stability. M3: how is 110% defined and why. Recommend using vibrator hammer with variable moment. M4: note that hammer on crane induces severe dynamic loadings into the crane. M5: pulling casing free can result in severe shock loading of the crane and voids the certificate of the crane.	
M. CASING EXTRACTION	Casing Extraction section does not include removing casing with the Oscillator M.2 capity is indicated by load charts M.3 secondary line shal bee attached to casing as a security measure if vibro hammer slips off.	M.2 delete "Winch and the Rigging"
M. CASING EXTRACTION	M.2 & M.5 - How is the extraction load determined M.3 - Specify necessity to thoroughly inspect the crane and equipment, in accordance with manufacturer's specifications and legislated requirements	
M. CASING EXTRACTION	take out all reference to cranes , this is a drill rig standard not a crane .	remove - M.3 , M.4 & M.5 . Make it clear that this is adrill rig standard and casing removal should be applicatple to extracting with a drill rig
M. CASING EXTRACTION	again, here we are talking about a crane being able to extract pull? On loads. Not really sure if a qualified experience crane operator would want to do this type of pull on a crane that is not designed to do that? In M.5 you state that the operator is prohibited from bouncing, shock loading or free-falling. Kind of counterdicting the task. This whole section needs to be reviewed.	
N. DRILLED SHAFT ENTRY		
N. DRILLED SHAFT ENTRY		

Section	Comments and Rationale	Revised text (proposed change to orginal text)
N. DRILLED SHAFT ENTRY	N.1 and N.2 contradict each other.	
N. DRILLED SHAFT ENTRY	Information should be inserted to address entry for tool retrieval, emergency rescue, or other possible entry necessities.	Consult ANSI A10.23 for possible suggested text.
N. DRILLED SHAFT ENTRY	there are situations that shaft entry is required , we have to decide hoew to do it safely using the ADSC manual of entering a drilled shaft	we have to have a section that will address safety concerns as it relates to entering a drilled shaft ,
N. DRILLED SHAFT ENTRY	needs to be reviewed.	
O. PRESSURIZED LINES AND HOSES		
O. PRESSURIZED LINES AND HOSES	Is there an CSA standard for this ? Always follow manufacturer assembly procedures. O10: not relevant in this section.	
P. FALL PROTECTION	remove referrence regarding hole covers. P.7 move to the Reinfocing section.	
P. FALL PROTECTION	P.7 signage or temp fencing as an option to go with caps on rebar	
P. FALL PROTECTION	There is no text which covers having an emergency action plan for rescue	Needs text regarding emergency action plan for rescue / retrieval
P. FALL PROTECTION	P5- All holes cased to minimum depths should be considered	
P. FALL PROTECTION	this is a good section , we have to add that all fall protection plans must include a emergency response plan that has a retreaval plan	all fall protection plans must include a emergeny response plan to remove a person from a drilled shaft.
P. FALL PROTECTION	In Ontario, as of April 2017 the new regulations state all workers who are working at over the legal height limit must have taken working at heights and carry proof of the certification at all times.	
P. FALL PROTECTION	Note P.6 is too broad in application. There are daily instances where personnel must stand on equipment such as inspections, fuelling and greasing. It would not be practical to initiate a lockout/tagout procedure for this. There are also many instances such as alignment of cables, greasing of slewing rings, counterweight removals etc where personnel stand on equipment while it is in limited operation.	
P. FALL PROTECTION	P4: specify height above grade, min 4ft ? P7: who supplies materials should not be described in this document.	
Q. USING DRILLING FLUIDS	missing safety guidelines; Positive Head pressure within drilled shaft vs water table outside	
Q. USING DRILLING FLUIDS	There is no text which covers entry into any large / bulk mixing / storage tanks i.e. confined space, and having an emergency action plan for rescue	Add text for confined space entry??
Q. USING DRILLING FLUIDS	I am fine with this section	
Q. USING DRILLING FLUIDS		
Q. USING DRILLING FLUIDS	add follow manufacturer specifications and operaitons instructions.	
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE	To asses time of use for maintenance and inspection	R.1 serial numbers/tags/rating shall be visible on tools?

Section	Comments and Rationale	Revised text (proposed change to orginal text)
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE	Should there be a warning to never use fingers to clean out kelly bar pin holes - danger of amputation exists	Never place finger(s) into kelly bar box or hole on tooling or in the kelly bar itself. Always use a tool to clear any debris.
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE		ensure proper PPE is being used by the personal working with or repairing tools . Safety glasses , gloves , ect
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE	who is selecting and inspecting the tool. What are the qualifications of the operator to select the tool, qualified signaler and how is that determined?	
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE		
R. DRILL TOOL INSPECTION AND ATTACHING PROCEDURE	R1: add and are in good shape and suitable for the work. Add note: tools cannot be turned into the workplatform for storage/changing, since it will compromise the integrity of the workplatform and will void the work platform certificate.	
S. WORKING CLOSE TO OVERHEAD POWER LINE	Shouldn't step one be remove the power from the equation if possible	
S. WORKING CLOSE TO OVERHEAD POWER LINE	S1 Why "paint roller"? The steps for before proceeding with work need to be better identified, and the resultant action to be taken need to be better structured for ease of understanding.	Eliminate "paint roller". Number the steps to be taken, and better organize the resultant steps.
S. WORKING CLOSE TO OVERHEAD POWER LINE	The title needs to be changed as Working close to overhead power line is not a term that is used in the industry and is mis-leading which could lead to accidents Perhaps a term such as, Minimum safe limits of approach: distance from Electrical power lines. Or, safe working distance from live power lines etc. Also, we must be aware of underground utilities as well. Look at OHSA and Z-150 or Z-248, or Concrete Pump Z-151 etc for suggested wording. IHSA has established a working group as well to review 750v and under.	
S. WORKING CLOSE TO OVERHEAD POWER LINE	this section is very important and has covered most things	remove the reference to paint roller not really sure what that means
S. WORKING CLOSE TO OVERHEAD POWER LINE		
S. WORKING CLOSE TO OVERHEAD POWER LINE		
T. GAS MITIGATION WHILST DRILLING	The text is not spaced correctly - perhaps cut an pasted form another document?	Re-format the text and eliminate possible references to a facility (e.g. KFL procedures)
T. GAS MITIGATION WHILST DRILLING	this is a cut and paste from another document and seems to cover most issues	
T. GAS MITIGATION WHILST DRILLING		
T. GAS MITIGATION WHILST DRILLING		
U. WORKING OVER / NEAR WATER	rated capacity of what? What are the operators qualifications ? For a crane a licensed is required and it doesn't matter if the rated capacity is 50% on a barge. Whatever, the crane is capable of lifting determines what license is required,	
U. WORKING OVER / NEAR WATER	U5 - "A temporary anchor point (such as belly wrapping jersey barriers or Lego block) which can be moved to prevent over swing with self-retractable or fall restraint horizontal life line that would not impede the travel of other trades, equipment or workers in the scope of work area." This is unclear	U5 - Clairify the sentence for better understanding

Section	Comments and Rationale	Revised text (proposed change to orginal text)
U. WORKING OVER / NEAR WATER	remove all reference to cranes , this is a drill rig standard	
U. WORKING OVER / NEAR WATER		
U. WORKING OVER / NEAR WATER	Add as per manufacturer specifications (barge list charts, etc.). Add weather conditions and considerations for the environment using biodegradable oil. U4: As per marine engineer specifications.	
V. WORKING NEAR TRANSPORT ROUTES	This section appears to be unfinished. Examples of a form which could be used to identify hazards and their mitigation are inserted. As opposed to a form, should these requirements be spelled out in text, and have the form be a suggestion?	Spell out the requirements for working near transport routes
V. WORKING NEAR TRANSPORT ROUTES	these forms are examples , they are a form of these documents should be used when working on or near transport routes	Just make the comment generic in this section to make sure the form in the standard or some adequate form is used.
V. WORKING NEAR TRANSPORT ROUTES		
V. WORKING NEAR TRANSPORT ROUTES		
W. PRE-WORK JOB SITE RISK ASSESSMENT	Add more room for comments and signing the sheet. Up to 12 people.	
W. PRE-WORK JOB SITE RISK ASSESSMENT	to be discussed	
W. PRE-WORK JOB SITE RISK ASSESSMENT	This section only has a form inserted. Is it unfinshed?	Spell out the requirements for a risk assesment or refer back to section B
W. PRE-WORK JOB SITE RISK ASSESSMENT	these forms are examples , they are a form of these documents should be used as a pre-work job site risk assessment	Just make the comment generic in this section to make sure the form in the standard or some adequate form is used.
W. PRE-WORK JOB SITE RISK ASSESSMENT		
W. PRE-WORK JOB SITE RISK ASSESSMENT		
APPENDIX - Definitions	Add : definition of drill rig, size / torque needs to be qualified. >50kNm. Drill rig operator : should be qualified and competent. Add specification of qualifications and competencies. Kelly bar : add definition of locking bar. Rename piling/grade platform as work platform. Add definition for front person. Add shake-off function. Add sectional casing. Spelling on Tremie.	

Annex E – Workshop Evaluation Results

CSA Group

Meeting Details

Meeting:	CSA Workshop on Safe Drill Rig Operations
Date:	December 7-8, 2016
Location:	CSA Offices - Mississauga, ON

Meeting Evaluation

		Did Not Meet Needs & Expectations	Met Needs & Expectations	More Than Met Needs & Expectations	Excellent
1	Clarity of goals & objectives		5	3	4
2	Organization & facilitation of meeting		3		9
3	Value of meeting to your organization		5	1	6
4	Clarity of path forward (next steps)		4	3	5

Workshop Follow-up

	Yes	No
Would you like to be kept informed of CSA's activities in this sector?	12	
Would you like to participate in future work to support the outcome of this workshop?	12	