Oregon OSHA

www.orosha.org

ADSC

The International Association of Foundation Drilling

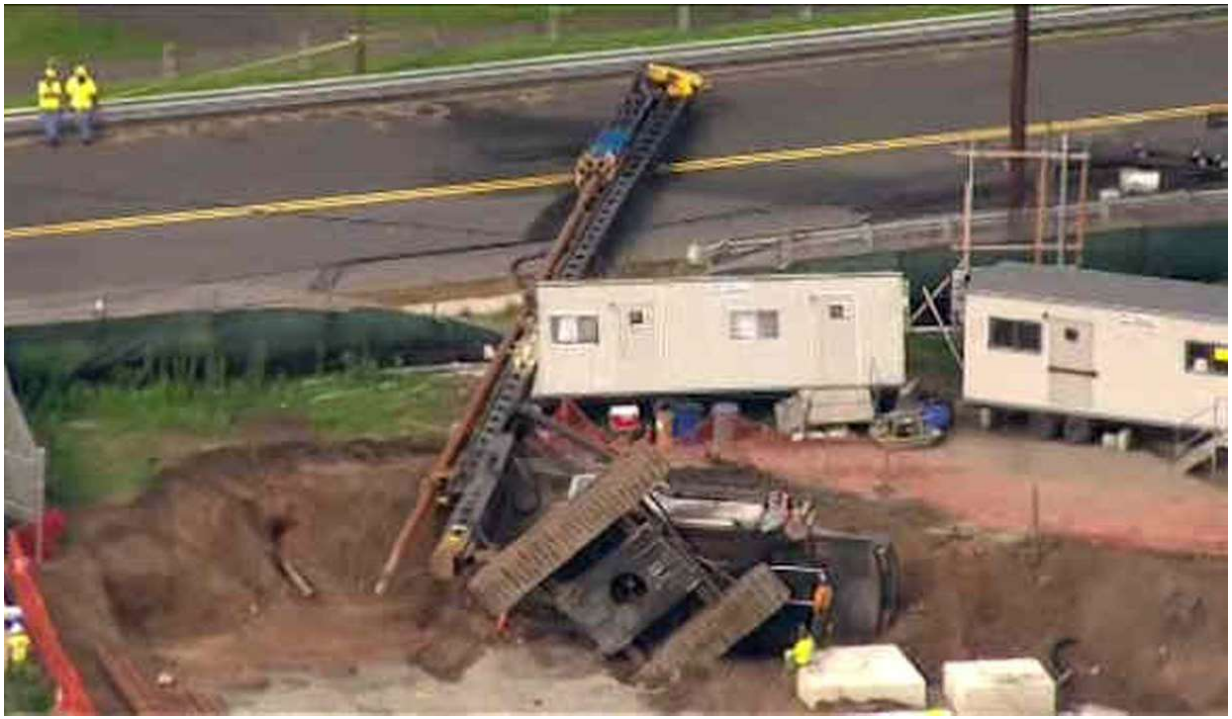
WEST COAST CHAPTER

What is a Working Platform?

Richard Marshall, CHST

Director of Safety

ADSC: The International Association of Foundation Drilling



Working Platforms

Working Platform – A temporary geotechnical structure or existing subgrade that provides a stable support surface for a piece of construction equipment working in a semi-static condition or in transport between operating locations on a single site.

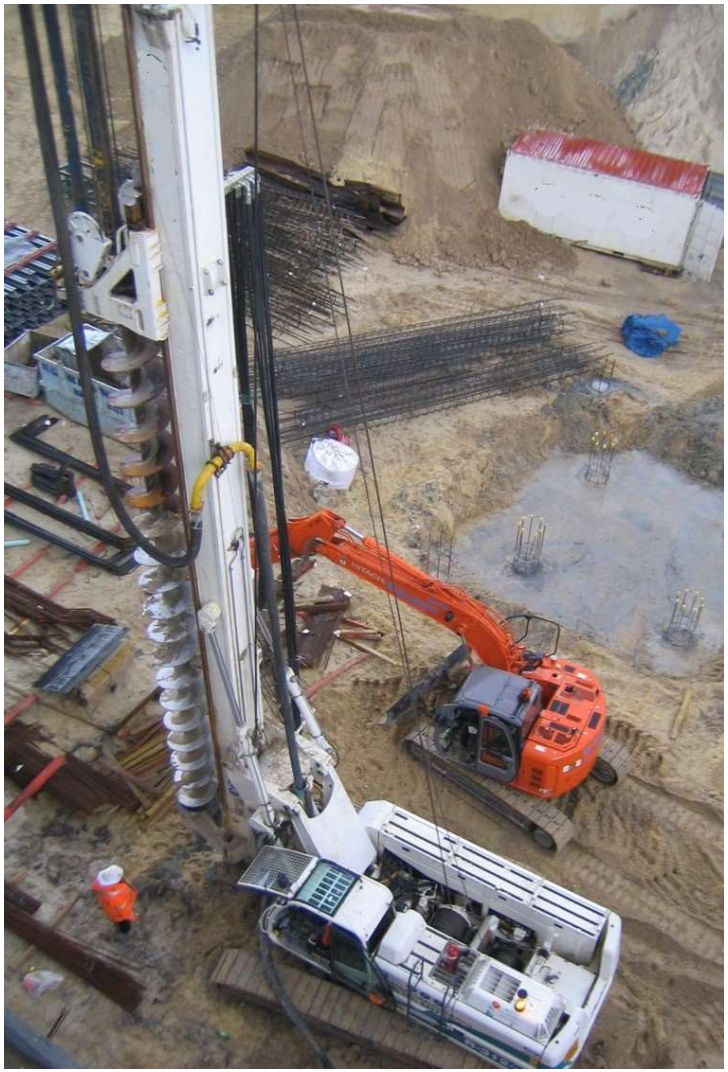
This includes areas designated for unloading or loading and setup of a Tracked Plant or similar machine.

A Working Platform may consist of the existing subgrade, or may be improved using aggregate, geosynthetics, soil, steel or timber crane mats, or other constructed features.

Tracked Plant

Tracked Plant - any large construction equipment on either tracks or wheels that operates in a semi-static position but may be mobile between operating locations.

The Tracked Plant designation does not apply to dump trucks, skid steers, or any other equipment that operates primarily in transport mode but **does** pertain to concrete trucks and other equipment functioning along a confined path.



Evolving Foundation Equipment

Modern equipment is more powerful, have higher centers of gravity, and may have a static weights upwards of 300+ tons.

This is to keep up with the demand for deeper and larger diameter foundations (either driven or drilled) necessary to take higher load capacities, combined with the need for more environmentally friendly installation techniques.

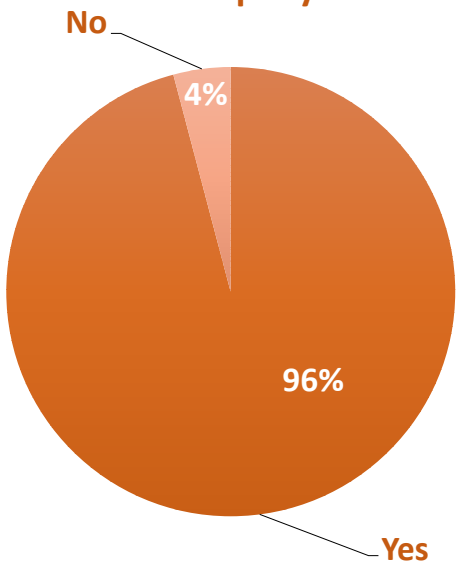
Foundation Drilling Equipment Evolution

Early 1960's

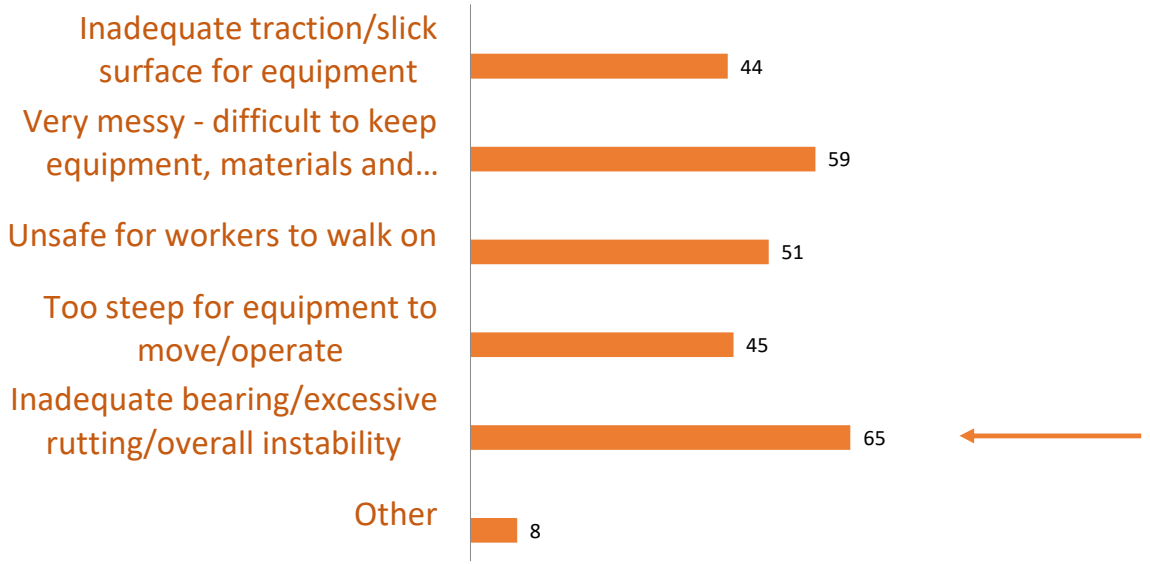
Modern Foundation Drill Rig

DFI MEMBER SURVEY RESULTS

Have inadequate working surfaces ever caused operational issues for your company?



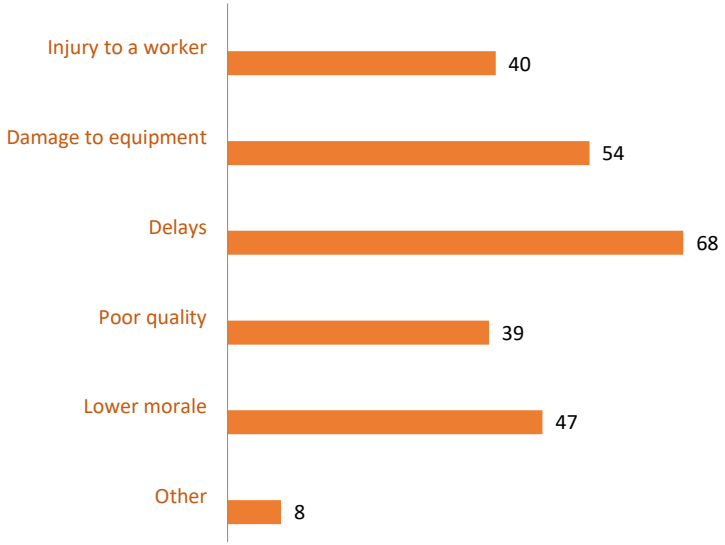
If you have experienced safety or operational issues due to an insufficient working surface, what types of issues have you had? (select all that apply)



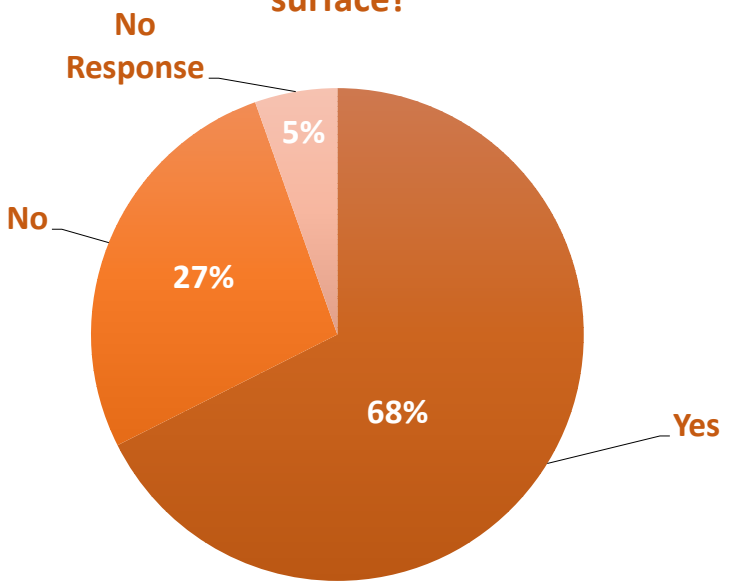
**Based on 74 individual survey respondents with 272 responses*

DFI MEMBER SURVEY RESULTS

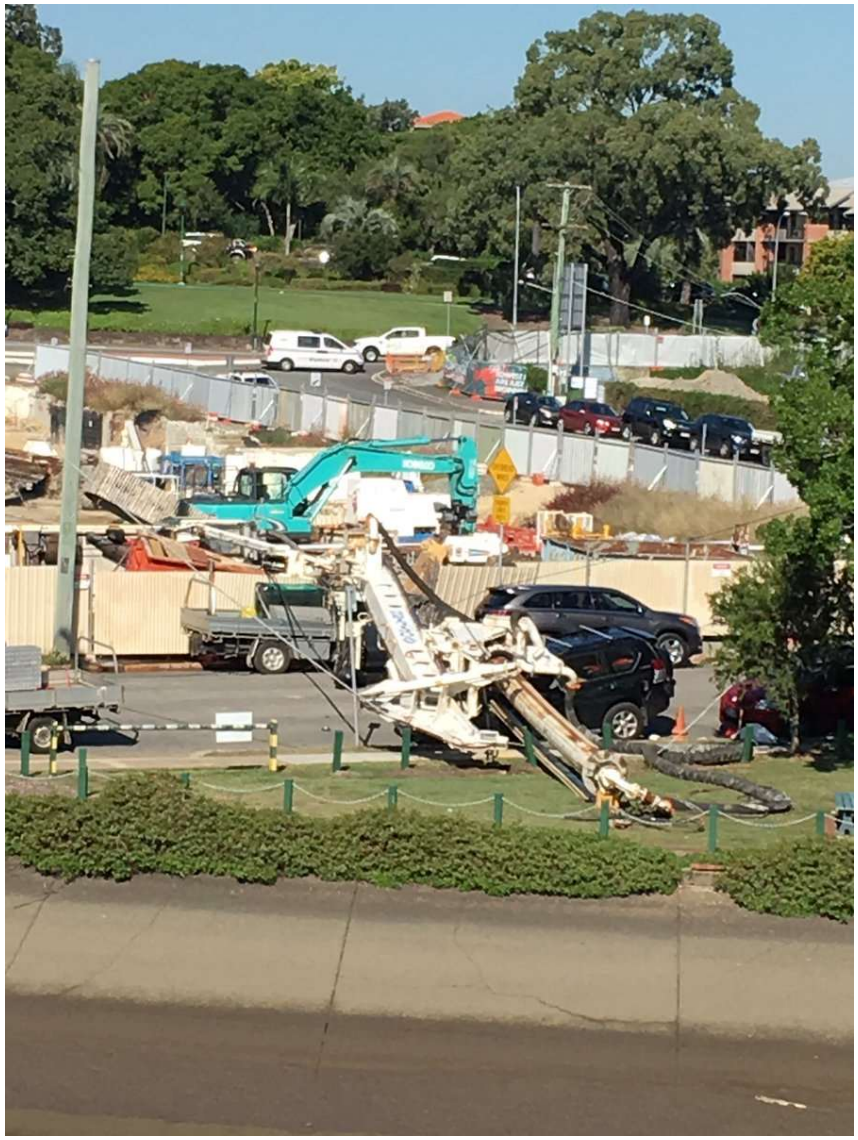
What have been the consequences of the inadequate working surface?



Has your company ever tipped a rig, crane, excavator, or other large piece of equipment due to an inadequate working surface?



**Based on 74 individual survey respondents and 256 responses*



There is a lack of understanding amongst owners, general contractors, construction managers regarding the importance of preparing a safe working platform capable of supporting the equipment to be used.

There is also much disagreement as to whose responsibility it is to design, prepare and maintain such a platform throughout the course of the project. Is it “Us or “By Others”?

Safe or Unsafe Platform

Profit vs. Loss

“The first duty of business is to survive, and the guiding principle of business economics is not the maximisation of profit – it is the avoidance of loss…”

Peter Drucker - described as "the founder of modern management"

Risk – Does it exist?

- **Contractual Risk**
- **Financial Risk**
- **Occupational Risk**
- **Quality Risk**
- **Legal Risk**

Contractual Risk

Penalties you may have to pay for not completing a job on time.

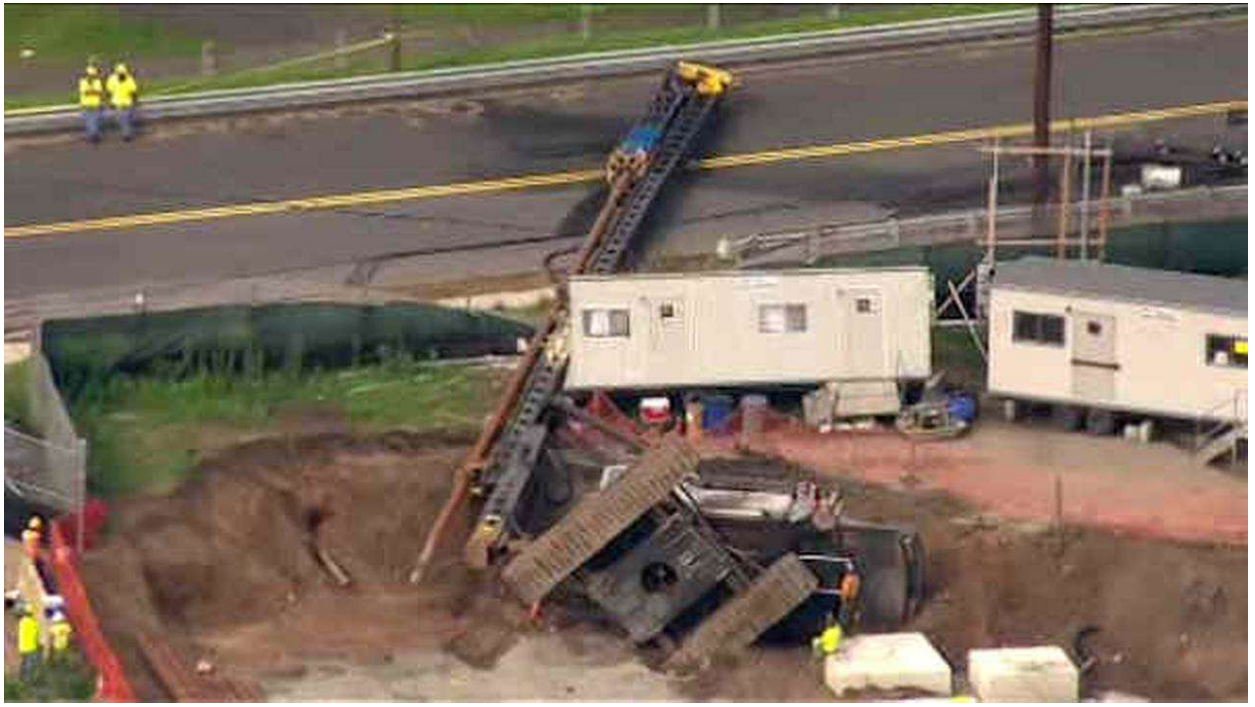
How can you maintain schedule if your working platform cannot support the necessary equipment needed to install a deep foundation?

Financial Risk

Not only is there financial damage such as the cost of equipment cleanup / removal and repair/replacement of an overturned rig, but how about potential financial damage to the adjacent property owner?

Occupational Risk

Possible injury or a fatality to an employee as a result of a poor working platform.



Quality Risk

Machine set up level

Mast is Plumb

Rig does not tip forward (sink into the platform) during tool removal or spin-off

This helps drill a straight, plumb shaft – every time!

Risk is mitigated by having a safe working platform to operate from

Legal Risk

If a member of the general public is injured or killed as a result of a poor working platform, what are the legal risks?

Prioritize Risk

- Once you've identified the potential risks, the next step is to prioritize those risks. To do this, you need to determine what impact each risk will have and the probability that it will occur.
- High impact, high probability risks should go to the top of your list. A risk with low impact and a low probability of occurrence at the bottom.
- **Working platforms have historically been very low on the priority list – until a piece of equipment overturns due to poor ground conditions.**

Legal Requirements for Working Platforms

In North America, there are two requirements that specifically address safe working platforms (ground conditions) for deep foundation equipment:

- Rotary Foundation Drill Rigs – Province of Ontario, Canada
- Mobile Cranes (including Dedicated Pile Drivers) – OSHA in the U.S.
- And there are two OSHA state plan requirements that may also be applicable . . .

Working Platforms - Ontario

ONTARIO REGULATION 213/91
CONSTRUCTION PROJECTS
ROTARY FOUNDATION DRILL RIGS
Effective July 1, 2016
(Excerpted Highlights)

156.3 Sections 156.4 and 156.5 apply when a drilling operation at a project uses a *rotary foundation drill rig* that can exert a ground pressure of 200 kilopascals or more under its tires, crawlers or outrigger pads in any configuration, including during its operational activities.

Working Platforms - Ontario

156.4 (1) Before a drilling operation described in section 156.3 begins, a *professional engineer shall*,

(a) design a supporting surface for the drill rig in accordance with good engineering practice to adequately support the drill rig during all drilling and drill rig set-up activities;

(b) designate and design a path of travel for the drill rig to use on the project to ensure the path of travel safely supports the drill rig; and

(c) prepare a written report described in subsection (2). O. Reg. 345/15, s. 19.

Ground Conditions – Mobile Cranes
OSHA - CFR 1926 Subpart CC

1926.1402(b) - The equipment must not be assembled ***or used*** unless ground conditions are firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the equipment are met. The requirement for the ground to be drained does not apply to marshes/wetlands.

1926.1402(c) - The controlling entity must:

1926.1402(c)(1) - Ensure that ground preparations necessary to meet the requirements in paragraph (b) of this section are provided.

1926.1402(c)(2) - Inform the user of the equipment and the operator of the location of hazards beneath the equipment set-up area (such as voids, tanks, utilities) if those hazards are identified in documents (such as site drawings, as-built drawings, and soil analyses) that are in the possession of the controlling entity (whether at the site or off-site) or the hazards are otherwise known to that controlling entity.

OSHA State Plans

- CAL-OSHA - §1711 (c) - Reinforcing Steel and Post-Tensioning in Concrete Construction

- Washington L&I - WAC 296-155-680 – Subpart O, General provisions (Effective October 1, 2020)

CAL-OSHA - Construction Safety Orders

§1711

(c) Site Access and Layout. The controlling contractor shall ensure that the following is provided and maintained:

(1) Adequate access roads into and through the site for the safe delivery and movement of derricks, cranes, trucks, other necessary equipment, the material to be erected, and the means and methods for pedestrian and vehicular control.

(2) Except where infeasible due to space constraints in dense metropolitan areas, a firm, properly graded, and drained area, that is readily accessible to the work with adequate space for the safe assembly, rigging, and storage of reinforcing and post-tensioning materials, and the safe operation of the reinforcing contractor's equipment.

Washington L&I

WAC 296-155-680

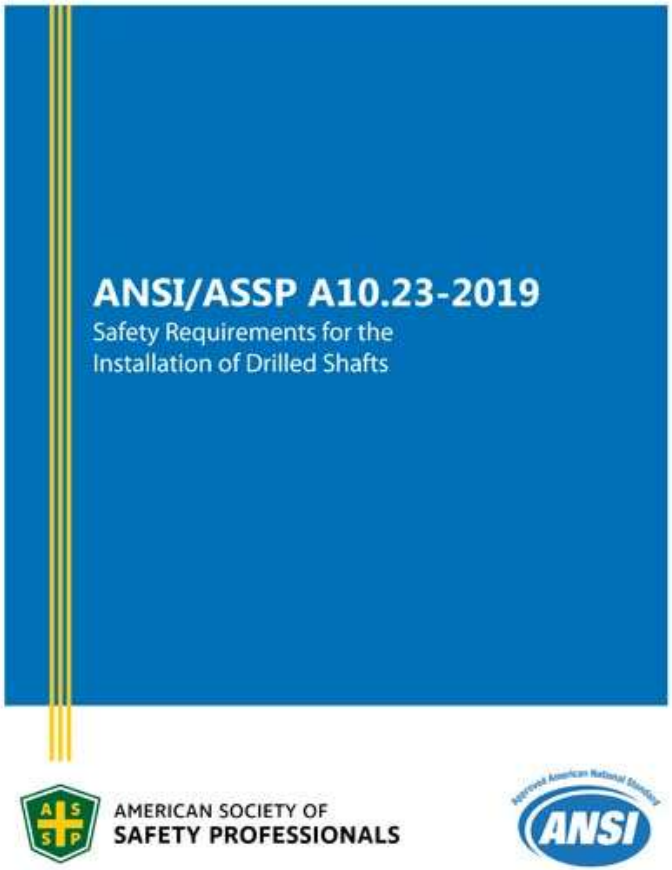
(7) **Site access and layout.** The controlling contractor must ensure that the following is provided and maintained:

(a) Adequate access roads into and through the site for the safe delivery and movement of derricks, cranes, trucks, other necessary equipment, the material to be erected, and the means and methods for pedestrian and vehicular control.

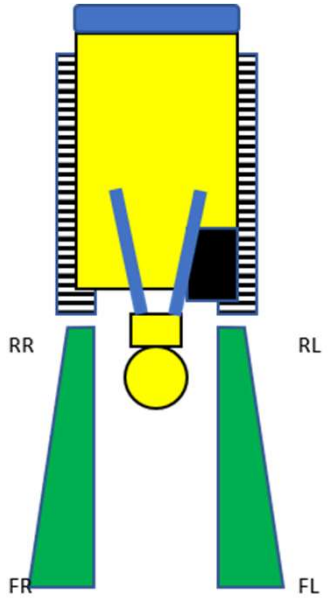
(b) A firm, properly graded, and drained area, that is readily accessible to the work with adequate space for the safe assembly, rigging and storage of reinforcing and post-tensioning materials, and the safe operation of the reinforcing contractor's equipment.

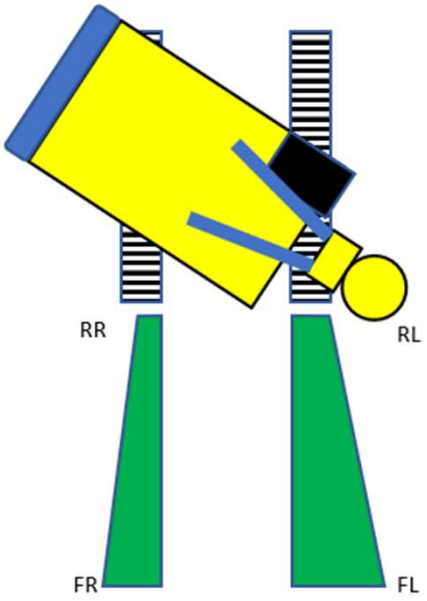
ANSI / ASSP Voluntary Standards

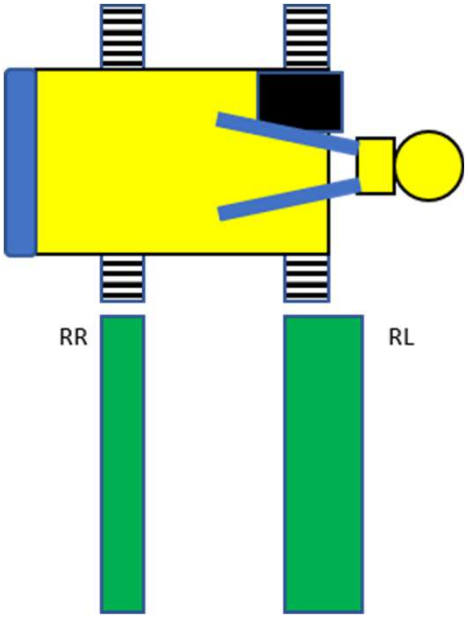
- A10.19 R2017 - Safety Requirements for Pile Installation and Extraction Operations
- A10.23 R2019 – Safety Requirements for the Installation of Drilled Shafts
- A10.30 2020 – Safety Requirements for the Installation of Ground Anchors and Micropiles



How Much Bearing Pressure Does My Equipment Exert on the Working Platform?





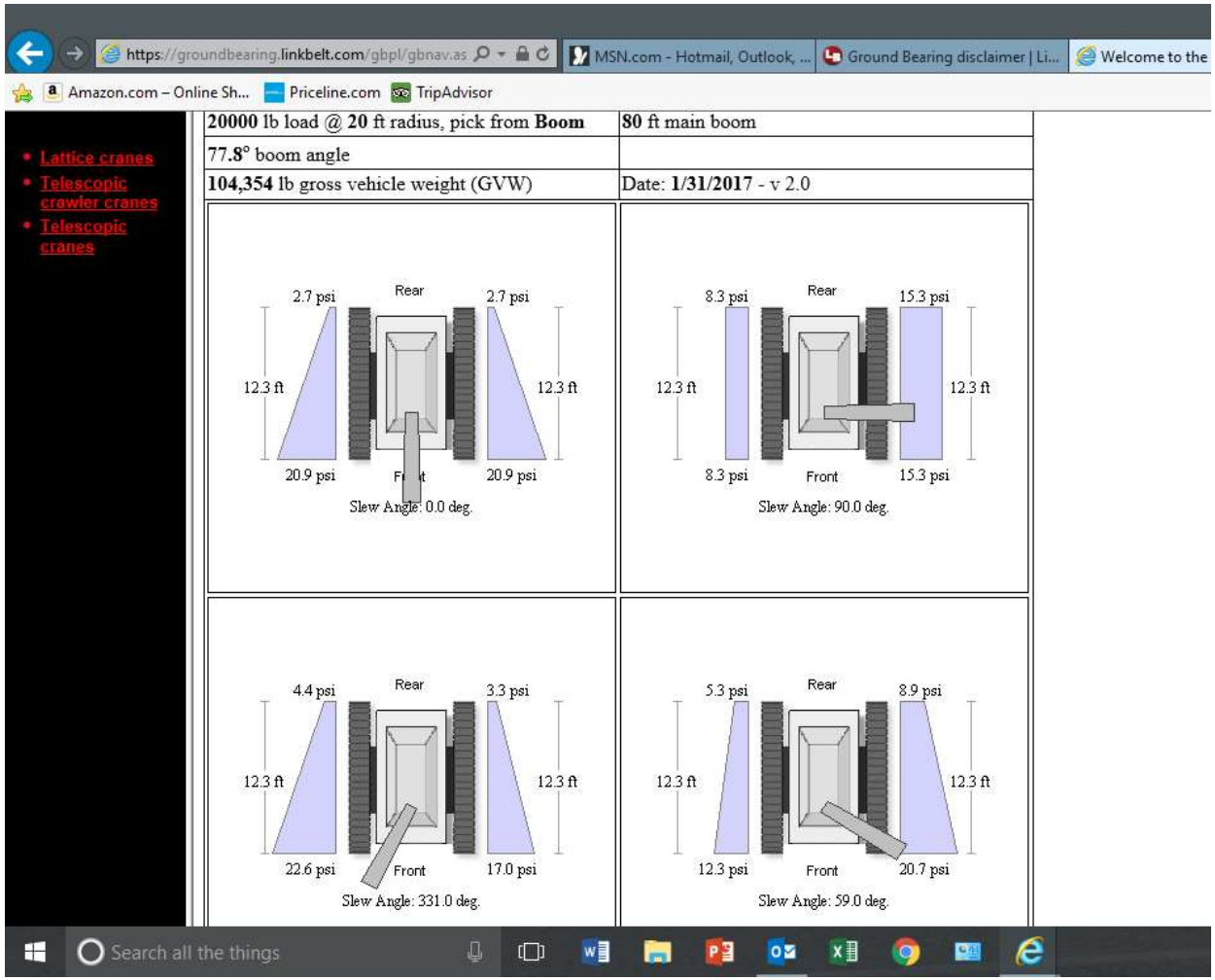


Ground Pressures for Mobile Cranes

This is a ground pressure diagram from Link-Belt Crane. You must input:

- Boom Length
- Load Radius
- Track Width
- Weight of Load
- Counterweight

This program will show differing pressures as the crane swings around with the load.



Ground Pressures for Dedicated Drill Rigs

This stability calculation applies to:
- Vertical operation only!
- Concrete supply pipe and leader access ladder not attached
- Leader extension 20.8ft installed
- Platform not attached to rotary drive
- 2. Auxiliary winch on Kelly leader top not attached
- Kelly bar MD36/3/36 max. 19180lbs completely compressed in highest position
- Top Kelly guide installed
- Kelly transmission BAT510 with attached damping and cardan without pressure pipe
- Weight of drilling tool max. 5511lbs
- The stated loads for the different winches are only permitted individually and may not be combined!
- Load on auxiliary winch only with completely empty drilling tool!

Leader vertical:	Rotary gearbox lifted max. 6.5ft			Rotary gearbox lifted max. 39.4ft			Rotary gearbox lifted all the way		
Support arm angle:	90.0°	81.9°	72.9°	90.0°	81.9°	72.9°	90.0°	81.9°	72.9°
Radius:	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft
Auxiliary winch [lbs]:	30865	30865	30865	30865	30865	24251	30865	30865	17637
Kelly winch [lbs]:	92594	92594	81571	92594	85980	59525	92594	73855	49604
Feed winch [lbs]:	123459	120152	82673	119050	87083	60627	89287	67241	47399

Max. ground pressure [PSI] under chain with 3.3ft base plates for:	Load (front):			Load (lateral):			Load (diagonal):		
Support arm angle:	90.0°	81.9°	72.9°	90.0°	81.9°	72.9°	90.0°	81.9°	72.9°
Radius:	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft	Min: 17.0ft	Center: 19.0ft	Max.: 21.0ft
Max. permitted load on auxiliary winch:	37.0	42.5	50.4	27.5	29.9	32.4	41.2	49.2	58.6
Max. permitted load on Kelly winch:	47.8	56.9	64.1	33.0	35.7	36.8	55.5	66.3	73.8
Max. permitted load on feed winch:	58.6	71.0	64.1	37.7	40.3	36.8	68.3	81.4	73.8
Max. ground pressure [PSI] under 27.6" support pad when pulling:									497.8

Machine may only be moved under the following conditions:
- Drilling head and drill casing detached
- Drilling tool emptied
- Rotary drive and tool are in lowest possible position
- No load on auxiliary hoist
- Support arm cylinder fully extended
- Ground firm and level
- Leader vertical
- Max. travel speed with load: 0.3 mph, travel only permitted on firm ground or excavator support mats
- Travel only permitted when uppercarriage is parallel to undercarriage!
- No dynamic effects whatsoever permitted, travel with extreme caution and think one step ahead!

Negative Effects of a Poor Working Platform

- Lack of productivity
- Difficultly in achieving high quality control
- Worker injury/fatality, equipment damage, risk to adjacent structures, utilities, and the public at large

Equipment Downtime

Cost of up righting equipment:

- Rented crane(s)
- Tractor trailer(s)
- Labor – crew is not productive when working to salvage the overturned unit
- Travel – Office personnel making site visit, conduct investigations
- Travel – Manufacturer's representative to assess damage, assist in clean up
- The "Blame Game"

Equipment Downtime

- Cost of repairing damaged equipment
- Possible rental of equipment to maintain schedule
- Cost of replacing damaged equipment
- Environmental Clean-up (spilled fuel & oil)
- Increased insurance premiums – due to overturn accident

Access

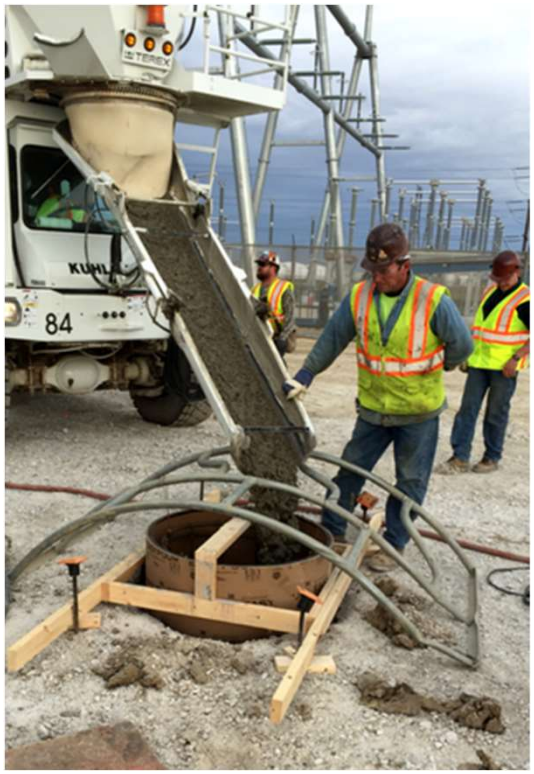
If you cannot get your equipment onto the jobsite, let alone safely unload or load it, how will that impact your schedule?

Productivity

How productive are you if the rig is stuck in the work surface – over, and over again?

Productivity

You are far *more* productive when the ready-mix truck can access the shafts for pouring concrete . . .



Productivity

You cannot be productive if you must battle the jobsite conditions, just to install an anchor

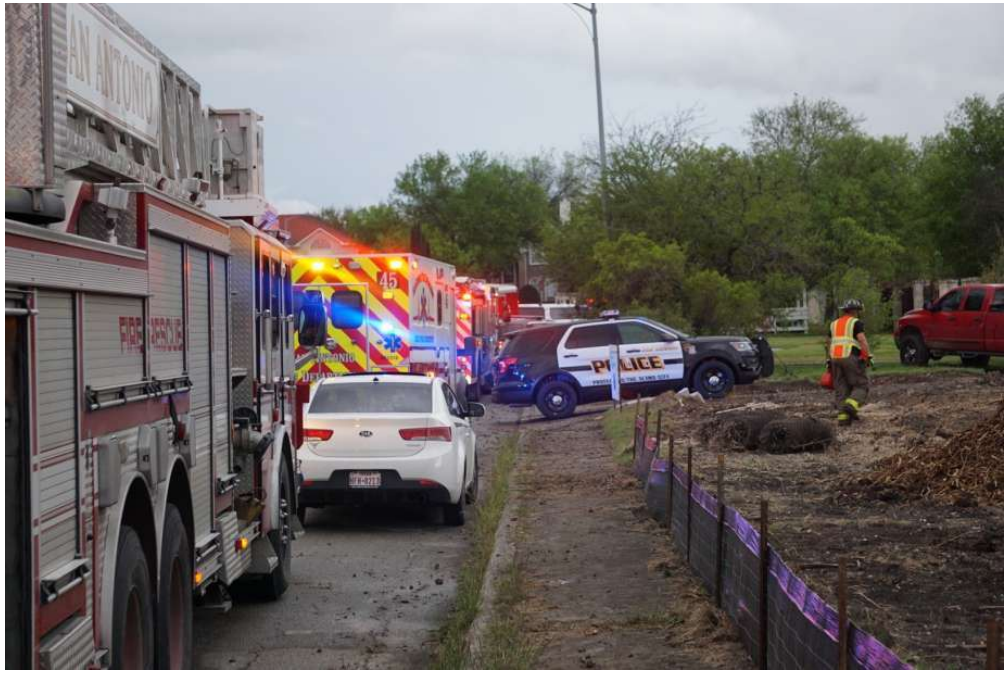
Productivity

A safe work platform allows for faster loading and unloading of equipment, faster assembly and disassembly, and you are safer during the performance any of these tasks

Rebar Assembly and Transport

What if we must assemble the cage away from the drilled shaft? How do we transport it to the shaft . . . Safely?

Emergency Equipment Access



Safe Working Platforms

Due to existing ground conditions at a given site, it may take some engineering to construct a safe working platform . . .

Safe Working Platforms

Or, it could be the addition of a simple dry, level compacted pad or the use of crane mats for you to work from . . .

Safe Working Platforms

The ADSC-IAFD, PDCA, and DFI Guidance Document helps ensure a safe working platform in three areas:

- Recognition of the need for proper analysis and preparation of working platforms by controlling entities and acknowledgment of responsibility for such tasks
- Common use of appropriate contract language for prime contracts and subcontracts
- Enforcement through industry consensus.

Safe Working Platforms

ADSC-IAFD, PDCA, and DFI anticipate that deep foundation contractors and their equipment suppliers will fully and readily present the real working loads, geometries, and operating conditions of their foundation equipment to allow for realistic assessments of working platform safety to be made.

Safe Working Platforms = Risk Management

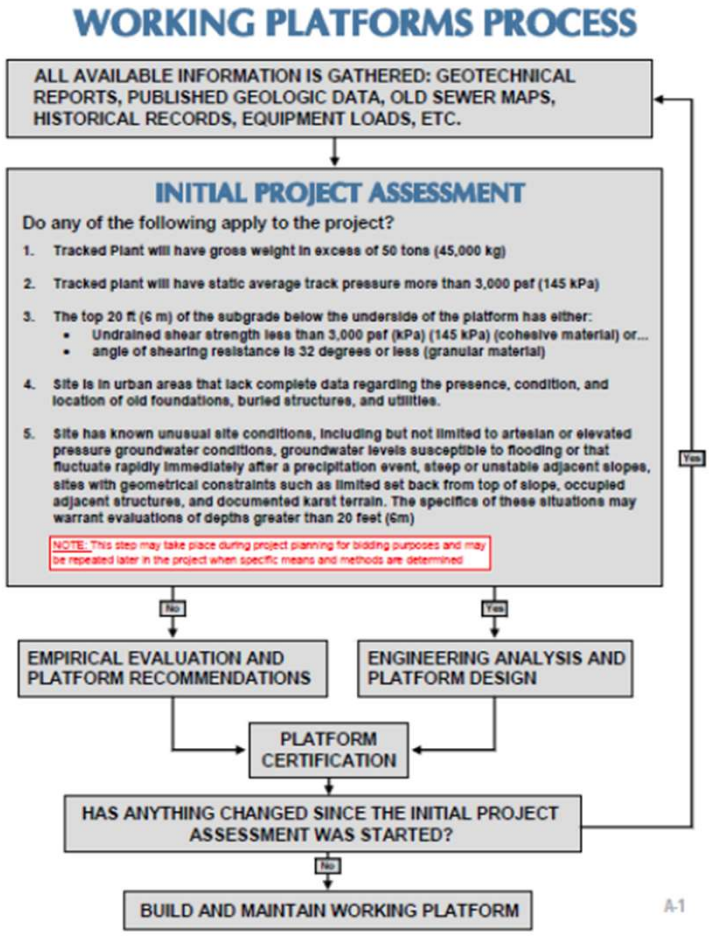
- This risk management tool provides a framework for administering a responsible program for maintaining jobsite safety while promoting communication among project stakeholders concerning roles and responsibilities in the process.

- Additionally, it supports the practice of Prevention through Design (PtD) and Design for Construction Safety (DfCS) which encourages consideration of the safety of construction and maintenance workers during the pre-construction phase of a project.

- Safety is without a doubt the most crucial investment we can make. The question is not what it costs . . . . but what it saves!

Safe Working Platforms

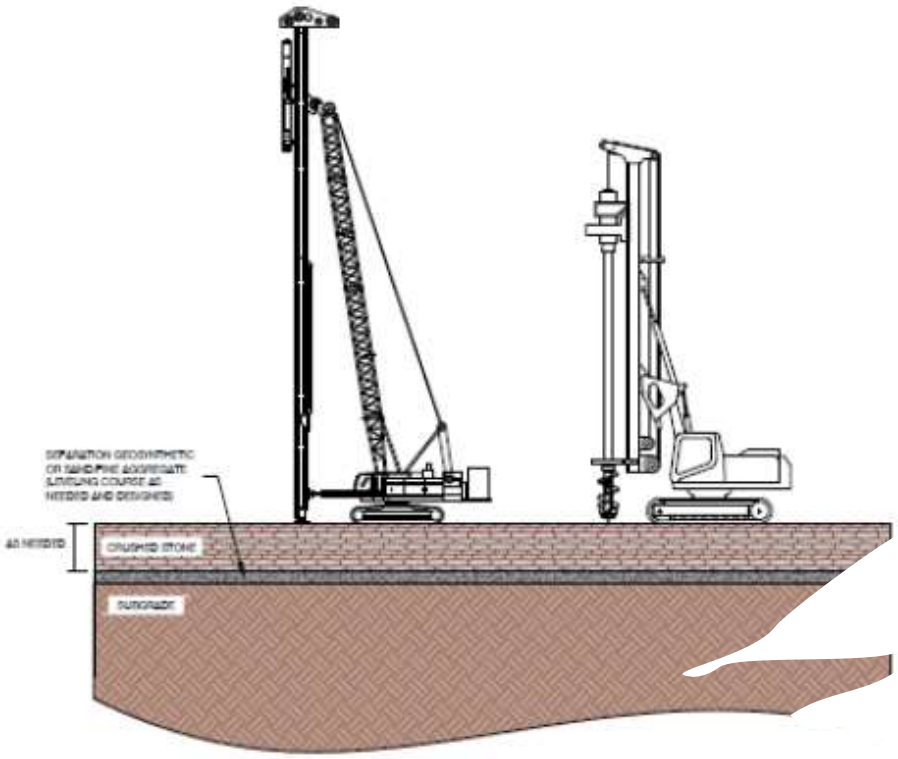
ADSC-IAFD, PDCA, and DFI anticipate that the engineering, design, and insurance community will be become more aware of the importance of working platform safety and will incorporate appropriate data and general recommendations relative to construction-phase subgrade conditions into geotechnical reports and construction plans.



Role of Risk Management

You Manage Risk in order to . . .

Keep Failure From Being Successful!



WORKING PLATFORM:
Crushed Stone Only

Role of Risk Management

Risk management strategies can be very helpful in bringing down premium costs. If you decrease the risks for injury, fatality, or equipment damage, that reduces the possibility of workers and the public bringing claims against the employer, and to the project.

A Safe Working Platform is a risk management tool that will help owners, general contractors, construction managers, and specialty contractors manage their exposures. SWPs greatly reduce equipment overturning risks and – hopefully – prevent them from occurring.

Safe Working Platforms

We *<u>can</u>* make a difference – but we *<u>all</u>* must commit to doing so – for every job we do!

NATIONAL COMMISSION FOR THE CERTIFICATION OF CRANE OPERATORS (NCCCO)

NCCCO Foundation Drill Rig and Dedicated Pile Driver Operator Certification

Operator Certification

There are three equipment operator certifications that positively affect deep foundation installation safety. They each are specific to a type of equipment used in our industry:

- Mobile Cranes
- Dedicated Pile Drivers
- Foundation Drill Rigs (including Anchor and Micropile Rigs)

Dedicated Pile Driver - OSHA

1926.1400(a) This standard applies to power-operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load. Such equipment includes, but is not limited to: Articulating cranes (such as knuckle-boom cranes); crawler cranes; floating cranes; cranes on barges; locomotive cranes; mobile cranes (such as wheel-mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); multi-purpose machines when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load; industrial cranes (such as carry-deck cranes); dedicated pile drivers; service/mechanic trucks with a hoisting device; a crane on a monorail; tower cranes (such as a fixed jib, *i.e.*, "hammerhead boom"), luffing boom and self-erecting); pedestal cranes; portal cranes; overhead and gantry cranes; straddle cranes; sideboom cranes; derricks; and variations of such equipment. However, items listed in paragraph (c) of this section are excluded from the scope of this standard.

Dedicated Pile Driver - OSHA

Operators of mobile cranes equipped with pile driving or drilling attachments are already covered under the existing crane certification . . .

1926.1400(b) *Attachments*. This standard applies to equipment included in paragraph (a) of this section when used with attachments. Such attachments, whether crane-attached or suspended include, but are not limited to: Hooks, magnets, grapples, clamshell buckets, orange peel buckets, concrete buckets, drag lines, personnel platforms, augers or drills and pile driving equipment.

Mobile Crane with Fixed Pile Driving Leads

Mobile Crane with Swinging (Suspended) Pile Leads

Dedicated Pile Driver

However, the Dedicated Pile Driver (DPD) Operator certification program addresses a need identified by the industry for an operator certification specifically designed for operators of these specialized machines.

Dedicated Pile Driver

"Dedicated pile-driver is a machine that is designed to function exclusively as a pile-driver. These machines typically have the ability to both hoist the material that will be pile-driven and to pile-drive that material."

Dedicated Pile Driver

Dedicated Pile Driver

Dedicated Pile Drivers

In a partnership with the Pile Driving Contractors Association (PDCA), the National Commission for the Certification of Crane Operators (NCCCO) developed a new certification for operators of dedicated and purpose-built pile driving rigs.

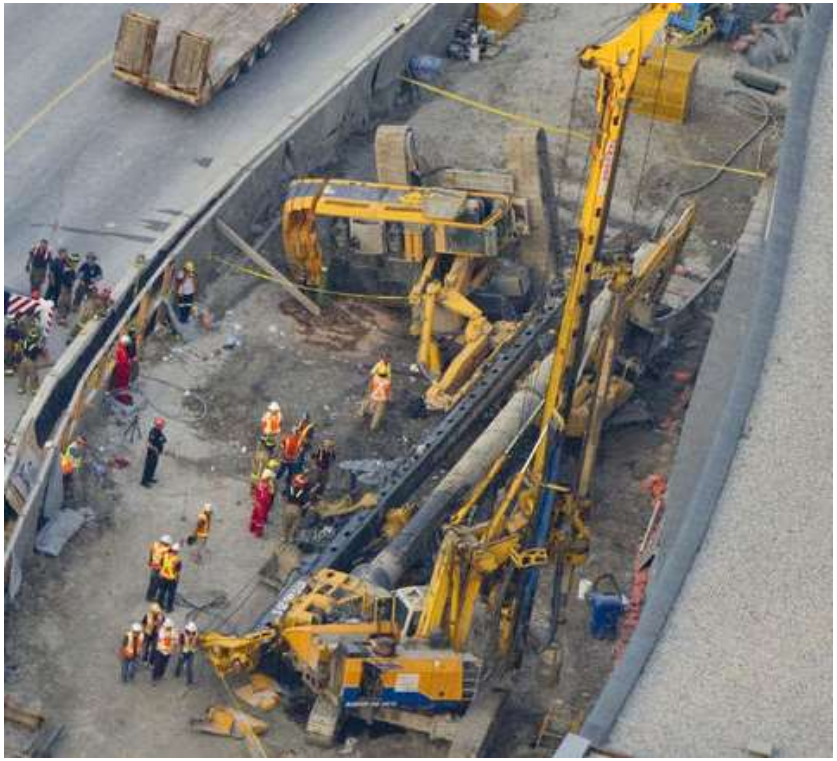
The Dedicated Pile Driver Operator Certification became available in late 2016.

Foundation Drill Rigs

In late 2012 and early 2013, discussions held within the ADSC Drilled Shaft and Safety Committees lead to the belief that a Task Force should be created to answer questions and to draft a list of “Must Haves” for a certification program for Foundation Drill Rig Operators.

This Task force was created to respond to the up-and-coming industry needs and to offer a benefit to the ADSC membership.

Why?



In 2010, a fatal accident involving a foundation drill rig, spawned the government of Ontario Canada to mandate a certification requirement. This rule went into effect in 2016.

156.8 *(1) No worker shall operate a rotary foundation drill rig with an effective torque greater than 270 kilonewton metres unless the worker,*

(a) holds a certificate of qualification issued under the Ontario College of Trades and Apprenticeship Act, 2009, that is not suspended, in the trade of hoisting engineer – mobile crane operator 1; or

(b) is an apprentice who is working pursuant to a training agreement registered under the Ontario College of Trades and Apprenticeship Act, 2009, that is not suspended, in the trade of hoisting engineer – mobile crane operator 1. O. Reg. 345/15, s. 19.

Why?

How do you respond to the request from an Owner or General Contractor – “We need a copy of your drill rig operator’s certification.”

Typically, one would write down on company letterhead, the operator’s experience (xx years operating a rotary drill rig), and perhaps list a few similar projects they have worked on.

How much longer will this approach be accepted?

Why?

The ADSC considers itself as a pro-active association. Despite our having a great working relationship with OSHA, it was decided to actively pursue some form of certification – one which we would author and control – before it was mandated by our government.

And ensure it not be associated with any other equipment operator certification, including a mobile crane.

Can We Do This?

We sent a delegate to an ANSI Certification training class. This allowed us to better explore the possibility of the ADSC becoming a “certifying body” which would meet the rigorous ANSI accreditation process.

It was quickly learned that the ADSC alone would be woefully under-prepared to take on such a task. The costs associated with the initial process, program administration, and the re-certification procedures would be far too great a burden to the ADSC membership.

At long last . . .

February 23, 2017—The National Commission for the Certification of Crane Operators (NCCCO) and ADSC – The International Association of Foundation Drilling have announced plans to jointly develop a certification program for operators of foundation drill rigs. The official announcement was made at ADSC's Annual Meeting in La Quinta, CA, in February 2017.

The FDR/AMP Certification Program became available December 2018

The Process


Education of the Operator
Certification of the Operator
Accreditation of the Exam
Training of the Operator
Qualification of the Operator
Evaluation of the Operator

Education

An education (or the process of receiving or giving systematic instruction) is a hands-on process that requires both theory and practice.

Ideally, an operator learns definitions and processes from instructors/mentors, and course materials and is then given an opportunity to practice and apply those learned instructions on the appropriate equipment.

Certification

Certification would occur *after* an individual receives appropriate education either on the job, or from a trade union, trade association, educational institution.

Certification, such as one gets from the National Commission for the Certification of Crane Operators (NCCCO) for example, demonstrates the candidate has skills and knowledge that subject matter experts have deemed necessary for *safe performance* of a given type of equipment.

Certification

The NCCCO Foundation Drill Rig Operator Certification is in no way a "certification" of the operator's proficiency to install a given product – i.e., a drilled shaft or tieback anchor.

It is a certification of the candidate's ability to recognize the safe operational procedures and then safely perform basic maneuvers inherent to all types of large and small foundation drill rigs.

Accreditation

Accreditation of the certifying body is established by an independent credentialing authority, the American National Standards Institute.

ANSI carries the assurance that the examination is fair, sound, and that valid assessments of the knowledge and skills they are intended to measure, for the safe operation of given equipment exist.

Training

Training is more finite and is typically of shorter duration. Training often consists of development and eventual mastery of a specific skill or concept.

An operator may have passed a certification exam and may understand the parts and processes of the equipment in general but will still need further expert training (by a manufacturer or employer) on the operation of a specific foundation drill rig or procedure, in order to be deemed “qualified” by their employer.

Qualification

Expert training on a specific foundation drill rig and the performance of certain tasks, ensures that an individual can be deemed competent by their employer to operate a specific piece of machinery.

This means that the operator can differentiate the specialized and unique attributes that each individual type of foundation drill rig possesses and can operate the equipment and perform those tasks - safely.

Evaluation

Once the operator has gone through the process of education, certification, training, and employer qualification, they need to be evaluated by the employer on their ability to perform the tasks assigned to them.

Evaluation may take place coincidently to qualification, but only for a specific machine and task. Each time the operator is assigned to a substantially different machine or task, they should be “evaluated” to ensure they can operate the equipment and perform those tasks - safely.

Practical Exams – FDR & AMP

Practical Exams

Dedicated Pile Driver

Written Exams

The Core Exam (Written or Computer Based) will have questions related to the following “Domains”:

DOMAIN 1: PROJECT SITE

DOMAIN 2: Assembly / Disassembly

DOMAIN 3: PRE-OPERATION

DOMAIN 4: OPERATION

DOMAIN 5: TECHNICAL KNOWLEDGE

DOMAIN 6: MANUFACTURERS’ STABILITY / RANGE CHARTS FOR AUXILIARY WINCH

Separate Specialty Exam for Anchor/Micropile Foundation Drill Rig

CERTIFICATION POLICIES

The following policies apply to all NCCCO certification programs:

- NCCCO Code of Ethics
- Disciplinary Policy
- Substance Abuse Policy
- Testing Accommodations Policy
- Change of Address Policy
- Appeals Policy and Procedures
- Information Release Policy
- Recertification Policy

RECERTIFICATION REQUIREMENTS

NCCCO certification is valid for five years. ***Recertification candidates must complete all recertification requirements during the 12 months prior to their certification's expiration date.*** This includes:

- Passing the Recertification Written Examination(s)
- Continuing to meet medical requirements
- Compliance with NCCCO's Substance Abuse Policy
- Compliance with the Code of Ethics

Criteria for Test Sites

To be an approved written test site, facilities must meet all NCCCO criteria for hosting a Written Exam.

If the facility meets the stated criteria, NCCCO will provide all necessary information to allow tests to be scheduled.

A facility's status as an CCO Written Exam test site lapses after one year from the date of approval if no tests are administered.

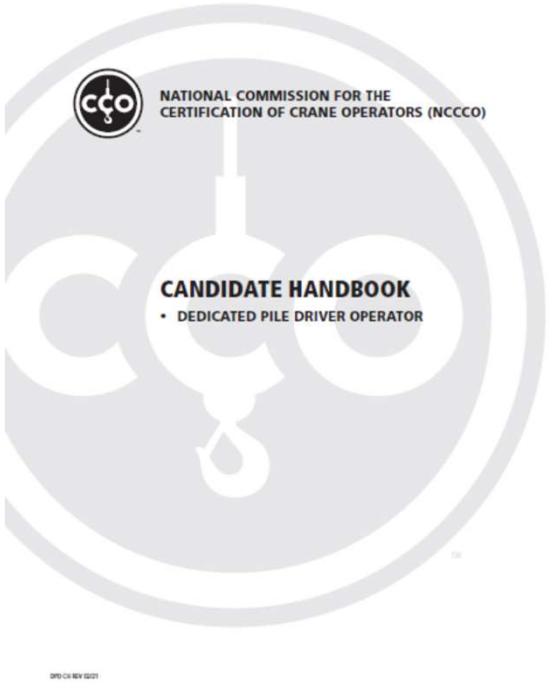
Practical Examiners

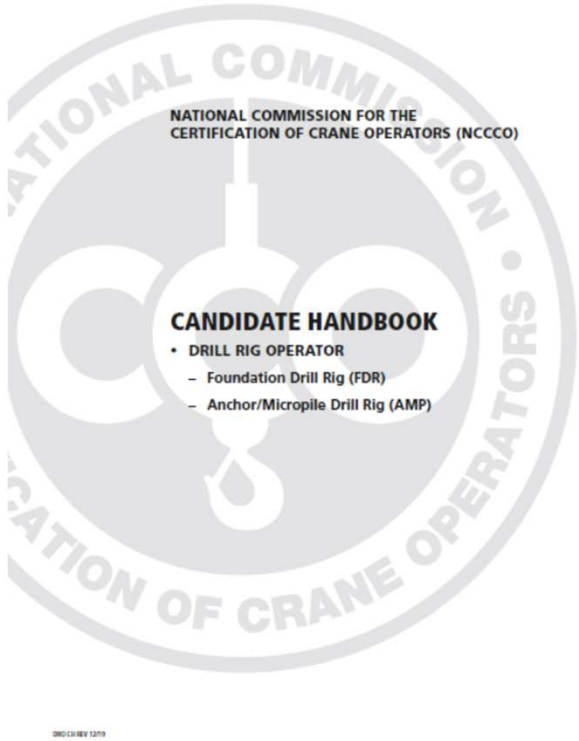
NCCCO-accredited Practical Examiners are CCO-certified personnel who have been trained and authorized by NCCCO to administer the practical examinations for CCO certification programs.

NCCCO Practical Examiners are recognized as professionals in their field and may offer their services for hire.

Employers with NCCCO-accredited Practical Examiners on staff appreciate the convenience of being able to schedule in-house tests to accommodate changing schedules caused by weather, workloads, and other factors.

Candidates Handbook

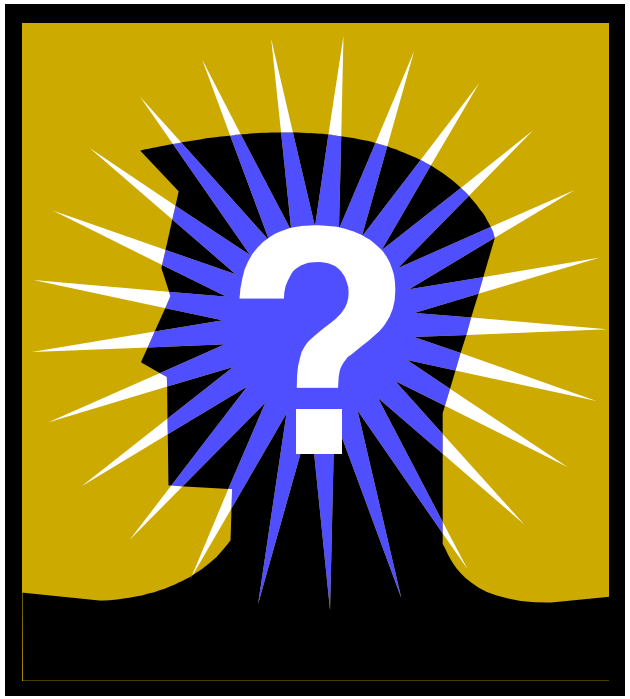




Reference Manual

ADSC developed “Reference Manuals” for a potential candidate to use as a “study guide” for the written exams.

There is a written manual for Large Diameter Foundation Drill Rigs (Kelly Bar, CFA, Jet Grout, Displacement Pile, etc.) and a separate manual for Small Diameter Foundation Drill Rigs (Anchor / Micropile)



Questions and Answers

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