



Geotechnical & Environmental Drilling

Health & Safety Plan (HASP)

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Corporate Health & Safety Manual (HASP)

Table of Contents



June 2014 – Revision 4.0

Welcome from Company Owners	5
INTRODUCTION.....	6
THE PURPOSE AND SCOPE OF THIS HASP	7
SECTION 1 - PRE-FIELDWORK	8
1.1 - Introduction	8
1.2 - Planning the Project	8
1.3 - Preparing the Site-Specific Health and Safety Plan (HASP)	9
1.4 - Planning and Facilitating the Kick-off Meeting.....	10
SECTION 2 - MOBILIZATION, SET UP, AND DEMOBILIZATION	12
2.1 - Performing Pre-Mobilization Tasks	12
2.1.1 - Inspections and Maintenance	12
2.2 - Loading and Unloading a Truck Mounted Drill Rig	13
2.3 - Physically Accessing the Equipment and Vehicles	13
2.4 - Traveling to the Site	13
2.4.1 - Driver Requirements.....	13
2.4.2 - Road Travel and Vehicle Safety	14
2.4.3 - Transporting Drill Rigs	14
2.4.4 - Entering the Site	15
2.5 - Confirmation Activities for Clearances and Borehole Positioning.....	16
2.5.1 - Permits	16
2.5.2 – Markings	16
2.5.3 - Site Communication and Safety Review.....	16
2.5.4 - Walk Through and Visual Inspection	17
2.6 - Preparing for Drilling	17
2.6.1 - Preparing the Site	17
2.6.2 - Traffic Control	18
2.6.3 - Considerations for Retail Service Stations and Other Onsite Locations	18
2.6.4 - Working in or Near Active Roadways	19
2.6.5 - Establishing Work Areas Using Monitoring or Barricades.....	19
2.6.6 - Establishing Site Security	19
2.6.7 - Storage and Material Handling	19
2.6.8 - Fire Prevention	20
2.6.9 - Safety Equipment	21
2.7 - Moving People and Equipment at the Site	21
2.7.1 - Placing the Equipment.....	21
2.7.2 - Loading and Unloading Rigs.....	23
2.7.3 - Start Up	23
2.8 - Shut Down - Temporary (Daily) and Permanent	24
2.8.1 - Temporary Shut Down.....	24
2.8.2 - Demobilization	24

Corporate Health & Safety Manual (HASP)

Table of Contents



SECTION 3 - DRILLING OPERATIONS.....	26
3.1 - Rig Set-up	26
3.1.1 - Drill Rig Stabilization.....	26
3.1.2 - Overhead Hazards	27
3.2 - Raising the Mast	29
3.2.1 - Jump Starting an Engine with a Dead Battery	29
3.3 - Auger Drilling.....	30
3.4 - Rotary Drilling.....	32
3.5 - General Drilling Safety	33
3.5.1 - Training.....	33
3.5.2 - Housekeeping On and Around the Drill Rig	33
3.5.3 - Equipment Inspection	35
3.5.4 - General Inspection Routine	35
3.5.5 - Set-up	35
3.5.6 - Start-up.....	35
3.5.7 - Drilling.....	36
3.5.8 - Adding and Removing Drill Rods.....	37
3.5.9 - Positioning Pipe and Casing.....	38
3.5.10 - Pressurized Systems	38
3.5.11 - Most Common Injuries.....	38
3.5.12 - Near Losses, Incidents and Injuries and Treatment	38
3.5.13 - First Aid Kits/Fire Extinguishers.....	39
3.5.14 - Underground utilities.....	39
3.5.15 - Environmental Contamination (if applicable)	39
3.5.16 - Working on Streets or Highways	39
3.5.17 - Operating the Drilling Rig.....	40
3.5.18 - Working on the Mast - General Repairs.....	40
3.5.19 - Special Precautions for Drilling in Landfills	40
3.5.20 - Lighting.....	41
3.6 - Electrical Safety	41
3.6.1 - Supplying Power to the Job Site.....	41
3.6.2 - Safe Use of Electricity.....	42
3.6.3 - Reacting to Contact with Electricity	42
3.6.4 - Electrical Equipment.....	42
3.7 - General Equipment Safety	42
3.7.1 Safe Use of Hand Tools.....	42
3.8 - Personal Protective Equipment.....	45
3.8.1 - Individual Protective Equipment	45
Training	47
3.9 - Weather and Night Work.....	47
3.9.1 - Weather Considerations	47
3.9.2 - Night Work Safety.....	49
3.10 - Wire Rope, Hoists and Hammer Safety	49
3.10.1 - Wire Rope Safety.....	49
3.10.2 - Hoist Safety	51

Corporate Health & Safety Manual (HASP)

Table of Contents



3.10.3 - Sheaves.....	51
3.11 - Health and Hygiene.....	52
3.11.1 - Personal Hygiene Requirements	52
3.11.2 - Chemical Hazards	52
3.11.3 - Dust	52
3.11.4 - Noise	52
3.11.5 - Supplemental Hearing Conservation Procedure.....	52
3.11.6 - Ambient Air Monitoring	55
3.12 - Materials Handling	56
3.12.1 - Proper Lifting	56
3.12.2 - Heavy Materials, Drums and Containers - Lifting and Moving.....	56
3.12.3 - Drum Handling.....	57
3.13 - Forklift Operations.....	57
3.13.1 - Forklift and Forktruck Operations	57
3.13.2 - Employee Operating Instructions.....	60
3.14 - Fire Protection.....	60
3.14.1 - Fire on the Rig	60
3.14.2 - Other Fire and Explosion Precautions	61
3.15 - Rig Inspections and Maintenance	61
3.16 - Decontamination	63
3.16.1 - Typical Cleaning Methods	63
3.16.2 - Personnel and Equipment Decontamination Plan	63
3.16.3 - Standard Materials and Equipment	64
3.16.4 - Field Sampling Equipment Cleaning Procedures	64
3.16.5 - Preventing the Spread of Contamination	65
3.16.6 - Hazards of Decontamination	65
3.16.7 - Wastewater and Decontamination Fluids	67
3.16.9 - Health and Safety Hazards of Sampling.....	68
3.16.10 – Work Area Monitoring	68
3.16.11 – Respiratory Protection Procedure	72
3.16.12 – Hydrogen Sulfide (H ₂ S) and Benzene Awareness Procedure	75
SECTION 4 - WELL CONSTRUCTION, DEVELOPMENT, AND	
ABANDONMENT	79
4.1 - Introduction	79
4.2 - Roles and Responsibilities	79
4.3 - Personal Protective Equipment (PPE)	79
4.4 - Waste containment	80
4.5 - Traffic	80
4.6 - Housekeeping of Bagged Material	80
4.7 - Transport Well Materials to Location.....	81
4.7.1 - Well Casing and Annular Materials.....	81
4.7.2 - Potential Hazards for Moving Well Materials	81
4.8 - Install Screen and Casing	81
4.9 - Install Annular Materials.....	82
4.10 - Develop the Well.....	82

Corporate Health & Safety Manual (HASP)

Table of Contents



4.10.1 - Potential Hazards of Well Development	83
4.11 - Surface Completion.....	83
4.11.1 - Potential Hazards of Surface Completion:	83
4.12 - Abandoning Wells	83
4.12.1 - Potential Hazards of Over Drill	84
4.12.2 - Potential Hazards of Abandon in Place	84
SECTION 5 – ADDITIONAL SHOP & JOBSITE EQUIPMENT REPAIR	
CONSIDERATIONS	85
5.1 - Introduction	85
5.2 - Lockout/Tagout Checklist.....	85
5.2.1 - Equipment, machinery and personnel	85
5.2.2 - Energy Control Program	85
5.2.3 - Training requirements.....	86
5.3 – Welding Safety Introduction.....	87
5.3.1 - Welding and Cutting Safety Guidelines	87
5.3.2 – Arc Welding Safety Guidelines	90
5.4 – Shop & Jobsite Supplemental Hazard Communication Program	91
5.5 – Confined-Space Entry Introduction.....	92
5.5.1 – Confined Space Entry Regulation.....	92
5.6 – Fall Protection Introduction.....	92
5.6.2 – Fall Protection.....	93
HDI HEALTH & SAFETY PLAN (HASP) APPENDICES.....	96
Appendix A – Holocene Heat Stress Supplement - How do you prevent heat illness?	97
Appendix B – Holocene Bloodborne Pathogens Exposure Control Procedure	100
Appendix C – Holocene Job Orientation Guide	104
Appendix D – Holocene Employee’s Report of Injury Form	105
Appendix E – Holocene Incident Investigation Report Form	106
Appendix F – Holocene Crew Safety Meeting or “Toolbox” Safety Notes	110
Appendix G – Holocene Equipment Safety Inspection Checklist	111
Appendix H – Holocene Job Safety Analysis (JSA) Worksheet.....	112
Appendix I –Holocene Safety Disciplinary Supplemental Procedure.....	113
Appendix J – Holocene First Aid Procedure.....	114
Appendix K - Holocene Ladder Safety Supplemental Procedure	117



Welcome from Company Owners

Jay A. Graham & Clay E. Griffith

The health, safety, and well being of our employees and the protection of the environment are of utmost importance to Holocene Drilling, Inc (HDI). HDI is committed to complying with local, state, and federal environmental, health, and safety regulations.

HDI will strive to create a zero accident culture by eliminating workplace hazards and modifying unsafe behaviors through education, effective performance, and management procedures.

All members of HDI are accountable for ensuring compliance with Health & Safety Plan (HASP) policies and procedures. You must use all safety devices and guards available, and wear specified personal protective equipment when required. If any safety device or guard is not working or is removed, you must immediately report these conditions to your supervisor.

If you sustain an injury or are involved in an accident, **NO MATTER HOW MINOR**, you must **IMMEDIATELY** report it to your supervisor.

As a member of the HDI team, employees are expected to obey every applicable safety rule, and to perform his or her duties in the safest manner possible at all times.

As a condition of employment, you are required to read the entire HASP Employee Safety Manual and learn its contents. If you have questions about the manual or its contents, you should discuss those questions or concerns with your supervisor or the HASP Manager.

It is your responsibility to know all safe operating procedures, safety appliances, personal protective equipment, and safety rules and regulations. If you are faced with a situation in which you are uncertain of the appropriate safe work practice or procedure, you should immediately stop work and ask your supervisor.

As an employee of HDI, you are the foundation of our HASP and Site-Specific HASP programs. Moreover, you must use your own good judgment and common sense to supplement the safety rules and policies outlined in this manual.

To all new team members, Welcome Aboard!

Jay A. Graham, President

Clay E. Griffith, Vice President

Holocene Drilling, Inc.



INTRODUCTION

The Holocene Drilling, Inc. (HDI) Health & Safety Plan (HASP) gives guidance to address some of the most common safety concerns that should be considered while performing drilling activities. It is not intended to address every possible situation that may arise or every hazard which may come to exist during drilling activities.

The intended audience for this HASP includes all HDI employees, but is not limited to:

- ◆ Clients and client companies the work is performed for
- ◆ Facility managers
- ◆ Engineers
- ◆ Geologists
- ◆ Project managers
- ◆ Environmental health and safety professionals and managers
- ◆ HDI Site health and safety plan (HASP) managers
- ◆ HDI Drillers and rig operators
- ◆ HDI Driller Assistants
- ◆ HDI Field technicians
- ◆ HDI Contractors and subcontractors
- ◆ Utility clearance companies and field crews

Your safety is an ongoing concern for you, HDI, and the companies that HDI performs work for...in other words, safety is everyone's concern.

This drilling safety HASP has been prepared to assist you in understanding geotechnical and environmental drilling and direct push safety guidelines and common practices. When working on a project where more stringent safety practices are required, always defer to the more conservative practice. It contains suggested safety practices and is not intended to establish standard industry requirements. This HASP is to assist HDI employees to work safely and with close adherence to HDI and drilling industry requirements. Many aspects of drilling and direct push safety can only be accomplished by using every employee's intelligence, careful attention to detail, and common sense.

The vision of this HDI document is to provide a brief summary of some of the best available drilling safety knowledge in our industry. By adopting these proven practices, HDI employees can reduce the potential for personal injury and safety related losses.



THE PURPOSE AND SCOPE OF THIS HASP

This HASP's purpose is to assist in preventing losses to the following four situations during geotechnical and environmental drilling and direct push operations:

- ◆ Injury to workers
- ◆ Negative impact on the community
- ◆ Negative impact on the environment
- ◆ Damage to surface and subsurface structures

HDI's goal is to augment, not replace, site-specific safety plans. These procedures are a collection of safety practices and lessons learned and compiled by knowledgeable driller's, health & safety personnel, and other geotechnical and environmental engineering professionals. As HDI progresses as a company and we learn new techniques, we hope to keep this HASP up-to-date by revising it periodically to evolve with new practices and technology so that it reflects the future drilling practices for HDI.

The following sections include guidance for:

- ◆ Drilling pre-clearance
- ◆ Borehole siting
- ◆ Drilling and direct push operating equipment
- ◆ Mobilizing and demobilizing equipment
- ◆ Well construction



SECTION 1 - PRE-FIELDWORK

1.1 - Introduction

Geotechnical & Environmental drilling can be performed safely with proper pre-fieldwork planning and proactive adjustment of planned safe work procedures to actual conditions in the field. As every experienced driller and environmental professional knows, it is very difficult to predict all hazards that may be encountered during drilling fieldwork. The pre-field work preparations suggested here are applicable to mechanical drilling and push probe where portable drill rigs are used for soil boring advancement, subsurface soil and water sample collection, or groundwater monitoring well installation. If these pre-fieldwork preparations are diligently completed, the job can proceed safely and smoothly with less down time. It is recommended that supporting documentation for the pre-fieldwork preparations is retained in the project files.

1.2 - Planning the Project

Project planning begins when the customer's drilling needs are made known to the geotechnical or environmental consultant or driller. Pre-fieldwork planning can be reflected in a proposal to the client to secure the work assignment, or in a work plan used to communicate the technical approach and work procedures that will be used to safely complete the work. Following award of the project to HDI, planning and scheduling should focus on preparations that will contribute to a safe and efficient operation at the job site.

Much of the responsibility for planning, effective communication, and associated task work rests with HDI's project manager, however, experience has demonstrated participation by the client's project manager, (with other key personnel as needed) and the contractor's field team in the planning process significantly contributes to insuring a safe and efficient job site.

The following list of items should be considered during the project planning stage prior to mobilizing to begin fieldwork:

- ◆ Scope of work - overall project and drilling task objectives
- ◆ Client, corporate, and job-site health and safety requirements
- ◆ Technical approach (the means and methods to accomplish customer scope of work)
- ◆ Procurement and vendor selection
- ◆ Technical capabilities and equipment
- ◆ Drillers
- ◆ Public and private utility locators
- ◆ Traffic control and security
- ◆ Laboratory services (including data validation, as required)
- ◆ Waste transportation and disposal (if required)



Pre-qualification requirements to be considered

- ◆ Safety performance
- ◆ Training and experience of personnel
- ◆ Age and condition of required equipment
- ◆ Medical and substance abuse surveillance
- ◆ Proof of adequate insurance
- ◆ Licenses and registrations
- ◆ References
- ◆ Ability to meet schedule

Roles and responsibilities (client, owner, consultant, driller) for communications, work execution, and safety

Schedule (work phasing and sequencing, prioritization, project kickoff, fieldwork, reporting, closeout)

Permits and access agreements

1.3 - Preparing the Site-Specific Health and Safety Plan (HASP)

The site-specific hazards and potential risks associated with known conditions at the property or work area should be identified, reviewed, and addressed in the site-specific HASP. The site-specific HASP should be reviewed by project staff and readily available to them onsite during fieldwork.

Drilling activities are inherently dangerous and warrant detailed coverage in project specific health and safety planning. Drilling can be addressed in a HASP and Site-Specific Job Safety Analysis (JSA) developed by the contractor and the field team leader. The safe work procedures specified in the JSAs should be consistent with HDI's overall project HASP, and the client's site-specific health and safety requirements.

A JSA is a safety analysis tool that breaks down each work task into steps, assesses hazards and potential hazards associated with each step, and identifies corrective measures to mitigate or eliminate the hazard. JSAs should be prepared by workers experienced in the job to be performed and reviewed by the project team before going to the field, and then again onsite during the initial project kickoff and tailgate meetings. The following are tasks that may be addressed by one or more JSA:

1. Mobilization and Demobilization
2. Traffic control
3. Site security and site access
4. Delineation and identification of critical zones
5. Borehole siting and clearance - subsurface clearance protocol
6. Rig maintenance
7. Drilling operations
8. Equipment decontamination procedures
9. Well construction



10. Well development
11. Surface completions
12. Well abandonment
13. Well sampling
14. Emergency situation notification and procedures

JSAs should be developed, reviewed, and approved prior to the start of field activities, and updated as necessary based on new information or changed conditions.

1.4 - Planning and Facilitating the Kick-off Meeting

Informed planning and communication allows drilling tasks to be consistently performed safely. Essential participants in the review and kickoff process are the client/owner, consultant, driller, and field personnel that will execute the work. Following review, the participants should formally agree to or suggest revisions to the project plan. They should commit to rigorously implementing the HASP and stopping work when any unforeseen hazards are identified. Topics that may be addressed during the kickoff meeting include:

Scope of work

1. Client objectives
2. Technical approach - means and methods

Roles and responsibilities

1. Site management – owner or operator
2. Project management or field team leader
3. Health and safety management
4. All site workers – stopping unsafe conditions

Schedules

1. Mobilization
2. Drilling activities
3. Clean-up
4. De-mobilization
5. Sample management (e.g., deciding if rush turnaround services necessary for analytical results)

Simultaneous operations - on or off site activities that could impact drilling activity logistics or safety

Changed conditions

1. Access
2. Scope
3. Weather (include heat and cold management)
4. Work hour limitations
5. Construction



Review, verify and validate hazards and mitigation measures

Communication between field team, customer, and project management

1. Clearly communicate to project staff that stop work authority resides with every member of the project staff
2. Reporting incidents
3. Management of Change (MOC)
4. Schedule

Documentation

1. Sign-off on review and acceptance of HASP
2. Workplace inspection and audits
3. Completed checklists (pre-drill protocol, borehole clearance review, and others)
4. Adjustments to JSA to accommodate changing conditions.

Project planning and kickoff set the stage for safe work performance. However, incident free operation will be dependant on daily reviews of work to be performed and associated hazards and mitigation measures. Adjustments to JSAs to accommodate changed conditions should be made before work commences. Before beginning each field task, or when conditions change, HDI employees should:

Think through the task's work steps

1. Consider the potential for injury
2. Identify what they must do to prevent injuries or accidents from occurring.



SECTION 2 - MOBILIZATION, SET UP, AND DEMOBILIZATION

This section applies to mobilization and demobilization for the following types of site operations: air knifing, air vacuuming, drilling, using track and truck mounted drills, and equipment. This section does not cover safety related to site mobilization in passenger vehicles.

2.1 - Performing Pre-Mobilization Tasks

2.1.1 - Inspections and Maintenance

It is important to ensure all HDI vehicles are road worthy (that is, that they have been properly maintained and inspected) before using them on public roadways or project sites. Federal, state, and local laws require that vehicles be properly maintained and safe to operate upon our highways. It is the responsibility of the owner or operator to ensure that:

All drivers are properly licensed for the equipment that they are to be driving and that they are trained in safe driving procedures.

Equipment is inspected prior to being moved and any deficiencies corrected prior to moving the equipment.

Complete annual inspections of vehicles is performed.

All drivers should have in their possession the Federal Motor Carrier Safety Regulations Pocketbook. These regulations require that no motor vehicle be driven unless the driver thereof has satisfied him or her self that the following parts and accessories are in good working order, nor will any driver fail to use or make use of such parts and accessories when and as needed:

- Service brakes, including trailer brake connections
- Parking (hand) brake
- Steering mechanism
- Lighting devices and reflectors
- Tires
- Horn
- Windshield wiper or wipers
- Rear-vision mirror or mirrors
- Coupling devices
- Seat belts
- Cleanliness and housekeeping of vehicle exterior/interior

The above is a representative list of items that must be checked prior to moving a vehicle.

Perform a final examination to verify that the vehicle and load are safe to be moved. Know the height, width and weight of the load. Verify that any needed permits are obtained or will be obtained en route to the drill site.



Verify that all necessary traffic-control devices for each site to be visited that day are loaded in the vehicles before they leave the office.

For contract traffic-control services, verify that they are scheduled to be at the site with all needed equipment.

2.2 - Loading and Unloading a Truck Mounted Drill Rig

When loading or unloading a drill rig on a trailer or a truck, follow these precautions:

1. Select an area of level ground for loading and unloading.
2. Have a spotter guide the driver off of the trailer or truck.
3. Before using a ramp, verify the brakes of the drill rig are in working order.
4. Ensure that any ramps used are designed for this purpose and provide a sturdy and solid. Enough base to bear the weight of the drill rig with carrier including tooling.
5. Verify that when the drill rig is on the trailer, the weight of the drill rig, carrier and tools are centered on the centerline of the trailer. In addition, some of the trailer load should be transferred to the hitch of the tow vehicle. Refer to the trailer recommendations for weight distribution provided by the manufacturer.
6. Verify the drill rig is secured to the towing vehicle with ties, chains, or load binders that can handle the required weight.

2.3 - Physically Accessing the Equipment and Vehicles

Use proper mounting and dismounting techniques when climbing into and from vehicles or equipment. Some tips are:

- Face the equipment and use the hand and footholds provided – maintain three points of contact with the equipment
- Do not jump off equipment.
- Use vehicle ladders to access truck beds.
- Do not climb on tires.

2.4 - Traveling to the Site

2.4.1 - Driver Requirements

All HDI drillers and drivers must:

1. Be properly licensed and operate vehicles in compliance with federal, state, and local regulations.
2. Be aware that every car, truck, tractor, and drill rig has its own handling characteristics; every new driver should learn these characteristics in the company of an experienced driver.

3. Every employee should be qualified on each type of vehicle and equipment the employee will operate prior to operating the vehicle or equipment unsupervised.
4. Every employee knows the dimensions of any equipment he or she is driving, including the required overhead clearance, and the width, length and weight of the rig. The driver also knows the load limits for highways and bridges, and verifies that the vehicle is not exceeding those limits.

2.4.2 - Road Travel and Vehicle Safety

Perform a pre-trip vehicle inspection and obey state and federal DOT guidelines. Check vehicle maintenance records to assure any needed maintenance has been performed. Pre-operate equipment before leaving for the site and be familiar with operator's manual. Leave early, practice defensive driving, and observe the speed limit.

Drill rigs are top-heavy:

1. Maneuver highway ramps or tight curves at a slow and safe speed, avoid quick lane changes.
2. Allow a safe distance between you and the vehicle ahead and use your turn signals.
3. Know the traveling height of your equipment.
4. Secure any load(s) properly.
5. Inspect trailer and hitch, safety chains, wiring connectors, lights, and brakes, if applicable.

While traveling to and from the site observe the following:

1. Move disabled vehicle off the road and set out flares and reflectors or cones, and leave trouble lights on and flashing.
2. Never work under a vehicle unless steps have been taken to prevent it from rolling. In addition to setting the parking brake, use chock blocks or other methods to secure the vehicle to prevent movement.
3. Never leave mobile equipment unattended unless the controls are placed in gear or the Park position and the parking brake is set. When parked on a grade, chock the wheels or turn them into the bank.
4. Allow for mast overhang when cornering or approaching other vehicles or structures.
5. Do not operate trucks 1-ton and above unless equipped with automatic backup alarms.
6. Wear seatbelts at all times as driver or passenger when the vehicle is in motion.

2.4.3 - Transporting Drill Rigs

When transporting an HDI drill rig onto and off of a drilling site, follow these procedures:

1. Verify all measurements of the drill rig with carrier including the traveling height (overhead clearance), width, length, and the highway and bridge load, width and overhead limits. Allow adequate margins, it is your responsibility to verify they are not exceeded.
2. Prior to moving a drill rig, check to verify that the brakes are in reliable working order.



3. When cornering or approaching other vehicles or structures remember to allow room for the mast overhang.
4. Keep in mind that the drill rig mast is often too tall to clear the canopies of service stations and other facilities, even in the travel position.
5. Monitor low hanging electrical lines, particularly at the entrances to drilling sites, restaurants, motels, or other commercial sites.
6. When traveling on a street, road, or highway, the mast of the drill rig must be completely lowered.
7. If the rig is being left unattended, remove all ignition keys.
8. Passengers are not allowed to ride on the drill rig.
9. Use caution when driving equipment with a high center of gravity, such as a portable drill rig. Allow for the increased and higher weight by making turns slowly and allowing for a greater stopping distance than normally needed.
10. Always know where your helper or driller is. Never move the drill until they are accounted for.
11. Establish, learn, and use the proper signals when moving a drill rig.
12. Never move the drill rig with the mast up- even short distances.

2.4.4 - Entering the Site

It is the responsibility of the HDI operator of the vehicle or rig to ensure that the drill site is safe to enter and that it is safe to begin work. Such inspections often include the following:

1. Are high voltage overhead power lines or any other utility lines present in the immediate area? A safe distance of thirty or more feet laterally to either side of the overhead utility should be observed when setting up in the vicinity of overhead lines. This distance may need to be adjusted, depending on the hazards involved, size of mast on the drill rig, and other considerations.
2. Have all underground utilities been identified?
3. Is there a danger of being struck by other moving vehicles?
4. Is there a danger because of possible instability of high walls, banks, pits, rivers, and other related items?
5. Are poisonous plants, animals, or insects in the area of the drill site?
6. Is the site designated as a Hazardous Waste Site or have other hazards been identified or suspected, such as H₂S, Methane, or other chemicals? If so, are proper procedures for working in these environments in place, including proper training of employees and certification of safety equipment?
7. Is there a danger of lightning strikes? This subject must be addressed regardless of time of year or current weather conditions.
8. MSDS sheets must be on hand for all materials and chemicals brought to the site.



2.5 - Confirmation Activities for Clearances and Borehole Positioning

2.5.1 - Permits

Copies of all necessary permits will be provided to the HDI Lead Driller or Acting Lead Driller, and any further information relevant to the drilling operation.

It is the HDI driller's responsibility to verify the necessary permits have obtained and it is safe to drill.

Based on either site conditions or the planned ground disturbance activities, to ensure the safety of all on-site personnel and subsurface structure integrity, consideration should be given to locking out selected site utilities or temporarily shutting down a portion of or the entire facility.

2.5.2 – Markings

Complete utility location prior to drilling [One Call: 811 or your local utility locating service] and coordinate with the drilling contractor and site personnel.

1. Mark locations in white.
2. Field verify utility locations.
3. Document all utility locates on a plot plan or other map of the site.
4. Observe the area for indications of utilities.
5. Hand dig if questions remain or if required by the property owner.
6. Refer to your specific Utility Clearance and Isolation procedure.

2.5.3 - Site Communication and Safety Review

Verify all new HDI drill rig workers are informed of safe operating practices and emergency procedures on and around the drill rig and provide each new drill rig worker with a copy of the organization's drilling operations safety manual and, when appropriate, the drill rig manufacturer's operations and maintenance manual. The HDI site safety supervisor should assure that each new HDI employee reads and understands the safety manual. If applicable, the emergency shut off/kill switch location and use should be reviewed with all HDI crew members as well as visitors to the site.

If the site poses a chemical safety hazard, review potential signs and symptoms of exposure, routes of exposure, and protective measures to be used to minimize or prevent exposures (such as protective clothing and monitoring).



2.5.4 - Walk Through and Visual Inspection

Upon arriving at the drill site, verify that it is safe to enter and set up on the site. As mentioned earlier, it is important to:

1. Look for overhead and underground power and other utility lines.
2. If present, verify that the rig is being set up a safe distance from these lines.
3. Investigate and note all overhead obstructions.
4. Check boring locations for proximity to any overhead lines.
5. Maintain required clearance from electrical lines. Refer to section 4 – Drilling Operations for more detail. High-tension lines require greater clearances.
6. Consider having lines in the work area covered to provide a greater safety margin

If necessary, contact someone to verify that these lines are safe to work near (that they have been de-energized provided that they were supposed to have been de-energized). Assume a line is energized until you have verified it isn't. If in doubt, do not raise the mast - ASK!

Examine the actual location where the drill is to be set. If possible, it is best to have a level and clean area. Remove rock and other debris that may interfere with the drilling operation or pose safety hazards.

Be sure to follow the instructions contained in the HDI or client's site health and safety plan. This includes the wearing of special chemical protective clothing, air purifying respirators or self-contained breathing apparatus before moving into location.

Walk the line the rig is to travel in order to delineate any soft or wet ground. Look for field tile washouts, hidden ditches or drop-offs, boulders, debris, or other potential obstacles.

2.6 - Preparing for Drilling

2.6.1 - Preparing the Site

Prior to drilling, adequate site clearing and leveling should be performed to accommodate the drill rig and supplies and provide a safe working area. Drilling should not be commenced when tree limbs, unstable ground, or site obstructions cause unsafe drilling conditions. Housekeeping should be done to ensure a clear area for all site personnel.

Prior to move-in, the site should be adequately cleared and leveled to accommodate the drilling equipment and supplies, and to minimize fire hazards.

Evaluate the drilling site prior to setting the leveling jacks, especially if the location is on water saturated, frozen, or loose, caving soil. Do not set up on sloped ground. If necessary, build up solid, compacted earth where the jacks will contact the ground.



Job site should be on level ground (recommended no more than 5% grade), with solidly compacted soil to support the drill rig and auxiliary equipment. If it is necessary to work on a slope, the rig should be backed perpendicular to the slope so at least the rig is level left to right and the driller's platform is closer to the ground.

If it is necessary to drill within an enclosed area, verify that exhaust fumes are conducted out of the area. Exhaust fumes can be toxic and some cannot be detected by smell.

2.6.2 - Traffic Control

Traffic control devices may consist of items such as:

- ◆ High visibility vests/shirts
- ◆ Traffic cones
- ◆ Flags
- ◆ Caution tape
- ◆ Other devices such as signs, barricades, amber flashing lights, or fencing

It is recommended that each work area be cordoned off with traffic cones or other traffic control devices as appropriate to site-specific conditions. To increase visibility to vehicular traffic, it is recommended that every other cone have a flag inserted through its middle. Caution tape should be used to join all of the traffic control devices so that no one can easily walk through the work area. It is also recommended that work vehicles be used to shield field personnel from traffic hazards when practical. In addition, high-visibility clothing should be worn by workers.

2.6.3 - Considerations for Retail Service Stations and Other Onsite Locations

As there are no lanes marked out for traffic flow through most of these sites, and there are typically numerous entry points onto them, field personnel are vulnerable to traffic from all sides. In order to minimize the risk of being struck by a vehicle while performing tasks on site, field personnel may consider the following guidelines when developing work site traffic control plans:

1. Review the site-specific Health and Safety Plan (HASP) for safety and any special traffic control details for the site you will be working on and the tasks you will be performing.
2. Wear the appropriate PPE for the work to be performed as indicated in the HASP.
3. Assess the work location for potential traffic exposure. Stay alert at all times since vehicular traffic is often continuous and uncontrolled on these sites. Evaluate all possible directions from which traffic may approach including the possibility of vehicles backing up. Never assume any potential pathway to be safe. Attempt to set up the work area on site with field personnel facing toward the highest potential for traffic while they work.
4. Conduct a site pre-job safety meeting and complete the Daily Site Checklist, if included in the HASP, and sign-off on both the checklist and the HASP.
5. Using the traffic control devices, establish your work zone as per the specifications detailed within the HASP.



6. Perform all work to be completed within the work zone before breaking down the traffic control system.
7. Clear the work area and break down the traffic control system.

2.6.4 - Working in or Near Active Roadways

Traffic control in these areas should be managed through development of an appropriate traffic control plan. A traffic control plan specific to the work site should be developed and included in the HASP, prior to performing work in these areas. Local and state requirements should also be consulted for possible permitting or additional traffic control requirements prior to performing any work in these areas.

2.6.5 - Establishing Work Areas Using Monitoring or Barricades

The HDI field supervisor will designate the work zone based on site constraints before drilling begins. Preferably, the geotechnical workstation should be set up outside of the immediate drilling work area a distance of at least 1.5 times the mast height away from the drill.

1. When possible, an exclusion zone with a radius of at least one mast length shall be created around the rig. Unauthorized personnel shall be kept clear of this zone.
2. Post No Smoking signs around work area
3. Establish designated smoking area away from work area
4. Client will monitor air concentrations using direct-reading, real-time instruments such as OVM and colorimetric detector tubes
5. Define and secure all work areas with safety cones, safety tape, construction fence, other barriers, or signs as appropriate.

2.6.6 - Establishing Site Security

Confirm required security is in place and as dictated by the site-specific HASP prior to beginning drilling operations. This may involve security personnel, physical barriers, or both.

2.6.7 - Storage and Material Handling

The key for a safe and smooth startup is to organize the work area prior to commencing drilling operations:

1. Do not attempt to commence drilling before everything is unloaded and organized. Drilling will progress smoothly and accidents will be less likely if the driller takes the time to properly set up and organize first.
2. The first requirement for safe field operation is that everyone understands and fulfills the responsibility for maintenance and housekeeping on and around the drill rig.

3. Suitable storage locations should be provided for all tools, materials, and supplies so that tools, materials, and supplies can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor. Store items so that the work can proceed in an orderly fashion, with sufficient room in the work area to move about without tripping over supplies or equipment. Do not store equipment in places that would interfere with escape routes in an emergency.
4. Avoid storing or transporting tools, materials, or supplies within or on the mast of the drill rig.
5. Establish a suitable location for storage of tools, equipment and supplies so those items can be safely and conveniently stored and located when needed. Keep all tools supplies and equipment in their proper places.
6. Every crewmember must inspect their work site upon arrival to verify that equipment is in safe condition and the job site is in proper order. Return the job site to proper order prior to proceeding with work.
7. Drill rod, casing, augers and similar tools should be stacked orderly on racks to prevent sliding, rolling, spreading, or falling. When stationed on the ground prior to use, these tools may need to be chocked to prevent inadvertent or unanticipated rolling.
8. Work areas, platforms, walkways and other access-ways should be kept free of obstructions such as materials and tools, and substances such as debris, grease, ice, and mud, in order to minimize the tripping, slipping and falling hazards around the drill rig.
9. All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, visitors or animals from stepping or falling into the hole.
10. Use approved cleaning solvents instead of flammable liquids as cleaning agents on or near a drill rig.
11. Never use compressed air for the purpose of cleaning clothes.
12. All trash should be placed in bags and stored in areas outside of the immediate work area.
13. All controls, meters, dials, and operational and warning lights should be kept free of dirt, grease, and mud.
14. Keep all flammable liquids in proper containers and stored away from heat and spark sources.
15. All drilling fluids must be contained and disposed off-site
16. Pipe, drill rods, casing, augers, and similar drilling tools should be orderly stacked on racks or sills to prevent spreading, rolling, or sliding.
17. Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.
18. Work areas, platforms, walkways, scaffolding, and other access-ways should be kept free of materials, debris, and obstructions and substances such as ice, grease, or oil that could cause surfaces to become slick or otherwise hazardous.

2.6.8 - Fire Prevention

Fire prevention must be addressed prior to commencing any HDI job. Failure to prevent a fire on a job site could result in severe injury or even death of employees. In addition to the potential for loss of life, severe equipment damage can result along with damage to surrounding areas. It is therefore the responsibility of the owner, operator, driller, helper, and anyone else involved in the drilling operation to take proper steps to reduce the possibility of a fire.



Such steps should include:

1. When possible, the surrounding area should be cleared of materials that are readily combustible, such as weeds, grass.
2. No smoking policies should be observed when working on drilling operations.
3. Fire extinguishers of the appropriate size and type for the particular fire hazard involved must be present on the drill site. It is recommended and required on some jobs, that a fire extinguisher be present in every vehicle involved with the drilling activities.
4. Only onsite personnel, trained in basic fire fighting techniques and in the proper operating procedures associated with the use of fire extinguishers, should respond to fires.

The best method, of course, is to prevent the fire entirely. Proper storage of fuels and good maintenance of hoses, and equipment on the rig will prevent many fires. A proactive approach is by far better than the best reactive solution to any problem.

2.6.9 - Safety Equipment

Safety equipment to consider includes but is not limited to traffic cones, PPE, barricades, barrier tape, signage, A fire extinguisher, blood borne pathogen kit, and first aid kit should be kept or available on site. Telephone access is essential. Identify the location of the nearest available telephone and, unless specifically forbidden by the site owner, ensure the team has access to a cell phone (unless prohibited). If the team is planning to use a cell phone, check for adequate signal strength upon arrival at the site. Refer to section 4.8 for additional information about safety equipment.

2.7 - Moving People and Equipment at the Site

Navigating across the site requires special attention. Many safety incidents occur in and around moving vehicles and equipment. The following guidelines will help eliminate some common dangers.

2.7.1 - Placing the Equipment

The following safety suggestions relate to off-road movement:

1. Never drive onto an off-road site or move a drill rig without first walking the route to check for depressions, rocks, stumps, gullies and similar obstacles. Be aware that overhead clearance requirements can vary dramatically as the vehicle rocks up and down while driving over obstacles and rough terrain.
2. Check the brakes of the drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
3. Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mounting.
4. Discharge all passengers before moving a drill rig on rough or hilly terrain.



5. Use caution when traveling side-hill. Conservatively evaluate side-hill capability of drill rigs because the arbitrary addition of drilling tools may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire-pressures before traveling in hilly terrain (do not exceed rated tire pressure).
6. Attempt to cross obstacles such as small logs and small erosion channels or ditches squarely, not at an angle.
7. Use the assistance of someone on the ground as a guide when lateral or overhead clearance is close.
8. After the drill has been moved to a new drilling site, set all brakes and locks. When grades are steep, block the wheels.
9. Never move a drill rig with the mast up.
10. Maintain eye contact with the operator when directing the rig on to a boring location.
11. Always walk around the truck prior to backing to assure that the area behind the truck is clear of equipment and workers.
12. Never back out of a site onto a highway, unless traffic control is provided.
13. Always position the vehicle in the safest possible place at drilling locations
14. When working in a lane-closure do not enter the lane closure until it is set up, do not work in an improperly set up lane closure.
15. CDL holders required by DMV to wear corrective lenses must wear them at all times performing Safety sensitive duties.
16. When overhead electrical power lines exist at or near a drilling site or project, consider all wires energized.
17. Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the utility and ask them to lift or raise the lines or de-energize (turn off) the power.
18. Before raising the drill rig mast on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised and while being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 feet (6 m) or, if known, the minimum clearance stipulated by Federal, state, and local regulations.
19. Keep in mind that both hoist lines and overhead power lines can be moved toward each other by the wind.
20. If there are any questions concerning the safety of drilling sites in the vicinity of overhead power lines, call the power company. The power company will provide expert advice at the drilling site as a public service and at no cost.
21. Watch for overhead obstructions. Never travel between borehole locations with the mast, or feed cylinders, in a raised position.
22. Know the location(s) of any other heavy equipment moving or working on-site.
23. Weekly, inspect the complete drive train of a carrier for loose or damaged bolts, nuts, studs, shafts, and mountings.
24. When travel takes you off road and into hill terrain, use the front axle (for 4x4, 6x6, etc. type vehicles or carriers). If equipped with multiple speed transfer case, operate in low range. Always refer to the manufacturer's recommendations.



2.7.2 - Loading and Unloading Rigs

When loading or unloading a drill rig on a trailer or a truck, follow these precautions:

1. Verify you are on level ground for loading and unloading
2. Have someone on the ground guiding you.
3. Before using a ramp, verify the brakes of the drill rig are in working order
4. Ensure that any ramps used are designed for this purpose and provide a sturdy and solid enough base to bear the weight of the drill rig with carrier including tooling.
5. When the drill rig is on the trailer, verify the weight of the drill rig, carrier and tools are centered on the centerline of the trailer. In addition, some of the trailer load should be transferred to the height of the towing vehicle. Refer to the trailer recommendations for weight distribution provided by the manufacturer.
6. Verify the drill rig is secured to the towing vehicle with ties, chains, or load binders that can handle the required weight.
7. Inspect the trailer tires before loading or unloading. A flat tire will cause the rig and trailer to lean and equipment could come off the trailer.
8. When traveling on the road, be sure the rig's slide base is in fully, that the rig is completely on the trailer, in the proper position, and secured.
9. Skidding the rig off the trailer and to boring locations requires forethought and caution. Do not ride the skids when moving the rig. Avoid potential rollovers by skidding the rig perpendicular up a slope, not parallel or at a shallow angle to the slope.
10. Provide a secure base and use cribbing of the appropriate size to level the rig.
11. Secure the rig to the pavement, floor, or ground with anchor bolts, frost augers, chains, cables, or as appropriate.

2.7.3 - Start Up

Precautions for Setting up and Blocking the Drilling Rig.

It is the driller's responsibility to verify the rig is properly set up. The stability of the drilling rig is critical to assure safe drilling operations. Some things to consider when setting up are provided below.

1. Whenever possible, the driller should choose a dry, level, and reasonably smooth drilling site. Verify the rig's parking brake is engaged and that the wheels which will remain on the ground are blocked. Blocking the rig will help to provide a more stable drilling structure by distributing the weight of the rig evenly. If the rig is equipped with jacks or outriggers, they will be extended from the rig to the ground, raising the rig partially or entirely off the ground. Proper blocking of the rig will prevent differential settling which could result in the rig toppling sideways. Blocks should be placed between the jack swivel and the ground to provide more support area under the pad.
2. All drill rig personnel and visitors should be instructed to stand clear of the drill rig immediately prior to and during starting of an engine.
3. Before start-up, check that all brakes are set, all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers or air controls are in the correct position.
4. Follow all guidelines provided by manufacturers with regards to starting up engines.

5. Check for warning or lockout tags on the controls. Do not start any engine without having the tag removed by the person responsible for the install.
6. Prior to lowering the leveling jacks, we recommend that a timber or plank be placed beneath the jack. By performing this function, it will be less likely that the jacks will sink into the ground. Even on asphalt, jacks could possibly, over time, sink down to the point that the rig might not remain level. Insure that the rig is level and everything is secured prior to raising the mast. Before the mast is raised, the rig must be leveled and stabilized with the leveling jacks.
7. Verify before drilling is started with a particular drill, that the operator (who may be the safety supervisor) has had adequate training and is thoroughly familiar with the drill rig, its controls, and its capabilities.
8. Inspect the drill rig when it first arrives onsite and then at least daily for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, damaged pressure gauges, and pressure relief valves.
9. Check and test all safety devices such as kill switches at least daily and preferably at the start of a drilling shift. Drilling should not be permitted until all kill switches and warning systems are working correctly. Do not wire around, bypass, or remove an emergency device.
10. Verify all gauges, warning lights, and control levers are functioning properly and listen for unusual sounds on each starting of an engine.
11. Verify nothing is loose on the mast that would fall when the mast is raised to its upright position. When the mast is raised, take measures to secure it properly.

2.8 - Shut Down - Temporary (Daily) and Permanent

2.8.1 - Temporary Shut Down

Inspect equipment at the start of each shift (pre-op) and at the end of each shift (post-op). Correct all major defects and safety defects prior to the start of work. All air and water lines and pumps should be drained when not in use if freezing weather is expected. If appropriate, the rig should be winterized at the end of each day.

All unattended boreholes must be adequately covered or otherwise protected to prevent HDI drill rig personnel, site visitors, or animals from stepping or falling into the hole. For remote, idled, or access controlled sites, clearance holes can be left open, however, use hazard cones, fencing or other methods to identify the hazard.

2.8.2 - Demobilization

Refer to the pre-travel inspection and safe driving procedures outlined in Section 1 and 2 when demobilizing.

1. When loading equipment prior to demobilization, be especially alert to potential back injuries. Use proper lifting techniques including getting help if necessary.
2. Verify any waste materials have been removed from the site or properly contained, labeled and scheduled for pickup.



3. All open boreholes should be covered and protected or backfilled adequately and according to local and state regulations on completion of the drilling project.

SECTION 3 - DRILLING OPERATIONS

3.1 - Rig Set-up

The drilling contractor is responsible for ensuring that the rig is properly set-up. This includes such tasks as stabilizing the rig, clearing the location of overhead obstructions that may contact the mast as it is being raised or is in the fully raised position, and raising the mast. Each task is discussed in greater detail below.

3.1.1 - Drill Rig Stabilization

Rig stability is essential for conducting safe drilling operations. Components to assuring proper stabilization include rig placement (or location), use of hydraulic leveling jacks, use of blocking (or cribbing), and use of wheel chocks. Specific items to consider include the following:

Rig Placement

1. To the extent possible, situate the rig on dry, level (recommended no more than 5% grade), and stable compacted ground surface.
2. To the extent possible, avoid rough terrain and sites that do not allow sufficient space for worker access and egress to and from rig and associated support equipment.
3. Carefully evaluate the drilling site prior to setting the leveling jacks, especially if the location is on water saturated, frozen, or loose, caving soil.
4. Avoid situating rig on sloped ground. If necessary, build up solid, compacted earth where the jacks contact the ground.
5. Rig is to be backed perpendicular to slope so at least the rig is level left to right, and the driller's platform is closer to the ground.
6. The jacks from left to right should be as level as possible to prevent the rig from moving during operation.
7. When setting up drilling fluid discharge, ensure it is channeled away from the rig to avoid soil erosion under jacks and cribbing.
8. Avoid situating rig where overhead obstructions, such as tree limbs, canopies, overhead power lines, and piping racks, create unsafe drilling or tool handling conditions.
9. Engage the emergency brake once the rig has been positioned.

Jacks

1. Lower or extend leveling jacks and outriggers to raise the rig partially, or in some cases entirely, off the ground and to minimize the potential for the rig to tip over once the mast is raised.
2. Do not position hands on or near jacks as jacks are being lowered or raised.
3. Maintain jacks in lowered position as long as mast is raised.
4. Non-skid jack pads are recommended for unimproved terrain or slopes.
5. Be sure to monitor all rig jacks during setup and operation (front center and/or rear).
6. Jacks should be inspected throughout drilling operations to identify changing ground conditions.

Blocking and Cribbing

1. Blocking and cribbing is designed to distribute the weight over a larger surface area. When drilling on non-compacted soil, use blocks of sufficient strength to support the weight of the rig and to provide a more stable drilling structure. The larger the blocks (length, width, and height) the more evenly distributed the rig's weight will be and the potential for differential settling will be minimized. Blocks will more evenly distribute the rig's weight and will prevent differential settling.
2. Recheck the status of blocking and cribbing at the beginning of each shift to evaluate stability.
3. Locate blocks between the jack swivel and ground.
4. Re-level drill rig if settling occurs after initial set-up.

Wheel Chocks

1. If the rig is positioned on an incline and leveling of ground is impossible or impractical:
2. Chock the wheels of the rig remaining in contact with the ground.
3. Chock wheels of all support equipment and trailers.
4. It is highly recommended that wheel chocks be used even if the rig is on level ground.

3.1.2 - Overhead Hazards

Contact with overhead obstructions when raising the rig mast can result in property damage, injury, and, most importantly, loss of life. The most frequent cause of job-related death in the drilling industry is electrocution caused by contact of the drill rig with overhead power lines. Additionally, contact with overhead power lines can result in electrical shock and electrical burns. Drilling should not commence without first determining the risk posed by obstructions such as tree limbs, protruding objects and structures, and overhead power lines.

The proposed drilling location should be inspected by the drilling contractor prior to setting-up the rig to ensure that all such obstructions have either been removed or that the risk of contacting such obstructions has otherwise been mitigated. Specific items to consider include the following:

Structures

1. Prior to raising mast, review location for the presence of overhead structures, such as canopies, trees, or piping racks.
2. Maintain sufficient horizontal space (approximately 10 ft) between overhead structures and rig to allow for mast to go past vertical when being raised.

Overhead Power Lines

1. Contact the power company for expert advice on drilling in the vicinity of overhead power line(s) at a specific location and to determine if the power line(s) can be de-energized during drilling operations. Never assume a line is de-energized - ASK! If in doubt, do not raise the mast.
2. Inspect location for sagging power lines before making entry with rig. Never lift power lines to gain entry to location.

3. Note location of overhead utilities on all boring location plans and site work plans. Whenever possible, locate borings to avoid any possibility of contact with power lines. Walk completely around the rig to determine what the distance will be between the nearest power line and the mast as it is being raised and in the raised position
4. When drilling near overhead power lines is unavoidable, allow sufficient space between the mast and the overhead lines. Because of the difficulty in estimating distances from the ground and the effects of wind on the power lines and hoist lines of the mast, it is advisable to maintain a 20-foot clearance.
5. Post signs on ground level to alert workers to the presence of overhead utilities.
6. Never raise the mast of the rig without a designated spotter.
7. Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following per 29 CFR 1926.550(ii): For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet, For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV over 50 kV, or twice the length of the line insulator, but never less than 10 feet,
8. In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, and 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.
9. Use a more conservative spacing requirement as stipulated by state or local regulations,
10. Because of the difficulty in estimating distances from the ground and the effects of wind on the power lines and hoist lines of the mast, it is advisable to maintain at least a 20-foot clearance.
11. Confirm with the power company that overhead power lines have been de-energized prior to drilling.
12. Never drive the drill rig from hole to hole with the mast in the raised or partially raised position.

If contact between rig and power line occurs:

1. Assume the entire rig to be electrified. Do not attempt to enter or leave the rig or touch any part of it. Although people in the rig may not be affected, anybody touching the rig while in contact with the ground is in danger of being electrocuted.
2. Have someone call the power company and the local fire rescue squad immediately for assistance.
3. Do not touch any person who may be in contact with the current.
4. If a rescue is attempted, use a dry, clean rope or a dry, unpainted wood pole to remove the victim. Do not touch the victim until he has been removed from the current.
5. If the victim is unconscious when released from the current, check his breathing and pulse and, if needed, begin CPR immediately.
6. Under most circumstances, the operator and other personnel on the seat of the vehicle should remain seated and not leave the vehicle. Do not move or touch any part, particularly a metallic part, of the vehicle or the drill rig.
7. If you are on the ground, stay away from the vehicle and the drill rig, do not let others get near the vehicle and the drill rig, and seek assistance from local emergency personnel, such as the police or fire department.

3.2 - Raising the Mast

Once the rig has been properly stabilized and the location cleared of overhead obstructions, the rig mast can be raised. Specific items to consider include the following:

Starting the engine

1. Start all engines in accordance with the manufacturer's manual.
2. All drilling rig personnel and visitors should be instructed to stand clear of the drilling rig immediately prior to and during starting of an engine.
3. Check for warning or lockout tags on the engine controls. If a warning or lockout tag is attached to the switch, do not start the engine until the warning tag has been removed by the person who installed it.
4. Verify all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct non-actuating positions, and the cathead rope is not on the cathead before starting a drilling rig engine.

3.2.1 - Jump Starting an Engine with a Dead Battery

Use the following procedure when jump starts are necessary:

1. Connect one of the positive (+) cable clamps (red) to the positive terminal of the discharged battery.
2. Connect the positive clamp (red) from the other end of the jumper cable to the positive (+) terminal of the good battery.
3. Connect the clamp from the negative jumper cable (black) to the negative (-) terminal of the good battery.
4. Connect the negative cable clamp (black) on the other end of the jumper cable to the engine block or other good engine metal surface on the vehicle with the discharged battery. Do not connect the negative clamp to the negative (-) terminal of the discharged battery. This may trigger a spark and result in explosion of the gases surrounding the battery, causing injury.

Raising the Mast

1. Before raising the mast, look up to check for overhead obstructions.
2. Remove all loose objects, such as equipment and tools from the mast and inspected for damaged parts
3. Raise the mast only after the leveling jacks are down. Do not raise the jacks until the mast has been lowered completely.
4. Before raising the mast, all drill rig personnel (with exception of the operator) and visitors should be cleared from the areas immediately to the rear and the sides of the rig. No other work should be performed in the vicinity of the mast while it is being raised or lowered.
5. Only qualified personnel may raise or lower the mast.
6. Raise the mast a few inches in order to check brakes.
7. Never drive the drill rig from hole to hole with the mast in the raised or partially

raised position.

Securing Mast

1. Secure or lock the mast in upright position according to the drilling manufacturer's recommendations.

3.3 - Auger Drilling

Auger drilling uses direct power to rotate (screw) flighted augers into the ground. Drill rigs must have kill switches in operable condition. Familiarize yourself with their location and operation. At least two persons must be present when operating the rig. Do not wear loose clothing, jewelry, hair, or equipment near the auger

The operator and tool handler should establish a system of responsibility for the series of various activities required for auger drilling, such as connecting and disconnecting auger sections, and inserting and removing the auger fork. The operator must assure that the tool handler is well away from the auger column and that the auger fork is removed before starting rotation.

Be aware of the following hazards which may be unique to this type of drilling:

1. Clean the auger's male and female ends with a wire brush. Do not clean out bolt holes with your fingers. When applicable, couple the rig to the next auger while that auger is on the ground, then allow the machine to pick it up and place it on the down-hole string. Idle the machine down before engaging the rotation.
2. Only use the manufacturer's recommended method of securing the auger to the drill drive coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tools during rotation.
3. Whenever possible, use tool hoists to handle auger sections.
4. Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground, or over other hard surfaces such as the drilling rig platform.
5. Never allow feet to get under the auger section that is being hoisted.
6. Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.
7. Use low-profile auger pins.
8. Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
9. Look at the auger head while slowly engaging the clutch or rotation control and starting rotation.
10. When rotating augers, stay clear of the rotating augers and other rotating components of the drilling rig. Never reach behind or around a rotating auger for any reason whatsoever.
11. Slowly rotate the auger and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about 1 foot or more below the ground surface.
12. If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control and repeat the hole starting process.

13. An auger guide can facilitate the starting of a straight hole through hard ground or a pavement.
14. Never place your hands between the drill rig and an auger, even when attempting to free damaged or bound sampling equipment from the auger.
15. Use a long-handled shovel to move auger cuttings away from the auger. Never use hands or feet to move cuttings away from the auger. It is preferable to move cuttings while the auger is inactive.
16. Augers should be cleaned only when the drill rig is in neutral and the augers have stopped rotating.
17. After loosening the top auger from the down-hole string, allow the machine to pick up the auger off of the string and set it on the ground, then uncouple from the machine.
18. Care should be taken to ensure augers are properly stored and secured when not in use and during transport.

When using screw together augers consider the following:

1. When coupling augers, idle the machine down while screwing together the augers and remove the auger catcher before rotating the auger string.
2. When uncoupling augers, clean off the area where the pipe wrench jaws will engage the bottom auger.
3. Drillers should remove their hands from the rotation lever or clutch handle while allowing the helper to place the wrench in the proper position. The helper should loosely hold on to a rope attached to the end of the pipe wrench to maintain tension. After breaking the auger, drillers should remove their hand from the rotation lever or clutch handle while allowing the helper to remove the wrench and put the auger catcher in place.

When using bolt-together augers, consider the following:

1. Do not use bolts with excessively rounded heads or worn out threads.
2. Do not use a worn out socket or breaker bar.
3. Pull on the breaker bar to tighten bolts. Do not push.
4. Drillers should remove their hands from the rotation lever or clutch handle while auger bolts are removed and the auger catcher is positioned.
5. If the top auger will not disengage from the string, strike the auger with a hammer on the thick area of the female coupling end.
6. Do not strike the flights, bolt holes, or the body (tube) of the auger.
7. If the auger cap bolt will not loosen by hand, tap it with a hammer or use the breaker bar and socket.
8. If the top cap will not disengage from the auger, strike the cap with a hammer.

When using solid stem flight augers, consider the following:

1. Place the C-pin so the movement of cuttings up the flights will not disengage it.
2. Drillers should remove their hands from the rotation lever or clutch handle while allowing the helper to remove the C-pin and put the auger catcher in place.
3. When hoisting a string of augers from the borehole, use the proper top adapter that will not allow the string to become disengaged from the hoist line.



3.4 - Rotary Drilling

The term mud rotary means direct rotary drilling using mud slurry or water circulation to remove cuttings and keep the borehole wall stabilized. Be aware of the following hazards which may be unique to this type of drilling:

1. Lifting heavy equipment (such as drill rods, flight augers)
2. Rotating equipment and parts, flight augers.
3. Slippery or dangerous work areas caused by messy mud pits or troughs (workers could fall in), keep work area clear.
4. Water swivels and hoisting plugs should be lubricated and checked for frozen bearings before use.
5. Do not hold on to the discharge hose, or allow it to coil around your feet, while the tools are rotating.
6. When unscrewing a side-mount water swivel from the drill string, be sure the string is sitting on the bottom of the borehole. Do not hold on to the back-up wrench while tools are rotating.
7. Use the proper size wrench to makeup and breakout joints of casing. Put yourself in a stable position and pull, do not push, on the wrench.
8. Keep hands away from the bottom of the bit assembly when removing it from, or inserting it into, the casing or boring. Set the assembly on the ground and remove it from the overshot - do not allow it to hang from the wire line.
9. Use full grip circle wrenches to assemble and disassemble core barrels.
10. Keep hands away from the bottom of the core barrel or inner tube when removing it from, or inserting it into, the casing, augers, or drill rods.

Air rotary is direct rotary drilling using high pressure air circulation to remove cuttings and keep the bit cool. Be aware of the following hazards which may be unique to this type of drilling:

1. Rotating/lifting equipment.
2. High pressure air lines.
3. Air discharge of cuttings at high velocity (use a cover to control discharge of cuttings).
4. Heavy drill rods being lifted.
5. High noise levels, wear hearing protection.
6. Space limitations (large drill rig and support vehicle).
7. Dust generation in dry formations (move upwind and use a cover or water spray for dust control).

Listed below are general rotary (air and mud) drilling hazards:

1. Do not brake drill rods during their lowering into the hole with drill rod chuck jaws.
2. Drill rods should not be held or lowered into the hole with pipe wrenches.
3. If a string of drill rods is accidentally or inadvertently released into the hole, do not attempt to grab the falling rods with your hands or a wrench.

4. In the event of a plugged bit or other circulation blockage, high pressure in the piping and hose between the pump and the obstruction should be relieved or bled down before breaking the first tool joint.
5. When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use your unprotected hands to clean drilling fluids from drill rods.
6. If work must progress over a portable drilling fluids (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with a rough surface or cover panels of adequate strength to hold drilling rig personnel.
7. Drill rods should not be lifted and leaned unsecured against the mast. Either provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay down the rods in a safe area.
8. Drill rod chuck jaws should be checked periodically and replaced when necessary.
9. The capacities of hoists and sheaves should be checked against the anticipated weight of the drill rod string plus other expected hoisting loads.
10. Only the operator of the drill rig should brake or set a manual chuck so that rotation of the chuck will not occur prior to removing the wrench from the chuck.

3.5 - General Drilling Safety

3.5.1 - Training

Employees working in the proximity of an operating HDI drilling rig and the support equipment required to complete wells should be thoroughly familiar with the operational hazards involved. Prior to commencing investigative work, all employees must review the Site-Specific HASP and the hazards surrounding a drill operation. Document this by having the employees read and agree with the provisions of the Site-Specific HASP and then by having them sign an acknowledgement form.

3.5.2 - Housekeeping On and Around the Drill Rig

Good housekeeping is a proactive approach to keeping the job-site clean which in-turn reduces accidents and injuries. A clean work environment adds to drilling speed and efficiency. Customers like it when you keep and leave a work-site clean because it shows professionalism. Together, good housekeeping improves working conditions and safety practices. Every crewmember should inspect the work site upon his arrival to assure that equipment is in safe condition and the job site is in proper order. Return the job site to proper order prior to proceeding with work.

Housekeeping means cleaning-up, which is an ongoing part of drilling, rather than an occasional activity. Follow these suggestions to make your housekeeping efforts more efficient:

1. Identify where to unload equipment and supplies.
2. Put materials in a convenient place where they can be safely handled without hitting or falling on anyone.
3. Find a safe place for tools you pick up, not on the edge of a truck bed.

4. Drill rods, casing, augers, and similar tools should be orderly stacked on racks to prevent sliding, rolling, spreading, or falling
5. Place fire extinguishers and first aid kits in easily accessible locations
6. Decide on a location for trash collection: All trash should be placed in bags and stored in areas outside of the immediate work area.
7. Determine a steam cleaning site that reduces the mess
8. Every crew member is responsible for site clean-up
9. Good housekeeping can eliminate most trip hazards

The first requirement for safe field operation is that everyone understands and fulfills the responsibility for maintenance and housekeeping on and around the drill rig.

1. Suitable storage locations should be provided for all tools, materials, and supplies so that tools, materials, and supplies can be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor, without creating tripping hazards, and without protruding at eye or head level.
2. Avoid storing or transporting tools, materials, or supplies within or on the mast of the drill rig.
3. Pipe, drill rods, casing, augers, and similar drilling tools should be stacked orderly on racks or sills to prevent spreading, rolling, or sliding.
4. Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.
5. Work areas, platforms, walkways, scaffolding, and other access ways should be kept free of materials, debris, and obstructions and substances such as ice, grease, or oil that could cause surfaces to become slick or otherwise hazardous.
6. Keep all controls, control linkages, warning and operation lights, and lenses free of oil, grease, and ice.
7. Do not store gasoline in any portable container other than a self-closing, non-sparking, red container with flame arrester in the fill spout and having the word gasoline clearly visible. The container must also comply with all other hazard communication requirements.
8. Dirty or contaminated pipe, drill rods, augers, or sampling equipment, should be moved away from the work area to prevent possible exposure to non-protected personnel and also to prevent cross-contamination of clean materials.
9. Wastewater and drilling fluids must be properly contained and labeled and stored out of the operational area.
10. The use of additional footing safeguards (mats) should be evaluated on a case-by-case basis.
11. Remove and dispose of empty bags or other containers, which have held drilling mud, cement or other dust producing materials.
12. Do not leave items such as hand tools, rakes, shovels, or other small equipment left lying on the ground to pose a trip hazard.
13. Welding gas cylinders should be stored in an upright and secured position. Protective caps should be in place when the cylinders are not in use.
14. Never use compressed air for cleaning clothes.



15. All unattended boreholes must be adequately covered or otherwise protected to prevent personnel, site visitors, or animals from falling into the hole. All open boreholes should be covered, protected, or back filled adequately and according to local and state regulations or customer requirements upon completion of the drilling project.
16. Walk around, not over, obstacles. Carefully choose a walking path to avoid ruts and steep slopes. Walk around freshly placed fill, gravel, or rip-rap. Keep your eyes on the path.
17. Avoid storing or transporting tools, materials, or supplies within or on the mast of the drill rig.

3.5.3 - Equipment Inspection

Inspect equipment at the start of each shift (pre-op) and at the end of each shift (post-op).
Correct all major defects and safety defects prior to the start of work.

3.5.4 - General Inspection Routine

1. Inspect drilling equipment, cranes, winches, generators and compressors prior to use - correct any identified problem before proceeding with work
2. Verify that the emergency shutoff switch works
3. Verify that preventative maintenance has been conducted
4. Wear proper PPE: Hardhat, safety glasses with side shields, and steel-toed boots as a minimum
5. Conduct tailgate safety meetings and facilitate a safe work culture
6. Pre qualify drilling subcontractors
7. Verify that Drillers and Helpers have proper training and experience
8. Refer to company specific Drilling Safety Guidelines, Subcontractor Health and Safety Requirements, and Behavior Based Safety procedures.

3.5.5 - Set-up

See details below for set-up precautions related to proximity to power lines.

3.5.6 - Start-up

All HDI Drillers and Driller's Assistants will:

1. All personnel should know location and use of emergency shut-down/kill switch.
2. Identify potential pinch points and hazards which could injure fingers and toes.
3. Traffic barricades should be positioned.
4. Operate as a team in which every crewmember is responsible for their own safety and that of each of the other crewmembers.
5. Know their individual duties so that work can progress smoothly, efficiently and safely.



6. Stay alert with their minds on their jobs.
7. Stay observant for safety problems and correct them as they occur or report the problem to the lead worker.
8. Use all required and recommended safety equipment.
9. Refrain from engaging in practical jokes/horseplay around the drilling rig and work site.
10. Get proper rest and nutrition so that they report to work in a physically and mentally fit condition.
11. Never work under the influence of alcohol or drugs, whether legal or illegal.
12. Pass an operational capability test administered by the employee's supervisor or supervisor's representative on each type of equipment the employee will operate on state business prior to operating the equipment unsupervised.
13. Always use the buddy system whenever working near areas of vehicular traffic, public roads or public property.
14. Remove cuttings with a long-handled shovel, not your hand or foot.

3.5.7 - Drilling

Considerations during general operation:

1. No visitors are permitted in the vicinity of the work area without proper protective clothing and authorized permission.
2. Only personnel necessary to achieve drilling objectives should remain within the exclusion zone. All others should remain outside the exclusion zone.
3. Effective communication (hand signals), especially under high noise conditions, is essential to safety. Clarify use of hand signals.
4. If the operator of the rig must leave the area of the controls, he operator should shift the transmission controlling the rotary drive and the feed control to neutral.
5. All crew members should be familiar with basic controls of the rig, including how to stop the engines, align the kelly with the borehole, raise and lower the drive head, raise and lower hoists, and chuck or unchuck the rods.
6. Do not climb the rig mast while equipment is running. Shut down/lock out equipment and use full body safety harness if climbing mast is necessary.
7. The operator of a drilling rig should only operate the rig from the position of the controls.
8. The operator should shut down the drilling engine before leaving the vicinity of the drilling rig.
9. Drilling should always proceed cautiously, especially at depths less than ten feet.
10. Operation of drilling equipment should be limited to qualified personnel.
11. Do not exceed the manufacturers' technical specifications for items such as speed, force, torque, pressure, and flow.
12. If drilling in an enclosed area, make certain the exhaust fumes are vented from the work site.
13. If drilling with air, direct the exhaust and cuttings away from the workers.
14. Never operate the drill rig with any of the machinery guards removed.
15. Drill rods and sampling barrels should never be left unsecured, leaning against or balanced across the drill rig.
16. Never exceed the pipe and rod racks design maximum load.

17. Always make provisions to prevent stock from accidental rolling.
18. When core is being extruded from a core barrel, hands should be kept out of line of the end of the barrel.
19. Attach safety chains or cables swivel, air, and other pressure hoses.
20. When cranking pumps or other motors keep head well back of the crank area to avoid being hit when motor turns over.
21. Fugitive dust control is to be used during dry drilling, especially in potential areas of naturally occurring asbestos.
22. When adding and removing drill rod:
23. Only the drill operator will brake or set the chucks, to eliminate the possibility of engaging the transmission prior to removing the chuck wrench.
24. Do not use the chucks as a brake on a string of drill rods that are being lowered into a hole. Braking the drill string with the chuck will result in metal slivers on the drill rod and consequent hand injuries, and could result in losing the drill rod down the hole.
25. Check the chuck jaws periodically and replace them as necessary.
26. Never place hands on wrenches where they can get trapped between the wrench and the drill rig.
27. Ensure that wrenches are removed from rods before starting to drill.
28. Do not take hold of the male thread end of drill rod. Watch for sharp burrs on rods and casing, and file sharp edges off rods when necessary.
29. Do not use extension leverage (cheaters) on pipe wrenches to break drill rod. If extension leverage is needed, the wrong tool is being used.
30. Clean drill rods with a rubber wiper or other suitable device when being removed from a hole.
31. Allow drilling fluids to drain from drill rods into the mud pit before setting the rod to the side, to minimize the amount of mud around the work area.
32. The operator knows the capacity of the hoist and mast, and the weight of the drill rod, to prevent the hoist capacity from being exceeded.
33. The drill rig operator must exercise care to lower the hoist slowly while the drill rod is being carried away from the hole.
34. There should be at all times at least three wraps of hoisting line on the hoist drum to prevent a line load from being applied directly to the fastening clamp.
35. Do not guide or hold onto moving wire line work cables with bare hands.

3.5.8 - Adding and Removing Drill Rods

When adding and removing drill rod:

1. Only the drill operator will brake or set the chucks, to eliminate the possibility of engaging the transmission prior to removing the chuck wrench.
2. Do not use the chucks as a brake on a string of drill rods that are being lowered into a hole. Braking the drill string with the chuck will result in metal slivers on the drill rod and consequent hand injuries, and could result in losing the drill rod down the hole.
3. Check the chuck jaws periodically and replace as necessary.
4. Never place hands on wrenches where they can get trapped between the wrench and the drill rig.
5. Ensure that wrenches are removed from rods before starting to drill.



6. Do not take hold of the male thread end of drill rod. Watch for sharp burrs on rods and casing, and file sharp edges off rods when necessary.
7. Use of extension leverage (like a cheater pipe) on pipe wrenches to break drill rod should be avoided whenever possible. If extension leverage is needed, the wrong tool is probably being used. In rare instances where extension is required, use extreme caution to avoid slippage and possible injury.
8. Clean the drill rod with a rubber wiper or other suitable device when being removed from a hole.
9. Allow drilling fluids to drain from drill rods into the mud pit before setting the rod to the side, to minimize the amount of mud around the work area.
10. Do not guide or hold onto moving wire line work cables with bare hands.

3.5.9 - Positioning Pipe and Casing

When positioned in the mast, drill pipe or casing should be secured until attached and in the drilling position.

If work stops during positioning of drill pipe or casing into the mast, lower any suspended load to the ground or lay it down on the support vehicle. The following are general field practices that apply to all drilling operations regardless of method:

Direct water discharge hoses away from leveling blocks

3.5.10 - Pressurized Systems

No repair or maintenance will be performed on pressurized systems unless all pressure has been relieved.

Extreme caution will be used when opening any valve.

All relief valves will be installed so that any discharge will be directed away from workers and equipment.

Any extensions necessary for proper venting of relief valves will be secured against whipping and incorporate whip checks.

3.5.11 - Most Common Injuries

- ◆ Electrocution
- ◆ Heat Stress/Exhaustion and Heat Stroke
- ◆ Slipping and falling
- ◆ Getting dirt in the eye while steam cleaning or while hitting auger and rods with hammer
- ◆ Cutting fingers from handling augers and heavy objects
- ◆ Injuring back from improper lifting

3.5.12 - Near Losses, Incidents and Injuries and Treatment

No matter how minor, all near losses, incidents, and injuries will be reported to a supervisor immediately.



3.5.13 - First Aid Kits/Fire Extinguishers

Each rig will be equipped with a fully supplied, approved first aid kit and an ABC fire extinguisher of suitable size for the fire hazard to be encountered at the job site. All HDI foremen will be American Red Cross or equivalent CPR/First Aid trained and available to assist other injured employees with CPR or First aid in all work sites beyond 3- 4 minutes from medical help.

3.5.14 - Underground utilities

Complete utility locates prior to drilling [One Call: 811 or your local utility locating service] and coordinate with the drilling contractor and site personnel.

1. Mark locations in white
2. Field verify utility locations
3. Document all utility locates on a plot plan or other map of the site.
4. Observe the area for indications of utilities
5. Hand dig if questions remain or if required by the property owner
6. Refer to your specific Utility Clearance and Isolation procedure

3.5.15 - Environmental Contamination (if applicable)

Before Visqueen or other plastic is laid down, the site will be cleared of trip hazards, obstacles or debris such as rocks, sticks, ruts and holes.

Contain cuttings in drums or plastic sheeting.

Wear proper PPE and minimize contact with soil, sediment, groundwater, or other contamination. Work upwind of the boring.

If unusual soil discoloration or odors are encountered, stop work, evacuate area and contact the safety manager. The approach will need to be re-evaluated and a PPE upgrade may be required

Follow all provisions of the HDI Health and Safety Plan

3.5.16 - Working on Streets or Highways

Always follow state and local laws concerning traffic control signage, cones, and barricades.

1. Do not work before sun-up, after sundown, or any time visibility is poor.
2. Position support vehicle(s) between the work area and oncoming traffic.
3. Use safety strobe lights on all vehicles and equipment.
4. Wear appropriate reflective safety vests.
5. Use radios when flagging (if applicable).



3.5.17 – Operating the Drilling Rig

Only HDI employees will operate the drilling rig or handle equipment associated with HDI drilling operations, including winches, augers, drive rods, ropes, and cables. Technicians, field personnel and any visitors must be aware of the location of the emergency shut-down/kill switches and operation of these devices, and the devices must be in safe working condition prior to the start of the project and thereafter. The Technician should never leave the controls of the drilling rig while the tools are rotating unless all employees are clear of rotating equipment. During drilling operations the Well Technician at the controls must be aware of the Assistant Technicians position and actions at all times. Operation of the winches and or rotary actions should only occur once the Well Technician has visually or verbally confirmed that the Assistant Technician is all clear. During assembly operations (auger attachment or rodding connection) no mechanical operations should occur until body position or hand placement is confirmed to be in a non-pinch or crush position. Only employees necessary to run the rig are allowed in close proximity, except during essential sampling and other activities. Technicians will not reach into or near pinch points, the borehole, or the rotating equipment, unless the drilling rig has been shut down.

3.5.18 - Working on the Mast - General Repairs

Drillers should not climb the mast to make repairs if the mast can be lowered. If the mast cannot be lowered to make repairs, workers may use a ladder or may climb the mast if proper fall protection, such as a harness and attached lanyard, is available. Fall protection devices, in the form of a harness and lanyard, will be used where workers are 6 feet or greater in height (if a ladder or personal lift is not available). No one should climb the mast to make repairs while the drilling rig is operating. During general repairs or maintenance actions Technicians must also consider extra caution with respect to hand tools and potential slippage actions. Keep tools clean and free of grease and oils, plus thoroughly clean any bolt heads or parts before wrenching. These actions may prevent slippage and possible hand injuries. Where possible, leather gloves should be worn (cotton gloves may be worn where dexterity is an issue).

3.5.19 - Special Precautions for Drilling in Landfills

In addition to the usual physical hazards of drilling, employees drilling in landfills may experience an increased hazard from methane gas. Methane, a decomposition product of organic materials is a very flammable gas, which may accumulate in the borehole or in the general work area. To help reduce the hazards due to the presence of methane while drilling in landfills, the following procedures should be implemented:

1. No smoking within 75 feet from the drilling area.
2. The drilling rig should be equipped with a spark-arresting muffler; a diesel engine can sometimes be preferred.
3. All ignition sources should be at least 75 feet from the borehole and, if possible the rig should be located upwind of the borehole,
4. Monitor methane concentrations as frequently as possible using a Combustible Gas Indicator (CGI).
5. The frequency of monitoring must be established in the Site-Specific (HASP).



6. The meter should be kept near the rig.
7. Results of the monitoring data should be entered into the field log,
8. Calibrate the CGI against a reference gas at least weekly.
9. All work will stop if gases are detected at 10 percent or greater of the lower explosive limit (LEL) in the hole being drilled.
10. Under such circumstances it may become necessary to inert, ventilate, or flood the borehole with water during drilling to reduce the risk of down-hole explosions.

3.5.20 - Lighting

Lighting around a drilling operation should be sufficient to provide illumination at all times.

3.6 - Electrical Safety

3.6.1 - Supplying Power to the Job Site

Drilling projects sometimes require around the clock operations and, therefore, require temporary electrical lighting. In general, all wiring and fixtures used to provide electricity for drilling operations should be installed by qualified personnel in accordance with the National Electrical Code (NFPA70 1999) with consideration of the American Petroleum Institute's recommended practices for electrical installations for production facilities (API RP 500B). Lights should be installed and positioned so that the work area and operating positions are well lighted without shadows or blind spots. The following are specific recommendations for land based drilling operations:

1. Before working on an electrical power or lighting system, lockout the main panel box with your own lock and keep the key on your person at all times.
2. Install all wiring using high quality connections, fixtures, and wire. Be sure that the wiring is insulated and protected with consideration for the drilling environment.
3. Do not use makeshift wiring and equipment.
4. Place all lights positioned directly above working areas in cages or similar enclosures to prevent loose or detached lamps or vapor tight enclosures from falling on workers.
5. Install lights so as to eliminate glare or blind spots on tools, ladders, walkways, platforms, and the complete working area.
6. Locate and guard electrical cables to prevent damage by drilling operations or by the movement of personnel, tools, or supplies.
7. Use only three prong, U blade, grounded type plug receptacles and have adequate current carrying capacity for the electrical tools that may be used.
8. Use only electrical tools that have three prong, U blade, ground wire plugs, and cords.
9. Do not use electrical tools with lock on devices.
10. Provide adequate grounding for all electrical welders, generators, control panels, and similar devices.
11. Provide secure protective enclosures on control panels, fuse boxes, transformers, and similar equipment.
12. Avoid attaching electrical lighting cables to the mast or other components of the drill rig. If this must be done, use only approved fasteners. Do not string wire through the mast.

13. Do not use poles used to hold wiring and lights for any other purpose.
14. Turn power off before changing fuses or light bulbs.
15. Require all workers in a drilling area illuminated with electrical lighting to wear safety head gear that protects the worker's head, not only against falling or flying objects, but also against limited electrical shock and burns according to ANSI Z89.1 and Z89.2.
16. Allow only trained, designated personnel to operate electrical equipment.
17. Do not permit unqualified field personnel to work on or near electric lines or devices.

3.6.2 - Safe Use of Electricity

Electrical shock can occur if equipment is maintained improperly or operated unsafely. Care and common sense minimizes danger and reduces the chance of fire resulting from electrical faults.

1. Do not work on electrical parts unless you are sure they are disconnected
2. Never splice, connect, or handle live circuits
3. Verify test flow or possible leaks will not spray water into any electrical enclosures such as starters, control boxes, or connection boxes during testing
4. Verify all electrical equipment is properly grounded

3.6.3 - Reacting to Contact with Electricity

If a drill makes contact with electrical wires, it may or may not be insulated from the ground by the tires of the carrier. Under either circumstance, the human body, if it simultaneously comes in contact with the drill rig and the ground, will provide a conductor of the electricity to the ground. Death or serious injury can be the result.

3.6.4 - Electrical Equipment

Get permission from the owner's representative before utilizing electrical outlets on-site. Do not operate electrical equipment in standing water or excessively wet conditions.

3.7 - General Equipment Safety

3.7.1 Safe Use of Hand and Power Tools

With a vast number of hand and power tools that are likely to be used on a drill rig or during repair, the best rule of thumb is to use a tool only in the manner for which it was intended. Keep cutting tools sharp. Always wear the proper PPE when using hand or power tools. When pounding or cutting gloves and safety glasses shall be worn as well as hearing protection if it is a loud power tool. If an accident occurs, treat all cuts and scratches immediately with simple first aid measures to prevent infection, which can occur in a matter of hours. Some other guidelines are:

1. Inspect tools prior to use.
2. Use tools for their intended use only.
3. Do not use damaged tools.
4. Pull, do not push wrenches - verify there is a good grip.

5. Never use excessive force on a tool. If excessive force is required, the wrong tool is being used.
6. Keep all tools clean and orderly stored when not being used.
7. Do not leave tools on ladders or other overhead working spaces.
8. Do not leave tools on the ground.
9. Never throw or drop tools. Use hoists or hand lines to raise or lower tools.
10. Always use non-sparking tools in areas of potentially explosive materials or atmosphere.
11. If any hand or power tool is deemed unsafe or is not in compliance with all regulatory agencies it shall be tagged “do not use” or physically removed.

Hand Tools

As many different types of hand tools may be used on or around a drill rig and in repair shops, there are an equal number of instructions for proper use. Use the tool for its intended purpose - is the most important rule.

The following suggestions apply to safe use of several hand tools that frequently are used on and around drill rigs:

When a tool becomes damaged, either repair it before using it again or get rid of it. Do not use tools with split or defective handles or worn parts. If a tool becomes damaged, repair it before using it again or replace it.

When using a hammer, any kind of hammer for any purpose, wear safety glasses and require all others around you to wear safety glasses.

When using any kind of chisel or punch, for any purpose, wear safety glasses and require all others around you to wear safety glasses.

Keep all tools cleaned and stored appropriately when not in use

Hammers

Use only hammers that are in good condition with handles firmly attached. Repair or replace hammers with defective handles or mushroomed heads. If the head has mushroomed, dress it prior to using it. When repairing a handle, never use nails as a substitute for a wedge.

Always grip the handle close to the end. Choking the grip near the head is less accurate and effective.

Set nails with a light blow to minimize the possibility of finger injuries.

Always use a hammer with a flat face to drive nails, never use a machinist's hammer for this purpose.

Never pound objects with the hammer's handle.

To prevent flying metal splinters, never strike a hardened object such as a wrench or another hammer with anything but a rawhide or soft-metal hammer.

Wrenches

Keep all pipe wrenches clean and in good repair. Use a wire brush frequently to clean the jaws of pipe wrenches. An accumulation of dirt and grease can cause wrenches to slip.

Use a wrench of adequate size, a larger wrench is safer than using a cheater pipe.
If using an adjustable wrench, note that the fixed jaw is stronger than the movable one.
If possible, pull on a wrench using your arm muscles rather than push on it.
Maintain good footing, one foot bracing behind the other, when using a wrench.
Remove sharp objects from the area in case of a fall.
Position your hands so they will not be crushed or smashed if the nut or joint releases.
Never apply a wrench to moving machinery.
Never use a wrench as a hammer.
Wire brush the jaws of pipe wrenches frequently, and replace worn jaws periodically.
Use wrenches - not pliers - on nuts.
Never use pipe wrenches in place of a rod holding device.
Replace hook and heel jaws when they become visibly worn.

When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be pinched between the wrench handle and the ground or the platform if the wrench should slip or the tool joint suddenly let go. When using a wrench on a tight nut: first use some penetrating oil, use the largest wrench available that fits the nut, when possible pull on the wrench handle rather than pushing, and apply force to the wrench with both hands when possible and with both feet firmly placed. Do not push or pull with one or both feet on the drill rig or the side of a mud pit or some other blocking-off device. Always assume that you may lose your footing -- check the place where you may fall for sharp objects. Never use a cheater bar on an aluminum pipe wrench

Screwdrivers

Always use a screwdriver that closely fits the screw slot.
Never use a screwdriver with a worn, chipped, or broken tip.
Never use a screwdriver as a substitute for a chisel or pry bar.
Keep cutting tools sharp.

If an accident occurs, treat all cuts and scratches immediately with simple first aid measures to prevent infection, which can occur in a matter of hours.

Pinch points

Never place your hand or other body parts under auger or in holes in the auger
Attach one flight at a time
Stand clear of outriggers
Wear leather gloves
Identify any and all places where moving equipment could trap a body part and act to eliminate the hazard.

Power Tools

Always read the owner's manual of the tool that you are using to learn the correct application and the limitation of the tool.
Lubricate tools as recommended by the manufacturer.
Properly ground power tools -- Never run power tools in damp or wet locations.
Never operate power saws or grinders without safety guards.



Always have proper lighting when using power tools.
Do not abuse the cord - never carry a tool by its cord, or yank the cord to remove the plug from a receptacle.
Secure the work with clamps to allow both hands to be free to operate the tool.

Remove adjusting keys and wrenches prior to starting the power tool.
Keep the work area clean and free of clutter that can interfere with the work or get caught in the power tool.
Do not overreach, keep good footing and balance when using power tools.
Do not carry plugged-in tools with your finger on the start switch.
Disconnect all tools from power source when not in use and when servicing.

3.8 - Personal Protective Equipment

3.8.1 - Individual Protective Equipment

Certain personal protective equipment (PPE) must be worn because of the physical hazards posed by the drilling operation. For most HDI geotechnical, mineral, and groundwater drilling projects, individual protective equipment must include a safety hat, safety shoes, safety glasses, and close fitting gloves and clothing. The HDI or HDI Client's Site-Specific Health and Safety Plan will dictate other PPE and precautions necessary to address site related hazards and risks. All protective equipment is provided by the respective employer(s) and each employee is expected to use their PPE properly and maintain it in a sanitary and reliable condition. All PPE supplied to employees will be fitted to each employee to ensure proper use, and employee owned PPE will not be allowed. Damaged PPE will not be used. All employees who wear PPE will be properly trained on how to use it and its limitations. Re training will be conducted anytime the work place changes making previous training obsolete, PPE changes, employee shows lack of use, improper use, or insufficient skills or understanding. All PPE training will be documented and kept on file. If unique hazards are expected a hazard assessment will be conducted both on paper and in conversation with supervisors or the safety department. The hazard assessments will be documented and kept on file. The proper PPE will be selected for each employee.

Hard Hats

Hard hats must be worn by everyone working or visiting at or near a drilling site (worn with the brim in front, only). All hard hats must be kept clean and inspected each working day to assure they are in good repair with the headband and crown straps properly adjusted for the individual drill rig worker or visitor. A hard hat is the number one piece of safety equipment. They should be worn on all drilling sites, shop or yard areas where work might be performed under heavy objects, or where there is the possibility of injury from falling objects. A hard hat protects you from falling objects. For your protection, OSHA regulations allow government inspectors to assess fines for not wearing hard hats, safety shoes or boots

Safety shoes or boots should be worn by all drilling personnel and all visitors to the drill site that observe drilling operations within close proximity of the drill rig. All safety shoes or boots must meet the requirements of ANSI.



Gloves

All drilling personnel should wear gloves for protection against cuts and abrasions that could occur while handling wire rope or cable and from contact with sharp edges and burrs on drill rods and other drilling or sampling tools. All gloves must be closefitting and not have large cuffs or loose ties that can catch on rotating or translating components of the drill rig. Where possible, leather gloves should be worn (cotton gloves may be worn where dexterity is an issue).

Gloves should be worn when work activities involve handling the drilling equipment, sampling devices or even when servicing the drill unit. The type of glove will be dependent upon the task being performed and potential for chemical or other

contaminants. At a minimum leather gloves should be worn when assembling tooling or servicing and repairing the drill unit. If dexterity is an issue (small bolts or screws), cotton or nitrile gloves maybe adequate.

Eye Protection

All drilling personnel should wear safety glasses. General prescription glasses and sunglasses are not safety glasses. All safety glasses must meet the requirements of ANSI. Use safety glasses whenever using a hammer, chisel, power tool or any other tool that can cause particles to fly.

Hearing Protection

Hearing protection devices such as ear plugs and ear muffs should be worn as required when the noise exposure is 85 dBA or greater over an 8-hour workday. Although noise levels vary with the type of drilling equipment used, potentially hazardous noise levels are likely to be generated during split-spoon sampling and air drilling. Typically, speech at normal conversational levels becomes difficult at 2 to 3 feet when noise levels are in excess of 85 dBA. When appropriate, each drill rig worker must wear noise-reducing hearing protection that meets the requirements of ANSI.

Fall Protection

Fall protection is required when working at heights of greater than 6 feet (guard rails or a personal fall arrest system). Establish a good solid footing and that walking and working surfaces are as clean and dry as possible. Work to be done above three feet on the mast should require use of a safety harness, or the mast must be lowered. At a minimum fall protection must be used in accordance with applicable regulatory or client requirements. The most stringent being applicable.

Clothing

The clothing of the individual drill rig worker is not generally considered protective equipment, however, the worker's clothing should be comfortable but must be close fitting, without loose ends, straps, draw strings, belts or otherwise unfastened parts that might catch on some rotating or translating component of the drill rig. Rings and jewelry



must not be worn during a work shift. In addition to loose clothing, hair should be tied back, as loose long hair can catch in mechanical equipment. All jewelry, including rings must be removed before beginning each shift. All personnel should wear clothing appropriate for the weather conditions.

High Visibility Clothing

High visibility clothing is required when working in environments that are regulated by Department of Transportation and or when working on active roadways or other high traffic areas such as service stations. It is also required for night work operations.

Other Protective Equipment

For some drilling operations, the environment or regulations may dictate that other protective equipment be used. The requirement for such equipment must be determined jointly by the management of the drilling organization and the safety supervisor. Such equipment might include face shield, respirator, and insect repellent.

When drilling is performed in chemically or radiological contaminated environment, special protective equipment, and clothing may, and probably will, be required. The design and composition of the protective equipment and clothing must be determined jointly by the management and the client who requests the drilling services, and under some circumstances, with the concurrence of a health and safety professional.

Training

PPE training will occur at a new hire orientation and anytime PPE changes, workplace changes, employee shows lack of use or improper use there after.

3.9 - Weather and Night Work

3.9.1 - Weather Considerations

Cold

Extended exposure to windy, cold weather can lead to frostbite, hypothermia, and possibly death. The cold stress equation is as follows:

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURY & ILLNESS

The Occupational Safety and Health Administration (OSHA) and the Mine Safety and Health Administration (MSHA) offer the following steps for recognizing, evaluating, and controlling cold stress:

Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.



Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.

Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol, which cause dehydration. Eat warm, high-calorie foods like hot pasta dishes.

Dress appropriately, layer clothing to adjust to changing environmental temperatures.

Wear a hat and gloves, in addition to underwear that will keep water away from the skin (i.e., polypropylene).

Take frequent breaks in warm, dry shelters to allow the body to warm up.

Perform work during the warmest part of the day.

Avoid exhaustion or fatigue because energy is needed to keep muscles warm.

Workers are at greater risk when they have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension, they take certain medications (check with a doctor, nurse, or pharmacy to see if any medications being taken have adverse affects while working in cold environments), or they are in poor physical condition. a

During freezing weather, do not touch any metal parts of the drill rig with exposed flesh.

Heat

During hot weather take frequent breaks and drink plenty of fluids.

Dress appropriately for the conditions expected.

Maintain a supply of drinking water on each service vehicle (REQUIRED).

Take breaks as needed to cool off.

Watch for indicators of heat exhaustion or heat stroke.

Inclement Weather

Drilling operation should be terminated during an electrical storm, and the complete crew should move away from the drill rig.

Although drilling operations can proceed through a wide range of weather conditions, operations must cease if weather conditions are severe enough to create a safety hazard. Safety hazards from weather may include, but are not limited to, low visibility for approaching traffic, inability for the driller's to see, grasp, or handle equipment, and rough seas while working on the barge. Other conditions can create safety hazards, and can be decided in the field.

The Driller has the responsibility to determine if the severity of the conditions warrants stopping the drilling operation.

If performing tasks during inclement weather, work deliberately and adjust the work procedures to address the changed conditions.

Stay away from the drill during electrical storms.

Lightning

Because of the high potential for lightning strike on the mast of a drilling rig, drilling must cease when thunder and lightning storms approach and are within 5 miles. Workers should take shelter away from the rig during the potential for lightening. If possible, the mast should be lowered prior to the advancement of thunder and lightning storms. A minimum of 20 minutes should be allowed after a lightning strike before drilling resumes.



3.9.2 - Night Work Safety

Schedule night work in advance to allow employees to adjust their schedules and avoid unnecessary fatigue.

Wear required protective clothing:

Orange or lime-green vests with reflective strips, and
White coveralls.

Use sufficient illumination:

Traveling public must be able to identify all locations where employees are grouped together and engaged in work activities.

The lighting must be oriented so that the traveling public is not temporarily blinded. The intensity of the illumination should not be any brighter than that necessary to perform the work.

3.10 - Wire Rope, Hoists and Hammer Safety

This section concerns rotating equipment, hammers, wire ropes, and hoists (the part of the drilling rig which may cause serious injuries), and drilling techniques most commonly used during auger and rotary drilling:

1. Use tools only for the job for which they were intended.
2. Stay clear of cables while lifting equipment or while drilling rig is under heavy strain.
3. Do not ride on hook, ropes, or other traveling lines of the rig.
4. When moving or hoisting stabilizers or drill collars, tag lines should always be used. A helper should not use his hands to hold or control heavy tooling. Instead, he should loop a rope around it and hold onto both ends of the rope.
5. Inspect pulley sheaves for wear and cable and rope positioning.

3.10.1 - Wire Rope Safety

Worn or misused wire rope is potentially one of the most dangerous pieces of equipment on any drilling rig. When a wire rope breaks, it is typically under significant tension and therefore has a tendency to snap back, like a rubber band. Be constantly aware of the condition of wire rope, which is used to hoist drill pipe or other heavy object. Wire rope used for such purposes and has begun to fray or unravel, or which has a number of breaks, should be removed from service and replaced prior to mobilization.

Listed below are guidelines regarding wire ropes and hoists:

1. Always wear the appropriate gloves when handling wire ropes.
2. Minimize shock loading on wire rope, apply loads smoothly and steadily.
3. Protect wire rope from sharp corners or edges.

4. Do not guide wire ropes onto cable drum with your hands.
5. Discard cable when kinked or frayed.
6. Thoroughly inspect all wire ropes that have not been used for a period of a month or more.
7. Install all connections and end fittings, which consist of spliced eyes and various manufactured devices, according to the manufacturer's specifications.
8. If a ball bearing type hoisting swivel is used to hoist drill rods, inspect and lubricate swivel bearing daily to assure that the swivel freely rotates under load.
9. If a rod slipping device is used to hoist drill rods, do not drill through or rotate drill rods through the slipping device, do not hoist more than 1 ft. (0.3 m) of the drill rod column above the top of the mast, do not hoist a rod column with loose tool joints, and do not make, tighten, or loosen tool joints while the rod column is being supported by a rod slipping device. If drill rods should slip back into the borehole, do not attempt to break the fall of the rods by hand or by tensioning the slipping device.
10. Most sheaves on drill rigs are stationary with a single part line.
11. Never increase the number of parts of line without first consulting with the manufacturer of the drill rig.
12. Wire ropes must be properly matched with each sheave. If the rope is too large, the sheave will pinch the wire rope. If the rope is too small, it will groove the sheave. Once the sheave is grooved, it will severely pinch and damage larger sized wire ropes.
13. Following the installation of a new wire rope, first lift a light load to allow the wire rope to adjust.
14. Use replacement wire ropes that conform to the drill rig manufacturer's specifications.
15. Apply loads smoothly and steadily to minimize shock loading of a wire rope.
16. There should be at all times at least three wraps of hoisting line on the hoist drum to prevent a line load from being applied directly to the fastening clamp

All wire ropes and fittings should be visually inspected prior to and during use and thoroughly inspected at least once a week for:

1. Abrasion
2. Broken wire
3. Wear
4. Reduction in rope diameter, reduction in wire diameter, reduction in wire diameter
5. Fatigue, corrosion
6. Damage from heat
7. Improper reeving
8. Jamming, crushing
9. Bird caging
10. Kinking,
11. Core protrusion
12. Damage to lifting hardware

Wire ropes should be replaced when inspection indicates excessive damage. End fittings and connections consist of spliced eyes and various manufactured devices. All manufactured end fittings and connections should be installed according to the manufacturer's instructions and loaded according to the manufacturer's specifications.

3.10.2 - Hoist Safety

Listed below are guidelines regarding wire ropes and hoists:

1. Replace damaged safety latches on safety hooks before using.
2. Always use proper lifting devices.
3. Use tool handling hoists only for vertical lifting of tools (except when angle hole drilling).
4. Do not use tool handling hoists to pull on objects away from the drill rig, however, drills may be moved using the main hoist of the drill if the wire rope is spooled through proper sheaves according to the manufacturer's recommendations.
5. When stuck tools or similar loads cannot be raised with a hoist, disconnect the hoist line and connect the stuck tools directly to the feed mechanism of the drill.
6. Do not use hydraulic leveling jacks for added pull to the hoist line or to the feed mechanism of the drill.
7. When attempting to pull out a mired down vehicle or drill rig carrier, only use a winch on the front or rear of the vehicle and stay as far as possible away from the wire rope. Do not attempt to use tool hoists to pull out a mired down vehicle or drill rig carrier.
8. Avoid sudden loading in cold weather.
9. Never use frozen ropes.
10. Replace faulty guides and rollers.
11. Know the working load of the equipment and rigging being used and the weight of the load being lifted. Never exceed these limits.
12. Periodically inspect and test hoist clutches and brakes.
13. Know and do not exceed the rated capacity of mast hooks rings, links, swivels, shackles, and other lifting aids.
14. Never conduct any hoisting operations when the weather conditions are such that hazards to personnel, the public, or property are created.
15. Never use a hoist line to ride up the mast of a drill rig.
16. The drill rig operator must exercise care to lower the hoist slowly while the drill rod is being carried away from the hole.

3.10.3 - Sheaves

Inspect and lubricate sheave wheels, shafts, and pins often. Use the proper sheave diameter and width to match the hoist line that runs over it.

Most sheaves on drill rigs are stationary with a single part line.
Replace worn sheaves or worn sheave bearings.



3.11 - Health and Hygiene

3.11.1 - Personal Hygiene Requirements

The Site-Specific HASP should identify exclusion zone requirements and decontamination needs. Often a break area outside the restricted work areas will be established with a hand and face washing facility. Before eating, drinking, or smoking, all employees should thoroughly wash their hands and face. To help limit the potential for ingestion of contaminants, eating, drinking, chewing, or smoking is not allowed when working in the immediate vicinity of the drilling rig or in any restricted work areas (exclusion and decontamination zones).

3.11.2 - Chemical Hazards

Review material safety data sheets (MSDS)
Follow manufacturer's instructions for use, handling and storage
Use recommended protective equipment
Label all containers

3.11.3 - Dust

Minimize generation of dust from soil, sand or bentonite.
Stay out of visible dust clouds.
Wet materials if necessary to eliminate visible dust.

3.11.4 - Noise

Always wear hearing protection when operating or working near the rig.

3.11.5 - Supplemental Hearing Conservation Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to identify controls and their implementation to provide adequate protection for employees exposed to noise levels which may exceed 85 Decibels measured on the A-Scale (dBA) average over an eight-hour time period as required by federal and state agencies. Any employee exposed to 85dbA or higher noise levels will be provided with hearing protection.

2. SCOPE

- 2.1 This procedure is applicable to HDI personnel exposed to noise levels in excess of 85 dBA.



3. RESPONSIBILITY

- 3.1 Managers shall ensure personnel with an exposure greater than 85 dBA Time Weighted Average (TWA) receive annual audiometric tests and hearing conservation training.
- 3.2 Supervisors shall ensure that employees comply with the following procedures:
 - 3.2.1 Ensure employees are aware of the hearing conservation program and comply with its procedures.
 - 3.2.2 Ensure adequate hearing protection is available and in use, and forward any concerns to the Health & Safety Officer.
- 3.3 Employees shall comply with the following procedures:
 - 3.3.1 Wear hearing protectors when required.
 - 3.3.2 Inform their supervisor or the Health & Safety Officer of any perceived noise increases in their work areas.
- 3.4 The Health & Safety Officer shall:
 - 3.4.1 Develop and maintain the Hearing Conservation Procedure, which shall include requirements for monitoring, audiometric testing, hearing protectors, training, and records retention.
 - 3.4.2 Standardize hearing protection equipment.
 - 3.4.3 Identify personnel for placement in the hearing conservation program.
 - 3.4.4 Administer training annually or whenever PPE changes.
 - 3.4.5 Notify the appropriate supervisor of employees due and/or overdue for medical exams.
 - 3.4.6 Monitor employees with standard threshold shifts, and notify them in writing.
 - 3.4.7 Re-evaluate or re fit the chosen PPE if standard threshold shifts occur.
 - 3.4.8 Randomly monitor noise levels company wide to identify which employees need to be involved in the hearing conservation program with the use of a dosimeter. Monitoring will also ensure that noise levels have not changed and the proper PPE has been selected.

4. OBJECTIVE

- 4.1 The objective of this program is to define actions and controls to prevent personnel from being adversely affected by occupational noise.

5. PROCEDURE

5.1 Monitoring

- 5.1.1 Monitoring shall be performed by the Safety Department in areas where information indicates that any employee's exposure may exceed an eight-hour time weighted average (TWA) of 85 dB, impact sound levels exceeding 140 dB, or intermittent noise may exceed the acceptable levels.
- 5.1.2 Monitoring shall be repeated, as appropriate, whenever a change in production, process, equipment, or controls increases noise exposure to the extent that additional employees may be exposed at or above the action level (50% dose) or the attenuation provided by hearing protectors being used by the employees in question may not be adequate.
- 5.1.3 Sound level and noise dosimeters shall be calibrated according to manufacturer's instructions.
- 5.1.4 Employees and their managers exposed at or above 85 dBA TWA shall be notified by the Health & Safety Officer of the monitoring results.

5.2 Audiometric testing program

- 5.2.1 Personnel exposed at or above the action level shall receive a baseline audiogram in which subsequent audiograms can be compared.
- 5.2.2 Annual audiograms shall be compared with baselines to determine validity. This comparison shall take place immediately following the annual audiogram, if possible. If an employee is not part of the hearing conservation program and gets exposed they will receive a audiogram within 6 months.
- 5.2.3 Standard Threshold Shift (STS). An STS is defined as a change in the hearing threshold of 10 dB or greater in the 2000, 3000, and 4000 Hz in either ear. If an STS has occurred:
 - 5.3.3.1 A test shall be conducted again as soon as possible (immediately following the exams that revealed the possible STS, if possible).
 - 5.3.3.2 The employee shall be informed in writing within 21 days of determination.
 - 5.3.3.3 If an STS occurs the PPE will be re evaluated which will include refitting or selecting a different method of hearing protection. A medical evaluation may be required also.



- 5.2.4 Further evaluation shall be determined by the attending physician (if a technician has performed the initial test and the STS was attained, a physician shall perform the second test).
- 5.25 Prior to baseline audiograms all employees will have 14 hours without exposure to workplace noise.
- 5.3 Hearing protectors
 - 5.4.1 Hearing protectors are available to employees exposed to noise at or above 85 dBA TWA at no cost to the employee.
 - 5.4.2 Self-molded earplugs shall be made available.
- 5.4 Annual training meeting requirements shall be given to affected employees.

6. RECORDS

- 6.1 An accurate record of employee exposure measurements shall be required by these standards.
- 6.2 Noise exposure records shall be retained by the HDI office for at least two years.
- 6.3 Audiometric tests records shall be retained by the HDI office for the duration of the employee's employment.
- 6.4 Records of the engineering feasibility studies shall be maintained in the HDI office for three years.
- 6.5 Training records shall be maintained for three years.

3.11.6 - Ambient Air Monitoring

Vapors

Approach areas where vapors are suspected from the upwind direction and stay upwind or crosswind from potential sources of vapors (use flagging, wind socks, or similar devices to indicate wind direction).



3.12 - Materials Handling

3.12.1 - Proper Lifting

Back injury is a common drilling injury. Improper lifting causes lower-back pain even for those who are strong and in good condition. Almost 65 percent of workers have back pain at some point during their working career. Think through the process - How can you move the material or equipment and still minimize total weight, distance traveled, and frequency of movement? Be sure of your footing.

When possible, let the drill rig do the work or use other mechanical devices to lift and move materials. Ask others to help with awkward or heavy items and equipment. Offer to help someone else with lifting. Stretch and warm-up muscles before lifting. Use proper lifting techniques. Move heavy objects with the aid of handcarts whenever possible.

Proper lifting takes the hazard out of moving heavy objects. Ask someone who knows how to demonstrate the following procedures. Then use them whenever you lift something either at work or at home:

1. Establish you can lift the load safely or ask for help
2. Use a mechanical lifting device if available
3. Inspect route to be traveled making sure of sufficient clearance
4. Look for any obstructions or spills
5. Inspect the object to decide how it should be grasped
6. Look for sharp edges, slivers, or other things that might cause injury
7. Do not move any object that will obstruct your field of vision when transporting the load.

Before lifting a relatively heavy object:

1. Approach the object by bending at the knees.
2. Keeping your back vertical and un-arched while obtaining a firm footing.
3. Grasp the object firmly with both hands.
4. Stand slowly and squarely while keeping your back vertical and un-arched.

3.12.2 - Heavy Materials, Drums and Containers - Lifting and Moving

1. Do not lift or move heavy containers without assistance.
2. Do not lift or move awkward loads without assistance.
3. Use proper bending and lifting techniques by lifting with arms and legs and not with back.
4. If possible, use powered lift truck, drum cart, or other mechanical means.
5. Take breaks if feeling faint or overexerted.
6. Spot drums in storage area prior to filling.
7. Wear appropriate PPE including leather gloves and steel-toed boots.
8. If using rigging equipment it must be inspected daily before each use.
9. Any hoisting equipment that is defective must be tagged and physically removed.

10. All hoisting equipment will not be loaded in excess of its maximum ability.
11. Any and all hooks used will have functional latching gates.
12. At no time will any employee be allowed under a lifted load.
13. If anything large that could cause a injury or property damage by swinging is lifted a tag line will be applied.
14. All rigging equipment that is not in use will be removed from the immediate work area and properly stored away.

3.12.3 - Drum Handling

1. If a hoist is used to load drums, only lifting attachments specifically designed for drum lifting should be used. Do not use makeshift lifting attachments.
2. Use only the proper tools and equipment to move, load or unload drums.
3. Drums should be lined with a clear plastic before any material is placed in them.
4. All drums should be placed into spill containment basins. If basins are not available, drums should be stored or placed on edge in such a manner as to avoid the accumulation of rainwater on the lids. The exterior of drums should be wiped clean before being stored to eliminate run off contaminants due to rain.
5. Use chemical and leather gloves will to protect hands from cuts caused by mill burrs or rough edges.
6. Avoid pinching or crushing hands or fingers between other drums or objects while moving.
7. Before drums are pulled over on their sides, all caps and bungs should be secured and there should be sufficient clearance for hands and feet.
8. When opening closed drums that have been exposed to heat from the sun or other sources, personnel should stand clear and open slowly until any pressure is relieved.
9. All fluid and material containers should be clearly labeled to avoid improper use.
10. Hazardous materials should be labeled and handled accordingly.
11. Hazardous waste drums must be labeled in accordance with applicable federal and state regulations.
12. Position hands and fingers to avoid pinching, smashing, or crushing when closing drum rings
13. Do not lift or move heavy containers without assistance
14. Use proper bending and lifting techniques by lifting with legs and avoid lifting with the back.
15. If possible, use powered lift truck, drum cart, or other mechanical means
16. Designate an appropriate drum storage area

3.13 - Forklift Operations

3.13.1 - Forklift and Forktruck Operations

Only drivers and operators authorized by HDI and trained in the safe operations of industrial trucks and forklifts or industrial tow tractors are permitted to operate such vehicles. Devise methods to train operators in safe operation of powered industrial truck and forklifts.

Stunt driving and horseplay are strictly prohibited.



No riders are permitted on vehicles unless provided with adequate riding facilities.

Employees may not ride on the forks of lift trucks.

Employees may not place any part of their bodies outside the running lines of an industrial truck and forklift, or between mast uprights or other parts of the truck where shear or crushing hazards exist.

Employees are not allowed to stand, pass, or work under the elevated portion of any industrial truck and forklift, loaded or empty, unless it is effectively blocked to prevent it from falling.

Drivers will check the industrial truck and forklift at least once per shift, and if it is found to be unsafe, report the matter immediately to your supervisor. Do not put the vehicle in service again until it has been made safe. Check for the proper functioning of tires, horn, and any other warning devices, lights, battery, controller, brakes, steering mechanism, cooling system, and the lift system for fork lifts (forks, chains, cable, and limit switches).

No industrial truck and forklift will be operated with a leak in the fuel system.

Industrial trucks and forklifts will not exceed the authorized or safe speed, always maintaining a safe distance from other vehicles, keeping the truck under positive control at all times and observe all established traffic regulation. For trucks traveling in the same direction, a safe distance may be considered to be approximately 3 truck lengths or preferably a time lapse-3 seconds-passing the same point.

Do not pass trucks traveling in the same direction at intersections, blind spots, or dangerous locations.

Slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, travel with the load trailing.

Look in the direction of travel and do not move a vehicle until certain that all persons are in the clear.

Industrial trucks and forklifts will not be driven up to anyone standing in front of a bench or other fixed object of such size that the person could be caught between the truck and object.

Grades will be ascended or descended slowly. When ascending or descending grades in excess of 10 percent, loaded trucks should be driven with the load upgrade.

On all grades the load and load engaging means should be tilted back if applicable, and raised only as far as necessary to clear the road surface.

Motorized hand and hand-rider trucks should be operated on all grades with the load-engaging means downgrade.

Carry the forks as low as possible, consistent with safe operations.



When leaving an industrial truck or forklift unattended, either:

The power will be shut off, brakes set, the mast brought to the vertical position, and forks left in the down position. When left on an incline, block the wheels, or the power may remain on provided the brakes are set, the mast is brought to the vertical position, forks are left in the down position, and the wheels will be blocked, front and rear.

When the operator of an industrial truck and forklift is dismounted and within 25 feet (7.6 meters) of the truck which remains in the operator's view, the load engaging means will be fully lowered, controls placed in neutral, and the brakes set to prevent movement. Exception: Forks on fork-equipped industrial truck and forklifts may be in the raised position for loading and unloading if the forks are raised no more than 42 inches above the level where the operator and loaders are standing and the power is shut off, controls placed in neutral and the brakes set. If on an incline, the wheels will be blocked.

Vehicles will not be operated on floors, sidewalk doors, or platforms that will not safely support the loaded vehicle.

Prior to driving onto trucks, trailers and railroad cars, check their flooring for breaks and other structural weaknesses.

Cross railroad tracks diagonally, wherever possible. Parking closer than 8 ½ feet from the centerline of railroad tracks is prohibited.

Do not load trucks in excess of their rated capacity.

Do not move a loaded vehicle until the load is safe and secure.

Take extreme care when tilting loads. Tilting forward with the load engaging means elevated is prohibited except when picking up a load. Elevated loads will not be tilted forward except when the load is being deposited onto a storage rack or equivalent. When stacking or tiering, backward tilt will be limited to that necessary to stabilize the load.

Place the load-engaging device in such a manner that the load will be securely held or supported.

Take special precautions in securing and handling of loads by trucks equipped with attachments, and during the operation of these trucks after the loads have been removed.

Every HDI employee who operates an industrial truck and forklift will be instructed in the following procedures and in any other practices dictated by the work environment. Such information will be provided at the time of initial employment. Copies of these instructions, printed in a language understood by the majority of the employees, will be conspicuously posted at a place frequented by the drivers.



3.13.2 - Employee Operating Instructions

1. Securely fasten your seat belt.
2. Where possible, avoid operating the forklift/industrial truck near ditches, embankments, and holes.
3. Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.
4. Stay off slopes too steep for safe operation.
5. Watch where you are going, especially at row ends, on roads, and around trees.
6. Do not permit others to ride.
7. Operate the forklift/industrial truck smoothly-no jerky turns, starts, or stops.
8. Hitch only to the drawbar and hitch points recommended by forklift manufacturers.
9. When forklift is stopped, set brakes securely and use park lock if available.
10. Every HDI employee who operates an industrial truck or forklift will be required to check the industrial truck or forklift prior to operation each day and if it is unsafe report the matter immediately to a foreman or mechanic and will not use the industrial truck or forklift again until it has been made safe.
11. HDI Employees are prohibited from stunt driving or horseplay while operating an industrial truck or forklift.
12. No repairs will be performed on any agricultural or industrial trucks, forklifts or tractors until arrangements have been made to reduce the probability of injury to repairmen or others caused by sudden movement or operation of such equipment or its parts.

3.14.1 - Fire on the Rig

Always carry an approved Class ABC fire extinguisher on the HDI drill rig that meets the requirements of DOT regulation 49 CFR 393.95. The fire extinguisher should be located to permit visual determination of whether it is fully charged and is readily accessible for use.

Learn how to use fire extinguishers and know where they are located on the drilling rig and support vehicles.

Remember the four letter word PASS and the fire is controllable, you can put a fire out successfully.

P - PULL the pin

A - AIM at the base of the fire standing approximately eight feet from the fire

S - SQUEEZE the handle

S - SWEEP the fire by moving the extinguisher back and forth as you aim at the base of the fire until it is out.

HDI Fire Extinguishers will be inspected monthly for condition and expiration date and tag with the date of annual inspection and inspector's name. If the tag is not located on the extinguisher, replace it with one that is properly tagged. Fire extinguisher training will be conducted at the employee orientation and annually thereafter. The training will familiarize employees on how to use fire extinguisher and the hazards that can occur fighting fire. Place the fire extinguisher in an easily accessible location within 10 ft of drilling rig.



3.14.2 - Other Fire and Explosion Precautions

1. Do not refuel an engine while it is running or while it is still hot.
2. Use a funnel when refueling from a can.
3. No Smoking while handling or dispensing fuels.
4. Fuels should be handled, transported, and stored in approved, properly marked containers.
5. Store fuels away from equipment exhaust.
6. Do not store fuels inside a building.

Flammable and combustible materials are typically present at drilling sites. These materials include gasoline, diesel fuel, polyethylene, wood, weeds, and others. To help prevent these materials from igniting, employees should first and foremost ensure that all sources of ignition (such as matches or lighters) have been identified and maintained at a safe distance from flammable and combustible materials.

1. Smoking, open flames, or spark producing equipment should not be permitted within 75 feet of drilling rigs, open wells, gasoline-driven pumps, or fuel storage areas.
2. Flammable liquids (includes empty and full cans) should not be stored or left within 50 feet of drilling rigs, pumps, or other related machinery.
3. Containers used for fuel will be bonded and grounded during dispensing to prevent the discharge of static electricity.
4. Safety fuel containers must be returned to a designated safe storage area after fueling is completed.

3.15 - Rig Inspections and Maintenance

HDI Drilling employees are responsible for maintaining the drilling rig in safe and proper working condition. Conducting routine inspection of the rig and associated support equipment and performing all required maintenance are key components to ensuring proper working condition. Specific items to consider when performing inspection and routine maintenance are discussed in greater detail below.

Inspections

The HDI driller should inspect the drill rig when it first arrives onsite and at least daily thereafter for structural damage, loose bolts and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged hoses, or damaged pressure gauges and pressure relief valves. Daily inspections should include the following:

Inspect and test major systems to ensure proper condition and to identify signs of excessive wear.

1. Kill Switches
2. Protective Guards
3. Cable Systems



4. Leveling Jacks and Outriggers
5. Drill Controls
6. Hydraulic Lines
7. Connections, fittings, and valves
8. Exhaust Systems
9. Brake Systems

Immediately notify and HDI Senior Driller of any equipment or safety device in need of repair. Correct all identified equipment and safety device defects prior to drilling.

Maintenance

The HDI Drillers and Employees should maintain logs, documenting all preventative maintenance performed on a given rig. Any maintenance determined to be necessary once the rig has arrived on location should be completed prior to drilling. Maintenance activities should never be performed while drilling. Specific items to consider when performing maintenance include the following:

General Maintenance

1. Never use gasoline or other flammables to perform cleaning duties around the rig.
2. Place all transmissions, gearboxes, hydraulic valves, and hoist levers in neutral before initiating repairs.
3. Have all preventative maintenance, or other scheduled maintenance, completed as recommended.
4. Shut down the drill rig and remove the positive cable from the battery to clean, repair or lubricate fittings, unless the adjustment requires the rig to be running. The operator and lubricator must coordinate their efforts to successfully perform the maintenance safely.
5. While performing maintenance, either remove or tag the key to prevent accidental starting of the rig.
6. Apply grease and oil only through oil and grease inlets.
7. Always chock wheels, lower leveling jacks, and set hand brakes prior to working under a drill rig.
8. Whenever possible, reduce operating systems to a zero energy state, that is, release all pressure from hydraulic, drilling fluid and air pressure systems, prior to performing maintenance. Use extreme caution when opening drain plugs, pressure caps, valves, and removing hoses and hydraulic lines.
9. Never weld or cut on or near a fuel tank.
10. Replace all caps, plugs, clamps, cables and guards prior to returning the rig to service.
11. Never modify any part of the mast without permission from the equipment shop.
12. If it should become necessary to drain oil, fuel, hydraulic fluid or any other industrial fluid in the field, never allow the fluid to drain onto the ground. The fluid must be containerized and disposed of in an appropriate manner according to site-specific requirements. Avoid spillage.
13. All cab areas should be clean and free of loose materials, equipment, tools, and unsecured personal items.

3.16 - Decontamination

Decontamination procedures are used to remove or neutralize contaminants that have accumulated on personnel, samples, tools or equipment and to ensure the protection of personnel from permeating substances, chemicals, and infectious agents. Decontamination reduces or eliminates transfer of these contaminants to clean areas, prevents the mixing of incompatible substances, and minimizes the likelihood of sample contamination. Various decontamination methods will physically remove, inactivate by chemical detoxification, disinfection, sterilization, or remove contaminants by both physical and chemical means. In many cases, gross contamination can be removed by physical means.

3.16.1 - Typical Cleaning Methods

Typical cleaning methods work by either dissolution or by forcing the contaminant off a surface with pressure. In general, less of the equipment surface is removed using non-abrasive methods.

1. High-Pressure Water - using a high-pressure pump, an operator controlled directional nozzle, and high-pressure hose. Operating pressure usually ranges from 340 to 680 psig, which relates to flow rates of 20 to 140 lpm.
2. Steam Cleaning - using water delivered at high pressure and high temperature in order to remove accumulated solids or oils.
3. Mechanical - using brushes with metal, nylon, or natural bristles or utilizing appropriate tools to scrape, pry, or otherwise remove adhered materials.
4. Dissolving - using chemicals to dissolve surface contaminants as long as the solvent is compatible with the equipment and protective clothing. Organic solvents include alcohols, ethers, ketones, aromatics, straight-chain alkanes, and common petroleum products. Halogenated solvents are generally incompatible with protective clothing and are toxic.
5. Surfactants reduce adhesion forces between contaminants and the surface being cleaned and prevent reposition of the contaminants. Non-phosphate detergents dissolved in tap water is an acceptable surfactant solution.
6. Disinfection and Sterilization - using chemical disinfectants to inactivate infectious agents. Standard sterilization methods are impractical for large equipment and personal protective clothing.

3.16.2 - Personnel and Equipment Decontamination Plan

As part of the HDI or Client's site-specific health and safety plan, a personnel and equipment decontamination plan should be developed and set up before any personnel or equipment enters the areas of potential contamination. These plans should include:

1. Number and layout of decontamination stations.
2. Decontamination equipment needed.
3. Appropriate decontamination methods.
4. Procedures to prevent contamination of clean areas.



5. Methods and procedures to minimize worker contact with contaminants during removal of protective clothing.
6. Methods and procedures to prevent cross-contamination of samples and maintain sample integrity and sample custody.
7. Methods for disposal of contaminated clothing, equipment, and solutions.

Revisions to these plans may be necessary for health and safety when the types of protective clothing, site conditions, or on-site hazards are reassessed based on new information.

3.16.3 - Standard Materials and Equipment

The following are standard materials and equipment that may be used as a part of the decontamination process:

1. Appropriate protective clothing.
2. Air purifying respirator (APR).
3. Field log book.
4. Non-phosphate detergent.
5. Selected high purity, contaminant-free solvents.
6. Long-handled brushes.
7. Drop cloths (plastic sheeting).
8. Trash containers.
9. Paper towels.
10. Galvanized tubs or equivalent (baby pools).
11. Tap water.
12. Contaminant-free distilled or deionized water.
13. Metal or plastic container for storage and disposal of contaminated wash solutions.
14. Pressurized sprayers, water.
15. Pressurized sprayers, solvents.
16. Trash bags.
17. Aluminum foil.
18. Sample containers.
19. Safety glasses or splash shield.
20. Emergency eyewash bottle.

Specific decontamination materials and equipment will be specified in the HDI or Client's site-specific HASP.

3.16.4 - Field Sampling Equipment Cleaning Procedures

The general equipment cleaning steps that may be followed for general field sampling activities are provided below:

1. Physical removal.
2. Scrub with non-phosphate detergent plus tap water.
3. Tap water rinse.
4. 10% nitric acid (required during sampling for inorganics only).



5. Distilled or deionized water rinse.
6. Solvent rinse (required during sampling for organics only).
7. Total air dry (required during sampling for organics only).
8. Triple rinse with distilled or deionized water.

This procedure can be expanded to include additional or alternate solvent rinses that will remove specified target compounds if required by site-specific work plans or as directed by a particular client.

Special considerations for solvents:

1. Solvent rinses are not necessarily required when organics are not a contaminant of concern.
2. An acid rinse is not necessarily required if analysis does not include inorganics.
3. Always reference appropriate analytical procedure for specific decontamination solutions required for adequate removal of the contaminants of concern.
4. Sampling equipment that requires the use of plastic or Teflon tubing should be disassembled, cleaned, and the tubing replaced with clean tubing, if necessary, before commencement of sampling or between sampling locations.
5. The use of distilled or deionized water may be acceptable for decontamination of sampling equipment provided that it has been verified by laboratory analysis to be analyte-free distilled or deionized water.
6. The use of an untreated potable water supply may not be an acceptable substitute for tap water.

3.16.5 - Preventing the Spread of Contamination

Several procedures can be established to minimize contact with waste and the potential for contamination including:

1. Employing work practices that minimize contact with hazardous substances (avoid areas of obvious contamination, avoid touching potentially hazardous substances).
2. A specified area will either be available or can be constructed where fluids generated during decontamination can be captured for disposal.
3. Use of remote sampling, handling, and container-opening techniques.
4. Covering monitoring and sampling equipment with plastic or other protective material.
5. Use of disposable outer garments and disposable sampling equipment with proper containment of these disposable items.
6. Use of disposable towels to clean the outer surfaces of sample bottles before and after sample collection, and encasing the contaminants with plastic sheeting or over packs.
7. All HDI drill rigs are equipped with 5 gallon spill containment kits.

3.16.6 - Hazards of Decontamination

Due to the presence of water, chemicals, solvents, heat, pressure, and heavy equipment, decontamination activities can be very dangerous. The following are safety items to be considered during equipment decontamination.



Proper procedures for dressing prior to entrance into contaminated areas will minimize the potential for contaminants to bypass the protective clothing. Generally, all fasteners (zippers, buttons, and snaps) should be used, gloves and boots tucked under or over sleeves and pant legs, and all junctures taped, which should be detailed in the HDI or HDI Client's site health and safety plan. Only properly trained personnel should operate cleaning equipment.

Use PPE as directed in the health and safety plan, which may include safety glasses with face shield, goggles, poly-coated Tyvek®, aprons, gloves (nitrile, neoprene, or leather), steel toed boots, chemical resistant rubber boots, and respirators to prevent physical contact with potential contaminants and debris.

Be aware of the slipping hazards of wet or dry plastic inside the decontamination area.

When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. NEVER use unprotected hands to clean drilling fluids from drill rods.

Practice good housekeeping at all times, keeping the decontamination area free of slip, trip, or fall hazards.

Do not allow eating, smoking, drinking, chewing, or any hand-to-mouth contact in decontaminant areas.

Monitor affects of heat or cold stress or overexertion in the decontamination area.

Monitor air concentrations using direct-reading, real-time instruments such as organic vapor monitors (OVMs) and Draeger tubes.

Establish action levels or limits for ambient air concentration, explosive atmosphere, O₂ deficient atmosphere, and make sure these action levels are understood by decontamination personnel.

Monitor air concentrations using direct-reading, real-time instruments such as OVM and Draeger tubes.

Upgrade PPE as necessary (safety glasses with splash shields or goggles, respirators, neoprene gloves, and slicker suit or laboratory apron).

Stay upwind (use flagging or similar device to indicate wind direction)

Avoid blocking traffic and stay out of the way of drilling activities.

Set up near a water supply and keep natural drainage in mind to reduce run-off and clean up.

Position equipment so over-spray does not get on vehicles or private property.

Allow for adequate ventilation because exhaust fumes can be lethal.

Do not operate near anything flammable where a spark or open flame could start a fire or explosion.



3.16.7 - Wastewater and Decontamination Fluids

Reference MSDS of decontamination solutions for incompatibilities with site contaminants, skin or inhalation hazards, or flammable properties.

Avoid decontamination chemicals/solutions that permeate, degrade, or damage personal protective equipment.

Adhere to all Federal, State, and local agency laws, codes, and regulations when handling, transporting, and storing of wastewater, drilling fluids and decontamination fluids. The material being removed from drill sites must be packaged, moved, stored, treated, and disposed of in a manner that prevents its release into the environment.

Drums and containers used to transport drilling waste will meet the appropriate US Department of Transportation (DOT), OSHA, and EPA regulations for the materials that they contain.

Appropriate manifest and chain of custody documentation should be used and the waste generator should maintain records as required by applicable regulations.

Drums and containers used to contain and store drilling wastes and other hazardous materials must be appropriately labeled in accordance with federal and state regulations.

Drums and containers will be inspected as required by regulations.

Drum and container integrity will be assured prior to being moved.

If leakage or spillage occurs, it will be cleaned up immediately. If necessary, the waste material will be transferred to another container to minimize leakage and appropriate measures taken to prevent reoccurrence.

The drums will have exterior contamination removed at the worksite prior to transportation.

Blocking devices to plug flow paths to create a collection point for filtration and protection of material entering drain inlets or contaminating drill sites are to be used if necessary (such as waddles, sand bags, or plastic dams).

3.16.8 - Steam Cleaning/Pressure Washing

The steam cleaner flame may not be intrinsically safe.

1. Check hose for possible weakness or potential break points prior to use.
2. Avoid pointing any cleaning wand toward body and never use steam, high pressure water, or compressed air for the purpose of cleaning clothes because injury can occur from contact with a high-pressure stream, water, or air.
3. Be aware of heat and hot water from steam cleaner.
4. Burns can occur from contact with hot equipment or water.
5. Wear appropriate eye protection as foreign objects may enter eyes due to splashing.
6. Be aware of slip/trip hazards while walking on wet surfaces.
7. Avoid contact of skin with hazardous rinsing agents (solvents or acids).

8. Keep hoses, troughs, and support equipment in good condition.
9. Do not spray inside vehicle cab.
10. Avoid spraying painted surfaces to keep from removing paint.
11. When shutting down steam cleaner, press spray gun release lever for two minutes or until cool water flows out.
12. Drain hoses and debris into storage containers.

3.16.9 - Health and Safety Hazards of Sampling

Soil and groundwater sampling present various hazards. Besides the usual physical hazards of normal drilling activities and hazards that the individual sites pose, chemical, biological, radiological, and explosive hazards are added when drilling and sampling from monitoring wells. Drilling and sampling activities expose workers to various chemicals that were placed in the ground, either accidentally or intentionally and extreme caution must always be taken when performing these activities in areas of known or suspected waste sites. Not only should workers be aware of the hazards that individual chemicals pose, but of the potential effects of mixtures or chemical interactions because the combination of substances at a waste site may have a more powerfully adverse effect on human health than they would individually. Some of the most significant hazards identified when sampling in known or suspected hazardous waste areas are:

1. Exposure to chemicals or waste
2. Strains
3. Sprains
4. Cuts
5. Pinch points
6. Slips trips, falls.

Sampling procedures are highly complex and must be tailored to fit the chemical being monitored, the hydrogeologic situation, and the design of the monitoring wells. Detailed descriptions of groundwater and soil sampling techniques can be found in publications by the Environmental Protection Agency (Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, EPA 542-S-02-001, EPA-540-S-95-504), ASTM (D5088-02), National Ground Water and National Drilling Associations as well as various scientific journals.

3.16.10 – Work Area Monitoring

Before sampling in areas of potential contamination, it is important to understand what potential physical or chemical hazards the site may pose in addition to the chemical hazards of the materials and preservatives being brought onsite for the purpose of sampling. Historical land use, waste manifests, environmental site assessments, surveys, as built drawings or any other historical documentation may be used to help provide site information. Once a site is ready to be sampled or drilled, the real or potential dangers from fire, explosion, airborne contaminants, radiation, or oxygen deficient atmospheres may need to be monitored. The following details hazards and the equipment used to identify those hazards. Action limits should be set prior to entering the field based on the known or suspected contaminants that may be encountered onsite.

1. **Combustible Gases** -- The atmosphere in any location capable of containing or generating a combustible concentration of gases should be monitored with a combustible gas meter. Actions should be taken in response of the meter reaching a defined percentage of the lower explosive limit (LEL); 25% is often used to cause an immediate evacuation of the site.
2. **Oxygen Deficiency** -- A location capable of containing or generating an oxygen deficiency either by depletion or displacement should be monitored with an oxygen meter. Any reading less than 19.5% oxygen will result in the use of self-contained breathing apparatus (SCBA).
3. **Organic Vapors and Gases** -- The atmosphere can be monitored with either a photoionization detector (PID) or a flame ionization detector (FID). When appropriate, cyanide gas and halogenated vapors will also be monitored. Any response above background concentrations may trigger an upgrade in PPE and respiratory protection. In addition, chemical specific Draeger tubes can also be used to identify presence of specific chemicals.
4. **Inorganic Vapors and Gases** -- There are only a few direct reading instruments with the capability to detect and quantify non-specific inorganic vapors and gases. PIDs have a very limited capability in this area. If specific inorganics are known or suspected of being present, an attempt should be made to provide appropriate monitoring if possible. In the absence of a monitoring capability always assume a worse case scenario and upgrade the level of protection to a level that gives respiratory and skin protection that is appropriate to a worse case assumption.
5. **Radiation** - When radiation may be encountered at a site, a Geiger-Mueller detector for beta and gamma radiation should be used to monitor airborne levels.

Hazards

1. Explosions from methane gas produced by the decay of organic materials in sanitary landfills. An explosion potential also exists in monitoring work involving hydrocarbon recovery.
2. Toxic substances used in manufacturing pesticides, herbicides, solvents, paints, and other common products. Sometimes certain nontoxic chemicals placed in a disposal site will react with other chemicals to produce highly toxic chemicals.
3. Biologic wastes from hospitals or medical laboratories at universities that contain bacteria and viruses.
4. Chemical wastes that are corrosive, highly reactive, flammable, or explosive.
5. Radioactive wastes from hospitals and industrial and university laboratories.

Before attempting to conduct monitoring work at a waste site, the drilling contractor should learn exactly what types of wastes were handled there, provide the necessary protective clothing and training for personnel, and stress that any physical changes in a worker's health may be caused by contact with the waste. Always be prepared for worst case conditions.

Precautions

The following precautions should be assessed when sampling:

1. Maintain good housekeeping practices, store sampling supplies, coolers, tools, and equipment orderly and out of the main traffic area to avoid slip, trip, and fall hazards.

2. Be aware of the electrical hazards associated with using groundwater-sampling pumps.
3. Use ground fault circuit interrupters in wet or moist conditions. Inspect wires for cuts, wearing and fraying. Remove these wires from service and mark DANGER DO NOT USE if faulty.
4. Follow manufacturer's instructions when using generators.
5. Use intrinsically safe electrical equipment in areas suspected to have flammable or explosive hazards.
6. Be aware of biological hazards when revisiting wells for sampling. Often wasps, bees, ants, spiders and other insects and animals take up residence inside or around monitoring wells. Be aware of these potential hazards as wells caps are opened.
7. Request MSDSs for sample preservatives as well as site constituents. Wear appropriate chemical gloves when handling samples as preservatives often contain acidic or corrosive chemicals.

When using bailers for groundwater sampling, consider the following:

1. Use caution and proper lifting techniques when utilizing larger bailers as they are extremely heavy and awkward when full of sampling liquid.
2. Use increased level of PPE, Tyvek, respirator (if necessary), goggles, splashguard, gloves, chemical resistant boots, or booties to protect skin and eyes from contact with contaminated liquids.

When moving equipment consider the following:

1. Avoid wearing loose or baggy clothing.
2. Wear appropriate PPE including leather gloves.
3. Wear appropriate PPE including gloves, goggles, Tyvek suit, respirator, rubber boots, or splashguard when handling contaminated materials as detailed in the health and safety plan.
4. Upgrade PPE as site conditions change and additional PPE is warranted.

When handling sharp sampling tools:

1. Use correct tools for opening soil sleeves.
2. Cut away from body when opening sleeve or cleaning soil cores.
3. Always use a sturdy surface when cutting and handling soil cores.
4. Consider using a carrot peeler or metal putty knife in lieu of knives while preparing and cutting soil samples.

Avoid sample cross contamination by:

1. Decontaminating or disposing of sampling equipment between sampling locations.
2. Double-checking sample labels to ensure accuracy and adhesion to containers.

When performing standard penetration test, consider the following:

1. Split barrel samplers should be inspected daily for excessive wear to threads or bowing of split-tube halves.
2. Keep the ball check free of debris to ensure proper operation.

3. Keep hands away from the bottom of the sampler when removing it from, or inserting it into, the casing or augers.
4. When using pipe wrenches to disassemble the sampler, put yourself in a stable position, and place hands and fingers such that they will not be smashed between the handle and the ground.
5. Inspect 140 lb Safety Hammer daily for cracks or excessive wear to the hammer body, top bail, or threads. Do not hold on to the sampling rods while operating the hammer
6. Do not use hands to manipulate the down hole hammer when transferring it to vertical use.
7. Inspect inner workings of the automatic hammer regularly and lubricate lifting mechanism(s) often.

When conducting Shelby Tube Sampling, consider the following:

1. Use the correct size socket-head bolts.
2. Keep the ball check free of debris to ensure proper operation.
3. Pull, do not push, the pipe wrench while turning the sampling rods to break the sample free while down hole.
4. Do not use the machine to turn the rods.
5. Keep hands away from the bottom of the sampler when removing it from, or inserting it into, the casing or augers.
6. When removing a tube from the head, do not suspend the sampling rods from a slip ring.

Consider the following when using all types of core barrels:

1. Use full grip circle wrenches to assemble and disassemble core barrels.
2. Keep hands away from the bottom of the core barrel or inner tube when removing it from, or inserting it into, the casing, augers, or drill rods.

When using a sample extruder (hydraulic ram), consider the following:

1. There are two extremely dangerous pinch points that can crush or sever extremities.
2. The first pinch point is located at the hydraulic ram, where the ram is inserted into the top of the Shelby tube. This is typically a tight fit and a potential pinch point.
3. The second pinch point area is where the Shelby tubes seats against the front plate.
4. The Shelby tube often becomes unseated when retracting the hydraulic ram, which can cause the Shelby tube to be shoved up onto the ram header and split the metal at the top of the tube causing sharp metal fragments to become high-speed projectiles or for the tube to bend abruptly and hit the person operating the extruder. To prevent this ALWAYS steady the Shelby tube by placing your hand on the mid-portion of the tube while retracting the ram.
5. Only trained and qualified personnel should operate sample extruders
6. Always use side shield safety glasses or goggles when operating the extruder and operate the extruder slowly.
7. Be aware of pinch points and keep hands and clothing away from these areas.
8. When extruding very moist soils, be aware of formation water spraying from the end of the Shelby tube.
9. Inspect hydraulic fluid lines of the hydraulic extruder leading to and from the ram assembly for wear or cuts. If cuts occur, fluid could be expelled at high velocity.

3.16.11 – Respiratory Protection Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to provide the appropriate administrative controls for respiratory protection.

2. SCOPE

- 2.1 This procedure is designed for HDI employees whose job assignments require the use of respirators; at no time will any HDI employees work in an Immediately Dangerous to Life and Health (IDLH) Atmosphere.

3. RESPONSIBILITY

- 3.1 Supervisors shall be responsible for implementing the Respiratory Protection Procedure.
- 3.2 Supervisors shall ensure that employees comply with the following procedures:
 - 3.2.1 Proper selection of equipment and recognition of respiratory hazards in their area of operation.
- 3.3 Employees shall comply with the following procedures:
 - 3.3.1 Wear the appropriate respirator for the chemical hazard found in the workplace.
 - 3.3.2 Obtain new cartridges and gas canisters when necessary.
 - 3.3.3 Maintain awareness of hazards in the workplace and changing conditions.
 - 3.3.4 Contact their supervisor immediately, if at any time unusual circumstances regarding these procedures arise.
- 3.4 The Health & Safety Officer shall:
 - 3.4.1 Provide training and consultation of management personnel to be responsible for the respiratory program in their areas.
 - 3.4.2 Provide or coordinate annual fit testing for all employees who are expected to wear a respirator or SAR's.
 - 3.4.3 Perform random inspections, monitoring, and sampling to assure program effectiveness.
 - 3.4.4 Work with a medical physician to determine appropriate protocols.
 - 3.4.5 The Health & Safety Officer will routinely evaluate the program by asking employees about the fit, selection, use, and maintenance along with job site inspections.



- 3.5 HDI will be responsible to oversee and assist the implementation of this program.
- 3.5.1 HDI will provide respirators, training, and all necessary medical evaluations at no cost to the employee.

4. OBJECTIVE

- 4.1 The objective of this procedure is to provide guidelines for safe use and care of respiratory equipment so that employees can be protected from harmful vapors and oxygen deficiency.

5. PROCEDURE 5.1 Maintenance and care of respirators

- 5.1.1 Employees shall inspect respirators routinely before and after each use and during cleaning. If masks are defective, a new one shall be obtained from the supervisor.
 - 5.1.2 Respirators shall be cleaned and disinfected after each use.
 - 5.1.3 Respirators shall be air dried in a clean area.
 - 5.1.4 Respirators shall be placed in clean plastic bags; sealed for the next use; and stored in a convenient, clean, and sanitary location. Bags shall be labeled with the employee's name.
 - 5.1.5 At the beginning of each job the job site will be analyzed to find out if respirators are needed. Anytime work is being performed in a area with levels of gases or fumes present that exceeds PEL's or anytime work is being performed in a confined space or a hazardous waste site or any area that is oxygen deficient respirators, SCBA, or SAR's will be issued.
- 5.2 Issuing and field testing respirators
- 5.2.1 Prior to issue, each negative pressure respirator wearer shall be given a qualitative fit test. All respirators, training and medical evaluations will be provided to the employee. Medical evaluations will be confidential and conducted during working hours.
 - 5.2.2 Employees shall not have facial hair which interferes with the seal area of a respirator.
 - 5.2.3 If a spectacle, goggle, face shield, or welding helmet must be worn while wearing a respirator, equipment selected shall not adversely affect the seal of the face piece to the face. All employees expected to wear a respirator must be clean shaven at all times. Glasses shall not be worn.
 - 5.2.4 Before each use, the employee shall make an inspection of tightness of connections and the condition of the face piece, headbands, valves, filter holders, and filters. If any questionable items are found, they shall be corrected before the respirator is used.
 - 5.2.5 A positive pressure test shall be performed.

- 5.2.6 A negative pressure test shall be performed.
 - 5.2.7 The respirator selection will be based upon the hazard that the employee is exposed to. All respirators issued will be NIOSH certified respirators.
 - 5.2.8 If at anytime a respirator feels like it is not sealed or is not working properly the employee is to remove themselves from the work area to address the issue.
 - 5.2.9 Only NIOSH certified respirators will be provided to employees.
 - 5.2.10 To verify and maintain the respirator program effectiveness employees will be randomly asked about the fit, selection, use, and maintenance of their given PPE.
 - 5.2.11 If using an air supplied respirator grade D or better air will be used. Oxygen is not used in compressed air units. All cylinders must meet DOT requirements and all safety issues.
 - 5.2.12 Anytime a SCBA or SAR is being used the compressor will be located in a clean environment with a in line purification and tagged to indicate the date it must be changed out. A carbon monoxide detector will be in place and set to alarm at 10PPM. All fittings will be incompatible with non respirable gases and containers.
- 5.3 Respiratory protection and qualitative fit test
- 5.3.1 An HDI qualified fit test representative shall administer the fit test.
 - 5.3.2 Employees shall be instructed and trained in the proper use and limitations of their respirators when and where they are required.
 - 5.3.3 Employees that are expected to wear a respirator or SAR shall maintain ability to pass a Qualitative Fit Test and ensure a satisfactory seal of the respirator to the face.
 - 5.3.4 All employees expected to wear a respirator or SAR will be fit test annually.
- 5.4 Employees shall be instructed and trained in the proper use of respirators and SAR's and their limitations upon initial assignment of respirator use and annually there after if they are expected to use a respirator.
- 5.5 Employees will be occasionally asked about fit, selection, use and maintenance of respirators to evaluate the effectiveness of the training and the program.
- 5.6 Fit testing will occur before initial use, whenever a different respirator is used and annually. SAR's will be inspected before and after use.
- 6. RECORDS**
- 6.1 Respirator fit test records shall be maintained by the HDI office indefinitely.
 - 6.2 Fit test pocket cards shall be issued to employees by the Health & Safety Officer.

- 6.3 Training records will be kept on file by human resources for 3 years.
- 6.4 Human resources will retain all records for fit testing, training, respirator program and medical evaluations in accordance with 29 CFR 1910.1020. All medical records will be made available to the employee at anytime.

3.16.12 – Hydrogen Sulfide (H₂S) and Benzene Awareness Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to provide specific instructions to reduce workers risk by exposure to hydrogen sulfide and or benzene at drill sites.

2. SCOPE

- 2.1 This procedure is designed for HDI employees who have the potential for being exposed to hydrogen sulfide or benzene.

3. RESPONSIBILITY

- 3.1 Managers or Supervisors shall be responsible for the implementation of this program.
- 3.2 Employees shall comply with the following procedures:
 - 3.2.1 Wear the assigned PPE.
 - 3.2.2 Inform their supervisors of equipment that needs to be replaced or repaired.
 - 3.2.3 Inform their supervisors if they have been exposed.
- 3.3 The Health & Safety Officer shall:
 - 3.3.1 Develop and maintain the hydrogen sulfide and benzene awareness program and conduct hazard assessments of the work areas at each HDI location where hydrogen sulfide or benzene is expected. Inform employees of all site specific emergency plans when working near benzene or hydrogen sulfide.

4. OBJECTIVE

- 4.1 The objectives of this procedure are to:
 - 4.1.1 Identify employees with occupational exposure or potential occupational exposure to hydrogen sulfide and benzene.



- 4.1.2 Provide all HDI employees with procedures to eliminate or minimize employee exposure and what to do in the event hydrogen sulfide or benzene is suspected.

5. PROCEDURE

- 5.1 HDI will use the proper PPE when hydrogen sulfide and or benzene are present.
- 5.2 Engineering and work practice controls shall be used to eliminate or minimize exposure to employees. If the potential for exposure continues after implementing these controls, personal protective equipment (PPE) shall be worn. The following controls will be examined and maintained on a regular schedule:
 - 5.3 Employees shall wear Tyvek suits, gloves, safety glasses and rubber boots when hydrogen sulfide or benzene is present in the work area.
 - 5.4 The use of a portable air monitor will be used to detect hydrogen sulfide when it is present. The alarm will be set at the appropriate permissible exposure limit of 10 PPM.
 - 5.4 If hydrogen sulfide is expected a air monitor will be operating in the working area. If the air monitor alarm sounds employees will evacuate the work area until the hazard has been eliminated or a self contained breathing apparatus or airline respirator has been put in place.
 - 5.5 Fire extinguishers will be removed from the rig and placed in a readily available position away from the direct work area when hydrogen sulfide or benzene is present.
 - 5.6 Work area restrictions
 - 5.6.1 Eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses shall not be permitted where exposure to hydrogen sulfide and or benzene are present.
 - 5.6.2 Smoking or any other sources of ignition will not be permitted at the work area when hydrogen sulfide or benzene is present as they are extremely flammable.
 - 5.7 Personal protective equipment (PPE)
 - 5.7.1 Employees shall wear PPE at all times.
 - 5.7.2 PPE shall be worn to prevent exposure to hydrogen sulfide or benzene.
 - 5.7.3 Contaminated PPE shall be removed immediately and placed in an approved container. The Health & Safety Officer shall be contacted for disposing the container.
 - 5.7.4 Contaminated boots will be washed and sanitized at the end of each shift before leaving the work area.
 - 5.7.5 Contaminated PPE other than rubber boots shall not be reused.



- 5.9 Housekeeping
 - 5.9.1 Employees shall clean and decontaminate the area immediately when the following exposures occur:
 - 5.9.1.1 Water, mud, or soil spills containing hydrogen sulfide or benzene.
 - 5.9.1.2 The end of each work shift (if surfaces have become contaminated since the last cleaning).
 - 5.10 Post-exposure evaluation and follow-up
 - 5.10.1 Exposures shall be reported, investigated, and documented.
 - 5.10.2 After a reported exposure, the exposed employee shall immediately receive a confidential medical evaluation and follow-up.
 - 5.10.3 Information shall be provided to the healthcare professional as required.
 - 5.10.4 Healthcare professional's written opinion
 - 5.11.4.1 Within 15 days after the evaluation is completed, the employee shall receive a copy of HDI medical consultant's written opinion.
 - 5.11 Training and information requirements
 - 5.11.1 Training shall be given to employees impacted by this procedure.
 - 5.11.2 Employees will be informed of all site specific contingent emergency plans when working in a environment known to contain H2S or benzene.
 - 5.12 Evaluation and review
 - 5.12.1 This program shall be reviewed annually to evaluate its effectiveness and updated as needed.
- 6. RECORDS**
- 6.1 Medical records shall be maintained by Human Resources indefinitely.
 - 6.2 Training records shall be maintained by the Health & Safety Officer for three years.
- 7. HYDROGEN SULFIDE AWARENESS**
- 7.1 Hydrogen Sulfide can be found at any drilling site, either in the water, mud, or soil. Hydrogen sulfide is routinely found underground at landfills, petroleum sites, in volcanic gases, and near any large amount of human or animal waste. Be aware when drilling near any of those types of locations.
 - 7.2 Hydrogen Sulfide is toxic, colorless, and carries the odor of rotten eggs.
 - 7.3 Hydrogen Sulfide is extremely flammable.



- 7.4 Symptoms of exposure would include but are not limited to eye irritation, respiratory irritation, convulsions, conjunctivitis, dizziness, headache, irritability, and weakness.

8. BENZENE AWARENESS

- 8.1 Benzene can be found at any drilling site, more commonly found at petroleum refineries, gas stations, and anywhere crude oil is present.
- 8.2 Benzene is toxic, colorless and carries a aromatic odor.
- 8.3 Benzene is extremely flammable.
- 8.4 Symptoms of Benzene exposure are but not limited to irritation of eyes, nose, and skin, shortness of breath, euphoria, headache, dizziness, and nausea.

SECTION 4 - WELL CONSTRUCTION, DEVELOPMENT, AND ABANDONMENT

4.1 - Introduction

Well construction consists of placing a well screen and casing (riser) into the open borehole. The materials of construction can include screen and blank casing composed of polyvinyl chloride (PVC), low carbon steel, fiberglass, stainless steel, and other more exotic materials. Annular materials such as gravel or filter pack (surrounding the screen), fine sand seal, (above the gravel pack), bentonite pellets, (above the fine sand seal) and a grouting material (impervious materials such as cement or high-solids bentonite grout) are placed in the annulus between the borehole and screen or riser casing, after the screen and casing are installed. Finally a surface completion consisting of a well pad, locking riser and protective bollards are installed to protect the above ground portions of the well.

Well development includes the operations, performed on the constructed well, which mitigate the formation damage caused by the drilling methods. Both chemical and physical techniques can be used during well development operations. Chemical methods include treating the well with specialty chemicals such as polyphosphates, acids and other specific compounds designed to increase the flow from the formation into the well. Physical methods may include, high pressure jetting of water into the well, surging, bailing, swabbing or even the introduction of dry ice or compressed air into the well to create a low pressure environment inside the well screen and casing.

Well abandonment activities are performed on extraction, injection and monitor wells when the well is no longer needed for its intended function. Wells can be abandoned by simply installing and impermeable material (grout) inside of the well, or requirements may dictate that the entire well must be removed from the ground (over drilling).

4.2 - Roles and Responsibilities

In most instances the consultant or owner determines the depth of the well and the precise location of the well materials. The data are then provided to the driller who physically installs the well materials into the borehole. Depending on the contractual arrangements, the driller or owner may purchase the well materials and transport the materials to the actual well site. Well development criteria are also provided to the driller by the owner or consultant. Finally, well abandonment parameters are many times determined by state and local regulations.

4.3 - Personal Protective Equipment (PPE)

The PPE requirements for well construction are similar to the protection worn during the drilling operations. At a minimum the following PPE is required:

1. Hard hat
2. Steel toed boots
3. Gloves



4. Safety glasses
5. Hearing protection

Additional dermal and respiratory protection is dictated by the site-specific health and safety plan. The field personnel must remember that as the well materials are being added to the borehole, fluids are being displaced and may rise to the ground level in the borehole. Therefore, the PPE should mitigate potential exposure to the contaminants present in the subsurface or ground water. PPE for well development must also be determined based on the chemicals used for well development and the potential for exposure to contaminated ground water.

4.4 - Waste containment

Two waste streams will be generated during well construction, subsurface materials such as soil and ground water and rubbish including, empty filter pack and cement bags, five gallon pails, boxes and bags from the well screen and casing along with other packing containers.

The soil cuttings and ground water should be contained in the same manner as the material generated during the drilling operations.

The rubbish and trash must be properly controlled in labeled containers during well construction. Placing the material in receptacles as they are used eliminates the potential for slips, trips, and falls caused by personnel movement around the well site.

Well development activities generate a rubbish waste stream (from packaging of the chemicals) and the ground water produced during pumping activities.

4.5 - Traffic

Many times the well is constructed in a high traffic area such as a retail service station. The traffic control plan developed for the drilling operations should also be used for the well construction, development, and abandonment phases of the project.

4.6 - Housekeeping of Bagged Material

Filter pack, transition sand, cement, and high solids bentonite grout are normally packaged in paper bags weighing between 50 lbs and 100 lbs. Many times the bagged material is stored on the project location in inclement weather conditions. Rain and sunlight can and will degrade the packaging material which leads to breakage and spillage of sand, gravel and grout material. Additionally, the bagged material must be stacked in a manner which is safe for personnel moving the sacks.

The following sections detail the steps used in well construction activities along with potential hazards of the operations.

4.7 - Transport Well Materials to Location

Prior to the movement of materials to the well location the following items will need to be considered:

1. Distance from supply vehicle to the well location
2. Weight, size and length of the materials
3. Site terrain and pathways
4. Method of movement and equipment to be used

4.7.1 - Well Casing and Annular Materials

Movement of the well casing material (PVC, Stainless) and annular materials (filter pack, seal materials and cement or grout) may involve the use of manual or mechanical handling methods such as:

1. Forklift
2. Manually (PVC screen and casing, individual bags of gravel, sand and grout)

4.7.2 - Potential Hazards for Moving Well Materials

Potential hazards include:

1. Manual lifting of heavy bags and awkward lengths of pipe
2. Slips trips and falls
3. Pinch points
4. Obstructions (overhead and pathway)
5. Long lengths of piping
6. Traffic

4.8 - Install Screen and Casing

Prior to installation of well screen and casing into the borehole the following items should be considered:

1. Type of screen and casing PVC (manual installation) steel and stainless steel (rig installation)
2. Weight of casing string (rig capacity)
3. Overhead obstructions and clearance
4. Connection type (threaded, welded)

Potential Hazards for Screen and Casing Installation include:

1. Manual screen slotting
2. Manual lifting of awkward lengths or heavy pipe
3. Pinch points
4. Obstructions (overhead and pathway)



5. Connections
6. Torque
7. Pinch Points
8. Pipe length and weight
9. Hand Tools - pipe wrenches

4.9 - Install Annular Materials

Prior to the installation of annular materials the following should be considered:

1. Weight of bagged materials (typically 50 - 100 lbs)
2. Package shape, bags, pails
3. Dust and chemical issues (minimization of dust generation)
4. Distance from the staging area or off-load location to the well

Potential Hazards of annular material installation include:

1. Silica and other dust (Avoid skin and eye contact; Wear respiratory protection)
2. Pressurized lines during grout mixing and placement
3. Opening bags
4. Knives, box cutters, hammers, screw driver
5. Trash obstacles

4.10 - Develop the Well

In most cases, well development activities are performed by a separate rig and crew - not by the drilling rig and crew. Therefore the development rig crew must consider the same operational safety checks as the drilling rig. Refer to previous sections of this guide for information about:

1. Pre-Mobilization Tasks
2. Traveling to Site
3. Confirmation Activities
4. Preparation and Set Up
5. Moving People and Equipment to Site
6. Rig Set Up
7. Raising the Mast

Prior to well development the following should be considered:

Methods:

- Physical
1. Swab
 2. Bail
 3. Airlift
 4. Overpump



Chemical

1. Acid
2. Mud thinners (polyphosphates, liganosulfates)

Fluid containment - drums tanks

1. Labeling
2. Long term storage
3. Hauling

4.10.1 - Potential Hazards of Well Development

1. Pinch points
2. Tool lengths
3. Moving cables
4. Contaminated fluids
5. Acids and polyphosphates
6. Electricity
7. Noise
8. Pressurized lines

4.11 - Surface Completion

Prior to well surface completion the following should be considered:

1. Type of completion - flush mount, above grade, locking
2. Bollard location and clearances

4.11.1 - Potential Hazards of Surface Completion:

1. Traffic control
2. Mixing concrete
3. Heavy vaults and boxes
4. Striking underground utilities
5. Vault settlement - trip hazard, surface water intrusion

4.12 - Abandoning Wells

Prior to well abandonment the following should be considered:

Rig mobilization and rig up - from Section 4 – Drilling Operations

Method

1. Over drill
2. Abandon in place



4.12.1 - Potential Hazards of Over Drill

All previous sections of the guideline apply.

4.12.2 - Potential Hazards of Abandon in Place

1. Silica and other dust – Skin and eye contact must be avoided and respiratory protection worn.
2. Pressurized lines during grout mixing and placement
3. Opening bags – knives, box cutters, hammers, screw drivers may be unsafe if not used properly
4. Trash obstacles
5. Fluid containment
6. All pipe handling safety guidelines apply

Each job location has site-specific parameters that govern the means and methods for well installation, development and abandonment activities. The drilling method and drill rig will dictate the specific hazards involved. Daily tailgate meetings and job safety analysis should be developed for the specific tasks based on the drilling method and rig, type of well materials, or location of material staging area.

Specific job safety analysis for well construction may include:

1. Proper lifting techniques
2. Loading and unloading of forklift or truck beds
3. Hand tool usage
4. Drum handling



SECTION 5 – ADDITIONAL SHOP & JOBSITE EQUIPMENT REPAIR CONSIDERATIONS

5.1 – Introduction

This section is designed as a Supplement to the HDI HASP Document, and is intended to address those areas which may occur during routine HDI Equipment, Fabrication, and Maintenance, as well as any repair that may take place at an HDI Jobsite. HDI considers Lockout/Tagout, Welding Safety, Hazards Communication, and Confined Space Entry as key components to all equipment fabrication, repair, and maintenance. **ALL HDI EMPLOYEES ARE REQUIRED TO ADHERE TO THESE SPECIFICATIONS AT ALL TIMES.**

5.2 - Lockout/Tagout Checklist

YES NO COMPLETION DATE

5.2.1 - Equipment, machinery and personnel

- | | | | |
|--|-------|-------|-------|
| a. A list of equipment and machines that need to be locked out has been developed. | _____ | _____ | _____ |
| b. All new machinery (after Jan. 1990) has the ability to accept a lockout device. | _____ | _____ | _____ |
| c. Specific <u>written</u> Energy Control Procedures are developed and used for each piece of equipment. | _____ | _____ | _____ |
| d. A list of all <u>authorized</u> employees has been developed. | _____ | _____ | _____ |
| e. A list of all <u>affected</u> employees has been developed. | _____ | _____ | _____ |

5.2.2 - Energy Control Program

- | | | | |
|---|-------|-------|-------|
| a. A <u>written</u> Energy Control Program has been developed. | _____ | _____ | _____ |
| b. Does the written program state the methods of compliance, including the: | | | |
| Intended use of procedures. | _____ | _____ | _____ |
| Steps for shut down, isolating, blocking and securing energy. | _____ | _____ | _____ |



- Steps for placement, removal,
and transfer of lockout/tagout devices. _____

- Requirements for testing to
verify effectiveness of lockout/tagout. _____

- c. Compliance with energy control procedures
is verified at least annually. The results of the
inspection are certified and kept on file. _____

- d. Lockout/tagout devices are provided.
(locks, hasps, tags, etc.). _____

- e. Lockout devices are singularly identified,
durable, standardized, substantial and
employee identifiable. _____

- f. Lockout devices are used only for energy
control. _____

- g. A tagout system is used only if a isolating
device cannot be locked out. _____

- h. Tagout devices are located at the same
location as lockout devices. _____

- i. Tagout devices warn against hazardous
conditions such as Do Not Start,
Do Not Open. _____

- j. Energy isolation is performed ONLY by
authorized employees. _____

- k. Affected employees are notified before and
after lockout/tagout. _____

5.2.3 - Training requirements

- a. Group lockout/tagout procedures are
used when needed. _____

- b. Information about each others' lockout
program is exchanged with
contractors. _____

- c. Continuity of lockout/tagout is provided
during shift change and
personnel changes. _____



- d. Authorized employees - recognition of energy sources, type and magnitude of energy and methods and procedures necessary for isolation and control. _____
- e. Affected employees - purpose and use of energy control procedures. _____
- f. Other employees - instructed on the procedures locked or tagged out. _____
- g. For tagout system – limitations of tags. _____
- h. Retraining - when change in job, assignment, equipment, process, procedure or the result of an inspection. _____
- i. Training is certified with names and dates. _____

5.3 – Welding Safety Introduction

The purpose of this section is to address specific guidelines to be followed by HDI Employees when conduction welding operations either at an HDI Maintenance Facility or at an HDI Jobsite. All employees performing welding repair or construction must be properly trained and certified or supervised by a Senior HDI Driller or Mechanic. **NO EMPLOYEES ARE ALLOWED TO WELD ON HDI PREMISES WITHOUT PROPER SUPERVISION AND TRAINING.**

5.3.1 - Welding and Cutting Safety Guidelines

1. Always follow the manufacturer’s recommendations for setting up and operating equipment, selection of tip size, and gas cylinder operating pressures.
2. Always use a regulator to reduce gas cylinder pressure to the operating pressures recommended by the equipment manufacturer. All piping and equipment must meet the standards of the Compressed Gas Association.
3. Always ensure that all connections are leak tight. Each time connections are loosened and retightened each connection should be checked with a soap and water solution (oil free soap). Do not check with flame.
4. Before “lighting up” clear out each line by letting a small amount of gas flow (separately) to remove any mixed gases that might be in the lines.
5. Never use defective, worn or leaky equipment. Repair it or take it out of service.

6. Never use acetylene in excess of 15 psi pressure. Higher pressures with acetylene are dangerous. If the cylinder is not fitted with a hand wheel valve control, any special wrench required must be placed on the cylinder while the cylinder is in service. On manifolds, one wrench for each manifold will suffice.
7. Always have an appropriate fire extinguisher in good operating condition readily available when operating welding or cutting equipment.
8. Never perform welding, cutting, brazing, or heating operations in a poorly ventilated area. Avoid breathing fumes from these operations at all times, particularly when zinc, cadmium, or lead coated metals are involved.
9. Never perform welding or cutting operations near combustible materials (gasoline cans, paints, paper, rags, etc.).
10. Always protect yourself, others present, welding hoses, gas cylinders, and flammable materials in the area from hot slag and sparks from the welding and cutting operations.
11. The welder and spectators must always wear goggles to protect the eyes from injurious light rays, sparks and hot molten metal during welding, cutting, and heating operations. Eye protection must comply with the established ANSI Standards.
12. Always wear clean, oil free clothing during welding and cutting operations. Protect the hands with leather welding gloves to avoid burns from radiation and hot molten slag. Low cut shoes and trousers with cuffs or open pockets should not be worn.
13. Never use a match or cigarette lighter to light a cutting or welding torch. Always use a spark igniter. Fingers are easily burned by the igniting gas when a match or cigarette lighter is used.
14. Ensure that the material being welded or cut is secure and will not move or fall on anyone.
15. Never use a welding, cutting, or heating torch on a container that has held a flammable liquid. Explosive vapors can accumulate and linger in closed containers for extended periods of time.
16. Never use a regulator for gasses other than those for which it was designed for by the manufacturer since the diaphragm and seat materials may not be compatible with other gasses.
17. Never attempt to adapt and use a fuel gas or inert gas regulator on an oxygen cylinder. A special protective device is incorporated on the oxygen regulator to harmlessly dissipate the heat caused by the recompression when the cylinder valve is quickly opened. Such a protective device is not furnished on fuel gas and inert gas regulators.
18. Never tamper with the safety devices on cylinders, fuse plugs, safety discs, etc. and do not permit torch flames or sparks to strike the cylinder.
19. Always refer to the various gasses by their proper names. (Do not refer to oxygen as “air” or acetylene as “gas”.)
20. All cylinders, particularly acetylene, should be restrained securely in an upright position to prevent accidents. A non-vertical position for an acetylene cylinder in use would allow the discharge of acetone through the regulator and into the cutting torch, clogging the mixer passages and creating a fire hazard. It would reduce the efficiency of the flame and contaminate the weld area. It also can cause voids in the porous material inside the cylinder, which can lead to acetylene explosions.
21. Store all gas cylinders not in use away from excessive heat sources, such as stoves, furnaces, radiators, the direct rays of the sun, and the presence of open flames. Cylinders in storage should always be secured in an upright position.
22. Keep all burning or flammable substances away from the oxygen or fuel gas storage area (at least 20 feet) and post “No Smoking” signs.

23. Upon completion of a welding, heating, or cutting operation immediately inspect the surrounding areas for smoldering embers. Allow at least one half hour to elapse before leaving the area and conduct another thorough inspection just before leaving. Also alert other personnel of fire possibilities.
24. Always have the properly fitted wrench to fasten a regulator to a cylinder. Never tighten the regulator by hand.
25. Always leave the fuel gas cylinder valve wrench in place when the cylinder valve is open so that it can be closed quickly in an emergency. Do not open acetylene valves more than one-quarter (1/4) turn.
26. Before connecting a regulator to a gas cylinder, open the cylinder valve for a moment. Called cracking the cylinder valve, this will blow out any foreign material that may have lodged in the valve during transit. Do not stand in front of the valve when “cracking”.
27. After attaching a regulator to a gas cylinder, be sure the regulator adjusting screw is fully released (backed off in a counter clockwise direction so that it swivels freely) before the cylinder valve is opened. Never stand in front of a regulator when you are opening a cylinder valve.
28. Always open the cylinder valve slowly so that gas pressure will build up slowly in the regulator (particularly in the oxygen cylinder). Quick opening of the cylinder valve causes a build up of heat due to recompression of the gas. When combined with combustible materials, ignition and explosion may result.
29. If a leak develops in a fuel gas cylinder that cannot be stopped by closing the valve, immediately place the cylinder outside of the building away from possible fire or ignition sources in a location that is free from wind currents that might carry the gas to an ignition source.
30. Never attempt to mix gasses in a cylinder or fill an empty one from another (particularly oxygen cylinders). Mixture of incompatible gasses and/or heat caused by recompression of the gas or gasses may result in ignition and fire. Only the owner of a cylinder may mix gasses in it.
31. When a gas cylinder is ready for return to the supplier, be certain the cylinder valve is closed to prevent internal contamination and the shipping cap is in place to protect the cylinder valve. Identify empty cylinders.
32. Never use oxygen or other gasses as a substitute for compressed air in operation of air-operated tools, blowing off parts, or for ventilation purposes. The only exception to this rule is where oxygen is used to blow out port passages and talcum powder or dust from welding hoses when setting up new or old “dusty” equipment.
33. Do not attempt to do your own repair on welding equipment. Equipment that is improperly repaired can cause leaks and other hazardous conditions. Repairs must be performed by qualified repair personnel.
34. Never repair welding hose with tape. Use of tape and many hose splicers can reduce the pressure to the torch and can cause hazardous conditions. Welding hose must meet the specifications of the Compressed Gas Association.
35. Use the shortest length of hose possible. Longer hoses require higher gas pressures and can be hard to handle.
36. Never use oil or grease on any part of welding or cutting equipment and never let it come into contact with oil or grease. This includes gas cylinders, work bench, regulators, torches, tips, threads on bottles, and clothes that are worn, such as jackets, gloves, and aprons. Oxygen and oil or grease can cause explosions and fire.
37. Never use a hammer on the valve cover caps to loosen them. Use a piece of wood to soften the impact and prevent sparks and damage to the cap.

38. When moving gas cylinders always roll them on their bottom edges or in a cart designed for their movement. Sliding or dragging them or rolling causes excessive wear and may weaken their walls by metal erosion. Slings and electromagnets are not authorized when transporting cylinders.
39. Never use cylinders as rollers to move material. Do not let them bump into each other or let them fall.
40. Fuel gas and liquefied fuels must be stored and shipped valve end up.
41. Do not hammer on any cylinder. Do not tamper with the relief valves. If you have trouble, contact the supplier for assistance.
42. Suitable eye protection must be worn for all welding and cutting operations.
43. Cylinders must be secured. Valves must be closed when unattended and caps must be on the cylinders when the regulators are not on the cylinders.
44. Cylinders must be upright when they are transported in powered vehicles.
45. All cylinders with a water weight of over 30 lbs. must have caps or other protection.
46. All fuel gases must be used through a regulator on cylinder or manifold.
47. Compressed gas cylinders must be upright except for short periods for transportation.
48. Repair work on gauges and regulators must be done by qualified personnel.
49. Only 4 inches of hose per foot may be covered with tape. Defective hoses must be removed from service.
50. Oxygen must not be used for ventilation.
51. Oxygen regulators must be marked "Use No Oil". Regulators and fittings must meet the specifications of the Compressed Gas Association.
52. Union nuts on regulators must be checked for damage.
53. Before removing a regulator, shut off cylinder valve and release gas from regulator. Equipment must be used only as approved by the manufacturer.
54. Caps must be on cylinders unless they are transported on a special carrier.
55. Hot warnings on materials are required.
56. Fire is the biggest hazard in welding. The area should be cleared for a radius of 35 feet. Fire shields should be used. The area should be monitored for 30 minutes or more after end of work to ensure there is no delayed ignition.
57. Proper personal protective equipment must be worn by all welders and assisting personnel.
58. All welding personnel should be advised of the hazards from heating zinc, lead, cadmium, and any other substances that could cause health problems from the welding activity.

5.3.2 – Arc Welding Safety Guidelines

1. Chains, wire ropes, hoists, and elevators must not be used to carry welding current.
2. Leather capes should be used for overhead welding.
3. The neck and ears must be protected from the arc.
4. Conduits with electrical conductors in them must not be used to complete a welding circuit.
5. Welding shields must be used to protect other workers from injurious light rays.
6. Welding leads must be inspected regularly for damage to insulation. Only proper splicing will be authorized. There should be no splices in stinger lead within 10 feet of the stinger and the leads should never be wrapped around the body.



5.4 – Shop & Jobsite Supplemental Hazard Communication Program

The purpose of the Hazard Communication Program is to ensure that the hazards of all chemicals produced or imported by chemical manufacturers or importers are evaluated. Information concerning the hazards must be transmitted to affected employers and employees before they use the products.

1. Inventory Lists – Know the hazardous chemicals in your workplace that are a potential physical or health hazard. Make an inventory list of these hazardous chemicals; this list must be a part of your written program.
2. MSDS – Make sure there is a material safety data sheet (MSDS) for each chemical and that the inventory list and labeling system reference the corresponding MSDS for each chemical. MSDS database will be readily available for viewing in the HDI office and all chemicals stored on or within the drill rigs will be available inside the rig.
3. Labeling System – Each container entering the workplace must be properly labeled with the identity of the product, the hazardous warning, and the name and address of the manufacturer. Pictures and symbols will apply as well. Labels and all other forms of warning need to be well taken care of. Labels and other forms of warning are not to be defaced or removed at anytime.
4. Written Program – Develop, implement, and maintain a comprehensive written hazard communication program at the workplace that includes provisions for container labeling, material safety data sheets, and an employee training program. The program will be communicated in English but will be translated if a employee with another language is hired.

Employees must be made aware of where hazardous chemicals are used in their work areas. They must also be informed of the requirements of the Hazard Communication Standard, the availability and location of the written program, the list of hazardous chemicals, and the material safety data sheets. Employees will be trained upon new hire orientation and annually there after.

This code specifically requires employers to train employees in the protective practices implemented in their workplace, the labeling system used, how to obtain and use MSDSs, the physical and health hazards of the chemicals and the recognition, avoidance and prevention of accidental entrance of hazardous chemicals into the work environment.

Non routine tasks can be the most hazardous due to employees not being trained or informed on how to deal with a task that is not expected or non routine. Employees will be informed and reminded on a regular basis of the hazards involved in emergency or non routine tasks and general rules and guidelines to follow to ensure no chemical exposure will occur.

If working on a multi employer jobsite employees must follow HDI hazard communication procedures. If the general contractor of the jobsite has additional rules and guidelines to follow all HDI employees will follow those rules or guidelines. Keep in mind on multi employer jobsites not all employers have the same hazard communication procedures in place as HDI does. Do not use or store any other employers chemicals.



5.5 – Confined-Space Entry Introduction

Fatalities and injuries constantly occur among construction workers who, during the course of their jobs, are required to enter confined spaces. In some circumstances, these workers are exposed to multiple hazards, any of which may cause bodily injury, illness, or death. Workers are injured and killed from a variety of atmospheric factors and physical agents.

5.5.1 – Confined Space Entry Regulation

The construction standard (WAC 296-155) requires that companies follow WAC 296-809, when working in confined spaces. There is an exception for work on sewer systems under construction.

Employers must consult with employees and their authorized representatives on the development and implementation of all aspects of the permit required confined space entry program required by the Confined Space Standard, (WAC 296-809).

All information required by the Confined Space Standard must be available to employees affected by the standard (or their authorized representatives).

You must first determine if you have any confined space situations. A confined space has three characteristics; it must have **all three** characteristics to be considered a confined space:

- a. Large enough to get your body entirely inside to do your work
- b. Not designed or intended for continuous occupation
- c. Restricted entry or exit

If you do have any confined spaces, you must not enter them until you have carefully evaluated the hazards inside to determine what type of entry procedure may be used for each confined space you have:

- Non-permit-required confined space (NPRCS)
- Permit-required confined space (PRCS)
- Alternate Entry

5.6 – Fall Protection Introduction

The purpose of this procedure is to provide specific instructions for the use of fall protection, and to ensure that affected employees are trained and made aware of the safety provisions which are required by federal and state agencies.



5.6.2 – Fall Protection

1. SCOPE

- 1.1 This procedure is designed for HDI employees whose job assignments expose them to fall hazards above Six feet.

2. RESPONSIBILITY

- 2.1 HDI shall be responsible for providing fall protection equipment.
- 2.2 Managers shall be responsible for ensuring compliance with this procedure.
- 2.3 Supervisors shall ensure that employees comply with this procedure.
- 2.4 Employees shall:
 - 2.4.1 Follow the Fall Protection Procedure.
 - 2.4.2 Wear the Personal Protective Equipment (PPE) assigned to them.
 - 2.4.3 Ensure that their fall protection equipment is in safe operating condition.
- 2.5 The Health & Safety Officer shall develop and maintain the Fall Protection Procedure.
- 2.6 Fall protection must be provided for employees at all heights of 6 feet and greater.

3. OBJECTIVE

- 3.1 The objective of this procedure is to identify guidelines and procedures for safe operations which involve the risk of employees falling more than six feet.

4. PROCEDURE

- 4.1 Site specific fall protection work plan
 - 4.1.1 The supervisor and employee(s) that participate in activities where a fall hazard of 6 feet or more exists shall hold a safety training meeting prior to performing work. A fall protection work plan shall be discussed for each project where fall protection will be needed and documented on the Safety Meeting form. If possible, the supervisor shall review and approve fall restraint and anchor points with employees.

- 4.2 Employees traveling or working in an elevated area wherever a fall exposure exists shall make use of fall protection by securing their safety lanyard whenever feasible to an available substantial anchoring point.
- 4.3 Anchor points
 - 4.3.1 Anchor points shall be selected based on force and load requirements.
 - 4.3.2 The use of anchor points shall be discussed during the safety meeting.
 - 4.3.3 The selection of the anchorage point shall reduce free fall to the shortest distance possible.
 - 4.3.4 Anchor points may be the equipment structure in some cases.
 - 4.3.5 Guardrails and railings shall be used only as anchor points if they have been designated as such.
- 4.4 Walking and working surfaces
 - 4.5.1 Each employee on a walking/working surface six feet or more above lower levels shall be protected from falling by a guardrail system (a safety net system or personal fall arrest/restraint system may also be used), whenever feasible.
- 4.5 Access and egress with ladders
 - 4.5.1 A body harness and restraint system shall be used when climbing ladders greater than 25 feet in height, unless the ladder is enclosed with a protective case. Controlled access zones will not be used.
- 4.6 Fall protection equipment
 - 4.6.1 Personal fall protection devices shall meet ANSI requirements.
 - 4.6.2 Full body harnesses shall be used for fall arrest purposes and fall restraint.
 - 4.6.3 Fall protection equipment shall be inspected prior to use. These inspections shall include visually observing that the load stitches are intact and belts and lanyards are not deteriorated or frayed. Any equipment found defective shall be removed from service.
- 4.7 Elevated platforms
 - 4.7.1 Safety harness and Lanyard will be the approved manner of fall protection while in any elevated platform.
 - 4.7.2 All anchorage points will meet the 5000 lb. rating as required.
 - 4.7.3 All anchorage points will have the approval of HDI Management or Safety Officer.



5. TRAINING

- 5.1 All employees will be trained on how to recognize that a fall hazard exists.
- 5.2 Any employee that is expected to work around or near a fall hazard that cannot be controlled by means of guardrails shall be trained on how to use the fall restraint and or fall arrest equipment.
- 5.3 Employees will be re trained as any equipment or procedures change.
- 5.4 All training will be documented and kept in the HDI office.
- 5.5 Safety Solutions will prepare all training programs and conduct the training.

6. RESCUE PROCEDURES/ACCIDENT & NEAR MISS REPORTING

- 6.1 911 will be called immediately and used for any rescue procedures
- 6.2 Any accident or near miss will be investigated immediately after employee has been rescued or the near miss has been reported.



HDI HEALTH & SAFETY PLAN (HASP) APPENDICES

Appendix A – Holocene Heat Stress Supplement

Appendix B – Holocene Bloodborne Pathogens Supplementary Procedure

Appendix C – Holocene Sample Job Orientation Guide

Appendix D – Holocene Sample Employee’s Report of Injury Form

Appendix E – Holocene Sample Incident Investigation Report Form

Appendix F – Holocene Sample Crew Safety Meeting or “Toolbox” Safety Notes

Appendix G – Holocene Sample Equipment Safety Inspection Checklist

Appendix H – Holocene Sample Job Safety Analysis Worksheet

Appendix I – Holocene Safety Disciplinary Action Procedure

Appendix J – Holocene First Aid Supplemental Procedure

Appendix K – Holocene Ladder Safety Supplemental Procedure

Appendix A – Holocene Heat Stress Supplement - How do you prevent heat illness?

1. Supply adequate water and encourage workers who work in hot weather to drink regularly, even when not thirsty. A small amount of water every 15 minutes is recommended rather than a large amount after hours of sweating.
2. Learn the signs and symptoms of heat-related illness.
3. Inform workers they should avoid alcohol or drinks with caffeine before or during work in hot weather.
4. Try to do the heaviest work during the cooler parts of the day.
5. Adjusting to work in heat takes time. Allow workers to acclimatize. Start slower and work up to your normal pace.
6. Wear lightweight, loose-fitting, light-colored, breathable (e.g. cotton) clothing and a hat.
7. Allow workers to take regular breaks from the sun. Loosen or remove clothing that restricts cooling.
8. Watch workers for symptoms of heat-related illness. This is especially important for non-acclimatized workers, those returning from vacations and for all workers during heat-wave events.
9. If exertion causes someone's heart to pound or makes them gasp for breath, become lightheaded, confused, weak or faint, they should STOP all activity and get into a cool area or at least into the shade, and rest.

Heat Stroke or Heat Exhaustion? How do you tell the difference?

The two major heat-related illnesses are heat exhaustion and heat stroke. Heat exhaustion, if untreated, may progress to deadly heat stroke. **Heat stroke is very dangerous and frequently fatal.** If workers show symptoms, *always take this seriously* and have them take a break and cool down before returning to work. *Stay with them.* If symptoms worsen or the worker does not recover within about 15 minutes, call 911 and have them transported and medically evaluated. *Do not delay transport.*

The telling difference is mental confusion or disorientation in ALL heat stroke victims.

You can ask these 3 questions:

- ◆ What is your name?
- ◆ What day is this?
- ◆ Where are we?

If a worker can't answer these questions, assume it is heat stroke.



What are the symptoms of heat exhaustion and heat stroke?

Heat Exhaustion	Heat Stroke
<ul style="list-style-type: none"> • Heavy sweating • Exhaustion, weakness • Fainting / Lightheadedness • Paleness • Headache • Clumsiness, dizziness • Nausea or vomiting • Irritability 	<ul style="list-style-type: none"> • Sweating may or may not be present • Red or flushed, hot dry skin • Any symptom of heat exhaustion but more severe • Confusion / Bizarre behavior • Convulsions before or during cooling • Collapse • Panting/rapid breathing • Rapid, weak pulse • Note: May resemble a heart attack

What do you do if someone is suffering from heat exhaustion or heat stroke?

Heat Exhaustion	Heat Stroke (medical emergency)
<ul style="list-style-type: none"> • Move the worker to a cool, shaded area to rest; do not leave them alone. • Loosen and remove heavy clothing that restricts evaporative cooling. • Give cool water to drink, about a cup every 15 minutes. • Fan the worker, spray with cool water, or apply a wet cloth to their skin to increase evaporative cooling. • Recovery should be rapid. Call 911 if they do not feel better in a few minutes. • Do not further expose the worker to heat that day. Have them rest and continue to drink cool water or electrolyte drinks. 	<ul style="list-style-type: none"> • Get medical help immediately, call 911 and transport as soon as possible. • Move the worker to a cool, shaded area and remove clothing that restricts cooling. • Seconds count – Cool the worker rapidly using whatever methods you can. For example, immerse the worker in a tub of cool water; place the worker in a cool shower; spray the worker with cool water from a garden hose; sponge the worker with cool water; or, if the humidity is low, wrap the worker in a cool, wet sheet and fan them vigorously. Continue cooling until medical help arrives. • If emergency medical personnel are delayed, call the hospital emergency room for further instruction. • Do not give the worker water to drink until instructed by medical personnel.



Heat Stress Check List

1. Does the worksite have temperature extremes (above 85 degrees in higher humidity, above 90-95 degrees in lower humidity) that may cause heat stress?
2. Do employees do heavy labor or wear heavy protective clothing? (increases heat stress conditions)
3. Do employees have access to adequate drinking water at all times?
4. Are employees allowed work breaks during prolonged heavy labor?
5. Do workers have access to shade during breaks?
6. Have employees been trained on the symptoms of heat-related illness (heat exhaustion and heat stroke)?
7. Are employees trained on first aid measures for heat-related illness?



Appendix B – Holocene Bloodborne Pathogens Exposure Control Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to provide specific instructions to reduce workers risk by minimizing or eliminating employees' exposure to bloodborne pathogens, such as the Hepatitis B Virus (HBV), non-A and non-B hepatitis, and Human Immunodeficiency Virus (HIV).

2. SCOPE

- 2.1 This program applies to all occupational exposure to blood or other potentially infectious material.

3. RESPONSIBILITY

- 3.1 Managers or Supervisors shall be responsible for the implementation of this program.
- 3.2 Employees shall comply with the following procedures:
 - 3.2.1 Wear the assigned PPE, provided by the employer at no cost to the employee.
 - 3.2.2 Inform their supervisors of equipment that needs to be replaced.
 - 3.2.3 Inform their supervisors if they have been exposed.
- 3.3 The Health & Safety Officer shall:
 - 3.3.1 Develop and maintain the Bloodborne Pathogens Exposure Control Procedure and conduct hazard assessments of the work areas at each HDI location for exposure determination. Exposure determination will have no regard to PPE
 - 3.3.2 Copies of the Bloodborne Pathogens Exposure Control Procedure are available for employees to view in the HDI office at anytime.

4. OBJECTIVE

- 4.1 The objectives of this procedure are to:
 - 4.1.1 Identify employees with occupational exposure or potential occupational exposure to blood and OPIMs.
 - 4.1.2 Provide procedures to eliminate or minimize employee exposure.



5. PROCEDURE

- 5.1 HDI will use universal precautions to prevent contact with blood or OPIMs.
- 5.2 Engineering and work practice controls shall be used to eliminate or minimize Also exposure to employees. If the potential for exposure continues after implementing these controls, personal protective equipment (PPE) shall be worn. The following controls will be examined and maintained on a regular schedule:
- 5.3 Employees shall wash their hands and skin with soap and water or flush mucous membranes with water immediately after contact with blood or OPIMs and PPE removal, if hand washing station is not available a antiseptic solution will be used.
- 5.4 Contaminated needles and other contaminated sharps shall not be bent, recapped, removed, sheared, or purposely broken.
- 5.5 Sharps shall be disposed in sharps containers immediately after they are used.
- 5.6 Work area restrictions
 - 5.6.1 Eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses shall not be permitted where exposure to blood or OPIMs have occurred.
 - 5.6.2 Food and drink shall not be kept in refrigerators, freezers, shelves, cabinets, or on countertops or benches where blood or OPIMs are present.
- 5.7 Personal protective equipment (PPE)
 - 5.7.1 Employees shall wear PPE when they may be exposed to infectious or potentially infectious materials.
 - 5.7.2 PPE shall be worn to prevent contaminating a work surface or when helping a fellow employee dress a wound.
 - 5.7.3 Contaminated PPE shall be removed immediately and placed in an approved leak proof container. The Safety Department shall be contacted for disposing the container.
 - 5.7.4 Contaminated saturated clothing shall not be laundered.
 - 5.7.5 Contaminated PPE shall not be reused.
- 5.8 Labels, tags, and bags
 - 5.8.1 Biohazard labels shall be affixed to regulated waste containers; refrigerators and freezers containing blood and OPIMs; and other containers used to store, move, or ship blood or OPIMs. Tags can also be used to label containers or equipment.

NOTE: Red bags or red containers may be substituted for labels.



- 5.8.2. If applicable, place biohazard contaminated materials in the designated biohazard waste containers.
- 5.9 Housekeeping
 - 5.9.1 Employees shall clean and decontaminate the area immediately when the following exposures occur:
 - 5.9.1.1 First aid procedures are completed.
 - 5.9.1.2 Blood or OPIM spills.
 - 5.9.1.3 The end of each work shift (if surfaces have become contaminated since the last cleaning).
 - 5.9.1.4 Biohazard pails, bins, cans, and similar receptacles shall be inspected regularly for visible signs of contamination or deterioration of container integrity. These containers shall be decontaminated immediately or replaced as needed.
- 5.10 Biohazard waste shall be disposed in compliance with applicable federal and state regulations.
- 5.11 Post-exposure evaluation and follow-up
 - 5.11.1 Exposures shall be reported, investigated, and documented.
 - 5.11.2 All HDI vehicles are equipped with first aid kits containing antiseptic for possible exposure
 - 5.11.3 After a reported exposure, the exposed employee shall immediately receive a confidential medical evaluation and follow-up.
 - 5.11.4 Information shall be provided to the healthcare professional as required.
 - 5.11.5 Healthcare professional's written opinion
 - 5.11.5.1 Within 15 days after the evaluation is completed, the employee shall receive a copy of the medical examiners report.
- 5.12 Training and information requirements
 - 5.12.1 Training shall be given to employees upon initial assignment and within 1 year of previous training. The training will include what the different labels and warning signs mean as well as the steps to take if an exposure occurs.
 - 5.12.2 Hepatitis B Vaccine is available to any employee that falls under the blood borne pathogens program at no cost to the employee.
- 5.13 Evaluation and review
 - 5.13.1 This program shall be reviewed annually to evaluate its effectiveness and updated as needed.



6. First Aid

- 6.1 First aid supplies/kits will be readily available in all HDI vehicles.
- 6.2 First aid supplies will be in a weather sealed box and packages.
- 6.3 First aid kits will be inspected periodically by the driver of the vehicle and after every first aid event.
- 6.4 If first aid is rendered and the injured employee needs medical attention in Minor injuries transport in a HDI vehicle will occur. If injuries are severe 911 will be called for transport. All driller foremen will have a phone on them for emergency services calls.
- 6.5 A portable eye wash station will be kept on HDI drill rigs for emergency eye flush.
- 6.6 When drivers are dispatched to distant areas where 911 is not available the contact information of the nearest hospital will be provided.
- 6.7 Foreman drillers or driller helpers who assist each other in first aid activities in the field can be exposed to infectious materials. A shop employee assisting another shop employee in first aid activities can also be exposed to infectious materials. Rubber gloves should be worn and blood will be cleaned up immediately.
- 6.8 First Aid kits shall consist of appropriate items that are adequate for the environment in which they will be used.

RECORDS

- 7.1 Medical records shall be maintained by Human Resources for the duration of employment plus an additional 30 years.
- 7.2 Records shall be made available upon request and transfer of records shall be in compliance with 29 CFR 1910.1020 (h).
- 7.3 Training records shall be maintained by the HDI Health & Safety Officer for a duration of no less than 3 years.

8. FORMS

- 8.1 Exposure Incident Evaluation and Follow-up



Appendix C – Holocene Job Orientation Guide

Company: Holocene Drilling
 Trainer:
 Date

Employee:
 Hire Date:
 Position:

This checklist is a guideline for conducting employee safety orientations for employees new to *Holocene Drilling, Inc.* Once completed and signed by both supervisor and employee, it serves as documentation that orientation has taken place.

	Date	Initials
1. Explain the company safety program, including:		
Orientation	_____	_____
On-the-job training	_____	_____
Safety meetings	_____	_____
Incident investigation	_____	_____
Disciplinary action	_____	_____
2. Use and care of personal protective equipment (Hard hat, fall protection, eye protection, etc.)	_____	_____
3. Line of communication and responsibility for immediately reporting injuries.		
A. When to report an injury	_____	_____
B. How to report an injury	_____	_____
C. Who to report an injury to	_____	_____
D. Filling out incident report forms	_____	_____
4. General overview of operation, procedures, methods and hazards as they relate to the specific job	_____	_____
5. Pertinent safety rules of the company and WISHA	_____	_____
6. First aid supplies, equipment and training		
A. Obtaining treatment	_____	_____
B. Location of Facilities	_____	_____
C. Location and names of First-aid trained personnel	_____	_____
7. Emergency plan		
A. Exit location and evacuation routes	_____	_____
B. Use of fire fighting equipment (extinguishers, hose)	_____	_____
C. Specific procedures (medical, chemical, etc.)	_____	_____
8. Vehicle safety	_____	_____
9. Personal work habits		
A. Serious consequences of horseplay	_____	_____
B. Fighting	_____	_____
C. Inattention	_____	_____
D. Smoking policy	_____	_____
E. Good housekeeping practices	_____	_____
F. Proper lifting techniques	_____	_____

NOTE TO EMPLOYEES: Do not sign unless ALL items are covered and ALL questions are satisfactorily answered.

The signatures below document that the appropriate elements have been discussed to the satisfaction of both parties, and that both the supervisor and the employee accept responsibility for maintaining a safe and healthful work environment.

Date: _____
 Date: _____

Supervisor's Signature: _____
 Employee's Signature: _____



Appendix D – Holocene Employee’s Report of Injury Form

Instructions: Your employees may use this form to report all work related injuries, illnesses, or “near miss” events (which could have caused an injury or illness) – *no matter how minor*. This helps you to identify and correct hazards before they cause serious injuries. This form should be completed by employees as soon as possible and given to a supervisor for further action.

I am reporting a work related: <input type="checkbox"/> Injury <input type="checkbox"/> Illness <input type="checkbox"/> Near miss	
Your Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this injury/near miss? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Date of injury/near miss:	Time of injury/near miss:
Names of witnesses (if any):	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe step by step what led up to the injury/near miss. (continue on the back if necessary):	
What could have been done to prevent this injury/near miss?	
What parts of your body were injured? If a near miss, how could you have been hurt?	
Did you see a doctor about this injury/illness? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, whom did you see?	Doctor’s phone number:
Date:	Time:
Has this part of your body been injured before? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, when?	Employer:
Your signature (optional):	Date:



Appendix E – Holocene Incident Investigation Report Form

Instructions: Complete this form as soon as possible after an incident that results in serious injury or illness. (Optional: Use to investigate a minor injury or near miss that *could have resulted in a serious injury or illness.*)

This is a report of a: <input type="checkbox"/> Death <input type="checkbox"/> Lost Time <input type="checkbox"/> Dr. Visit Only <input type="checkbox"/> First Aid Only <input type="checkbox"/> Near Miss	
Date of incident:	This report is made by: <input type="checkbox"/> Employee <input type="checkbox"/> Supervisor <input type="checkbox"/> Team <input type="checkbox"/> Final Report

Step 1: Injured employee (complete this part for each injured employee)

Name:	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female	Age:
Department:	Job title at time of incident:	
Part of body affected: (shade all that apply)	Nature of injury: (most serious one)	This employee works:
	<input type="checkbox"/> Abrasion, scrapes <input type="checkbox"/> Amputation <input type="checkbox"/> Broken bone <input type="checkbox"/> Bruise <input type="checkbox"/> Burn (heat) <input type="checkbox"/> Burn (chemical) <input type="checkbox"/> Concussion (to the head) <input type="checkbox"/> Crushing Injury <input type="checkbox"/> Cut, laceration, puncture <input type="checkbox"/> Hernia <input type="checkbox"/> Illness <input type="checkbox"/> Sprain, strain <input type="checkbox"/> Damage to a body system: <input type="checkbox"/> Other _____	<input type="checkbox"/> Regular full time <input type="checkbox"/> Regular part time <input type="checkbox"/> Seasonal <input type="checkbox"/> Temporary
		Months with this employer
		Months doing this job:
		(e.g.: nervous, respiratory, or circulatory systems)

Step 2: Describe the incident

Exact location of the incident:	Exact time:
What part of employee's workday? <input type="checkbox"/> Entering or leaving work <input type="checkbox"/> Doing normal work activities <input type="checkbox"/> During meal period <input type="checkbox"/> During break <input type="checkbox"/> Working overtime <input type="checkbox"/> Other	



Names of witnesses (if any):

Number of attachments:	Written witness statements:	Photographs:	Maps / drawings:
What personal protective equipment was being used (if any)?			
Describe, step-by-step the events that led up to the injury. Include names of any machines, parts, objects, tools, materials and other important details.			
Description continued on attached sheets: <input type="checkbox"/>			

Step 3: Why did the incident happen?	
Unsafe workplace conditions: (Check all that apply) <input type="checkbox"/> Inadequate guard <input type="checkbox"/> Unguarded hazard <input type="checkbox"/> Safety device is defective <input type="checkbox"/> Tool or equipment defective <input type="checkbox"/> Workstation layout is hazardous <input type="checkbox"/> Unsafe lighting <input type="checkbox"/> Unsafe ventilation <input type="checkbox"/> Lack of needed personal protective equipment <input type="checkbox"/> Lack of appropriate equipment / tools <input type="checkbox"/> Unsafe clothing <input type="checkbox"/> No training or insufficient training <input type="checkbox"/> Other: _____	Unsafe acts by people: (Check all that apply) <input type="checkbox"/> Operating without permission <input type="checkbox"/> Operating at unsafe speed <input type="checkbox"/> Servicing equipment that has power to it <input type="checkbox"/> Making a safety device inoperative <input type="checkbox"/> Using defective equipment <input type="checkbox"/> Using equipment in an unapproved way <input type="checkbox"/> Unsafe lifting by hand <input type="checkbox"/> Taking an unsafe position or posture <input type="checkbox"/> Distraction, teasing, horseplay <input type="checkbox"/> Failure to wear personal protective equipment <input type="checkbox"/> Failure to use the available equipment / tools <input type="checkbox"/> Other: _____
Why did the unsafe conditions exist?	



Why did the unsafe acts occur?

Is there a reward (such as “the job can be done more quickly”, or “the product is less likely to be damaged”) that may have encouraged the unsafe conditions or acts? Yes No
If yes, describe:

Were the unsafe acts or conditions reported prior to the incident? Yes No

Have there been similar incidents or near misses prior to this one? Yes No

Step 4: How can future incidents be prevented?

What changes do you suggest to prevent this injury/near miss from happening again?

Stop this activity Guard the hazard Train the employee(s) Train the supervisor(s)
 Redesign task steps Redesign work station Write a new policy/rule Enforce existing policy
 Routinely inspect for the hazard Personal Protective Equipment Other: _____

What should be (or has been) done to carry out the suggestion(s) checked above?

Description continued on attached sheets:



Step 5: Who completed and reviewed this form? (Please Print)	
Written by:	Title:
Department:	Date:
Names of investigation team members:	
Reviewed by:	Title:
	Date:



Appendix F – Holocene Crew Safety Meeting or “Toolbox” Safety Notes

CREW SAFETY MEETING

Company/Contractor Name		Address	
Date	Time	# of employees attending	
Subjects discussed			

Minutes:

Crew Leader Comments:

Minutes taken by _____



Appendix G – Holocene Equipment Safety Inspection Checklist

Date: _____

Project: _____

Equipment: _____

All guards and fenders	_____	OK	_____	Needs Repair
Brakes	_____	OK	_____	Needs Repair
Lights – front, rear, side, dash	_____	OK	_____	Needs Repair
Back-up alarm – horn	_____	OK	_____	Needs Repair
Ladders, stairs, hand holds	_____	OK	_____	Needs Repair
ROPS (Roll-over protection)	_____	OK	_____	Needs Repair
Seat belts	_____	OK	_____	Needs Repair
Fire extinguisher	_____	OK	_____	Needs Repair
Glass	_____	OK	_____	Needs Repair
Tires	_____	OK	_____	Needs Repair
Electrical cords	_____	OK	_____	Needs Repair
Ground fault circuit interrupters	_____	OK	_____	Needs Repair
Electrical hand tools	_____	OK	_____	Needs Repair
Powder actuated tools	_____	OK	_____	Needs Repair
Pneumatic condition of all hand tools	_____	OK	_____	Needs Repair

Other Items Checked:

Oil level and leaks	_____	OK	_____	Needs Repair	_____	Add	_____	Change
Hydraulic oil level and leaks	_____	OK	_____	Needs Repair	_____	Add	_____	Change
Anti-freeze level and leaks	_____	OK	_____	Needs Repair	_____	Add	_____	Change
Fuel level and leaks	_____	OK	_____	Needs Repair	_____	Add	_____	Change
First aid kit	_____	OK	_____	Needs Repair	_____	Add	_____	Change

Repaired by: _____

Checked by: _____



Appendix H – Holocene Job Safety Analysis (JSA) Worksheet

TITLE OF JOB OPERATION:

Date: _____

Title of person who does job:

Employee observed:

Location: _____

Analysis made by:

Analysis approved by: _____

Sequence of basic job steps	Potential injuries or hazards	Recommended safe job procedures

Personal protective equipment required for this position



Appendix I –Holocene Safety Disciplinary Supplemental Procedure

Holocene Drilling believes that a safety and health Accident Prevention Program is unenforceable without some type of disciplinary policy. Our company believes that in order to maintain a safe and healthful workplace, the employees must be cognizant and aware of all company, State, and Federal safety and health regulations as they apply to the specific job duties required. The following disciplinary policy is in effect and will be applied to all safety and health violations. HDI management will be responsible for the enforcement of this program. A safety violation can be but is not limited to: not following verbal or written safety procedures, guidelines, or rules. Horse play, failure to wear PPE, or abuse of selected PPE.

The following steps will be followed unless the seriousness of the violation would dictate going directly to Step 2 or Step 3.

- 1.) First time violation and corrective action will be discussed between supervisor and employee.
- 2.) A second time offense will be followed up in written form and a copy of this written documentation will be entered into the employee's personnel folder. Supervisor will discuss the infraction with the employee and explain corrective action.
- 3.) A third time violation will result in time off or possible termination, depending on the seriousness of the violation.



Appendix J – Holocene First Aid Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to provide specific instructions to all HDI employees on what to do when first aid is needed and the steps to being prepared.

2. SCOPE

- 2.1 This procedure is designed for HDI employees who have potential of job site injuries requiring first aid or medical assistance.

3. RESPONSIBILITY

- 3.1 Managers or Supervisors shall be responsible for the implementation of this program.
- 3.2 Employees shall comply with the following procedures:
 - 3.2.1 Follow the procedures in the first aid program.
 - 3.2.2 Inform their supervisors of equipment that needs to be replaced.
 - 3.2.3 Inform their supervisors of any injuries that occurred.
- 3.3 The Safety Department shall:
 - 3.3.1 Develop and maintain the First Aid program and conduct assessments of the effectiveness of the program.
 - 3.3.2 Investigate all reported injuries.

4. OBJECTIVE

- 4.1 The objectives of this procedure are to:
 - 4.1.1 Identify employees with the steps to take in first aid situations.
 - 4.1.2 Provide procedures to ensure first aid supplies are stocked.

5. PROCEDURE

- 5.1 HDI use universal precautions to prevent contact with blood or OPIMs during first aid contact.
- 5.2 Rubber gloves should be worn at all times by any employee providing first aid assistance of another employee.
- 5.3 Employees shall wash their hands and skin with soap and water or flush mucous membranes with water immediately after any first aid activities.



- 5.4 Any work areas contaminated with blood or any other bodily fluids from first aid activities will be cleaned up immediately, all contaminated clothing will be bagged and tagged.
- 5.5 First Aid in the field is designed for small cuts, abrasions, sprains and strains. If a major injury occurs HDI must seek medical assistance immediately.
- 5.6 All HDI drill rigs will have a fully stocked first aid kit and eye wash at all times. The kits and eyewash will be inspected weekly or after first aid is administered. The supervisor will be notified immediately of anything needed.
- 5.7 In the absence of medical assistance within 3-4 minutes of the work area the foreman driller will be responsible for administering first aid. All foreman drillers will be American Red Cross CPR/First Aid trained.
- 5.8 If any employee is seriously injured 911 will be called.
- 5.9 If emergency services are not available in the work area the foreman driller will be provided with a map and phone numbers of the nearest medical assistance upon dispatch. All foreman drillers carry a cell phone on them at all times.
- 5.10 If an employee is not seriously injured but needs medical assistance he or she will be transported to the nearest hospital or physician in a HDI vehicle.

6.0 Work Area Restrictions

- 6.1 Eating, drinking, smoking, applying cosmetics or lip balm, or handling contact lenses shall not be permitted when first aid has been conducted until all PPE has been disposed of and the work area has been sanitized.
- 6.2 Only first aid supplies may be stored in the first aid kit.

7.0 Personal Protective Equipment (PPE)

- 7.1 Employees shall wear rubber gloves when administering first aid.
- 7.2 PPE shall be worn to prevent contaminating a work surface or when helping a fellow employee dress a wound.
- 7.3 Contaminated PPE shall be removed immediately and placed in an approved container that is tagged. HDI supervisors will properly dispose of it.
- 7.4 Contaminated saturated clothing shall not be laundered.
- 7.5 Contaminated PPE shall not be reused.

8.0 Supplies

- 8.1 Each driver will inspect his or her first aid kit weekly or after any first aid is administered.



- 8.2. If anything is lacking report it to your supervisor immediately.
- 8.3 If the eye wash has been used report it to the supervisor immediately.
- 8.4 First Aid kits will consist of appropriate items that are adequate for the environment in which they will be used.

9.0 Post-First Aid and follow up

- 9.1 First Aid activities will be reported, and investigated immediately by the supervisor and the safety department.
- 9.2 A inspection of the first aid kit will be conducted.

10.0 Training and information requirements

- 10.1 American Red Cross or equivalent CPR/First Aid training will be given to all HDI driller foremen. This training will be updated as previous training expires or working conditions change.

11.0 Evaluation and review

- 11.1 This program shall be reviewed annually to evaluate its effectiveness and updated as needed.

6. RECORDS

- 6.1 Medical records shall be maintained by Human Resources indefinitely.
- 6.2 Training records shall be maintained by Human Resources.



Appendix K – Holocene Supplemental Ladder Safety Procedure

1. PURPOSE

- 1.1 The purpose of this procedure is to provide specific instructions for the safe use and care of ladders.

2. SCOPE

- 2.1 This procedure is designed for HDI employees whose job assignments require the use of a ladder.

3. RESPONSIBILITY

- 3.1 Managers shall be responsible for implementing the Ladder Safety Procedure.
- 3.2 Supervisors shall ensure that ladders are used in a safe manner.
- 3.3 Employees shall ensure the Ladder Safety Procedure is followed.
- 3.4 The Health & Safety Officer shall develop and maintain the Ladder Safety Procedure.

4. OBJECTIVE

- 4.1 The objective of this program is to provide guidelines and procedures for the safe use and maintenance of ladders.

5. PROCEDURE

5.1 Proper use of ladders

- 5.1.1 Ladders shall be inspected before each use. If a ladder is broken, cracked, or defective in any way, it shall be tagged for disposal and removed from the work area immediately.
- 5.1.2 Ladders shall be secured at the top or bottom to prevent slippage. Safety shoes shall be placed on ladders.
- 5.1.3 Portable ladders shall never be used horizontally as substitutes for scaffold planks, runways, or any other service for which they have not been designed.
- 5.1.4 When a task can only be done while standing on a portable ladder, the length of the ladder shall be such that the worker stands on a rung no higher than the fourth from the top. The ladder shall also be secured.
- 5.1.5 Unless suitable barricades have been erected, ladders shall not be set up in passageways, doorways, driveways, or other locations where they can be struck or displaced by persons or vehicles using the access route.



- 5.1.6 Only one person at a time shall be allowed on a single-width ladder.
- 5.1.7 Ladders shall not be placed against flexible or movable surfaces.
- 5.1.8 Three-point contact shall be maintained when climbing up or down a ladder. That means two hands and one foot or two feet and one hand shall be on the ladder at all times. This is especially important when getting on or off a ladder at heights.
- 5.1.9 When working from a ladder, the center of gravity shall be kept between the side rails. A person's center of gravity is approximately in the center of the body at belt height. The location of the center of gravity can shift when reaching out to either side of a ladder, especially with material, tools, or equipment in the hands. As the body's center of gravity and hand-held objects move beyond the side rails, the ladder tends toward instability.
- 5.1.10 Hands shall be used only for climbing ladders. Tools, equipment, and materials shall be placed in a container and raised or lowered by rope, if necessary.
- 5.1.11 Workers shall not straddle the space between a ladder and another object.
- 5.1.12 Ladders shall be placed on secure footings.
- 5.1.13 Ladder shall not be rested on any of its rungs. Ladders shall rest on their side rails.
- 5.1.14 Employees shall watch for overhead power lines before attempting to erect any ladder.
- 5.1.15 All ladder rungs must be uniformly spaced or meet ANSI/OSHA standards.
- 5.1.16 All ladders will be used in the manner they were designed for.

5.2 Straight/Extension ladders

- 5.2.1 When a straight or extension ladder is used for access from one work level to another, the side rails shall extend a minimum of three feet above the top of the upper landing surface and all ladders must be placed at a ratio of 4:1
- 5.2.2 The base of straight ladders should be placed at a one-to-four ratio from the vertical surface.
- 5.2.3 Before setting up straight ladders, the area shall be checked for overhead power lines.
- 5.2.4 Straight ladders shall be used only for their intended purpose.



5.3 Step ladders

- 5.3.1 The top step of ordinary types of step ladders shall not be used as a step.
- 5.3.2 When working from a step ladder over five feet high, workers shall not stand on a step higher than the third step from the top of the stepladder.
- 5.3.3 Step ladders shall not be used as straight ladders.

5.4 Inspection and maintenance

- 5.4.1 Ladders found to be defective shall be removed, tagged, and scrapped.

5.5 Storage and transportation

- 5.5.1 Storage areas shall permit easy access.
- 5.5.2 Ladders shall be stored on their sides, as practicable.

6. Ladder Safety Practices

- 6.1 Always ensure the ladder base is placed on flat solid ground.
- 6.2 Never stand on the top two rungs of a ladder or the top step of a step ladder.
- 6.3 Always travel on the ladder facing it, with both hands and feet on the ladder at all times.
- 6.4 Never get in a hurry on a ladder. Take it slow and steady and do not skip any rungs when traveling up or down a ladder.
- 6.5 Never carry anything in your hands while on a ladder, both hands and feet must be free to safely travel on a ladder and avoid a fall.
- 6.6 Never reach out from the ladder. If you need to reach outside of the ladder then you need to descend and adjust the ladders location properly so leaning or reaching out does not happen.
- 6.7 At no time shall any ladder be loaded beyond its maximum intended load capacity. If a large load is needed on a ladder you must find the proper ladder to support that load.