Building Blocks of Training a New Driller

A National Driller Driller EDU Course
Brock Yordy
Proud Father & Trophy Husband
3rd Generation Driller
Global Drilling SME: US Military & Labor Drilling Operations w/VEOLIA, SUEZ, Halliburton, Barrick, Kinross, & BHP
R&D – Training: Versa Drill & GEFCO Trainer - Educator - Advocate
Host - Writer - Podcaster The Driller Authorized OSHA Trainer
BD & Training Development - Venture Drilling Supply
The Employment Field

161,262,000 Employed Americans

Americans seeking Employment: 5,247,000

Unemployment Rate of 3.4%

9 + Million Job Openings

5.6 Million Unemployed

Average Hourly Wage $27.00 - $28.00

Average Annual Salary $59,428
The Construction Employment Field

7.9 million employees – 750 Employers - Generate $1.5 trillion worth of business annually.
20% = management, business, and financial operations.
1.5 million left construction work in other industries in 2022
1 in 5 construction workers are older than 55 years old. 1 in 4 drillers are over 58 years old.
94% Men - 6% Women
25% of the workforce are foreign-born US Citizens.
Highest-Paid Construction Jobs: Electricians, Plumbers/Pipefitters, and Carpenters.
161 million Americans working with an average pay of $27.00 - $28.00
With reliable hours of operation with no impact from Climate Change.
Median Construction pays $22.00
Climate Change impacts multiple aspects of each project.
The unemployment rate is 3.4%
Recruitment
New Hires in Water & Clean Energy

• 300,000 New Jobs in the Energy Sector - U.S. Energy & Employment Report
• 17% of Green Workforce is older than 55 years old.
• 30% of Green Workforce is younger than 30 years old.
• 9% Veterans
• 114,000 New Jobs since 2022.
  • Solar – 12,000 New Jobs
  • Wind 5,000 New Jobs
  • Geothermal 1,000 New Jobs
• LinkedIn Green Skills Report –
  • Concentration on Green Talent increased from 7% to 13% in 2023.
• Top skills added in past three years – Renewable – Solar – Power distribution
Expectations

- Hours of operation
- Working conditions
- Travel expectations
- Skill expectations
  - CDL - Trades
- Collaboration
  - Jobsite hierarchy
- Promotion
  - Milestones
- Succession Planning
Employee Retention Program

Create
Create Opportunities for Collaboration and Competition
- Don’t assume that the new hire hasn’t started researching:
  - Job Process
  - Innovation
  - Alternative Solutions

Utilize & Empower
Utilize Special Skills
- The next generation has been developing special skills from a young age.
- Recognize skill sets and build upon them.
- Find ways to overcome their weaknesses

Harness 21st Data
5G: Smart Decision Making
- GPS - Logs - Product Information
- Safety Data Sheets
- Smart Apps
- Safety
- Communication
- Good Decision Making
Employee Expectations

- Family Sustaining Wage.
- Safe place to work.
- Onboarding and Training Plan.
  - Company SOP
  - Milestones.
  - Leadership.
  - Engagement at all levels.
Loss of time injuries in Construction

Meet me back here at 4:15
Creating Goals into Building Blocks

1. Track progress with a simple 3-by-5-inch notecard.

2. Ask the future driller to write down five goals they want to achieve by the end of the first year.
Creating 5 Building Blocks & Expectations

3. Take the notecard and write down five company goals.
   1 goal for the end of month one.
   2 goals to be achieved by six months.
   2 goals to be achieved by the end of the year.

4. Establish dates for the next three meetings

5. Photocopy and Laminate the card.
Creating Quality Goals - Employee

- Achievable within a given timeline
- Base Fundamentals. Controls – Functions
- Local Geology
- Regulations
- SOPs – Safety Protocols.
- Goals must start the development process.

Consider where they want to be in one year, personally and professionally.
Creating Quality Goals – Company

• Achievable in the timeline.
  • Time is given to achieve.
• Goals that encourage growth and development.
• Goals with incentives for growth.
• Goals mutually beneficial for both employee and company.

Timelines, Milestones, and Material that can be studied outside of work are crucial to success.
Top Five

1. Create Job Safety Analyses or Standard Operating Procedures for all processes.
2. Improve one process through technology or better practices.
3. Create a timeline for professional development. Obtain license or professional certifications.
4. Identify cost-cutting measures or efficiencies for regularly performed work.

All goals require documentation, milestones, and collaboration.
Reviews of Original Goals

1. Review the employee’s original five goals and progress.
2. Add uncompleted goals to future timeline.
3. Discuss the original goals and change as they deem fit.
4. Very humbling to reflect on goals.
Review the company’s goals and create new ones to replace completed ones.
From Assistant to Driller
“We are discovering the unknown together.”

“We are harnessing the subsurface together.”
“Experience is what you get when you didn’t get what you wanted” Experience = Knowledge

Tribal Knowledge gathered over years of experience.

Knowledge Broker, Knowledge Sharer or Knowledge Keeper.

Defining the right training program: SOP, JSA, CEU – Site Hazards Identification Tactics 😊

Trainer – Coach – Mentor

Developing good decision-makers

Re-examine all you have been told. Dismiss what insults your soul.
— Walt Whitman
Training Programs
Tribal Training vs. Formal Training Center

- Experience is Knowledge
- Application – Multiple ways to completion
- What is a successful execution?
- Leadership

- Science is Knowledge
- Project Specifications
- Physics
- Application
- Execution
- Understanding Roles
How do we train New Hires?
Industry best practice for knowledge sharing.
Assistant Driller Development

21st century training tools

- Online videos
  - NGWA University
  - IGSHPA Training
  - OSHA
  - Driller EDU
- Magazine articles
- Podcasts
- Trade Schools – Center of Excellences

Company Training Tools

- Standard Operating Procedure
- Job Safety Analysis
- Project Success and Failures
- Hands On and In the Field
Drilling Basics Certification Preparation Program

Self-paced

$998 Enroll Now

Courses available in this program:
- Drilling Basics: General Workplace Safety
- Drilling Basics: Geology and Groundwater
- Drilling Basics: Hydrogeology and Fluid Mechanics
- Drilling Basics: Rig Types and Well Design
- Drilling Basics: Drill Rig Safety
Developing a Driller Mindset

Trust!

- Trust among all members from the office to the field.
- Trust in the process
- Trust in project knowledge and execution
- Defined job process that allows for accountability
- Procedures for all known elements.

Trust!
Defining processes promotes growth by building confidence within the organization and the field.

The goal is to set teams up for safe and efficient project completions.

Establishing Best Practices

Ability to switch up crews

Increase Productivity

Predict Cost
Components to SOPs

1. Personal Protective Equipment
2. Equipment & Tools
3. Materials
4. Lifecycle
5. Roles & Responsibilities
Creating Successful – Standard Operating Procedures

1. TEAM INVOLVEMENT
2. CREATE AN OUTLINE OF ALL TASKS
3. CONSIDER WORST CASE SCENARIO
4. BEST PRACTICE TO PROPER EXECUTION
From Classroom to Practical

- Mentors / Coaches
- The Drilling System
- Embracing the Science & Physics behind drilling.
- Drilling by the Book
- Drilling Programs
• The best mentors and coaches create a lifelong impact.
• Age does not define a mentor.
• Share Knowledge without fear.
• Include the student in critical discussions
  • “What do you mean you did it exactly the way I told you to!?!?”
• Mutual exchange of knowledge.
• A culture of expertise and trust.
The Drilling System

1. Geology
   - Big Solids – Non-Reactive
   - Little Solids – Reactive

2. Rig
   - Capabilities
   - Limitations
   - Rotation – Thrust – Pullback

3. Cutting Action
   - Tri-Cone – Drag – PDC
   - Hammer

4. Pumping Action - Up-Hole Velocity

5. Penetration Rate

6. Hole - Job Specifications

7. Staff - Manpower

8. Site Management – Footprint

9. Project Wrap Up

10. The Driller
Drilling by the Book

Chapter 1: Mother Nature – Geology

- Type of soils
- Soil formation Hydraulics
- Down hole pressures
- Depth to water

The Next Chapters:

- Rig capabilities
  - Rotation
  - Pullback
  - Pulldown

- Fluid pumping capacity
  - Mud pumps
  - Air compressor
  - Volume Requirements

- Bit selection
  - Type – cutting action
  - Bit hydraulics
  - Size - borehole diameter
The back of the book.
1. Feed pressure exerted by the rig.
2. Rotation turns the bit, creating cutting action.
3. Fluid is pumped downhole to move drill solids out of the hole.
Embrace Science &
Physics of Drilling

- Subsurface Dynamics
- Bottom Hole Assembly
- Up Hole Velocity
- Fluid Dynamics
- Equivalent Circulating Density
- Rate of Penetration
- Solids Creation
- Product Installation
- Resource Extraction
A 1-inch size solid traveling at 60 ft. per minute up hole requires a fluid up hole velocity of greater than 60 ft. per minute.

If you don’t know the science and physics of drilling

Gravity Wins
Borehole Creation.

<table>
<thead>
<tr>
<th>Open</th>
<th>Stable</th>
<th>Straight – in desired direction required</th>
<th>Gauge</th>
<th>Clean</th>
<th>Simple Product Installation</th>
<th>Efficient Resource Extraction</th>
</tr>
</thead>
</table>
Fluid Velocity & Physics

- **Water-based drilling fluid = mud**
  - 60 to 150 feet per minute

- **Air**
  - 3,500 to 7,500 feet per minute

- **Water + air + foaming agent = foam**
  - 200 feet per minute

- **Specialty foam**
  - 100 feet per minute

Water + air + foaming agent = foam
Creating cuttings that stay intact from bit face to the surface through fluid energy exerted through velocity.
Solids Content

Percent Solids Calculation -

Mud weight – Weight of water

Multiplied by 8 = % solids

9.0 – 8.34 = .66

.66 x 8 = 5.28 % solids

<table>
<thead>
<tr>
<th>Mud Weight</th>
<th>% Solids</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.0</td>
<td>5.28 %</td>
</tr>
<tr>
<td>9.5</td>
<td>9.28%</td>
</tr>
<tr>
<td>10.0</td>
<td>13.28%</td>
</tr>
<tr>
<td>10.5</td>
<td>17.28%</td>
</tr>
<tr>
<td>11.0</td>
<td>21.28%</td>
</tr>
</tbody>
</table>

Brock Yordy – 269-348-5156  Questions@askbrock.com
Solids Deterioration

Quarter size cutting become Dime size cuttings

• Solids Breakdown
  • Finer solids create more surface area to move
  • Penetration rates slow down
  • Uphole Velocity Decrease
  • Increase in fluid density and viscosity
  • Solids build-up down hole
  • Break the fracture gradient of the formation
  • Plugged bit
  • Stuck pipe
  • Hole destabilization
  • Collapsed hole

Brock Yordy – 269-348-5156 Questions@askbrock.com
<table>
<thead>
<tr>
<th>Bit Size</th>
<th>Gallons Per Foot</th>
<th>Cubic Ft 20 Foot Per Rod</th>
<th>Cubic Ft Created in 100’ Hole</th>
<th>Cubic Yards 300 Ft Hole</th>
<th>Cubic Yards in 600 Ft Hole</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5</td>
<td>0.825</td>
<td>2.2</td>
<td>11.2</td>
<td>1.22</td>
<td>2.45 CYs</td>
</tr>
<tr>
<td>5.5</td>
<td>1.23</td>
<td>3.2</td>
<td>16.44</td>
<td>1.82</td>
<td>3.65 CYs</td>
</tr>
<tr>
<td>6”</td>
<td>1.47</td>
<td>3.9</td>
<td>19.6</td>
<td>2.18</td>
<td>4.367 CYs</td>
</tr>
<tr>
<td>8”</td>
<td>2.61”</td>
<td>6.97</td>
<td>1.29 CYs</td>
<td>3.877 CYs</td>
<td>7.785 CYs</td>
</tr>
<tr>
<td>8.75”</td>
<td>3.12</td>
<td>8.34</td>
<td>1.54 CYs</td>
<td>4.63 CYs</td>
<td>9.269 CYs</td>
</tr>
<tr>
<td>9.875”</td>
<td>3.98</td>
<td>10.64</td>
<td>1.97 CYs</td>
<td>5.91 CYs</td>
<td>11.824 CYs</td>
</tr>
<tr>
<td>10.0”</td>
<td>4.08</td>
<td>10.90</td>
<td>2.02 CYs</td>
<td>6.06 CYs</td>
<td>12.12 CYs</td>
</tr>
</tbody>
</table>
A 5-gallon bucket equals 0.7 cubic feet (5-gallon buckets contain 5 gallons, with 1.75-inches of open space at the top).

A 3-cubic-foot wheelbarrow equals 22.44 gallons.

A 150-gallon livestock tank equals 20.05 cubic feet.

A 6-foot-long skid steer bucket equals 0.5 cubic yards or 100.98 gallons.

A 300-gallon mud pan equals 1.485 cubic yards.

A standard 8-foot truck bed equals 2.5 cubic yards or 504.9 gallons.

A standard dump truck holds 10 cubic yards or 2,019.6 gallons.
### Drilling Programs

**Creating Your Book**

| Project Name: ______________________ |
| Rig #:__________________________ |
| Driller: _________________________  Assistant:__________________________ |

#### Hole Specifications

<table>
<thead>
<tr>
<th>Number of Holes:____</th>
<th>Hole Diameter: __________</th>
<th>Gallons Per Ft: __________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hole Depth: __________</td>
<td>Hole Volume: ____________</td>
<td>Fluid Volume: ____________</td>
</tr>
<tr>
<td>Cubic Ft Per Rod:____________</td>
<td>Total Cubic Yards: ______</td>
<td>Displacement Volume: __________</td>
</tr>
<tr>
<td>Drilling Method: _________________</td>
<td>Bit: _________________</td>
<td>Bit #2: ________________</td>
</tr>
<tr>
<td>Pump Volume: ________GPM</td>
<td>- Up Hole Velocity: _____FPM</td>
<td>- Bottom Circulating Time:______ MINS</td>
</tr>
<tr>
<td>Solids Control Unit: _________________</td>
<td>Volume:_____________ Cleaning Capacity:______GPM</td>
<td></td>
</tr>
</tbody>
</table>
Drillers Log BOOK

1. The reference point for all depth measurements.
2. The depth at which each change of formation occurs.
3. The depth at which the first water was encountered.
4. The depth at which each stratum was encountered.
5. The thickness of each stratum.
6. A Step Further in identification of the material of which each stratum is composed, such as:
   • a. Clay
   • b. Sand or Silt
   • c. Sand and Gravel—
     • Indicate whether gravel is loose, tight, angular, or smooth; color.
   • d. Cemented formation—
     • Indicate whether grains (if present) have natural cementing material between them, silica, calcite, etc.
   • e. Hard rock—
     • Indicate whether sedimentary bedrock or igneous (granite-like, basalt-like, etc.)
7. The depth interval from which each water and formation sample was taken.
Choosing the best project for Developing Drillers

<table>
<thead>
<tr>
<th>Equipment availability</th>
<th>Geology</th>
<th>Time to completion</th>
<th>Product installation</th>
<th>Product extraction</th>
<th>Manpower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site management</td>
<td>Clean up and disposal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

• The company's best Driller might not be the best choice for a coach.
  • Project execution and success?
  • Time to train?
  • Pressure to perform.
• Optimizing Success
  • Choose the right project
  • Align the project timeline with the training timeline
  • Trust the process
  • Involve the entire company in development
Trusting your instincts.
Crew Knowledge Blocks

- Design Specifications
- Best Practices and Methods
- Project Tasks
- Incorporation of Professionals
- Goals to Completion
- Wrap Up
Driller Knowledge Blocks

- Regional Best Practices
- The Cost of Operation and Level of Risk
- Leadership – Roles – Responsibilities
- Well Logs & Regulations
- Rig and Tooling Specifications
- Hole Specifications
- Construction Specifications
Knowledge and Experience

“Experience is what you get when you didn’t get what you wanted.”

Randy Pausch “The Last Lecture”

1. Success is built upon a foundation of achievement and failures.

2. Regardless of Tribal Knowledge or Academic Knowledge completing a project is dependent on consistent results.
Creating Teachable Lessons

- All project experience, whether good or bad, creates teachable lessons.
- How we distribute these lessons determines the outcome of our next project.
- Senior Employees are responsible for preventing new hires from experiencing the same failures that impacted the company’s bottom line.
After Action Reviews

• What was expected to happen?
• What really happened?
• Why did it happen?
• How do we prevent it from happening again?
• What went well?
• What can be improved upon?
Proper Execution
Two Team Players Under 30
Retaining

• What is the cost
• Company Culture
• It’s a young person’s game
• Innovation requires early adopters.
Maintaining the Team

1. Do you enjoy what you do?
2. Do you feel safe?
3. What do you want to learn next?
4. Call - Text - Snapchat - Facetime - Email – Note in the paycheck –
5. After Work Discussions
Creating a Collaborative Process

• CHECK YOUR EGO
• Start conversations with defaulting to trust.
• Trust your company’s methods and success rates.
• Question Everything with an open mind.
• Share Best Practices and New Methods
• Science
• Instincts
• Experience
• Knowledge
• WE ARE DISCOVERING THE UNKNOWN TOGETHER.
The individuals we develop and inspire today will be tomorrow's experts to complete our goal of net zero & water sustainability.

Thanks
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