

**Competency Matrix for Drilling Engineering  
SPE Task Force on Minimal Competency**

Drilling Task	Drilling Knowledge/Skill*		
	Minimum Competence Breadth	Minimum Competence Depth	Above Minimum Competence
Maintain well control.	Calculate mud weight necessary to maintain well control or volume of mud required to fill the hole while tripping out.	Design and/or implement procedure to successfully circulate out an influx.	Design and/or implement procedure to successfully control an underground blowout.
Develop casing program (sizes, setting depths).	Understand relationship between desired production flow rates and tubing/casing configuration.	Determine the surface casing setting depth required to protect fresh water sands. Prepare pore pressure and frac pressure versus depth plots. Define the setting depth of protective pipe, if required.	Optimize the number and depths of protective casings. Optimize the size of the casing strings and liners.
Design casing.	Understand basic design principles (burst, collapse, tension in the pressure/temperature environment that the casing will encounter).	Design production casing/liner to maintain well integrity.	Design casing/connections for hostile environments (HPHT, H2S, salt, etc.).
Maintain regulatory compliance.	Understand requirement to protect fresh water with surface casing setting depth/cement or requirements on directional programs to stay within lease/block boundaries.	Understand the process required to comply with regulatory requirements. (e.g., design an abandonment procedure to isolate zones per regulation or that may cross flow, know what regulatory applications to prepare, and how to verify compliance).	Calculate emissions from rig operations (air pollutants from engine exhaust rates, % oil on cuttings, etc.).
Select the mud program.	Calculate the minimum mud weight required for each hole interval.	Select acceptable mud types. Specify mud properties (e.g., density and fluid loss requirements).	Optimize the cost of the mud systems by altering the inhibitive nature of the mud systems. Establish the critical minimum inhibition requirements.
Design a directional well path (including horizontal/multilaterals).	Understand the relationship between difficulty and lateral displacement.	Select appropriate kickoff points, build rates, required hole angles and bottom hole assemblies.	Optimize the directional program and casing design to avoid key seating. Evaluate casing wear and develop designs to mitigate the problem.

Drilling Task	Drilling Knowledge/Skill*		
	Minimum Competence Breadth	Minimum Competence Depth	Above Minimum Competence
Specify equipment.	Recommend wellhead/BOP ratings to maintain well integrity.	Determine BOP stack arrangements, establish test requirements. Calculate ton miles to slip and cut drill line.	Design equipment components for a fit-for-purpose rig to optimize cost.
Develop procedure to implement formation evaluation program.	Understand hole considerations for successful open hole logging.	Understand interaction between mud composition, hole integrity and types of logs that can be run successfully.	Design well testing operations procedure for hostile environment (e.g., HPHT, mobile marine drilling unit).
Develop hydraulics program.	Understand basic principles of fluid mechanics and non-Newtonian fluids.	Calculate pressure drop through the system and optimize bit hydraulics.	Integrate hydraulics program with geological setting and mud program.
Develop solids control program.	Understand regulatory requirements for pits.	Size standard solids control equipment (shaker, desander, desilter) for mud and hydraulics programs.	Design closed loop system with zero discharge.
Design cementing program.	Understand regulatory requirements (fresh water protection, zone isolation, etc.).	Design cement slurry and procedure with sufficient time and other characteristics to successfully complete job.	Design cement jobs for special situations (shallow water flow, underground blowout, etc).
Monitor drilling operations and optimize drilling performance.	Identify drilling parameters important to monitor.	Monitor drilling parameters, recognize problem areas and recommend improvements.	Coach inexperienced personnel in monitoring and optimization techniques.
Conduct fishing operations.			Recognize clearances necessary to conduct fishing operations. Determine the maximum safe tensional and torsional loads on the drillstring. Determine the maximum safe hoisting load for the derrick. Establish time limits for jarring and fishing attempts. Determine the optimum recovery procedures. Design speciality fishing tools.