



# GSM, INC.

*A Professional Team of Registered Consulting Petroleum Engineers*

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## RESUME

RICHARD S. CARDEN

### PERSONAL:

Date of Birth:	September 27, 1954
Marital Status:	Married - Six children
Registered:	E.I.T. Montana State Board of Professional Engineers and Land Surveyors

### EDUCATION

Montana College of Mineral Science and Technology,  
Butte, Montana, BS Petroleum Engineering, 1977  
Preston L. Moore's Drilling Practice School  
University of SW Louisiana Well Control School

### EXPERIENCE

1984 - Present

GSM. - Consulting Engineer. Provides well site consulting and engineering to drill and complete wells in the Anadarko Basin, Permian Basin and Texas Panhandle. Provides well design work for horizontal and directional wells, development wells, exploratory wells and air drilled wells all over the world.

Teaches industry training courses for PetroSkills. The courses include Drilling Practices, Advanced Well Control, Directional Horizontal and Multilateral Drilling, Underbalanced and Air Drilling, and Basic Drilling Technology. Has been teaching industry seminars since 1981.

Has worked on numerous blowouts flowing uncontrolled at the surface and blowing out underground. Used snubbing and stripping operations to control underground blowouts. Designed relief wells and provided wellsite consulting for the drilling of same for blowouts in the Anadarko Basin, SE Texas and South America. Designed and successfully implemented dynamic kill techniques.

Provided engineering, planning and wellsite consulting for the Grand Canyon Waterline project. The well was designed to provide a water conduit for the National Park Service. It was directionally drilled from the top of the canyon to an exit point in the canyon. The

exit was vertically 2800' deep with a horizontal displacement of 3800'. The well was the first of its kind in the world having an inclination over 70° using air and mist as a drilling fluid in a 14 3/4" hole.

Planned and provided wellsite consulting for several DOE sponsored horizontal drilling research projects in West Virginia and Kentucky. At the time, one well was the longest air drilled horizontal well in the world with over 2000 feet of horizontal wellbore (i.e. 87° to 92°). The well is also the first air drilled horizontal well that was both logged and cored at 90°. Planned and provided wellsite consulting for numerous other horizontal drilling projects all over the United States plus a horizontal drilling project in New Zealand.

Provided engineering and wellsite consulting for an underbalanced drilling project in Australia. Four wells were re-entered and drilled underbalanced to minimize formation damage. Provided engineering and wellsite consulting for numerous other projects including an H<sub>2</sub>S injection well and power company waste water injection well.

1983 - 1984

WELL PRODUCTION TESTING, INC. - Worked as a geothermal drilling consultant in California, Nevada, and New Mexico. Experience included well site consulting and engineering during the completion phase of the Los Alamos National Laboratory's Hot Dry Rock Project; geothermal well design for temperatures up to 700°F; and design of geothermal well test equipment.

1979 - 1983

GRACE, SHURSEN, MOORE & ASSOCIATES, INC. - Position held was drilling consultant on the following:

Los Alamos National Laboratory's Hot Dry Rock Geothermal Research Project. The project involved the drilling of two holes to an average depth of 14,000 feet, with temperatures above 600°F. Both holes were deviated to 35° and the second hole was drilled directly above the first with a vertical separation of 1,200 feet. The wells were drilled through sedimentary formations to 2,500 feet and granitic rock from 2,500 to total depth.

Experience was gained in high temperature drilling, directional work, fishing and casing design. Completed September, 1981.

While in the Oklahoma City office, responsibilities included well site consulting for drilling and completions in the Anadarko Basin and the Panhandle Area of Texas; designing drilling programs for 20,000+ wells; casing design for deep, high pressure wells; auditing of previously completed drilling and completion programs; well design for a relief well to kill a blowout in the Anadarko Basin; and was involved with the directional work associated with locating and killing the blowout. Taught drilling, pressure control, directional drilling, and completion seminars in the United States, Venezuela, Indonesia, Europe and India.

1978 - 1979

MARATHON OIL COMPANY, Casper District - Drilling Engineer for extensive exploratory and development drilling program in Wyoming, Utah, Colorado, Nebraska, and California. Assignments included design and planning of drilling programs and as field supervisor of deep drilling 10,000' to 18,000' efforts.

1977 - 1978

MARATHON OIL COMPANY - Production Engineer. Assignments included field and office work associated with oil production, workovers and completions in the Big Horn Basin. Production Engineer for an 8,000 BOPD field under secondary recovery.

1975 - 1976

Worked summers as roustabout and engineering intern for Marathon Oil Company in the Big Horn Basin, Wyoming.

#### TECHNICAL PAPERS AND PUBLICATIONS:

"Sidetracking Experience in Hot Granitic Wellbores", Roland A Pettitt and Richard S. Carden, Geothermal Resource Council, Transactions Vol. 5, October, 1981, pp. 267-70.

"Precision Directional Drilling of Hot Dry Rock Geothermal Production Well EE-3", Richard S. Carden, John C. Rowley, and Catherine Helmick, presented at the Geothermal Resource Council 1982 annual meeting, October 11-14, 1982.

"Unique Aspects of Drilling and Completing Hot Dry Rock Geothermal Wells", R. S. Carden, R. W. Nicholson, R. A. Pettitt, and J. C. Rowley, Journal of Petroleum Technology, May, 1985, pp. 821-834.

Authored an instruction manual for use in the Horizontal and Directional Drilling Seminars.

"Grand Canyon Directional Drilling and Waterline Project", G. M. Lattimore, R. S. Carden, and T. Fischer, SPE/IADC 16169.

"Computer Applications in the Planning and Drilling of a 2000-ft Horizontal Well in Wayne County, West Virginia", W. K. Overbey, R. S. Carden, and J. B. Williams, SPE 16501.

"Drilling a 2000-ft Horizontal Well in the Devonian Shale", A. B. Yost II, W. K. Overbey, and R. S. Carden, presented at SPE Technical Conference & Exhibition, September 27-30, 1987.

"Equations Determine Maximum Horizontal Wellbore Length", R. S. Carden, Oil and Gas Journal, Dec. 26, 1988, pp. 121-125.

"Directional Drilling Experience with Air", R. S. Carden and A. B. Yost II, presented at the ASME 1990 Energy-Sources Technology Conference and exhibition, January 14-17, 1990, New Orleans, Louisiana.

"Air Drilling and Multiple Hydraulic Fracturing of a 72° Slant Well in Devonian Shale", A. B. Yost II, R. S. Carden, J. G. Muncey, W. E. Stover, and R. J. Scheper, SPE 21264, presented at the SPE Eastern Regional Meeting, Columbus, OH, 1990.

"Horizontal Drilling with Air", R. S. Carden, ASME paper 91-PET-19, presented at the 14th annual ASME Energy-Sources Technology Conference and Exhibition (ETCE), January 20-23, 1991 Houston

"Air Drilling Has Some Pluses for Horizontal Wells," Oil and Gas Journal, Apr. 8, 1991, pp. 76-78.

Co-authored an instruction manual for use in the Air Drilling Seminar.

"Feasibility Study for the Drilling of a Horizontal Well in the West Panhandle Field," L. L. Taylor, R. S. Carden, K. A. Selinger, SPE 27929, presented at the SPE Mid-continent Gas Symposium, Amarillo, TX, 1994.

Co-authored Underbalanced Drilling Manual, published by the Gas Research Institute, 1997. GRI reference number GRI-97/0236.

Contributing author to Blowout and Well Control Handbook, Gulf Publishing, 2003