

Drew Robert Van Orden, P.E.

Title: Senior Consulting Scientist

Education:

- M.A. Applied Statistics, University of Pittsburgh, 1998
- M.S. Mineral Process Engineering, Pennsylvania State University, 1979
- B.A. Meteorology and Oceanography, Millersville State College, 1975

Employment History:

- 1986-Present RJ Lee Group, Inc.
- 1996-97 BJL Laboratories, Director Technique
- 1985-86 Consulting Engineer
- 1979-85 U.S. Steel Technical Center, Research Project Engineer

Summary:

- » Extensive experience in mineral process engineering, including process optimizations and plant automation
- » Designed and directed studies to assess worker exposures to various materials
- » Lead author of the ASTM D-5756 Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Mass Concentration
- » Conducted site evaluations at mines and quarries
- » Directed large study on the effect of an earthquake on ambient asbestos concentrations
- » Provided data analyses and document review to the HEI-AR
- » Designed and managed quality control programs
- » Performed statistical analyses of complex data sets

Honors, Awards, Memberships:

- » Registered Professional Engineer, Mineral Engineering, Commonwealth of Pennsylvania
- » Society of Mining, Metallurgy, & Exploration, SME/AIME
- » ASTM International, ASTM
- » American Society of Quality, ASQ
- » American Statistical Association, ASA
- » American Industrial Hygiene Association, AIHA
- » National Society of Professional Engineers, NSPE
- » American Association for the Advancement of Science, AAAS

Selected Publications

Van Orden, D. (2011). "Present and Future Impact of the NIOSH Roadmap on a Contract Laboratory for EMP Evaluations," presented at the 2011 SME Annual Meeting, Denver CO, March 2, 2011.

McGrath, D. B, **Van Orden, D. R.**, Howard, R. M., Guerrero, P., and Davis, S. C. (2010). "Two Different Methods, Three Different Variations, Four Different Sources: What Bulk Asbestos PLM Method Is Your Laboratory Using? Part 2," *Journal of Occupational and Environmental Hygiene*, 7, D65 — D68.

McGrath, D. B, **Van Orden, D. R.**, Howard, R. M., Guerrero, P., and Davis, S. C. (2010). "Two Different Methods, Three Different Variations, Four Different Sources: What Bulk Asbestos PLM Method Is Your Laboratory Using? Part 1," *Journal of Occupational and Environmental Hygiene*, 7, D53 — D56.

Jones, A. D., Apsley, A., Clark, S., Addison, J., **Van Orden, D. R.**, and Lee, R. J. (2010). "Laboratory Tests to Compare Airborne Respirable Mass and Fibre Concentrations from Soil Samples from Libby, Montana," *Indoor Built Environment*, 19, pp. 286-297.

Lee, R. J., Allison, K. A., Bunker, K. L., Harris, K. E., Huntington, J. C., Sanchez, M. S., Strohmeier, B. R., and **Van Orden, D. R.** (2010). "The Challenges of Defining and Characterizing Asbestos," Northeastern and Southeastern Joint Regional Meeting of the Geological Society of America, Baltimore, MD, March 14, 2010.

Van Orden, D. (2010). "Asbestos Analytical Methods: Separating Fact From Fiction," presented at the *Legal Symposium for the Aggregates Industry*, National Stone, Sand & Gravel Association Meeting, Cincinnati, Ohio, February 15, 2010.

Lee, R. J., **Van Orden, D. R.**, and Sanchez, M. (2010). "Common Errors Associated with the Analysis of Tremolitic Talc," presented at 2010 ME Beard Conference, San Antonio, TX, January 28, 2010.

Lee, R. J., **Van Orden, D. R.**, Allison, K. A., and Bunker, K. L. (2009). "Characterization of Airborne Amphibole Particles in Libby, MT," *Indoor Built Environment*, 18, pp. 524–530.

Van Orden, D. R., Lee, R. J., Allison, K. A., and Addison, J. (2009). "Width Distributions of Asbestos and Non-Asbestos Amphibole Minerals," *Indoor Built Environment*, 18, pp. 531–540.

Van Orden, D. (2009). "Evaluation of Talc for Asbestos Content," presented at the 2009 Regulatory Science Summit, Arlington, VA, December 15, 2009.

Van Orden, D. (2009). "Evaluation of Raw Materials for Asbestos Content," presented at the 5th Annual Joint Western Regional Mine Safety & Health Conference, Reno, NV, October 27, 2009.

Van Orden, D. R. and Sanchez, M. (2009). "CARB Definitions of Asbestos," presented at 2009 GSA Annual Meeting, Portland, OR, October 21, 2009.

Ross, M., Langer, A. M., Nord, G. L., Nolan, R. P., Lee, R. J., **Van Orden, D.**, and Addison, J. (2008). "The mineral nature of asbestos," *Regulatory Toxicology and Pharmacology*, 52, S26–S30.

Huntington, J. C., Ptasienski, J. T., Bunker, K. L., Strohmeier, B. R., **Van Orden, D. R.**, and Lee, R. J. (2008). "A new method for fracturing mineral particles for cross-sectional FESEM analysis," *Periodico di Mineralogia*, 77, pp. 43-50.

Sanchez, M. S., Lee, R. J. and **Van Orden, D.** (2008). "Extinction Characteristics of Six Tremolites with Differing Morphologies," *Microscope*, 56, pp. 13-27.

Lee, R., Strohmeier, B., Bunker, K., Sanchez, M., and **Van Orden, D.** (2008). "The Challenge of Naturally Occurring Asbestos – Characterization of Amphibole Particles in Mixed Mineral Dust," Keynote presentation at the 2008 Roy J. Shlemon Specialty Conference on The Geological Assessment of Naturally Occurring Hazardous Substances, AEG Foundation and Association of Environmental & Engineering Geologists, Folsom, CA, June 4-6.

Glenn, R. E., Lee, R. J., Jastrem, L. M., Bunker, K. L., **Van Orden, D. R.**, and Strohmeier, B. R. (2008). "Asbestos: By Any Other Name, Is It Still?" *Chemical Regulation Reporter*, 32, pp. 22-33. *September 15, 2011* Page 3 of 4

Lee, R. J., Strohmeier, B. R., Bunker, K. L., and **Van Orden, D. R.** (2008). "Naturally Occurring Asbestos: A Recurring Public Policy Challenge," *Journal of Hazardous Materials*, 153, pp. 1-21.

Lee, R. J. and **Van Orden, D. R.** (2008). "Airborne Asbestos in Buildings," *Regulatory Toxicology and Pharmacology*, 50, pp. 218 - 225.

Van Orden, D. R., Allison, K. A. and Lee, R. J. (2008). "Differentiating Amphibole Asbestos from Non-Asbestos in a Complex Mineral Environment," *Indoor and Built Environment*, 17, pp. 58-68.

Cohen, H. J. and **Van Orden, D. R.** (2008). "Asbestos Exposures of Mechanics Performing Clutch Service on Motor Vehicles," *Journal of Occupational and Environmental Hygiene*, 5, pp. 148–156.

Andreozi, A., Ballirano, P., Bruni, B.M., Gianfagna, A., Gunter, M.E., Mazziotti-Tagliani, S., Pacella, A., Paoletti, L., Lee, R.J., **Van Orden, D.R.**, and Allison, K. (2007). "Fibrous amphiboles from Biancavilla: Crystal chemistry, environmental aspects, and health studies," RiMG Amphiboles short course, Rome, Italy.

Van Orden, D. R., McGrath, D. B., Howard, R. M., and Guerrero, P. (2007). "Applicable Polarized Light Microscopy Method for Asbestos NESHAP Compliance Testing," *Microscope*, 55, pp. 75-80.

Lee, R. J., Strohmeier, B. R., Bunker, K. L., and **Van Orden, D. R.** (2007). "Naturally Occurring Asbestos – A Recurring Public Policy Challenge," presented at the Geological Society of America Annual Meeting and Exposition, October 29, 2007. Geological Society of America *Abstracts with Programs*, 39, pp. 296.

Howard, R. M., Guerrero, P., McGrath, D. B., and **Van Orden, D. R.** (2007). "The EPA's Prosecution of Clean Air Act Asbestos NESHAP Cases Based Upon Nonbinding Bulk Test Methods," *San Diego Law Review*, 44, pp. 173 – 230.

Lee, R. J., Bowman, G. A., Strohmeier, B. R., **Van Orden, D. R.** (2007). "Limitations of Current Analytical Protocols as They Relate to Public Policy: The Libby, Montana Puzzle," presented at the 2007 Annual Meeting of the American Industrial Hygiene Association, Philadelphia, PA.

Sanchez, M. S., Gunter, M. E., Dyar, M. D., Badger, S. R., Hobbs, G. C., **Van Orden, D. R.**, and Potter, M. S. (2006). "Characterization Of Historical Amphibole Samples From The Former Vermiculite Mine Near Libby, Montana U.S.A.," poster presented at the 2006 Annual Meeting of the Geological Society of America, Philadelphia, PA, October 24, 2006.

Lee, R. J., Bowman, G. A., Strohmeier, B. R., and **Van Orden, D. R.** (2006). "Naturally Occurring Asbestos: An Alternate Analysis," poster presented at the 2006 Annual Meeting of the Geological Society of America, Philadelphia, PA, October 24, 2006.

Van Orden, D., Lee, R., Badger, S. and Hobbs, G. (2006). "The Importance of Correct Minerals Identification: Application of Mineral Identification to Asbestos Analyses," presented at the Industrial Minerals Association Meeting, Pittsburgh, PA, March 20 – March 22, 2006.

Van Orden, Drew R., Lee, R. J., and Badger, S. (2006). "Characterizing asbestos fiber comminution resulting from preparation of environmental samples," *Powder Technology*, 162, pp. 183 – 189.

Van Orden, Drew R. (2006). "Asbestos," in *Environmental Forensics: Contaminant Specific Guide*, R. D. Morrison and B. L. Murphy, eds., Academic Press, Chapter 2, pp. 19 – 34.

Van Orden, D. R., Lee, R. J., and Allison, K. A. (2005). "A Review of the Analysis of Amphibole Fibers," presented at the SME Annual Meeting, Salt Lake City, UT, February 28 – March 2, 2005. Pre-print 05-75. Blake, C. L., **Van Orden, D. R.**, Banasik, M.; and Harbison, R. D. (2003). "Airborne asbestos concentration from brake changing does not exceed permissible exposure limit", *Regulatory Toxicology and Pharmacology*, 38, pp 58-70.

Banasik, M.; **Van Orden, D. R.**; Blake, C. L.; and Harbison, R. D. (2003). "Automobile Brake Maintenance and Airborne Chrysotile Fiber Exposure," poster session, published as an abstract in *The Toxicologist*, 72 (S-1).

Lange, J. H.; Thomulka, K. W.; Lee, R. J.; **Van Orden, D. R.** (2002). "Surface and Passive Monitoring for Asbestos in an Industrial Facility," *Indoor Built Environment*, 11, pp. 327-333. September 15, 2011 Page 4 of 4.

Lee, R. J., **Van Orden, D.**, Powers, W. H., and Allison, K. A. (2001). "Implications of Analytical Techniques for Asbestos Identification," Presented at the National Stone, Sand & Gravel Association's Environment, Safety, and Health Forum, September 2001.

Lee, R. J.; **Van Orden, D. R.**; and Stewart, I. M. (1999). "Dust and Airborne Concentrations – Is There a Correlation?" *Advances in Environmental Measurement Methods for Asbestos*, ASTM publication STP 1342.

Lee, R. J.; **Van Orden, D. R.**; Dunmyre, G. R.; and Stewart I. M. (1996). "Interlaboratory Evaluation of the Breakup of Asbestos-Containing Dust Particles by Ultrasonic Agitation," *Environmental Science & Technology*, 30, pp. 3010 - 3015.

Lee, R. J.; Dagenhart, T. V.; Dunmyre, G. R.; Stewart, I. M.; and **Van Orden, D. R.** (1996). "Response to Comment on 'Effect of Indirect Sample Preparation Procedures on the Apparent Concentration of Asbestos in Settled Dusts,'" *Environmental Science & Technology*, 30, pp. 1405 - 1406.

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Oehlert, G. A.; Lee, R. J.; and **Van Orden, D. R.** (1995). "Statistical Analysis of Asbestos Fibre Counts," *Environmetrics*, 6, pp. 115 - 116.

Van Orden, D. R.; Lee, R. J.; Bishop, K. M.; Kahane, D.; and Morse, R. (1994). "Evaluation of Ambient Asbestos Concentrations in Buildings Following the Loma Prieta Earthquake," *Regulatory Toxicology and Pharmacology*, 21, pp. 117 - 121.

Lee, R. J.; **Van Orden, D. R.**; Corn, M.; and Crump, K. S. (1992). "Exposure to Airborne Asbestos in Buildings," *Regulatory Toxicology and Pharmacology*, 16, pp. 93 - 107.

Van Orden, D. R.; Stewart, I. M.; and Lee, R. J. (1989). "AHERA Quality Assurance Requirements for the Electron Microscopy Laboratory," presented to the National Asbestos Council, Inc., Sixth Annual Asbestos Abatement Conference and Exposition, Session 42, Anaheim, CA, March, 1989.

Van Orden, D. R. (contributing author) (1988). "Assessing Asbestos Exposure in Public Buildings," US Environmental Protection Agency, Washington, D.C., EPA 560/5-88-002.

Van Orden, D. R. (1986). "Simulation of Continuous Flotation Cells Using Observed Residence Time Distributions," published in *Advances in Mineral Processing*, P. Somasundaran, ed., Society of Mining Engineers.

Van Orden, D. R. (1985). "Simulation of Continuous Flotation Cells Using Observed Residence Time Distributions," presented at the Engineering Science Foundation Conference, Henniker, NH, August 1985.

Austin, L. G.; **Van Orden, D. R.**; McWilliams, B.; and Perez, J. W. (1981). "Breakage Parameters of Some Materials in Smooth Roll Crushers," *Powder Technology*, 28, pp. 245 - 251.

Austin, L. G.; **Van Orden, D. R.**; and Perez, J. W. (1980). "A Preliminary Analysis of Smooth Roll Crushers," *International Journal of Mineral Processing*, 6, pp. 321 - 336.

Van Orden, D. R.; Austin, L. G.; and Hogg, R. (1979). "A Method of Correcting Coulter Counter Size Distributions," *Proceedings of the Technical Program of International Powder and Bulk Solids Handling and Processing*, Philadelphia, PA, May 1979, pp. 161 - 167.

Austin, L. G.; Gallagher, E.; Celik, M.; Shah, J.; and Van Orden, D. R. (1978). "Description of Breakage Parameters of Coal in Various Laboratory Comminution Machines," presented to 1978 Annual Meeting of AIME, Denver, CO, February 1978.